

# **An Overview of Maternal Mortality and Severe Morbidity in the U.S. and in Connecticut**

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Boston University School of Public Health**

***Connecting Pathways to Decrease Maternal and Infant Mortality and Morbidity***

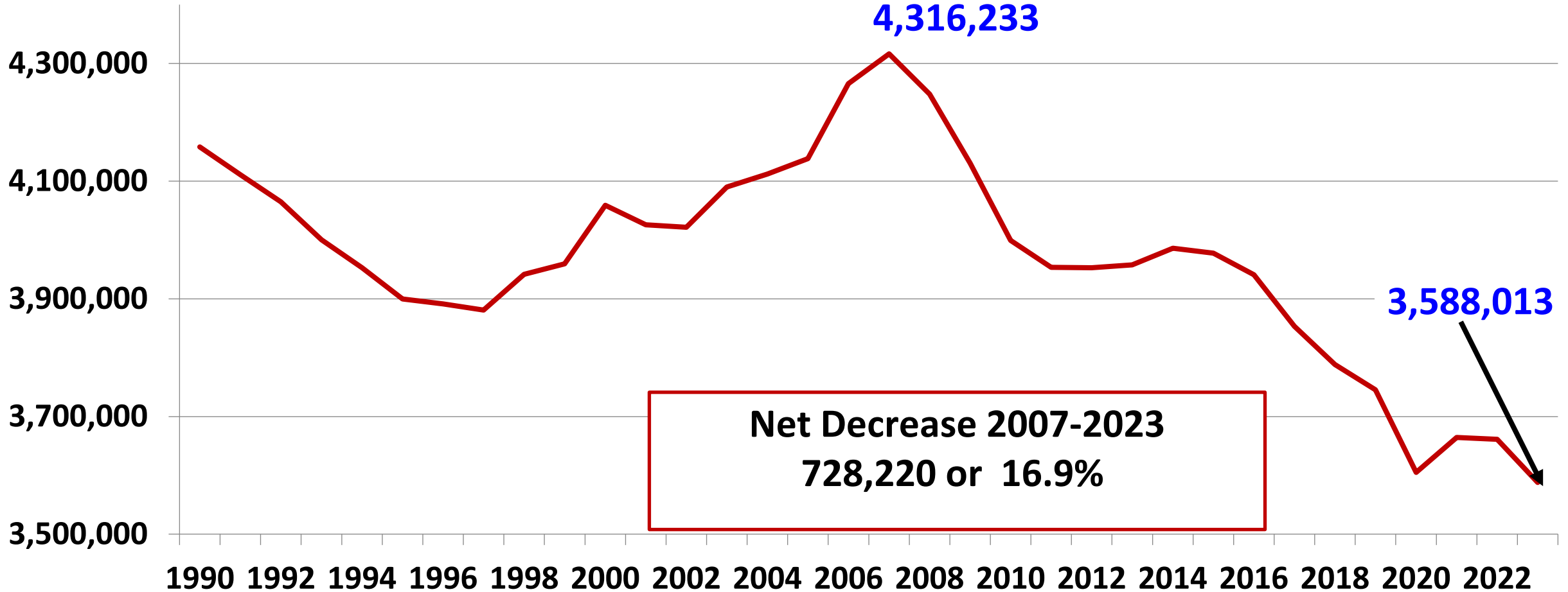
***March 19, 2024  
Rocky Hill, Connecticut***

# Outline of the Presentation

- 1. The Connecticut Context**
- 2. Clarifying Definitions**
- 3. Historical Context**
- 4. The Pregnancy Mortality Surveillance System**
- 5. Comparing the U.S. to the Rest of the World**
- 6. The Persistence of Racial Disparities**
- 7. COVID update on 2022-23 Data Releases**
- 8. Timing and Maternal Mortality a Public Health & Policy Problem**
- 9. The Way Forward**

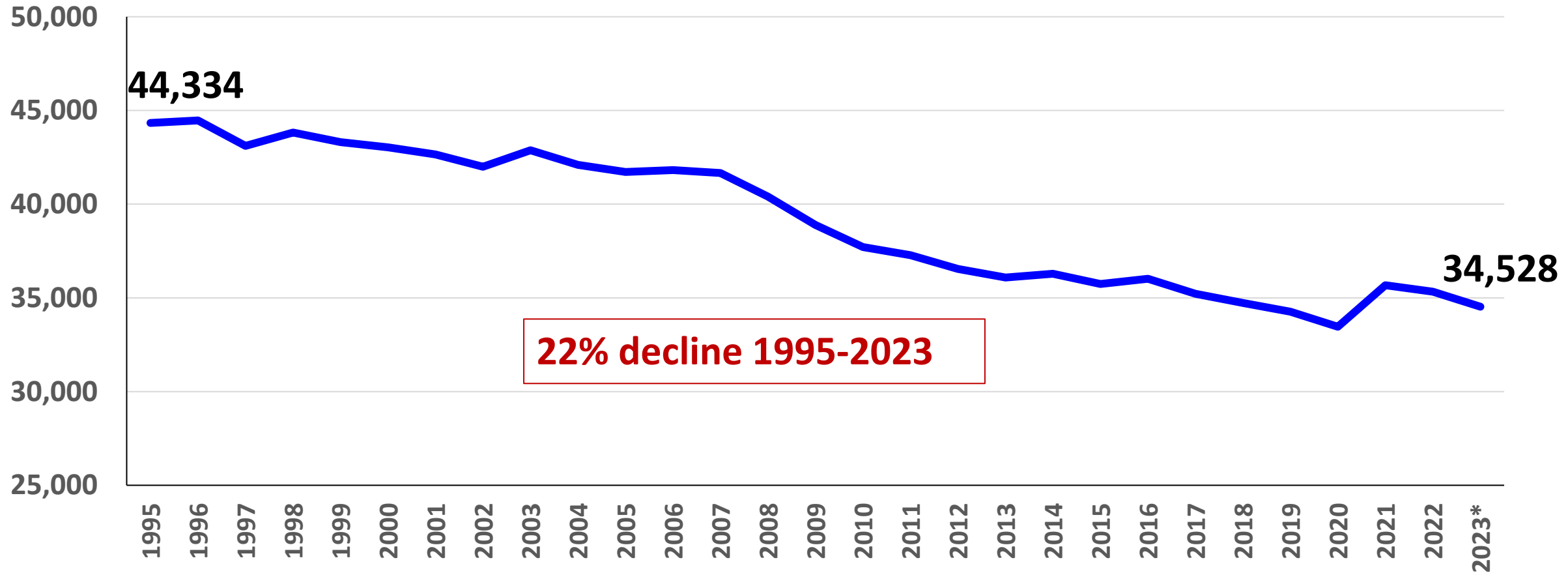
# **The Connecticut Context for Examining Birth**

# Total U.S. Births, 1990-2023 (Prov.)



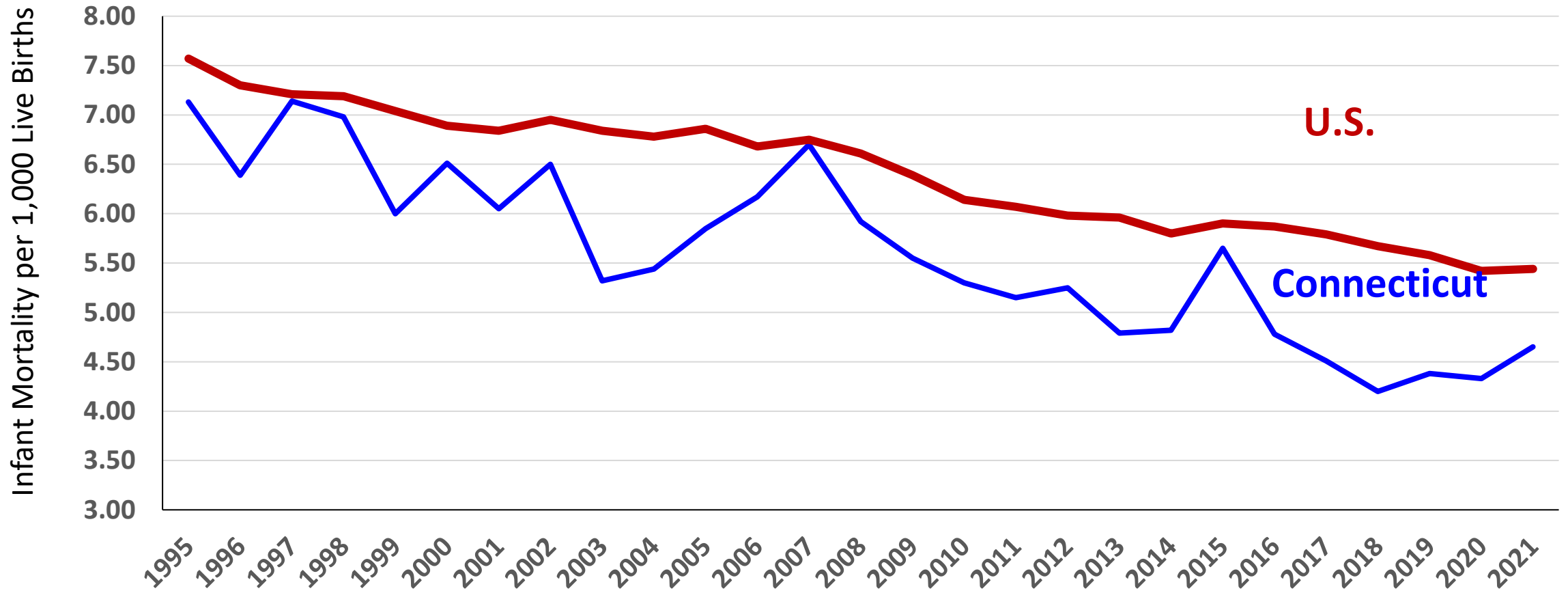
\*2023 data is provisional

# Total CT Births, 1995-2023

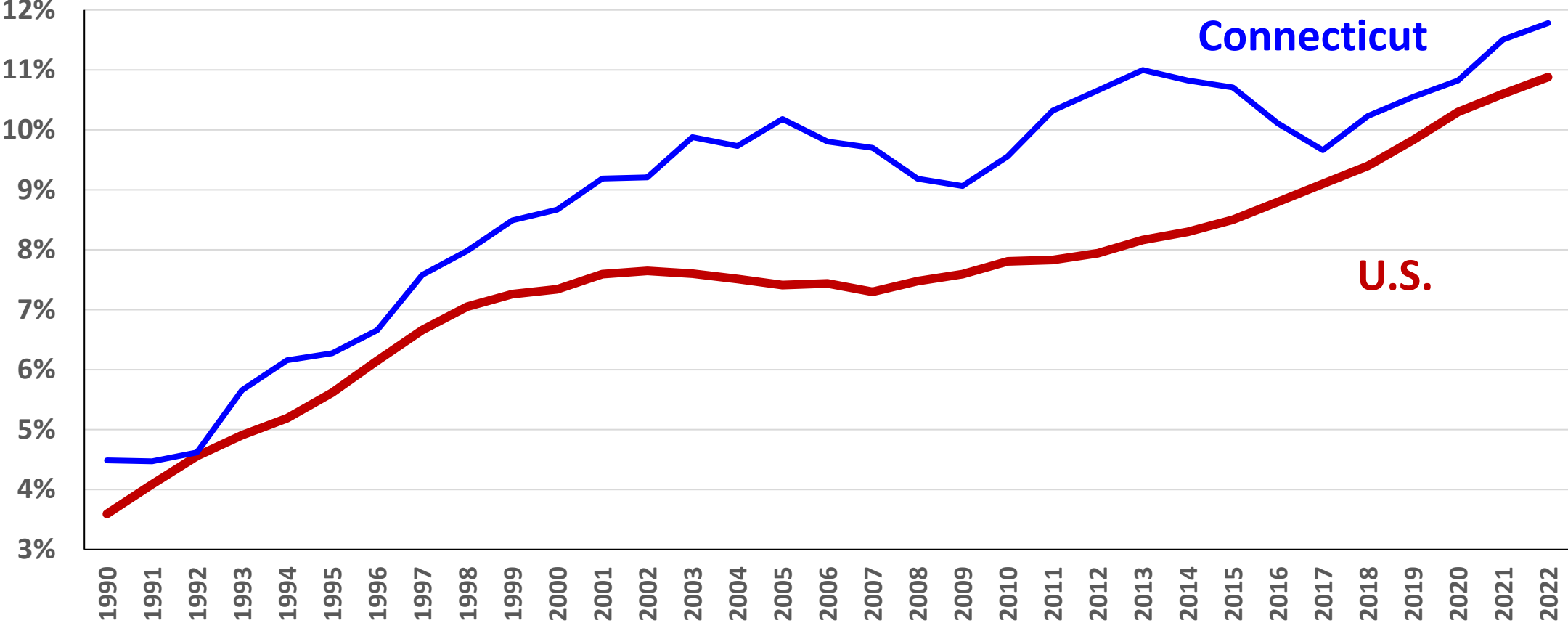


\*2023 data is provisional

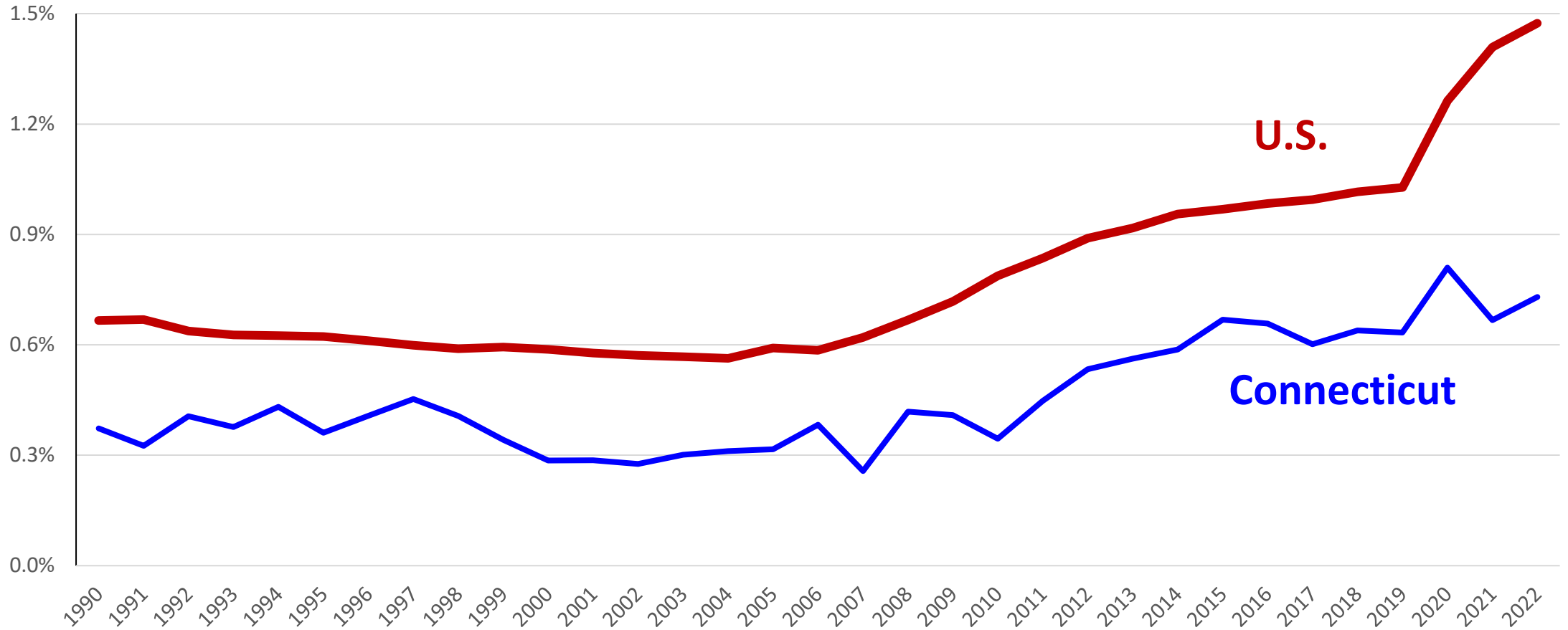
# Infant Mortality, CT and U.S., 1995-2021



# CNM Attended Births, CT & U.S., 1990-2022

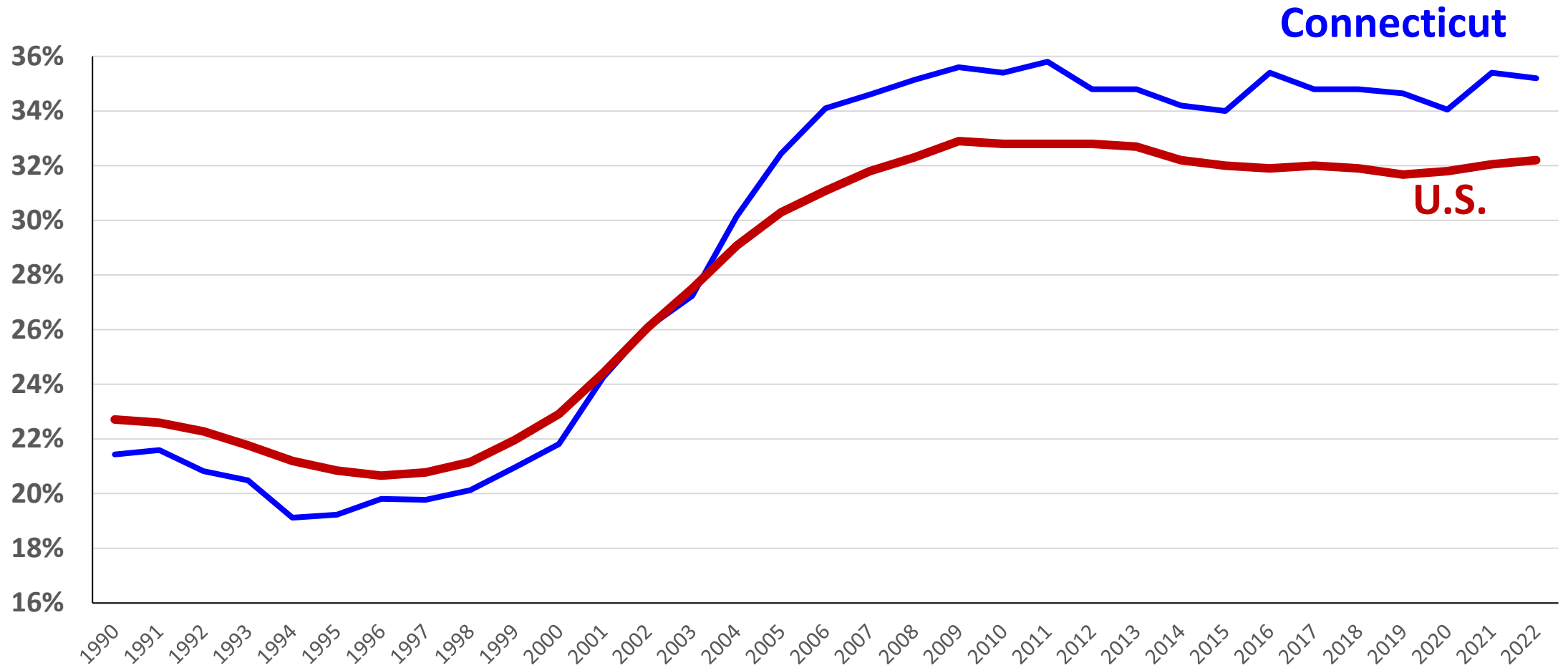


# Home Births, CT & U.S., 1990-2022

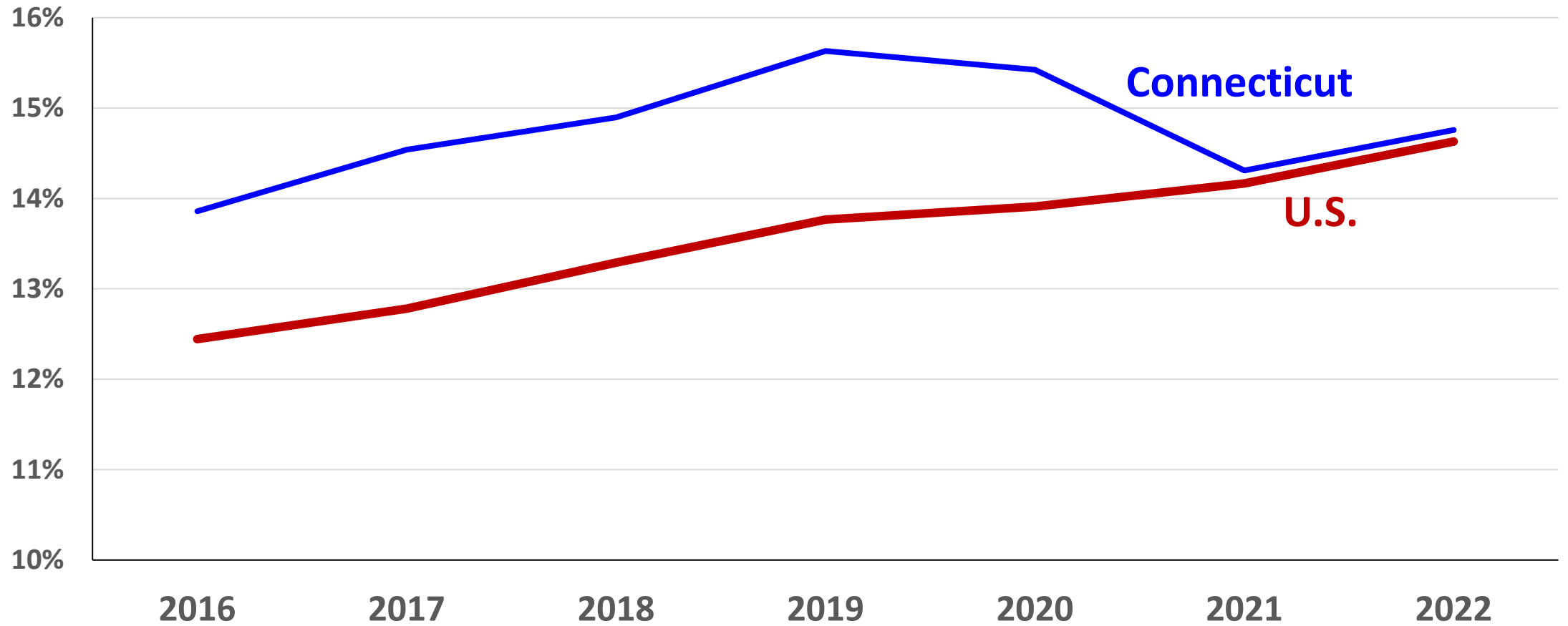




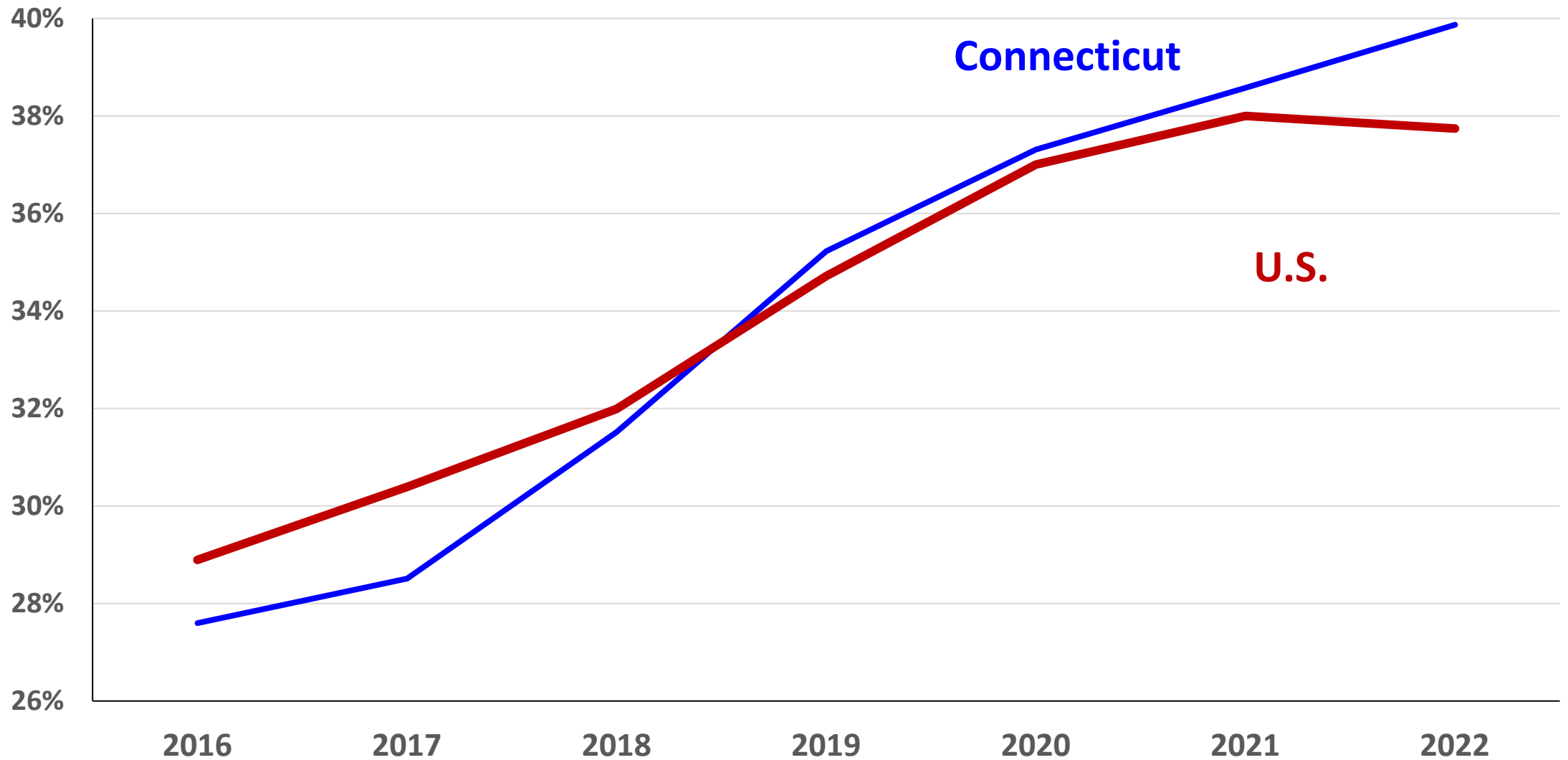
# Cesarean Rates, CT & U.S., 1990-2022



# VBAC Rates, CT & U.S., 2016-2022



# Inductions in Vaginal Birth, CT & U.S., 2016-2022



# Clarifying Definitions of Maternal Mortality

The three widely used definitions of maternal mortality:

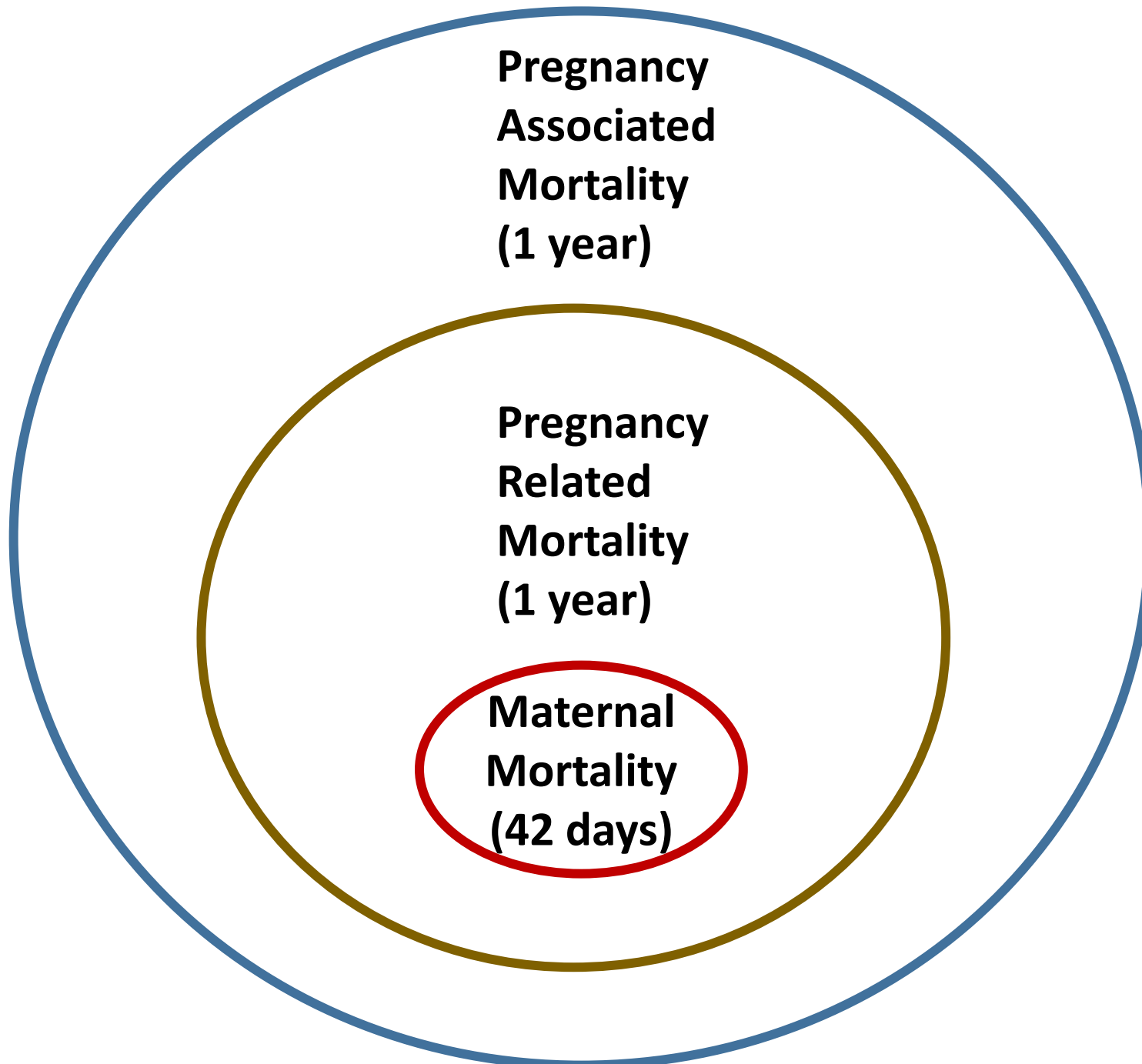
1. Pregnancy associated death

2. Pregnancy related death

3 Maternal mortality

# Three Definitions (in the U.S.)

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

# Different Sources & Different Measures

- **U.S. National Vital Stat. System** – Maternal Mortality
- **CDC Pregnancy Related Mortality System** – Pregnancy Related Mortality
- **State Maternal Mortality Review Committees** – Pregnancy Associated, Pregnancy Related & Maternal Mortality depending on states, but primarily Pregnancy Related Mortality

# US Maternal Mortality Surveillance

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

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





# Illustrating the Differences in Measures of Maternal Death: Same State (Connecticut); Same Years; 4 different results.

Pregnancy Associated Mortality (1 year) **34.4**

Pregnancy Related Mortality (1 year) **14.8**

Maternal Mortality (42 days) **7.6**

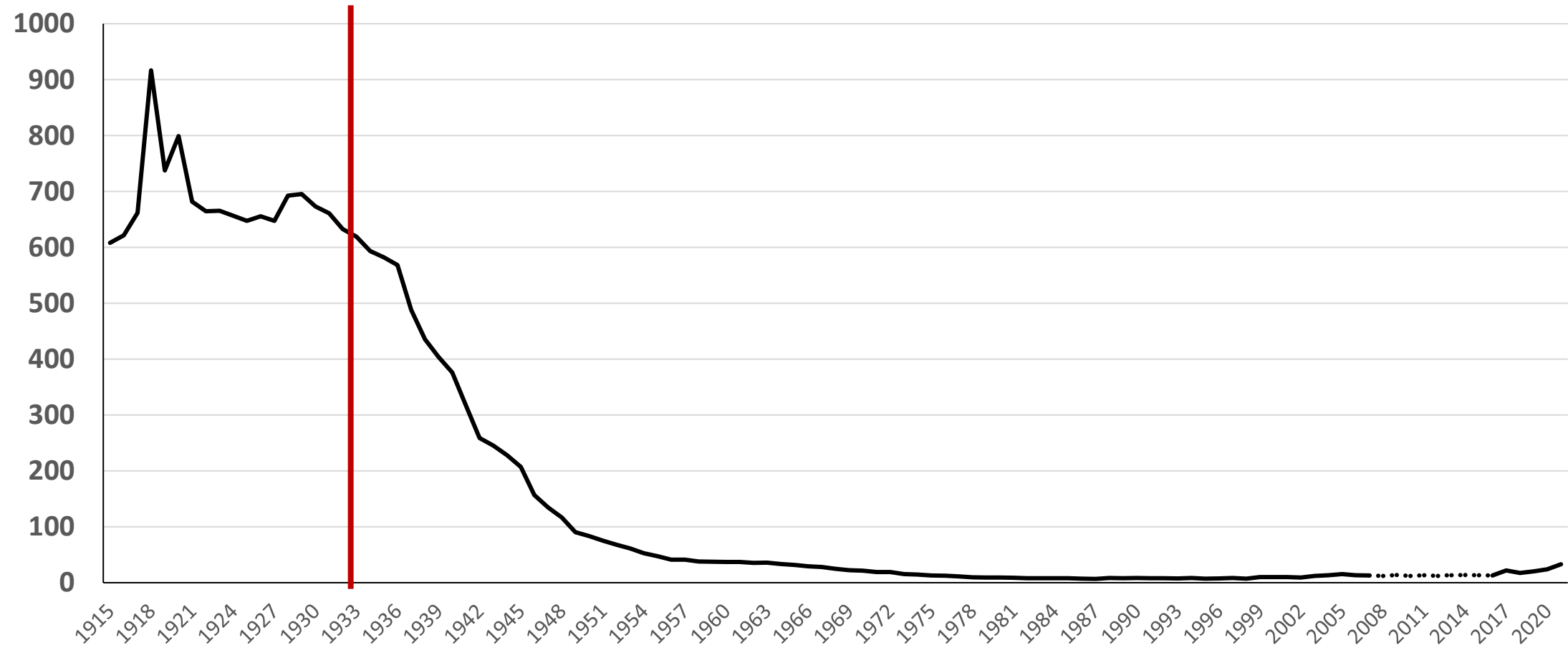
**NOTE: NVSS Data on CT  
Preg. Related Deaths for 2018-2020:  
24 Deaths; 102,443 births  
Rate – 23.4/100,000  
MMRC 20 Deaths Rate 19.5**

Sources: *Pregnancy Associated Deaths in CT & NVSS*

**Mortality Rates from the Connecticut Maternal Mortality Rev. Comm. per 100,000 live births, 2015-20**

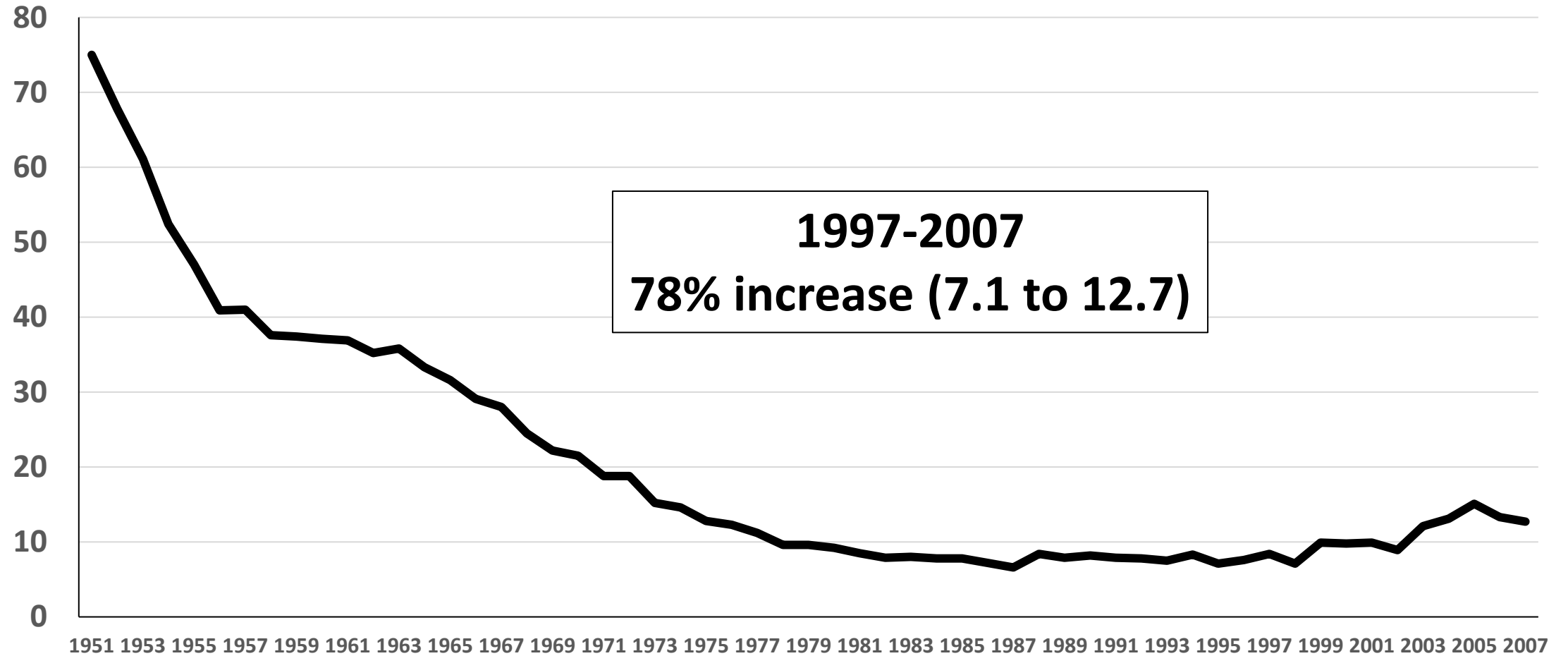
**How we got here**

# U.S. Maternal Mortality (per 100,000 births), 1915-2021



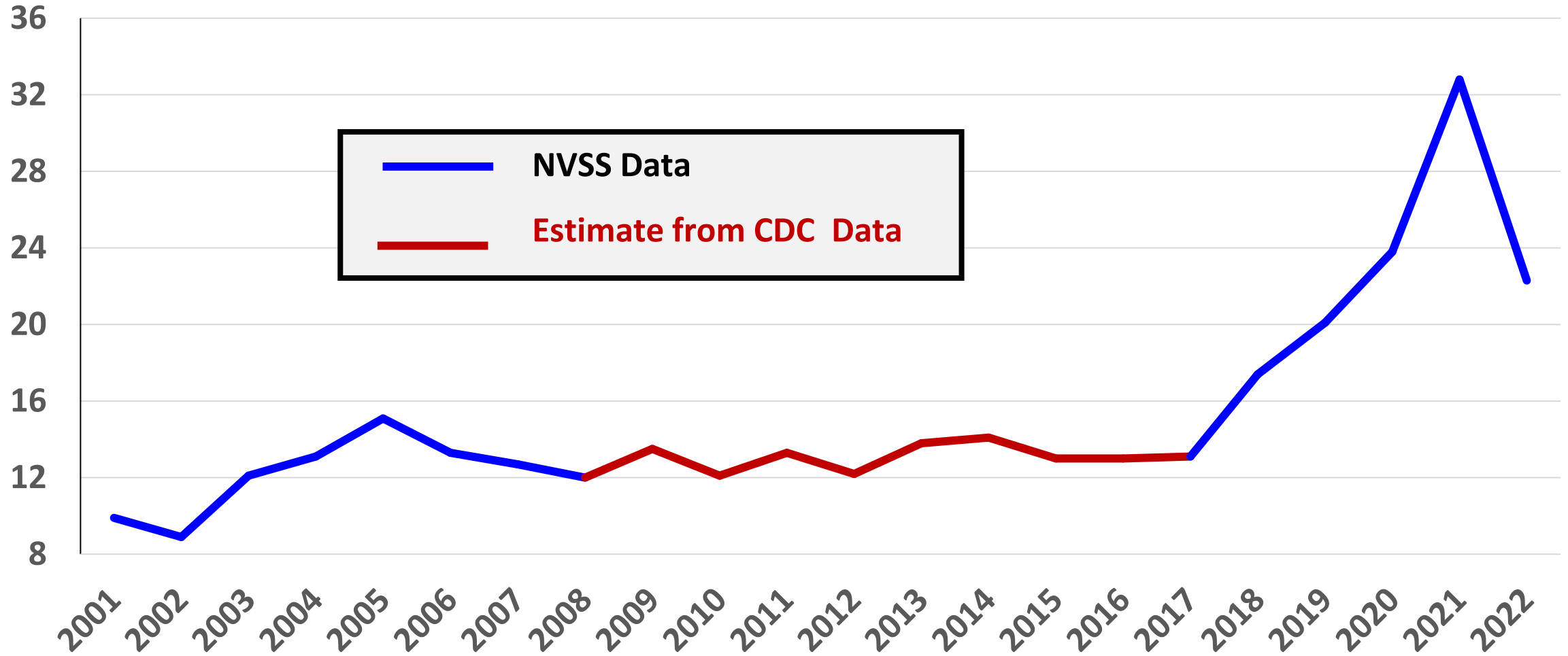
Sources: NCHS. Maternal Mortality and Related Concepts. Vital & Health Statistics. Series 33; #3. & annual data reports. 1915-1960 data from NCHS. *Vital Statistics Rates In The United States 1940-1960*. NOTE: Shifts in measurement (e.g. not all states were part of registration system prior to 1933) 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 Health E-Stat.Hyattsville, MD: NCHS. 2/2022.

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



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

# ***U.S. Maternal Mortality Ratio (per 100K births), 2000-2022***



# *The Pregnancy Related Mortality Surveillance 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.

# Pregnancy Mortality Surveillance System

## Reproductive Health

Reproductive Health	
About Us	+
Data and Statistics	+
Emergency Preparedness	+
Maternal and Child Health Epidemiology Program	+
Pregnancy Risk Assessment Monitoring System	
Infertility	+
Assisted Reproductive Technology (ART)	
Depression Among Women	+
Maternal and Infant Health	-
Pregnancy Complications	+
Weight Gain During Pregnancy	
Tobacco Use and Pregnancy	+
Pregnancy-Related Deaths	-
<b>Pregnancy Mortality Surveillance System</b>	
Perinatal Quality Collaboratives	+
Preterm Birth	+

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

### Pregnancy Mortality Surveillance System



#### When did CDC start conducting national surveillance of pregnancy-related deaths?

CDC initiated national surveillance of pregnancy-related deaths in 1986 because more clinical information was needed to fill data gaps about causes of maternal death.

#### How does CDC define pregnancy-related deaths?

For reporting purposes, a pregnancy-related death is defined as the death of a woman while pregnant or within 1 year of pregnancy termination—regardless of the duration or site of the pregnancy—from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

#### How are the data collected and coded?

Each year, CDC requests the 52 reporting areas (50 states, New York City, and Washington DC) to voluntarily send copies of death certificates for all women who died during pregnancy or within 1 year of pregnancy, and copies of the matching birth or fetal death certificates, if they have the ability to perform such record links. All of the information obtained is summarized, and medically trained epidemiologists determine the cause and time of death related to the pregnancy. Causes of death are coded by using a system established in 1986 by the American College of Obstetricians and Gynecologists and the Centers for Disease Control and Prevention Maternal Mortality Study Group.

#### How are the data used?

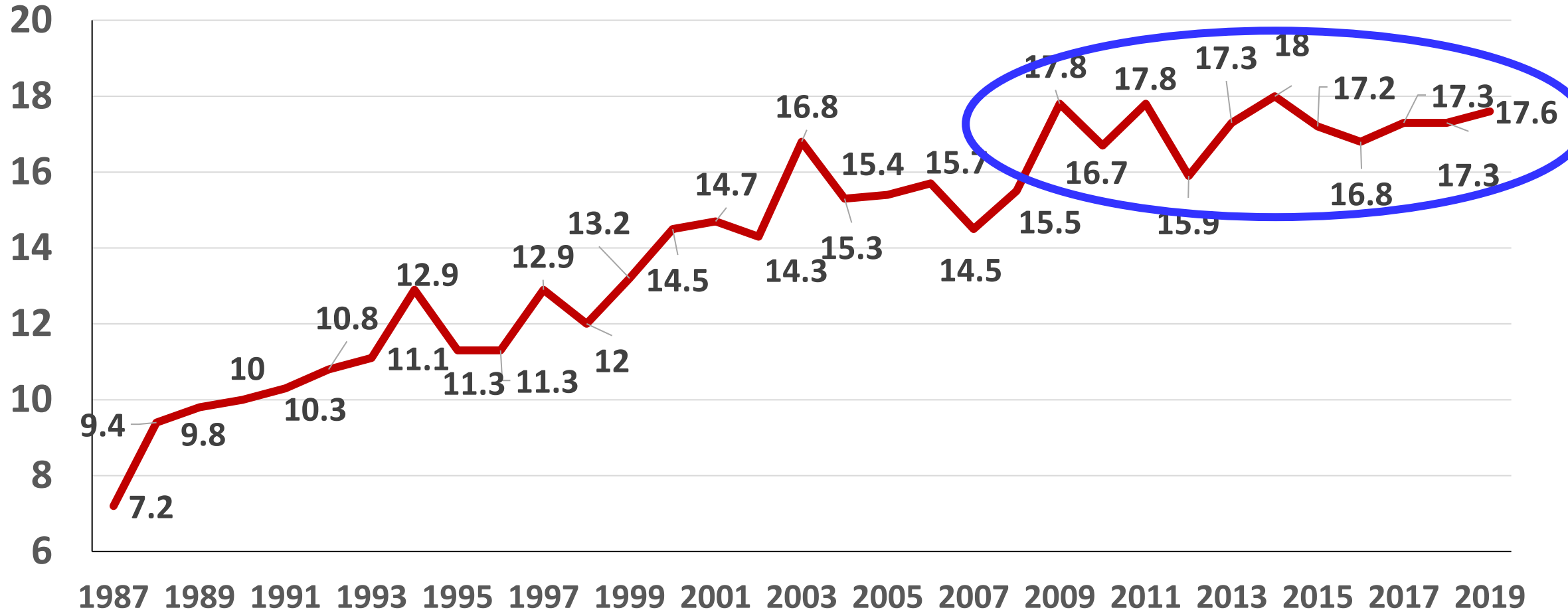
Data are analyzed by CDC scientists. Information about causes of pregnancy-related deaths and risk factors associated with these deaths is released periodically through peer-reviewed literature, CDC's *Morbidity and Mortality Weekly Reports*, and the CDC Web site. This information helps clinicians and public health professionals to better understand circumstances surrounding pregnancy-related deaths and to take appropriate actions to prevent them.



# Our best existing national measure

## *Pregnancy Related Mortality, U.S., 1987-2019*

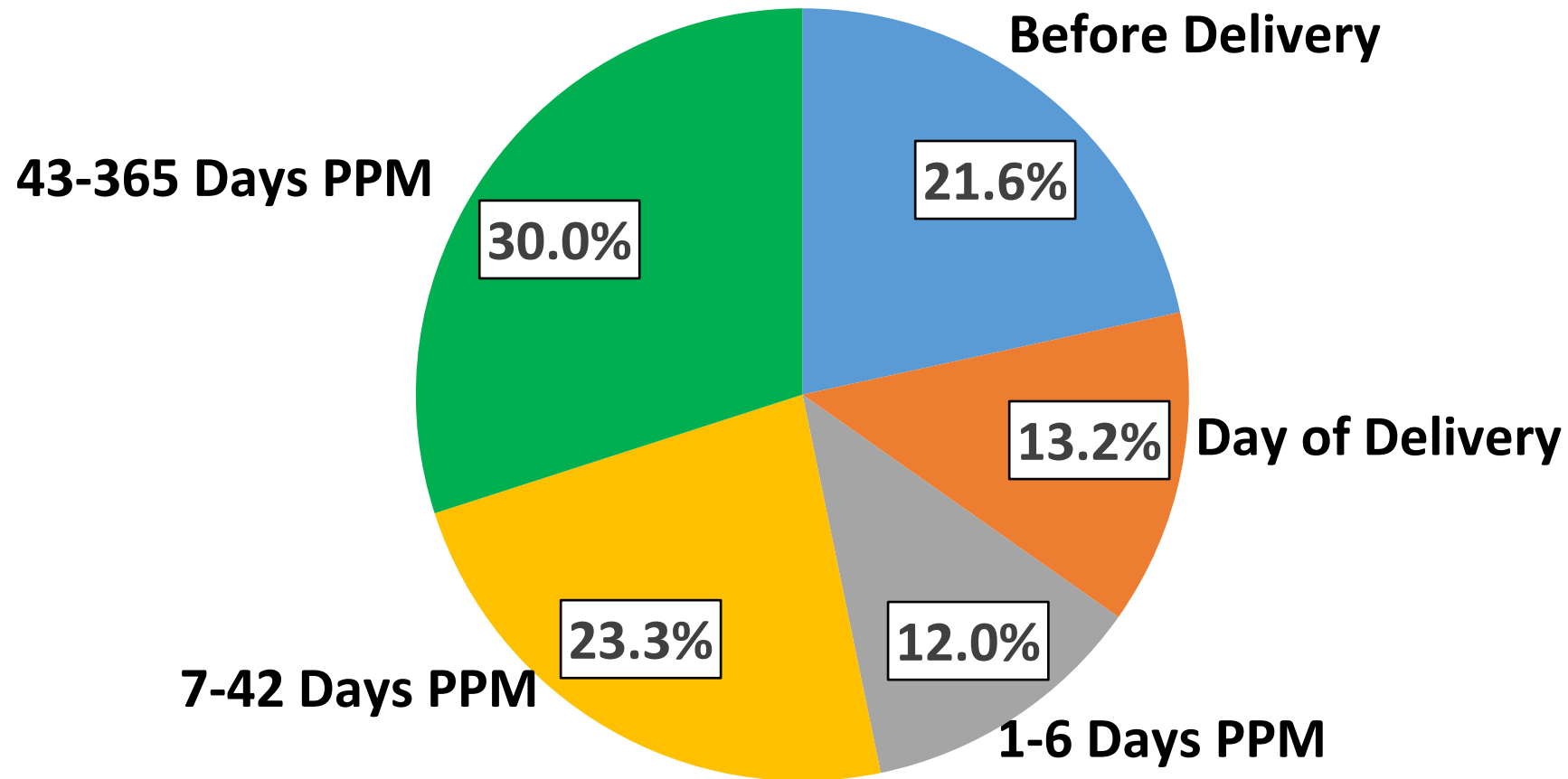
Pregnancy Related Mortality Ratio (per 100,000 births)



Source: CDC. <https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm>

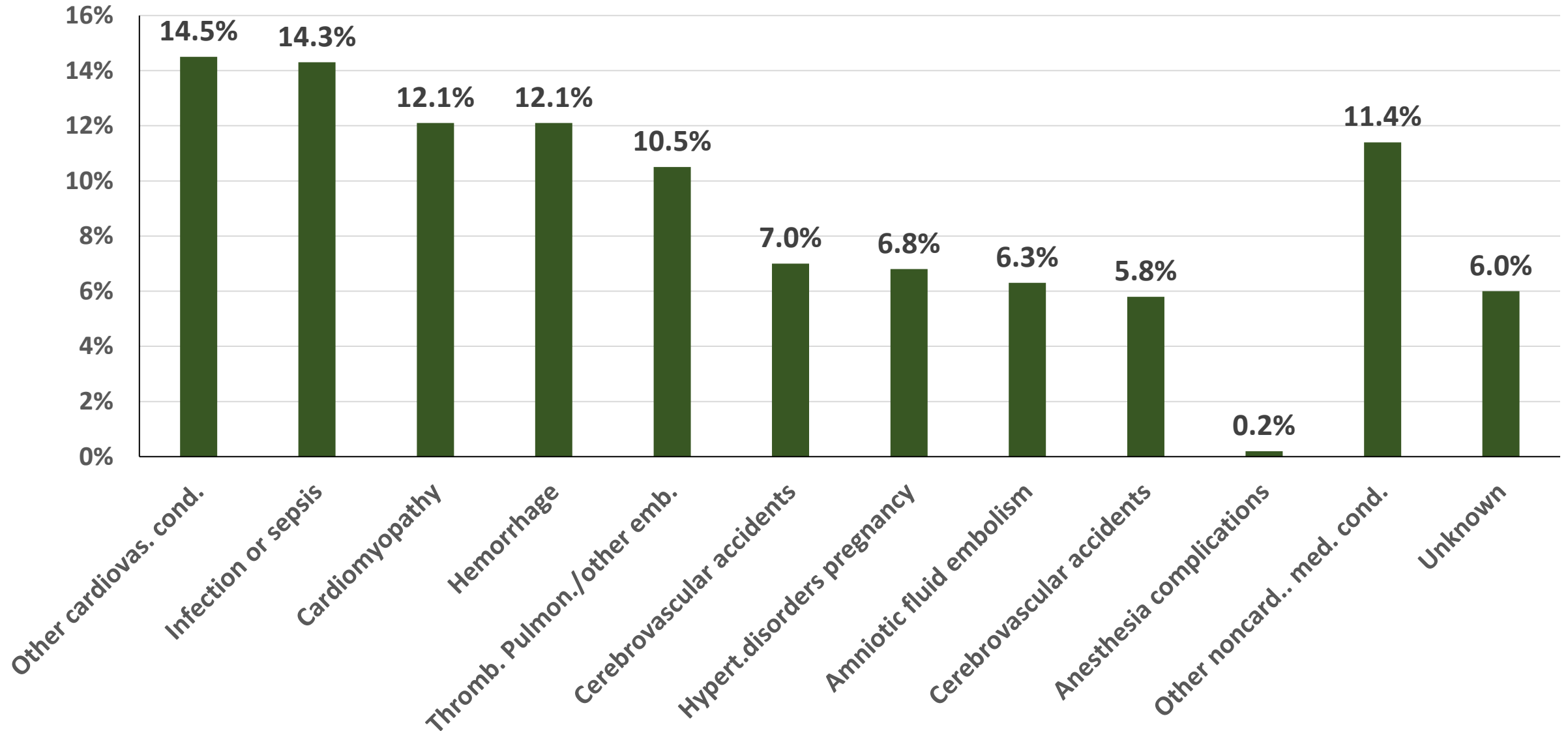


# Timing of Maternal Deaths (2017-19)



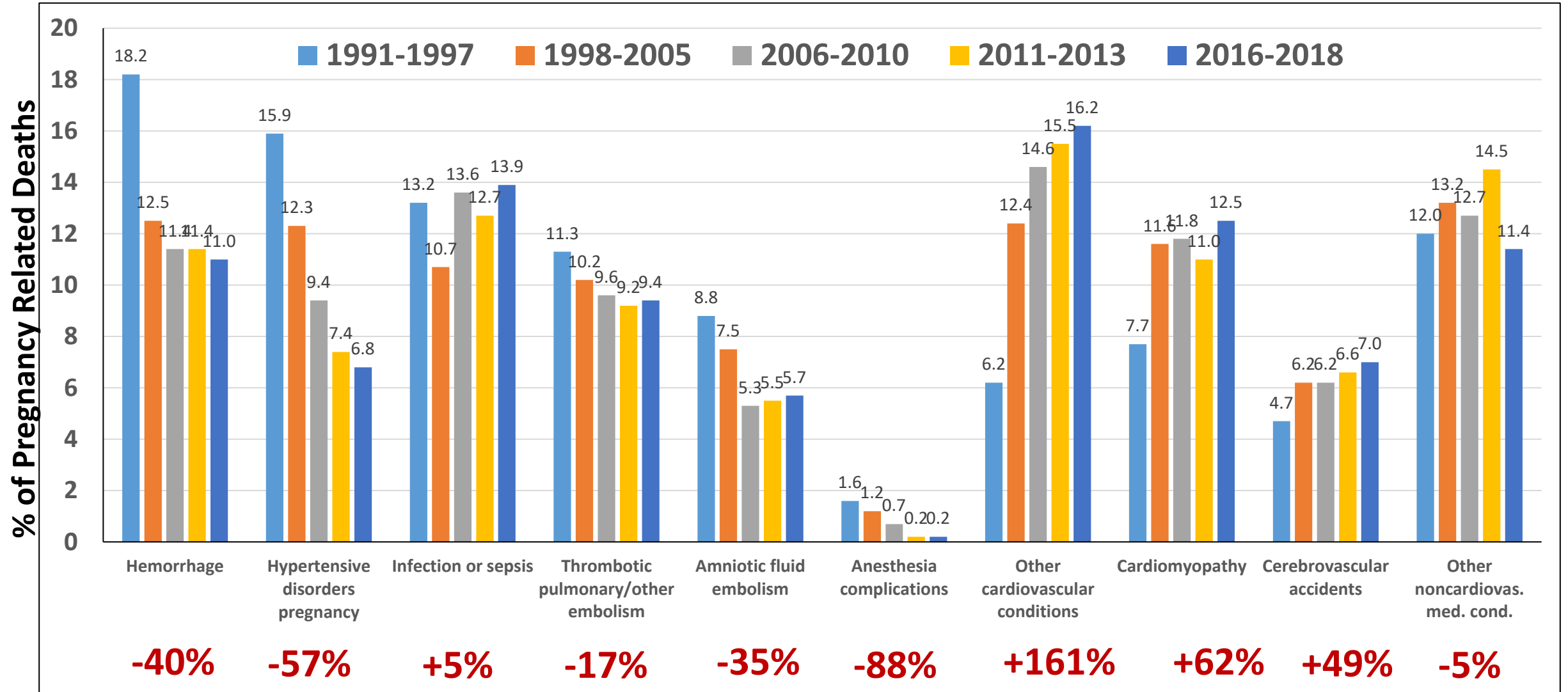
Source: Trost SL, Beauregard J, Njie F, et al. *Pregnancy-Related Deaths: Data from Maternal Mortality Review Committees in 36 US States, 2017–2019*. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2022.

# Causes of pregnancy-related death in the U. S.: 2017-19



Source: CDC Website. [https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm#:~:text=The%20Pregnancy%20Mortality%20Surveillance%20System%20\(PMSS\)%20defines%20a%20pregnancy%2D,or%20aggravated%20by%20the%20pregnancy.e](https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm#:~:text=The%20Pregnancy%20Mortality%20Surveillance%20System%20(PMSS)%20defines%20a%20pregnancy%2D,or%20aggravated%20by%20the%20pregnancy.e)

# Cause-specific proportionate Pregnancy-Related mortality: U. S., 1991–2018.



Source: Creanga. Pregnancy-Related Mortality in the United States. *Obstet Gynecol* 2017(1991-2013); CDC PRMSS (2016-2018).

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

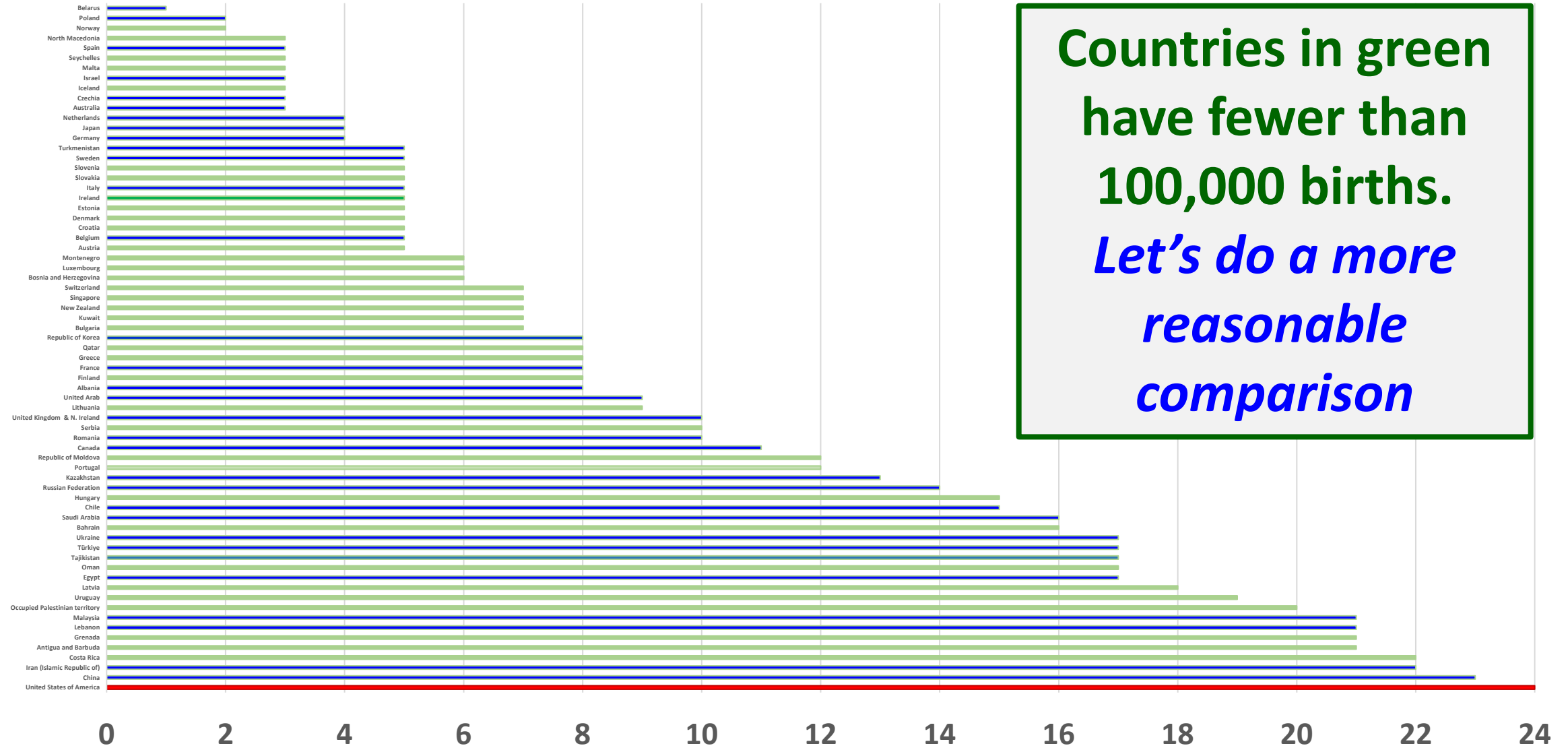
# U.S. in a Comparative Context, 1910, 1927, 2020

	1901-1910 <sup>1</sup>	1927 <sup>2</sup>	2020 <sup>3</sup>
	per 100K births	per 100K births	per 100K births
Norway	290	245	2
Australia	530	592	3
Italy	270	264	5
Sweden	230	278	5
Northern Ireland	550	480	5
New Zealand	460	491	7
France	520	287	8
England & Wales <sup>4</sup>	410	411	10
United States <sup>5</sup>	650	647	24

## Sources & Notes:

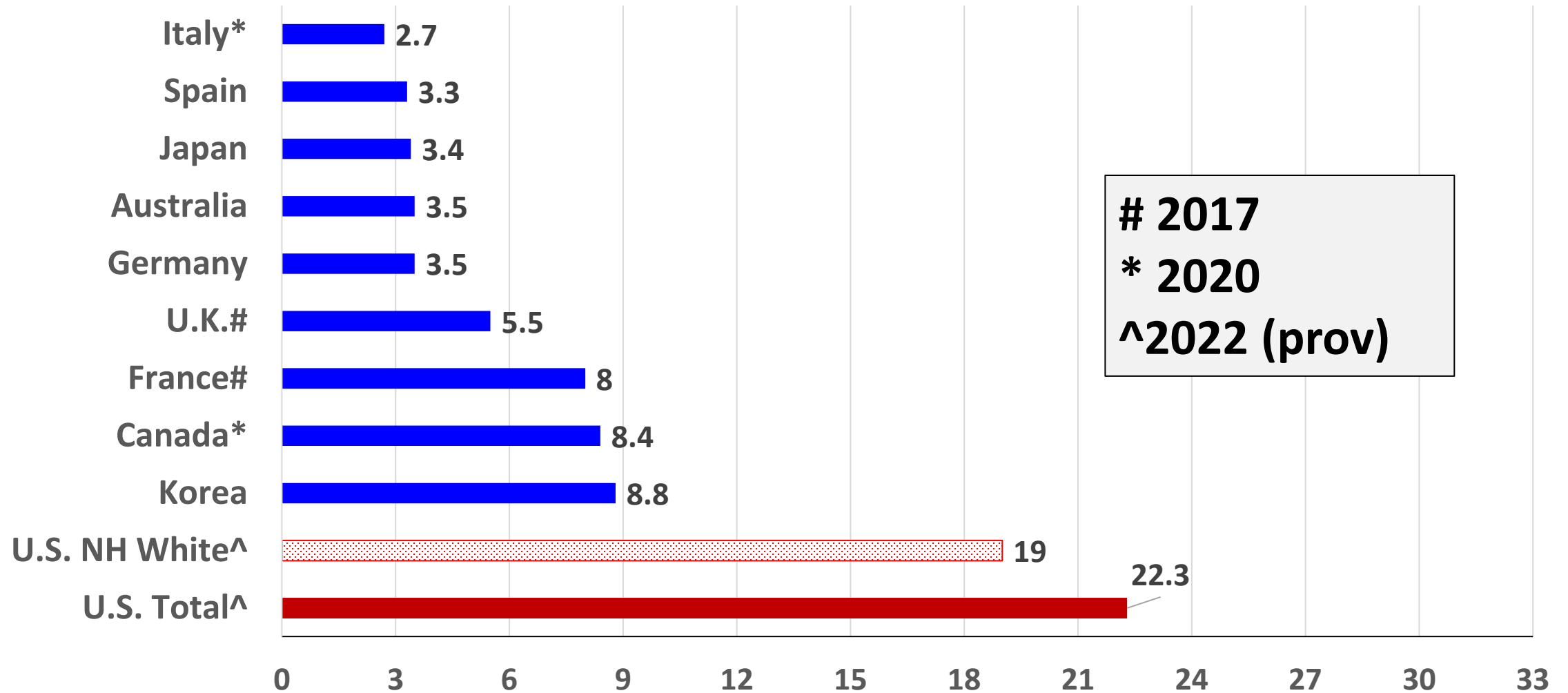
1. Meigs. *Maternal Mortality in U.S. & other countries*. 1917; 2. Tandy. *Comparability of Maternal Mortality Rates in the United States and Certain Foreign Countries*. 1933; 3. WHO. *Trends in Maternal Mortality, 2000-2020*; 4. UK rate in 2020; 5. Based on 10 reporting areas (CT,ME,MA,MI,NH,PN,RI,VT,NYC, DC) in 1910 & about 90% of all births in 1927.

# Maternal Mortality Ratios (per 100,000 births), 2020



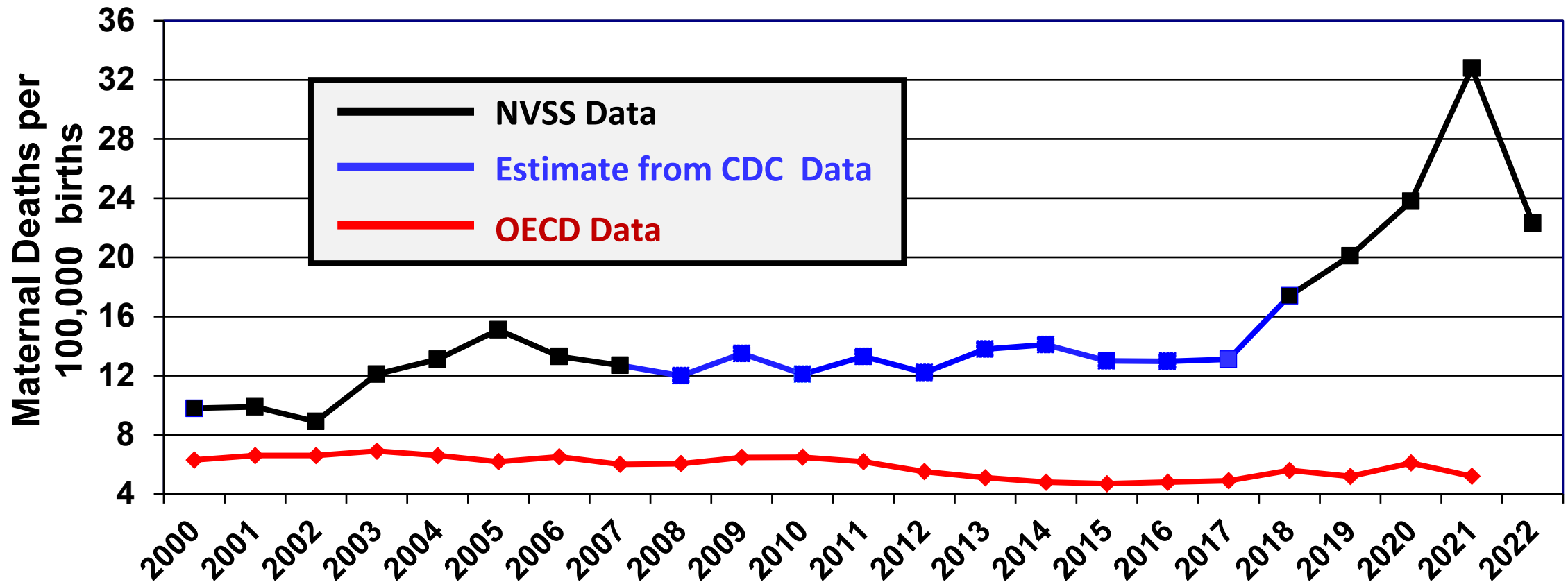
Countries in green have fewer than 100,000 births. *Let's do a more reasonable comparison*

# U.S. Maternal Mortality Ratio (per 100,000 births ) Compared to Industrialized Countries with 300,000+ births, 2021-22



# 2017  
\* 2020  
^2022 (prov)

# Maternal Mortality Ratio (per 100K births), 2000-2022, U.S. & Comparable Countries\*



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

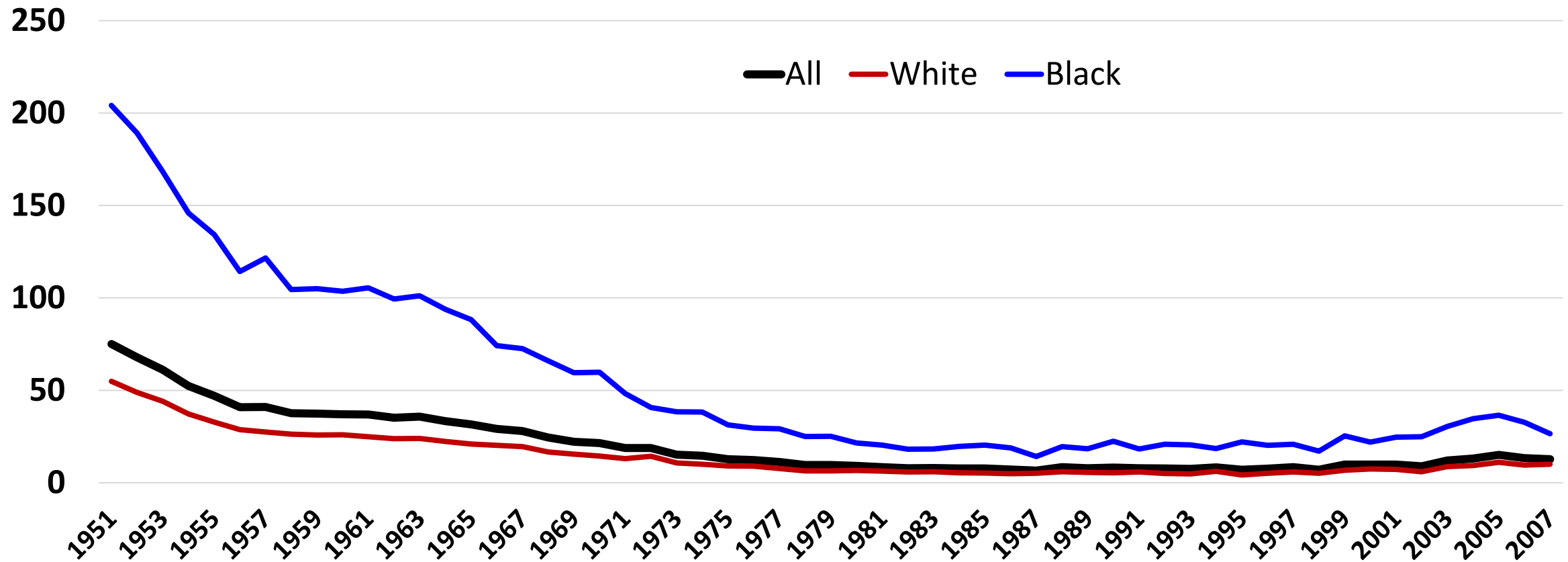
Sources: OECD Health Data 2024; & U.S. Estimated from NVSS & Pregnancy Mortality Surveillance System

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



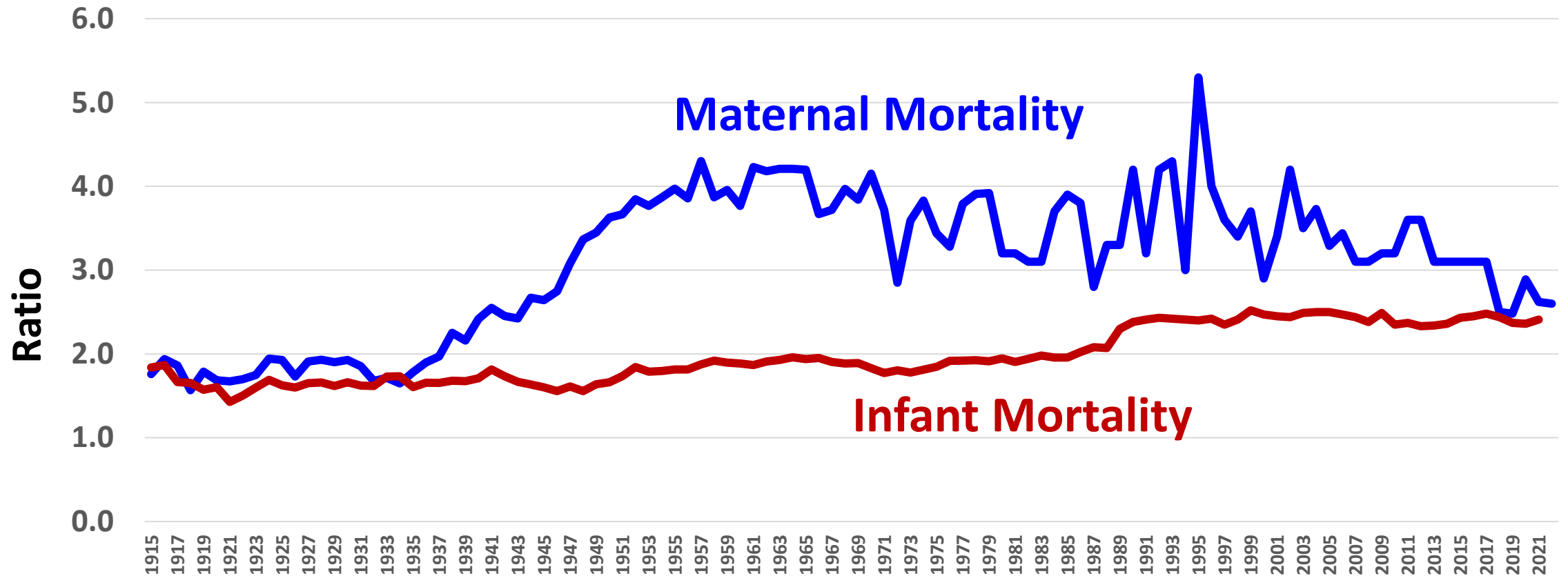
# The Persistence of Racial Disparities

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



**Source:** NCHS. Maternal Mortality and Related Concepts. Vital & Health Statistics. Series 33; #3. & annual data reports. 1915-1960 data from NCHS. *Vital Statistics Rates In The United States 1940-1960*. NOTE: Shifts in measurement (e.g. not all states were part of registration system prior to 1933; infant race was based on race of the child until 1980 & then race of the mother post 1980) accounts for some of the variation over time. 2007-2016 based on 2 year estimates of the pregnancy related mortality rate: Petersen E. *MMWR*.9/6/19.

# Black to White Ratios, U.S. Infant & Maternal Mortality, 1915-2021

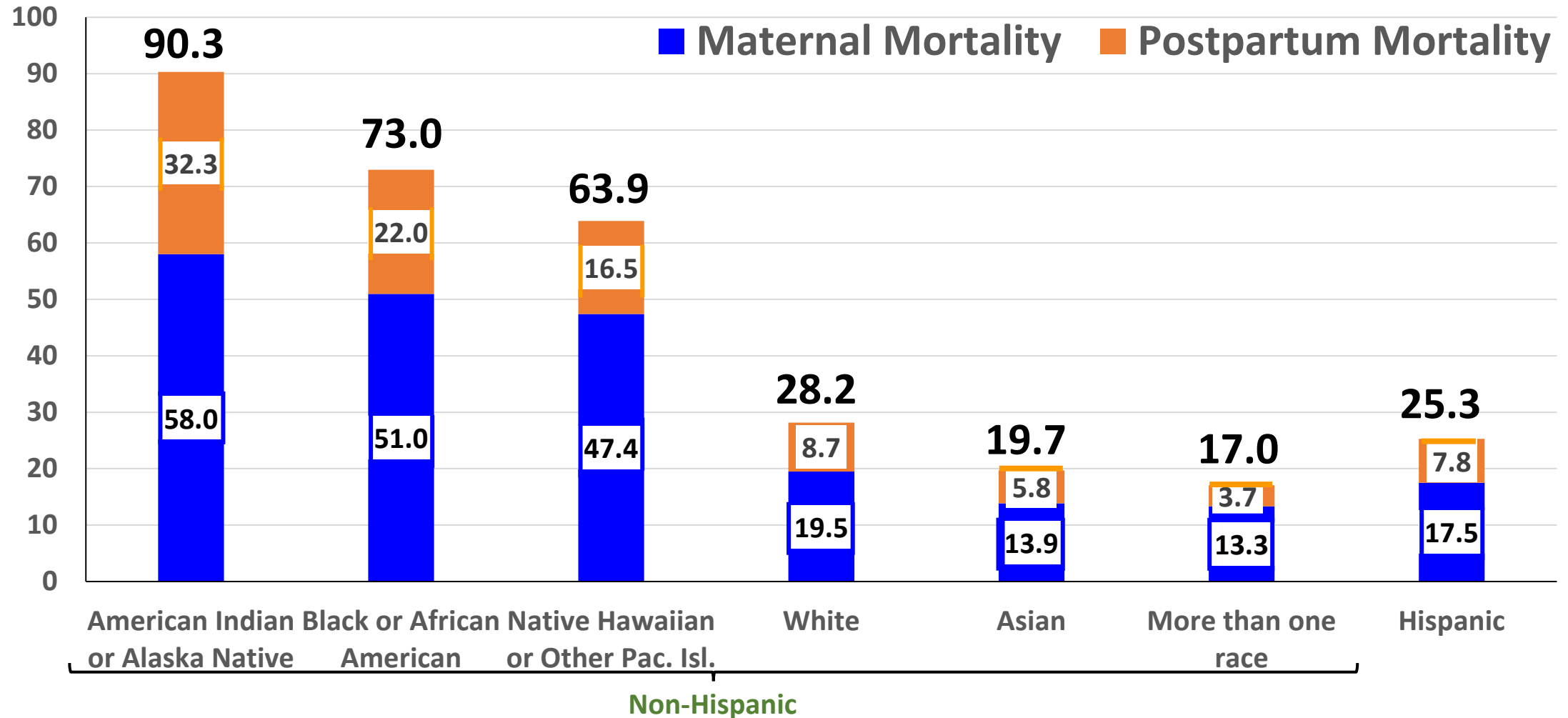


**Source:** NCHS. Maternal Mortality and Related Concepts. Vital & Health Statistics. Series 33; #3. & annual data reports. 1915-1960 data from NCHS. *Vital Statistics Rates In The United States 1940-1960*. NOTE: Shifts in measurement (e.g. not all states were part of registration system prior to 1933;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

# U.S. Maternal Mortality, by Race/Ethnicity, 2018-2022

	2018	2019	2020	2021	2022 (Prov.)
<b>Non-Hisp. White</b>	14.9	17.9	19.1	26.6	19.0
<b>Non-Hisp. Black</b>	37.3	44.0	55.3	69.9	49.5
<b>Hispanic</b>	11.8	12.6	18.2	28.0	17.0
<b>Non-Hisp Asian</b>	13.3	13.8	12.3	24.3	13.2
<b>Non-Hisp. AIAN</b>	*	49.2	48.5	118.7	46.7
<b>All</b>	17.4	20.1	23.8	32.9	22.3

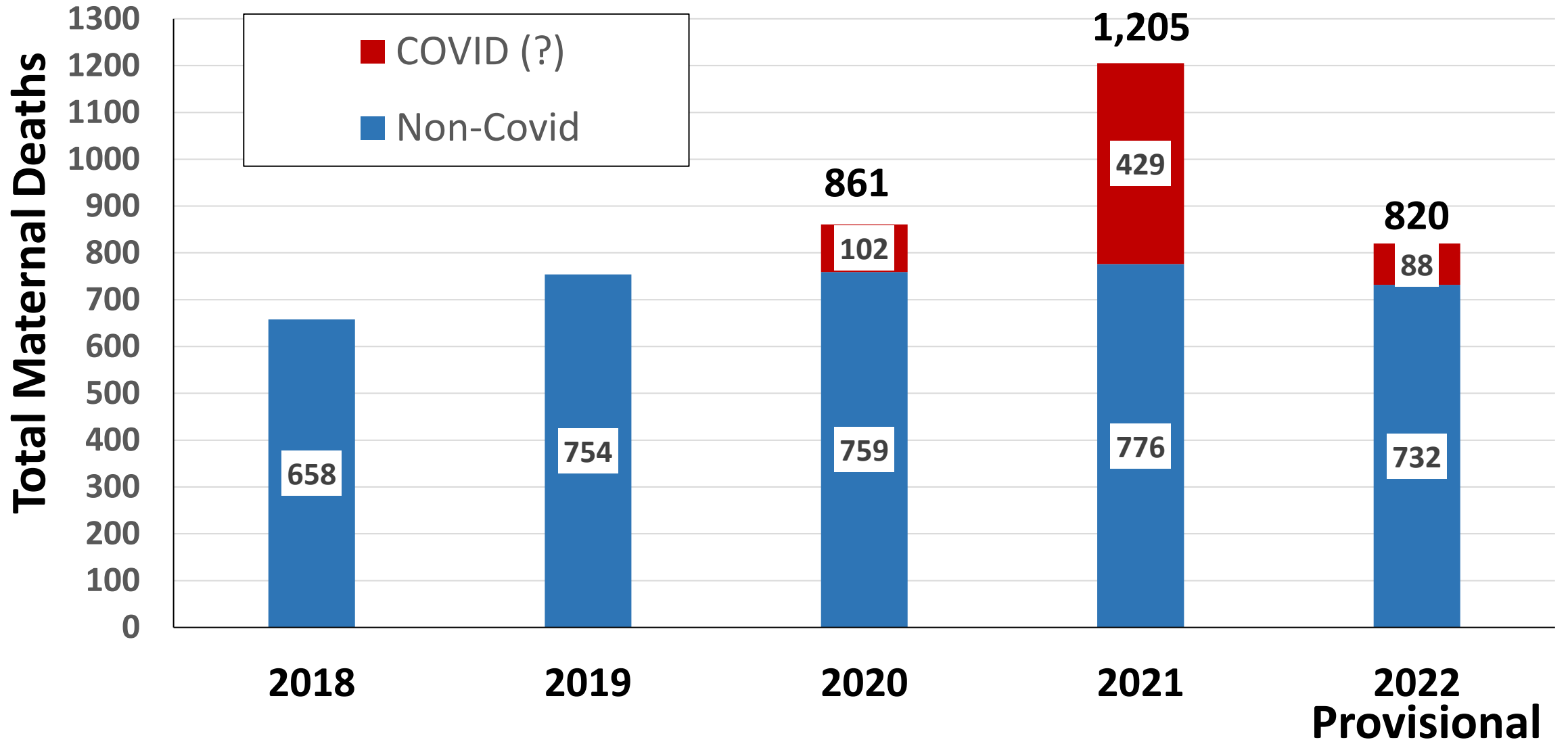
# U.S. Maternal and Pregnancy Related Mortality by Race/Ethnicity, 2018-2022\*



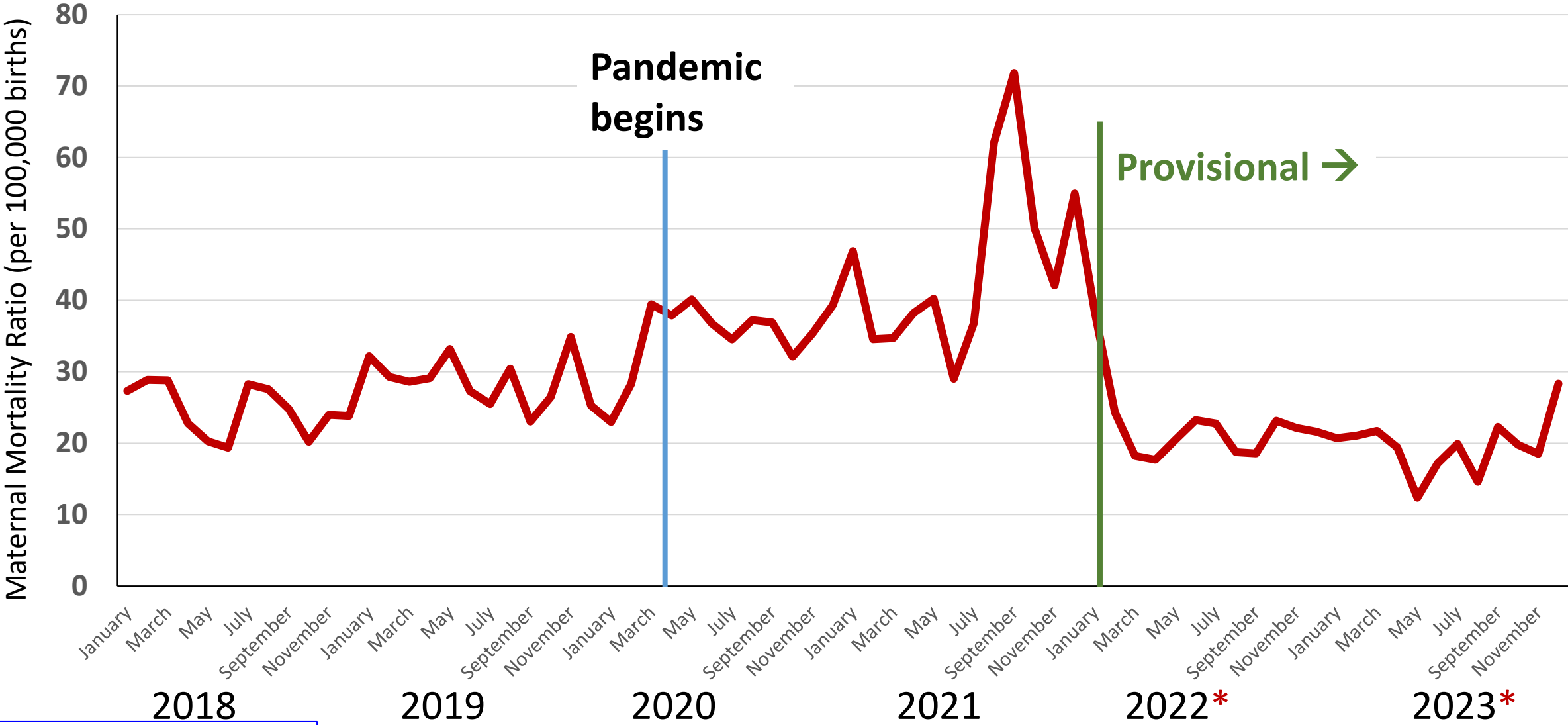
Source: NVSS; \* 2022 data is provisional

# **Maternal Mortality during a Pandemic**

# 2018-2022 COVID & Maternal Deaths Update



# NVSS Maternal Mortality (per 100,00 births) by Month, 2018- 2023

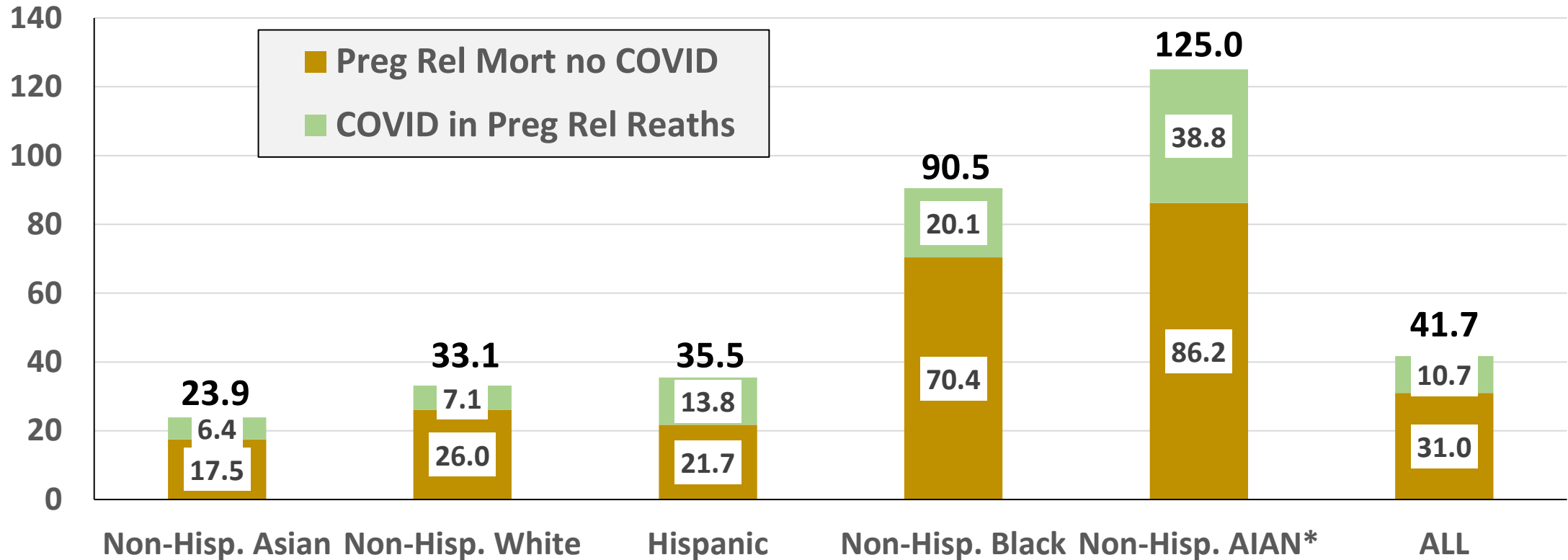


\* provisional data



# Pregnancy Related # Death Ratios with & without a COVID Code by Race-Ethnicity, April, 2020 – December, 2021

Pregnancy Related Mortality per 100,000 Births

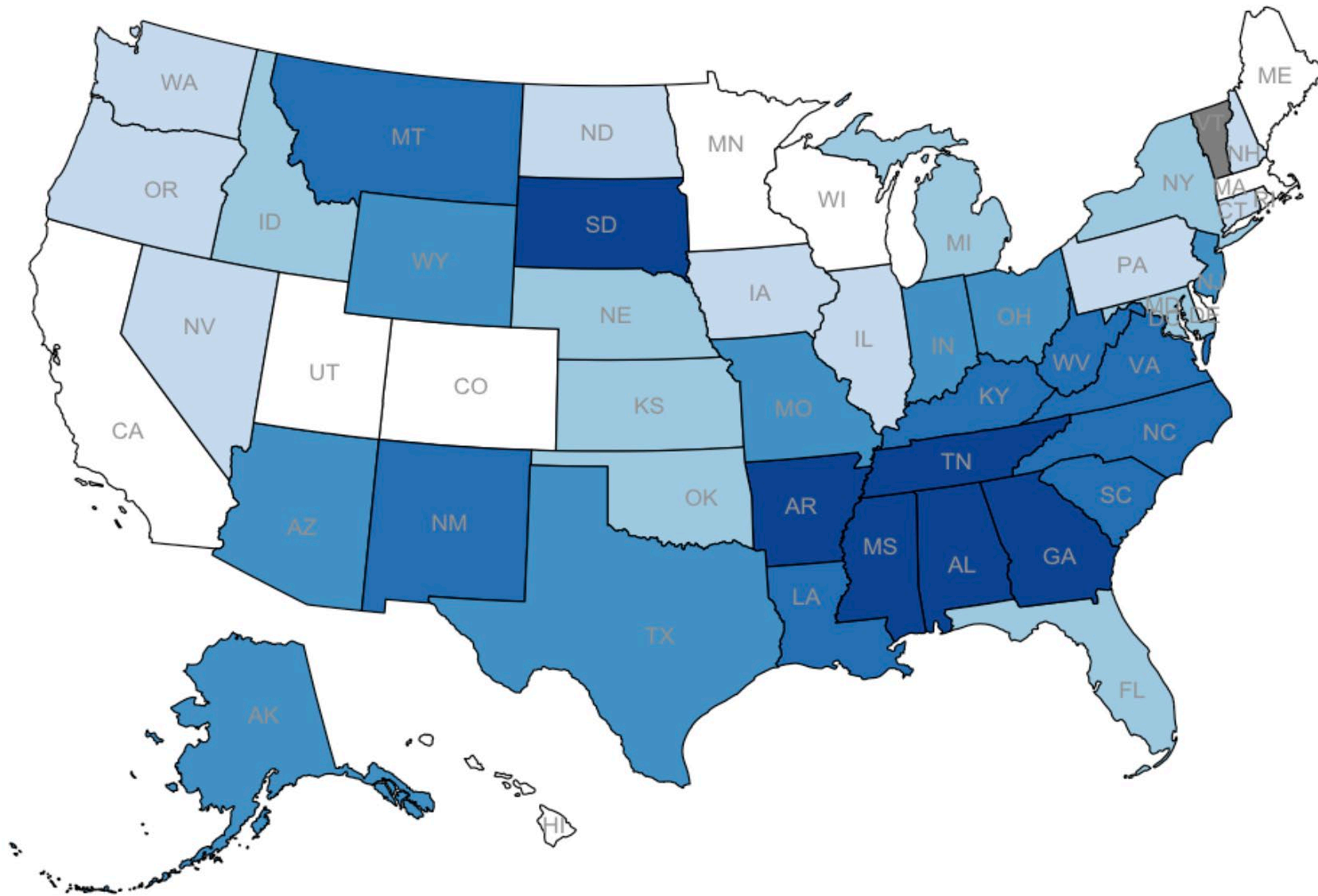


# Deaths during pregnancy and up to 1 year after delivery;

\*AIAN – American Indian Alaskan Native

Source: CDC Wonder

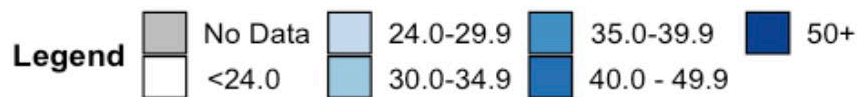
# **Maternal Mortality as a Public Health and Policy Problem**



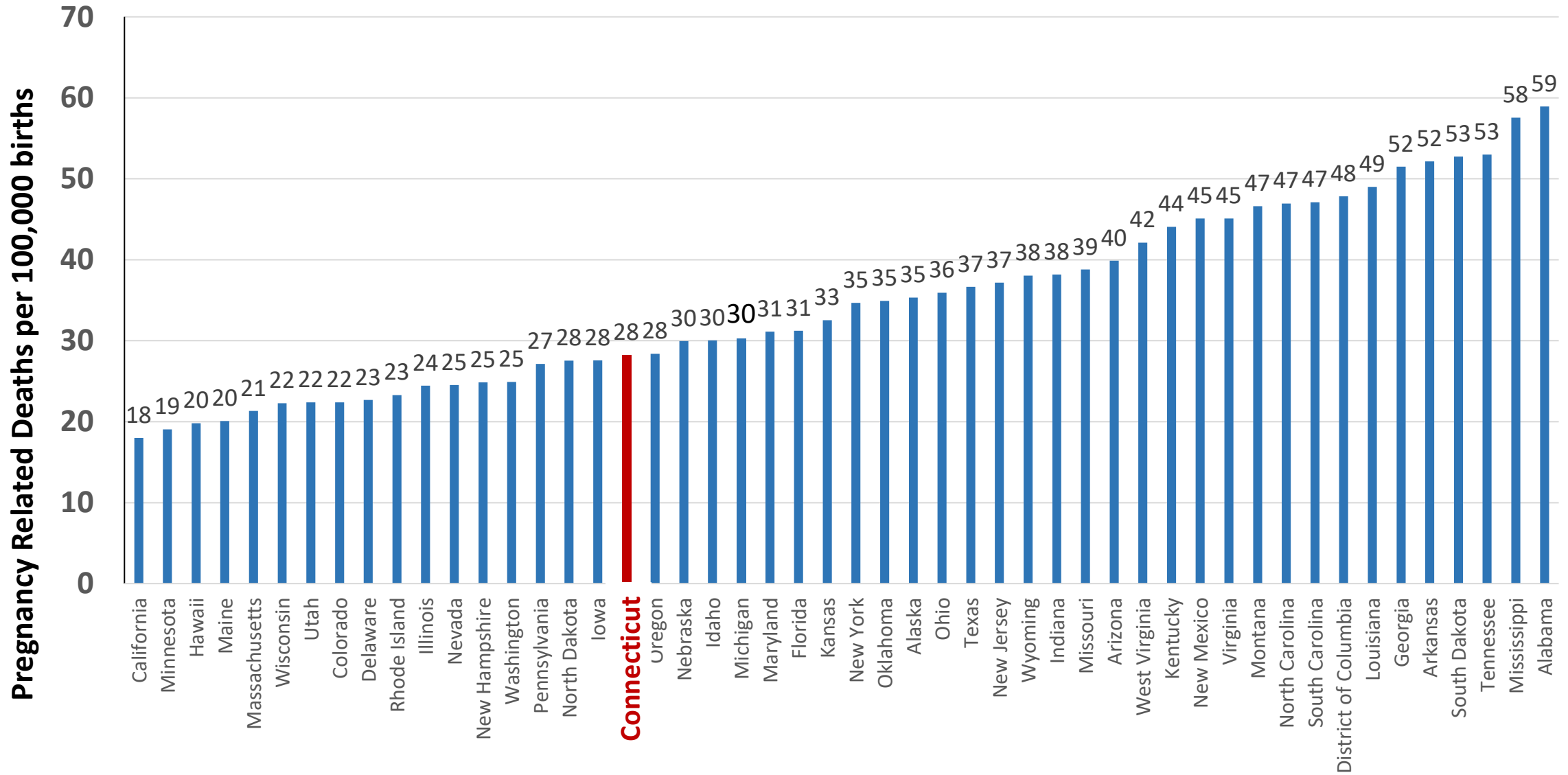
## Pregnancy Related Mortality Ratio, U.S. States\*, 2018-22^

Source: CDC Wonder

\* Vermont with < 10 maternal deaths, 2018-2022, is excluded from reporting.  
 ^ 2022 data provisional



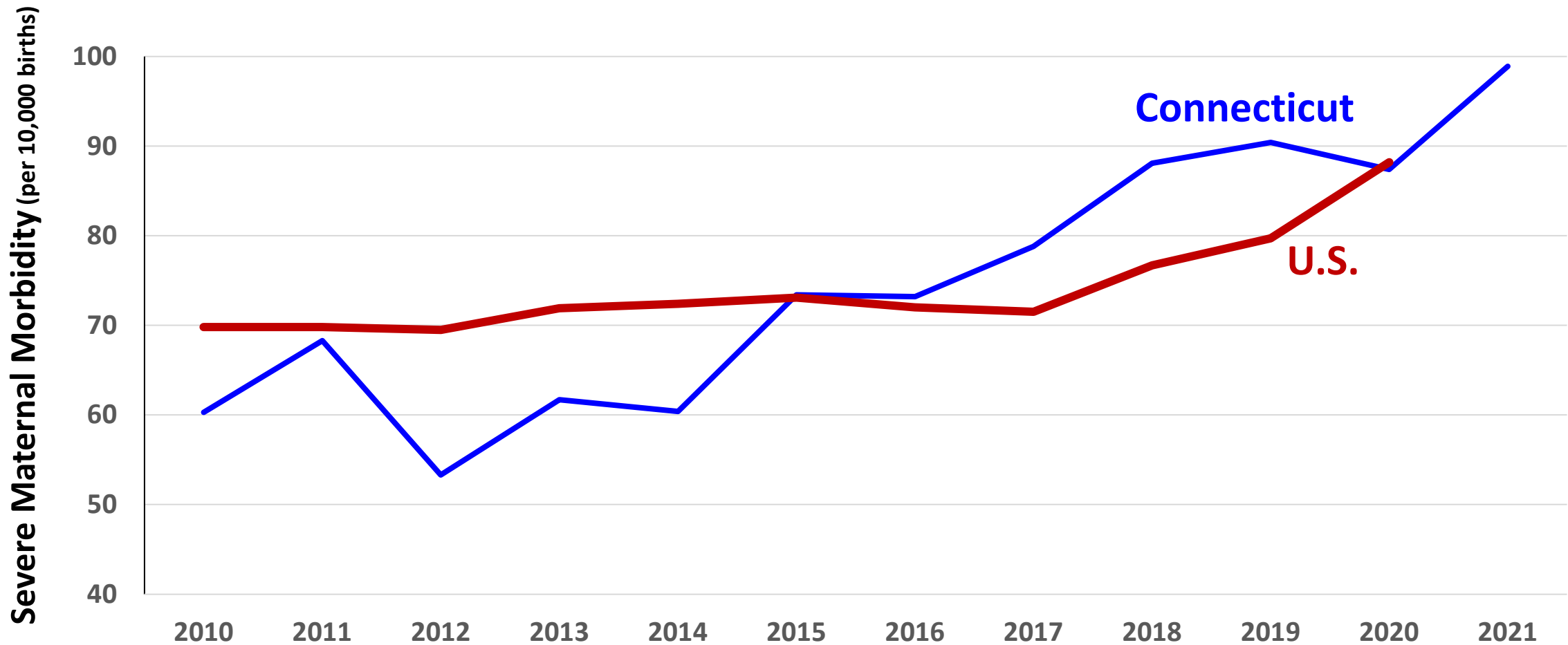
# Pregnancy Related# Mortality by State 2018-2022\*



\* 2022 data is provisional # Deaths during pregnancy through 1 year postpartum

Source: CDC Wonder

# Severe Maternal Morbidity, CT & U.S., 2010-2021



Source: HCUP--SMM Among In-Hospital Deliveries All inpatient stays, 2010 to 2021

# Not just about maternal mortality

## National Vital Statistics Reports



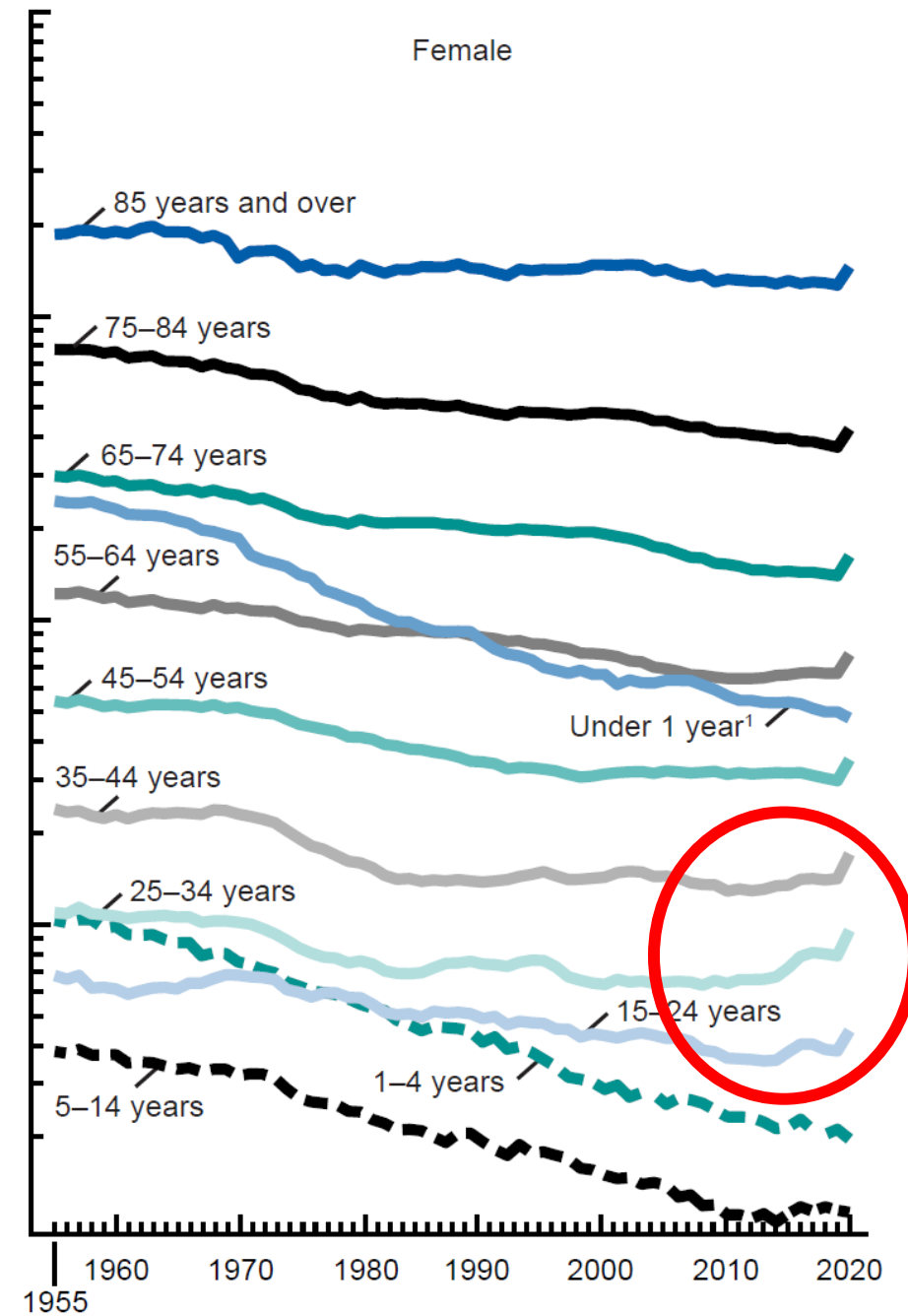

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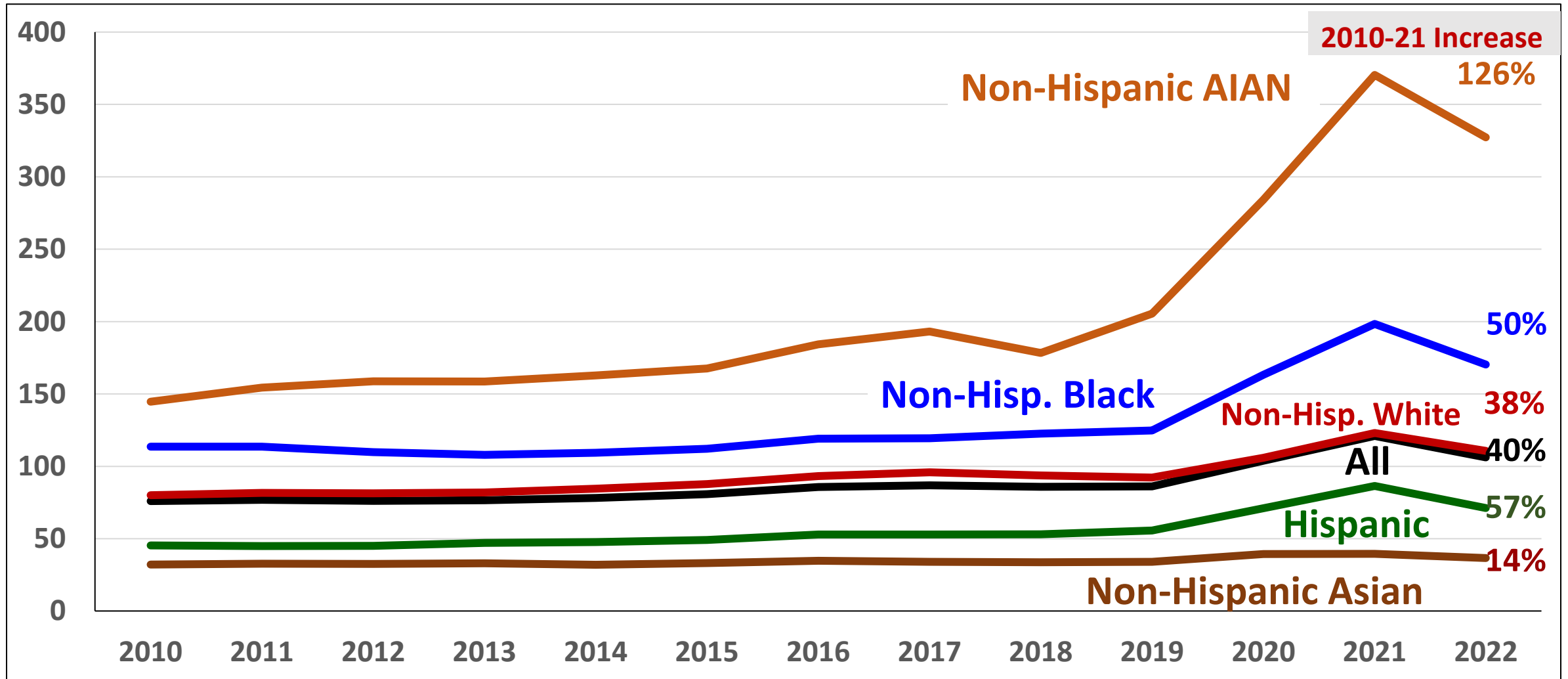
### Deaths: Final Data for 2020

by Kenneth D. Kochanek, M.A., Sherry L. Murphy, B.S., Jiaquan Xu, M.D., and Elizabeth Arias, Ph.D.

**STAT**  
**Maternal deaths represent the canary in the coal mine for women's health**  
*By Eugene Declercq and Neel Shah*  
August 22, 2018

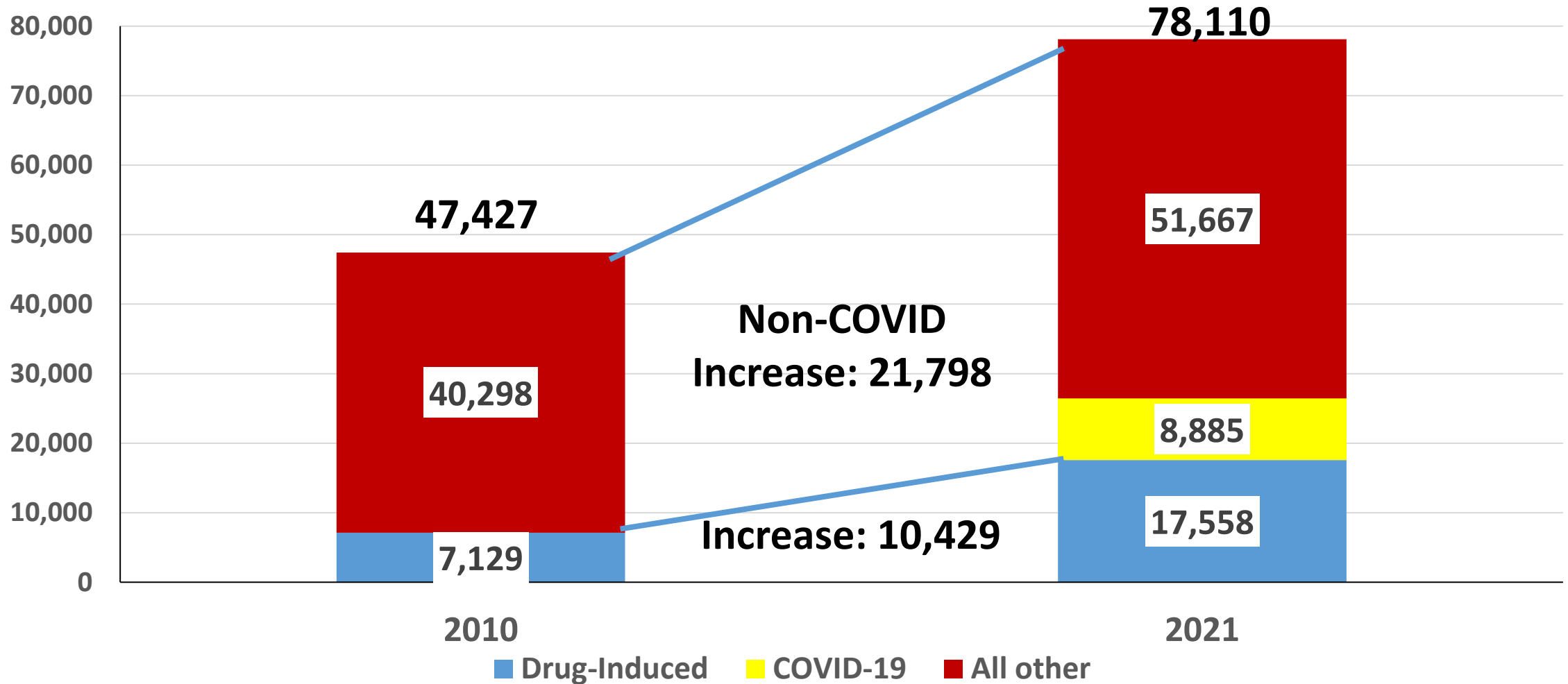


# Overall Deaths rates (per 100K), Females 15-44, 2010-2022



**All Female Deaths 15-44**  
**2010 -- 47,427; 2021 – 69,569 (COVID 3,390)**

# Increases in Female Deaths (15-44) 2010-2021: 47% of the non-COVID increase came from 1 cause





# The Way Forward

# The Solutions Discussed

- **Clinical**

- AIMS – Alliance for Innovation on Maternal Health (bundles & training)
- Training on Implicit Bias
- Diversifying the Maternity Workforce

- **Community**

- Expansion of community doula & home visiting services
- Diversification of doula workforce
- Birth center-CHC connection

- **Policy**

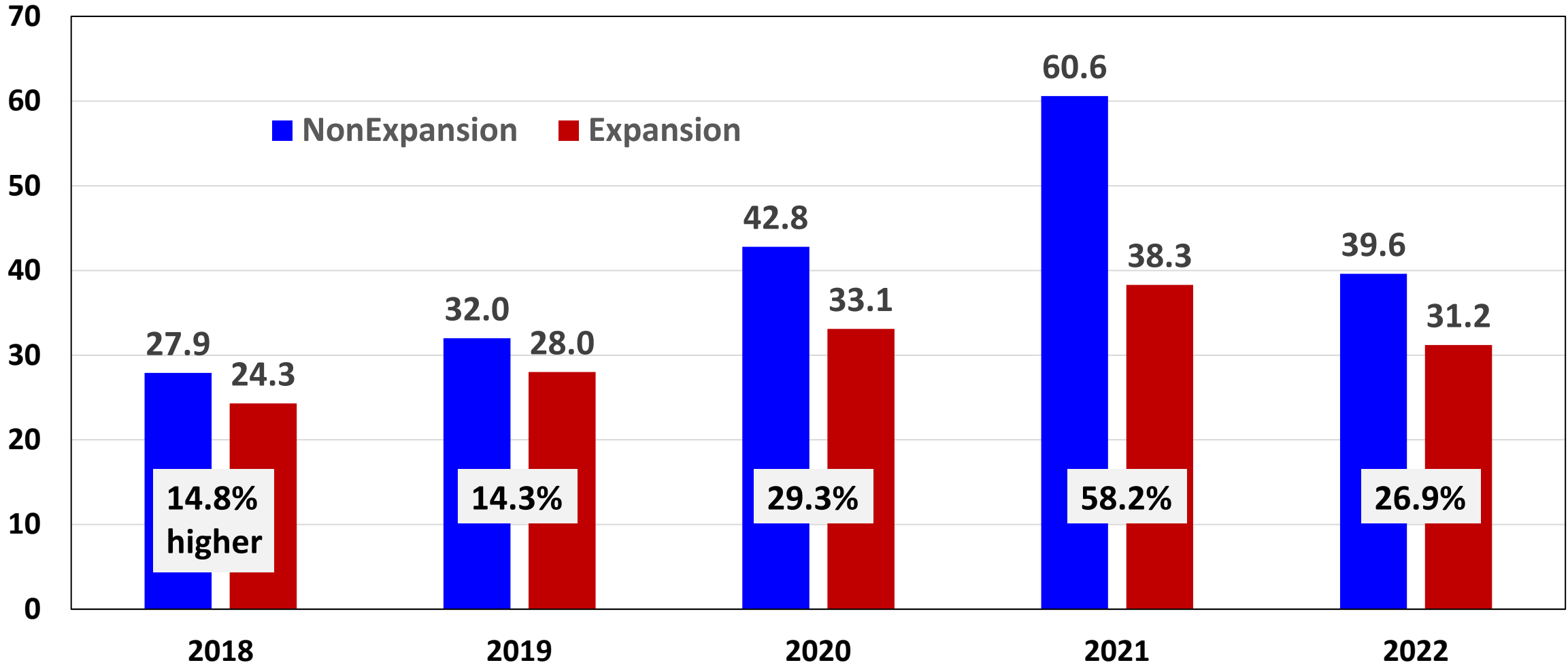
- Extending Guaranteed Medicaid Postpartum Coverage from 60 days to 1 year
- Funding initiatives described above
- Reproductive rights

# States Implementing\* 12 Month Extension of Postpartum Eligibility (as of 3/1/24)

<b>Alabama</b>	Louisiana	North Dakota	<b>Not Fully Implemented</b>
Alaska	Maine	Ohio	
Arizona	Maryland	Oklahoma	
California	Massachusetts	Oregon	
Colorado	Michigan	Pennsylvania	
Connecticut	Minnesota	Rhode Island	
Delaware	<b>Mississippi</b>	<b>South Carolina</b>	
District of Columbia	Missouri	South Dakota	
<b>Florida</b>	Montana	<b>Tennessee</b>	
<b>Georgia</b>	Nebraska	<b>Texas</b>	
Hawaii	New Hampshire	Vermont	
Illinois	New Jersey	Virginia	
Indiana	New Mexico	Washington	
<b>Kansas</b>	New York	West Virginia	
Kentucky	North Carolina	<b>Wyoming</b>	
			<b>Wisconsin</b>

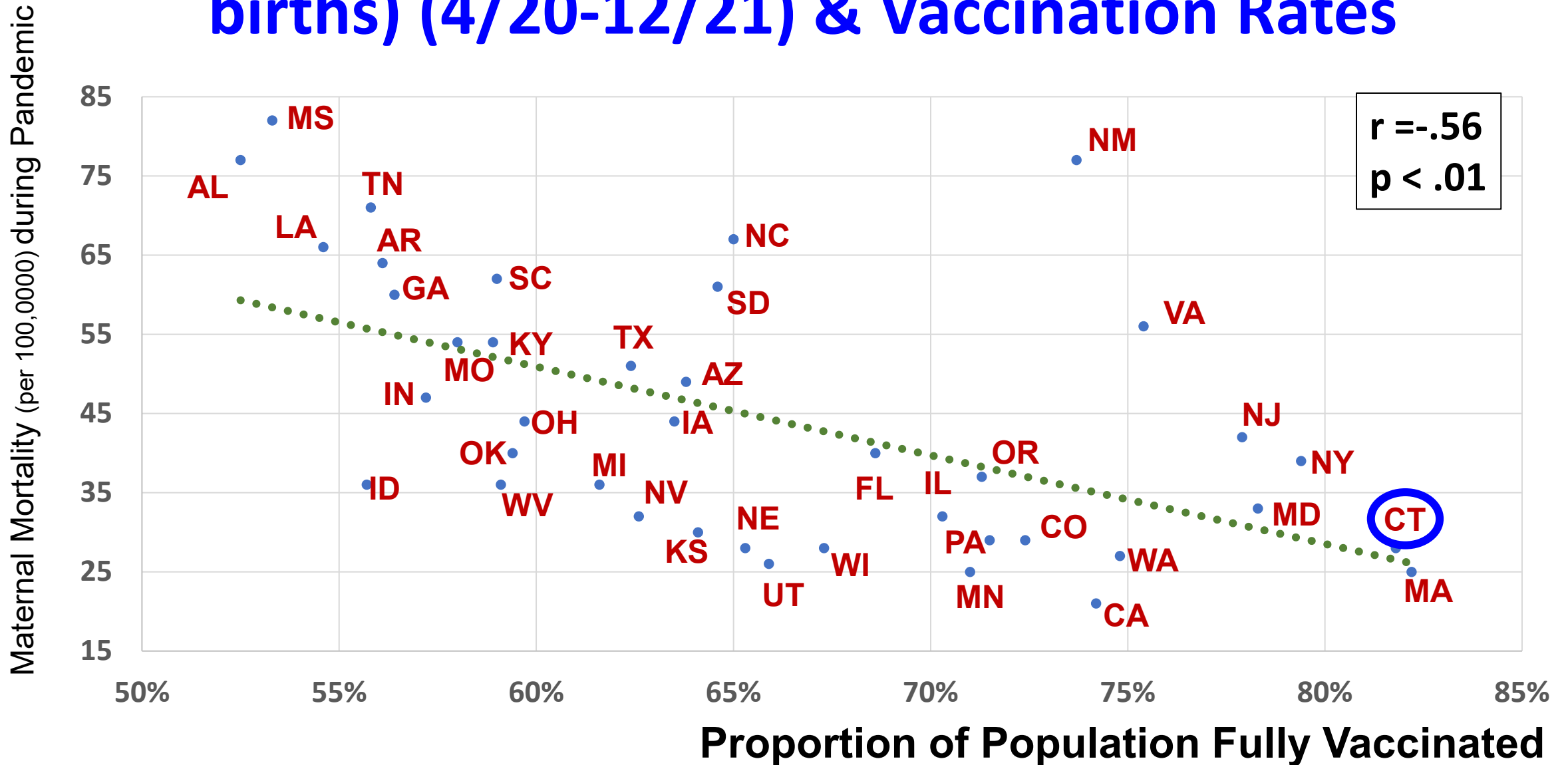
Source: <https://www.kff.org/medicaid/issue-brief/medicaid-postpartum-coverage-extension-tracker/#note-0-37/>

# Average Pregnancy Related Mortality\* in Medicaid Expansion and non-Expansion States, 2018-2022



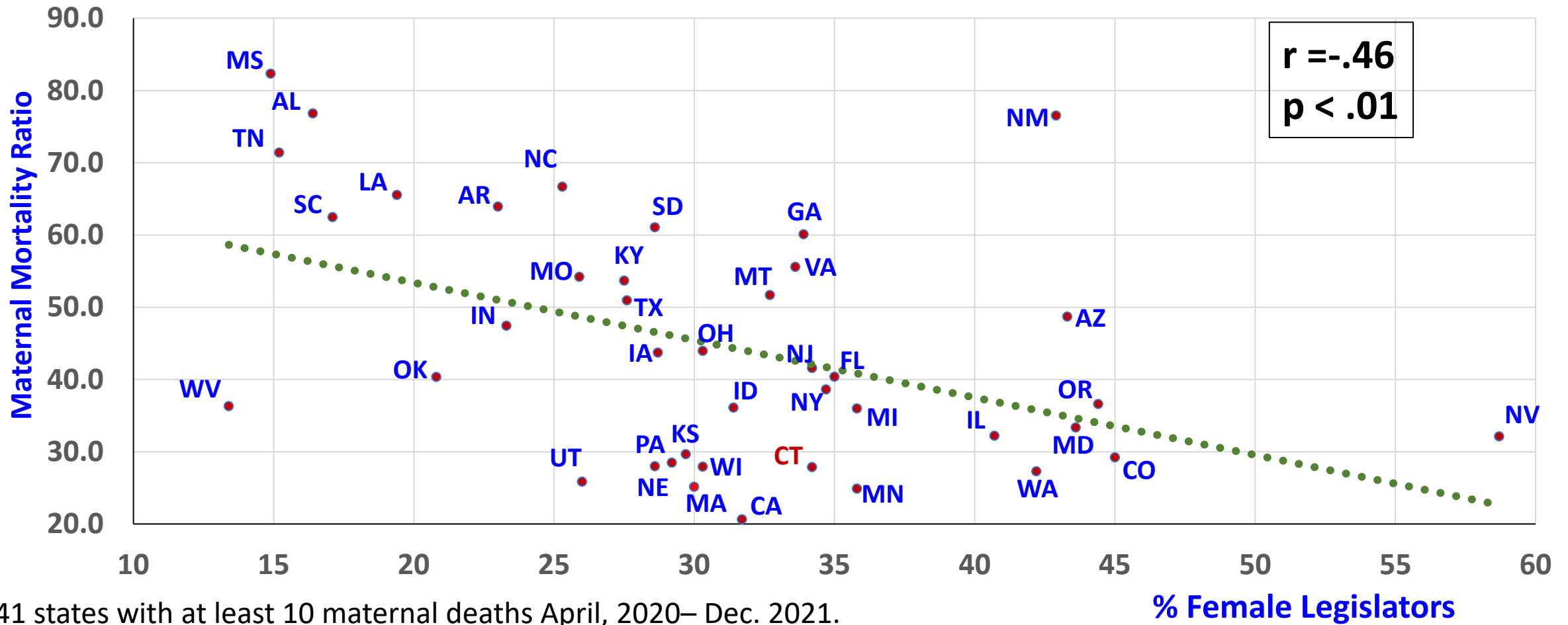
Non-Expansion States in 2024: Alabama, Florida, Georgia, Kansas, Mississippi, South Carolina, Tennessee, Texas, Wisconsin, and Wyoming

# State Pregnancy Related Mortality (per 100,000 births) (4/20-12/21) & Vaccination Rates



Sources: Vaccination NYTimes 10/20/22; Mat Mort: CDC Wonder

# Pregnancy Related Mortality (per 100,000 births) 2020-2021\* and % Female State Legislators 2021



\* 41 states with at least 10 maternal deaths April, 2020– Dec. 2021.

Sources: % Female Legis – Nat’l Conf State Legisl.; Pregnancy Related Mortality – CDC Wonder

# ***Four Policy Recommendations to Reframe Maternal Mortality into a Women's Health Campaign***

- 1. Use Maternal Mortality Review Committees to explore pregnancy associated deaths for causes and possible bases for prevention;***
- 2. Reframe pregnancy as opportunity to improve women's health in general rather than only a time to protect infant health;***
- 3. Fund a systematic process for listening to women tell us about their lives and experiences in pregnancy and beyond to craft sustainable solutions that are meaningful to them.***
- 4. Craft policies that keep women of all ages within the health and social system to prevent problems that lead to pregnancy associated deaths.***

# Black Maternal Health Week

April 11 - 17, 2021



BLACK MAMAS MATTER:  
CLAIMING OUR POWER, RESILIENCE & LIBERATION

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



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

# 10 YEARS



2010

2020

# EVERY MOTHER COUNTS



NATIONAL BIRTH EQUITY COLLABORATIVE



ALLIANCE FOR INNOVATION ON MATERNAL HEALTH

# NATIONAL MATERNAL HEALTH WEEK

MAY 5th-12th, 2019



## #MarchforMoms

## #BeyondMothersDay

- Promote State & Federal Legislative Efforts to Improve Maternal Health
- Drive Media Attention on State of Maternal Health
- Seek City, State and National Proclamations
- Organize Visits in DC on Capitol Hill May 10th
- Rally on National DC Mall on May 11th
- Livestream the Rally on Facebook Live
- Curate and Promote Daily Themes Related to Maternal Health

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





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