



# Conceptualizing Social Variables to Facilitate and Promote Gene/Environment Research

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**IOM June 16, 2005**

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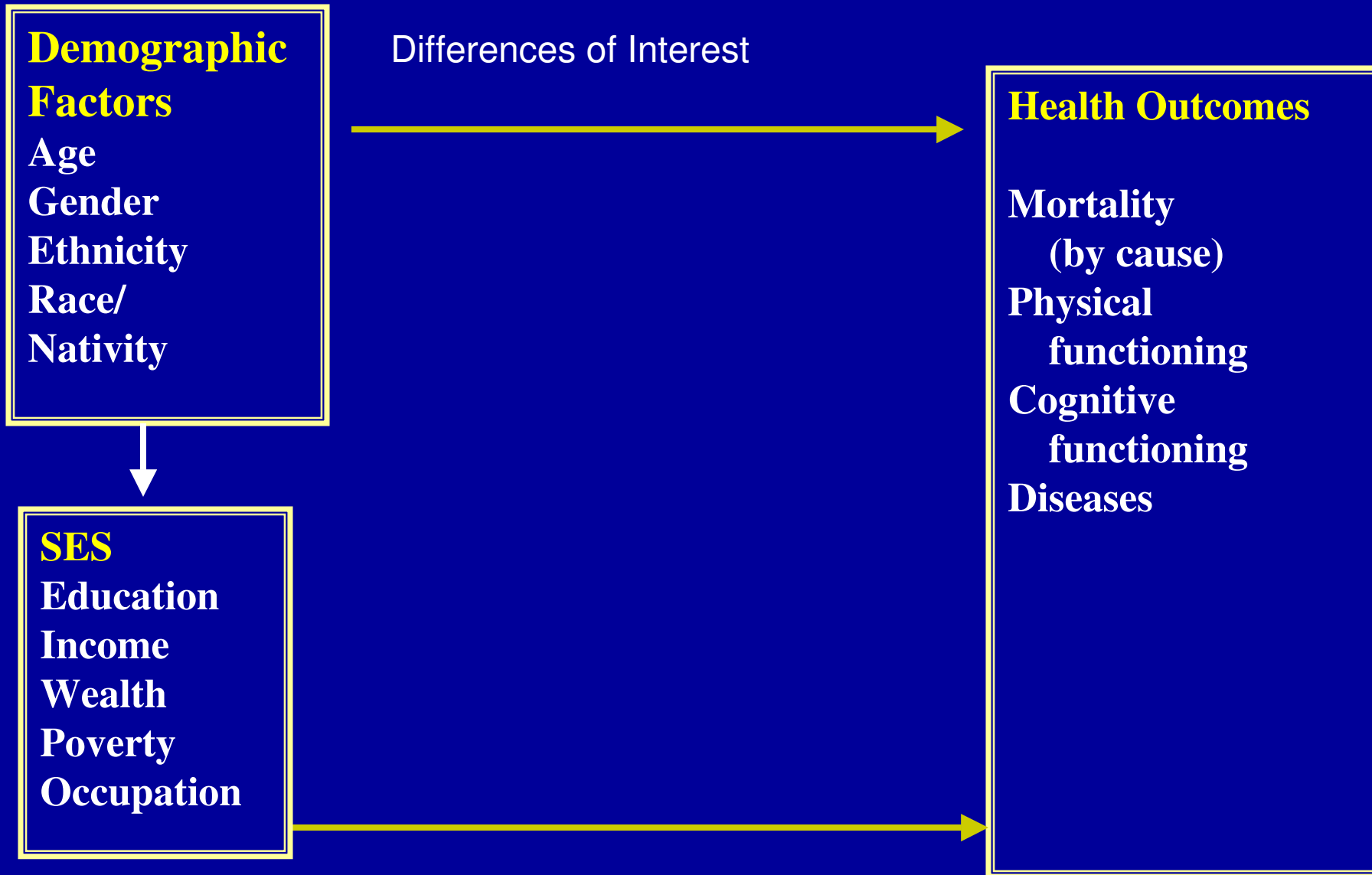
# Questions Assigned about Social Models of Health

What do we know about the connection between social environment and psychosocial variables?

What are the models currently being used to measure interaction between social environment and behavior?

What are the models currently being used to measure the interaction between social environment and health outcomes?

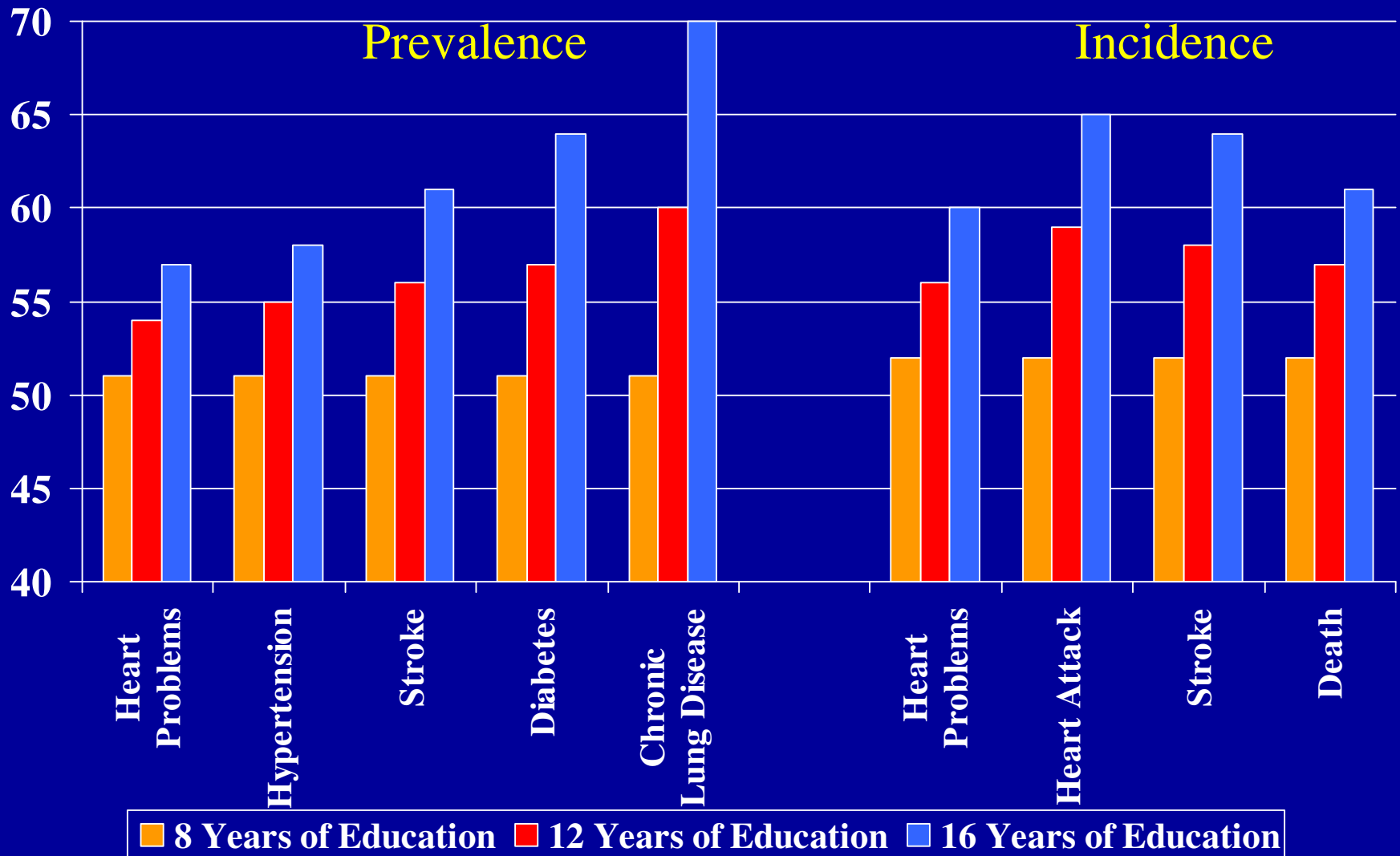
# Model of Social Environment and Population Health, Older Persons



# Measurement of Social Model Variables

- **Time dimension** –
  - For outcome variables - change not just state
    - E.g. cognitive change, onset of diabetes, heart attack
- **Social Variables** – some variables are fixed at birth
  - E.g. sex and race/ethnicity, and cohort or year of birth
- Others change over the life cycle
  - early life versus current state versus all life
    - E.g. SES - childhood status and current status, education may be relatively stable over the adult life cycle, income may change- but education is different in meaning for cohorts
- **Independence of variables** – Some are exogenous or independent – others are endogenous to the model
  - E.g. sex and race may partly determine education which in turn may determine occupation which may then determine income etc.

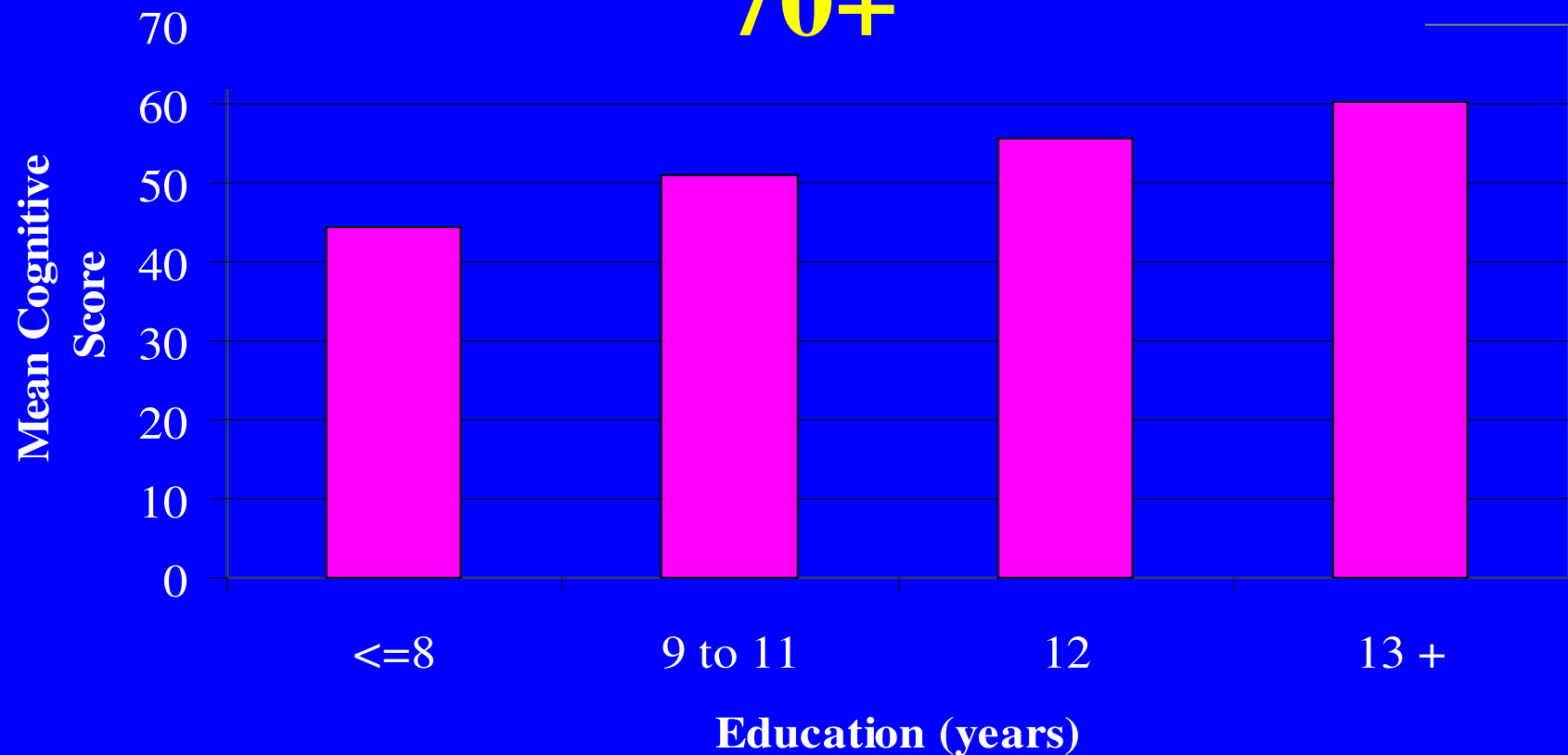
# Education is related to Disease Prevalence/Incidence and Death Equivalent Ages for Three Educational Groups: HRS (51-61)



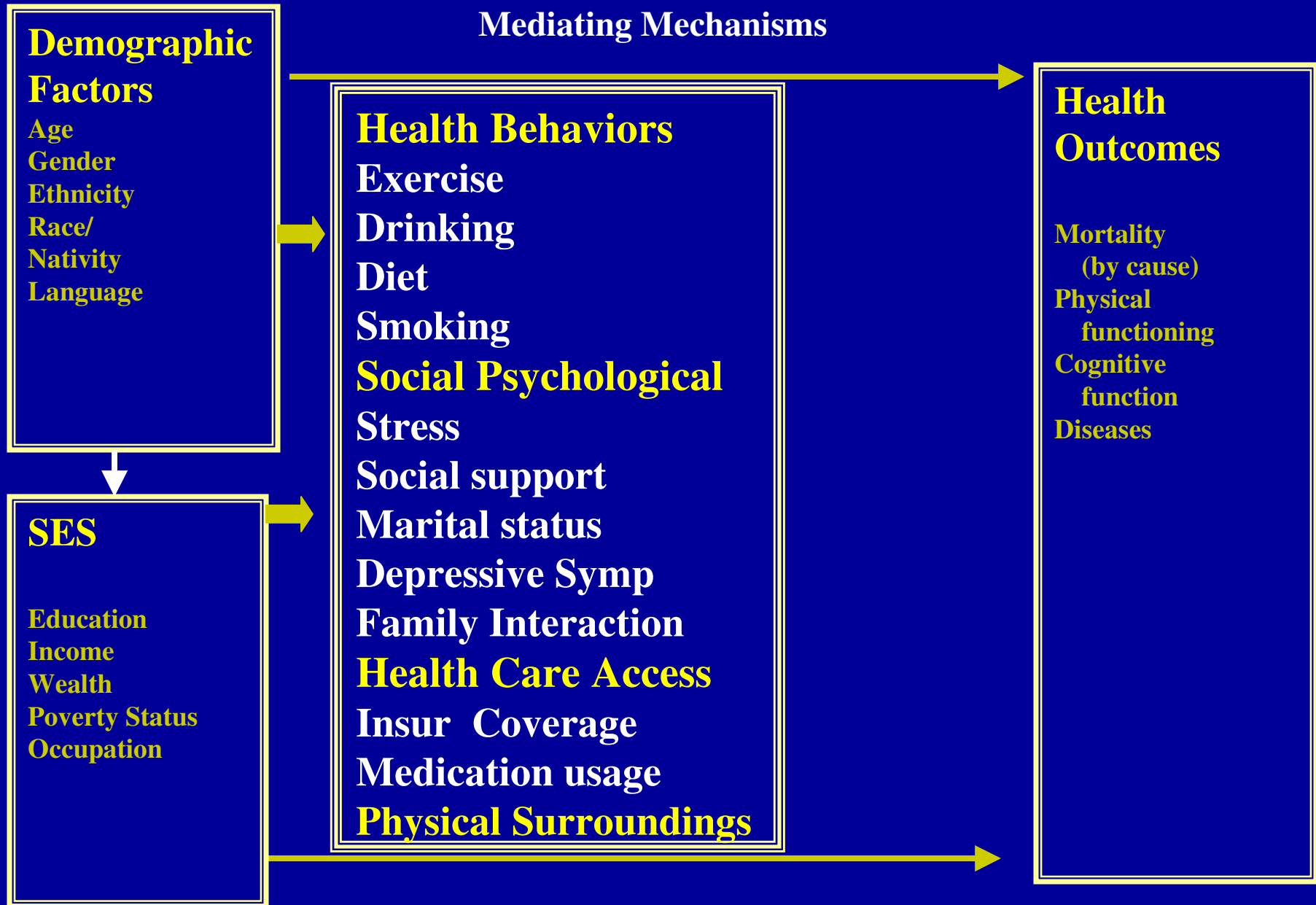
HRS WAVE 1 and 2: Crimmins and Hayward

# Cognitive Score is related to Education: MacArthur

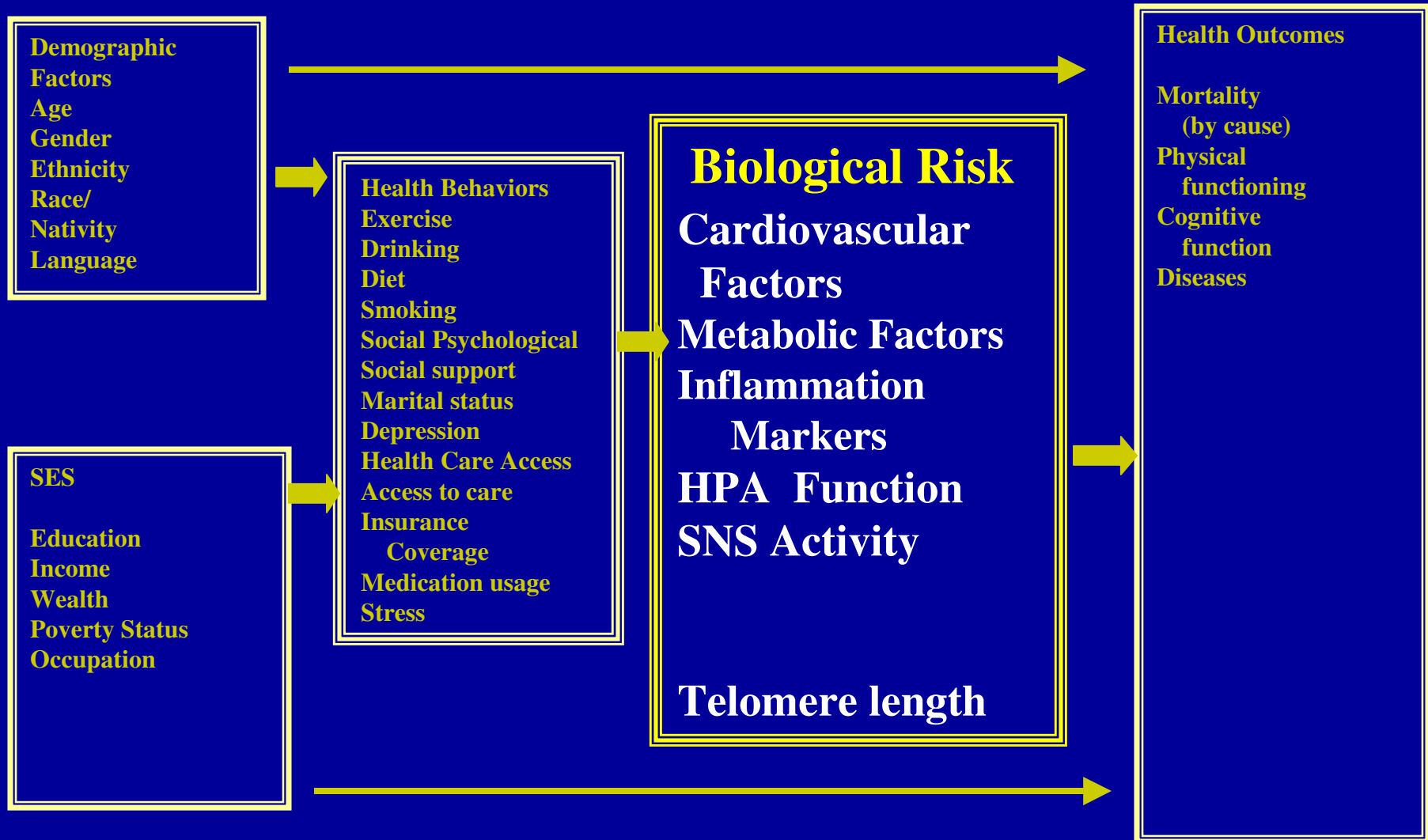
70+



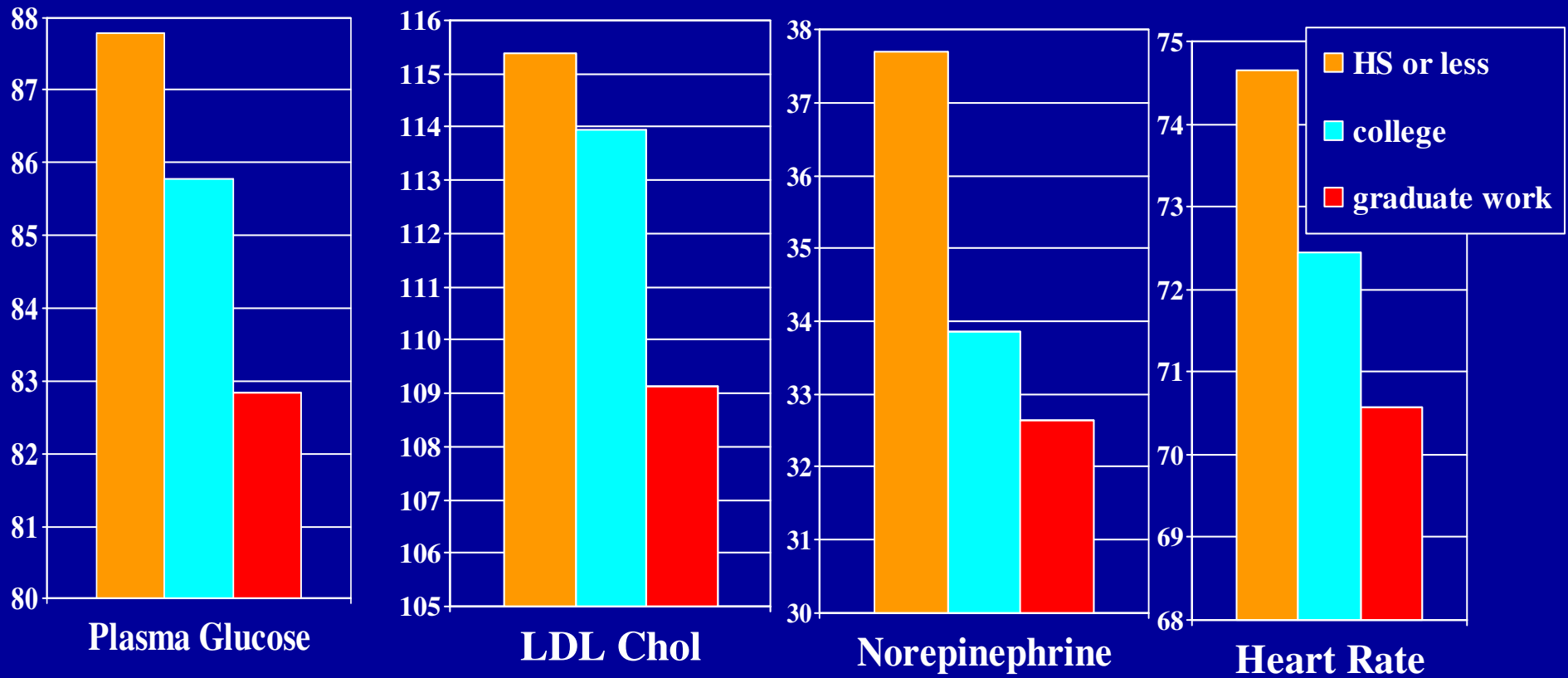
# Model of Social Environment and Population Health, Older Persons



# Intermediate Health Outcomes or Risk Factors

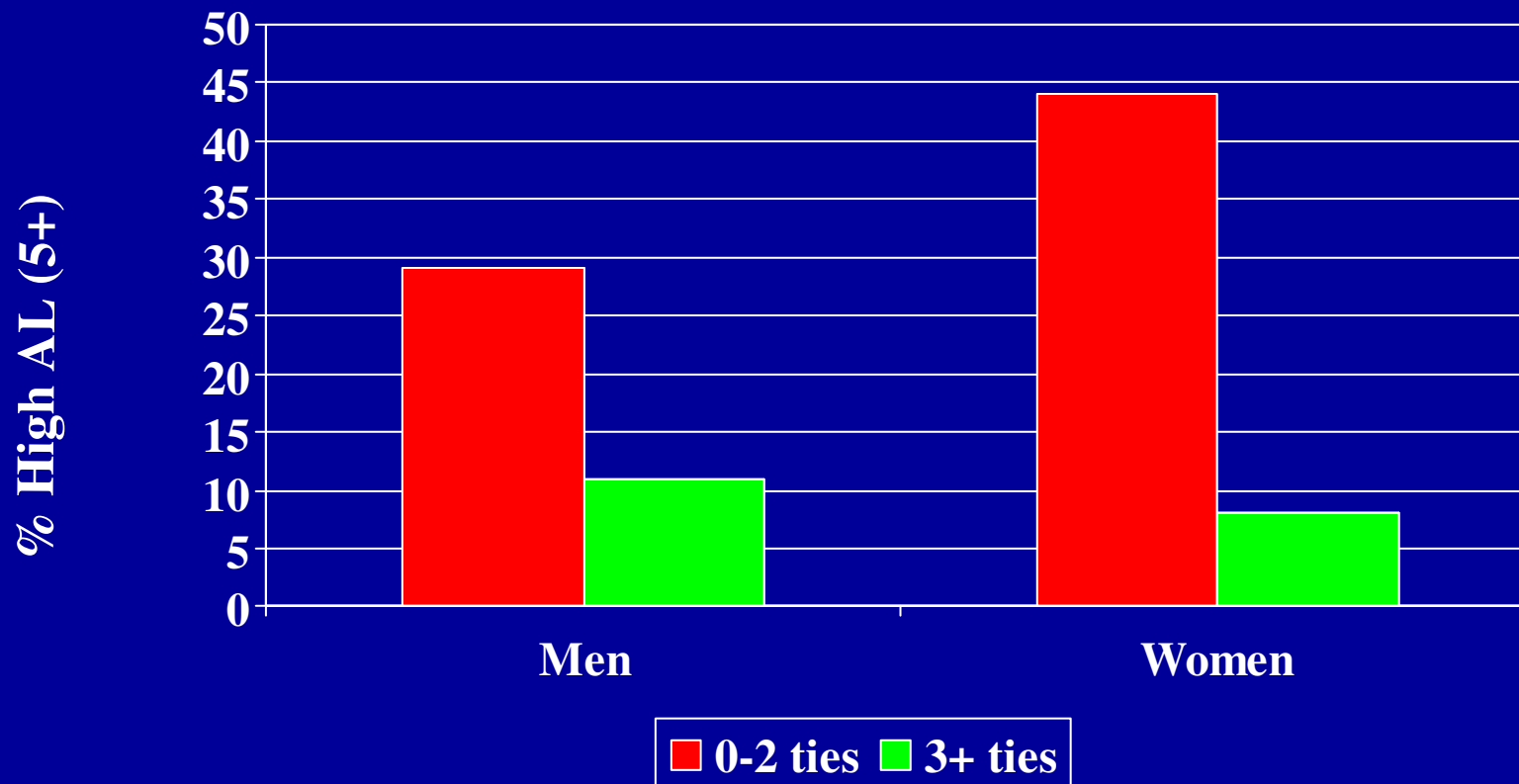


# Biological Parameters (2000) by Education: CARDIA



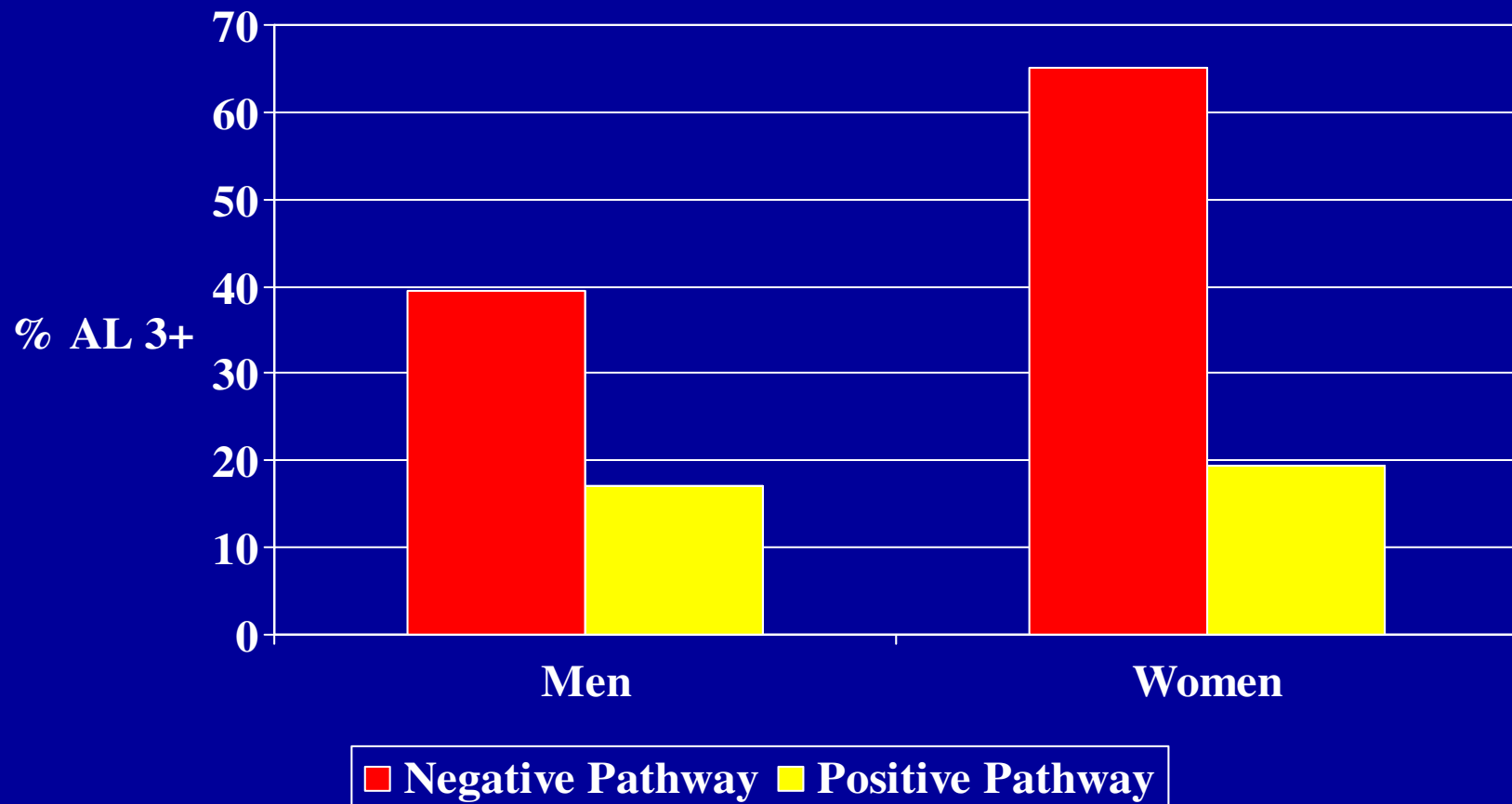
Source: Teresa Seeman

# Social Integration and 5 or more Biological Risk Factors: MacArthur Aging Study



Source: Seeman et al. 2002

# Social Relationship Histories & Biological Risk (WLS)



Source: Singer, B. and Ryff, CD (1999) Hierarchies of life histories and associated health risks. *Annals New York Acad. of Sciences* 896; 96-115

# Relationships not one way (feedback and compensatory):

## Interactive

- E.g personality may be linked to behaviors, which may be related to success in school and families and the amount of stress realized, health behaviors and and health outcomes
- Effects not the same for all groups –
  - E.g. work stress – women versus men
  - Education effect on black and white health

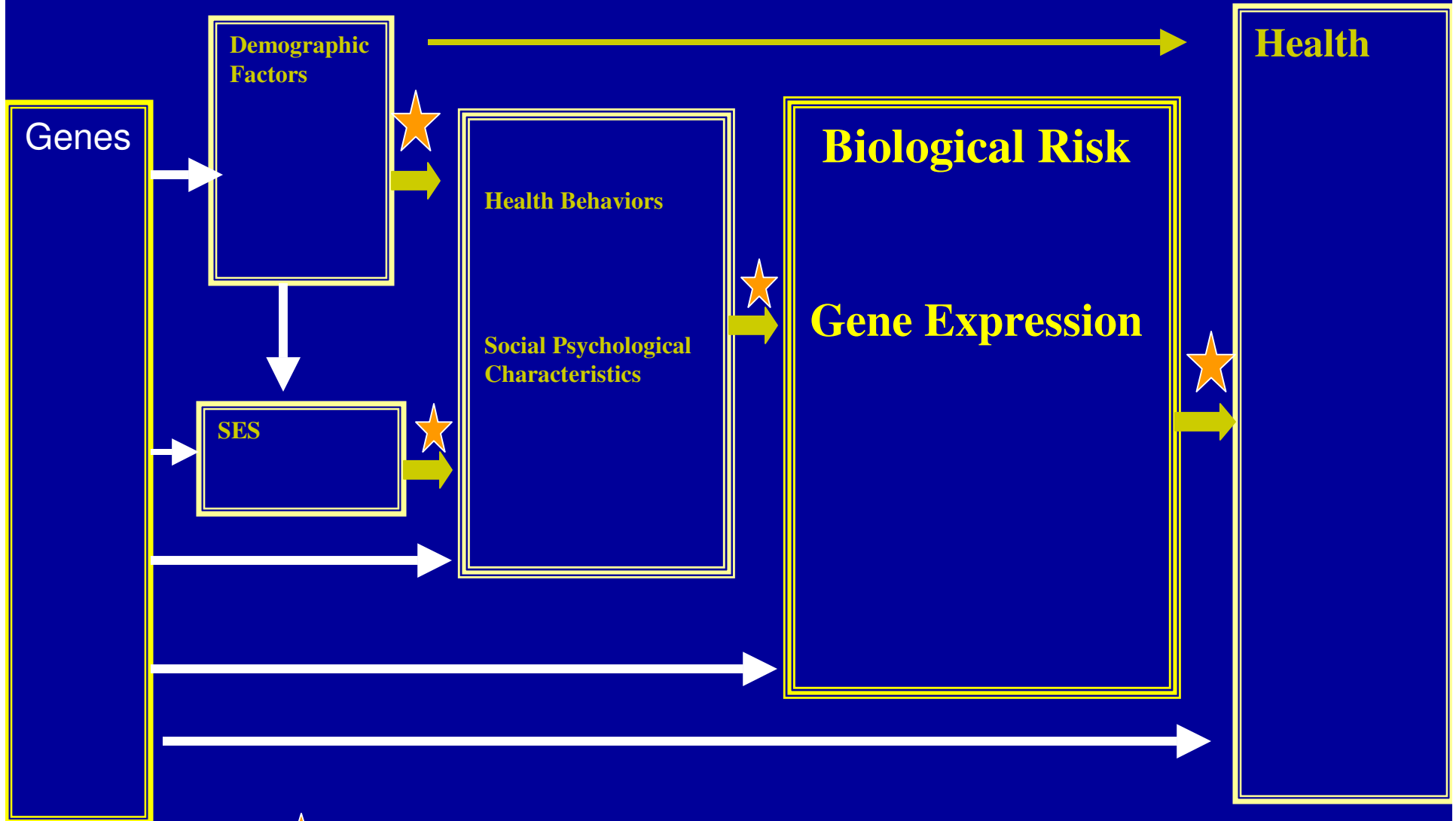
# Genes and Environment

What are the potential pathways through which the social environment and genes interact?

What are some ways researchers might measure the social environment's impact on genes, and vice versa?

What methods are currently being used to study the social environment that could provide models for genetic research?

# Adding Genes to the Model

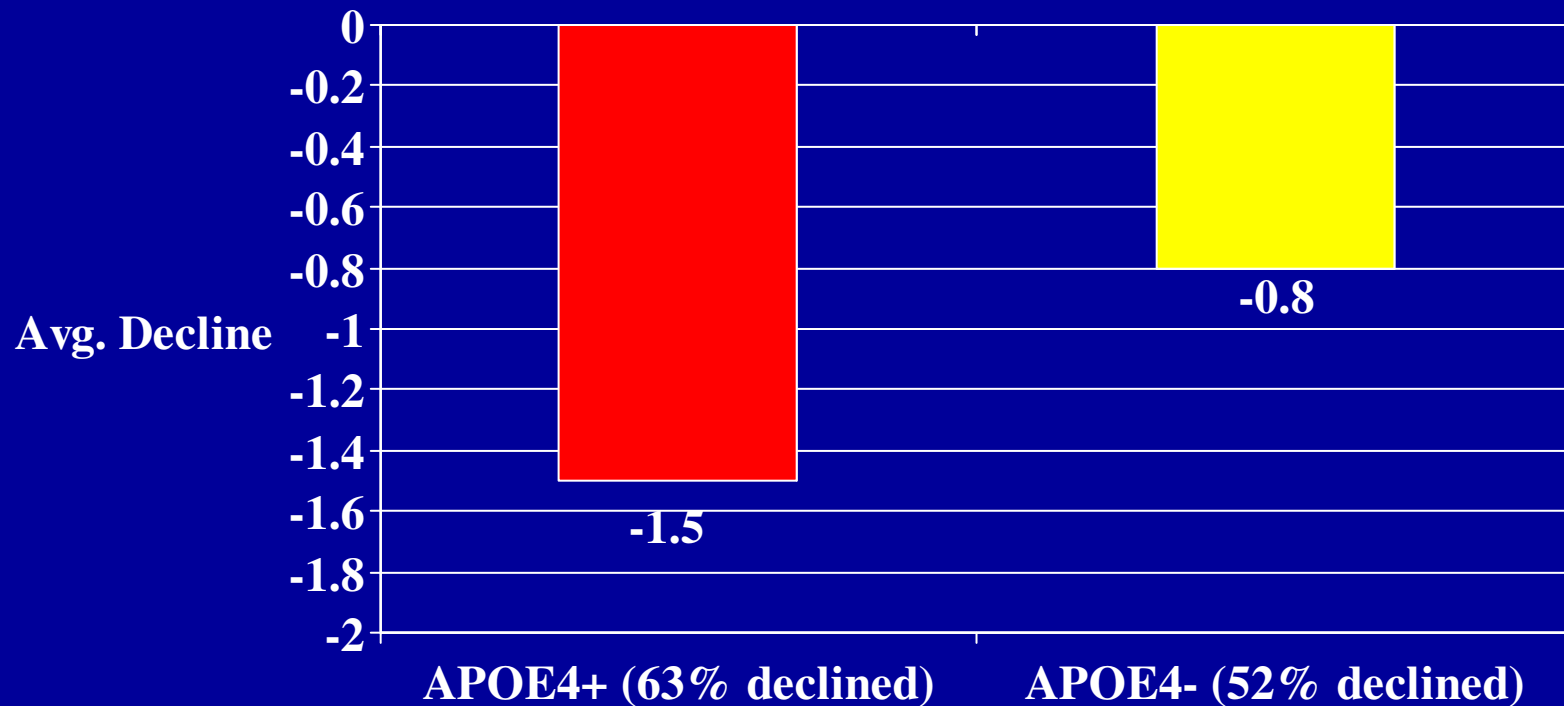


Genes can modify relationship

# Quantitative Genetics versus Molecular Genetics

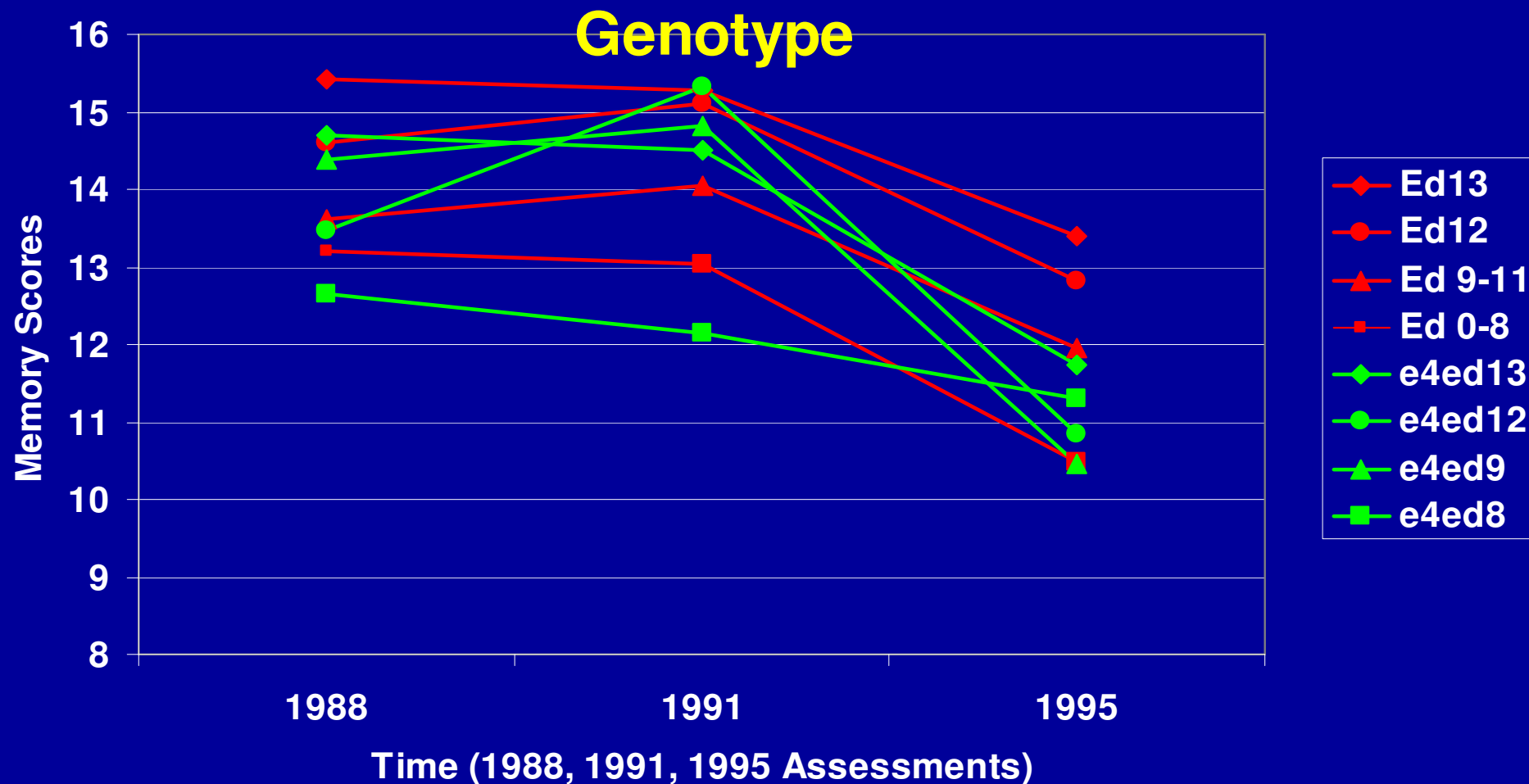
- Families, Twins, Adoption
- Population Change with Age – APOE, HLA, ACE
- Allelic Association
- Linkage

# APOE & Cognitive Decline: [SPMSQ] MacArthur Study of Successful Aging (1988-'95)



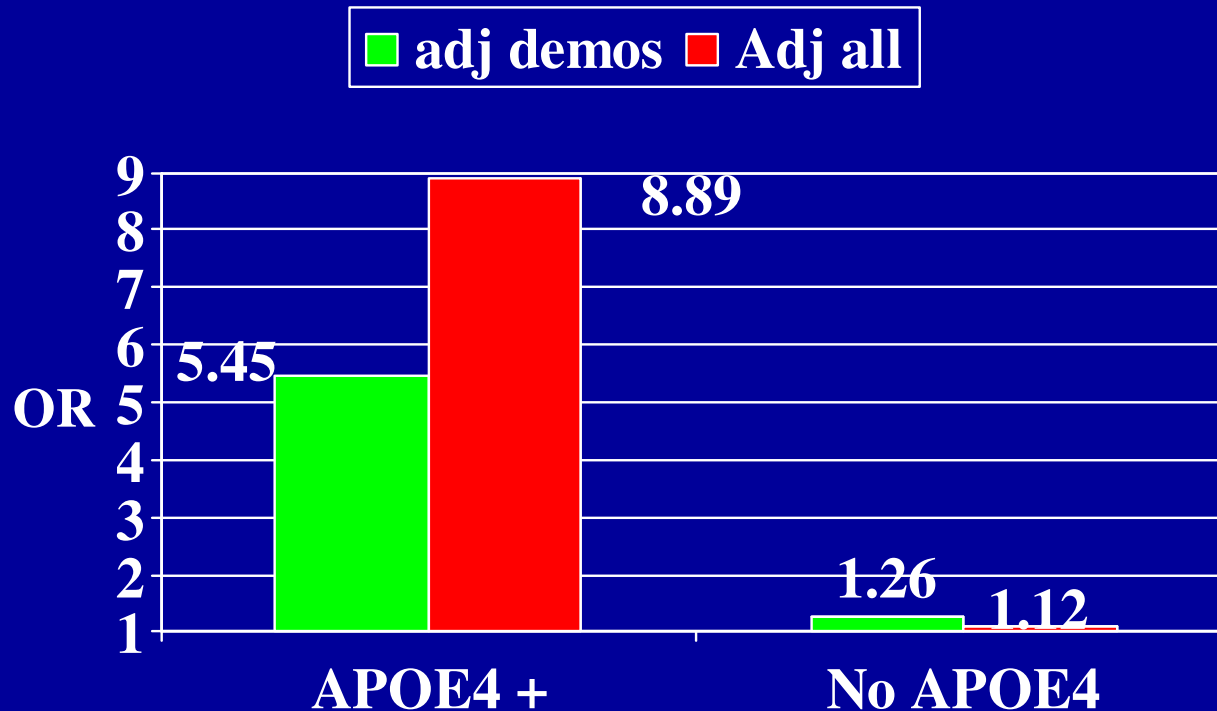
Source: Education and APOE4 in Longitudinal Cognitive Decline: MacArthur Studies of Successful Aging, 2005, T. Seeman, M. Huang, P. Bretsky, E. Crimmins, L. Launer, and J. Guralnik, *J of Geron: Psy Sci.*, 60, 74-83.

# Time Trends for Memory Performance - Interactions between Education & APOE



Source: Education and APOE4 in Longitudinal Cognitive Decline: MacArthur Studies of Successful Aging, 2005, T. Seeman, M. Huang, P. Bretsky, E. Crimmins, L. Launer, and J. Guralnik, J of Geron: Psy Sci., 60, 74-83.

# APOE, Antioxidants & Cognitive Decline: effects of serum beta-carotene



## Odds of Cog. Decline for Low vs. High Antioxidant Levels

*“Adj demos” model = 1988 SPMSQ, age, sex, race, ed, income,*

*“Adj all” = demos + smoking, Alcohol, CRP, IL-6, total & HDL cholesterol, BMI*

Hu P, Bretsky P, Crimmins EM, Guralnik JM, Reuben DB, Seeman TE. The effects of serum beta-carotene levels on decline of cognitive function in high-functioning older persons with or without apolipoprotein E4 alleles: MacArthur Studies of Successful Aging. (Submitted)

# How to do research on genes and the environment

- Population studies could benefit from having samples of twins and families
- Twin studies could benefit from having more information on environmental differences
- Emphasis on people who do not get phenotype as well as those who do

# Models for linking genes and environment

- All mechanisms in the model
- Both genes and environment may be less than perfectly measured (latent variables)
- Interactions appear to be the key