

# How today's race-based health inequality results (partly) from social inequality in the past

Report to the State of California  
Reparations Task Force, January 28, 2022

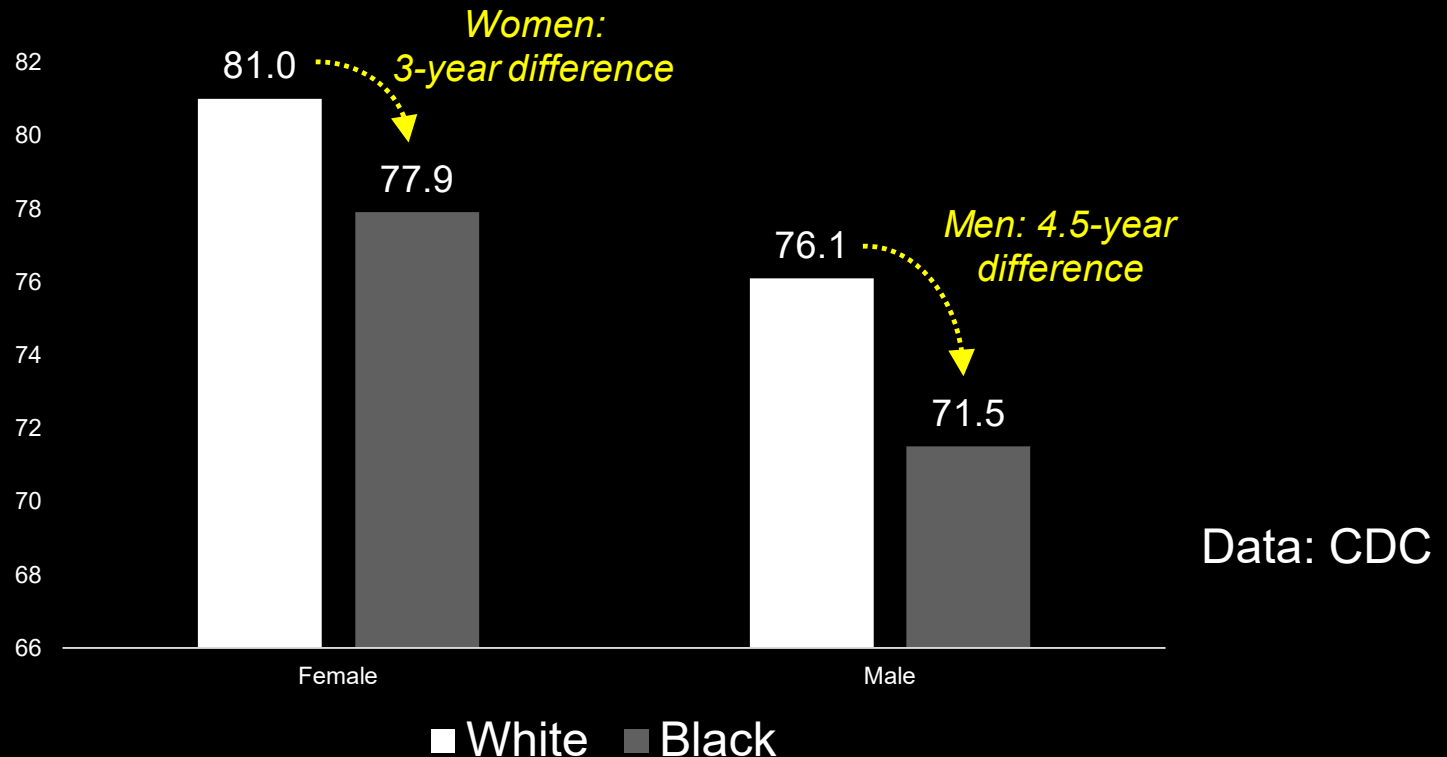
**Christopher Kuzawa, PhD MSPH**

Anthropology & Institute for Policy Research  
Northwestern University



# Refresher: stark US health inequality

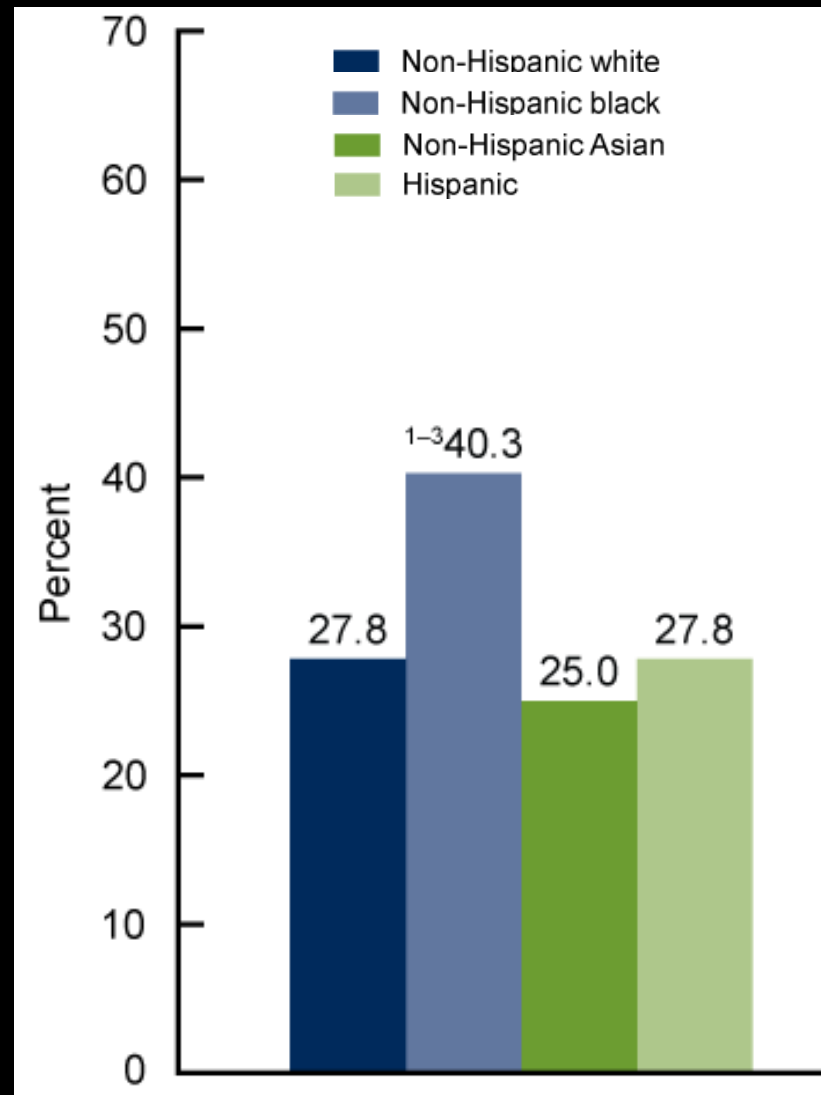
## US life expectancy at birth (2016)



Examples of major causes: Hypertension, obesity, kidney disease, low birth weight

# Hypertension in the US

(2015-2016)



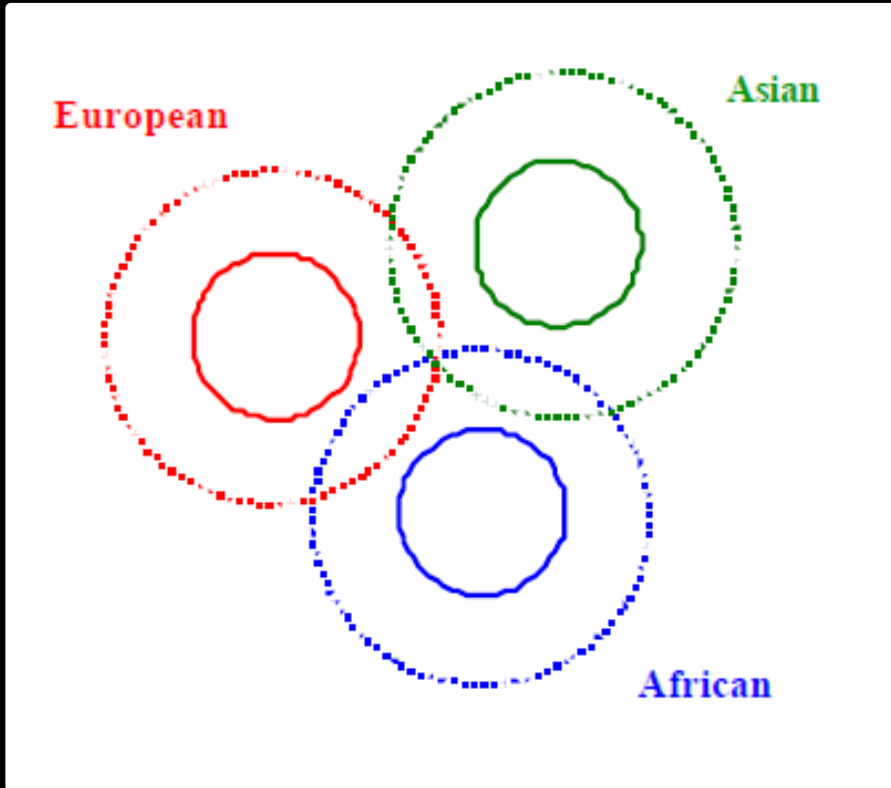
Source:  
NCHS 2017

**Refresher:** genes are not the  
cause of race-based health  
inequality in the United States

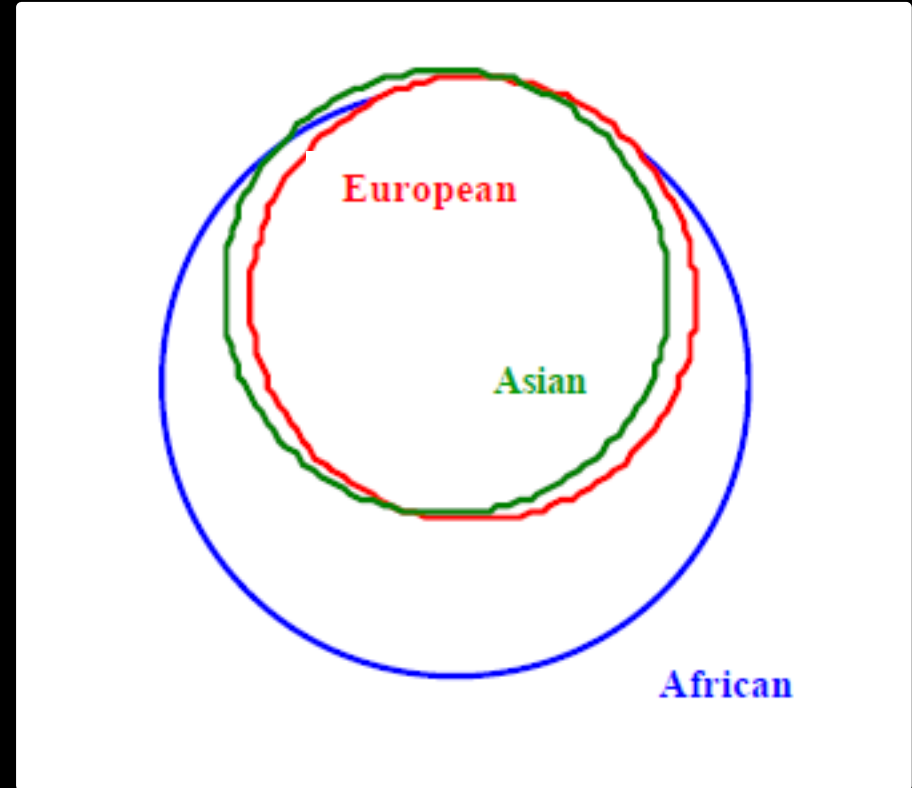
*First: genetic data show that humans do not come in “races”*

# Why there are no genetic “races”

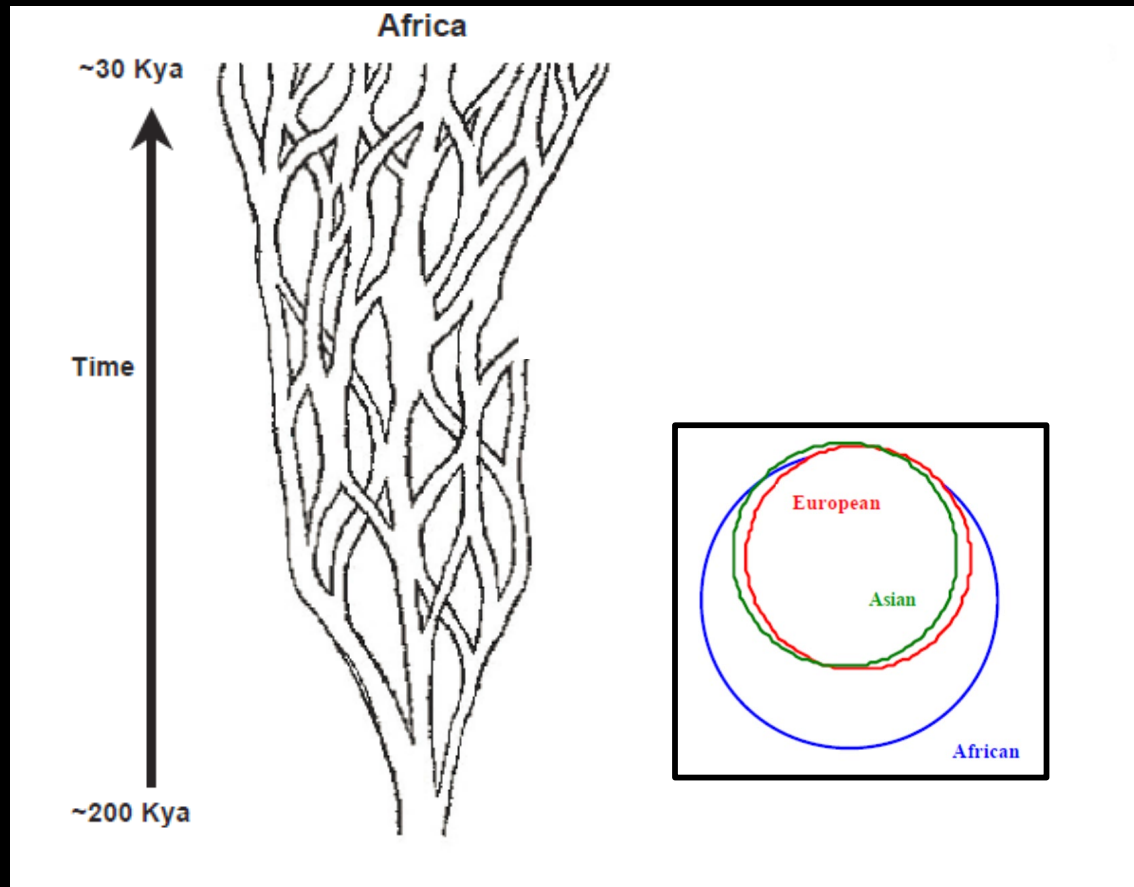
Idealized concept of race



What human genetic data actually show



# European and Asian populations harbor subsets of the original genetic diversity that evolved within Africa



Within countries, how people are categorized into groups (in the US, races) is a product of local historical, political and social forces and is not based in genetics

In the US, we are all familiar with this...

**Weather**

**Today:** Rain. High 64.  
 Low 51.  
**Thursday:** Mostly cloudy.  
 Low 63. High 52.

# The Washington Post

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WEDNESDAY, NOVEMBER 5, 2008

M Tu We Th Fr Sa Su

# Obama Makes History

## U.S. DECISIVELY ELECTS FIRST BLACK PRESIDENT

## DEMOCRATS EXPAND CONTROL OF CONGRESS



By ROBERT BARNES  
 and MICHAEL D. SHEAR  
*Washington Post Staff Writers*

Sen. Barack Obama of Illinois was elected the nation's 44th president yesterday, riding a reformist message of change and an inspirational exhortation of hope to become the first African American to ascend to the White House.

Obama, 47, the son of a Kenyan father and a white mother from Kansas, led a tide of Democratic victories across the nation in defeating Republican Sen. John McCain of Arizona, a 26-year veteran of Washington who could not overcome his connections to President Bush's increasingly unpopular administration.

Standing before a crowd of more than 125,000 people who had waited for hours at Chicago's Grant Park, Obama acknowledged the accomplishment and the dreams of his supporters.

"If there is anyone out there who still doubts that America is a place where all things are possible, who still wonders if the dream of our founders is alive in our time, who still questions the power of our democracy, tonight is your answer," he said just before midnight Eastern time.

"The road ahead will be long. Our climb will be steep. We may not get there in one year or even one term, but America, I have never been more hopeful than I am tonight that we will get there. I promise you: We as a people will get there."

The historic Election Day brought millions of new and sometimes tearful voters, long lines at polling places nationwide, and celebrations on street corners and in front of the White House. It ushered in a new era of Democratic dominance in Congress, even though the party's quest for the 60 votes needed for a veto-proof majority in the Senate remained in doubt early today. In the House, Democrats made major gains, adding to their already sizable advantage and returning them to a position of power that predates the 1994 Re-

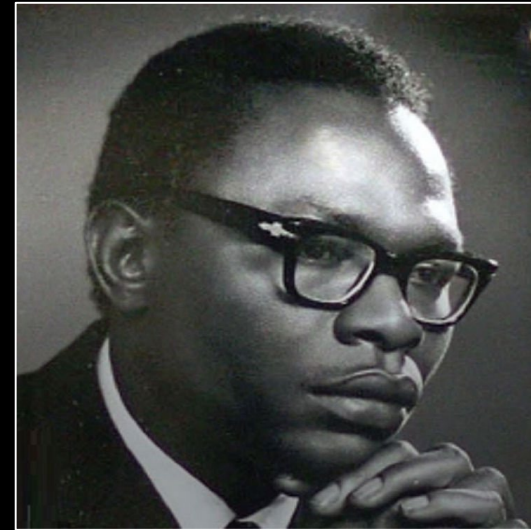
BY NIKKI KAHN — THE WASHINGTON POST

President-elect Barack Obama, with wife Michelle and their daughters, Sasha, 7, and Malia, 10, greets a crowd of 125,000 celebrating his victory in Grant Park, in his home town of Chicago.

See ELECTION, A16, Col. 1



# The (future) first black president with his grandparents



The “one drop rule” illustrates how “races” are defined by societal histories rather than by genes...

Although genes (of course) influence all of our traits, there is no evidence that they contribute to race-based US health inequality

## The Contribution of Genomic Research to Explaining Racial Disparities in Cardiovascular Disease: A Systematic Review

Jay S. Kaufman\*, Lena Dolman, Dinela Rushani, and Richard S. Cooper

**Authors' conclusion:** "...the accumulated evidence for genetic contributions to CVD disparities in blacks versus whites has been essentially nil."

JAMA Cardiology | Original Investigation

2020

### Association of Genetic West African Ancestry, Blood Pressure Response to Therapy, and Cardiovascular Risk Among Self-reported Black Individuals in the Systolic Blood Pressure Reduction Intervention Trial (SPRINT)

Shreya Rao, MD, MPH; Matthew W. Segar, MD, MS; Adam P. Bress, PharmD, MS; Pankaj Arora, MD; Wanpen Vongpatanasin, MD; Vijay Agusala, MD, MBA; Utibe R. Essien, MD; Adolfo Correa, MD; Alanna A. Morris, MD; James A. de Lemos, MD; Ambarish Pandey, MD, MSCS

**Authors:** "...our study adds to the existing evidence against the genetic basis for population-level racial disparities"

# Social/political/economic inequalities are what drive race-based health inequality

## *Differences in:*

- Income
- Educational opportunities
- Experiences of discrimination
- Health care access
- Neighborhood segregation
- Exposure to pollution/toxins
- Mass incarceration

# Social origins of race-based health inequality

- **What we've known for some time:** Differences in experiences like stress, opportunity, wages, and health care lead to chronic differences in health by race.
- **The rest of my talk:** Newer evidence that experiences early in life (in utero, infancy) can lead to durable biological changes that also influence health across the lifecycle.

Example of early environments  
and adult health (Philippines)

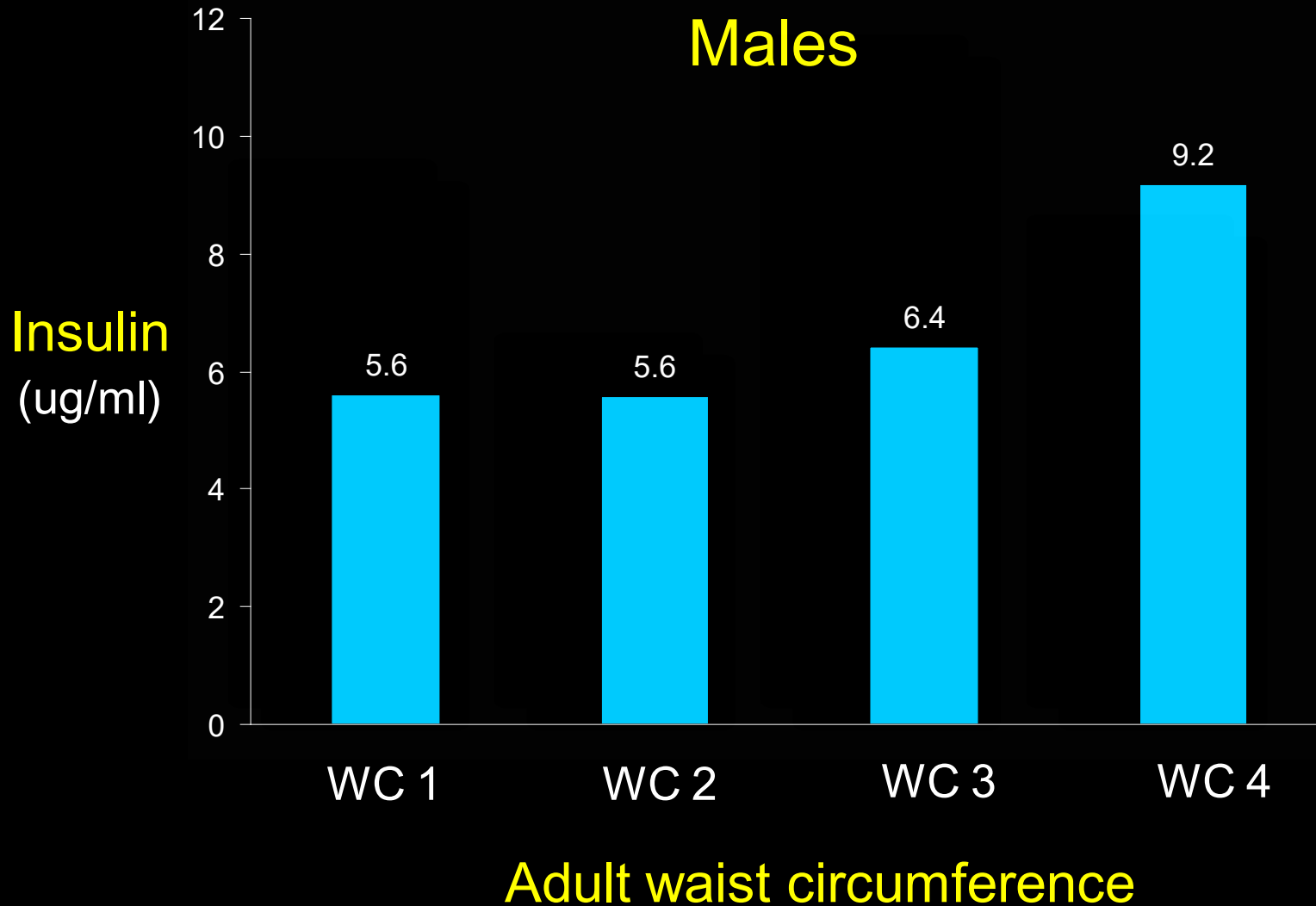
Cebu Study, Philippines

Enrolled 3,327 pregnant  
women in 1983

Offspring now 39 yrs old

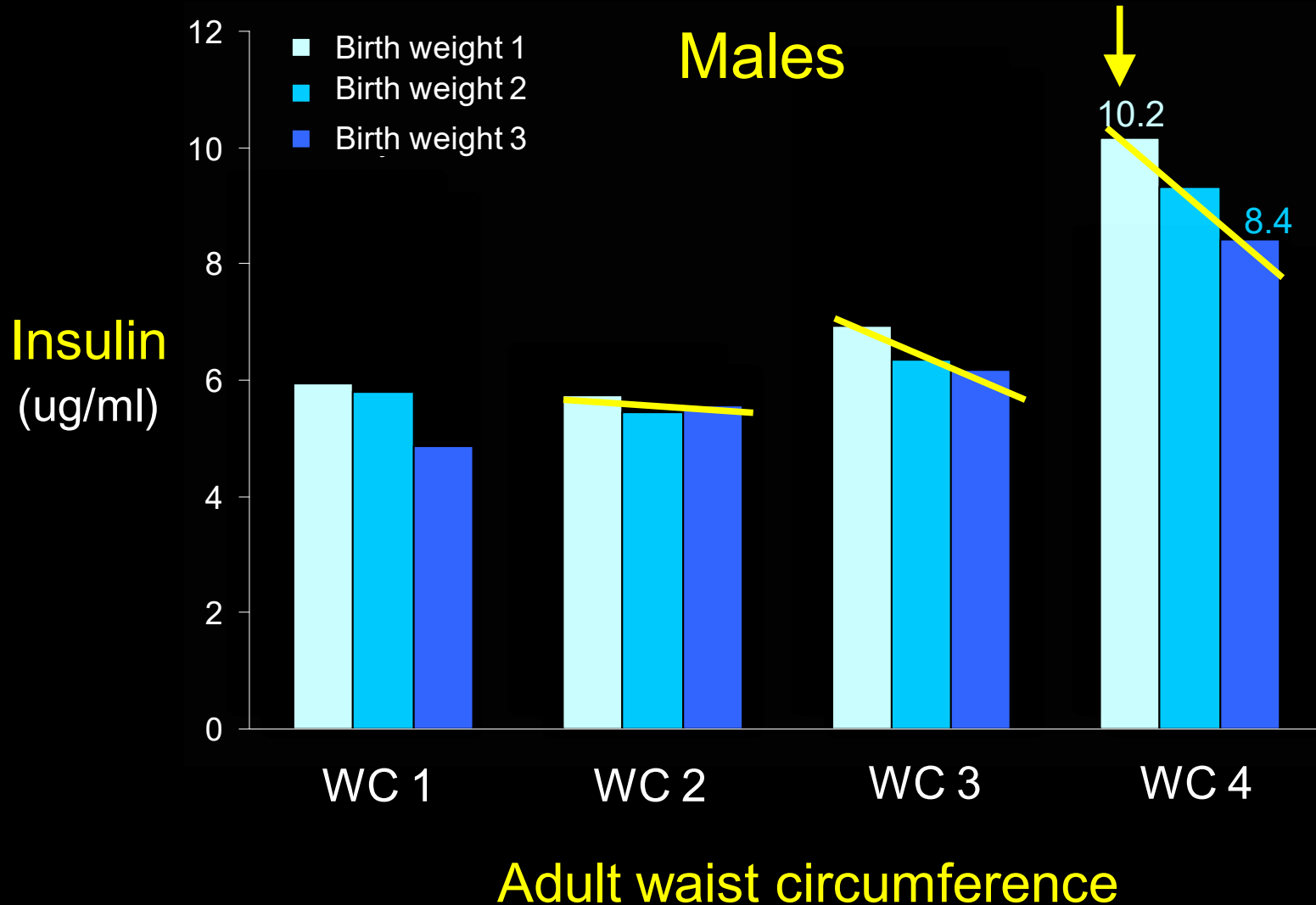


# Adult waist circumference and diabetes risk (Philippines)



# Adult waist circumference and diabetes risk (Philippines)

Highest diabetes risk: **born small + adult weight gain**

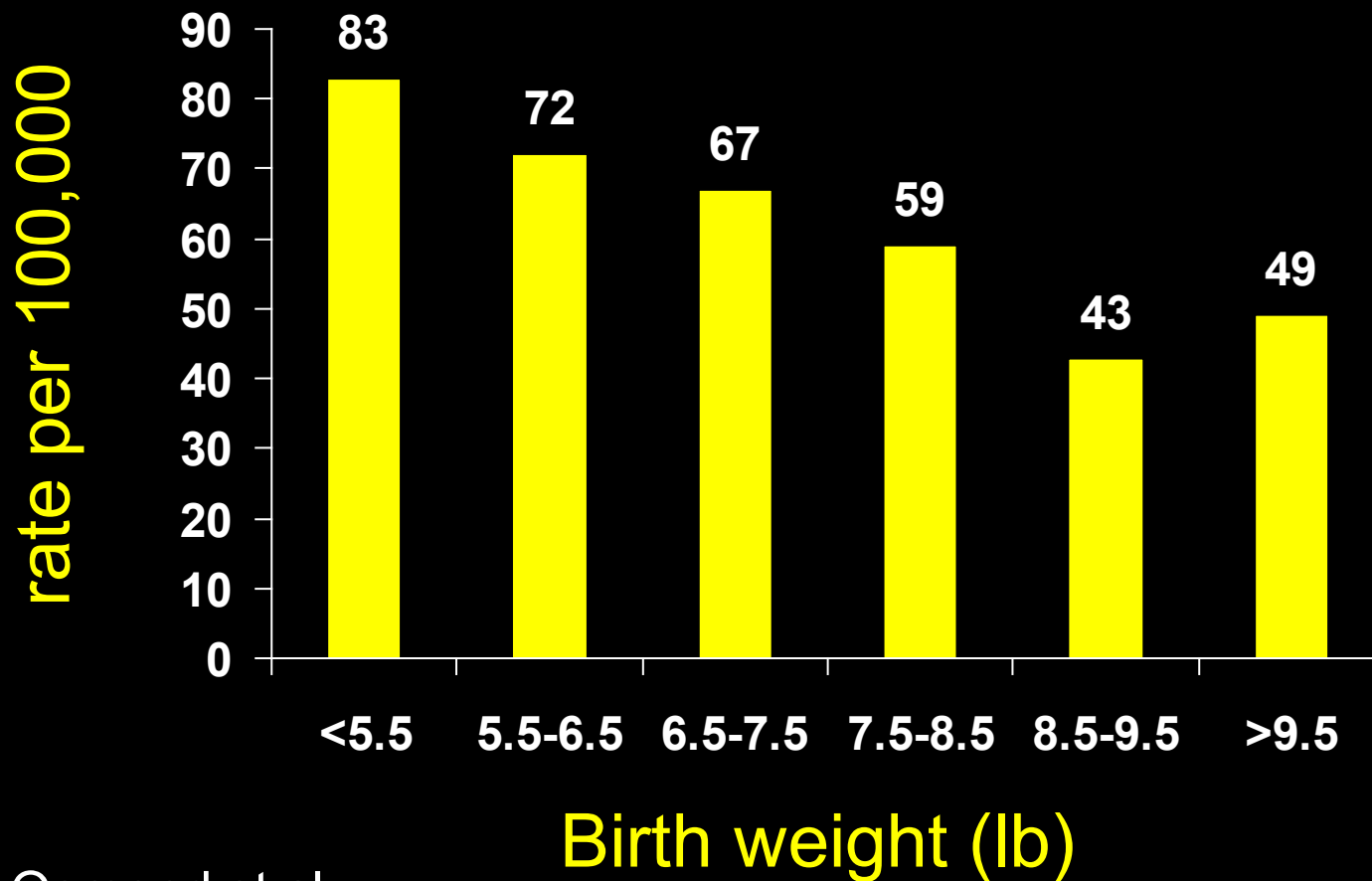




# The Developmental Origins of Health and Disease (DOHaD)

The roots of adult health trace (in part) to experiences during intrauterine and early postnatal life

# Birth weight & heart attack mortality (UK)



Source: Osmond et al  
1993 *BMJ* 307 (6918): 1519

# Developmental Origins of Adult Health

Fetal Stress or  
Undernutrition



Slow growth rate



Low birth weight



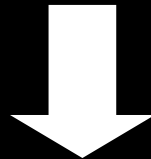
# Developmental Origins of Adult Health

Fetal Stress or  
Undernutrition



Developmental  
response

Cholesterol   Insulin resistance   Visceral fat   Hypertension

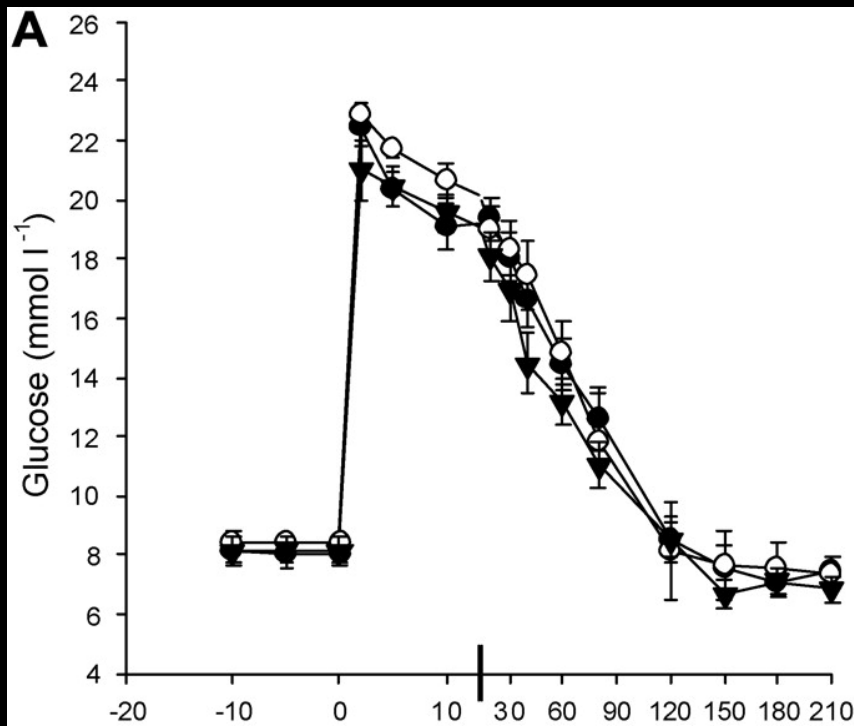


Cardiovascular Disease

Barker, DP (1997) *Nutrition*: 13(9) 807-13



# Insulin resistance after prenatal undernutrition (guinea pig)

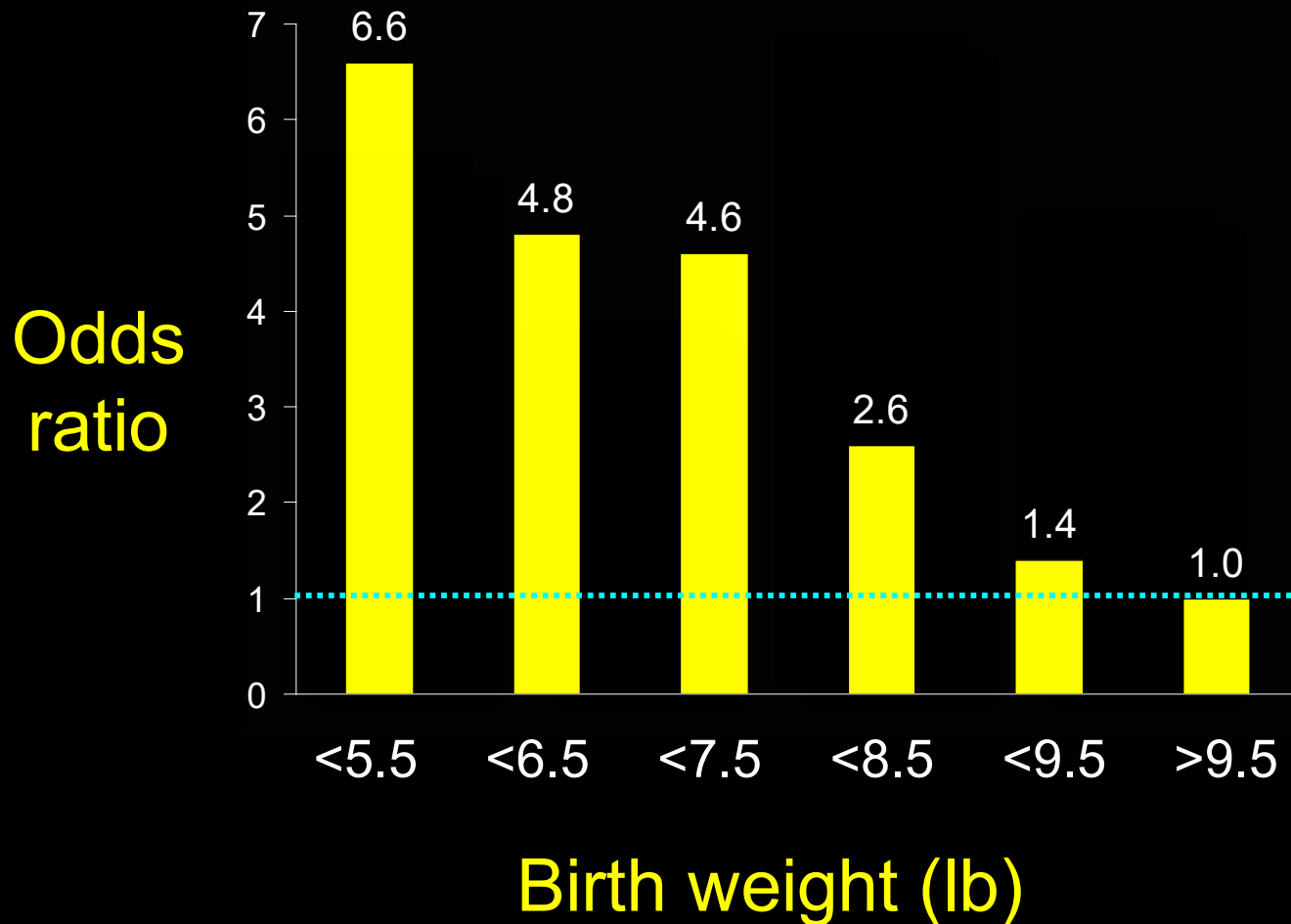


# Where does the biological “memory” of prenatal nutrition reside?

## Part of the story: epigenetic changes

- Chemical changes to chromosomes that influence which genes are silenced and which are turned on.
- Can be altered by environment (especially early in life) and persist in our bodies as we age.
- *Example: in rats, prenatal nutritional stress leads to epigenetic changes in the liver that contribute to adult diabetes*

# Birth weight and Diabetes (UK)



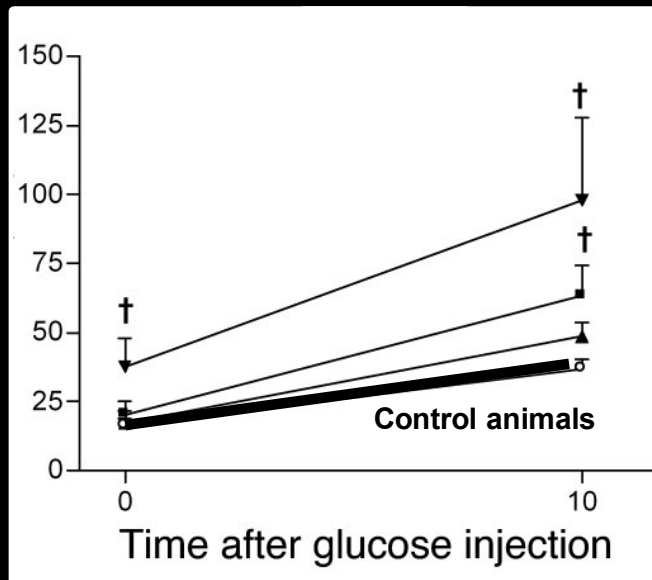
Hales et al 1991, Br Med J, 303: 1019-1022.

Exposure to prenatal psychosocial stress has similar effects on the fetus as undernutrition



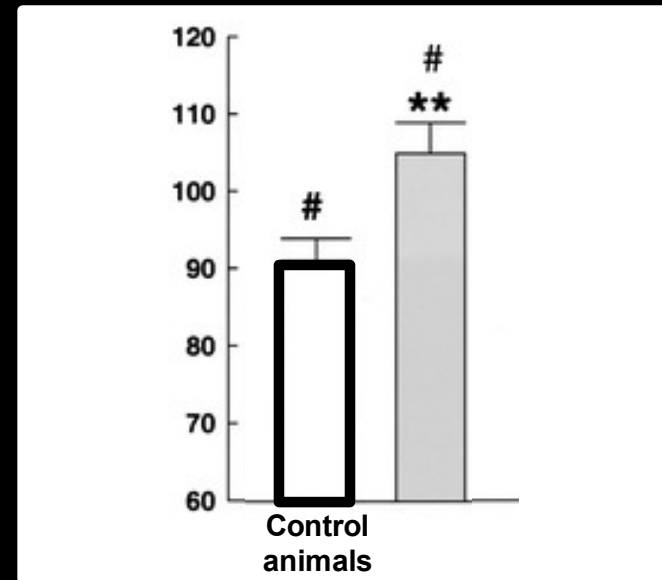
# Sheep exposed to maternal stress hormones as fetuses are more diabetic and hypertensive as adults

## Insulin (nM)



Dodic et al (2002) *Hypertension*

## Blood pressure (mmHg)



de Vries et al (2007) *J Clinical Invest*

# Summary: early stress and adult health inequality

- Developmental biology is sensitive to prenatal and early postnatal conditions.
- Maternal psychosocial and nutritional stressors lead to durable biological changes in offspring that elevate future risk for cardiovascular and other common diseases.
- Implication: mothers' experiences of environmental stressors can have lingering impacts on adult health in offspring.

**Part II.** How do pregnancy nutrition and stress contribute to US race-related health inequality?

# Major US health disparities: Disproportionate burden among African Americans

## Early life

Prematurity

Low birth weight

IUGR

## Adulthood

Heart attack

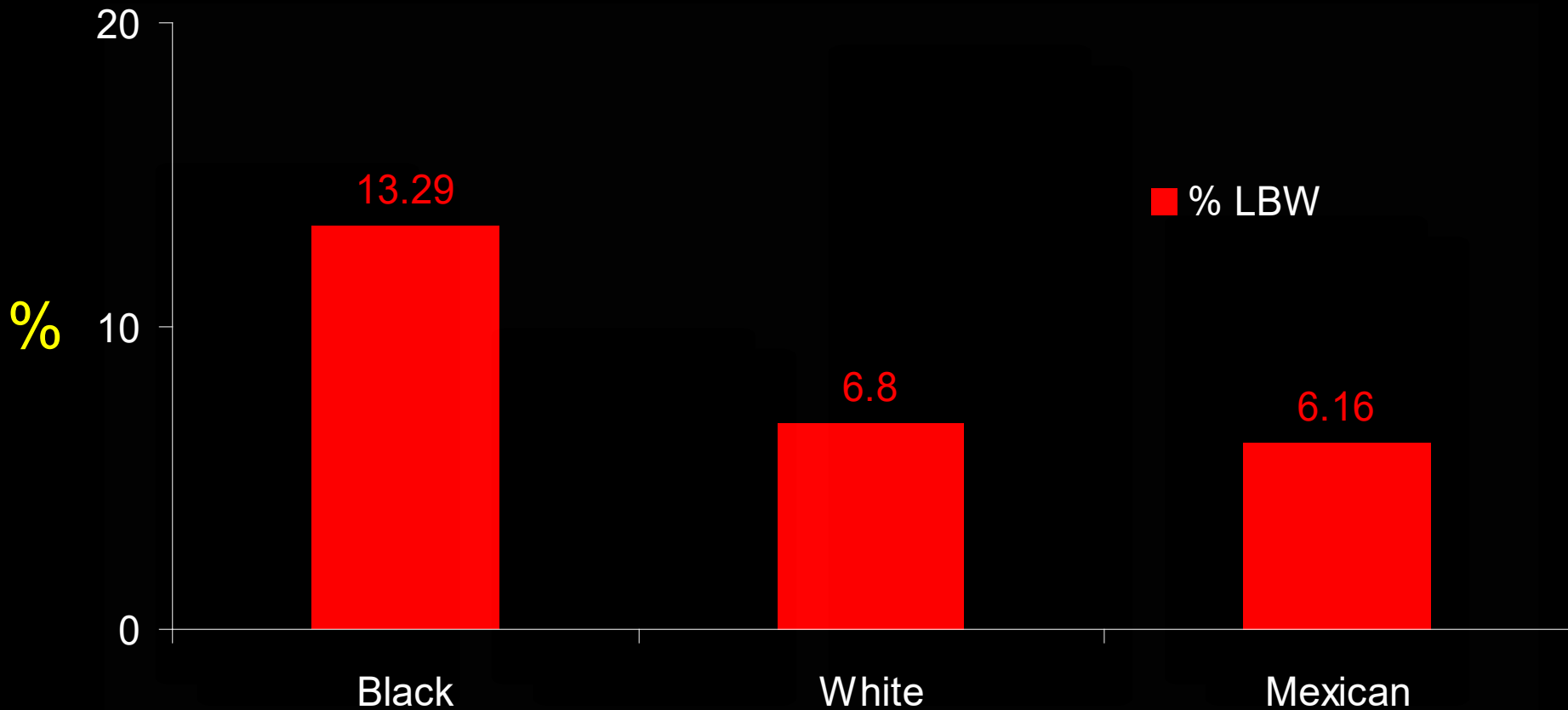
Stroke

Diabetes

Hypertension

# US health disparities

## Low birth weight



Source: NCHS 2004

# Major US health disparities: Disproportionate burden among African Americans

## Early life

Prematurity

Low birth weight

IUGR

?



## Adulthood

Heart attack

Stroke

Diabetes

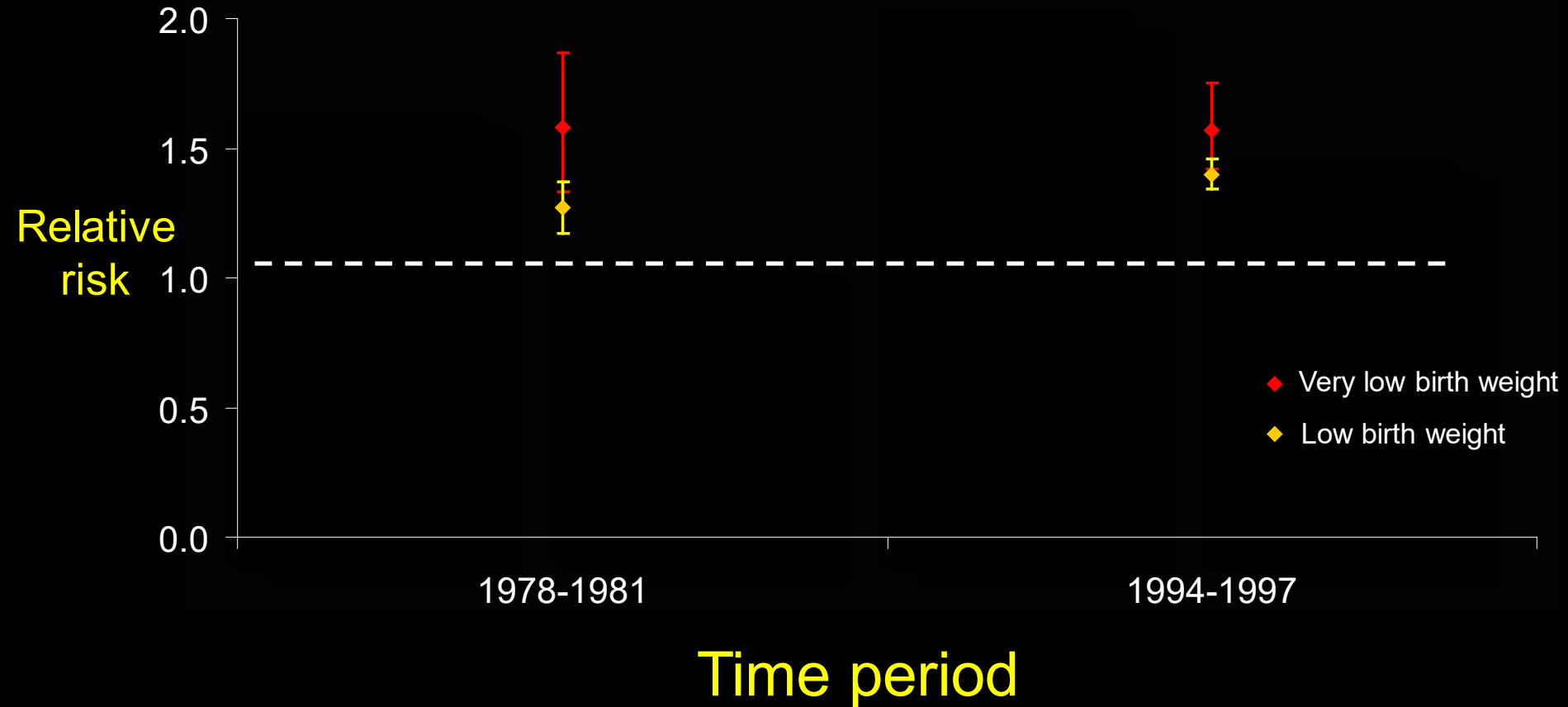
Hypertension

Might birth weight differences among  
“race” groups trace to genes?

*Evidence: birth outcomes in inter-racial marriages*

# Risk of low birth weight in interracial marriages

## Black mother (vs. white mother)



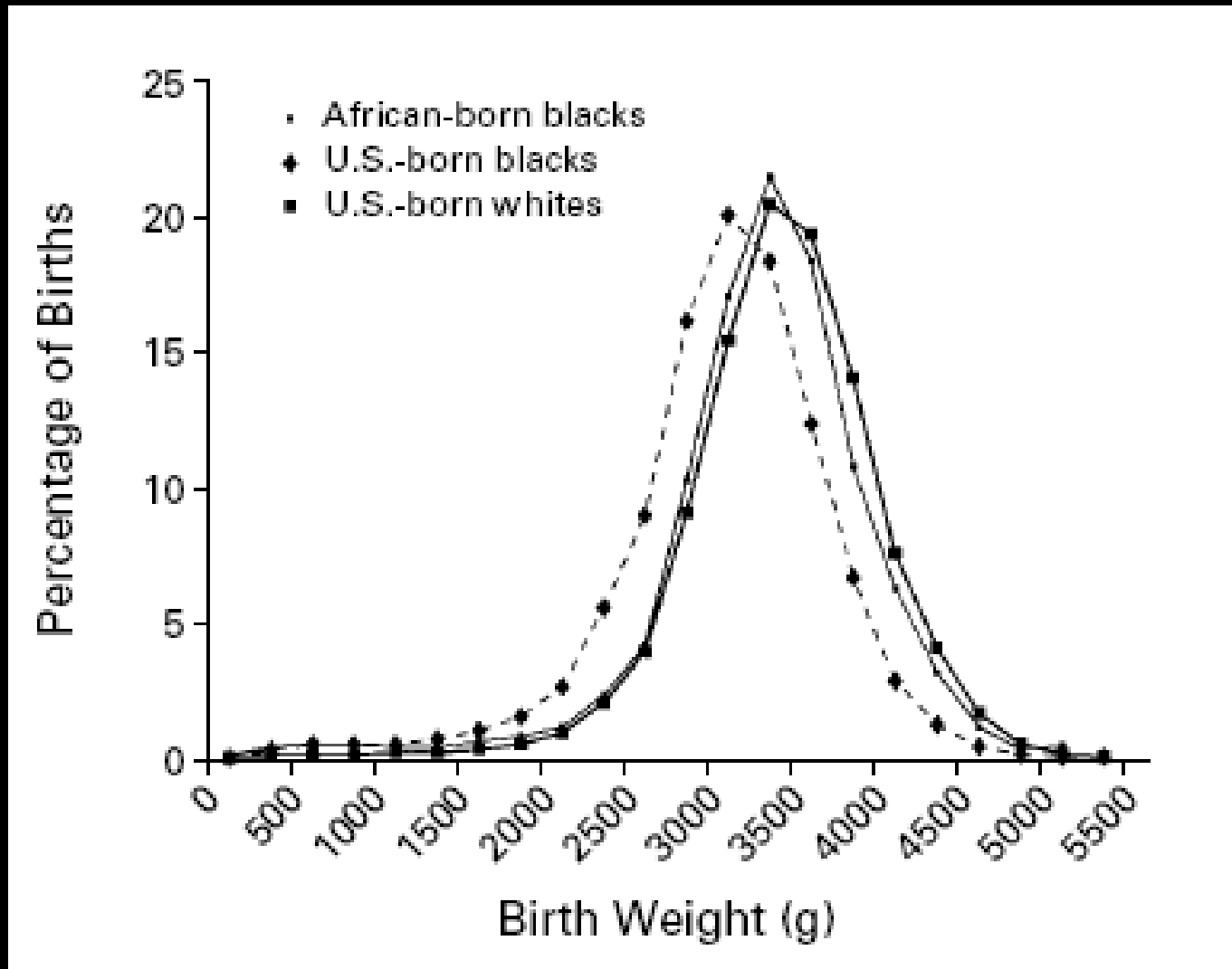


Might birth weight differences among  
“race” groups trace to genes?

*Evidence: birth outcomes in inter-racial marriages*

*Evidence: birth outcomes in recent US immigrants*

# Intergenerational birth weight trends



After one generation living in the US,  
birth weights of recent immigrants  
from Africa become lighter

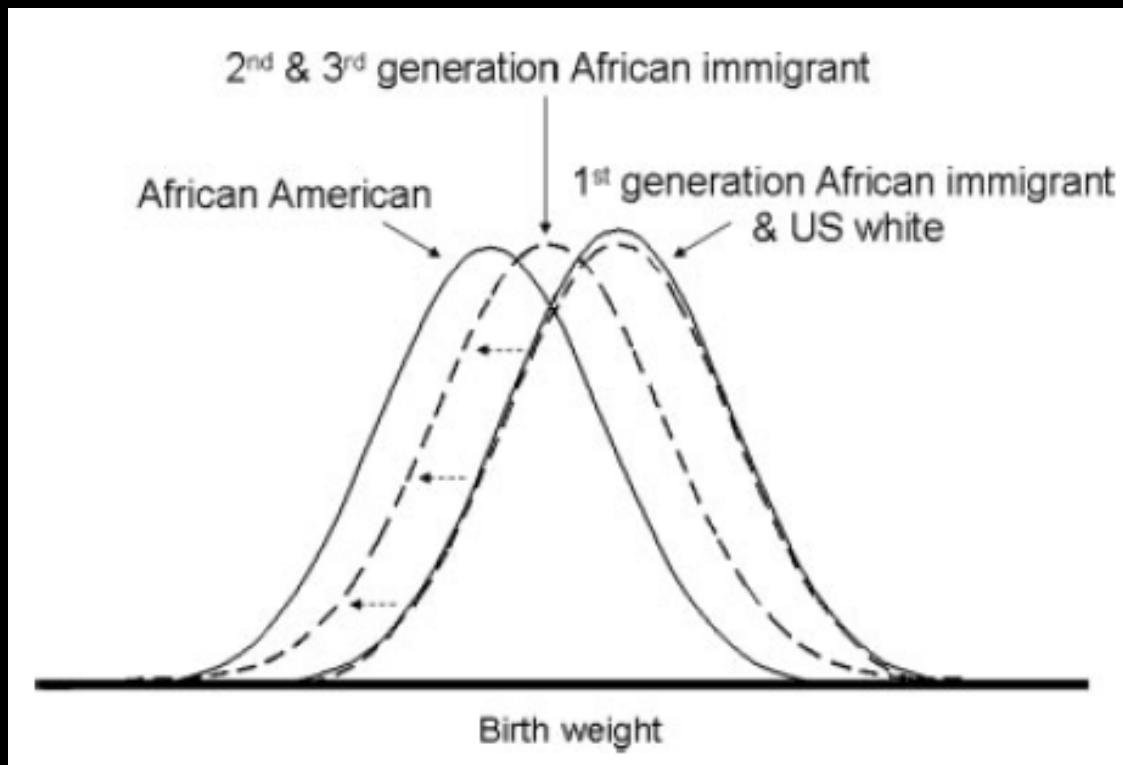


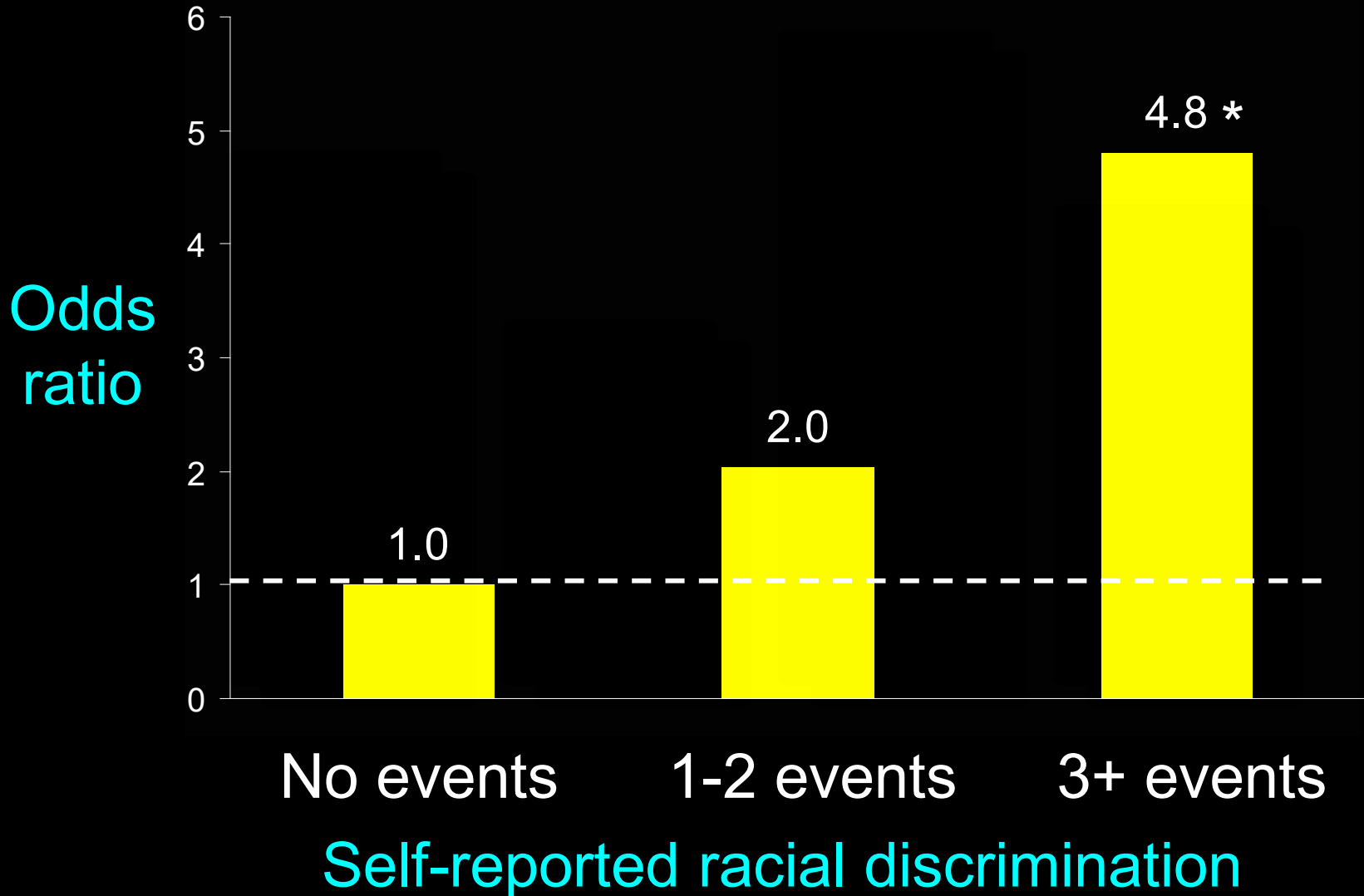
Figure: Kuzawa and Sweet (2009) *Amer J Hum Biol*  
Data: Collins et al (2002) *Amer J Epidemiol*

Adverse birth outcomes are predicted  
by a wide range of social and  
economic factors:

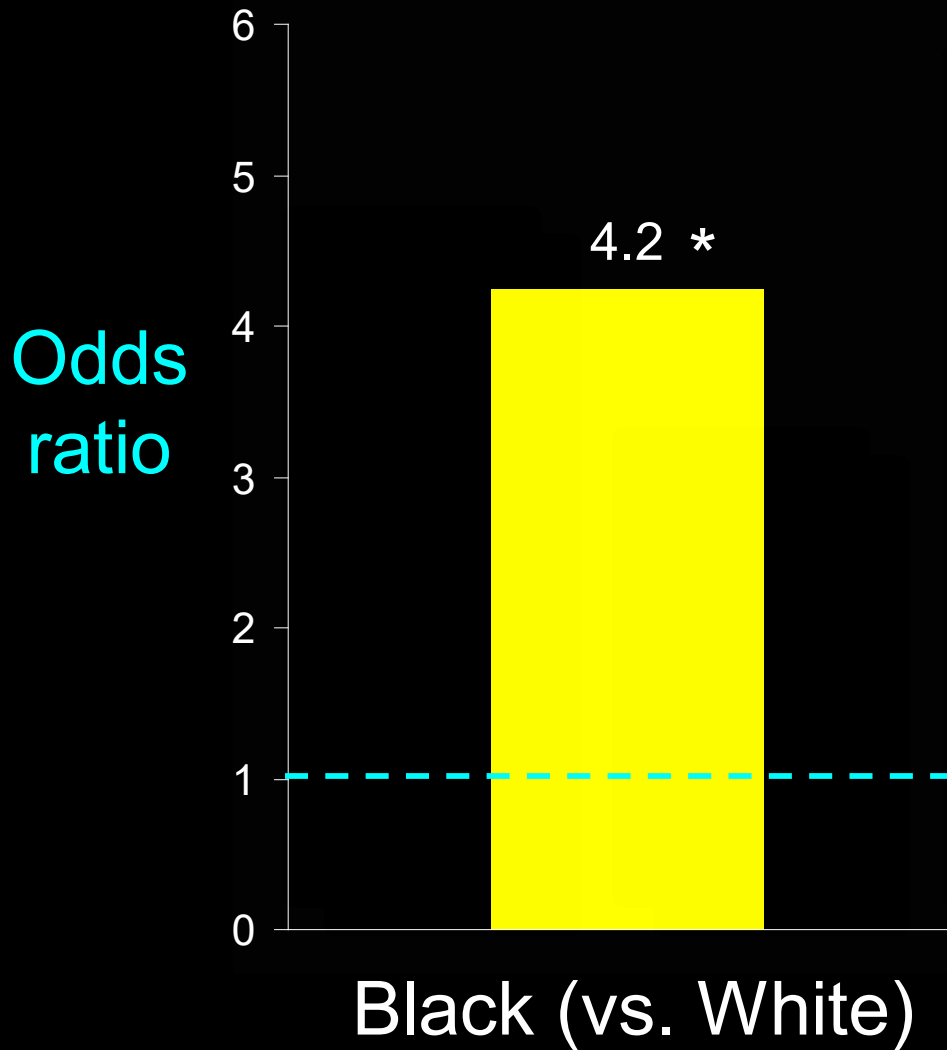
*Examples:*

- Education
- Residential segregation
- Neighborhood level poverty
- Racism
- Discrimination

# Racial discrimination and low birth weight

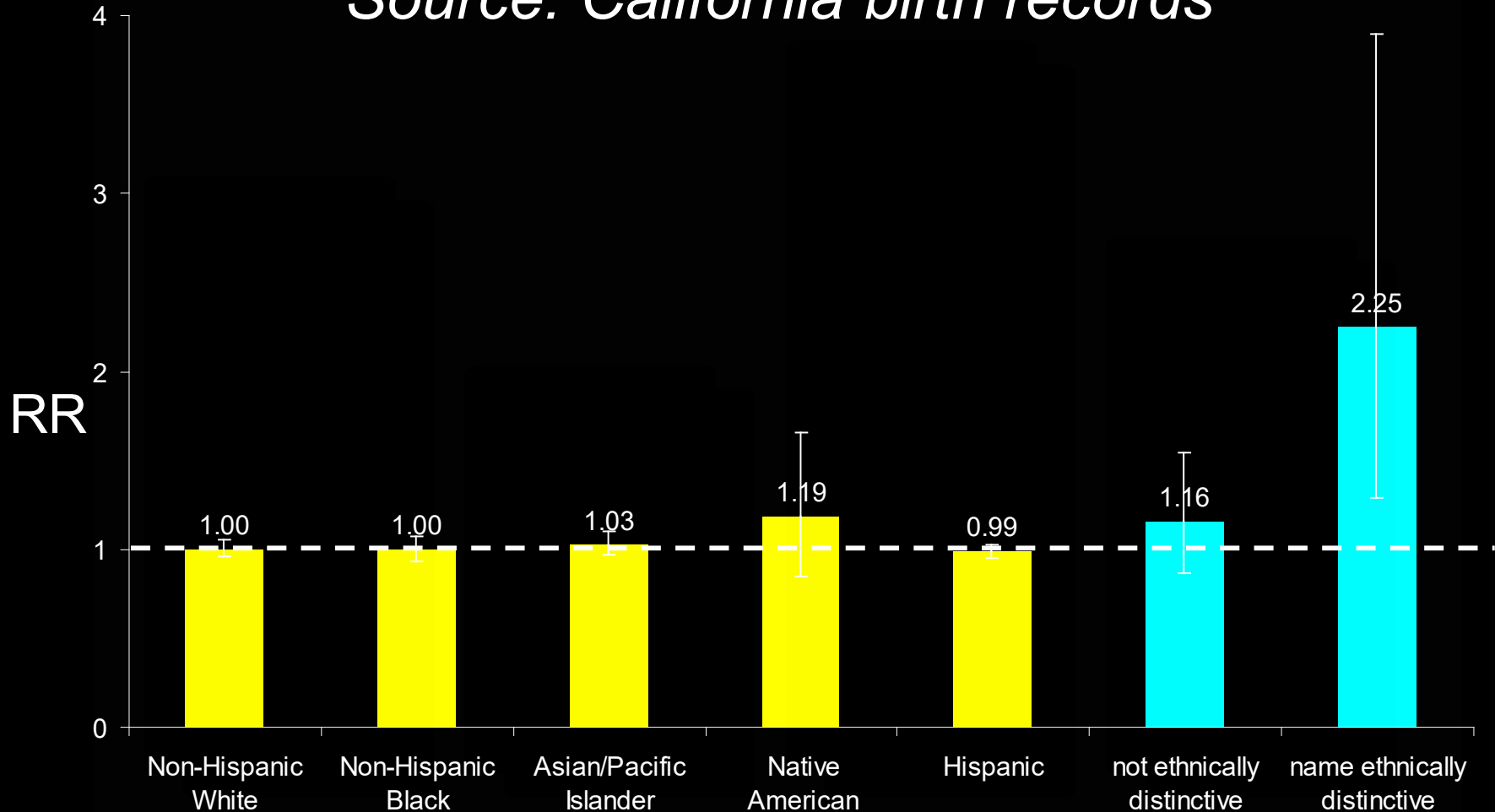


# Racial discrimination and low birth weight



# Relative risk of low birth weight in Arabic-named women post-Sept 11 compared to prior year

Source: California birth records



Arabic-named

Coping  
Buffering  
Social capital

Stressors  
Discrimination  
Racism

(-) ↘

↙ (+)

**“STRESS”**



*Long-term effects:*

Adulthood

Stress reactivity  
Hypertension  
Central obesity  
Diabetes  
Heart attack  
Stroke

*Durable biological changes*

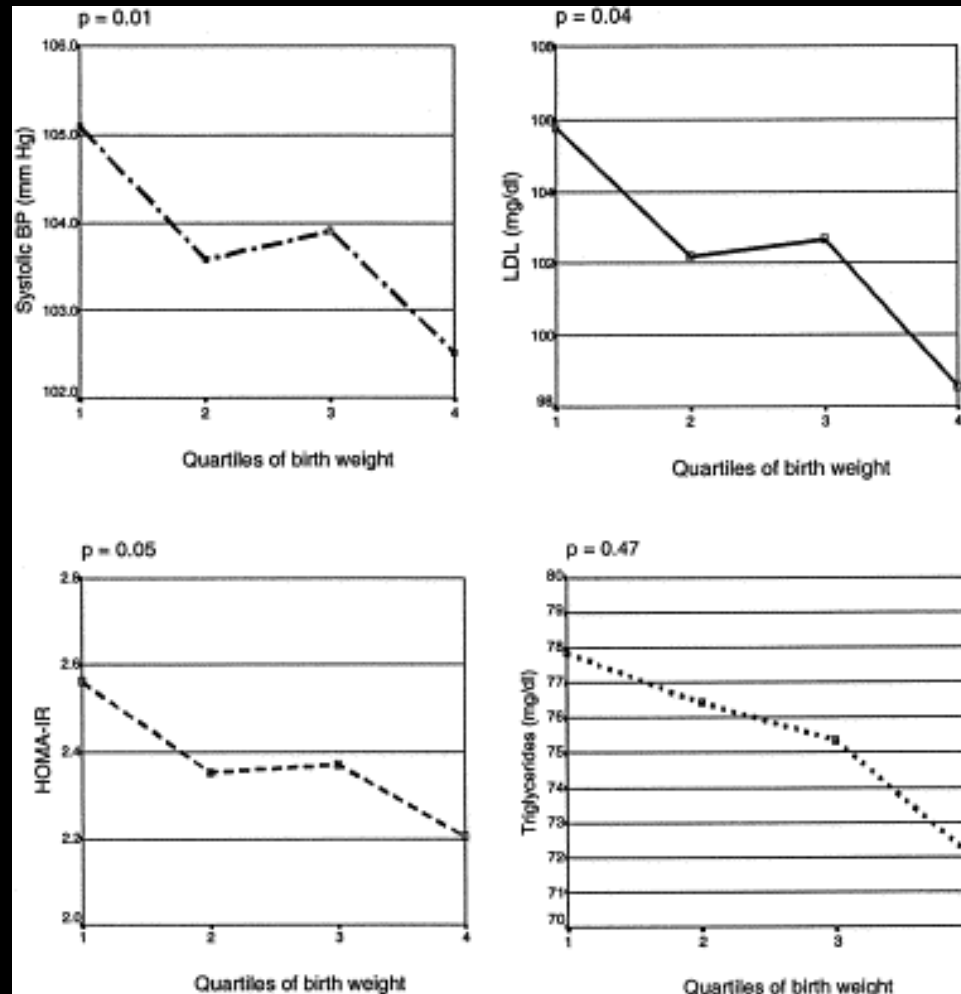
*Short-term effects:*

Prematurity, IUGR & low birth weight



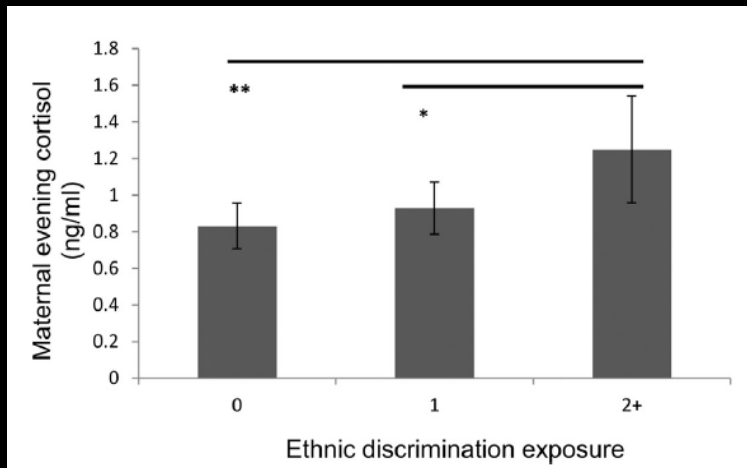
# Bogalusa Heart Study

## Black & White participants



# Intergenerational effects of ethnic discrimination in New Zealand

Mothers reporting discrimination have higher stress hormones (cortisol) during pregnancy...



Thayer & Kuzawa (2015) Soc Sci Med 128: 36-42.

Coping  
Buffering  
Social capital

Stressors  
Discrimination  
Racism

(-) ↘

↙ (+)

“STRESS”



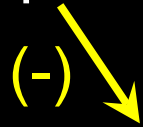
*Durable biological changes*

*Long-term effects:*

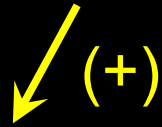
Adulthood

Stress reactivity  
Hypertension  
Central obesity  
Diabetes  
Heart attack  
Stroke

Coping  
Buffering  
Social capital



Stressors  
Discrimination  
Racism



**“STRESS”**



**Generation #2**

**Altered  
prenatal  
environment**



**Durable biological changes**

Maternal pre-pregnancy  
hypertension increases risk of  
intrauterine growth restriction (IUGR)

	<u>Odds ratio</u>
Mild IUGR	2.24 (1.47, 3.39)
Severe IUGR	3.45 (2.18, 5.46)

Being born small (or exposed to prenatal undernutrition/stress) is only one early life factor influencing later health

Being born too large is also a risk

# Additional pathways of importance

*Prenatal overnutrition also carries risks*

*This is not simply a story of genetic inheritance*

Diabetic mother



offspring

↑ glucose to fetus



macrosomic baby



↑ risk obesity & diabetes



Diabetic mother



grand-offspring

↑ glucose to fetus



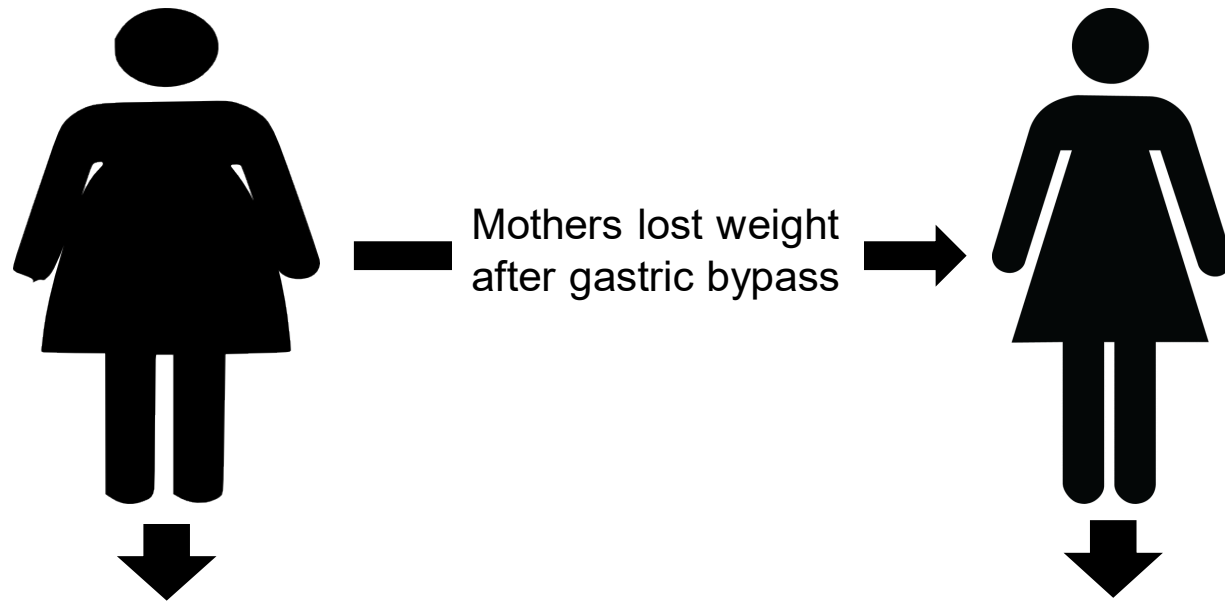
macrosomic baby



↑ risk obesity & diabetes



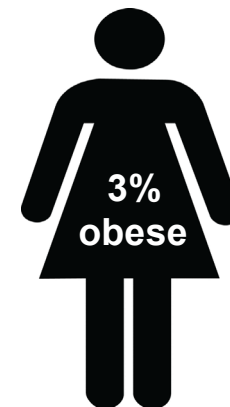
# Mothers' weight loss (gastric bypass) lowers obesity risk in their offspring



Child #1



Child #2



**Also improves:**

- Blood pressure
- Diabetes
- Cholesterol

Their children  
at 12 yrs. of age



# Major US health disparities

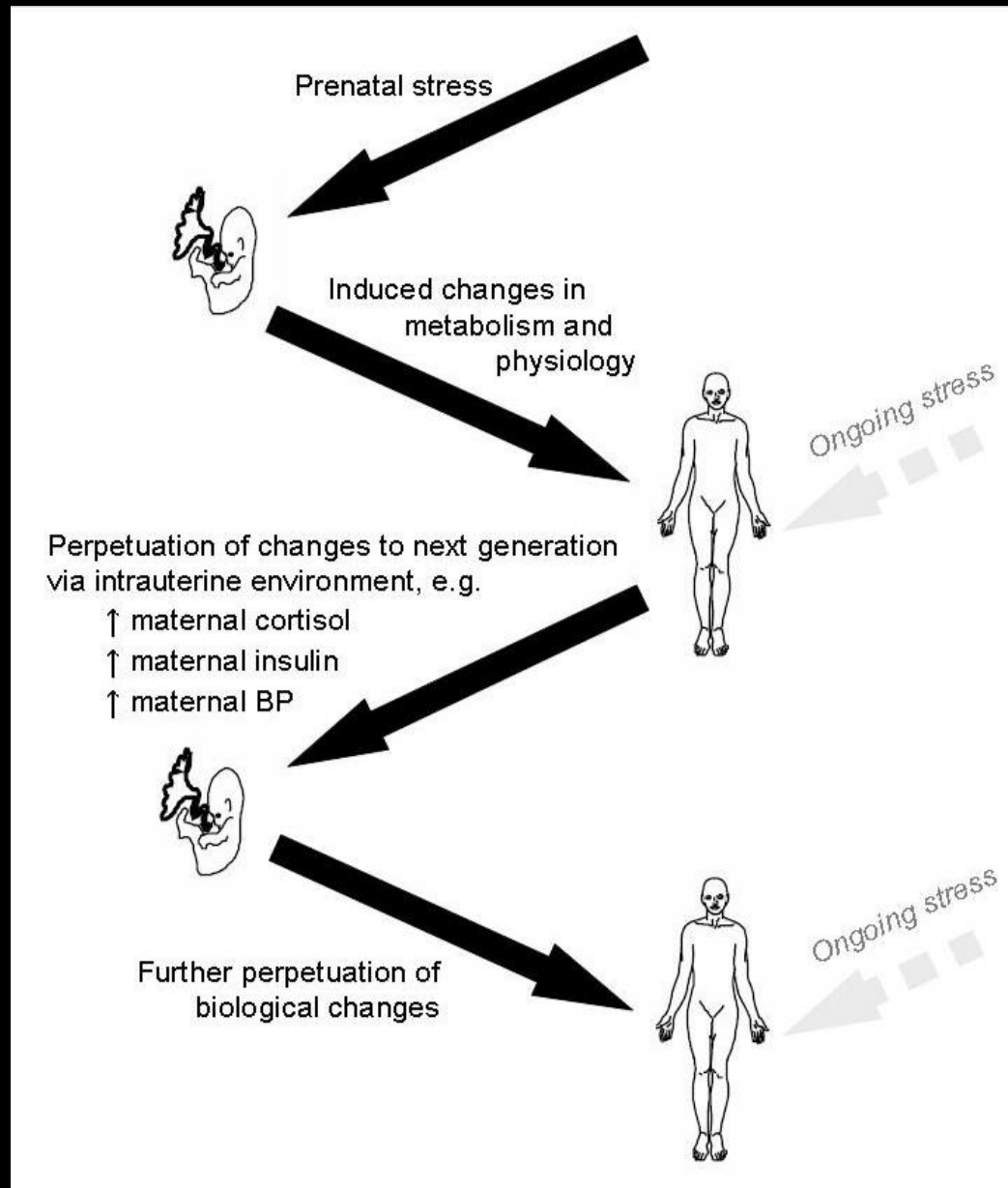
## Early life

Prematurity  
Low birth weight  
IUGR  
Macrosomia



## Adulthood

Hypertension  
Diabetes  
Inflammation  
↑Stress hormones  
Obesity



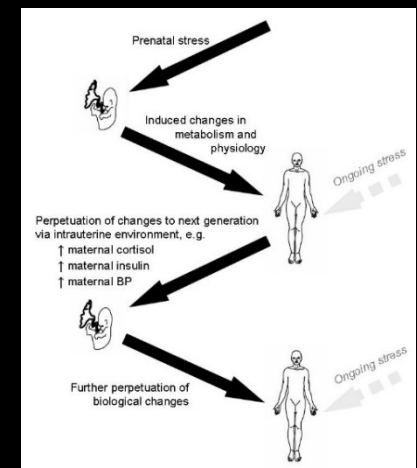
Wrap-up

# Evidence for social-developmental contributions to race-based health disparities

- ✓ African Americans have lower (average) birth weights
- ✓ Low birth weights trace to social causes
- Some adult biological changes (ex: hypertension, diabetes) → adverse gestational environment in next generation

Take-home:

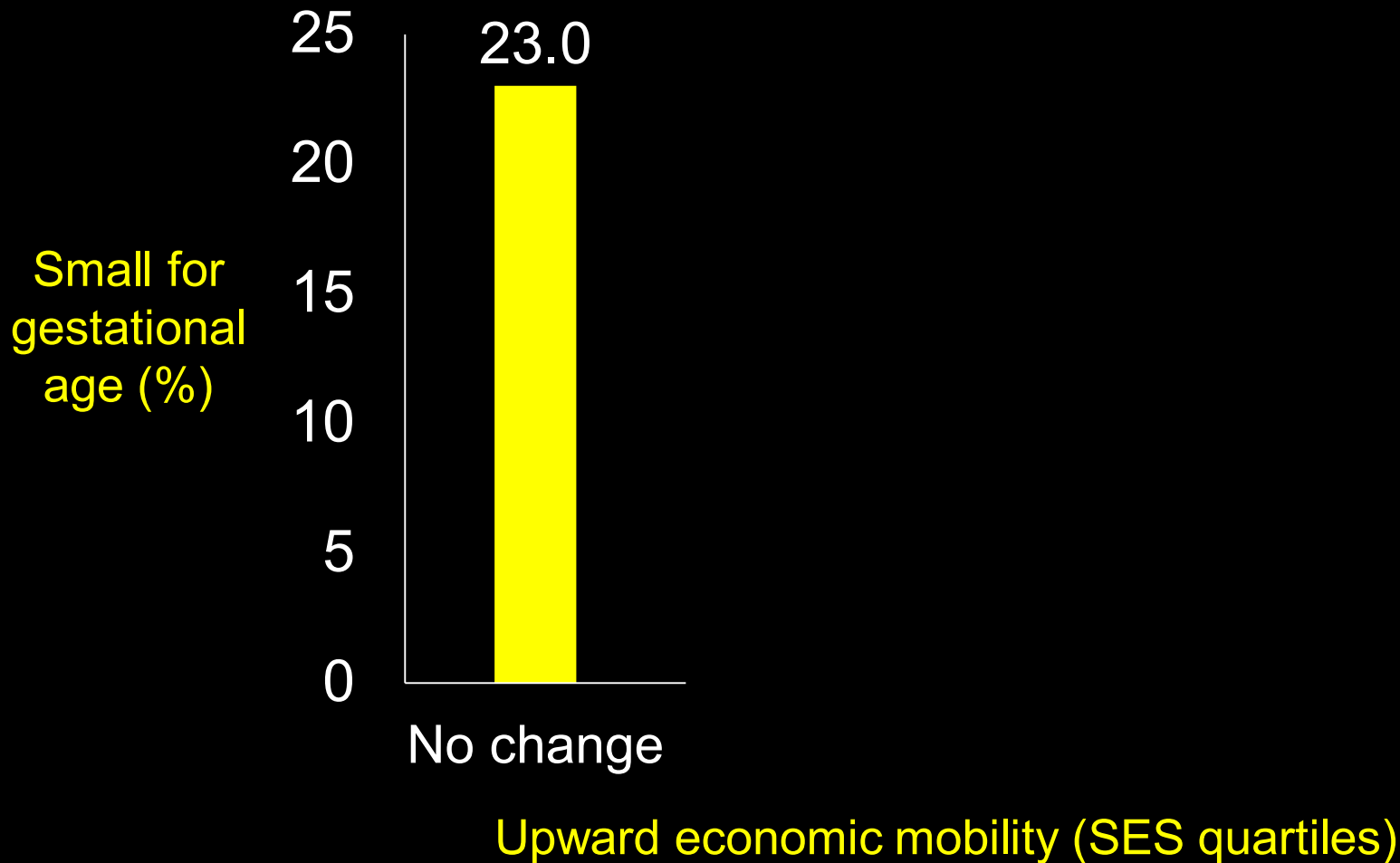
*Unequal social environments influence racial health inequality cumulatively via wear and tear (traditional view) but also via lifecourse and intergenerational pathways*



## How reparations could help:

*These developmental health inequalities are reversed by economic, educational or residential mobility*

# Upward economic mobility in African American women reduces risk of giving birth to small-for-gestational age (SGA) babies (Cook county, Illinois)



## Among African American women, upward income, educational and residential mobility lead to:

- Lower risk of small-for-gestational age
  - Lower risk of preterm-birth
  - Lower risk of low birth weight
- 
- *“Developmental origins” research shows that policies that improve these newborn and infant health outcomes will also help narrow the racial gap in adult health.*

**Thank you for your time**