

# **The Contemporary Challenge of Maternal Mortality in the U.S.**

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**[www.birthbythenumbers.org](http://www.birthbythenumbers.org)**

# Outline of the Presentation

1. Clarifying Definitions
2. Historical Context
3. The Strange Case of the Pregnancy Checkbox
4. The Pregnancy Mortality Surveillance System
5. Comparing the U.S. to the Rest of the World
6. The Persistence of Racial Disparities
7. Timing and Maternal Mortality a Public Health Problem
8. The Issue is Broader than Maternal Mortality
9. The Way Forward

# **1. Definitions – the multiple measures of maternal death**

**First a quick side trip into the terms rate and ratio. If you don't find that discussion enthralling you:**

**(a) are a normal human being; and**

**(b) can skip to slide 11 and wonder what you missed.**



# Is Maternal Mortality a Ratio or a Rate?

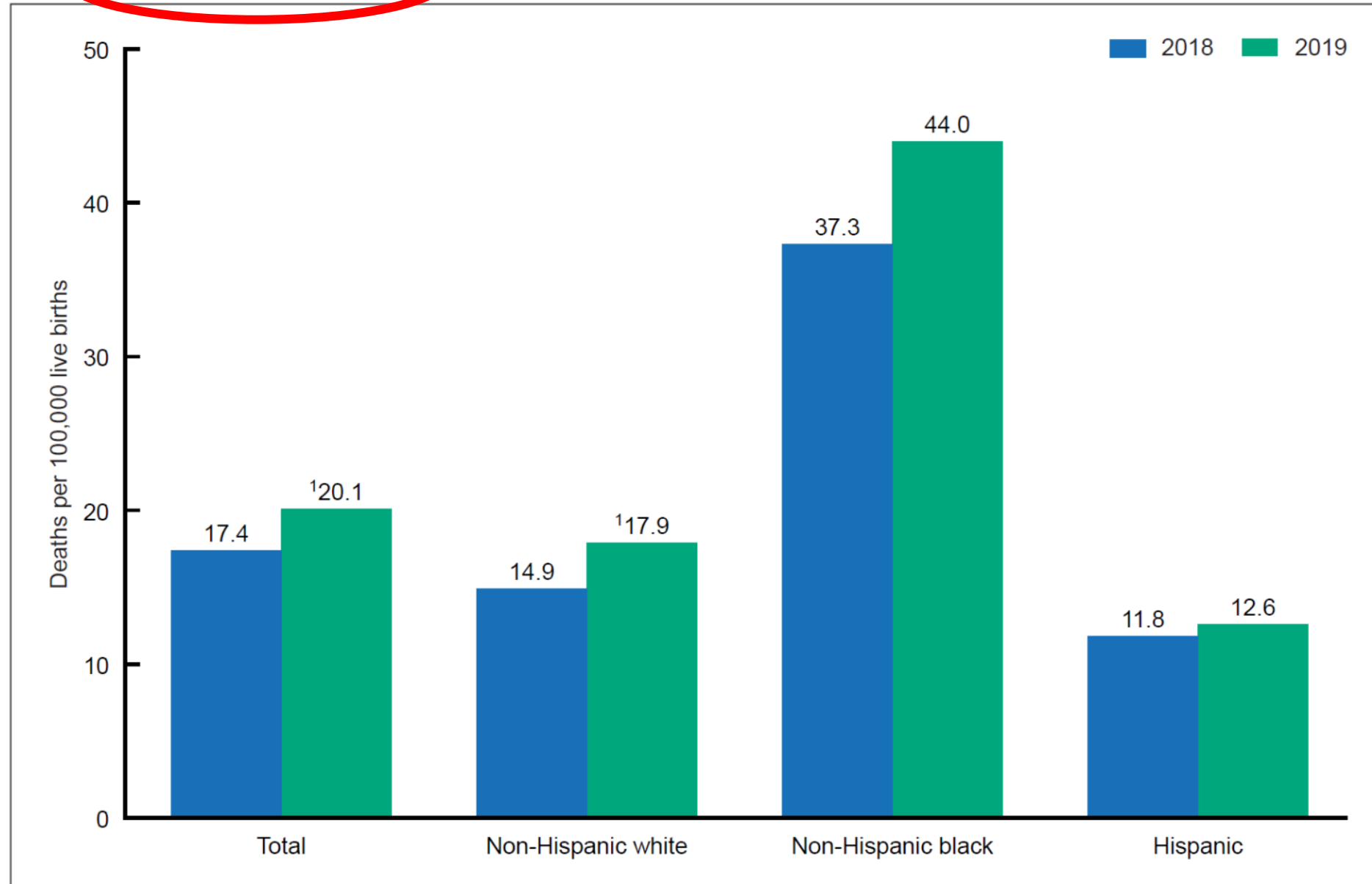
- *WHO reports maternal mortality as a ratio, while the U.S. National Vital Statistics System reports maternal mortality as a rate. What's the difference?*

- **Maternal Mortality Ratio:**

$$\frac{\text{Deaths during pregnancy up to 42 days ppm}}{\text{Live Births}}$$

It is a ratio because all the cases in the numerator (e.g. death during early pregnancy) are not included in the denominator.

**Figure 1. Maternal mortality rates, by race and Hispanic origin: United States, 2018–2019**

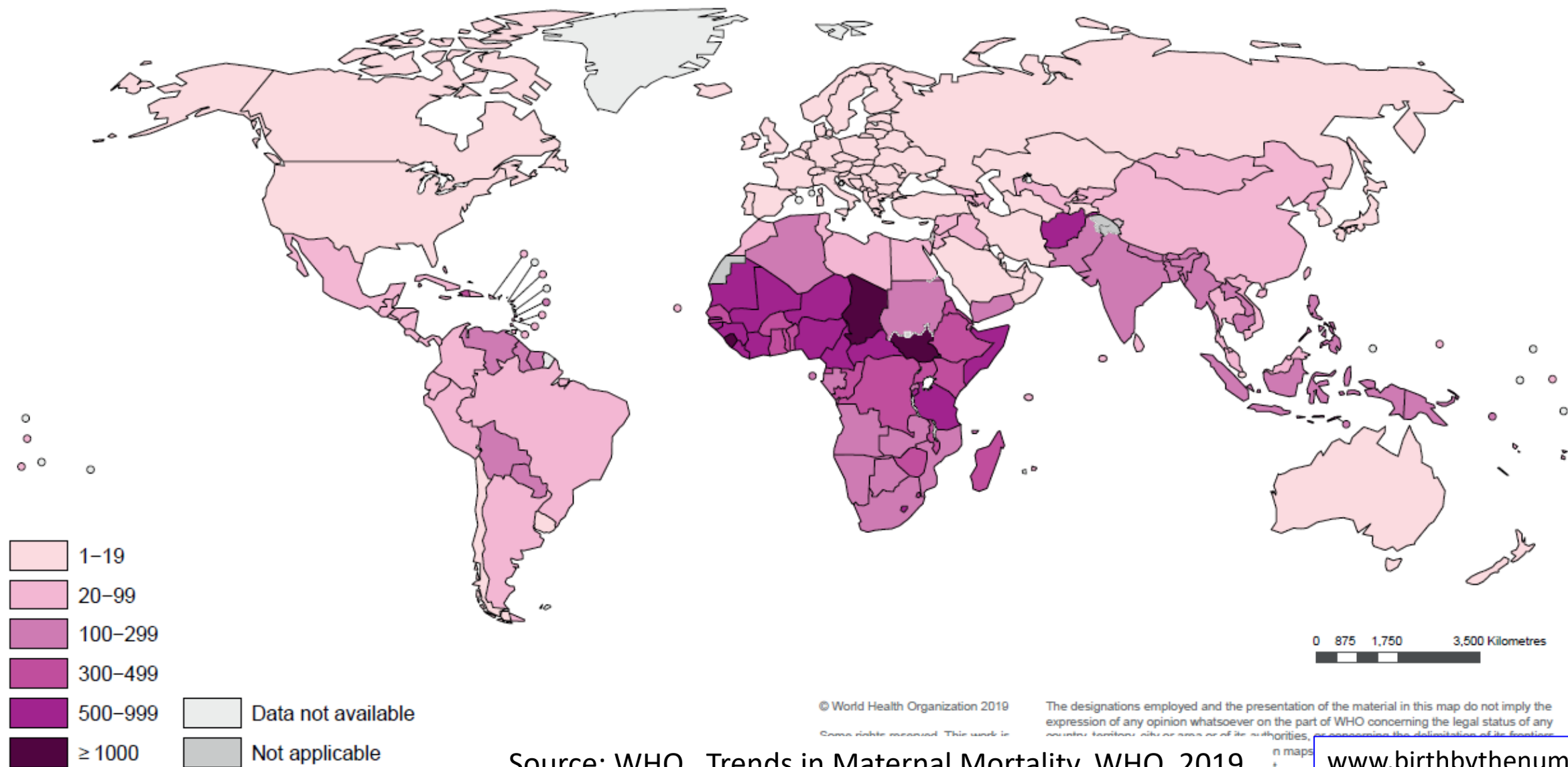


Source: Hoyert DL. Maternal mortality rates in the United States, 2019. NCHS Health E-Stats. 2021.

DOI: <https://doi.org/10.15620/cdc:103855>.

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

Figure 4.1. Maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 2017



Source: WHO. Trends in Maternal Mortality. WHO, 2019.

[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

# Is Maternal Mortality a Ratio or a Rate?

- **Rate**: # of events / total persons at risk in the population (usually % or number per 1,000/100,000)
- **Ratio**: # of events (or persons) / some *comparable* cohort of people or events

# Is Maternal Mortality a Ratio or a Rate?

- **RATE**: The frequency of an event in a population. All the cases in the numerator are included in the denominator

## Example:

*Teen Birth Rate*

Births to women 15-19

All women 15-19

- **RATIO**: simply divides one number by another – all the cases in the numerator are not included in the denominator

## Example:

*Maternal Mortality Ratio*

Maternal Deaths

Live Births

# So, why do we use maternal mortality ratios internationally?

*Because most countries don't have clear measurement of the total number of pregnancies, but do have some record of total births.*

# **The three widely used definitions of maternal mortality:**

**1. Pregnancy associated death**

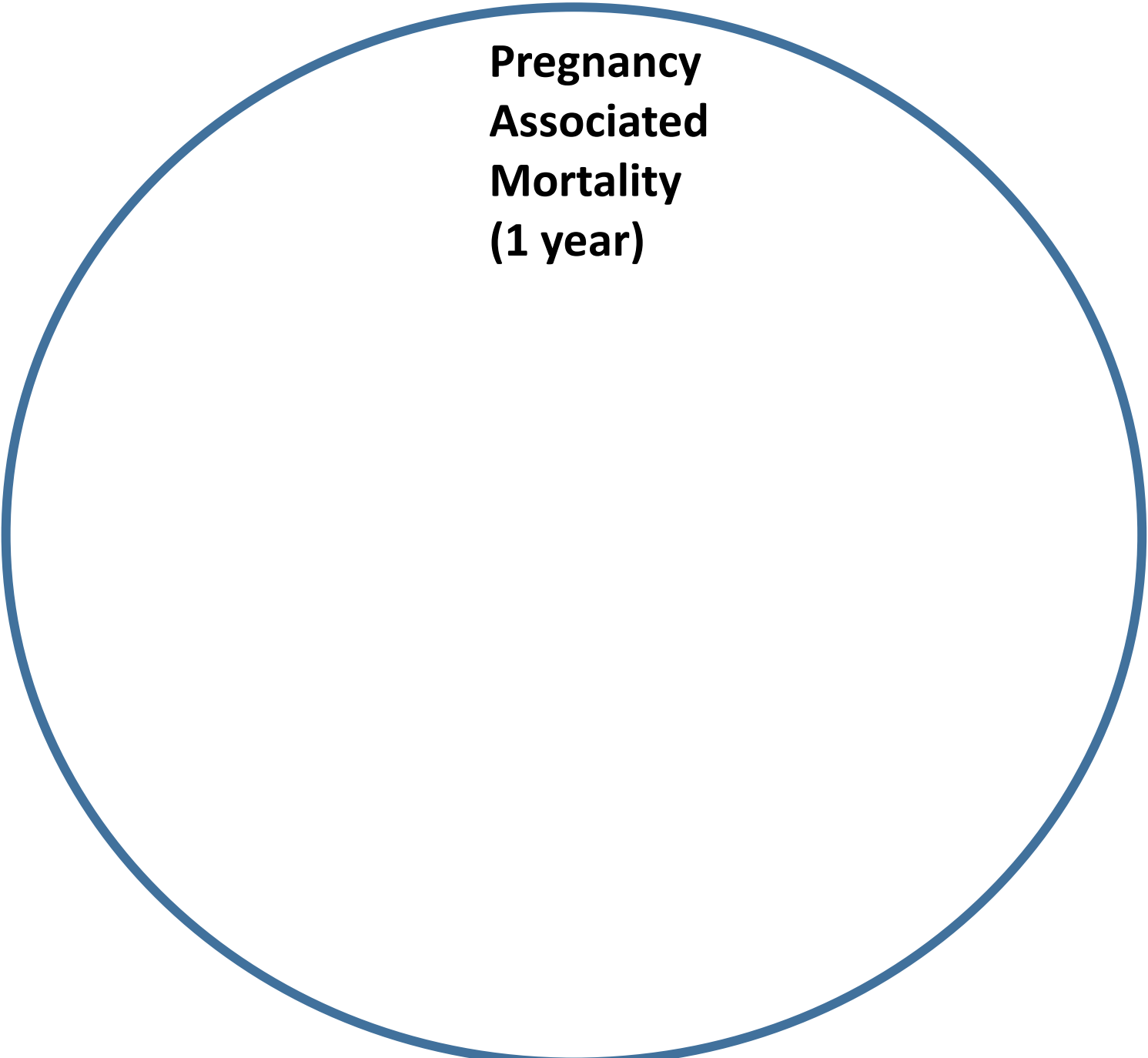
**2. Pregnancy related death**

**3 Maternal mortality**

# Three Definitions (in the U.S.)

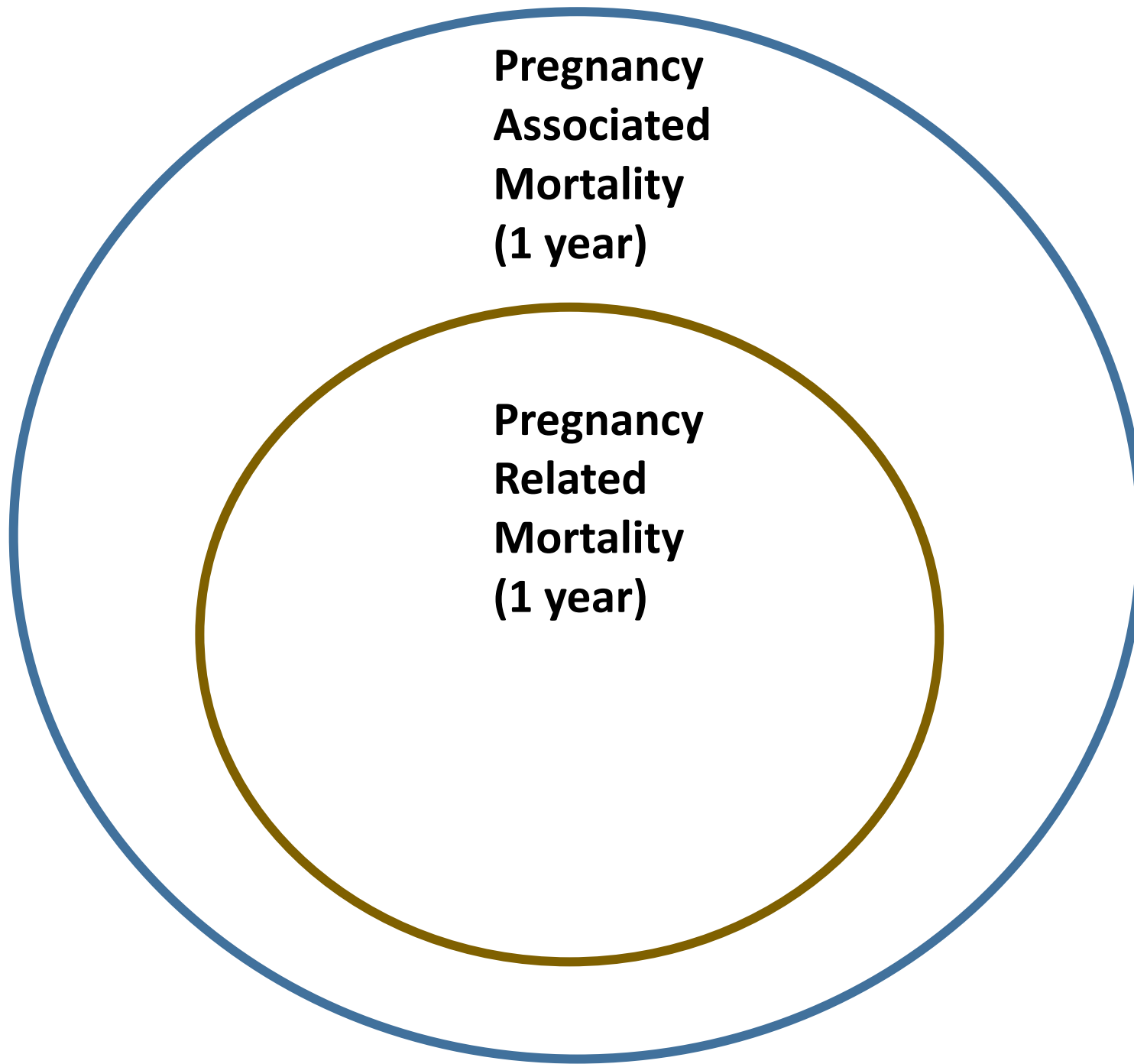
- **Pregnancy Associated Death** – The death of a women while pregnant or *within one year* of termination of pregnancy, *irrespective of cause*. (*WHO calls these “pregnancy related”*). *Starting point for analyses*.
- **Maternal Mortality Ratio** – the death of a woman *while pregnant or within 42 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*.



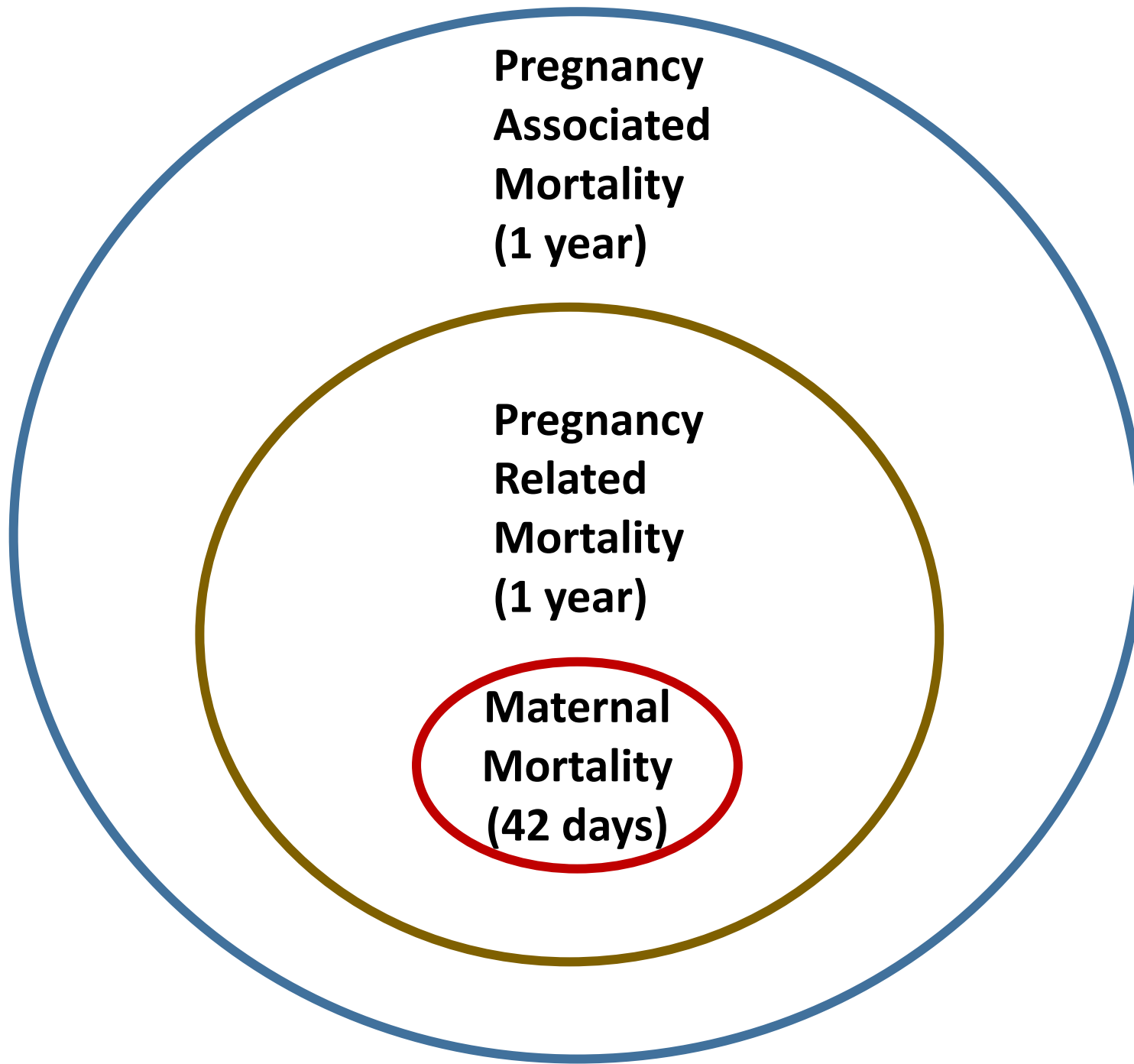


**Pregnancy  
Associated  
Mortality  
(1 year)**

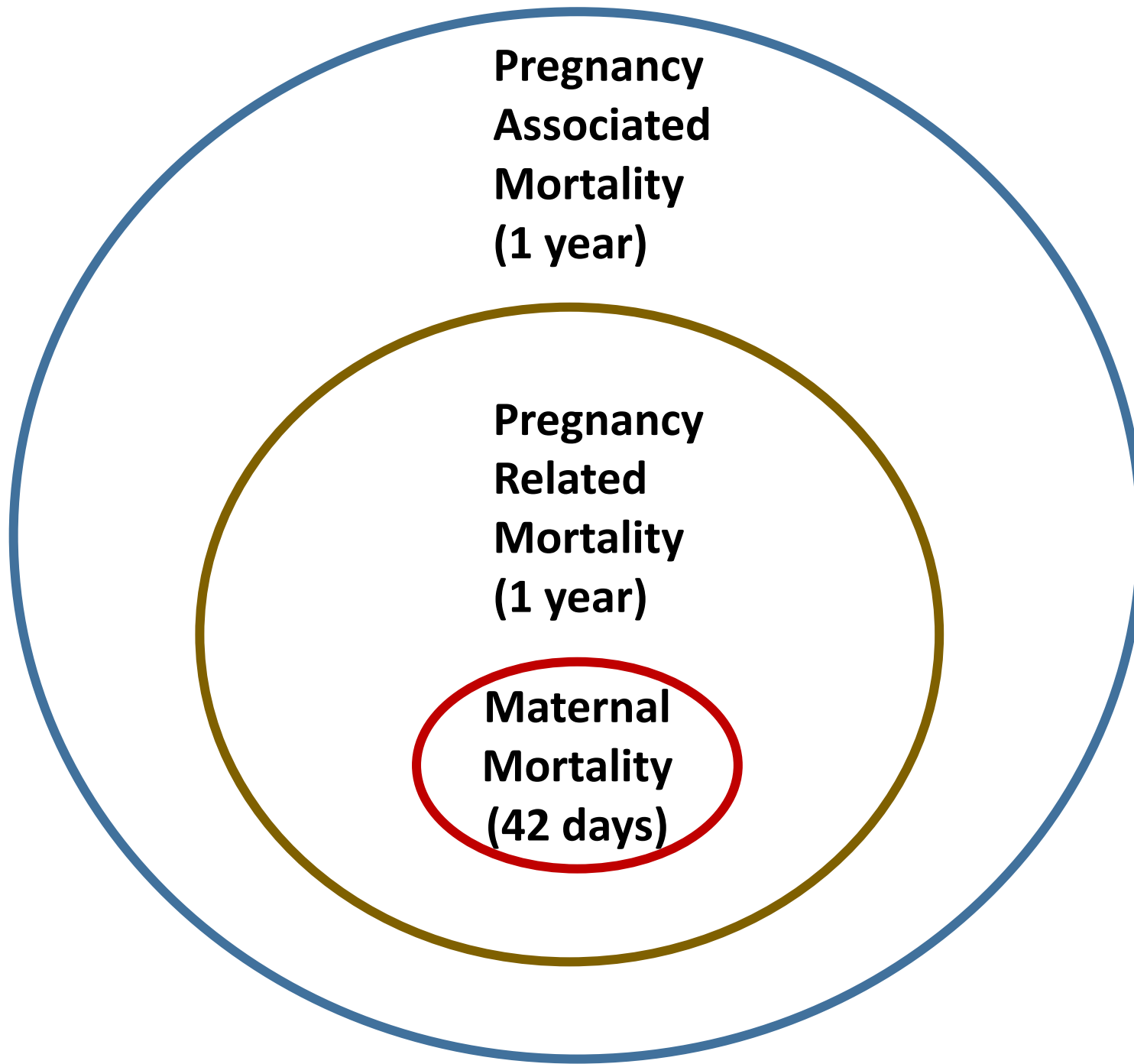
**Pregnancy  
Associated  
Mortality:**  
**All Deaths women  
of reprod. age  
pregnancy to 1  
year ppm**



**Pregnancy  
Related  
Mortality:**  
All Deaths  
women of  
reprod. age  
pregnancy to  
**1 year ppm**  
Related to the  
pregnancy



**Maternal Mortality:**  
All Deaths women  
of reprod. age  
pregnancy to **42**  
**days ppm Related**  
**to the pregnancy**

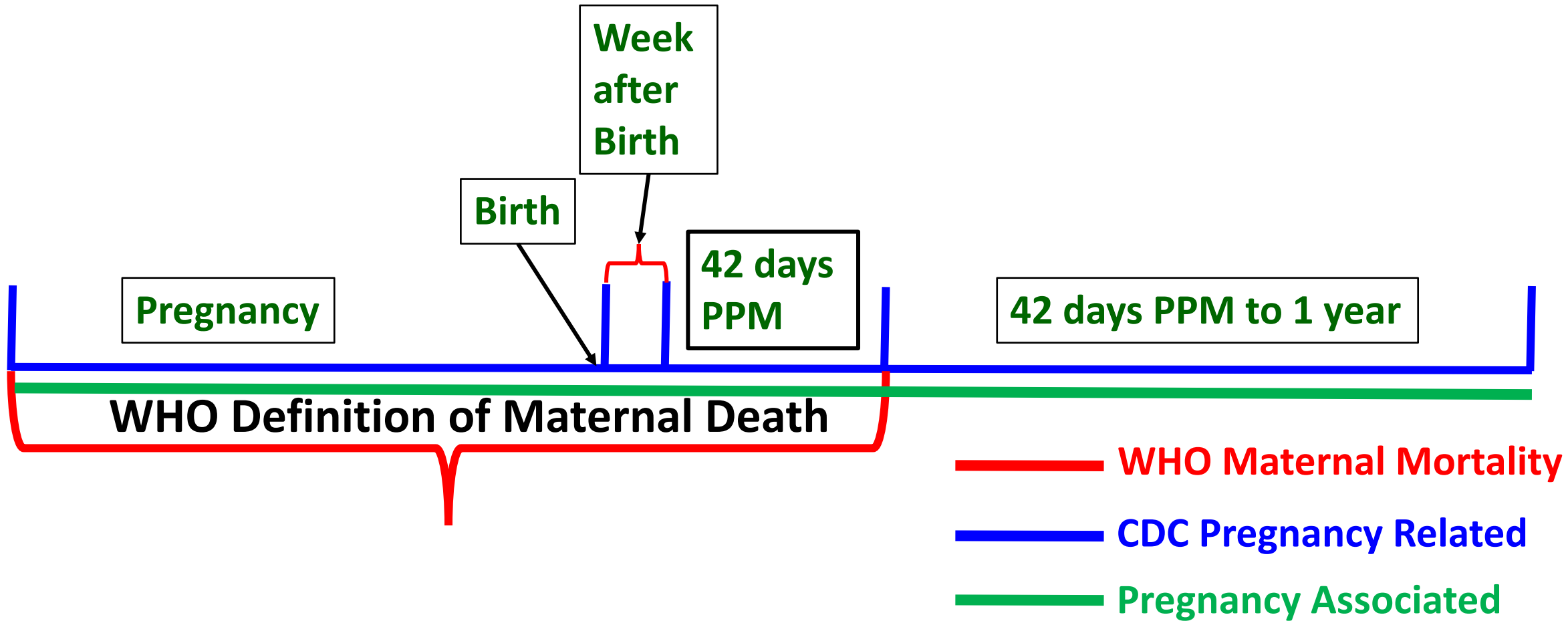


**Pregnancy Associated Mortality:** Deaths during pregnancy and up to **1 year postpartum**

**Pregnancy Related Mortality:** Deaths during pregnancy and up to **1 year postpartum** **& related to the pregnancy**

**Maternal Mortality:** Deaths during pregnancy and up to **42 days postpartum** **& related to the pregnancy**

# Timeline of Maternal Mortality Definitions



PPM – postpartum –period after the birth

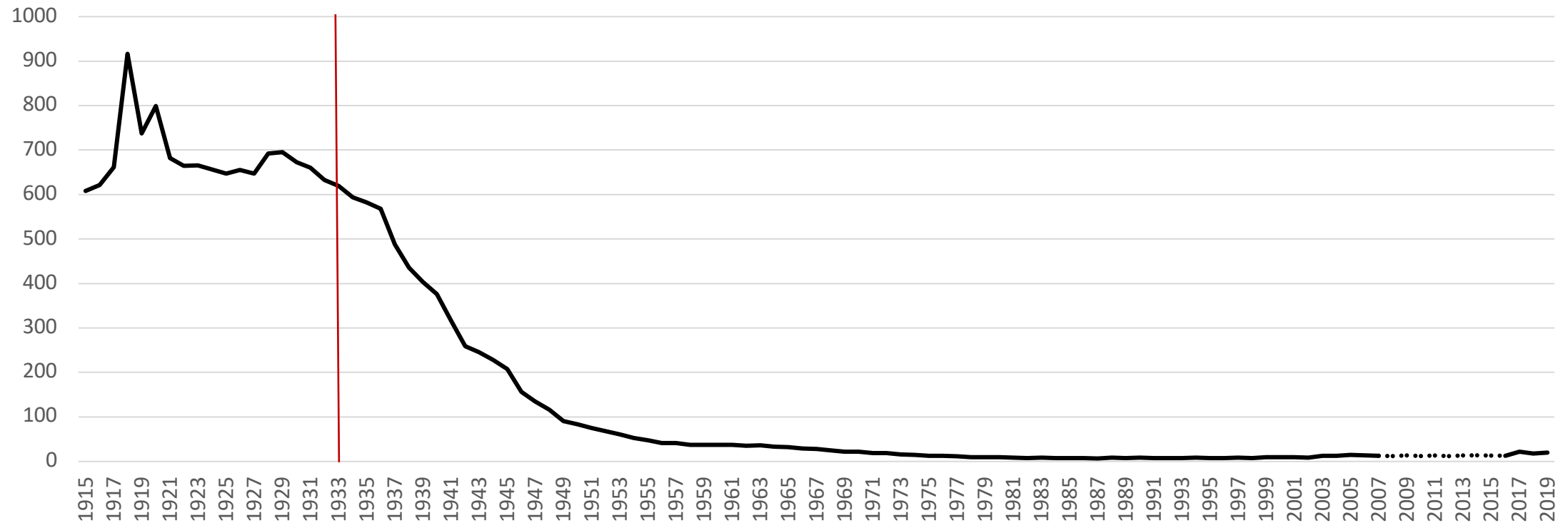
## **2. The Historical Trend in U.S. Maternal Mortality**

# Declaring Premature Victory

*“An examination of the rates for the different states indicates areas in which further improvement can be expected, but it is clear that maternal mortality is no longer a nationwide problem.....Childbearing has been made quite safe.”*

- Maternal Deaths One in a Thousand. *JAMA*, 1950; 144: 1096-7.
- *At the time the maternal mortality rate was 100 per 100,000*

# U.S. Maternal Mortality (per 100,000 births), 1915-2019



Sources: 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) 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; 2017: Rossen. *Impact of Pregnancy Checkbox, U.S. 1999-2017*.NCHS.VitalHlthStat.3(44);2020.; 2018: U.S. Hoyert DL etal. *NVSR*; vol 69 no 2. Hyattsville, MD: NCHS. 1/30/2020.



# Year State was Added to the Death Registry

Year	State	Year	State	Year	State
1880-----	Massachusetts. New Jersey. District of Columbia. <sup>1</sup>	1908-----	Washington. Wisconsin.	1919-----	Florida. Mississippi.
1890-----	Connecticut. Delaware. <sup>2</sup> New Hampshire. New York. Rhode Island. Vermont.	1909-----	Ohio.	1920-----	Nebraska.
1900-----	Maine. Michigan. Indiana.	1910-----	Minnesota. Montana. Utah.	1922-----	Georgia. <sup>5</sup> Idaho. Wyoming.
1906-----	California. Colorado. Maryland. Pennsylvania. South Dakota. <sup>3</sup>	1911-----	Kentucky. Missouri.	1923-----	Iowa.
		1913-----	Virginia.	1924-----	North Dakota.
		1914-----	Kansas.	1925-----	Alabama. West Virginia.
		1916-----	South Carolina. North Carolina. <sup>4</sup>	1926-----	Arizona.
		1917-----	Tennessee.	1927-----	Arkansas.
		1918-----	Illinois. Louisiana. Oregon.	1928-----	Oklahoma.
				1929-----	Nevada. New Mexico.
				1933-----	Texas.
				1959-----	Alaska.
				1960-----	Hawaii.

<sup>1</sup> Included as a State.

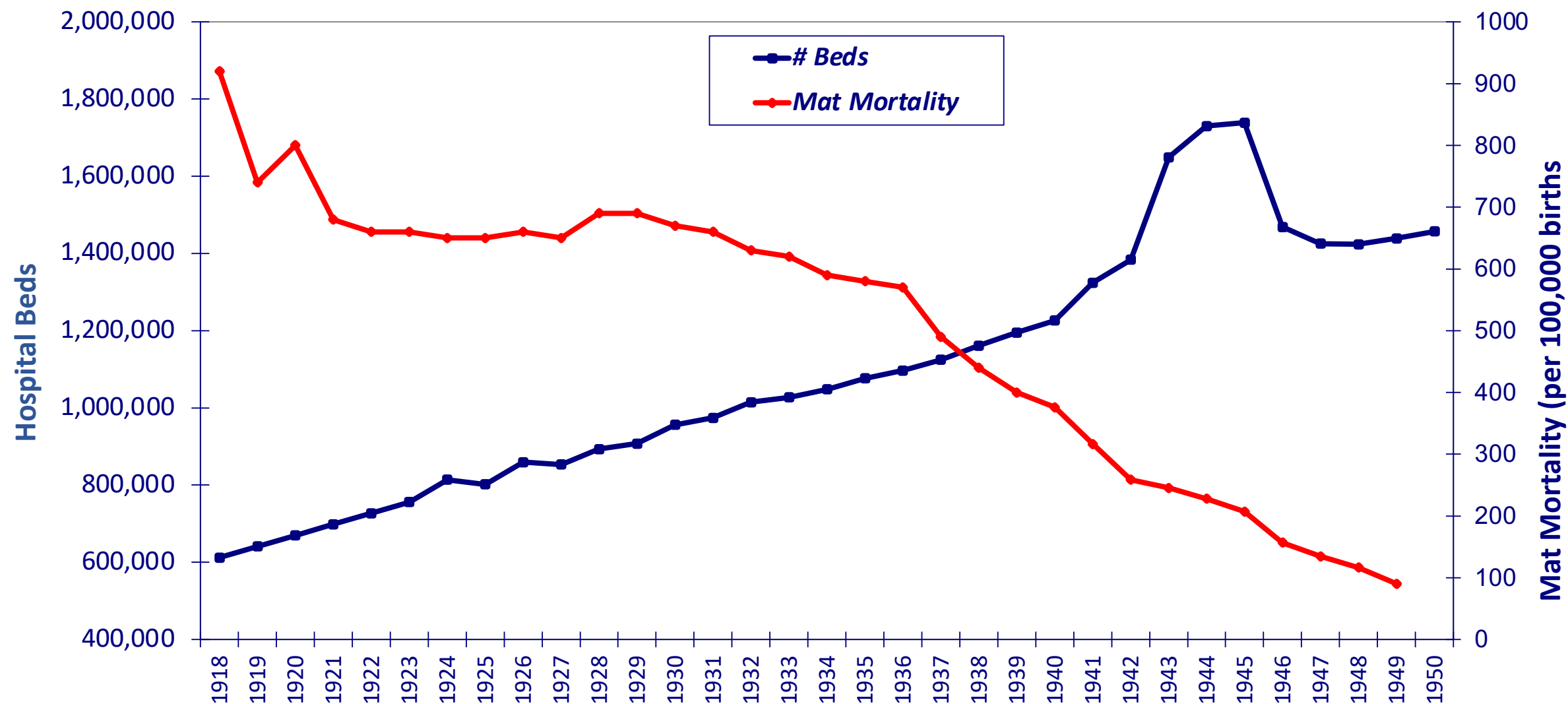
<sup>2</sup> Dropped from the registration system in 1900; readmitted in 1919.

<sup>3</sup> Dropped from the registration system in 1910; readmitted in 1930.

<sup>4</sup> Included only municipalities with populations of 1,000 or more in 1900 (about 16 percent of the total population); the remainder of the State was added to the system in 1916.

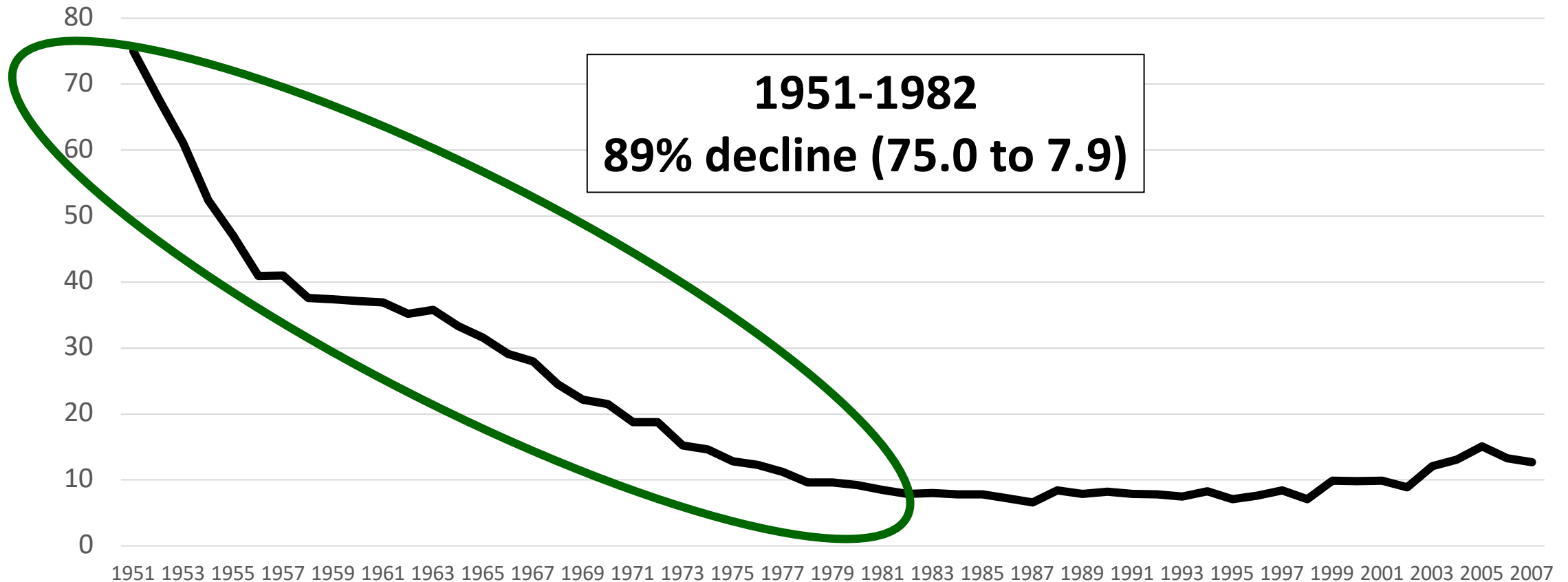
<sup>5</sup> Dropped from the registration system in 1925; readmitted in 1928.

# Number of U.S. Hospital Beds and Maternal Mortality, 1918-1950



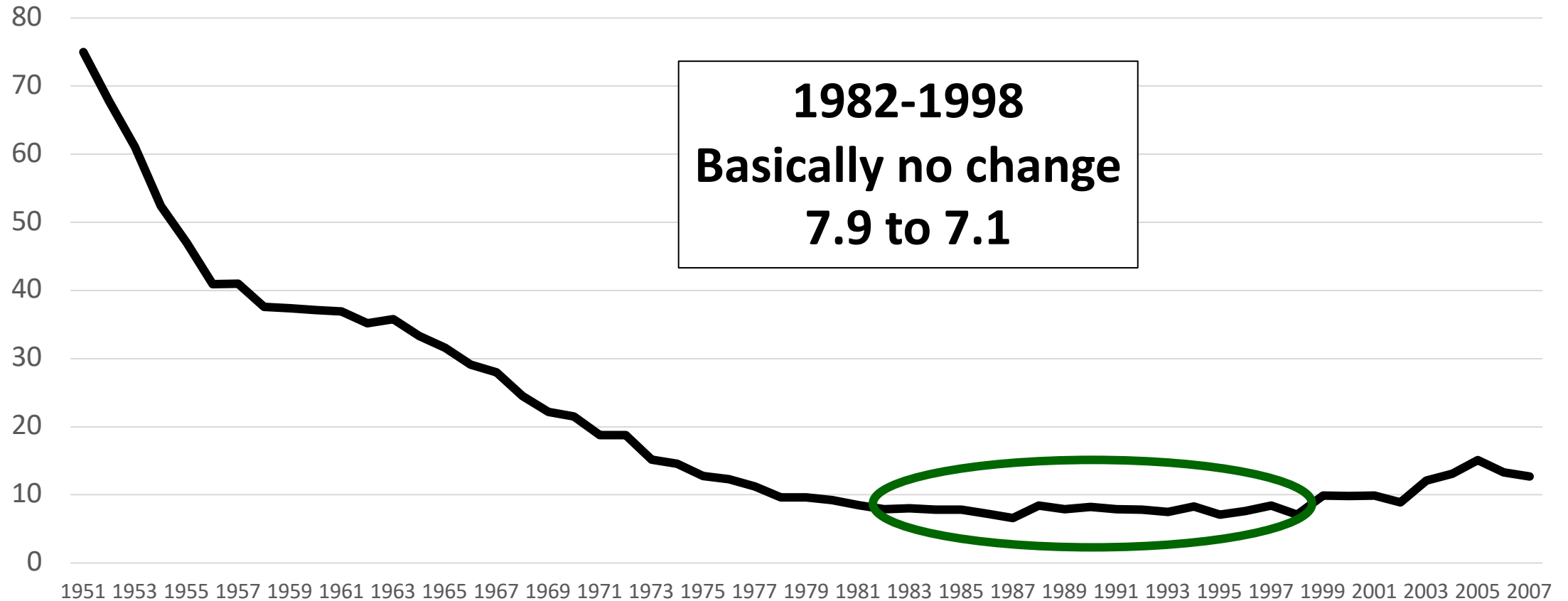
Sources: Hospital beds- Statistical Abstract & JAMA: Maternal mortality - NCHS. *Vital Statistics Rates In The United States 1940-1960.*

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



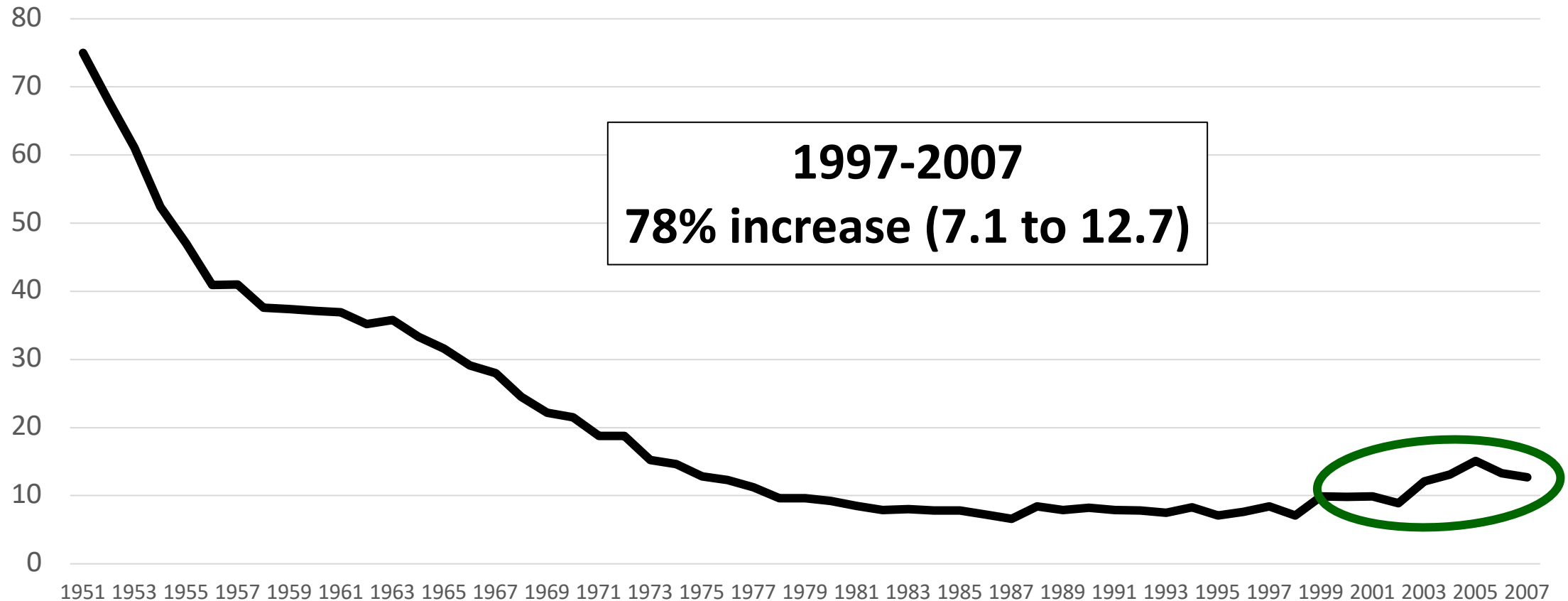
Source: NCHS. Deaths: Final Data. Annual Reports.

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



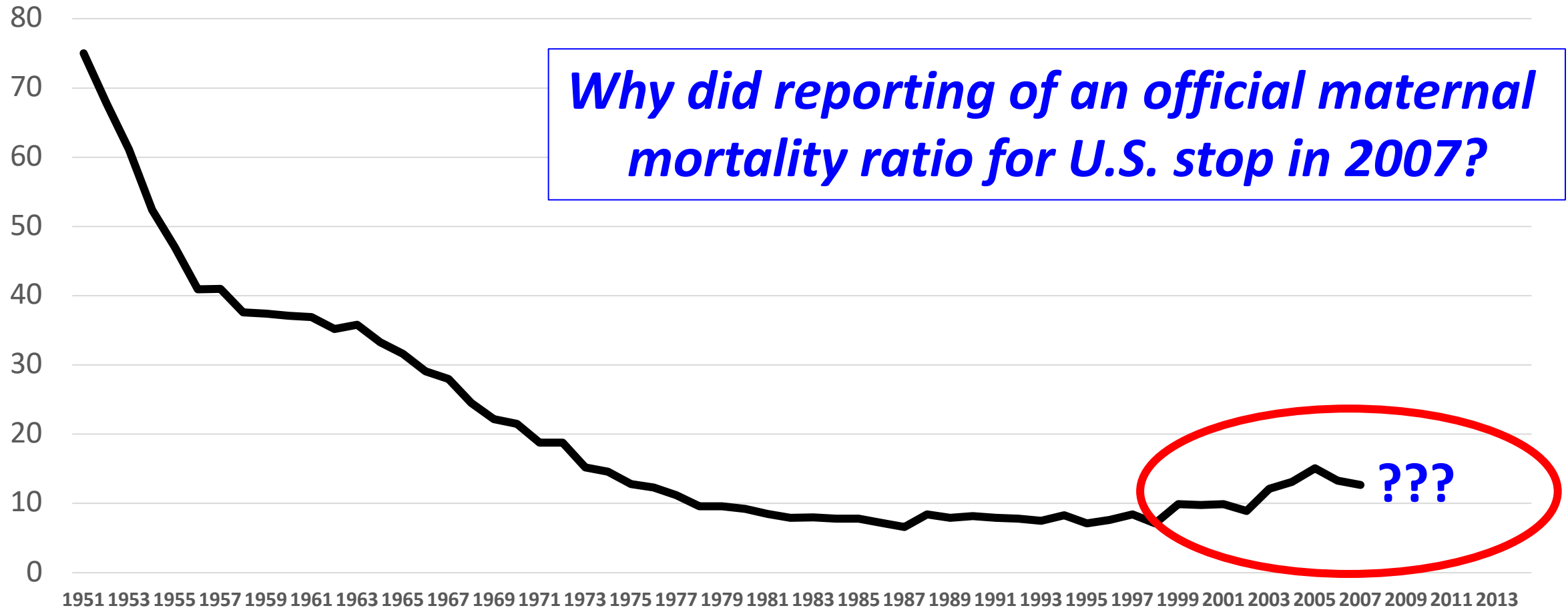
Source: NCHS. Deaths: Final Data. Annual Reports.

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



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

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



# Last reporting (2007)of a maternal mortality rate by NCHS

**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 O98–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”]

Cause of death (based on ICD–10, 2004)	Number					Rate				
	All origins <sup>1</sup>	Hispanic	Non-Hispanic <sup>2</sup>	Non-Hispanic white <sup>3</sup>	Non-Hispanic black <sup>3</sup>	All origins <sup>1</sup>	Hispanic	Non-Hispanic <sup>2</sup>	Non-Hispanic white <sup>3</sup>	Non-Hispanic black <sup>3</sup>
Maternal causes . . . . .(A34,O00–O95,O98–O99)	548	95	453	242	178	12.7	8.9	14.1	10.5	28.4
Pregnancy with abortive outcome . . . . .(O00–O07)	31	5	26	8	17	0.7	*	0.8	*	*
Ectopic pregnancy . . . . .(O00)	14	1	13	2	11	*	*	*	*	*
Spontaneous abortion . . . . .(O03)	9	2	7	3	3	*	*	*	*	*
Medical abortion . . . . .(O04)	–	–	–	–	–	*	*	*	*	*
Other abortion . . . . .(O05)	1	–	1	–	1	*	*	*	*	*
Other and unspecified pregnancy with abortive outcome . . . . .(O01–O02,O06–O07)	7	2	5	3	2	*	*	*	*	*
Other direct obstetric causes . . . . .(A34,O10–O92)	362	67	295	153	117	8.4	6.3	9.2	6.6	18.7
Eclampsia and pre-eclampsia . . . . .(O11,O13–O16)	64	13	51	29	19	1.5	*	1.6	1.3	*
Hemorrhage of pregnancy and childbirth and placenta previa . . . . .(O20,O44–O46,O67,O72)	41	12	29	18	9	0.9	*	0.9	*	*
Complications predominately related to the puerperium . . . . .(A34,O85–O92)	93	15	78	35	31	2.2	*	2.4	1.5	4.9
Obstetrical tetanus . . . . .(A34)	–	–	–	–	–	*	*	*	*	*
Obstetric embolism . . . . .(O88)	33	6	27	12	8	0.8	*	0.8	*	*
Other complications predominately related to the puerperium (O85–O87,O89–O92)	60	9	51	23	23	1.4	*	1.6	1.0	3.7
All other direct obstetric causes . . . . .(O10,O12,O21–O43,O47–O66,O68–O71,O73–O75)	164	27	137	71	58	3.8	2.5	4.3	3.1	9.2
Obstetric death of unspecified cause . . . . .(O95)	20	4	16	7	7	0.5	*	*	*	*
Indirect obstetric causes . . . . .(O98–O99)	135	19	116	74	37	3.1	*	3.6	3.2	5.9
Maternal causes more than 42 days after delivery or termination of pregnancy . . . . .(O96–O97)	221	39	181	92	70	5.1	3.7	5.6	4.0	11.2
Death from any obstetric cause occurring more than 42 days but less than 1 year after delivery . . . . .(O96)	215	38	176	92	66	5.0	3.6	5.5	4.0	10.5
Death from sequelae of direct obstetric causes . . . . .(O97)	6	1	5	–	4	*	*			

***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***



# 3. The Case of the Pregnancy Checkbox

*“This difficulty [in measuring maternal mortality] would be solved easily if universal birth and stillbirth registration was practiced and if death certificates required a statement as to the association of the puerperal state.”*

# 3. The Case of the Pregnancy Checkbox

*“This difficulty [in measuring maternal mortality] would be solved easily if universal birth and stillbirth registration was practiced and if death certificates required a statement as to the association of the puerperal state.”*

*Committee on Maternal Welfare. Maternal Mortality in Philadelphia 1931-1933 (1934)*

# Quick note on the federal reporting system of births and deaths.

- There is no centralized “national” reporting system in the U.S.
- Birth and death data is collected at the local level, compiled at the state level, and then selected items are sent to the National Vital Statistics System (NVSS).
- The states and the NVSS periodically negotiate an agreement (seen in the *U.S. Standard Certificate of Death*) on the specific items from state data collection used in the national file. These revisions were last made in 1975, 1989, and 2003.
- The failure to officially report U.S. maternal deaths from 2008-18 was a direct result of the 2003 revisions that attempted to improve reporting.

# The Check Box

## Determining Pregnancy Status to Improve Maternal Mortality Surveillance

Andrea P. MacKay, MSPH, Roger Rochat, MD, Jack C. Smith, MS, Cynthia J. Berg, MD

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

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

*16 States  
already had a  
checkbox as  
far back as  
1991-1992,  
but with  
different  
wording*

State	Wording	Wording of “Pregnancy Checkbox” in states prior to 2003	Time periods used: 42 days; 6 weeks; 3 months; 90 days; 12 mos; “last year”
Alabama	Was there a pregnancy in last 42 days? (Specify Yes, No, or dk.)		
California	If female, pregnant in last year? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> UNK		
Florida	If female, was there a pregnancy in the past 3 months?      Yes      No		
Idaho	If female aged  0–54: <input type="checkbox"/> not preg  win past yr <input type="checkbox"/> preg at time of death <input type="checkbox"/> not pregnant, but preg within 42 days of death <input type="checkbox"/> not pregnant but preg 43 days to 1 yr before death <input type="checkbox"/> unknown if preg w/in the past yr		
Illinois	If female, was there a pregnancy in past three months?  Yes <input type="checkbox"/> No <input type="checkbox"/>		
Indiana	Was decedent pregnant or 90 days postpartum? (Yes or no)		
Iowa	If female, was there a pregnancy in the past 12 months? (Specify yes or no)		
Kentucky	If female, was there a pregnancy in the past 12 months? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Louisiana	If deceased was female 10–49, was she pregnant in the last 90 days? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk		
Maryland	If female: Was decedent pregnant in the past 12 months? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown Separate field  on dates of death and delivery support capability to compute the other categories in the standard.		
Minnesota	Was female pregnant: At death?    yes    no      In last 12 months?    yes    no    unknown		
Mississippi	Had decedent been pregnant within 90 days prior to death? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Missouri	If deceased was female 10–49, was she pregnant in the last 90 days? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Un		
Montana	If female: <input type="checkbox"/> not preg within past year <input type="checkbox"/> not preg but preg within 42 days of death <input type="checkbox"/> not preg but pregnant 43 days to 1 year before death <input type="checkbox"/> pregnant at time of death <input type="checkbox"/> unknown if preg within past year		
New Jersey	If female, was she pregnant at death, or any time 90 days prior to death <input type="checkbox"/> Yes <input type="checkbox"/> No		
New Mexico	Was decedent pregnant within last 6 weeks? <input type="checkbox"/> Yes <input type="checkbox"/> No		
North Dakota	Was deceased pregnant within 18 months of death? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Nebraska	If female, was there a pregnancy in the past 3 months?  Yes <input type="checkbox"/> No <input type="checkbox"/>		
Texas	Was decedent pregnant at time of death <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> UNK within last 12 MO <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> UN		
Virginia	If female, was there a pregnancy in past 3 months?  Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>		
		Source: Hoyert DL, NVSR; vol 69 no 1. Hyattsville, MD: NCHS. 2020.	
		www.birthbythenumbers.org	



# Revised (2003) U.S. Standard Certificate of Death

LOCAL FILE NO.		U.S. STANDARD CERTIFICATE OF DEATH		STATE FILE NO.	
1. DECEDENT'S LEGAL NAME (Include AKA's if any) (First, Middle, Last)		2. SEX		3. SOCIAL SECURITY NUMBER	
4a. AGE-Last Birthday (Years)		4b. UNDER 1 YEAR Months Days		4c. UNDER 1 DAY Hours Minutes	
5. DATE OF BIRTH (Mo/Day/Yr)		6. BIRTHPLACE (City and State or Foreign Country)			
7a. RESIDENCE-STATE		7b. COUNTY		7c. CITY OR TOWN	
7d. STREET AND NUMBER		7e. APT. NO.		7f. ZIP CODE	
7g. INSIDE CITY LIMITS? <input type="checkbox"/> Yes <input type="checkbox"/> No					
8. EVER IN US ARMED FORCES? <input type="checkbox"/> Yes <input type="checkbox"/> No		9. MARITAL STATUS AT TIME OF DEATH <input type="checkbox"/> Married <input type="checkbox"/> Married, but separated <input type="checkbox"/> Widowed <input type="checkbox"/> Divorced <input type="checkbox"/> Never Married <input type="checkbox"/> Unknown		10. SURVIVING SPOUSE'S NAME (If wife, give name prior to first marriage)	
11. FATHER'S NAME (First, Middle, Last)		12. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last)			
13a. INFORMANT'S NAME		13b. RELATIONSHIP TO DECEDENT		13c. MAILING ADDRESS (Street and Number, City, State, Zip Code)	
14. PLACE OF DEATH (Check only one - see instructions)					
15. IF DEATH OCCURRED IN A HOSPITAL: <input type="checkbox"/> Inpatient <input type="checkbox"/> Emergency Room/Outpatient <input type="checkbox"/> Dead on Arrival					
16. IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL: <input type="checkbox"/> Hospice facility <input type="checkbox"/> Nursing home/Long term care facility <input type="checkbox"/> Decedent's home <input type="checkbox"/> Other (Specify):					
17. FACILITY NAME (If not institution, give street & number)		18. CITY OR TOWN, STATE, AND ZIP CODE		19. COUNTY OF DEATH	
20. METHOD OF DISPOSITION: <input type="checkbox"/> Burial <input type="checkbox"/> Cremation <input type="checkbox"/> Donation <input type="checkbox"/> Entombment <input type="checkbox"/> Removal from State <input type="checkbox"/> Other (Specify):		21. PLACE OF DISPOSITION (Name of cemetery, crematory, other place)			
22. LOCATION-CITY, TOWN, AND STATE		23. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY			
24. SIGNATURE OF FUNERAL SERVICE LICENSEE OR OTHER AGENT		25. LICENSE NUMBER (Of Licensee)			
ITEMS 24-28 MUST BE COMPLETED BY PERSON WHO PRONOUNCES OR CERTIFIES DEATH					
26. DATE PRONOUNCED DEAD (Mo/Day/Yr)		27. TIME PRONOUNCED DEAD			
28. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable)		29. LICENSE NUMBER		30. DATE SIGNED (Mo/Day/Yr)	
31. ACTUAL OR PRESUMED DATE OF DEATH (Mo/Day/Yr) (Spell Month)		32. ACTUAL OR PRESUMED TIME OF DEATH		33. WAS MEDICAL EXAMINER OR CORONER CONTACTED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
34. CAUSE OF DEATH (See instructions and examples)					
35. 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): _____					
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. _____					
PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I					
36. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No					
37. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No					
38. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown					
39. 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					
40. 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					
41. DATE OF INJURY (Mo/Day/Yr) (Spell Month)		42. TIME OF INJURY		43. PLACE OF INJURY (e.g., Decedent's home, construction site, restaurant, wooded area)	
44. LOCATION OF INJURY: State: _____ City or Town: _____		45. INJURY AT WORK? <input type="checkbox"/> Yes <input type="checkbox"/> No			
46. Street & Number: _____ Apartment No.: _____ Zip Code: _____		47. DESCRIBE HOW INJURY OCCURRED:			
48. IF TRANSPORTATION INJURY, SPECIFY: <input type="checkbox"/> Driver/Operator <input type="checkbox"/> Passenger <input type="checkbox"/> Native Hawaiian <input type="checkbox"/> Other (Specify):					
49. CERTIFIER (Check only one): <input type="checkbox"/> Certifying physician-To the best of my knowledge, death occurred due to the cause(s) and manner stated. <input type="checkbox"/> Pronouncing & Certifying physician-To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner stated. <input type="checkbox"/> Medical Examiner/Coroner-On the basis of examination, and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner stated.					
Signature of certifier: _____					
50. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 32)					
51. TITLE OF CERTIFIER		52. LICENSE NUMBER		53. DATE CERTIFIED (Mo/Day/Yr)	
54. FOR REGISTRAR ONLY- DATE FILED (Mo/Day/Yr)					
55. DECEDENT'S EDUCATION-Check the box that best describes the highest degree or level of school completed at the time of death. <input type="checkbox"/> 8th grade or less <input type="checkbox"/> 9th - 12th grade; no diploma <input type="checkbox"/> High school graduate or GED completed <input type="checkbox"/> Some college credit, but no degree <input type="checkbox"/> Associate degree (e.g., AA, AS) <input type="checkbox"/> Bachelor's degree (e.g., BA, BS, BS) <input type="checkbox"/> Master's degree (e.g., MA, MS, MEd, MEd, MEd, MEd) <input type="checkbox"/> Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)					
56. DECEDENT OF HISPANIC ORIGIN? Check the box that best describes whether the decedent is Spanish/Hispanic/Latino. Check the "No" box if decedent is not Spanish/Hispanic/Latino. <input type="checkbox"/> No, not Spanish/Hispanic/Latino <input type="checkbox"/> Yes, Mexican, Mexican American, Chicano <input type="checkbox"/> Yes, Puerto Rican <input type="checkbox"/> Yes, Cuban <input type="checkbox"/> Yes, other Spanish/Hispanic/Latino (Specify): _____					
57. DECEDENT'S RACE (Check one or more races to indicate what the decedent considered himself or herself to be) <input type="checkbox"/> White <input type="checkbox"/> Black or African American <input type="checkbox"/> American Indian or Alaska Native (Name of the enrolled or principal tribe) _____ <input type="checkbox"/> Asian Indian <input type="checkbox"/> Chinese <input type="checkbox"/> Filipino <input type="checkbox"/> Japanese <input type="checkbox"/> Korean <input type="checkbox"/> Vietnamese <input type="checkbox"/> Other Asian (Specify): _____ <input type="checkbox"/> Native Hawaiian <input type="checkbox"/> Guamanian or Chamorro <input type="checkbox"/> Samoan <input type="checkbox"/> Other Pacific Islander (Specify): _____ <input type="checkbox"/> Other (Specify): _____					
58. DECEDENT'S USUAL OCCUPATION (Indicate type of work done during most of working life. DO NOT USE RETIRED).					
59. KIND OF BUSINESS/INDUSTRY					

## 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 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 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:

## *U.S. Standard Pregnancy Question, 2003 (sort of)*

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 that did ask about pregnancy status.*

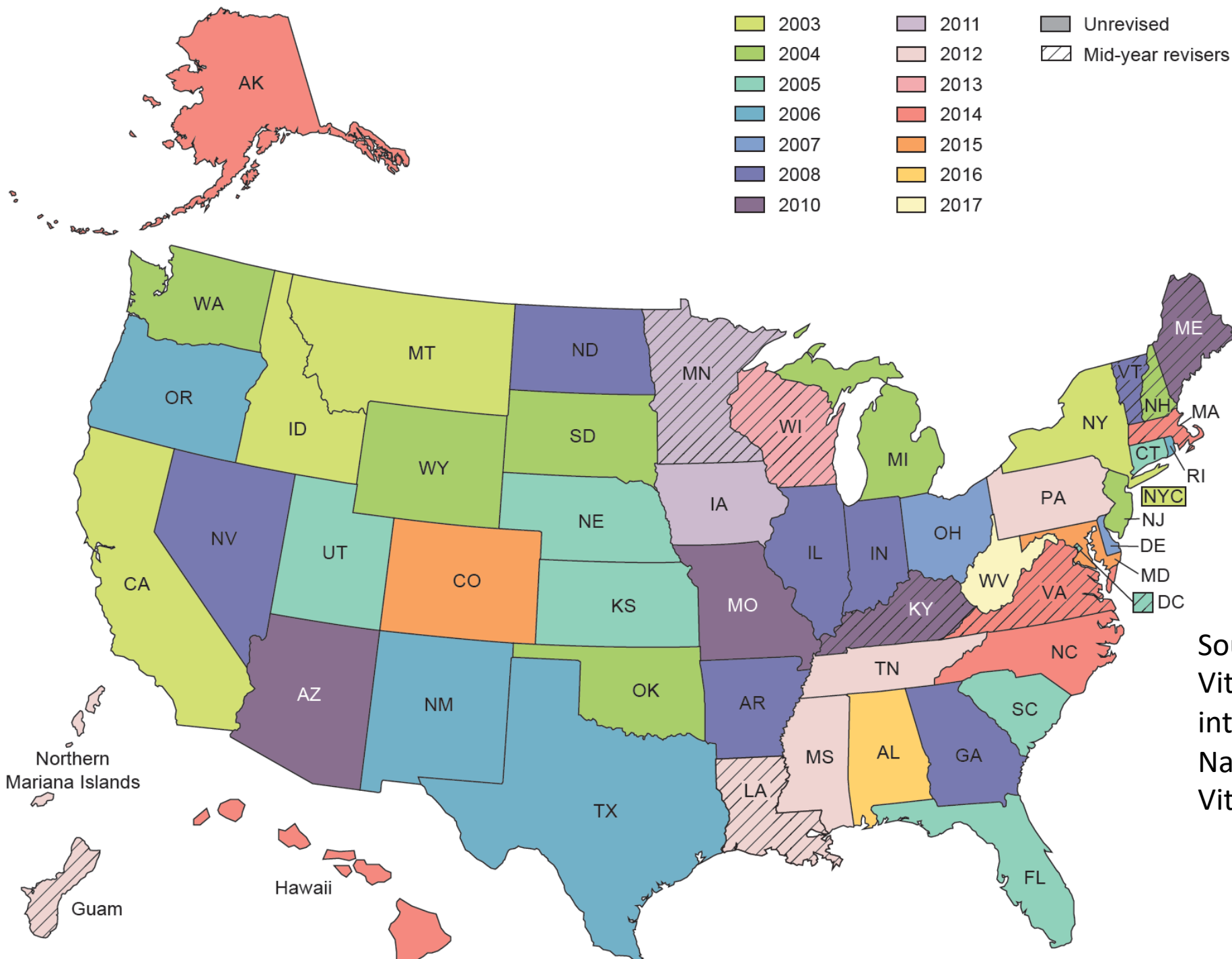
# Delays in Adoption of the U.S. Standard Pregnancy Question among States

	New Adopters*	Total
2003	4	4
2004	7	11
2005	7	18
2006	4	22
2007	2	24
2008	7	31
2009	0	31
2010	4	35
2011	2	37
2012	4	41
2013	1	42
2014	5	47
2015	2	49
2016	1	50
2017	1	51

<b>CA, ID, MT, NY</b>	<b>2003</b>
New Jersey	2004
Florida	2005
Texas	2006
Ohio	2007
Massachusetts	9/2014
Alabama	2016
<b>W. VA</b>	<b>2017</b>

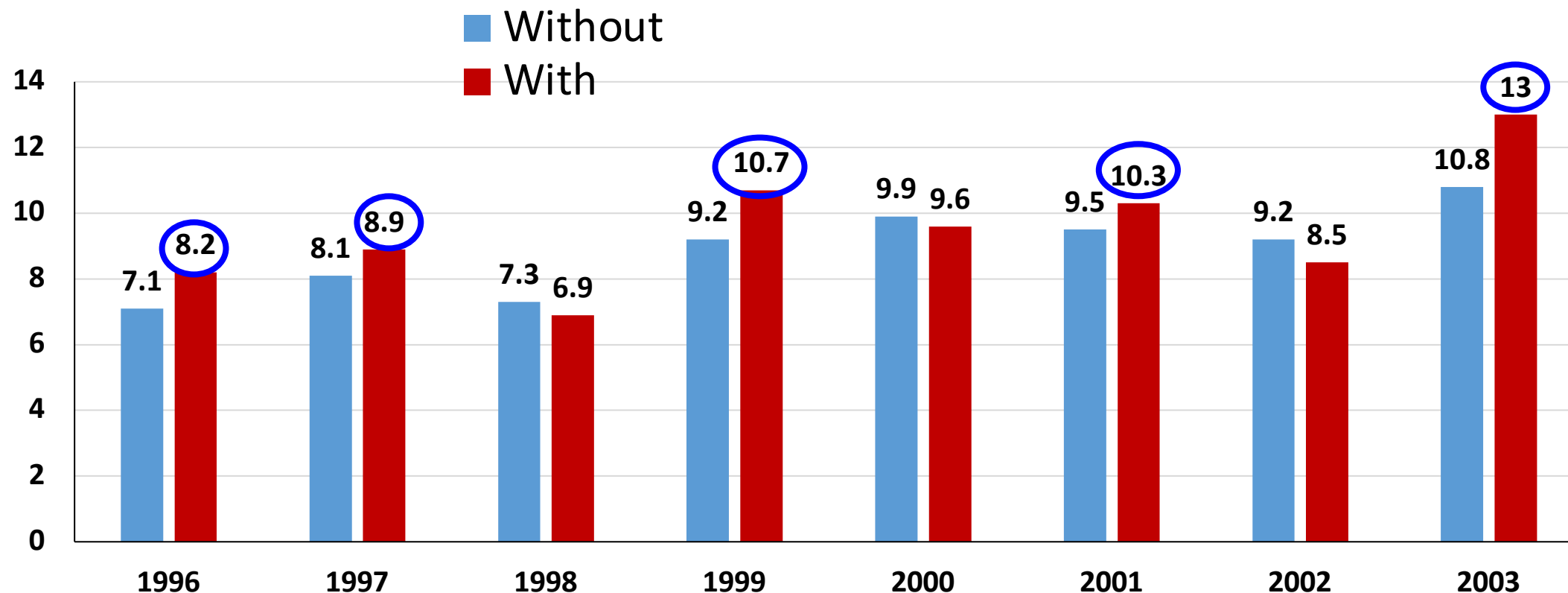
\* Note: Some states adopted change in the middle of the calendar year.





Source: Ventura SJ. The U.S. National Vital Statistics System: Transitioning into the 21st century, 1990–2017. National Center for Health Statistics. Vital Health Stat 1(62). 2018.

# 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?***

# 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*

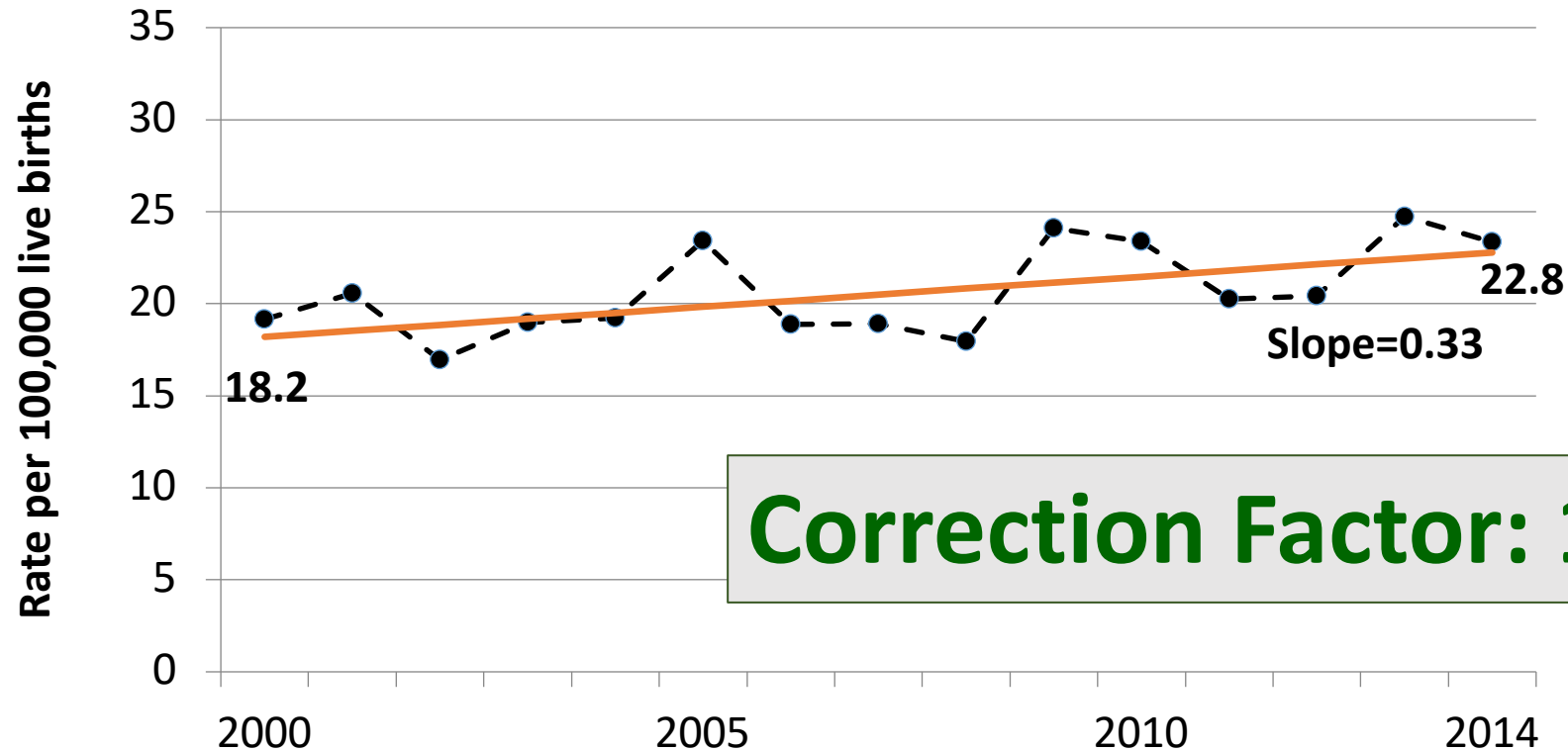
**RESULTS:** The estimated maternal mortality rate (per 100,000 live births) for 48 states and Washington, DC (excluding California and Texas, analyzed separately) increased by 26.6%, from 18.8 in 2000 to 23.8 in 2014. California showed a declining trend, whereas Texas had a sudden increase in 2011–2012. Analysis of the measurement change suggests that U.S. rates in the early 2000s were higher than previously reported.

# Correcting for Impact of Adding Pregnancy Box

$$\text{Correction factor} = \frac{\text{Sum of the number of maternal deaths in each state for 2 years following the revision date}}{\text{Sum of the number of maternal deaths in each state for the 2 years preceding the revision date}}$$

***Also did tests involving 1 year and 3 year periods with little change***

# States that had no question & added the checkbox



**Correction Factor: 1.93**

***Impact of adding the pregnancy checkbox was to approximately double a state's maternal mortality rate***

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.

# NVSS analyses of the checkbox

## National Vital Statistics Reports



Volume 69, Number 1

January 30, 2020

### 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

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

Analytical and Epidemiological Studies

## National Vital Statistics Reports



Volume 69, Number 2

January 30, 2020

### 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

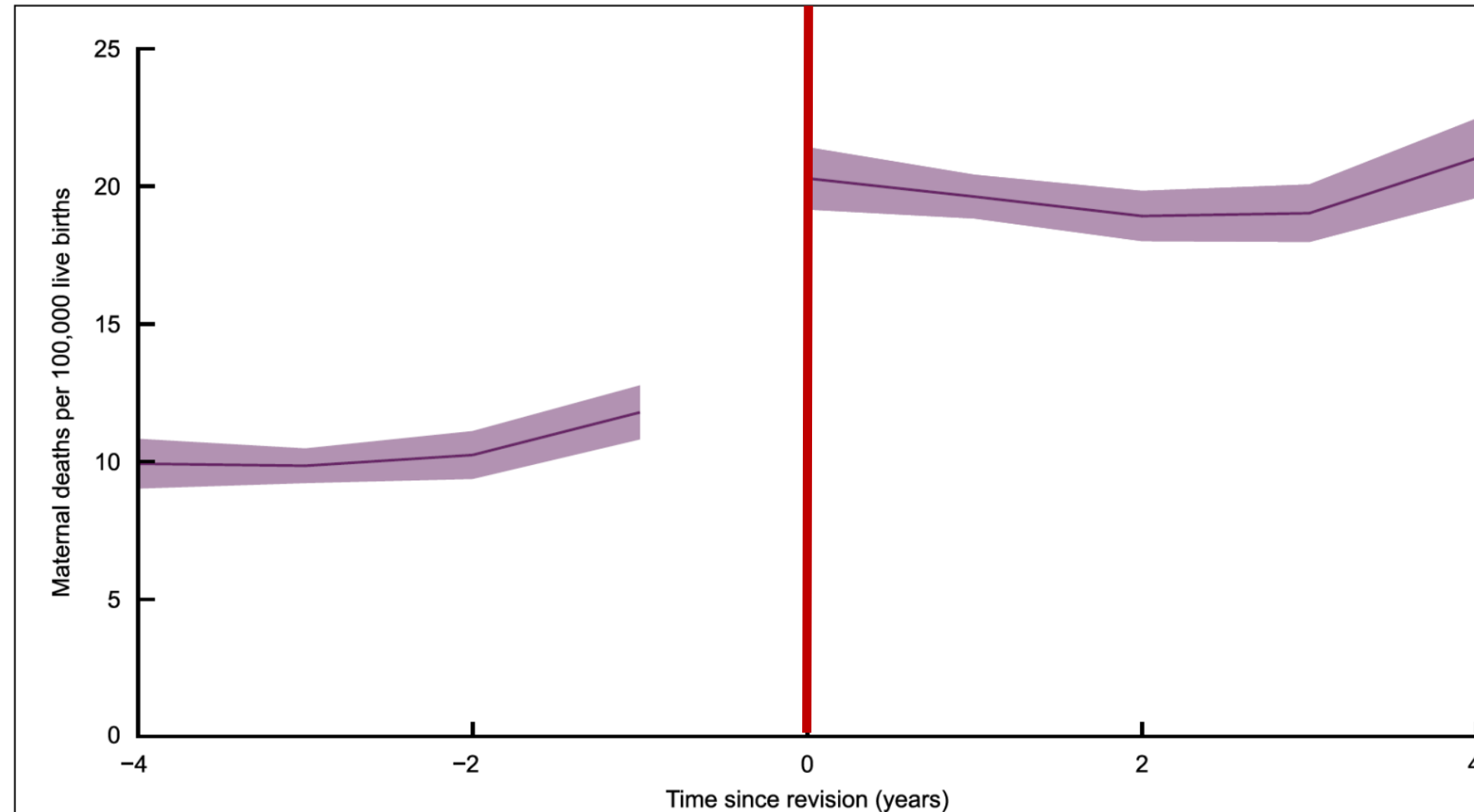
# Statistical Analysis

- *Objective 1: Quantify the impact of the staggered implementation of the pregnancy checkbox on MMRs*
- *Objective 2: Estimate trends in MMRs from 1999 through 2017, accounting for the checkbox*
- *Objective 3: Examine the impact of potential misclassification of pregnancy status on the death certificate on MMR trends from 1999 through 2017*



# NCHS Analysis of the Impact of Checkbox

Figure 1. Average change in maternal mortality rates associated with the pregnancy checkbox implementation:  
United States, 2003–2017



Source: Rossen LM, et al. *The impact of the pregnancy checkbox, 1999–2017*. NCHS. Vital Health Stat 3(44). 2020.



State

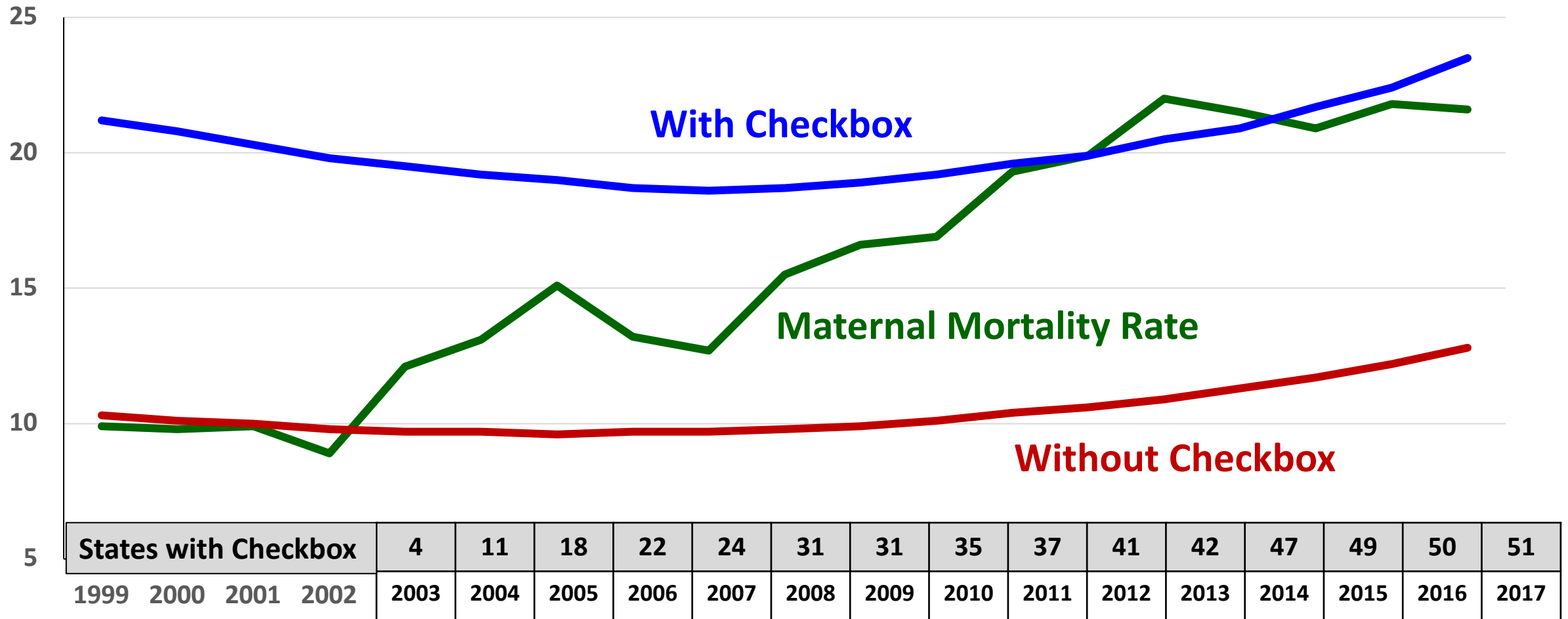
Change in maternal  
mortality rate (95% CI)

# ***Average change in maternal mortality rates associated with the pregnancy checkbox implementation, by state of occurrence: U. S., 2003–17***

Alabama	29.0 (18.4 – 39.7)	New Jersey	16.1 (11.0 – 21.1)
Alaska	4.0 (–8.7 – 16.7)	New Mexico	15.7 (–5.9 – 37.2)
Arizona	10.2 (2.2 – 18.1)	New York City	9.3 (2.7 – 15.9)
Arkansas	15.7 (1.0 – 30.4)	New York State <sup>1</sup>	6.6 (1.8 – 11.3)
California	9.9 (5.2 – 14.7)	North Carolina	9.5 (5.0 – 14.1)
Colorado	2.0 (–4.8 – 8.8)	North Dakota	25.3 (–14.3 – 64.9)
Connecticut	5.7 (–0.6 – 12.0)	Ohio	19.6 (12.7 – 26.4)
Delaware	19.0 (–15.5 – 53.5)	Oklahoma	29.9 (16.0 – 43.8)
District of Columbia	2.3 (–9.9 – 14.6)	Oregon	5.1 (–3.7 – 13.9)
Florida	9.3 (4.8 – 13.7)	Pennsylvania	– 2.4 (–8.4 – 3.6)
Georgia	3.2 (–2.4 – 8.7)	Rhode Island	–0.8 (–13.5 – 11.8)
Hawaii	–6.4 (–22.3 – 9.5)	South Carolina	18.3 (9.8 – 26.7)
Idaho	23.9 (4.7 – 43.2)	South Dakota	14.8 (–7.1 – 36.7)
Illinois	17.9 (10.6 – 25.1)	Tennessee	18.8 (11.2 – 26.3)
Indiana	20.4 (14.3 – 26.5)	Texas	12.5 (8.8 – 16.1)
Iowa	9.5 (–1.7 – 20.7)	Utah	10.9 (0.1 – 21.6)
Kansas	14.0 (4.3 – 23.8)	Vermont	4.4 (–16.6 – 25.4)
Kentucky	11.6 (0.6 – 22.7)	Virginia	7.4 (2.5 – 12.3)
Louisiana	38.2 (28.4 – 48.0)	Washington	3.7 (–2.3 – 9.6)
Maine	6.9 (–13.5 – 27.3)	West Virginia	4.6 (–17.4 – 26.6)
Maryland	–7.8 (–13.3 – –2.4)	Wisconsin	–4.8 (–12.9 – 3.2)
Massachusetts	2.4 (–1.6 – 6.5)	Wyoming	84.4 (–22.5 – 191.3)
Michigan	29.9 (20.4 – 39.3)		
Minnesota	1.5 (–6.2 – 9.2)		
Mississippi	–10.0 (–21.4 – 1.5)		
Missouri	6.5 (–3.9 – 16.9)		
Montana	0.4 (–24.2 – 25.0)		
Nebraska	–2.6 (–16.8 – 11.7)		
Nevada	–1.3 (–12.7 – 10.0)		
New Hampshire	5.3 (–12.9 – 23.4)		

Source: Rossen LM, etal. *The impact of the pregnancy checkbox, 1999–2017*. NCHS. Vital Health Stat 3(44). 2020.

# Observed and predicted maternal mortality rates: United States, 1999–2017



Source: Rossen LM, et al. *The impact of the pregnancy checkbox, 1999–2017*. NCHS. Vital Health Stat 3(44). 2020.

# Ratio of maternal deaths assigned using the checkbox item to maternal deaths assigned without using the checkbox item for maternal deaths: Selected states, 2015–2016

	Number of deaths		
State	Assigned by checkbox	Assigned w/out checkbox	Ratio
47 States & D.C.*	1,527	498	<b>3.07</b>
Florida	78	37	<b>2.11</b>
Georgia	134	28	<b>4.79</b>
Illinois	40	21	<b>1.90</b>
New York	72	41	<b>1.76</b>
Ohio	53	24	<b>2.21</b>
Texas	264	58	<b>4.55</b>

\* Excludes Alabama, California, & W. Virginia

Source: Hoyert Diet al. Evaluation of the pregnancy status checkbox on identification of maternal deaths. Nat'l

Vital Stat Rep; V 69 # 1. Hyattsville, MD: NCHS. 2020.

[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

# Two key problems raised by the checkbox

1. Over ascertainment

2 Loss of precision in identifying causes of maternal death – the rise of “other” causes.

# The problem with “other”

*Original Research*

## **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*

## 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,O43.2,O44-O46,O67,O71.0-O71.1, O71.3-O71.4,O71.7,O72)

Pregnancy-related infection (O23,O41.1,O75.3,O85,O86,O91)

Puerperal sepsis (O85)

**Other obstetric complications (O21-O22,O24-O28,O30-O41.0, O41.8-O43.1, O43.8-O43.9,O47--O66,O68-O70,O71.2, O71.5, O71.6, O71.8, O71.9,O73,O75.0-O75.2,O75.4-O75.9,O87-O90,O92)**

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,O74,O89)

**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)**

**Maternal Death  
ICD-10 Codes**

# Over Ascertainment??

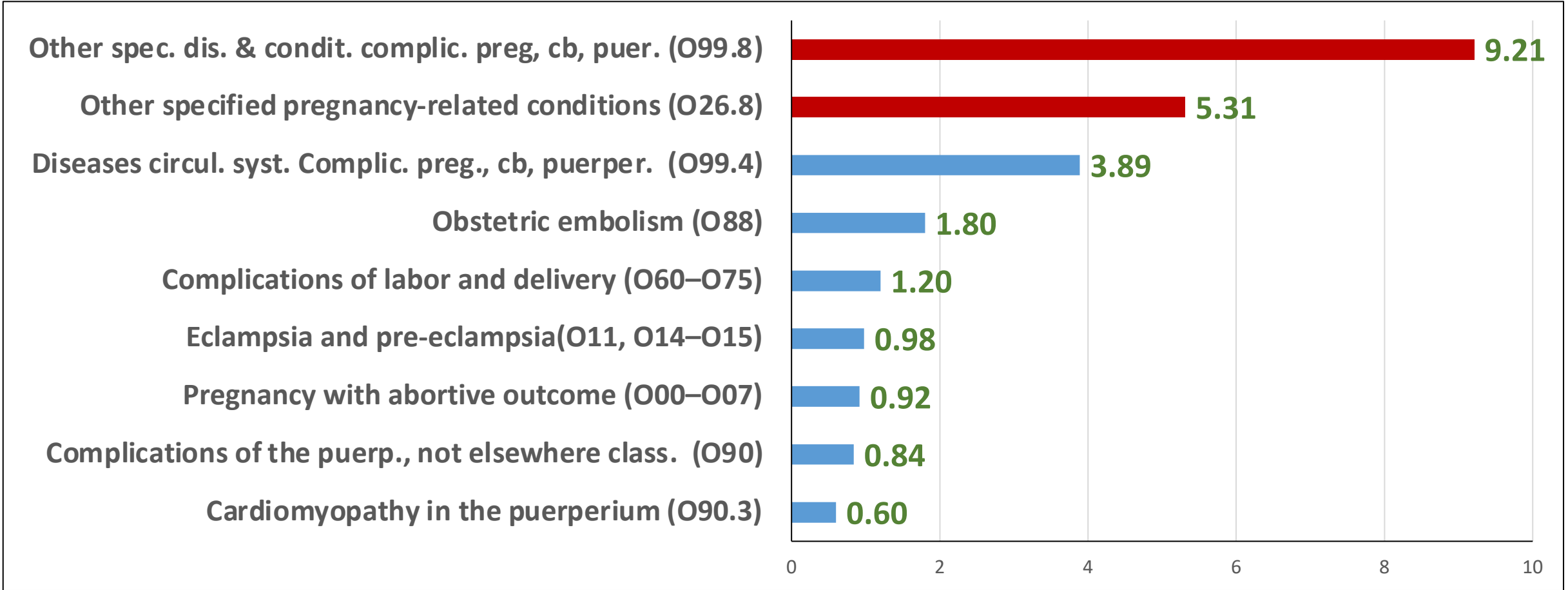
- Research into the cause of death category finds much of the increase is coming from *less specific ICD-10 codes*.
- Other specified pregnancy-related conditions (O26.8)
- Other obstetric complications (O21–O22, O24–O41.0, O41.8–O43.1, O43.8–O43.9, O47–O66, O68–O70, O71.2, O71.5, O71.6, O71.8, O71.9, O73–O75.2, O75.4–O75.9, O87–O90, O92)
- Other specified diseases and conditions (O99.8)
- Obstetric death of unspecified cause (O95)

# Impact of ill-defined causes on maternal deaths by cause of death, 27 states & DC, 2008-2009 to 2013-2014

	2008-9	2013-14	% Change
Underlying Cause of Death	Rate	Rate	2008/9-2013/'14
<b>Total Maternal</b>	20.6	25.4	<b>23.3</b>
Ill-defined "other" causes	7.0	10.4	<b>47.9</b>
<b><i>Total maternal minus ill defined</i></b>	13.5	15.0	<b>10.6</b>
<b>Total Direct Obstetric</b>	13.9	16.6	<b>19.7</b>
Other specified pregnancy related cond.	3.4	5.9	<b>73.0</b>
<b><i>Total direct obstetric minus ill defined</i></b>	10.5	10.7	<b>2.3</b>
<b>Total indirect causes</b>	5.3	8.2	<b>54.4</b>
Other specified diseases & conditions	2.2	3.9	<b>75.9</b>
<b><i>Total indirect minus ill defined</i></b>	3.1	4.3	<b>38.7</b>



# Ratios of deaths classified using pregnancy status checkbox to those classified without using the checkbox by Cause of Death, 47 states & D.C., 2015–2016



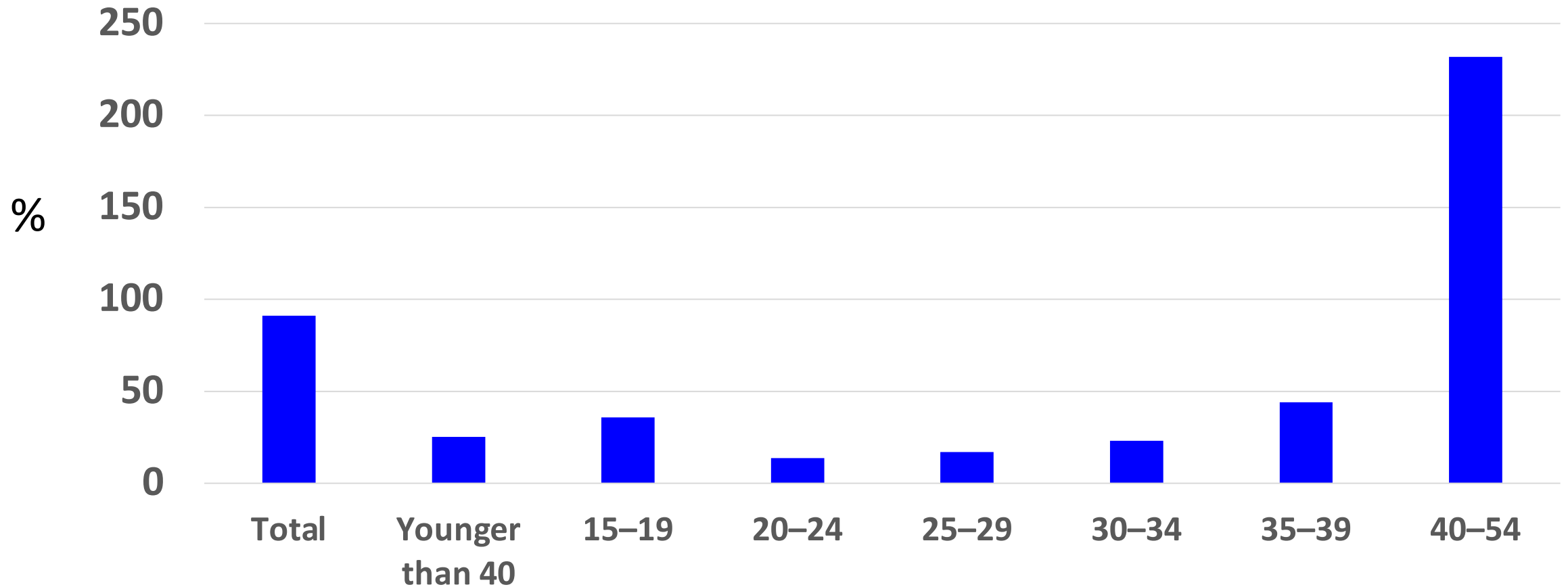
Source: Hoyert DL, et al. *Evaluation of the pregnancy status checkbox on the identification of maternal deaths.* NVSR; vol 69 no 1. Hyattsville, MD: NCHS. 2020.

# What of there were random error?

## *Impact of Random Error in Checking the Pregnancy Checkbox*

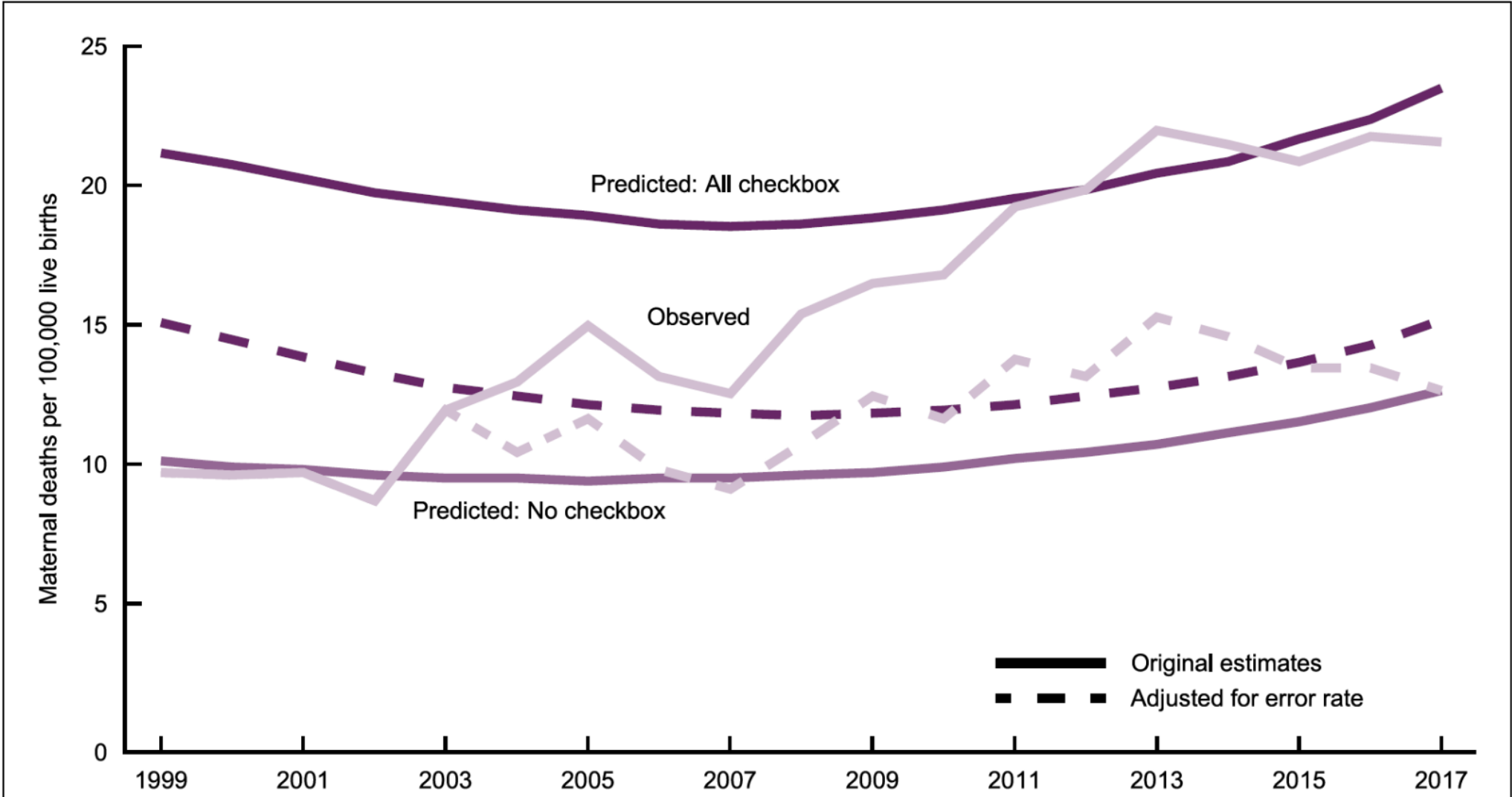
		Female Deaths	# Maternal Deaths
	# Maternal Deaths	Natural Causes	w/ 1% False Positives
Total	907	82,572	
<40	618	15,553	774
15–19	26	929	35
20–24	119	1,619	135
25–29	152	2,568	178
30–34	177	4,092	218
35–39	144	6,345	207
40–54	289	67,019	959

# Impact of a 1% Random Coding Error on Maternal Mortality Rates



Source: MacDorman M. *Obstet Gynecol* 2017;129:811–8

# Observed & predicted maternal mortality ratios, adjusted for a 1% error rate in the pregnancy checkbox: U. S., 1999–2017



Source: Rossen LM, etal. *The impact of the pregnancy checkbox, 1999–2017*. NCHS. Vital Health Stat 3(44). 2020.

# Number of births and deaths with positive pregnancy responses in the checkbox: United States, 2013

Age	Births	Deaths
40-44	134,540	145
45-49	10,329	89
50-54	780	148
55-59	74	33
60-64	7	51
65-69		45
70-74		51
75-79		46
80-84		42
85+		147

331 cases of positive pregnancy checkbox in deaths of women 65+

NOTE: Alabama, Alaska, Colorado, Hawaii, Massachusetts, North Carolina, Virginia, and West Virginia did not have the standard checkbox in 2013.

# How can there be so much misclassification?

## *Who completes death certificates?*

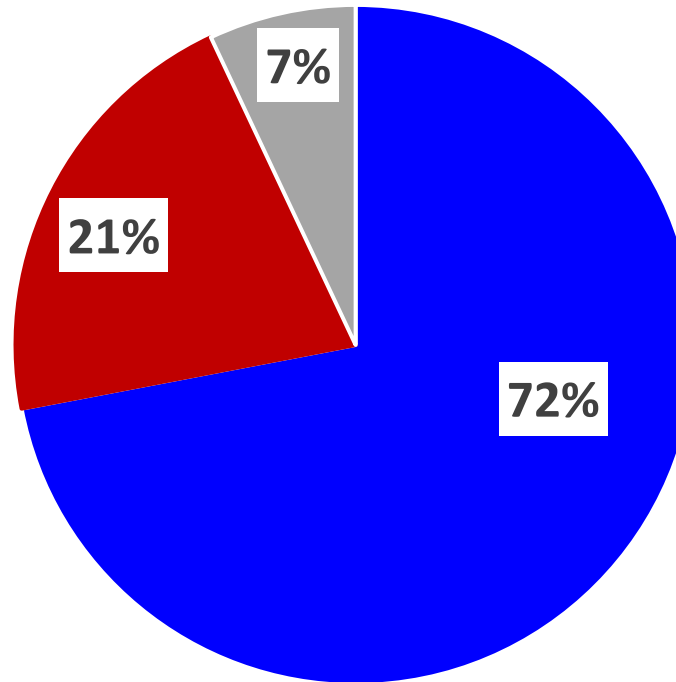
- *Death certificates can be signed by* a medical examiner, a primary physician, an attending physician, a non-attending physician, a nurse practitioner, a forensic pathologist or a coroner, but it varies according to state law. In Texas, for example, a justice of the peace can sign. Typically, deaths have to be recorded with local health departments within 72 hours of the death, and to the state within five to seven days.
- *Only about 8% of death certifications involve an autopsy*

PBS. Frontline. PostMortem.(2/1/2011) <https://www.pbs.org/wgbh/pages/frontline/post-mortem/things-to-know/death-certificates.html>

# Over-ascertainment: Results of a 4 state study (Georgia, Louisiana, Michigan, and Ohio)

## Pregnancy Checkbox Accuracy

**In 28% of cases with pregnancy checkbox checked, reviewers were not certain the woman was pregnant**

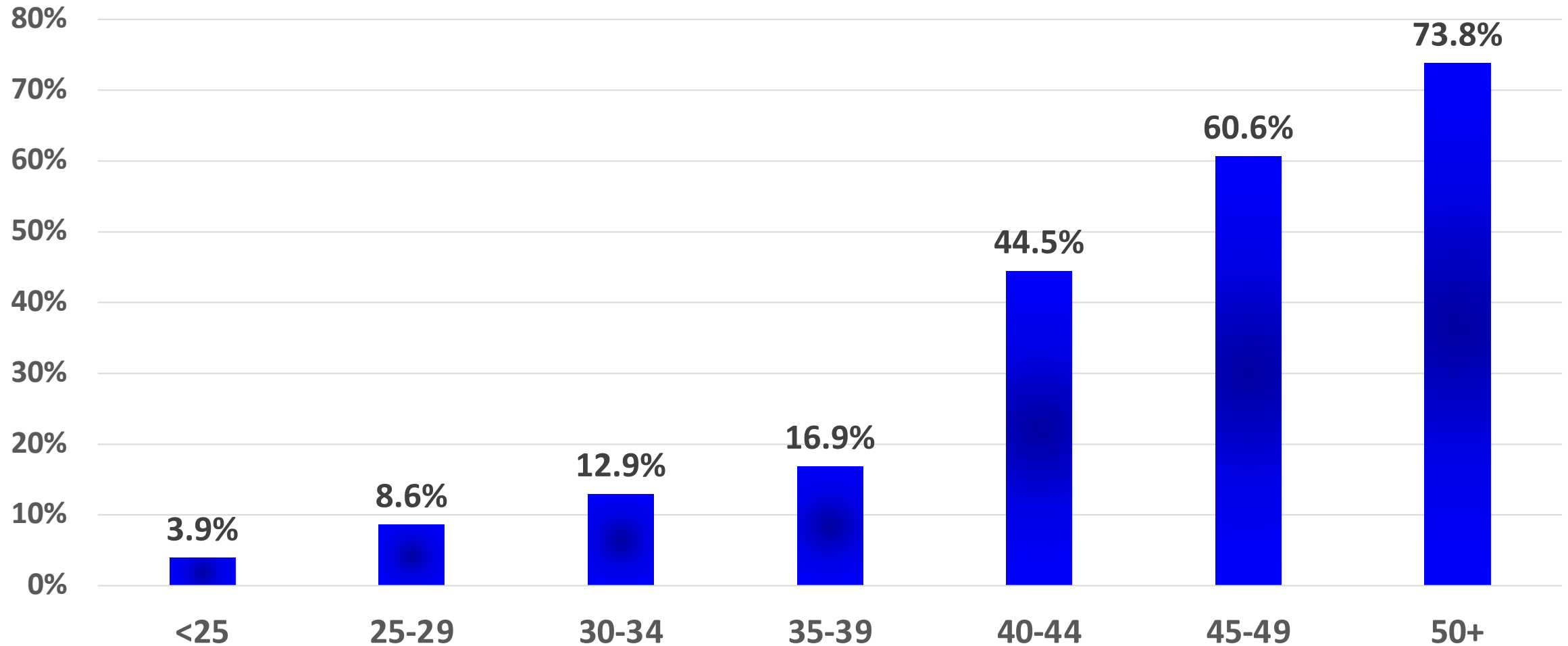


■ Pregnant ■ Not Pregnant ■ Unable to confirm

Source: A. Daymude. Checking the pregnancy checkbox: Evaluation of a four-state quality assurance pilot. *Birth* 2019 online & Catalano A. Validity of the Pregnancy Checkbox. *AJOG*.2019.online.

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

# False Positives on the Pregnancy Checkbox by Age



Source: Adapted from Catalano A. Validity of the Pregnancy Checkbox. *AJOG*.2019.online.



# 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.*

# Summary

- *The introduction of the pregnancy checkbox served its stated purpose – it identified cases that would have been otherwise missed.*
- *Unfortunately, it also led to a significant overcounting of women's death as maternal deaths.*
- *Even if you take a more conservative approach to determining the maternal mortality ratio, the U.S. data suggests we are not doing well.*

## ***4. The Pregnancy Related Mortality Surveillance System***

# Pregnancy Mortality Surveillance System



Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™



CDC A-Z INDEX ▾

## Reproductive Health

### Reproductive Health

About Us



Data and Statistics



Emergency Preparedness



Maternal and Child Health  
Epidemiology Program



Pregnancy Risk Assessment  
Monitoring System

Infertility



Assisted Reproductive  
Technology (ART)

Depression Among Women



Maternal and Infant Health



Pregnancy Complications



Weight Gain During  
Pregnancy

Tobacco Use and Pregnancy



Pregnancy-Related Deaths



### Pregnancy Mortality Surveillance System

Perinatal Quality  
Collaboratives



Preterm Birth



[CDC](#) > [Reproductive Health](#) > [Maternal and Infant Health](#) > [Pregnancy-Related Deaths](#)

## 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 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 actions to prevent them.



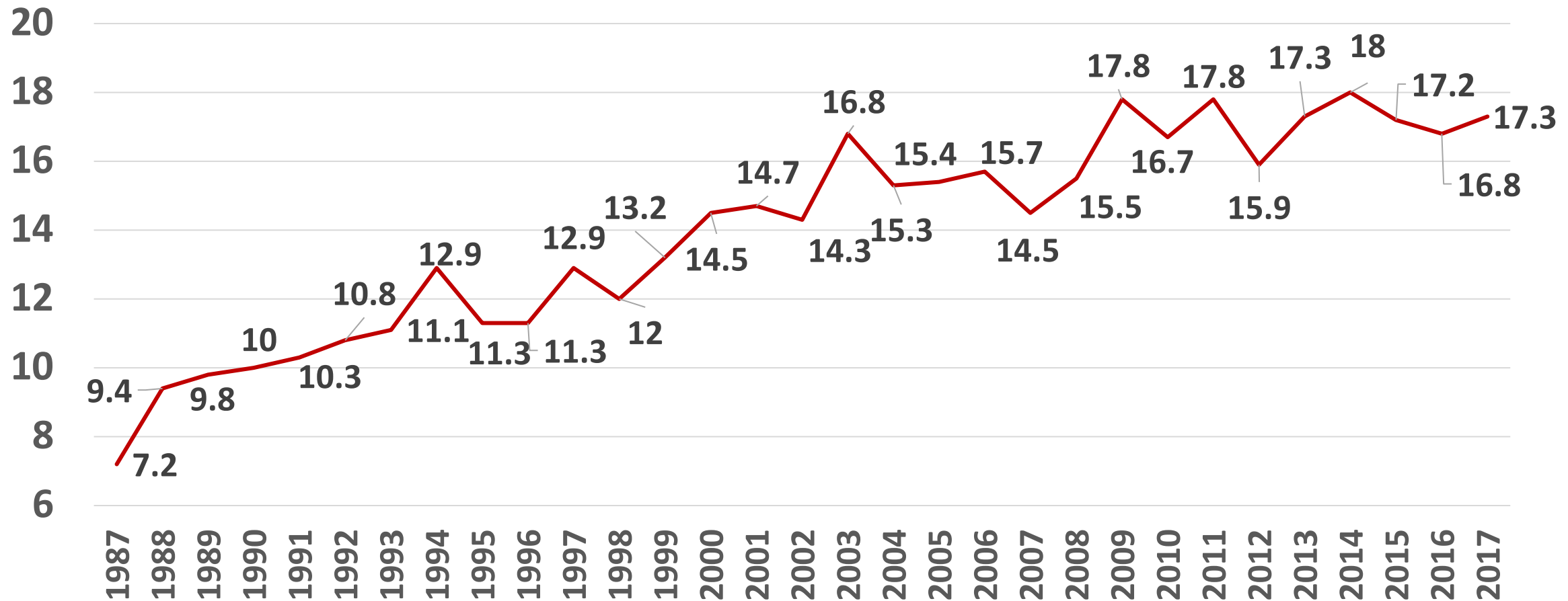
# Data for CDCs Pregnancy Related Mortality System

*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.*

# Our best existing measure

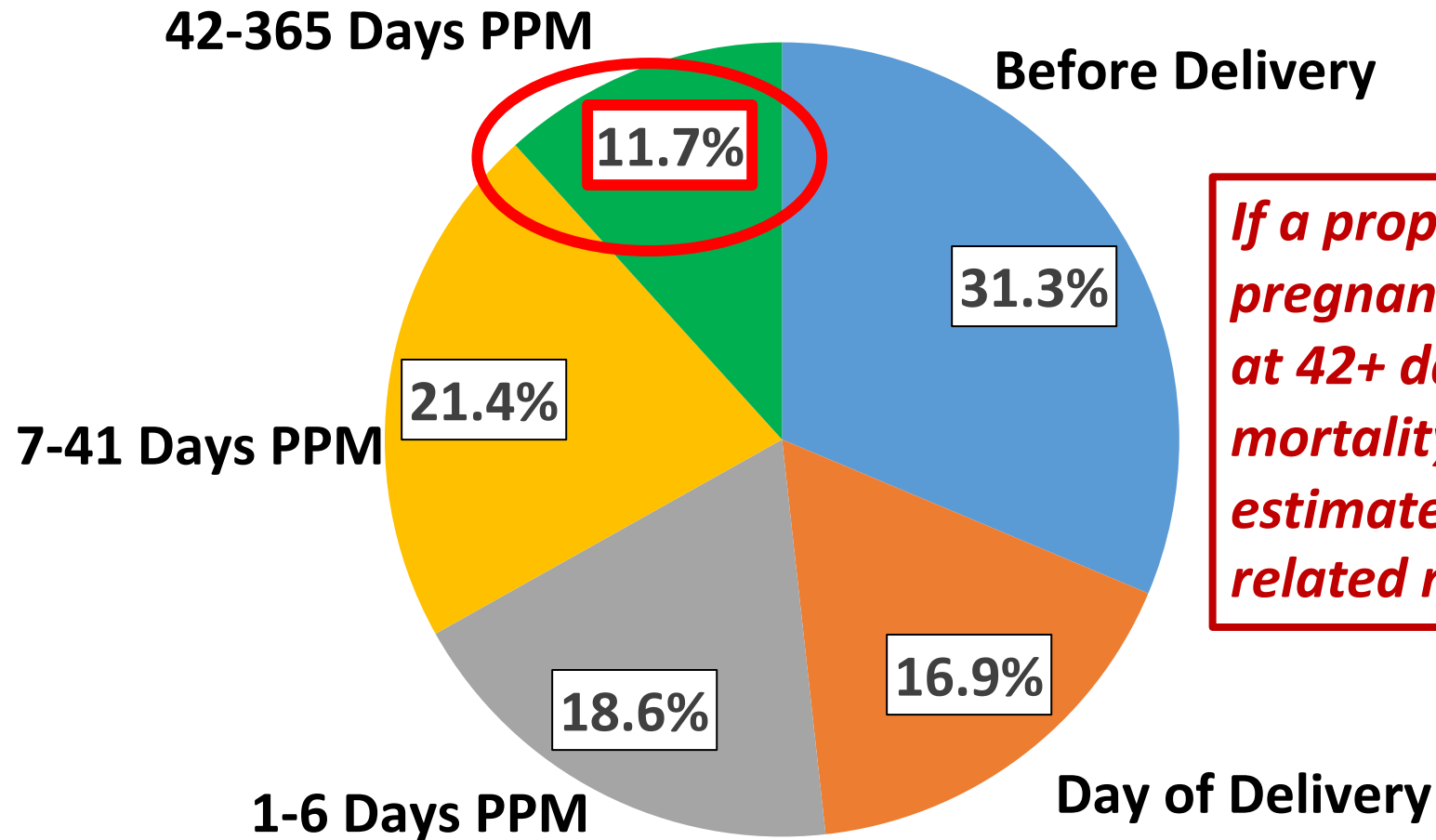
## *Pregnancy Related Mortality, U.S., 1987-2017*

Pregnancy Related Mortality Ratio (per 100,000 births)



Source: CDC. Adapted from Creanga. Pregnancy-Related Mortality in the United States. *Obstet Gynecol* 2017 & Petersen E. et al. Vital Signs: Pregnancy-Related Deaths, U.S., 2011–2015,. *MMWR* .vol.68. May 7, 2019. 1-7 & Petersen E et al. Racial/Ethnic Disparities in Pregnancy Related Deaths – U.S. 2007-'16. *MMWR* 9/6/19.

# Timing of Maternal Deaths



*If a proportion of the pregnancy related deaths occur at 42+ days, then the maternal mortality ratio can be estimated using the pregnancy related mortality rate.*

Source: Petersen E. et al. Vital Signs: Pregnancy-Related Deaths, United States, 2011–2015, and Strategies for Prevention, 13 States, 2013–2017. *MMWR* .vol.68. May 7, 2019. 1-7.





## Maternal Mortality Rates in the United States, 2019

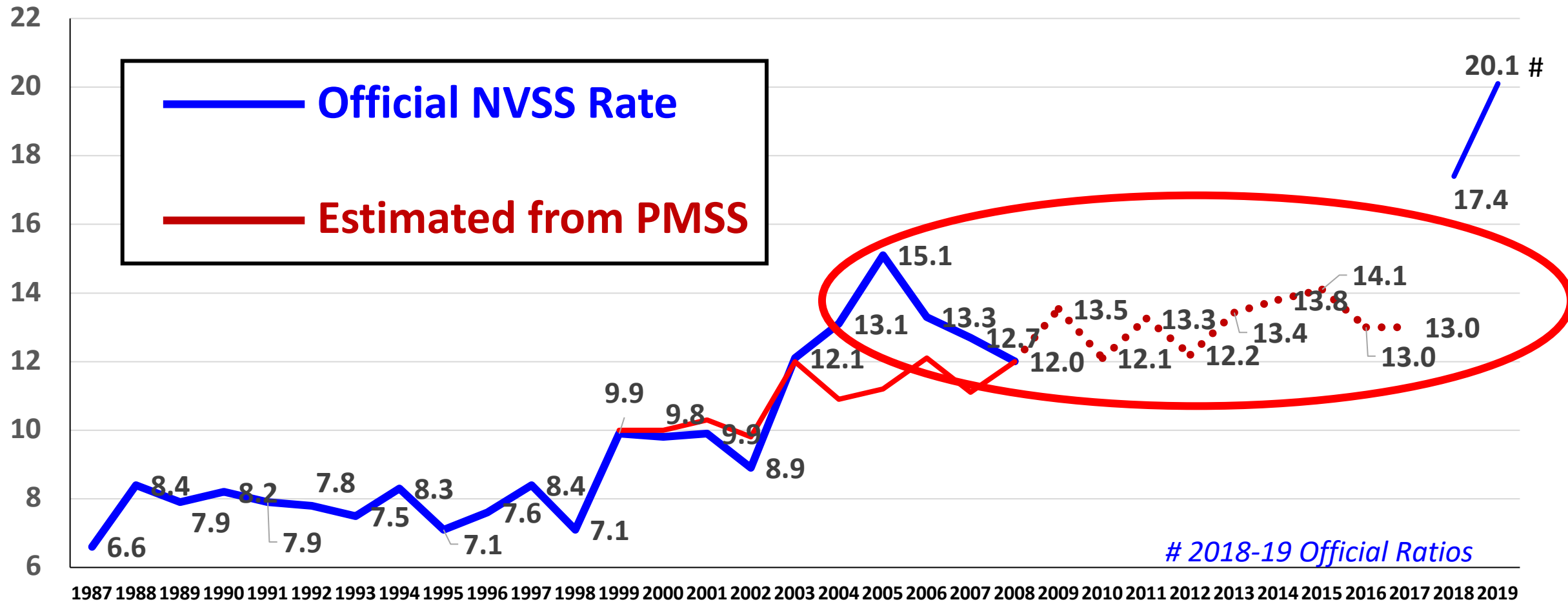
by Donna L. Hoyert, Ph.D., Division of Vital Statistics

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This report presents maternal mortality rates for 2019 based on data from the National Vital Statistics System. A maternal death is defined by the World Health Organization as, “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (1).” Maternal mortality rates, which are the number of maternal deaths per 100,000 live births, are shown in this report by age group and race and Hispanic origin.



# Maternal Mortality Ratios (per 100,000 live births), U.S. 1987-2019\*



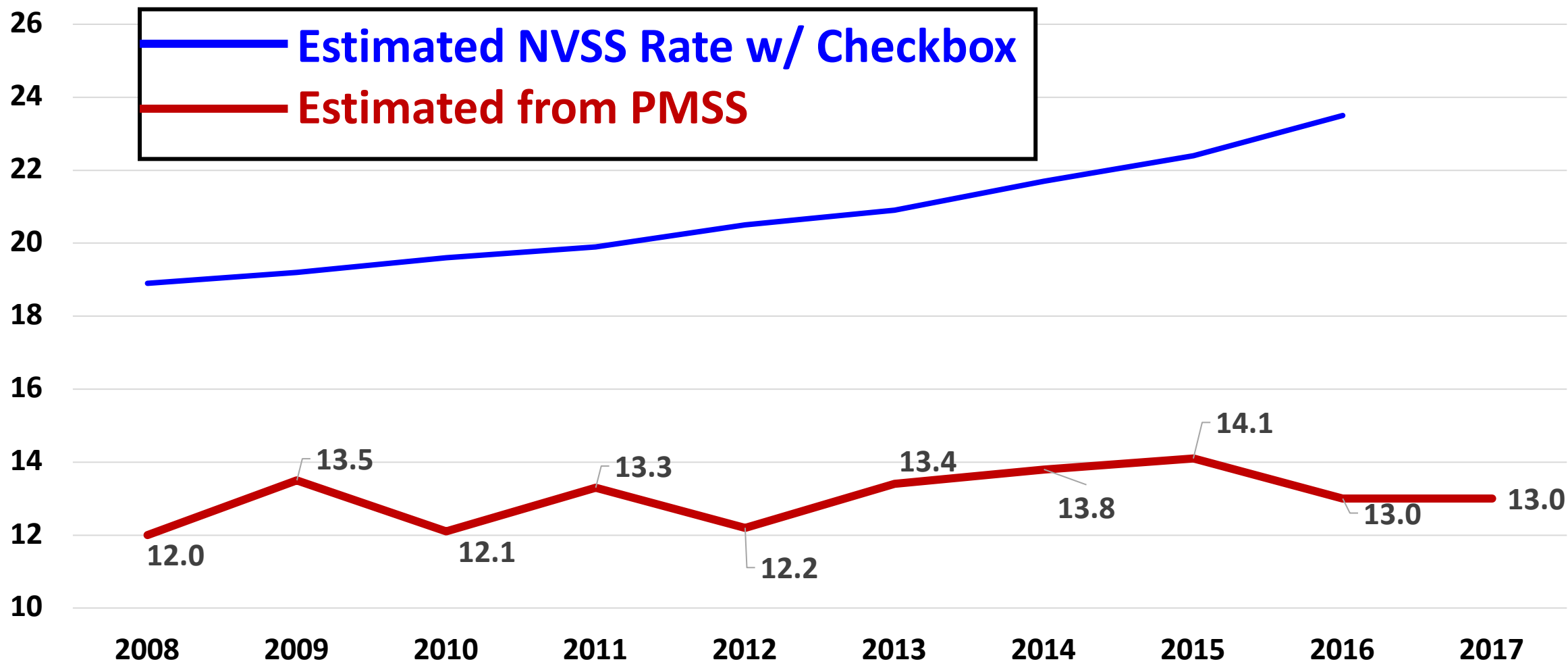
\* 1987-2007 & 2018-19 based on official NVSS reported ratio; 2008-2016 estimated based on Pregnancy-Related Mortality Ratio limited to 42 days postpartum.

Source: Adapted from: Callaghan W. <https://www.cdc.gov/grand-rounds/pp/2017/20171114-presentation-maternal-mortality-H.pdf>

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

# So is the maternal mortality going up in the U.S.?

*Maternal Mortality Ratios (per 100,000 live births), U.S. 2009-2016*



\* 1987-2007 based on official NVSS reported ratio; 2008-2016 estimated based on Pregnancy-Related Mortality Ratio limited to 42 days postpartum

Source: Hoyert DL et al. Maternal mortality in the United States: Changes in coding, publication, and data release, 2018.

National Vital Statistics Reports; vol 69 no 2. Hyattsville, MD: National Center for Health Statistics. 2020.

[www.birthingbythenumbers.org](http://www.birthingbythenumbers.org)

# Summary

- The Pregnancy Related Maternal Mortality System provides a reasonable alternative to the National Vital Statistics System and it has documented a steady increase in maternal deaths from 1987 to 2009.
- It has also shown a plateauing of the ratio from 2008-2017.
- The question is whether that plateauing is at an acceptable level and for that we need to place the U.S. in a comparative context.

# **5. Comparing the U.S. to the Rest of the World**

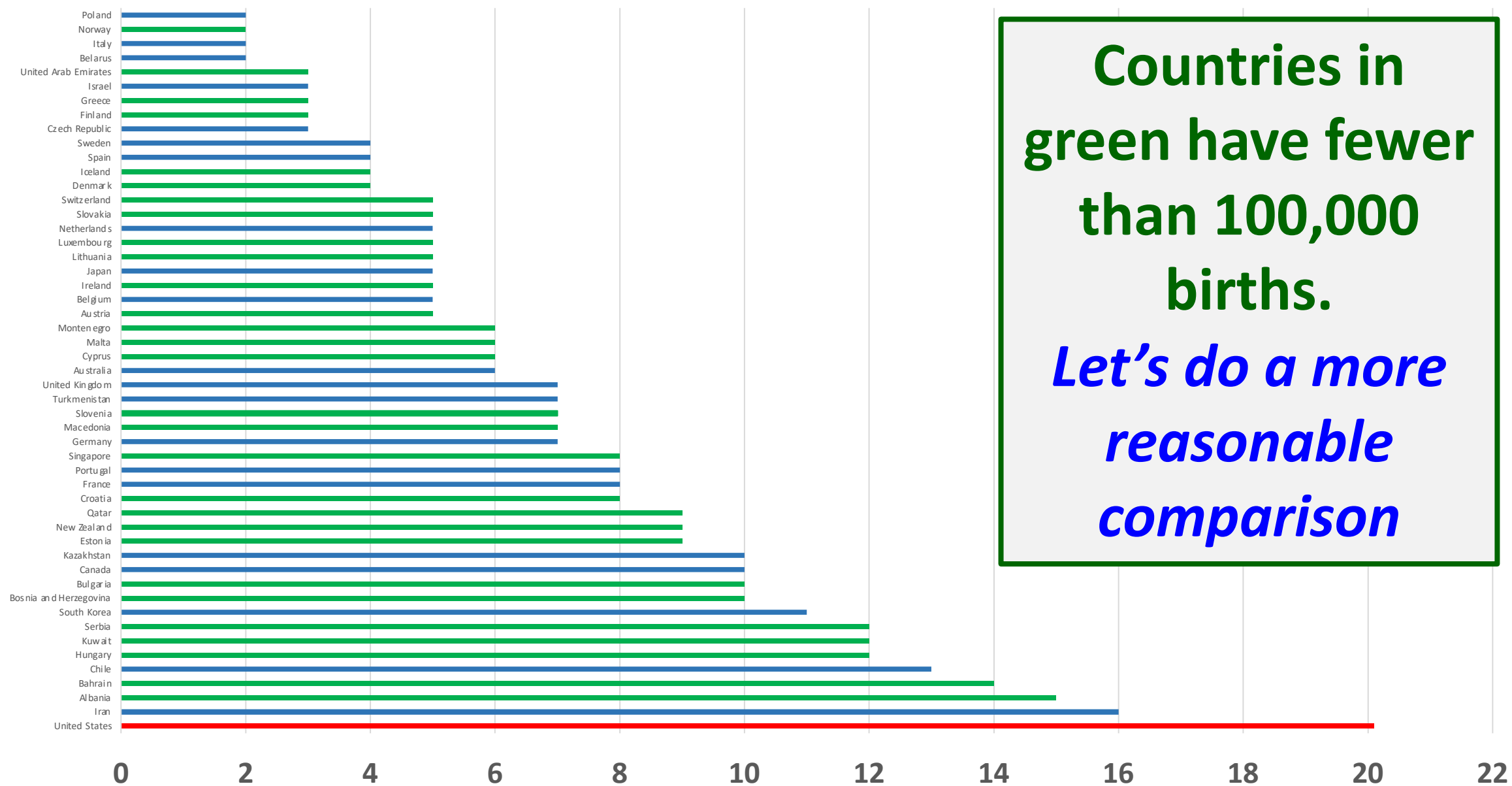
# U.S. in a Comparative Context, 1910, 1927, 2017

	1901-1910 <sup>1</sup>	1927 <sup>2</sup>	2017-19 <sup>3</sup>
	per 100K births	per 100K births	per 100K births
Norway	290	245	2
Italy	270	264	2
Sweden	230	278	4
Northern Ireland	550	480	5
Australia	530	592	6
England & Wales <sup>4</sup>	410	411	7
France	520	287	8
New Zealand	460	491	9
United States <sup>5</sup>	650	647	20

## Sources & Notes:

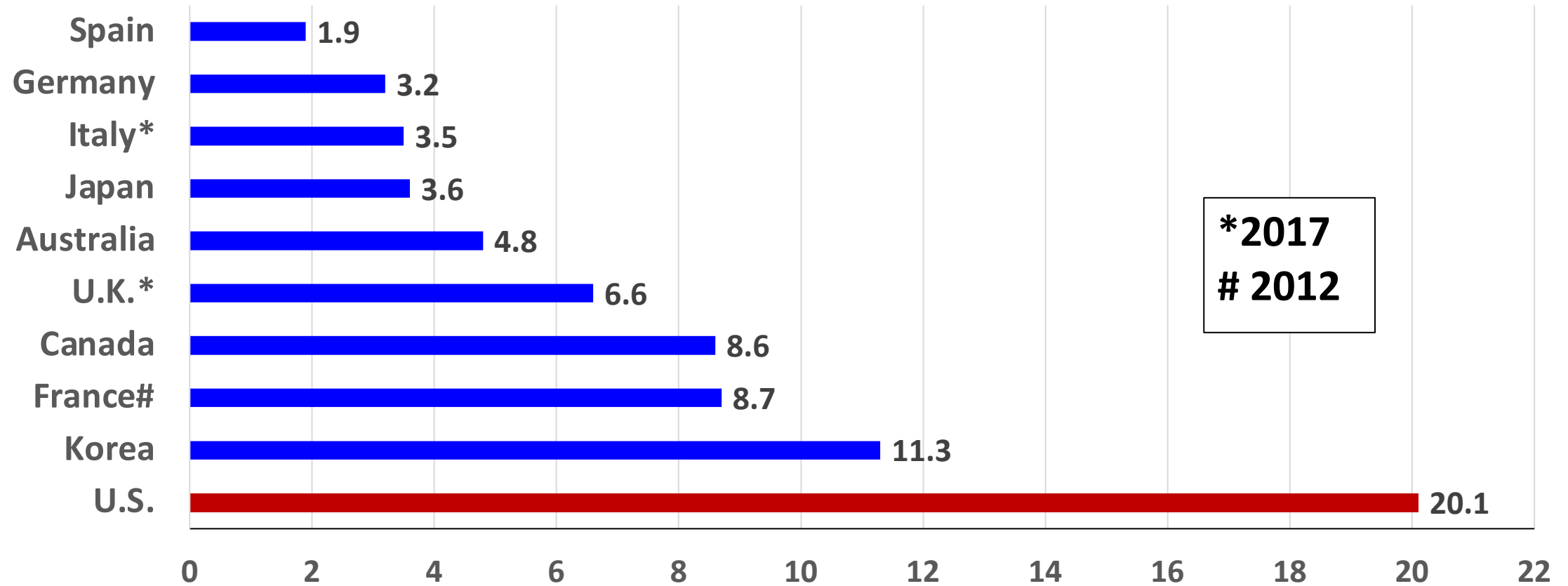
1. Meigs. *Maternal Mortality in U.S. & other countries*. 1917; 2. Tandy. *Comparability of Maternal Mortality Rates in the United States and Certain Foreign Countries*. 1933; 3. WHO. *Trends in Maternal Mortality, 2000-2017*; 4. UK rate in 2017; 5. Based on 10 reporting areas (CT,ME,MA,MI,NH,PN,RI,VT,NYC, DC) in 1910 & about 90% of all births in 1927.

# Maternal Mortality Ratios (per 100,000 births), 2017-19



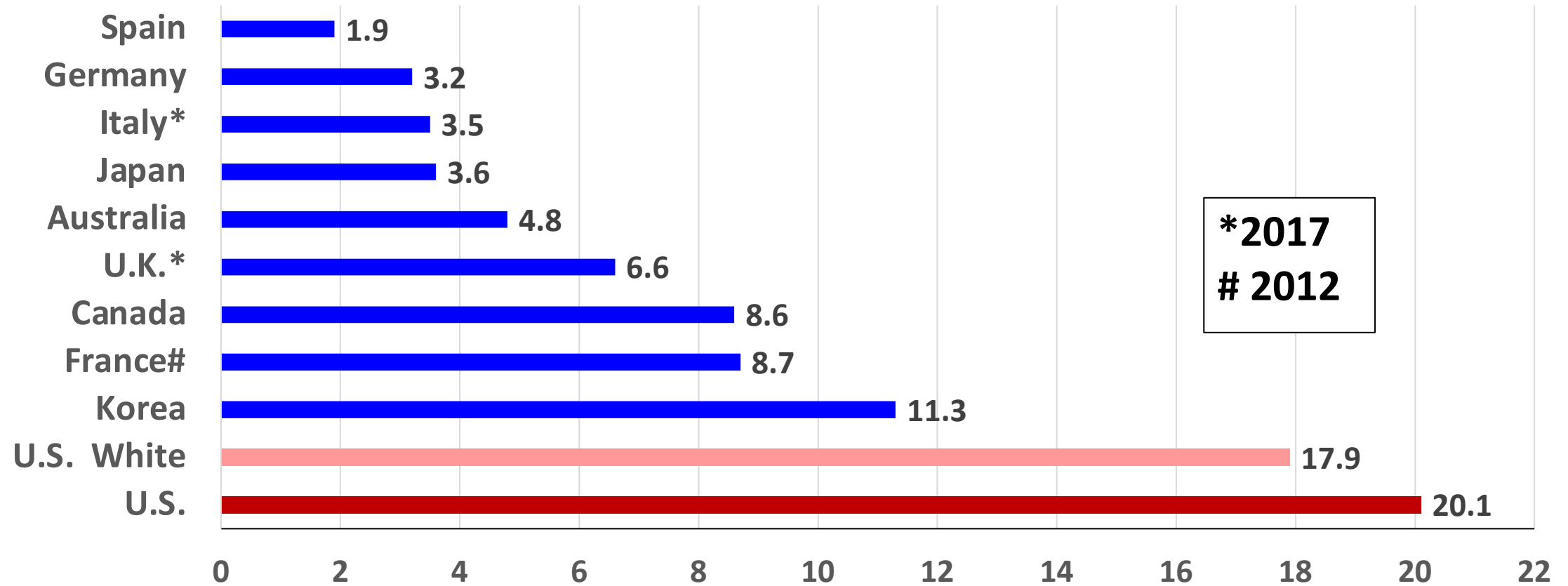
Source: WHO. *Trends In Maternal Mortality, 2000-2017*. (Geneva, 2019)

# U.S. Maternal Mortality Ratio (per 100,000 births ) Compared to Industrialized Countries with 300,000+ births, 2018-19



Source: OECD Health Data 2021 & U.S. Hoyert DL et al. National Vital Statistics Reports; vol 69 no 2. Hyattsville, MD: NCHS.  
1/30/2020.

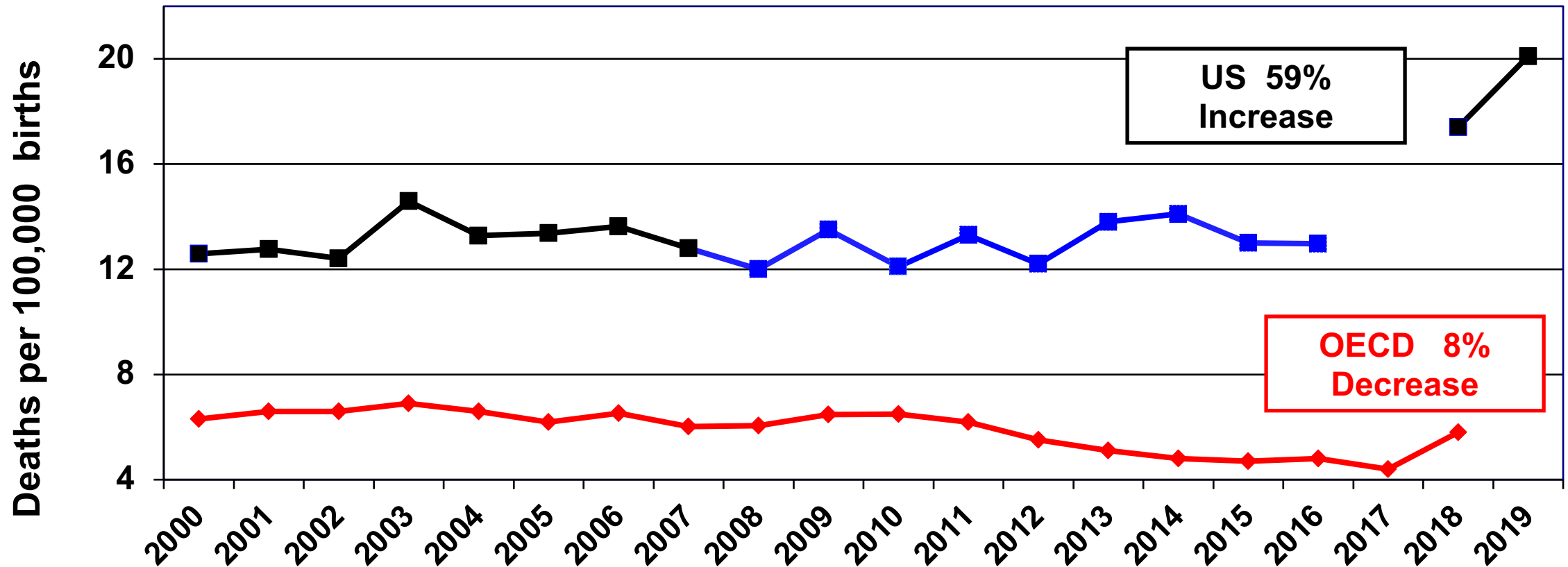
# U.S. Maternal Mortality Ratio (per 100,000 births ) Compared to Industrialized Countries with 300,000+ births, 2018-19



Source: OECD Health Data 2021 & U.S. Hoyert DL et al. National Vital Statistics Reports; vol 69 no 2. Hyattsville, MD: NCHS.  
1/30/2020.



# Maternal Mortality Ratio (per 100K births), 2000-2019, U.S. & Comparable Countries\*



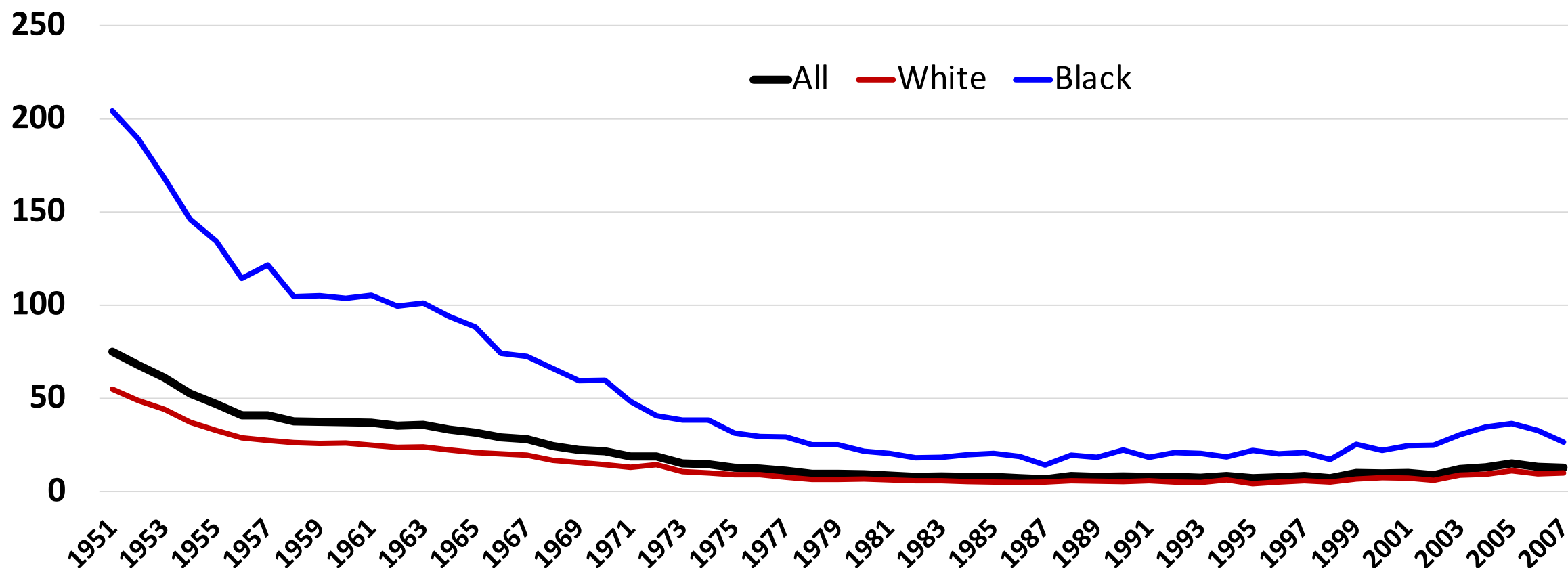
\* Countries with **300,000+** births (2017): Australia, Canada, France, Germany, Italy, Japan, S. Korea, Spain, United Kingdom

# Summary

- No matter how you structure a comparison, the U.S. fares poorly in cross-national comparisons.
- If you include all countries, the U.S. ranks in the 50s; if you limit it to large wealthy countries, the U.S. ranks 10<sup>th</sup>...out of 10 countries.
- In terms of comparative trends, the U.S. in 2000 had a maternal mortality rate double the average for the comparison countries and over the next 16 years fell further behind.

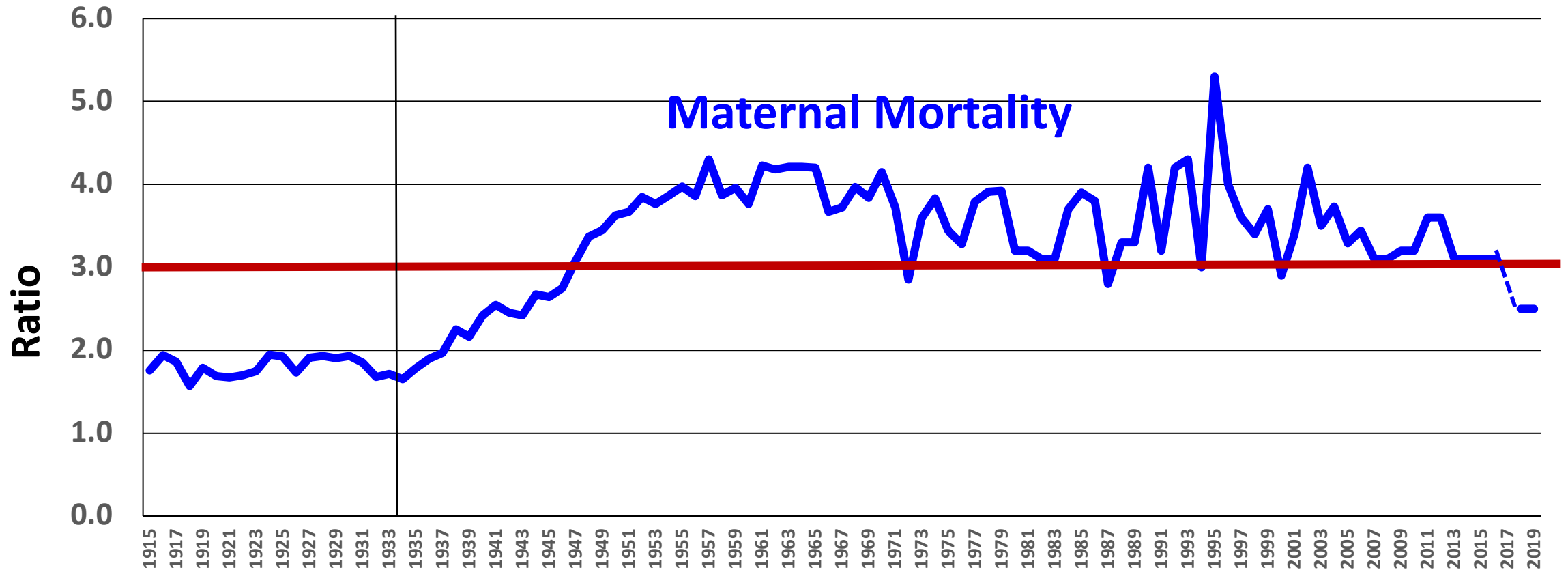
# **6. The Persistence of Racial Disparities**

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



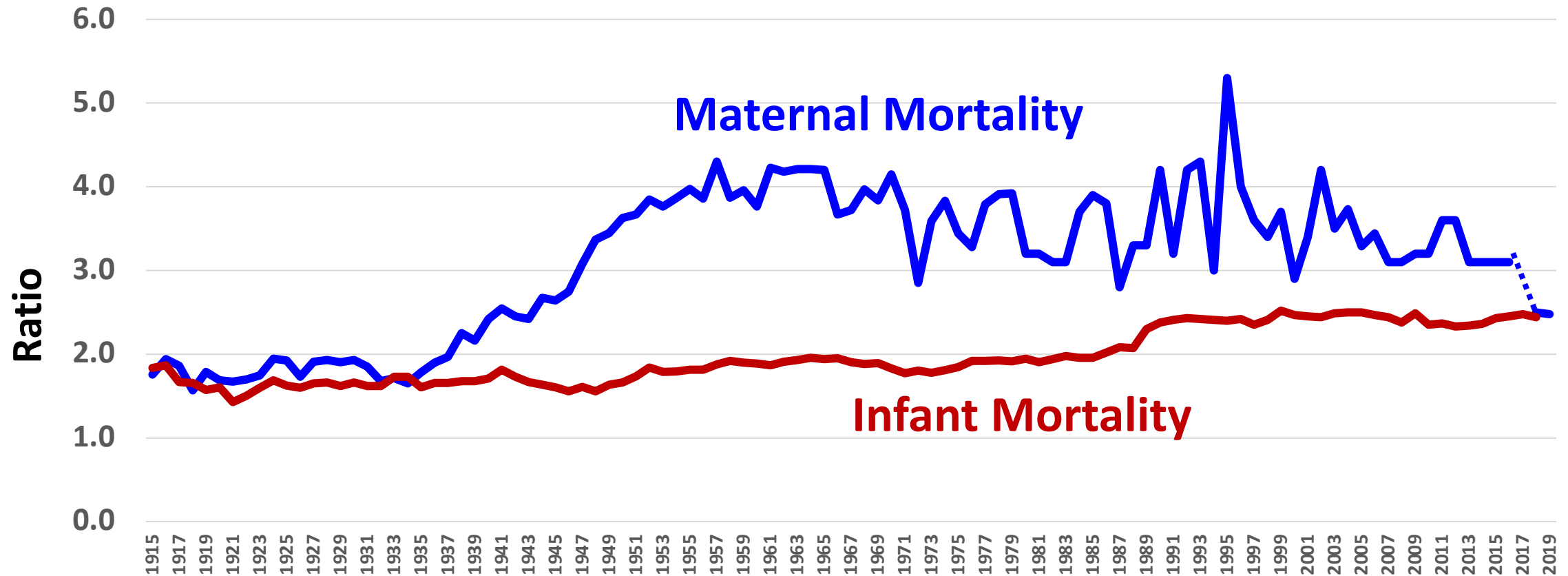
**Source:** NCHS. Maternal Mortality and Related Concepts. Vital & Health Statistics. Series 33; #3. & annual data reports. 1915-1960 data from NCHS. *Vital Statistics Rates In The United States 1940-1960*. NOTE: Shifts in measurement (e.g. not all states were part of registration system prior to 1933; 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.

# Black to White Ratios, U.S. Maternal Mortality, 1915-2019



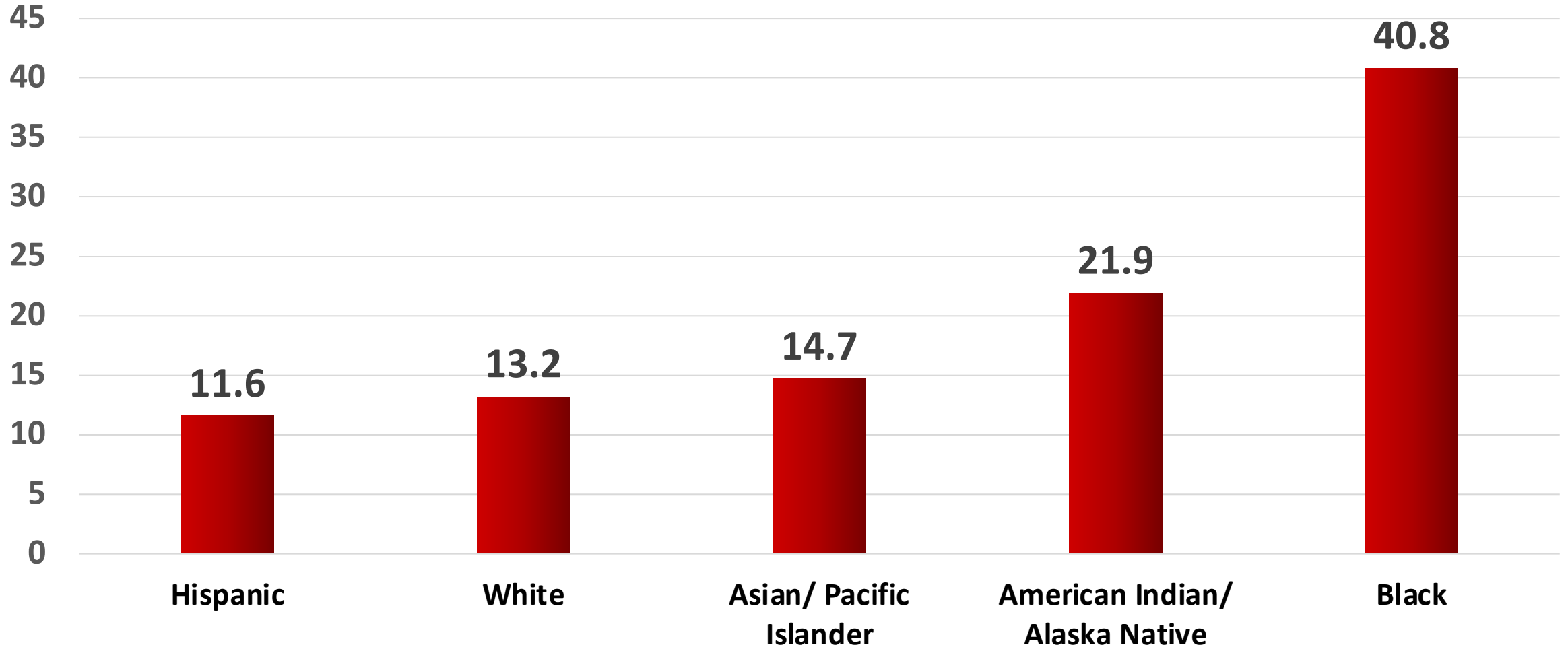
**Source:** NCHS. Maternal Mortality and Related Concepts. Vital & Health Statistics. Series 33; #3. & annual data reports. 1915-1960 data from NCHS. *Vital Statistics Rates In The United States 1940-1960*. NOTE: Shifts in measurement (e.g. not all states were part of registration system prior to 1933; 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.

# Black to White Ratios, U.S. Infant & Maternal Mortality, 1915-2019



**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.

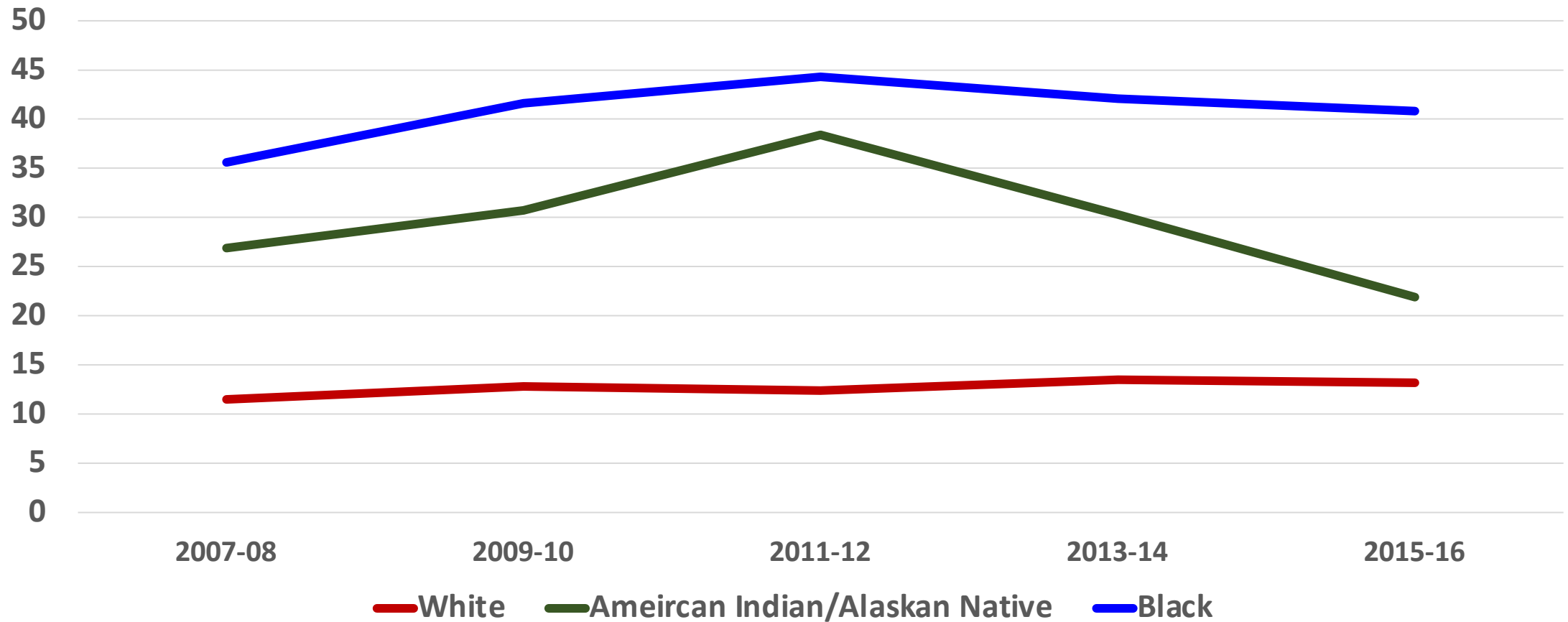
# Pregnancy Related Mortality Ratios by Race, U.S., 2015-2016



Source: Petersen E. et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — U.S., 2007–2016 . *MMWR*. 9/6/19; 68(35):762-765.

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

# Pregnancy Related Mortality Ratios (per 100,000 births) by Race/Ethnicity, U.S. 2007-2016.

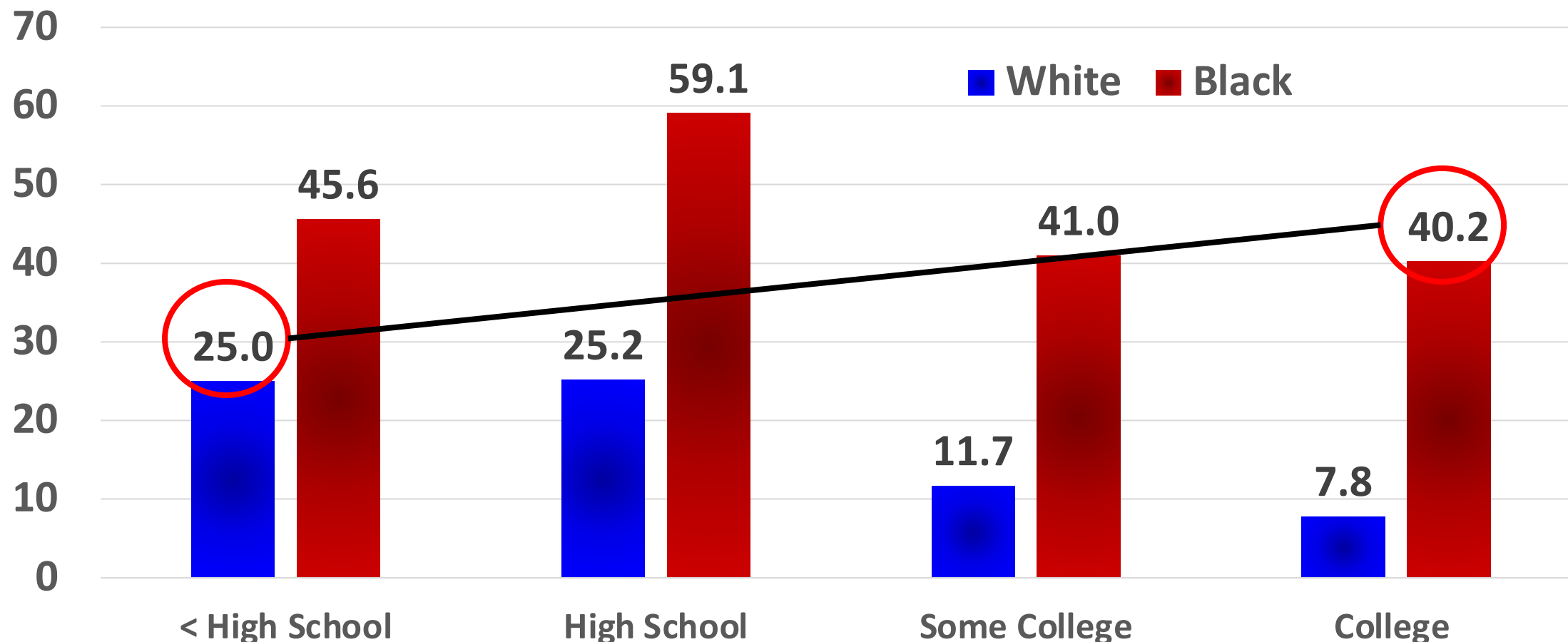


Source: Petersen E. et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — U.S., 2007–2016 . *MMWR*. 9/6/19; 68(35):762-765.

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

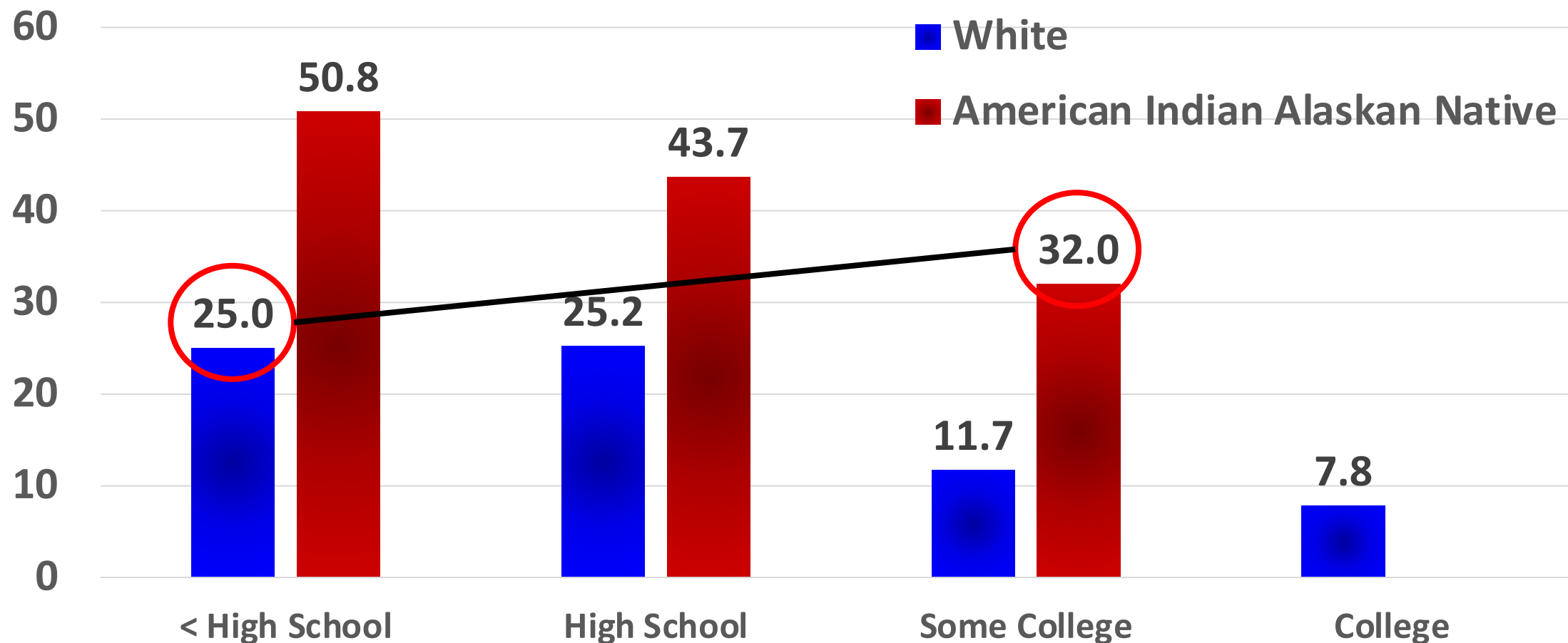


# Pregnancy-related mortality ratios (per 100,000 live births) by race/ethnicity, U.S. 2007-2016



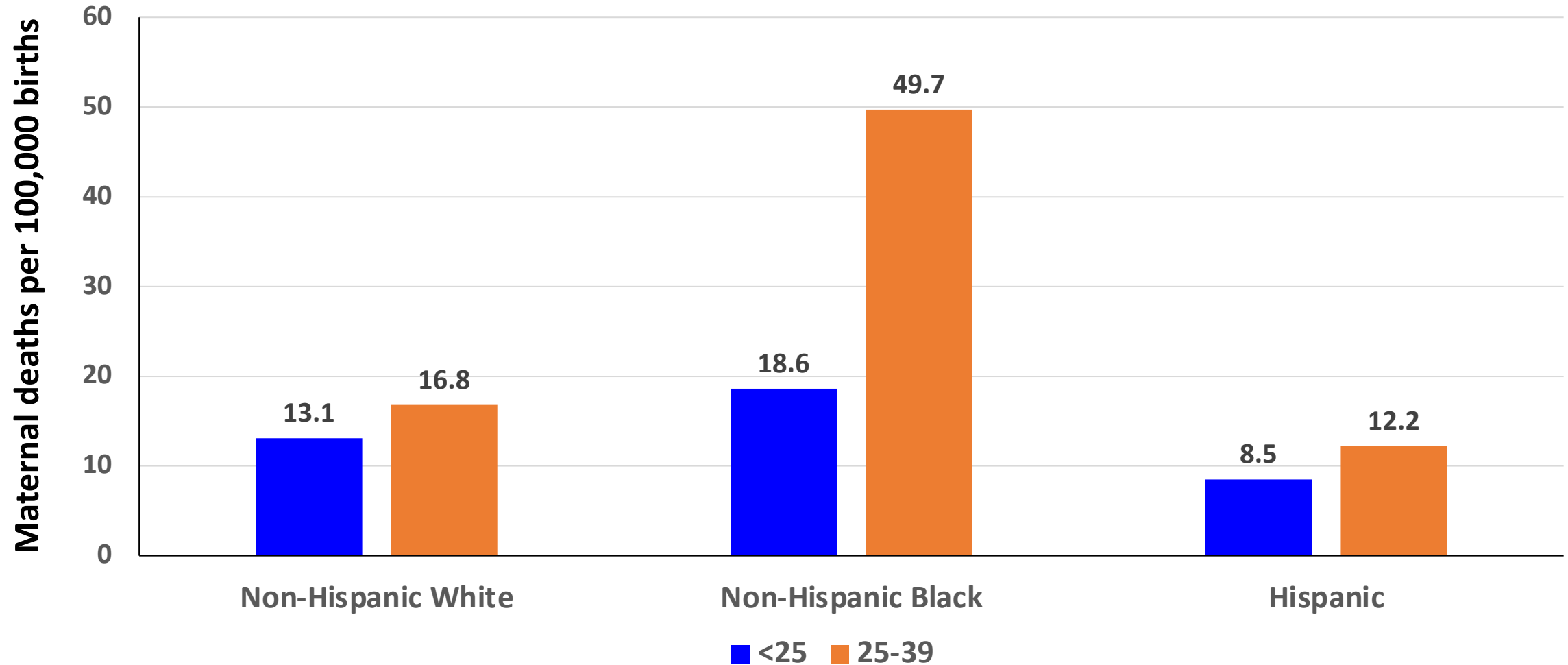
Source: Petersen E et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — United States, 2007–2016. *MMWR* 2/7/19; 68 (35): 762-765.

# Pregnancy-related mortality ratios (per 100,000 live births) by race/ethnicity, U.S. 2007-2016



Source: Petersen E et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — United States, 2007–2016. *MMWR* 2/7/19; 68 (35): 762-765.

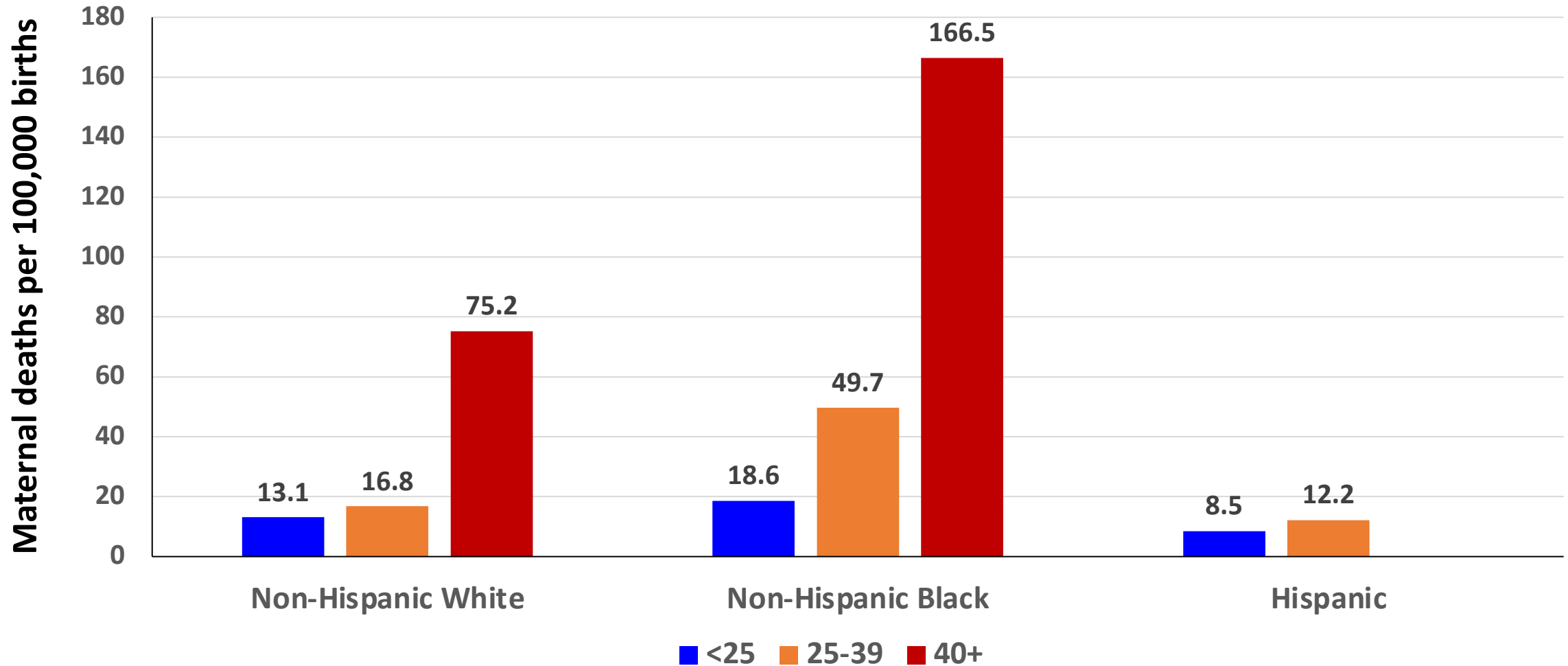
# Maternal mortality rates, by race & Hispanic origin and age: United States, 2019



Source: Hoyert DL. Maternal mortality rates in the United States, 2019. NCHS Health E-Stats. 2021.

DOI: <https://doi.org/10.15620/cdc:103855>.

# Maternal mortality rates, by race & Hispanic origin and age: United States, 2019

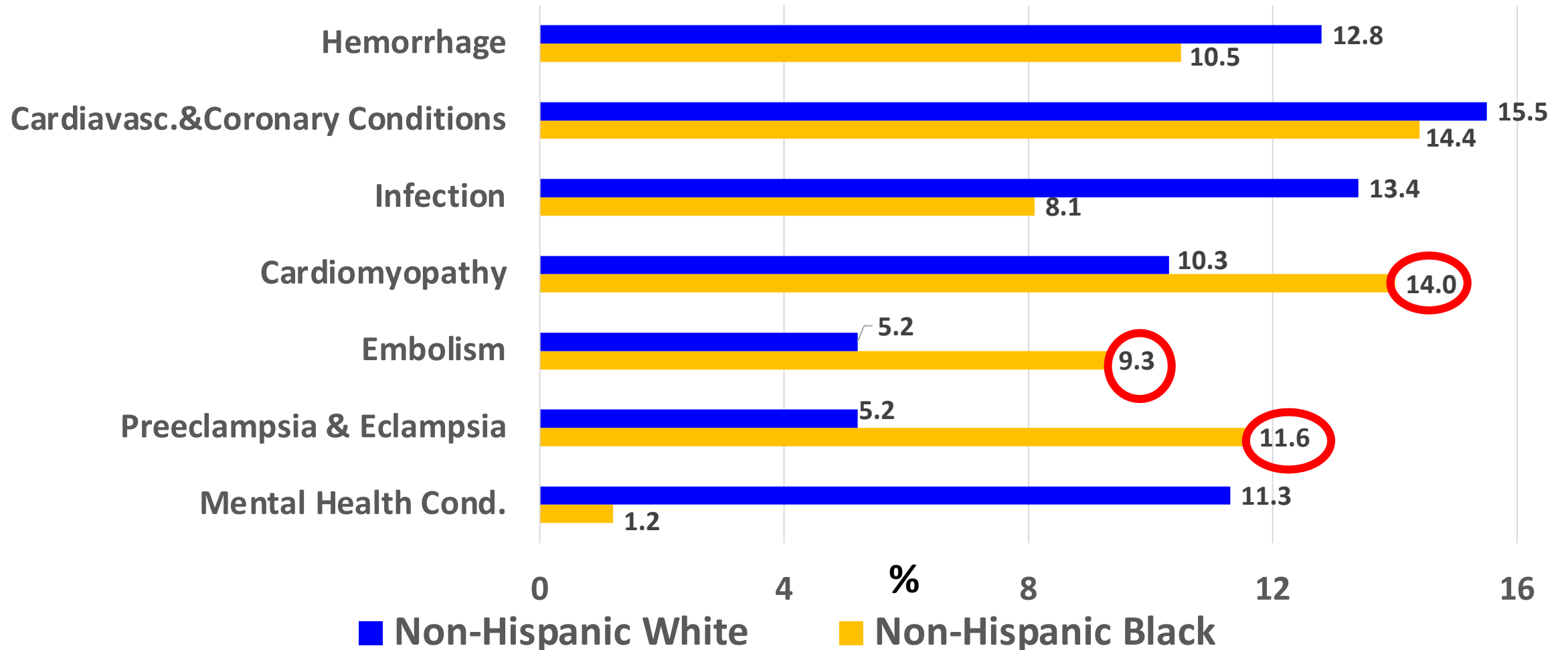


Source: Hoyert DL. Maternal mortality rates in the United States, 2019. NCHS Health E-Stats. 2021.

DOI: <https://doi.org/10.15620/cdc:103855>.

# Manifestation of Racial Disparities

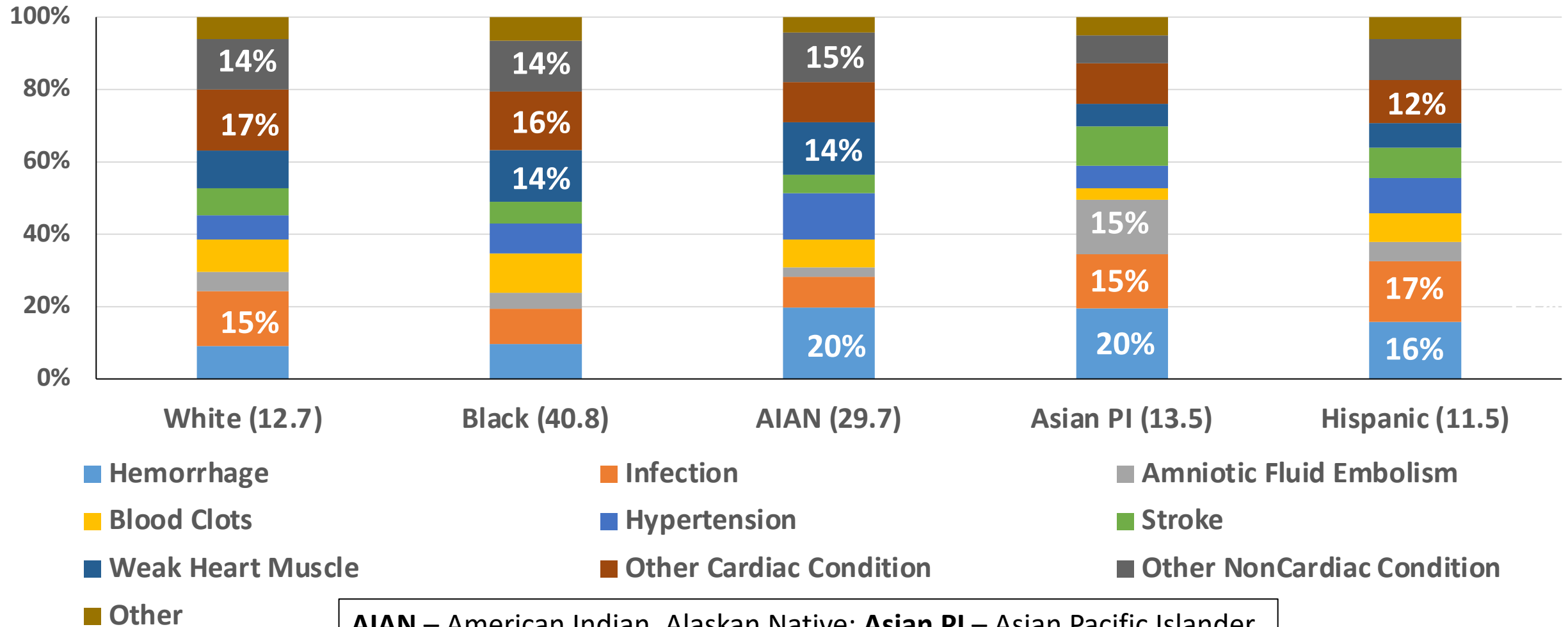
## Leading Underlying Causes of *Pregnancy-Related Deaths, by Race-Ethnicity*



Source: CDC. 2018. *Report from 9 Maternal Mortality Review Committees.*

[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

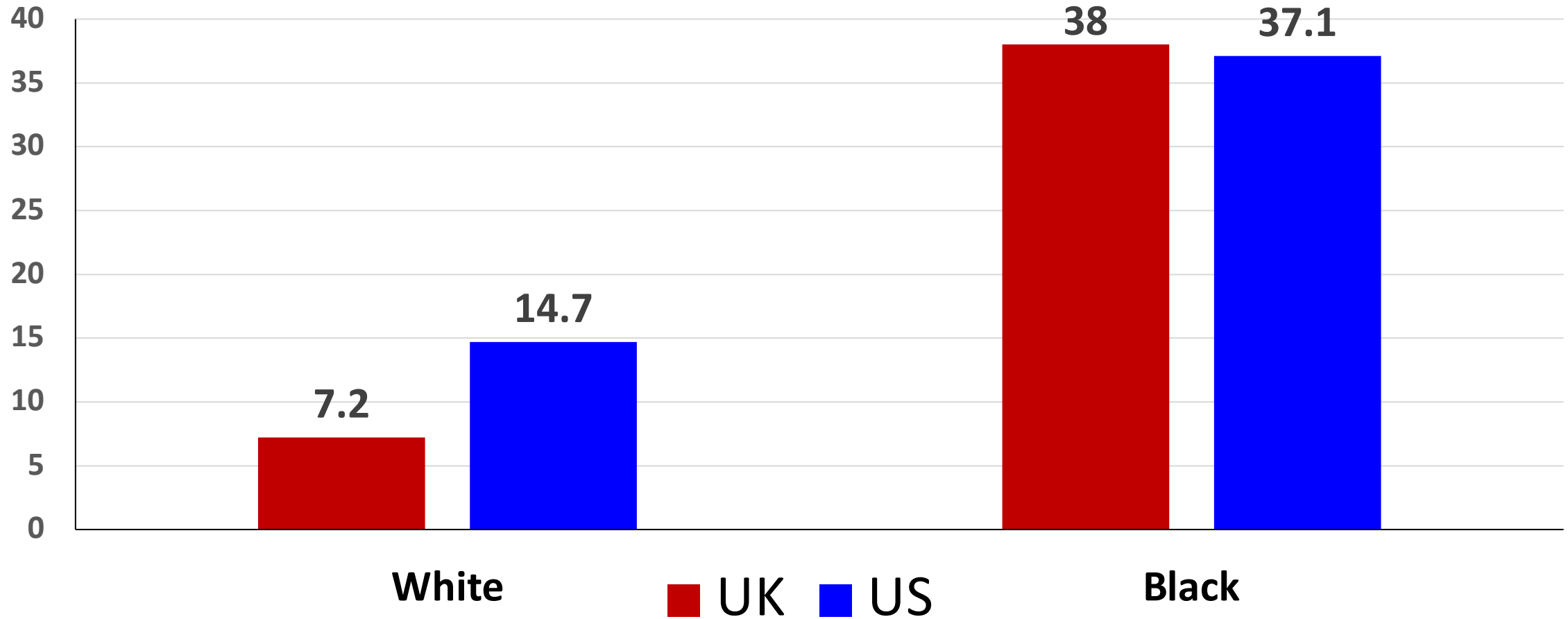
# Cause-specific pregnancy-related mortality, by race/ethnicity, U.S., 2007-2016 (%)



Source: Petersen E et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — United States, 2007–2016. *MMWR* 2/7/19; 68 (35): 762-765.

[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

# Maternal Mortality by Race, U.S. (2018) and U.K. (2015-2017)



Sources: U.S., Hoyert DL, Miniño AM. Maternal mortality in the U.S., 2018. Nat'l Vital Stat Rep.; vol 69 no 2. NCHS. 2020; MBRRACE-UK. UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2015-17. Oxford:NPEU, 2019

# Summary

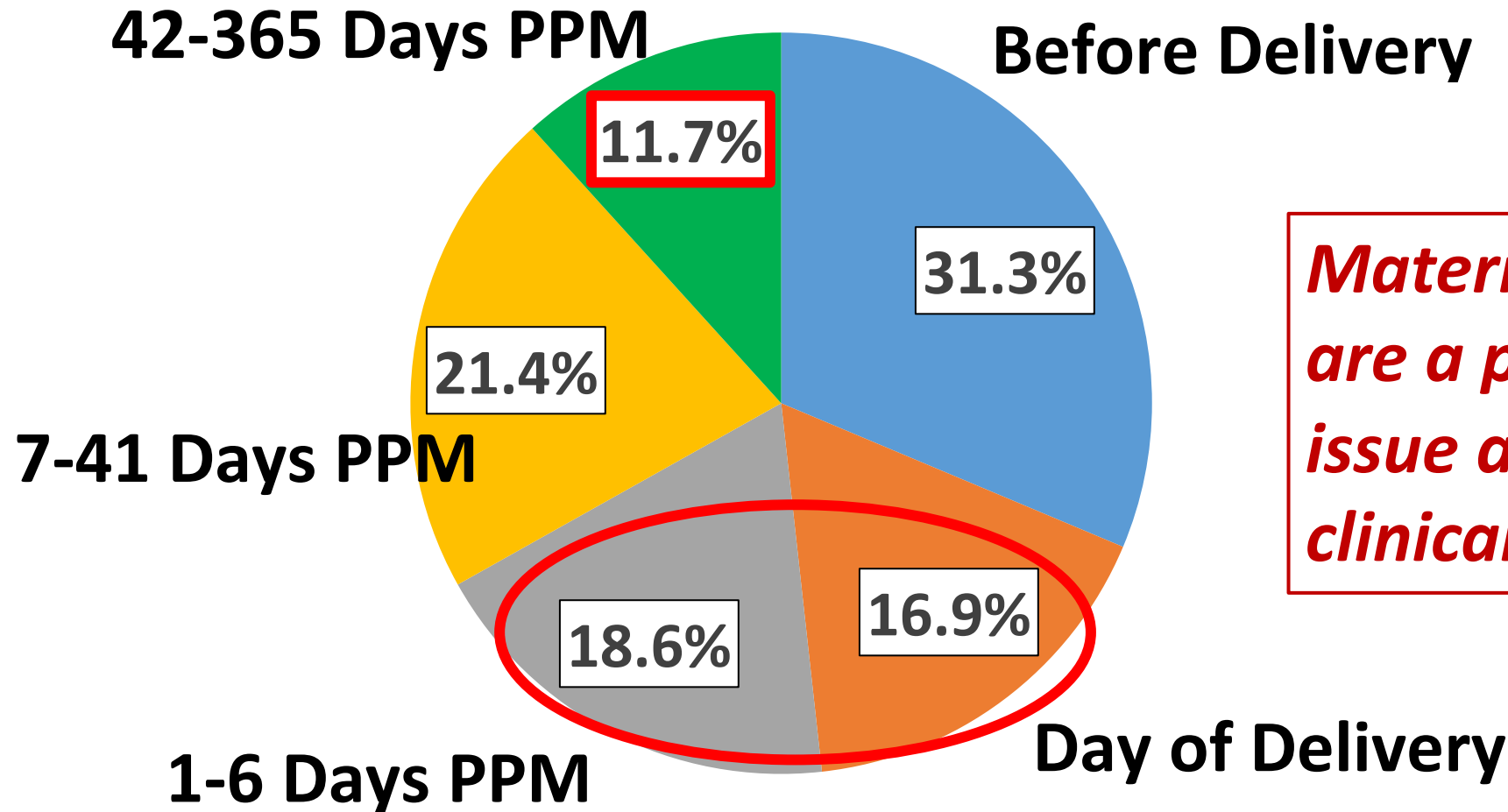
- Racial disparities in maternal mortality have existing in the U.S. as long as data has been collected.
- The consistency of the disparity with Black maternal mortality ratios 3 to 4 times that of white maternal mortality for decades reflects the lack of progress made in the U.S.
- Presently, the disparity does not reflect SES differences, with maternal education providing no protection for Black mothers.
- The maternal mortality ratios for American Indian/Alaskan natives were also far higher than those for white and Hispanic mothers.



# 7. Maternal Mortality as a Public Health Problem: *Timing & Causes of Death*

# Remember this chart?

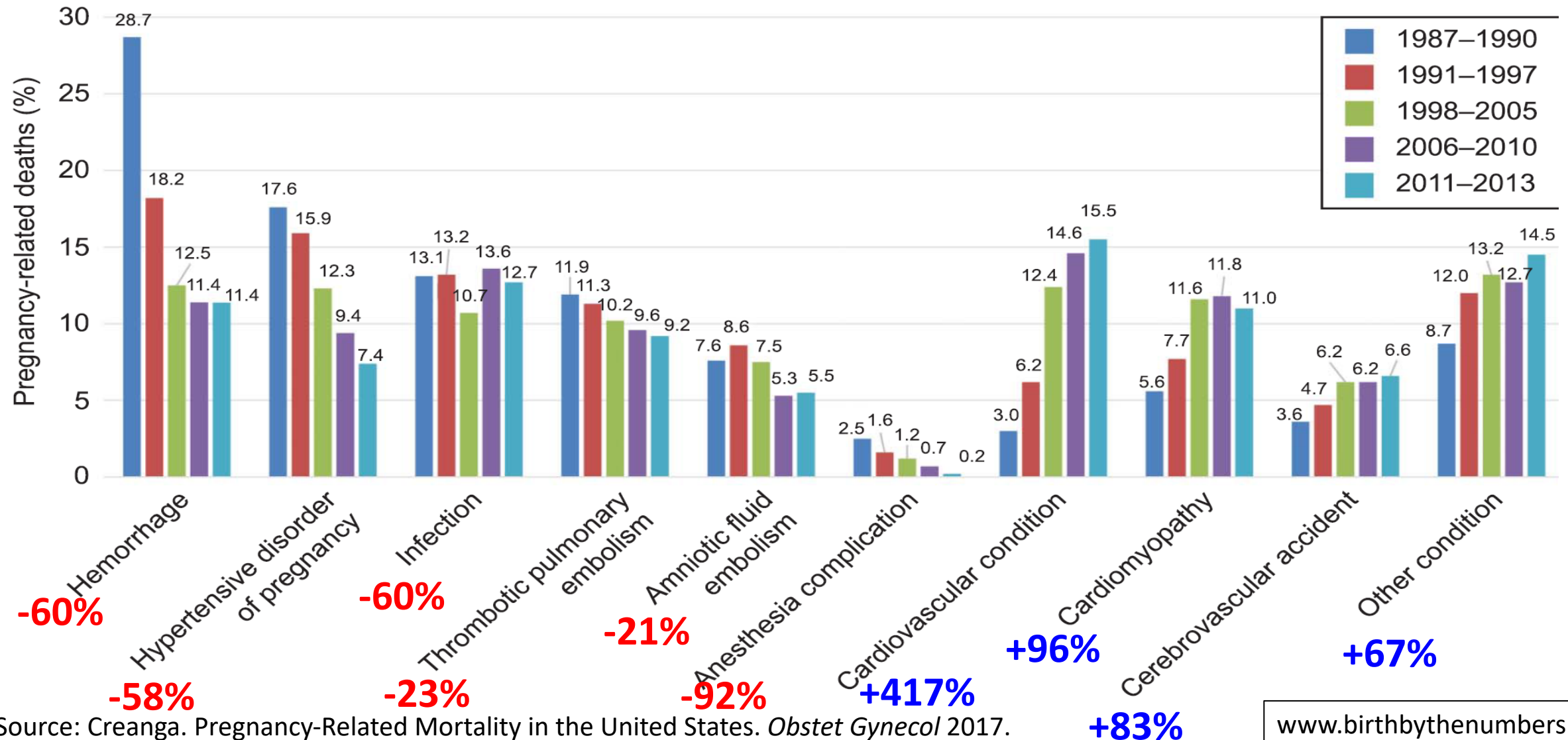
## *Timing of Pregnancy Related Deaths*



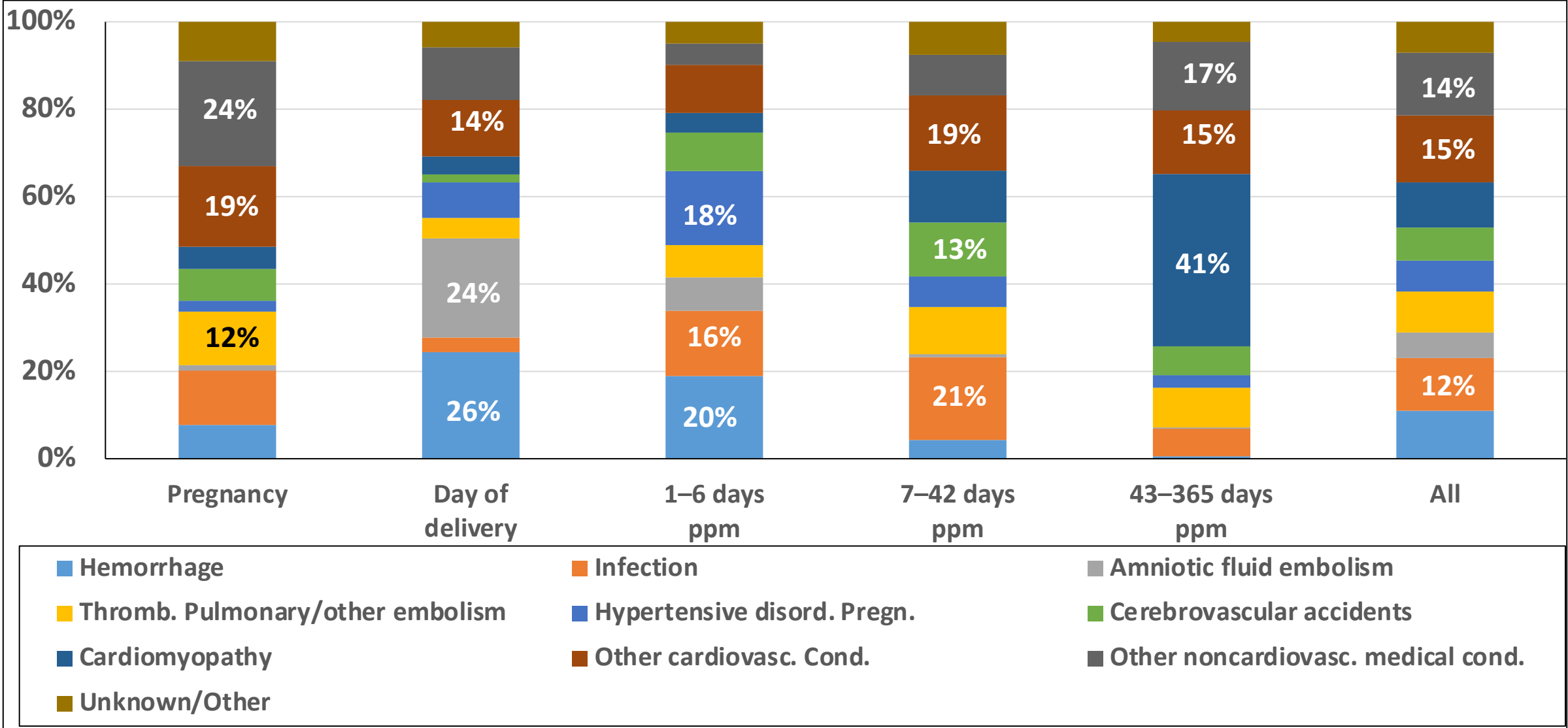
Source: Petersen E. et al. Vital Signs: Pregnancy-Related Deaths, United States, 2011–2015, and Strategies for Prevention, 13 States, 2013–2017. *MMWR* .vol.68. May 7, 2019. 1-7.

# Maternal Mortality as a Public Health Approach

## Cause-specific proportionate *Pregnancy-Related* mortality: United States, 1987–2013.

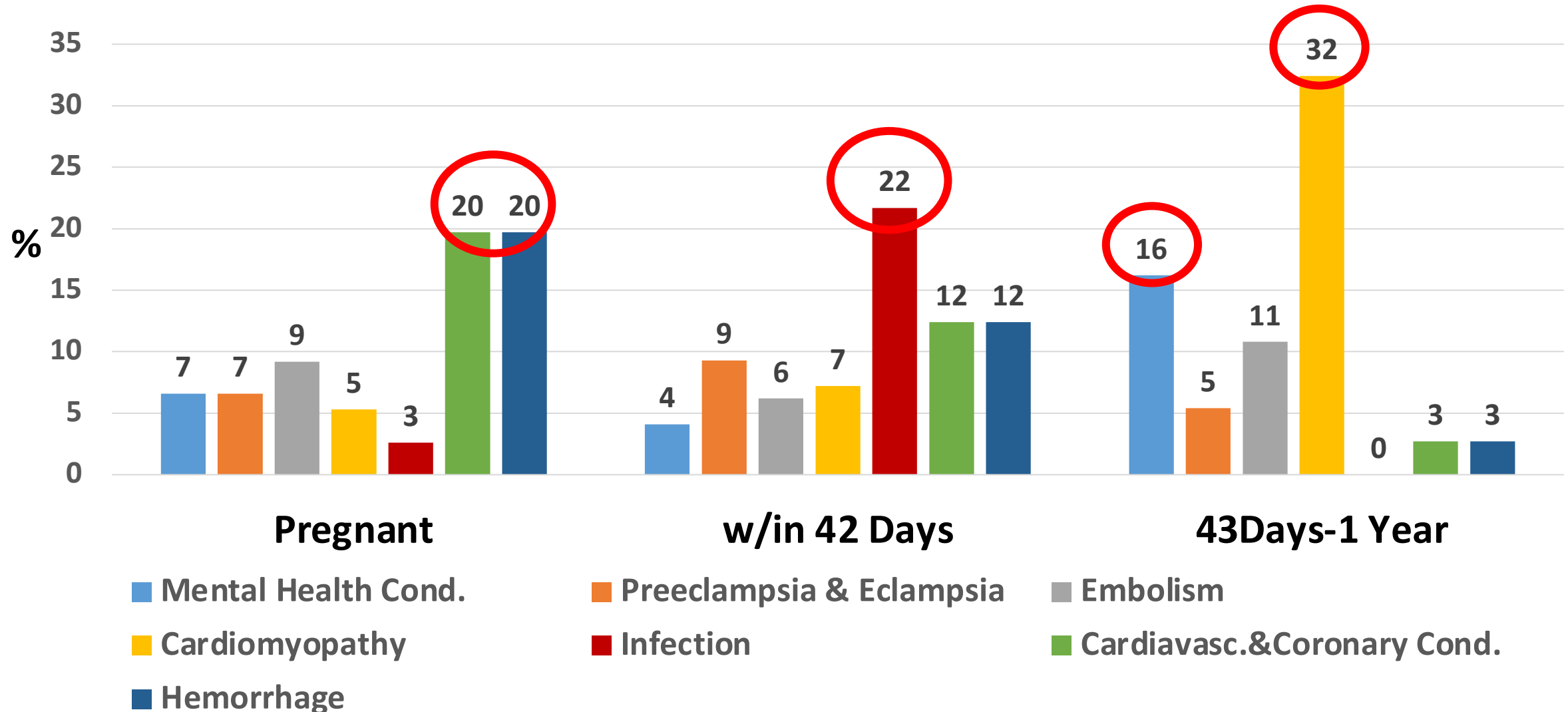


# Pregnancy-related deaths, by cause of death and time of death relative to the end of pregnancy, 2011-15



# Moving to a Public Health Approach

## *Underlying Causes of Pregnancy-Related Deaths, by **Timing of Death***



Source: CDC. 2018. *Report from 9 Maternal Mortality Review Committees.*

# Summary

- If only a third of maternal deaths occur at the time of birth, solutions have to look beyond the birth hospitalization to improve outcomes.
- We have made considerable strides in improving care at the time of birth. The recent increases have been largely among cardiovascular conditions, many of which only manifest after the birth.
- There are clearly different patterns of causes of death by timing indicating a need for more nuanced approaches.
- Research into the underlying causes of death suggests a need for a greater focus on maternal mental health, particularly in the postpartum period.

# **8. The Issue is Broader than Maternal Mortality**

# Not just about maternal mortality

## National Vital Statistics Reports



Volume 69, Number 13

January 12, 2021

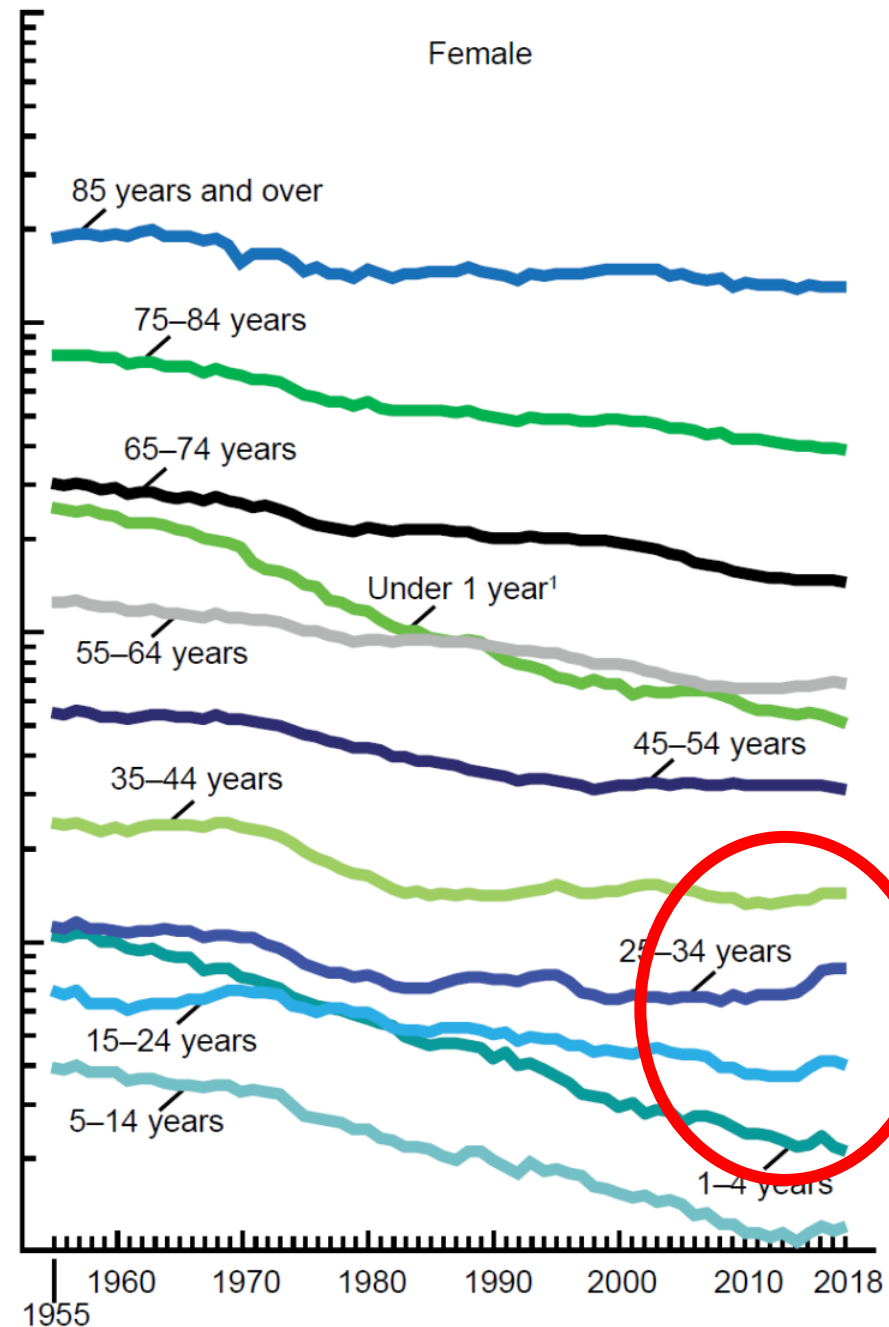
### Deaths: Final Data for 2018

STAT

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

By Eugene Declercq and Neel Shah

August 22, 2018



[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

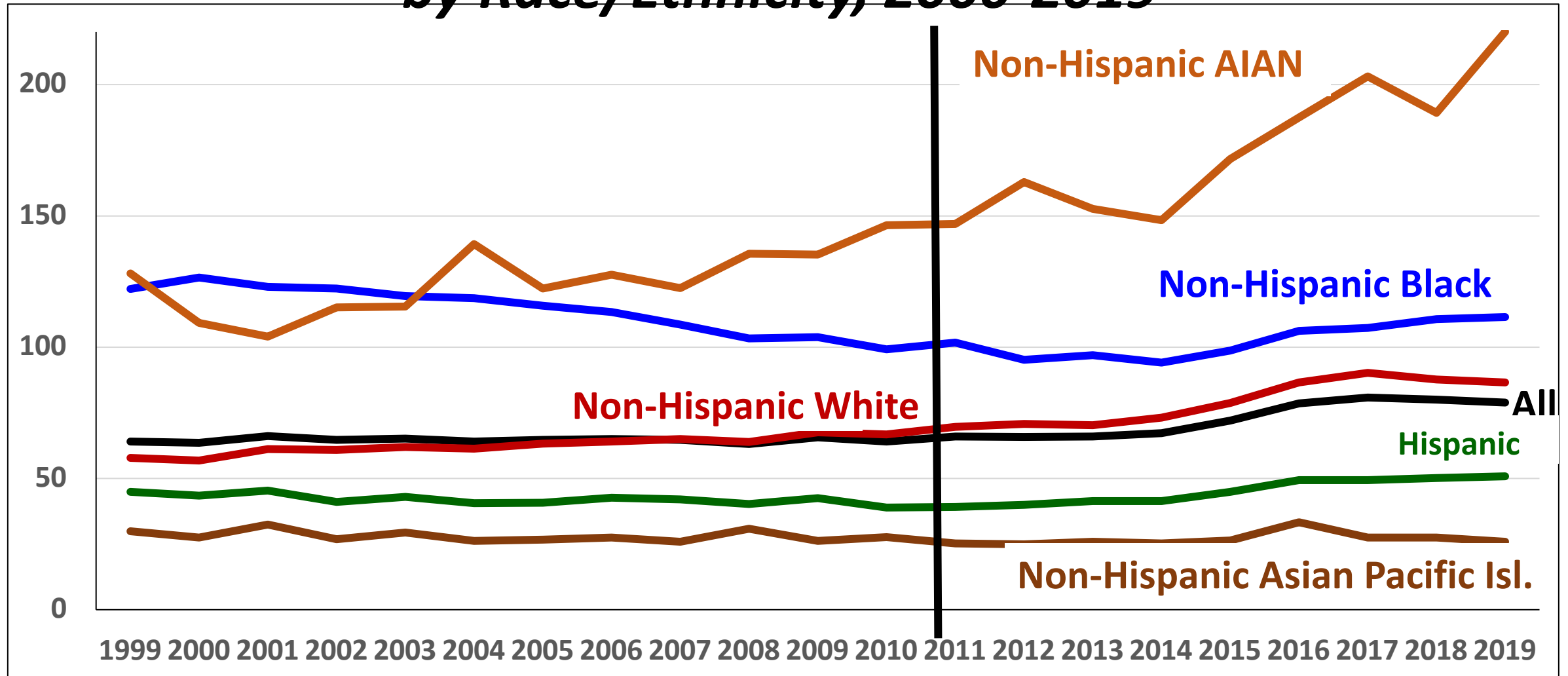


# Births in U.S. by Maternal Age, 2019

Age	# Births	%
<20	173,461	4.6%
20-24	704,342	18.8%
<b>25-29</b>	<b>1,078,097</b>	<b>28.8%</b>
<b>30-34</b>	<b>1,089,281</b>	<b>29.1%</b>
35+	702,359	18.7%
Total	<b>3,747,540</b>	<b>100.0%</b>

# The Problem is Bigger than Maternal Mortality

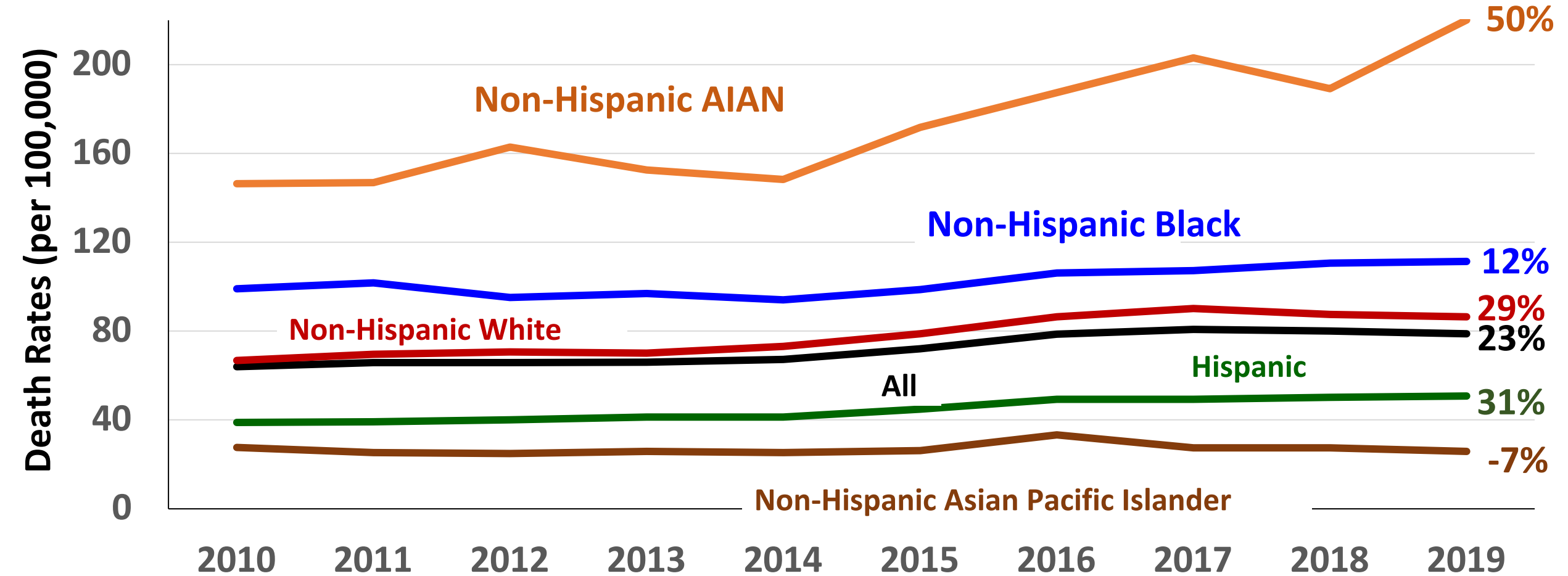
*Overall Deaths rates (per 100K), Females 25-34,  
by Race/Ethnicity, 2000-2019*



# The Problem is Bigger than Maternal Mortality

Deaths rates (per 100K), Females **25-34**, by Race/Ethnicity, 2010-19

% Increase  
2010-2019



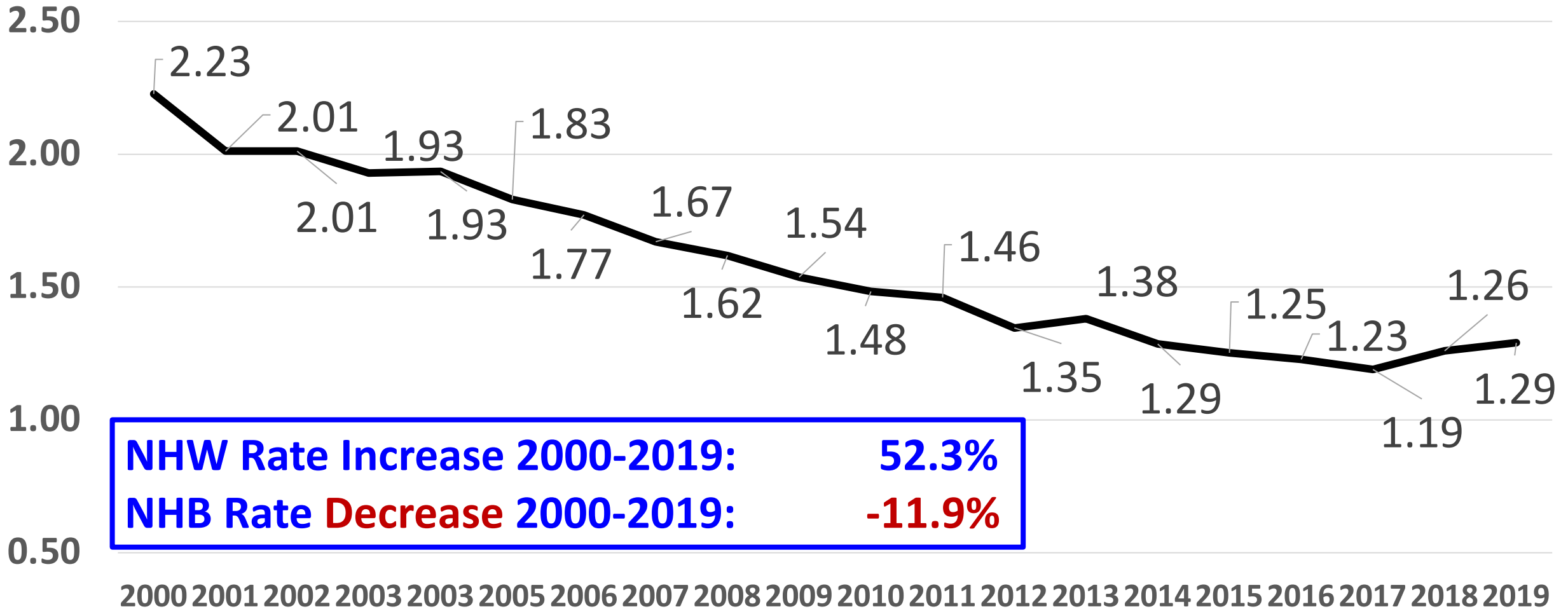
**NOTE: Pregnancy related mortality rate increased by <1% 2010-2017**

**All Female Deaths 25-34**  
**2010 -- 13,067; 2019 -- 17,827**

Source: NCHS.CDC Wonder  
Online Database

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

# Ratio of Black/White Female Death Rates, Women 25-34, 2000-2019



# Problem is Bigger than Maternal Mortality

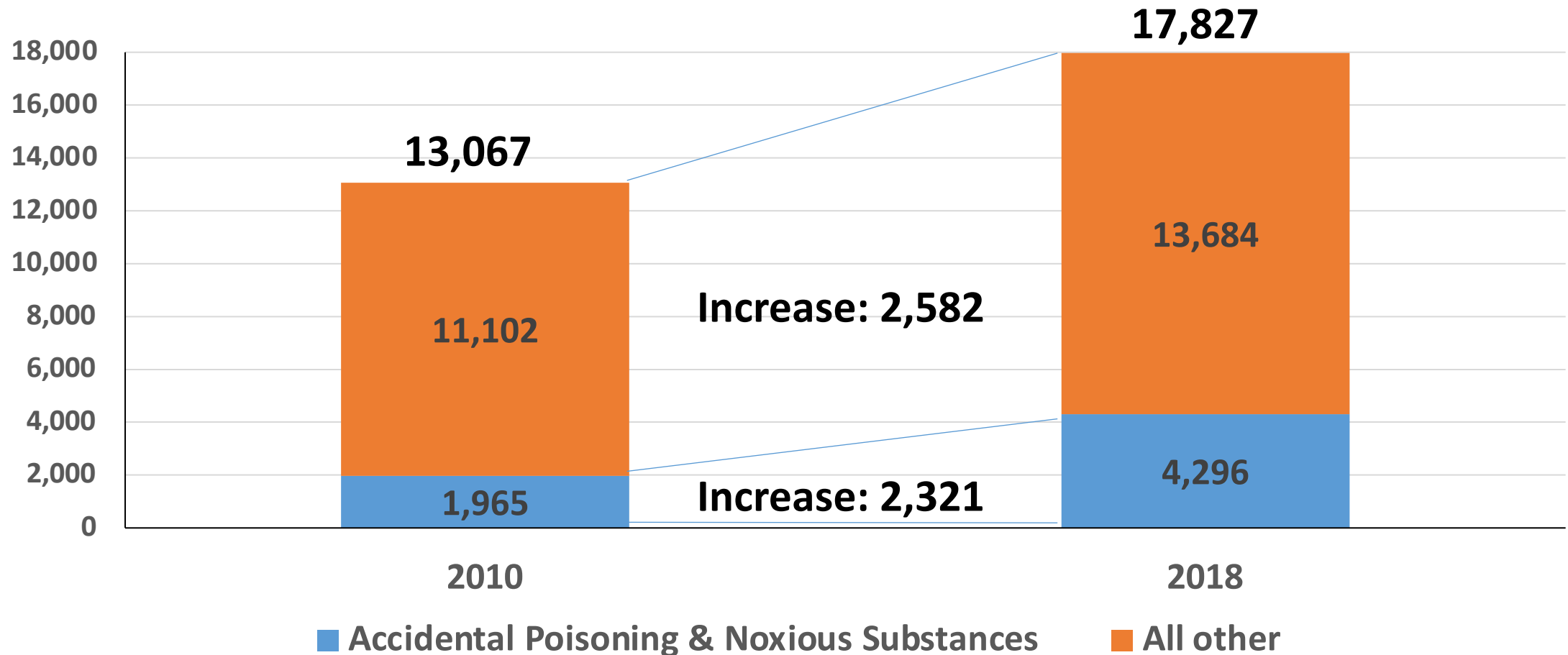
## *Top 10 Causes of Death for Women 25-34 in 2019*

	2019 Total Deaths	% of total	Rate per 100 K	% Change in rate 2010-2019	Proportion of 2010-19 Increase
<b>All causes</b>	17,827	100.0	78.9	18.1%	---
<b>Accidents (unintentional inj.)</b>	6,598	37.0	29.2	57.8%	59.4%
Malignant neoplasms	1,833	10.3	8.1	-10.0%	0.0%
<b>Intentional self-harm (suicide)</b>	1,526	8.6	6.8	28.3%	9.1%
Diseases of heart	1,167	6.5	5.2	6.1%	3.3%
Assault (homicide)	807	4.5	3.6	9.1%	2.6%
<b>Pregnancy, childbirth &amp; puerperium</b>	532	3.0	2.4	33.3%	3.5%
<b>Chronic liver disease and cirrhosis</b>	418	2.3	1.9	111.1%	5.0%
Diabetes mellitus	325	1.8	1.4	7.7%	1.3%
Cerebrovascular diseases	276	1.5	1.2	0.0%	0.5%
Influenza and pneumonia,	210	1.22	0.9	12.5%	0.9%
All other causes (residual)	4,135	23.2	18.3	17.3%	14.4%

Sources: CDC, NCHS. Underlying Cause of Death 1999-2018 on CDC WONDER Detailed Mortality Database, released in 2021. Accessed at <http://wonder.cdc.gov/ucd-icd10.html> on Jan. 14, 2021

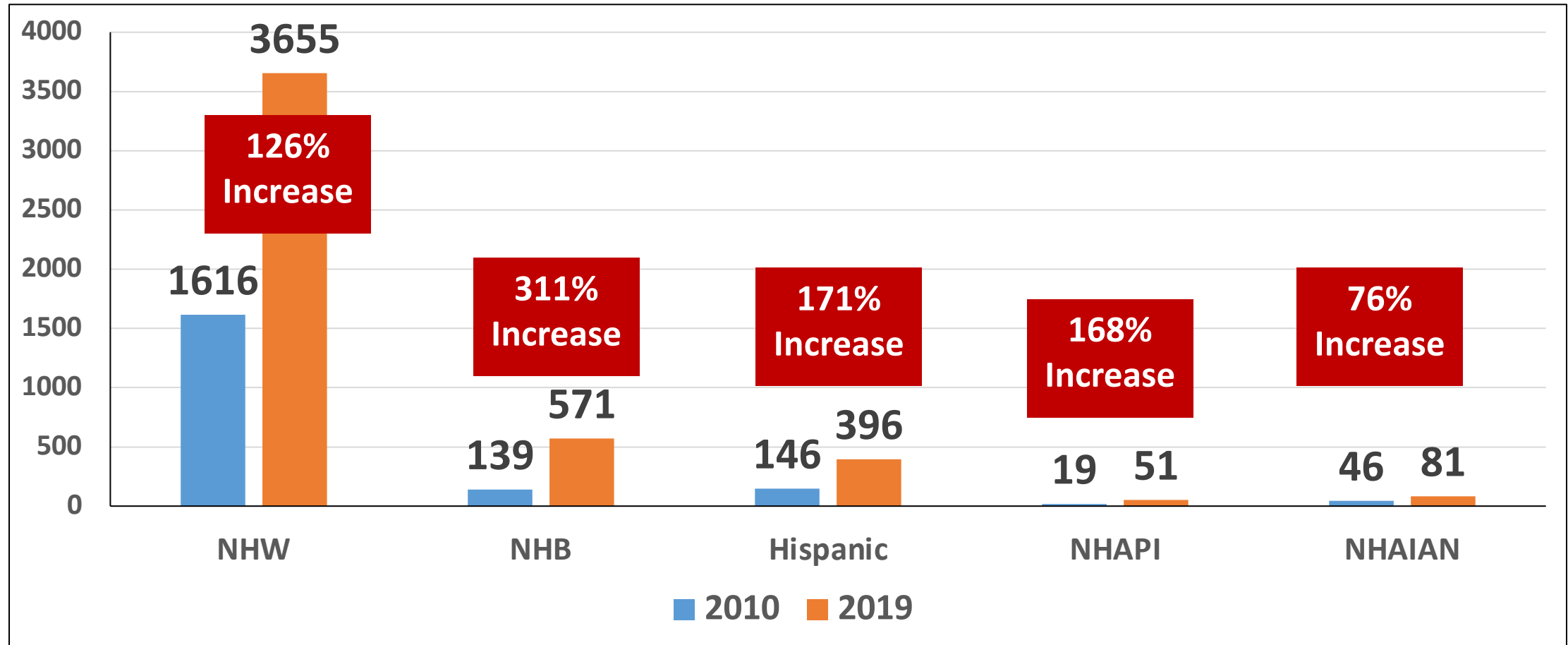
[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

# Increases in Female Deaths 2010-2019: 47% of the overall increase came from 1 cause



Sources: CDC, NCHS. CDC WONDER Online Detailed Mortality Database, released in 2020. Accessed at <http://wonder.cdc.gov/ucd-icd10.html> on Mar 9, 2020 10:27:59 PM

# Increase in Drug Induced Deaths, by Race/Ethnicity, 2010 & 2019



CDC, NCHS. CDC WONDER Online Detailed Mortality Database, released in 2020. Accessed at <http://wonder.cdc.gov/ucd-icd10.html> on Mar 9, 2020 10:27:59 PM

# Summary

- Pick your idiom: tip of the iceberg or canary in the coal mine – the 700 maternal deaths are a warning about a much larger problem in the U.S. -- the rising death rate among women of reproductive age.
- While the pregnancy related mortality rate has remained steady since 2010, the overall death rate for women 25-34 has increased by 23%.
- The death rate for non-Hispanic women is rising at a much faster rate than the rate among non-Hispanic black women.
- The primary cause of these increases in deaths appears to be substance use.

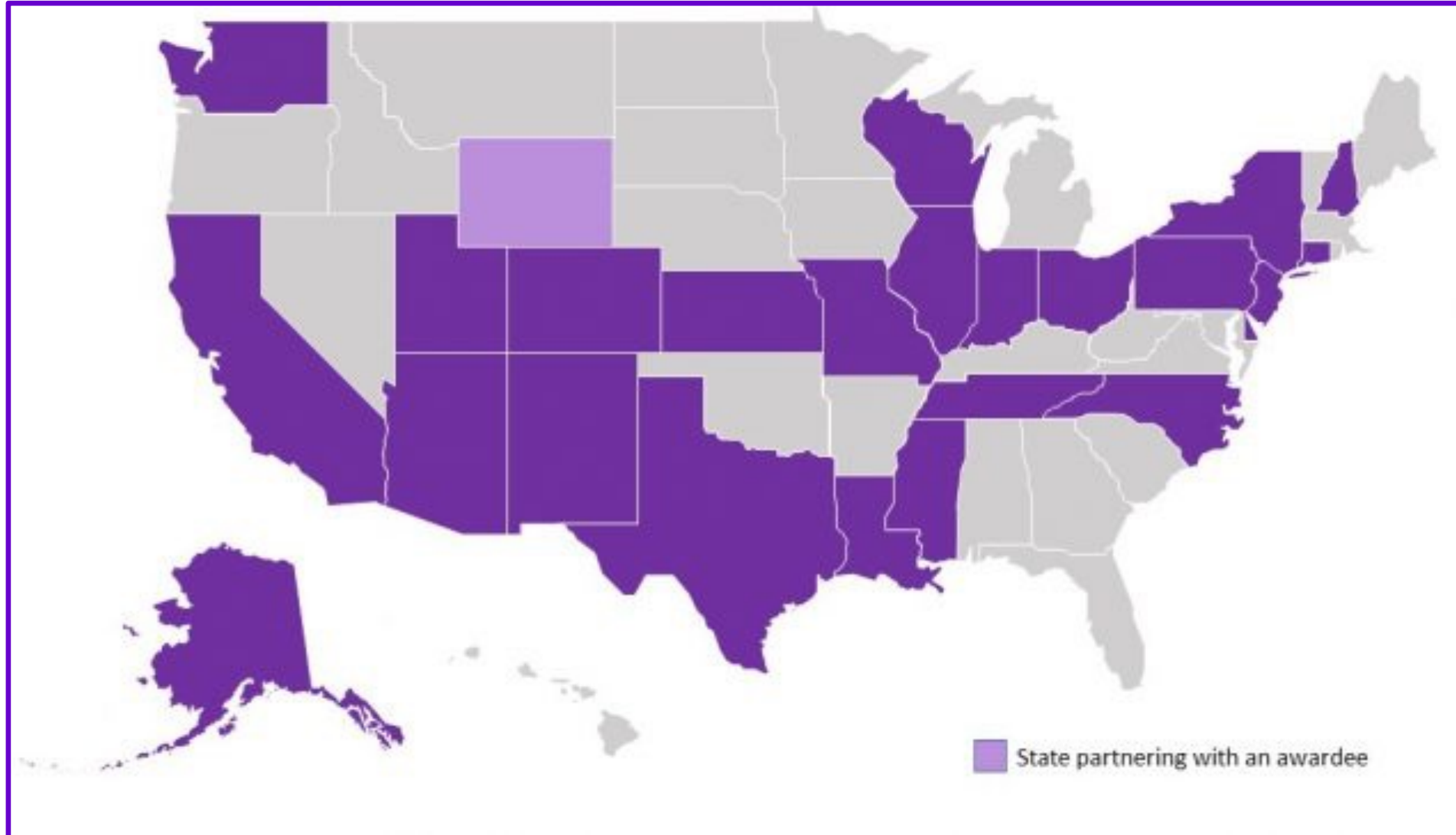


# 9. The Way Forward

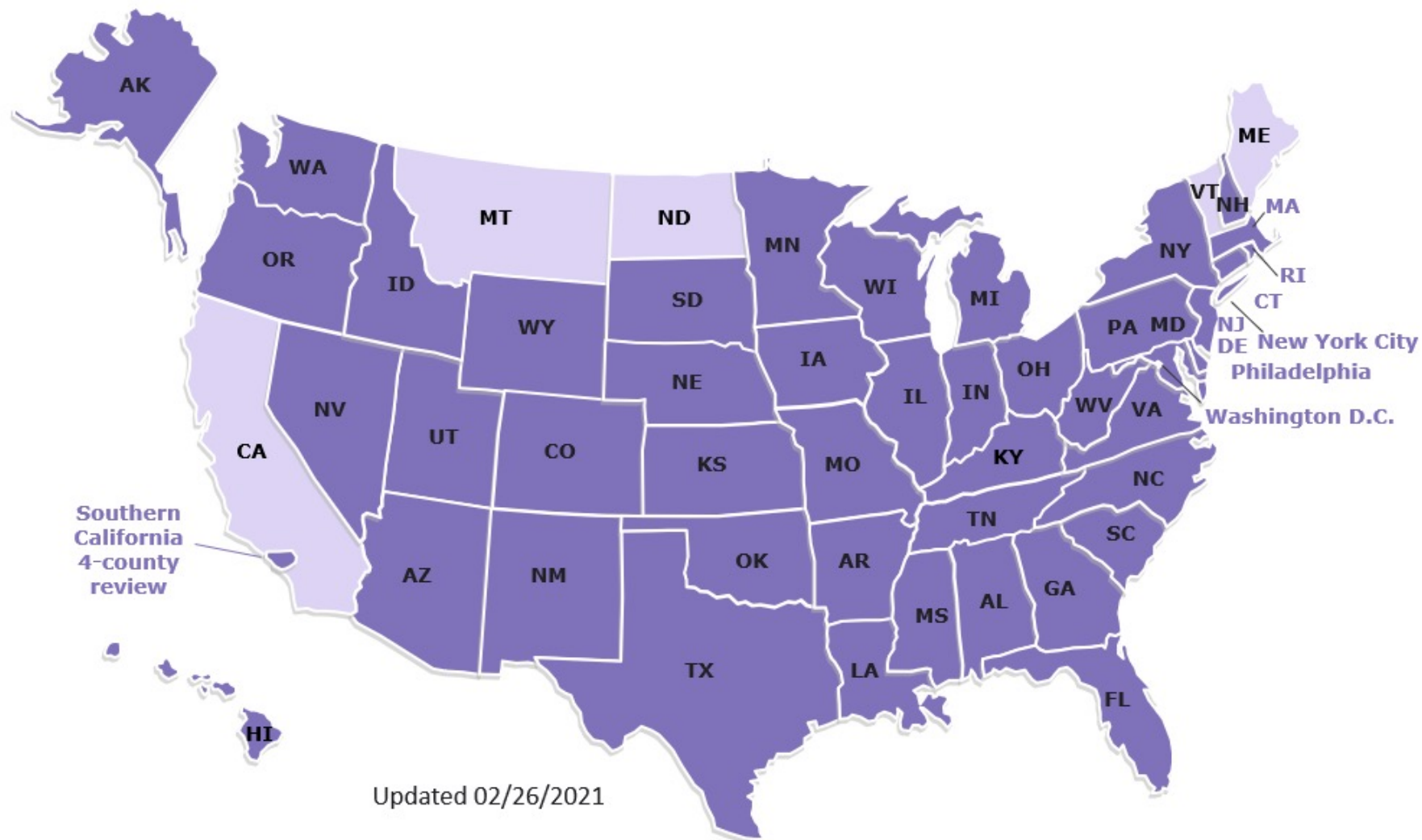
# Preventability

- **Definition:** A death is considered preventable if the committee determines there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

# States Funded Through ERASE MM



# Maternal Mortality Review Committees (MMRCs) in 50 State and Local Jurisdictions



# US Maternal Mortality Surveillance

	CDC – National Vital Statistics System (NVSS)	CDC – Pregnancy Mortality Surveillance System (PMSS)	State and Local Maternal Mortality Review Committees (MMRCs)
Data Source	Death certificates	Death certificates linked to fetal death and birth certificates	Death certificates linked to fetal death and birth certificates, medical records, social service records, autopsy, informant interviews, etc.
Time Frame	During pregnancy – 42 days	During pregnancy – 365 days	During pregnancy – 365 days
Source of Classification	ICD-10 codes	Medical epidemiologists	Multidisciplinary committees
Terms	Maternal death	Pregnancy associated, (Associated and) Pregnancy related, (Associated but) Not pregnancy related	Pregnancy associated, (Associated and) Pregnancy related, (Associated but) Not pregnancy related
Measure	Maternal Mortality Rate - # of Maternal Deaths per 100,000 live births	Pregnancy Related Mortality Ratio - # of Pregnancy Related Deaths per 100,000 live births	Pregnancy Related Mortality Ratio - # of Pregnancy Related Deaths per 100,000 live births
Purpose	Show national trends and provide a basis for international comparison	Analyze clinical factors associated with deaths, publish information that may lead to prevention strategies	Understand medical and non-medical contributors to deaths, prioritize interventions that effectively reduce maternal deaths

Reviewed in:

- Callaghan, William M. 2012. Overview of maternal mortality in the United States. *Seminars in perinatology*. 36; 1: 2-6.
- St. Pierre A, Zaharatos J, Goodman D, Callaghan WM. Challenges and opportunities in identifying, reviewing, and preventing maternal deaths. *Obstet Gynecol*. 2018;131(1):138–142.



REVIEW DATE

RECORD ID #

Month	Day	Year

--

PREGNANCY-RELATEDNESS: SELECT ONE

☐ **PREGNANCY-RELATED**

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

☐ **PREGNANCY-ASSOCIATED, BUT NOT -RELATED**

The death of a woman during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy

☐ **PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS**☐ **NOT PREGNANCY-RELATED OR -ASSOCIATED**

(i.e. false positive, woman was not pregnant within one year of her death)

ESTIMATE THE DEGREE OF RELEVANT INFORMATION (RECORDS) AVAILABLE FOR THIS CASE:

☐ **COMPLETE**

All records necessary for adequate review of the case were available

☐ **SOMEWHAT COMPLETE**

Major gaps (i.e. information that would have been crucial to the review of the case)

☐ **MOSTLY COMPLETE**

Minor gaps (i.e. information that would have been beneficial but was not essential to the review of the case)

☐ **NOT COMPLETE**

Minimal records available for review (i.e. death certificate and no additional records)

☐ **N/A**

DOES THE COMMITTEE AGREE WITH THE UNDERLYING CAUSE OF DEATH\* LISTED ON DEATH CERTIFICATE?

☐ YES ☐ NO

## COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH

TYPE	CAUSE (DESCRIPTIVE)
IMMEDIATE	
CONTRIBUTING	
UNDERLYING*	
OTHER SIGNIFICANT	

**IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING\* CAUSE OF DEATH**  
Refer to page 3 for PMSS-MM cause of death list. If more than one is selected, list in order of importance beginning with the most compelling (1-2; no more than 2 may be selected in the system).

--	--

DID **OBESITY** CONTRIBUTE TO THE DEATH? ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWNDID **MENTAL HEALTH CONDITIONS OTHER THAN SUBSTANCE USE DISORDER** CONTRIBUTE TO THE DEATH? ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWNDID **SUBSTANCE USE DISORDER** CONTRIBUTE TO THE DEATH? ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWNWAS THIS DEATH A **SUICIDE**? ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWNWAS THIS DEATH A **HOMICIDE**? ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> FIREARM                             | <input type="checkbox"/> FALL                      | <input type="checkbox"/> INTENTIONAL NEGLIGENCE |
| <input type="checkbox"/> SHARP INSTRUMENT                    | <input type="checkbox"/> PUNCHING/ KICKING/BEATING | <input type="checkbox"/> OTHER, SPECIFY:        |
| <input type="checkbox"/> BLUNT INSTRUMENT                    | <input type="checkbox"/> EXPLOSIVE                 |   |
| <input type="checkbox"/> POISONING/ OVERDOSE                 | <input type="checkbox"/> DROWNING                  |   |
| <input type="checkbox"/> HANGING/ STRANGULATION/ SUFFOCATION | <input type="checkbox"/> FIRE OR BURNS             | <input type="checkbox"/> UNKNOWN                |
|  | <input type="checkbox"/> MOTOR VEHICLE             | <input type="checkbox"/> NOT APPLICABLE         |

IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> NO RELATIONSHIP | <input type="checkbox"/> OTHER ACQUAINTANCE | <input type="checkbox"/> UNKNOWN        |
| <input type="checkbox"/> PARTNER         | <input type="checkbox"/> OTHER, SPECIFY:    | <input type="checkbox"/> NOT APPLICABLE |
| <input type="checkbox"/> EX-PARTNER      |   |   |
| <input type="checkbox"/> OTHER RELATIVE  |   |   |

COMMITTEE DETERMINATION OF PREVENTABILITY

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

WAS THIS DEATH PREVENTABLE?

☐ YES☐ NO

CHANCE TO ALTER OUTCOME?

☐ GOOD CHANCE☐ SOME CHANCE☐ NO CHANCE☐ UNABLE TO DETERMINE

CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION (Entries may continue to grid on page 5.)

CONTRIBUTING FACTORS WORKSHEET

What were the factors that contributed to this death?  
Multiple contributing factors may be present at each level.

RECOMMENDATIONS OF THE COMMITTEE

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

CONTRIBUTING FACTOR LEVEL	CONTRIBUTING FACTORS (choose as many as needed below)	DESCRIPTION OF ISSUE (enter a description for EACH contributing factor listed)	COMMITTEE RECOMMENDATIONS [Who?] should [do what?] [when?] Map recommendations to contributing factors.	PREVENTION LEVEL (choose below)	IMPACT LEVEL (choose below)
PATIENT/FAMILY					
PROVIDER					
FACILITY					
SYSTEM					
COMMUNITY					

CONTRIBUTING FACTOR KEY (DESCRIPTIONS ON PAGE 4)

- Delay
  - Adherence
  - Knowledge
  - Cultural/religious
  - Environmental
  - Violence
  - Mental health conditions
  - Substance use disorder - alcohol, illicit/prescription drugs
- Tobacco use
  - Chronic disease
  - Childhood abuse/trauma
  - Access/financial
  - Unstable housing
  - Social support/isolation
  - Equipment/technology
  - Policies/procedures
  - Communication
- Continuity of care/ care coordination
  - Clinical skill/ quality of care
  - Outreach
  - Law Enforcement
  - Referral
  - Assessment
  - Legal
  - Other

PREVENTION LEVEL	EXPECTED IMPACT LEVEL
<ul style="list-style-type: none"><li>• <b>PRIMARY:</b> Prevents the contributing factor before it ever occurs</li><li>• <b>SECONDARY:</b> Reduces the impact of the contributing factor once it has occurred (i.e. treatment)</li><li>• <b>TERTIARY:</b> Reduces the impact or progression of what has become an ongoing contributing factor (i.e. management of complications)</li></ul>	<ul style="list-style-type: none"><li>• <b>SMALL:</b> Education/counseling (community- and/or provider-based health promotion and education activities)</li><li>• <b>MEDIUM:</b> Clinical intervention and coordination of care across continuum of well-woman visits (protocols, prescriptions)</li><li>• <b>LARGE:</b> Long-lasting protective intervention (improve readiness, recognition and response to obstetric emergencies/LARC)</li><li>• <b>EXTRA LARGE:</b> Change in context (promote environments that support healthy living/ensure available and accessible services)</li><li>• <b>GIANT:</b> Address social determinants of health (poverty, inequality, etc.)</li></ul>



## IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH\* PMSS-MM

If more than one is selected, please list them in order of importance beginning with the most compelling (1-2; no more than 2 may be selected in the system).

\*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.

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> 10 Hemorrhage (excludes aneurysms or CVA)   | <input type="checkbox"/> 83 Collagen vascular/autoimmune diseases   | <input type="checkbox"/> 92.1 Epilepsy/seizure disorder  |
| <input type="checkbox"/> 10.1 Hemorrhage – rupture/laceration/ intra-abdominal bleeding                            | <input type="checkbox"/> 83.1 Systemic lupus erythematosus (SLE)  | <input type="checkbox"/> 92.9 Other neurologic diseases/NOS  |
| <input type="checkbox"/> 10.2 Placental abruption  | <input type="checkbox"/> 83.9 Other collagen vascular diseases/NOS  | <input type="checkbox"/> 93 Renal disease  |
| <input type="checkbox"/> 10.3 Placenta previa  | <input type="checkbox"/> 85 Conditions unique to pregnancy (e.g. gestational diabetes, hyperemesis, liver disease of pregnancy)                           | <input type="checkbox"/> 93.1 Chronic renal failure/End-stage renal disease (ESRD)   |
| <input type="checkbox"/> 10.4 Ruptured ectopic pregnancy   | <input type="checkbox"/> 88 Injury  | <input type="checkbox"/> 93.9 Other renal disease/NOS  |
| <input type="checkbox"/> 10.5 Hemorrhage - uterine atony/postpartum hemorrhage                                     | <input type="checkbox"/> 88.1 Intentional (homicide)  | <input type="checkbox"/> 95 Cerebrovascular accident (hemorrhage/ thrombosis/aneurysm/ malformation) not secondary to hypertensive disease |
| <input type="checkbox"/> 10.6 Placenta accreta/increta/percreta  | <input type="checkbox"/> 88.2 Unintentional   | <input type="checkbox"/> 96 Metabolic/endocrine  |
| <input type="checkbox"/> 10.7 Hemorrhage due to retained placenta  | <input type="checkbox"/> 88.9 Unknown/NOS   | <input type="checkbox"/> 96.1 Obesity  |
| <input type="checkbox"/> 10.8 Hemorrhage due to primary DIC  | <input type="checkbox"/> 89 Cancer  | <input type="checkbox"/> 96.2 Diabetes mellitus  |
| <input type="checkbox"/> 10.9 Other hemorrhage/NOS   | <input type="checkbox"/> 89.1 Gestational trophoblastic disease (GTD)   | <input type="checkbox"/> 96.9 Other metabolic/endocrine disorders  |
| <input type="checkbox"/> 20 Infection  | <input type="checkbox"/> 89.3 Malignant melanoma  | <input type="checkbox"/> 97 Gastrointestinal disorders   |
| <input type="checkbox"/> 20.1 Postpartum genital tract (e.g. of the uterus/ pelvis/perineum/necrotizing fasciitis) | <input type="checkbox"/> 89.9 Other malignancies/NOS  | <input type="checkbox"/> 97.1 Crohn's disease/ulcerative colitis   |
| <input type="checkbox"/> 20.2 Sepsis/septic shock  | <input type="checkbox"/> 90 Cardiovascular conditions   | <input type="checkbox"/> 97.2 Liver disease/failure/transplant   |
| <input type="checkbox"/> 20.4 Chorioamnionitis/antepartum infection  | <input type="checkbox"/> 90.1 Coronary artery disease/myocardial infarction (MI)/atherosclerotic cardiovascular disease                                   | <input type="checkbox"/> 97.9 Other gastrointestinal diseases/NOS  |
| <input type="checkbox"/> 20.5 Non-pelvic infections (e.g. pneumonia, TB, meningitis, HIV)                          | <input type="checkbox"/> 90.2 Pulmonary hypertension  | <input type="checkbox"/> 100 Mental health conditions  |
| <input type="checkbox"/> 20.6 Urinary tract infection  | <input type="checkbox"/> 90.3 Valvular heart disease congenital and acquired  | <input type="checkbox"/> 100.1 Depression  |
| <input type="checkbox"/> 20.9 Other infections/NOS   | <input type="checkbox"/> 90.4 Vascular aneurysm/dissection (non-cerebral)   | <input type="checkbox"/> 100.9 Other psychiatric conditions/NOS  |
| <input type="checkbox"/> 30 Embolism - thrombotic (non-cerebral)   | <input type="checkbox"/> 90.5 Hypertensive cardiovascular disease   | <input type="checkbox"/> 999 Unknown COD   |
| <input type="checkbox"/> 30.9 Other embolism/NOS   | <input type="checkbox"/> 90.6 Marfan Syndrome   |  |
| <input type="checkbox"/> 31 Embolism - amniotic fluid  | <input type="checkbox"/> 90.7 Conduction defects/arrhythmias  |  |
| <input type="checkbox"/> 40 Preeclampsia   | <input type="checkbox"/> 90.8 Vascular malformations outside head and coronary arteries   |  |
| <input type="checkbox"/> 50 Eclampsia  | <input type="checkbox"/> 90.9 Other cardiovascular disease, including CHF, cardiomegaly, cardiac hypertrophy, cardiac fibrosis, non-acute myocarditis/NOS |  |
| <input type="checkbox"/> 60 Chronic hypertension with superimposed preeclampsia                                    | <input type="checkbox"/> 91 Pulmonary conditions (excludes ARDS-Adult respiratory distress syndrome)  |  |
| <input type="checkbox"/> 70 Anesthesia complications   | <input type="checkbox"/> 91.1 Chronic lung disease  |  |
| <input type="checkbox"/> 80 Cardiomyopathy   | <input type="checkbox"/> 91.2 Cystic fibrosis   |  |
| <input type="checkbox"/> 80.1 Postpartum/peripartum cardiomyopathy   | <input type="checkbox"/> 91.3 Asthma  |  |
| <input type="checkbox"/> 80.2 Hypertrophic cardiomyopathy  | <input type="checkbox"/> 91.9 Other pulmonary disease/NOS   |  |
| <input type="checkbox"/> 80.9 Other cardiomyopathy/NOS   | <input type="checkbox"/> 92 Neurologic/neurovascular conditions (excluding CVAs)  |  |
| <input type="checkbox"/> 82 Hematologic  |   |  |
| <input type="checkbox"/> 82.1 Sickle cell anemia   |   |  |
| <input type="checkbox"/> 82.9 Other hematologic conditions including thrombophilias/TTP/HUS/NOS                    |   |  |



## CONTRIBUTING FACTOR DESCRIPTIONS

### DELAY OR FAILURE TO SEEK CARE

The provider or patient was delayed in referring or accessing care, treatment, or follow-up care/action.

### ADHERENCE TO MEDICAL RECOMMENDATIONS

The provider or patient did not follow protocol or failed to comply with standard procedures (i.e. non adherence to prescribed medications).

### KNOWLEDGE - LACK OF KNOWLEDGE REGARDING IMPORTANCE OF EVENT OR OF TREATMENT OR FOLLOW-UP

The provider or patient did not receive adequate education or lacked knowledge or understanding regarding the significance of a health event (e.g. shortness of breath as a trigger to seek immediate care) or lacked understanding about the need for treatment/follow-up after evaluation for a health event (e.g. needed to keep appointment for psychiatric referral after an ED visit for exacerbation of depression).

### CULTURAL/RELIGIOUS, OR LANGUAGE FACTORS

Demonstration that any of these factors was either a barrier to care due to lack of understanding or led to refusal of therapy due to beliefs (or belief systems).

### ENVIRONMENTAL FACTORS

Factors related to weather or social environment.

### VIOLENCE AND INTIMATE PARTNER VIOLENCE (IPV)

Physical or emotional abuse perpetrated by current or former intimate partner, family member, or stranger.

### MENTAL HEALTH CONDITIONS

The patient carried a diagnosis of a psychiatric disorder. This includes postpartum depression.

### SUBSTANCE USE DISORDER - ALCOHOL, ILLICIT/ PRESCRIPTION DRUGS

Substance use disorder is characterized by recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment, such as health problems or disability. The committee may determine that substance use disorder contributed to the death when the disorder directly compromised a woman's health status (e.g. acute methamphetamine intoxication exacerbated pregnancy-induced hypertension, or woman was more vulnerable to infections or medical conditions).

### TOBACCO USE

The patient's use of tobacco directly compromised the patient's health status (e.g. long-term smoking led to underlying chronic lung disease).

### CHRONIC DISEASE

Occurrence of one or more significant pre-existing medical conditions (e.g. obesity, cardiovascular disease, or diabetes).

### CHILDHOOD SEXUAL ABUSE/TRAUMA

The patient experienced rape, molestation, or one or more of the following: sexual exploitation during childhood plus persuasion, inducement, or coercion of a child to engage in sexually explicit conduct; physical or emotional abuse or violence other than that related to sexual abuse during childhood.

### LACK OF ACCESS/FINANCIAL RESOURCES

System issues, e.g. lack or loss of healthcare insurance or other financial duress, as opposed to woman's noncompliance, impacted woman's ability to care for herself (e.g. did not seek services because unable to miss work or afford postpartum visits after insurance expired). Other barriers to accessing care: insurance non-eligibility, provider shortage in woman's geographical area, and lack of public transportation.

### UNSTABLE HOUSING

Woman lived "on the street," in a homeless shelter, or in transitional or temporary circumstances with family or friends.

### SOCIAL SUPPORT/ISOLATION - LACK OF FAMILY/ FRIEND OR SUPPORT SYSTEM

Social support from family, partner, or friends was lacking, inadequate, and/or dysfunctional.

### INADEQUATE OR UNAVAILABLE EQUIPMENT/ TECHNOLOGY

Equipment was missing, unavailable, or not functional, (e.g. absence of blood tubing connector).

### LACK OF STANDARDIZED POLICIES/PROCEDURES

The facility lacked basic policies or infrastructure germane to the woman's needs (e.g. response to high blood pressure, or a lack of or outdated policy or protocol).

### POOR COMMUNICATION/LACK OF CASE COORDINATION OR MANAGEMENT/ LACK OF CONTINUITY OF CARE (SYSTEM PERSPECTIVE)

Care was fragmented (i.e. uncoordinated or not comprehensive) among or between healthcare facilities or units, (e.g. records not available between inpatient and outpatient or among units within the hospital, such as Emergency Department and Labor and Delivery).

### LACK OF CONTINUITY OF CARE (PROVIDER OR FACILITY PERSPECTIVE)

Care providers did not have access to woman's complete records or did not communicate woman's status sufficiently. Lack of continuity can be between prenatal, labor and delivery, and postpartum providers.

### CLINICAL SKILL/QUALITY OF CARE (PROVIDER OR FACILITY PERSPECTIVE)

Personnel were not appropriately skilled for the situation or did not exercise clinical judgment consistent with current standards of care (e.g. error in the preparation or administration of medication or unavailability of translation services).

### INADEQUATE COMMUNITY OUTREACH/RESOURCES

Lack of coordination between healthcare system and other outside agencies/organizations in the geographic/cultural area that work with maternal child health issues.

### INADEQUATE LAW ENFORCEMENT RESPONSE

Law enforcement response was not in a timely manner or was not appropriate or thorough in scope.

### LACK OF REFERRAL OR CONSULTATION

Specialists were not consulted or did not provide care; referrals to specialists were not made.

### FAILURE TO SCREEN/INADEQUATE ASSESSMENT OF RISK

Factors placing the woman at risk for a poor clinical outcome recognized, and the woman was not transferred/transported to a provider able to give a higher level of care.

### LEGAL

Legal considerations that impacted outcome.

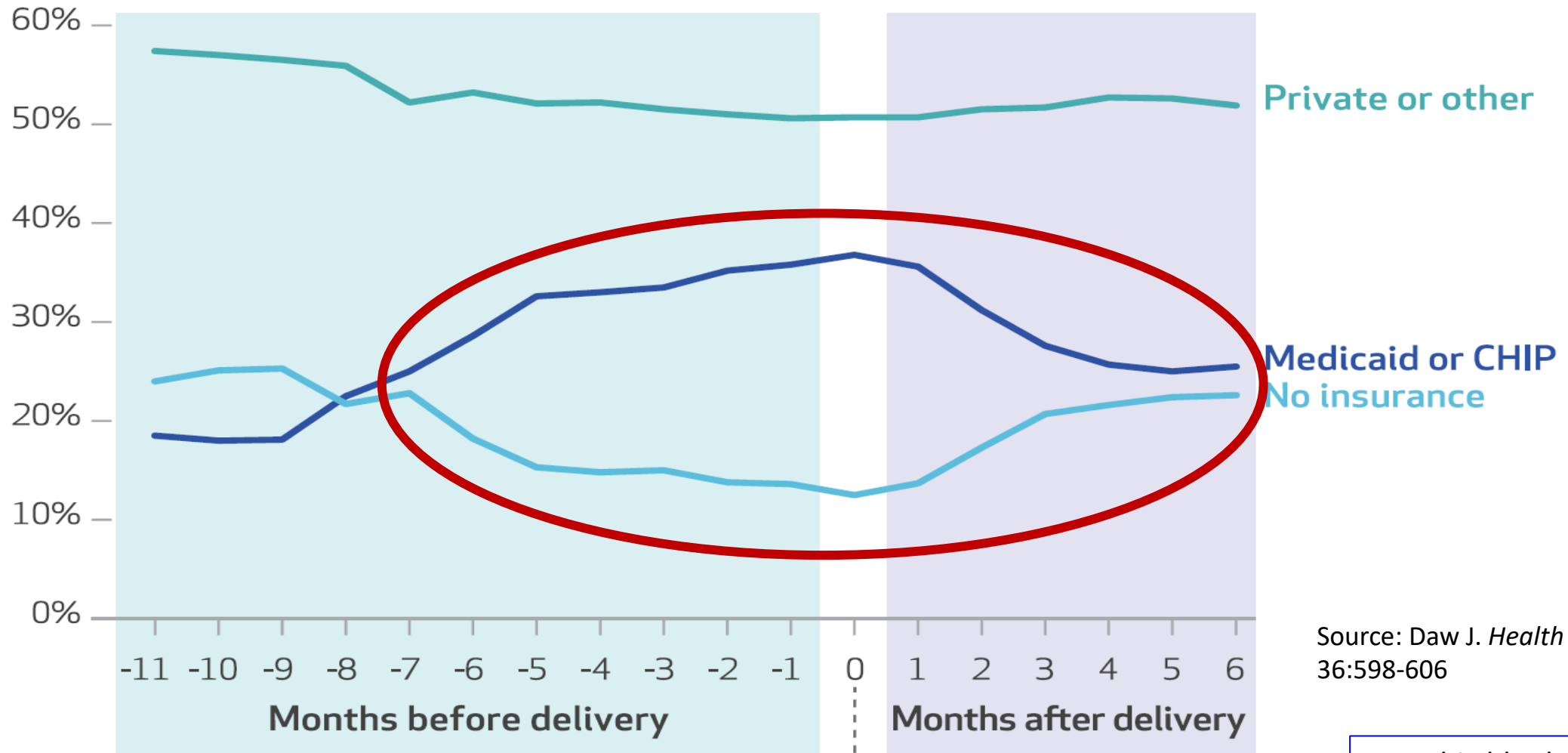
### OTHER

Contributing factor not otherwise mentioned. Please provide description.

# 9. The Way Forward

## *Keeping Women in the System*

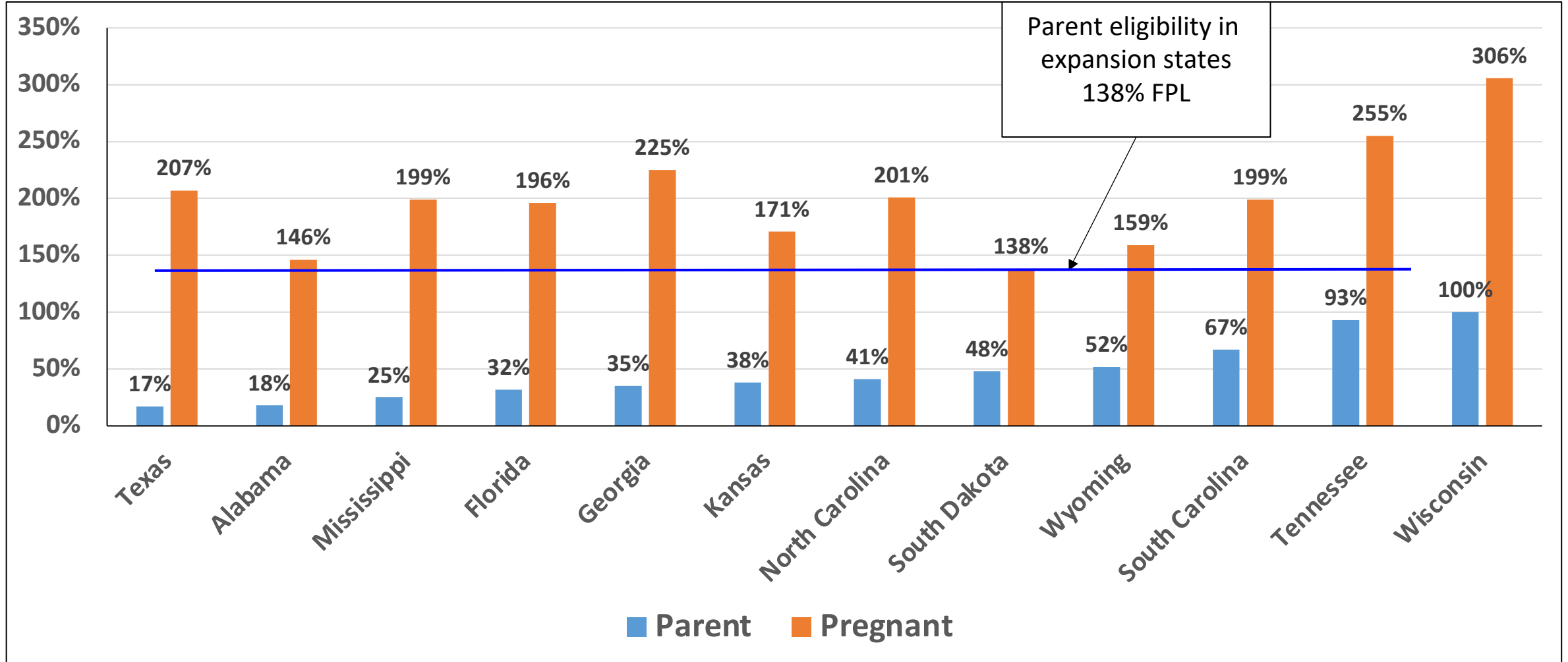
**Percentages of women who gave birth in the period 2005-13, by health insurance type and month before or after delivery**



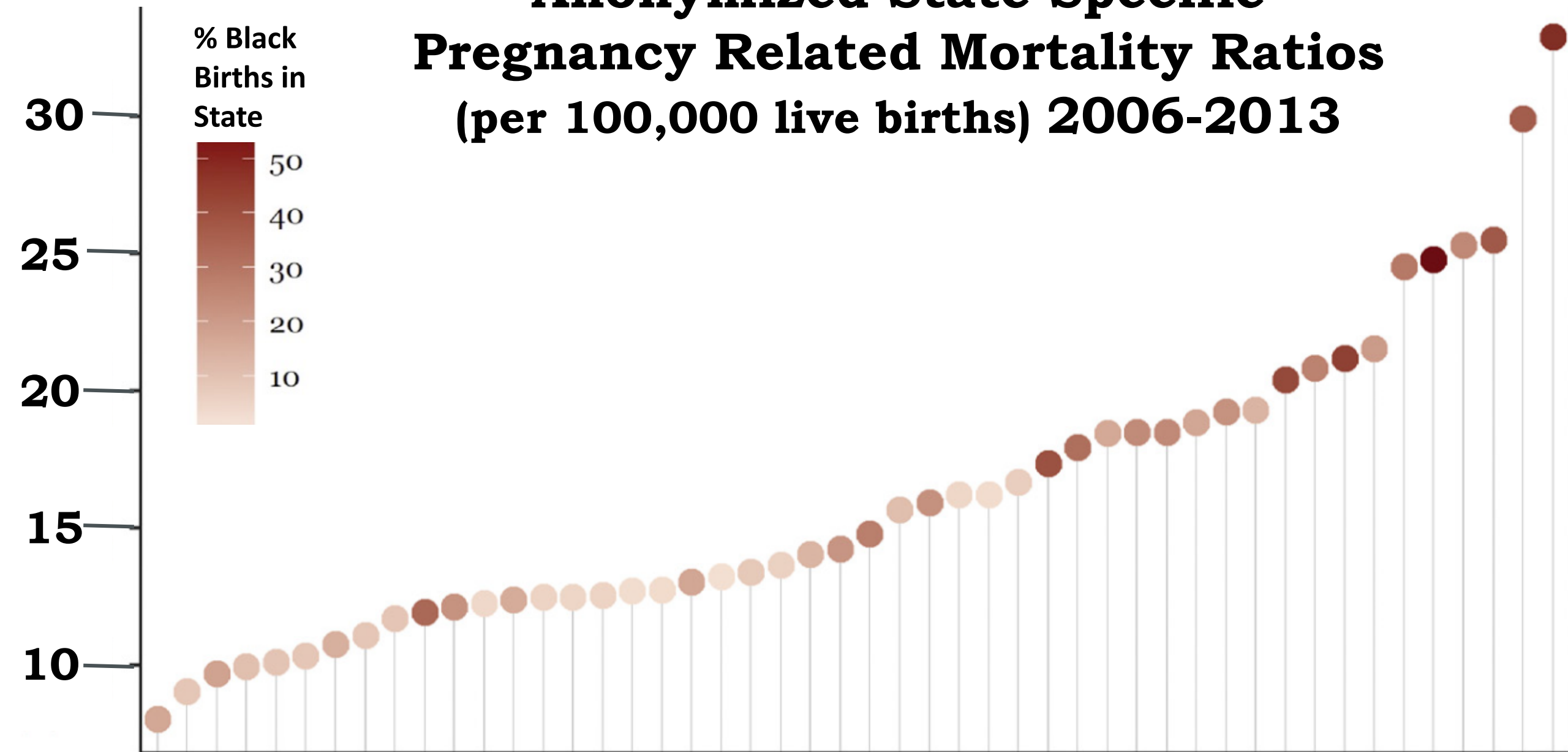
Source: Daw J. *Health Affairs* 2017;  
36:598-606

# Medicaid Eligibility for Parent vs Pregnant Women in Non-Expansion States

## *Medicaid eligibility thresholds, 2021*



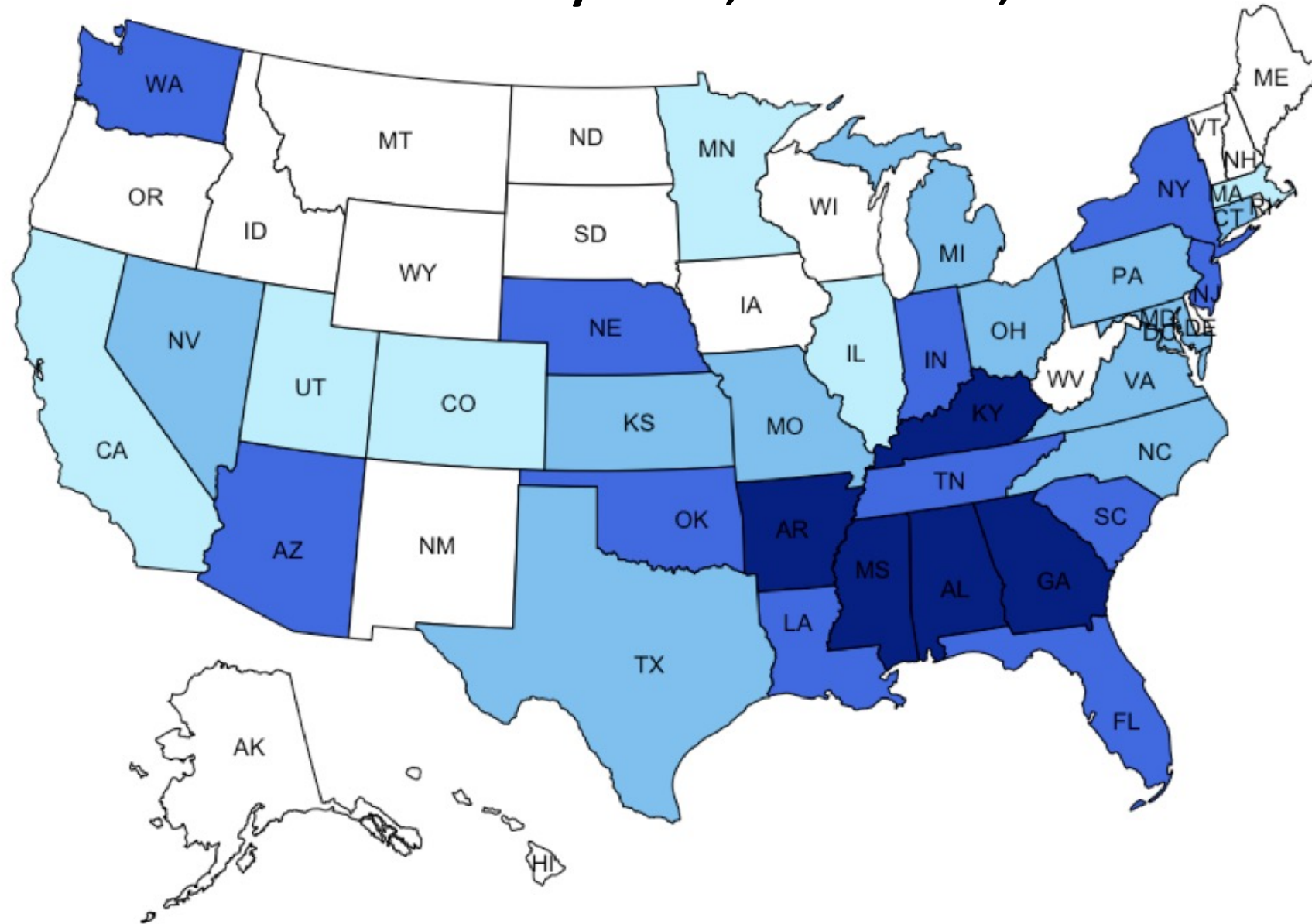
# Anonymous State Specific Pregnancy Related Mortality Ratios (per 100,000 live births) 2006-2013



Source: Adapted from: Kramer M.et.al. *Am J OBGYN*.2019.609

[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

# Maternal Mortality Ratio, U.S. States, 2018-19



**Source:** NCHS. NVSS.  
*Maternal Mortality by State,*  
2018-2019. Personal  
communication, Donna  
Hoyert

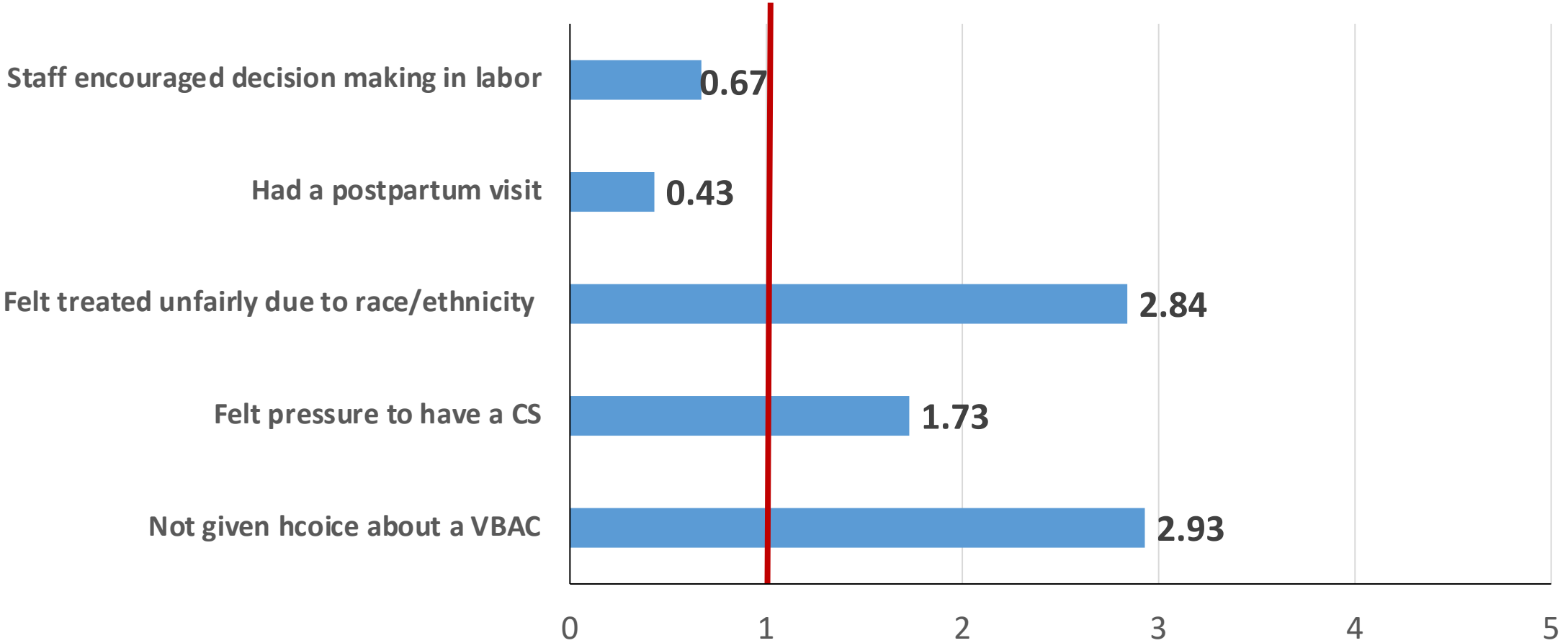
**Legend** No Data (<10 deaths) <15.0 15-19.9 20-29.9 30+

[www.birthingthenumbers.org](http://www.birthingthenumbers.org)

# Is expanding Medicaid eligibility out to 1 year postpartum the answer?

- Sort of...
- Since a significant proportion (12%) of maternal deaths occur between 42-365 postpartum, keeping women, especially vulnerable women, in the health care system makes sense.
- There is also the matter of how women on Medicaid are treated when they are getting care.

# Survey Results (Adjusted Odds Ratios\*) among women on Medicaid compared to private insurance



\* Adjusted for maternal age, prenatal provider, race/ethnicity, maternal education, US born, pregnancy complications, and agreement with statement “childbirth shouldn’t be interfered with unless medically necessary.” All ratios significant at  $p < .05$ .



# Four Policy Recommendations

1. Use Maternal Mortality Review Committees to **explore pregnancy associated deaths** for causes and possible bases for prevention;
2. Use linked datasets to examine women's health **through the lifecourse** and identify critical moments (e.g. pregnancy?) where intervention might matter;
3. **Fund a systematic process for listening to women tell us about their lives and experiences in pregnancy and beyond** to craft sustainable solutions that are meaningful to them.
4. Craft policies that keep **women of all ages** within the health and social system to prevent problems that lead to pregnancy associated deaths.



# Black Maternal Health Week

April 11 - 17, 2021

BLACK MAMAS MATTER:  
CLAIMING OUR POWER, RESILIENCE & LIBERATION



Join us April 11-17 for a week of activism and community building for Black Mamas! In solidarity with National Minority Health Month and the International Day for Maternal Health and Rights, **Black Mamas Matter Alliance** founded BMHW to raise awareness, inspire activism, and strengthen organizing for Black maternal health. Join the conversation: **#BMHW21** and **#BlackMaternalHealthWeek**

[www.blackmamasmatter.org/bmhw](http://www.blackmamasmatter.org/bmhw)



# 10 YEARS

2010 2020



## EVERY MOTHER COUNTS

# NBEC

## NATIONAL BIRTH EQUITY COLLABORATIVE



Lamaze  
INTERNATIONAL

60TH ANNIVERSARY

Midwives  
Alliance  
NORTH AMERICA



QMNC  
QUALITY MATERNAL & NEWBORN CARE

AMCHP  
ASSOCIATION OF MATERNAL & CHILD HEALTH PROGRAMS




AIM  
ALLIANCE FOR INNOVATION  
ON MATERNAL HEALTH



AMERICAN COLLEGE  
of NURSE-MIDWIVES

# NATIONAL MATERNAL HEALTH WEEK

MAY 5th-12th, 2019



#MarchforMoms

#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](http://www.birthbythenumbers.org)





Sam

Lee

Maya

Ruby

Corey

Lucy

Staige

Jordy

Kyla

Christina

Sarah

Katie

Sheridan

Annette

Ebere

Allison

Brittany

Jessica

Maura

Kali

Isabelle

[www.birthbythenumbers.org](http://www.birthbythenumbers.org)

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Veronica