

**The Life Course Perspective:  
*Moving from Theory to Action***

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# Moving from Theory to Action

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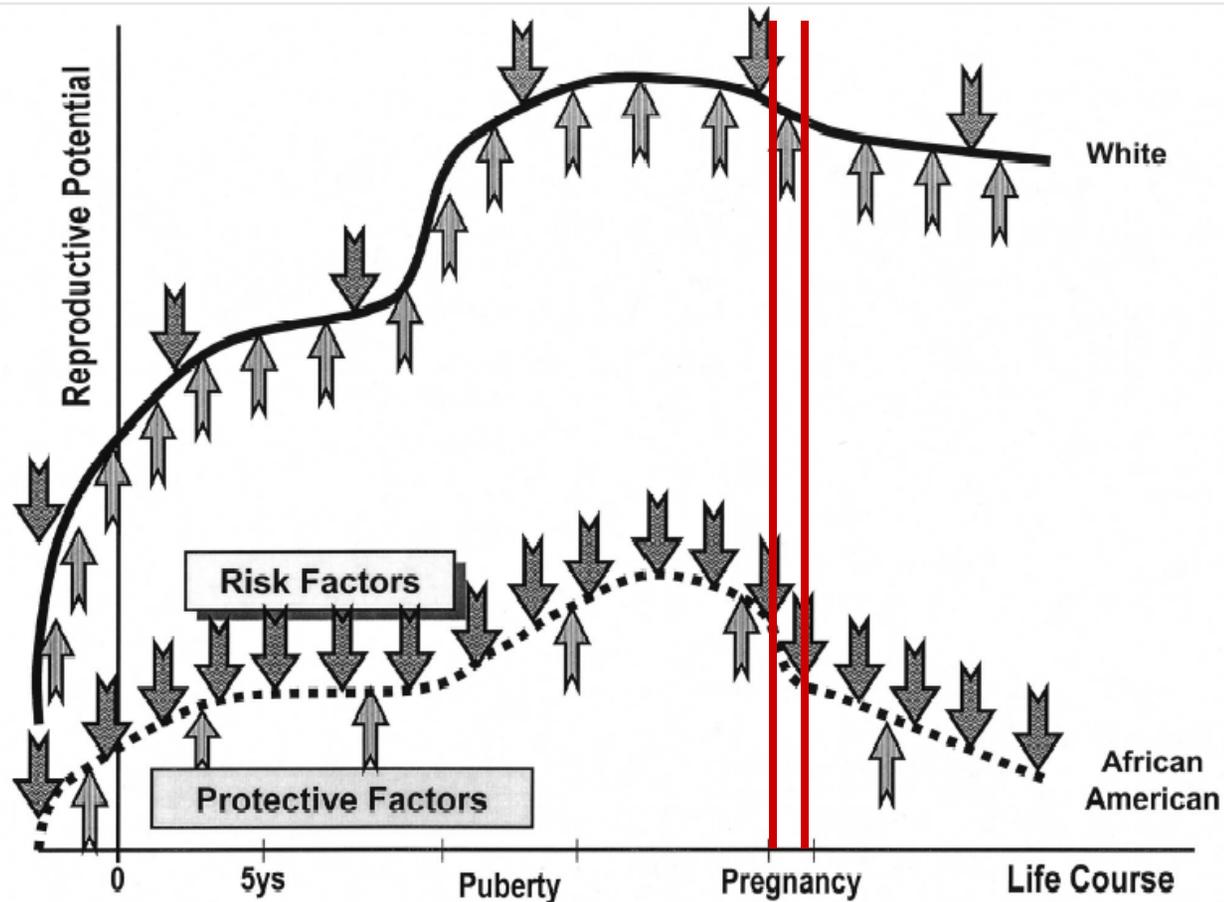
- ❑ Discuss how to apply the life course perspective to guide research, practice, and policy in MCH
  - ❑ Consider what role MCH Epi can play in moving the life course perspective from theory to action
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# Life-Course Perspective

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- A way of looking at life not as disconnected stages, but as an integrated continuum
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# Life Course Perspective



Lu MC, Halfon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Matern Child Health J.* 2003;7:13-30.

# Life Course Perspective

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- Developmental programming
  - Cumulative pathways
-

# Developmental Programming



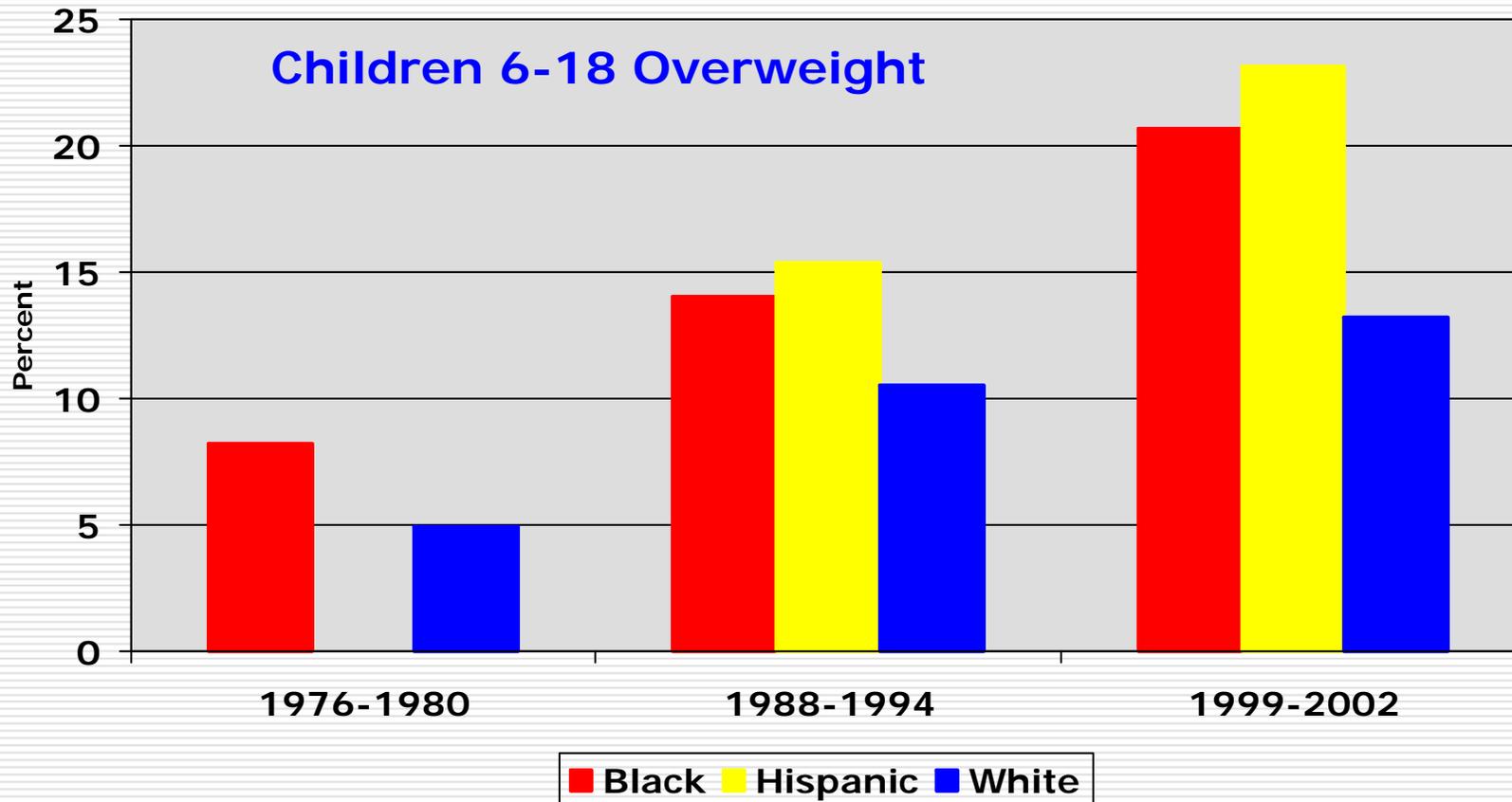


# Prenatal Programming of Childhood Obesity

**OBESITY:** A Weighty Issue  
for Children



# Epidemic of Childhood Overweight & Obesity



Source: National Center for Health Statistics, National Health and Nutrition Examination Survey

Note: Estimate not available for 1976-1980 for Hispanic; overweight defined as BMI at or above the 95<sup>th</sup> percentile of the CDC BMI-for-age growth charts

# Prenatal Programming of Childhood Overweight & Obesity

Matern Child Health J  
DOI 10.1007/s10995-006-0141-8

ORIGINAL PAPER

## Prenatal Programming of Childhood Overweight and Obesity

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**Abstract** *Objective:* To review the scientific evidence for prenatal programming of childhood overweight and obesity, and discuss its implications for MCH research, practice, and policy.

*Methods:* A systematic review of observational studies examining the relationship between prenatal exposures and childhood overweight and obesity was conducted using MOOSE guidelines. The review included literature posted on PubMed and MDCconsult and published between January 1975 and December 2005. Prenatal exposures to maternal diabetes, malnutrition, and cigarette smoking were examined, and primary study outcome was childhood overweight or obesity as measured by body mass index (BMI) for children ages 5 to 21.

*Results:* Four of six included studies of prenatal exposure to maternal diabetes found higher prevalence of childhood overweight or obesity among offspring of diabetic mothers, with the highest quality study reporting an odds ratio of adolescent overweight of 1.4 (95% CI 1.0–1.9). The Dutch famine study found that exposure to maternal malnutrition in early, but not late, gestation was associated with increased

odds of childhood obesity (OR 1.9, 95% CI 1.5–2.4). All eight included studies of prenatal exposure to maternal smoking showed significantly increased odds of childhood overweight and obesity, with most odds ratios clustering around 1.5 to 2.0. The biological mechanisms mediating these relationships are unknown but may be partially related to programming of insulin, leptin, and glucocorticoid resistance *in utero*.

*Conclusion:* Our review supports prenatal programming of childhood overweight and obesity. MCH research, practice, and policy need to consider the prenatal period a window of opportunity for obesity prevention.

**Keywords** Prenatal programming · Childhood obesity · Overweight · Developmental programming · Fetal programming · Gestational diabetes · Maternal malnutrition · Cigarette smoking

Childhood overweight and obesity is a growing problem in the United States and worldwide. The prevalence of childhood overweight in the U.S. tripled between 1980 and 2000 [1]. Today approximately 1 in 6 (16%) U.S. children are overweight with significant racial-ethnic disparities. For example, nearly 1 in 4 (23%) non-Hispanic black girls ages 6 to 19 are overweight, a prevalence almost twice that of non-Hispanic white girls [1].

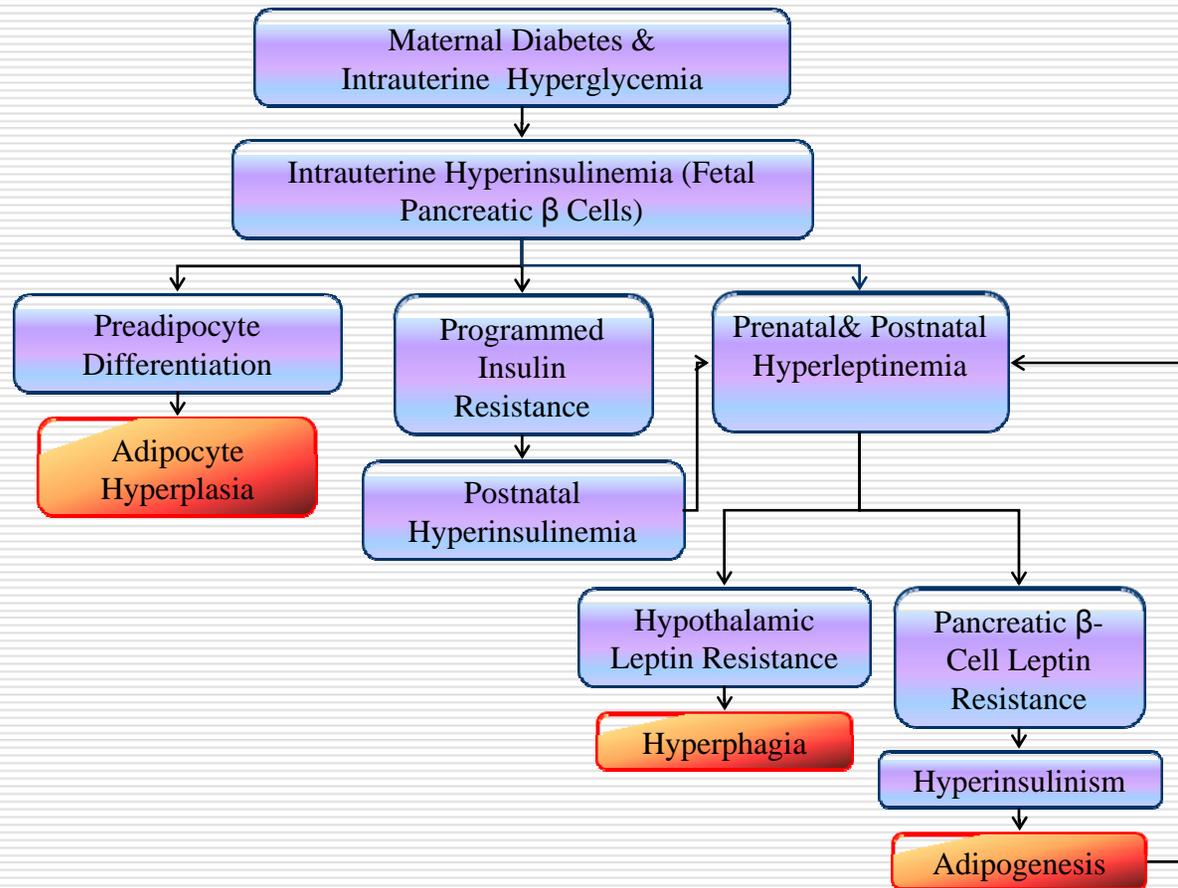
Overweight and obesity has significant lifelong consequences on the health and well-being of children [2, 3]. Childhood obesity is associated with early-onset Type II diabetes mellitus, hypertension, metabolic syndrome, and sleep apnea. It is also associated with cognitive or intellectual impairment and social exclusion and stigmatization as parts of a vicious cycle including school avoidance [3]. Childhood obesity tracks strongly into adulthood [4, 5]; obesity beyond

**Disclaimer:** The opinions expressed in this paper are the authors' and do not necessarily reflect the views or policies of the institutions with which the authors are affiliated.

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# Prenatal Programming of Childhood Obesity

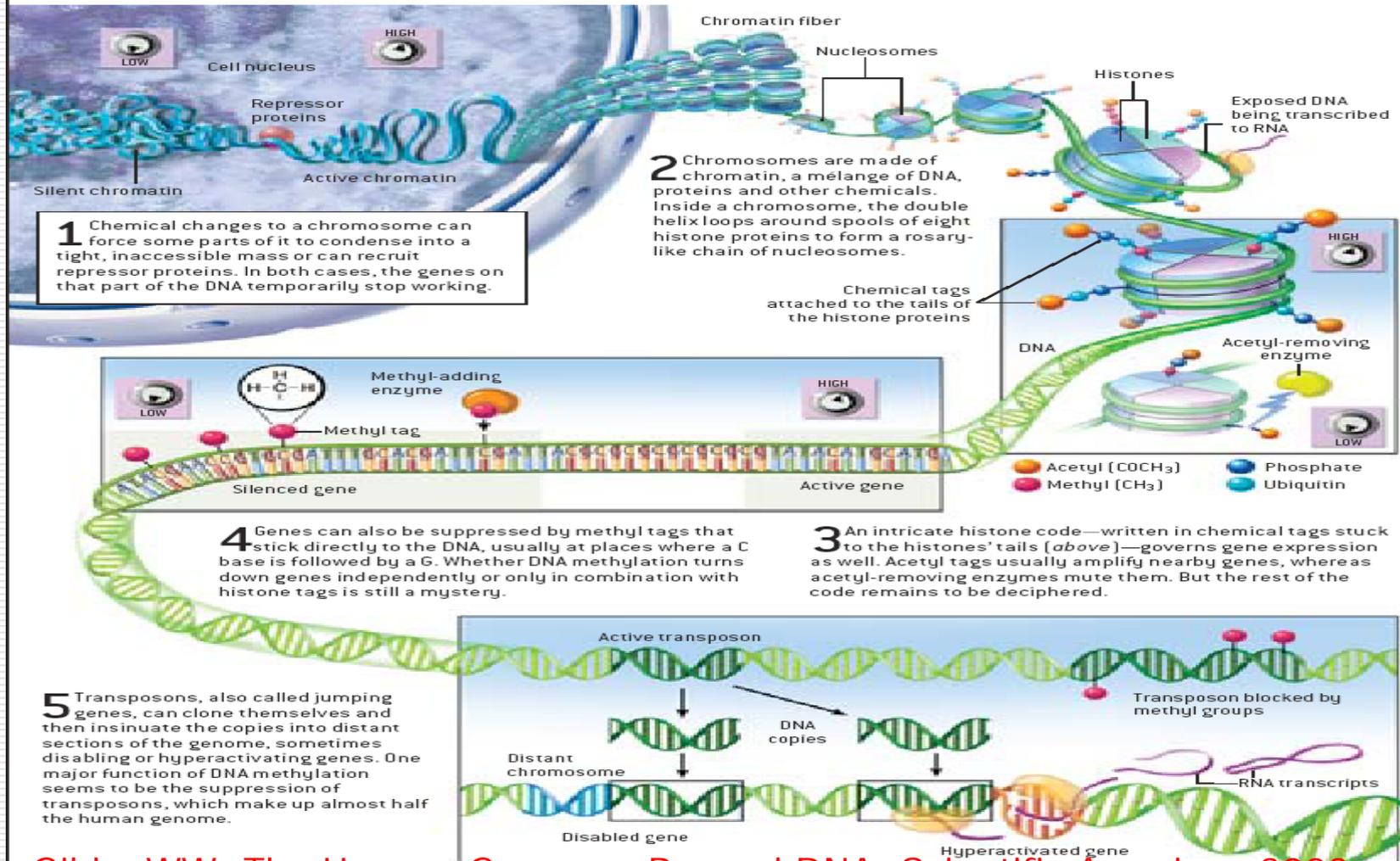


# Epigenetics

## VOLUME CONTROLS FOR GENES

THE DNA SEQUENCE is not the only code stored in the chromosomes. So-called epigenetic phenomena of several kinds can act like volume knobs to amplify or mute the effect of genes. Epigenetic information is encoded as chemical attachments to

the DNA or to the histone proteins that control its shape within the chromosomes. Among their many functions, the epigenetic volume controls muffle parasitic genetic elements, called transposons, that riddle the genome.



Gibbs WW. The Unseen Genome: Beyond DNA. Scientific American 2003

# Epigenetics

*Same Genome, Different Epigenome*

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R.A. Waterland, R.A. Jirtle, "Transposable elements: targets for early nutritional effects on epigenetic gene regulation," *Mol Cell Biol*, 23:5293-300, 2003. Reprinted in [the New Scientist 2004](#)

# Cumulative Pathways



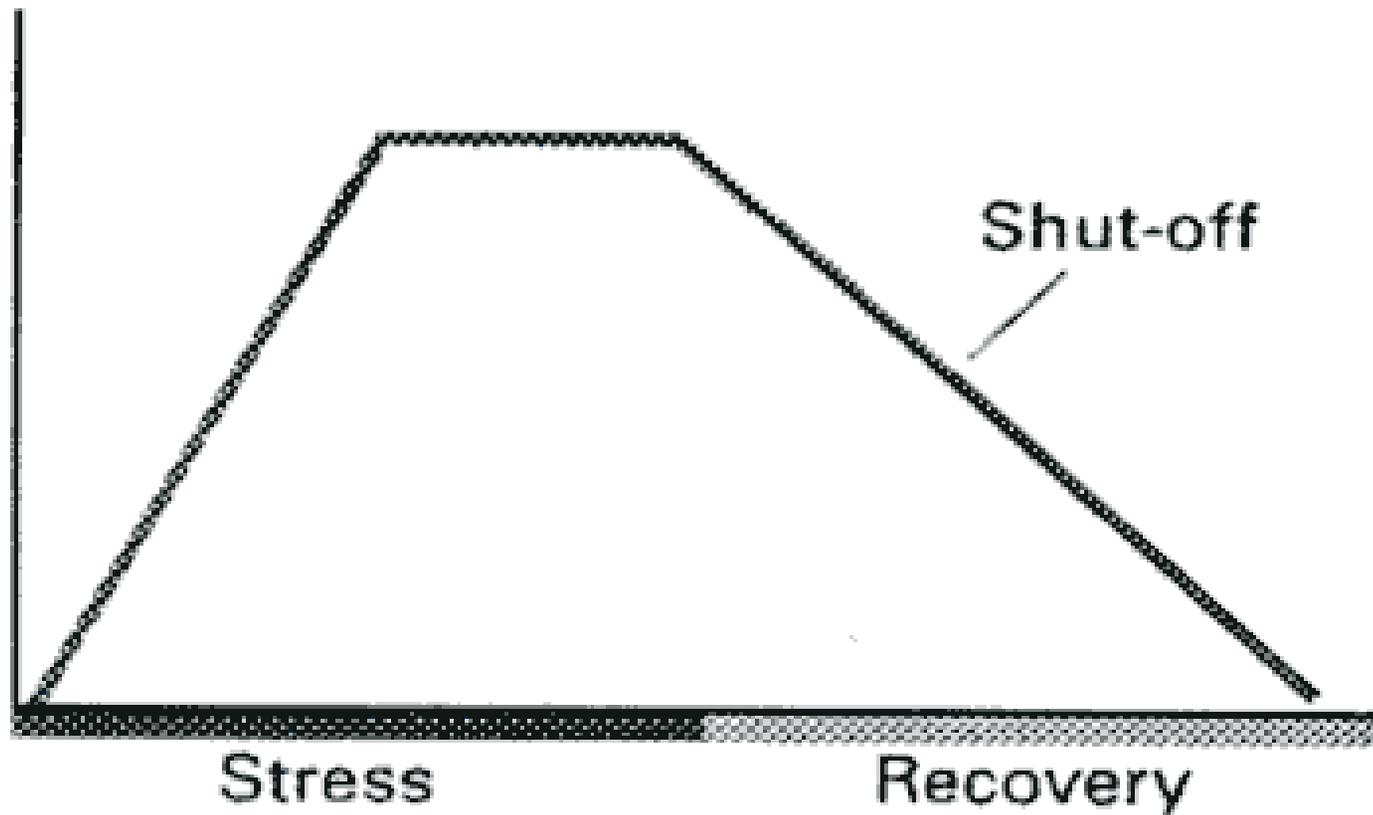
Photo: <http://www.lam.mus.ca.us/cats/encyclo/smilodon/>

# Allostasis:

## Maintain Stability through Change

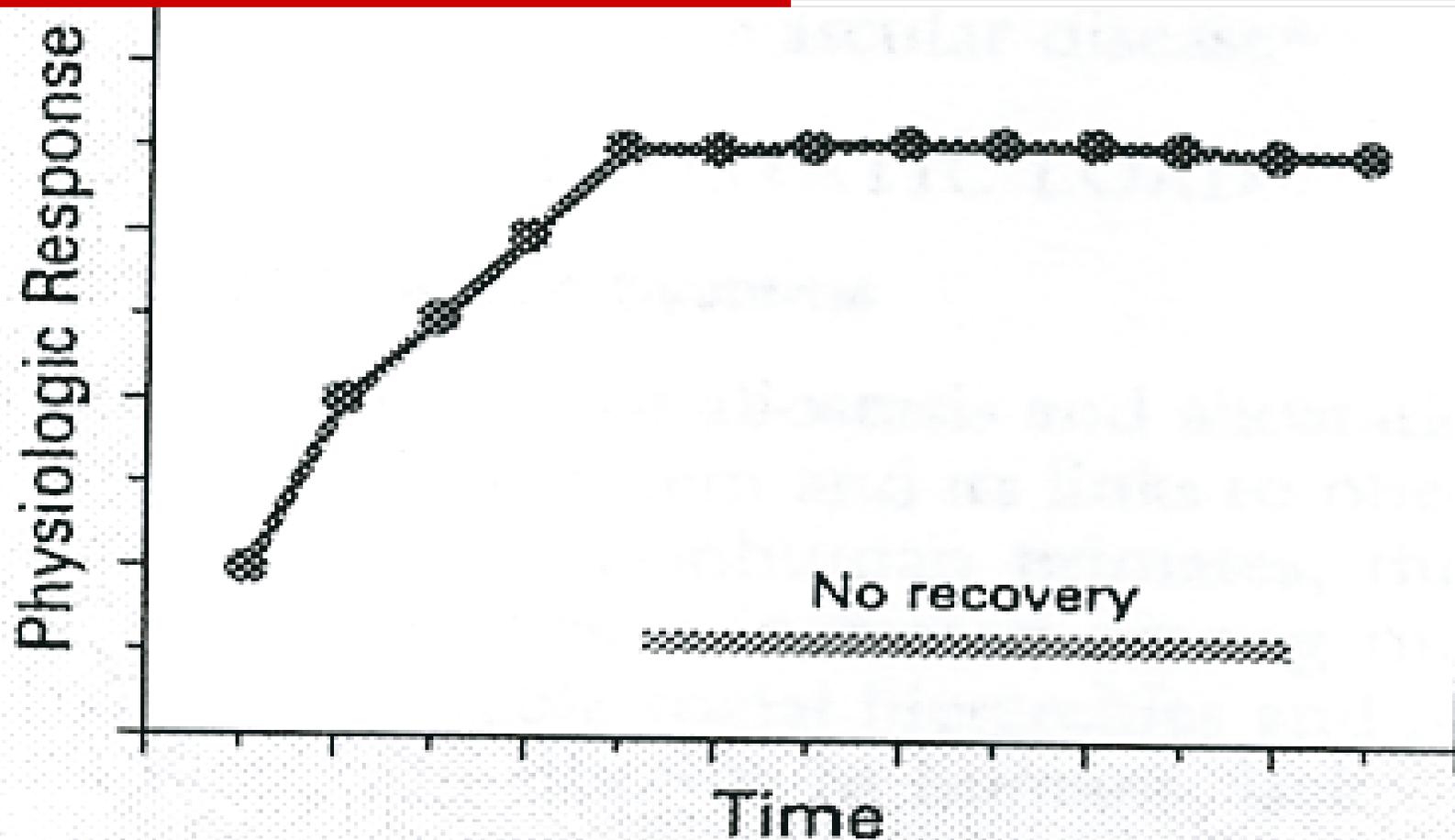
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Allostasis



McEwen BS. Protective and damaging effects of stress mediators. N Eng J Med. 1998;338:171-9.

# Allostatic Load: Wear and Tear from Chronic Stress



McEwen BS. Protective and damaging effects of stress mediators. N Eng J Med. 1998;338:171-9.

# Stressed vs. Stressed Out

## □ Stressed

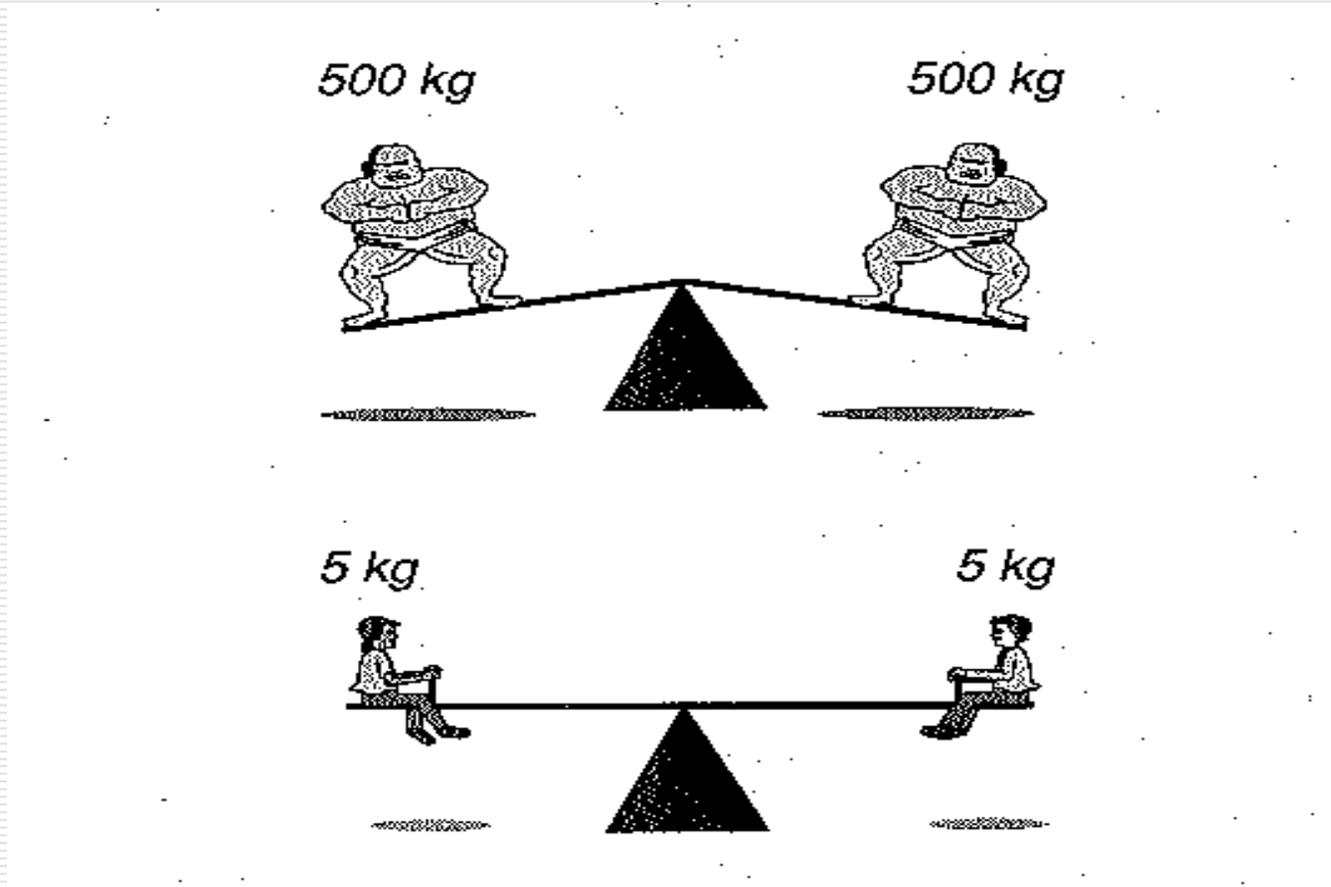
- Increased cardiac output
- Increased available glucose
- Enhanced immune functions
- Growth of neurons in hippocampus & prefrontal cortex

## □ Stressed Out

- Hypertension & cardiovascular diseases
- Glucose intolerance & insulin resistance
- Infection & inflammation
- Atrophy & death of neurons in hippocampus & prefrontal cortex

# Allostasis & Allostatic Load

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McEwen BS, Lasley EN. The end of stress: As we know it. Washington DC: John Henry Press. 2002

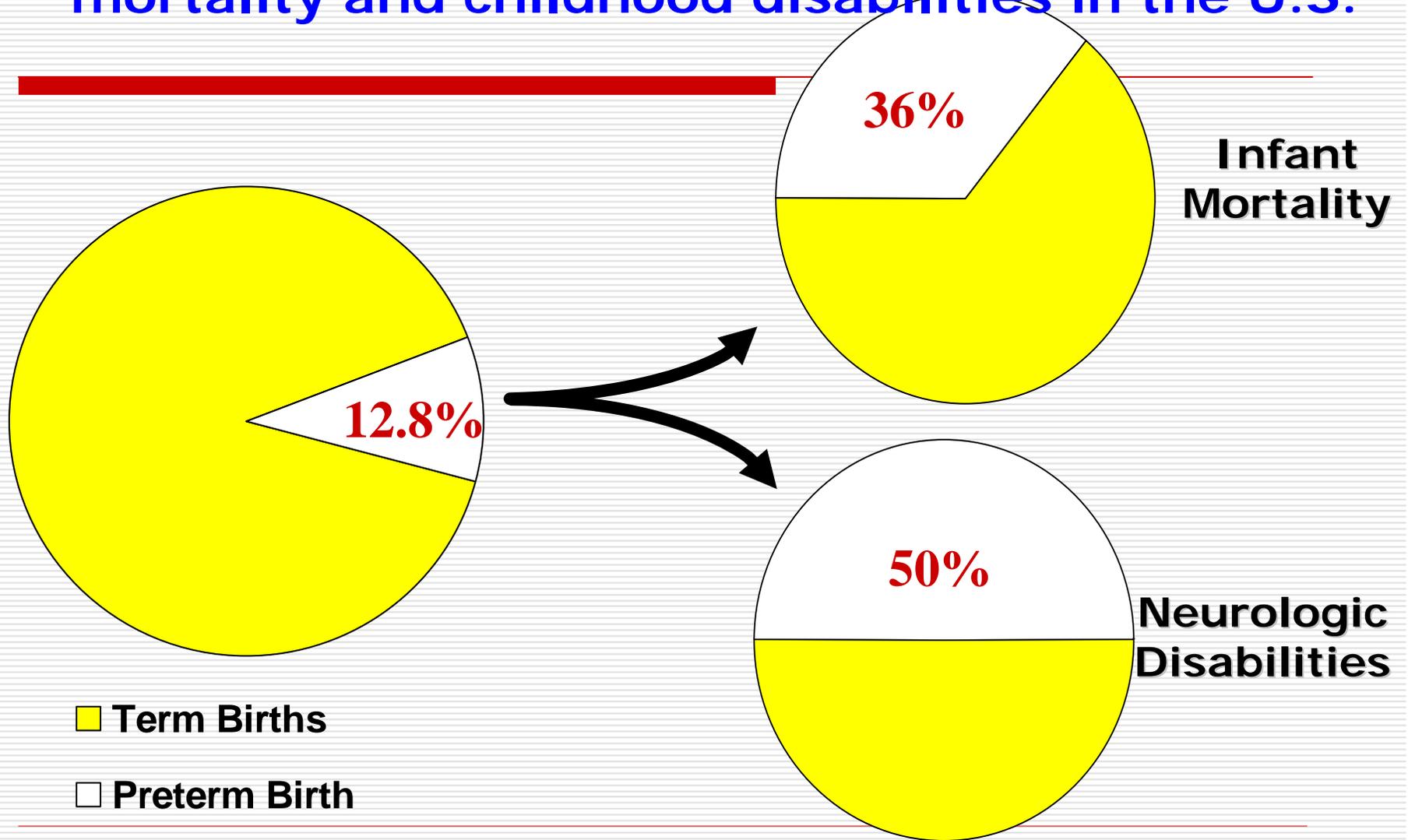
# Rethinking Preterm Birth



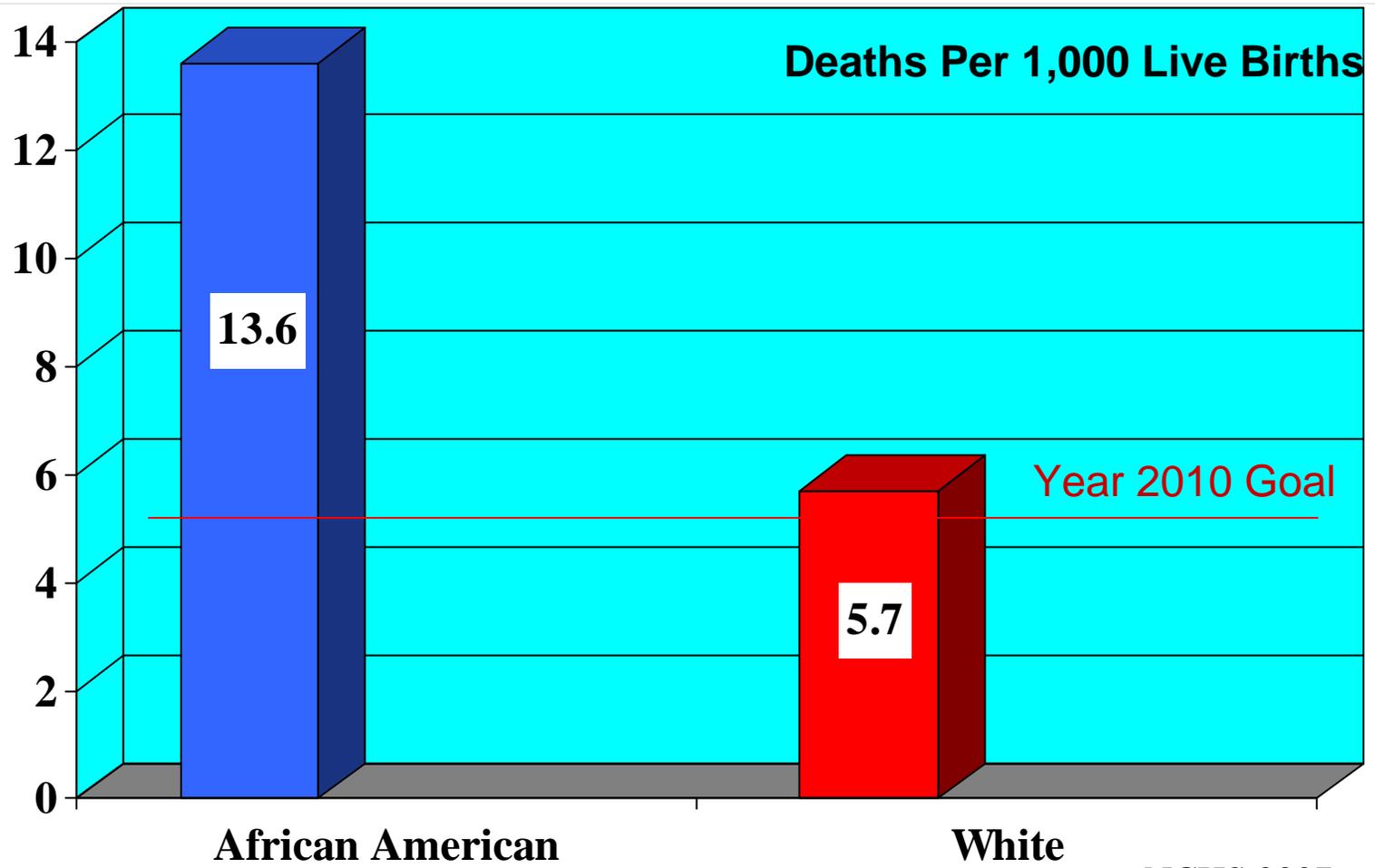
**WARNING**  
TO PREVENT INFANT FALL WHEN  
• DO NOT LEAVE INFANT UNATTENDED  
• DO NOT  
TODAY END



# Preterm birth is a leading cause of infant mortality and childhood disabilities in the U.S.

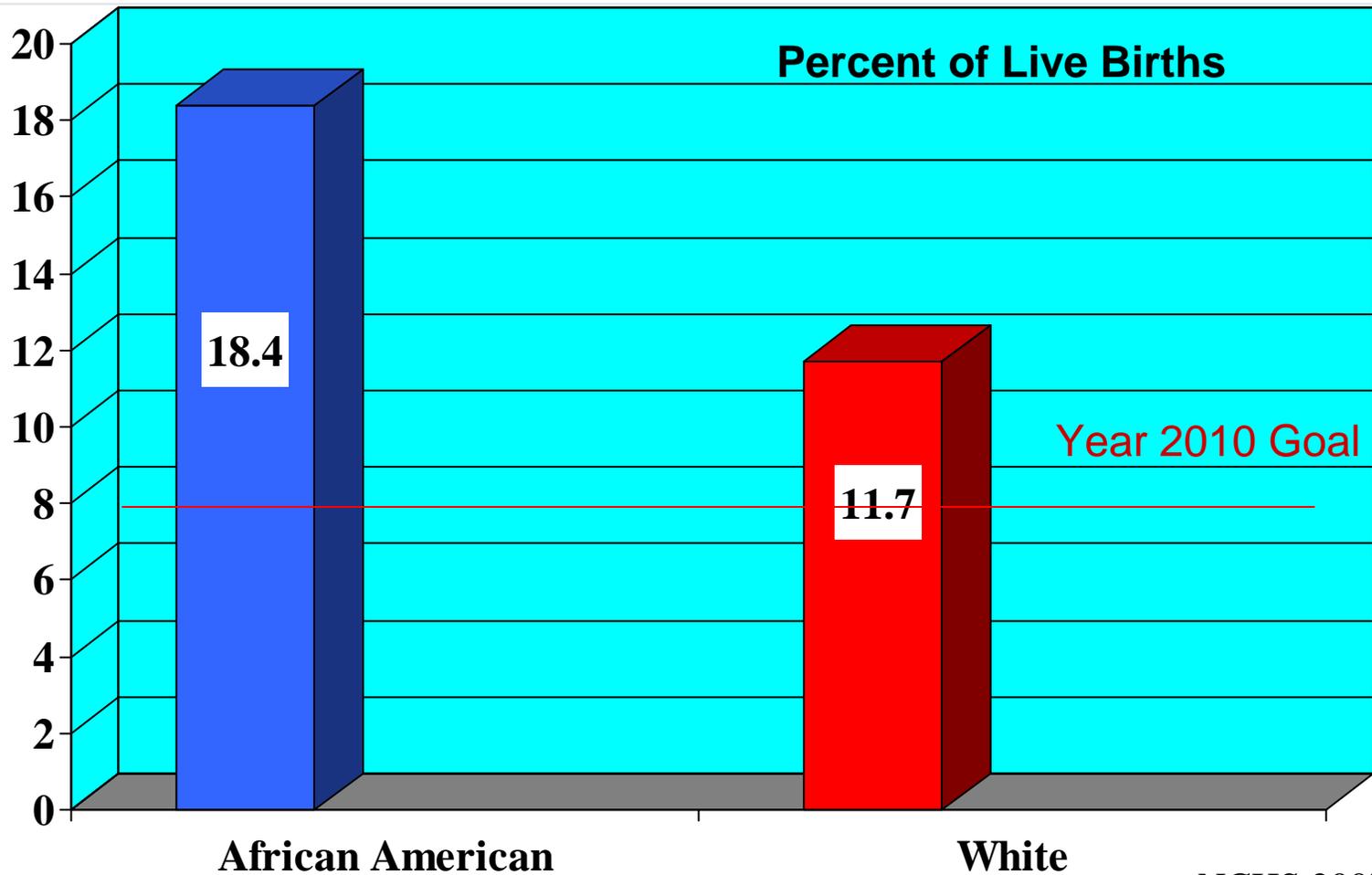


# Racial & Ethnic Disparities Infant Mortality



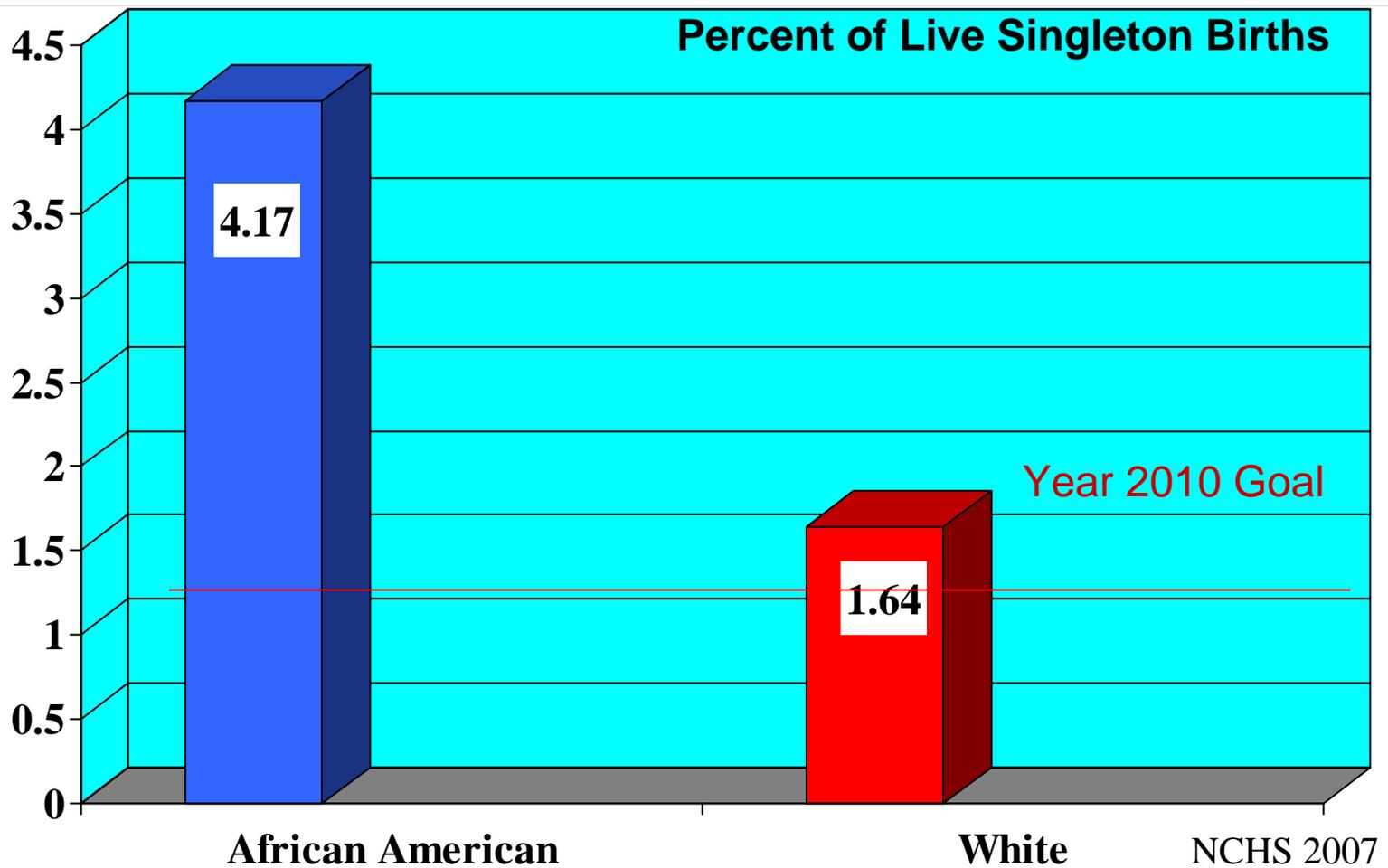
NCHS 2007

# Racial & Ethnic Disparities Preterm Births < 37 Weeks



NCHS 2007

# Racial & Ethnic Disparities Very Preterm Births < 32 Weeks

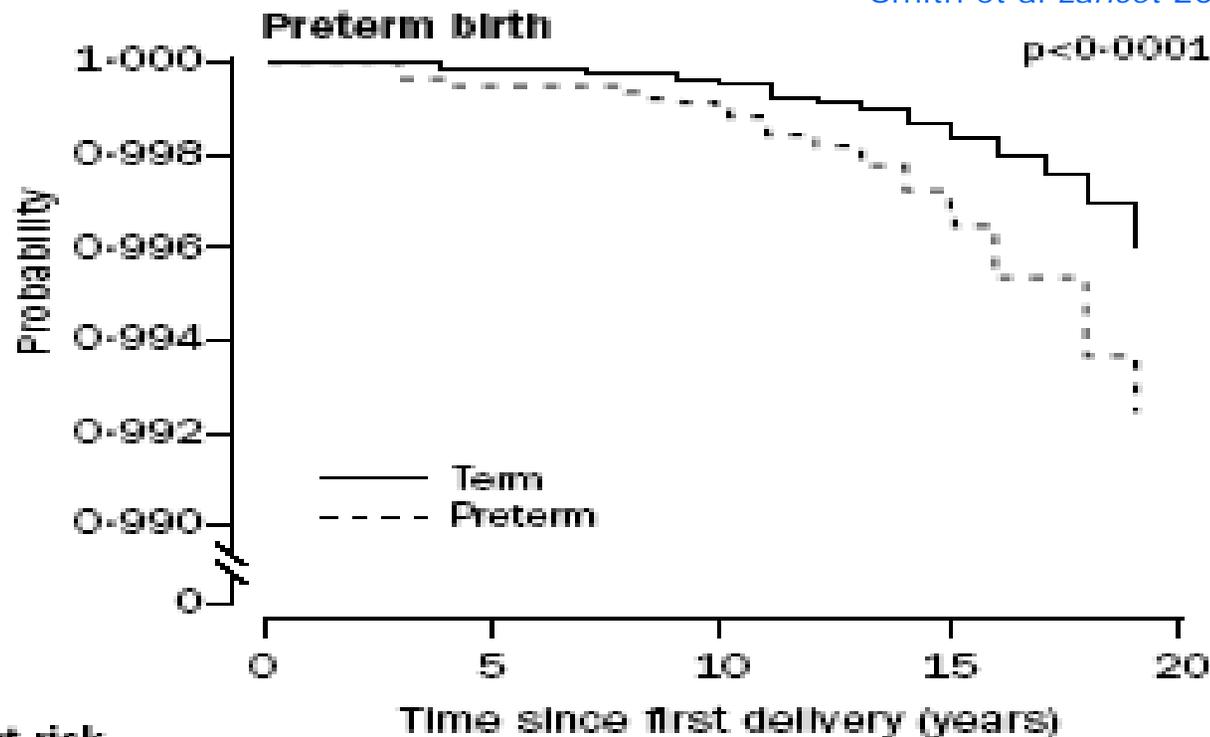


# Rethinking Preterm Birth

Vulnerability to preterm delivery may be traced to not only exposure to stress & infection during pregnancy, but host response to stress & infection (e.g. stress reactivity & inflammatory dysregulation) patterned over the life course (early programming & cumulative allostatic load)

# Preterm Birth & Maternal Ischemic Heart Disease

Smith et al *Lancet* 2001;357:2002-06

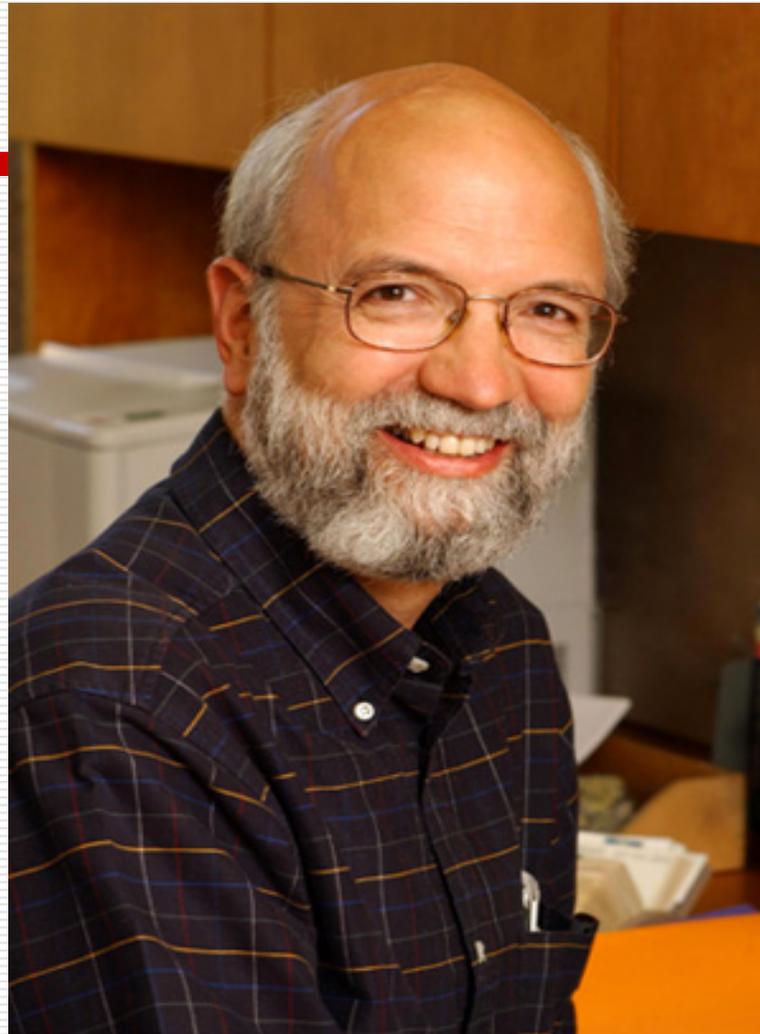


Number at risk

Term	121975	121813	121518	97169
Preterm	7315	7295	7262	5727

Kaplan-Meier plots of cumulative probability of survival **without** admission or death from ischemic heart disease after first pregnancy in relation to preterm birth

# Allen Wilcox, MD, PhD



# Mario Drummonds, MS, LCSW

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# Milton Kotelchuck, PhD, MPH

