

Addressing Five Demographic Questions Better through Including Bioindicators

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Reves, St.Petersburg, Florida,
2007

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Aging as an area of study

Data

Methods

Demographic Questions about Health

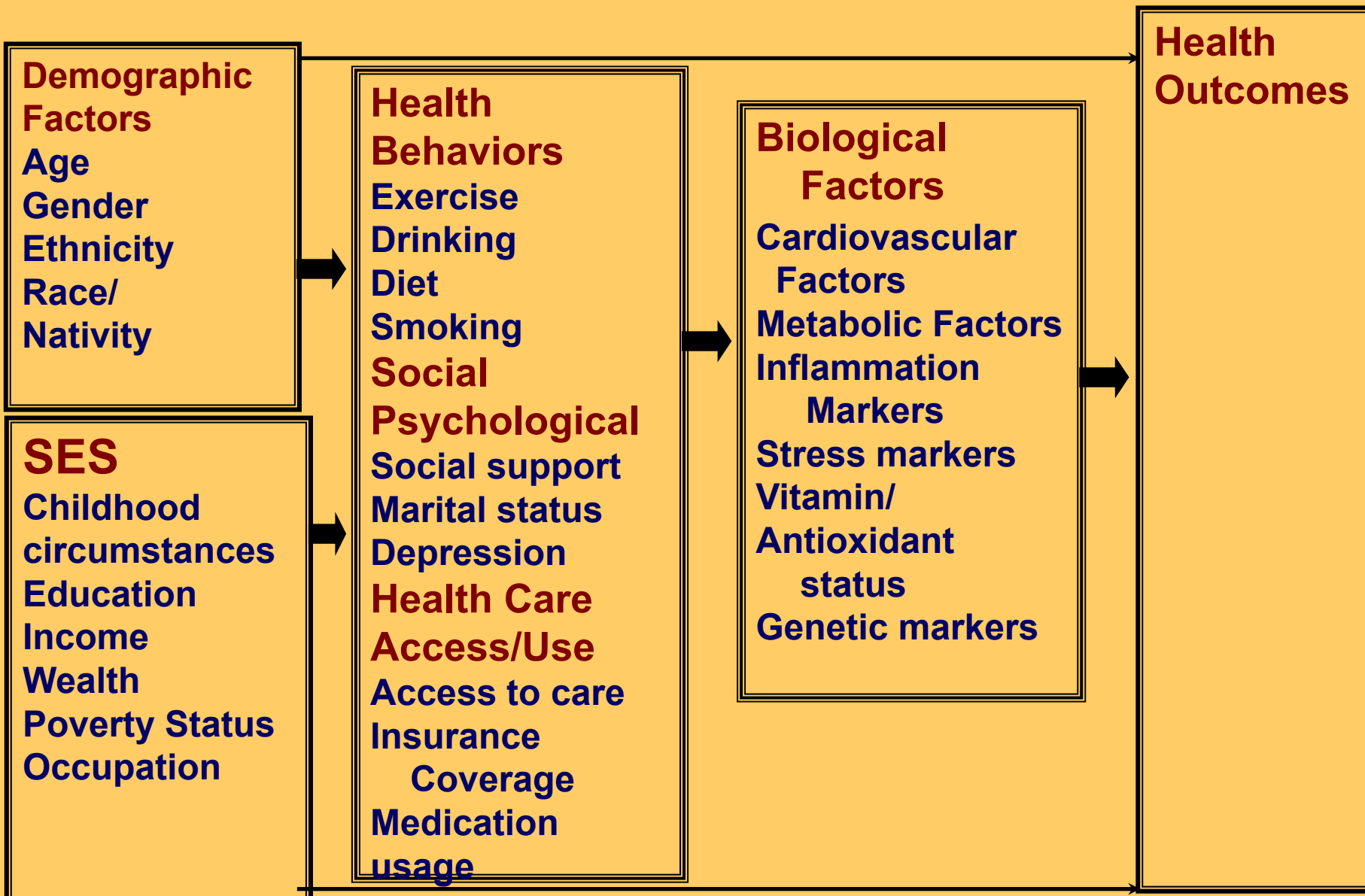
- **Time Trends :**

How and why is population health changing?

- **Differentials:**

What is the cause of differentials in health and mortality (Age, Socioeconomic Status, Race/Ethnicity, and Sex)

Model of Life Course Health Outcomes



Questions Better Understood With Bioindicators

Is the population healthier or less healthy now than in the past?

Why is mortality at the oldest ages lower than expected (from the Gompertz curve)?

Why are health differentials by SES and Race/ethnicity smaller at the older ages?

In there a Hispanic paradox in health?

How do you explain the cohort pattern of mortality decline over the past?

Trends in Biological Risk (Persons – 65+ NHANES 1990 – 2000)

Blood Pressure **Worse**

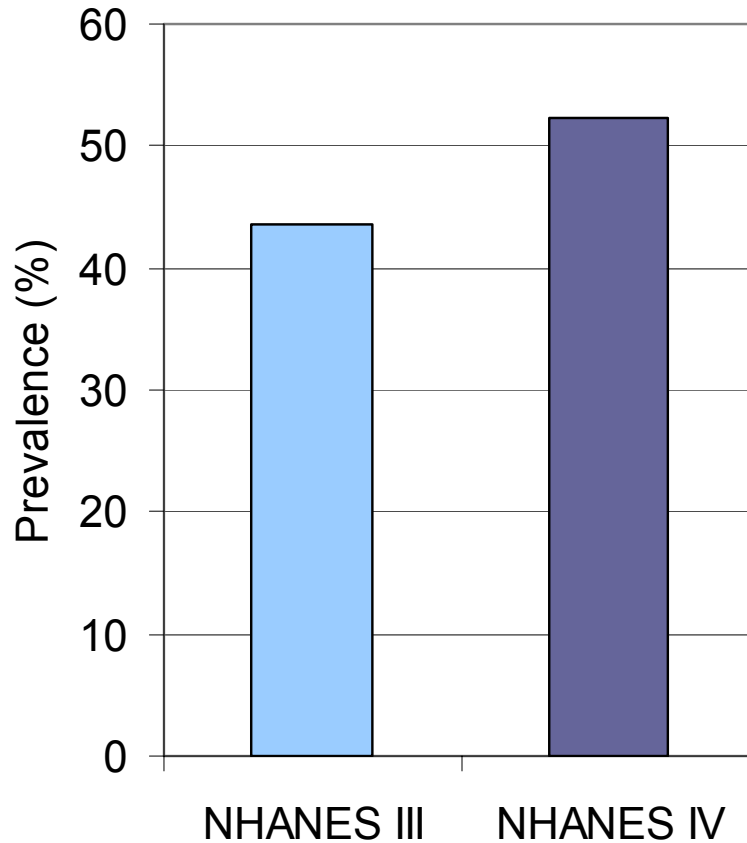
Cholesterol **Better**

Weight **Worse**

Inflammation **Worse**

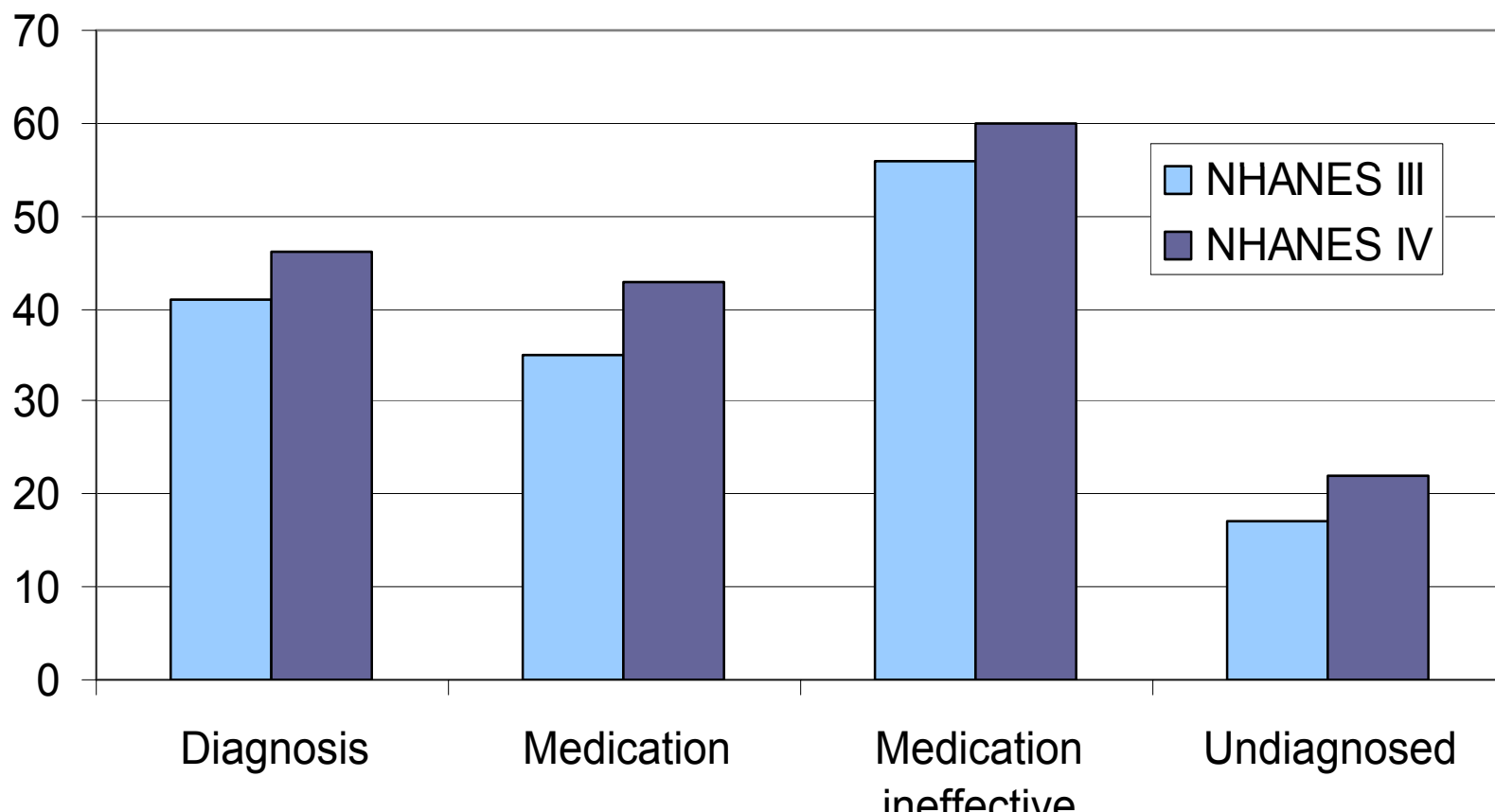
Homocysteine **Better**

Increased Systolic blood pressure

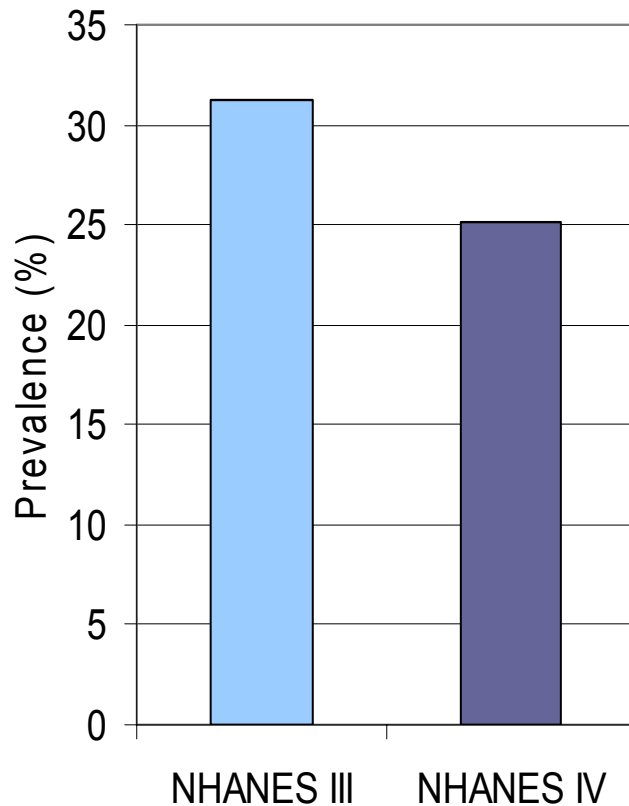


28% increased risk of high systolic blood pressure after controls for age and gender

Reasons for increased Systolic blood pressure

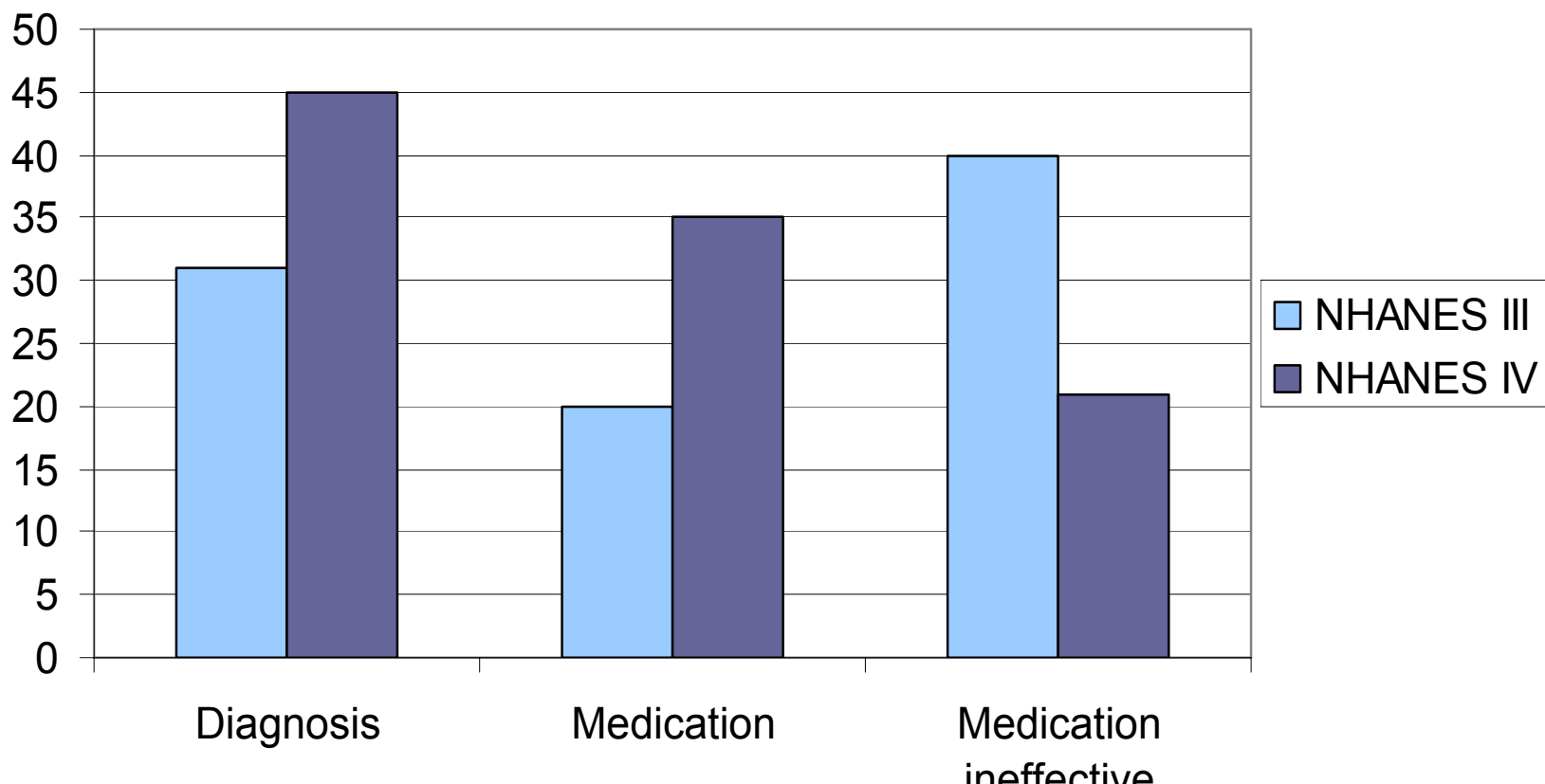


Decreases in Cholesterol



35% decreased risk of high total cholesterol after controls for age and gender

Reasons for decreased Cholesterol



Trends in Biological Risk Mixed

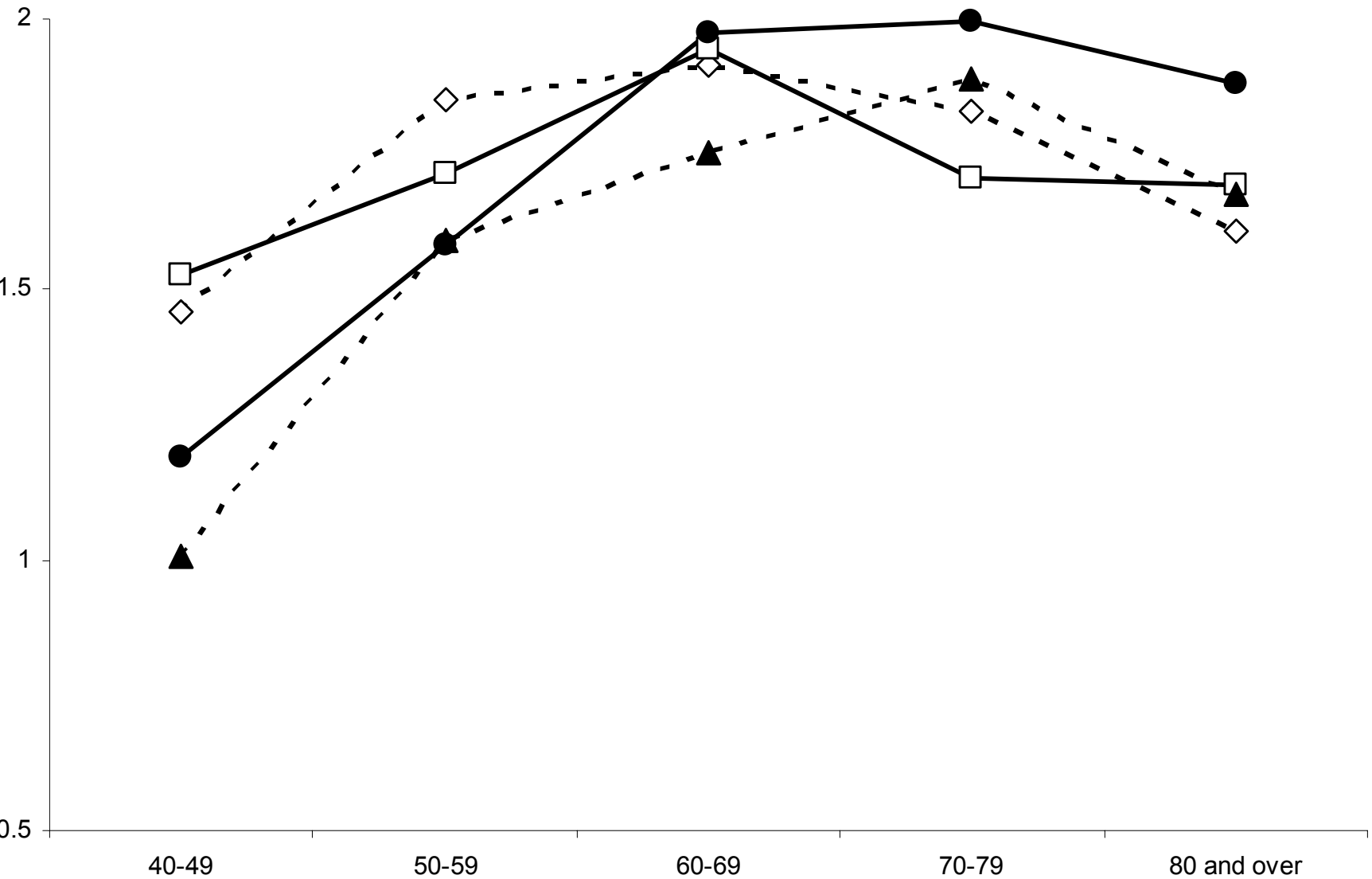
Getting better:

- Decrease in lipids related to more effective medication
- Decrease in homocysteine results from folate supplementation

Getting worse:

- Increase in hypertension related to more risk uncontrolled by drugs
- Increase in CRP related to increased obesity, more chronic conditions

Mean Number of High-Risk Cardiovascular Risk Factors by Sex and Age: NHANES III and IV



-◇- Men NHANES III

-▲- Women NHANES III

—□— Men NHANES IV

—●— Women NHANES IV

Why is mortality increase at the older ages lower than expected?

Biological risk in population does not continue to increase with age

People with high risk die younger leaving a population that is “healthier” at the older ages

Summary Indicator of Biological Risk – Measured High Levels

Cardiovascular Risk Factors

Blood Pressure (Systolic and Diastolic), Pulse

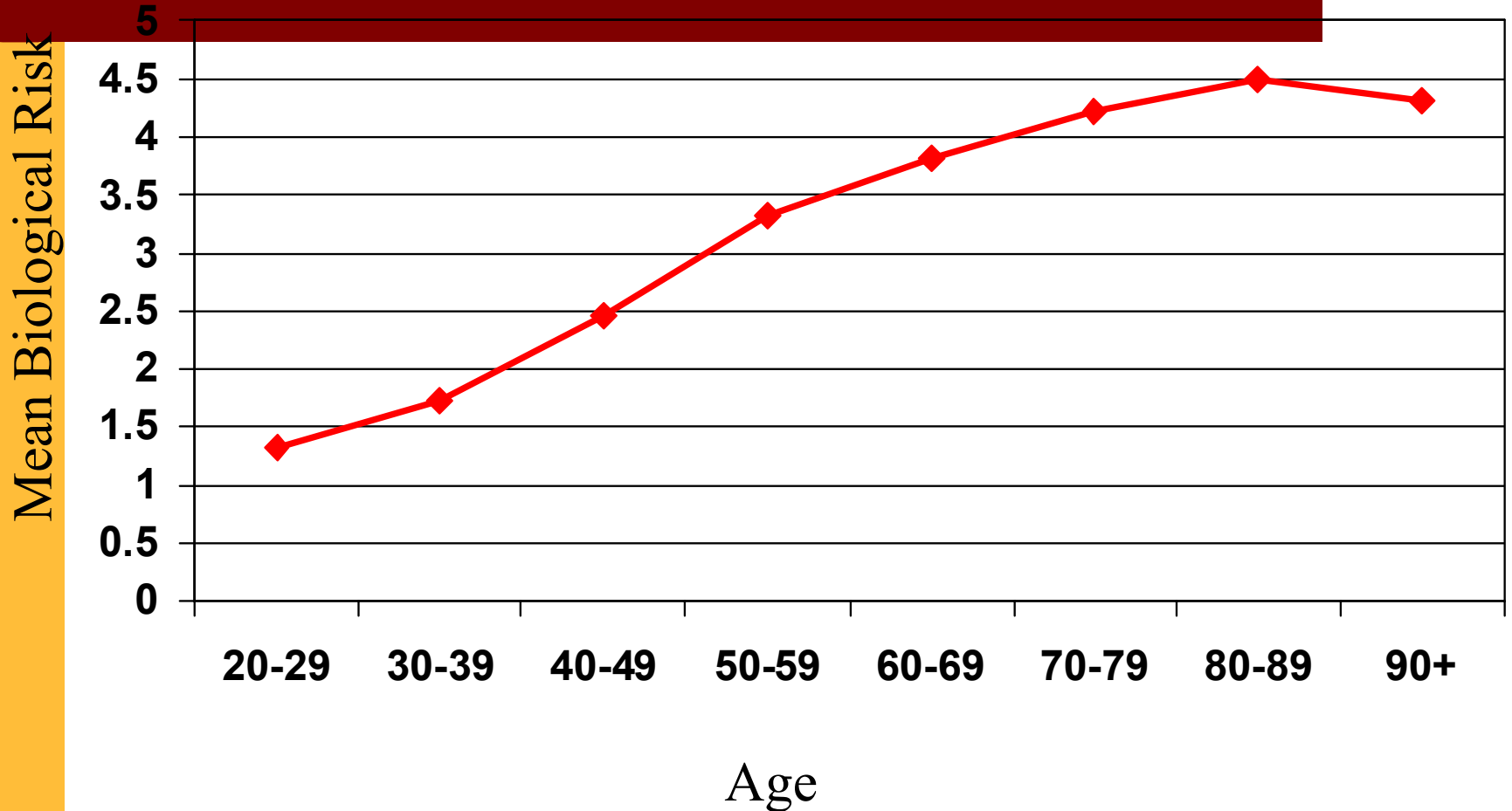
- **Metabolic Syndrome**

Obesity, Total Cholesterol, Glycated Hemoglobin

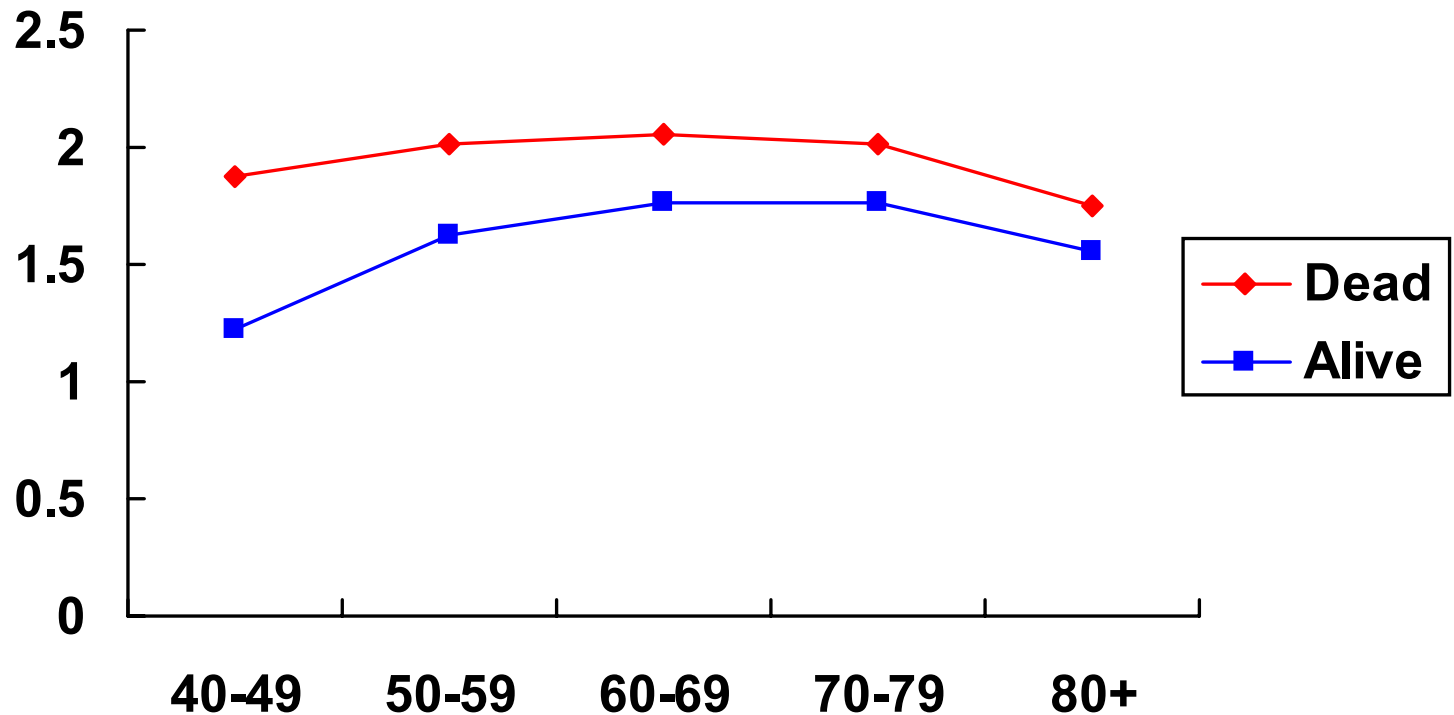
- **Markers of Inflammation**

C-Reactive Protein, Fibrinogen, Albumin

Mean Biological Risk by Age



Biological Risk Among Deaths and survivors



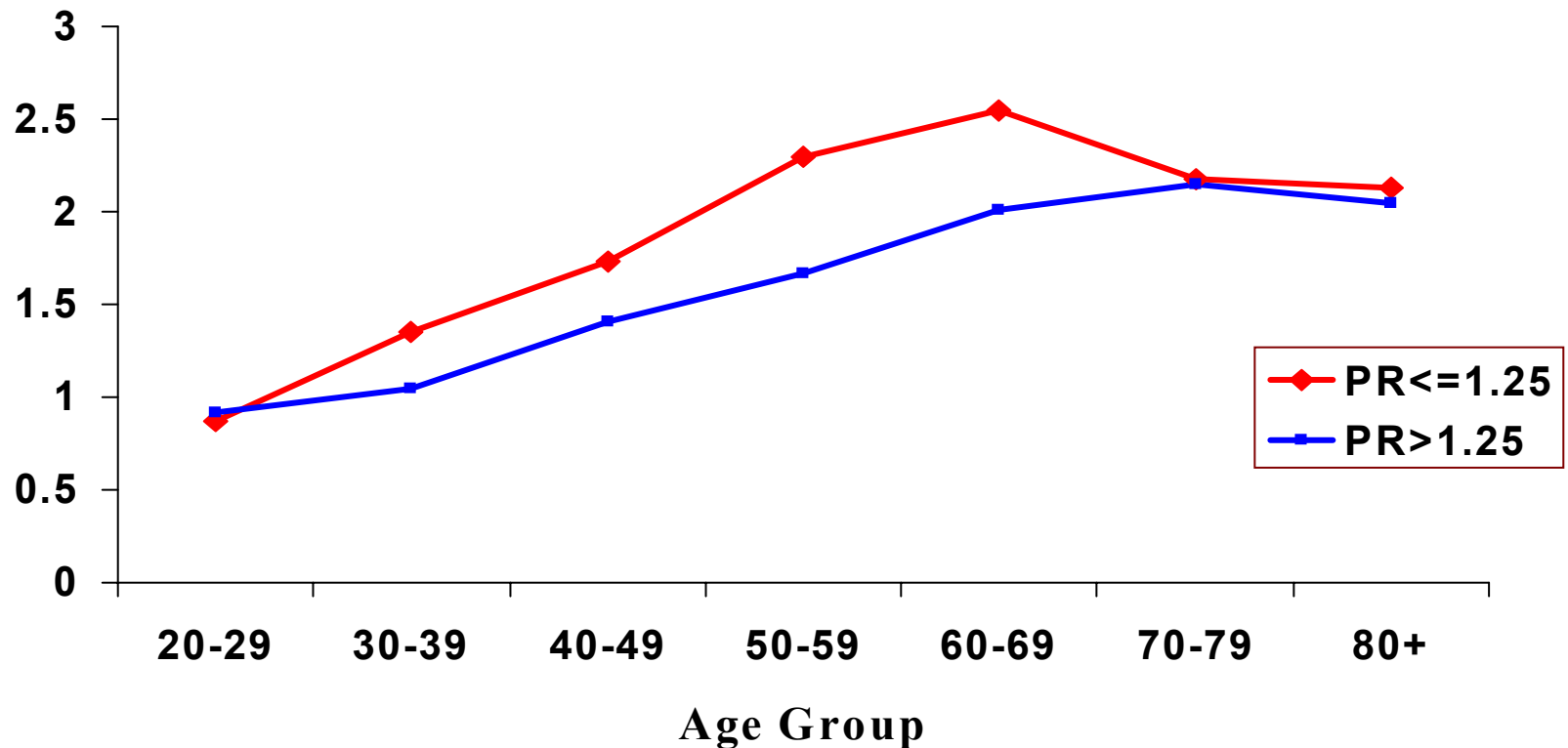
Source: NHANES III

Why are health differentials by SES smaller at older ages?

Number of biological risk factors increases earlier in life for those who are poor (or black)

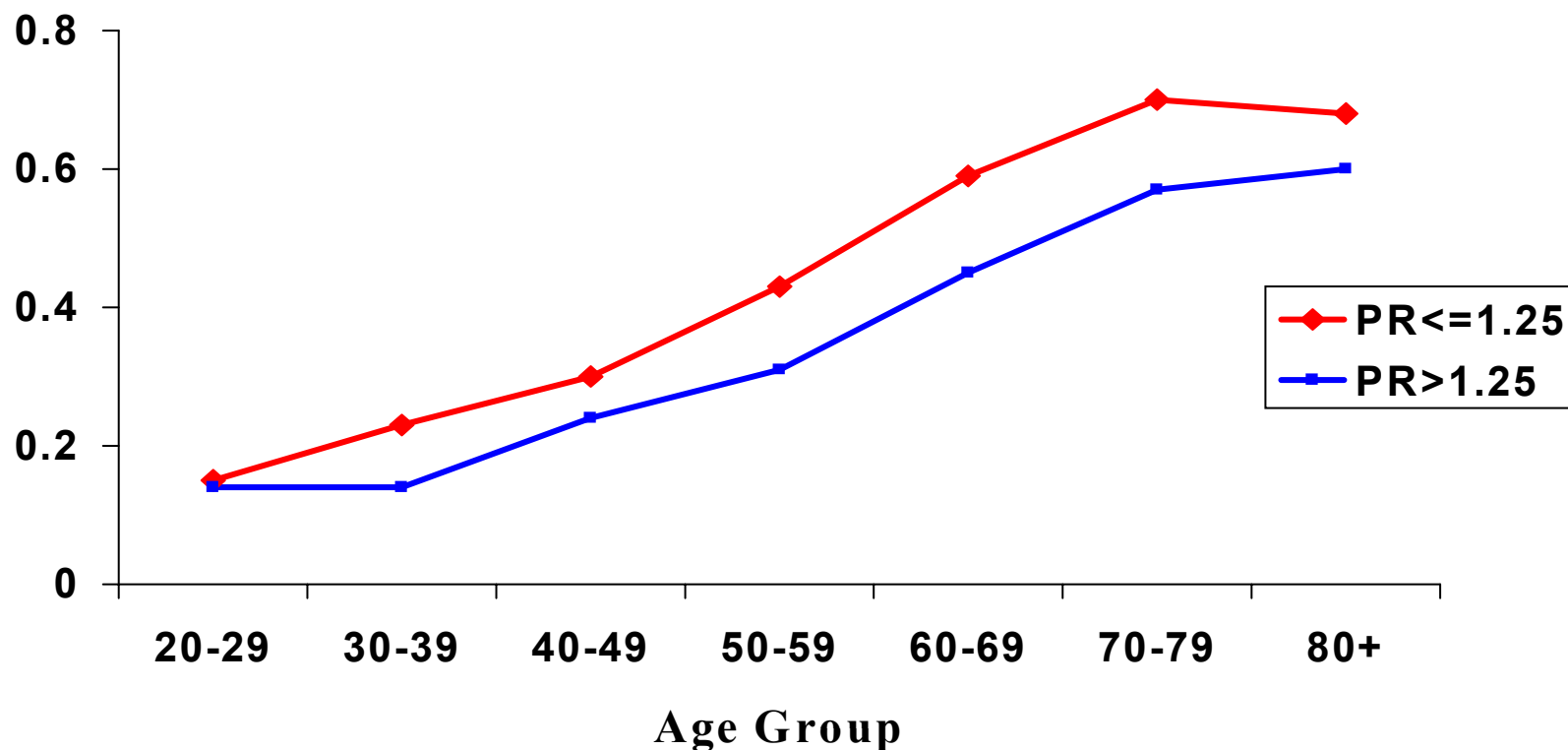
Population levels of biological risk are similar for rich and poor at the oldest ages

SES Differentials in Biological Risk: Mean Summary Risk (0-10) by Poverty and Age



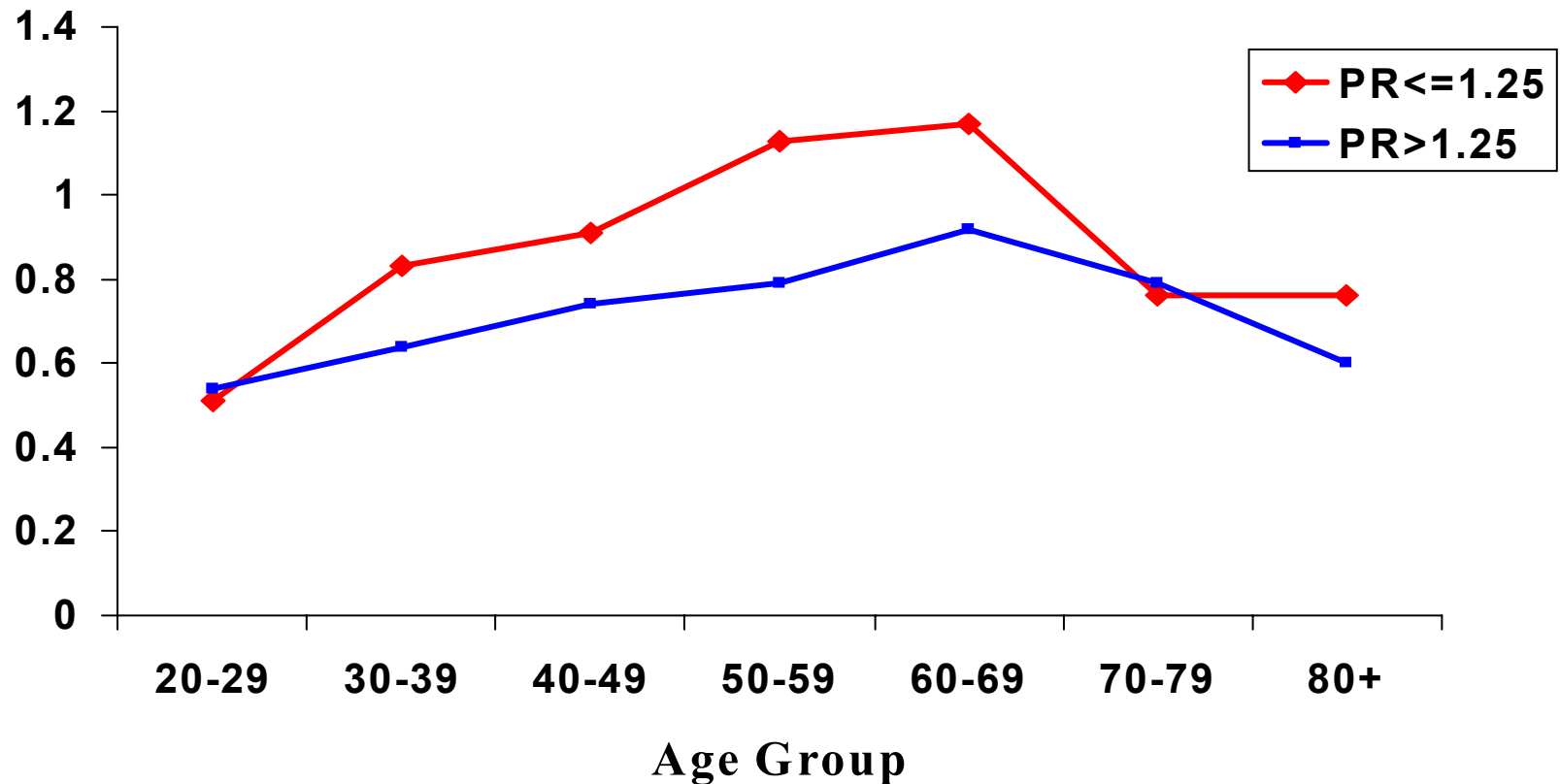
Source: NHANES IV

Mean Cardiovascular Risk Factors (0-3) by Poverty and Age



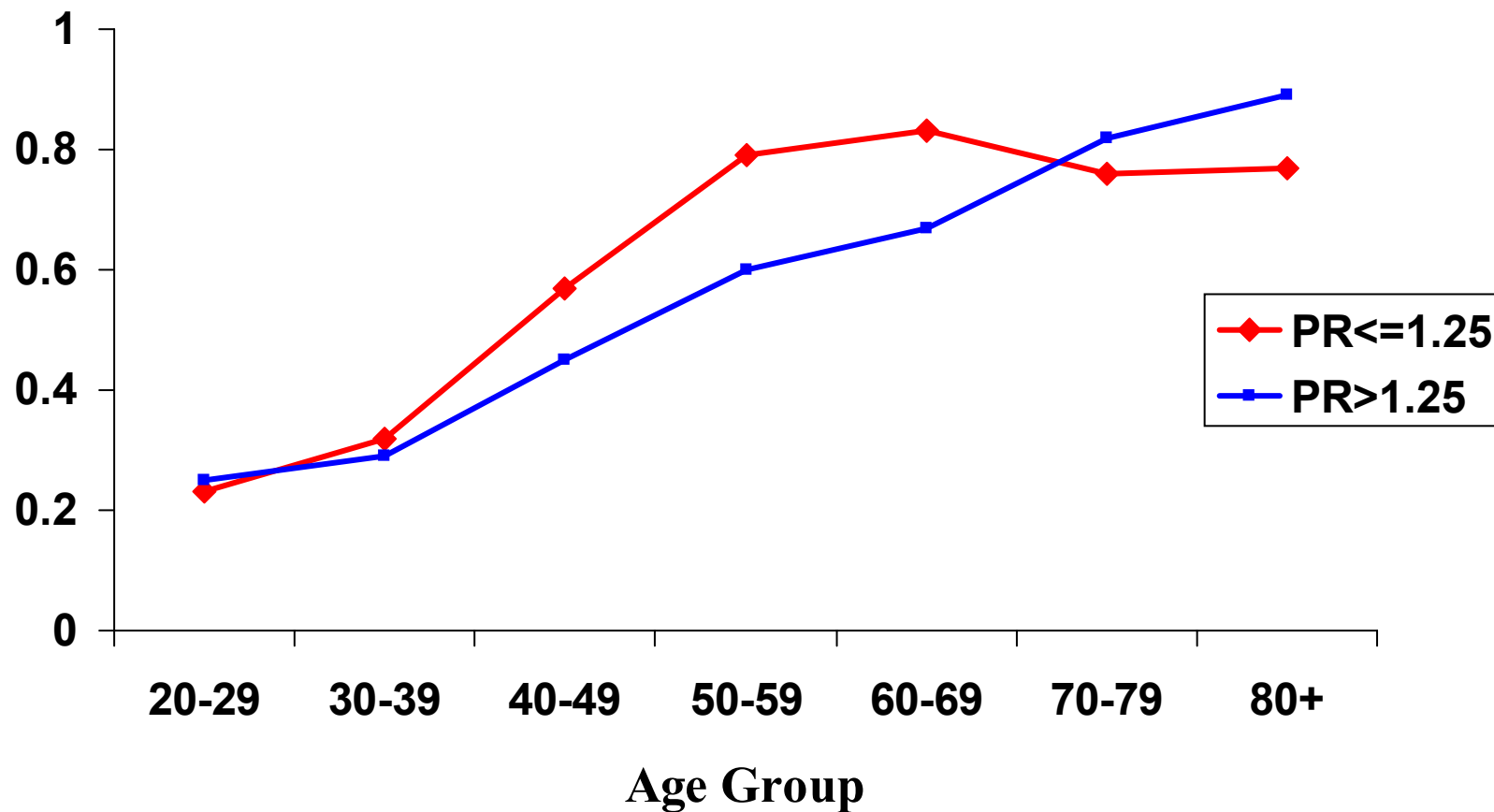
Source: NHANES IV

Mean Metabolic Risk (0-4) by Poverty and Age



Source: NHANES IV

Mean Inflammation Risk (0-3) by Poverty and Age

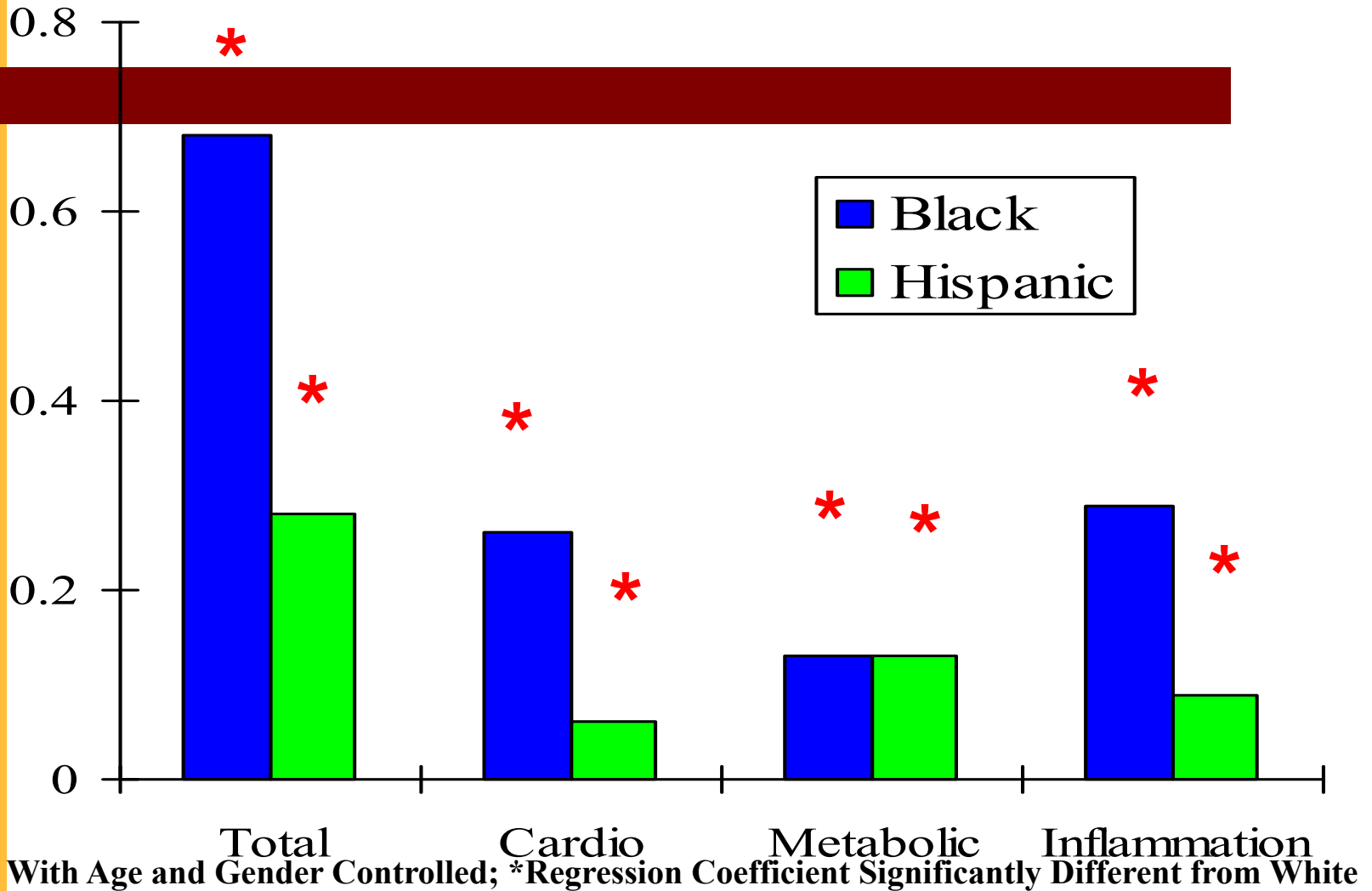


Is there a Hispanic Paradox?

Do Hispanics have biological risk as low as non Hispanic Whites?

How does risk differ with controls for SES?

Effects of Race/Ethnicity on Number of Biological Risk Factors

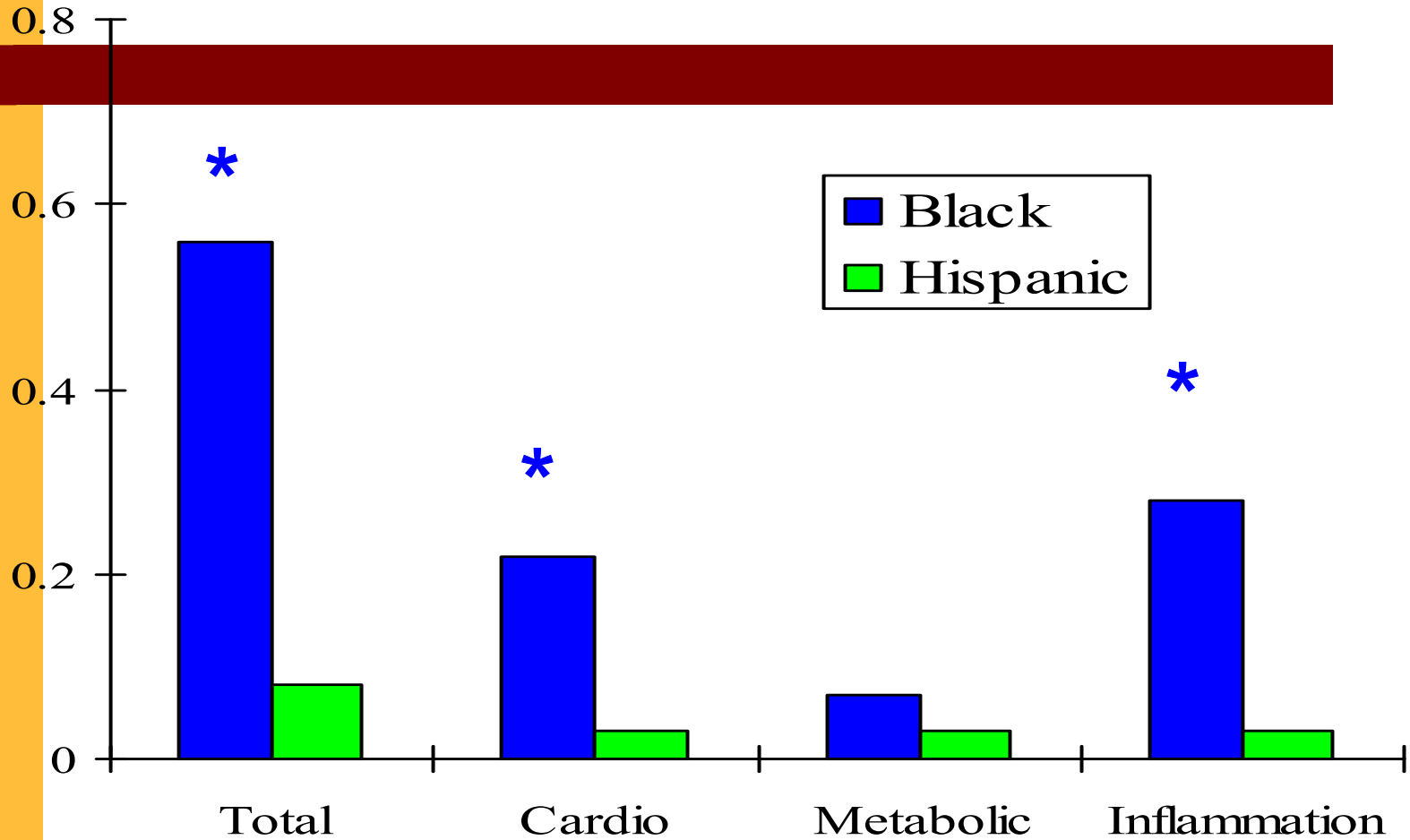


“Hispanic Paradox”? NO

**With age and gender controlled
Hispanics are higher in biological risk
than NH whites – All three types
Lower than Blacks – “Black” paradox**

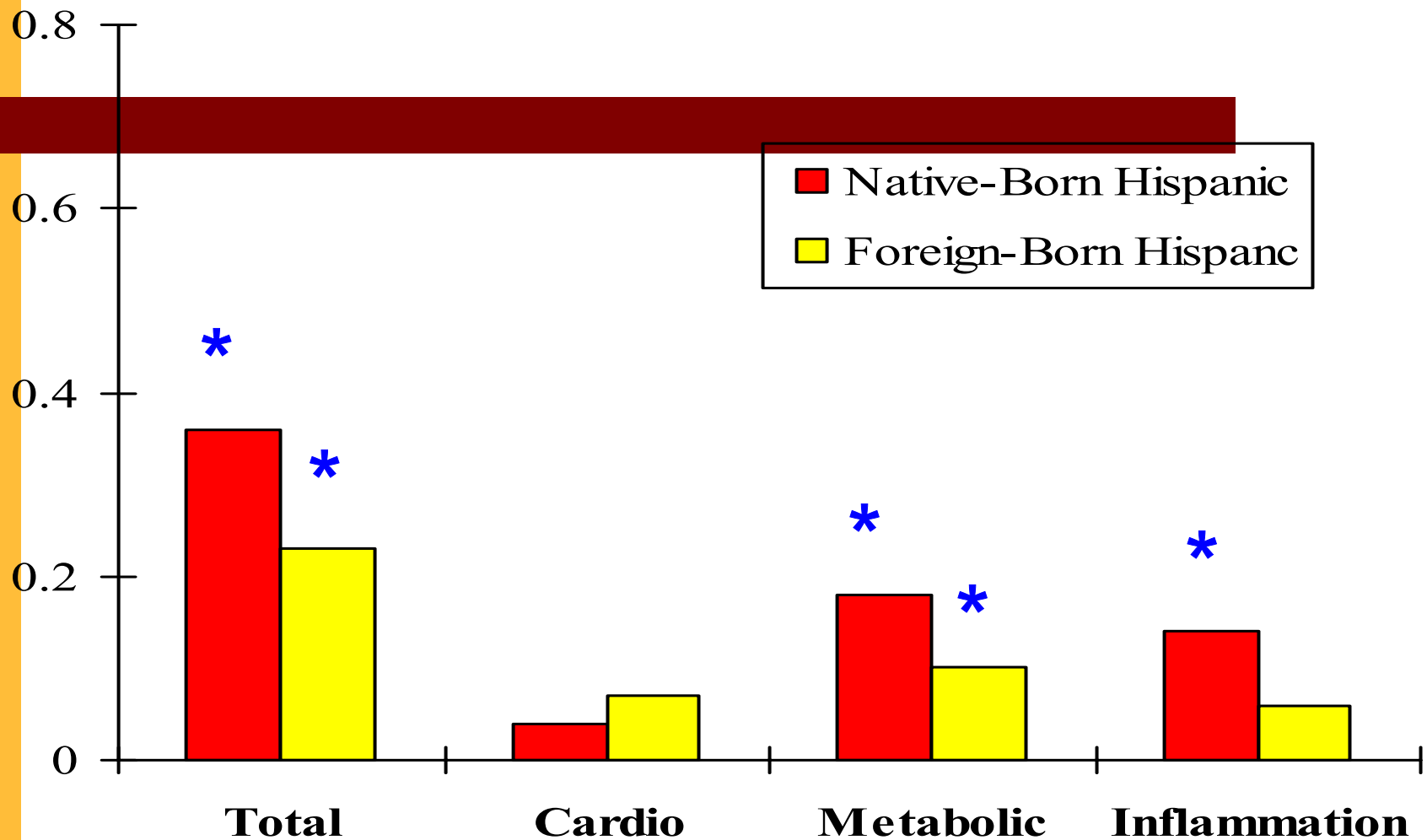
Next - Controls for low ed and poverty

Effects of Race/Ethnicity on Number of Biological Risk Factors



With Age, Gender, SES controlled; *Regression Coefficient Significantly Different from White

Effects of Hispanic Nativity on Number of Biological Risk Factors



With Age and Gender Controlled; *Regression Coefficient Significantly Different from White

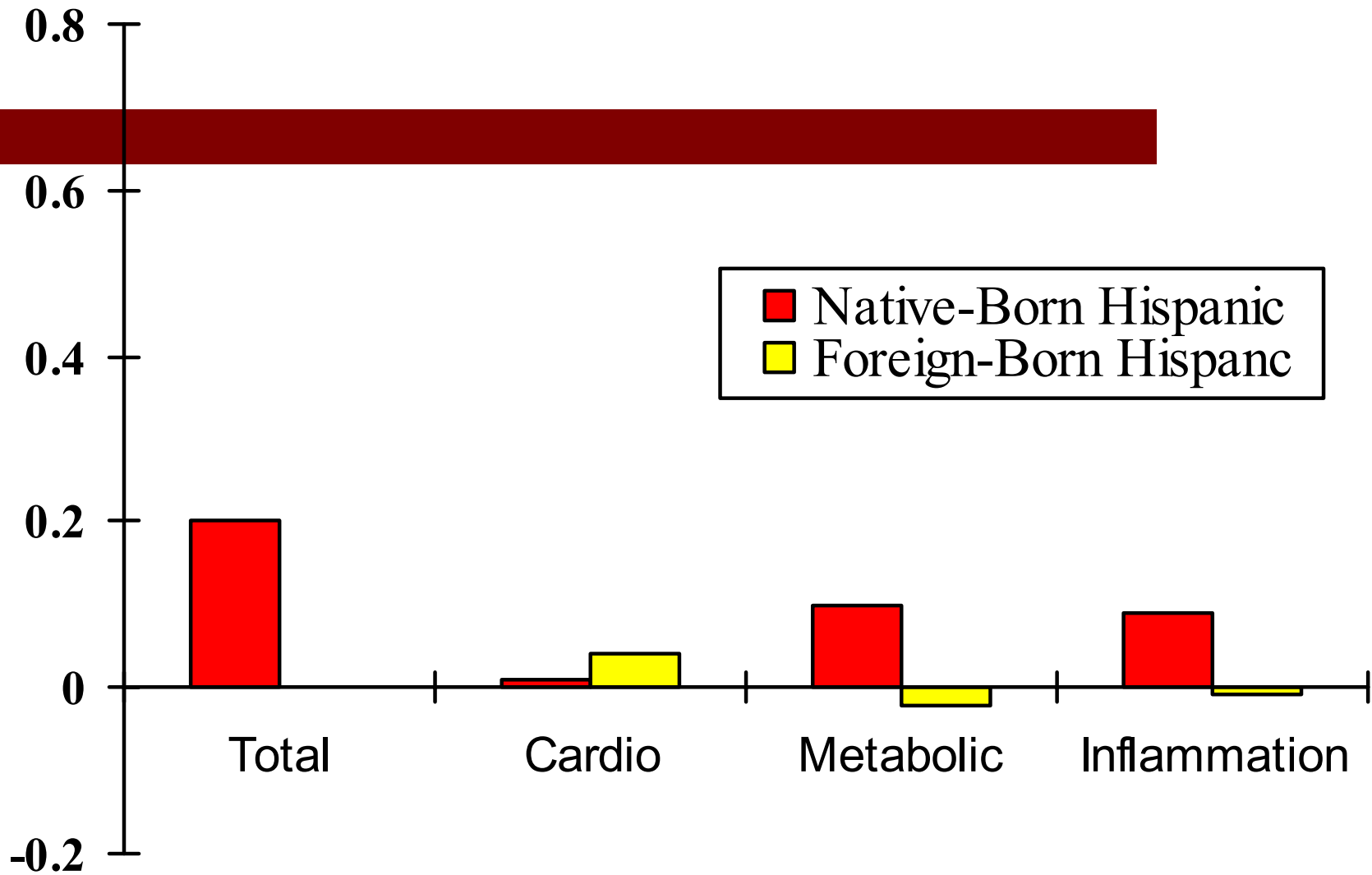
Native-born versus foreign-born Hispanic Americans

Both have more biological risk than non-Hispanic whites (without controls)

The two nativity groups – NB and FB - do not differ from each other

With controls for SES – Neither group differs from NH whites

Effects of Nativity on Number of Biological Risk Factors



Only Hispanics of Mexican Origin: Some change

Still higher overall biological risk (not cardiovascular)

With controls for SES – no differences overall

But results for Native –born and foreign-born differ

With controls for age and gender –

- Native born look worse (in all categories)**
- Foreign-born same as NHwhites (paradox)**
- Controls for SES –native born still worse**

Are foreign-born Mexican Americans a group selected for good health?

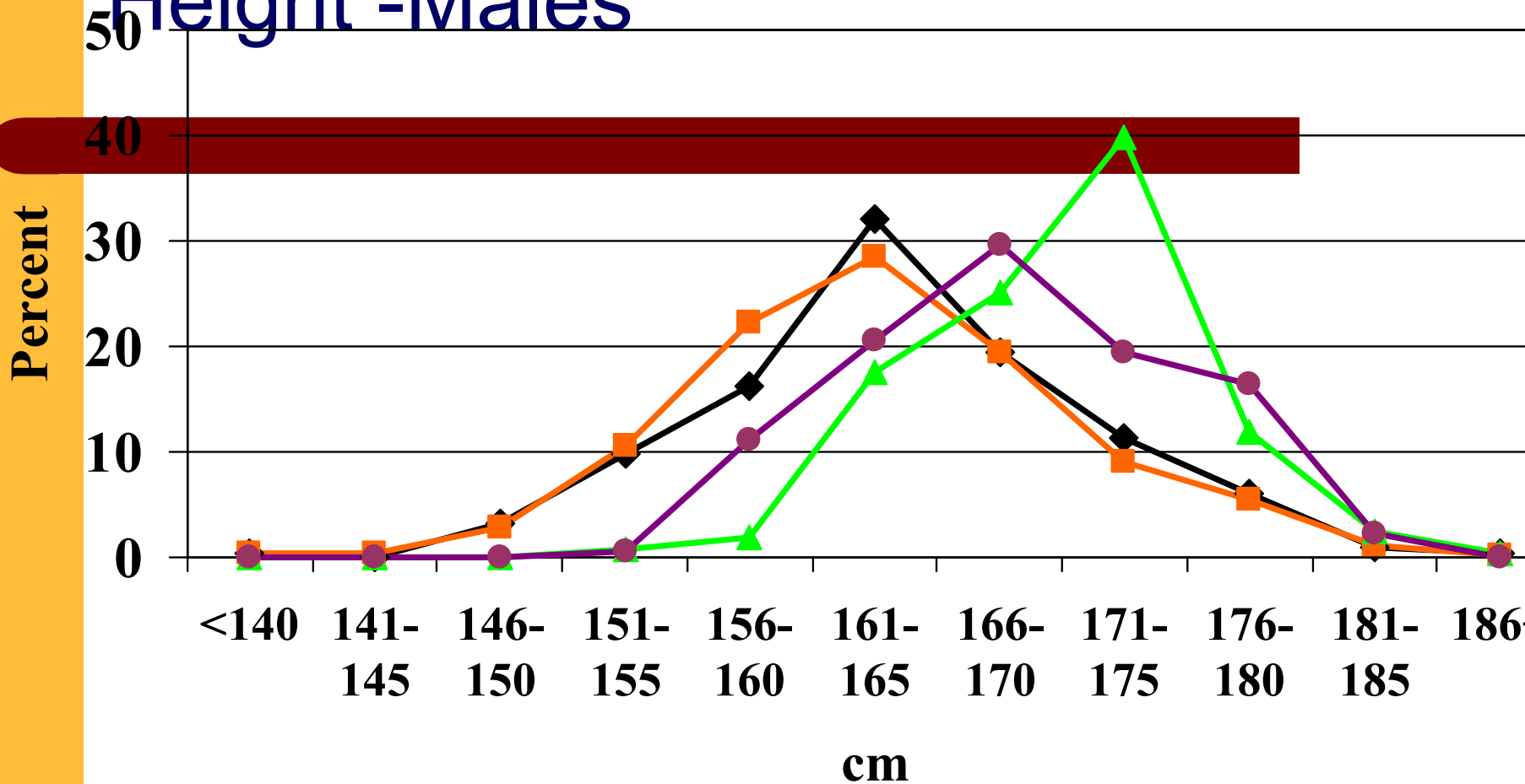
Compare childhood health among Mexicans who migrated and those who stayed in Mexico

MHAS and NHANES

Height as an indicator of childhood health and nutrition

Migrants are taller than those who did not migrate

Height - Males



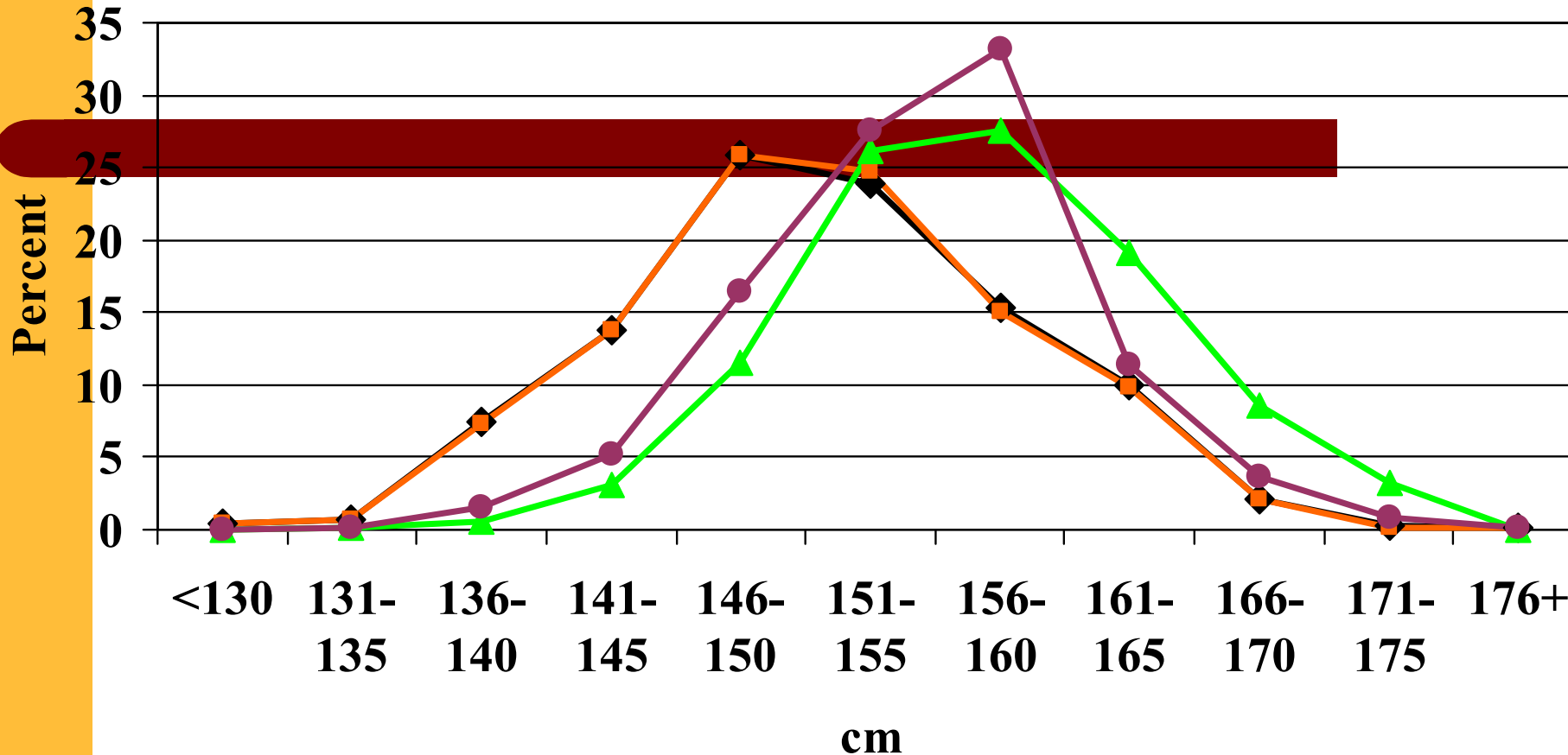
◆ Mexicans in Mexico

■ Return Migrants to Mexico

▲ US-born Mexican-Americans

● Foreign-born Mexican-Americans

Height - Females



◆ Mexicans in Mexico

■ Return Migrants to Mexico

▲ US-born Mexican-Americans

● Foreign-born Mexican-American

Explain Cohort Pattern of Mortality decline over past centuries

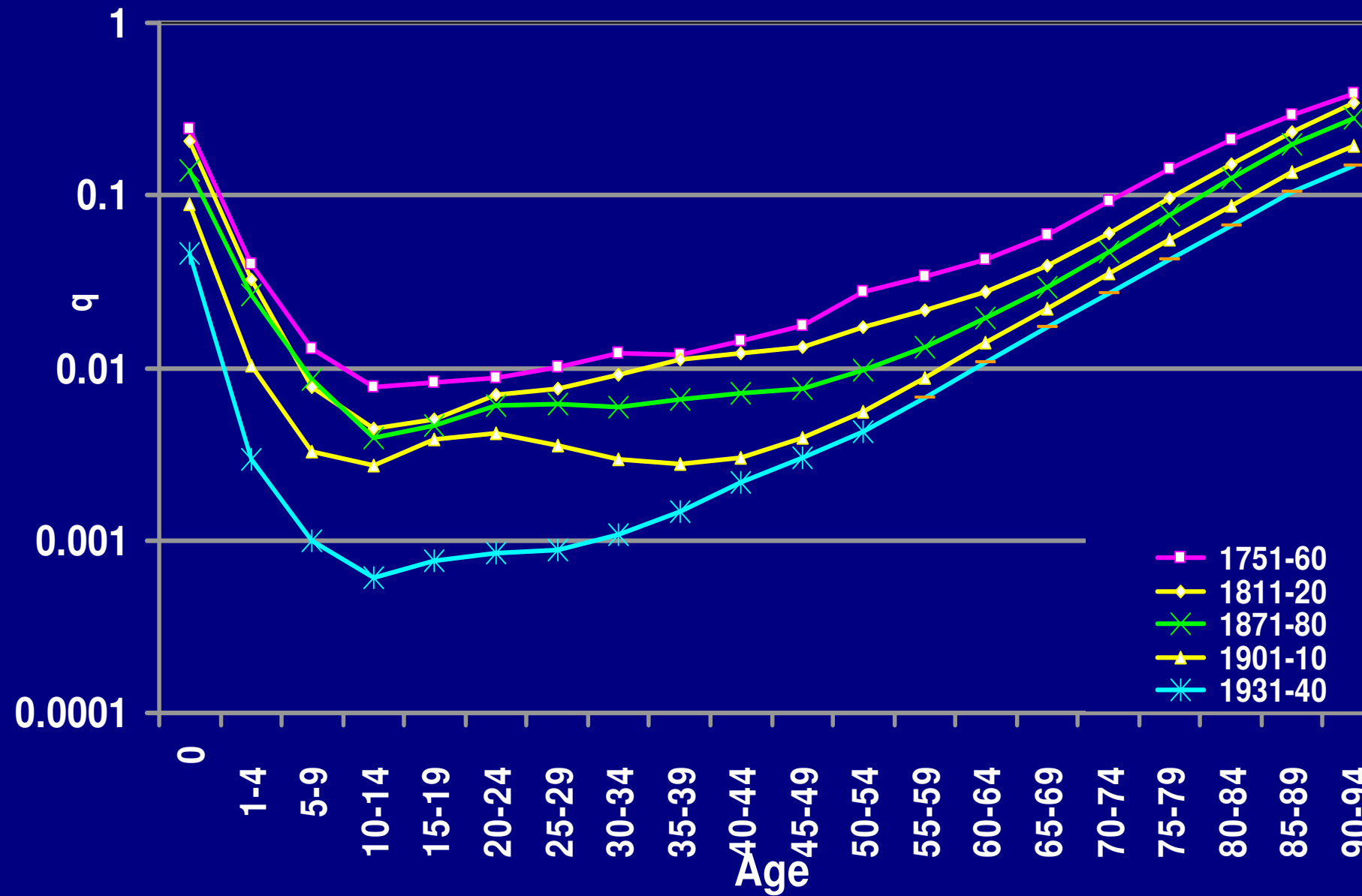
Many countries show cohort pattern of mortality decline after 1750

The cohorts with lower mortality while young, experienced lower mortality while old

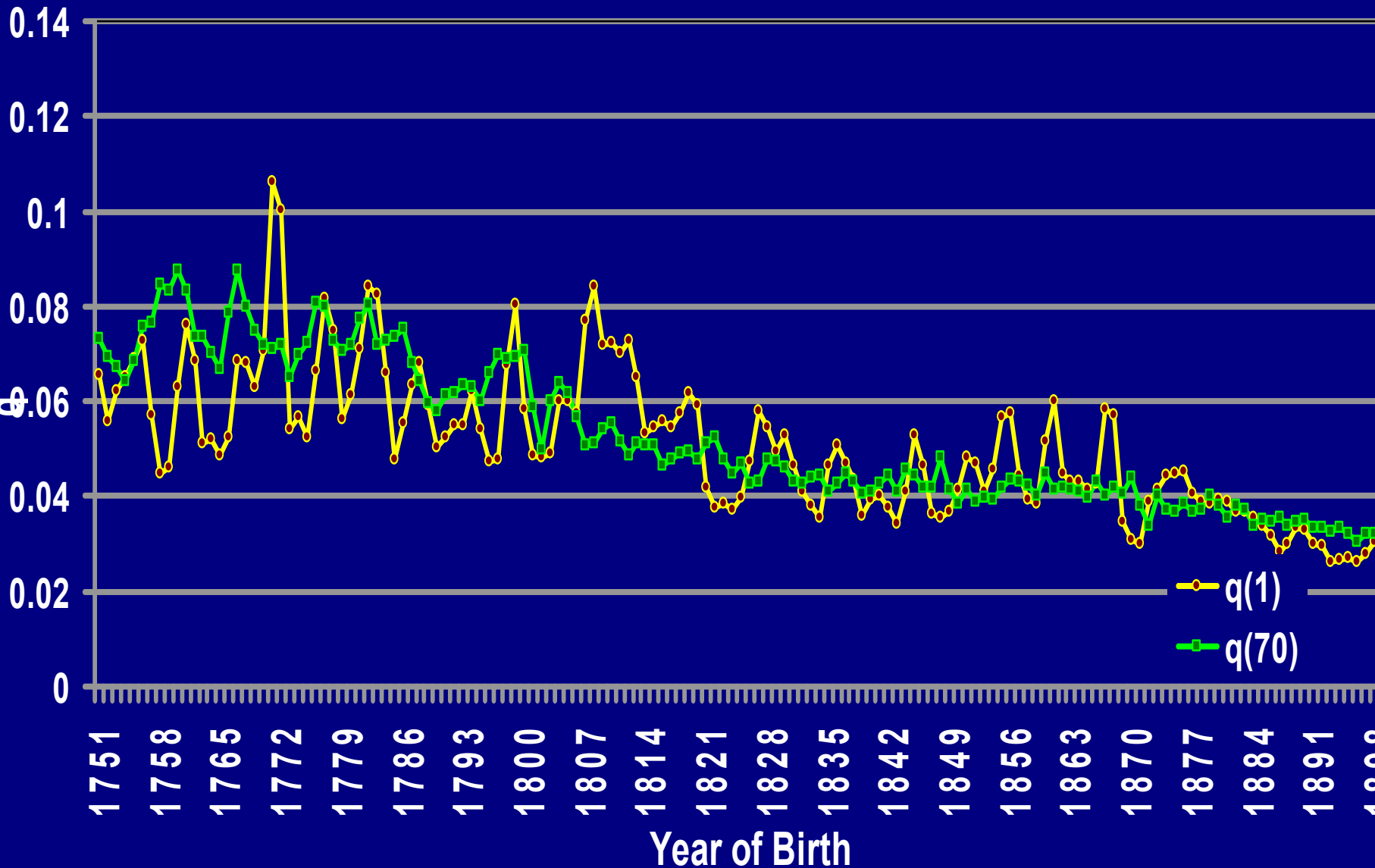
Finch & Crimmins. (2004). Inflammatory exposure and historical changes in human life-spans. Science, 305, 1736-1739.

Crimmins & Finch. (2006). Infection, Inflammation, Height, and Longevity. Proceedings of the National Academy of Sciences, 103, 498-503.

Cohort Mortality: Sweden (1751-1940)



Cohort Mortality: Sweden (Cohorts born 1751-1899)



Hypothesis: Inflammation is a link between conditions in youth and adulthood

As infection declined.

Survivors of cohorts with lower mortality experienced lower levels of inflammation throughout their lives

Lower inflammation meant less vascular damage – a slowing in the rate of aging

Lower inflammation meant more energy for growth

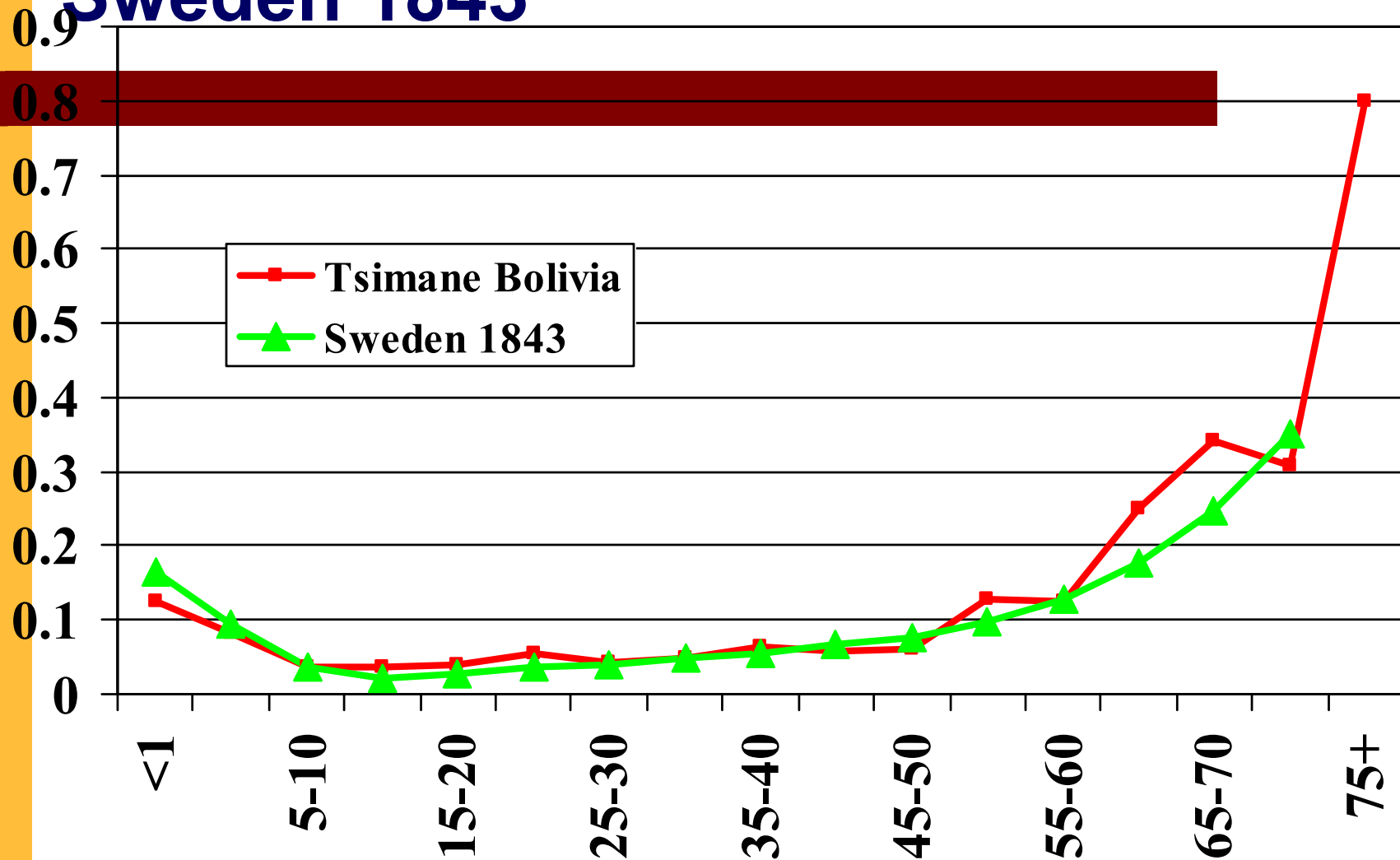
Change of mean height at age 20-21 : France



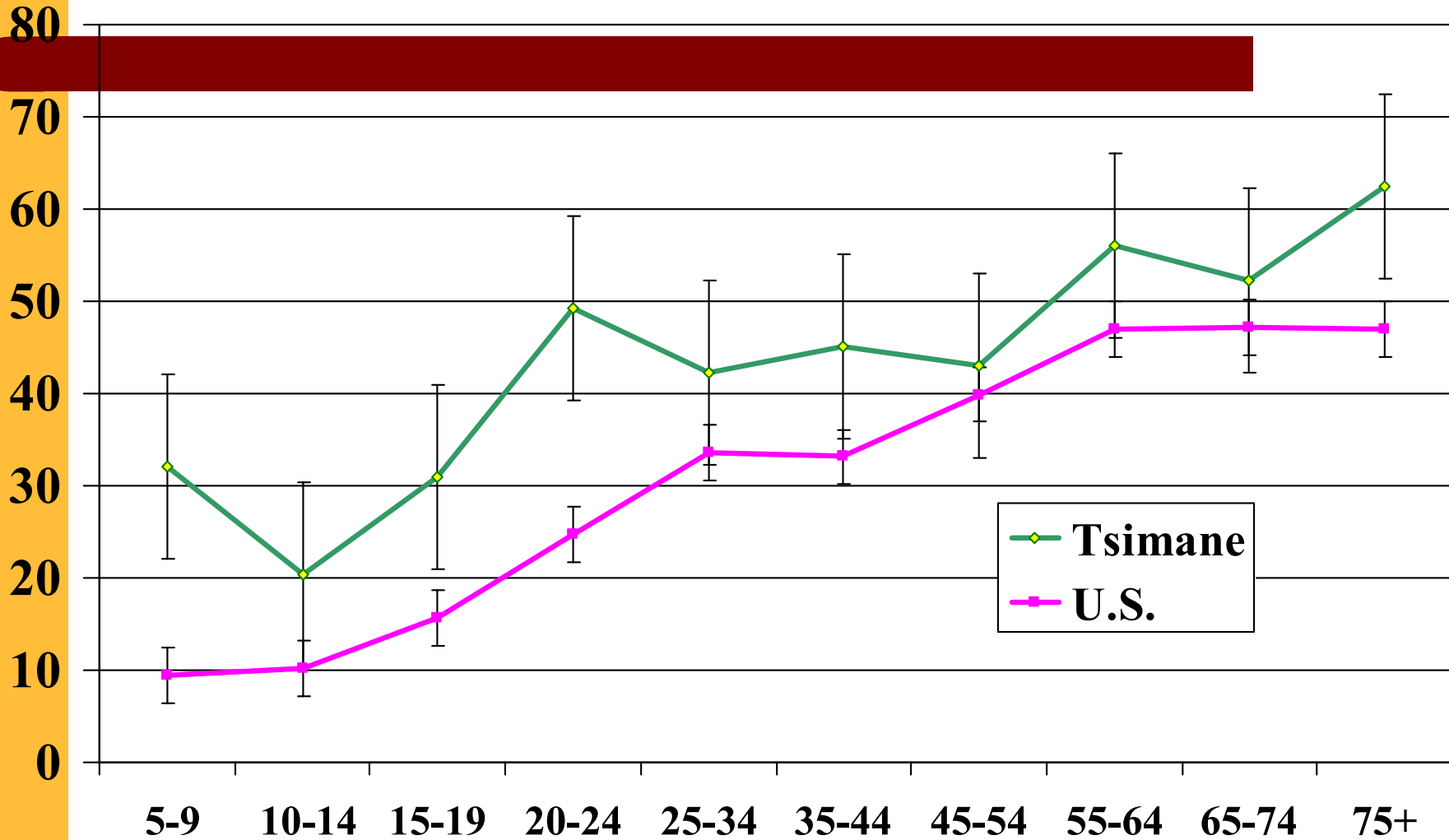
Testing the Hypothesis

Hillard Kaplan and Michael Gurven

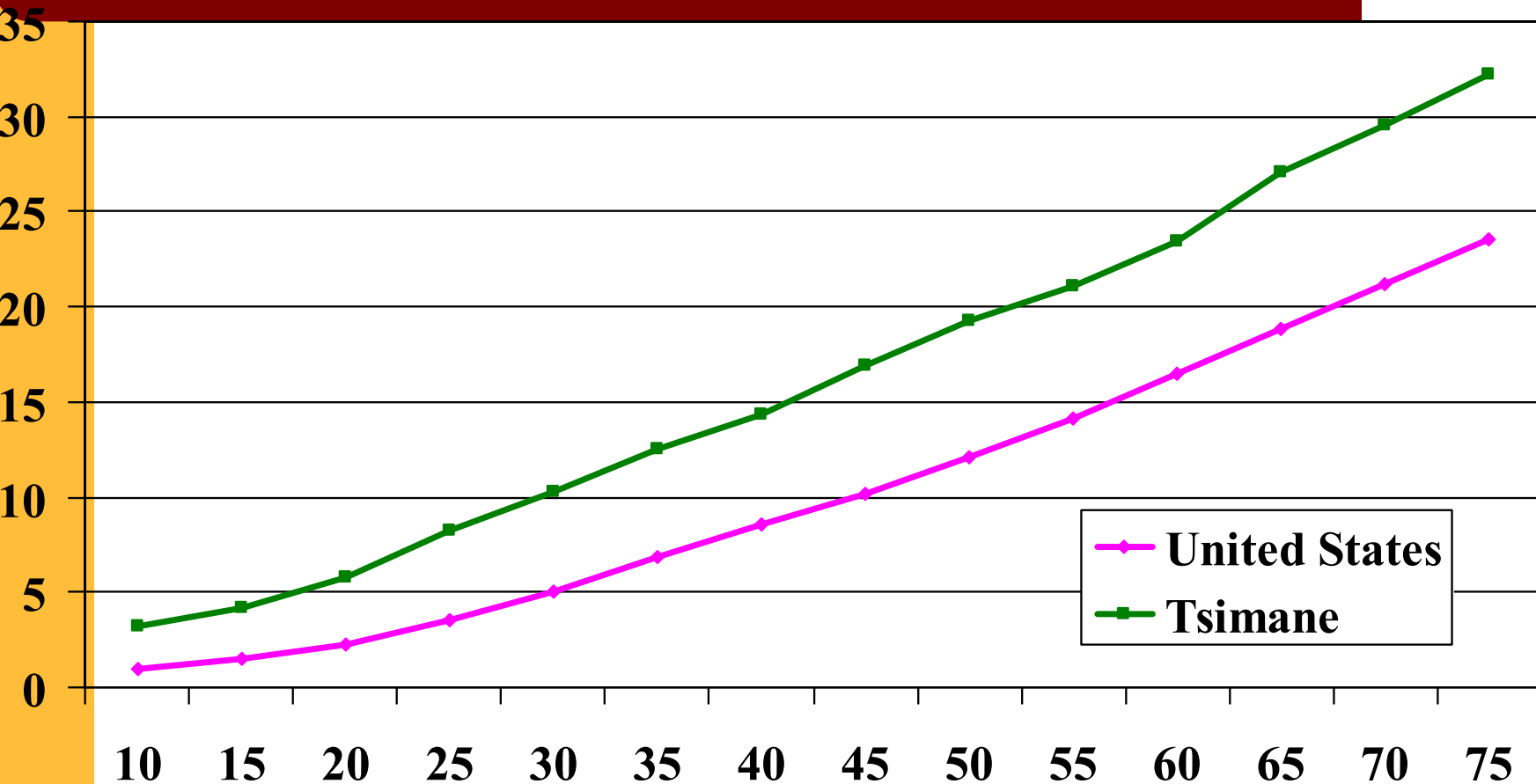
Mortality Among the Tsimane and Sweden 1843



Prevalence of High Risk CRP (>3mg/L) in Bolivia and the U.S



Years Lived with High CRP for Those Living to Specified Age



Summary: Introduction of Biological Markers

Provides answers (hypotheses) to potential mechanisms causing trends and differentials

Provides more objective measurement of relatively early health problems.

Acknowledgements

Collaborators

- Dawn Alley, Jung Ki Kim, Arun Karlamangla, Mark Hayward
- Teresa Seeman, Sandra Reynolds, Caleb Finch, Hillard Kaplan, Michael Gurven

National Institute on Aging

(Grant Nos. P30 AG17265, R01 AG023347, T32AG00037)