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

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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.

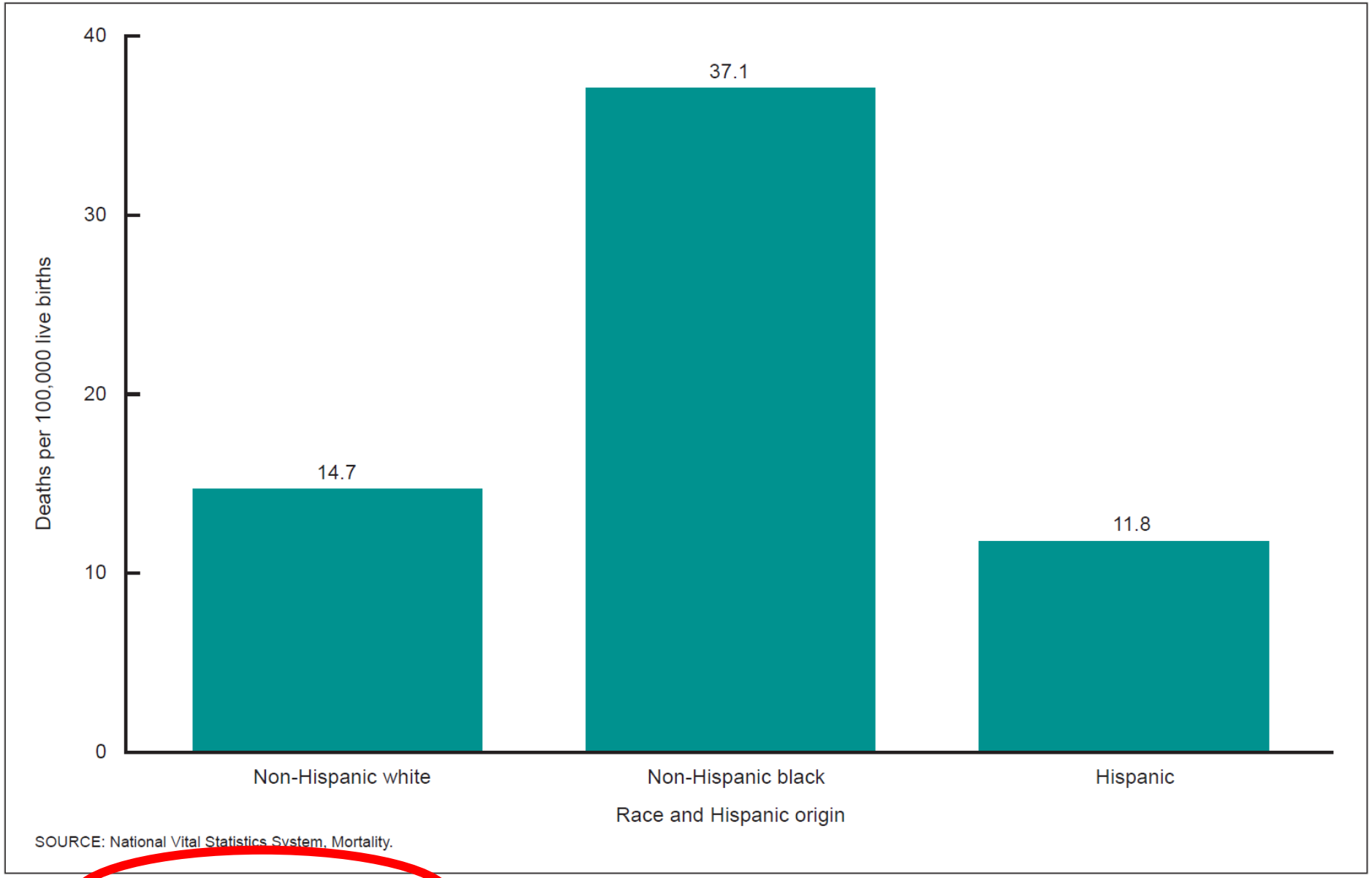

Figure 2. Maternal mortality rates, by single race and Hispanic origin: United States, 2018

Source: Hoyert DL, Miniño AM. *Maternal mortality in the United States: Changes in coding, publication, and data release, 2018*. Nati'l Vital Stati Rep; vol 69 no 2. Hyattsville, MD: NCHS. 2020.

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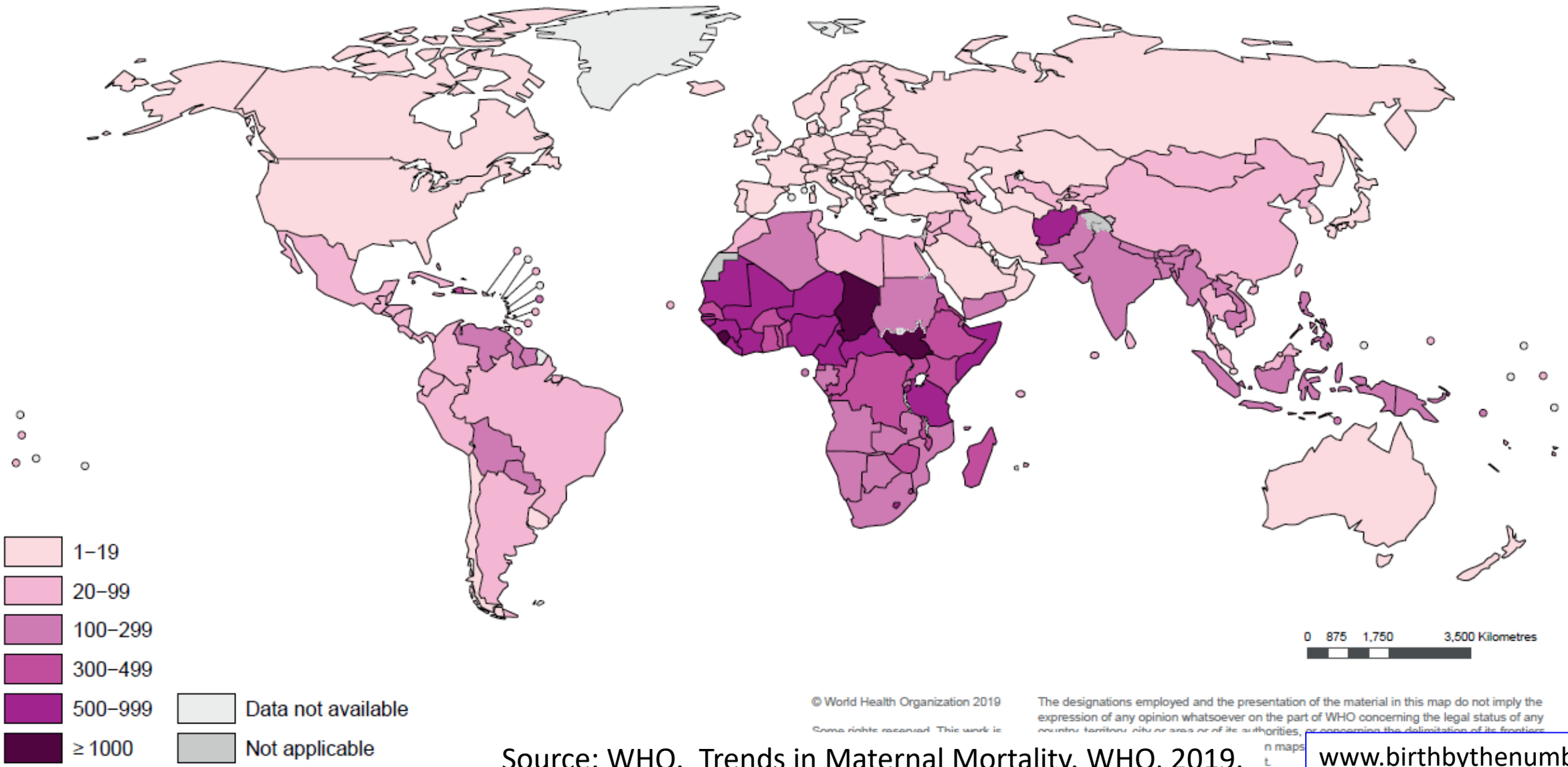
Figure 4.1. Maternal mortality ratio (MMR, maternal deaths per 100 000 live births), 2017



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

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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

$$\frac{\text{Births to women 15-19}}{\text{All women 15-19}}$$

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

Example:

Maternal Mortality Ratio

$$\frac{\text{Maternal Deaths}}{\text{Live Births}}$$

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 record 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.***

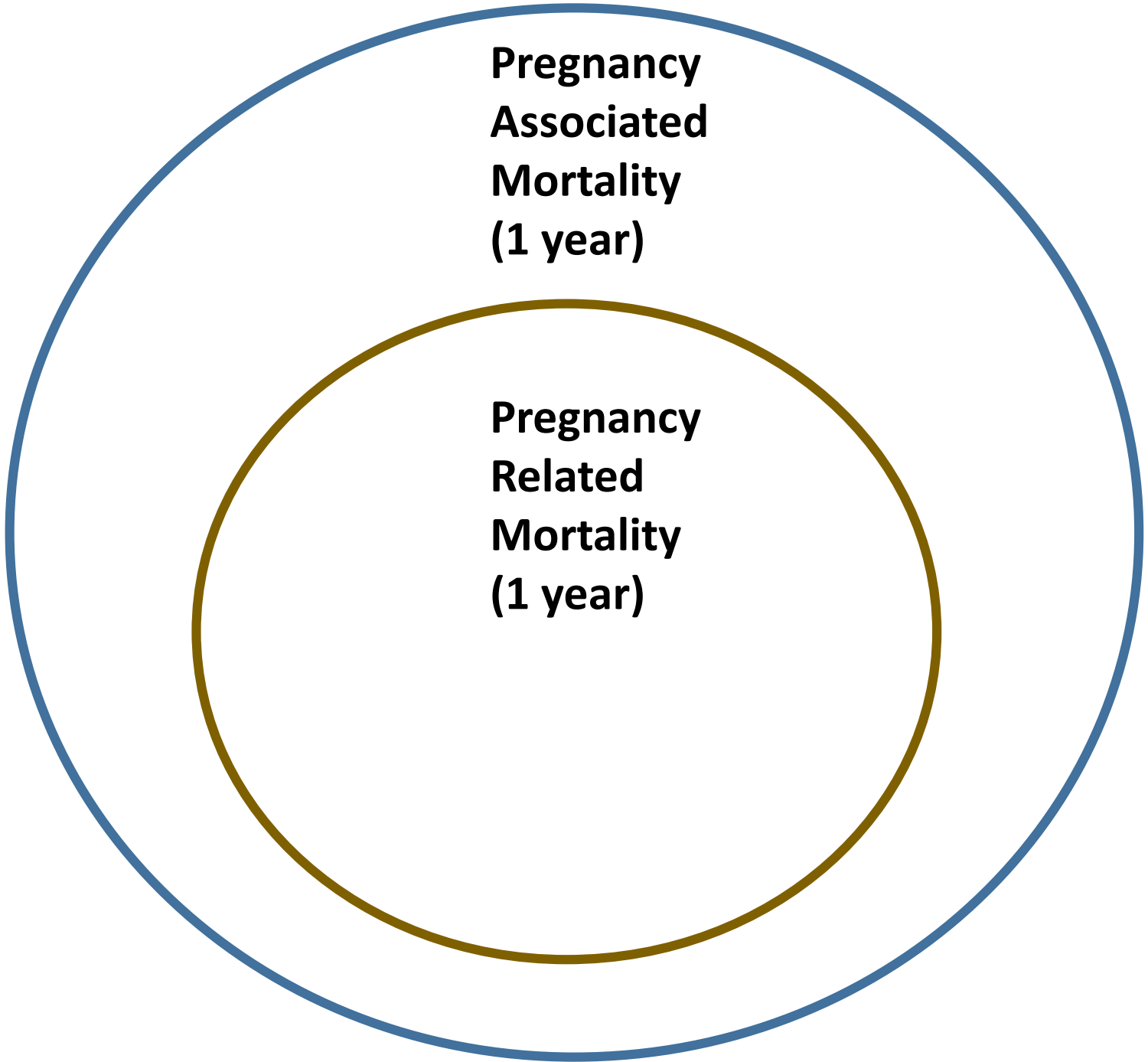
- **Maternal Mortality Ratio** – the death of a woman ***while pregnant or within 42 days of termination of pregnancy***, irrespective of the duration and site of the pregnancy, from any cause ***related to or aggravated by the pregnancy*** or its management but not from accidental or incidental causes. 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

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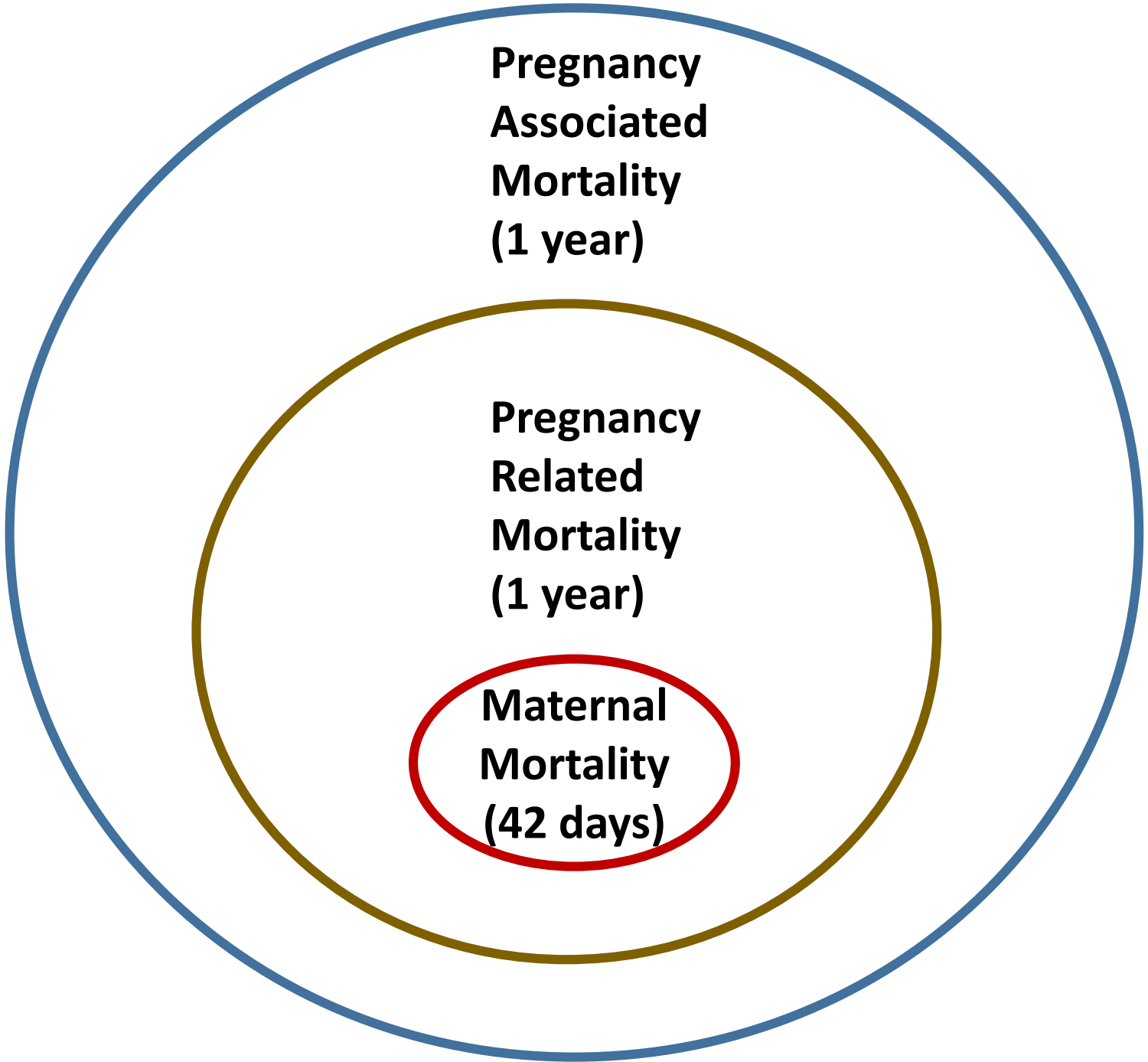

Maternal Mortality:
All Deaths women of reprod. age pregnancy to 42 days ppm Related to the pregnancy

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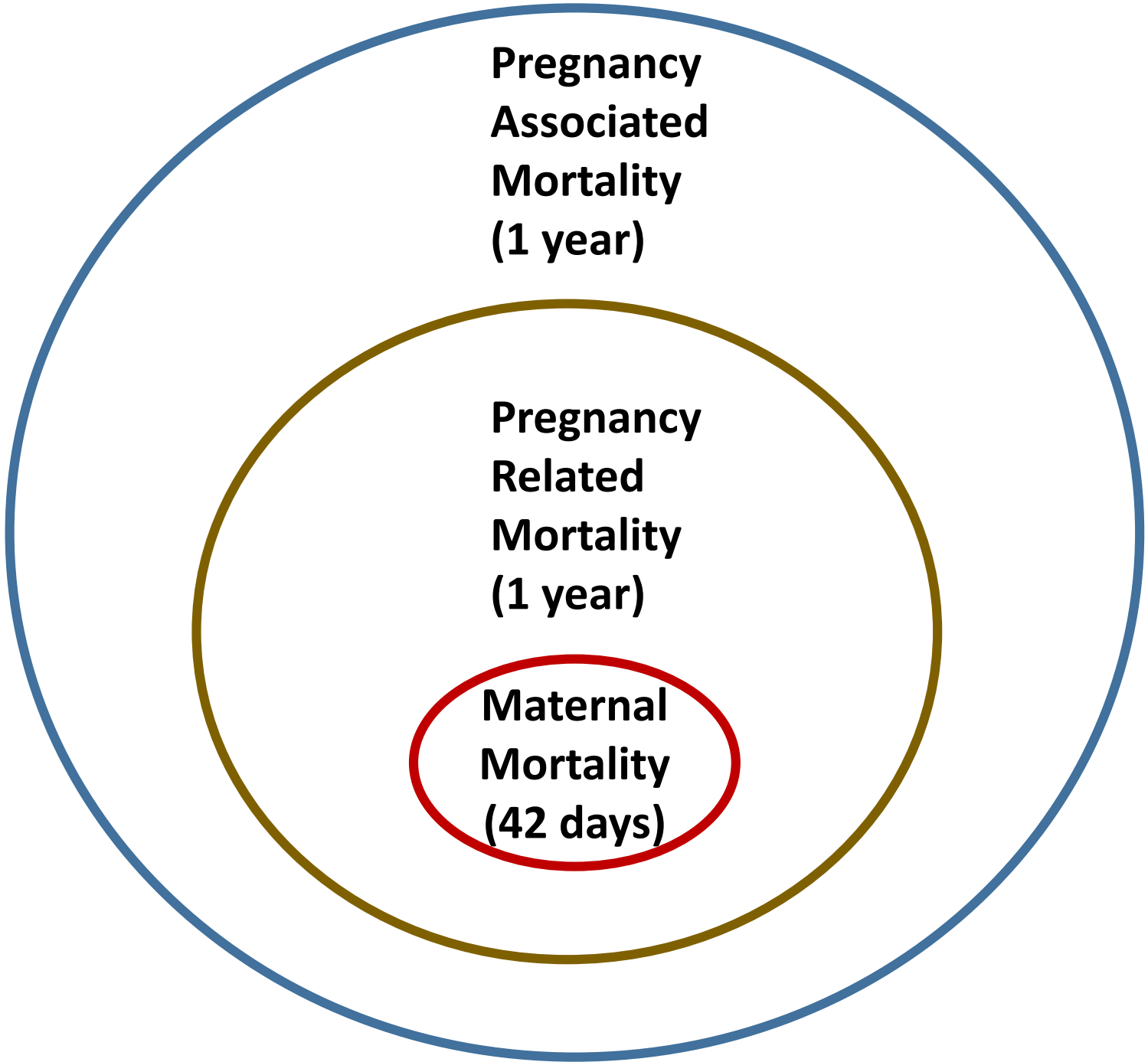

Pregnancy Associated Mortality: Deaths during pregnancy and up to 1 year postpartum

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***

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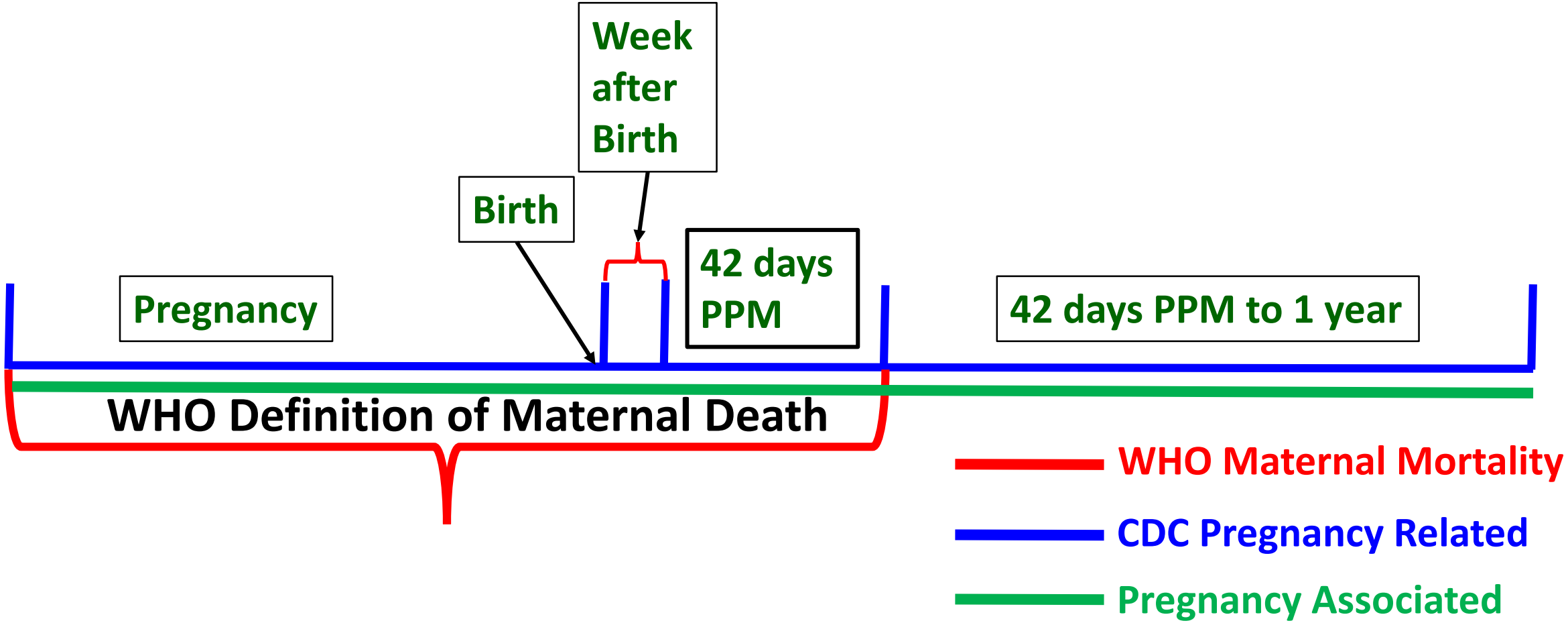
Timeline of Maternal Mortality Definitions



PPM – postpartum –period after the birth

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

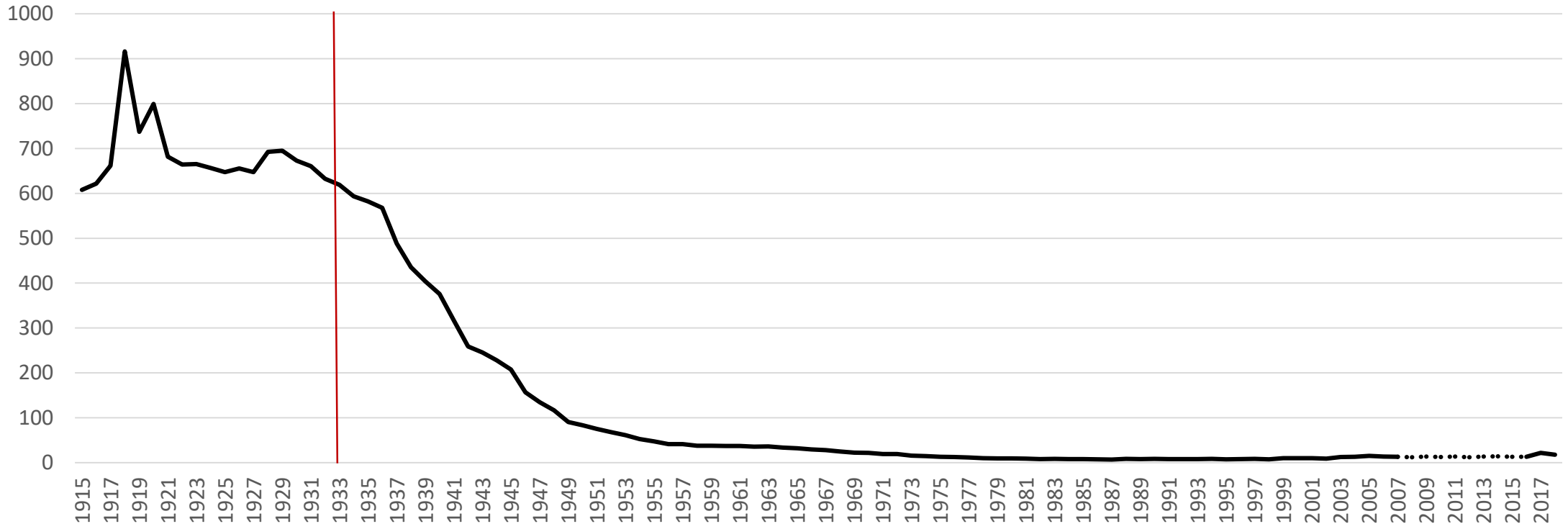
Declaring Premature Victory

"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), 1915-2018



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.

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Year State was Added to the Death Registry

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

[1] Included as a State.
[2] Dropped from the registration system in 1900; readmitted in 1919.
[3] Dropped from the registration system in 1910; readmitted in 1930.
[4] 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.
[5] Dropped from the registration system in 1925; readmitted in 1928.

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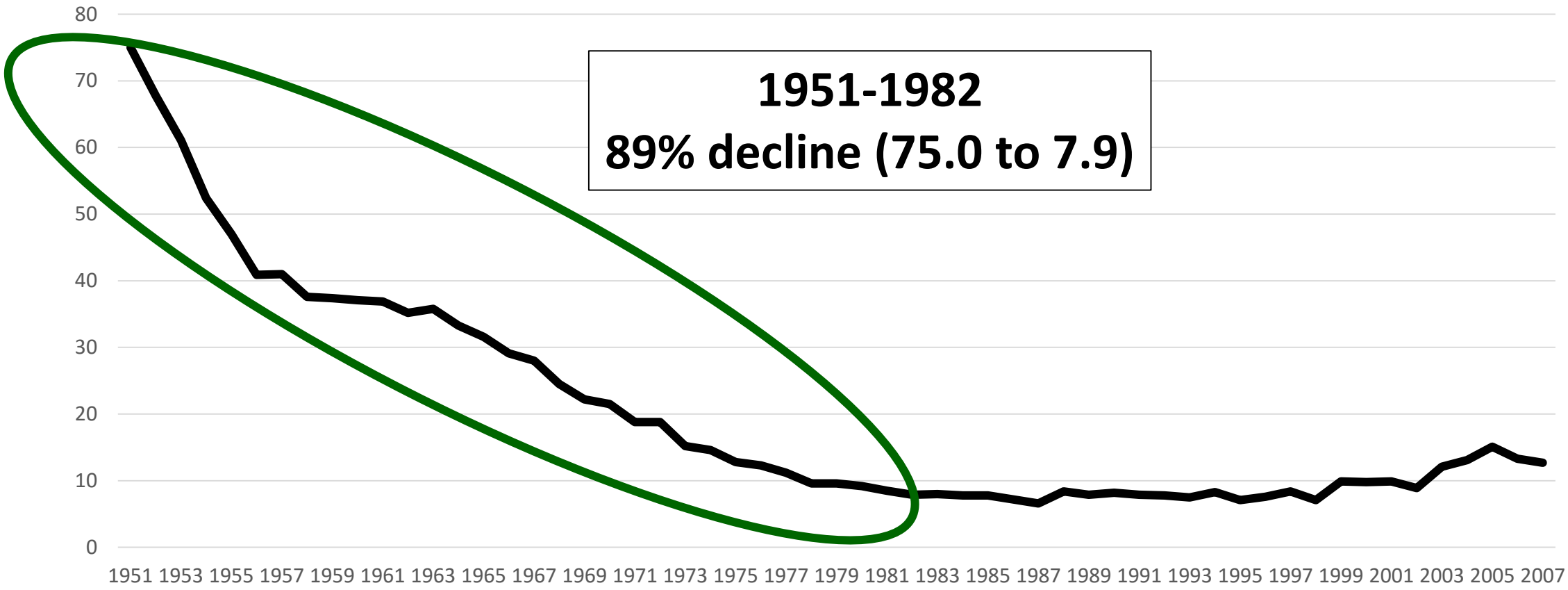
U.S. Maternal Mortality (per 100,000 live births), 1951-2007



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

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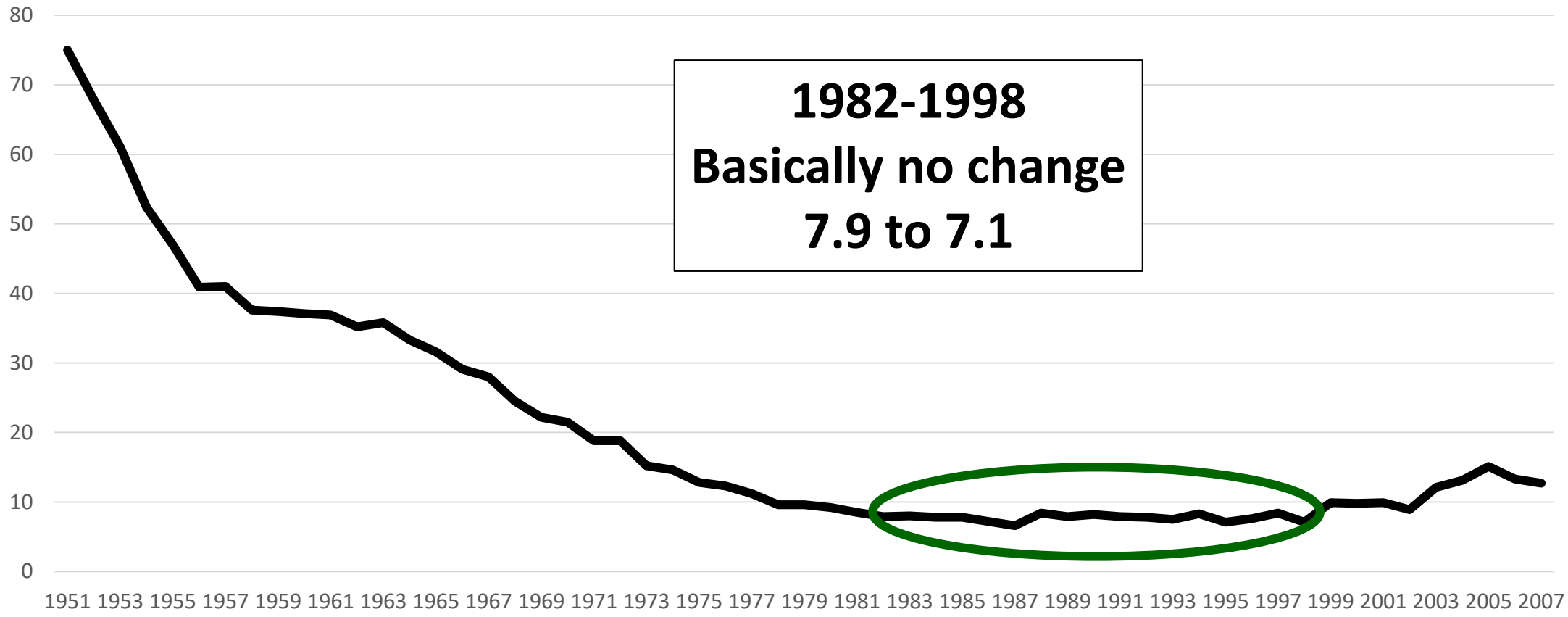
U.S. Maternal Mortality (per 100,000 live births), 1951-2007



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

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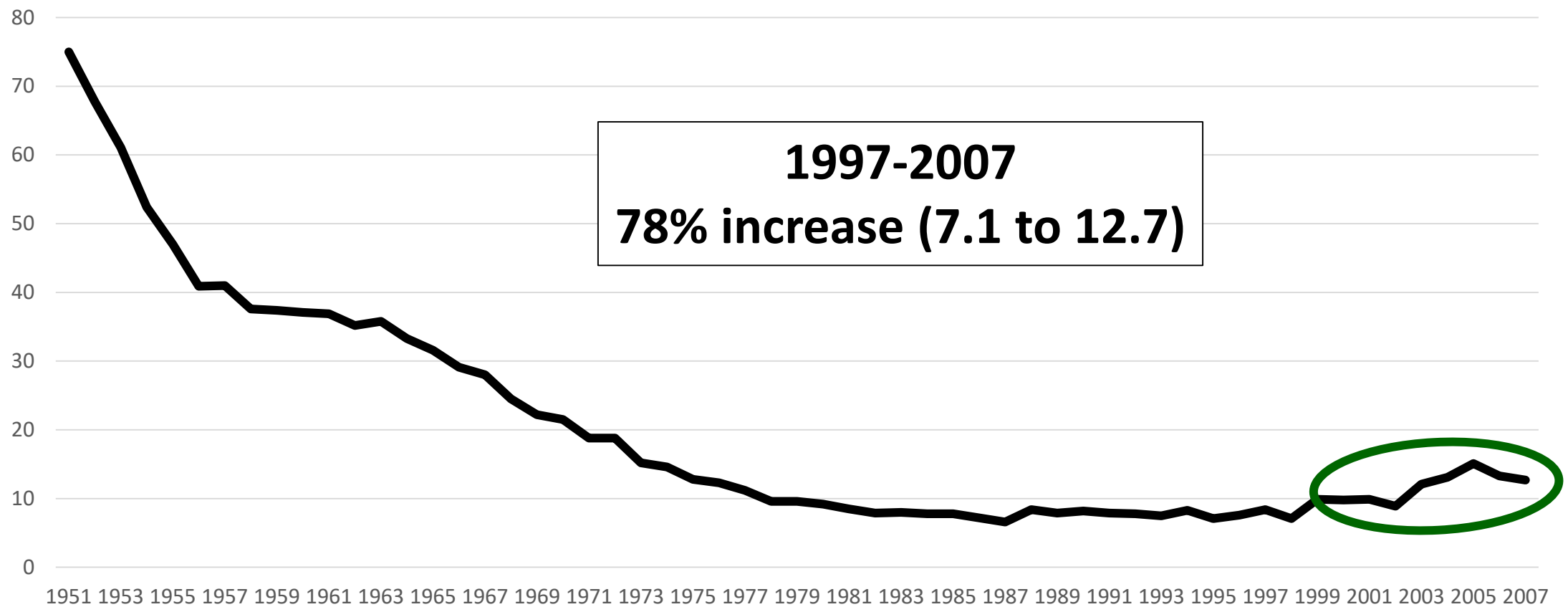
U.S. Maternal Mortality (per 100,000 live births), 1951-2007



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

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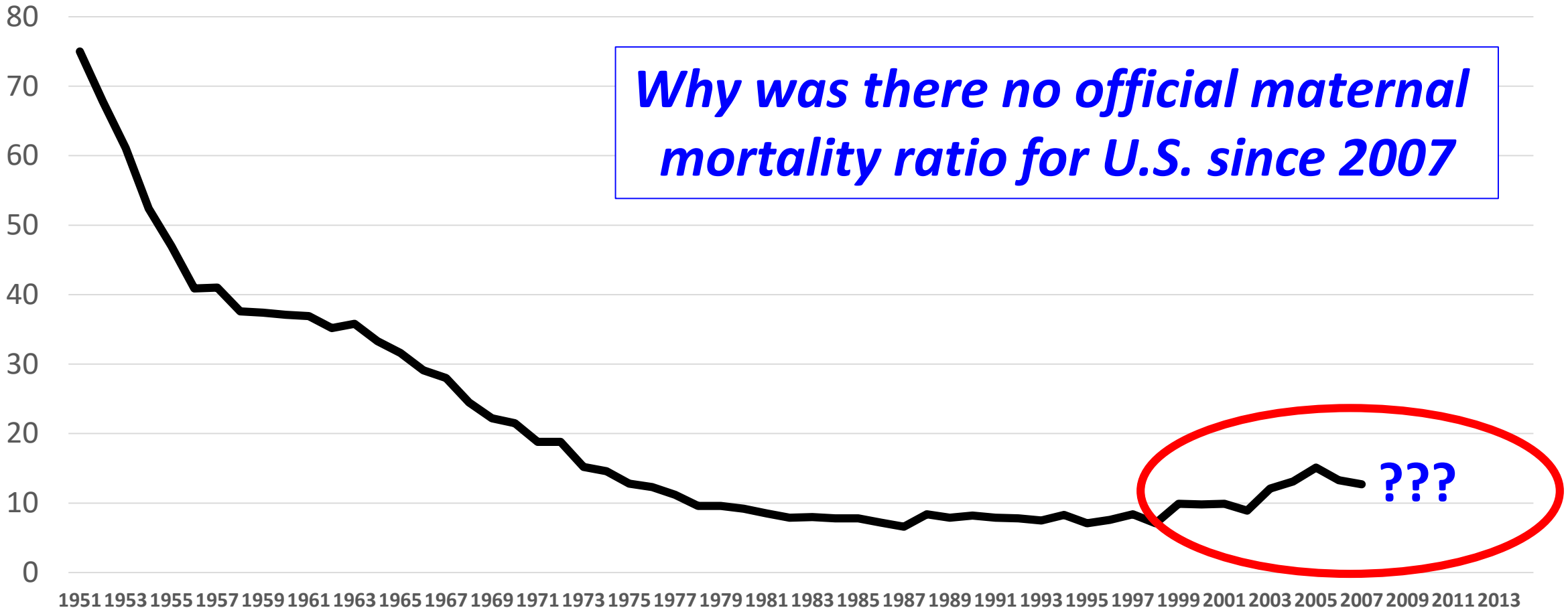
U.S. Maternal Mortality Ratio (per 100,000 live births) , 1951-2007



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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[1]	Hispanic	Non-Hispanic[2]	Non-Hispanic white[3]	Non-Hispanic black[3]	All origins[1]	Hispanic	Non-Hispanic[2]	Non-Hispanic white[3]	Non-Hispanic black[3]
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	*	*			

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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."

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"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 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,

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

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

Methods: Data derived from the Centers for Disease Control and Prevention's ong Mortality Surveillance System were used to identify states that included a ch death certificate in 1991 and 1992. Death certificates from those states we determine the number and proportion of pregnancy-related deaths identif 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

Am J Prev Med 2000;19(1S):35-39.

Wording of "pregnancy Checkbox" in states prior to 2003

State	Wording
Alabama	Was there a pregnancy in last 42 days? (Specify Yes, No, or dk.)
California	If female, pregnant in last year? □ Yes □ No □ UNK
Florida	If female, was there a pregnancy in the past 3 months? Yes No
Idaho	If female aged 0–54: □ not preg win past yr □ preg at time of death □ not pregnant, but preg within 42 days of death □ not pregnant but preg 43 days to 1 yr before death □ unknown if preg w/in the past yr
Illinois	If female, was there a pregnancy in past three months? Yes □ No □
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? □ Yes □ No
Louisiana	If deceased was female 10–49, was she pregnant in the last 90 days? □ Yes □ No □ Unk
Maryland	If female: Was decedent pregnant in the past 12 months? □ Yes □ No □ 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? □ Yes □ No
Missouri	If deceased was female 10–49, was she pregnant in the last 90 days? □ Yes □ No □ Un
Montana	If female: □ not preg within past year □ not preg but preg within 42 days of death □ not preg but pregnant 43 days to 1 year before death □ pregnant at time of death □ unknown if preg within past year
New Jersey	If female, was she pregnant at death, or any time 90 days prior to death □ Yes □ No
New Mexico	Was decedent pregnant within last 6 weeks? □ Yes □ No
North Dakota	Was deceased pregnant within 18 months of death? □ Yes □ No
Nebraska	If female, was there a pregnancy in the past 3 months? Yes □ No □
Texas	Was decedent pregnant at time of death □ yes □ no □ UNK within last 12 MO □ yes □ no □ UN
Virginia	If female, was there a pregnancy in past 3 months? Yes □ No □ Unknown □

Time periods used:
42 days;
6 weeks;
3 months;
90 days;
12 mos;
"last year"

Source: Hoyert DL, *NVSR*; vol 69 no 1. Hyattsville, MD: NCHS. 2020.

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

U.S. STANDARD CERTIFICATE OF DEATH

LOCAL FILE NO. STATE FILE NO.

NAME OF DECEDENT ____ For use by physician or institution

To Be Completed Verified By: FUNERAL DIRECTOR:

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? ☐ Yes ☐ No

8. EVER IN US ARMED FORCES? ☐ Yes ☐ No | 9. MARITAL STATUS AT TIME OF DEATH ☐ Married ☐ Married, but separated ☐ Widowed ☐ Divorced ☐ Never Married ☐ 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)

IF DEATH OCCURRED IN A HOSPITAL: ☐ Inpatient ☐ Emergency Room/Outpatient ☐ Dead on Arrival

IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL: ☐ Hospice facility ☐ Nursing home/Long term care facility ☐ Decedent's home ☐ Other (Specify):

15. FACILITY NAME (If not institution, give street & number) | 16. CITY OR TOWN , STATE, AND ZIP CODE | 17. COUNTY OF DEATH

18. METHOD OF DISPOSITION: ☐ Burial ☐ Cremation ☐ Donation ☐ Entombment ☐ Removal from State ☐ Other (Specify): | 19. PLACE OF DISPOSITION (Name of cemetery, crematory, other place)

20. LOCATION-CITY, TOWN, AND STATE | 21. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY

22. SIGNATURE OF FUNERAL SERVICE LICENSEE OR OTHER AGENT | 23. LICENSE NUMBER (Of Licensee)

To Be Completed By: MEDICAL CERTIFIER

ITEMS 24-28 MUST BE COMPLETED BY PERSON WHO PRONOUNCES OR CERTIFIES DEATH | 24. DATE PRONOUNCED DEAD (Mo/Day/Yr) | 25. TIME PRONOUNCED DEAD

26. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable) | 27. LICENSE NUMBER | 28. DATE SIGNED (Mo/Day/Yr)

29. ACTUAL OR PRESUMED DATE OF DEATH (Mo/Day/Yr) (Spell Month) | 30. ACTUAL OR PRESUMED TIME OF DEATH | 31. WAS MEDICAL EXAMINER OR CORONER CONTACTED? ☐ Yes ☐ No

CAUSE OF DEATH (See instructions and examples)

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

Approximate interval: Onset to death

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 | 33. WAS AN AUTOPSY PERFORMED? ☐ Yes ☐ No | 34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? ☐ Yes ☐ No

35. DID TOBACCO USE CONTRIBUTE TO DEATH? ☐ Yes ☐ Probably ☐ No ☐ Unknown

36. IF FEMALE: ☐ Not pregnant within past year ☐ Pregnant at time of death ☐ Not pregnant, but pregnant within 42 days of death ☐ Not pregnant, but pregnant 43 days to 1 year before death ☐ Unknown if pregnant within the past year

37. MANNER OF DEATH ☐ Natural ☐ Homicide ☐ Accident ☐ Pending Investigation ☐ Suicide ☐ Could not be determined

38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) | 39. TIME OF INJURY | 40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) | 41. INJURY AT WORK? ☐ Yes ☐ No

42. LOCATION OF INJURY: State: City or Town: Street & Number: Apartment No.: Zip Code:

43. DESCRIBE HOW INJURY OCCURRED: | 44. IF TRANSPORTATION INJURY, SPECIFY: ☐ Driver/Operator ☐ Passenger ☐ Pedestrian ☐ Other (Specify)

45. CERTIFIER (Check only one):
☐ Certifying physician-To the best of my knowledge, death occurred due to the cause(s) and manner stated.
☐ 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.
☐ 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:_____

46. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 32)

47. TITLE OF CERTIFIER | 48. LICENSE NUMBER | 49. DATE CERTIFIED (Mo/Day/Yr) | 50. FOR REGISTRAR ONLY- DATE FILED (Mo/Day/Yr)

To Be Completed By: FUNERAL DIRECTOR

51. DECEDENT'S EDUCATION-Check the box that best describes the highest degree or level of school completed at the time of death.
☐ 8th grade or less
☐ 9th - 12th grade; no diploma
☐ High school graduate or GED completed
☐ Some college credit, but no degree
☐ Associate degree (e.g., AA, AS)
☐ Bachelor's degree (e.g., BA, AB, BS)
☐ Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD)

52. 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.
☐ No, not Spanish/Hispanic/Latino
☐ Yes, Mexican, Mexican American, Chicano
☐ Yes, Puerto Rican
☐ Yes, Cuban
☐ Yes, other Spanish/Hispanic/Latino (Specify) _____

53. DECEDENT'S RACE (Check one or more races to indicate what the decedent considered himself or herself to be)
☐ White
☐ Black or African American
☐ American Indian or Alaska Native (Name of the enrolled or principal tribe) _____
☐ Asian Indian
☐ Chinese
☐ Filipino
☐ Japanese
☐ Korean
☐ Vietnamese
☐ Other Asian (Specify)_____
☐ Native Hawaiian
☐ Guamanian or Chamorro
☐ Samoan
☐ Other Pacific Islander (Specify)_____
☐ Other (Specify)_____

54. DECEDENT'S USUAL OCCUPATION (Indicate type of work done during most of working life. DO NOT USE RETIRED).

55. 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.

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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

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

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

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

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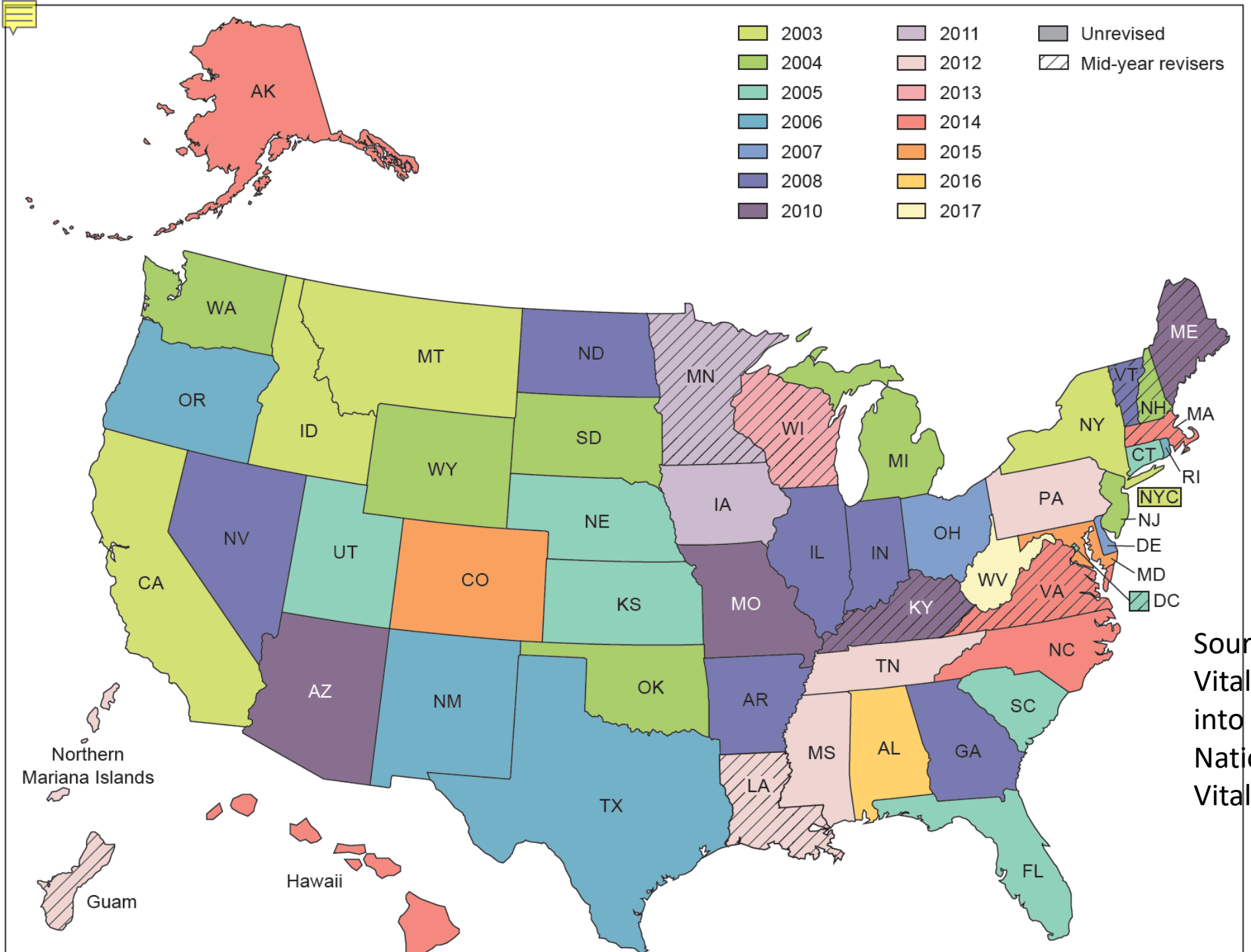

Source: Ventura SJ. The U.S. National Vital Statistics System: Transitioning into the 21st century, 1990–2017. National Center for Health Statistics. Vital Health Stat 1(62). 2018.

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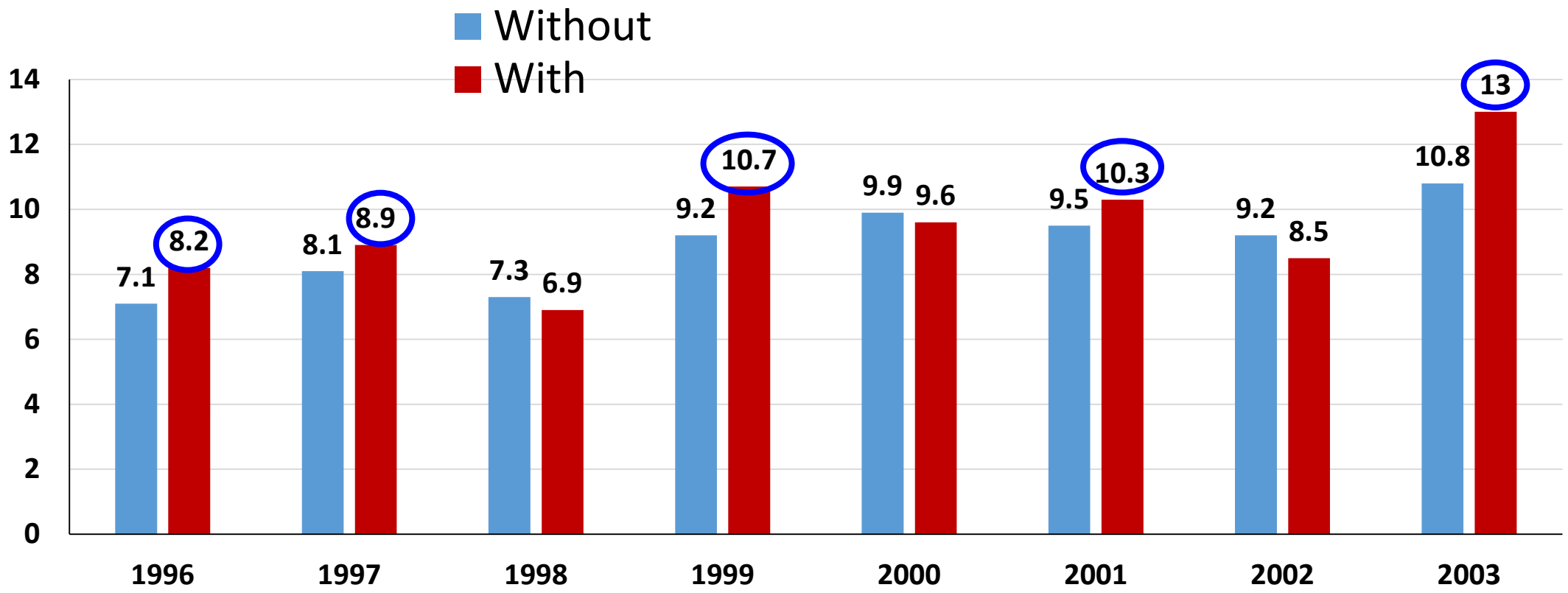
Maternal Mortality Rates (per 100,000) in States with & without a checkbox, 1996-2003



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

Source: Hoyert DL. *Maternal mortality and related concepts*. National Center for Health Statistics. Vital Health Stat 3(33). 2007.

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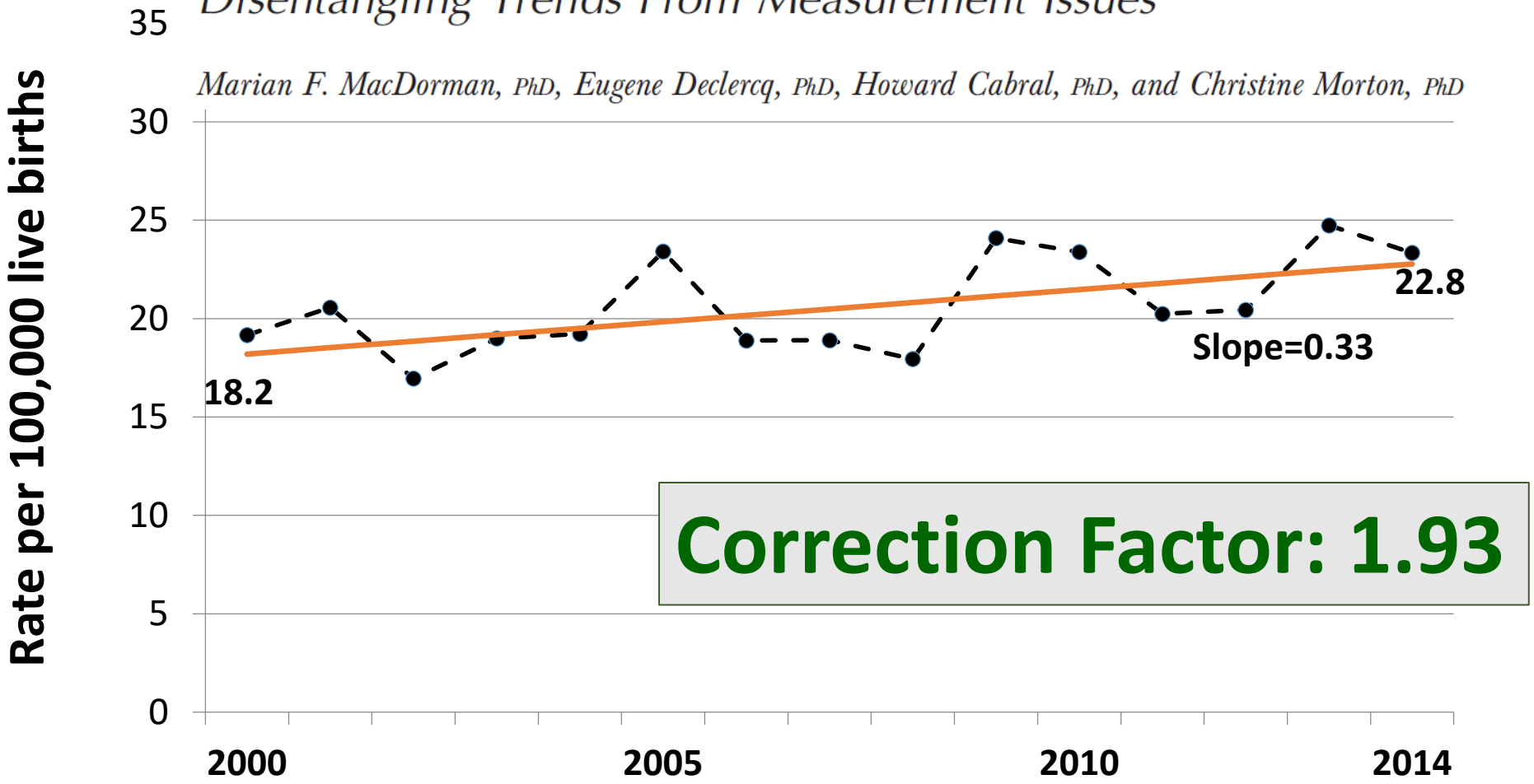
Original Research

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



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.

Original Research

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

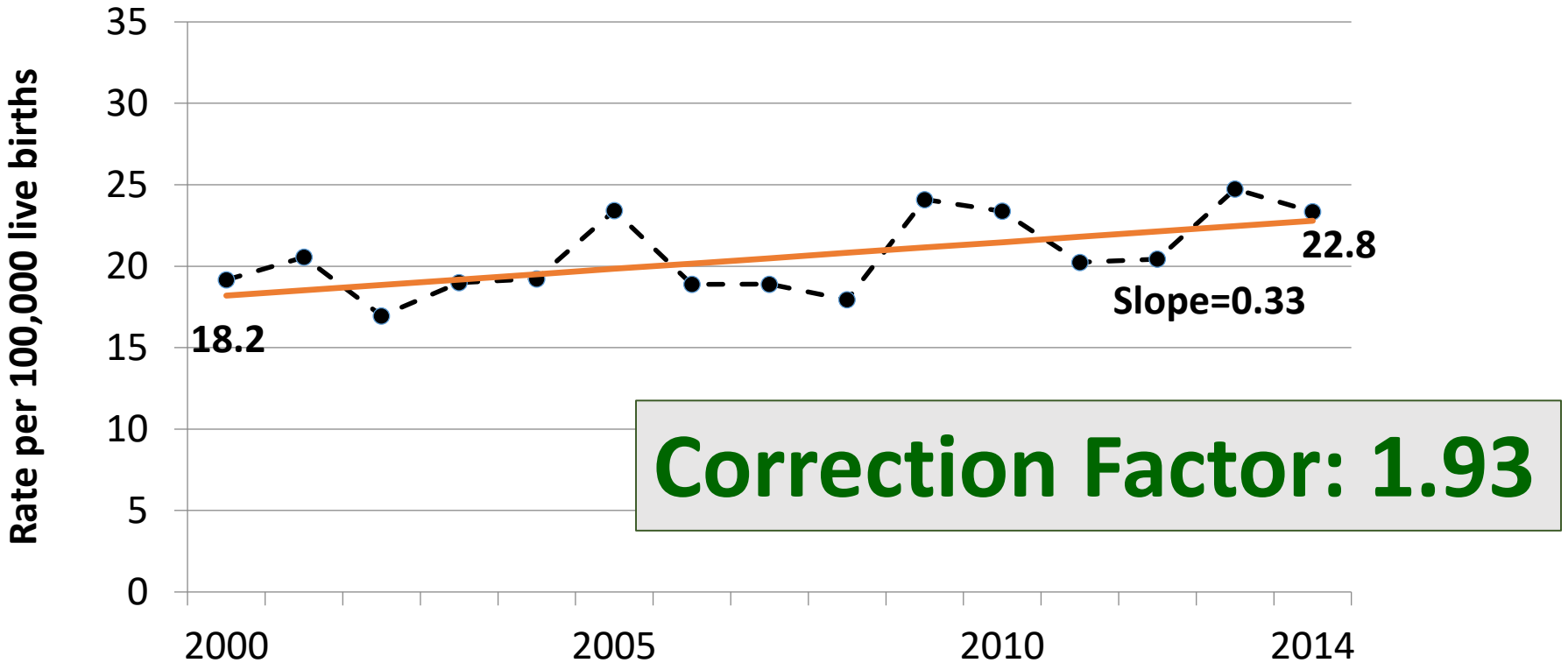
RESULTS: The estimated maternal mortality rate (per 100,000 live births) for 48 states and Washington, DC (excluding California and Texas, analyzed separately) increased by 26.6%, from 18.8 in 2000 to 23.8 in 2014. California showed a declining trend, whereas Texas had a sudden increase in 2011–2012. 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



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.

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NVSS analyses of the checkbox

National Vital Statistics Reports

NVSS

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

NVSS

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

www.birthbythenumbers.org

Statistical Analysis

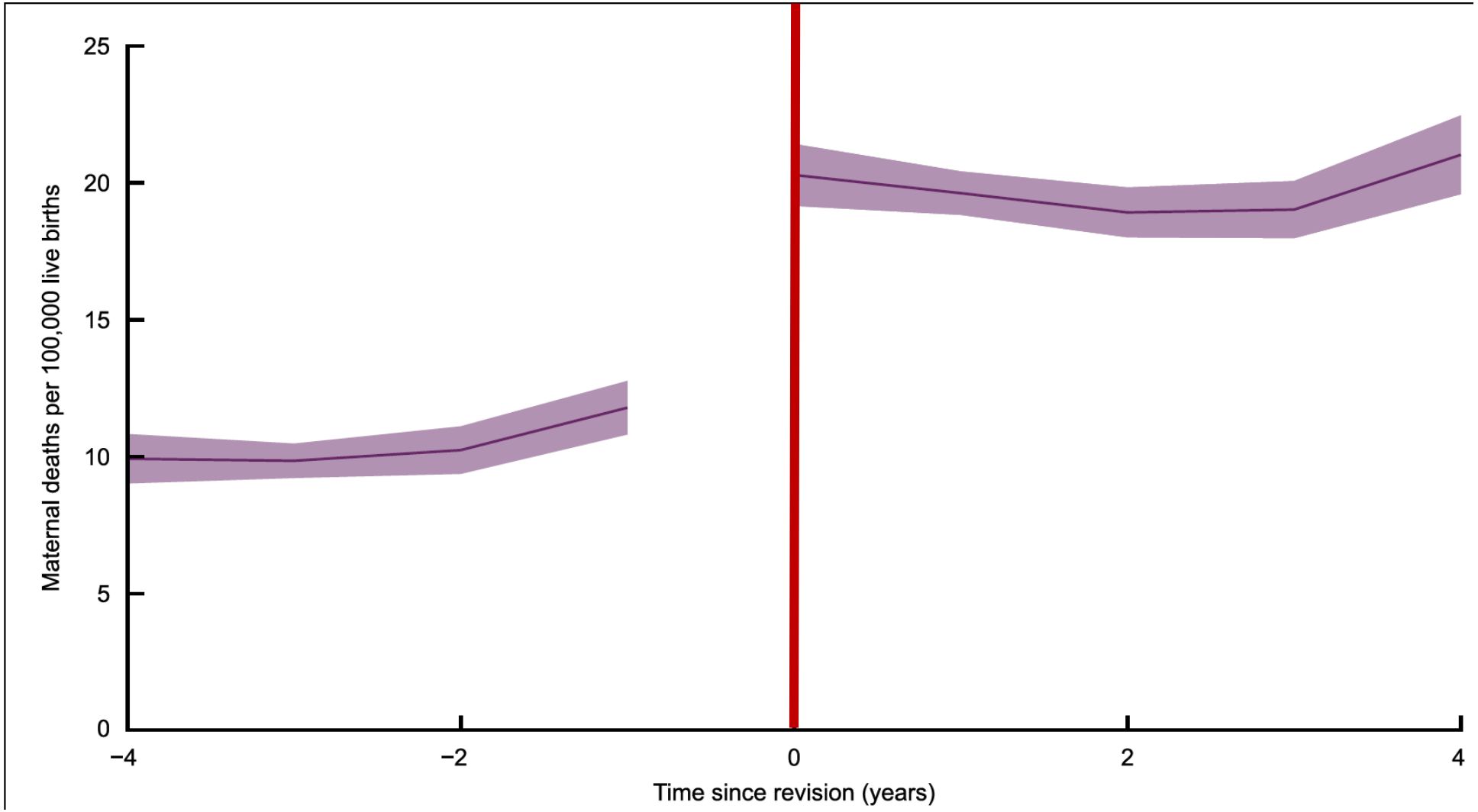
- ***Objective 1: Quantify the impact of the staggered implementation of the pregnancy checkbox on MMRs***

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

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

State	Change in maternal mortality rate (95% CI)
Alabama	29.0 (18.4 – 39.7)
Alaska	4.0 (–8.7 – 16.7)
Arizona	10.2 (2.2 – 18.1)
Arkansas	15.7 (1.0 – 30.4)
California	9.9 (5.2 – 14.7)
Colorado	2.0 (–4.8 – 8.8)
Connecticut	5.7 (–0.6 – 12.0)
Delaware	19.0 (–15.5 – 53.5)
District of Columbia	2.3 (–9.9 – 14.6)
Florida	9.3 (4.8 – 13.7)
Georgia	3.2 (–2.4 – 8.7)
Hawaii	–6.4 (–22.3 – 9.5)
Idaho	23.9 (4.7 – 43.2)
Illinois	17.9 (10.6 – 25.1)
Indiana	20.4 (14.3 – 26.5)
Iowa	9.5 (–1.7 – 20.7)
Kansas	14.0 (4.3 – 23.8)
Kentucky	11.6 (0.6 – 22.7)
Louisiana	38.2 (28.4 – 48.0)
Maine	6.9 (–13.5 – 27.3)
Maryland	–7.8 (–13.3 – –2.4)
Massachusetts	2.4 (–1.6 – 6.5)
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)
New Jersey	16.1 (11.0 – 21.1)
New Mexico	15.7 (–5.9 – 37.2)
New York City	9.3 (2.7 – 15.9)
New York State[1]	6.6 (1.8 – 11.3)
North Carolina	9.5 (5.0 – 14.1)
North Dakota	25.3 (–14.3 – 64.9)
Ohio	19.6 (12.7 – 26.4)
Oklahoma	29.9 (16.0 – 43.8)
Oregon	5.1 (–3.7 – 13.9)
Pennsylvania	– 2.4 (–8.4 – 3.6)
Rhode Island	–0.8 (–13.5 – 11.8)
South Carolina	18.3 (9.8 – 26.7)
South Dakota	14.8 (–7.1 – 36.7)
Tennessee	18.8 (11.2 – 26.3)
Texas	12.5 (8.8 – 16.1)
Utah	10.9 (0.1 – 21.6)
Vermont	4.4 (–16.6 – 25.4)
Virginia	7.4 (2.5 – 12.3)
Washington	3.7 (–2.3 – 9.6)
West Virginia	4.6 (–17.4 – 26.6)
Wisconsin	–4.8 (–12.9 – 3.2)
Wyoming	84.4 (–22.5 – 191.3)

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

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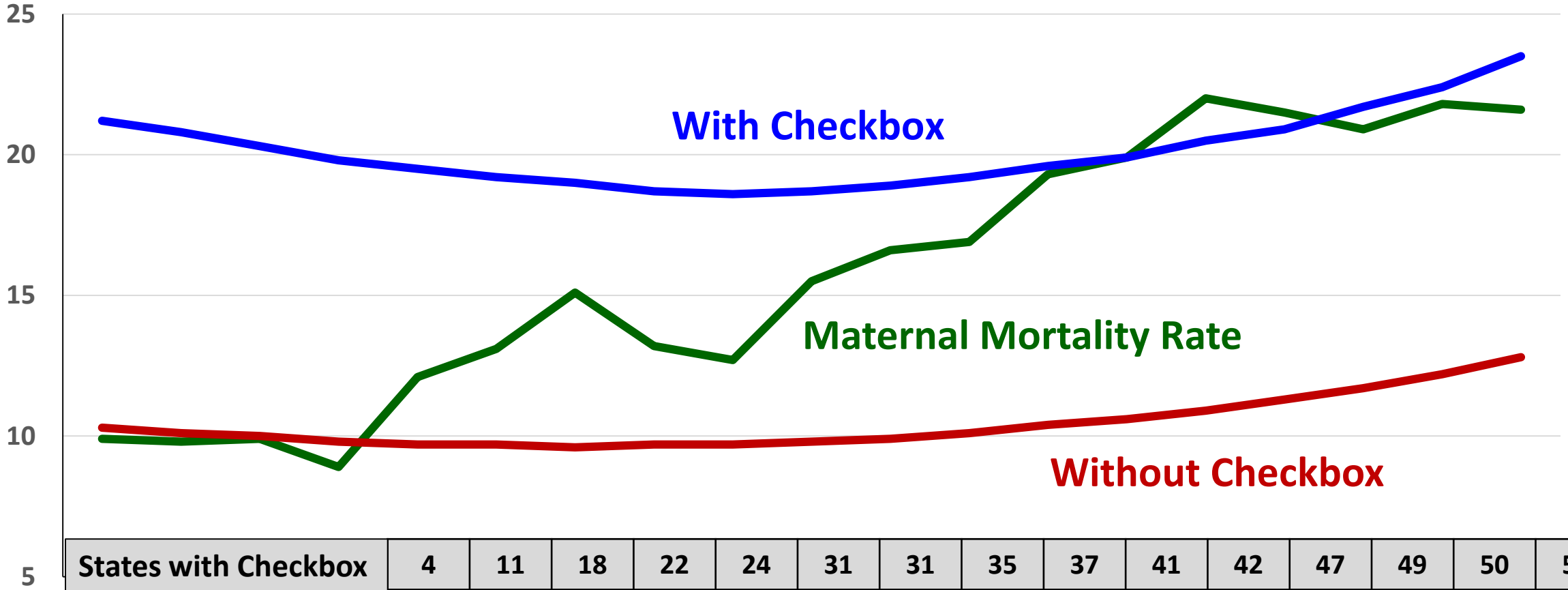
Observed and predicted maternal mortality rates: United States, 1999–2017



States with Checkbox	4	11	18	22	24	31	31	35	37	41	42	47	49	50	51
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017

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

www.birthbythenumbers.org

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	**3.07**
Florida	78	37	**2.11**
Georgia	134	28	**4.79**
Illinois	40	21	**1.90**
New York	72	41	**1.76**
Ohio	53	24	**2.21**
Texas	264	58	**4.55**

* Excludes Alabama, California, & W. Virginia

Source: Hoyert Dlet 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

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

www.birthbythenumbers.org

Source: MacDormanM. Trends in Mat. Mort. By Socioeconomic Characteristics. OBGYN 2017;129:811

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)

Source: MacDormanM. *OBGYN*.2017;129:811

Maternal Death ICD-10 Codes

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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)

Source: MacDormanM. *OBGYN*.2017;129:811

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**
Total Maternal	20.6	25.4	**23.3**
Ill-defined "other" causes	7.0	10.4	**47.9**
Total maternal minus ill defined	13.5	15.0	**10.6**
Total Direct Obstetric	13.9	16.6	**19.7**
Other specified pregnancy related cond.	3.4	5.9	**73.0**
Total direct obstetric minus ill defined	10.5	10.7	**2.3**
Total indirect causes	5.3	8.2	**54.4**
Other specified diseases & conditions	2.2	3.9	**75.9**
Total indirect minus ill defined	3.1	4.3	**38.7**

Source: MacDormanM. *OBGYN*.2017;129:811

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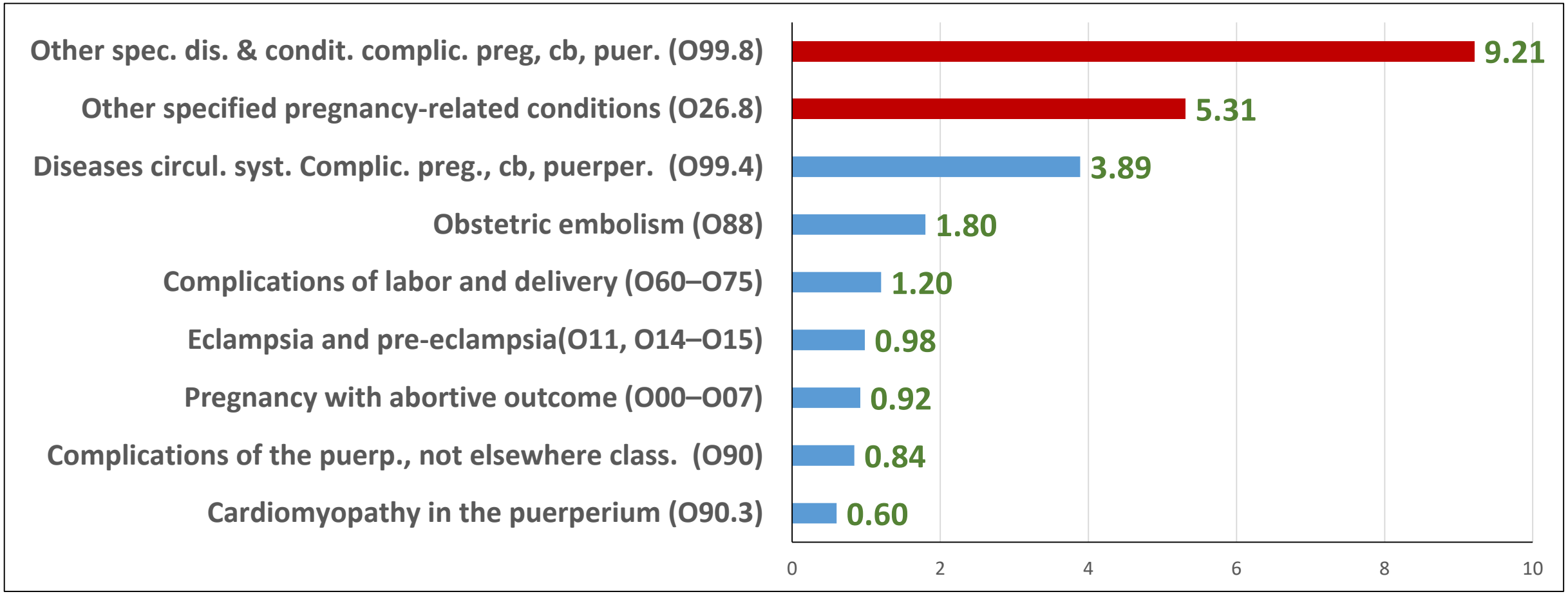
Ratios of deaths classified using pregnancy status checkbox to those classified without using the checkbox by Cause of Death, 47 states & D.C., 2015–2016



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

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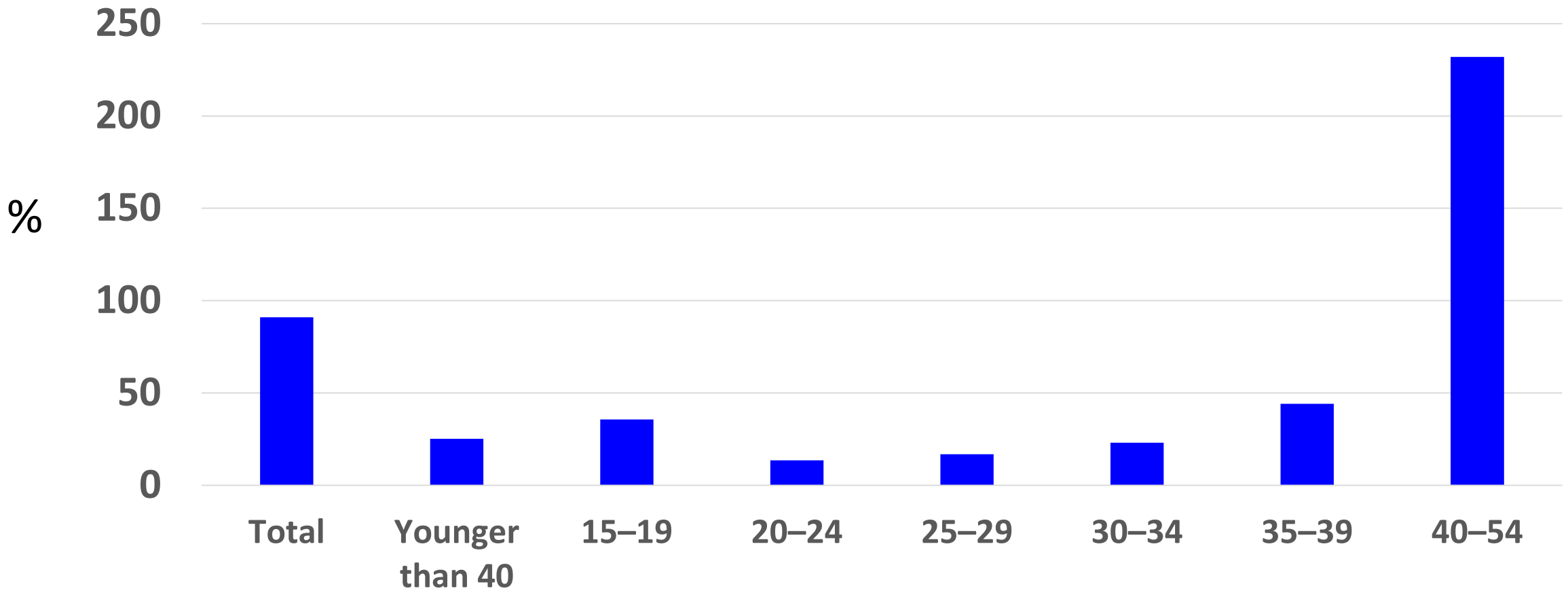
What of there were random error?

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

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

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



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

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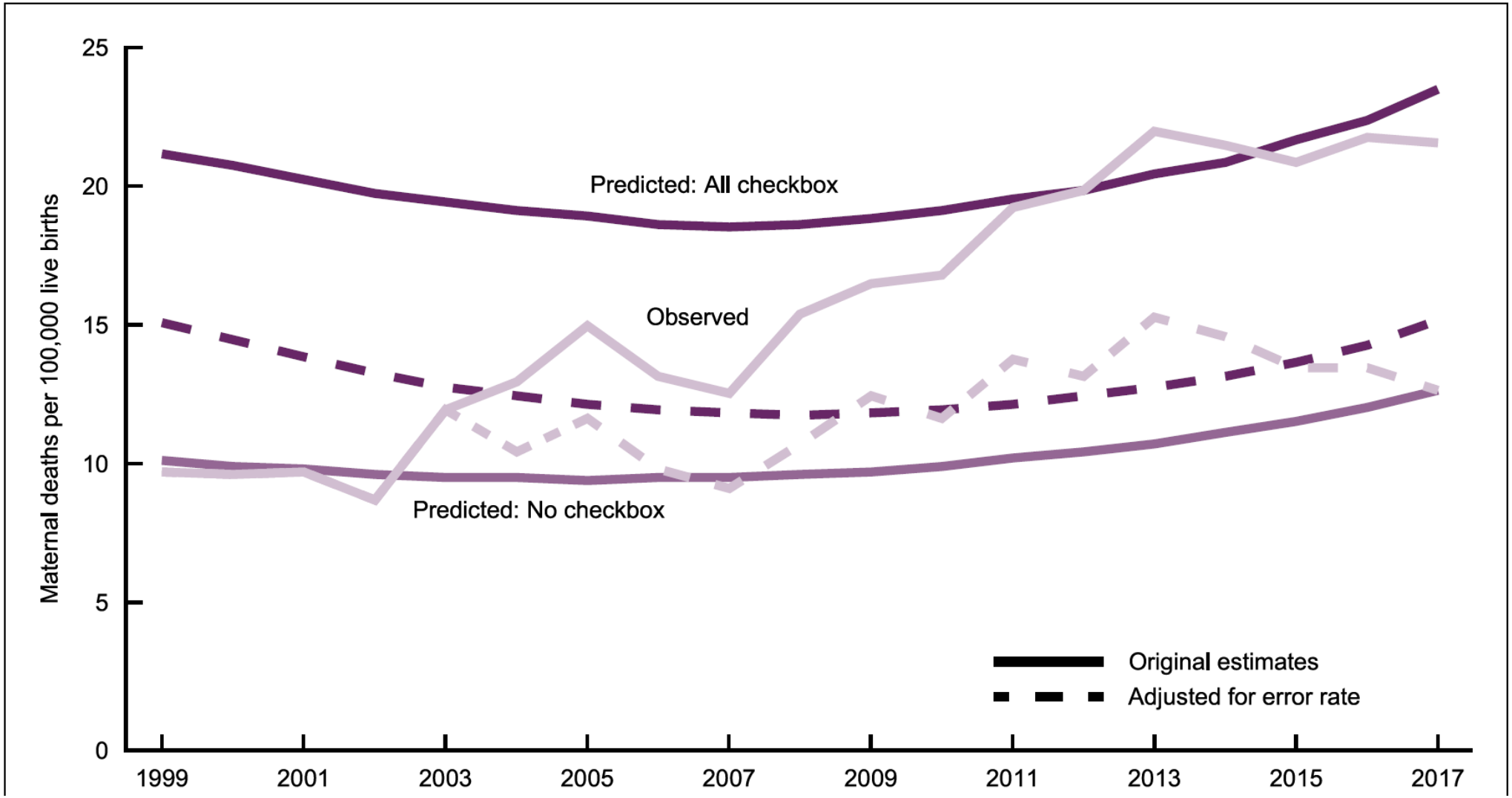
Observed & predicted maternal mortality ratios, adjusted for a 1% error rate in the pregnancy checkbox: U. S., 1999–2017



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.

Source: Hoyert & Miniño. *Maternal mortality in the United States, 2018*. NVSR; vol 69 no 2. Hyattsville, MD: NCHS. 2020

How can there be so much misclassification?

Who completes death certificates?

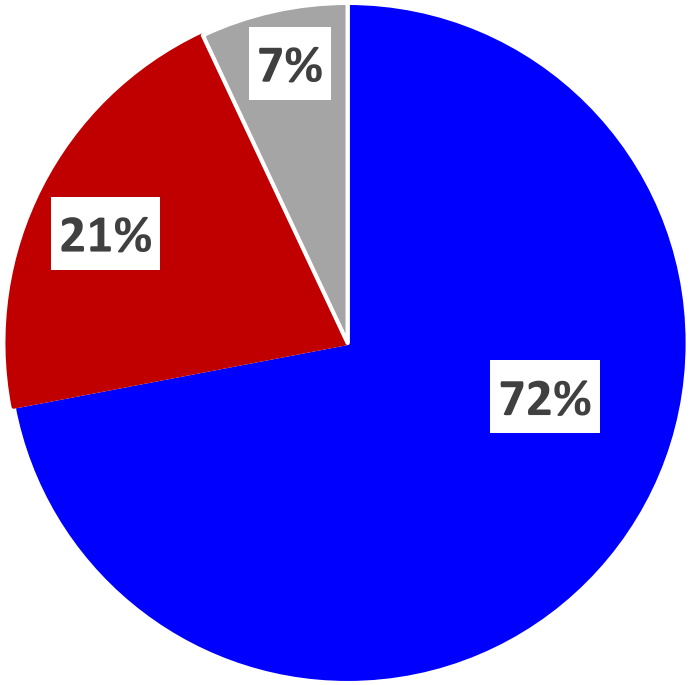
- *Death certificates can be signed by* a medical examiner, a primary physician, an attending physician, a non-attending physician, a nurse practitioner, a forensic pathologist or a coroner, but it varies according to state law. In Texas, for example, a justice of the peace can sign. Typically, deaths 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)

In 28% of cases with pregnancy checkbox checked, not certain woman was pregnant



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.

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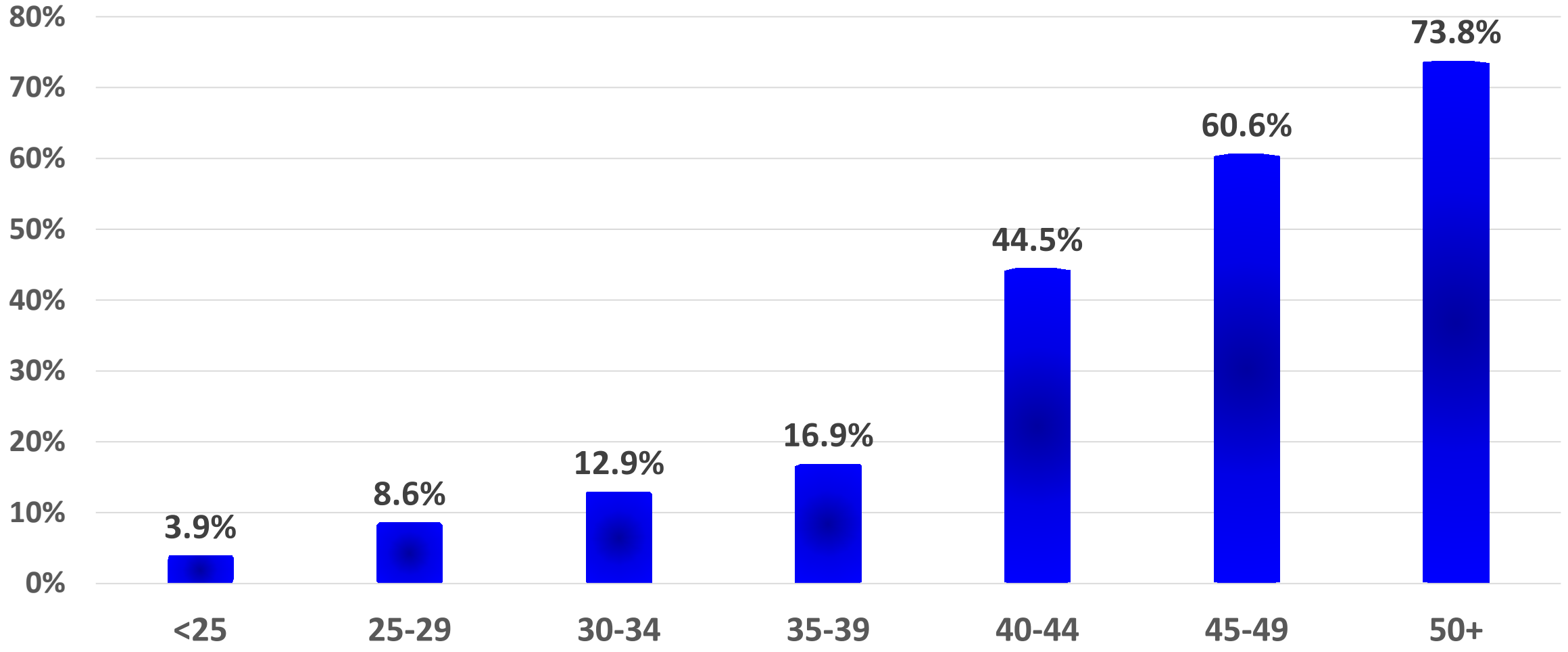
False Positives on the Pregnancy Checkbox by Age



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

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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.

Source: CDC. *Report from MMRCs: a view into their critical role.*

Summary

- *The introduction of the pregnancy checkbox served it's 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™

SEARCH

CDC A-Z INDEX

Reproductive Health

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?

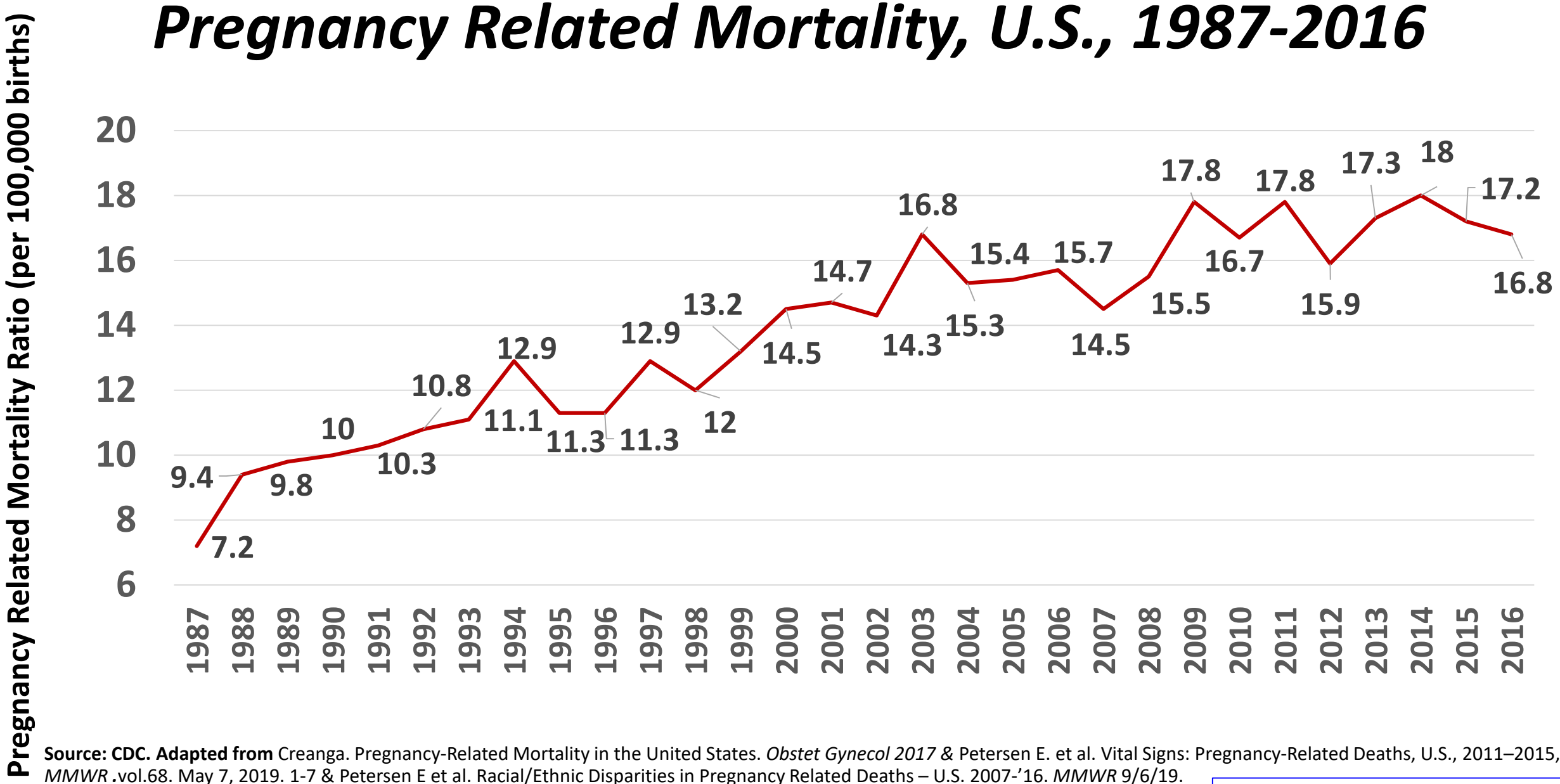
Data are analyzed by CDC scientists. Information about causes of pregnancy-related deaths and risk factors associated with these deaths is released periodically through peer-reviewed literature, CDC's *Morbidity and Mortality Weekly Reports*, and the CDC Web site. This information helps clinicians and 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., 1987-2016



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.

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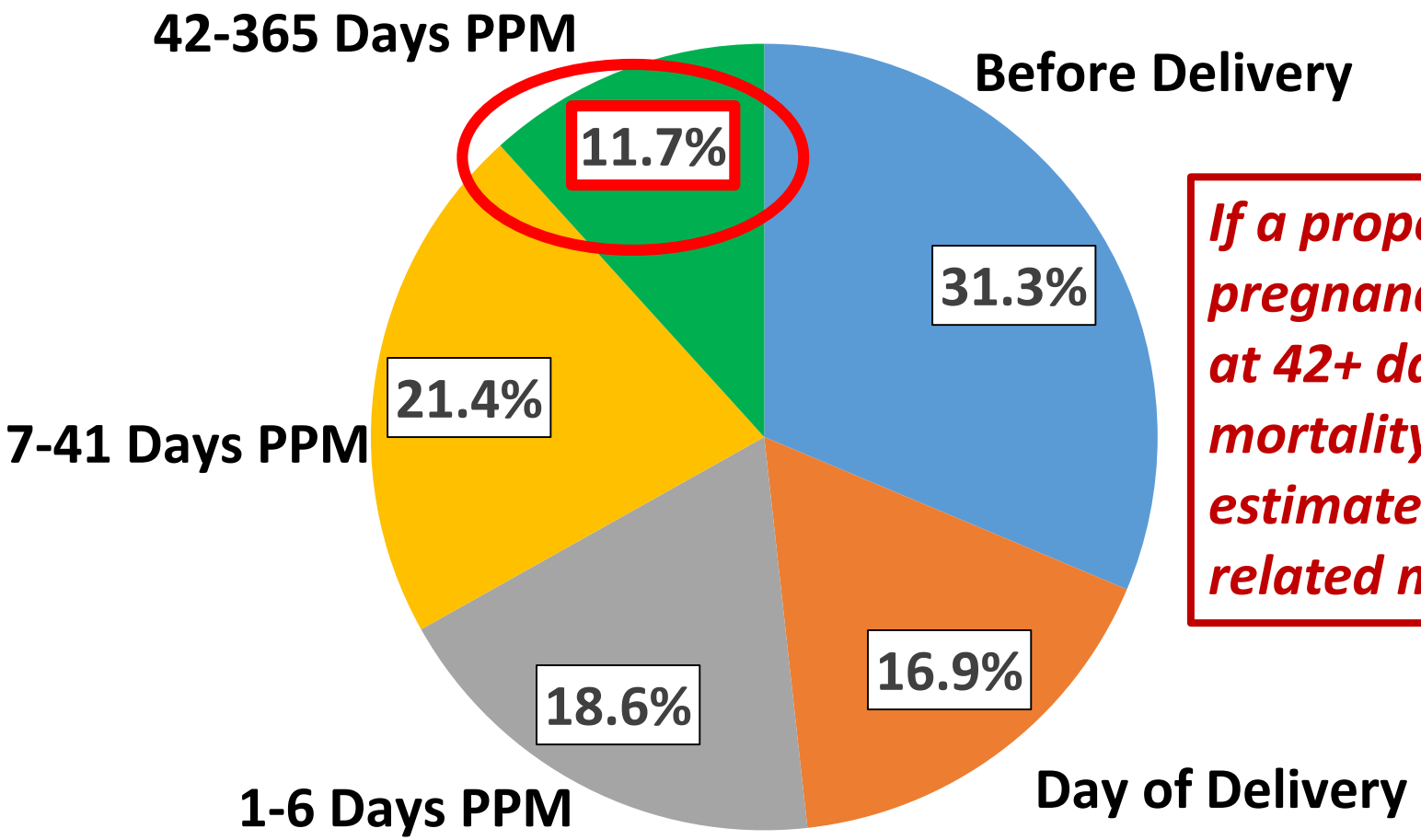
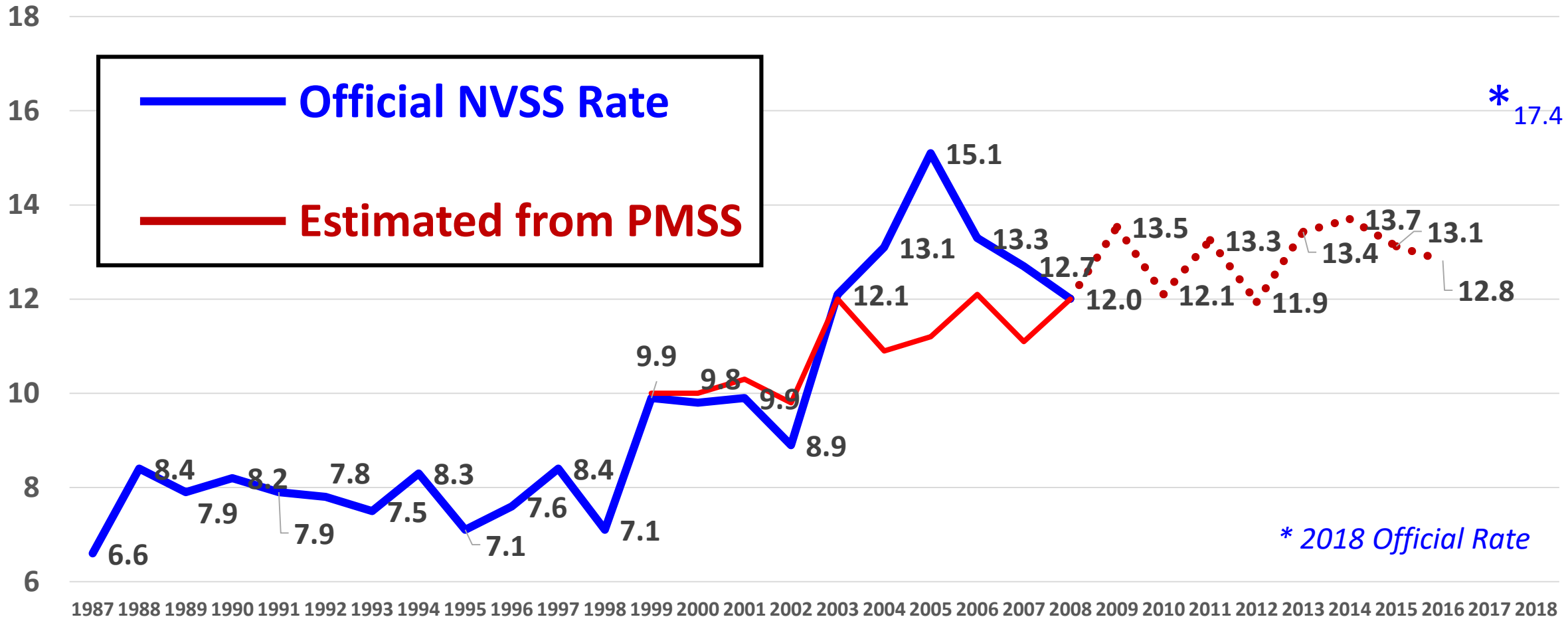
Timing of Maternal Deaths



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 Ratios (per 100,000 live births), U.S. 1987-2018#



1987-2007 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

NVSS: National Vital Statistics Syst.; **PMSS:** Pregnancy Related Maternal Mortality Surveillance Syst.

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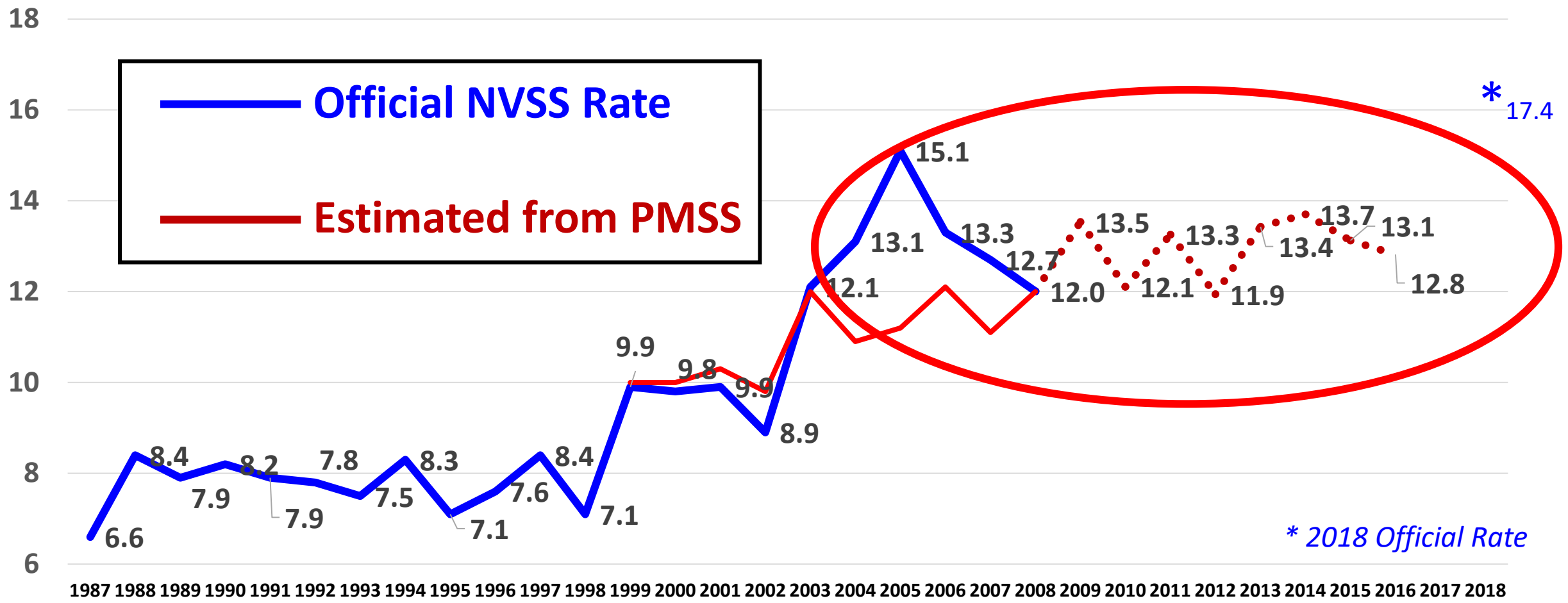
Maternal Mortality Ratios (per 100,000 live births), U.S. 1987-2018*



1987-2007 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

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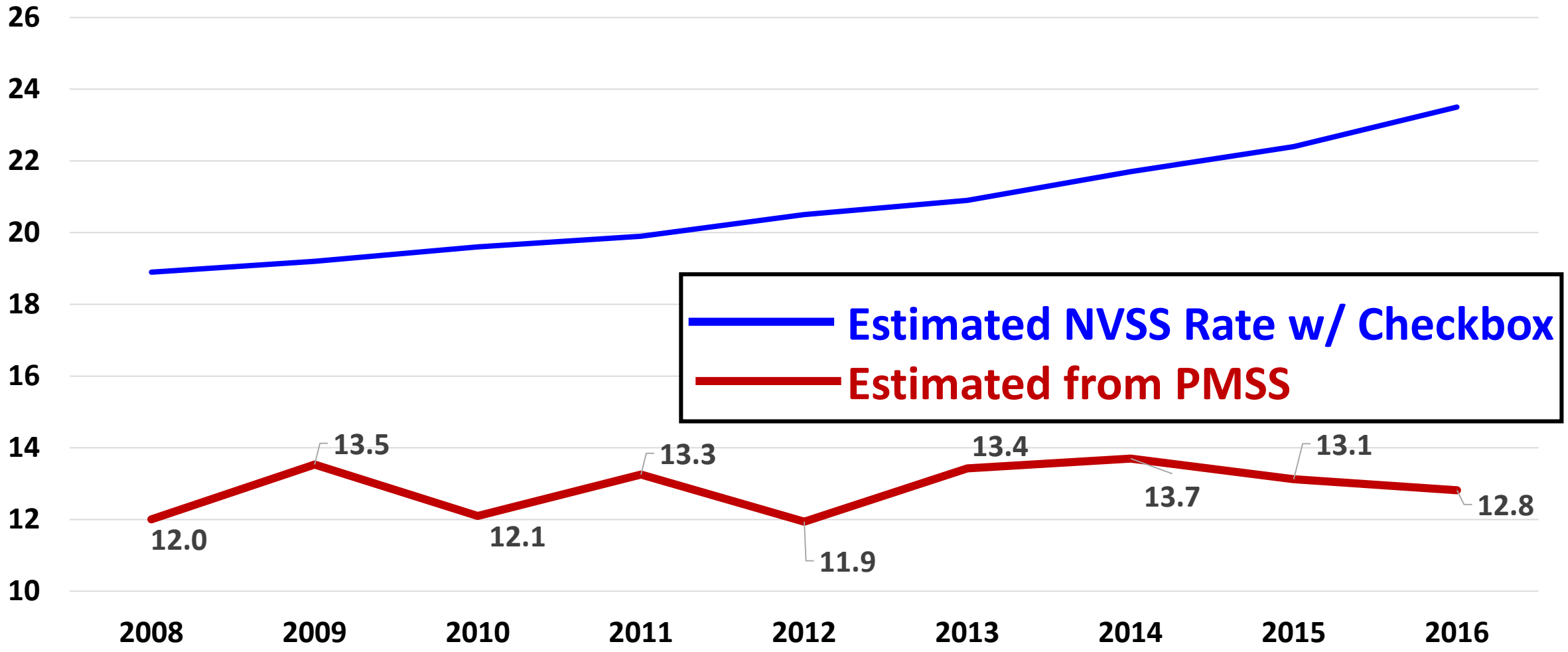
So is the maternal mortality going up in the U.S.?

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 etal. 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.

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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 2008-2016.

- 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[1]	1927 [2]	2017-18 [3]
	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[4]	410	411	7
France	520	287	8
New Zealand	460	491	9
United States[5]	650	647	17

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.

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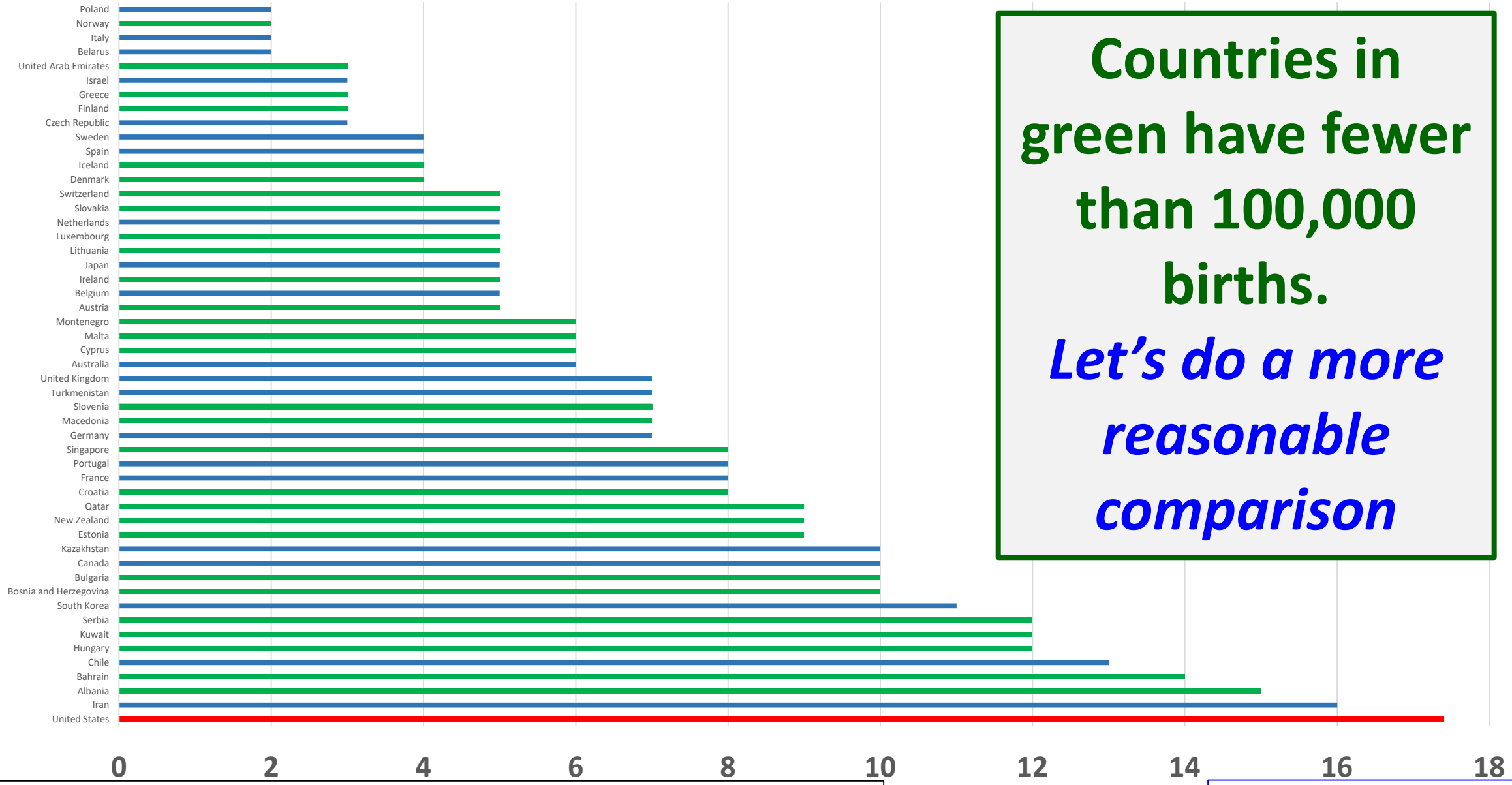
Maternal Mortality Ratios (per 100,000 births), 2017-18



Countries in green have fewer than 100,000 births.

Let's do a more reasonable comparison

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

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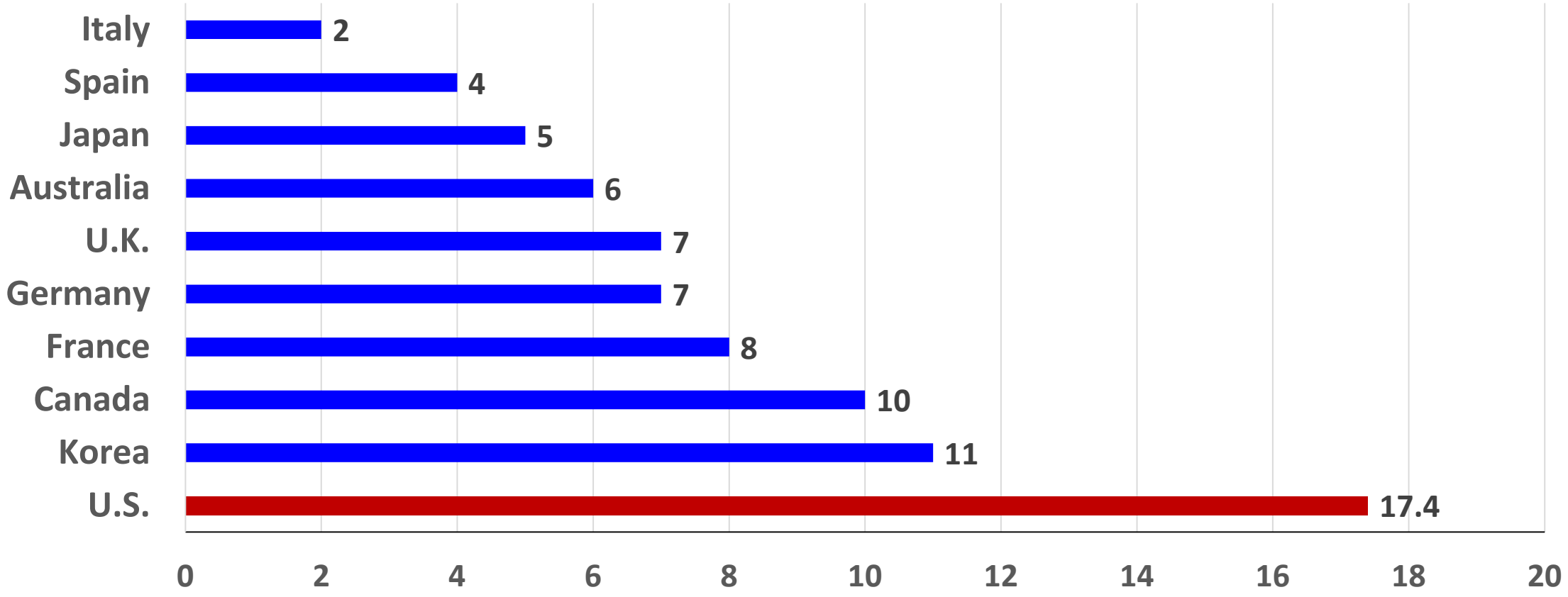
U.S. Maternal Mortality Ratio (per 100,000 births) Compared to Industrialized Countries with 300,000+ births, 2017-18



Source: WHO. *Trends In Maternal Mortality, 2000-2017* & U.S. Hoyert DL etal. National Vital Statistics Reports; vol 69 no 2. Hyattsville, MD: NCHS. 1/30/2020.

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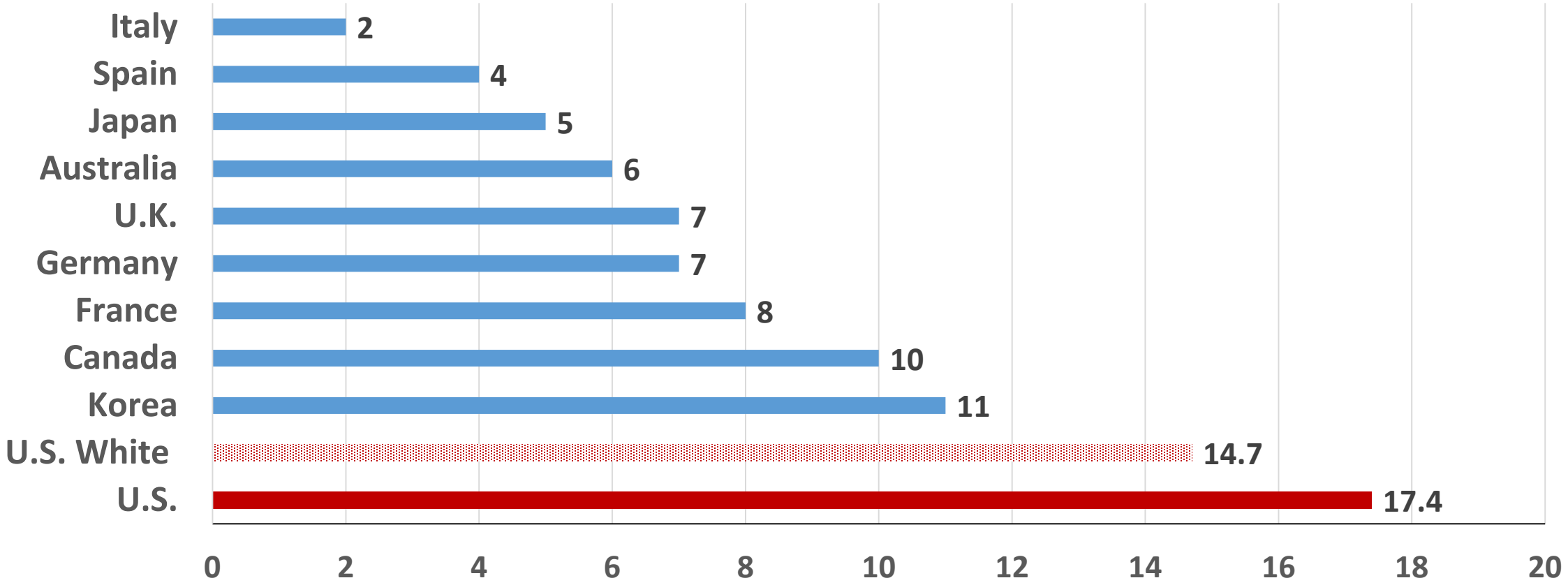
U.S. MMR (per 100,000 births) Compared to Countries with 300,000+ births, 2017-18



Source: WHO. *Trends In Maternal Mortality, 2000-2017* & U.S. Hoyert DL etal. National Vital Statistics Reports; vol 69 no 2. Hyattsville, MD: NCHS. 1/30/2020.

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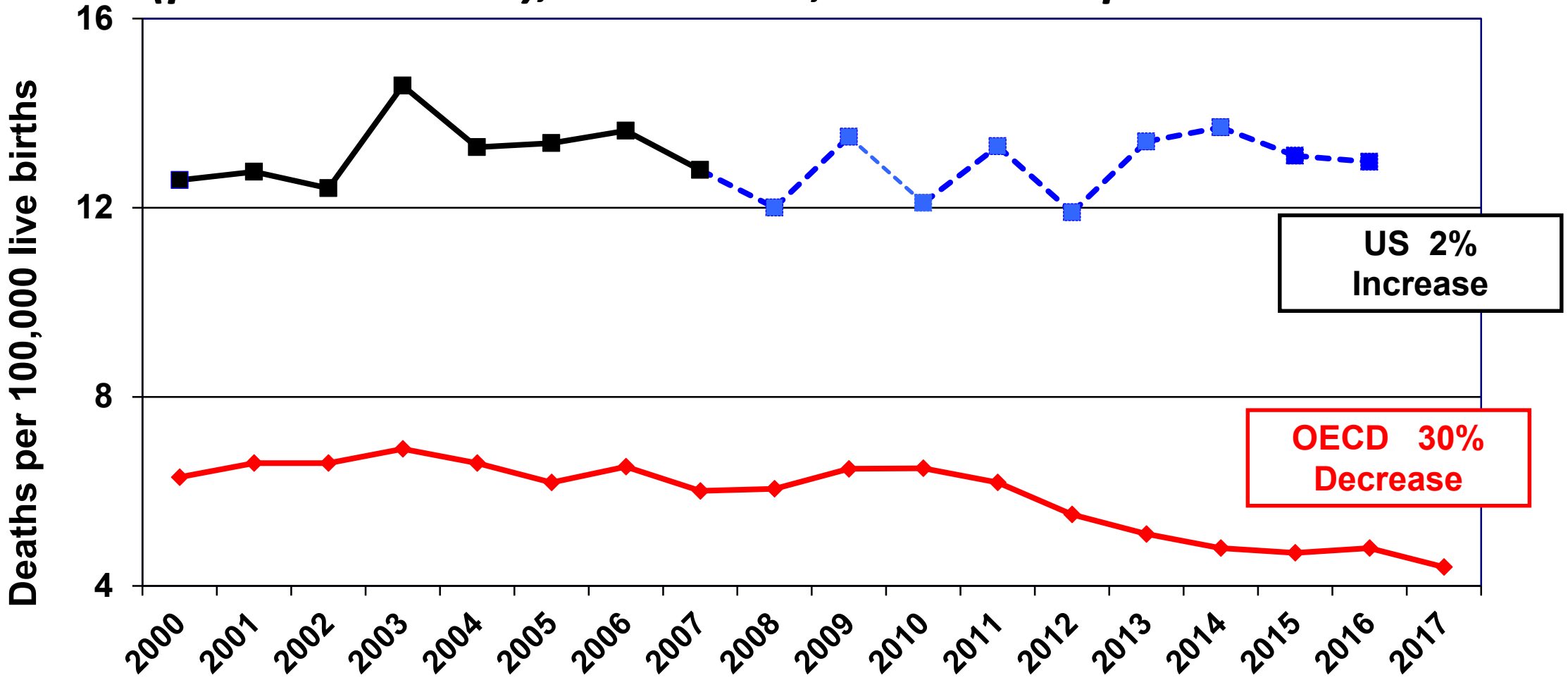
Trends for US vs Comparable Countries

*MMR (per 100K births), 2000-2016, U.S. & Comparable Countries **



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

Sources: OECD Health Data 2019; & U.S. Estimated from Pregnancy Mortality Surveillance System

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Summary

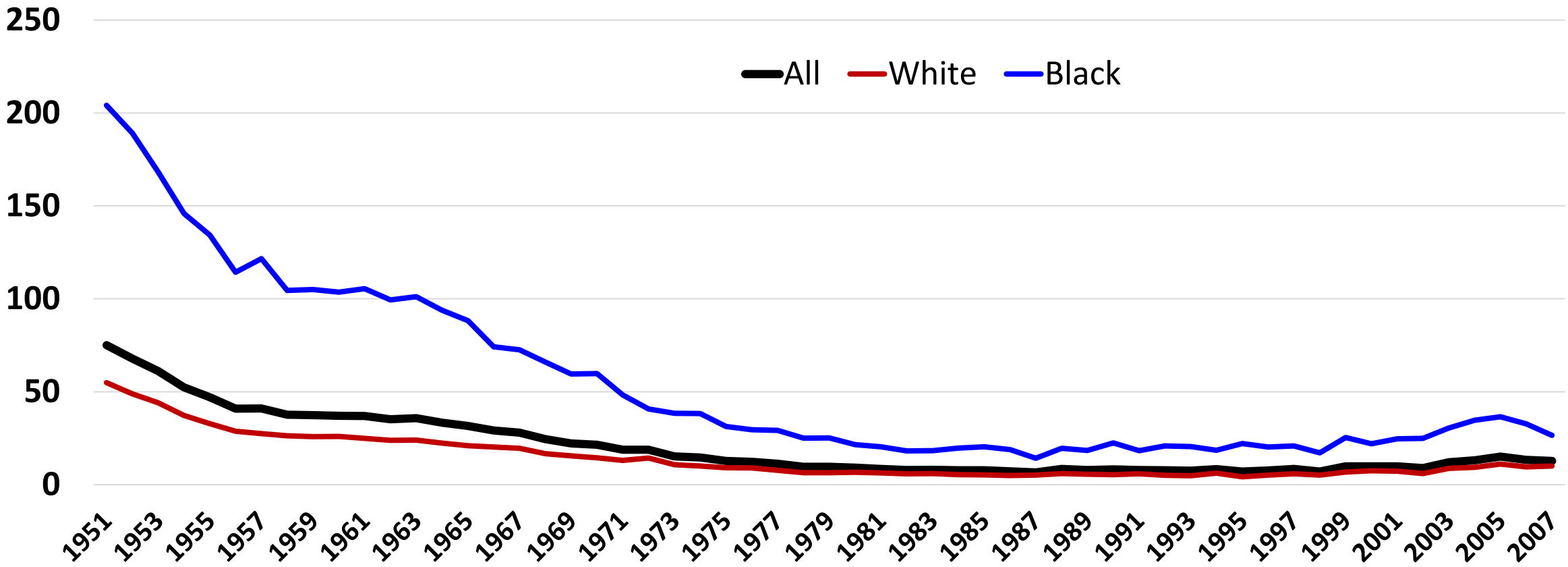
- No matter how you structure a comparison, the U.S. fares poorly in cross-national comparisons.

- If you include all countries, the U.S. ranks in the 50s; if you limit it to large wealthy countries, the U.S. ranks 10th…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.

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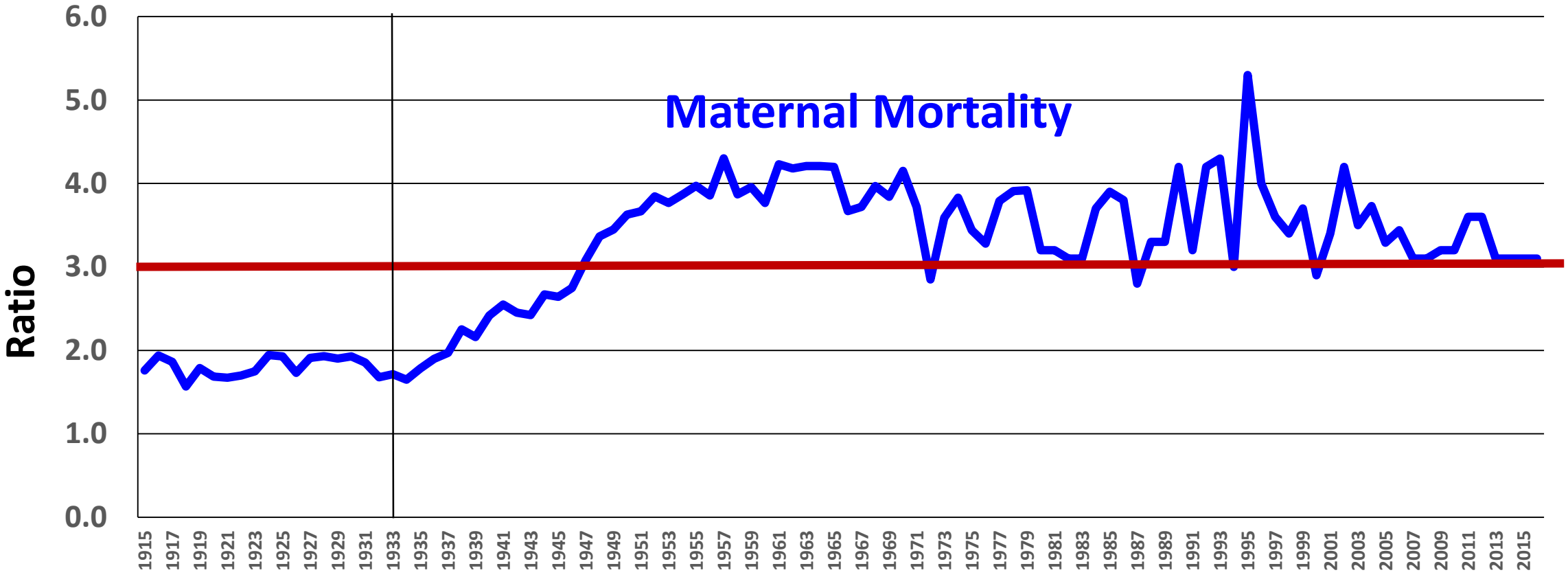
Black to White Ratios, U.S. Maternal Mortality, 1915-2016



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.

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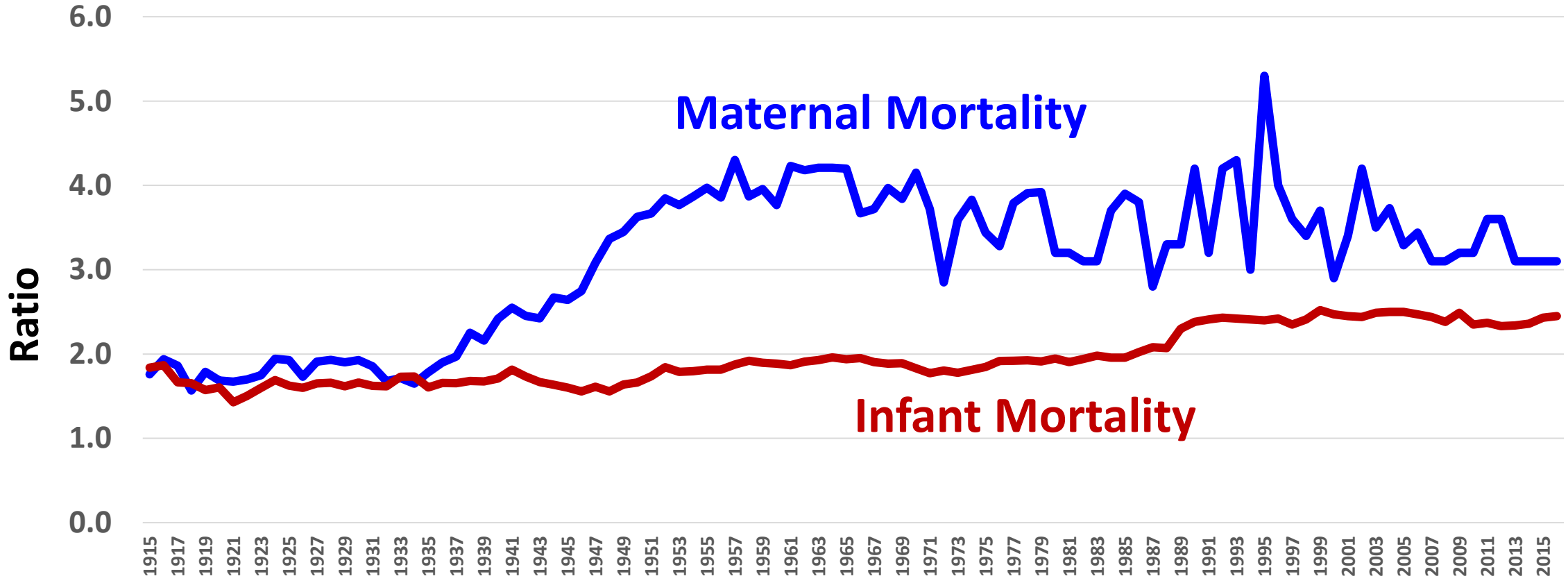
Black to White Ratios, U.S. Infant & Maternal Mortality, 1915-2016



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.

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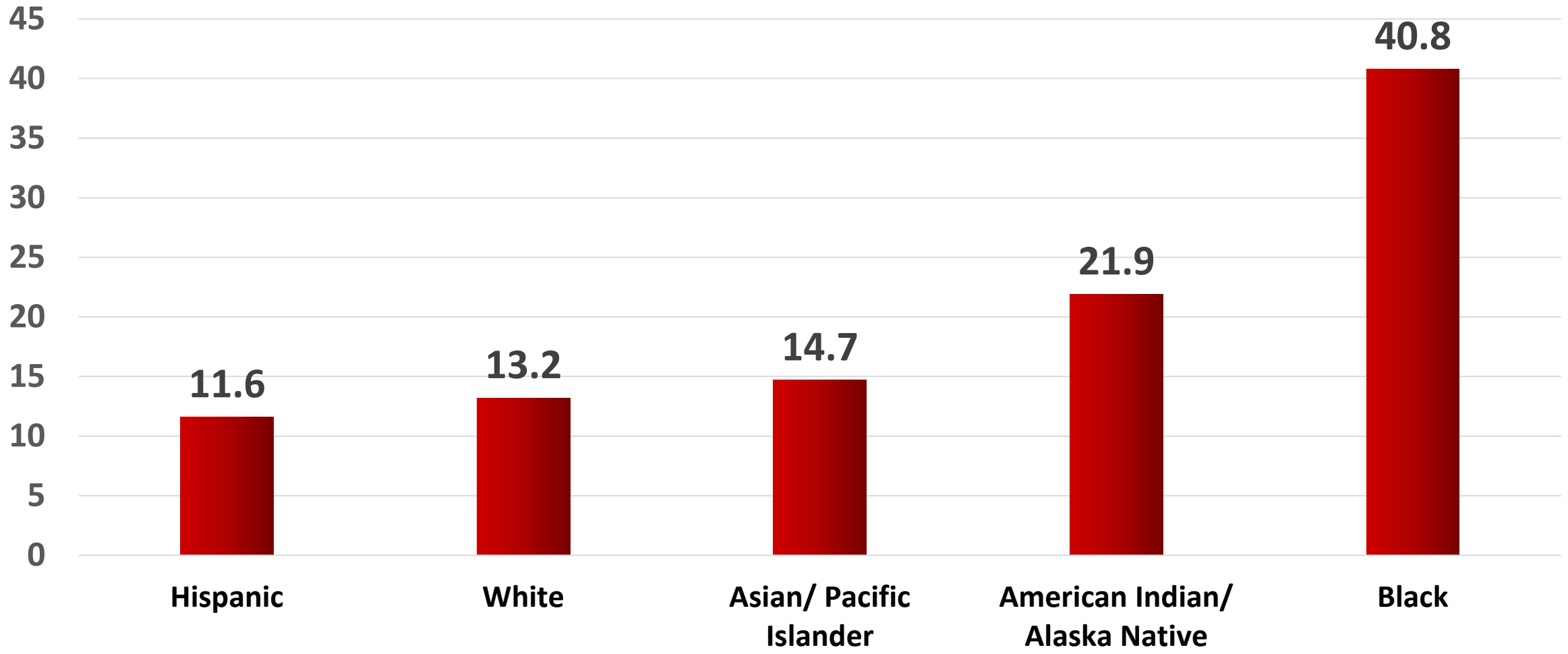
Pregnancy Related Mortality Ratios by Race, U.S., 2015-2016



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

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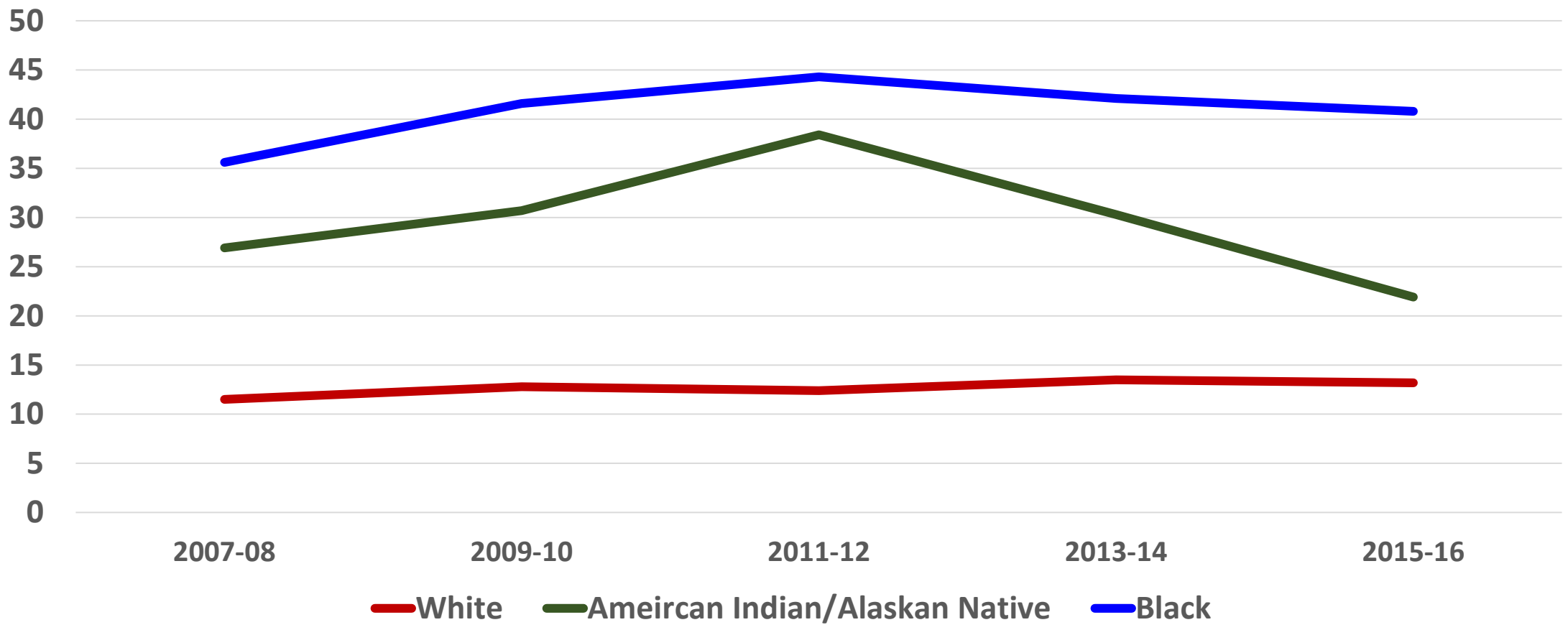
Pregnancy Related Mortality Ratios (per 100,000 births) by Race/Ethnicity, U.S. 2007-2016.



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

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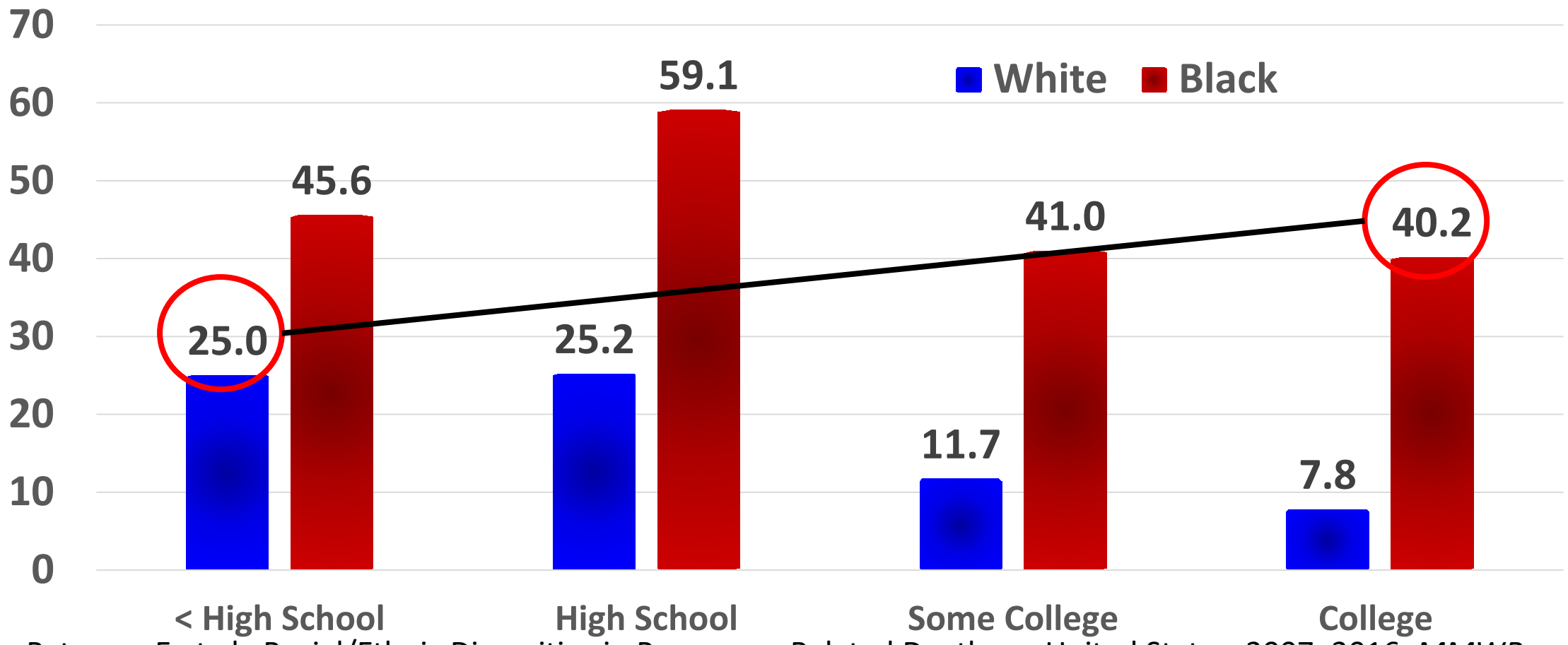
Pregnancy-related mortality ratios (per 100,000 live births) by race/ethnicity, U.S. 2007-2016



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

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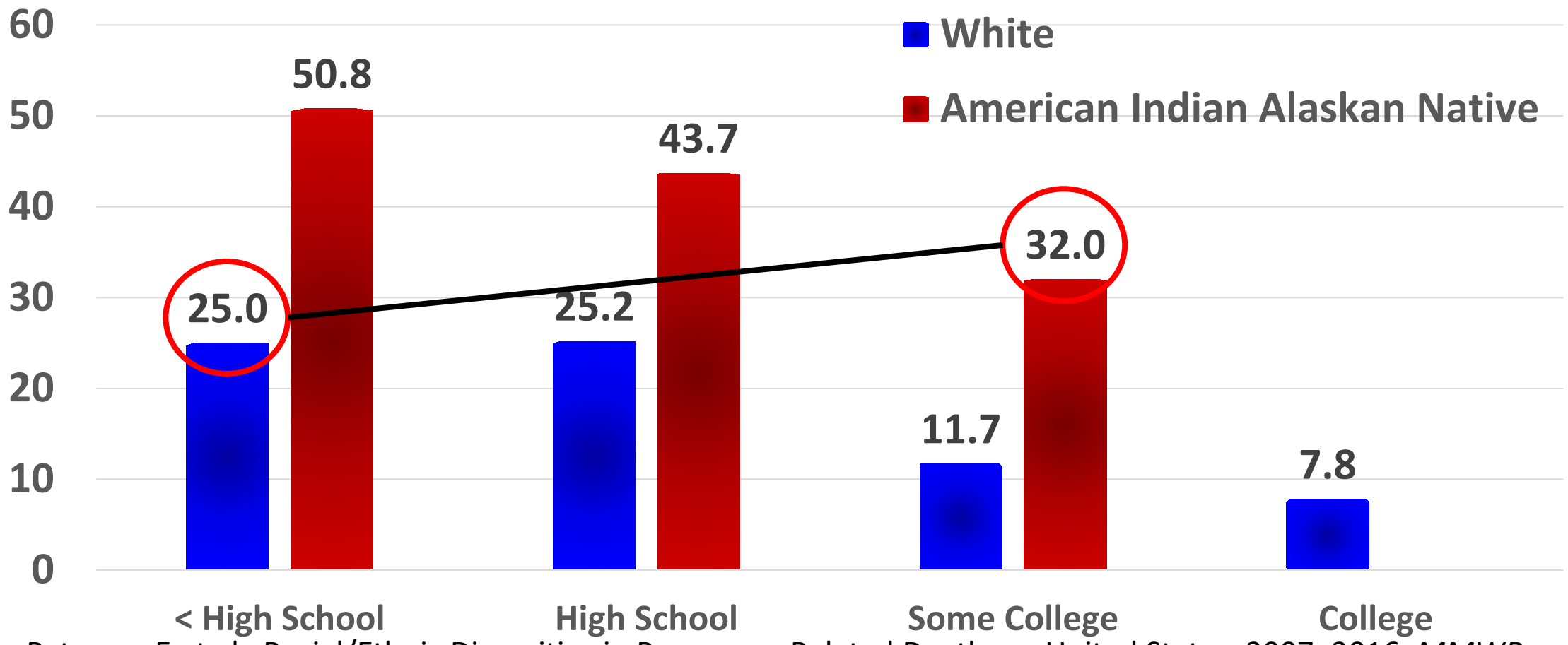
Pregnancy-related mortality ratios (per 100,000 live births) by race/ethnicity, U.S. 2007-2016



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

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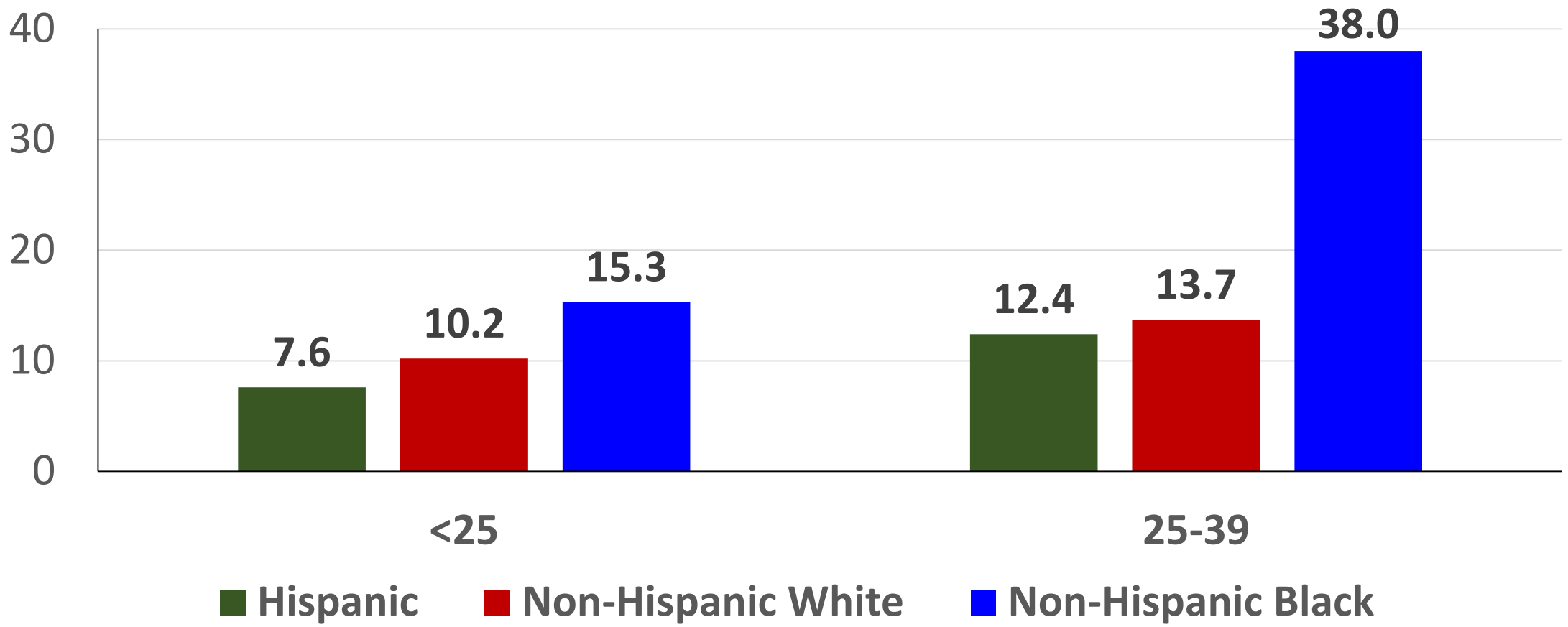
Maternal Mortality (per 100,000 live births) by Age and Race/Ethnicity, 2018



Source: Hoyert DL etal. 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.

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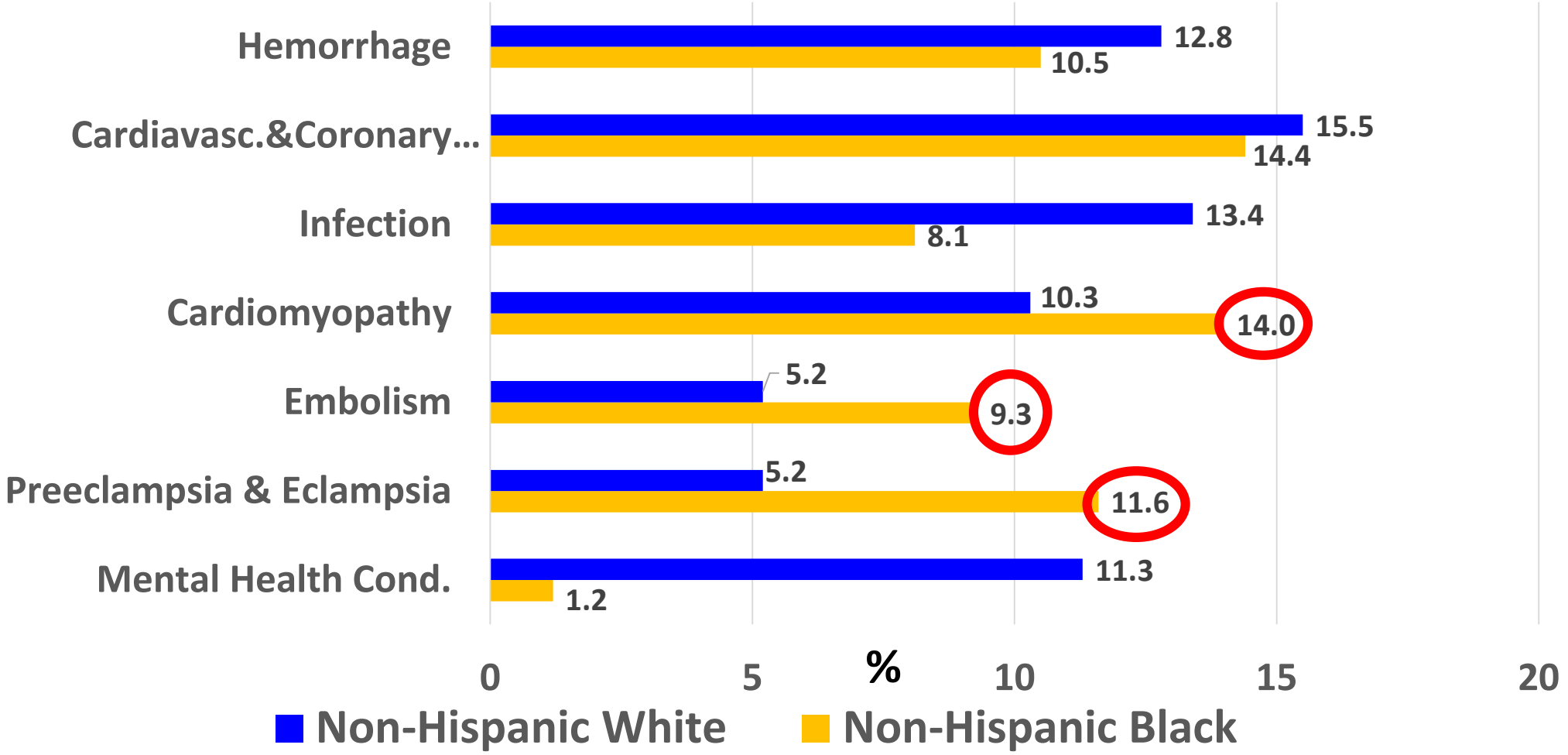
Manifestation of Racial Disparities

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



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

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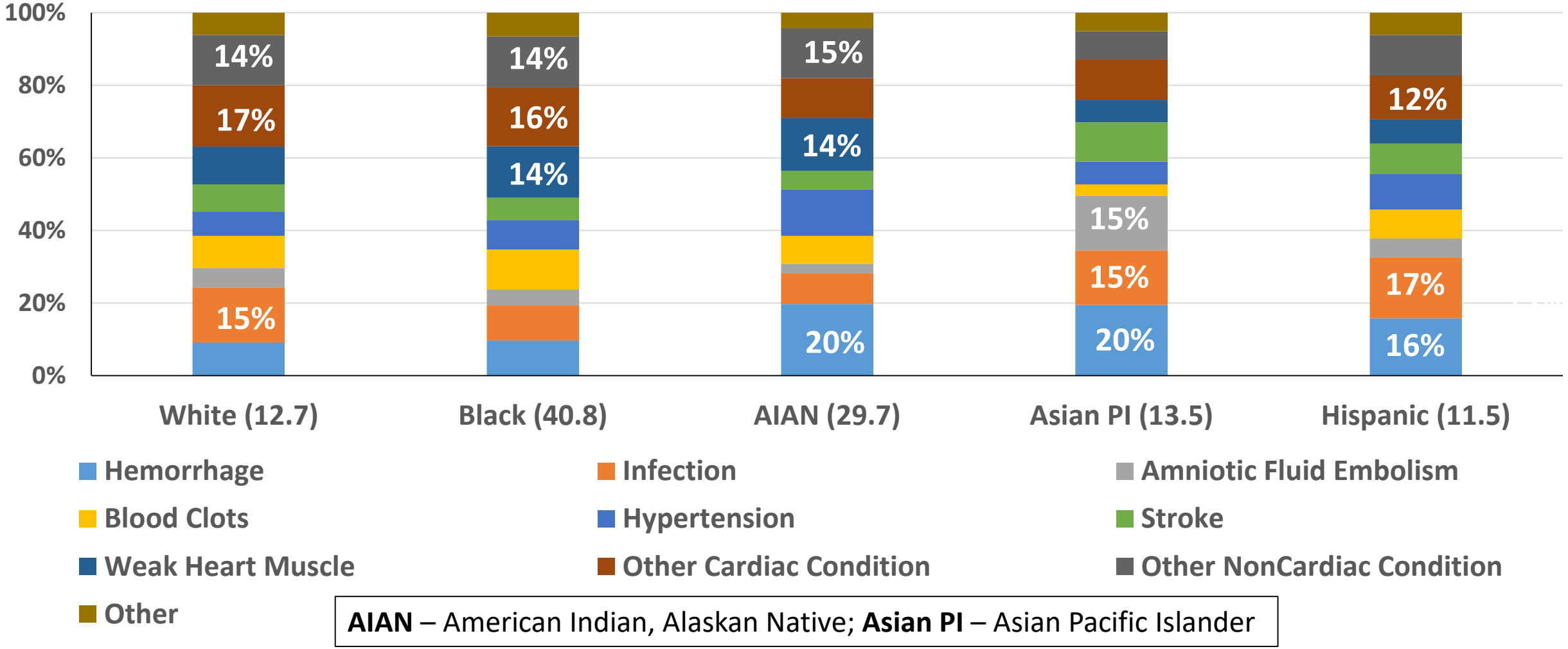
Cause-specific pregnancy-related mortality, by race/ethnicity, U.S., 2007-2016 (%)



AIAN – American Indian, Alaskan Native; **Asian PI** – Asian Pacific Islander

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

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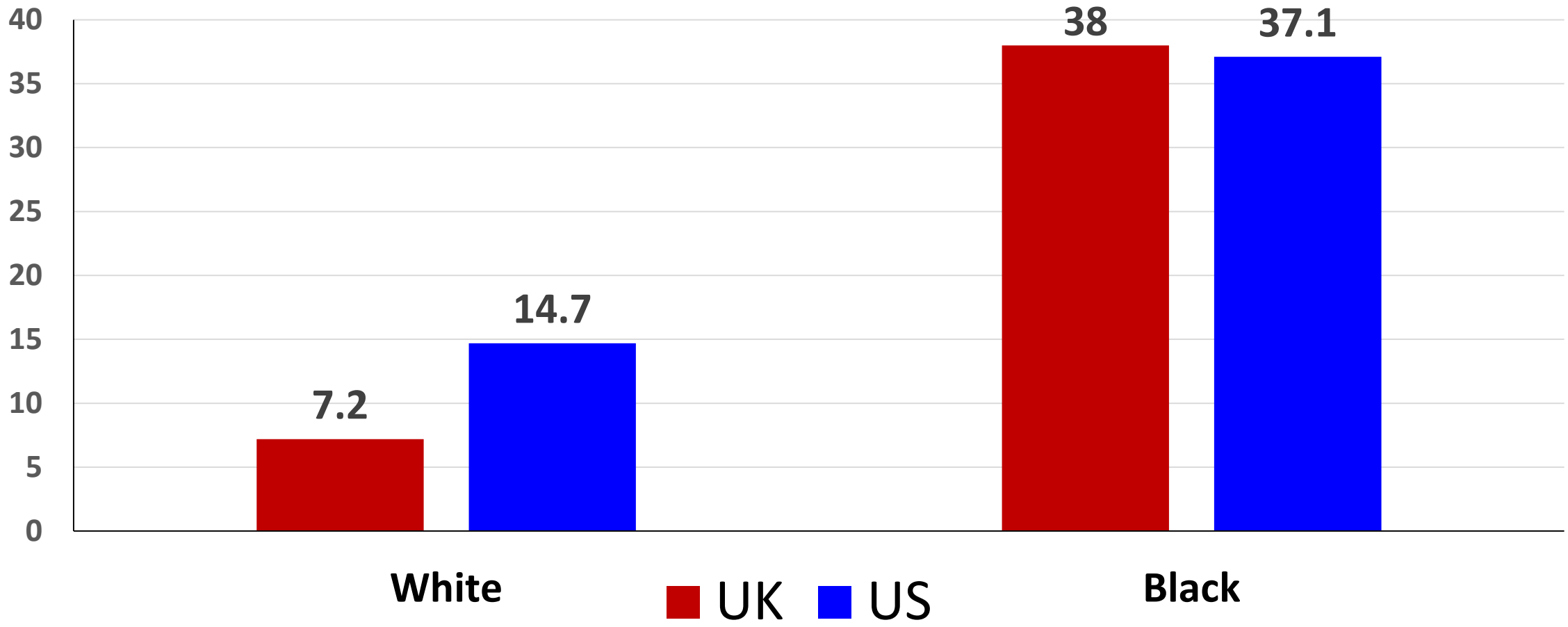
Maternal Mortality by Race, U.S. (2018) and U.K. (2015-2017)



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

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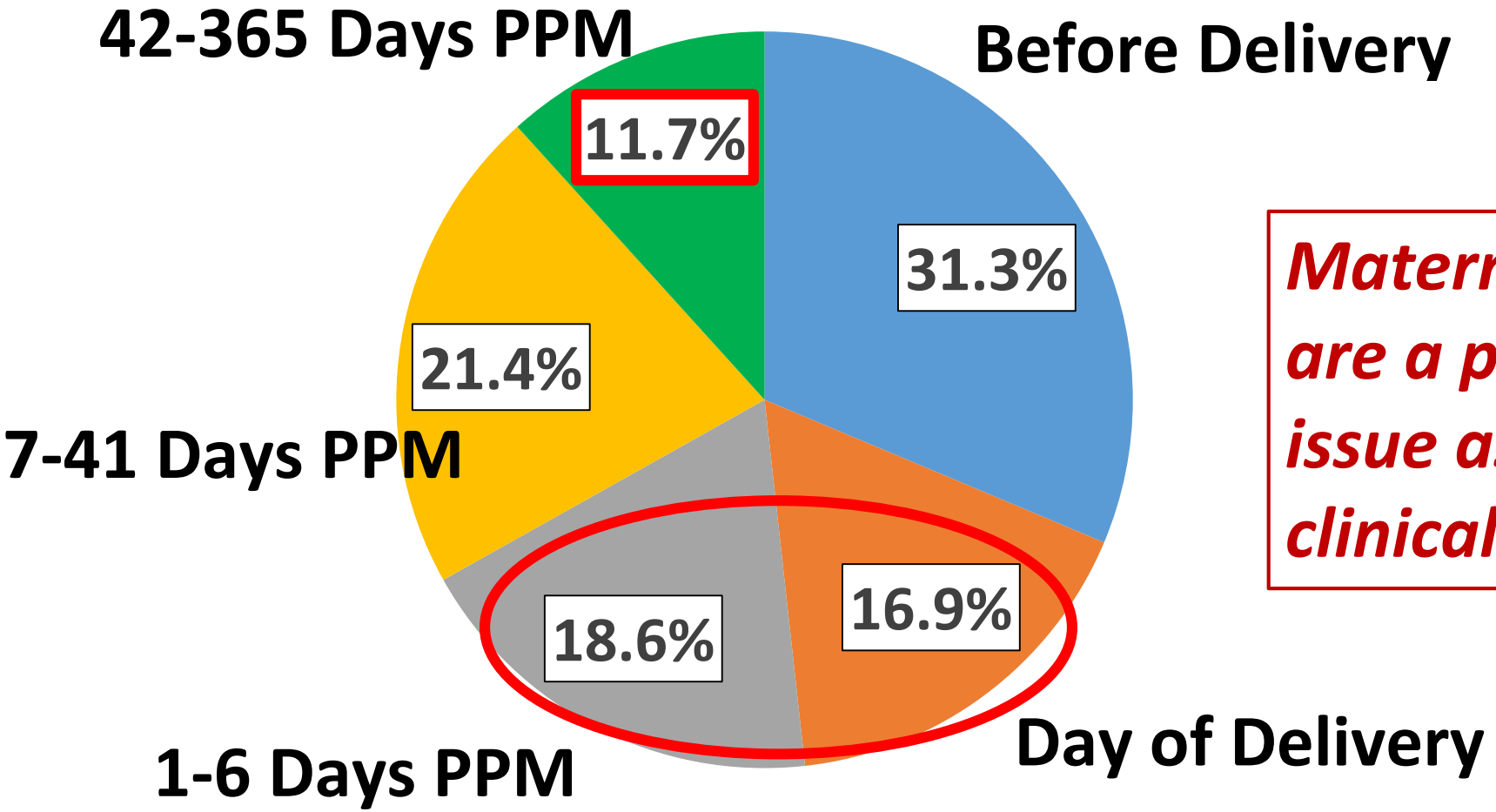
Summary

- 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



Maternal deaths are a public health issue as much as a clinical care issue.

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.

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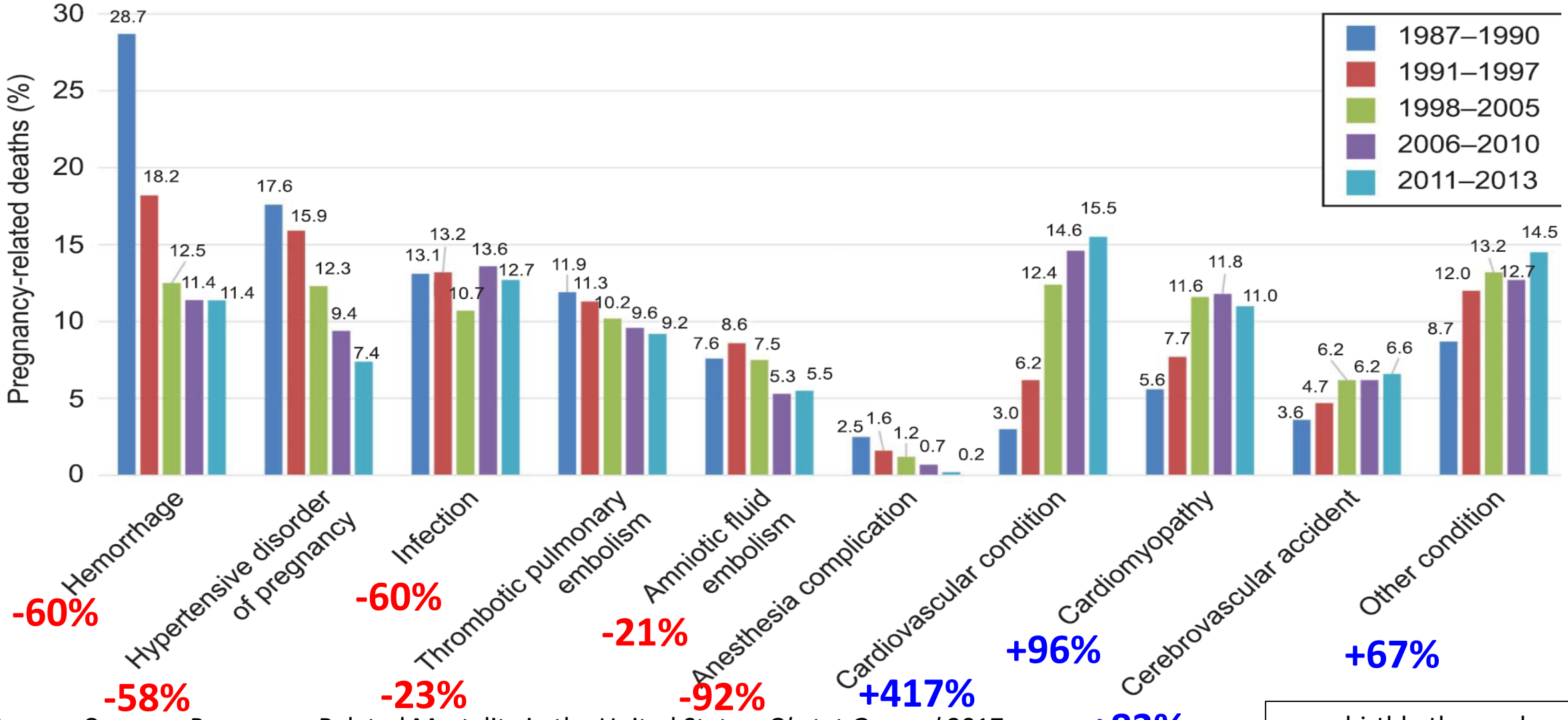
Maternal Mortality as a Public Health Approach

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



Source: Creanga. Pregnancy-Related Mortality in the United States. *Obstet Gynecol* 2017.

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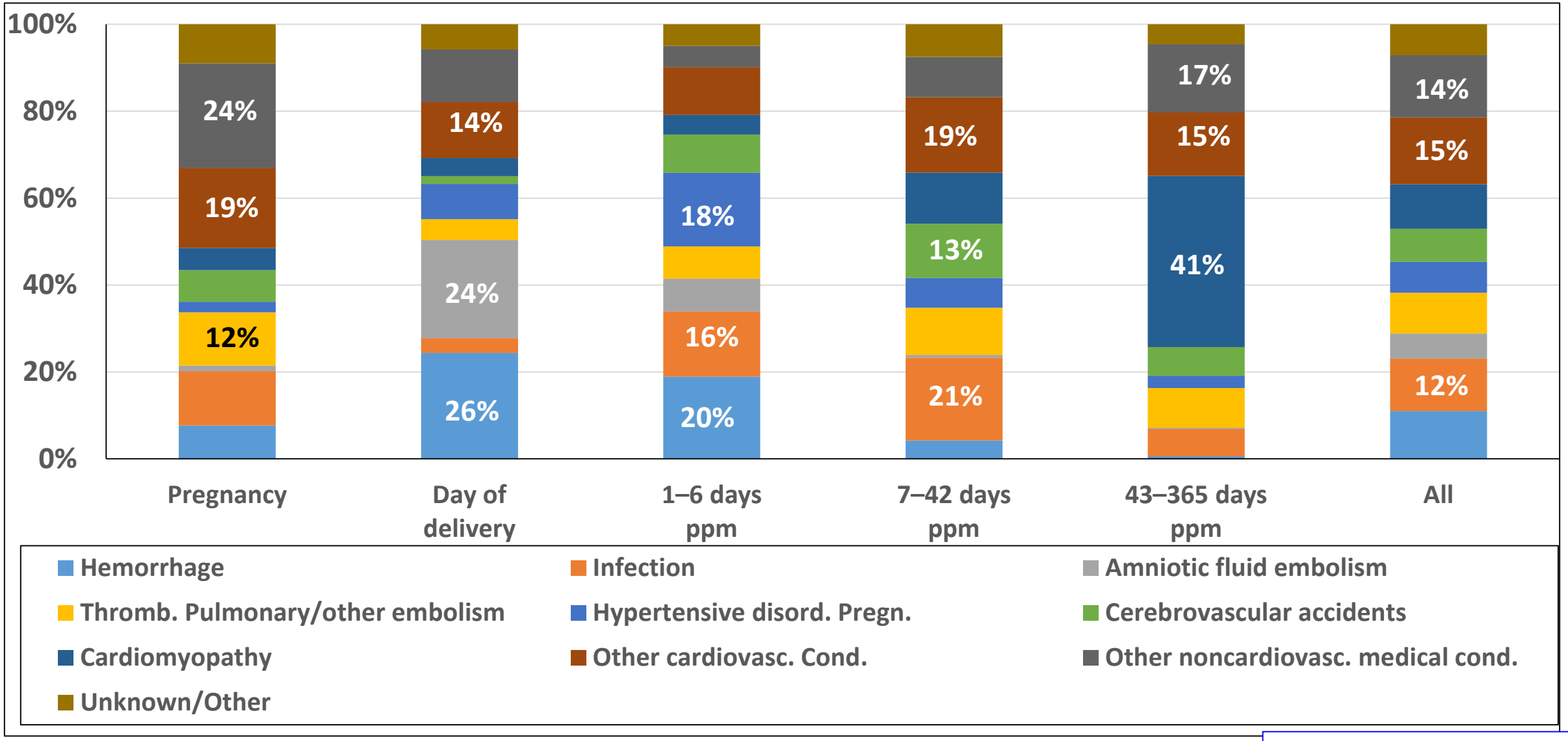
Pregnancy-related deaths, by cause of death and time of death relative to the end of pregnancy, 2011-15



Source: PetersenE. *Vital Signs*: Pregnancy-Related Deaths, U.S., 2011–2015. *MMWR* 2019; 68:423-29.

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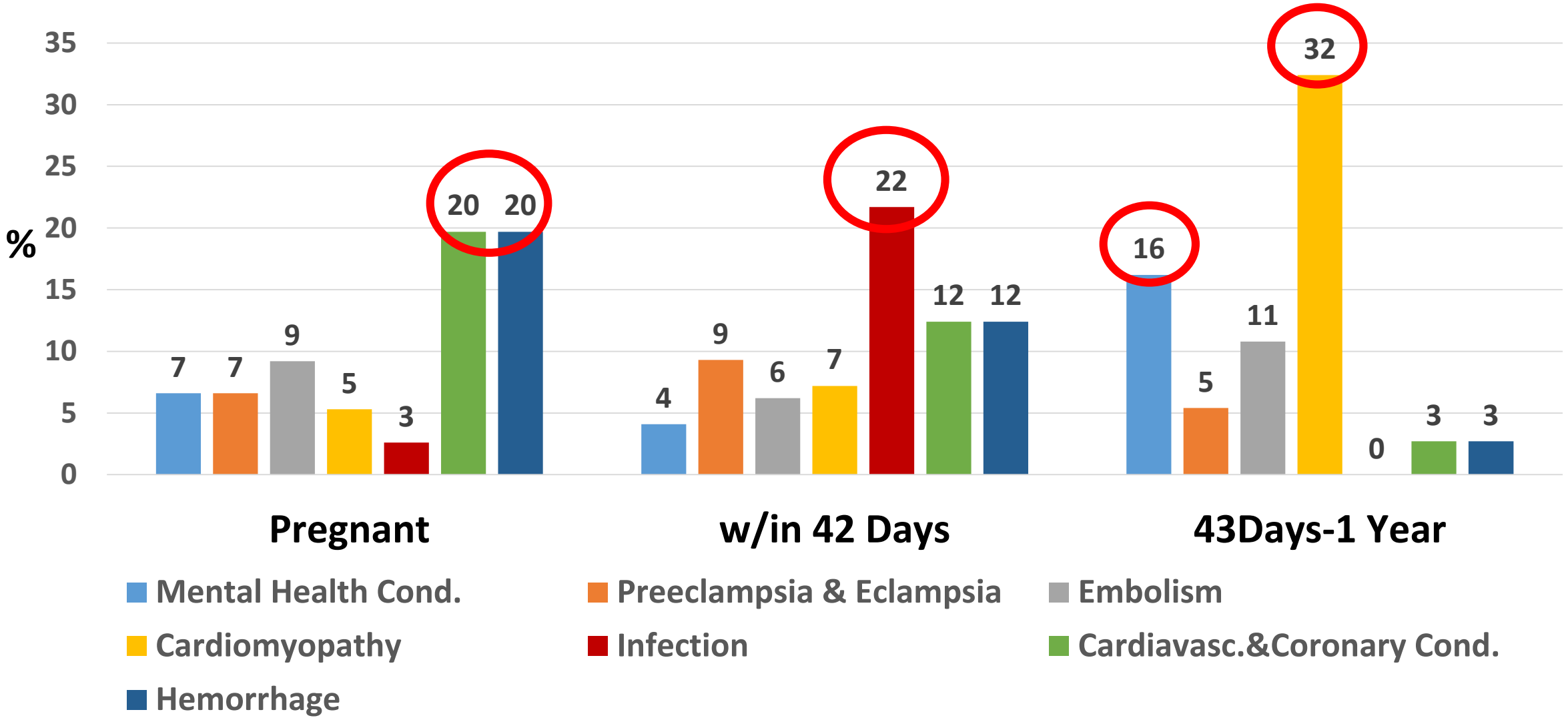
Moving to a Public Health Approach

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



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

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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 68, Number 9 June 24, 2019

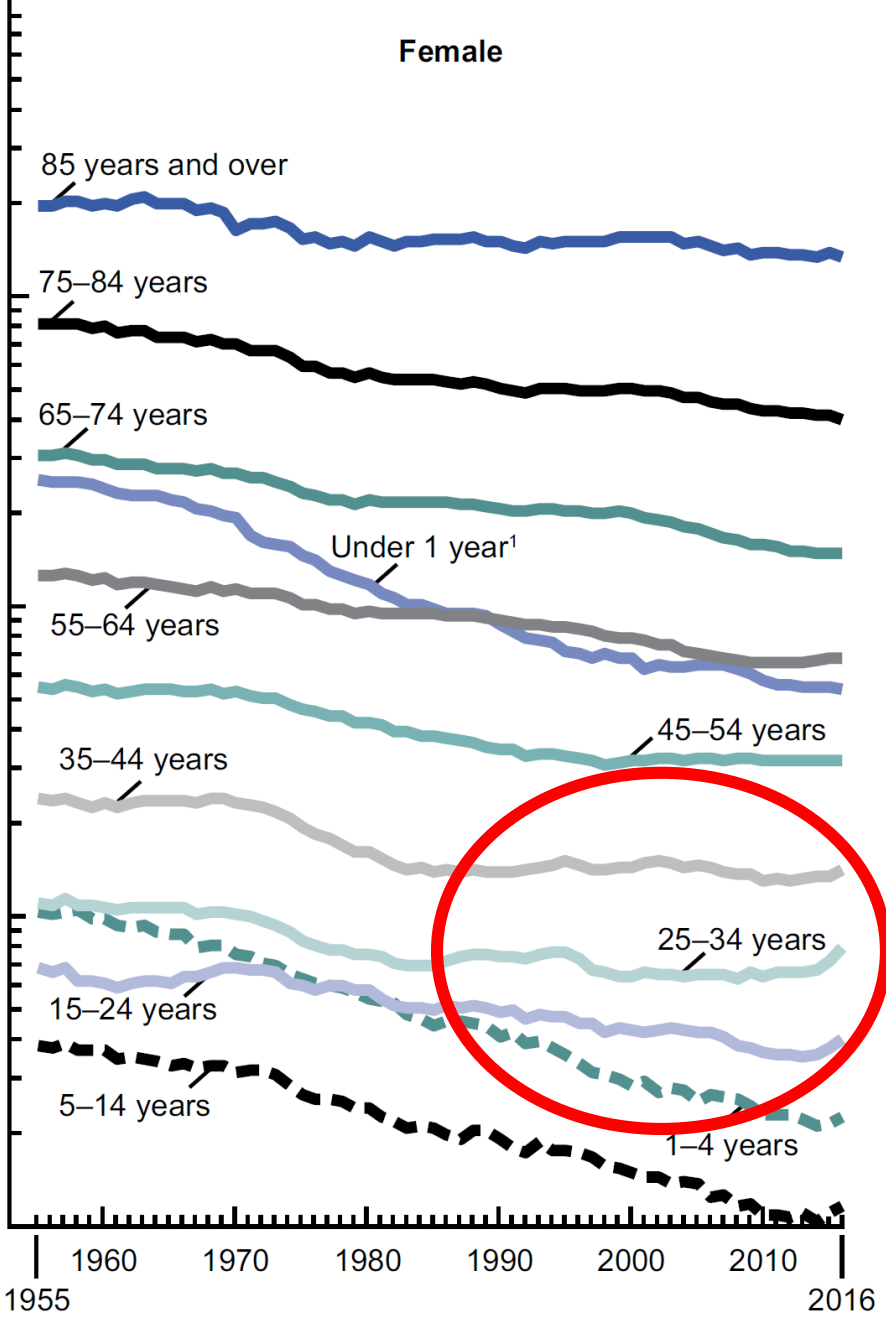
Deaths: Final Data for 2017

STAT

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

By Eugene Declercq *and* Neel Shah

August 22, 2018



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Births in U.S. by Maternal Age, 2018

Age	# Births	%
<20	181,607	**4.8%**
20-24	726,175	**19.2%**
25-29	**1,099,491**	**29.0%**
30-34	**1,090,697**	**28.8%**
35+	693,742	**18.3%**
Total	3,791,712	**100.0%**

Source: CDC Wonder

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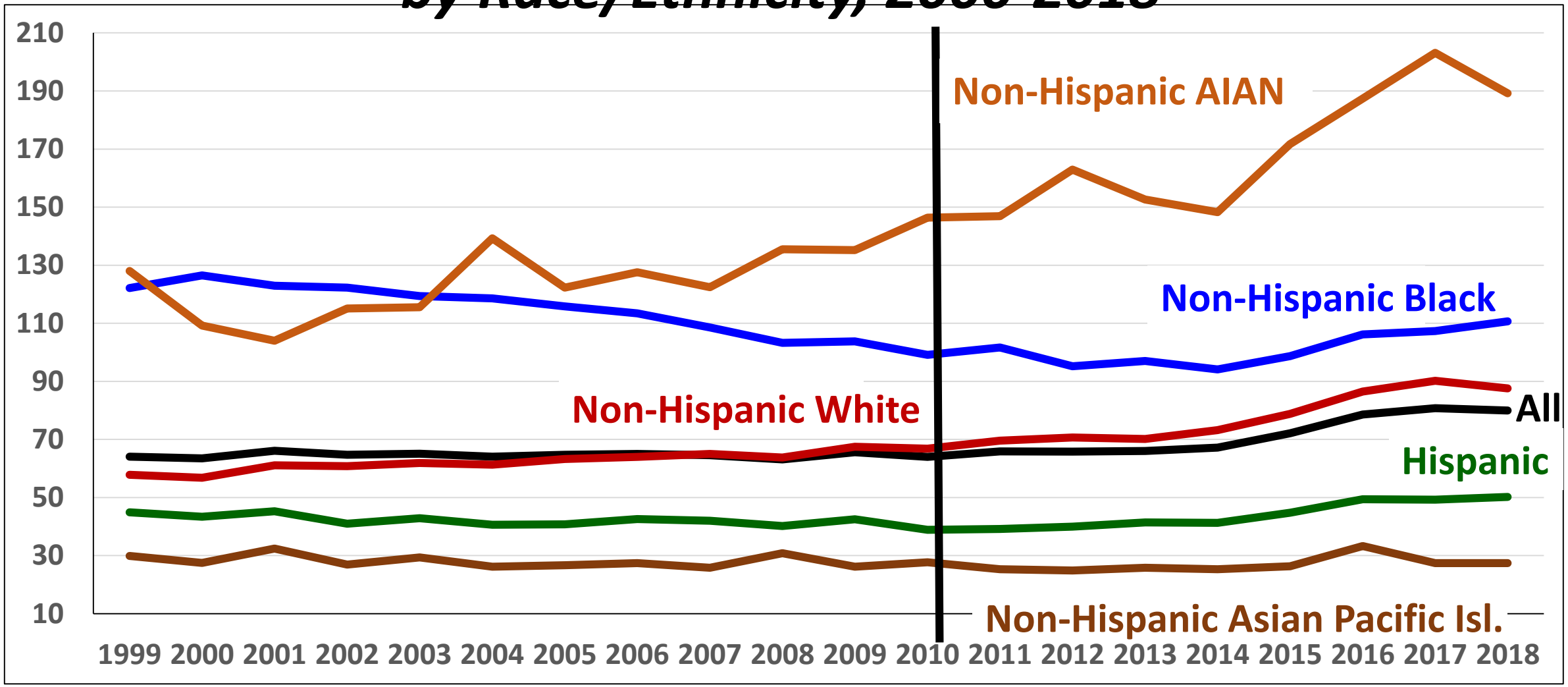
The Problem is Bigger than Maternal Mortality

Overall Deaths rates (per 100K), Females 25-34, by Race/Ethnicity, 2000-2018



Source: CDC Wonder

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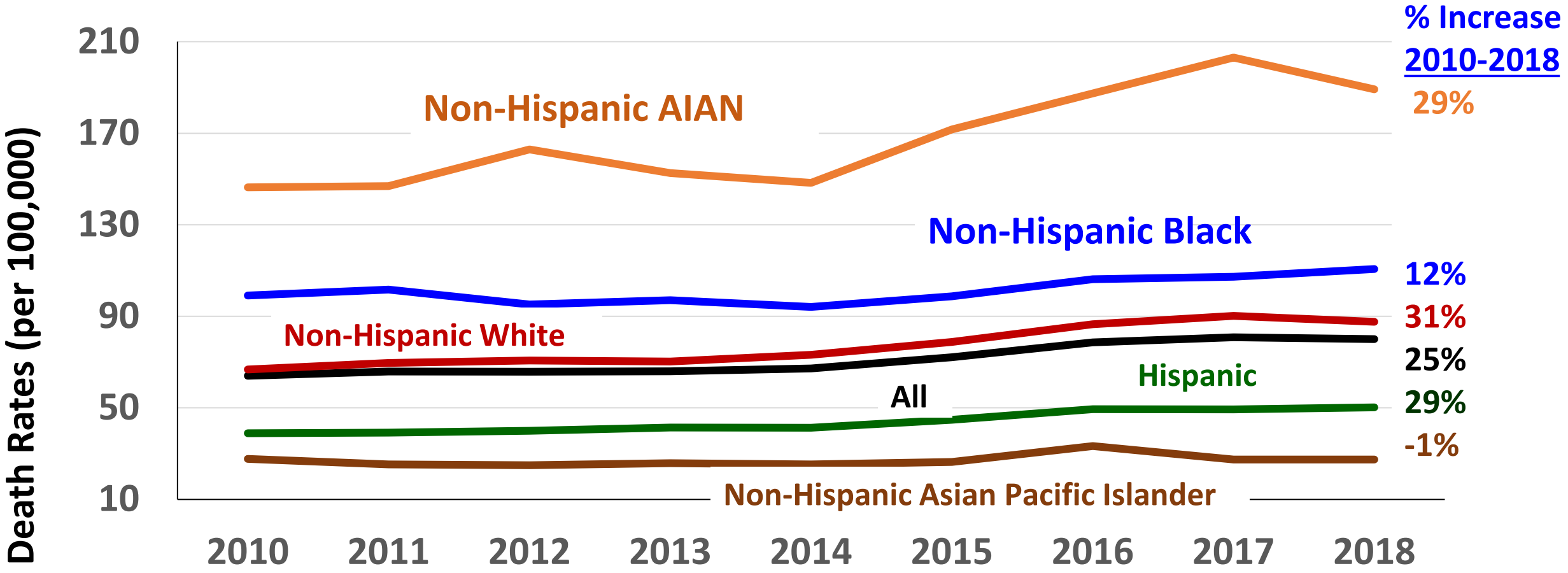
The Problem is Bigger than Maternal Mortality

Deaths rates (per 100K), Females 25-34, by Race/Ethnicity, 2010-2018



NOTE: Pregnancy related mortality rate increased by <1% 2010-2016

All Female Deaths 25-34
2010 -- 13,067; 2018 – 17,980

Source: NCHS.CDC Wonder Online Database

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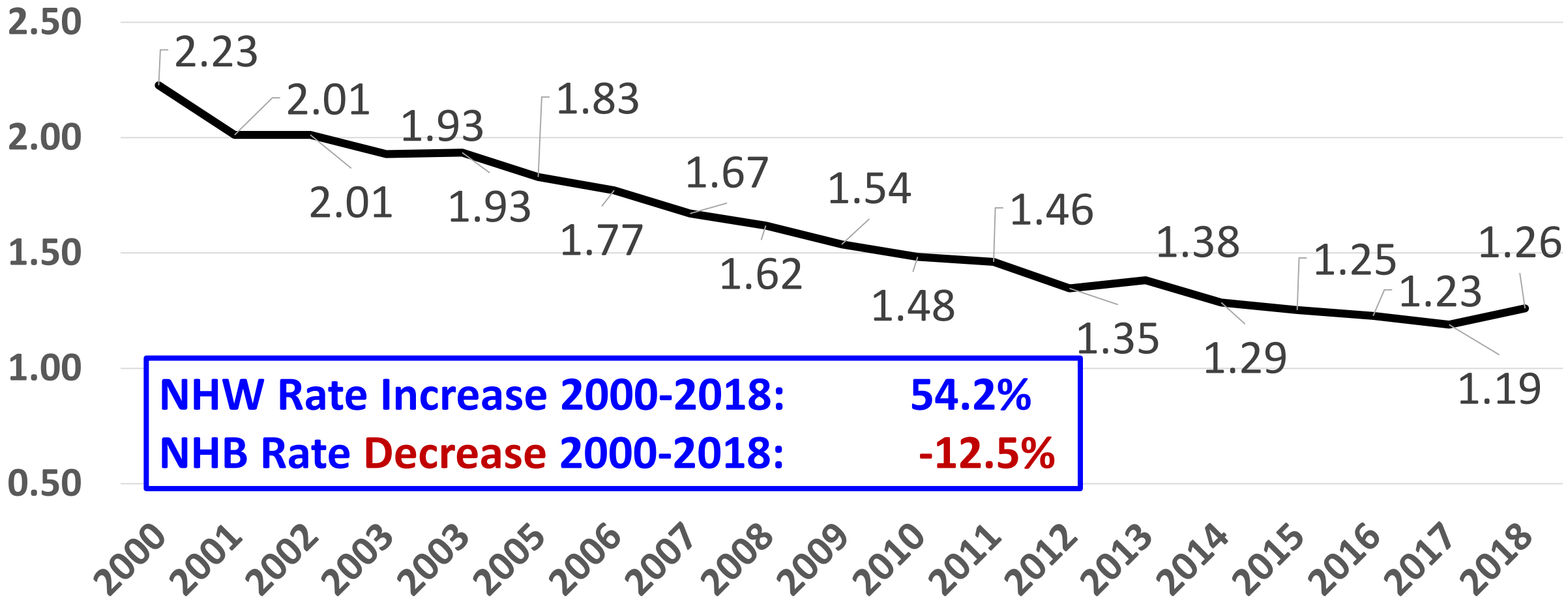
Ratio of Black/White Female Death Rates, Women 25-34, 2000-2018



NHW Rate Increase 2000-2018: 54.2%

NHB Rate Decrease 2000-2018: -12.5%

Source: CDC Wonder

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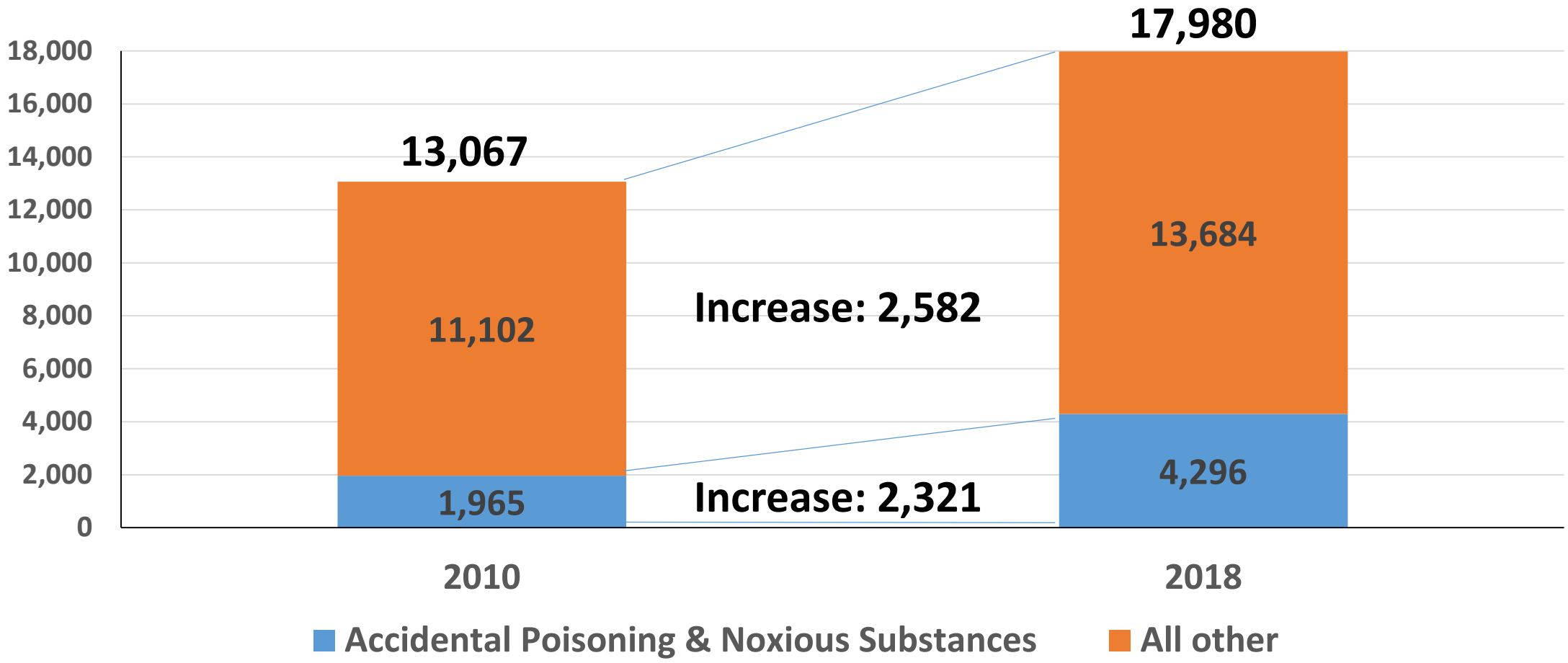
Problem is Bigger than Maternal Mortality

Top 10 Causes of Death for Women 25-34 in 2018

	2018 Total Deaths	% of total	Rate per 100 K	% Change in rate 2010-2018	Proportion of 2010-18 Increase
All causes	17,980	100.0	80.0	**25.0%**	---
Accidents (unintentional inj.)	6,500	36.2%	28.9	56%	55.6%
Malignant neoplasms	1,946	10.8%	8.7	-3%	2.3%
Intentional self-harm (suicide)	1,670	9.3%	7.4	40%	11.8%
Diseases of heart	1,220	6.8%	5.4	10%	4.3%
Assault (homicide)	872	4.8%	3.9	18%	3.8%
Chronic liver disease and cirrhosis	424	2.4%	1.9	111%	5.0%
Pregnancy, childbirth & puerperium	421	2.3%	1.9	6%	1.1%
Diabetes mellitus	346	1.9%	1.5	15%	1.7%
Cerebrovascular diseases	239	1.3%	1.1	-8%	-0.3%
Congenital malformations,	206	1.1%	0.9	13%	0.9%
All other causes (residual)	4,136	23.0	18.4	12.0%	14.0%

Sources: CDC, NCHS. Underlying Cause of Death 1999-2018 on CDC WONDER Detailed Mortality Database, released in 2020. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Mar 9, 2020 10:27:59 PM

Increases in Female Deaths 2010-2018: 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

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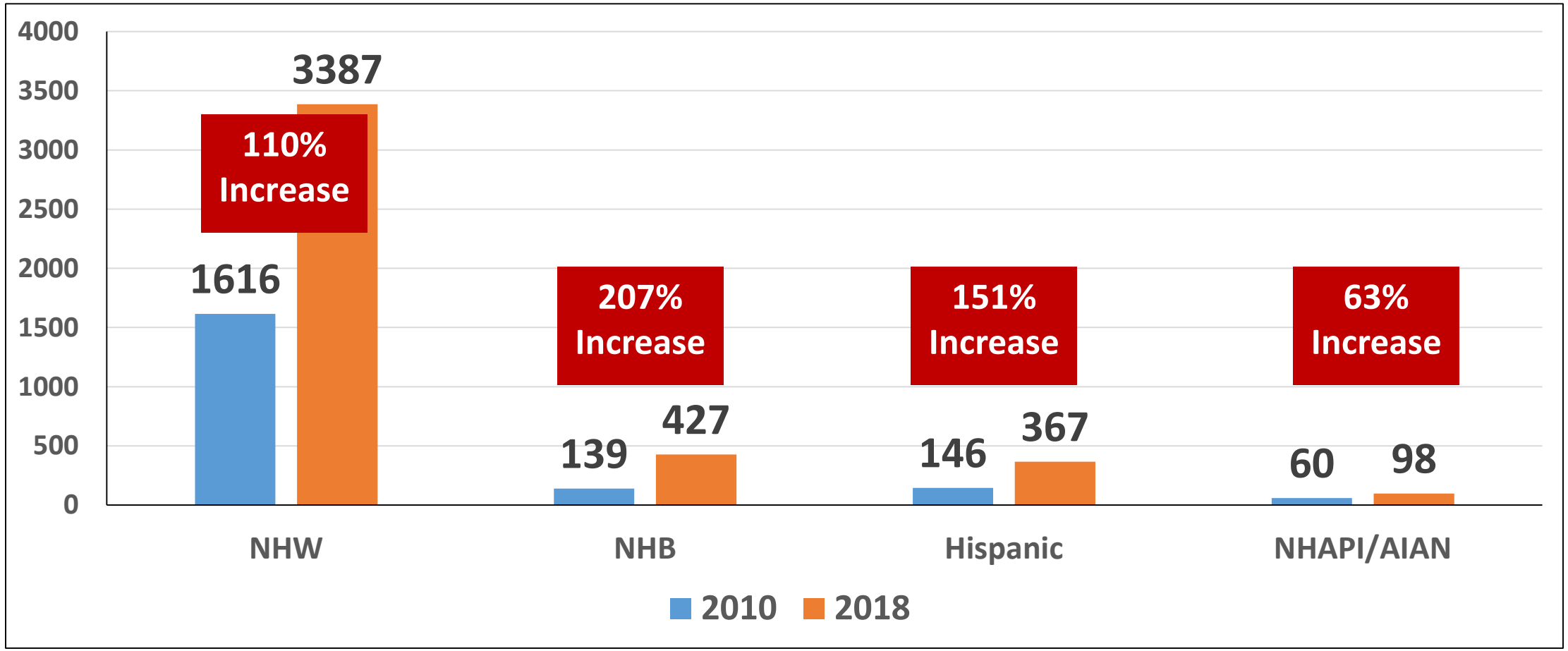
Increase in Substance Related Deaths, by Race/Ethnicity, 2010 & 2018



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

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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 25%.

- 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.

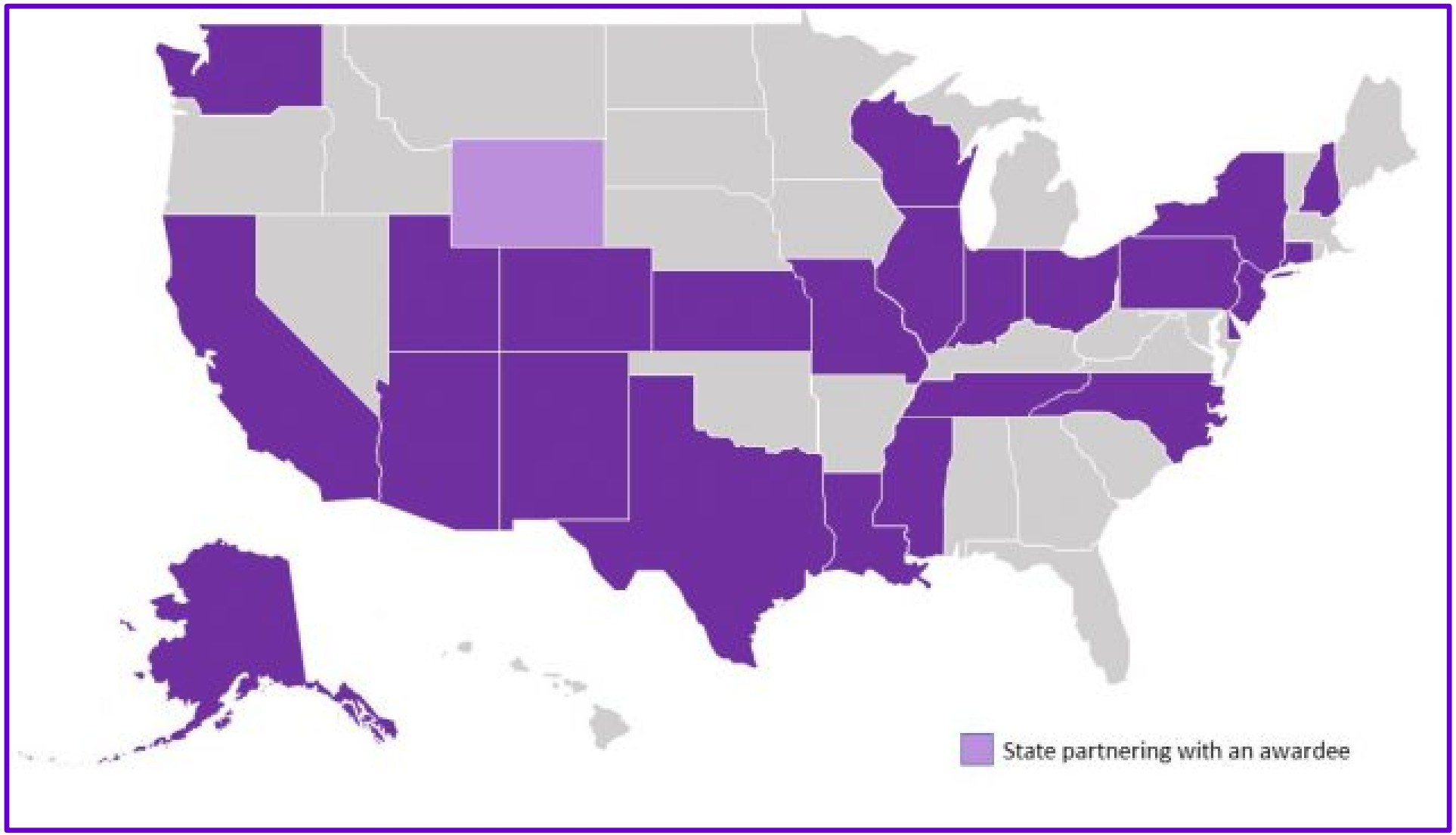
9. The Way Forward

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.

Source: Berg CJ, Harper MA, Atkinson SM, Bell EA, Brown HL, HageML, et al. Preventability of pregnancy-related deaths: results of a state-wide review. ObstetGynecol2005;106:1228–34.

States Funded Through ERASE MM



Source: https://www.cdc.gov/reproductivehealth/maternal-mortality/erase-mm/index.html

www.birthbythenumbers.org

REVIEW DATE

Month Day Year

RECORD ID #

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
- ☐ **MOSTLY COMPLETE**
  Minor gaps (i.e. information that would have been beneficial but was not essential to the review of the case)
- ☐ **SOMEWHAT COMPLETE**
  Major gaps (i.e. information that would have been crucial 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	☐ UNKNOWN
DID **MENTAL HEALTH CONDITIONS** ***OTHER THAN SUBSTANCE USE DISORDER*** CONTRIBUTE TO THE DEATH?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
DID **SUBSTANCE USE DISORDER** CONTRIBUTE TO THE DEATH?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
WAS THIS DEATH A **SUICIDE**?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
WAS THIS DEATH A **HOMICIDE**?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN

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

- ☐ FIREARM
- ☐ SHARP INSTRUMENT
- ☐ BLUNT INSTRUMENT
- ☐ POISONING/ OVERDOSE
- ☐ HANGING/ STRANGULATION/ SUFFOCATION
- ☐ FALL
- ☐ PUNCHING/ KICKING/BEATING
- ☐ EXPLOSIVE
- ☐ DROWNING
- ☐ FIRE OR BURNS
- ☐ MOTOR VEHICLE
- ☐ INTENTIONAL NEGLECT
- ☐ OTHER, SPECIFY:
- ☐ UNKNOWN
- ☐ NOT APPLICABLE

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

- ☐ NO RELATIONSHIP
- ☐ PARTNER
- ☐ EX-PARTNER
- ☐ OTHER RELATIVE
- ☐ OTHER ACQUAINTANCE
- ☐ OTHER, SPECIFY:
- ☐ UNKNOWN
- ☐ NOT APPLICABLE

*Underlying cause refers to the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury

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

- **PRIMARY:** Prevents the contributing factor before it ever occurs
- **SECONDARY:** Reduces the impact of the contributing factor once it has occurred (i.e. treatment)
- **TERTIARY:** Reduces the impact or progression of what has become an ongoing contributing factor (i.e. management of complications)

EXPECTED IMPACT LEVEL

- **SMALL:** Education/counseling (community- and/or provider-based health promotion and education activities)
- **MEDIUM:** Clinical intervention and coordination of care across continuum of well-woman visits (protocols, prescriptions)
- **LARGE:** Long-lasting protective intervention (improve readiness, recognition and response to obstetric emergencies/LARC)
- **EXTRA LARGE:** Change in context (promote environments that support healthy living/ensure available and accessible services)
- **GIANT:** Address social determinants of health (poverty, inequality, etc.)

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.

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

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.

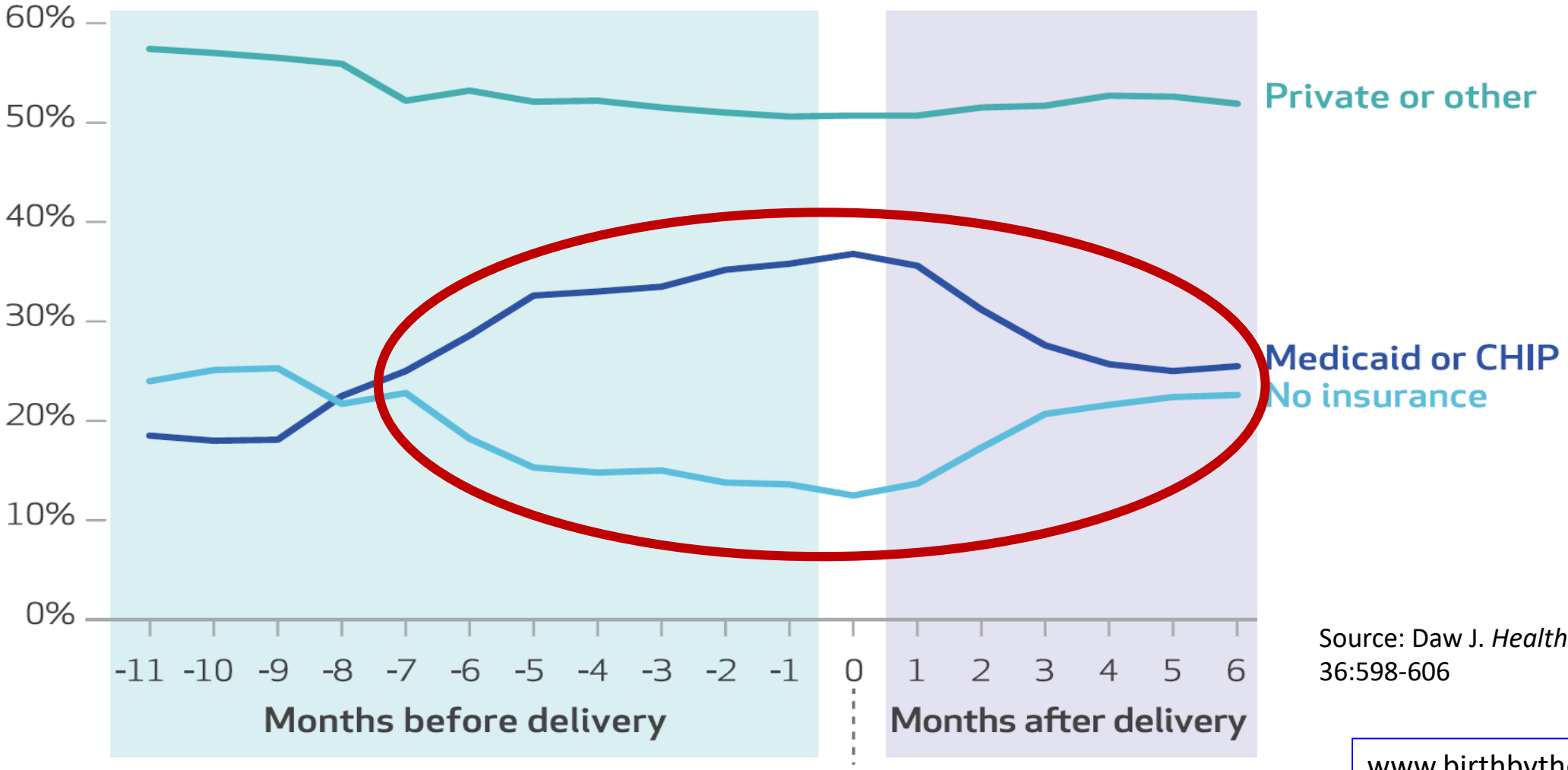
OTHER

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

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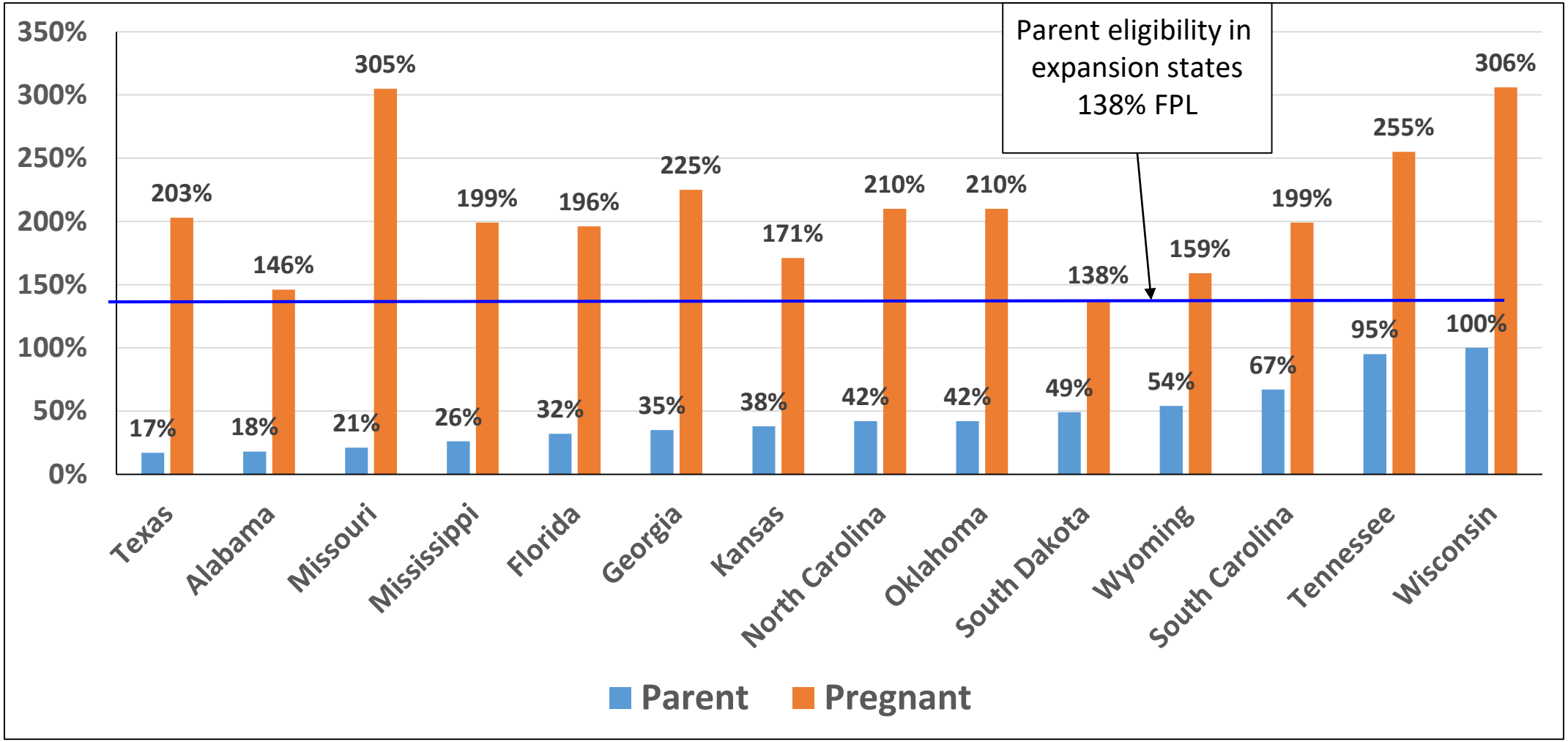
Medicaid Eligibility for Parent vs Pregnant Women in Non-Expansion States

Medicaid eligibility thresholds, 2019



Source: Ranji et al. *Expanding Postpartum Medicaid Coverage*. Kaiser Family Foundation, May 2019

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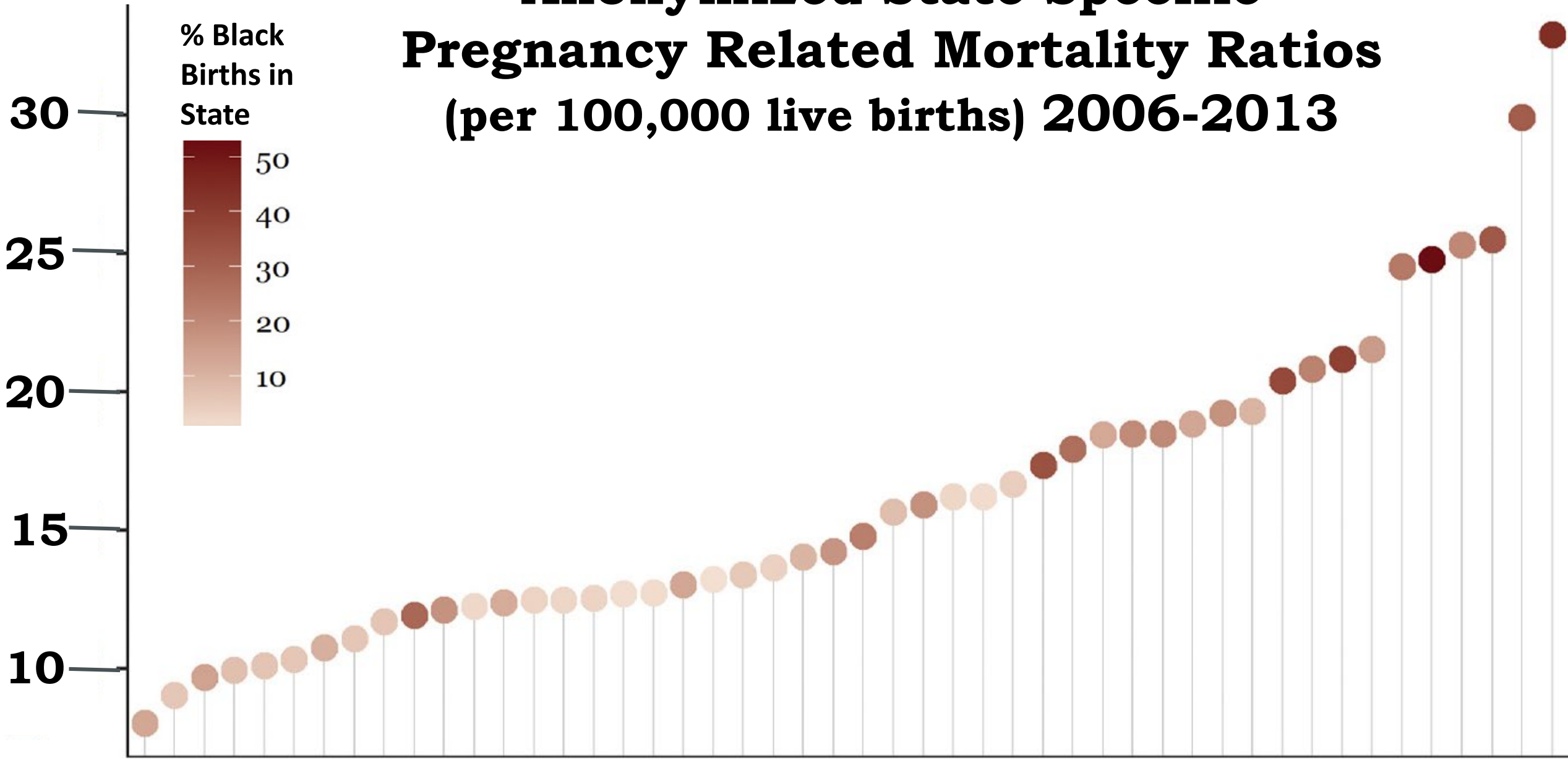
Anonymized State Specific Pregnancy Related Mortality Ratios (per 100,000 live births) 2006-2013



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

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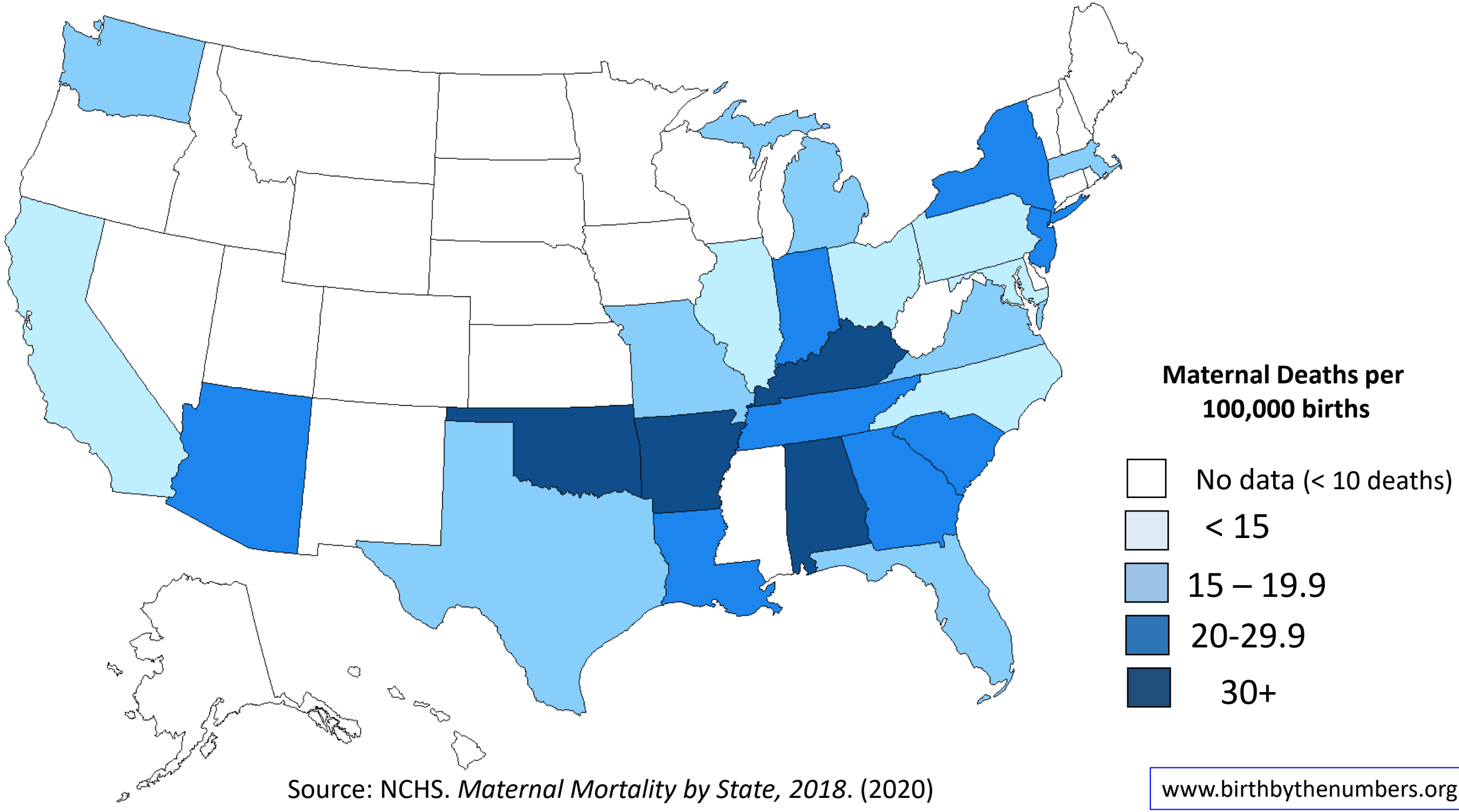

Source: NCHS. *Maternal Mortality by State, 2018*. (2020)

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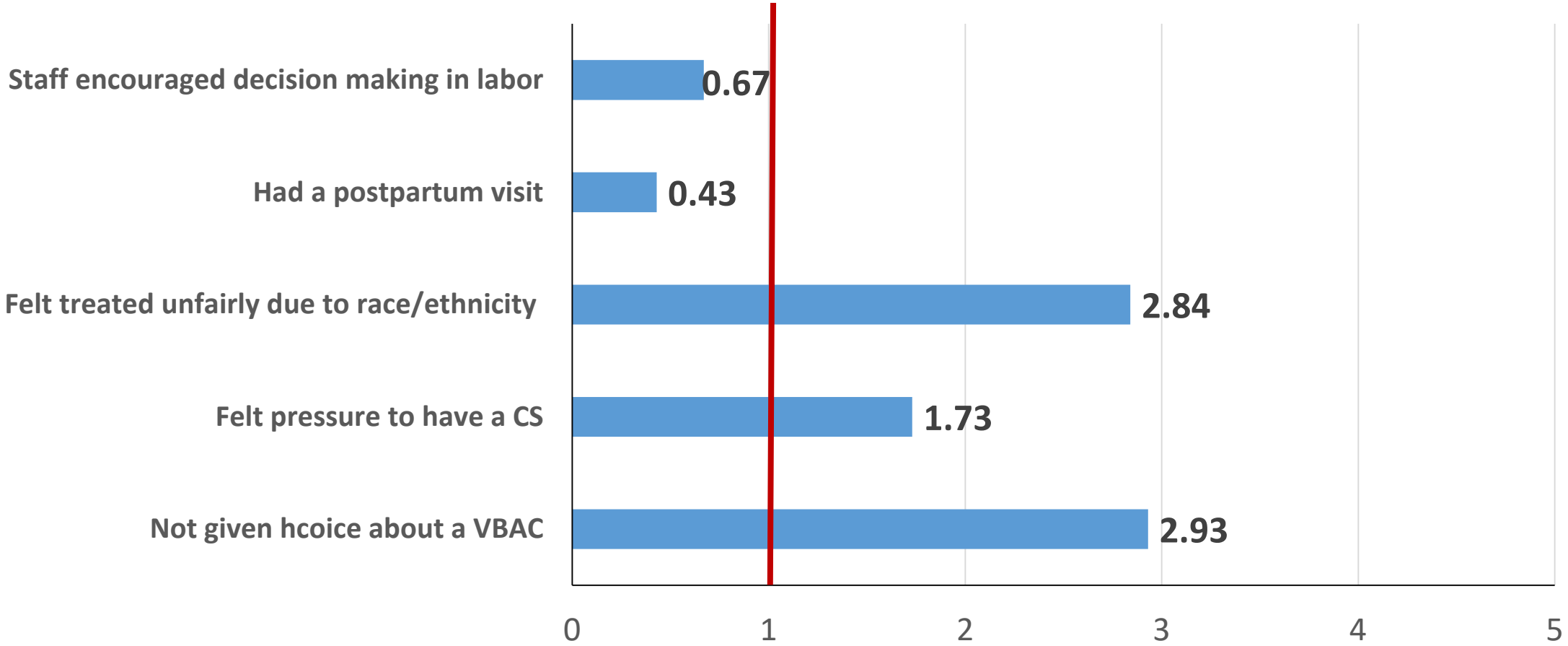
Is expanding Medicaid eligibility out to 1 year postpartum the answer?

- 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 $p < .05$.

Source: Declercq, E. Women's experience of agency & respect in maternity care by type of insurance in Cal.. PLOS One. 2020; 15(7): e0235262

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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.

MARCH for MOMS

FAMILY FRIENDLY

DC NATIONAL RALLY

A PRE-MOTHER'S DAY MOVEMENT TO MAKE SURE ALL MOMS GET THE CARE THEY DESERVE

Saturday May 11, 2019
On the National Mall, Washington DC

1:00 - 3:30 PM

Our country's most inspiring moms
(and their families)...
sounding off...
on a rock concert stage...
in the heart of the nation's capital.

Learn more at www.MarchforMoms.org

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

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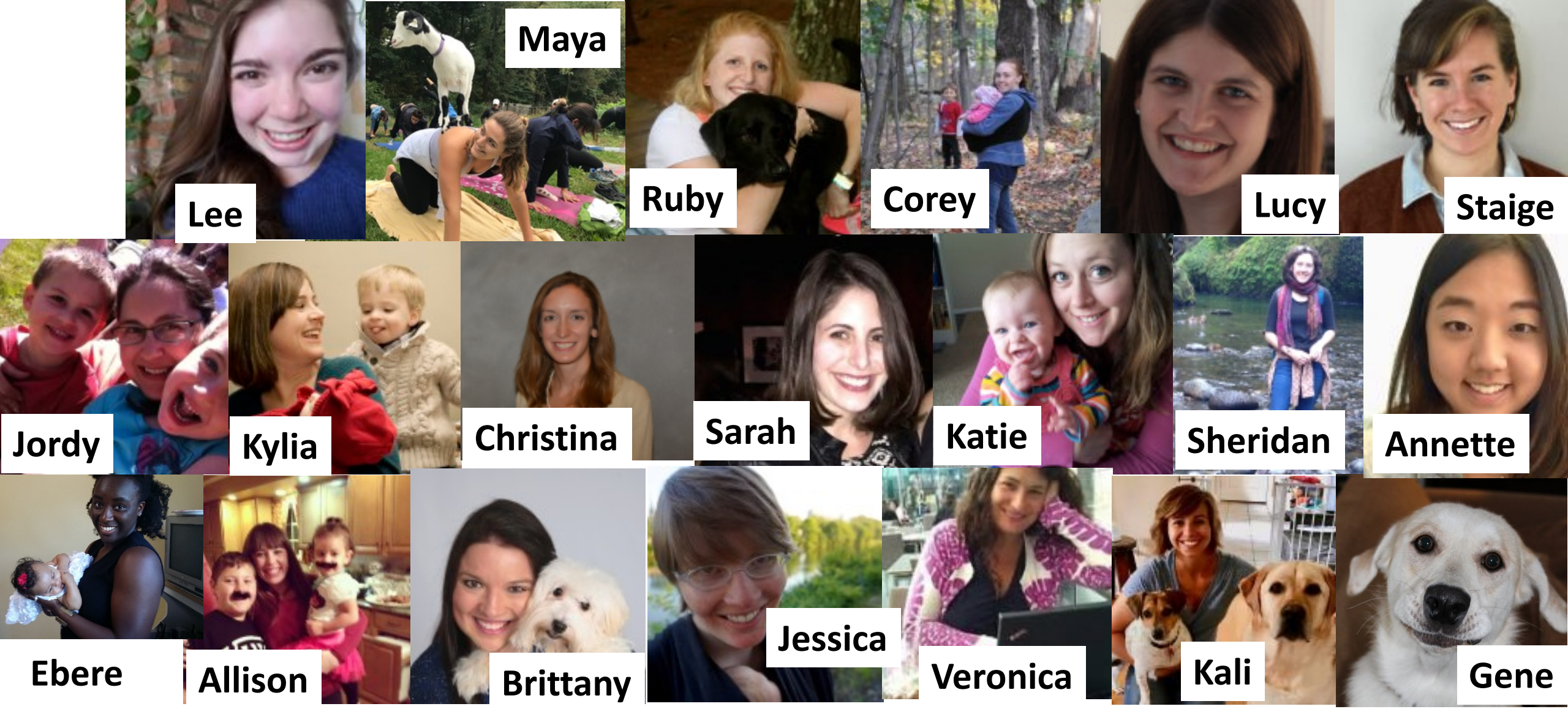

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