

Social variables and their measurement in epidemiologic studies

Ana V. Diez Roux
Department of Epidemiology
University of Michigan
June, 2005

Outline

- What are social variables?
- Examples of social variables in epidemiologic studies
- Measurement
- Social variables in biomedical research

Types of variables

- Biologic variables
- Behavioral or “lifestyle” variables
- Social variables

Social variables

- Characterize or reflect ways in which individuals are related to each other in groups
- Levels of organization

Society

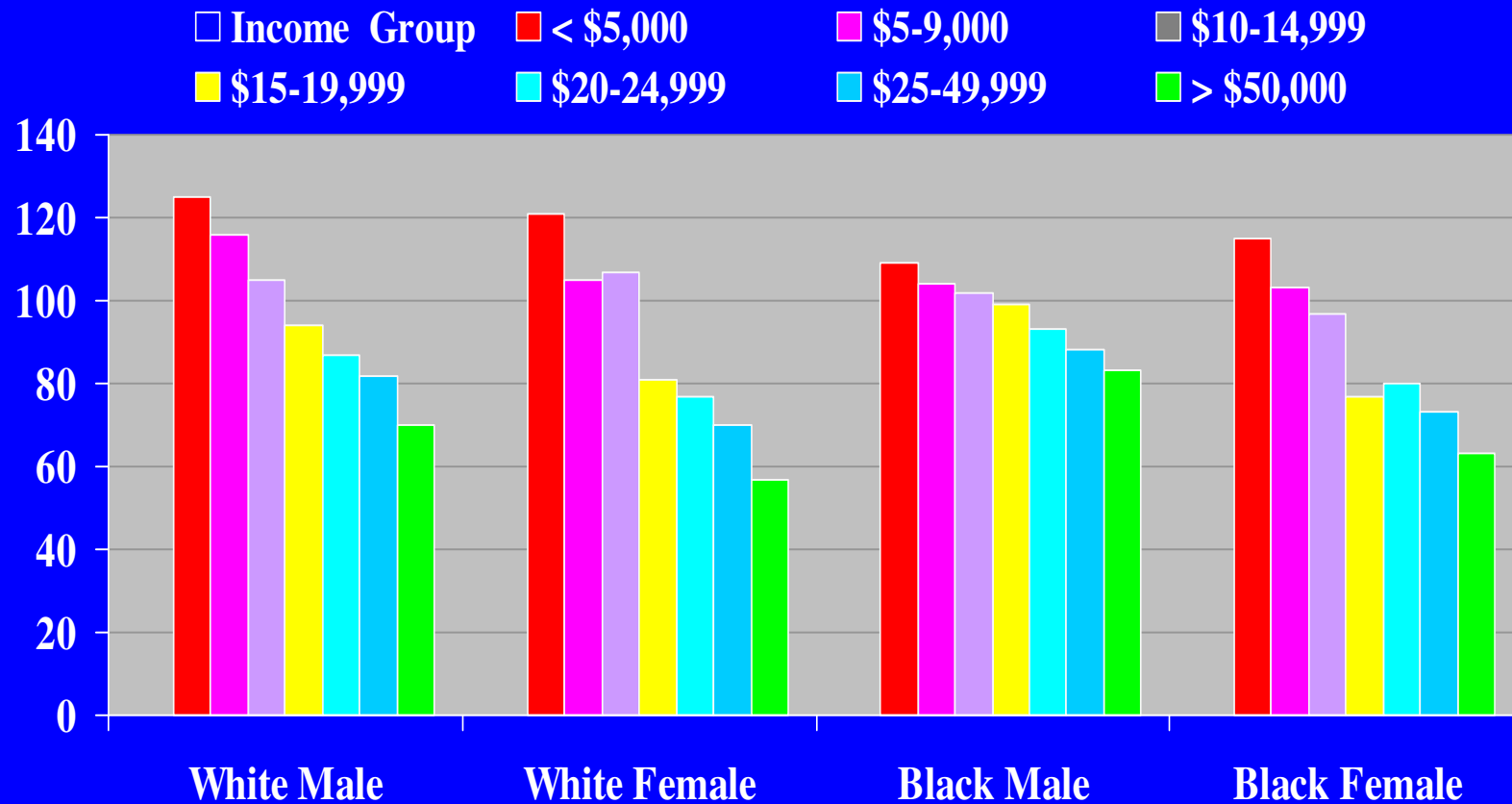
Groups

Individuals

Themes in the study of “social” variables

- Social gradient
- Life course effects
- Psychosocial characteristics
- Group-level measures

The Social Gradient



All-cause Mortality by Income, NLMS, 25+ Years

- What explains the gradient?
 - Absolute vs. relative position
 - Material or psychosocial explanations
- Can we eliminate the gradient by blocking proximal pathways?
- Common vs. different mechanisms

Life course

TABLE 4. Socioeconomic predictors of cardiovascular disease mortality, Alameda County Health Study, Alameda County, California, 1965–1996

Variable	Age-adjusted hazard ratio	95% confidence interval	Multivariable-adjusted hazard ratio*	95% confidence interval	Multivariable-adjusted hazard ratio†	95% confidence interval	Multivariable-adjusted hazard ratio‡	95% confidence interval
Childhood socioeconomic position								
High	1.00		1.00		1.00		1.00	
Low	1.34	1.13, 1.58	1.31	1.11, 1.56	1.30	1.09, 1.54	1.29	1.09, 1.54
Education								
High	1.00		1.00		1.00		1.00	
Medium	1.09	0.90, 1.32	1.00	0.82, 1.23	0.99	0.81, 1.22	0.99	0.80, 1.21
Low	1.21	0.98, 1.51	1.07	0.85, 1.36	1.06	0.84, 1.34	1.00	0.79, 1.28
Occupation								
Nonmanual	1.00		1.00		1.00		1.00	
Manual	1.08	0.85, 1.39	0.94	0.73, 1.23	1.00	0.75, 1.34	0.96	0.78, 1.29
Housewife	1.11	0.92, 1.34	1.06	0.88, 1.28	0.98	0.80, 1.19	0.99	0.80, 1.21
Annual household income								
High	1.00		1.00		1.00		1.00	
Medium	1.51	1.20, 1.90	1.49	1.18, 1.88	1.41	1.08, 1.84	1.42	1.08, 1.86
Low	1.44	1.15, 1.82	1.40	1.11, 1.77	1.44	1.11, 1.86	1.47	1.14, 1.91

* Multivariable model simultaneously adjusts for age (as a continuous variable), baseline household income, childhood socioeconomic position, education, and baseline occupation.

† Multivariable model with income and occupation as time-varying covariates.

‡ Multivariable model also includes smoking status, body mass index, and physical activity as time-varying covariates.

Life course

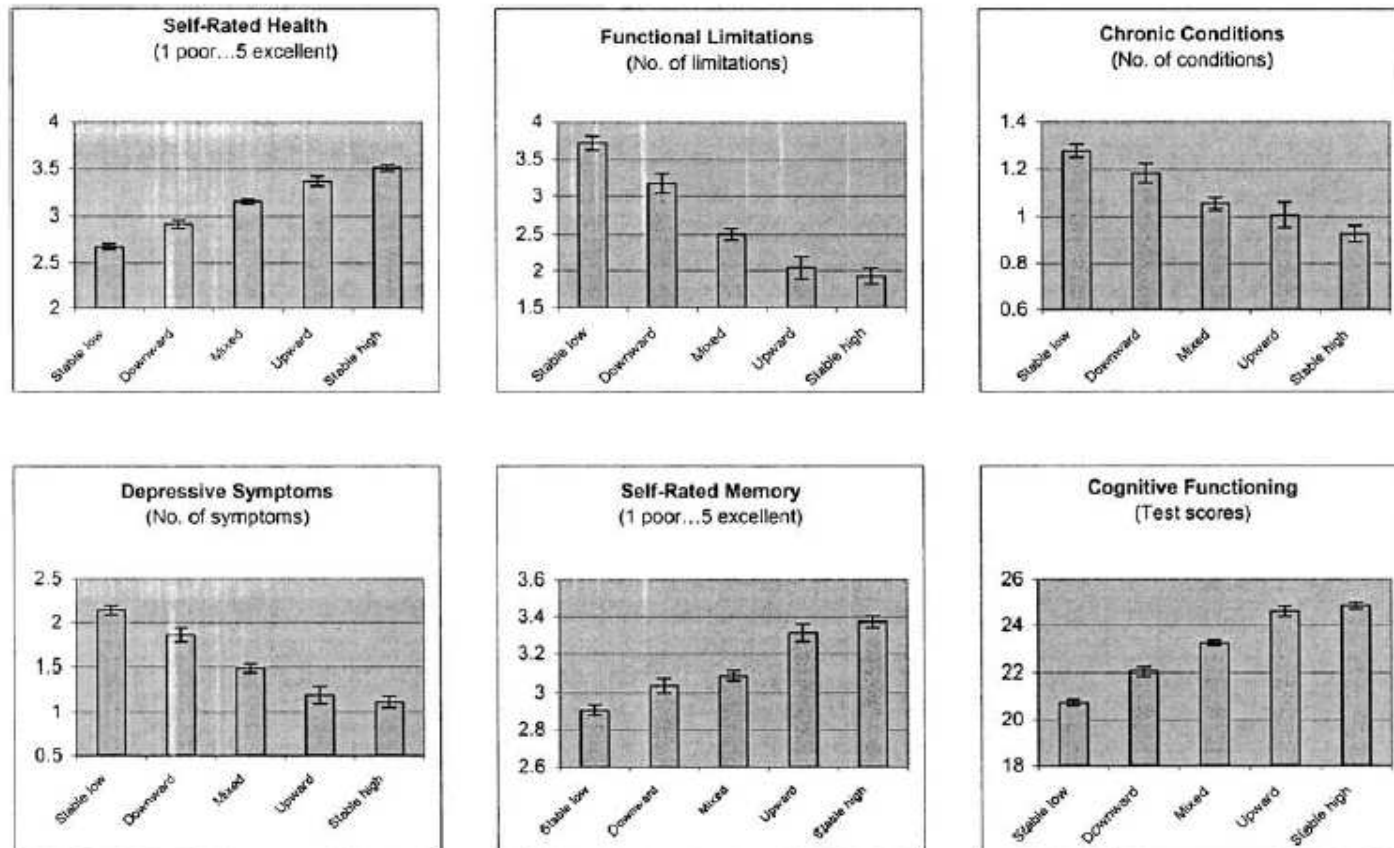
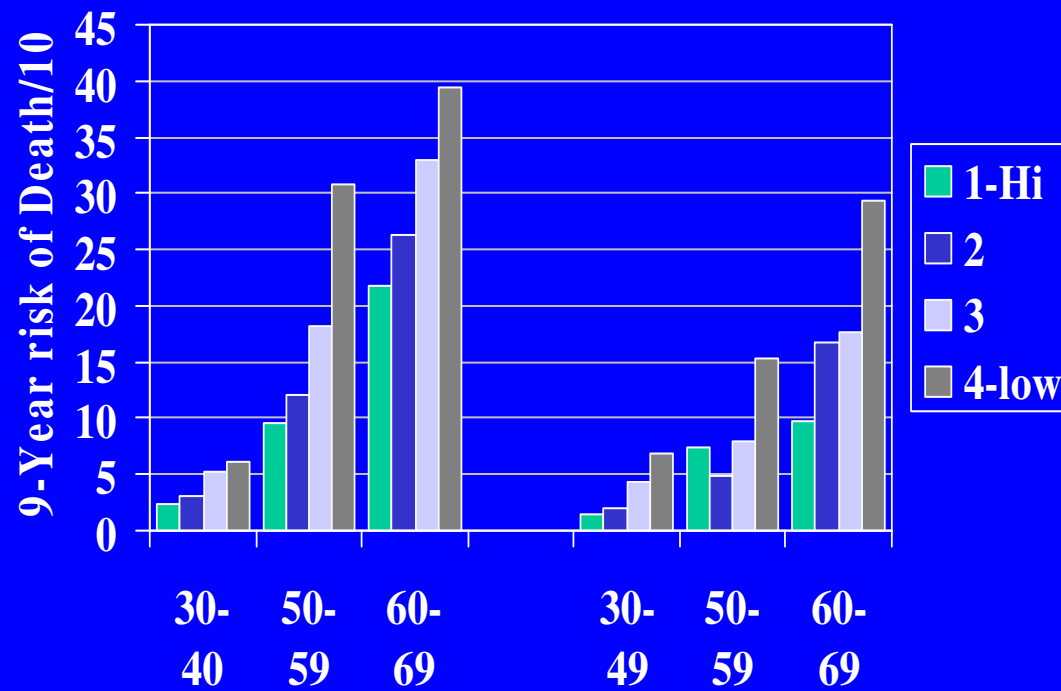


Figure 1. Social mobility and health outcomes (estimated means and 95% confidence intervals adjusted for gender, race/ethnicity, age, and childhood health).

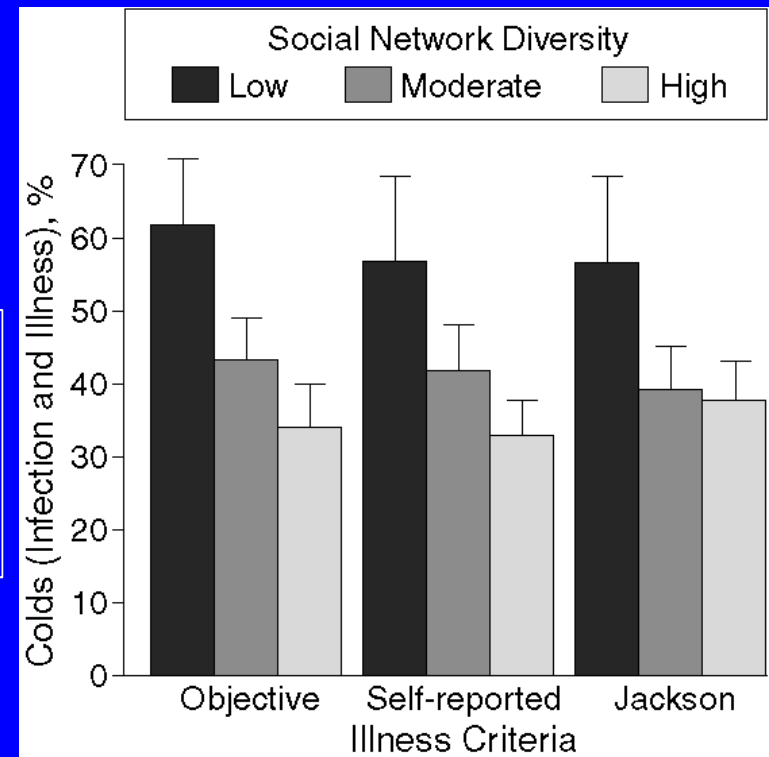
- Disentangling early vs. late effects
- Mechanisms
 - Critical periods
 - Cumulative effects
 - Interactions

Psychosocial variables



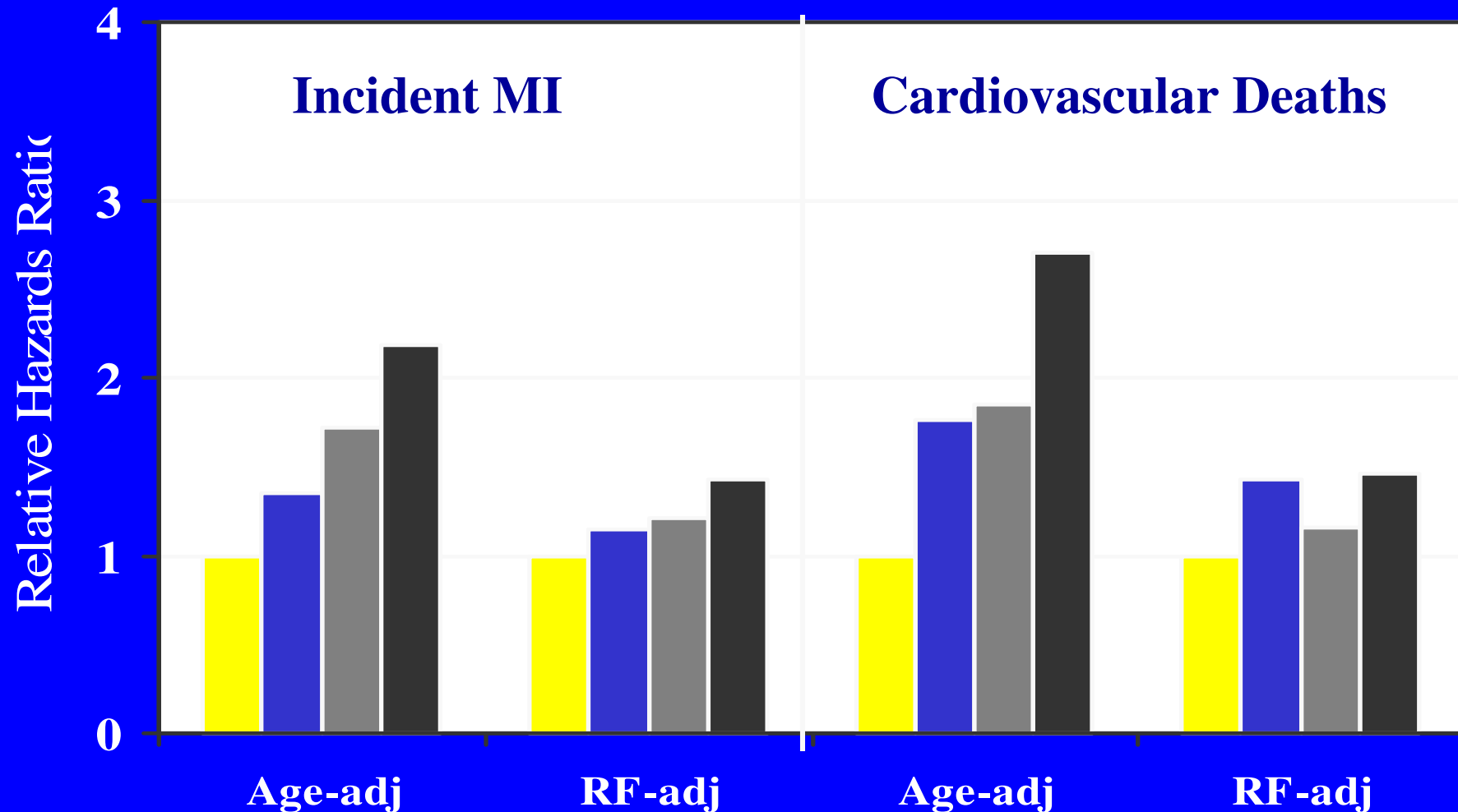
Social Network Index and Age

Berkman and Syme 1979



Cohen et al. 1997

Quartiles of Hostility and Risk of CVD: KIHD



Risk factor-adjusted models included covariates for biological, socioeconomic, & behavioral factors, social support, and prevalent diseases.

Everson et al 1997

- Behavioral mediators/confounders or “direct” biologic effects?
- Determinants of psychosocial attributes

Group-level variables

- Groups as more than collections of individuals
- “Contextual” effects of group-level attributes
- Interaction between group and individual-level attributes

Odds ratios of fair or poor self-rated health by levels of social capital indicators: BRFSS, 1993-1994

	Model 1	Model 2
Low Trust	1.67 (1.56, 1.75)	1.41 (1.33, 1.50)
Medium Trust	1.41 (1.35, 1.45)	1.14 (1.08, 1.21)
High Trust	1.00	1.00
Low group membership	1.43 (1.34, 1.55)	1.22 (1.14, 1.32)
Medium group membership	1.18 (1.13, 1.25)	1.11 (1.05, 1.16)
High group membership	1.00	1.00

Model 1 is adjusted for age, sex and race.

Model 2 is also adjusted for income, living alone, smoking, obesity, health insurance, and health care utilization.

Kawachi et al 1997

Hazard ratios of coronary heart disease by race-specific tertiles of neighborhood score before and after adjustment: the ARIC Study 1987-96

	Race-specific tertiles of neighborhood score*	Adjusted for age & center	Adjusted for age, center, income, education & occupation†	+ behavioral and biomedical risk factors‡
Whites	I (Low)	2.1 (1.6-2.8)	1.7 (1.3-2.3)	1.6 (1.1-2.2)
	II	1.7 (1.3-2.3)	1.5 (1.2-2.1)	1.5 (1.1-2.0)
	III (High)	1.0	1.0	1.0
	P trend	<0.001	<0.001	0.008
African-Americans	I (Low)	1.7 (1.2-2.3)	1.4 (0.9-2.0)	1.5 (1.0-2.3)
	II	1.4 (1.0-2.1)	1.3 (0.9-1.9)	1.5 (1.0-2.4)
	III (High)	1.0	1.0	0.09
	P trend	0.003	0.1	0.1

Diez Roux et al NEJM 2001

- Multilevel approaches
- Defining the relevant “groups” and group-level attributes
- Role of individual-level variables

Measurement of social variables (I)

- Level of organization
 - Individuals
 - Psychosocial characteristics (social connectedness, affect, hostility, optimism etc.)
 - Socioeconomic position
 - Groups
 - Structure of social networks, social cohesion, inequality
 - Society
 - Organization of work, macro economic conditions

Measurement of social variables (II)

- Time
 - Lifecourse
 - Lags

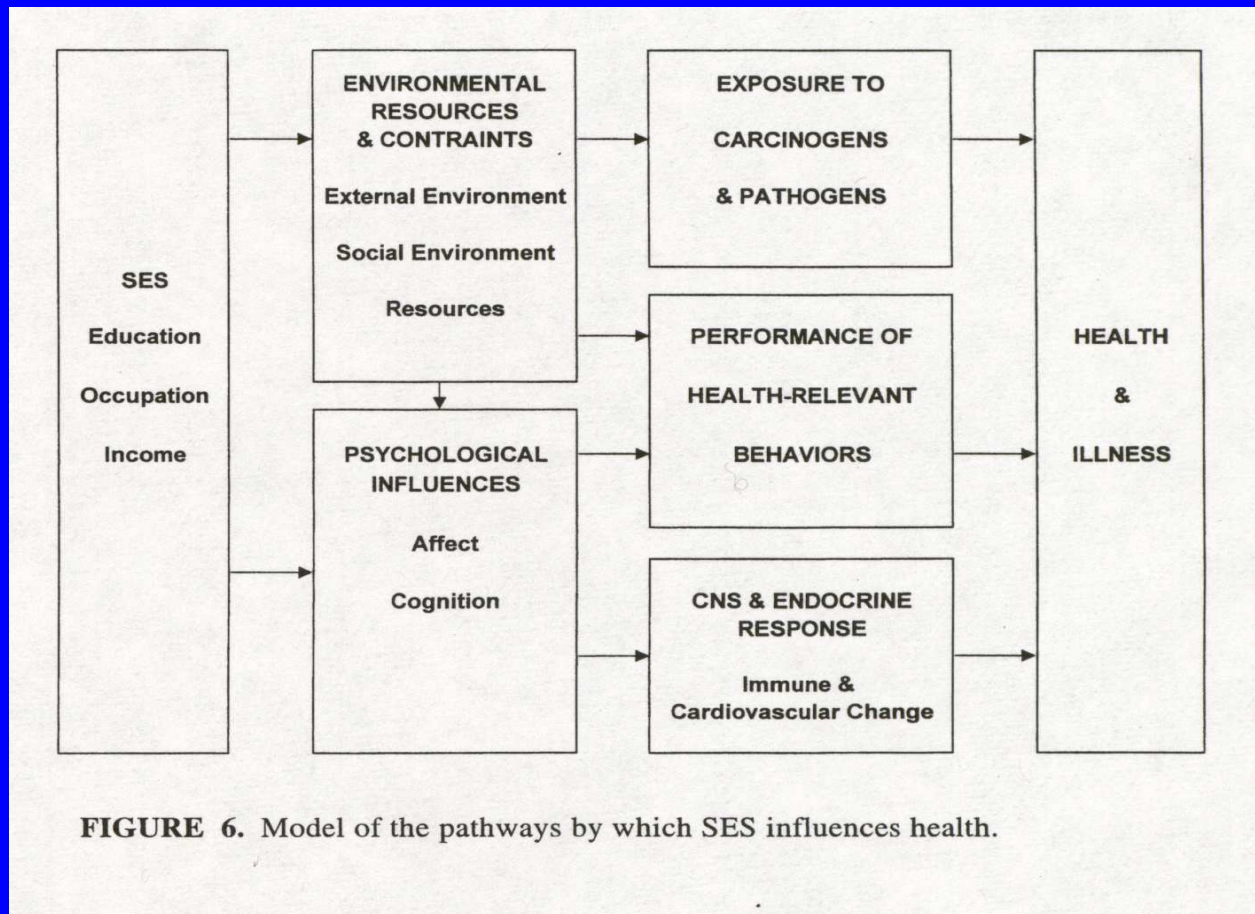
Measurement of social variables (III)

- Instruments
 - Theory
 - Scales
 - Ecological measurement

Models for the incorporation of social factors in biomedical research

- Social factors as antecedents for biologic processes
- Social factors as modifiers of biologic/genetic effects
- Social factors as integral parts of biologic systems

Social as antecedent to biological



Social as antecedent to biological

Clustering of interacting risk factors

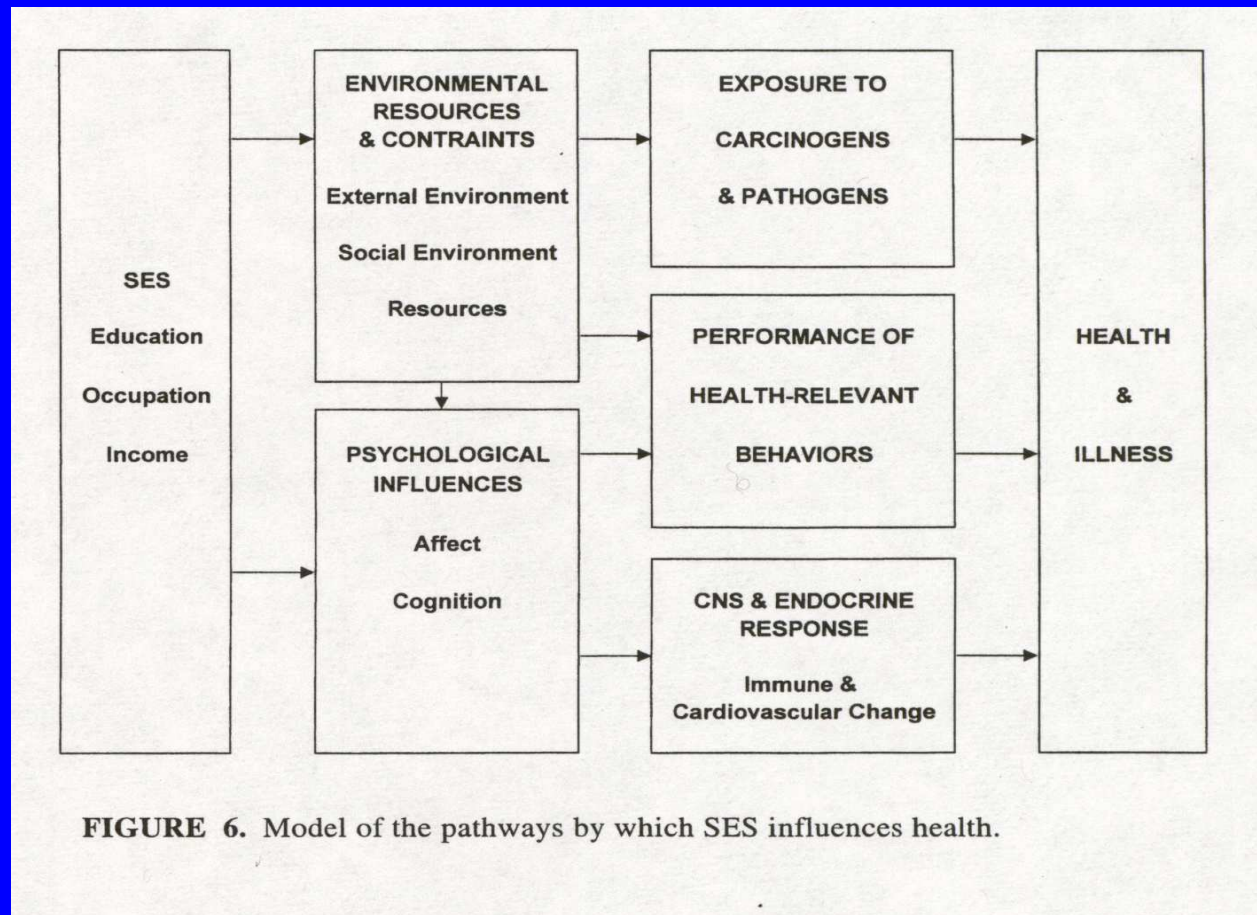


FIGURE 6. Model of the pathways by which SES influences health.

Social as context for biological

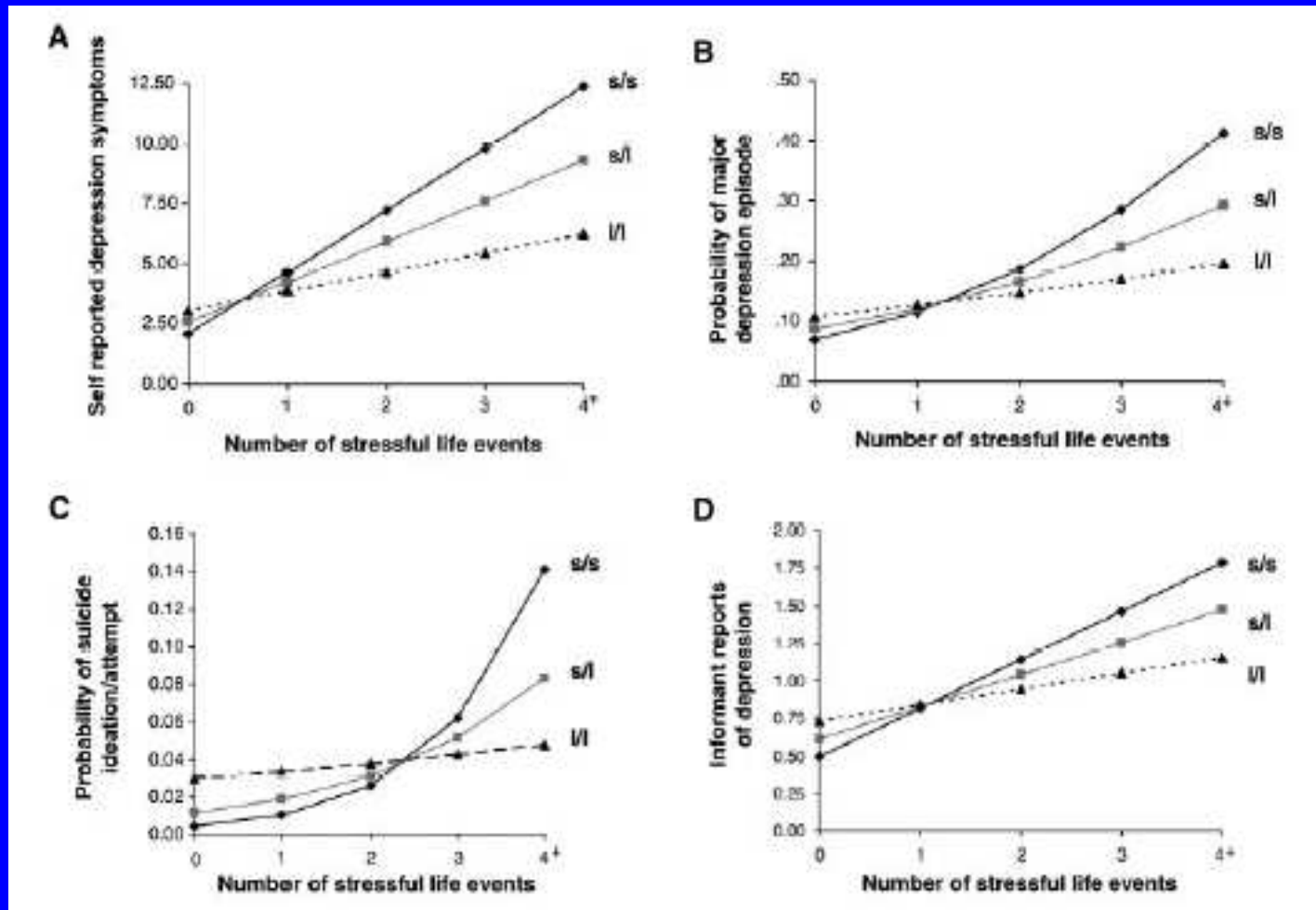
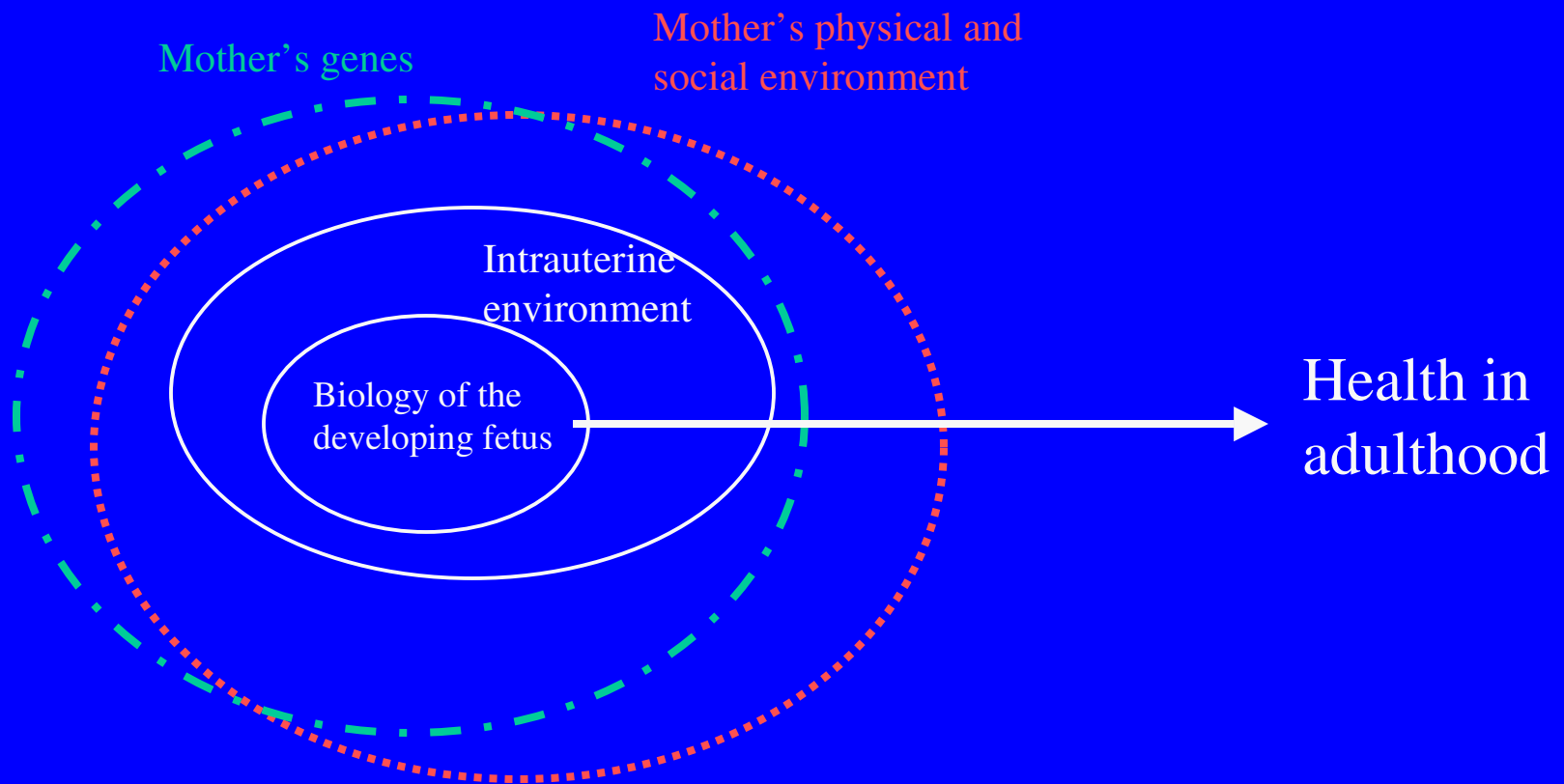


Fig 1. Results of regression analyses estimating the association between number of stressful life events (between ages 21 and 26 years) and depression outcomes at age 26 as a function of 5-HTT genotype. Caspi et al. Science 2003

Interrelations between social and biological over time

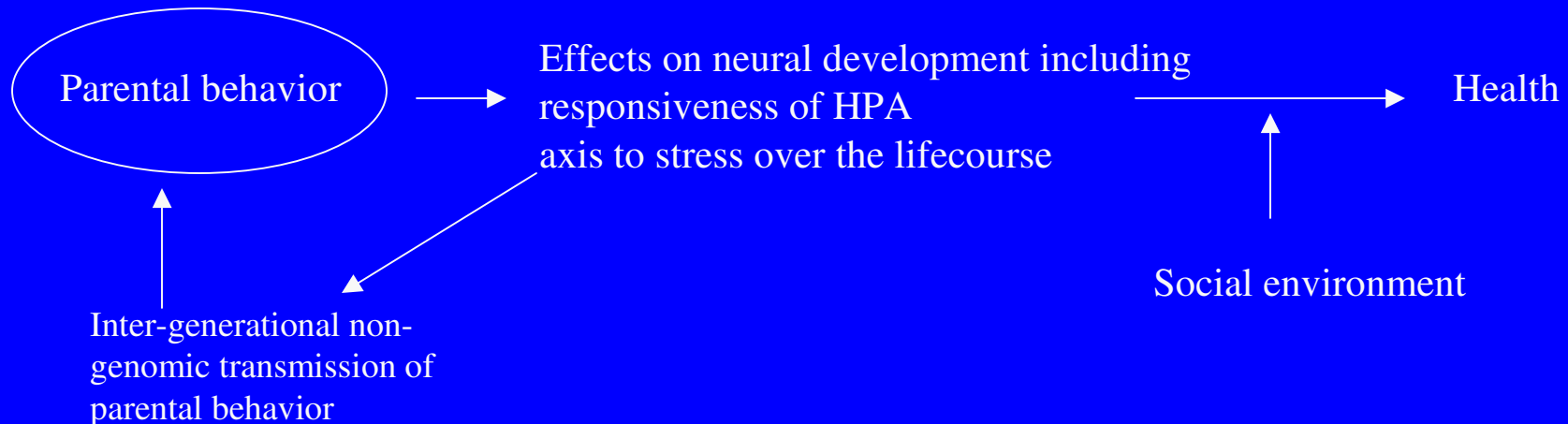
- Intrauterine environment and health in adulthood



Interrelations between social and biological over time and across generations

- Biological embedding of early experience

Parental social environment



Dynamic systems at multiple levels

“ If we consider disease to be embedded in a complex network in which biologic, social, and physical factors all interact, then we are impelled to develop new models and adopt different analytic methods.”

R. Stallones, 1973



