Cardiovascular Disease in Pregnancy

National Academies Meeting

May 12, 2025

Mary Norine Walsh, MD, MACC

Medical Director, Heart Failure and Cardiovascular Research Institute

Ascension St Vincent Heart Center, Indianapolis IN

Past President, American College of Cardiology

@MinnowWalsh

ASCENSION

My sister Peggy

HELLP SYNDROME

during pregnancy

HELLP syndrome is often considered to be a variant of **preeclampsia**. However, although HELLP syndrome and preeclampsia are closely linked, it's possible for an expectant mom to have HELLP syndrome without high BP or certain aspects of preeclampsia.
Characteristics of HELLP include:

H — HEMOLYSIS

This means that red blood cells are broken down too quickly. This can lead to anemia, a problem involving insufficient transport of oxygen throughout the body.

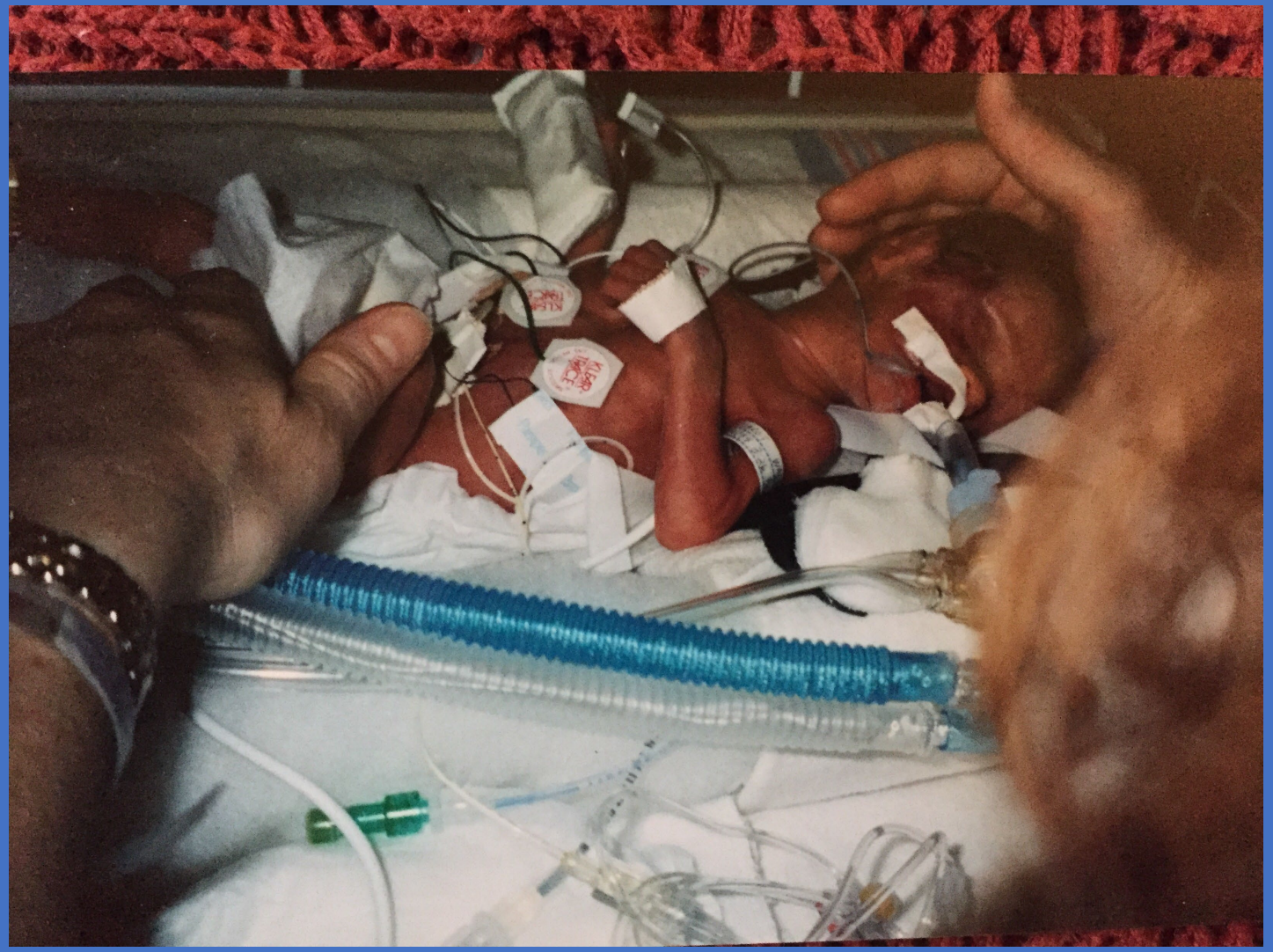
EL — ELEVATED LIVER ENZYMES

This can be taken as a sign that liver function is compromised.

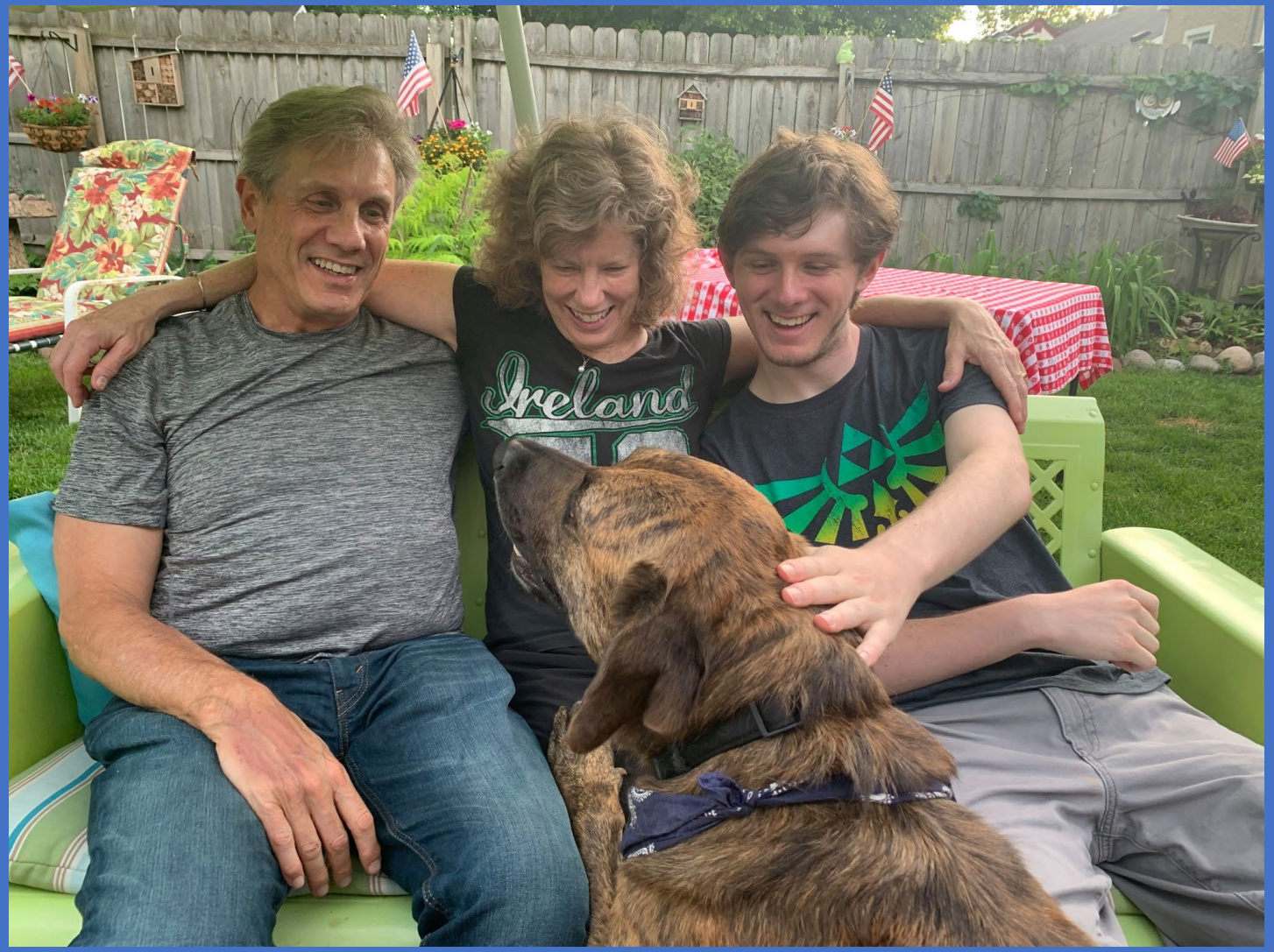
LP — LOW PLATELET COUNT

Platelets help with blood clotting, so an unusually low level of platelets indicates that a person is at risk for excessive bleeding.

Gabriel 28 weeks

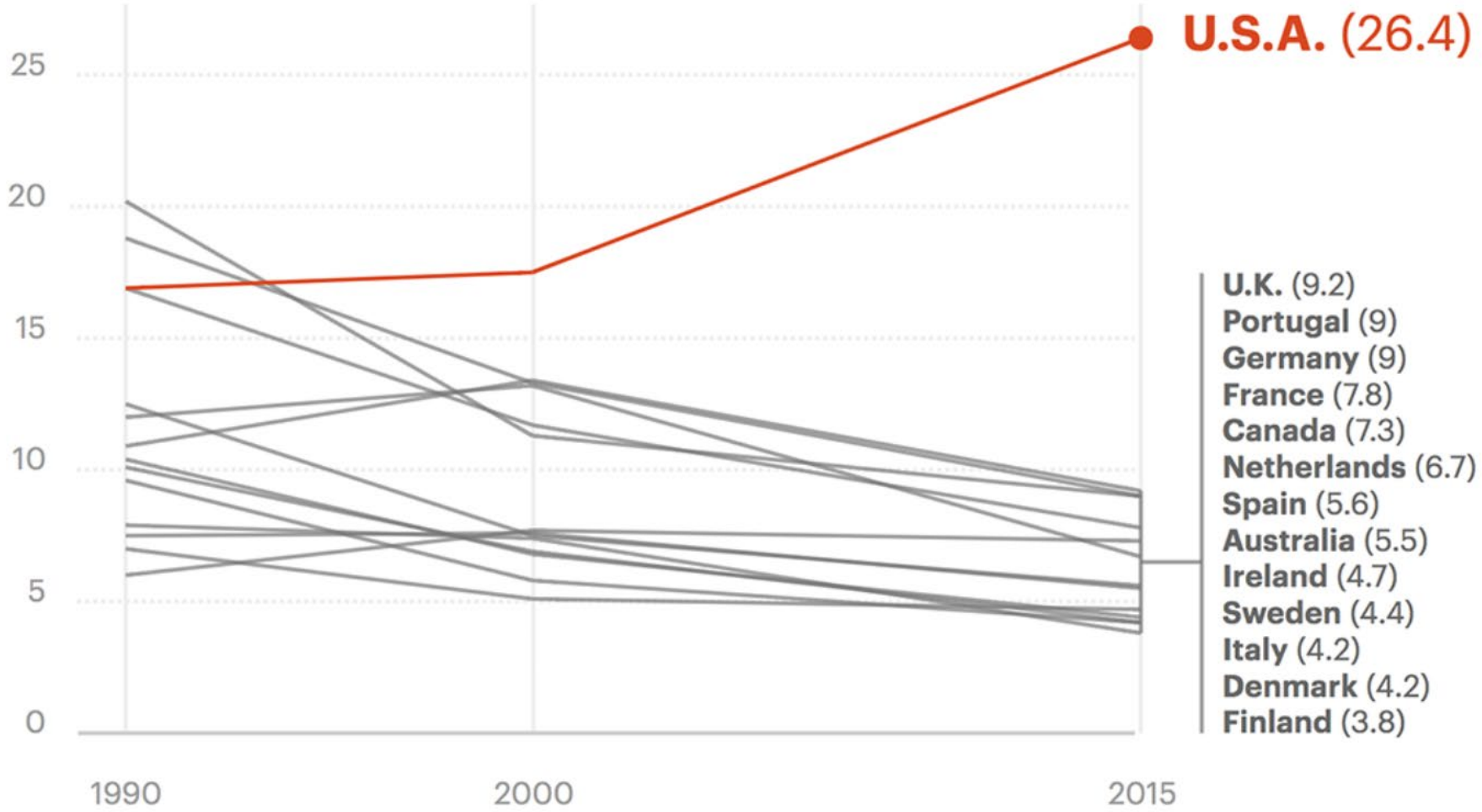


Gabriel and Peggy now



Maternal Mortality Is Rising in the U.S. As It Declines Elsewhere

Deaths per 100,000 live births



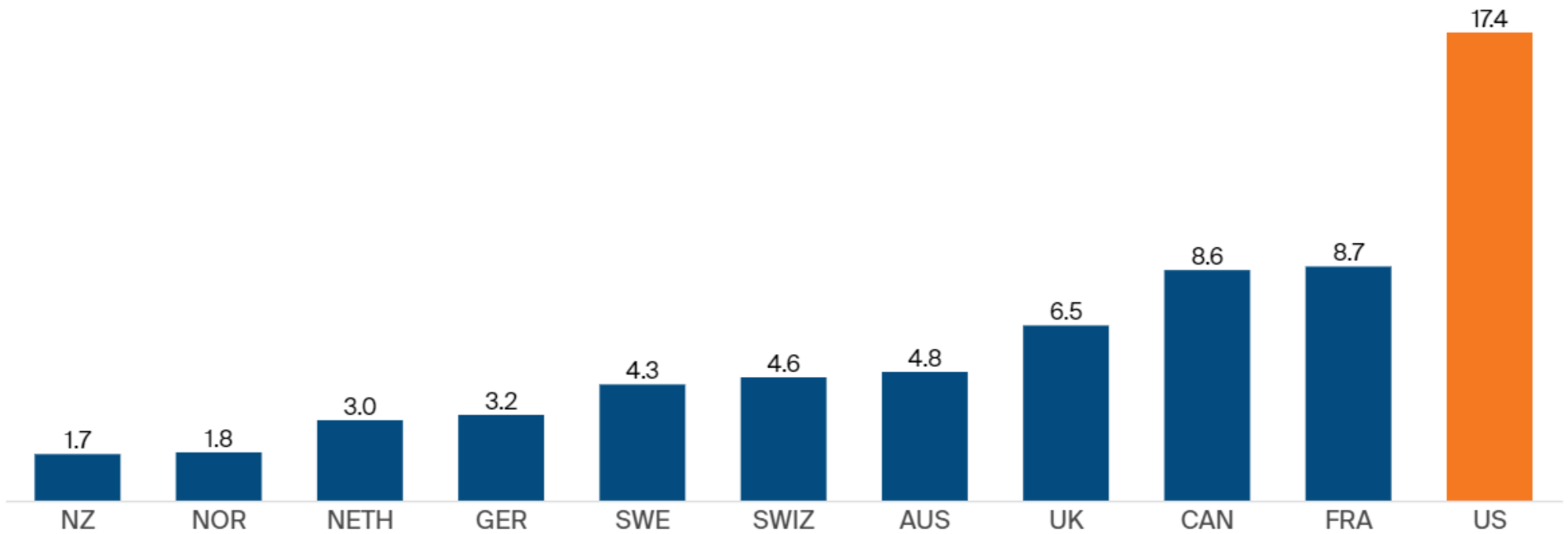
Notes

"Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015," *The Lancet*. Only data for 1990, 2000 and 2015 was made available in the journal.

Exhibit 1

Maternal Mortality Ratios in Selected Countries, 2018 or Latest Year

Deaths per 100,000 live births



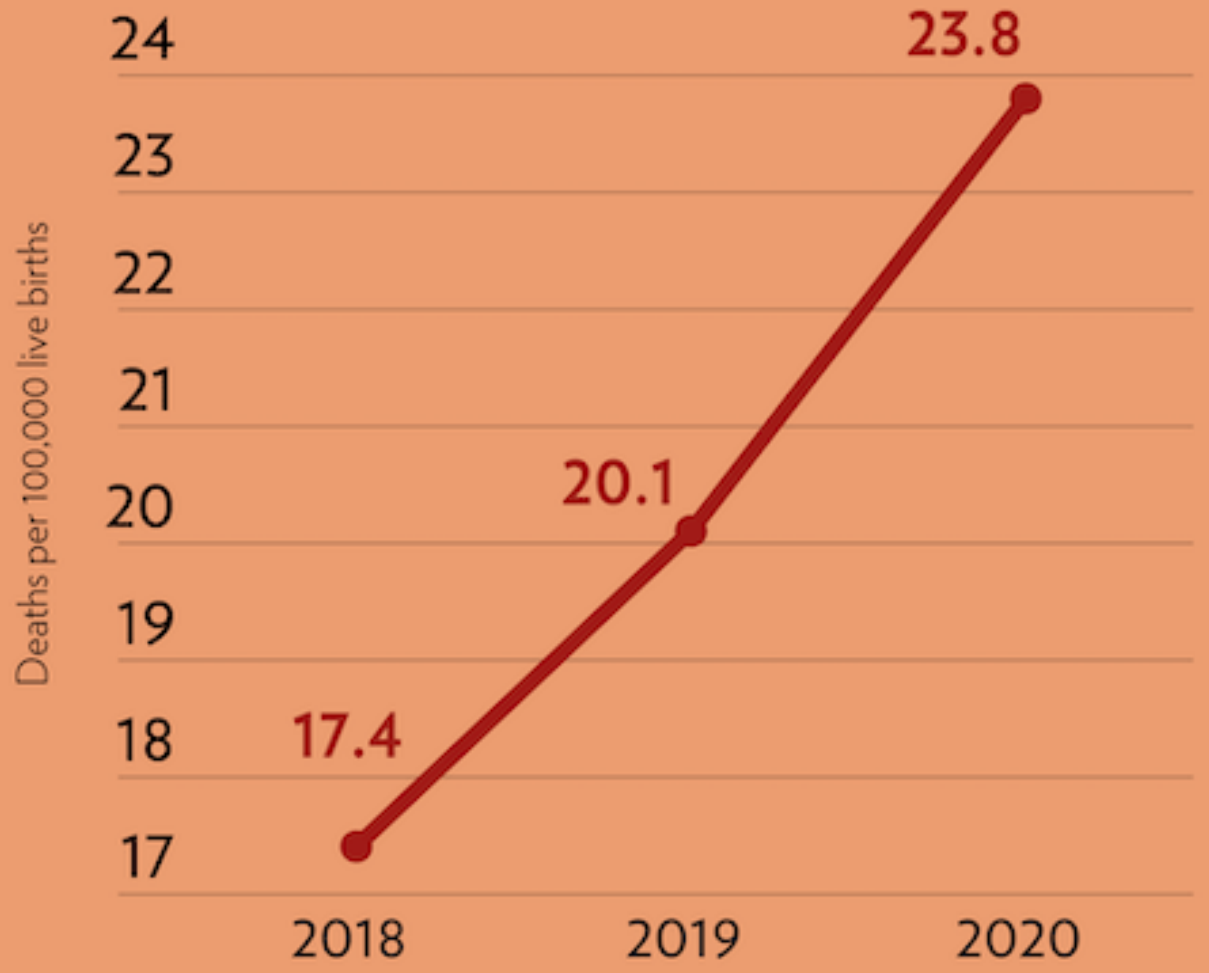
Download data

Notes: The maternal mortality ratio is defined by the World Health Organization as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Data: OECD Health Data 2020, showing data for 2018 except 2017 for Switzerland and the UK; 2016 for New Zealand; 2012 for France.

Source: Roosa Tikkanen et al., *Maternal Mortality and Maternity Care in the United States Compared to 10 Other Developed Countries* (Commonwealth Fund, Nov. 2020). https://doi.org/10.26099/411v-9255

The U.S. Maternal Mortality Rate Continues to Increase Substantially



Source: https://www.cdc.gov/nchs/data/hestat/maternal-mortality/2020/maternal-mortality-rates-2020.htm

Black Women Face Three Times the Maternal Mortality Risk as White Women

Black mothers: **55**

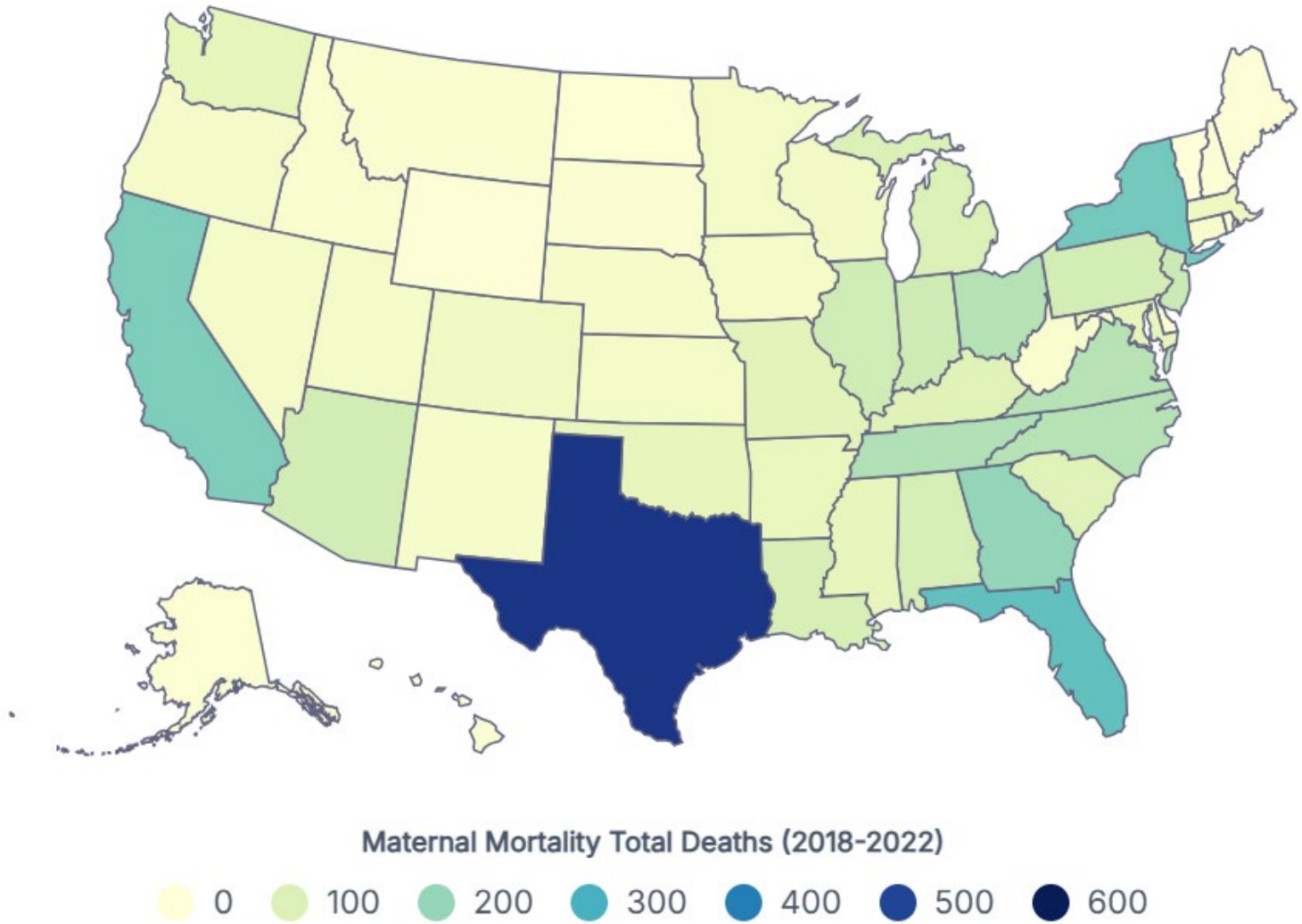
White mothers: **19**

Hispanic mothers: **18**

*Deaths per 100,000 live births

Source: https://www.cdc.gov/nchs/data/hestat/maternal-mortality/2020/maternal-mortality-rates-2020.htm

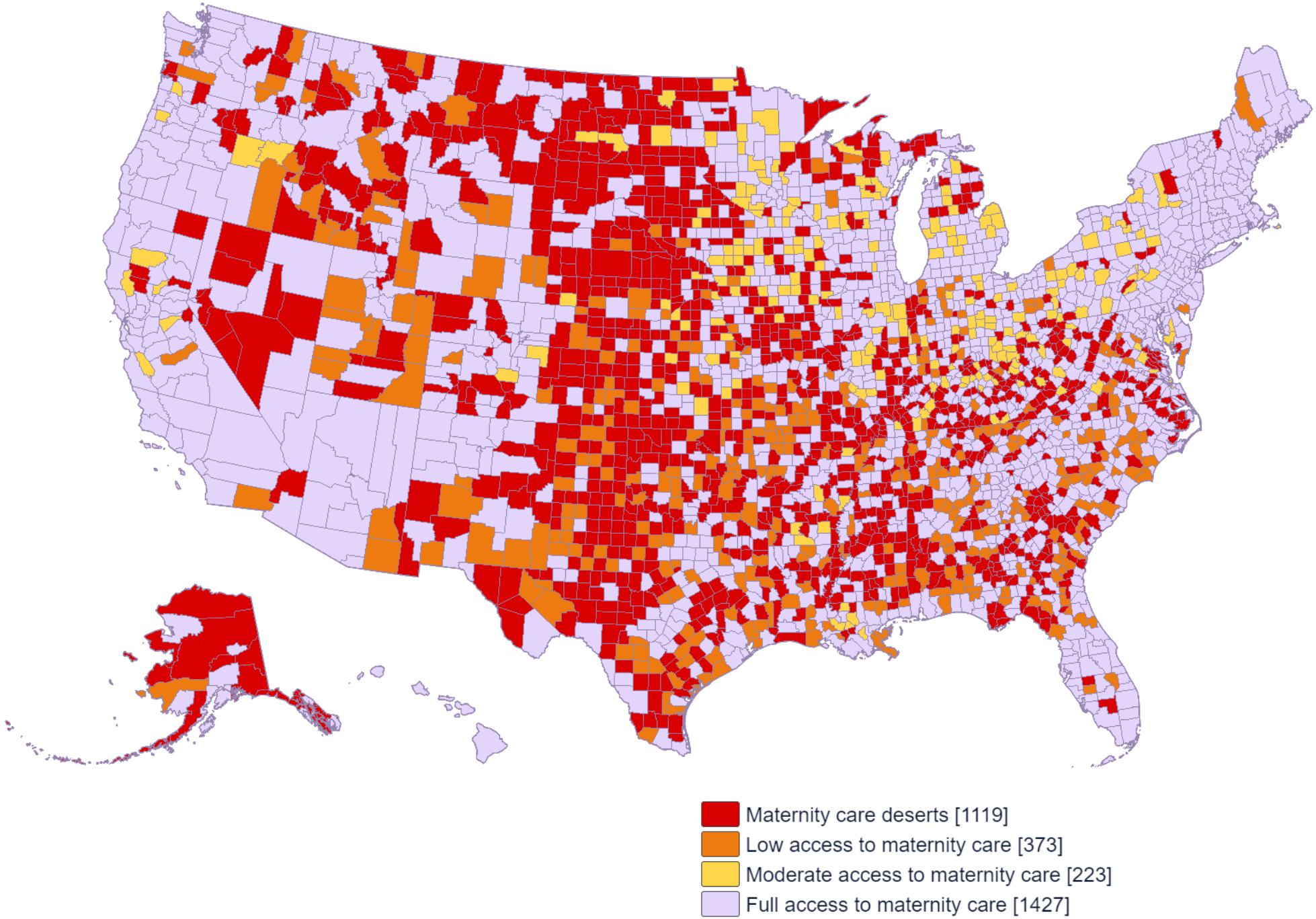
Maternal Mortality Rate by State 2025



https://worldpopulationreview.com/state-rankings/maternal-mortality-rate-by-state

Indiana

Indiana's maternal mortality rate is 43.6 per 100,000, making it the third-highest in the country. There are 33 counties in Indiana that have no hospital or that have a hospital but the hospital has no OB-GYN services. The Indiana State Department of Health plans to survey every birthing and delivery facility in the state to make sure they are meeting its new rules, such as requiring at-risk moms to deliver at facilities that have appropriate technology, equipment, and personnel on hand to manage these emergencies. Additionally, the state will hire nurses, midwives, and advanced practice nurses to go into some of Indiana's rural hospitals to help provide prenatal care.


Maternity care deserts [1119]
Low access to maternity care [373]
Moderate access to maternity care [223]
Full access to maternity care [1427]

What We Mean by Maternal Mortality

There are three commonly used measures of maternal deaths in the United States. While they all capture some aspect of maternal deaths, they are not equivalent.

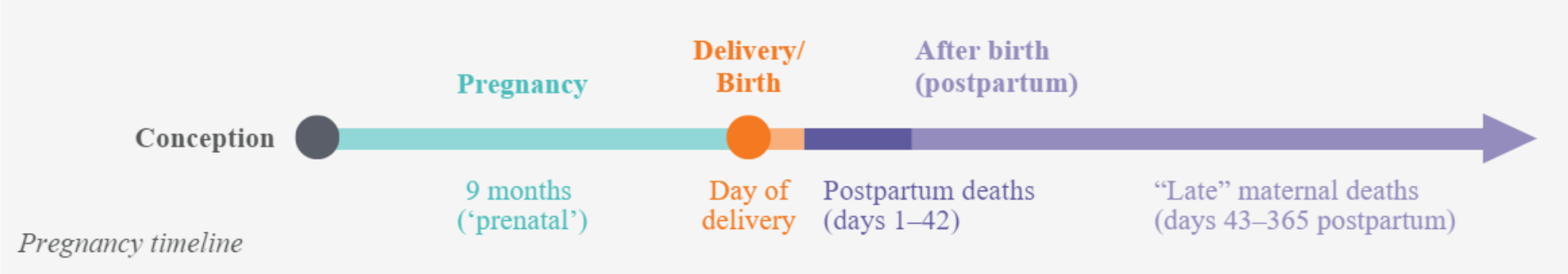
Pregnancy-associated death: Death while pregnant or within one year of the end of the pregnancy, irrespective of cause.

Pregnancy-related death: Death 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 in the U.S. only, this CDC measure is typically reported as a ratio per 100,000 births.

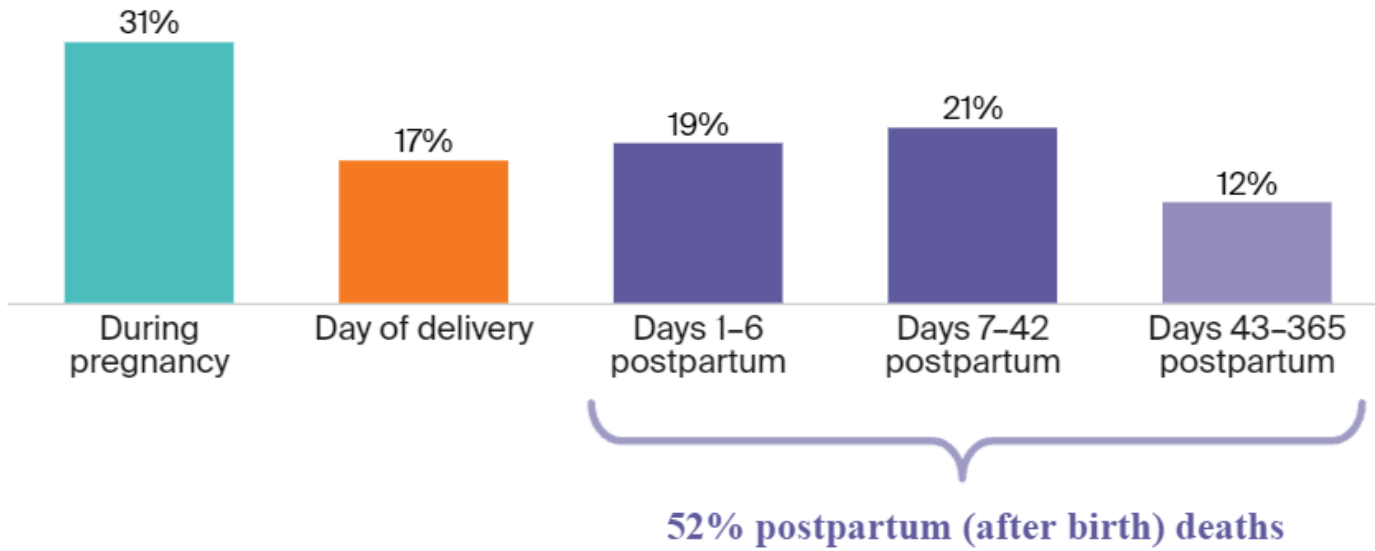
Maternal mortality: Death while pregnant or within 42 days of the end of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Used by the World Health Organization (WHO) in international comparisons, this measure is reported as a ratio per 100,000 births.

Exhibit 2

Timing of U.S. Maternal and Pregnancy-Related Deaths, 2011–2015



Pregnancy timeline

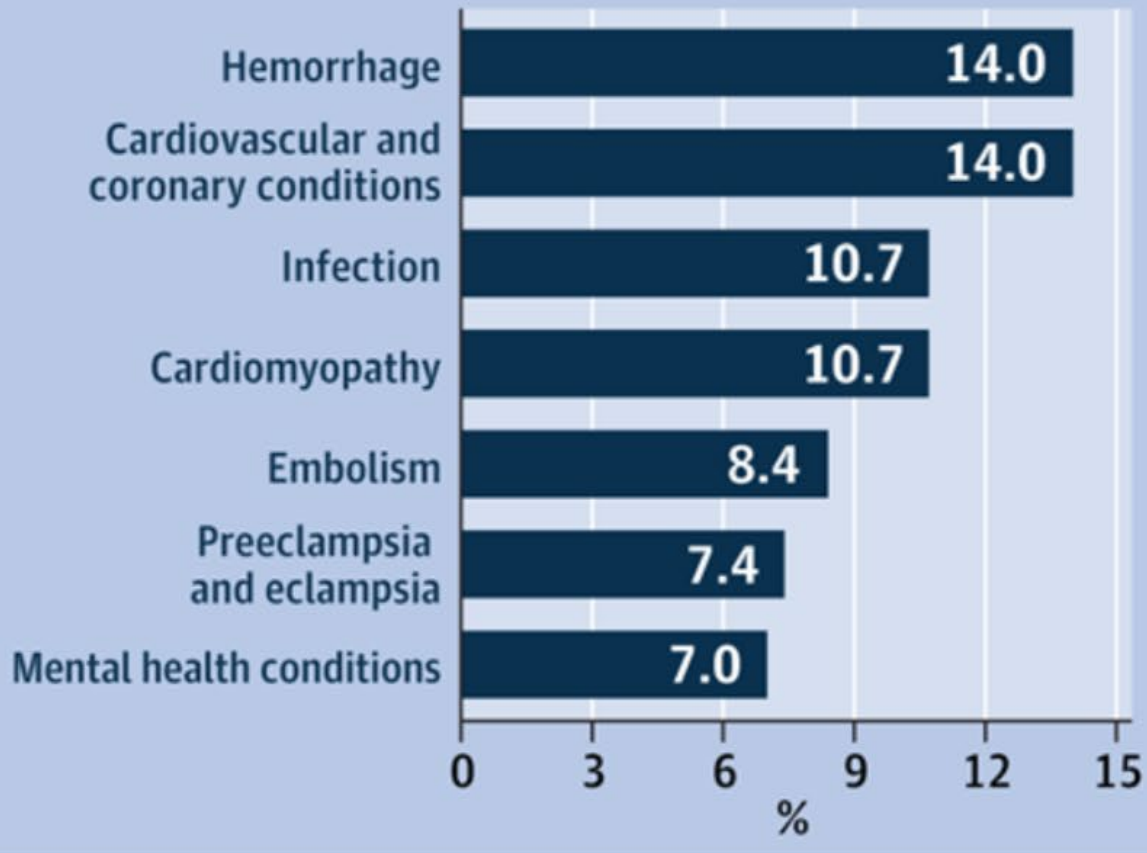


Data: Centers for Disease Control and Prevention Pregnancy-Related Mortality Surveillance data from: Emily E. Petersen et al., "Vital Signs: Pregnancy-Related Deaths, United States, 2011–2015, and Strategies for Prevention, 13 States, 2013–2017," *Morbidity and Mortality Weekly Report* 68, no. 18 (May 10, 2019): 423–29.

Source: Roosa Tikkanen et al., *Maternal Mortality and Maternity Care in the United States Compared to 10 Other Developed Countries* (Commonwealth Fund, Nov. 2020). https://doi.org/10.26099/411v-9255

Pregnancy-Related Deaths in the US

Leading underlying causes of pregnancy-related deaths



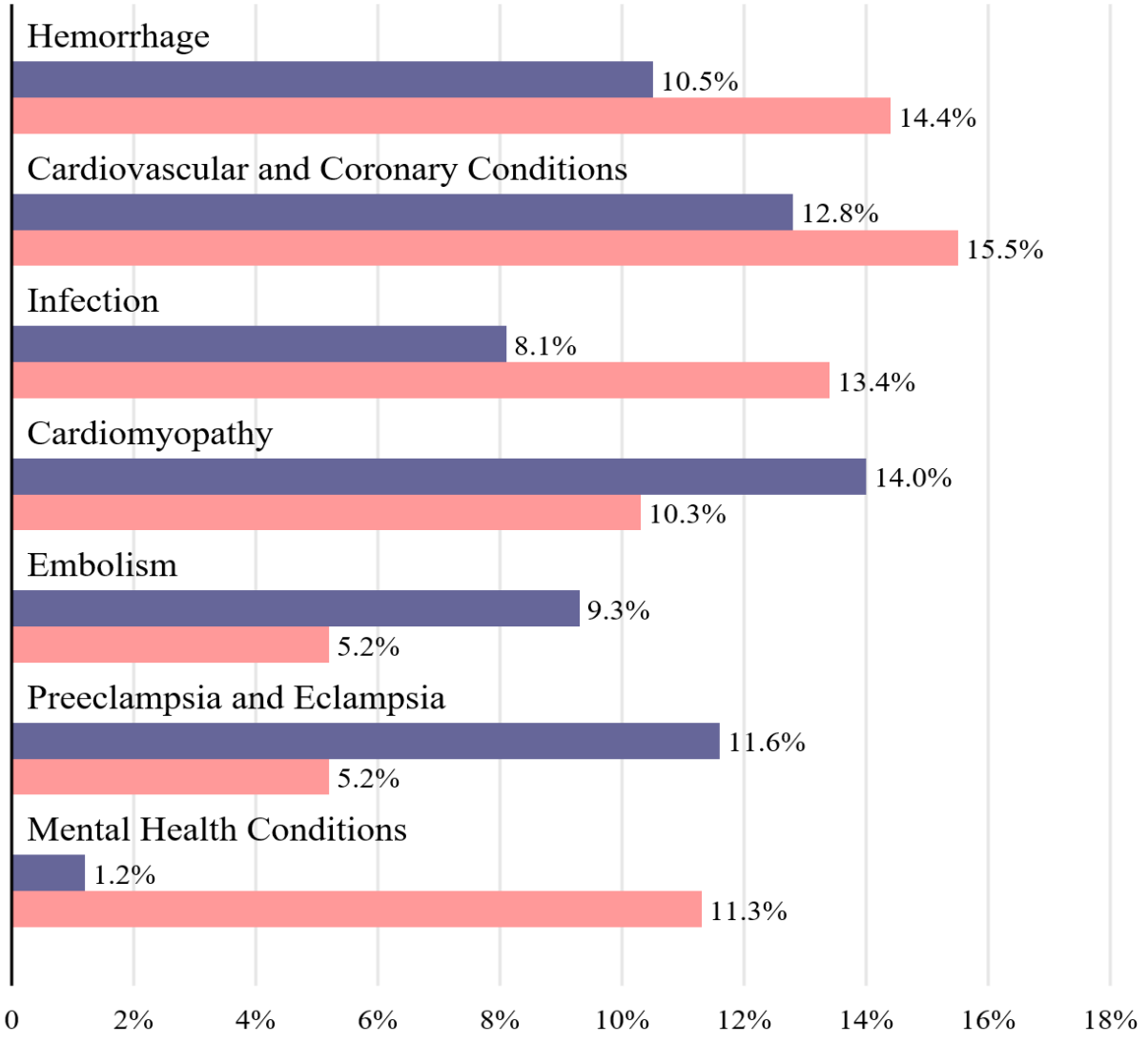
Preventability among pregnancy-related deaths

70.0%
of pregnancy-related deaths from **hemorrhage** are preventable

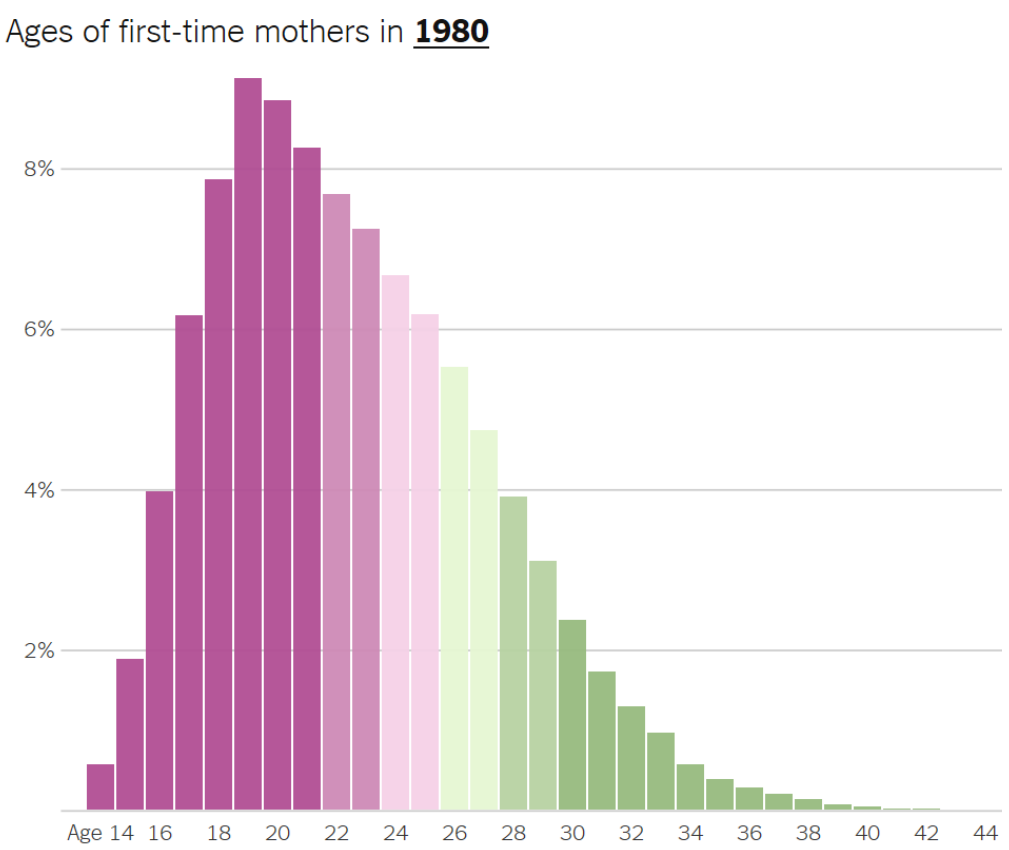
68.2%
of pregnancy-related deaths from **cardiovascular and coronary conditions** are preventable

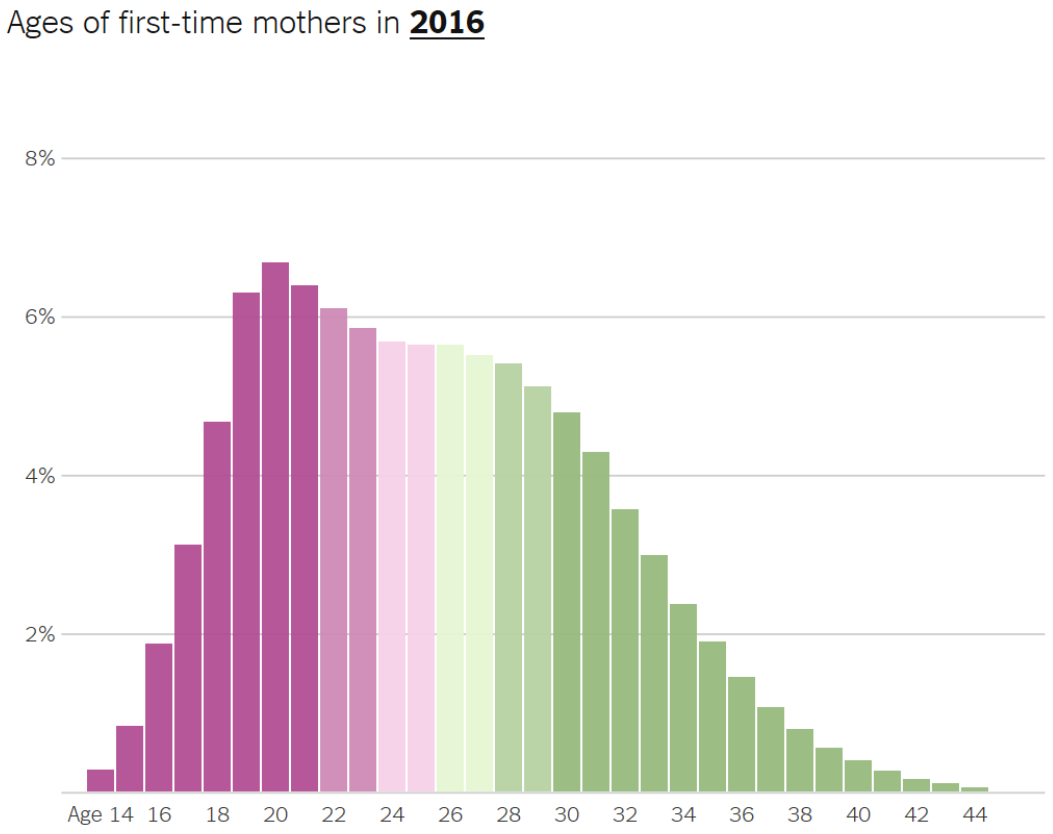
Source: Review to Action. *Report From Nine Maternal Mortality Review Committees.* https://reviewtoaction.org. Published 2018.

Pregnancy/Peripartum Risks by Race



Ages of First Time Mothers





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LEADERSHIP PAGE

Maternal Health

The Heart of the Matter

Edward T.A. Fry, MD, FACC, *President, American College of Cardiology*
Malissa J. Wood, MD, FACC, *Secretary and Board of Governors Chair, American College of Cardiology*
Mary Norine Walsh, MD, FACC, *Past President, American College of Cardiology*

ACC resources

- **The ACC Cardiovascular Disease in Women Committee and Cardio-Obstetrics Work Group have:**
  - published numerous scientific publications;
  - developed a “Cardio-Obstetrics Essentials "course in conjunction with the College’s Lifelong Learning Oversight Committee that was recently offered for the;
  - supported a cardio-obstetrics journal club;
  - hosted several educational webinars;
  - and collaborated with ACC state chapters and/or partner medical societies such as the American College of Obstetricians and Gynecologists, the Society for Cardiovascular Angiography and Interventions, and the American Heart Association to create educational content as well as to provide a clinical community and opportunity for engagement of interested clinicians.

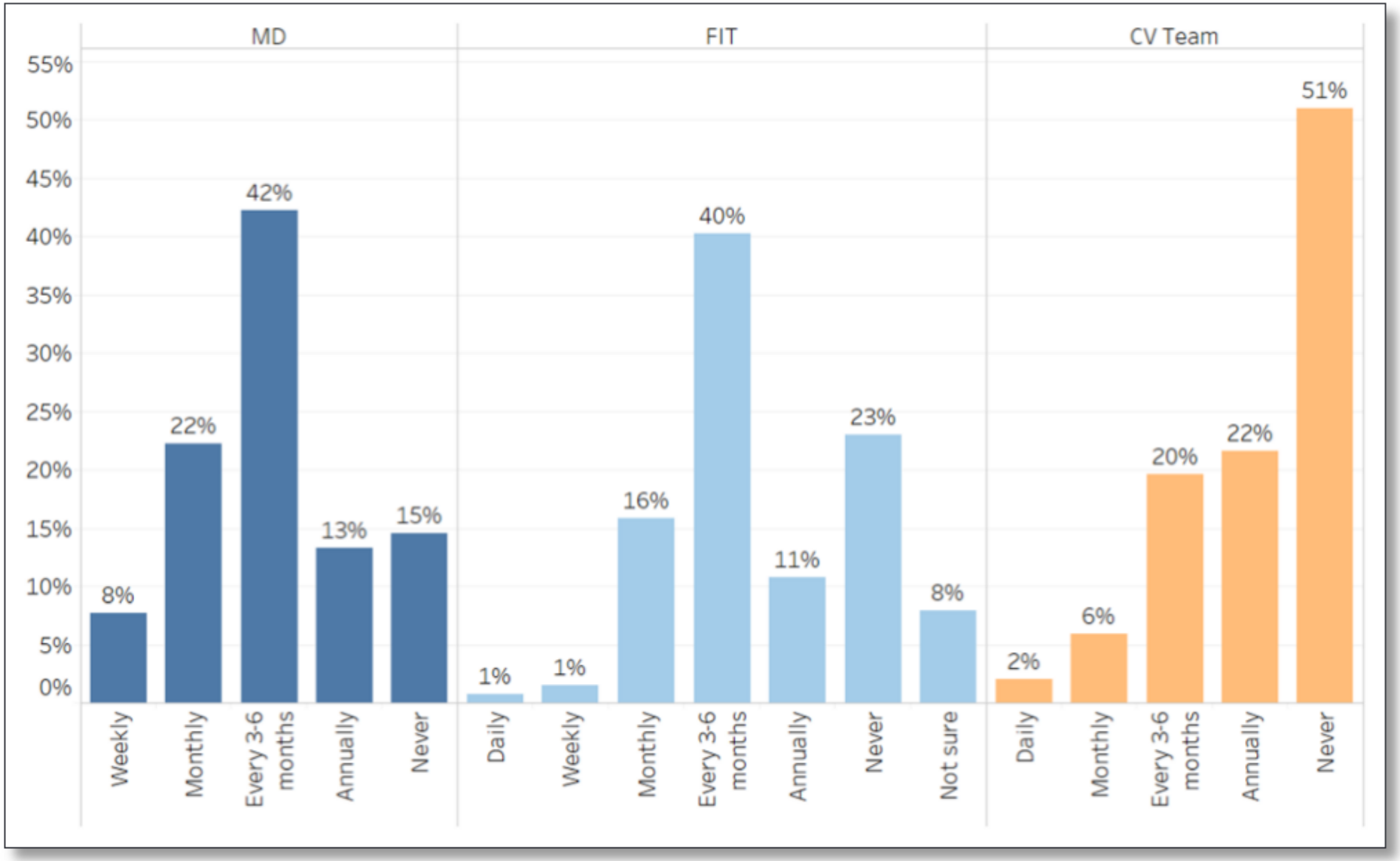


Figure 1. Reported frequency of evaluation of a pregnant or lactating patient by survey group.
Reported frequency of evaluation of a pregnant or lactating patient for the 3 surveyed groups: cardiologists (MDs), fellows in training (FITs), cardiovascular team (CV Team) members.

Bello, et al. JAHA April 2022

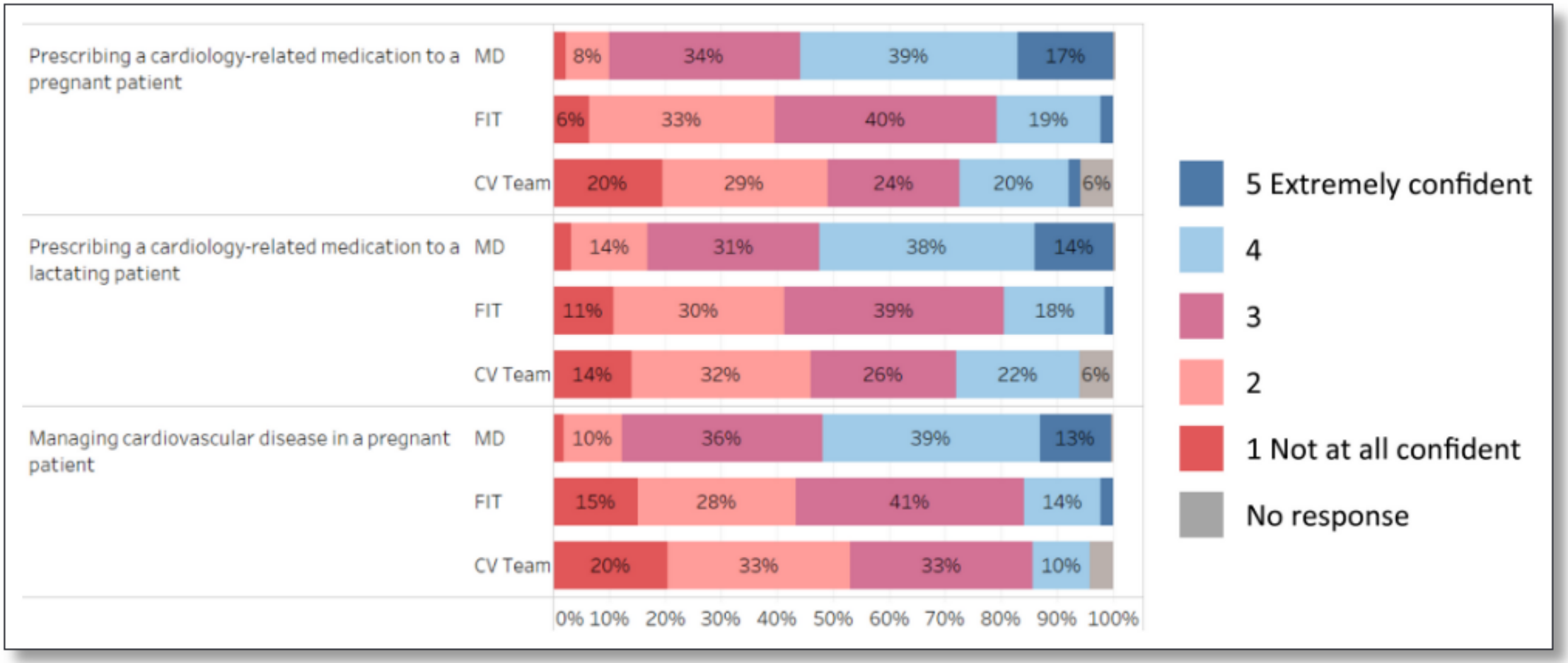


Figure 2. Self-reported confidence in treating pregnant or lactating patients by survey group.
Self-reported confidence in treating pregnant or lactating patients for the 3 surveyed groups: cardiologists (MDs), fellows in training (FIT), cardiovascular team (CV Team) members.

Bello, et al. JAHA April 2022

Preconception

- Contraception advice
- Optimize medical status
- Medication adjustment
- Risk assessment:
  - mWHO
  - CARPREG II
  - ZAHARA

Pregnancy

- Team-based care with patient
- Serial monitoring
- Delivery planning balancing maternal/ fetal risks

Labor/Delivery

- Mode: Vaginal delivery usually preferred
- Regional anesthesia
- Monitoring: consider pulse oximetry, telemetry if indicated

Postpartum

- Monitoring: minimum 48 hours
- Assess and treat cardiovascular complications
- Patient counseling on symptoms of complications

Fourth Trimester

- 3-7 days follow-up post-discharge
- Comprehensive evaluation within 6 weeks
- Consider addition of telehealth visits
- Contraception

Long-Term

- Identify women with APO (preeclampsia and hypertensive disorders, gestational diabetes, preterm delivery, small for gestational age)
- CVD risk screening

Davis, M.B. et al. J Am Coll Cardiol. 2021;77(14):1763-77.

TABLE 1 CARPREG II Risk Prediction Model

CARPREG II Predictors	Points
Prior cardiac event or arrhythmia	3
Baseline NYHA functional class III to IV or cyanosis	3
Mechanical valve	3
Ventricular dysfunction	2
High-risk left-sided valve disease/LVOT obstruction	2
Pulmonary hypertension	2
Coronary artery disease	2
High-risk aortopathy	2
No prior cardiac intervention	1
Late pregnancy assessment	1
CARPREG II Score	**Predicted Risk, %**
0 to 1	5
2	10
3	15
4	22
>4	41

CARPREG = Cardiac Disease in Pregnancy Study; LVOT = left ventricular outflow tract; NYHA = New York Heart Association.

TABLE 2 ZAHARA Risk Prediction Model Derived From Patients With Congenital Heart Disease

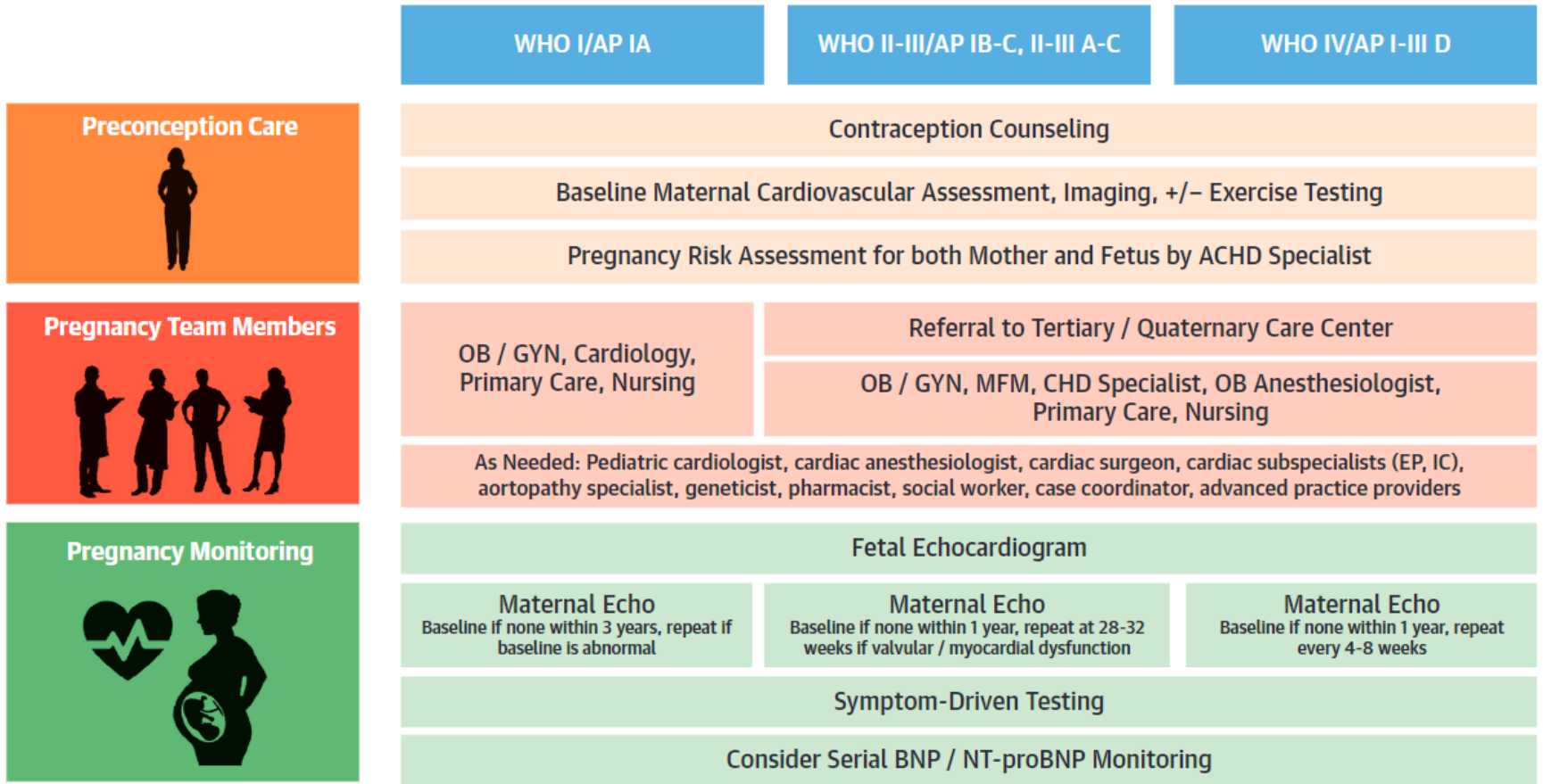
ZAHARA Predictors	Points
Prior arrhythmia	1.5
Cardiac medications before pregnancy	1.5
NYHA functional class ≥II	0.75
Left heart obstruction	2.5
Moderate or severe mitral regurgitation	0.75
Moderate or severe tricuspid regurgitation	0.75
Mechanical valve	4.25
Cyanotic heart disease (corrected or uncorrected)	1
ZAHARA Score	**Predicted Risk, %**
0–0.5	2.9
0.51–1.50	7.5
1.51–2.50	17.5
2.51–3.50	43.1
>3.50	70.0

NYHA = New York Heart Association; ZAHARA = Zwangerschap bij Aangeboren HARtAfwijking (Pregnancy in Women With Congenital Heart Disease) study.

ASCENSION

Davis, M.B. et al. J Am Coll Cardiol. 2021;77(14):1763–77.

CENTRAL ILLUSTRATION Multidisciplinary Cardio-Obstetrics Team Management for Women with Congenital Heart Disease



Lindley, K.J. et al. J Am Coll Cardiol. 2021;77(14):1778–98.

The ACHD Anatomy + Physiological Stage Classification scheme is based on simple, moderate, or great anatomical complexity (I, II or III respectively) and increasingly severe stages of abnormal physiology (A to D). The AP Stage Classification is outlined in detail in the 2018 AHA/ACC Guideline for the Management of Adults With Congenital Heart Disease (3). ACC = American College of Cardiology; AHA = American Heart Association; AP = ACHD Anatomy + Physiological Stage Classification; BNP = brain natriuretic peptide; CHD = adult congenital heart disease; EP = electrophysiology; IC = interventional cardiology; MFM = maternal-fetal medicine; NT-proBNP = N-terminal-pro hormone brain natriuretic peptide; OB/GYN = obstetrics and gynecology; WHO = World Health Organization.

CENTRAL ILLUSTRATION Management of Complex Acquired and Heritable Cardiovascular Disease in Pregnancy and Considerations for Subspecialty Cardiovascular Care

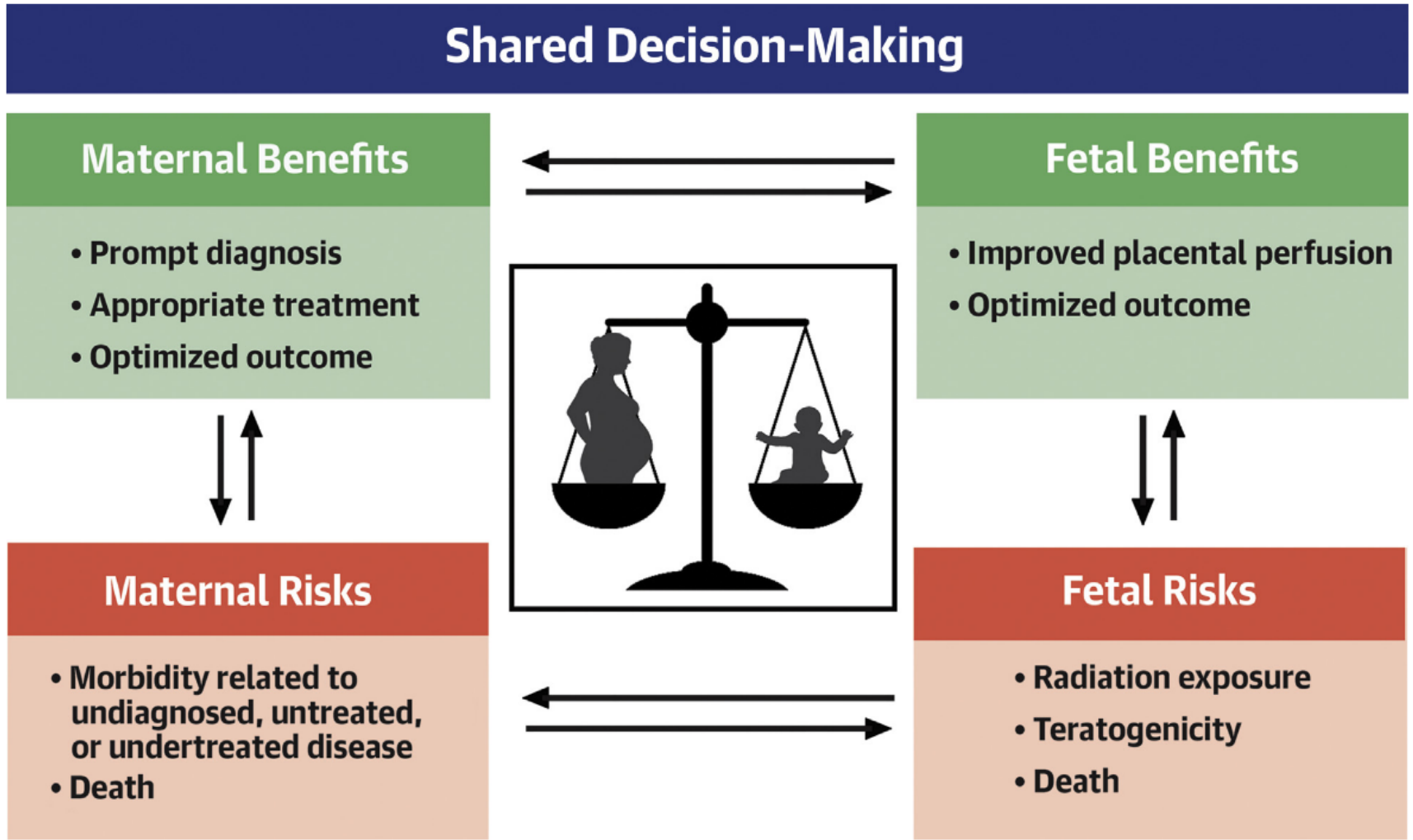
	Preconception Assessment	Peripartum Management	Postpartum/Long Term Management
Ischemic Heart Disease	• History of PCI/MI • Evaluate CAD medications • Symptom assessment	• Assessment for possible ACS • Consideration for coronary angiography • Management of antiplatelet therapy	• Contraception • Counseling for consideration of future pregnancies • Long term CVD risk modification
Cardiomyopathy	• History of cardiomyopathy • Evaluate HF medications • Functional class and myocardial reserve	• Acute HF management • Medication adjustment postpartum • Anticoagulation in women with PPCM	
Arrhythmia	• History of implantable device • History of arrhythmia • Assessment of antiarrhythmics, anticoagulation	• Acute management of arrhythmias • Consideration of ablation for acute refractory arrhythmias	
Hypertensive Disorders of Pregnancy	• History of chronic hypertension • Antihypertensive medication adjustment • Prevention of preeclampsia with low dose ASA	• Management of acute and severe hypertension • Medication adjustment postpartum • Postpartum blood pressure monitoring	

Multidisciplinary Expertise: Hypertension, Interventional, Electrophysiology, and Heart Failure

Park, K. et al. J Am Coll Cardiol. 2021;77(14):1799-812.

Cardiovascular subspecialties should be included in the assessment and management of various cardiovascular conditions during pregnancy shown. ACS = acute coronary syndrome; ASA = acetylsalicylic acid or aspirin; CAD = coronary artery disease; CVD = cardiovascular disease; HF = heart failure; MI = myocardial infarction; PCI = percutaneous coronary intervention; PPCM = peripartum cardiomyopathy.

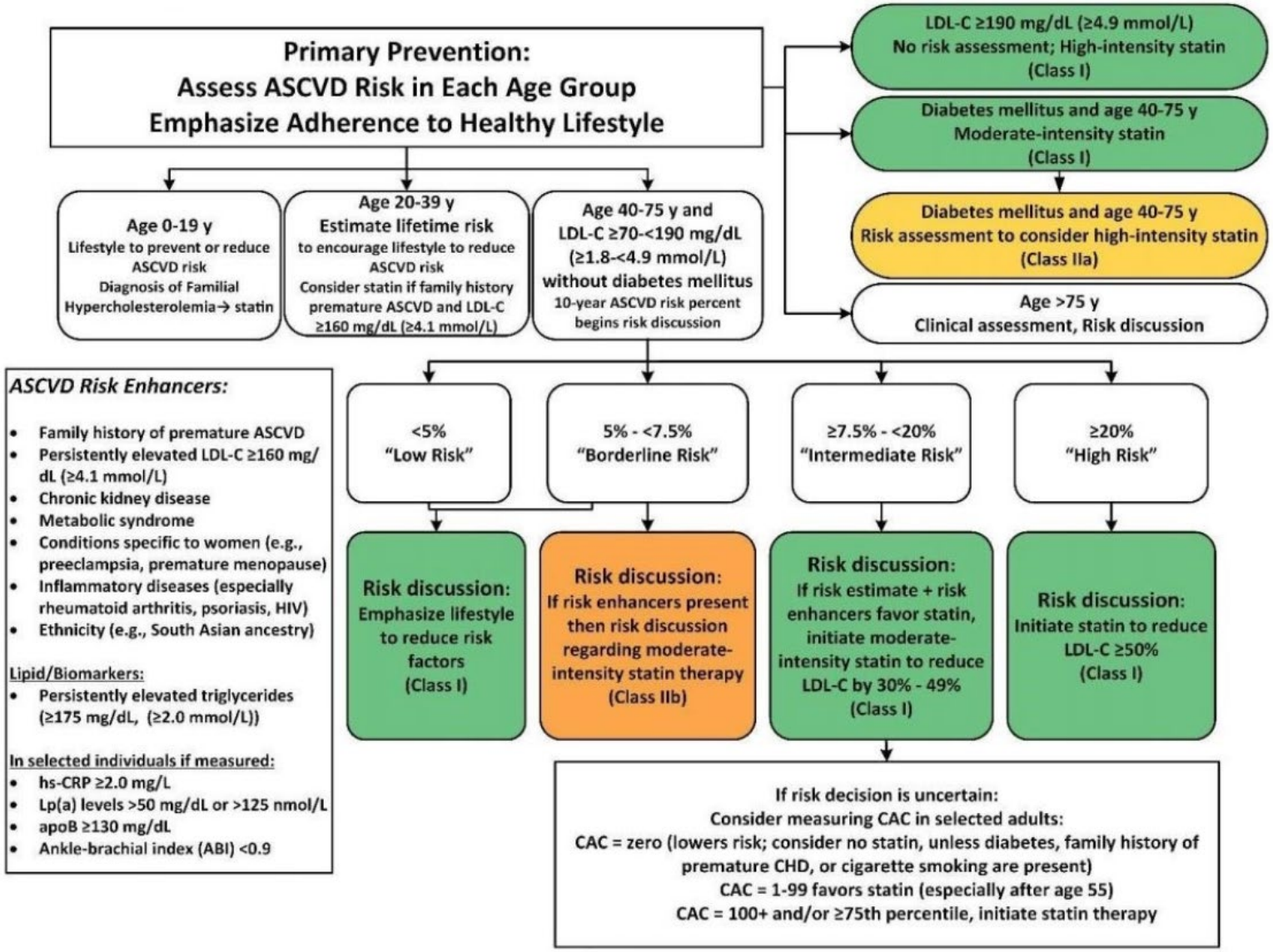
CENTRAL ILLUSTRATION **Shared Decision-Making Is the Cornerstone of Providing Optimal Care to Pregnant Women**



Bello, N.A. et al. J Am Coll Cardiol. 2021;77(14):1813-22.

When choosing diagnostic tests and medications for pregnant and lactating women, the interplay between maternal and fetal/infant risks and benefits must be carefully considered. Shared decision-making in consultation with the patient and cardio-obstetrics team is essential for optimal outcomes.

2019 ACC/AHA Guidelines on the Primary Prevention of Cardiovascular Disease



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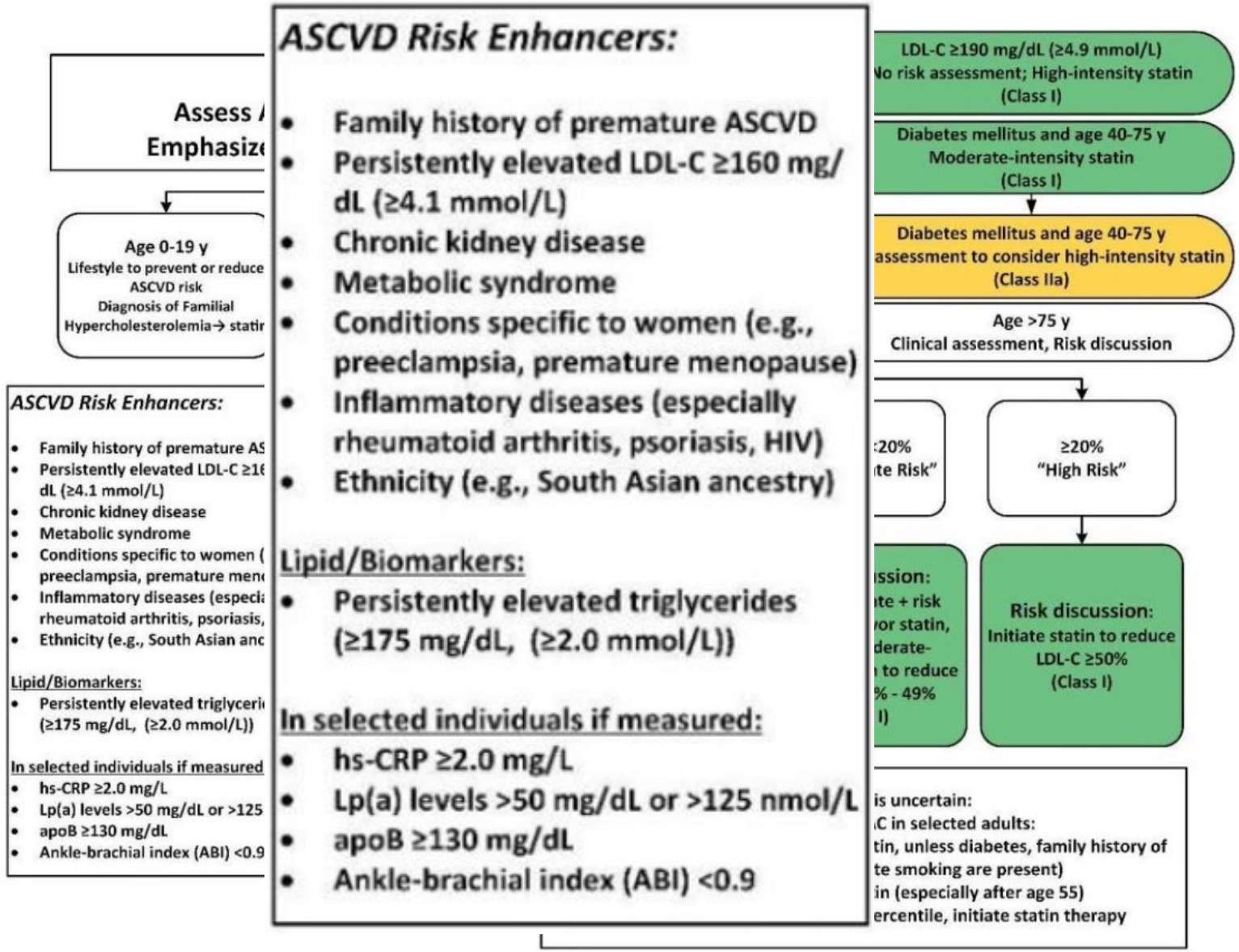
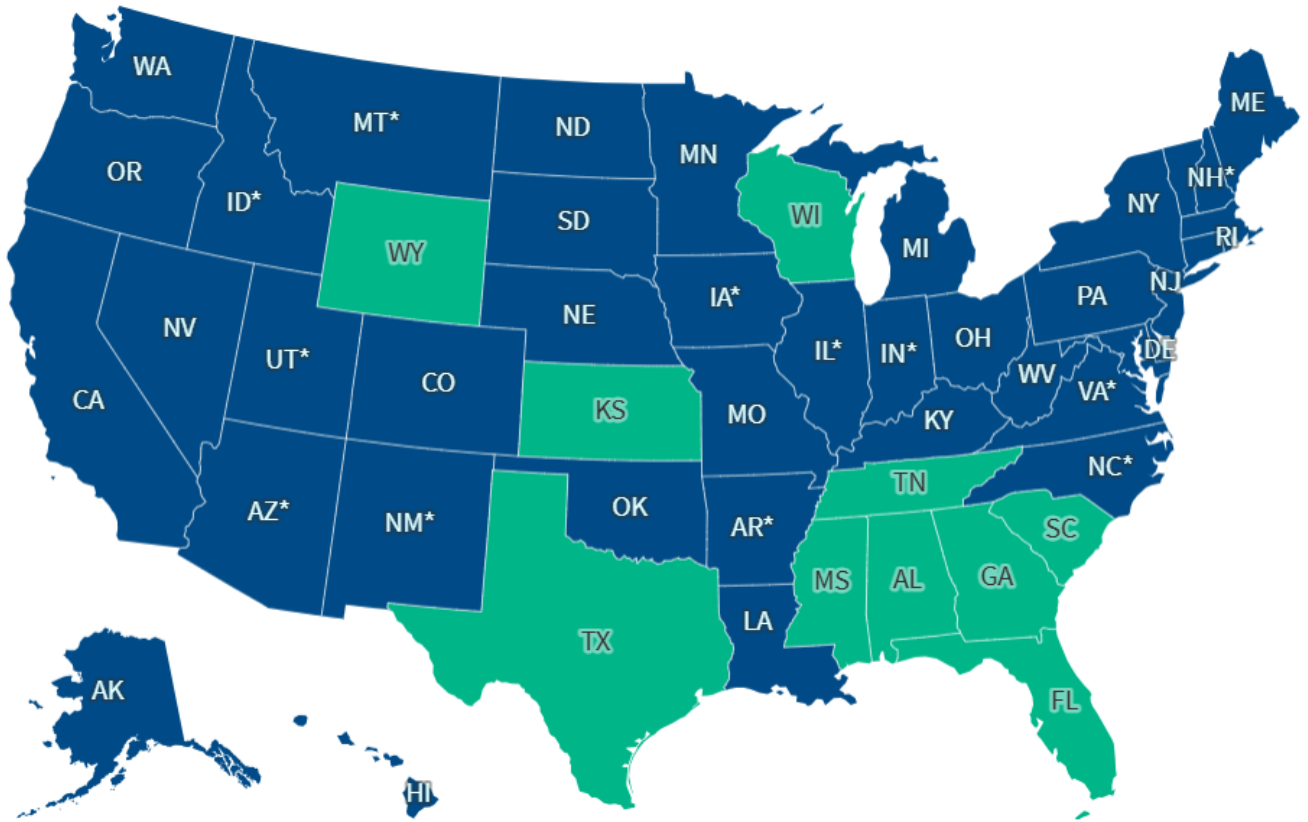


Medicaid expansion impacts maternal mortality

- The Medicaid program finances 40% of births in the U.S.
- The Affordable Care Act's (ACA) Medicaid expansion expanded Medicaid coverage to nearly all adults with incomes up to 138% of the Federal Poverty Level ($17,774 for an individual in 2021) and provided states with an enhanced federal matching rate (FMAP) for their expansion populations.
- The federal government covers 90% of the cost of Medicaid expansion under the ACA

Status of State Action on the Medicaid Expansion Decision

Adopted and implemented (41 states including DC) Not adopted (10 states)



Note: * State has a trigger law that would end expansion coverage or require states to take steps to mitigate increases in state costs if federal funding for the expansion is reduced.

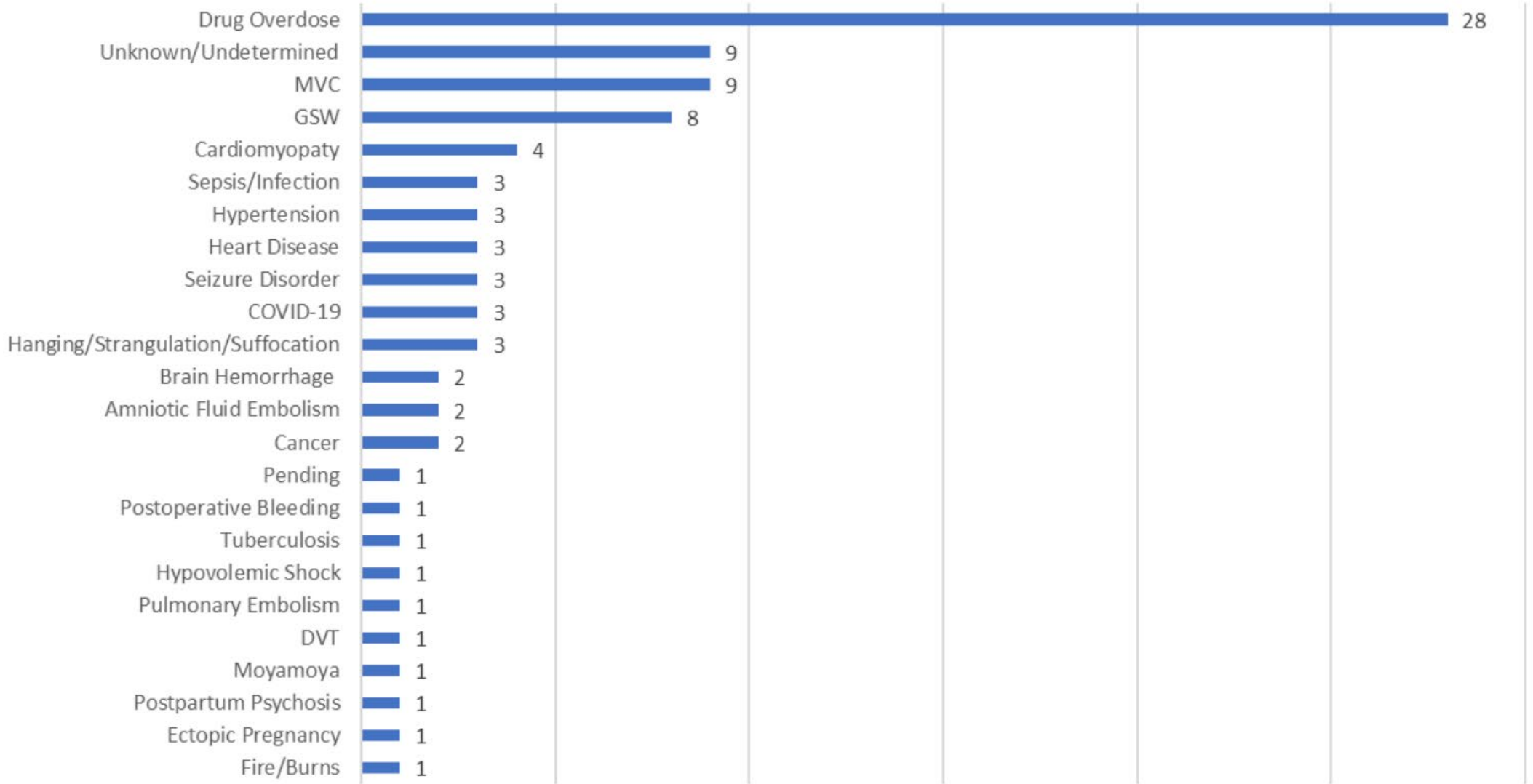
Source: KFF tracking and analysis of state actions related to adoption of the ACA Medicaid expansion and Searing, Adam. "Federal Funding Cuts to Medicaid May Trigger Automatic Loss of Health Coverage for Millions of Residents of Certain States." Say Ahhh! Georgetown Center for Children and Families, November 27, 2024 • Get the data • Download PNG

KFF

Understand Maternal Mortality in Your State

Figure 36: Committe Determination Causes of Death for all 2020 Pregnancy-Associated Deaths

Indiana MMRC 2020 (n=92)



Guiding Principles and Member Guidance: Maternal CV Care

Jul 15, 2022

ACC News Story

Background:

The ACC has long advocated for patients engaging with their doctor and the cardiovascular care team about their heart health and related risks. Shared decision-making is an essential tool in helping to navigate the risks and benefits of all treatment options, taking into account the latest science and medical evidence, social determinants of health, emphasis on health equity, and the patient's own beliefs and goals.

While the ACC has no official policy on abortion, clinical practice guidelines and other clinical guidance tools address the dangers of pregnancy in certain patient populations at higher risk of death or serious cardiac events. As such, the College is deeply concerned about the potential implications of the Supreme Court decision regarding *Dobbs vs. Jackson* on the ability of patients and clinicians to engage in important shared discussions about maternal health, or to remove previously available health care options, especially given the alarming maternal health crisis in the U.S.

Similar to topics like gun violence that impact the broader medical community and the patients we serve, the ACC will continue to work with the larger House of Medicine to address specific laws and policies as they move forward that would threaten or criminalize patient-clinician discussions regarding maternal cardiovascular care.

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