
Understanding and Reducing Disparities in Health
National Institutes of Health

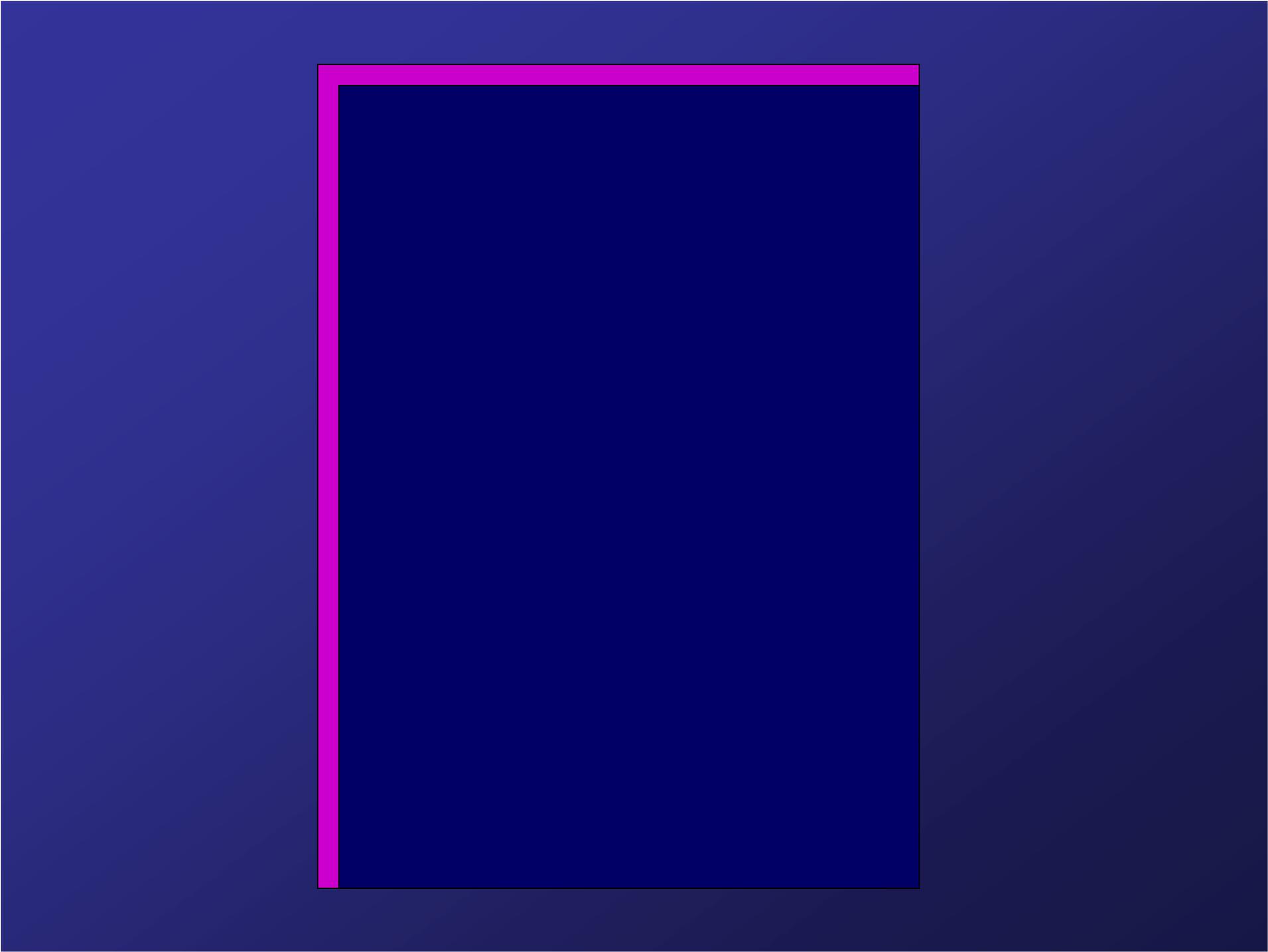
Health Disparities:
Measurement, Mechanisms and Meaning

Nancy E. Adler, PhD

October 23, 2006

Number of articles appearing in medical literature with key term “health disparity” or “health inequality.”

	'80-'84	'85-'89	'90-'94	'95-'99	'00-'04
Health disparities	0	1	11	18	439
Health inequalities	3	11	34	86	380



First Generation:

Poverty and health

Number of articles appearing in medical literature with key term "*Poverty & Health*"

1980-84

1985-89

1990-94

1995-99

2000-04

563

1058

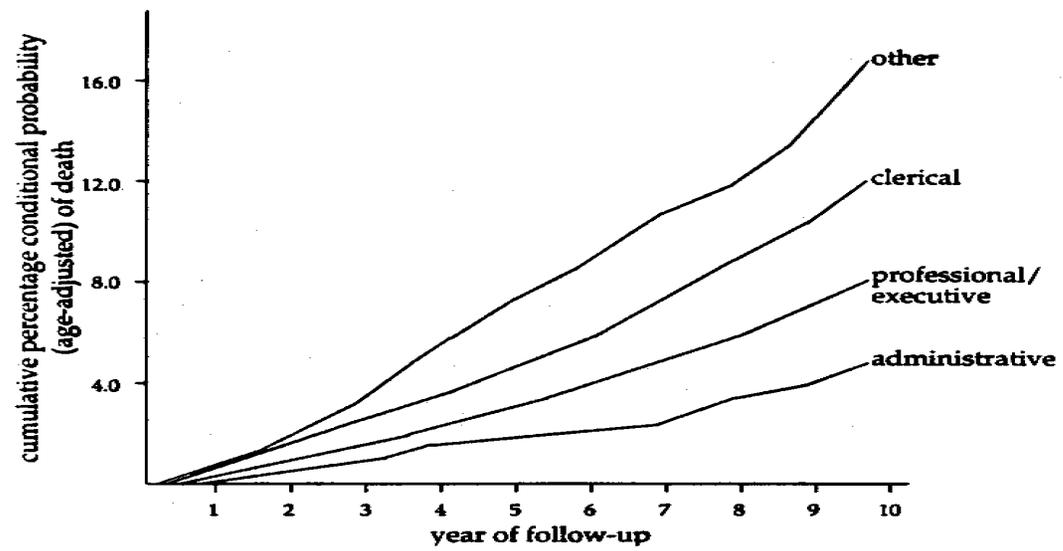
2401

3170

4315

Second Generation:

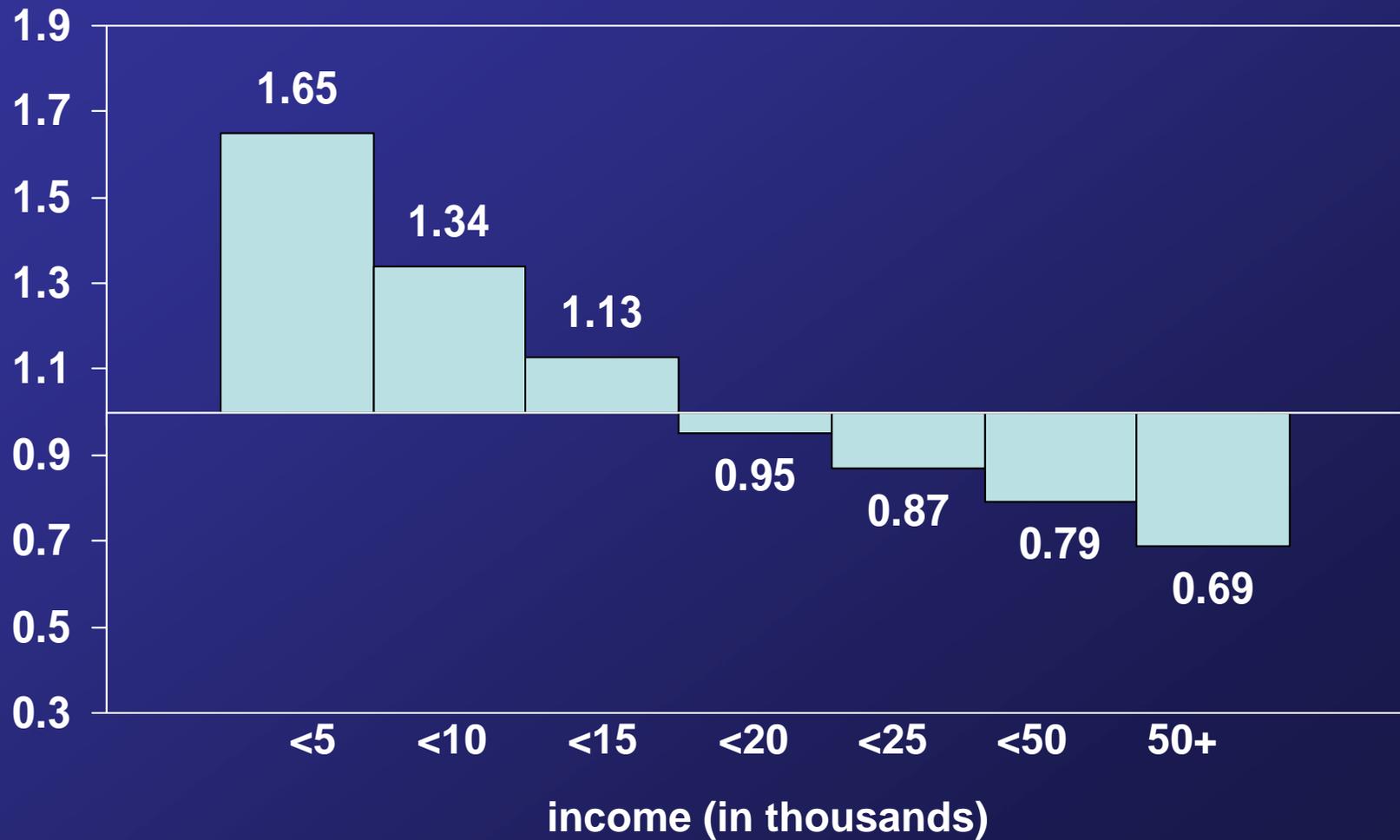
SES – health gradients



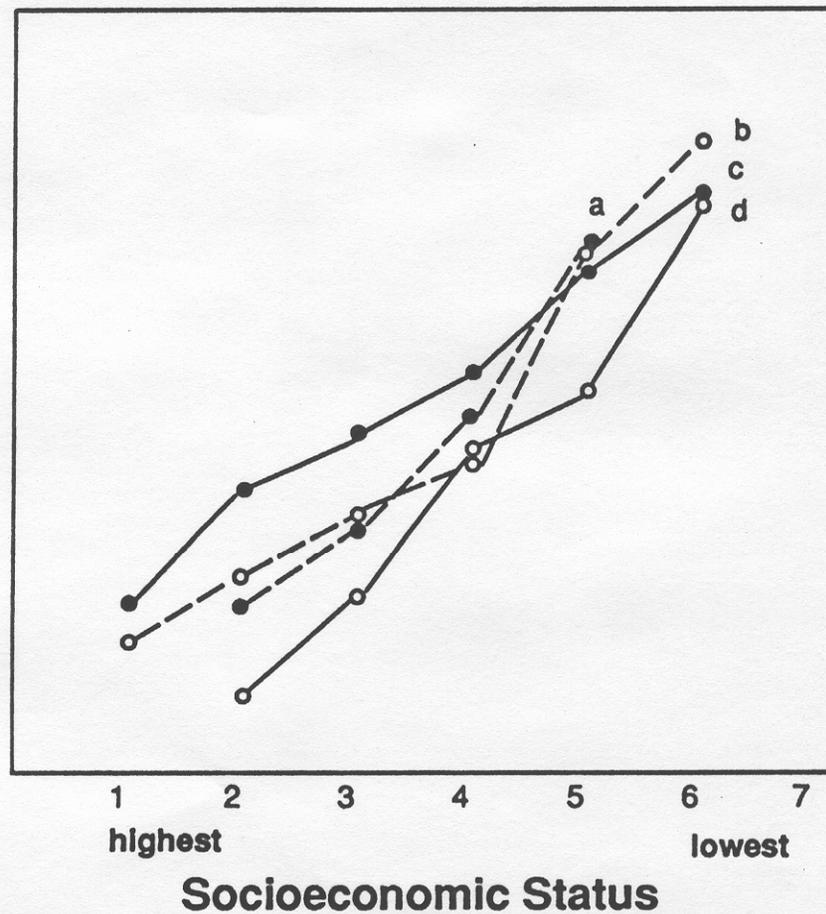
Whitehall study: all-cause mortality by year of follow-up.

Mortality ratio

(observed / expected)

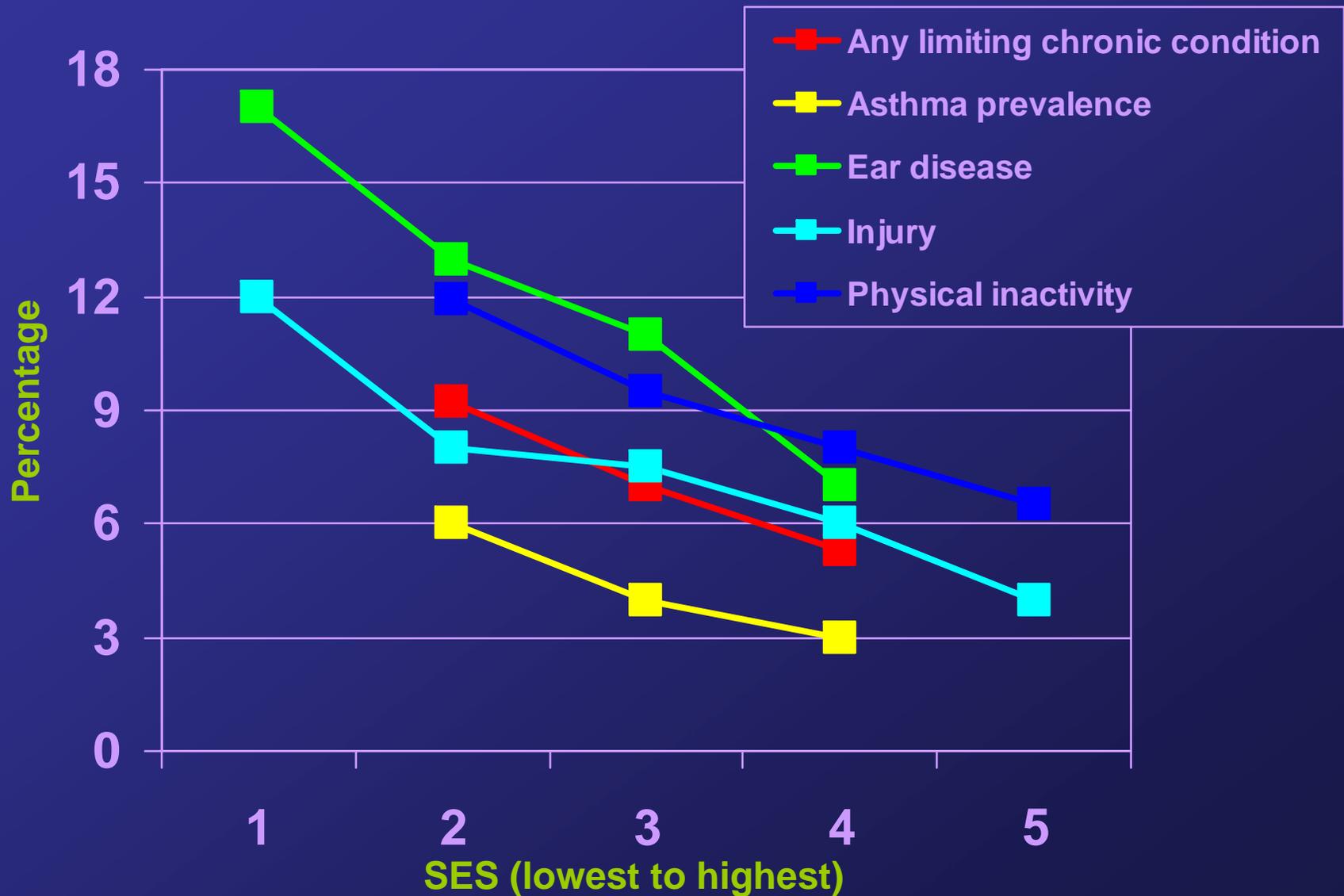


(a) Osteo- arthritis	(b) Chronic disease	(c) Hyper- tension	(d) Cervical cancer
25	150	16	30
20	125	14	25
15	100	12	20
10	75	10	15
5	50	8	10

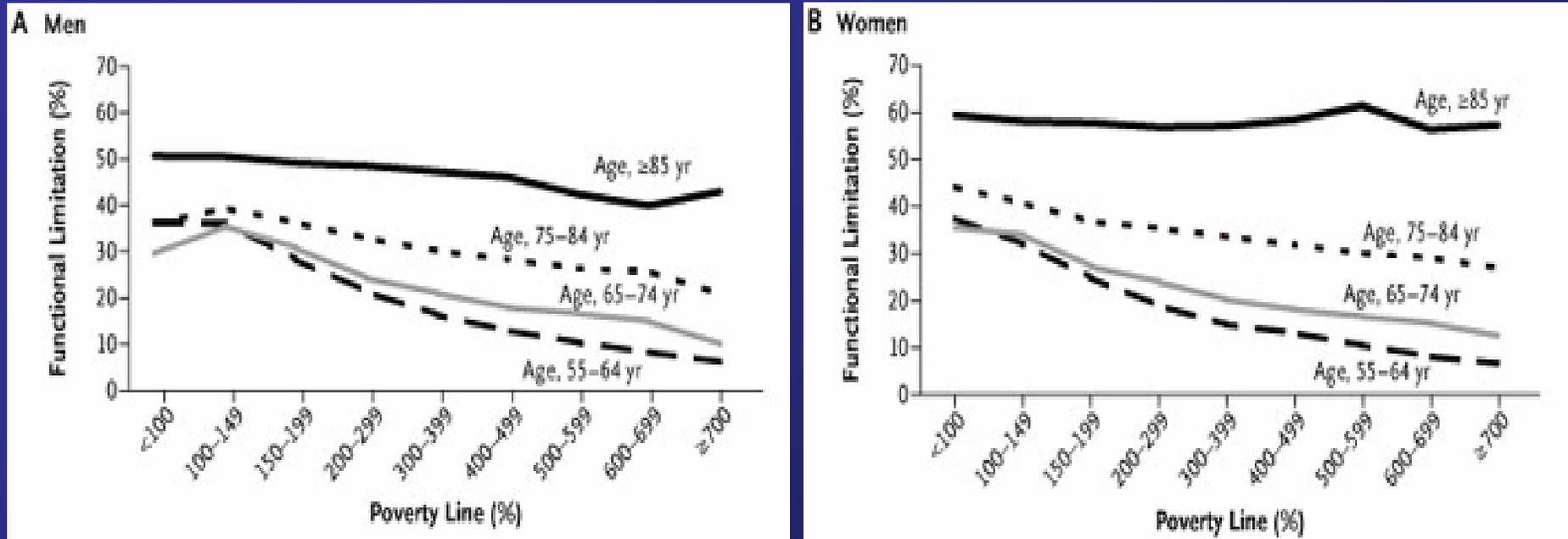


- a. Cunningham & Kelsey (1984), Percent diagnosed osteoarthritis.
- b. Townsend (1974), Relative prevalence of chronic disease.
- c. Kraus, Borhani & Franti (1980), Prevalence of hypertension.
- d. DeVasa & Diamond (1980), Rate of cervical cancer per 100,000.

Prevalence of Health Problems in Children

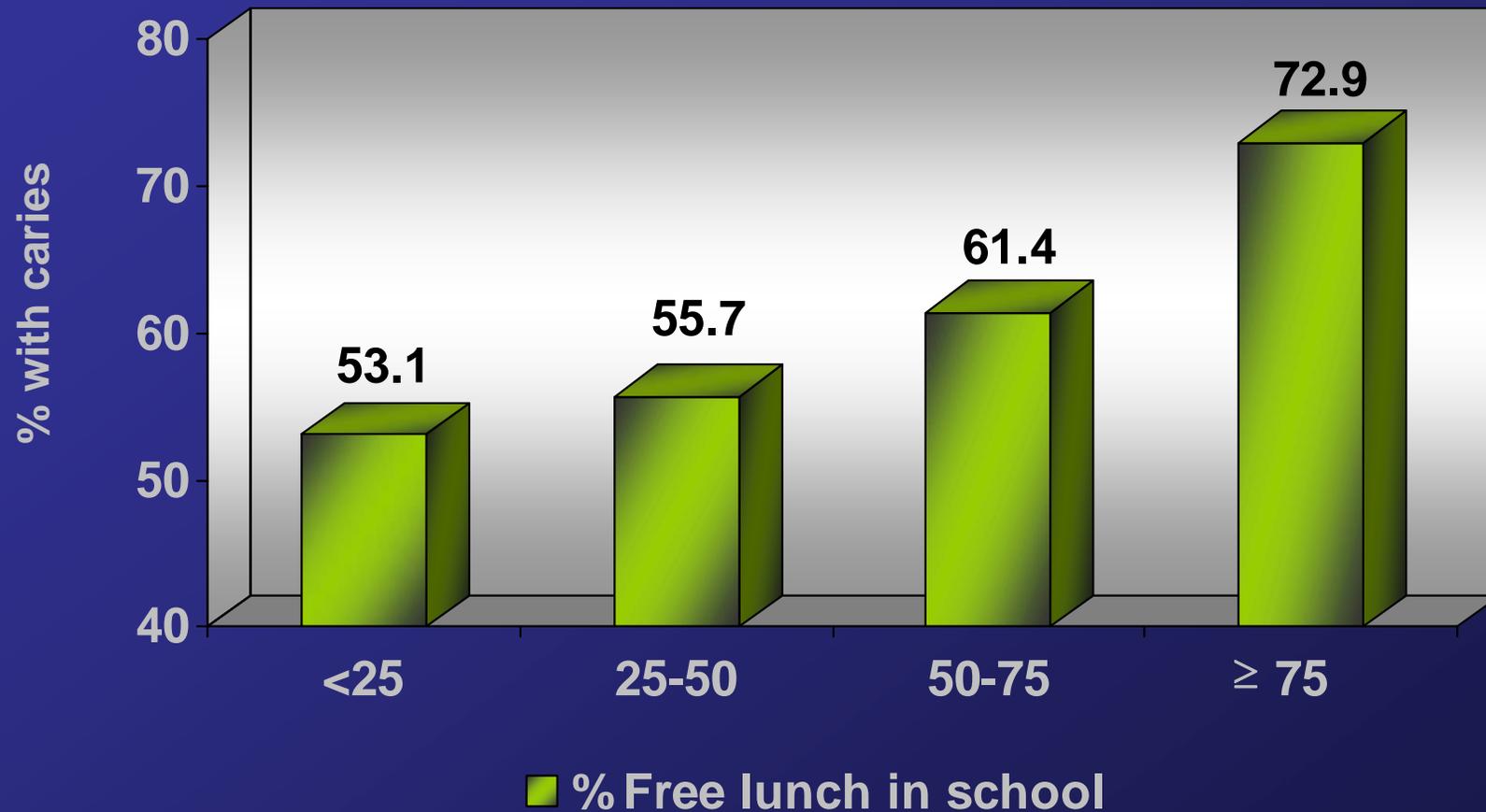


Percentage of men (panel A) and women (Panel B) with functional limitations, according to poverty status



Source: Minkler M, Fuller-Thomson E, & Guralnik JM (2006). Gradient of Disability across the Socioeconomic Spectrum in the United States. *New England Journal of Medicine*; 355:659-703. Figure 1, p. 699.

Dental caries in 21,399 kindergarteners & 3rd graders by school SES (% free lunch)



Source: California oral health needs assessment
CANDO (S. Gansky)

Third Generation

Mechanisms

MacArthur Network

How does SES get into the
body?

MacArthur

Network on SES & Health

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Ichiro Kawachi, M.D.
Harvard University

Michael Marmot, M.D.
University College
London Medical School

Bruce McEwen, Ph.D.
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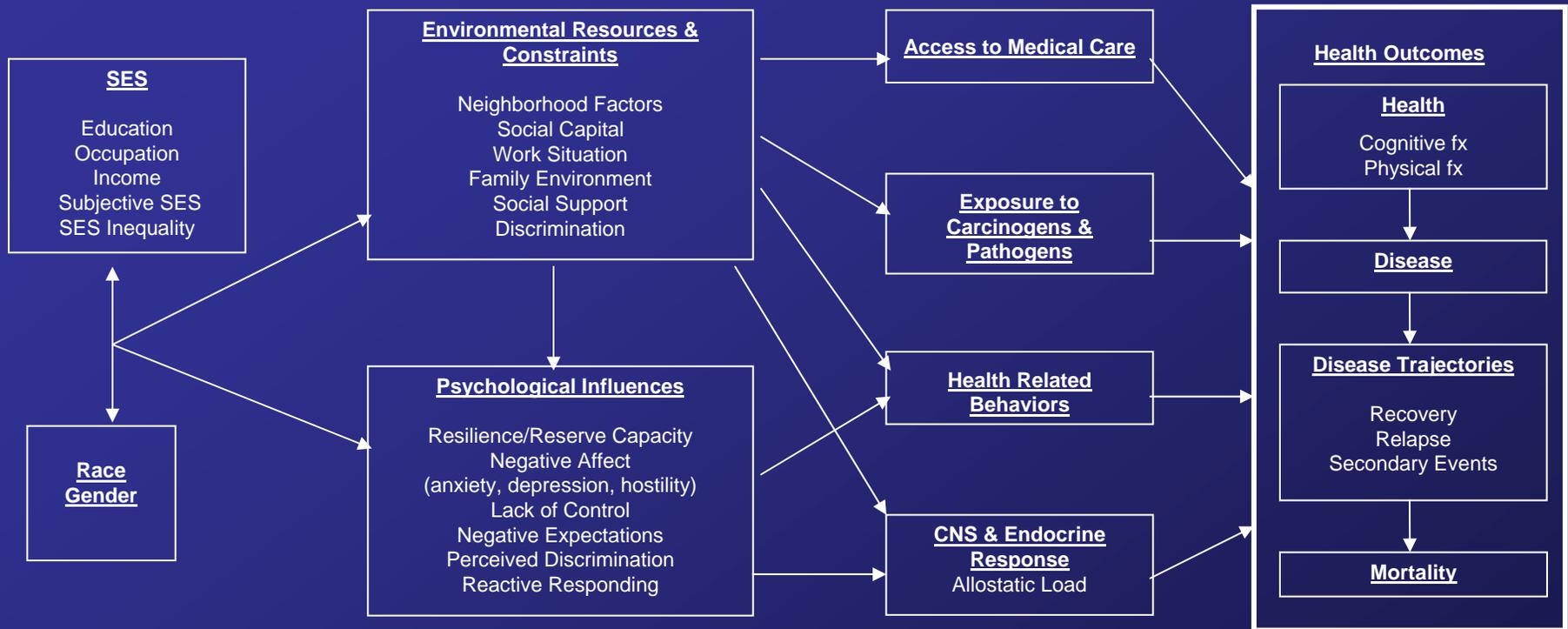
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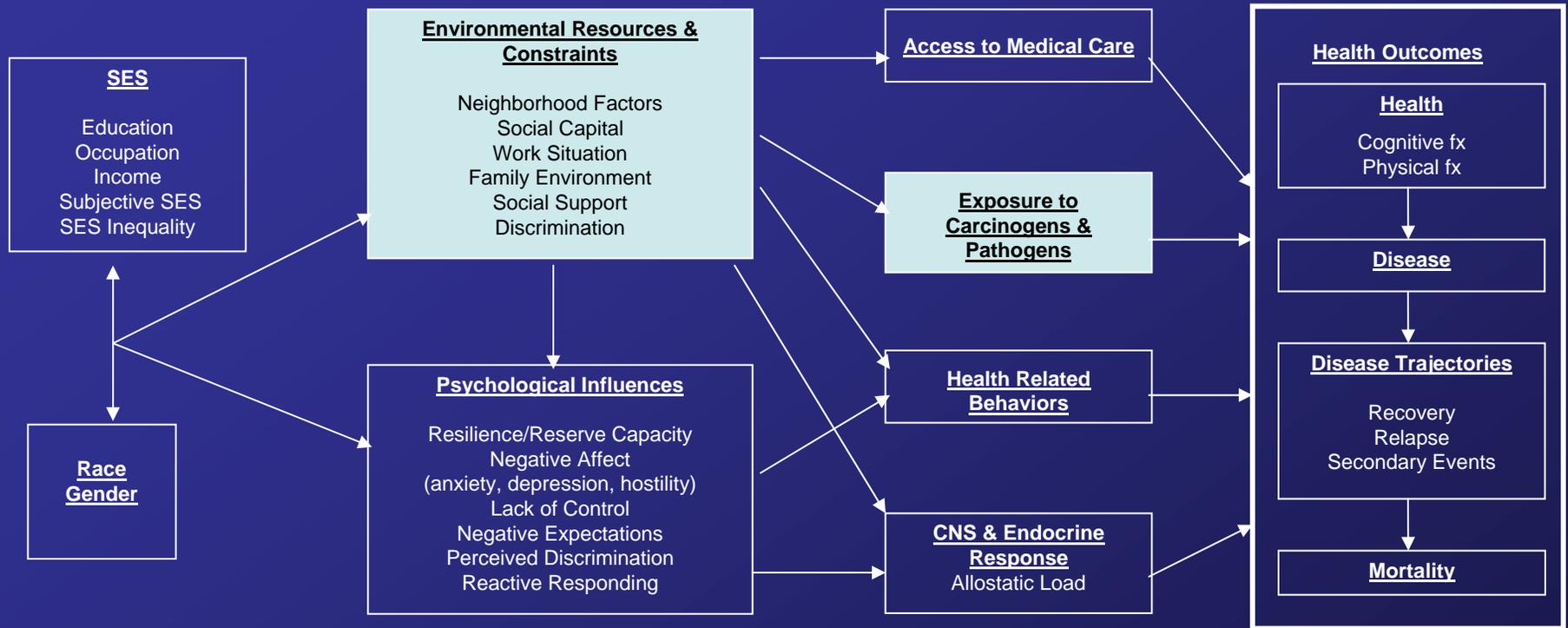
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Life Course



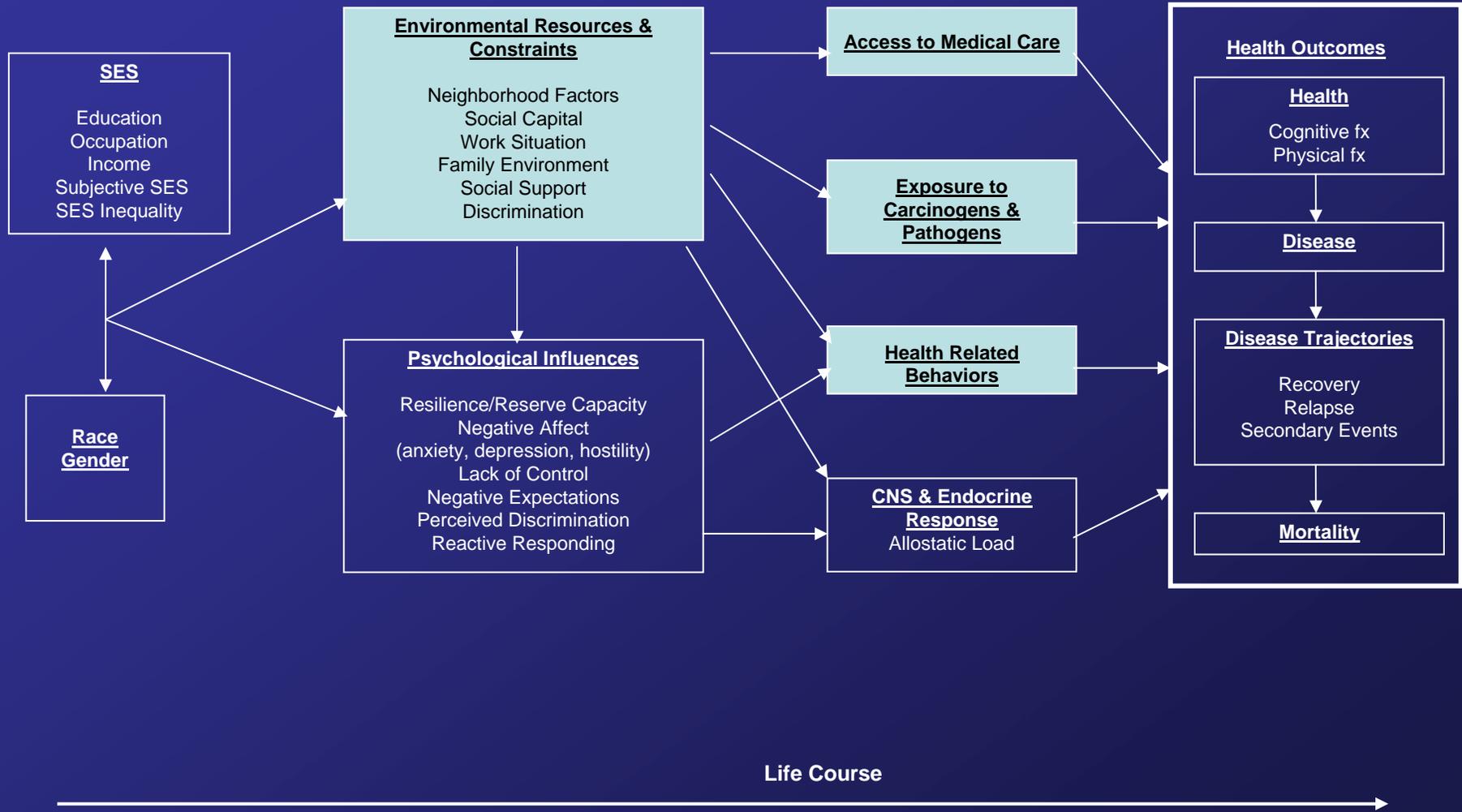
MacArthur Foundation Research Network model



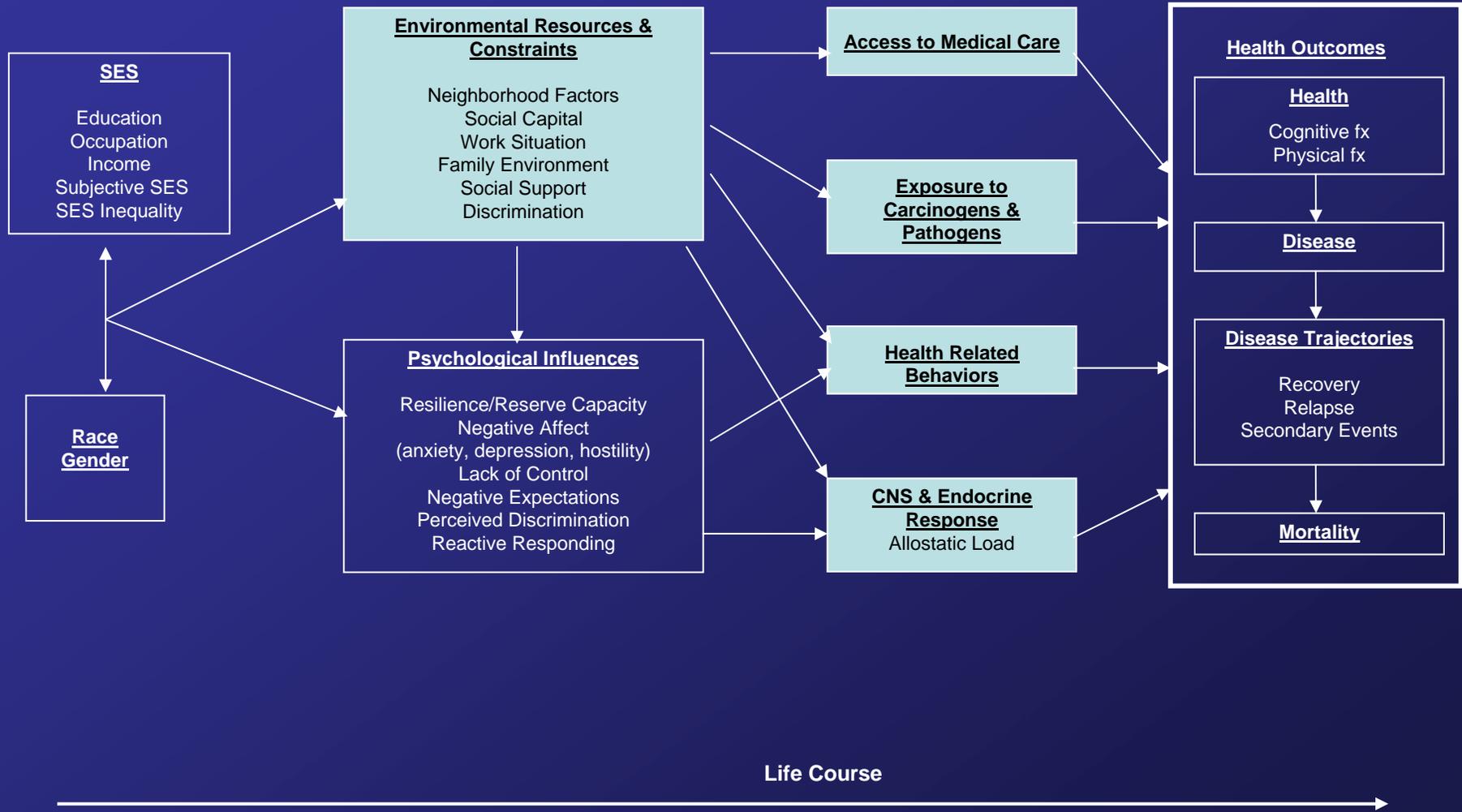
Life Course



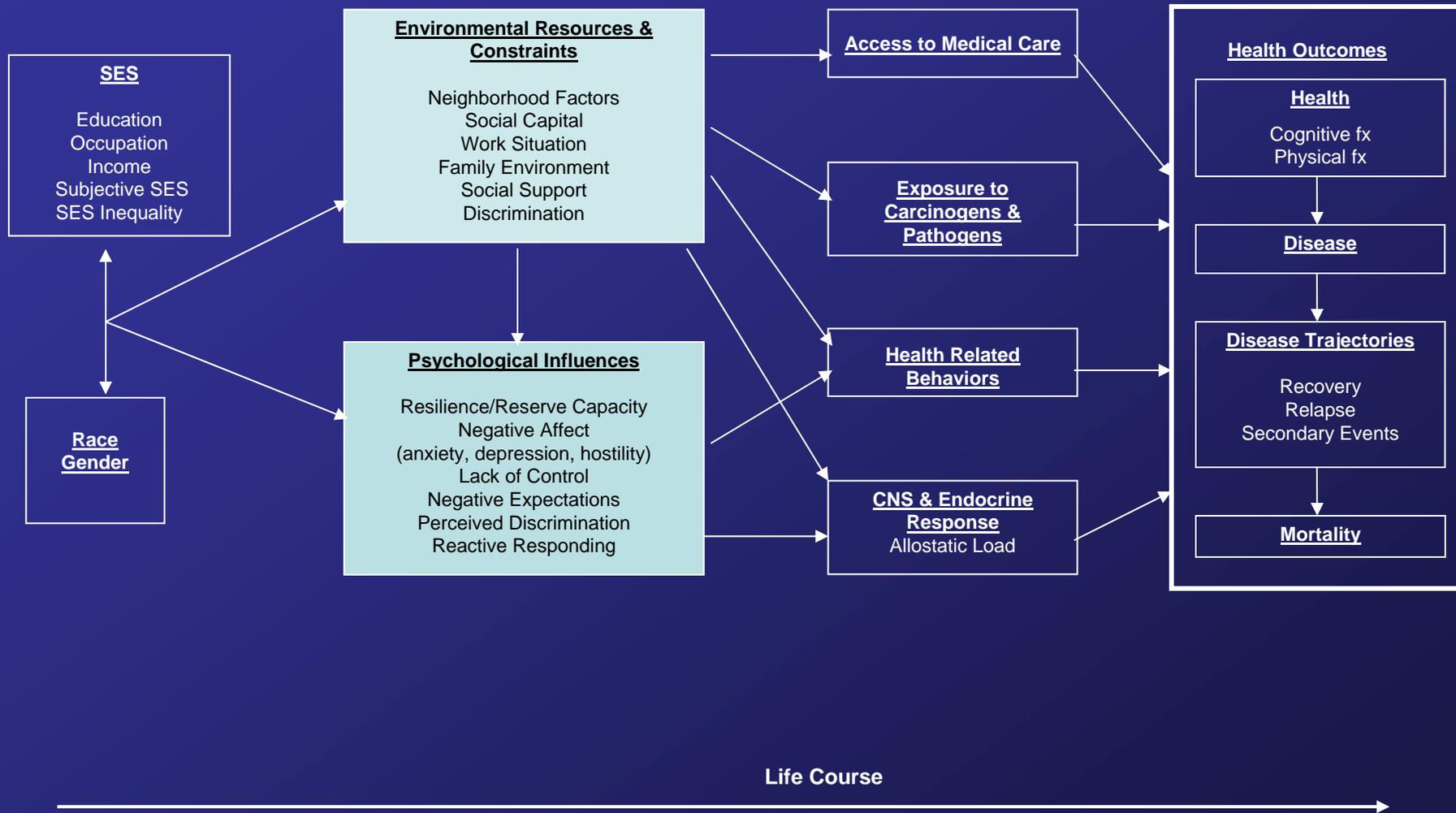
MacArthur Foundation Research Network model



MaArthur Foundation Research Network model



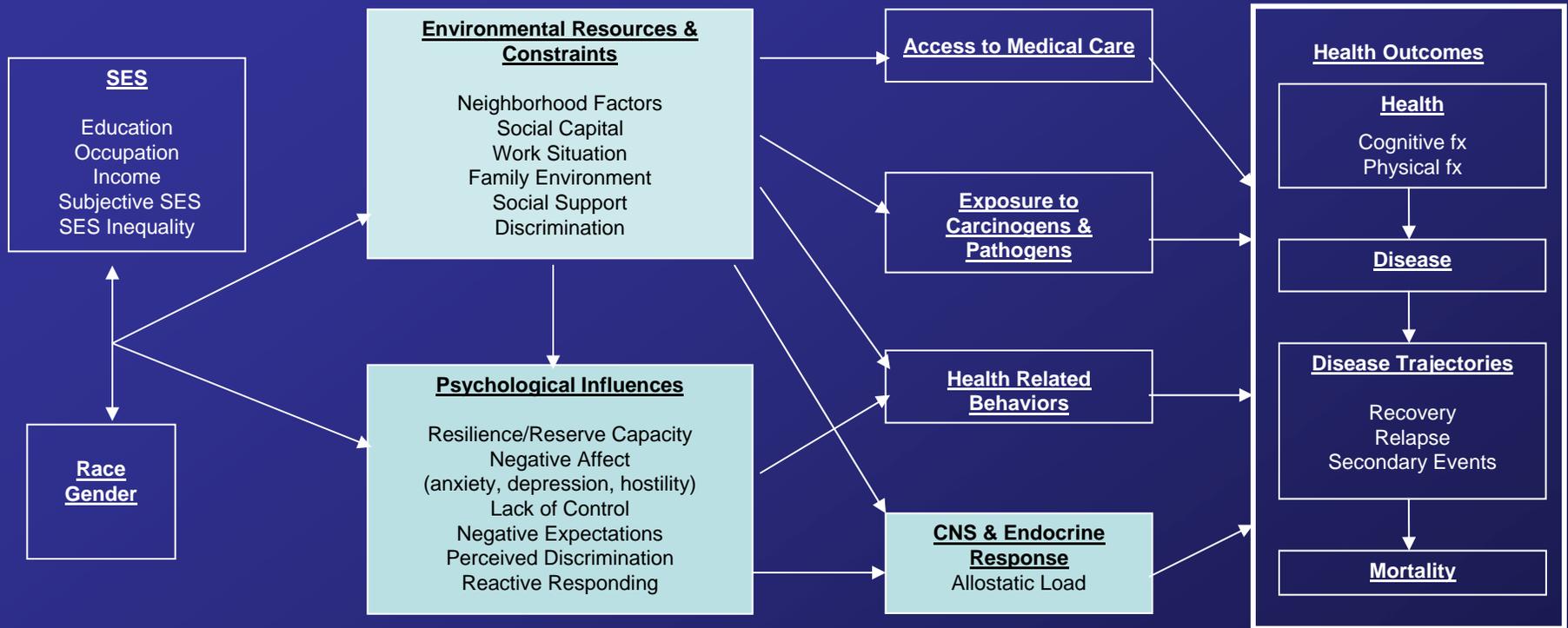
MaArthur Foundation Research Network model



MacArthur Foundation Research Network model

Psychological mediators:

- anxiety
- depression
- hostility/distrust
- lack of control
- perceived discrimination



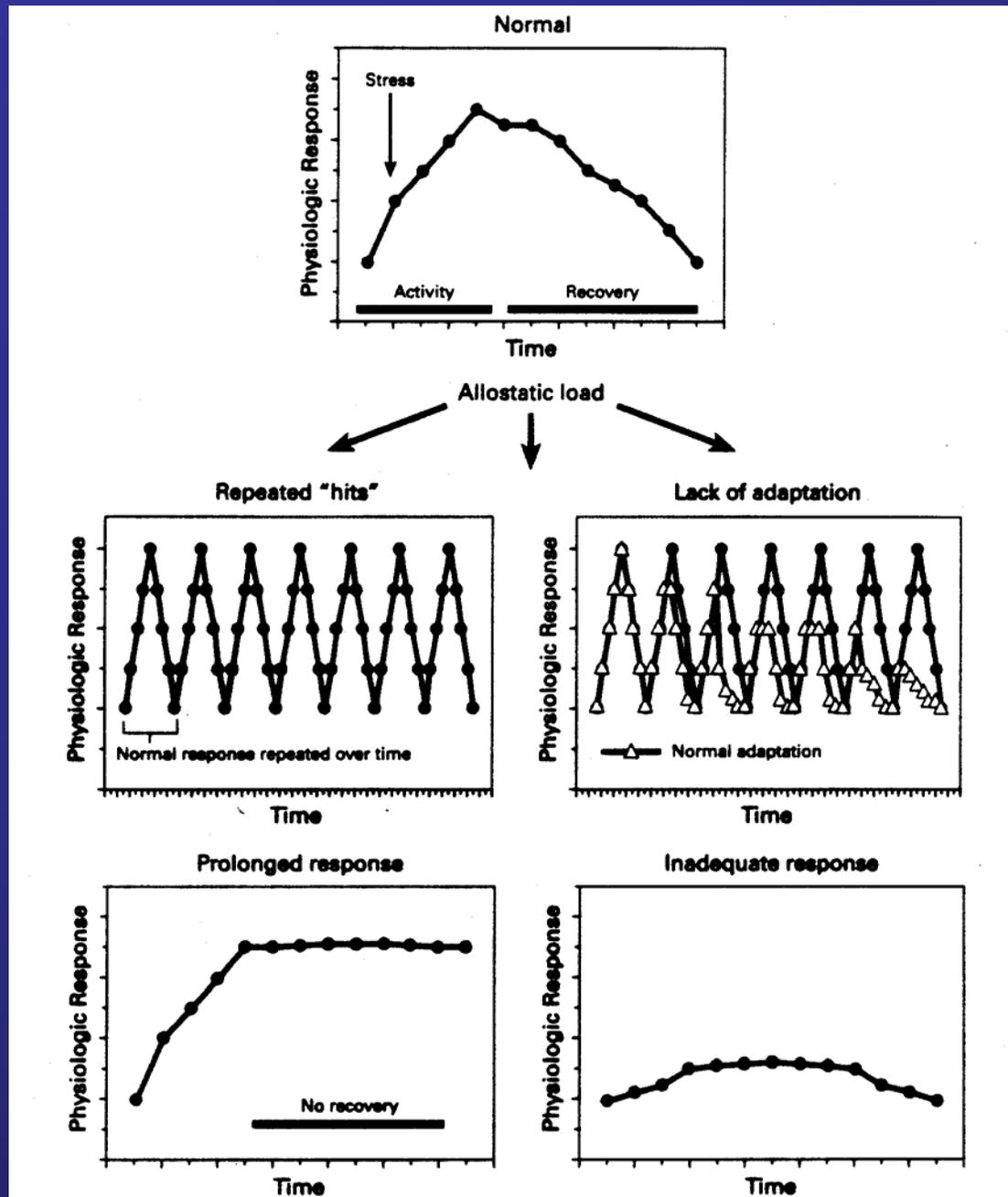
Life Course



MacArthur Foundation Research Network model



Three Types of Allostatic Load



Source: McEwen B,
*New England Journal of
Medicine*, 1998.

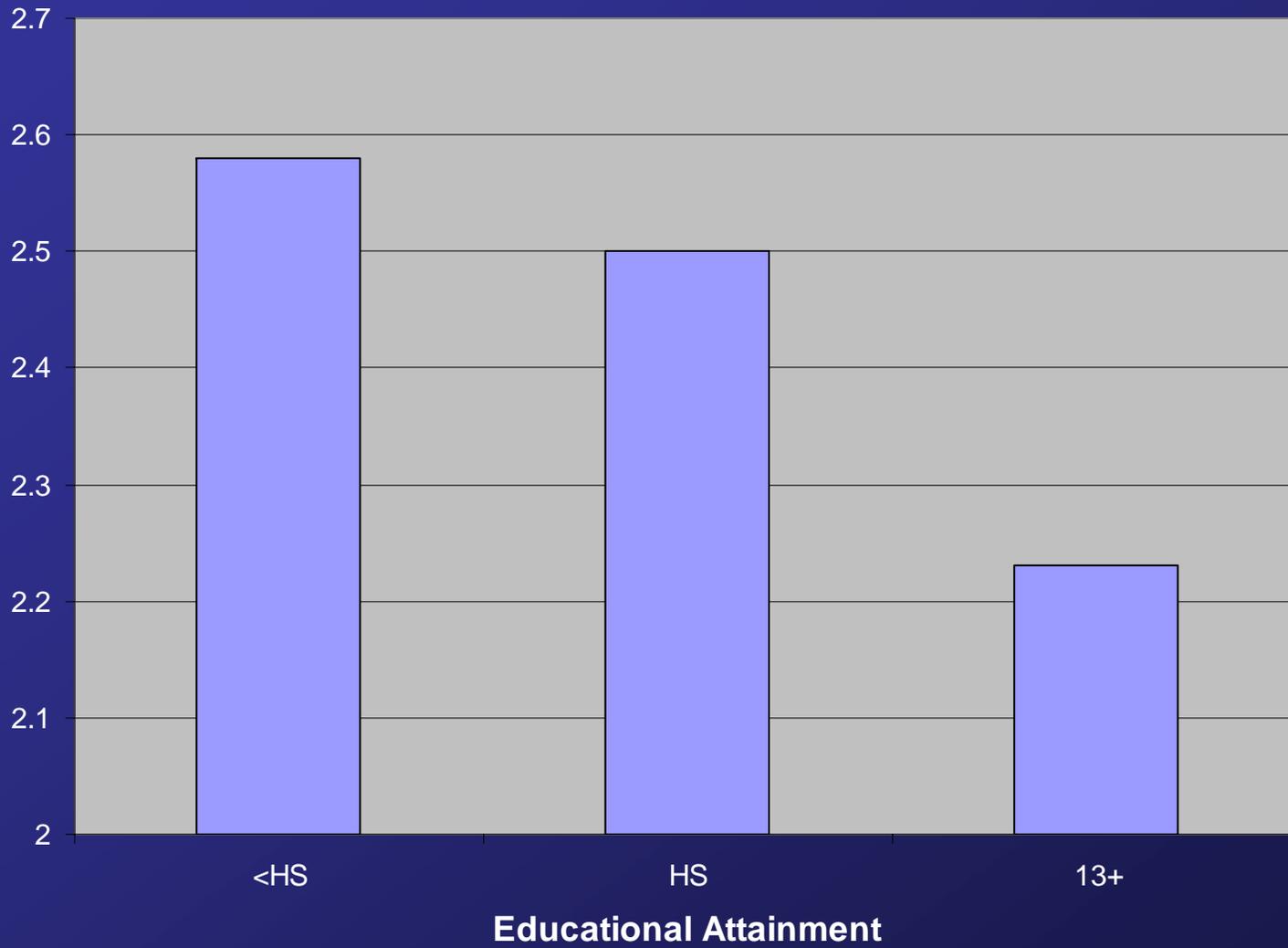
MACARTHUR STUDY OF SUCCESSFUL AGING ALLOSTATIC LOAD DATA

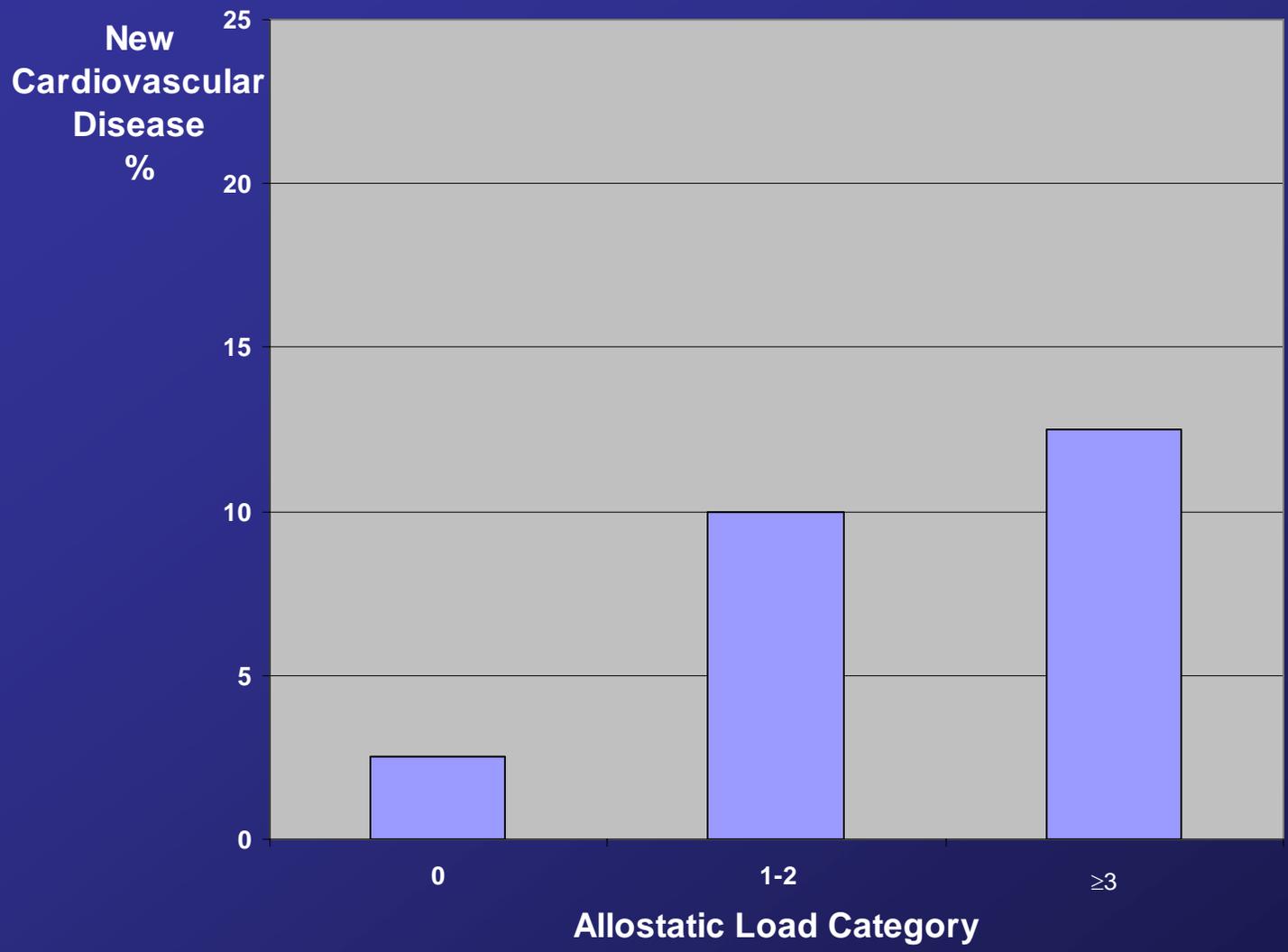
Regulatory Systems

Available Measures

Cardiovascular System	Systolic & Diastolic BP
Hypothalamic-Pituitary-Adrenal Axis	Urinary Free Cortisol (12hr) DHEA-S
Sympathetic Nervous System	Urinary Norepinephrine & Urinary Epinephrine (12hr)
Metabolism	Glycosylated Hemoglobin HDL & Total cholesterol
	Waist - Hip Ratio (WHR)

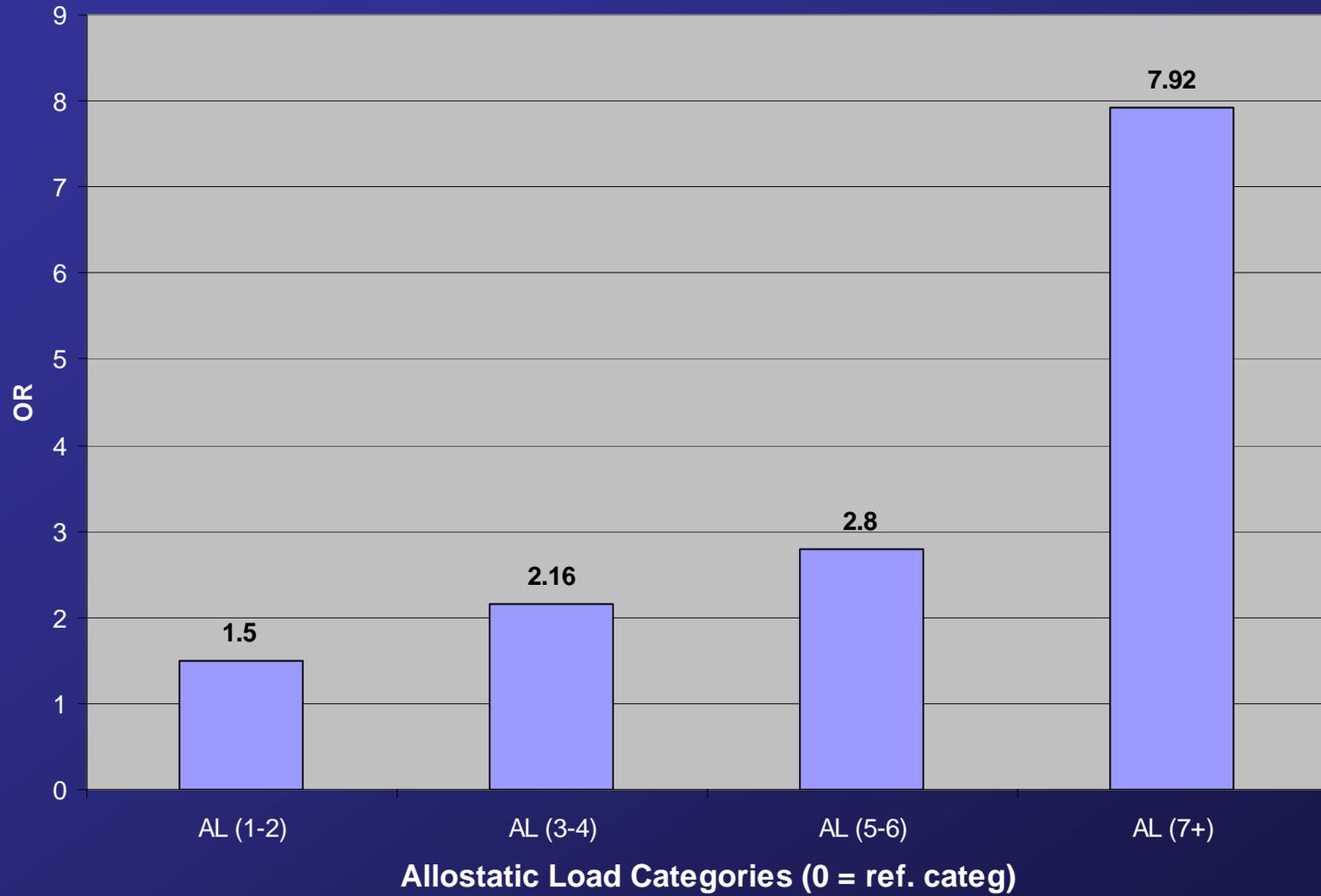
Allostatic Load by Education





New Cardiovascular disease (1988-1991) by allostatic load.

Allostatic Load and Mortality Risks



Cell Aging:

Another biological pathway?

Telomeres:

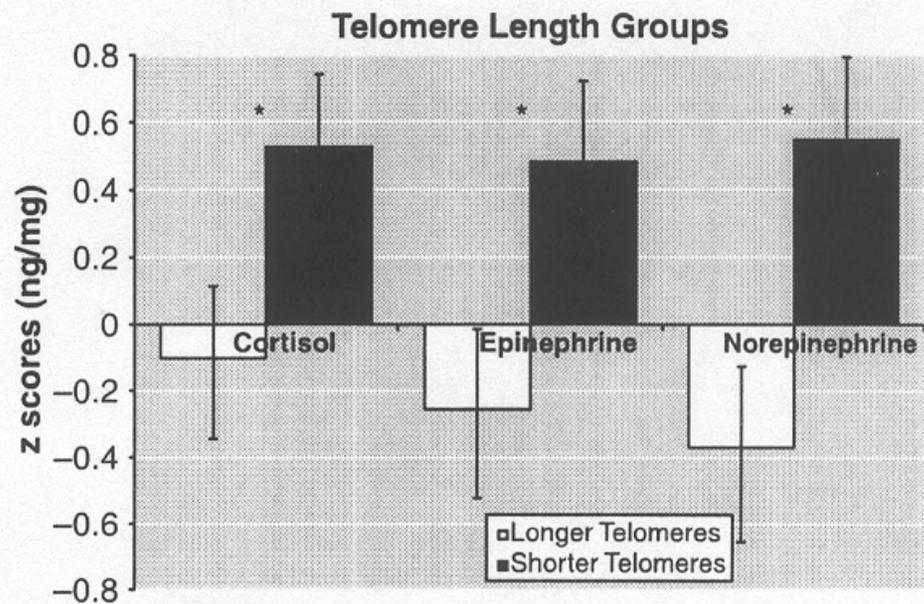
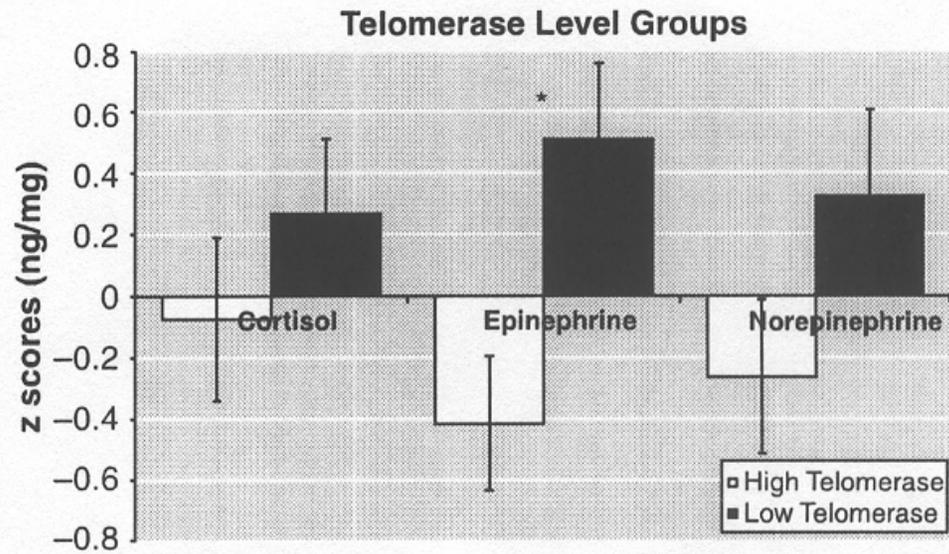
- DNA protein complexes
- cap chromosomal ends
- stabilizes chromosome

Telomerase:

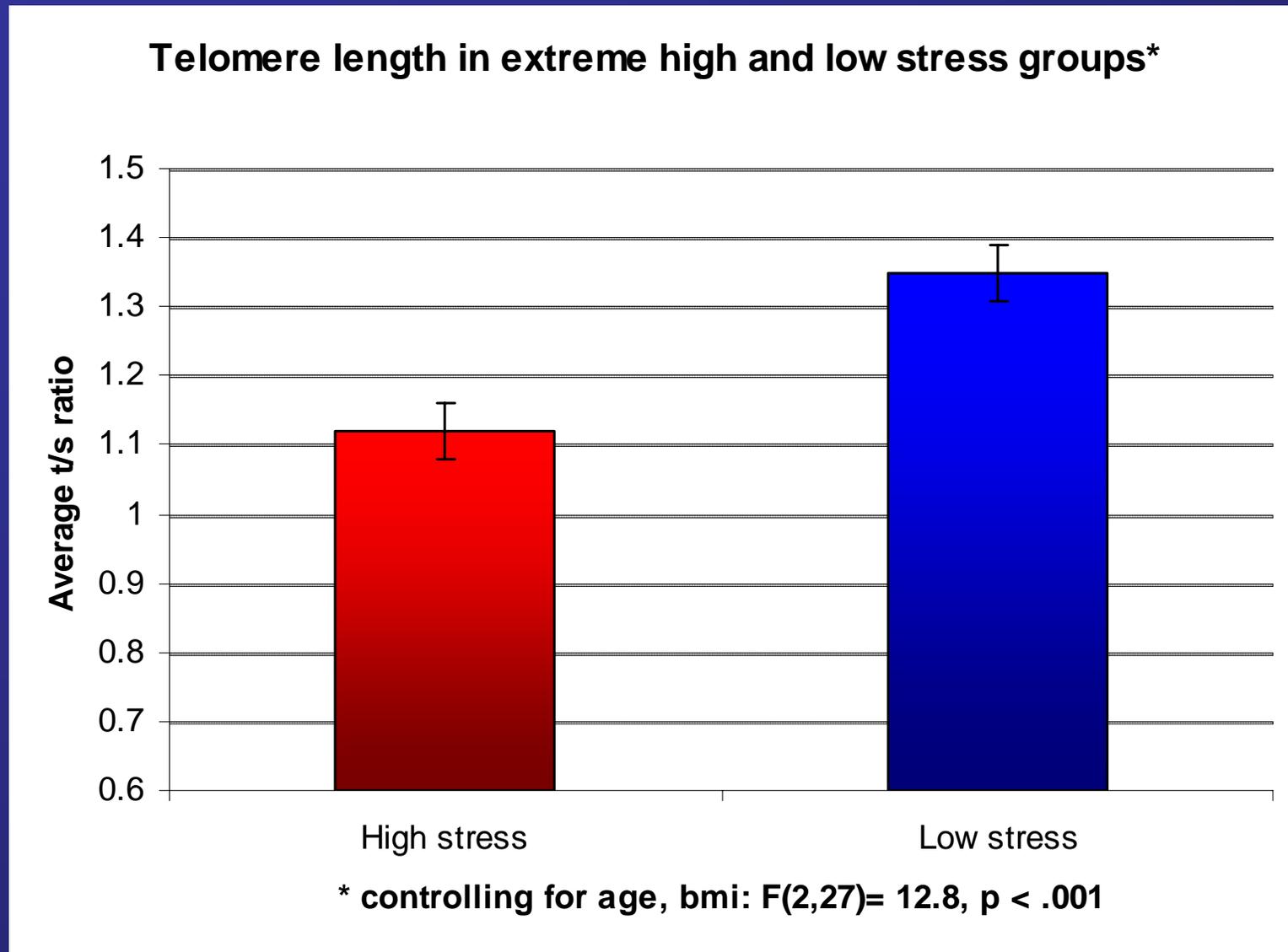
- cellular enzyme
- preserves telomere length
- preserves cell functioning

Stress and telomere study

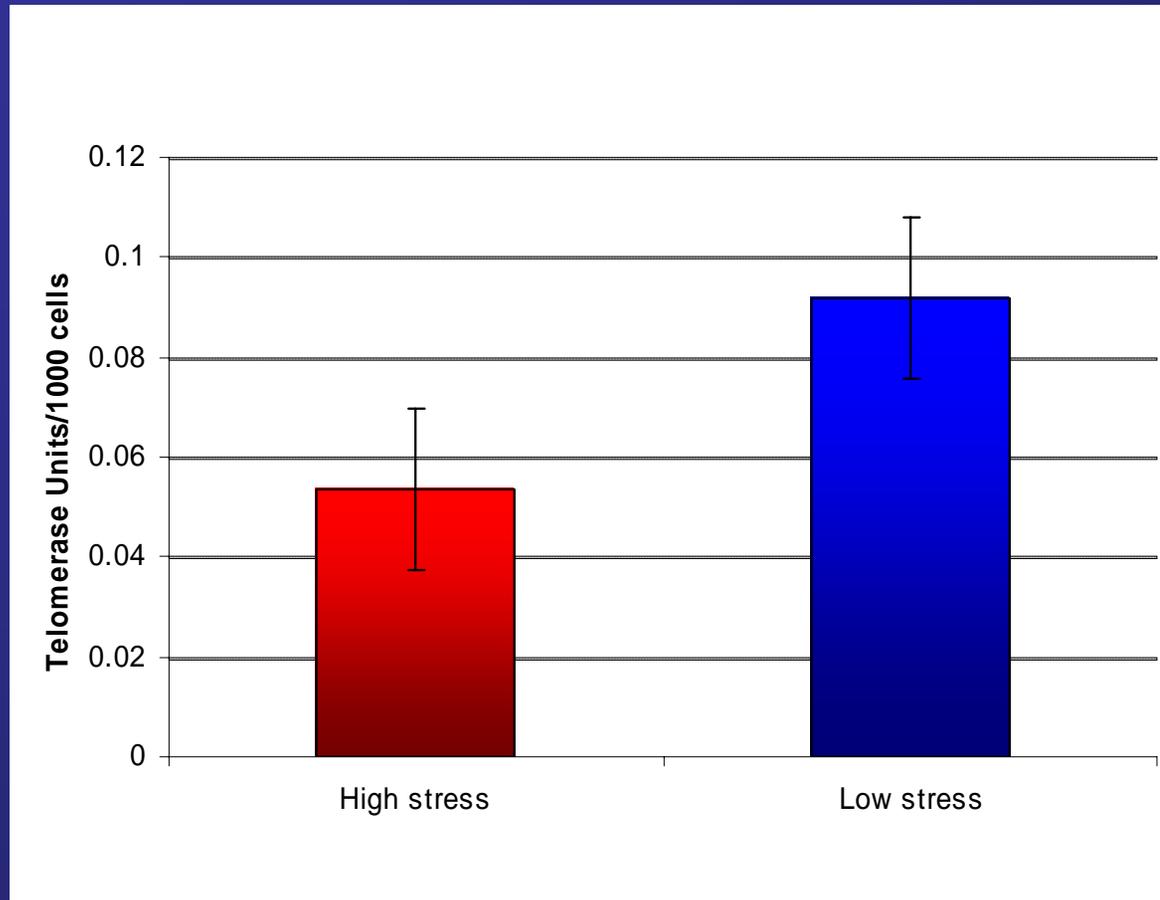
- 62 mothers age 20-50
- 40 had children with serious disorders
- 22 had healthy children



More telomere attrition in high stress group (~ 13 yrs of aging)



Telomerase is ~50% lower in extreme stress group



•controlling for age and body mass index: $F(3,27)= 3.1, p < .05$

Education and telomerase

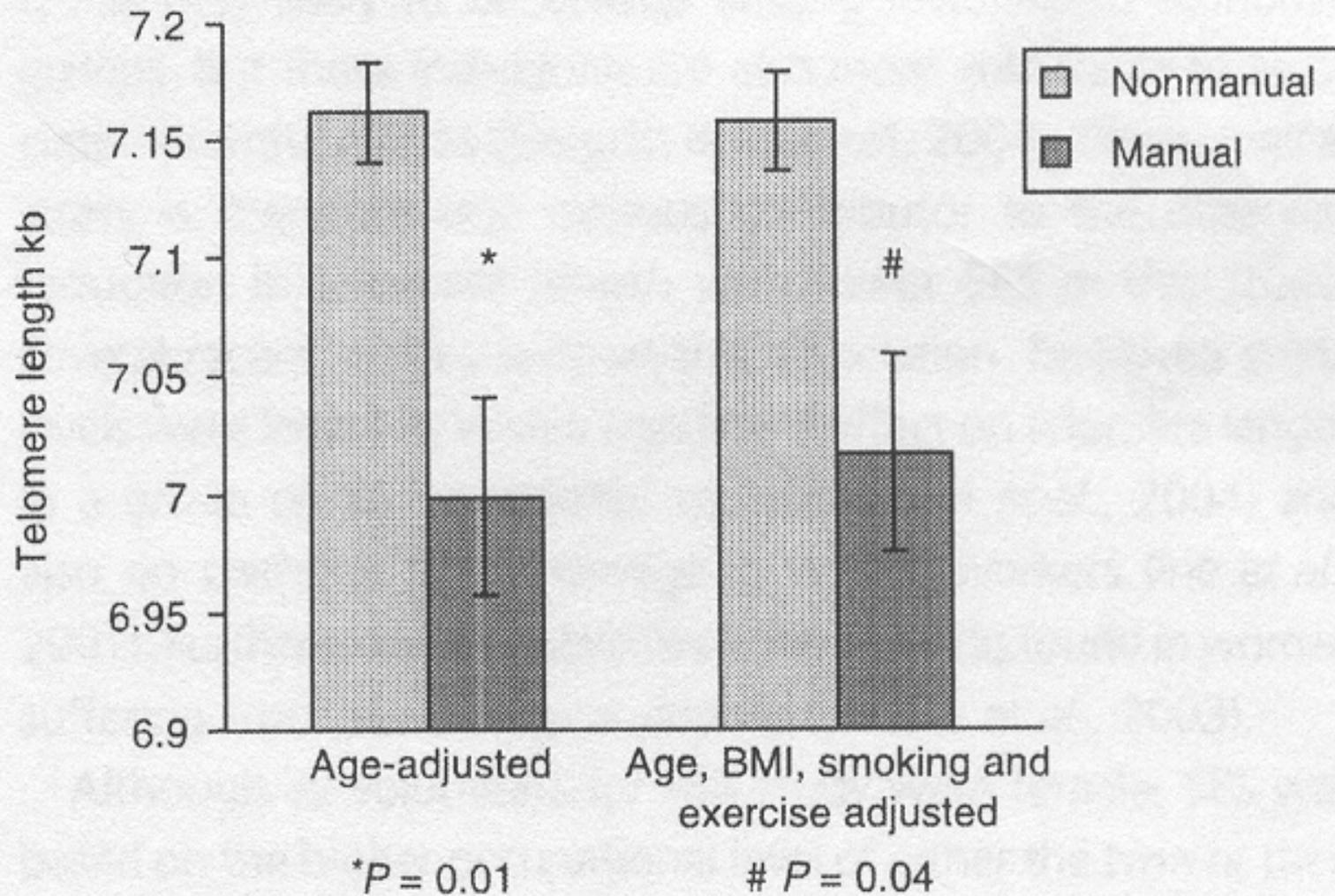
	<u>High telomerase</u>	<u>Low telomerase</u>
	n = 29	n = 33
Years of education	15.5 (.35)	14.5 (.33)
	difference p < .03	

Source: Epel et al. *Psychoneuroendocrinology*, 2006.

Occupation and telomere length

1552 female twins

Mean telomere length and standard error by manual vs. nonmanual social class groupings

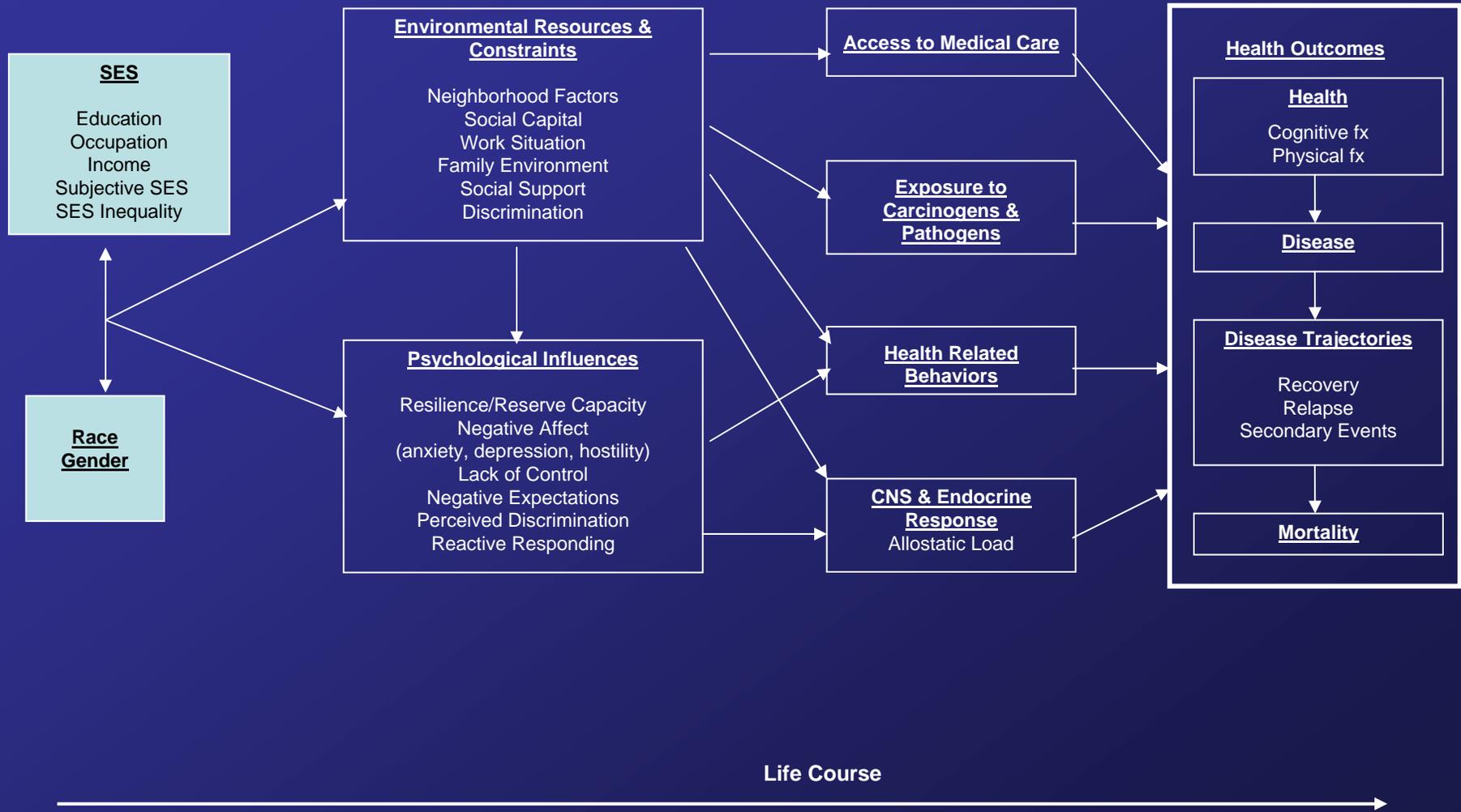


17 “discordant” twins

\bar{X} difference = 187 bp = (p < .02)

Fourth Generation

- Improving measurement
- Intersection of SES with race / ethnicity
- Linking biological processes
- Policy solutions
- Embracing complexity



MacArthur Foundation Research Network model

Improving measures of SES

1. Change over time
2. Drilling down
3. Expanding measures

Change over time

SES is dynamic not static

Over 30% experienced a 50%+ drop
in income over an 11-year period.

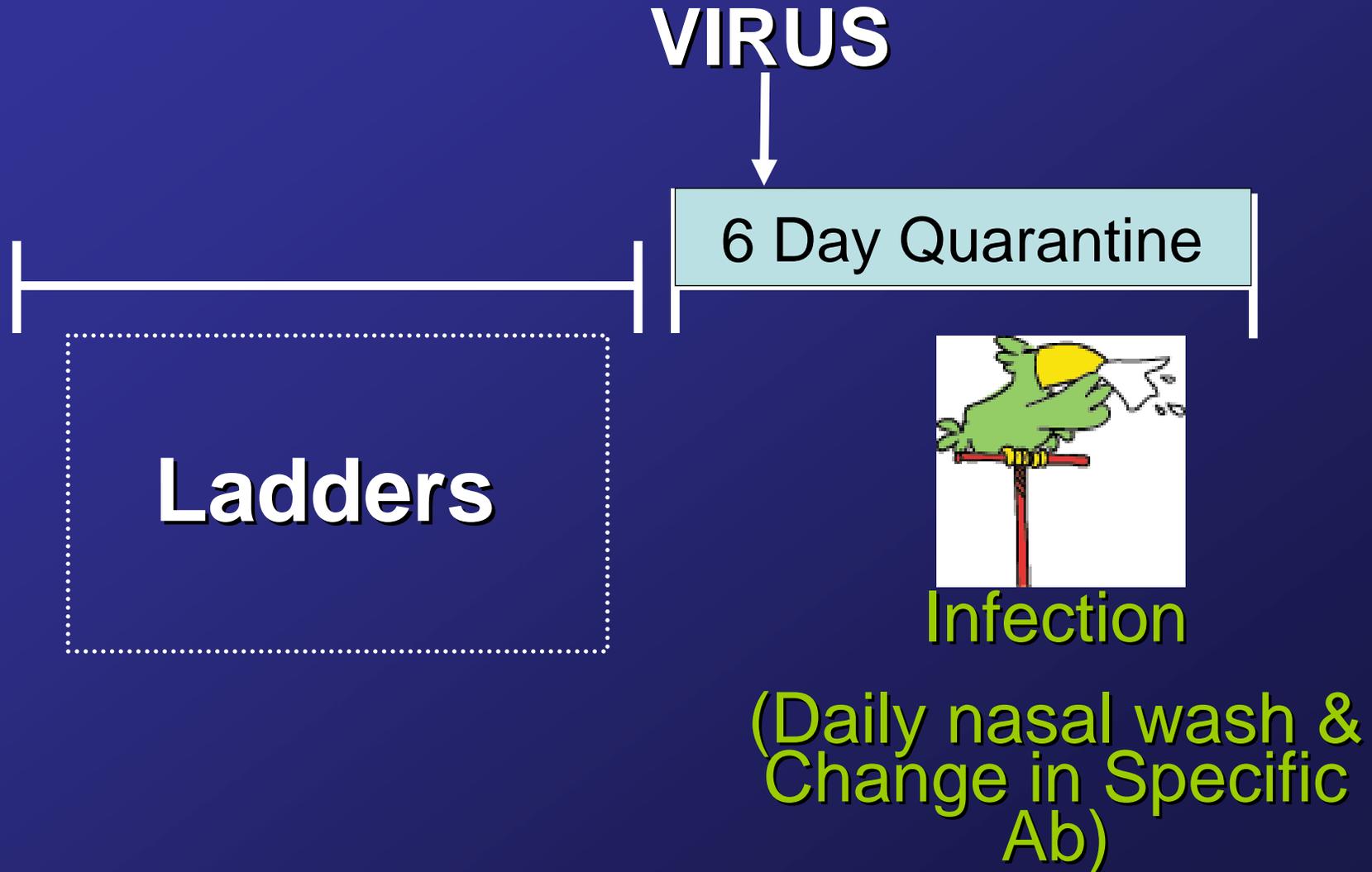
Source: Duncan G. Volatility of family income. 1988

Childhood SES

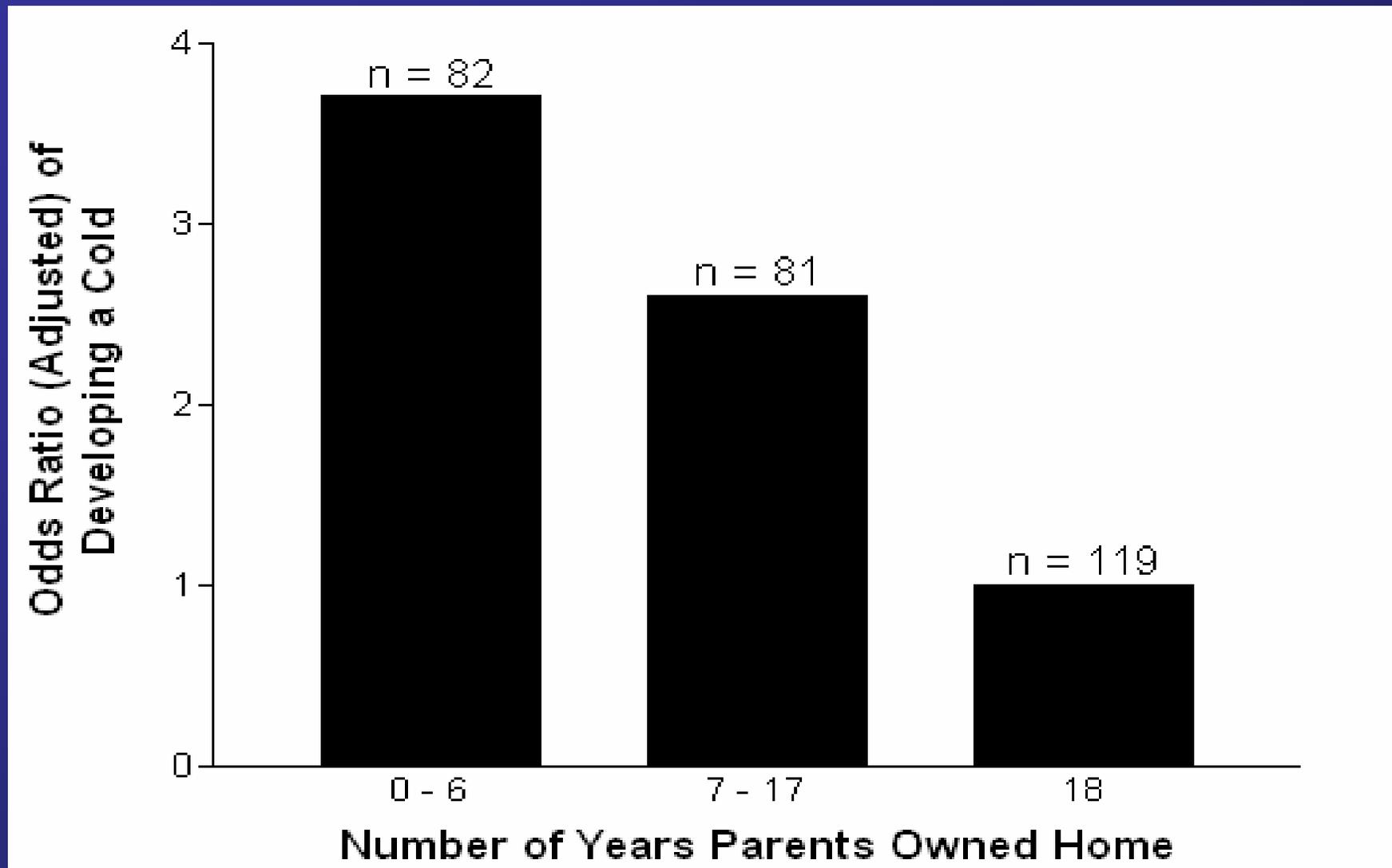
Example of parents' home
ownership

Pittsburgh Cold Study II

N=323 4 Years



Parent home ownership (ages 1-18) & risk of developing a cold



Drilling down: Meaning of education

years attended model

knowledge

each year contributes

credential model

sheepskin effect

personality model

investment in education

conscientiousness

quality weighting

Expanding measures

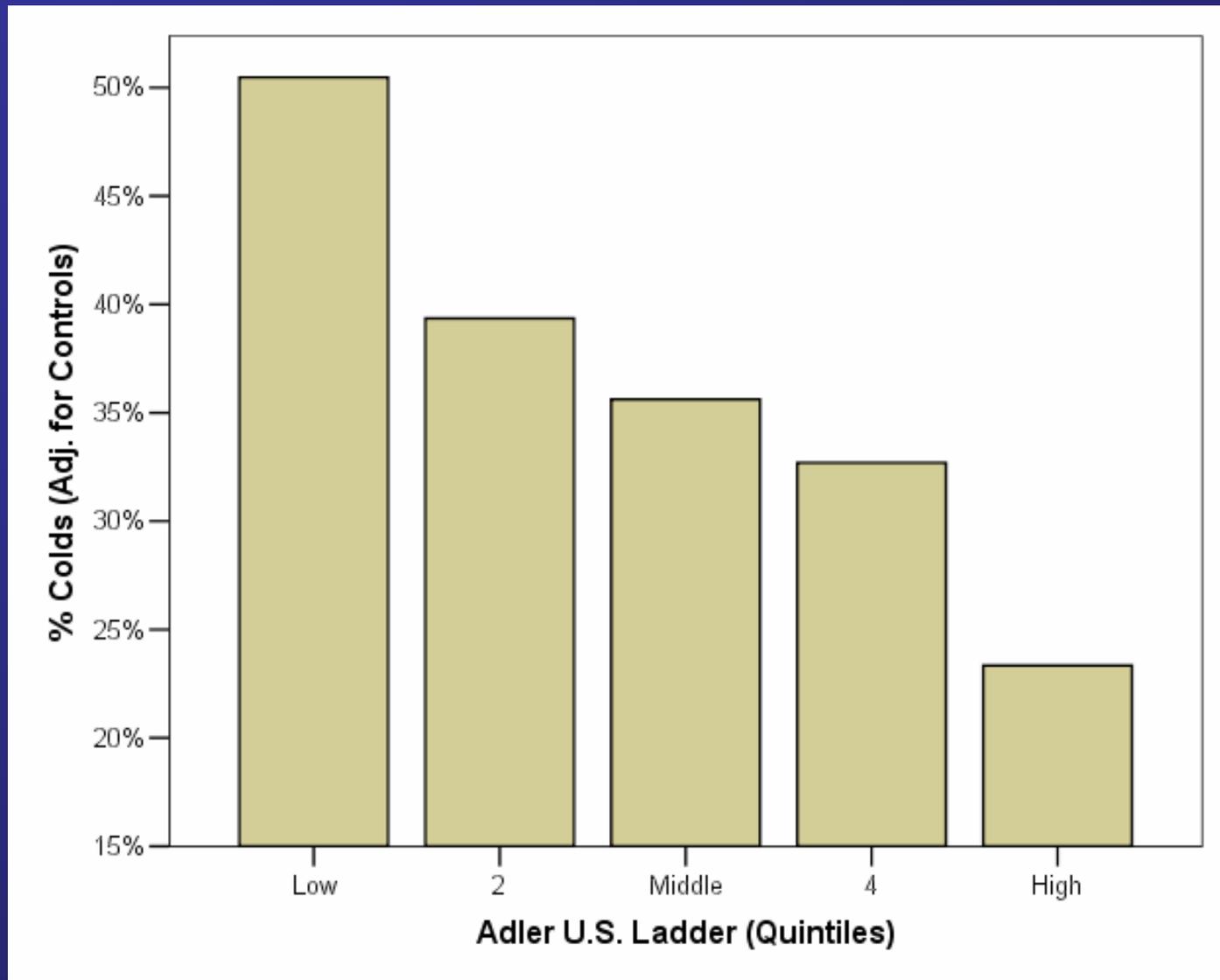
Wealth

Subjective status

Subjective status

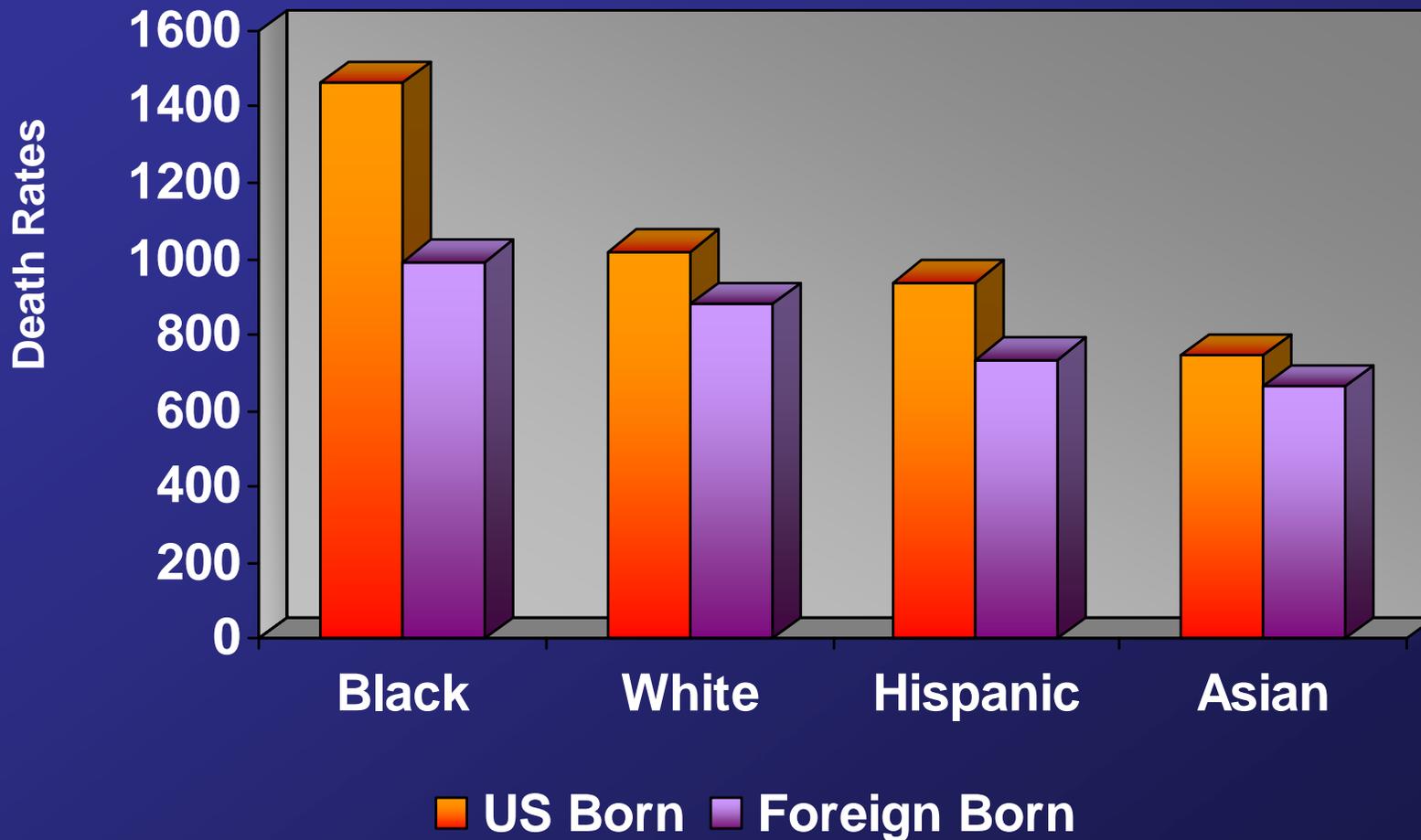


% Colds by USA Ladder



Intersection with race / ethnicity

Death rates among US and foreign born by racial ethnicity



Source: Singh & Hiatt, ISE, 2006

Life Expectancy at Age 25, U.S. Men Race and Income Differences

Income (1980 dollars)	White	Black	Race Diffs.
All	50.1	45.7	4.4
Less than \$10,000	45.0	41.6	
\$10,000-\$24,999	50.2	47.4	
\$25,000 or more	52.9	50.2	
SES Diffs.	7.9	8.6	

Source: NLMS: Lin et al., 2003

Life Expectancy at Age 25, U.S. Men Race and Income Differences

Income (1980 dollars)	White	Black	Race Diffs.
All	50.1	45.7	4.4
Less than \$10,000	45.0	41.6	3.4
\$10,000-\$24,999	50.2	47.4	2.8
\$25,000 or more	52.9	50.2	2.7
SES Diffs.	7.9	8.6	

Source: NLMS: Lin et al., 2003

Biology

Cell aging

Gene x environment interaction

Policy solutions

Embracing complexity