Nursing our mothers back to health:
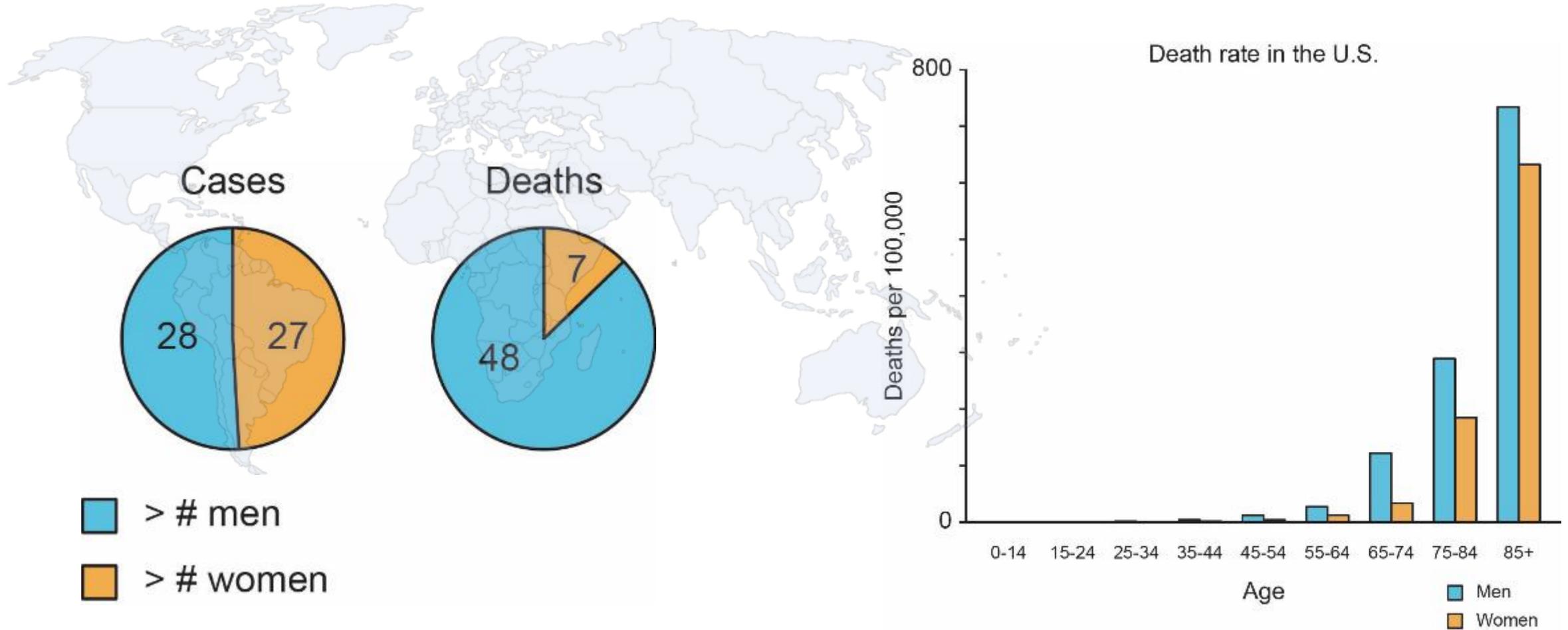## NIH's plans to improve maternal health

Janine A. Clayton, M.D.

NIH Associate Director for Research on Women's Health

Director, Office of Research on Women's Health
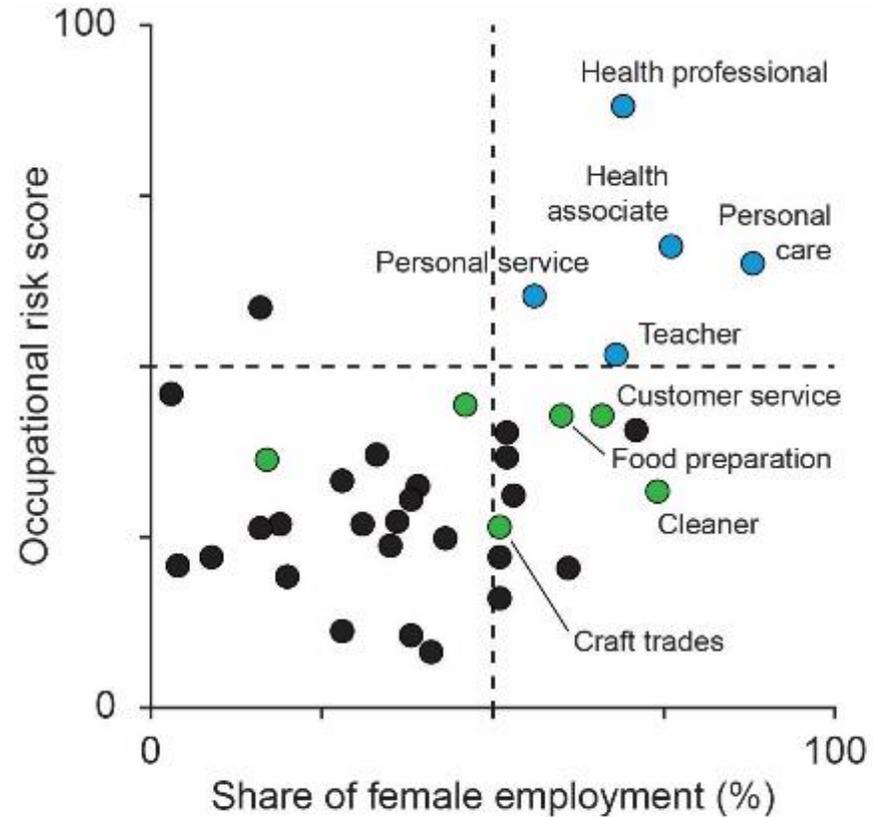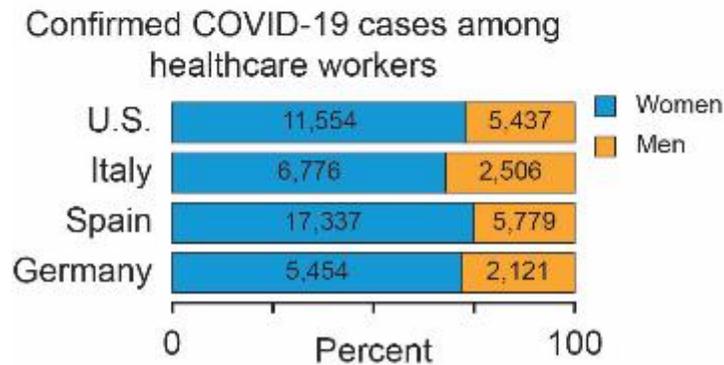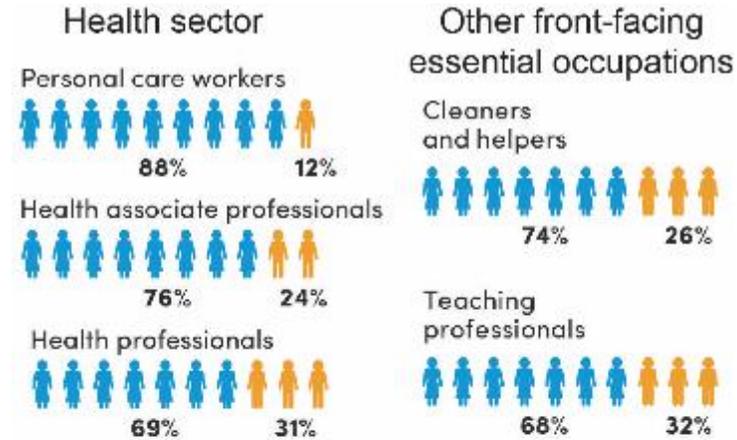
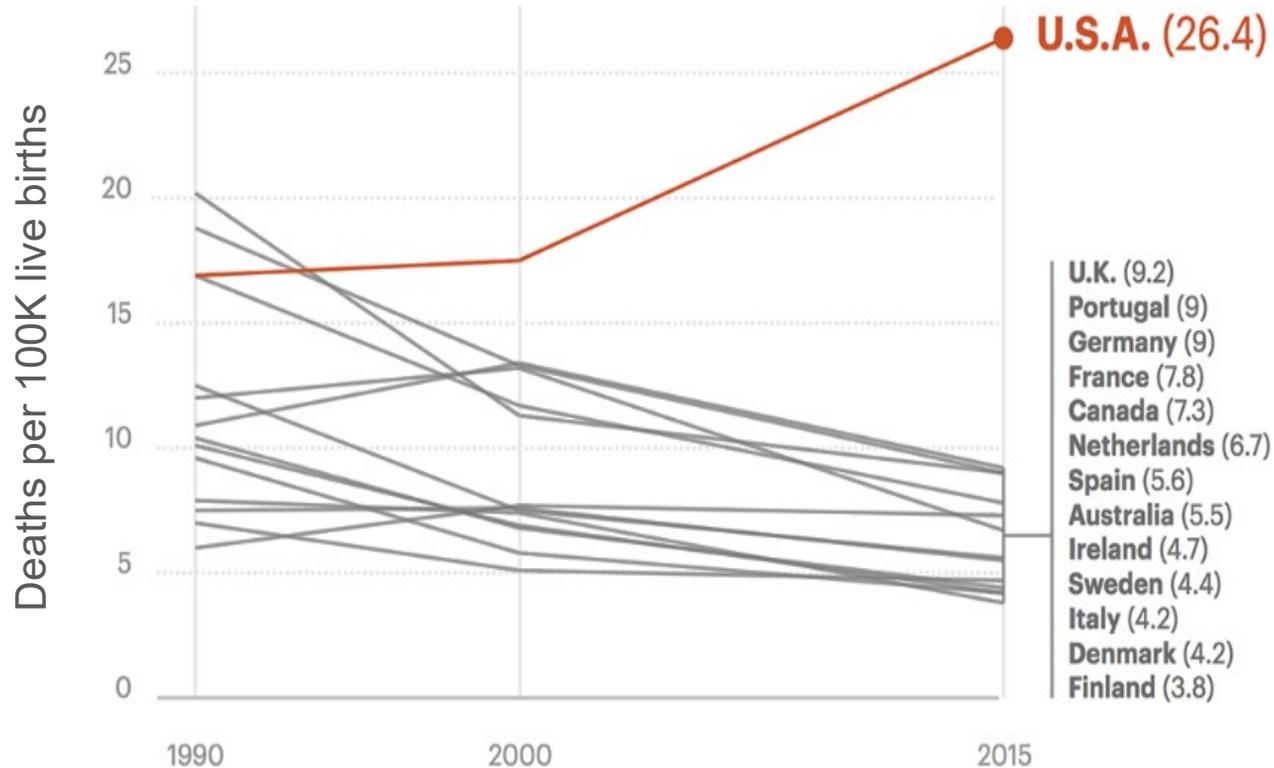National Institutes of Health

January 26, 2021

Facebook: /NIHORWH
Twitter: @NIH_ORWH

www.nih.gov/women

#ResearchForWomen

COVID-19 underscores the need for inclusive research

Women are more vulnerable to infection from occupational risk

Health sector

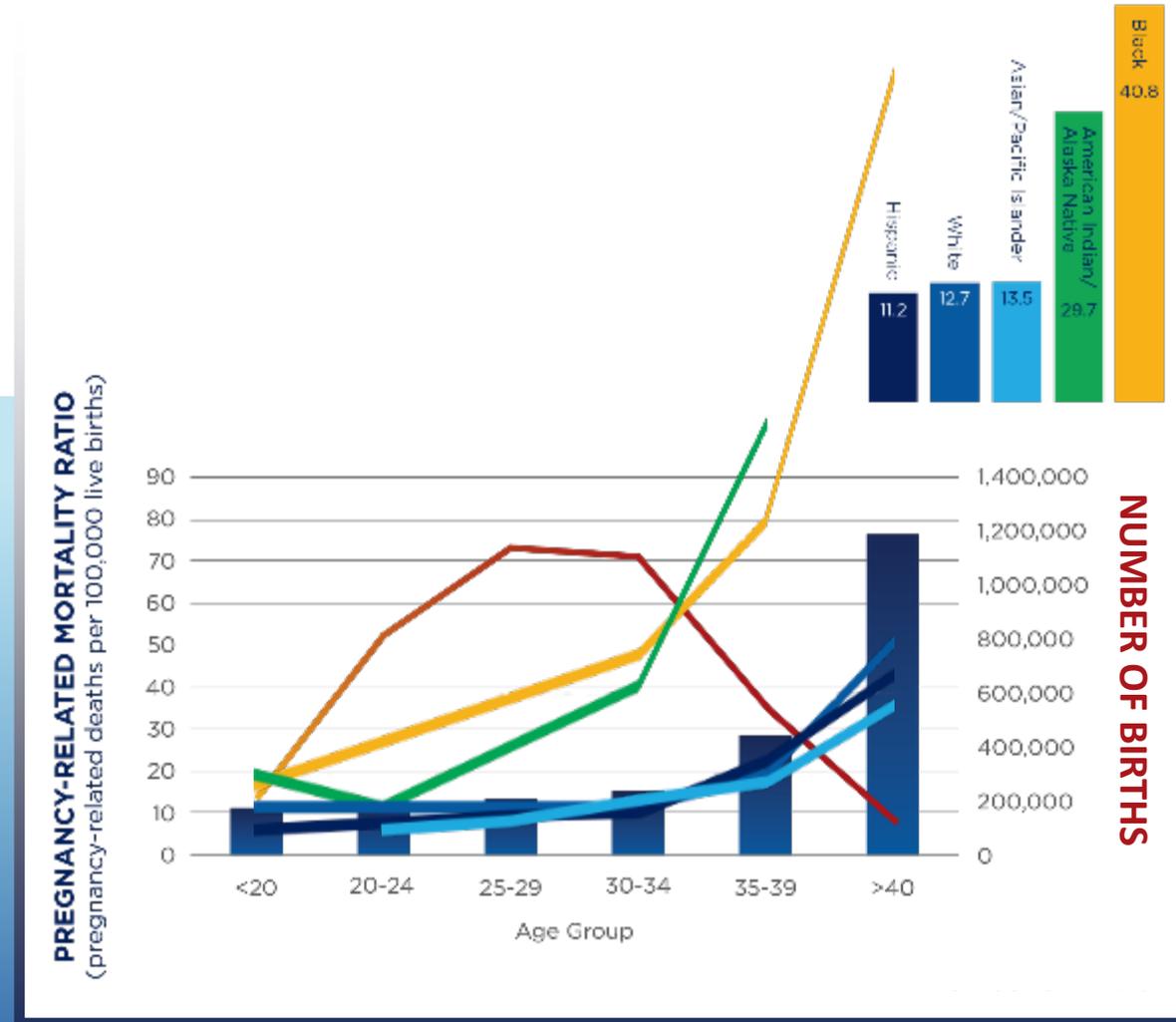**Personal care workers**
88%   12%

Health associate professionals
76%   24%

Health professionals
69%   31%

Other front-facing essential occupations

Cleaners and helpers
74%   26%

Teaching professionals
68%   32%

Confirmed COVID-19 cases among healthcare workers

	Women	Men
U.S.	11,554	5,437
Italy	6,776	2,506
Spain	17,337	5,779
Germany	5,454	2,121

0   Percent   100

UN WOMEN | WOMEN COUNT

Occupational risk score (vertical axis, 0 to 100)
Share of female employment (%) (horizontal axis, 0 to 100)

Health professional
Health associate
Personal care
Personal service
Teacher
Customer service
Food preparation
Cleaner
Craft trades

● Highly feminized occupation with high COVID-19 risk
● High risk of job loss

Azcona et al. 2020. WHO Spotlight: Will the pandemic derail hard-won progress on gender equality?

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Maternal mortality is increasing in the U.S. as it declines around the world

Deaths per 100K live births

U.S.A. (26.4)

U.K. (9.2)
Portugal (9)
Germany (9)
France (7.8)
Canada (7.3)
Netherlands (6.7)
Spain (5.6)
Australia (5.5)
Ireland (4.7)
Sweden (4.4)
Italy (4.2)
Denmark (4.2)
Finland (3.8)

1990   2000   2015

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The causes of maternal mortality are diverse and complex

5

The causes of maternal mortality are diverse and complex

Leading causes of maternal mortality
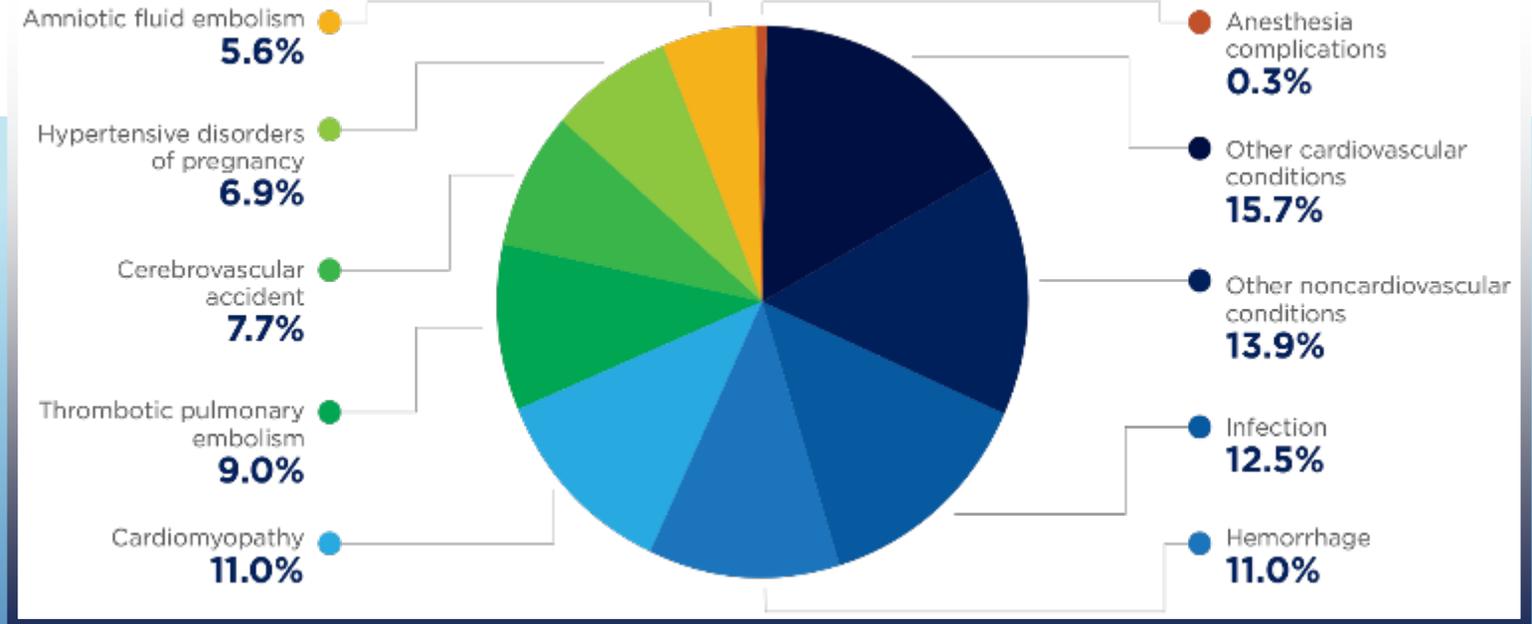
Amniotic fluid embolism
5.6%

Hypertensive disorders
of pregnancy
6.9%

Cerebrovascular
accident
7.7%

Thrombotic pulmonary
embolism
9.0%

Cardiomyopathy
11.0%

Anesthesia
complications
0.3%

Other cardiovascular
conditions
15.7%

Other noncardiovascular
conditions
13.9%

Infection
12.5%

Hemorrhage
11.0%

The causes of maternal mortality are diverse and complex

Proportion of deaths by timing of death

31% During pregnancy

17% Day of delivery

19% 1 to 6 days postpartum

21% 7 to 42 days postpartum

12% Between 43 and 365 days postpartum

HHS. 2020. Healthy women, healthy pregnancies, healthy futures: Action plan to improve maternal health in America.
https://aspe.hhs.gov/system/files/aspe-files/264076/healthy-women-healthy-pregnancies-healthy-future-action-plan_0.pdf
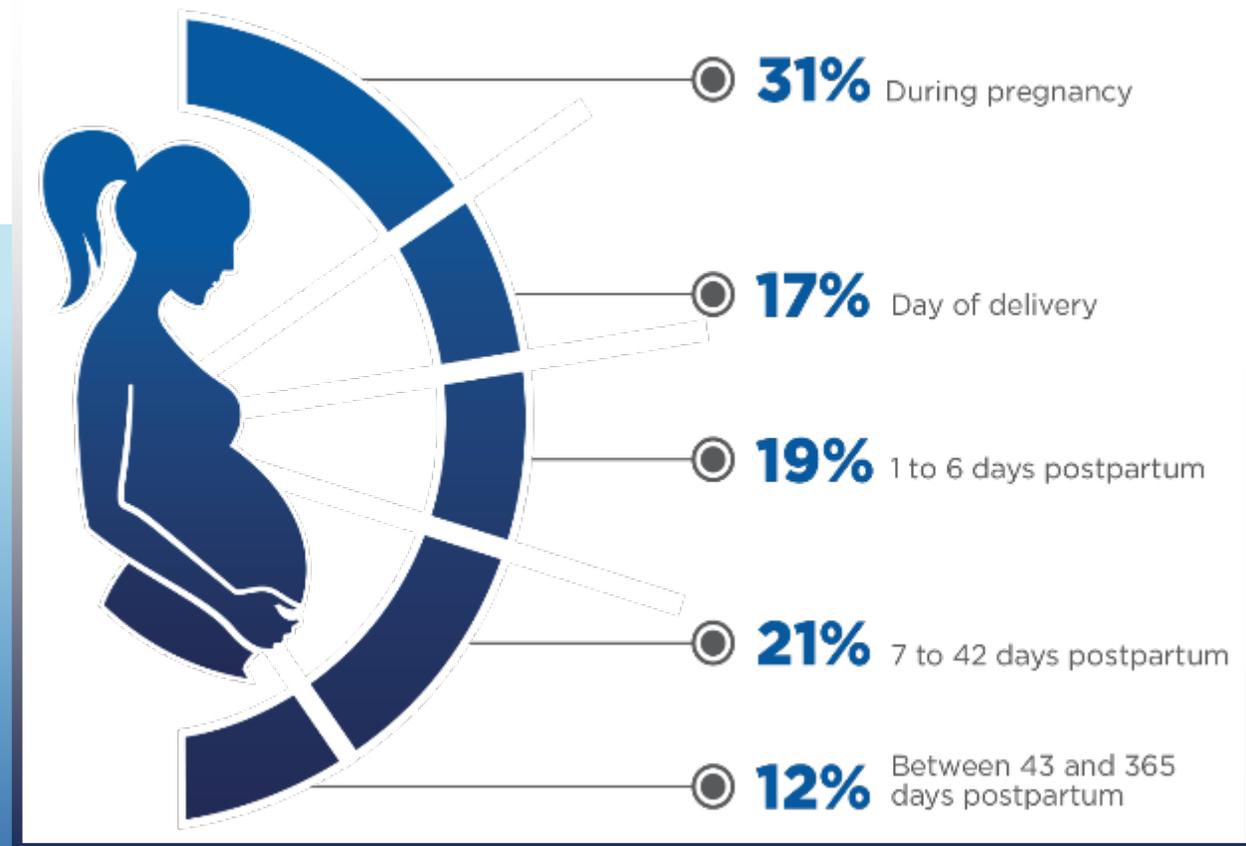Petersen EE, Davis NL, Goodman D, et al. 2019. *MMWR Morb. Mortal. Wkly. Rep.* 68: 423-429.
https://www.cdc.gov/mmwr/volumes/68/wr/mm6818e1.htm

The causes of maternal mortality are diverse and complex

Percent of deaths attributable to cardiovascular conditions by timing of death

Timing	Percent
During Pregnancy	31%
Day of Delivery	19%
1-6 days postpartum	24%
7-42 days postpartum	41%
43-365 days postpaartum	60%

0%   20%   40%   60%   80 %   100%

HHS. 2020. Healthy women, healthy pregnancies, healthy futures: Action plan to improve maternal health in America.
https://aspe.hhs.gov/system/files/aspe-files/264076/healthy-women-healthy-pregnancies-healthy-future-action-plan_0.pdf
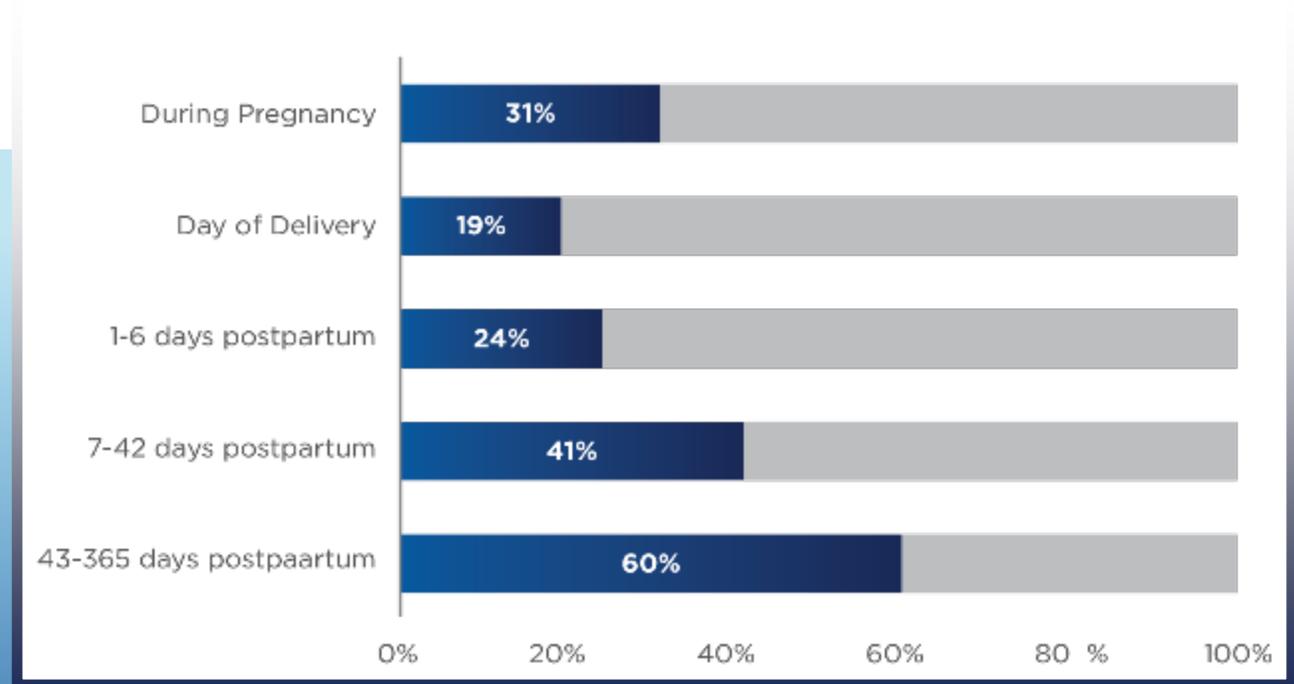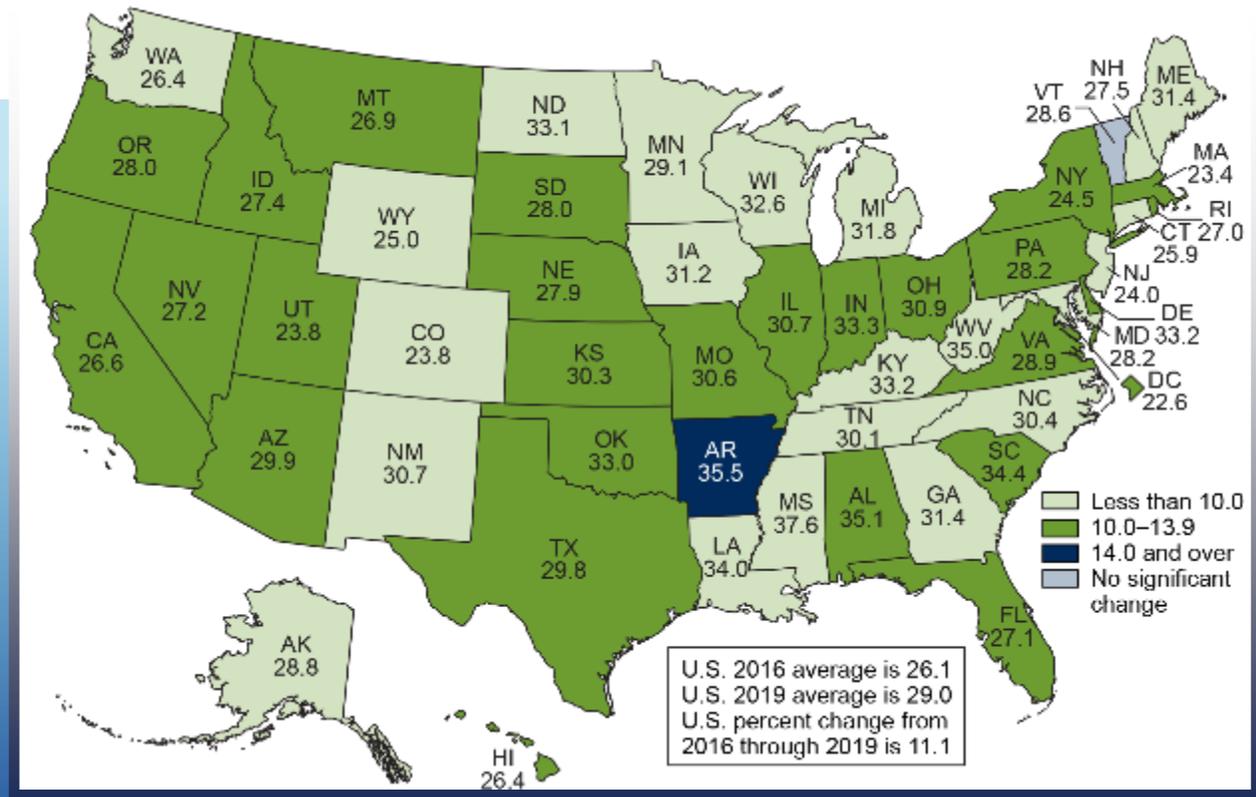Petersen EE, Davis NL, Goodman D, et al. 2019. *MMWR Morb. Mortal. Wkly. Rep.* 68: 423-429.
https://www.cdc.gov/mmwr/volumes/68/wr/mm6818e1.htm

The causes of maternal mortality are diverse and complex

Rise in pre-pregnancy obesity in 49 states from 2016 to 2019

Maternal mortality is the tip of the iceberg: We must solve many problems to improve women's health

Maternal Mortality

Maternal Morbidity → Affects over 100× more women than maternal mortality

Social Determinants of Health →

Complex and include:
- Health care access & quality
- Social, economic, & educational status
- Health consequences of racism & discrimination

NIH's Strategic Plan for women's health research aims to help mothers

1.5 Expand research on female-specific conditions and diseases, including reproductive stages, and maternal and gynecologic health.
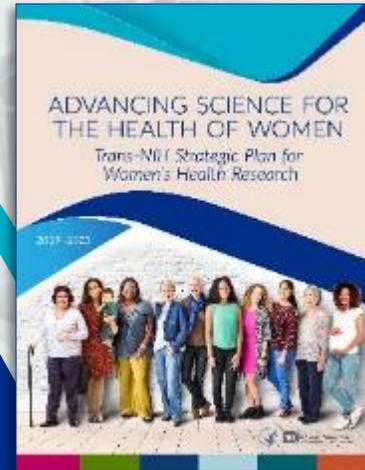
2.4 Expand and refine methods to improve recruitment and retention of women underrepresented in clinical research.

3.2 Identify collaborative opportunities and leverage partnerships to disseminate research.

4.4 Promote and support policies, mentoring and networks, collaborations, and infrastructure to retain and advance women in their careers.

5.2 Identify priority areas for additional study to advance the health of women.

https://orwh.od.nih.gov/about/trans-nih-strategic-plan-womens-health-research

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NIH-wide efforts target maternal health disparities

IMPROVE
NICHD, OD, ORWH

Maternal Mortality Task Force

- Cardiovascular disease
- Infection/immunity
- Mental health

FY20: 36 Awards, $7.5M

NIH | Eunice Kennedy Shriver National Institute of Child Health and Human Development

U3
ORWH

Understudied, Underreported, Underrepresented women

- Sickle cell disease
- Fibroid growth
- Biologic & social determinants of severe maternal morbidity

FY20: 11 Awards, $1.6M

IDeA States
NIGMS, ORWH

Institutional Development Award States program

Expand women's health research & research capability across the U.S.

FY20: 19 Awards, $4.8M

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Office of Research on Women's Health

IMPROVE: Implementing a Maternal health and Pregnancy Outcomes Vision for Everyone

- NIH-wide program that funds interdisciplinary research in foundational biology, behavioral, & sociocultural science
    1. Gain evidence on causes of maternal mortality & morbidity
    2. Improve health for women before, during, & after delivery
    3. Reduce preventable causes of maternal deaths

- Promote health equity in the U.S.
    - Evaluate structural & health care system issues in populations with high rates of maternal deaths & complications
    - Develop community partnerships to assess vulnerabilities & implement interventions to improve outcomes

- 36 projects ($7.5M) in FY2020
    - 17 ICOs participating; 12 funding projects

https://www.nih.gov/research-training/medical-research-initiatives/improve-initiative

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Office of Research on Women's Health
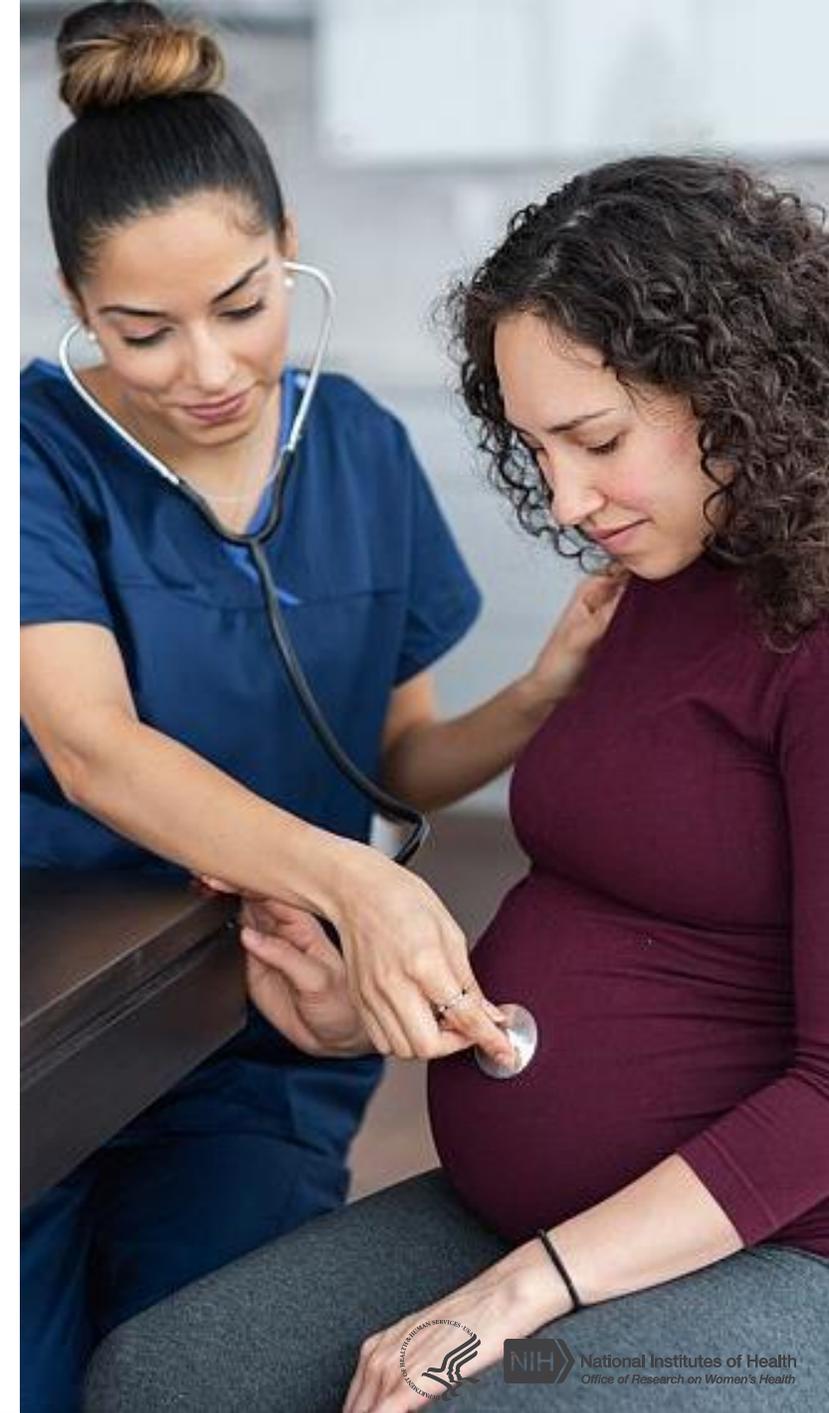
Goal 1: Incorporate community partnerships and participation to resolve health disparities

IC	Organization	Project
NICHD	Washington University	A health equity paradigm shift: Predictors of healthy pregnancy in African American women.
NIDA	Medical University of South Carolina	Reducing racial disparities and maternal mortality associated with untreated peripartum substance use and mental health disorders.
OD	Michigan State University	Mitigating the impact of implicit bias on maternal morbidity and mortality for African American women.
NINR	University of Pennsylvania	The role of host-microbial interactions in altering preterm birth risk among black women.

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Goal 2: Research leading causes of MMM to strengthen care and prevention strategies and improve outcomes

IC	Organization	Project
NIMH	University of Washington	Remote supervision for implementing collaborative care for perinatal depression.
NICHD	Massachusetts General Hospital	Maternal obesity and inflammation as drivers of maternal morbidity in COVID-19.
NINDS	Columbia University Health Sciences	Neurovascular unit dysfunction in women with severe preeclampsia.
NHLBI	Massachusetts General Hospital	Signatures of dysfunctional mitochondrial fatty acid oxidation that predispose to early-onset preeclampsia.
NCATS	Georgetown University	Maternal morbidity and mortality: Risk factors, early detection and personalized intervention.

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Goal 3: Develop an integrated understanding of MMM to identify risk factors and develop interventions

IC	Organization	Project
NHLBI	Miriam Hospital	Predictors of *de novo* development of obstructive sleep apnea in pregnancy.
NHLBI	Magee-Women's Res. Inst. & Found.	Preconception contributors to severe maternal morbidity in black and white women.
NIMHD	University of Central Florida	Social stressors and inflammation: A mixed methods approach to preterm birth.
NHLBI	Kaiser Foundation Research Institute	Prenatal blood pressure patterns to predict pregnancy-related hypertension and later life cardiovascular risk.
NICHD	University of Chicago	Improving health by linking postpartum and well-baby visits.
NIMH	University of Michigan	Relationship between mental health coverage and outcomes for privately insured women with perinatal mood and anxiety disorders (PMAD).

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IMPROVE can synergize with NINR goals

Innovative Models of Care for Reducing Inequities in **Maternal Health**
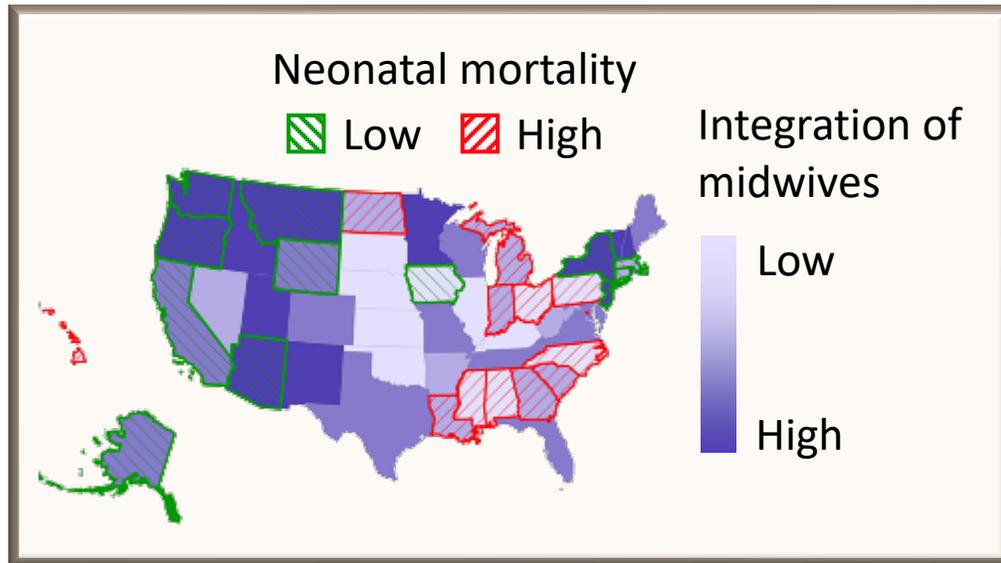
- Fund research on structural inequalities that affect maternal health disparities.
  - Policies that improve access to regular care
  - Initiatives to improve access to healthy food
  - Practices to reduce effects of bias and racism
- Develop person-centered approaches that are sustainable and scalable.
- Incorporate community-generated knowledge & include community members in research teams.
- Implement protocols to respect pregnant women, listen to them, and support them.

THE doula EFFECT
Evidence for Continuous Labor Support During Childbirth

39% DECREASE IN RISK OF CESAREAN

15% INCREASE IN LIKELIHOOD OF SPONTANEOUS VAGINAL BIRTH

10% DECREASE IN THE USE OF ANY MEDICATIONS FOR PAIN RELIEF

41 MINUTES SHORTER LABOR

38% DECREASE IN THE BABY'S RISK OF A LOW FIVE MINUTE APGAR SCORE

31% DECREASE IN RISK OF BEING DISSATISFIED WITH THE BIRTH EXPERIENCE

Cochrane Database Syst Rev. 2017 Jul 6;7:CD003766. doi: 10.1002/14651858.CD003766.pub6.
https://evidencebasedbirth.com/the-evidence-for-doulas/

WILDWORLDMAMA.COM

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Nurses improve pregnancy outcomes

Library of Congress (https://www.loc.gov/item/2001704194/)

Vedam et al. 2018. *PLoS ONE* 13: e0192523.
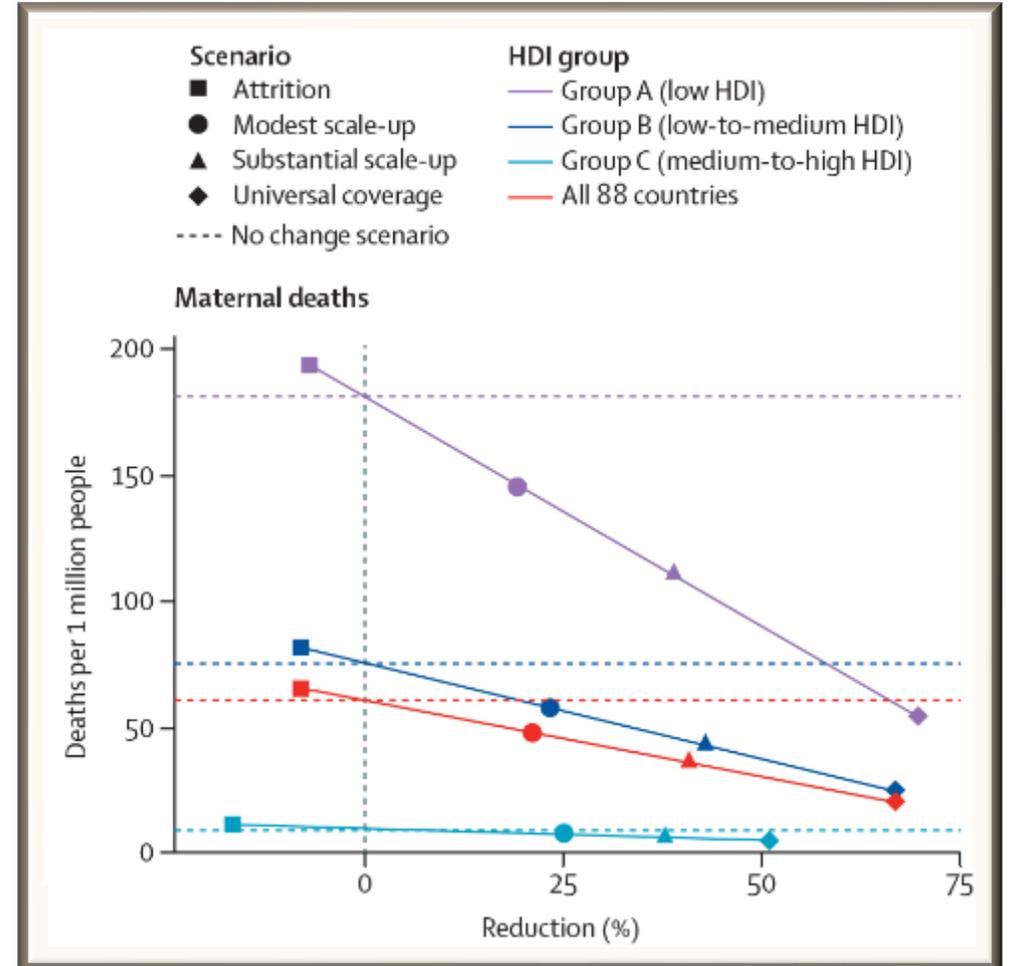
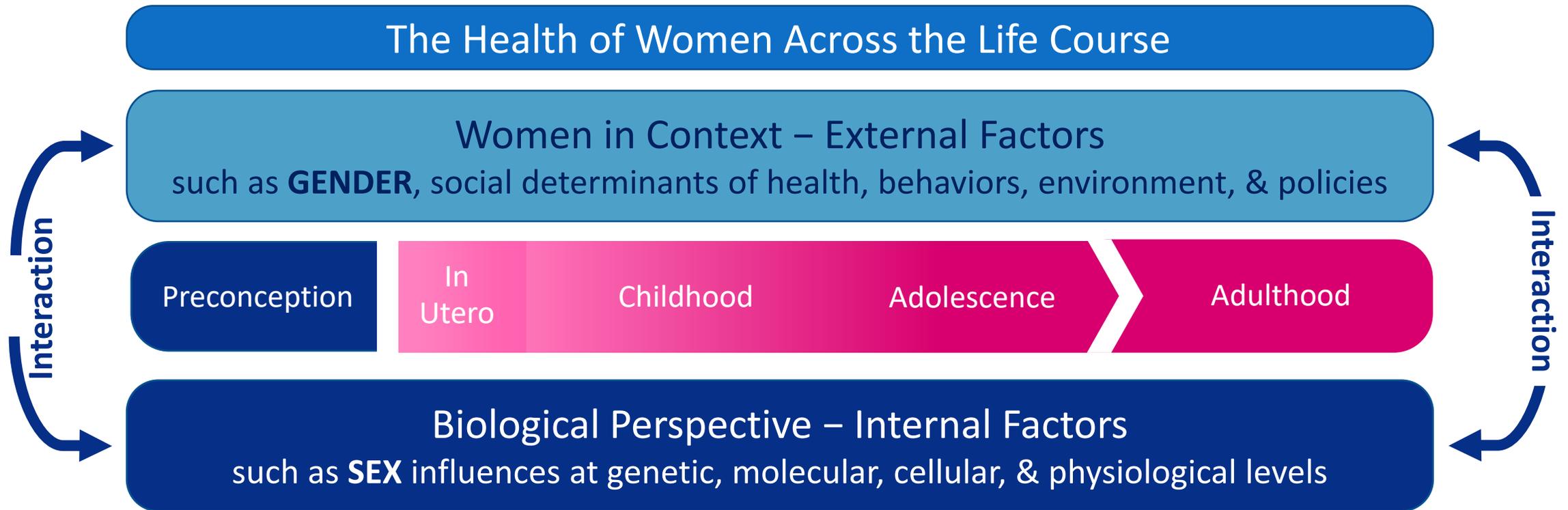Nove et al. 2021. *Lancet Glob. Health* 9: e24-32.

Moving the focus from reproductive health to the entire life course
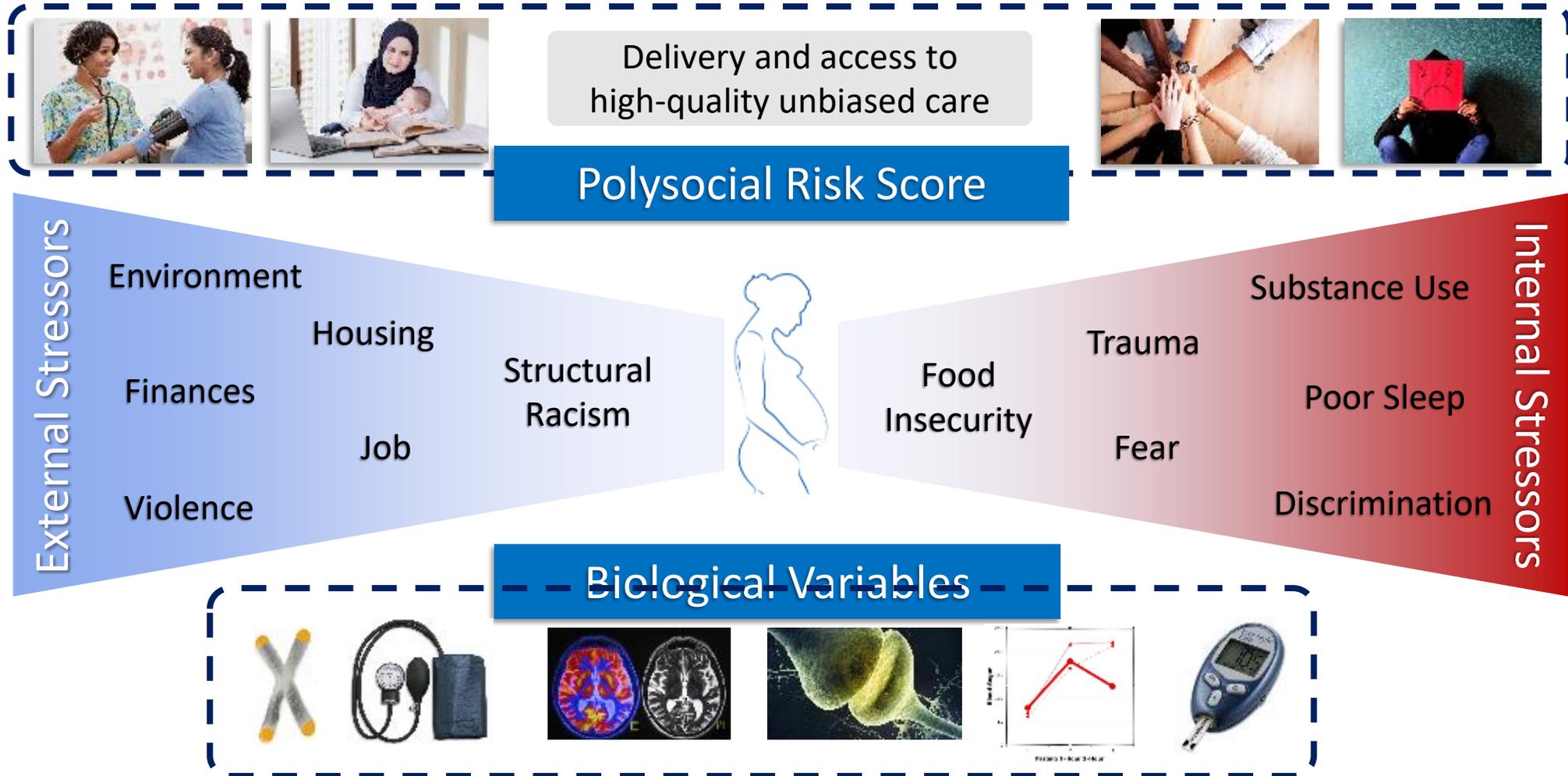

"Women's health" has traditionally had a narrow focus on reproductive health.

Today, **"health of women"** encompasses their whole being: head to toe, genetics to environment, and over the life course.

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ORWH uses a multidimensional framework to model the health of women

The Health of Women Across the Life Course

Women in Context – External Factors
such as **GENDER**, social determinants of health, behaviors, environment, & policies

Interaction

Preconception | In Utero | Childhood | Adolescence | Adulthood

Biological Perspective – Internal Factors
such as **SEX** influences at genetic, molecular, cellular, & physiological levels

NIH Strategic Plans and Visions

https://report.nih.gov/strategicplans

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Measuring the impact of biological and social determinants of health to predict maternal risk/resilience

Delivery and access to high-quality unbiased care

Polysocial Risk Score

External Stressors

Environment

Housing

Finances

Structural Racism

Job

Violence

Internal Stressors

Substance Use

Trauma

Food Insecurity

Poor Sleep

Fear

Discrimination

Biological Variables

Geronimus et al. 2006. *Am. J. Public Health* 96: 826-833.; Lu et al. 2019. *Ann. Epidemiol.* 36: 33-39.
Figueroa et al. 2020. *J. Am. Med. Assoc*. 232: 1553-1554.

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Pregnancy is a stress test, and we are failing our mothers
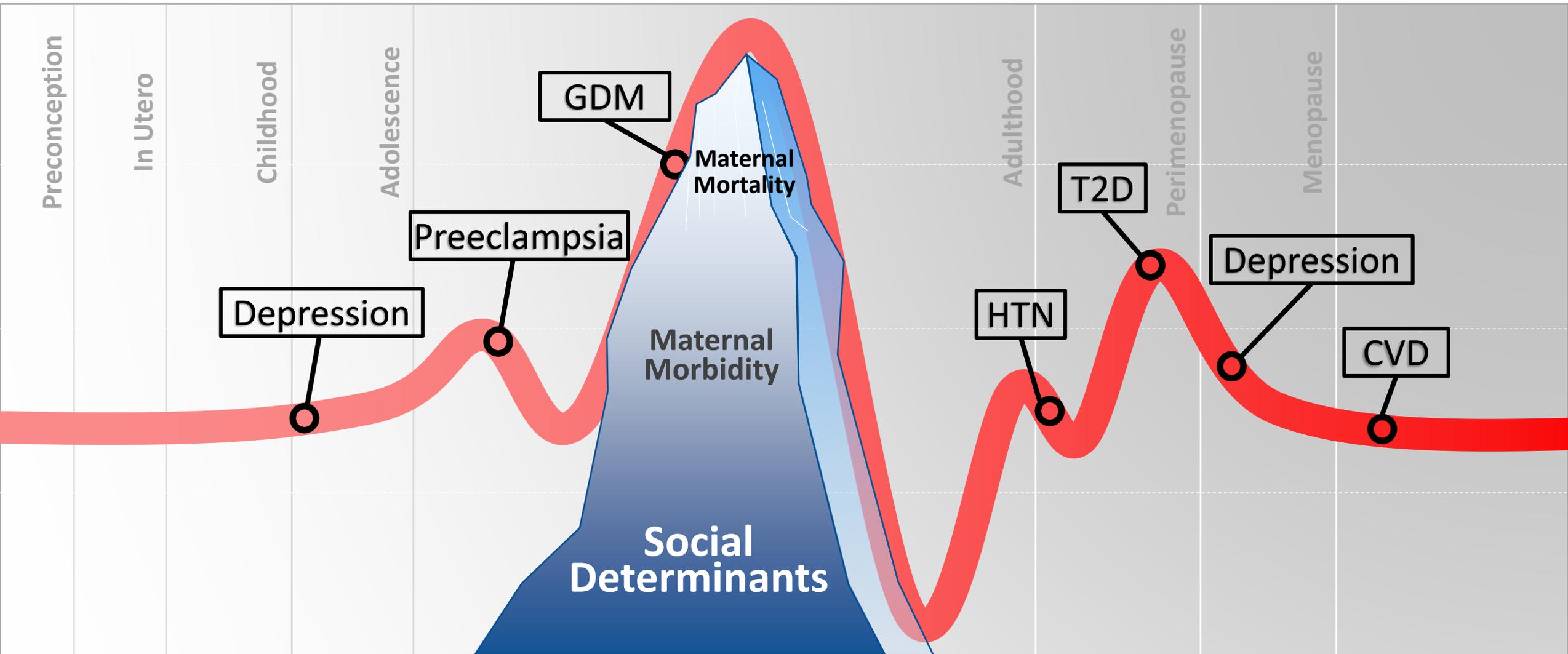
Disparities in maternal health reflect inequities in quality of life and security

Security Index

Uninsured Rate

THE STATE OF WOMEN

BY IRENE BERMAN-VAPORIS, LAWSON PARKER, AND ROSEMARY WARDLEY

Employment · Education · Maternal mortality · Political clout · Physical safety
How U.S. women fare in these key aspects of life varies widely across the nation, according to a new benchmark of women's well-being. The 2020 U.S. Women, Peace and Security Index measures women's inclusion in society, sense of security, and exposure to discrimination. It shows how obstacles and opportunities for women differ from state to state, driven by economic, racial, and ethnic disparities, among other factors.

National Geographic partnered with the Georgetown Institute for Women, Peace and Security to illustrate the U.S. index.
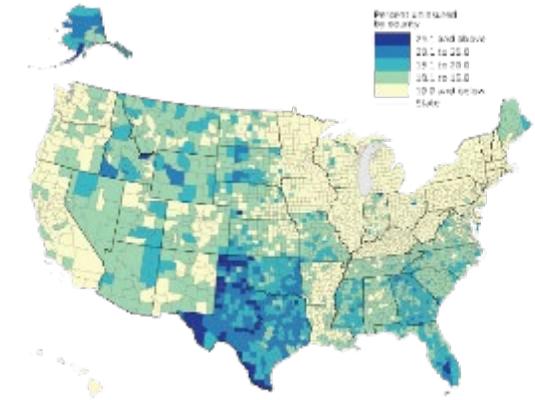
No place in the country achieves the best or worst possible score. All six New England states rank in the top 10; the five lowest performing states are located in the South.
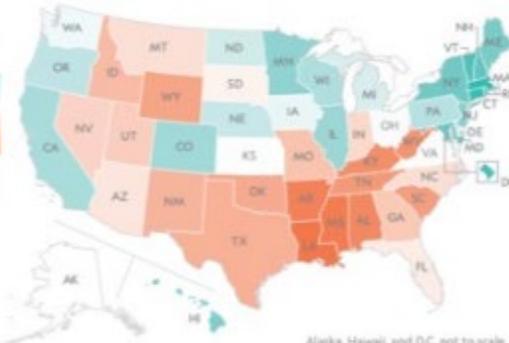
Massachusetts (RANK: 1)
Proactive legislative reforms in the state, including an equal pay act updated in 2018, have helped close gender gaps.

Alaska, Hawaii, and D.C. not to scale.

Maternal mortality (per 100,000 live births) — by state

National average: 30

☐ All women ● Black ● White

Healthcare affordability

Maternal mortality (per 100,000 live births) vs Healthcare affordability

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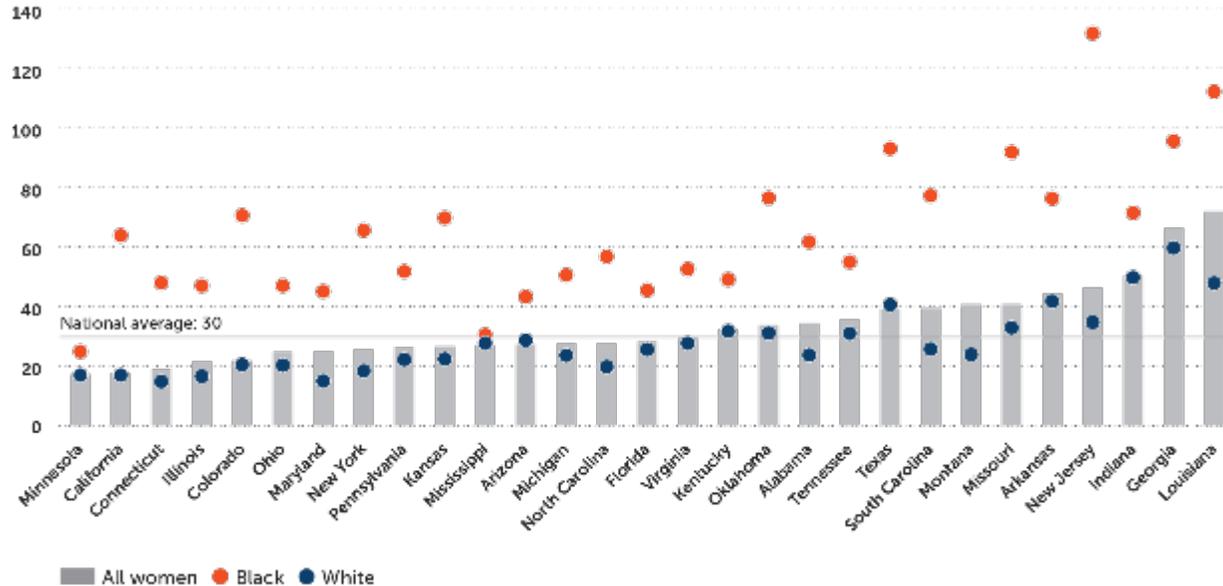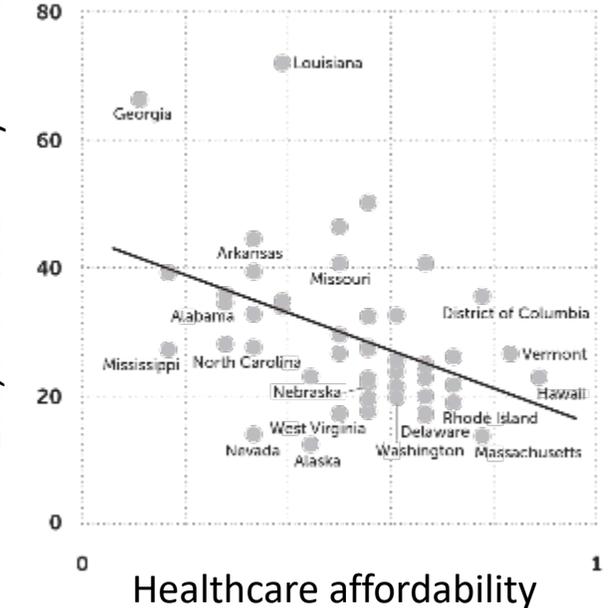
NIH has an extensive portfolio, but how can we leverage these data to fill the gaps in knowledge & care?

NIDDK	NIEHS	NIMHD	NIGMS	ORWH
Hyperglycemia & Adverse Pregnancy Outcome HAPO FOLLOW-UP STUDY	**Pregnancy as a vulnerable time period for women's Health**	**Addressing Racial Disparities in MMM**	**IDeA States Women's Health Research Supplement**	**Women of Understudied, Underrepresented, and Underreported Populations** U3
Long-term effects of blood glucose during pregnancy. - Launched in 2000 > 23,000 women - Highly diverse cohort	Environmental chemicals on maternal physiology, and long-term maternal health effects. - Launched in 2019 - RFA-ES-20-003	Mechanisms underlying racial disparities, interventions, or prevention strategies. - Launched in 2020 - RFA-MD-20-008	Expand research & research capability to address important issues of women's health. - Launched in 2020 - NOT-GM-20-017	FY2017-19	49 awards Examples: - Insulin resistance, neonatal adiposity, race/ethnicity - Sickle cell disease & maternal morbidity - Fibroid growth in African American women

*While NICHD is the scientific and financial lead, this list highlights data being collected NIH-wide.

NIH Eunice Kennedy Shriver National Institute of Child Health and Human Development National Institutes of Health Office of Research on Women's Health Health research throughout the lifespan

ORWH funds research on Understudied, Underreported & Underrepresented populations
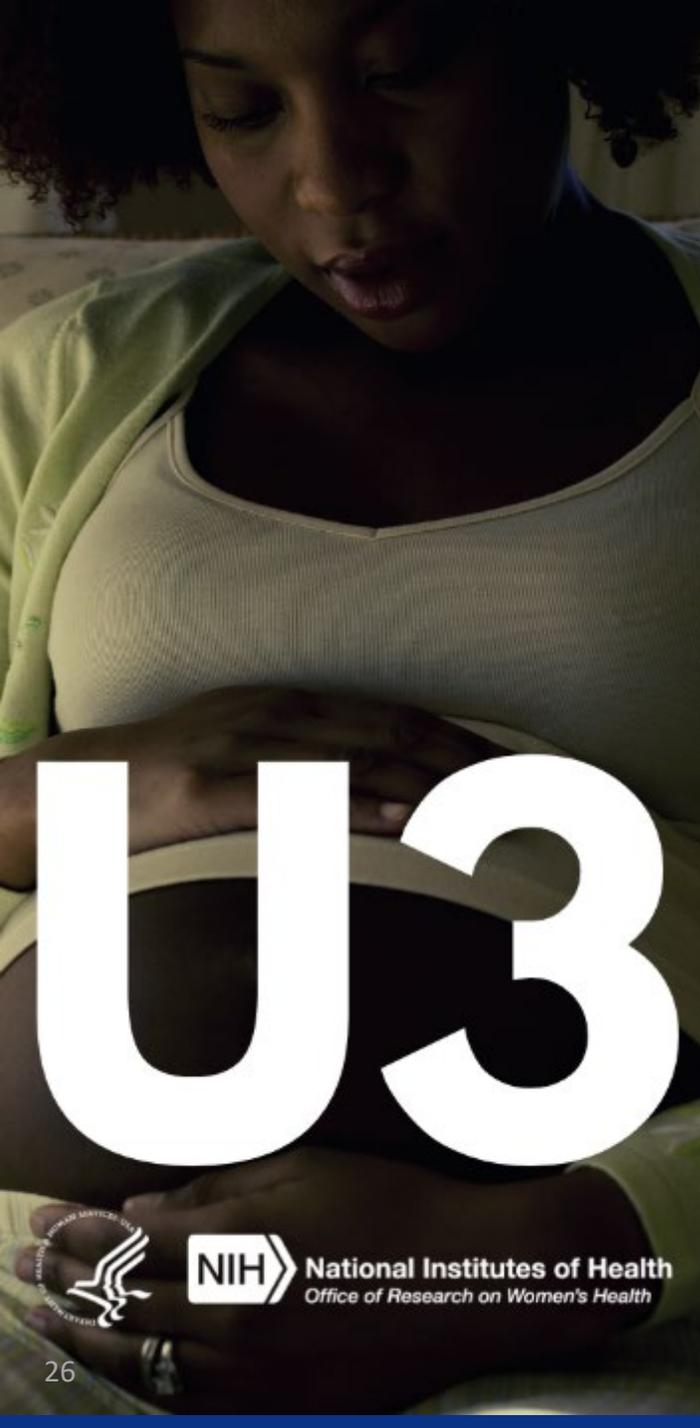
Influences of sex/gender at intersection of race/ethnicity and other social determinants of health and disease

$1.6 million funded in FY20: 11 awards with five ICOs

3 awards fund maternal health/pregnancy projects, including:

- Biologic and social determinants of severe maternal morbidity and its racial/ethnic disparities;

- Associations between life course socioeconomic conditions, placental epigenetic and transcriptional modifications, and pre-term birth;

- Prenatal substance use and risk factors among prenatal sexual minority women.

U3

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ORWH partners with NIGMS to expand the IDeA states program to include women's health research
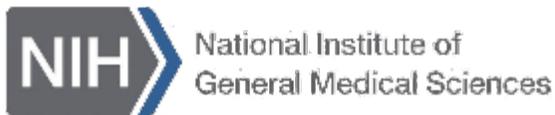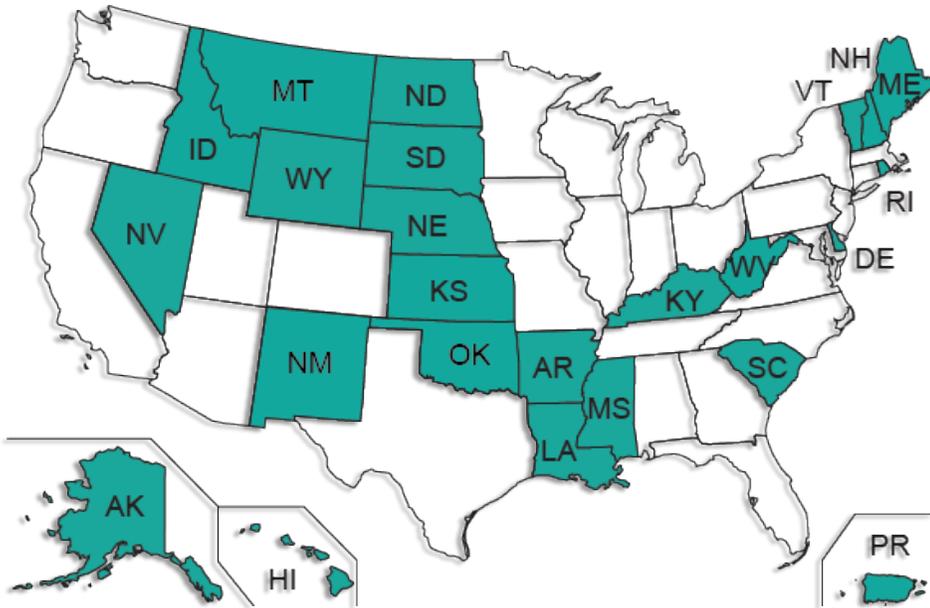
FY2020 Projects

Implementing the systematic treatment and management of postpartum hypertension (STAMPP-HTN) bundle in a high-risk Mississippi population.

Cardiac extracellular matrix remodeling failure in postpartum maternal health.

Novel mechanisms of protein misfolding and aggregation in preeclampsia.

Pilot testing of a mobile health intervention designed to increase physical activity and improve morbidity & mortality-related outcomes among pregnant women in rural settings.

JWH Special Issue examines multiple aspects of MMM and lays the groundwork for a new research agenda

JOURNAL OF
Women's Health

EDITOR-IN-CHIEF
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DEPUTY EDITOR
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ACADEMY OF
WOMEN'S
HEALTH

best practices for better outcomes

Society for Women's
Health Research

Mary Ann Liebert, Inc. publishers
www.liebertpub.com/jwh

Feb 2021 will be a Special Issue of the *Journal of Women's Health*

- 21 articles on maternal morbidity and mortality
- Authors from 20 NIH ICOs & 5 other HHS agencies describe the maternal health research agenda

JOURNAL OF WOMEN'S HEALTH
Volume 00, Number 00, 2020
© Mary Ann Liebert, Inc.
DOI: 10.1089/jwh.2020.8860

Clinical Outcomes in High-Risk Pregnancies Due to Advanced Maternal Age

Rosaly Correa-de-Araujo, MD, MSc, PhD,[1] and Sung Sug (Sarah) Yoon, RN, PhD[2]

National Institutes of Health
Office of Research on Women's Health

NIH programs complement the HHS Action Plan and the Surgeon General's Call to Action for Maternal Health

4 KEY GOALS emphasize a life course perspective to improve maternal and infant health outcomes.

POSTPARTUM
maintain ongoing touch points for women with medical and social service providers to ensure warning signs are identified and addressed, and by providing accessible information on parenting skills, self-esteem building and stress management, as well as other family supports

GOAL 1
Healthy Outcomes for All Women of Reproductive Age

GOAL 2
Healthy Pregnancies and Births

GOAL 3
Healthy Futures

GOAL 4
Improve Data and Bolster Research

PRE-PREGNANCY
perform recommended screenings and treat all young girls, adolescents, and women for a variety of health risk factors

DURING PREGNANCY
continue prevention efforts into pregnancy to prevent or mitigate the development of complications

3 TARGETS to improve maternal health outcomes

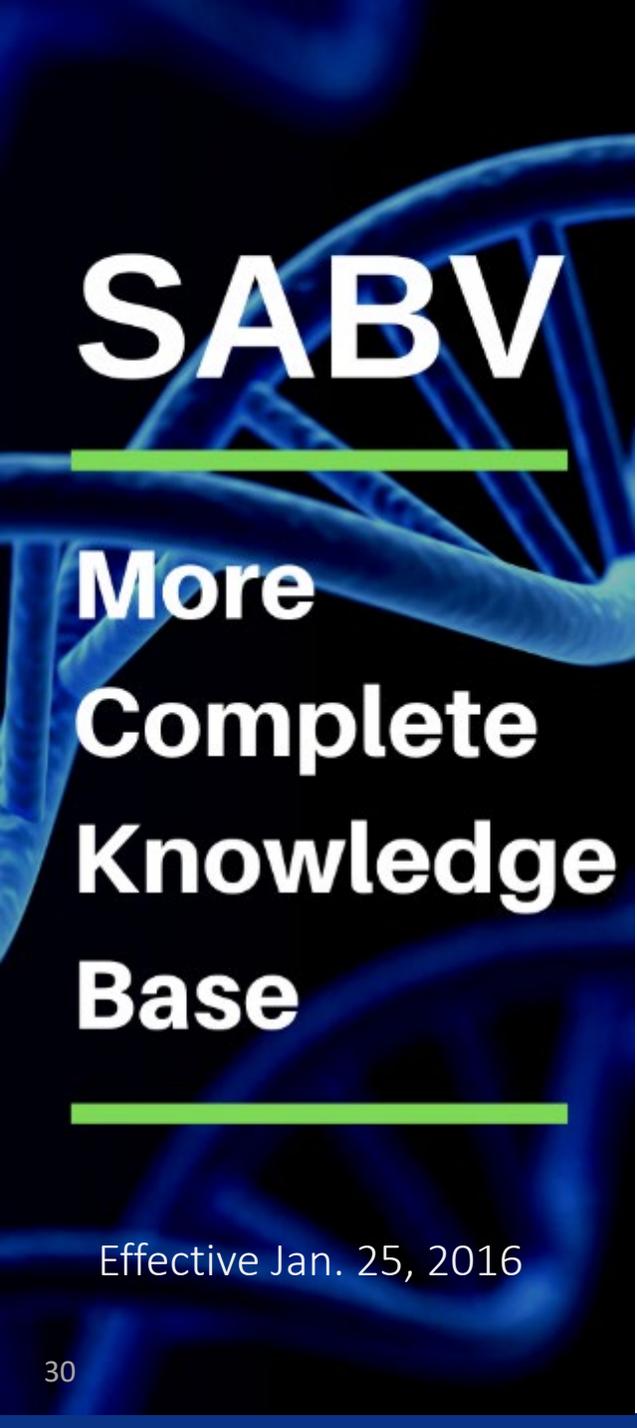Reduce maternal mortality rate by 50% in 5 years.

Reduce low-risk cesarean delivery rate by 25% in 5 years.

Achieve blood pressure control in 80% of women of reproductive age with hypertension in 5 years.

https://www.womenshealth.gov

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NIH's policy to consider Sex As a Biological Variable

SABV

More Complete Knowledge Base

Effective Jan. 25, 2016

Improves **design** of clinical research and trials

Informs sex- and gender-aware diagnosis and treatment

Enables **individualized** care for women and men

Fosters **system-based understanding** of the ways sex and gender influence health and disease

Clayton. 2016. *FASEB J.* 30: 519-524.

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# The NIH policy to consider Sex As a Biological Variable set new expectations for biomedical research

"NIH expects that sex as a biological variable will be factored into research **designs, analyses, and reporting** in vertebrate animal and human studies."

Effective Jan. 25, 2016

SABV Policy Notice: NOT-OD-15-102.

Integrating sex/gender, race & ethnicity, & age across the research continuum to advance health equity

Preclinical Studies | Translational | Phase I, II, III, IV Clinical Trials
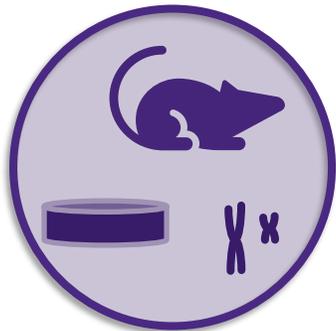
Laboratory

Healthy People

Clinic

Dissemination & Implementation | Results Reporting | Data Analyses

Health Policy | Individualized Health Care | Education & Training

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In Focus Quarterly bit.ly/ORWHInFocus

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