

Upstream and Downstream Approaches to Inequalities in Health

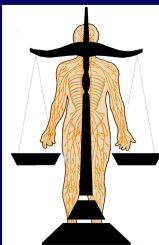
George A. Kaplan

Professor and Chair, Department of Epidemiology

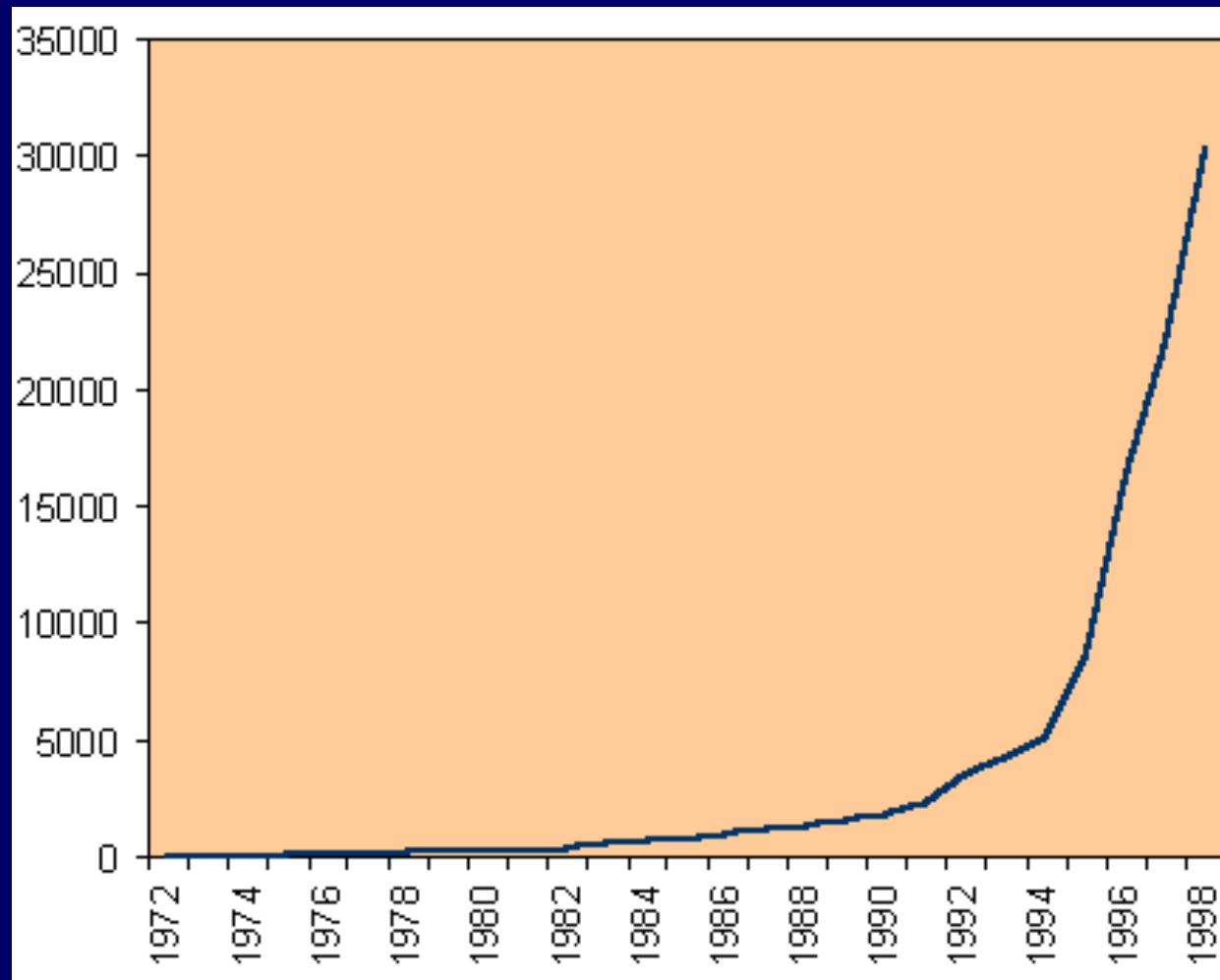
Director, Michigan Initiative on Inequalities in Health

Director, Michigan Interdisciplinary Center on Social Inequalities, Mind, and Body

University of Michigan



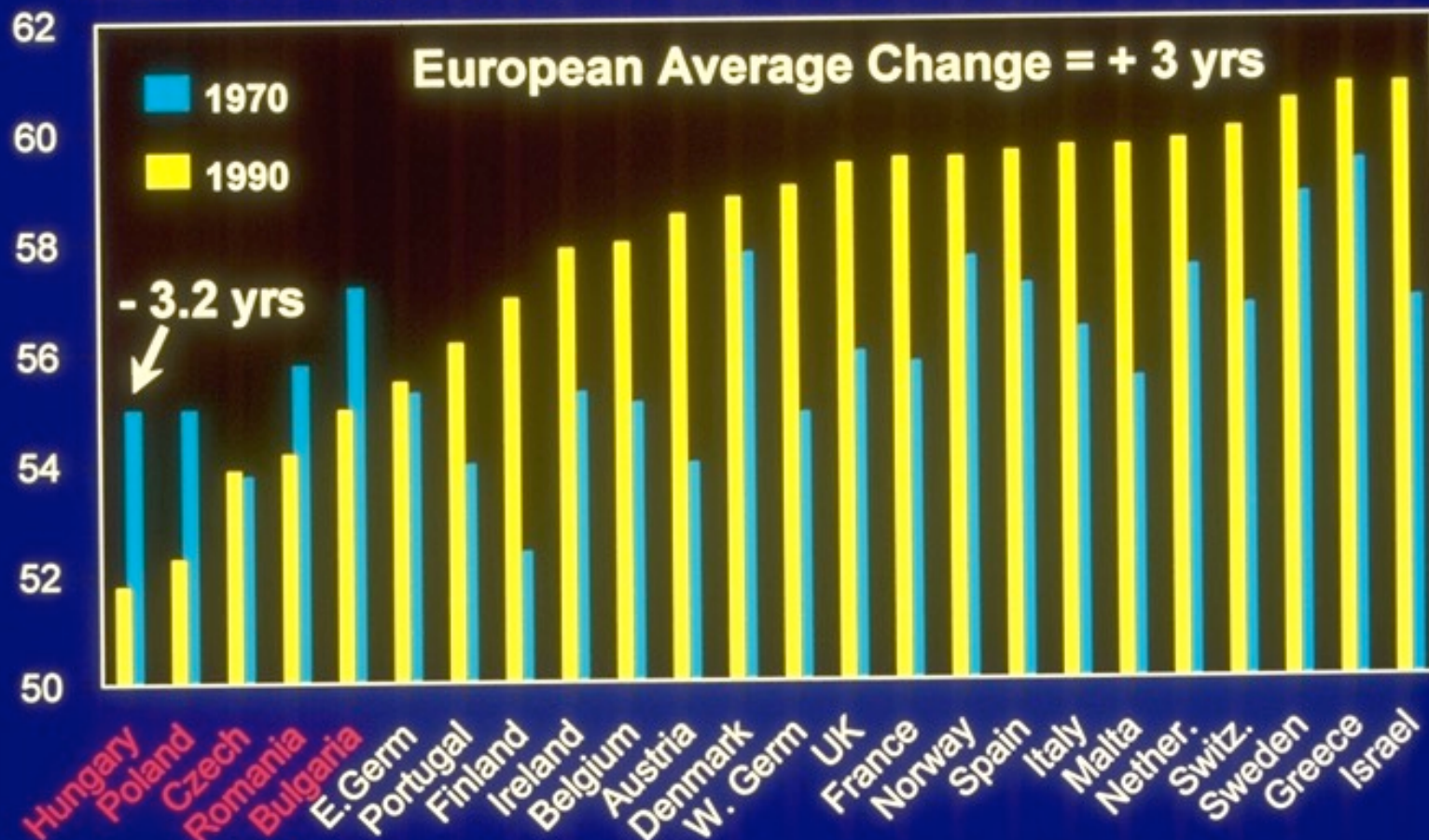
Numbers of Mapped Human Genes By Year



At the end of a century in which the average life expectancy in the United States has increased by nearly thirty years, victory over disease and disability has become an understandably popular and realistic goal. (emphasis added)

Harold Varmus, Statement before the House and Senate Appropriations Subcommittees on Labor, Health and Human Services, and Education, February 23-24, 1999

Male Life Expectancy at Age 15 in Europe - 1970 & 1990



Lifecourse

Social and Economic Policies

Institutions

Neighborhoods and Communities

Living Conditions

Social Relationships

Individual Risk Factors

***Genetic/Constitutional
Factors***

***Pathophysiologic
pathways***

***Individual/Population
Health***

Environment

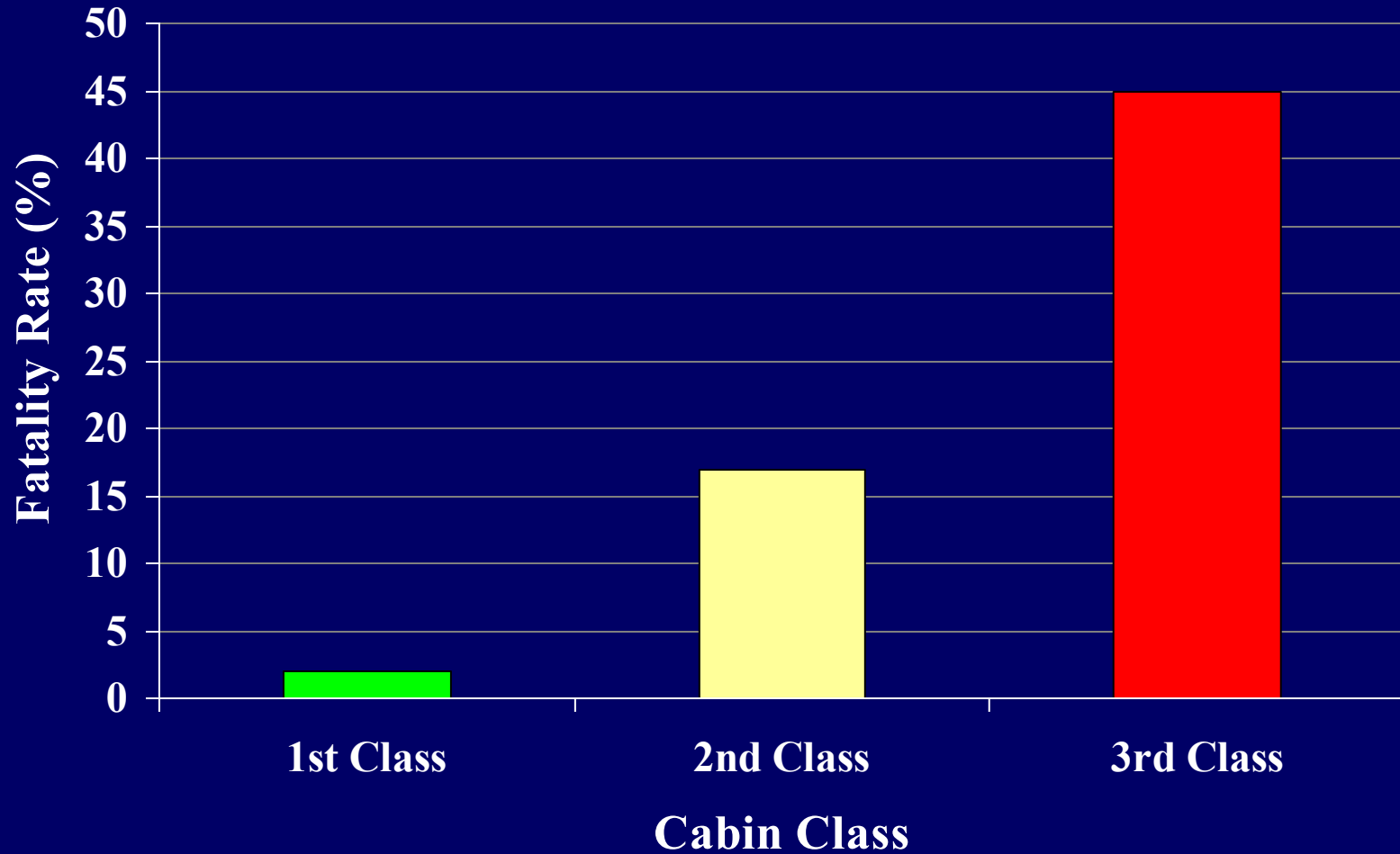
Socioeconomic Position and Health

- Widespread
- All age groups affected
- Affects multiple organs and risk factors
- Not fixed in time

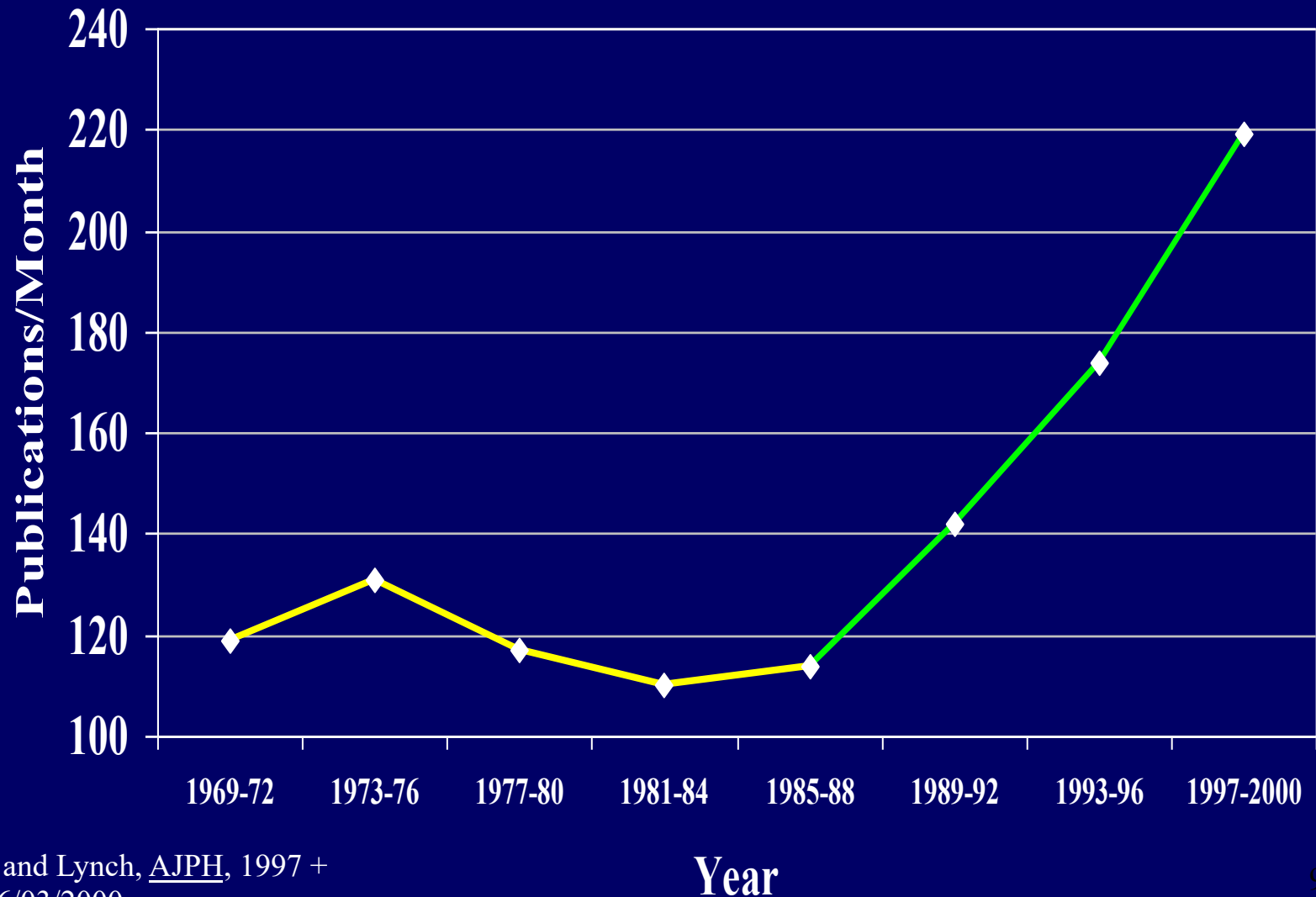


Davey Smith et al.

Fatality Rates for Women Passengers on the *Titanic*

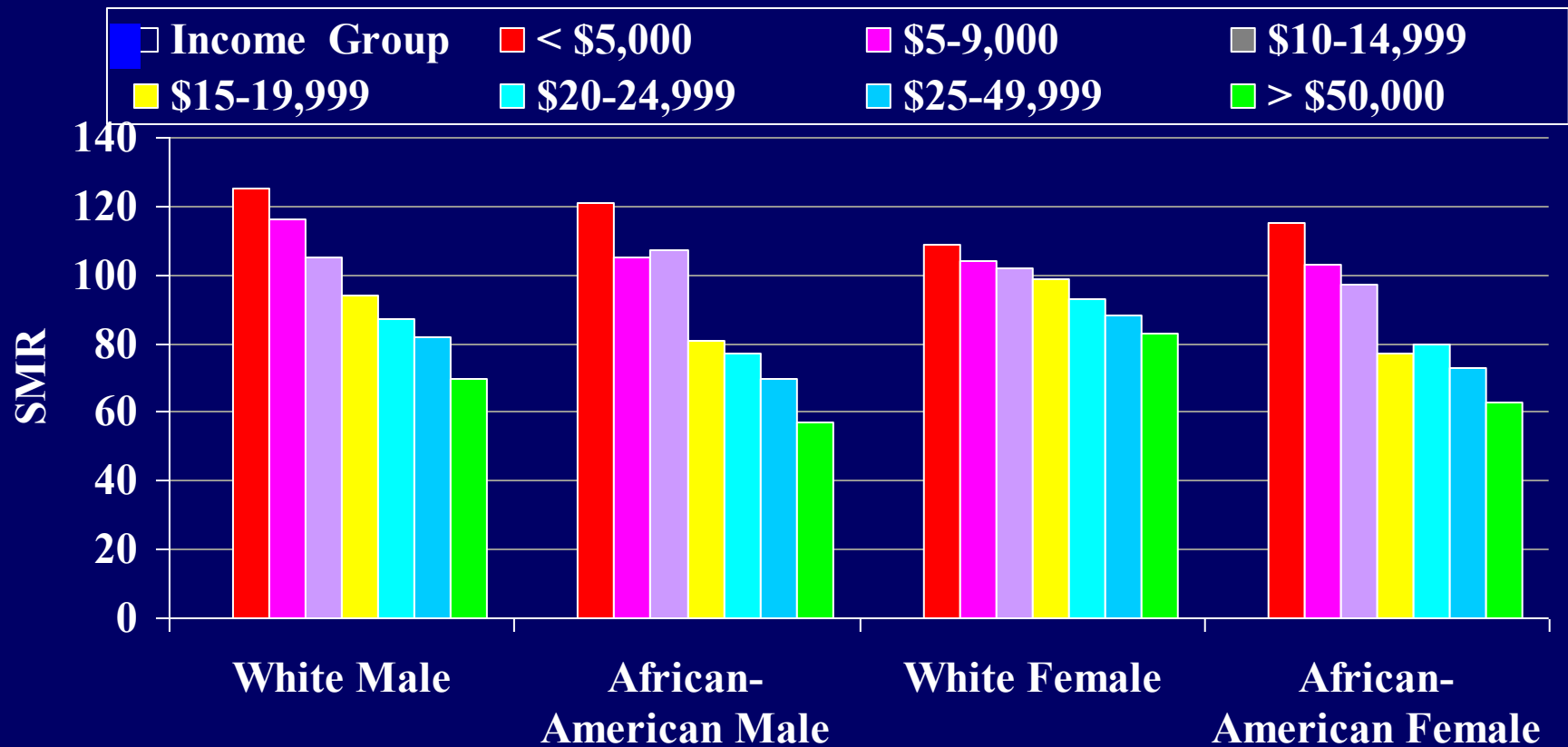


Number of publications per month with social class, socioeconomic factors, income or poverty listed as descriptors: MEDLINE search, 1969 through mid-2000.

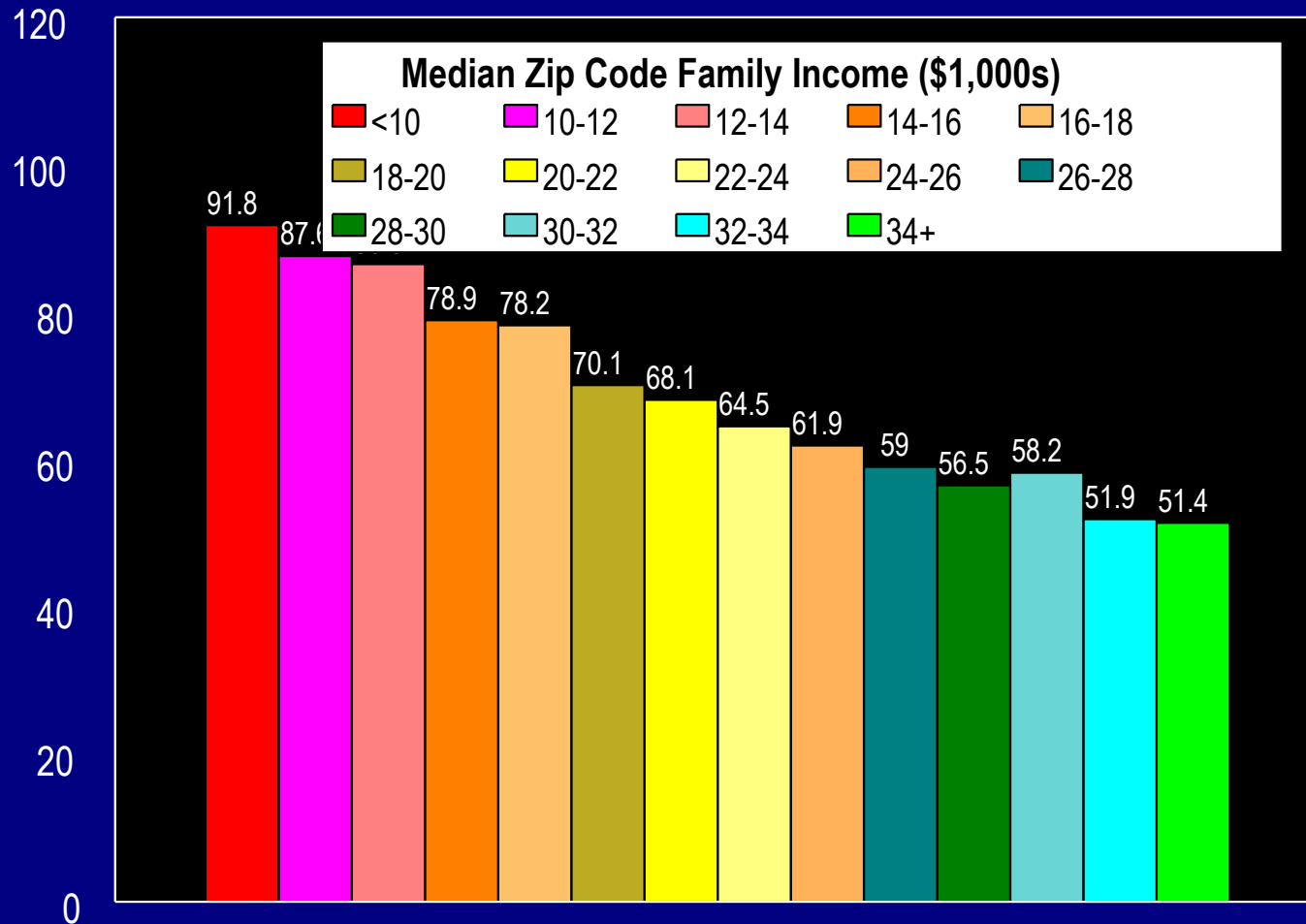


All-cause Mortality by Income

NLMS, 25+ Years



Deaths/10,000 in 300,685 Men: MRFIT, Age 35-57

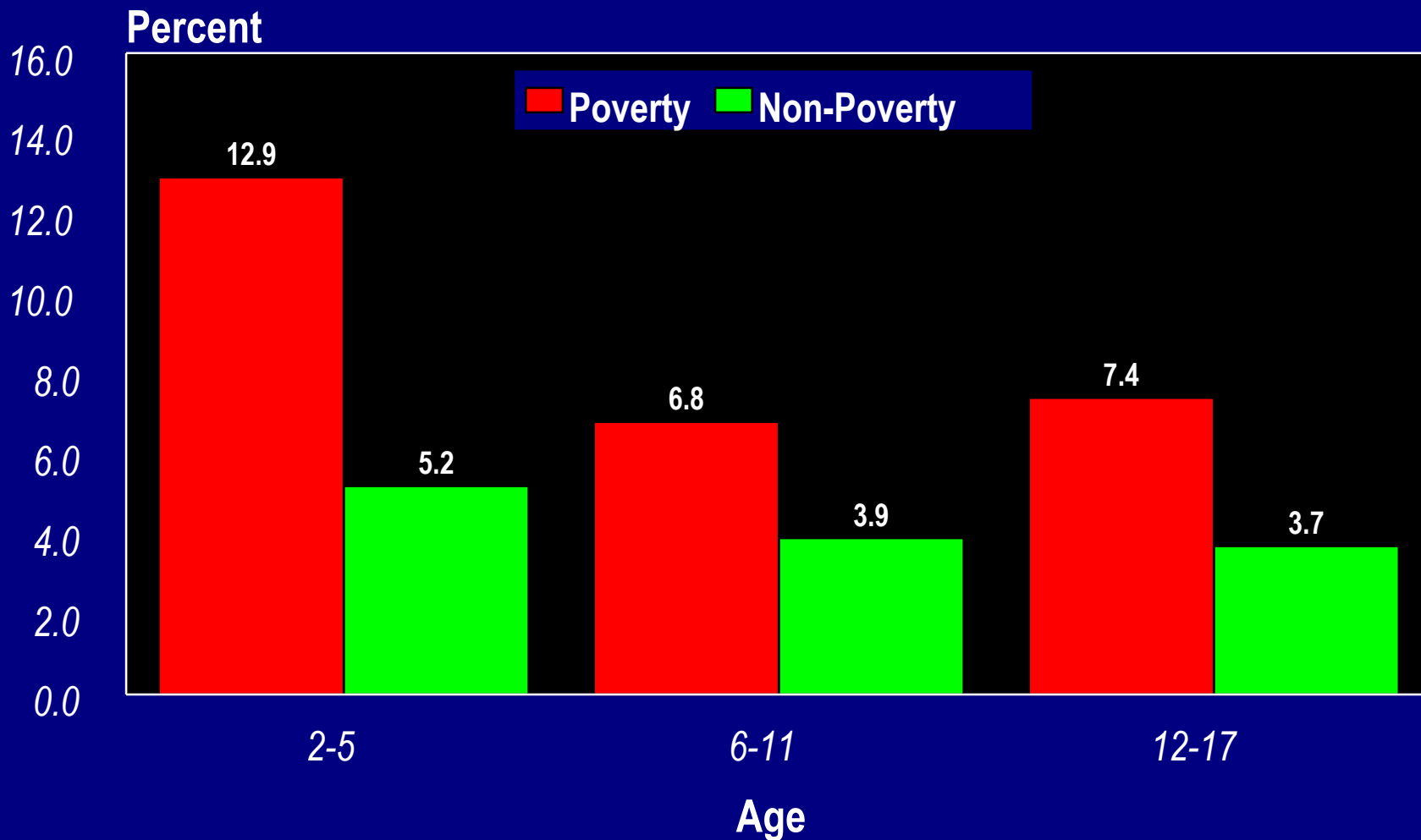


Davey Smith et al.,
1996

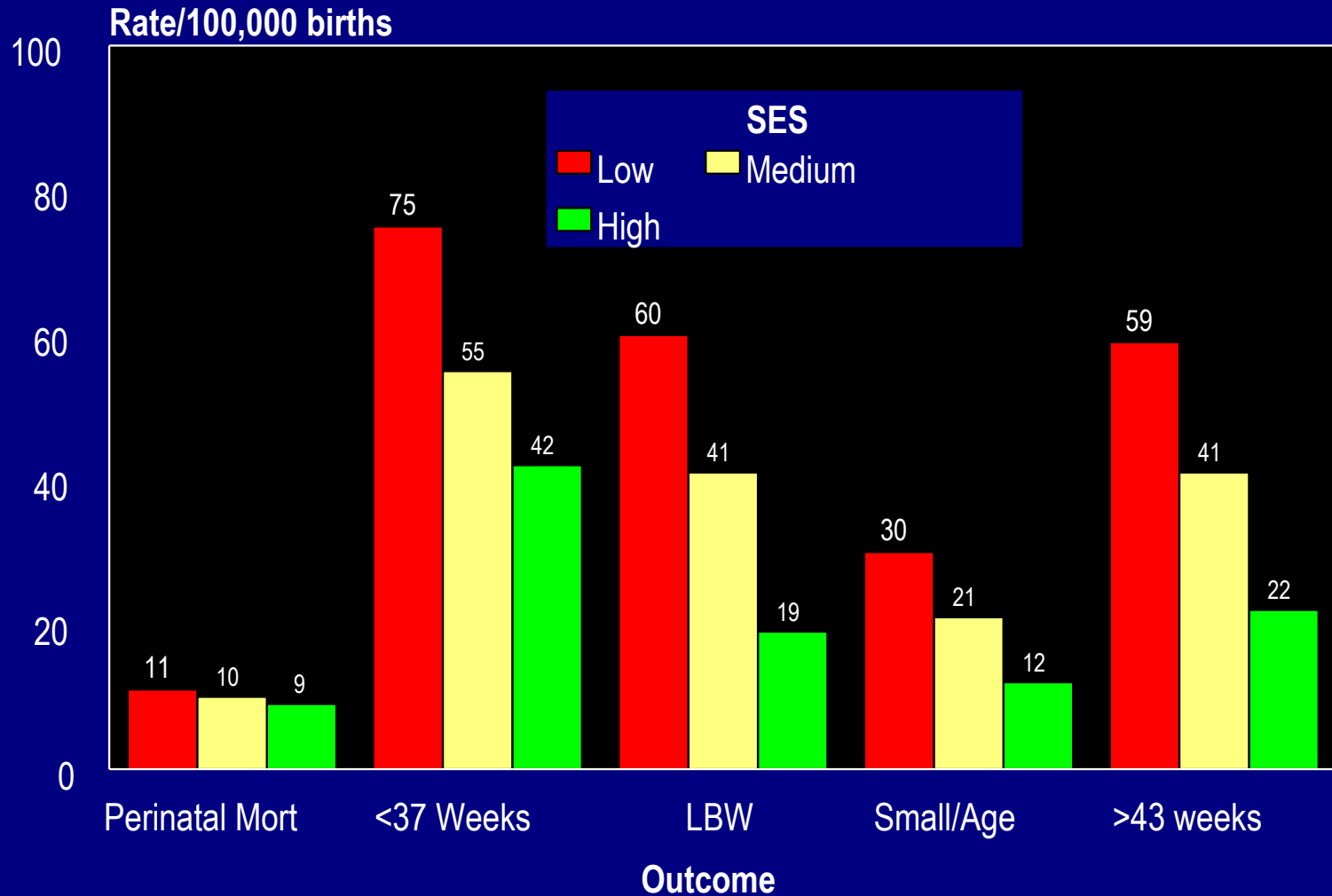
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Stunting* by Age and Poverty Status

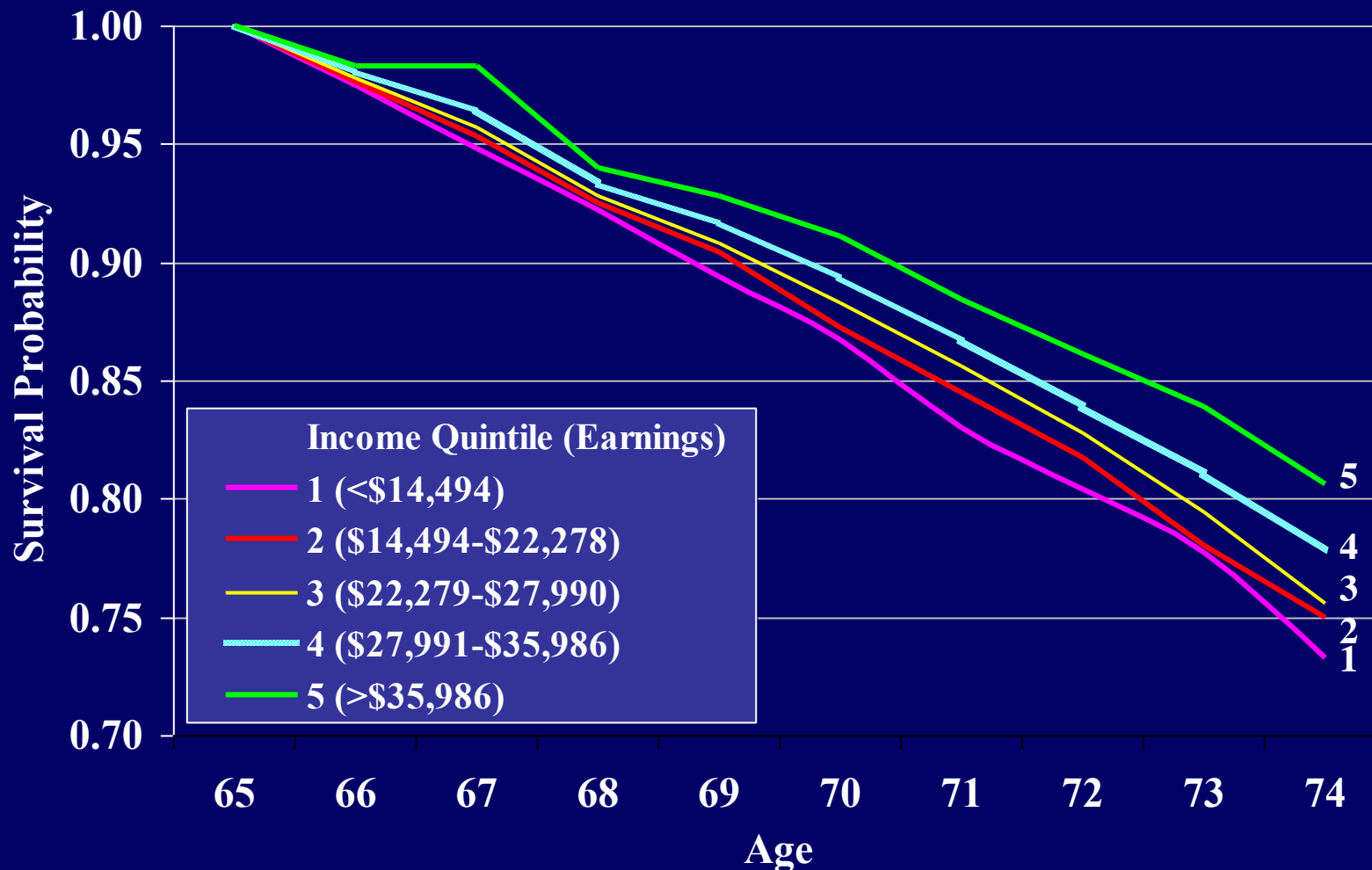


Pregnancy Outcomes by SES in Sweden



Survival from Age 65 by Pre-Retirement Earnings Quintile

546,759 Canadian Males in Canada Pension Plan



Socioeconomic Position and Health

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**Relative Risk
Associatd with
Lowest vs.
Highest Decile for
Causes of Death:
300,685 MRFIT
Screenees-White
Males, 35-57**

Cause	10% vs 90%	Direction
All Cause Mortality	1.59	+
All Cardiovascular	1.63	+
Coronary Heart Disease	1.62	+
Stroke	1.63	+
Hemorrhagic	1.04	0
Non-hemm.	2.39	+
All Cancer	1.38	+
Esophagus	1.64	+
Stomach	1.31	+
Rectum	1.98	+
Pancreas	1.14	+
Lung	1.76	+
Melanoma	0.53	-
Prostate	1.23	+
Brain	1.03	0
Lymphatic	0.91	0
Non-CA, Non-CVD	1.96	+
Infection	1.73	+
Diabetes	5.22	+
COPD	2.71	+
Pneumonia/Influenza	2.46	+
Cirrhosis	2.25	+
Violence	1.73	+
Accidents	1.63	+
Suicide	1.61	+
Homicide	3.15	+

Davey Smith, et al.

Chronic Conditions more Prevalent among those with < 12 Years of Education: NHIS, 1989, 65+ years

Arthritis

Gout

Intervertebral disc dis.

Bunions

Psoriasis

Visual impairment

Cataracts

Hearing impairment

Speech Impairment

Abs. of extremities

Paralysis

Deformity or orth. Impairment

Ulcer

Abd. hernia

Gastritis

Kidney dis.

Indigestion

Diverticulitis

Constipation

Goiter

Diabetes

Anemias

Migraine

Neuralgia/Neuritis

Kidney trouble

Ischemic heart dis.

Other heart dis.

Hypertension

Cerebrovascular dis.

Hardening of the arteries

Varicose veins

Chron. bronchitis

Asthma

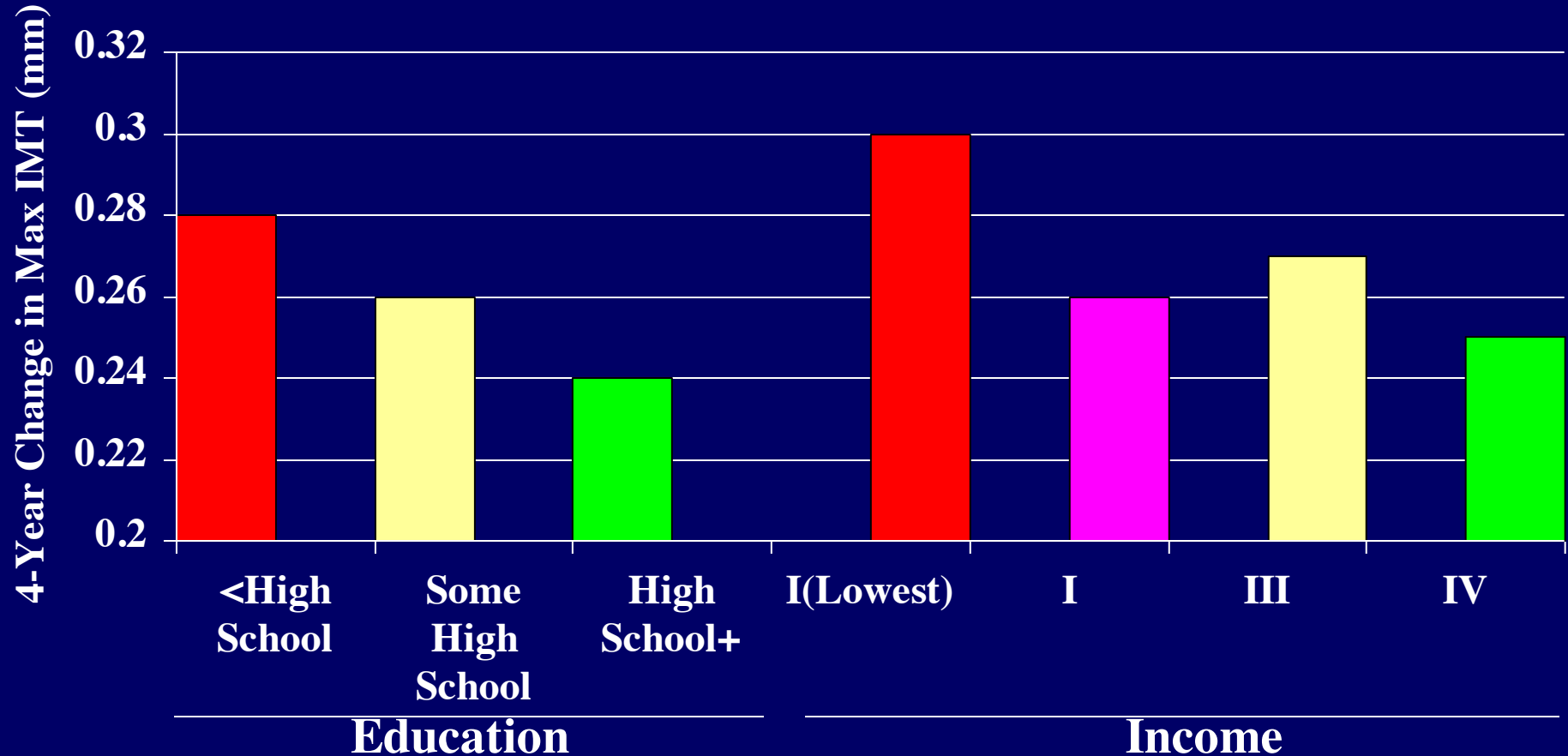
Hay fever

Chron. sinusitis

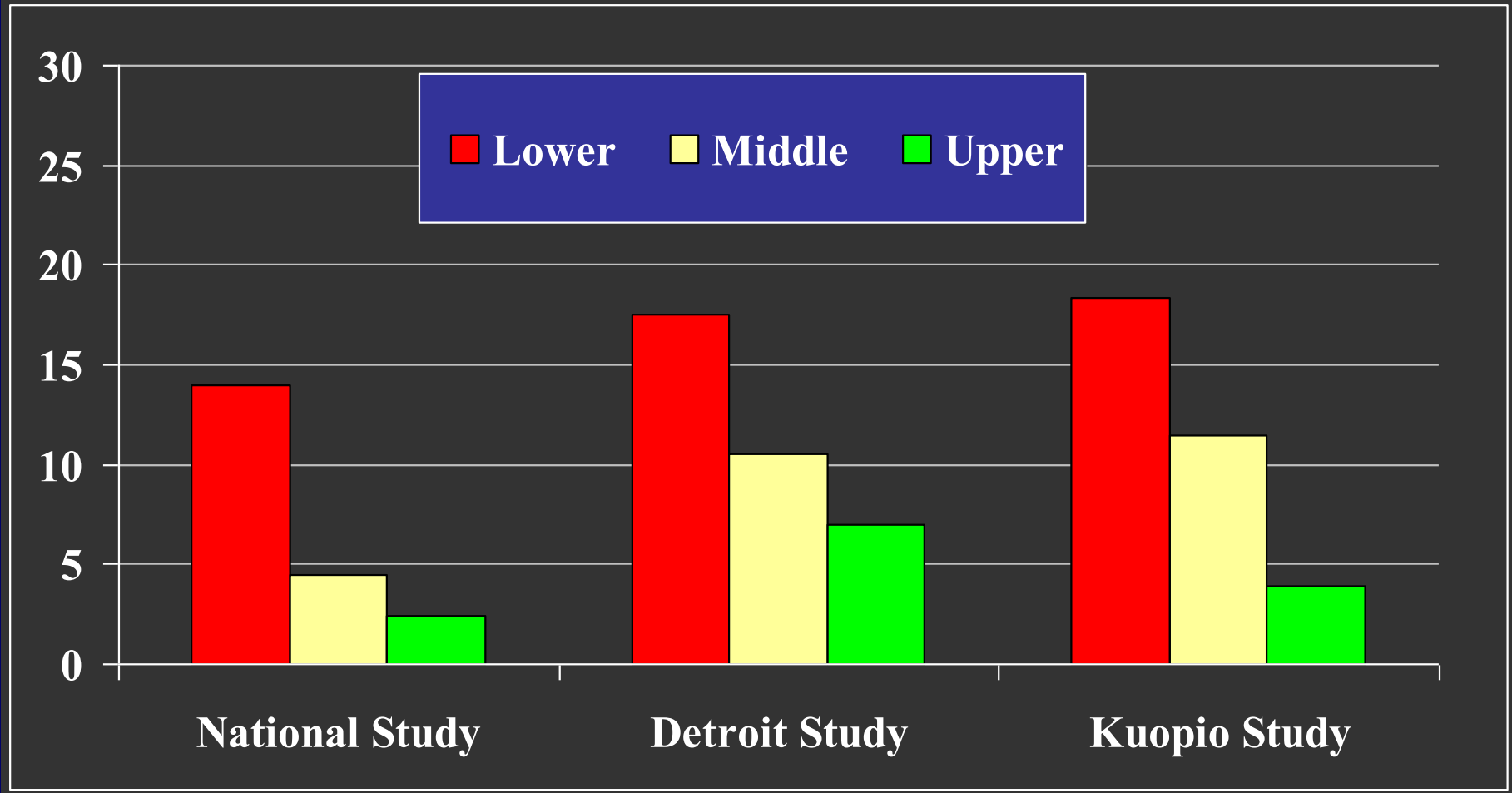
Emphysema

Series 10, No. 129

4-year Progression of Plaque Height by Education and Income Level

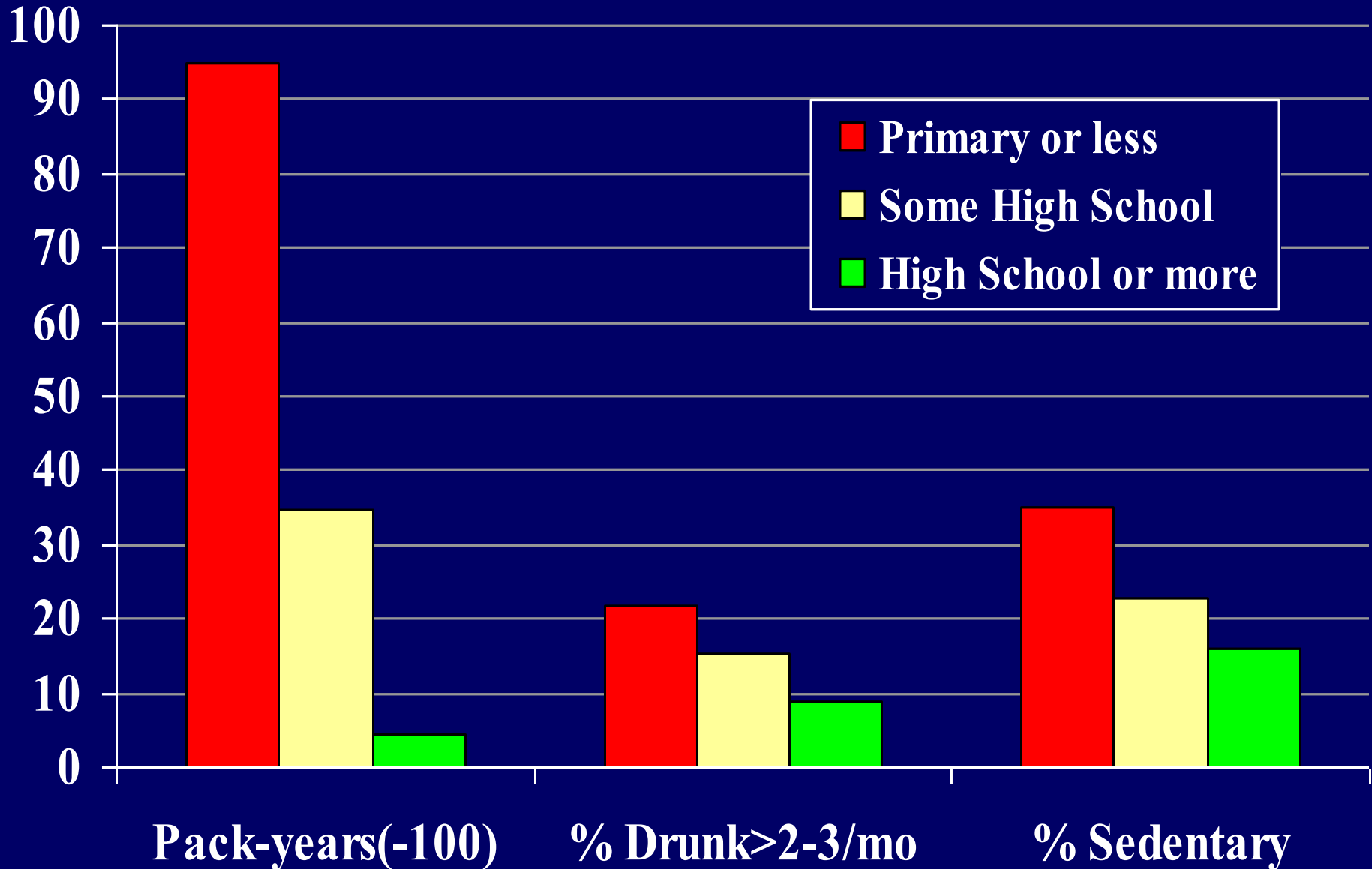


Prevalence of High Hopelessness by Income Tertiles



Behavioral Risk Factors by Level of Education

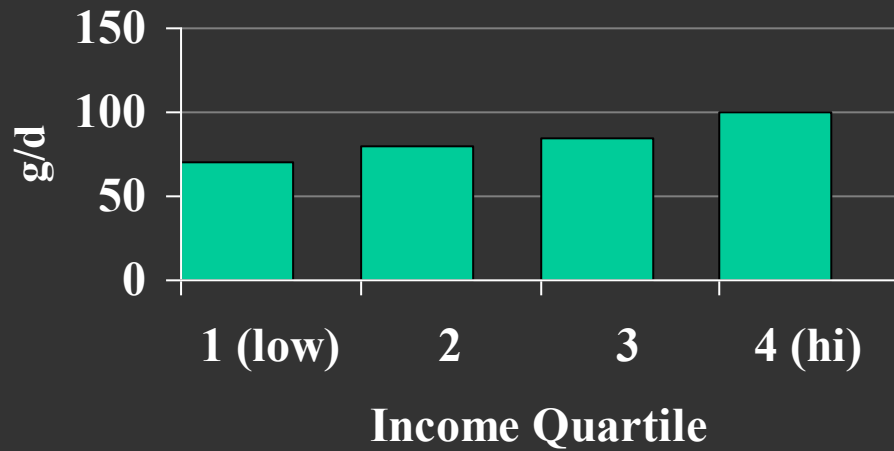
Kuopio Ischemic Heart Disease Risk Factor Study



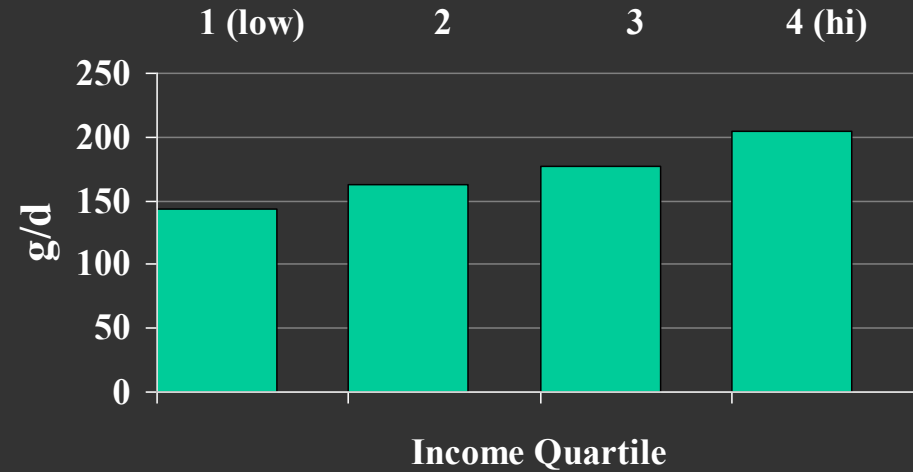
Dietary Consumption by Income Quartiles

Kuopio Ischemic Heart Disease Risk Factor Study

Vegetables



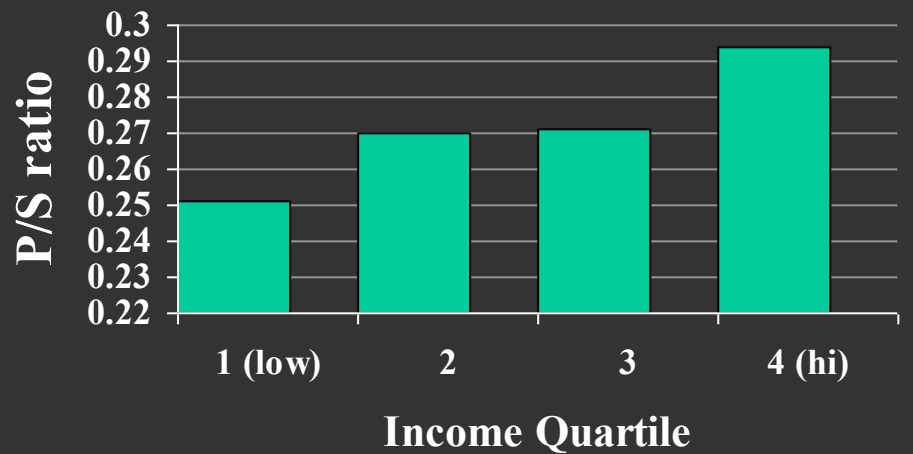
Fruits & Berries



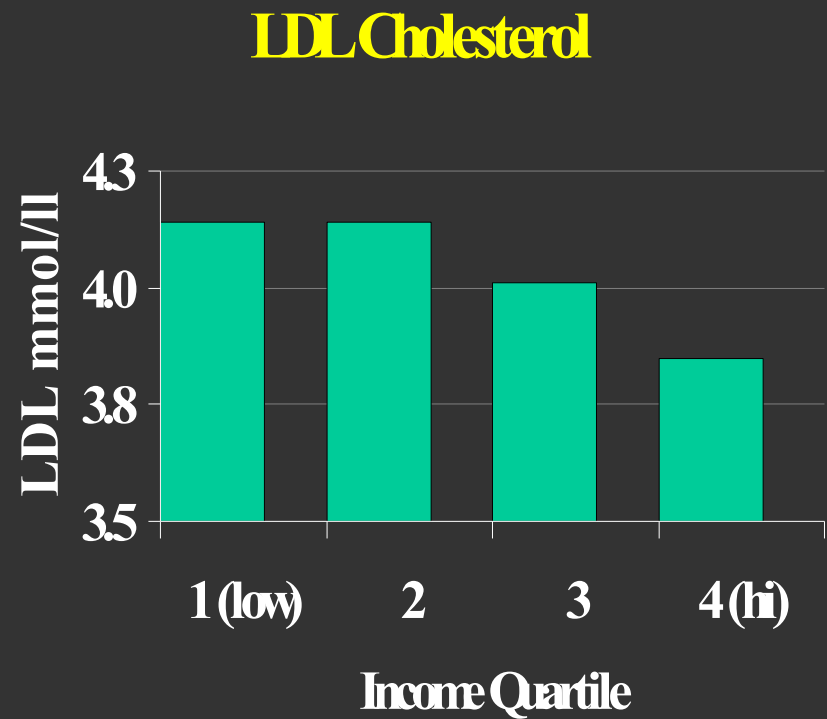
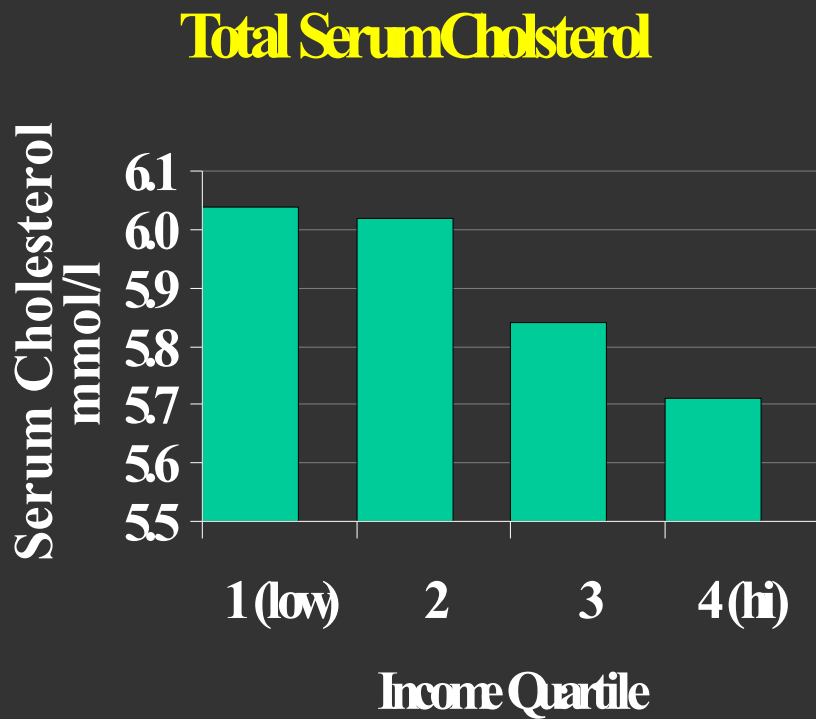
Sodium



P/S Ratio



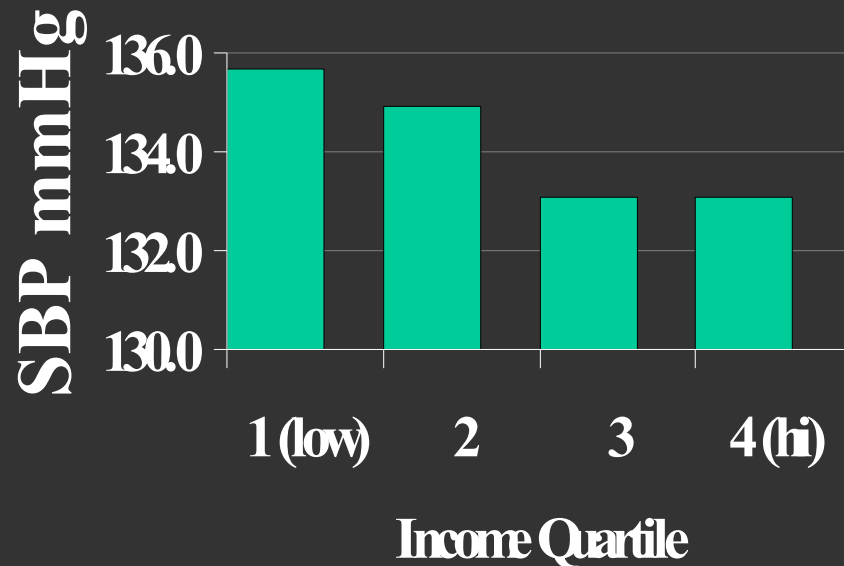
Total Serum Cholesterol and LDL by Income Quartiles Kuopio Ischemic Heart Disease Risk Factor Study



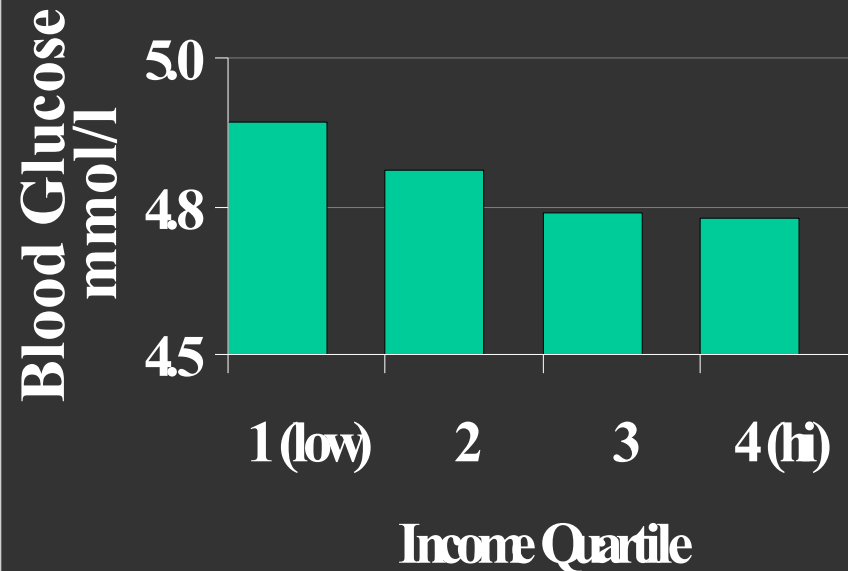
Systolic Blood Pressure and Fasting Glucose by Income Quartiles

Kuopio Ischemic Heart Disease Risk Factor Study

Systolic Blood Pressure



Fasting Blood Glucose



Fibrinogen and TPA by Income Quartiles

Kuopio Ischemic Heart Disease Risk Factor Study

Fibrinogen



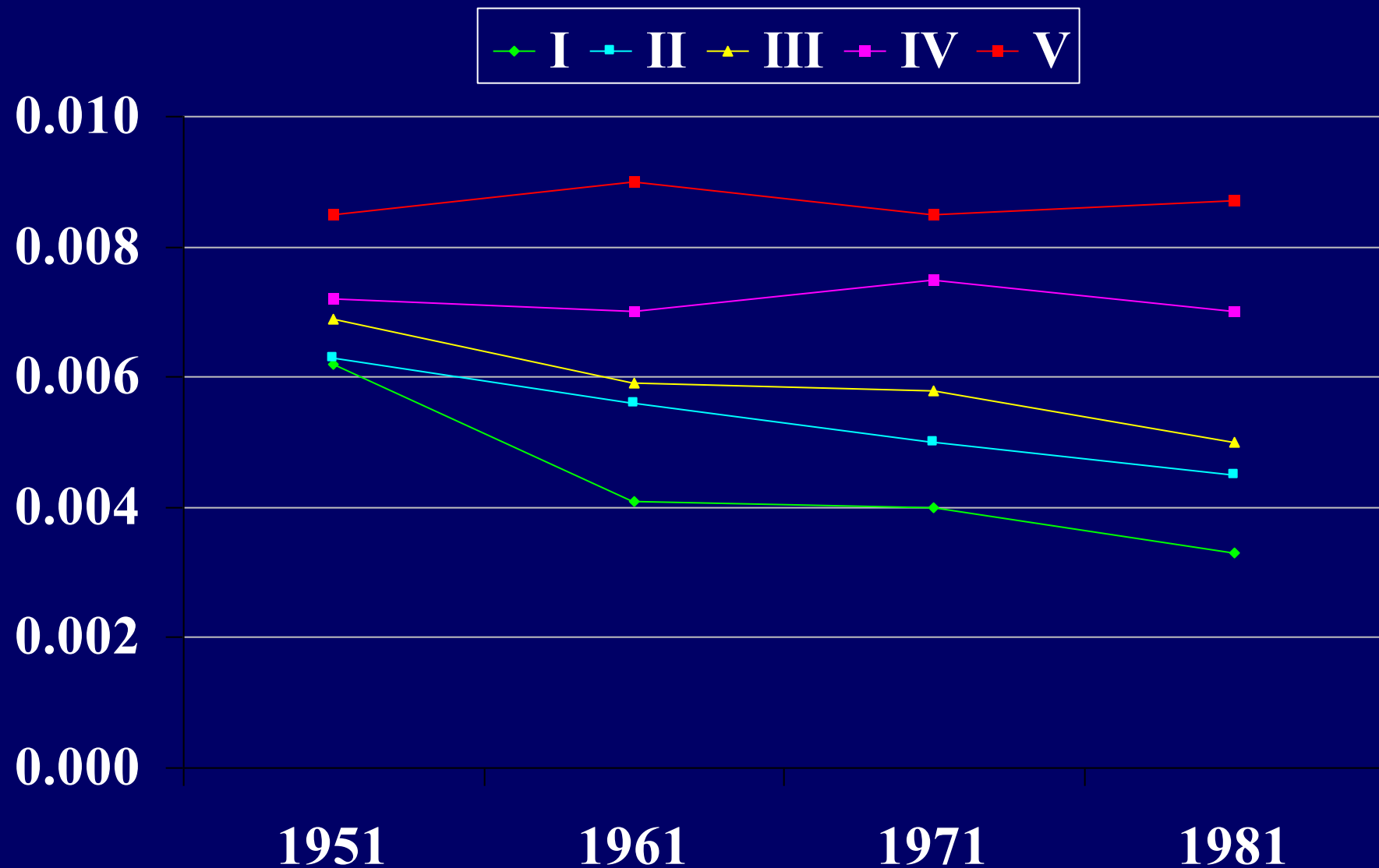
Tissue Plasminogen Activator



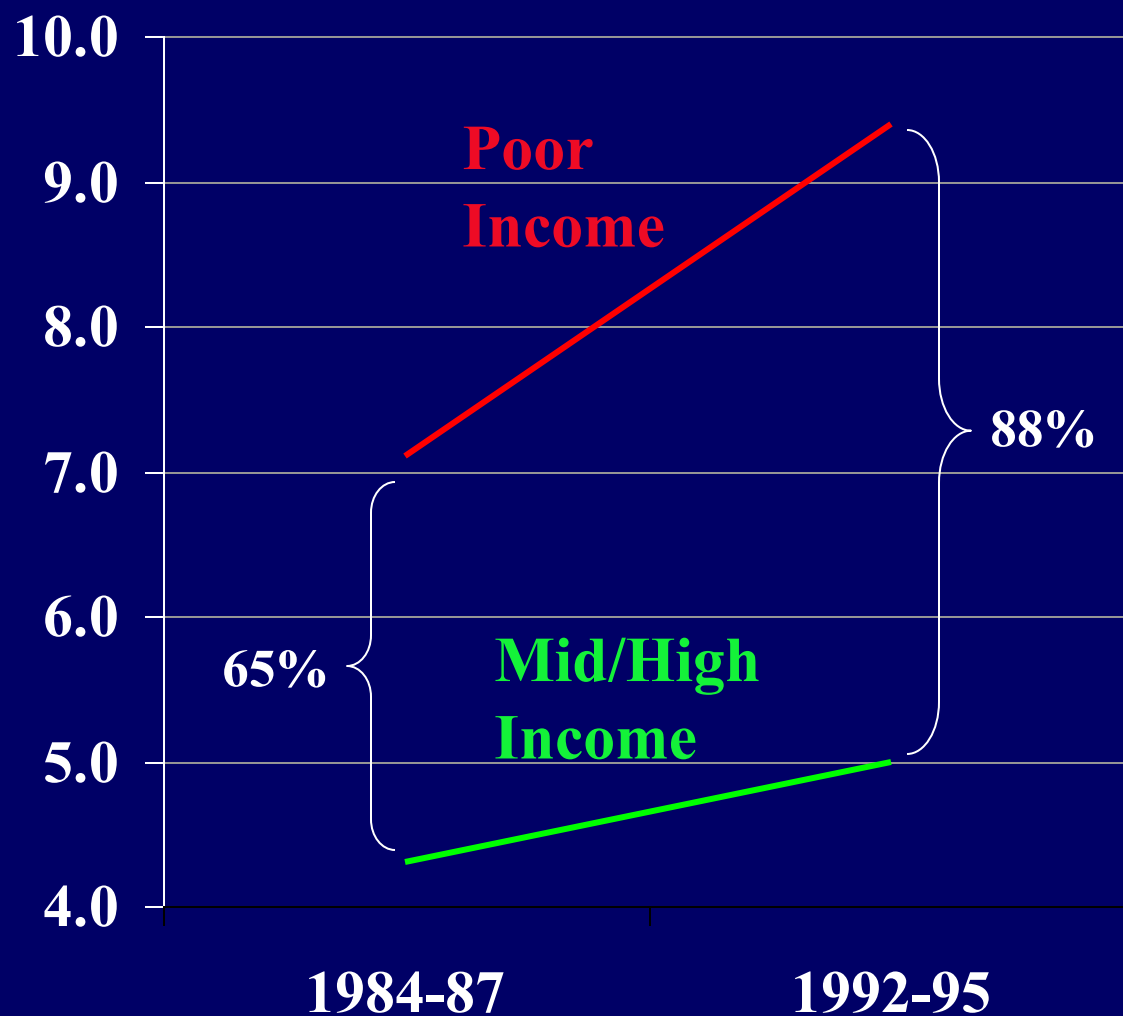
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Age-adjusted Death Rates by Social Class In England & Wales, 1951-81



Percent of Children under 18 with Activity Limitations



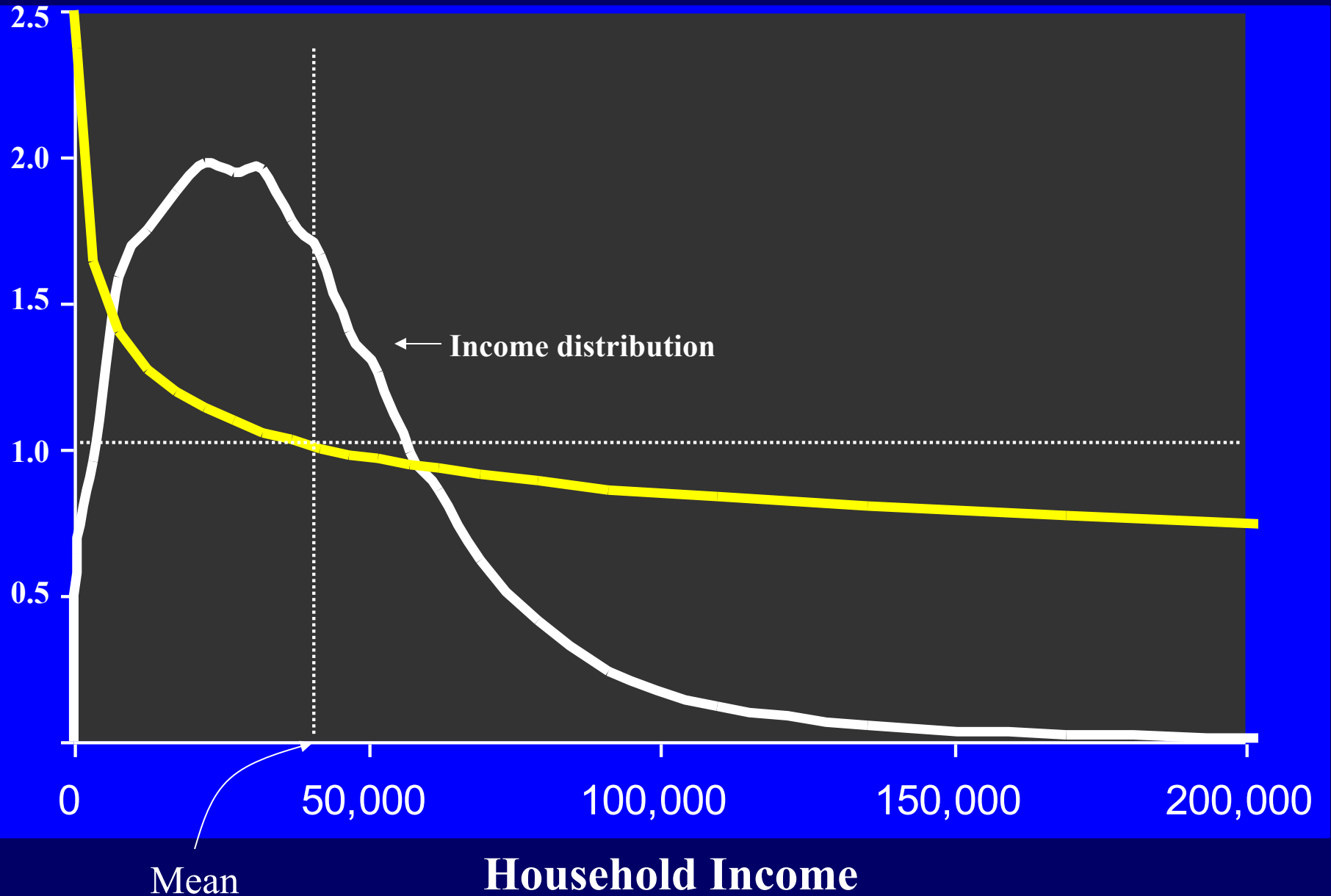
Current Issues

- The “Gradient”
- Importance of Life-Course Perspective
- Community/Neighborhood Effects
- Income Distribution
- Do Upstream Interventions Work/ Lost Opportunities
- What’s an Epidemiologist to Do?

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Relative Risk of Death by Income & Income Distribution



**Curvilinear relationship between
income and health risks**

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graph TD; A[Curvilinear relationship between income and health risks] --> B[Increasing the economic resources of lower income households will have the greatest impact on the population's health]; B --> C[Must reduce the lost opportunities to show the health benefits of increasing economic resources]; B --> D[Employment, education, minimum wage, EITC, benefits such as childcare, housing subsidies, job flexibility, etc.]
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the greatest impact on the
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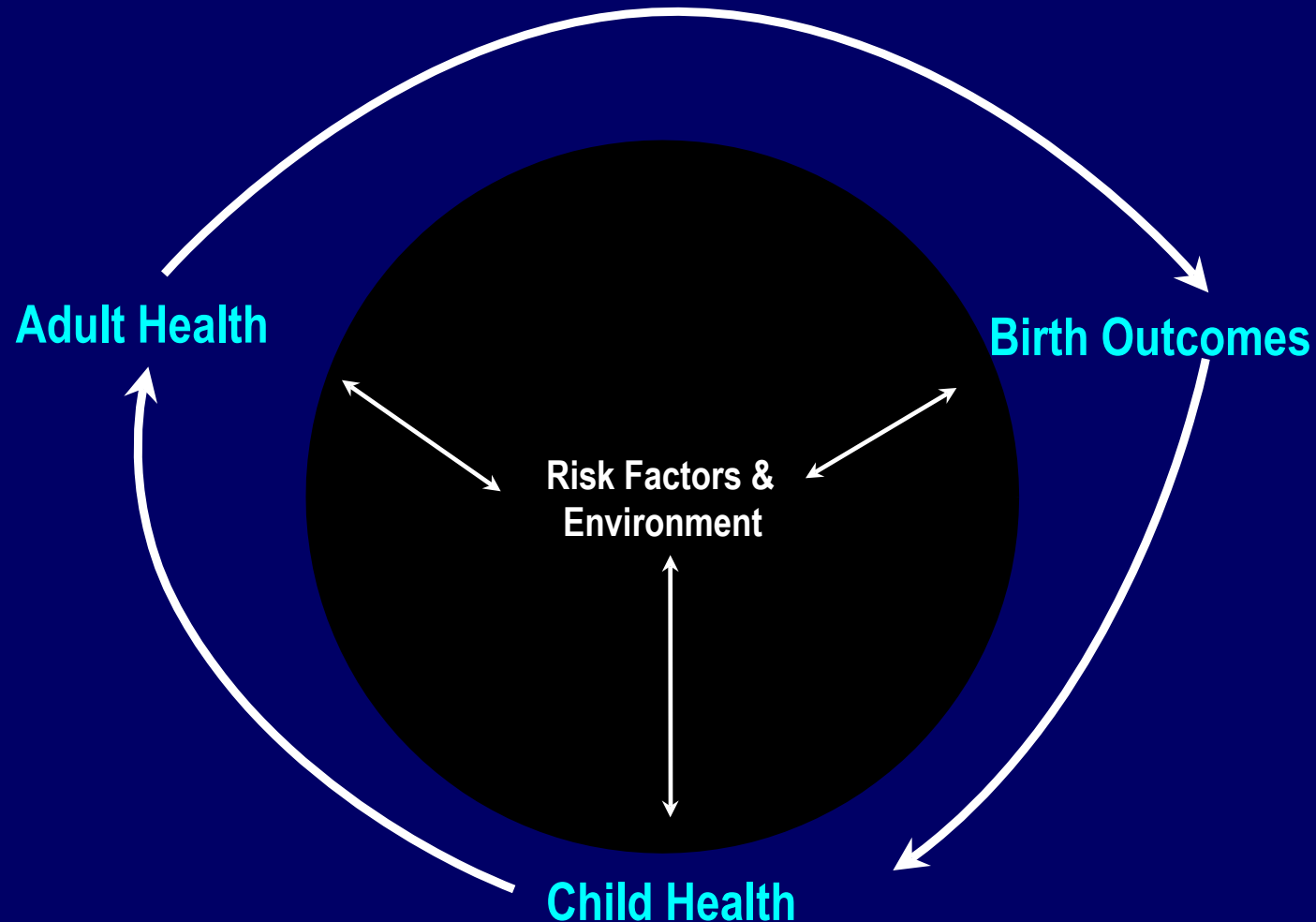
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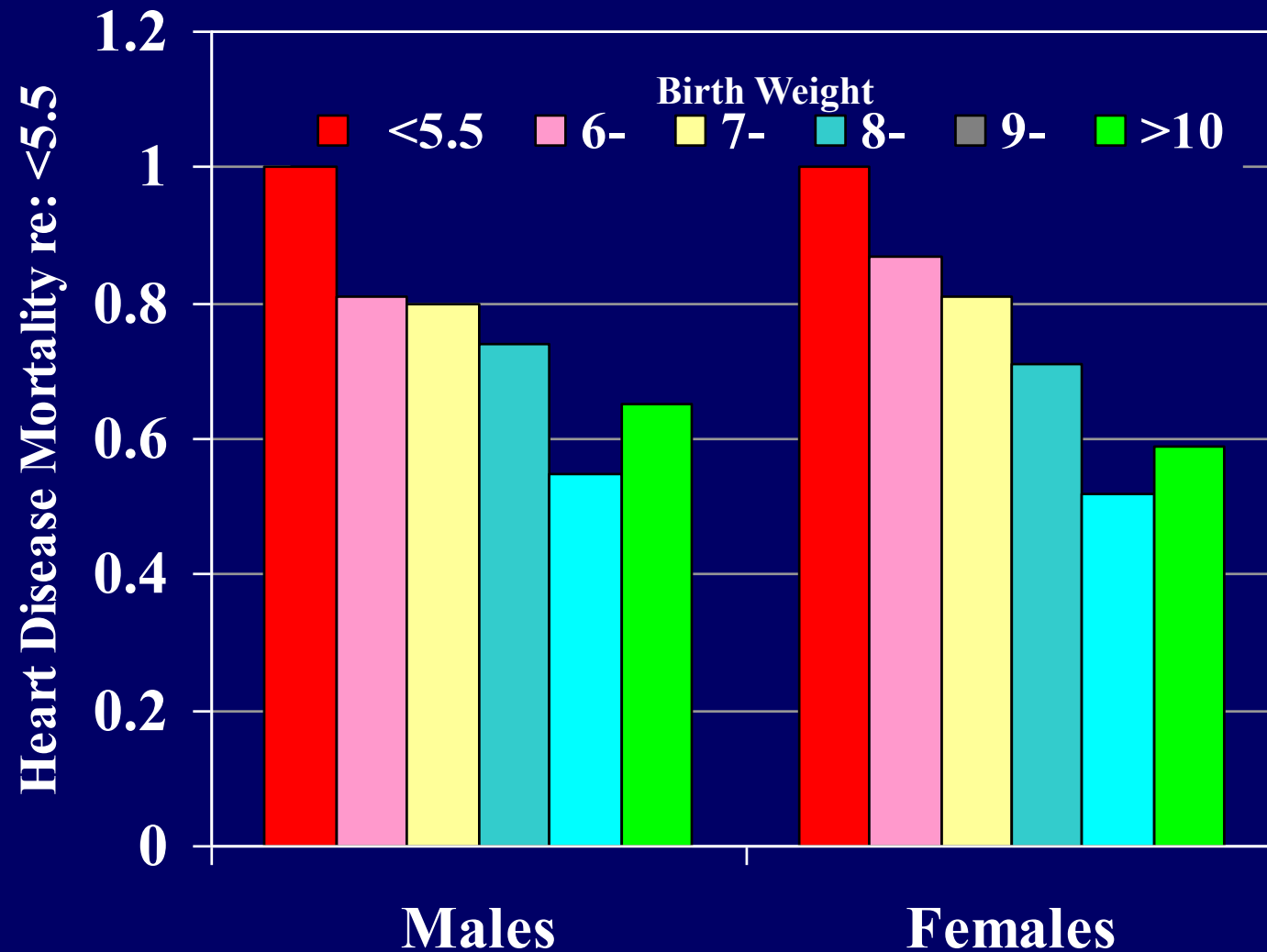
- The “Gradient”
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- Lost Opportunities

“The childhood shows the man, As the morning shows the day”

John Milton. *Paradise Lost* (1667), Line 220-221.



Coronary Heart Disease Mortality in Hertfordshire Adults by Weight at Birth (lbs)



Early Environmental Events and Later Development

Various studies indicate the following more common for poor children:

Homelessness

Poor and unaffordable housing

Residential mobility

Inadequate heating

Crowding

Cold, dampness, mold

Cockroaches, rats, mice

Poor quality child care

Decreased verbal interactions with adults

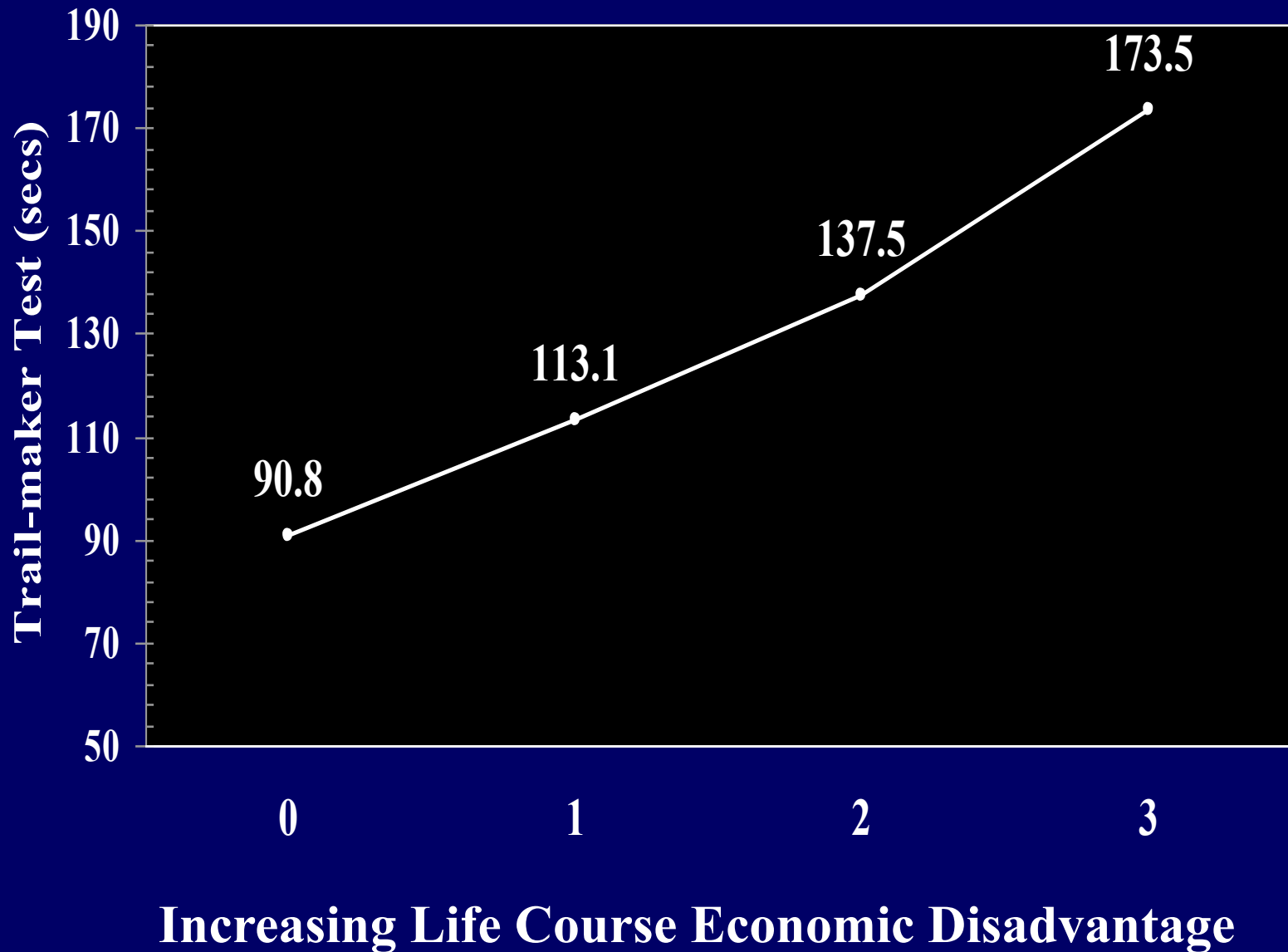
Inadequate schools

Fewer educational opportunities at home

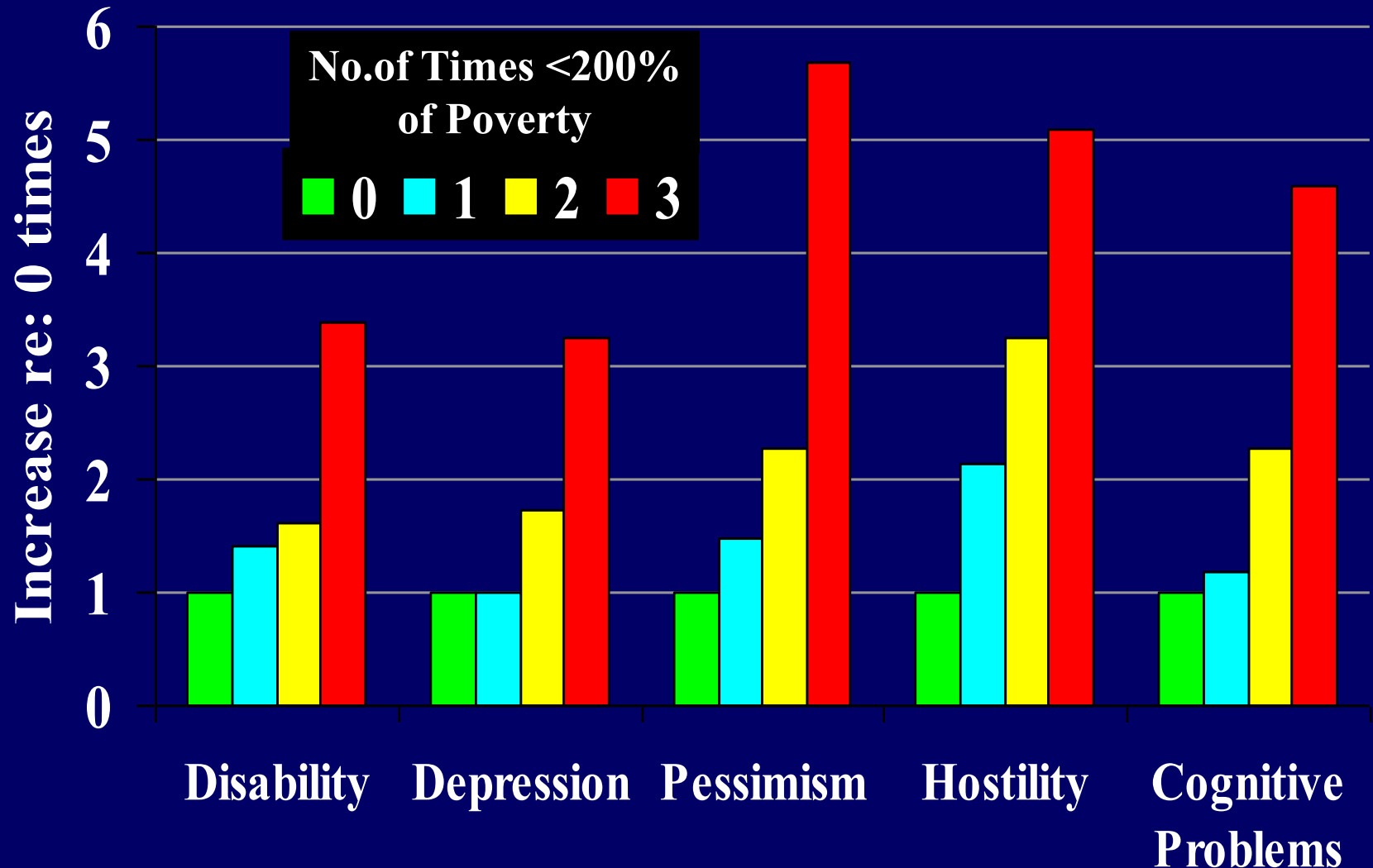
Few stimulating activities at home

Parental stress and depression

Cognitive Function at Age 58 & 64 and Life Course Socioeconomic Disadvantage



29-year Cumulative Impact of Economic Disadvantage on Five Health Outcomes



Sustained economic disadvantage can rob individuals and their communities of good health



These effects spiral downward through families, with impact on children and the unborn



This intergenerational transmission of disadvantage creates the matrix in which the inequalities in health of the future are produced

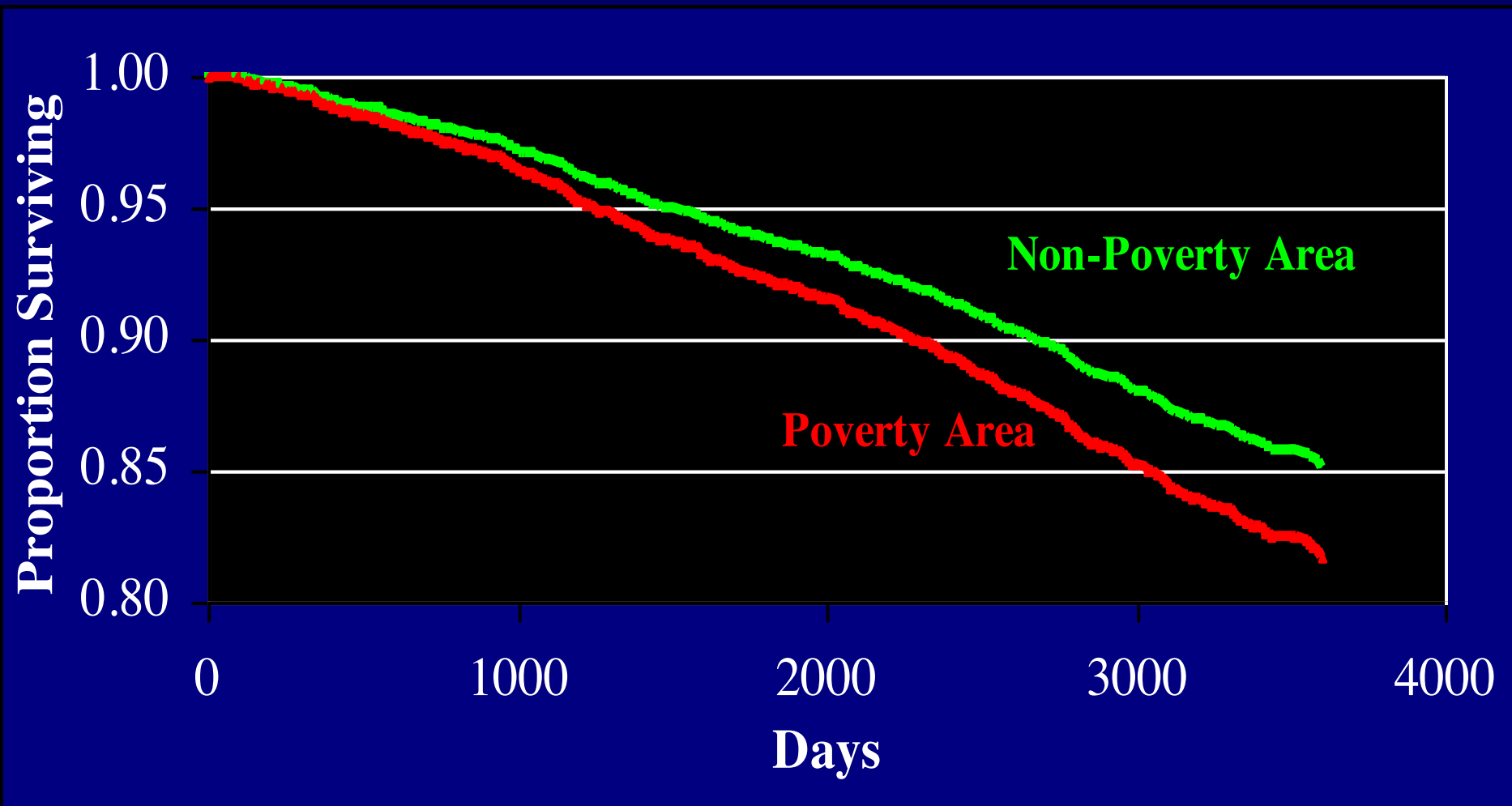


Investments in communities and families can halt this propagation of health inequalities

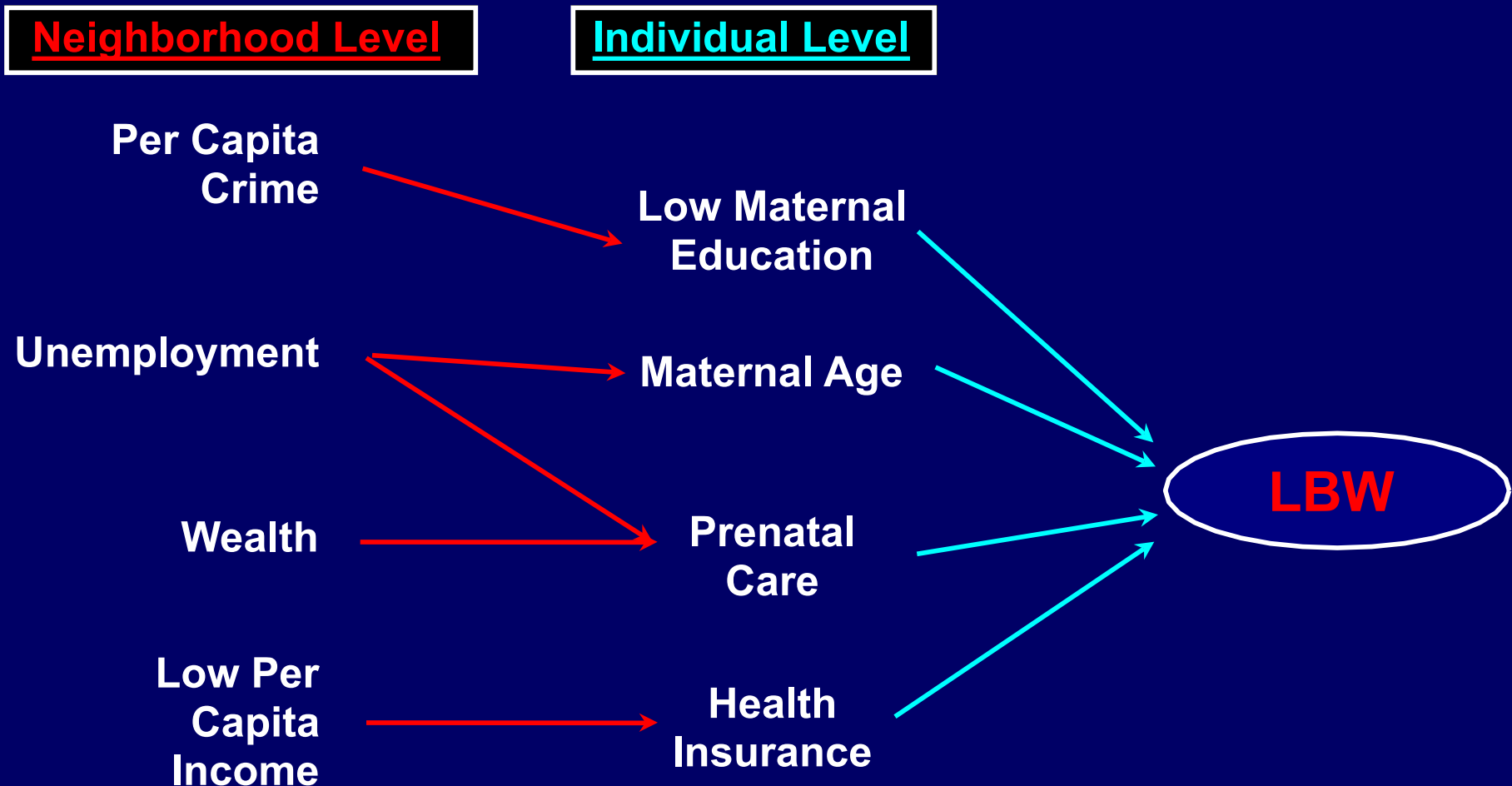
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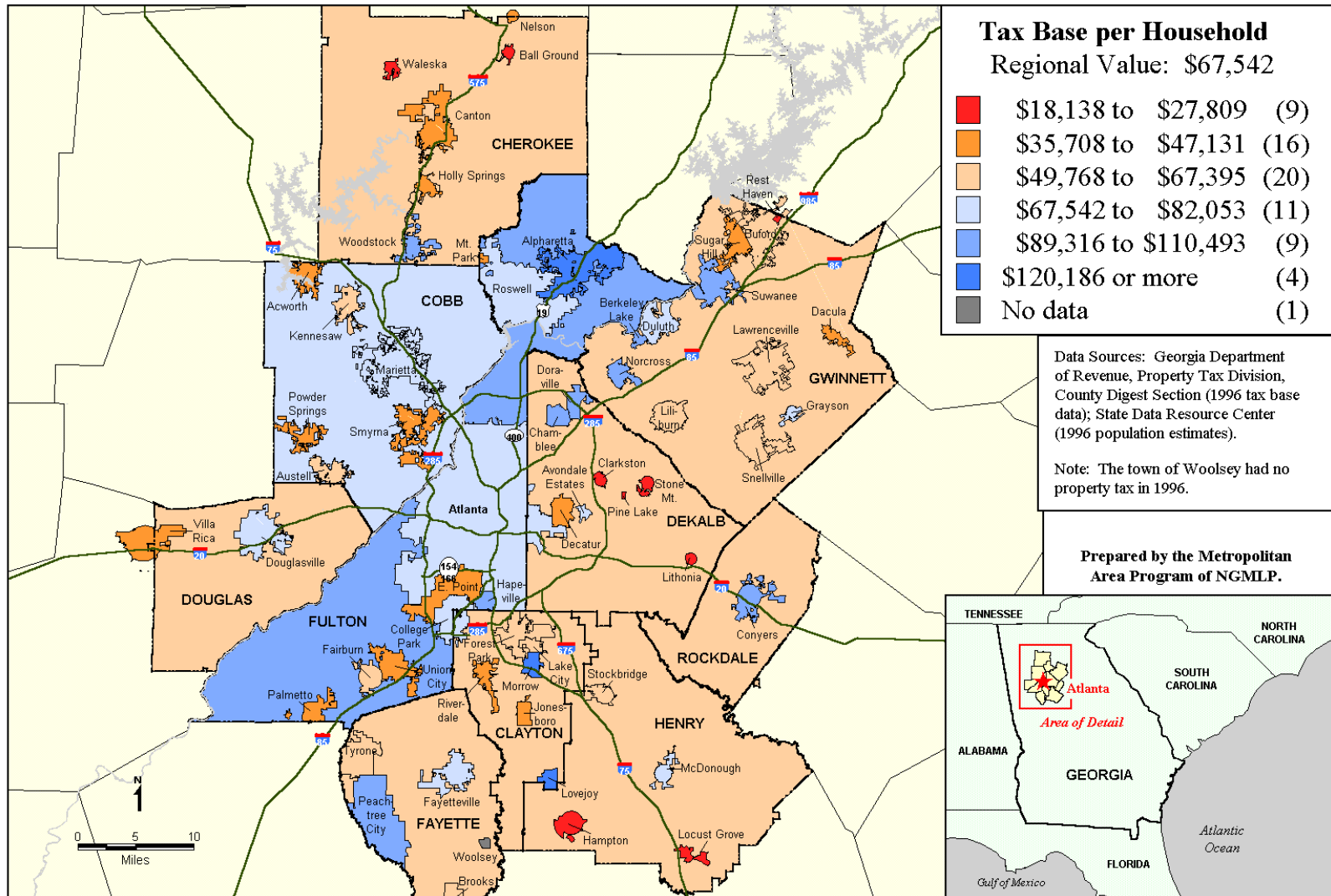
Age-adjusted Survival of White Females by Poverty Area Residence: Alameda County Study, 1965-1974



Interactions Between Neighborhood and Individual Risk Factors for Low Birth Weight



Total Tax Base Per Household by Municipality and County Unincorporated Area, 1996



Substantial inequalities in health are seen between geographic areas that vary in level of economic resources



These inequalities in health cannot be simply attributed to the behavior of area residents



Differences in infrastructure, material conditions, and formal and informal organizations and institutions are at the heart of these differences



Investments in communities may reduce current and future inequalities in health

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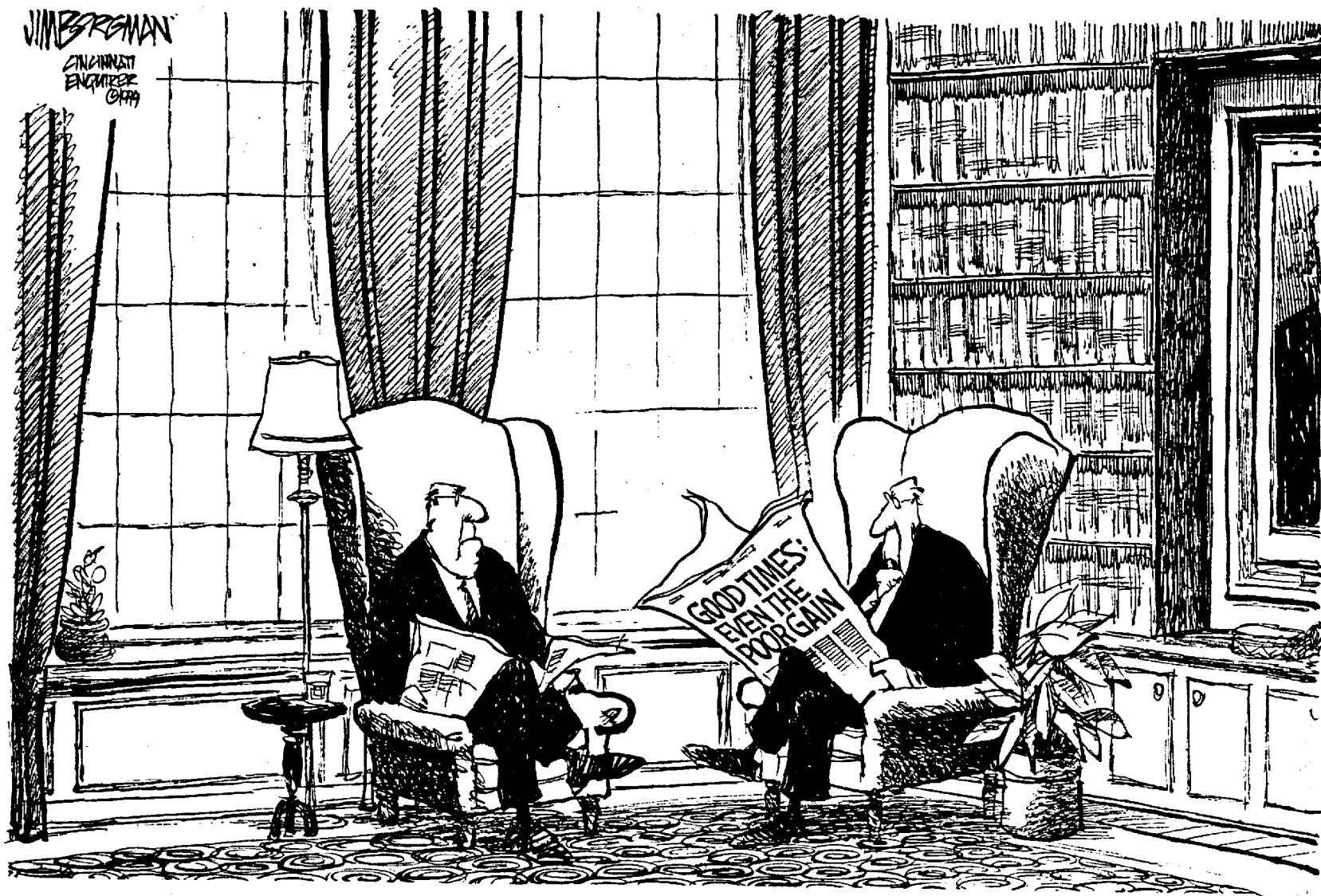
U.S. Income Inequality

“The gap between rich and poor has grown into an economic chasm so wide that this year the richest 2.7 million Americans, the top 1 percent, will have as many after-tax dollars to spend as the bottom 100 million.”

NY Times, Sept 5, 1999

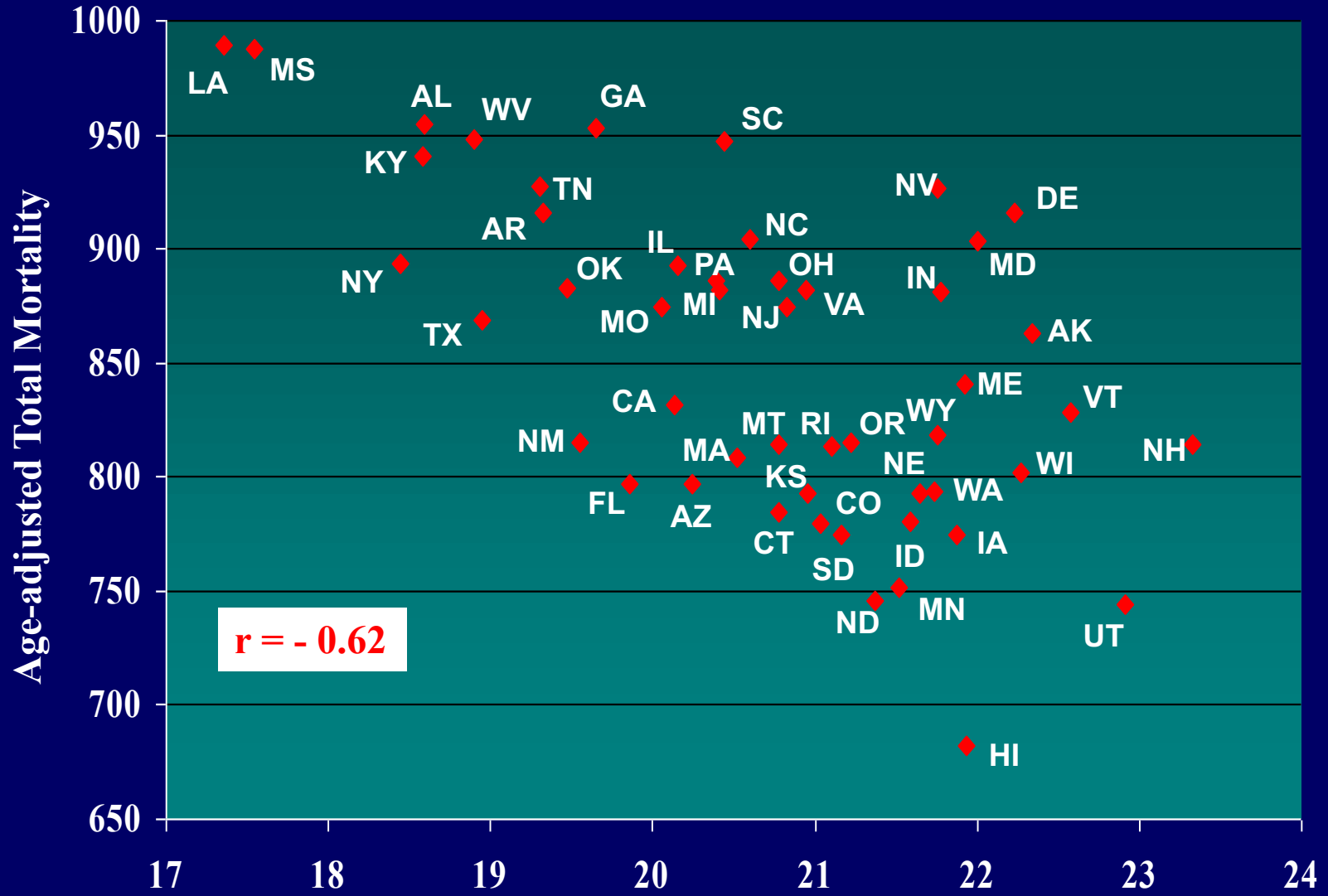
JIM BERGMAN

SINICINIST
ENGINEER
©1999



"WELL, IF THE ECONOMIC BOOM BENEFITS EVERYONE, WHAT GOOD IS IT?!"

Income Inequality and Mortality in US States, 1990 (adjusted for State Median Income)

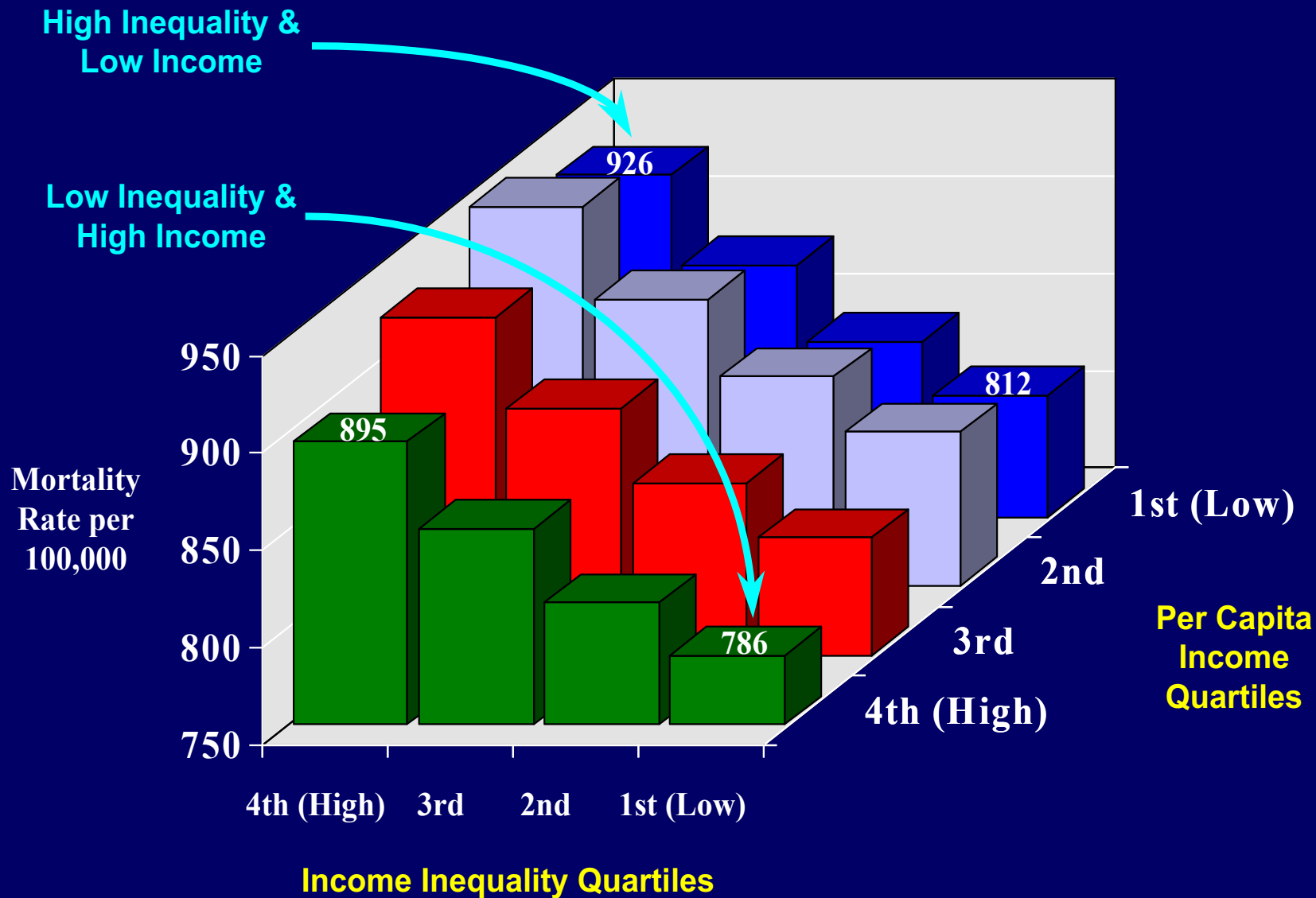


Income Inequality and Selected Health Outcomes

	<u>r</u>
% Live births <2500 gms	-0.65
Homicide	-0.74
Violent Crimes	-0.70
% Unable to Work - disability	-0.33
Per capita Spending on Protection	-0.38
Per capita Medical Spending	-0.67
% Sedentary	-0.34
% Smoking	-0.35

Income Inequality and Selected Educational Indicators

	<u>r</u>
% < High School Diploma	-0.71
% High School Dropout	-0.50
4th Grade Reading Scores	-0.58
4th Grade Math Scores	-0.64
Education / Total Spending	-0.32
Library Books Per capita	-0.42



Lynch, Kaplan, Pamuk, et al. AJPH (1998)

How large are these mortality effects ?

High Income Inequality
Low Average Income

925.8 per 100,00

Low Income Inequality
High Average Income

785.9 per 100,00

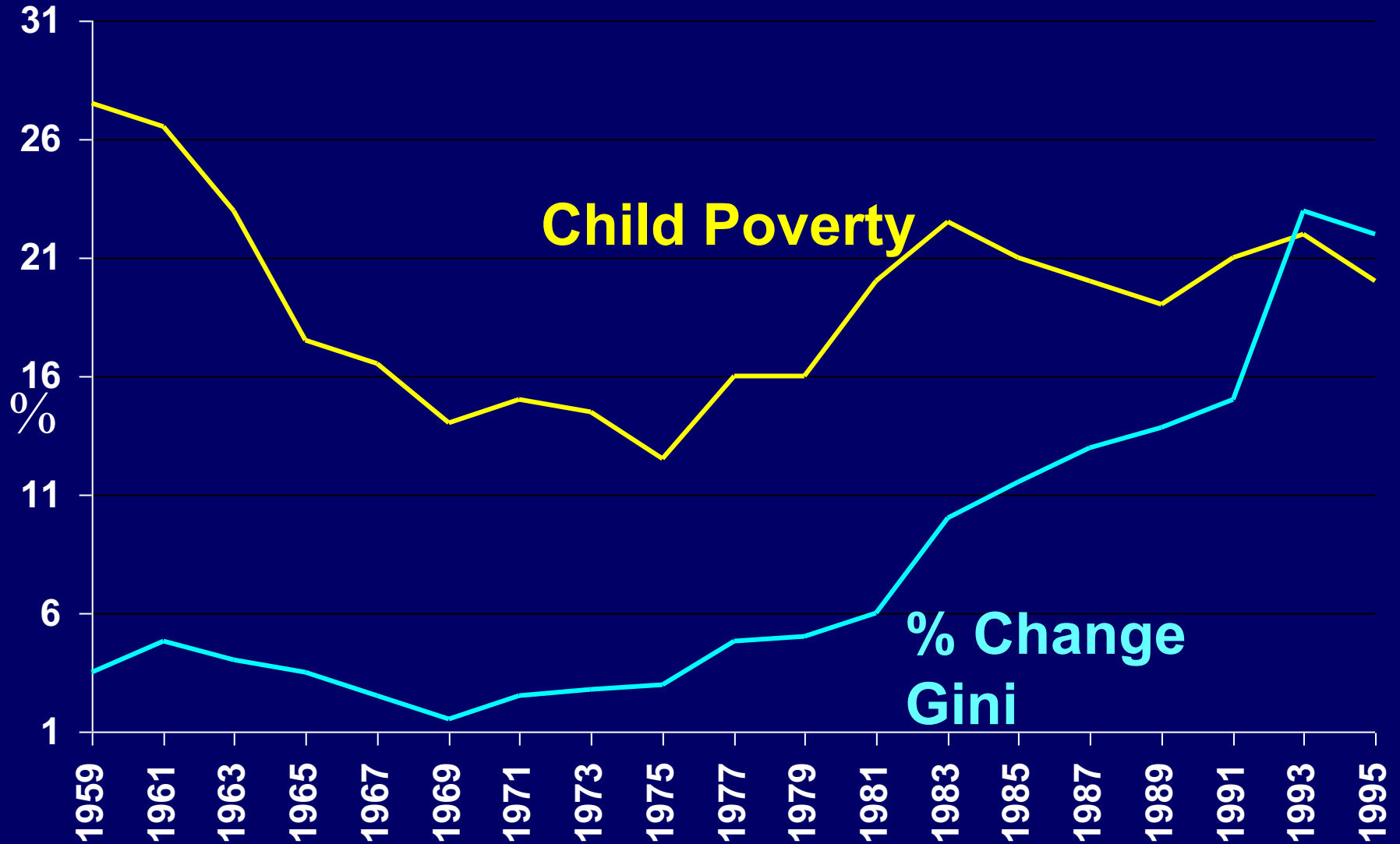
140 deaths per 100,000

Equivalent to the combined loss of life from
lung cancer, diabetes, motor vehicle crashes,
HIV infection, suicide and homicide in 1995.

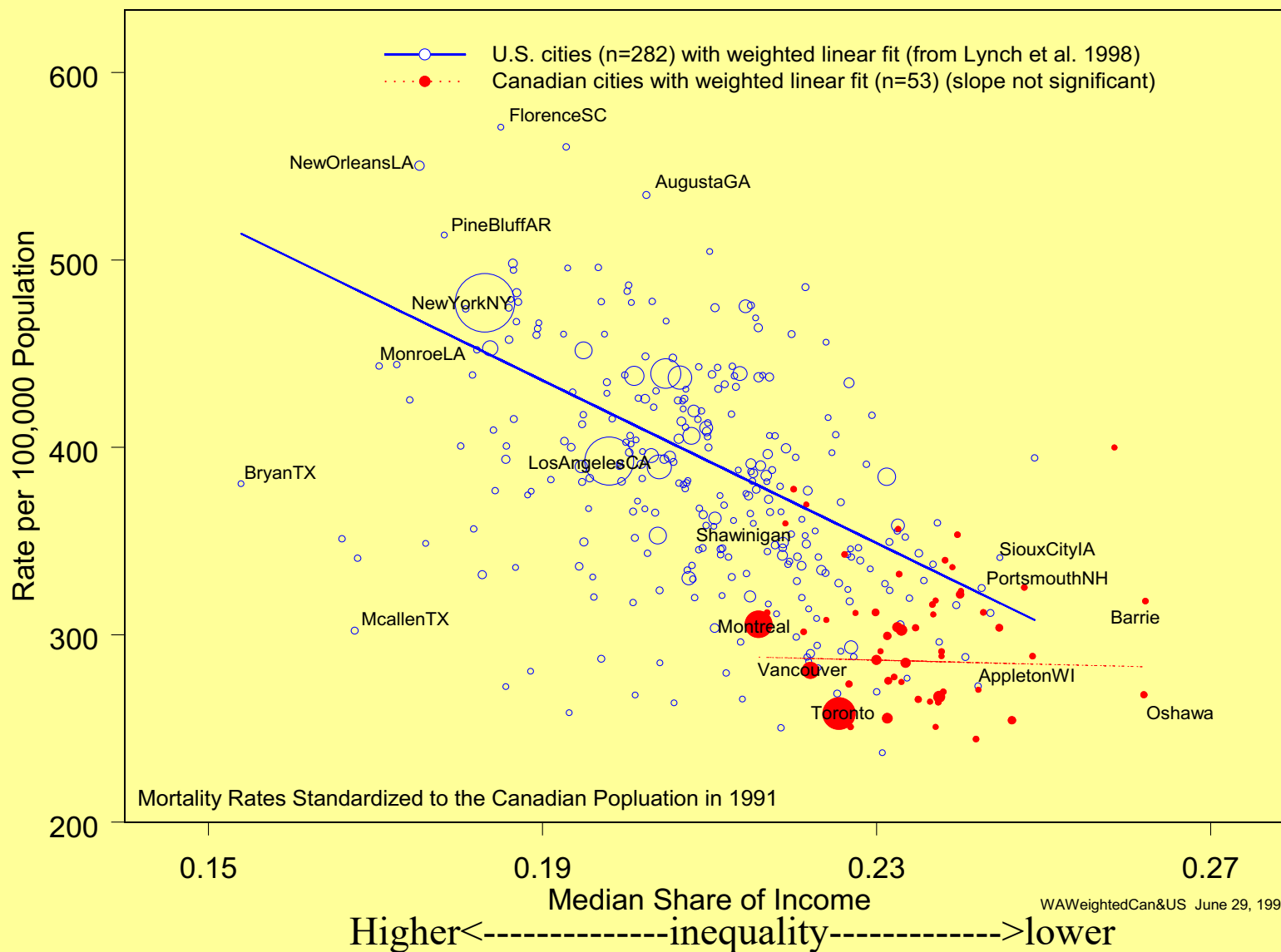
Trends in Inequality and Child Poverty 1967-1992

	%Change in Inequality	%Change in Child Poverty
UK	+ 30	+ 30
USA	+ 15 - 29	+ 30
Sweden	+ 15 - 29	- 5
Australia	+ 10 - 15	0
Denmark	+ 10 - 15	- 5
Canada	0	- 5
Finland	0	- 5
Spain	0	0
Israel	0	+ 5 - 10
W. Germany	0	+ 5 - 10

Income Inequality and Child Poverty USA (1959-1995)



Working Age (25-64) Mortality by Median Share U.S. and Canadian Metropolitan Areas



In an era of unprecedented prosperity, a rising tide has not lifted all boats leading to increased gaps between the rich and the poor



Accumulating evidence points to an important relationship between the size of such gaps and the population's health



While high levels of income and wealth inequality are a cause for concern, recent evidence suggests that both decreasing income inequality and mitigating its effects may improve health



Health effects of rising income inequality can be reduced by

```
graph TD; A[Health effects of rising income inequality can be reduced by] --> B[Direct effects of taxation, transfer, unemployment, minimum wage, & regulatory policies, etc.]; A --> C[Loosening the links between income inequality & housing, community infrastructure, non-cash benefits, etc.];
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Direct effects of taxation, transfer, unemployment, minimum wage, & regulatory policies, etc.

Loosening the links between income inequality & housing, community infrastructure, non-cash benefits, etc.

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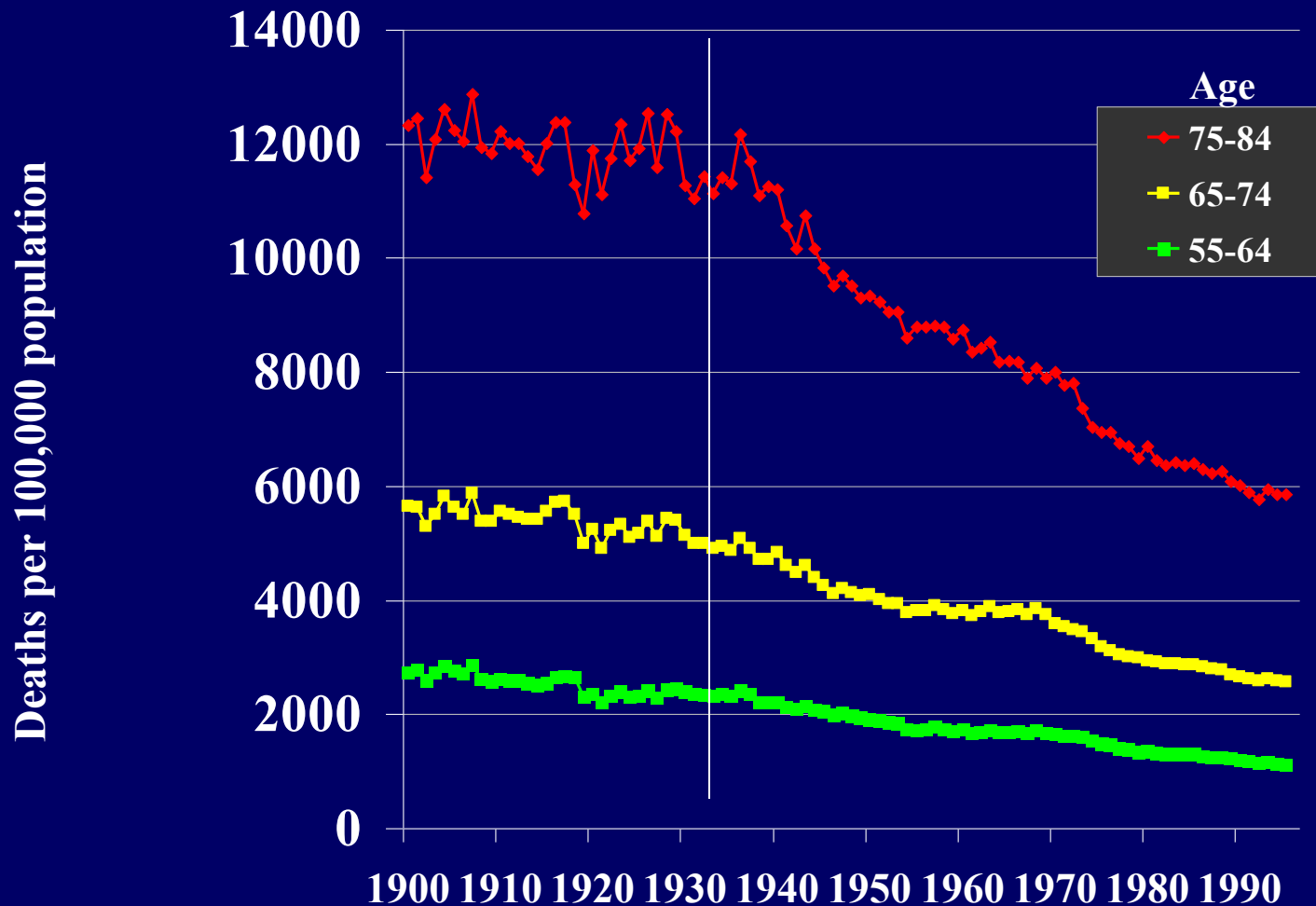
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- **Do Upstream Interventions Work?**

Lost Opportunities!

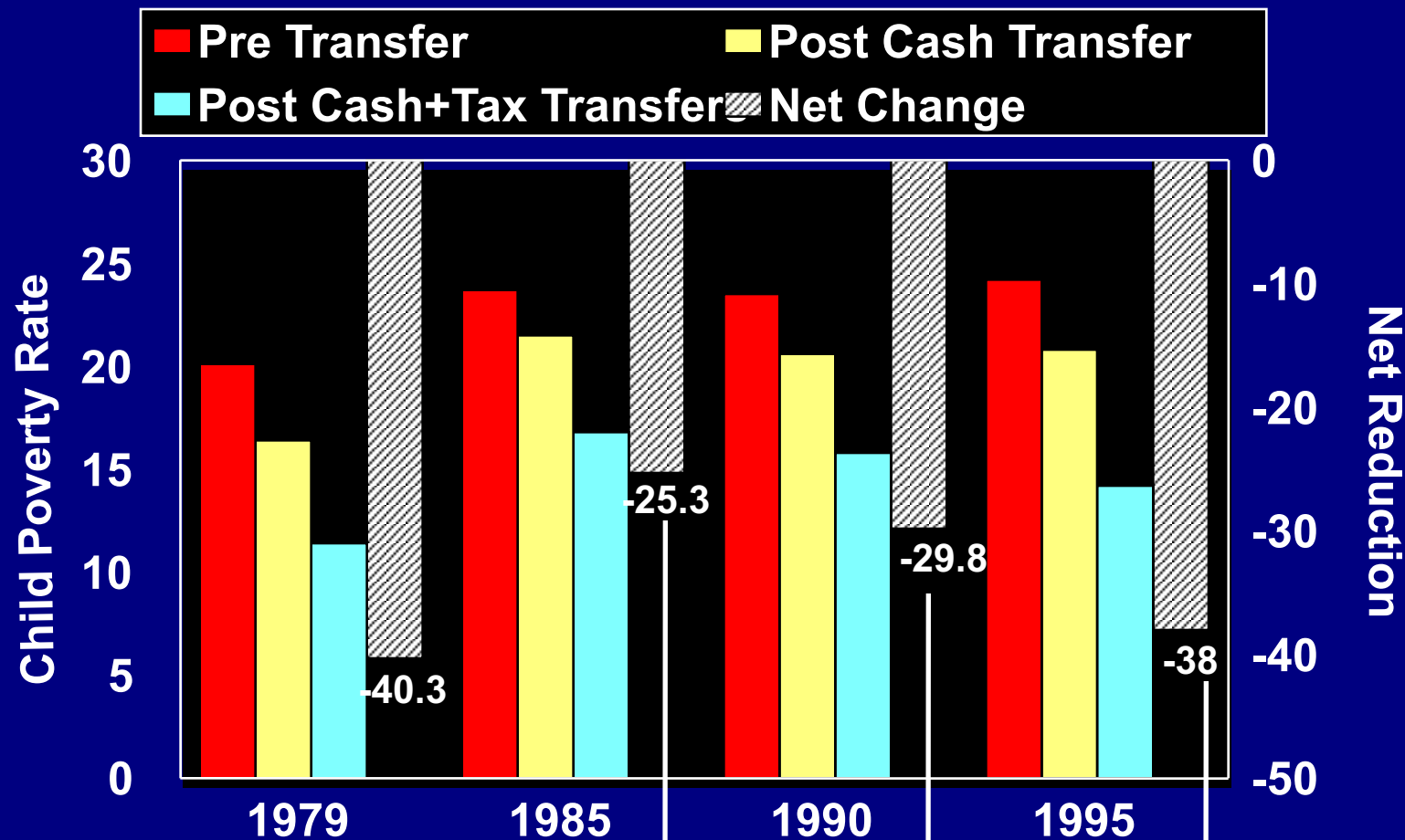
- **What’s an Epidemiologist to Do?**

- **War on Poverty**
- **Indexing**
- **EITC**
- **Head Start**
- **Relocation experiments**
- **etc.**

Total Mortality, US 1900-1995, before and after Social Security



Impact of Government Cash, Food, and Health Care Benefit Programs and Taxes on Child Poverty, 1979-1995



cuts in
cash/non-cash
benefits
inflation creep

restoration of
some cuts
tax reform

EITC

Help the Neediest

Invest in Children

Support Communities

**Reducing
Health
Inequalities**

**Health Impact
Statement**

**Reduce Income
Inequality**

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