


**Upstream and Downstream
Approaches to Inequalities in Health:
Challenges and Opportunities**

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CSEPH

**Upstream and Downstream Approaches
to Inequalities in Health**

- The Context
 - The 800 lb. genome gorilla, health, and health inequalities
 - Social Epidemiology and Population Health
 - Socioeconomic inequalities in health
- Some current explorations (briefly)
 - The downstream/bloodstream side of inequality
 - The life course and cumulative disadvantage
 - Communities as crucibles for growing health inequality
 - Economic equity and health



CSEPH

Upstream and Downstream Approaches to Inequalities in Health

- Challenges and Opportunities
 - Metaphors and Models
 - Need for Theory
 - Analytic and Methodologic Pitfalls
 - Perils and Promise of Interdisciplinarity
 - Personalizing Populations
 - Moderating Essentialism
 - Lost Opportunities



C. elegans Cell Lineage Map

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, 1999

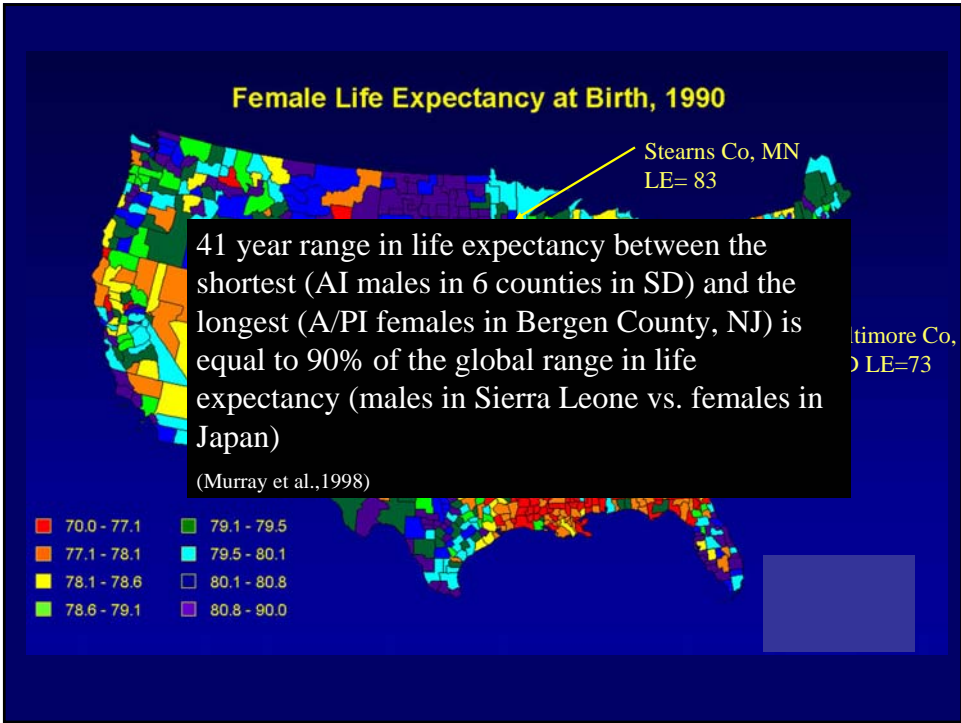
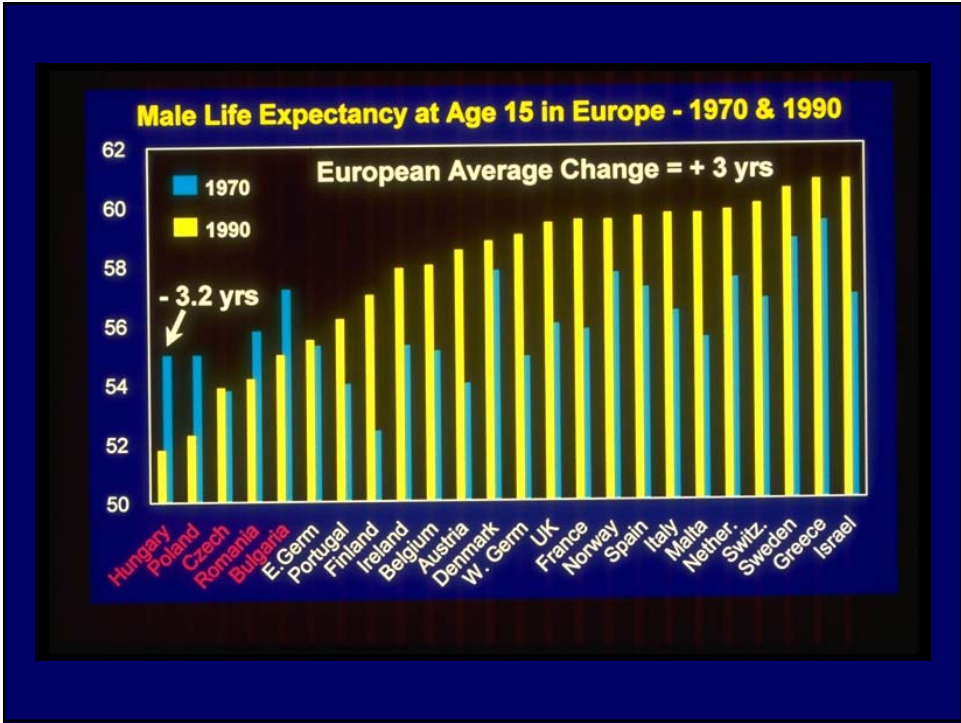
Figure 1

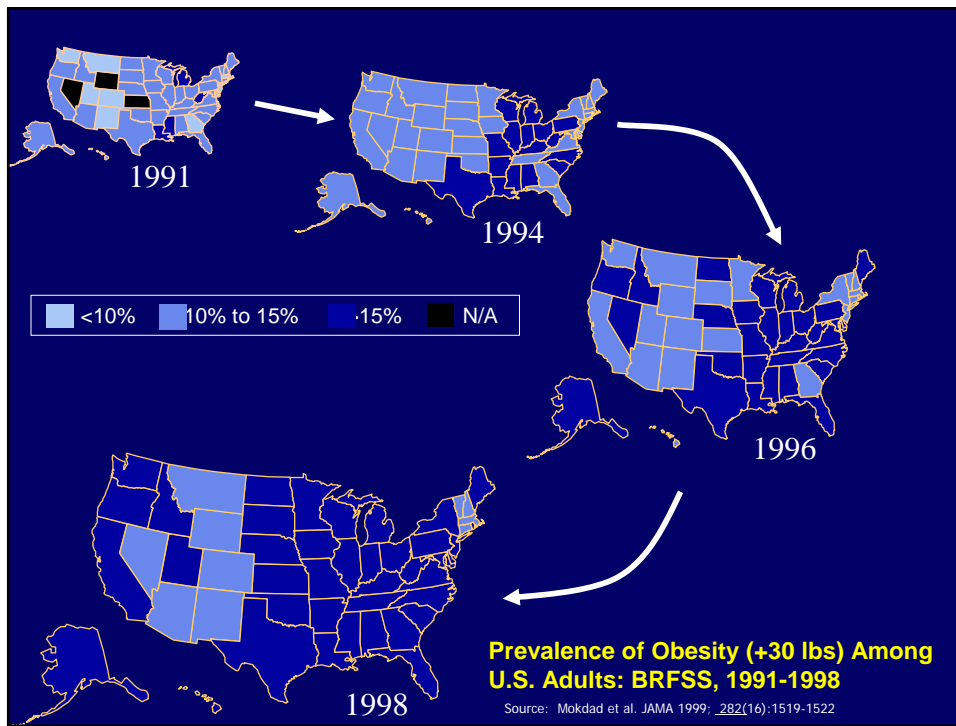


More than 150 years ago Rudolf Virchow, the great German pathologist, journeyed to Upper Silesia to investigate a great typhus epidemic. In his report to the Prussian government he focused not on a search for the critical bacilli, or the necessary animal vectors for transmission to humans. Instead, he called attention to the social, economic, and cultural factors responsible for the epidemic. In education and full employment, he argued, lay the cures for the prevention of future epidemics.

The primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social. Medicine and politics cannot and should not be kept apart.

Geoffrey Rose, *The Strategy of Preventive Medicine*, 1992



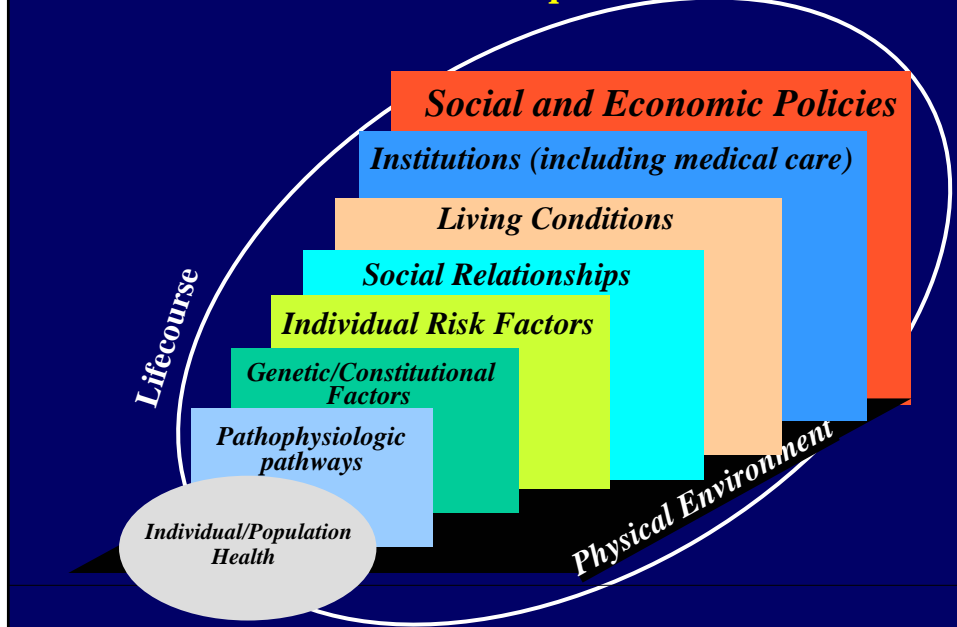


Heart Disease Death Rates, Age 25-64 Average Annual 1979 - 1989, Men

| Income 1980\$ | White | Black | B/W Ratio |
|---------------------|-------|-------|--------------|
| Less than \$10,000 | 324.1 | 390.8 | 1.21 |
| \$10,000 - \$14,999 | 255.4 | 292.8 | 1.15 |
| \$15,000 - \$24,999 | 136.9 | 142.2 | 1.04 |

Source: Health, United States, 1998

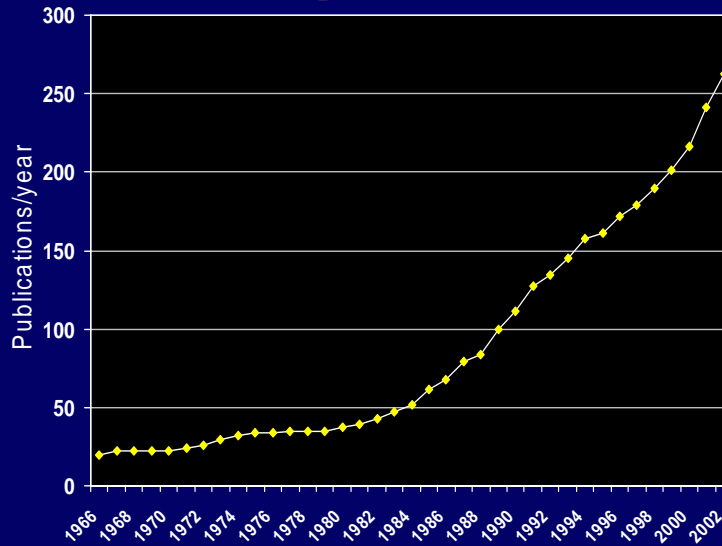
Determinants of Population Health and Health Inequalities



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Publications with Social Epidemiology in title,
abstract, or descriptors: MEDLINE, 1966-2002



What Do we Mean by Inequalities in
Health?

Inequality

Disparity

Inequity

There are many potential types of inequality/disparity/inequity

In what follows I will focus on socioeconomic inequalities

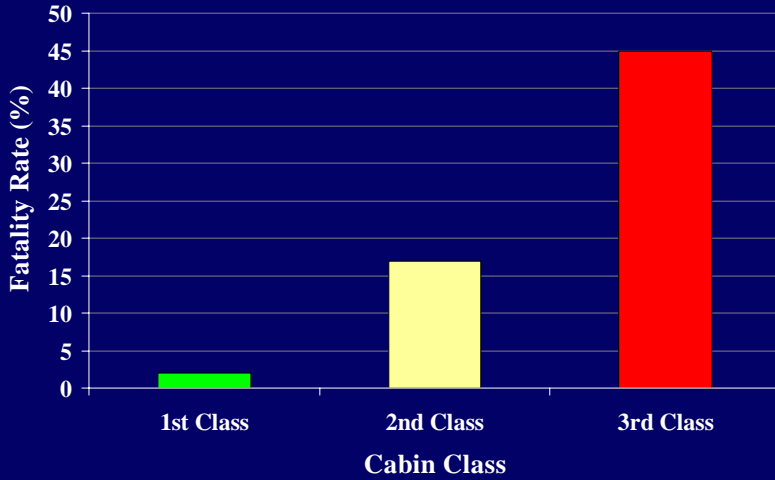
Socioeconomic Position and Health

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



Davey Smith et al.

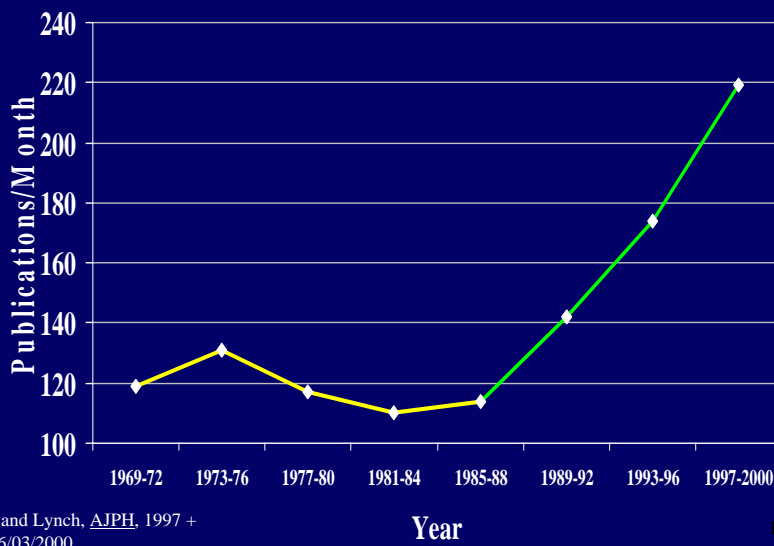
Fatality Rates for Women Passengers on the *Titanic*



Lord, 1955

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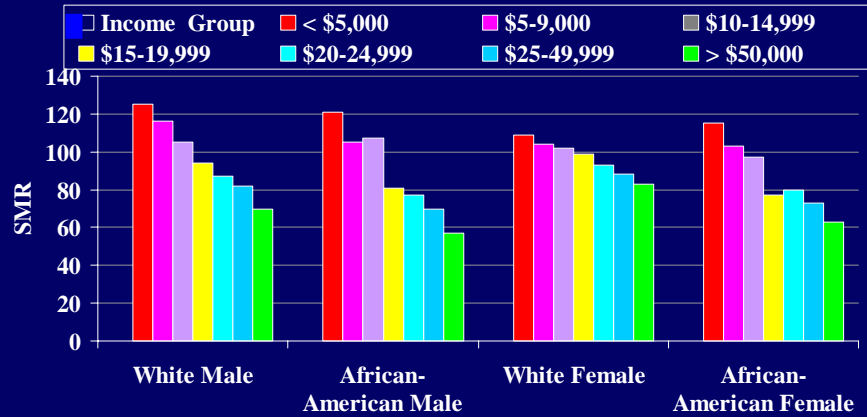
Number of publications per month with social class, socioeconomic factors, income or poverty listed as descriptors: MEDLINE search, 1969 through mid-2000.



Kaplan and Lynch, *AJPH*, 1997 +
update 6/03/2000

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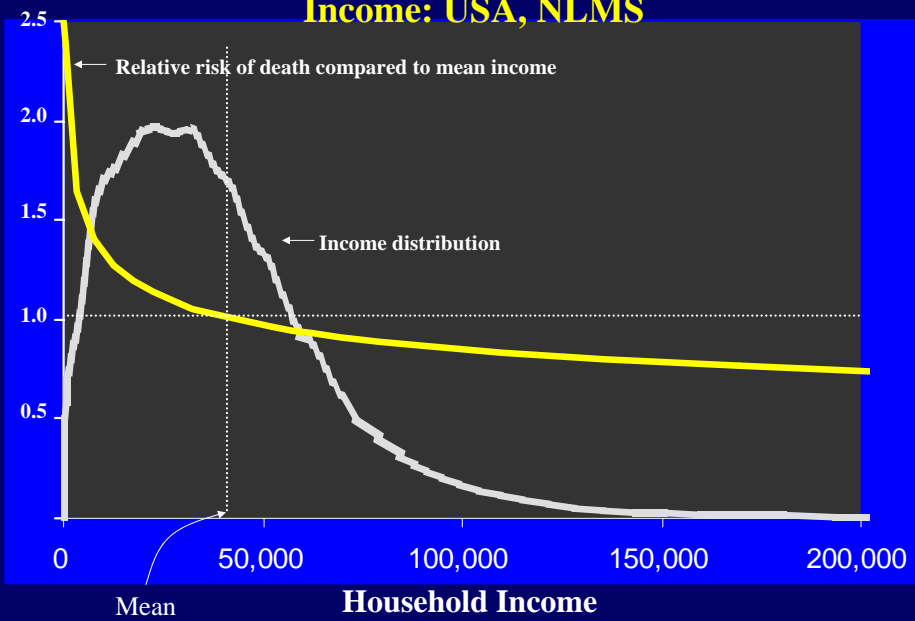
All-cause Mortality by Income NLMS, 25+ Years



Rogot et al., 1992

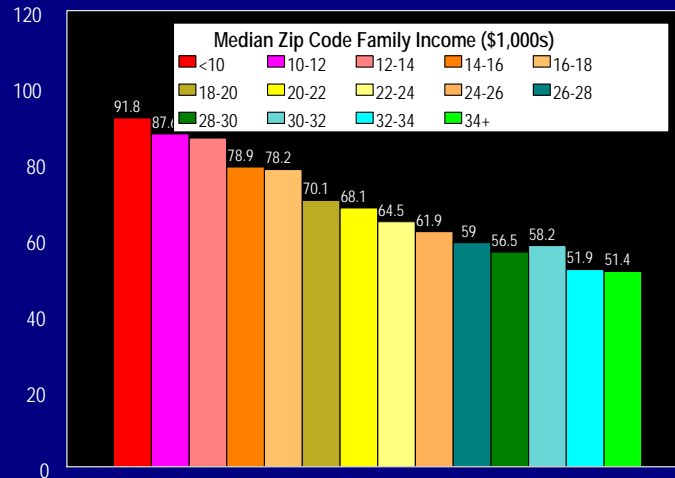
19

Relative Risk of Death by Income & the Distribution of Income: USA, NLMS



Wolfson, Kaplan, Lynch, Ross, Backlund, BMJ, 1999

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



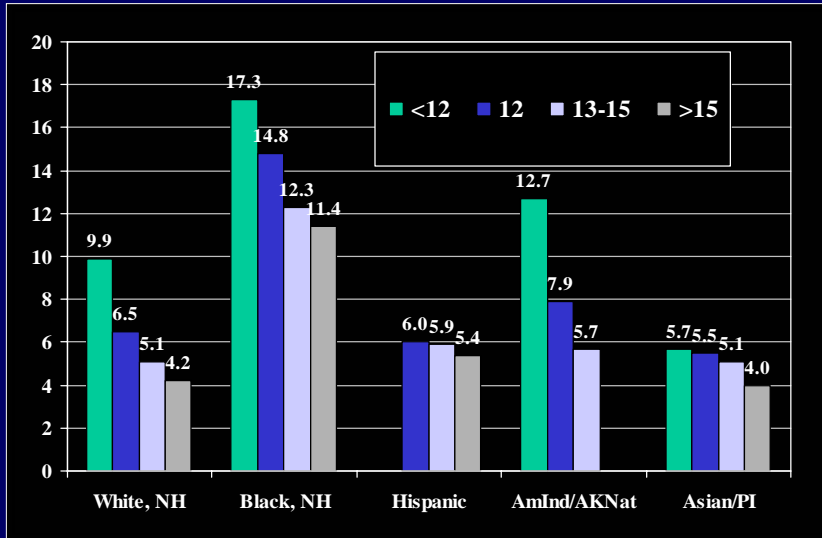
Davey Smith et al.,
1996

Socioeconomic Position and Health

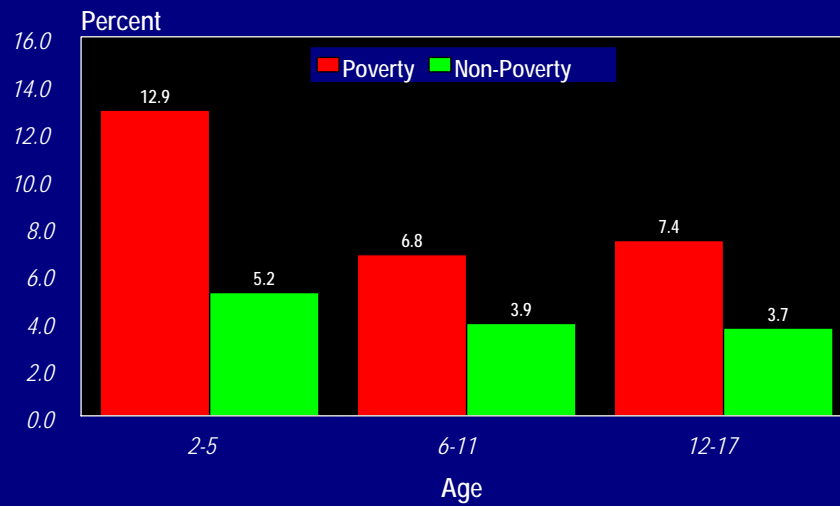
- Widespread
- **All age groups affected**
- Affects multiple organs and risk factors
- Not fixed in time



Infant Mortality Rates by Years of Education: United States, 1995, Mother 20+ years of age



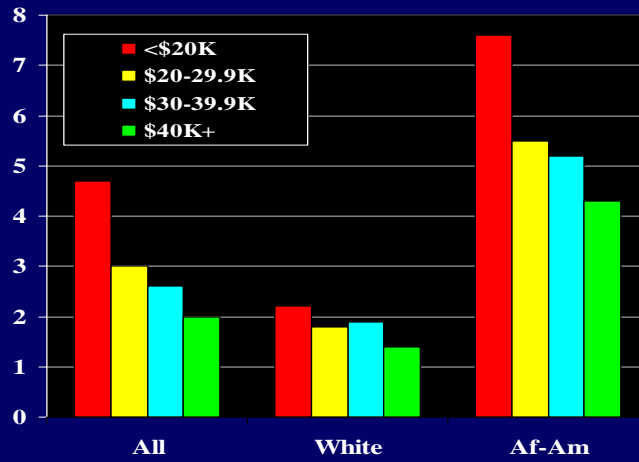
Stunting* by Age and Poverty Status



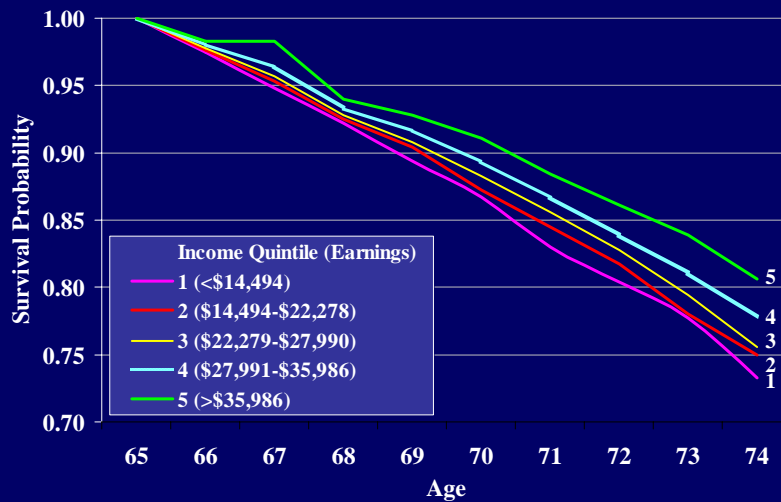
USDHHS, 1986

*height<5th percentile

Asthma Hospitalization Rate among children 1-4 years: U.S.,1989-91



Survival from Age 65 by Pre-Retirement Earnings Quintile 546,759 Canadian Males in Canada Pension Plan



Wolfson et al., 1993

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Socioeconomic Position and Health

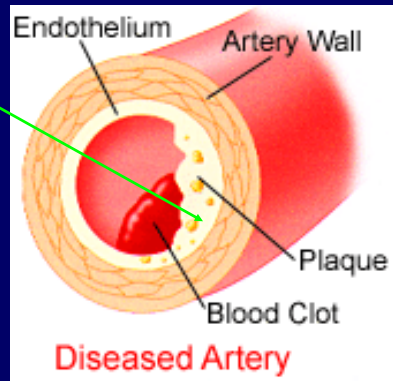
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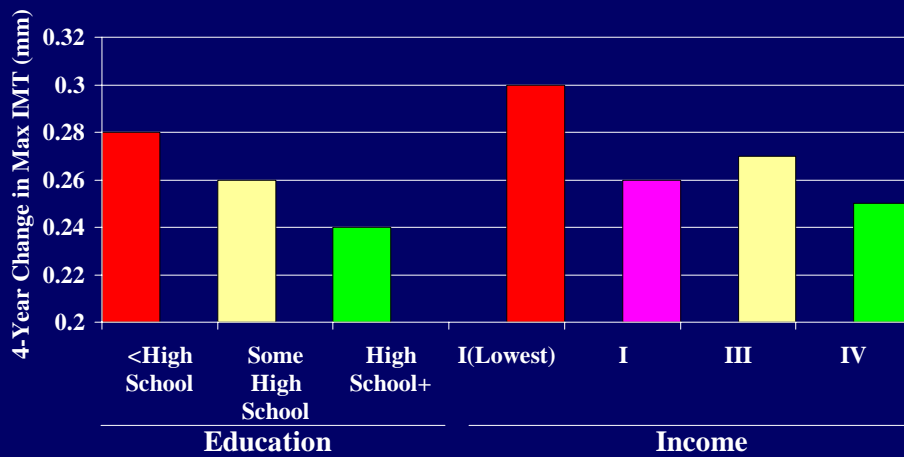
Chronic Conditions more Prevalent among those with < 12 Years of Education: NHIS, 1989, 65+ years

| | | |
|-------------------------------|---------------------|---------------------------|
| Arthritis | Gastritis | Cerebrovascular dis. |
| Gout | Kidney dis. | Hardening of the arteries |
| Intervertebral disc dis. | Indigestion | Varicose veins |
| Bunions | Diverticulitis | Chron. bronchitis |
| Psoriasis | Constipation | Asthma |
| Visual impairment | Goiter | Hay fever |
| Cataracts | Diabetes | Chron. sinusitis |
| Hearing impairment | Anemias | Emphysema |
| Speech impairment | Migraine | |
| Abs. of extremities | Neuralgia/Neuritis | |
| Paralysis | Kidney trouble | |
| Deformity or orth. Impairment | Ischemic heart dis. | |
| Ulcer | Other heart dis. | |
| Abd. hernia | Hypertension | |

Series 10, No. 129



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

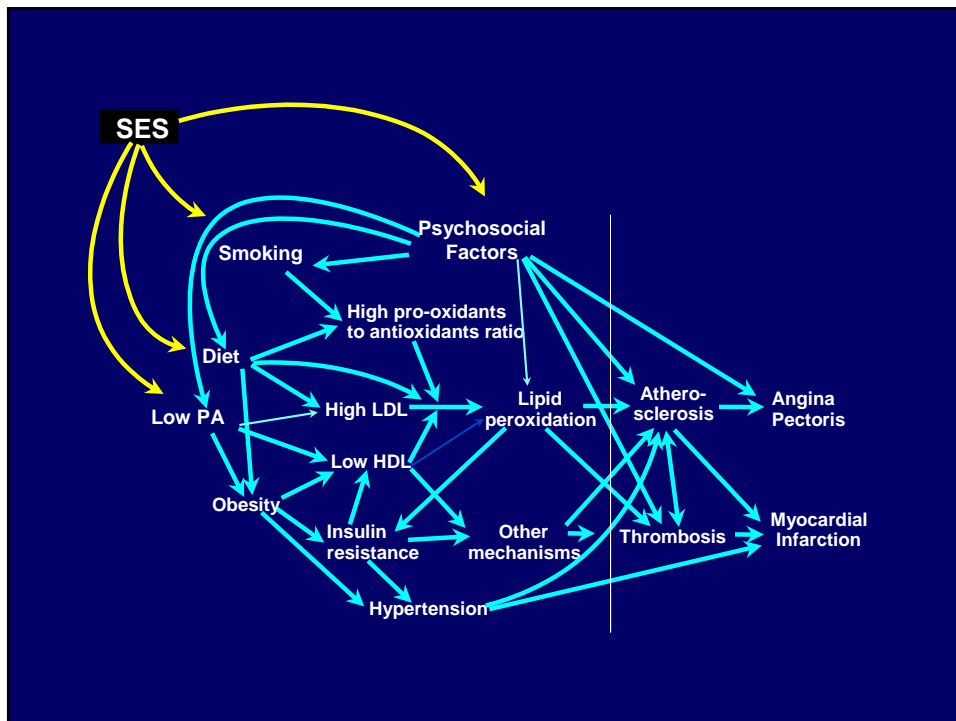


Lynch et al., 1997

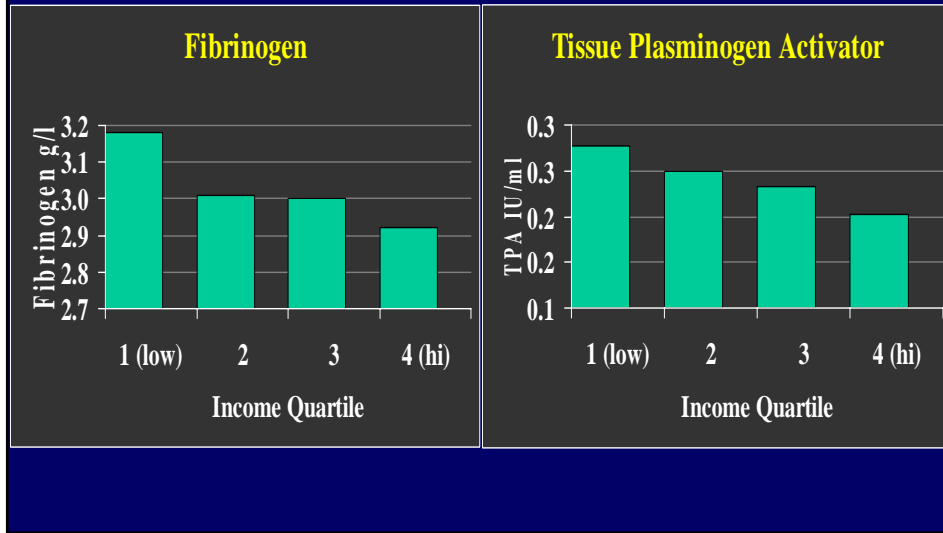
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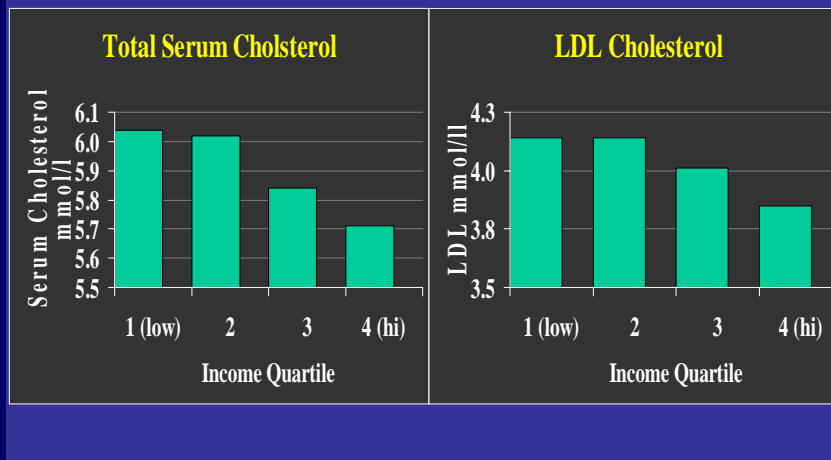
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Fibrinogen and TPA by Income Quartiles Kuopio Ischemic Heart Disease Risk Factor Study

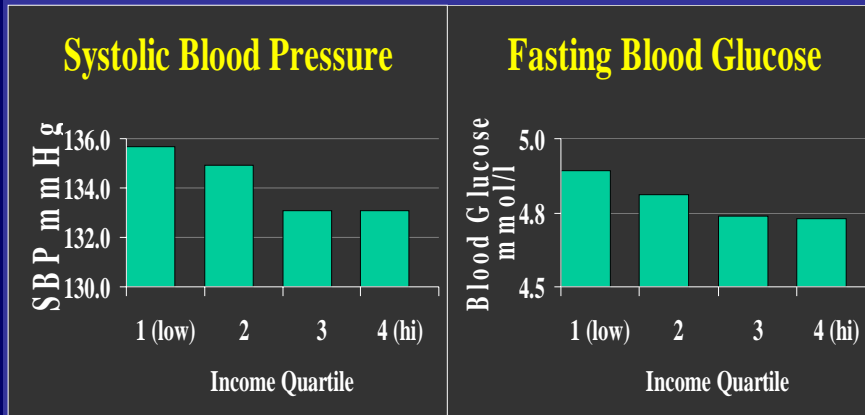


Total Serum Cholesterol and LDL by Income Quartiles Kuopio Ischemic Heart Disease Risk Factor Study

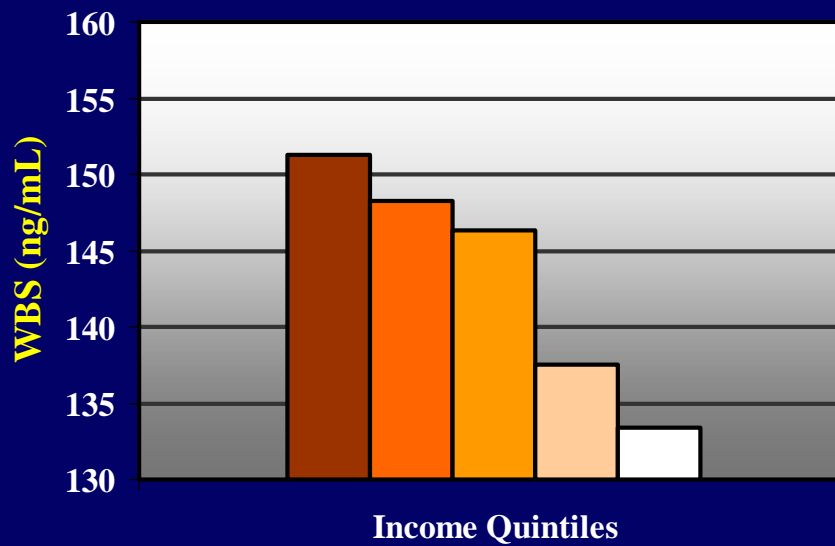


Systolic Blood Pressure and Fasting Glucose by Income Quartiles

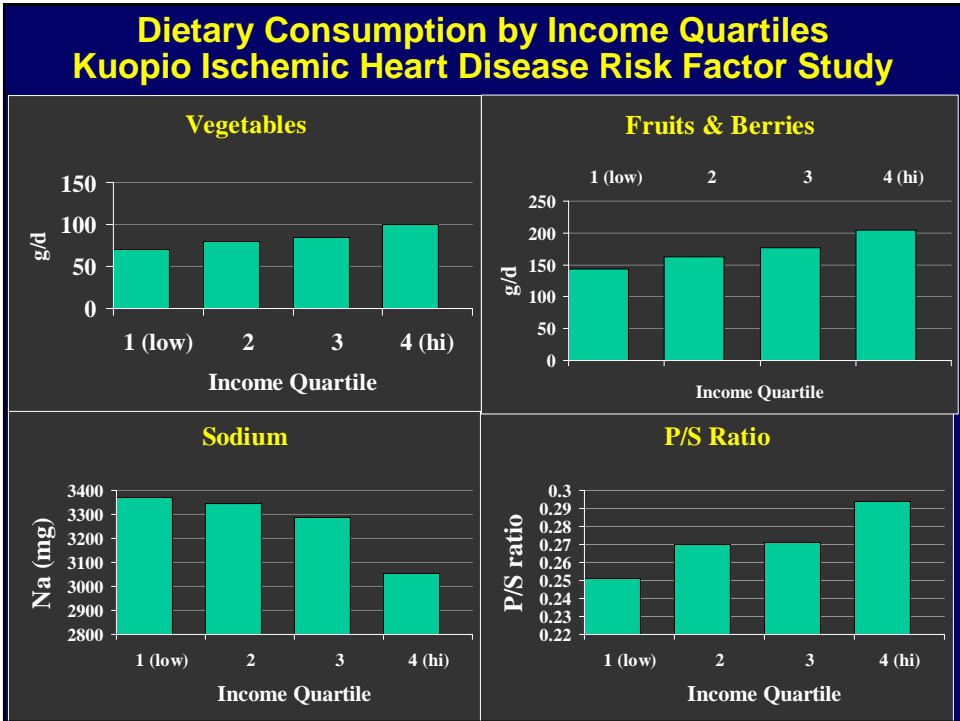
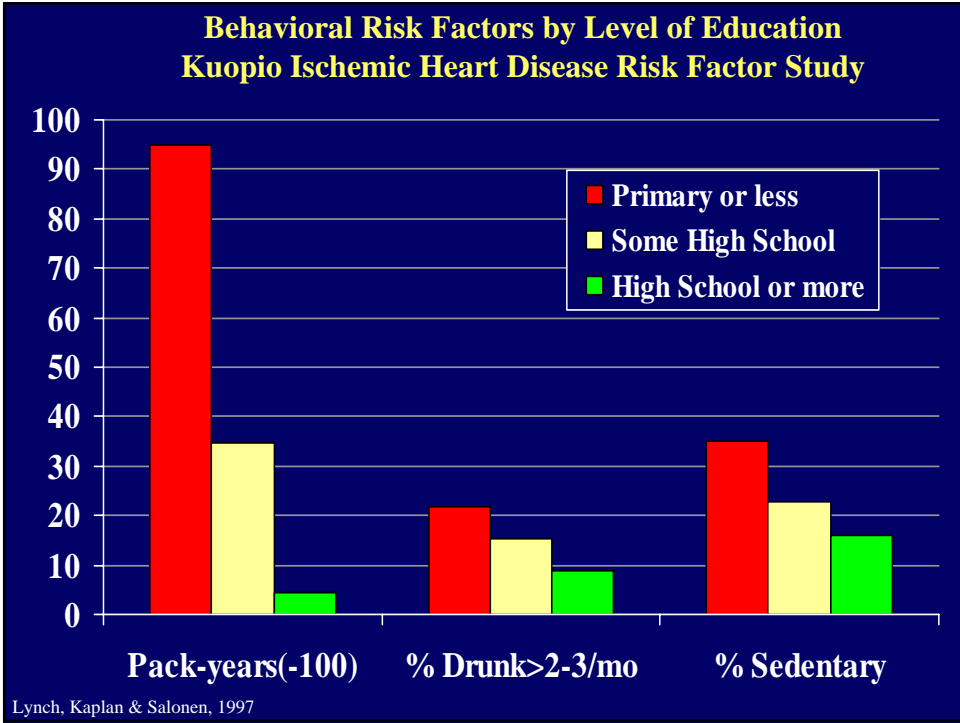
Kuopio Ischemic Heart Disease Risk Factor Study



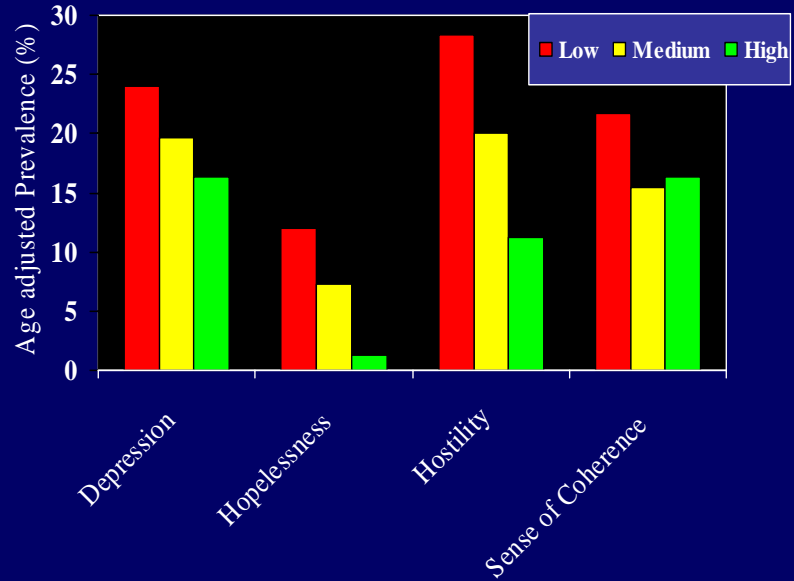
Income and Whole Blood Serotonin in the KIHD Study



Everson-Rose et al., in progress

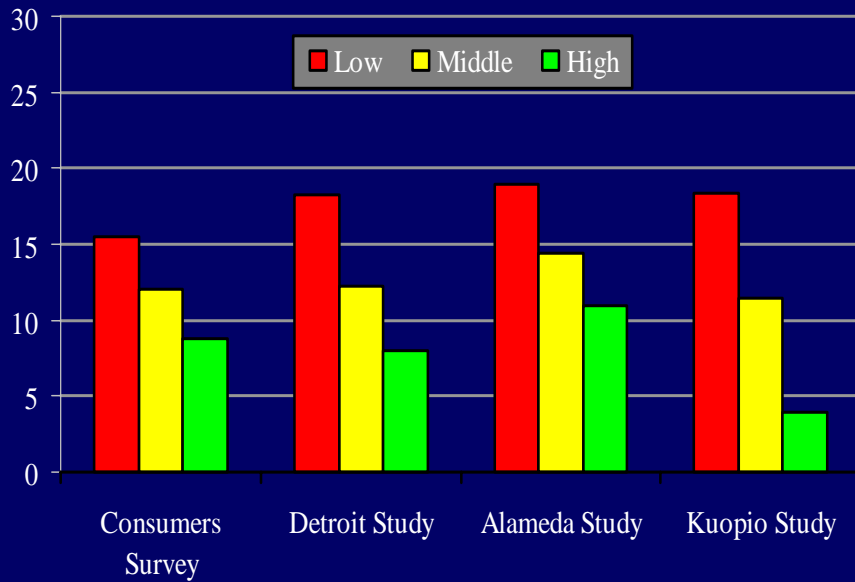


Prevalence (%) of Psychosocial Factors by Education
Kuopio Ischemic Heart Disease Risk Factor Study: 42-60 year-old men

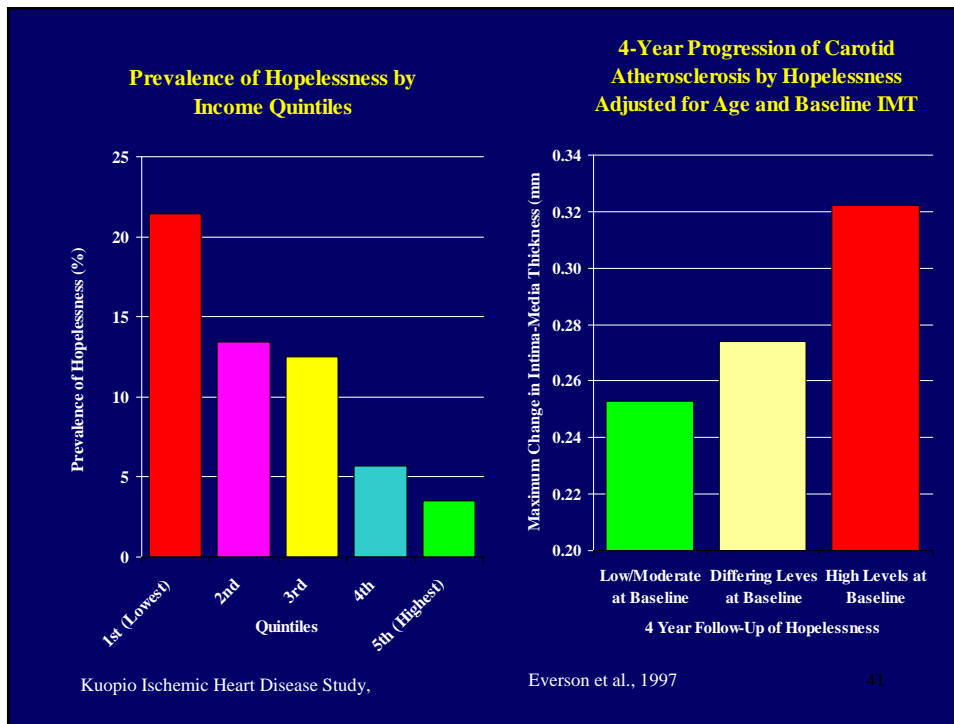


Lynch, Kaplan & Salonen, 1997

Prevalence of Depressive/Hopelessness Symptoms by Income Tertiles



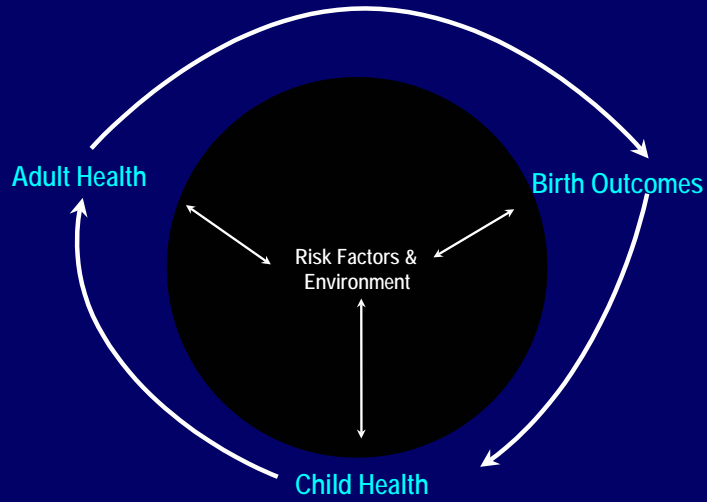
Everson et al., 2000



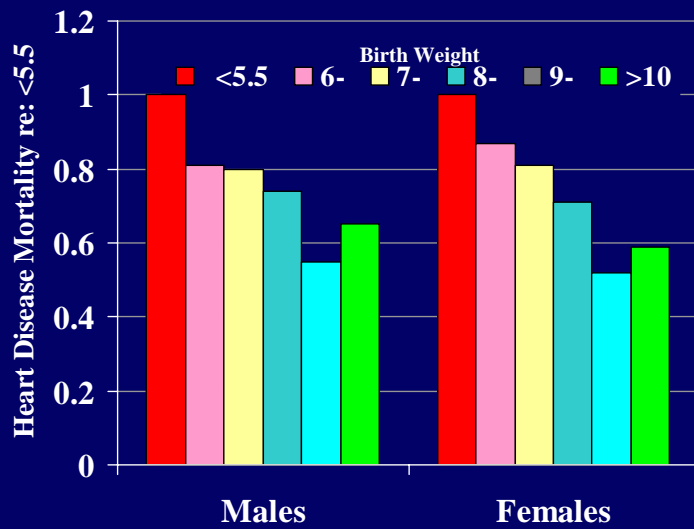
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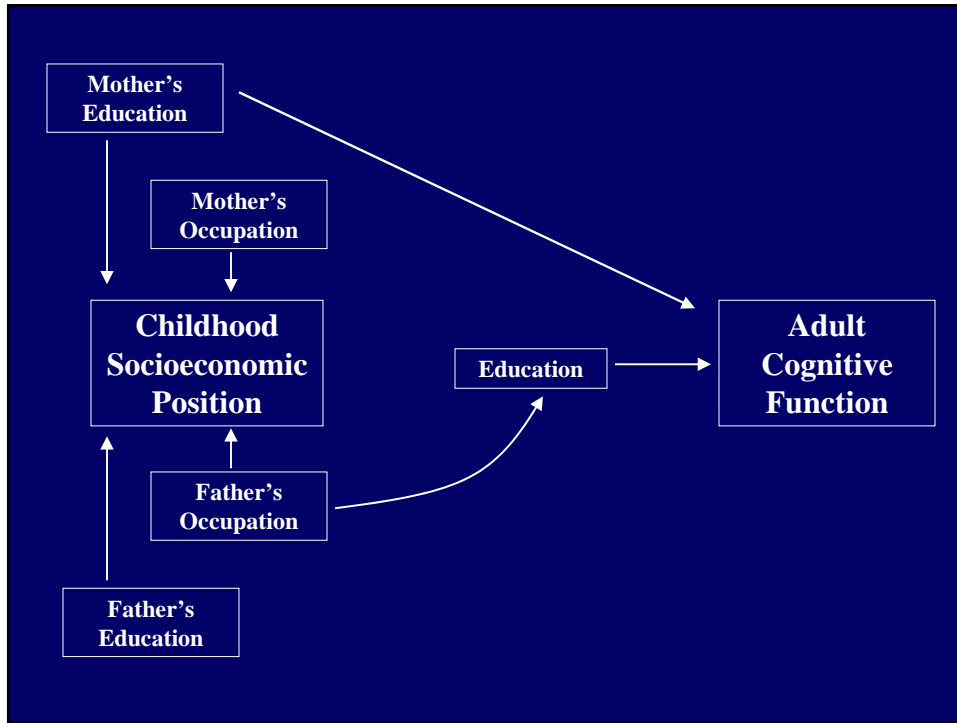
“The childhood shows the man, As the morning shows the day”
John Milton. *Paradise Lost* (1667), Line 220-221.



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



Osmond et al., 1993

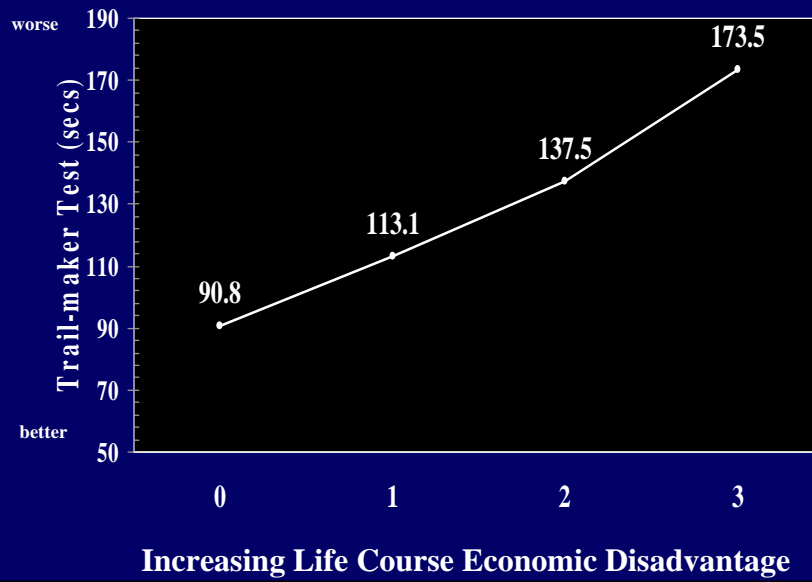


Early Environmental Events and Later Development

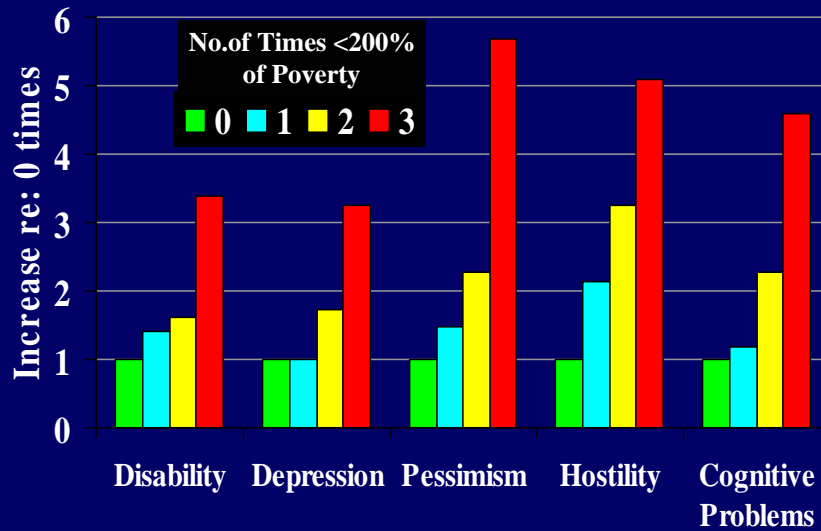
Various studies indicate the following more common for poor children:

- 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

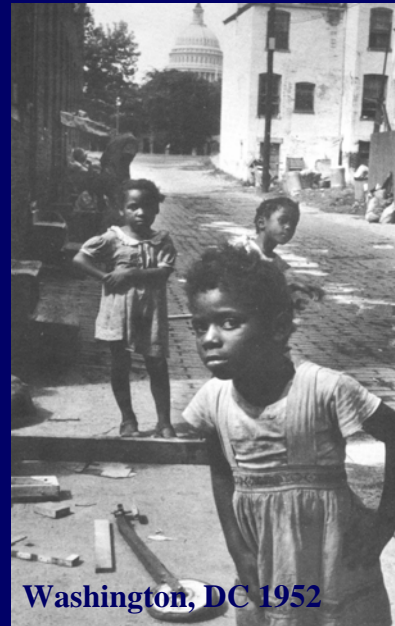


Lynch, Kaplan & Shema, NEJM, 1997

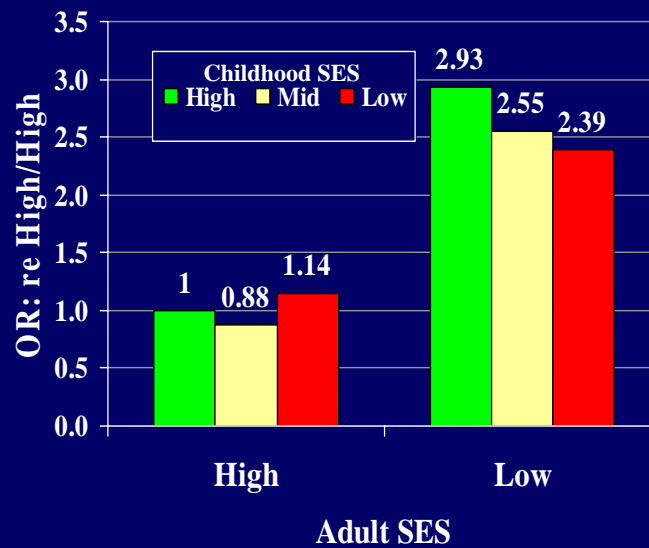
Grandmothers of the Current Generation



Barrington, 2003



Childhood and Adult SES and Mortality from All Causes Kuopio Ischemic Heart Disease Risk Factor Study



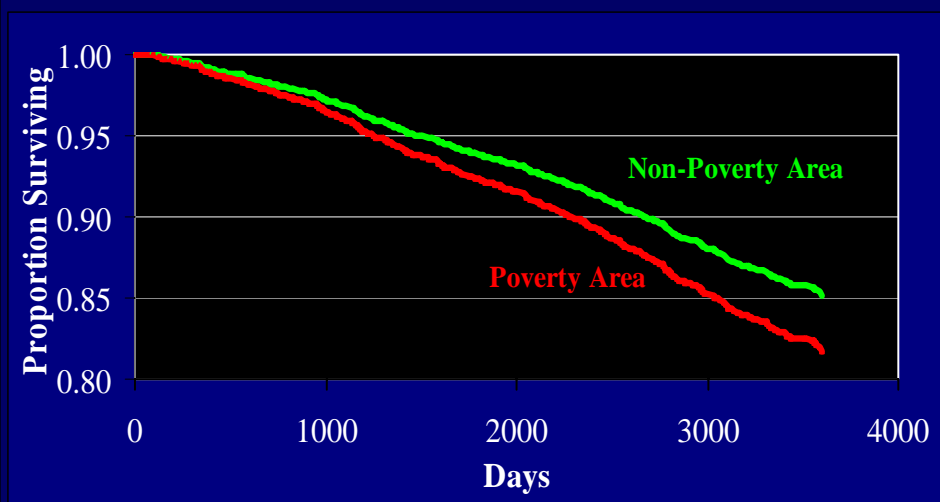
Lynch et al., 1994

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



Haan et al., 1987

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Those who lived in the poverty area over the next 9 years:

- had twice the decrease in physical activity
- were more likely to become depressed
- were twice as likely to become disabled
- were less likely to be “successfully” aging

Those in the Poverty neighborhoods

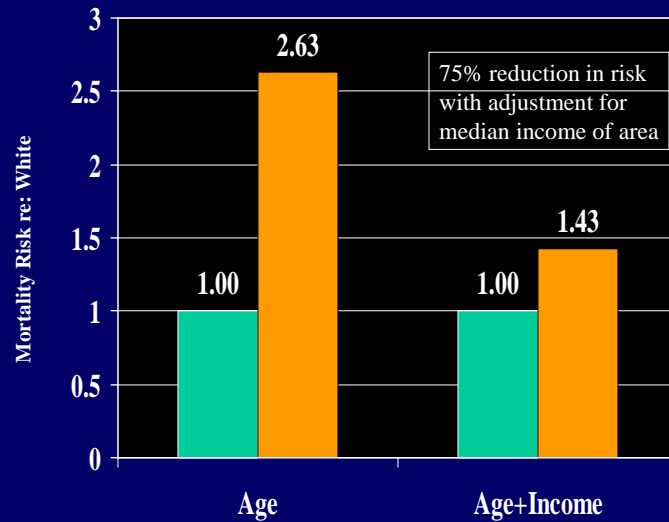
- **Were 5.8-8.0 lbs (M and F) heavier and gained 2.4-3.0 lbs (M & F) more over the next 9 years**

(after adjustment for age, race, education & income)

- **They were 3-8 times (depending on gender, race, and income) to develop NIDDM over the next 34 years**

Diabetes Mortality Differences between Whites and African-Americans before and after adjustment for Median Income of Area of Residence:

MRFIT: 320,909 men aged 35-47



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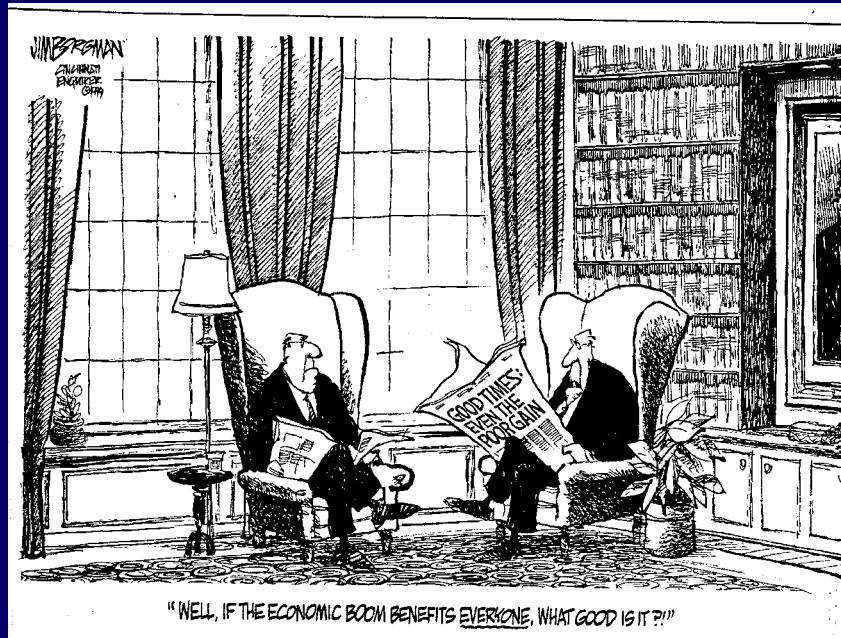
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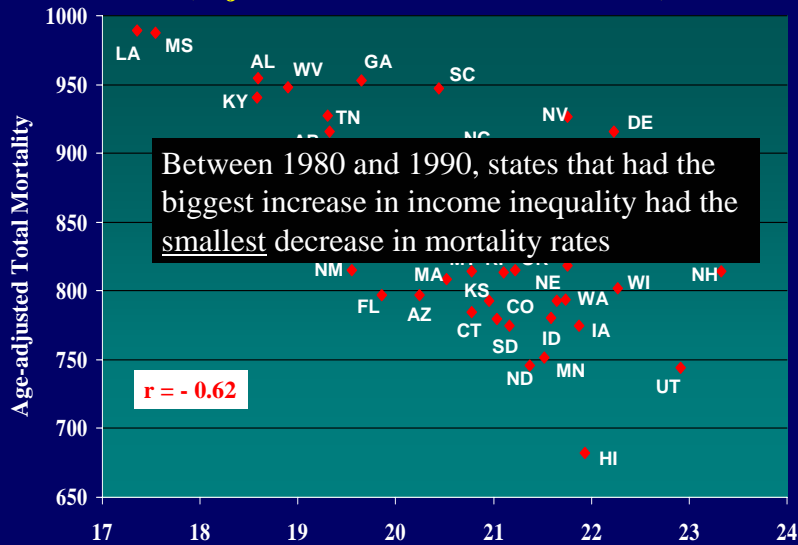
U.S. Income Inequality

“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



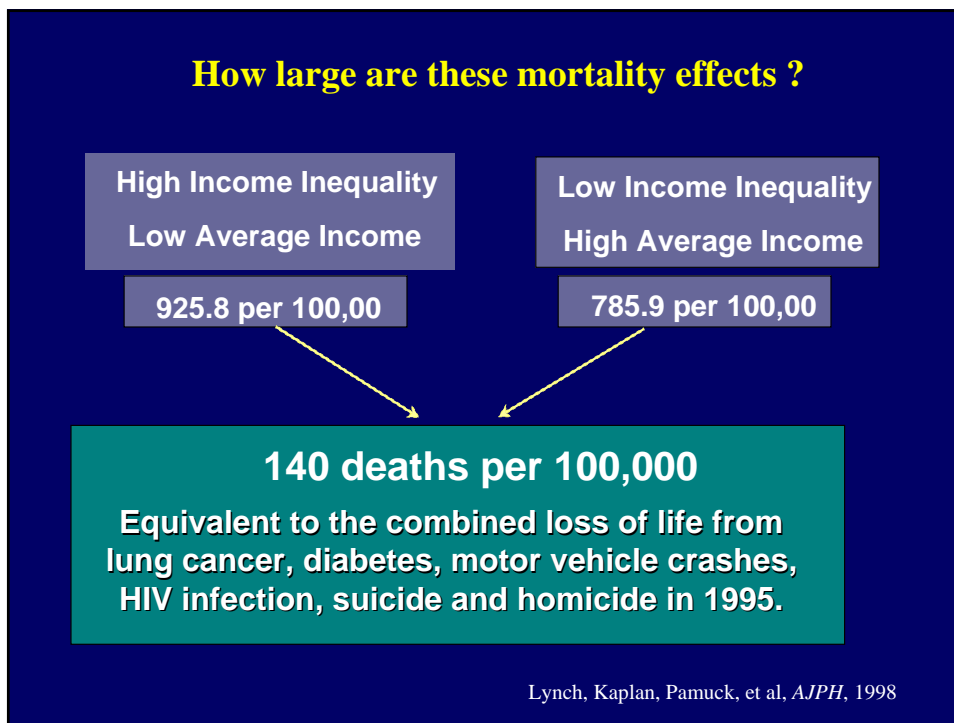
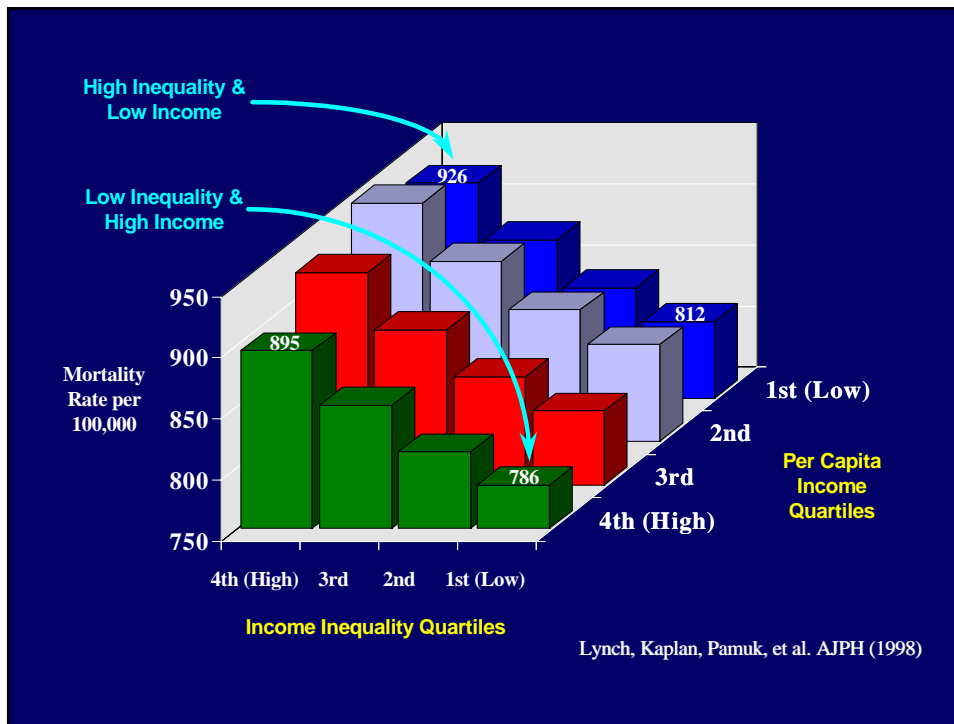
Income Inequality and Mortality in US States, 1990 (adjusted for State Median Income)

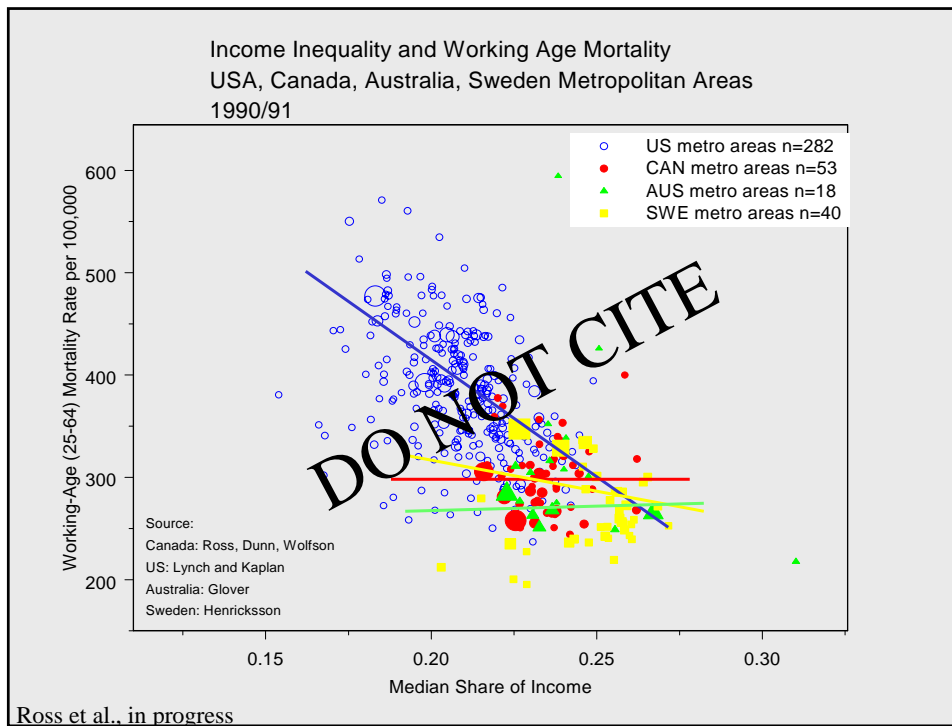


Kaplan et al. *BMJ* (1996) Income Share Held by Poorest 50% of the Population

Income Inequality and Selected Educational Indicators

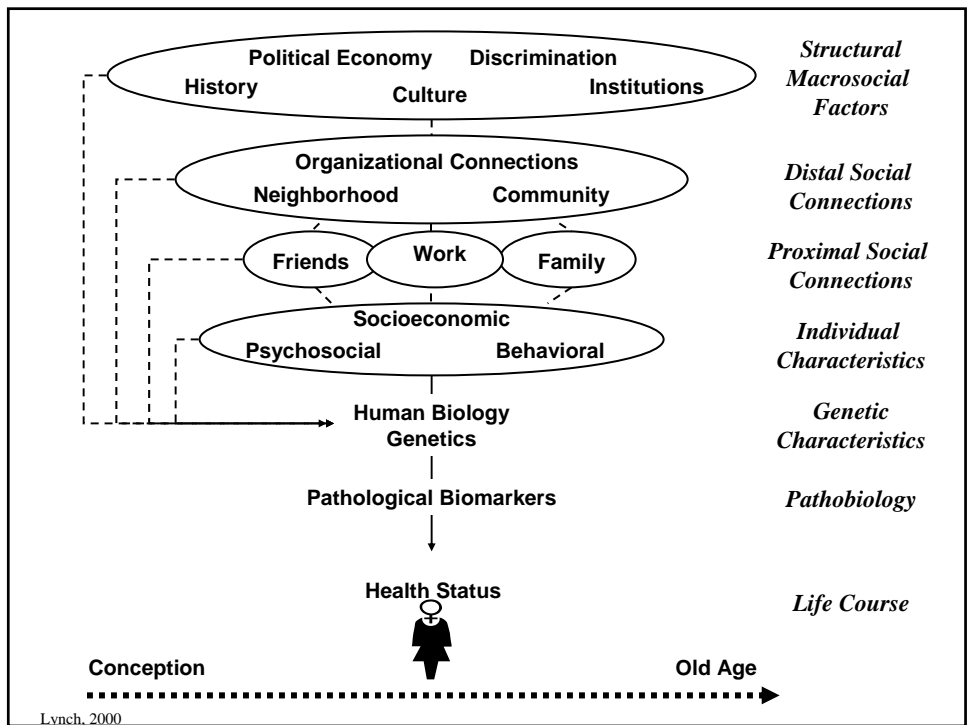
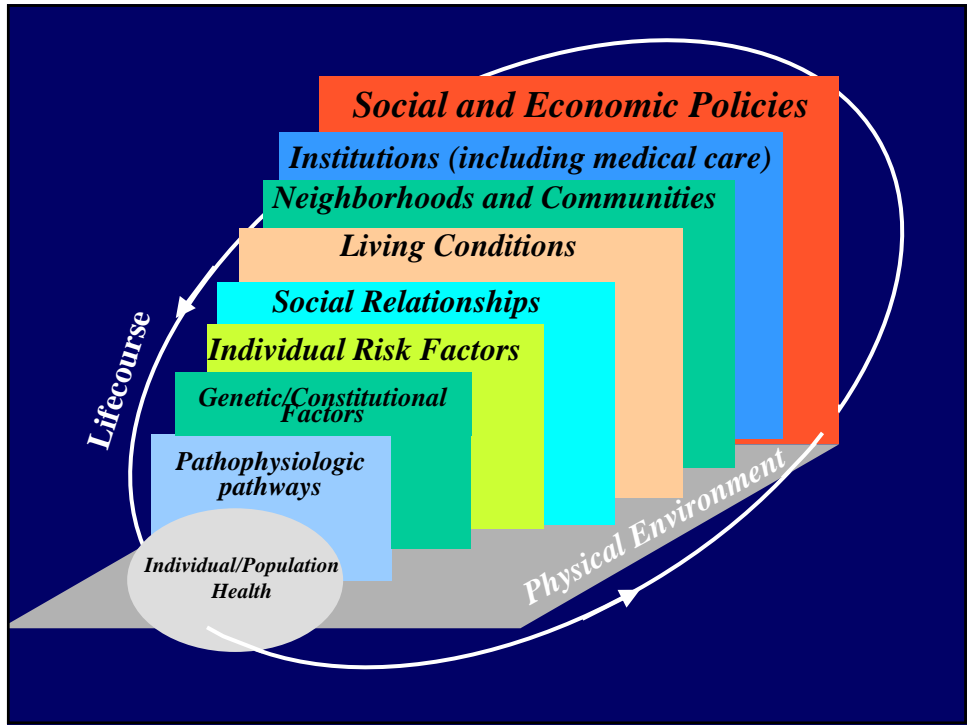
| | r |
|----------------------------|-------|
| % < High School Diploma | -0.71 |
| % High School Dropout | -0.50 |
| 4th Grade Reading Scores | -0.58 |
| 4th Grade Math Scores | -0.64 |
| Education / Total Spending | -0.32 |
| Library Books Per capita | -0.42 |

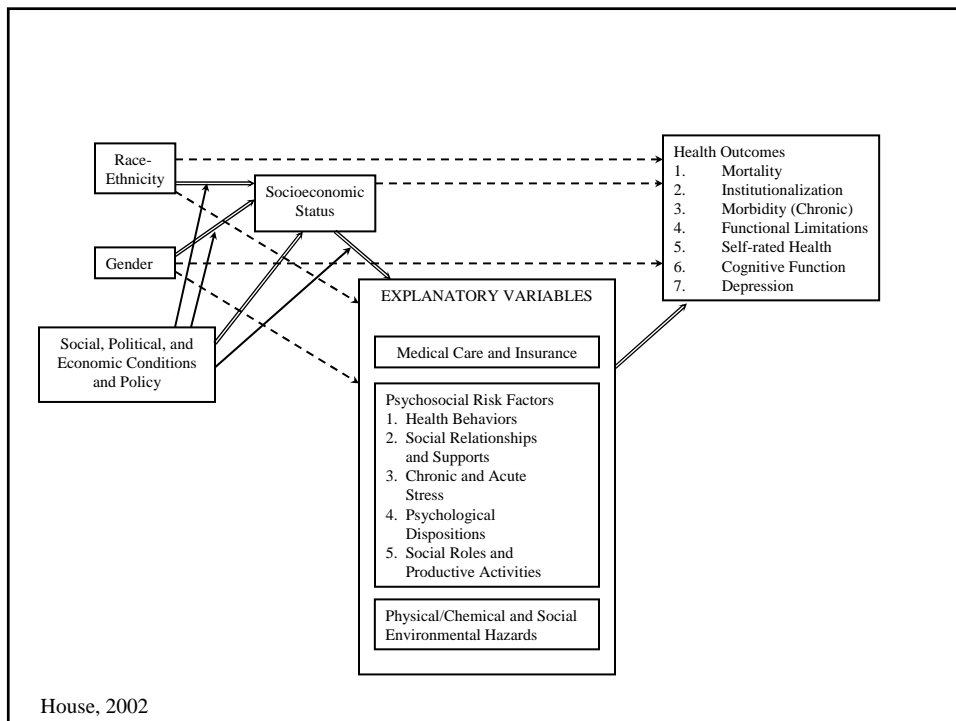
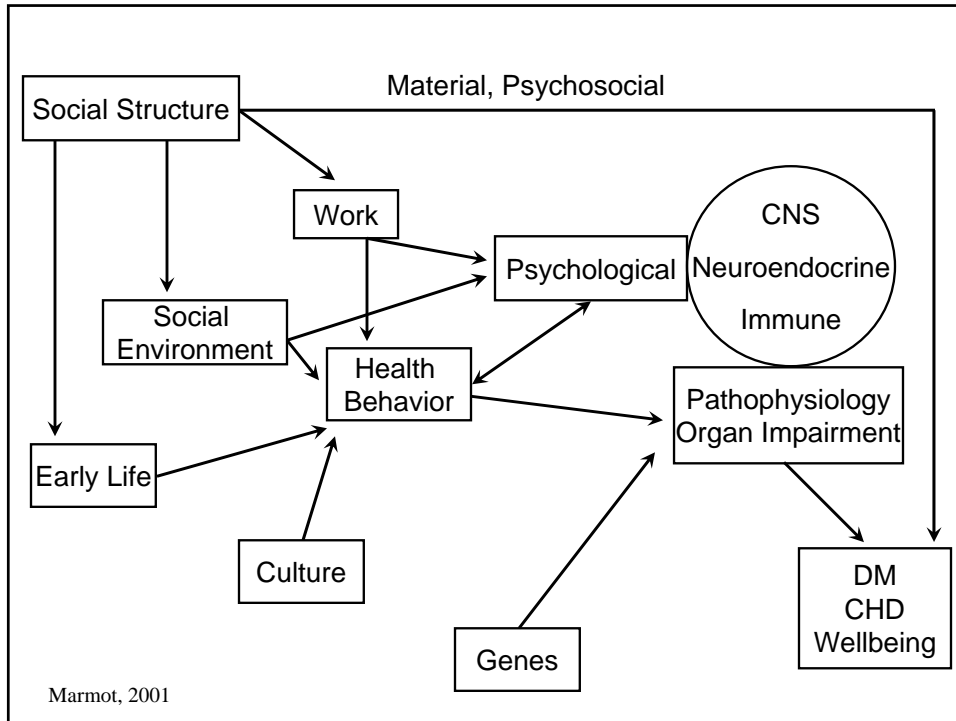


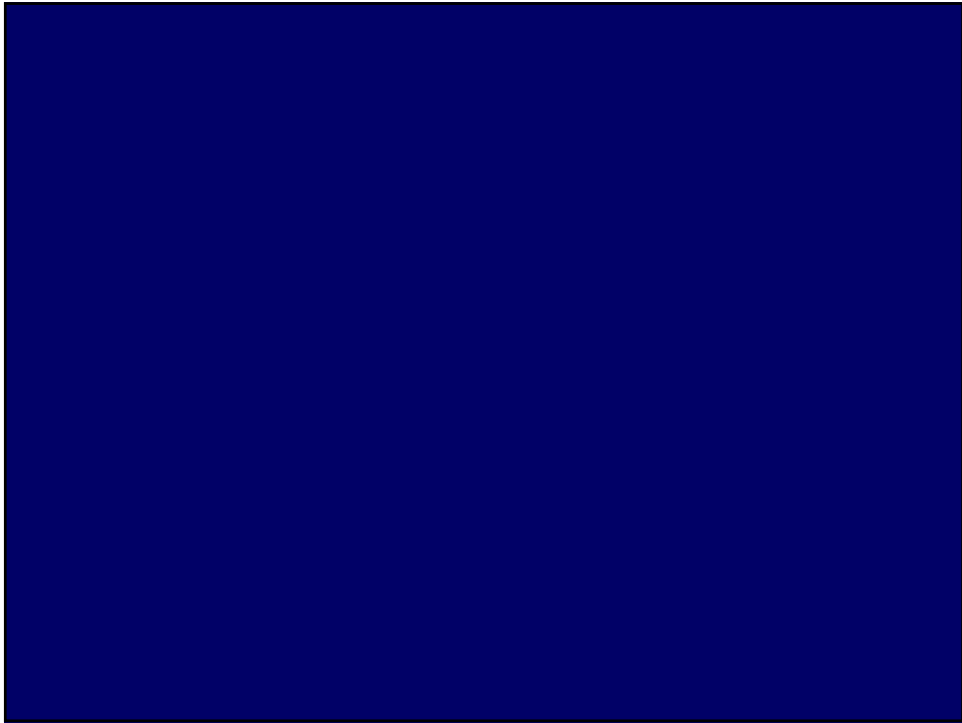


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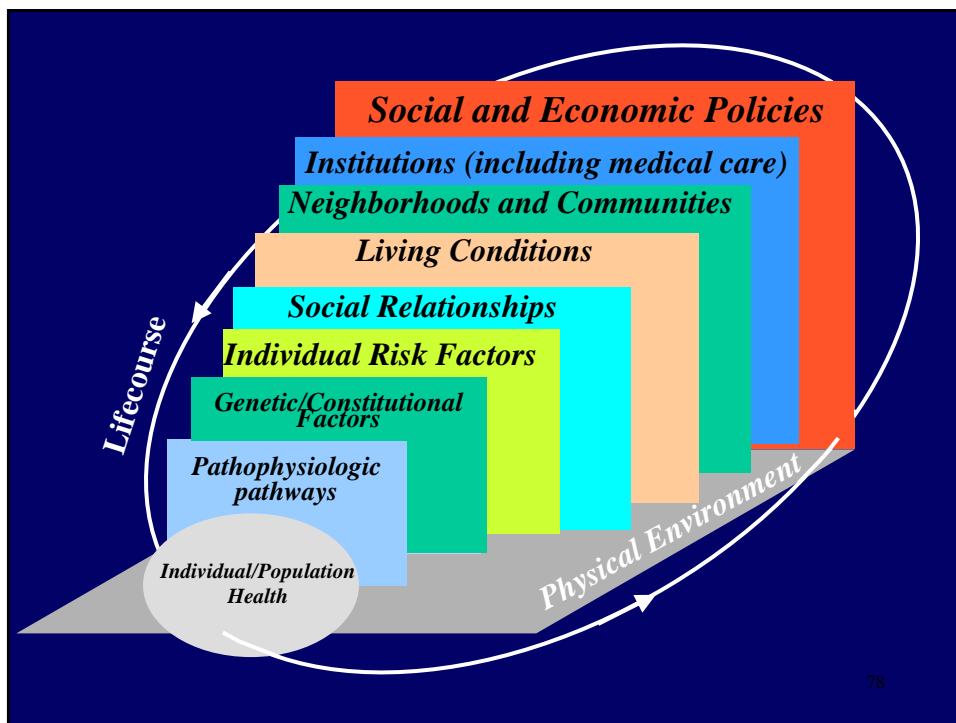
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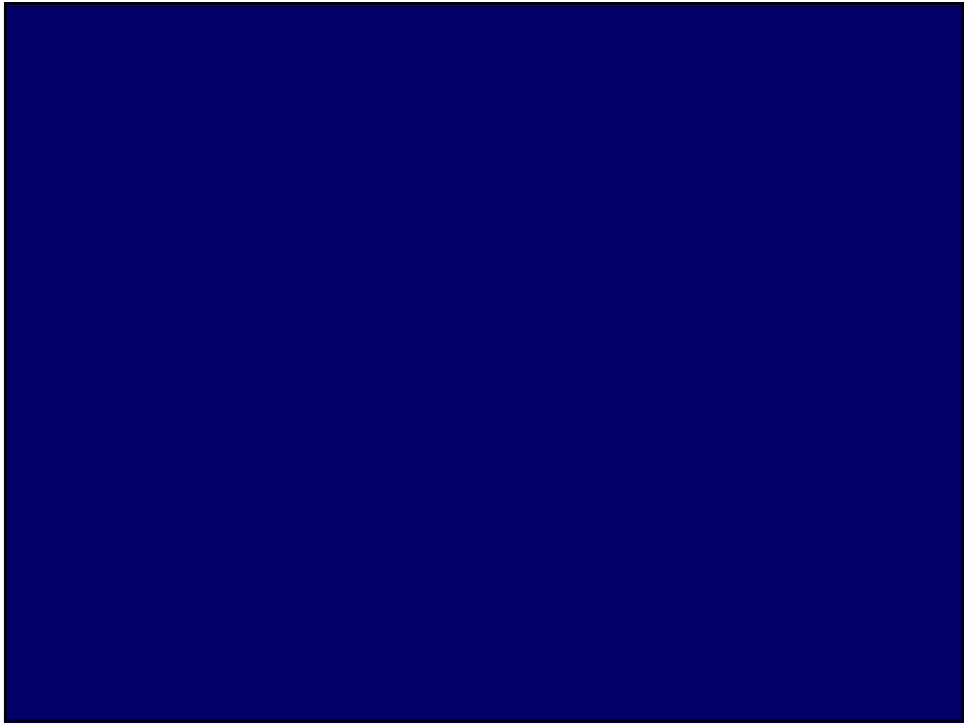


In a world of science in which the proximal and molecular explanation is seen as the “best,” a complete, satisfying, and useful understanding of inequalities in health may require the methodologic lens of complex systems and systems biology (even), the sensitivity and insights of the historian, poet and ethnographer, the knowledge of the biologist and ecologist, and the tools of the policy analyst and public health practitioner.

While there are many challenges, the study and remediation of inequalities in health could serve as a model for a new scientific paradigm– bridging the social and the biological.

A tall order, but an exciting one that holds promise for breaking the link between the social divides in society and the health divides, and in doing so perhaps (???) even helping to decrease the social divides.....





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 - **Globalization and health**
 - How do we understand?

- **1.2 billion people (20% of world's population) are estimated to live on less than \$1 per day**
- **3 billion (49% of world's population) on less than \$2 per day**
- **110 million primary school age children are out of school (60% of them girls)**
- **Many more live without adequate food, shelter, safe water, and sanitation.**

WHO, Global Poverty Report, July, 2000

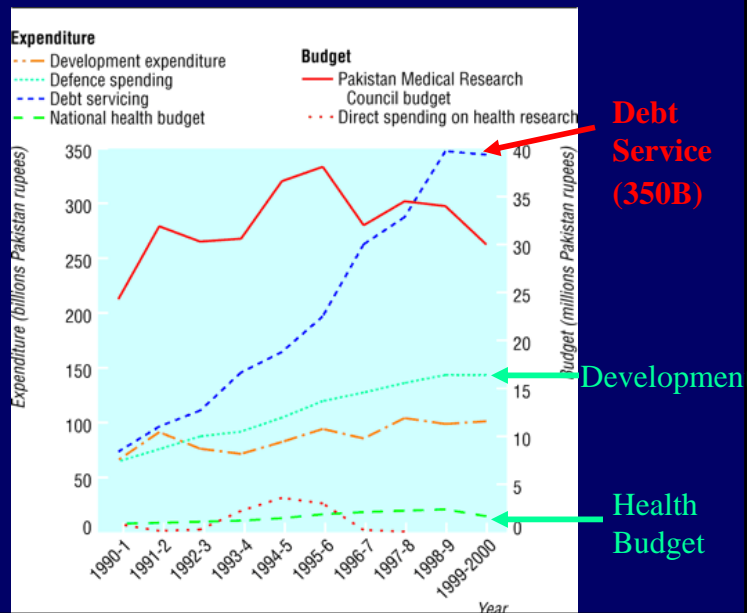
Social Impacts of 1998 Asian Financial Crisis in Thailand

Increases in:

- poverty
- unemployment
- divorce rates
- child abandonment
- drug use

Shivakumar et al., 2000

Debt Service vs. Other Expenditures in Pakistan

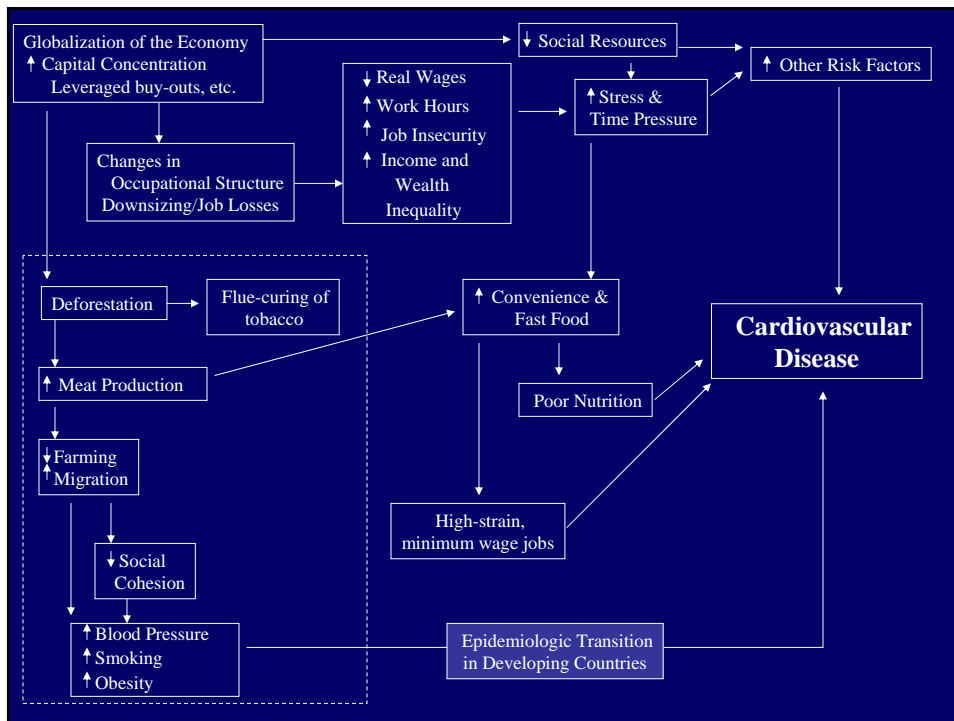


Bhutta, 2000

Cash Flow in and out of Pakistan from World Bank and IMF, 1999-2000

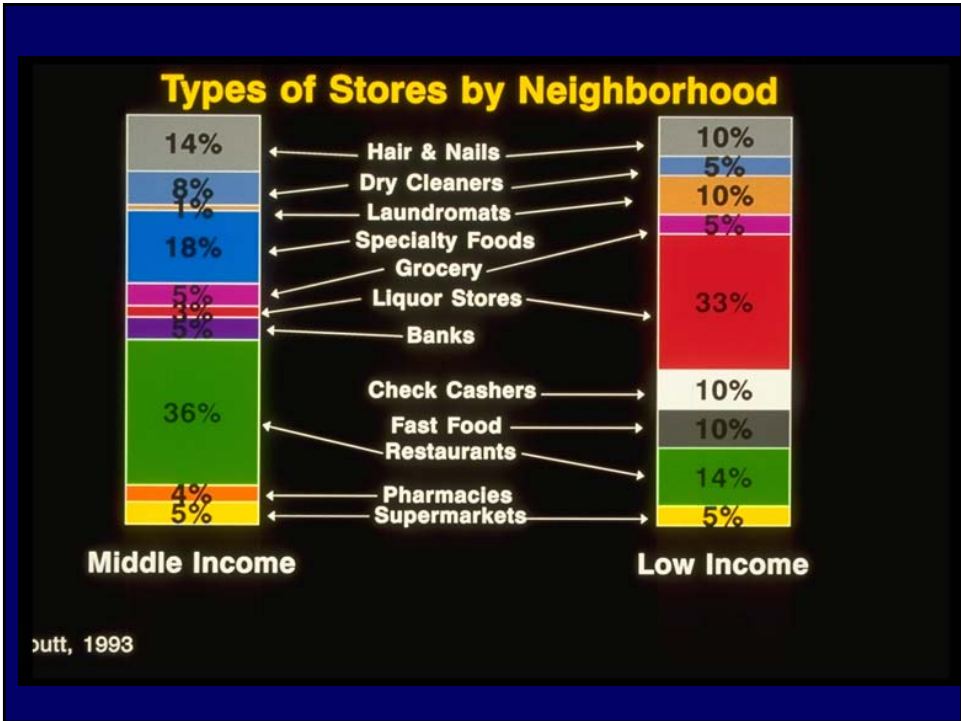
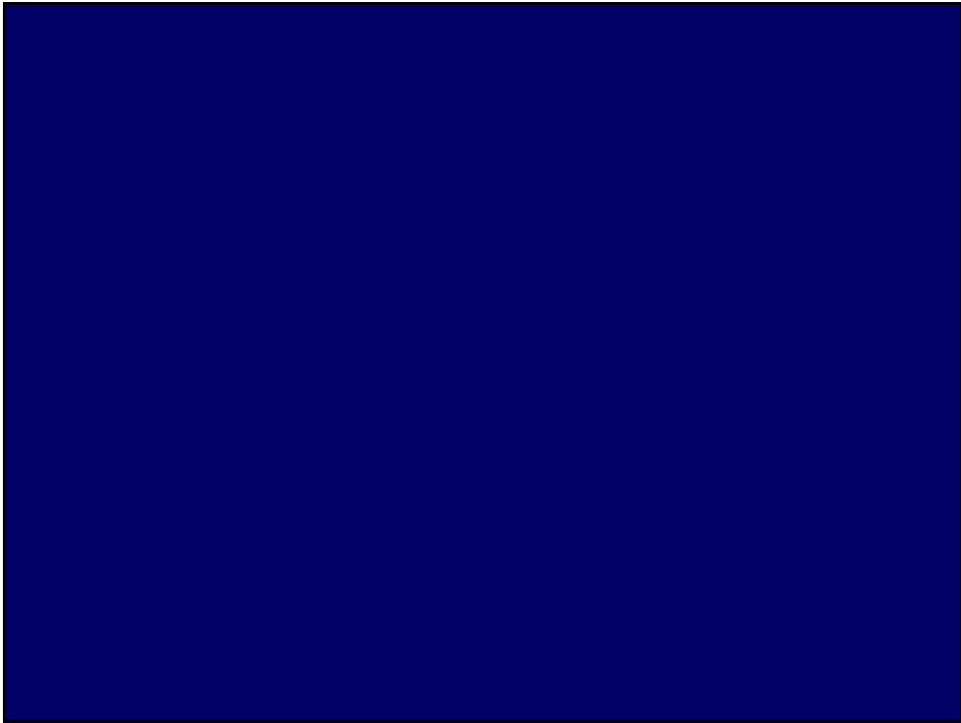
| | Into | Out of | Net |
|------------|------|--------|--------|
| World Bank | 250 | 514.2 | -264.2 |
| IMF | 0 | 329.1 | -329.1 |

Bhutta, 2000



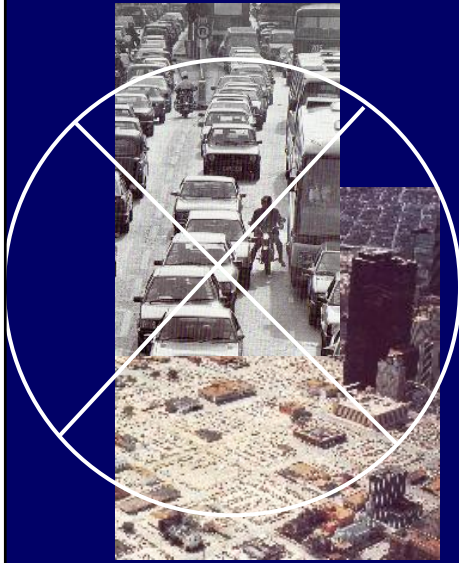
Upstream and Downstream Approaches to Inequalities in Health

- The 800 lb. genome gorilla and health inequalities
- Socioeconomic inequalities in health
- Some current explorations (briefly)
 - The downstream/bloodstream side of inequality
 - The life course and cumulative disadvantage
 - Communities as crucibles for growing health inequality
 - Economic equity and health
 - Globalization and health
 - **How do we understand?**



New Urbanism

Small, self-contained neighborhoods with the center no more than a quarter of a mile from the edge -- a reasonable walking distance. Improved public transit systems and greater integration of different types of land uses at the neighborhood level.



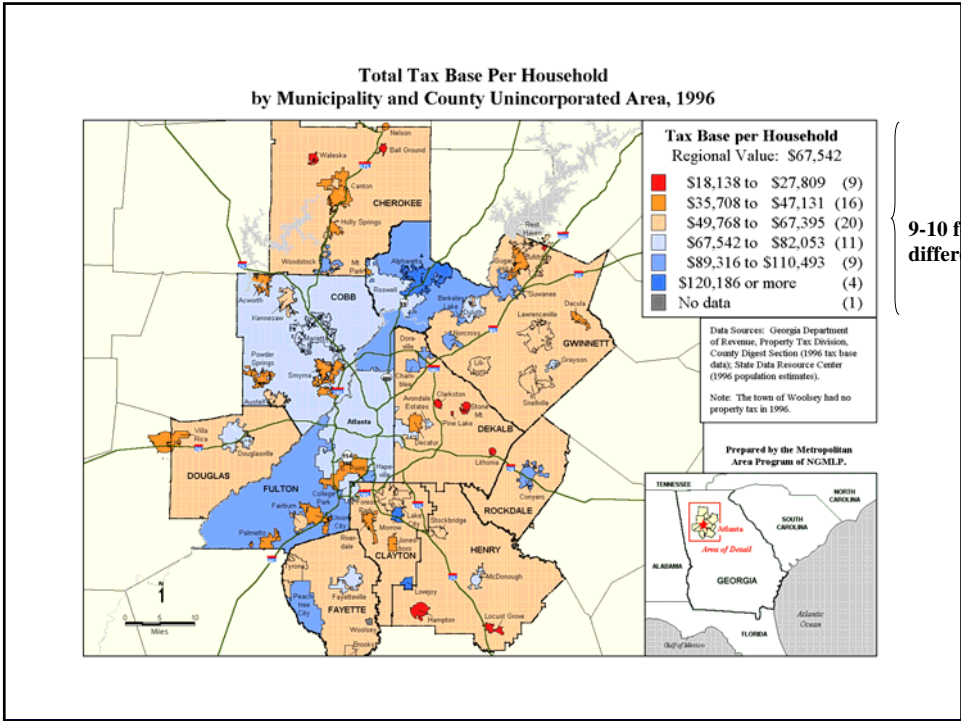
VS



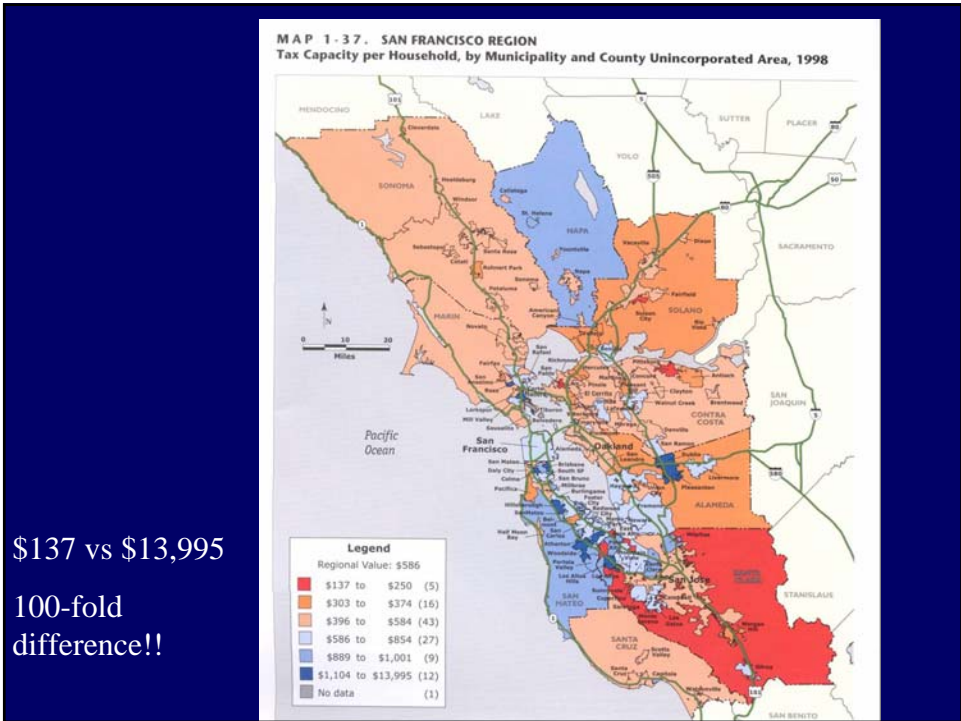
TABLE 7 - 2. Geopolitical Fragmentation in the 25 Largest Metropolitan Areas

| Metropolitan area | Total local governments | Population living in central city (%) | Geopolitical fragmentation index |
|----------------------|-------------------------|---------------------------------------|----------------------------------|
| Pittsburgh | 418 | 14.8 | 12.0 |
| St. Louis | 312 | 13.8 | 8.8 |
| Cincinnati | 235 | 18.0 | 6.7 |
| Minneapolis-St. Paul | 344 | 22.4 | 5.5 |
| Cleveland | 267 | 17.1 | 5.4 |
| Boston | 296 | 9.6 | 5.3 |
| Detroit | 335 | 18.4 | 3.3 |
| Kansas City | 182 | 34.6 | 3.1 |
| Atlanta | 127 | 11.4 | 3.1 |
| Philadelphia | 442 | 24.7 | 3.0 |
| Chicago | 567 | 31.7 | 2.1 |
| Milwaukee | 113 | 36.1 | 1.9 |
| Dallas | 196 | 23.1 | 1.8 |
| Portland | 87 | 23.2 | 1.8 |
| Seattle | 94 | 15.9 | 1.8 |
| Miami | 57 | 10.5 | 1.5 |
| San Francisco | 114 | 11.1 | 1.5 |
| Denver | 74 | 21.9 | 1.5 |
| Tampa | 39 | 13.0 | 1.4 |
| Washington, D.C. | 158 | 17.1 | 1.3 |
| New York | 756 | 37.3 | 1.0 |
| Houston | 123 | 41.1 | 0.7 |
| Los Angeles | 182 | 23.0 | 0.5 |
| Phoenix | 34 | 42.1 | 0.3 |
| San Diego | 19 | 43.7 | 0.2 |

Source: U.S. Census Bureau.



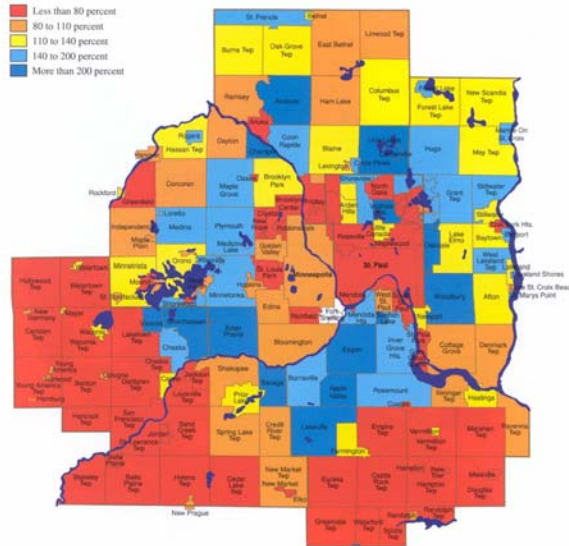
9-10 fold
differ



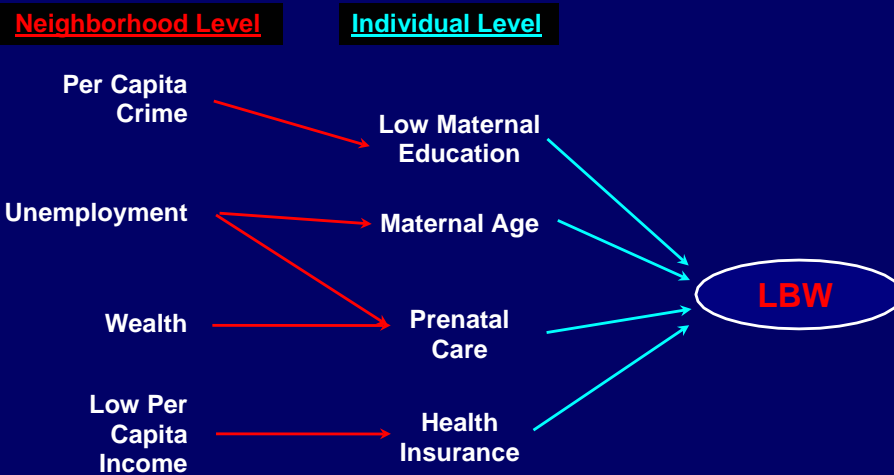
\$137 vs \$13,995

100-fold
difference!!

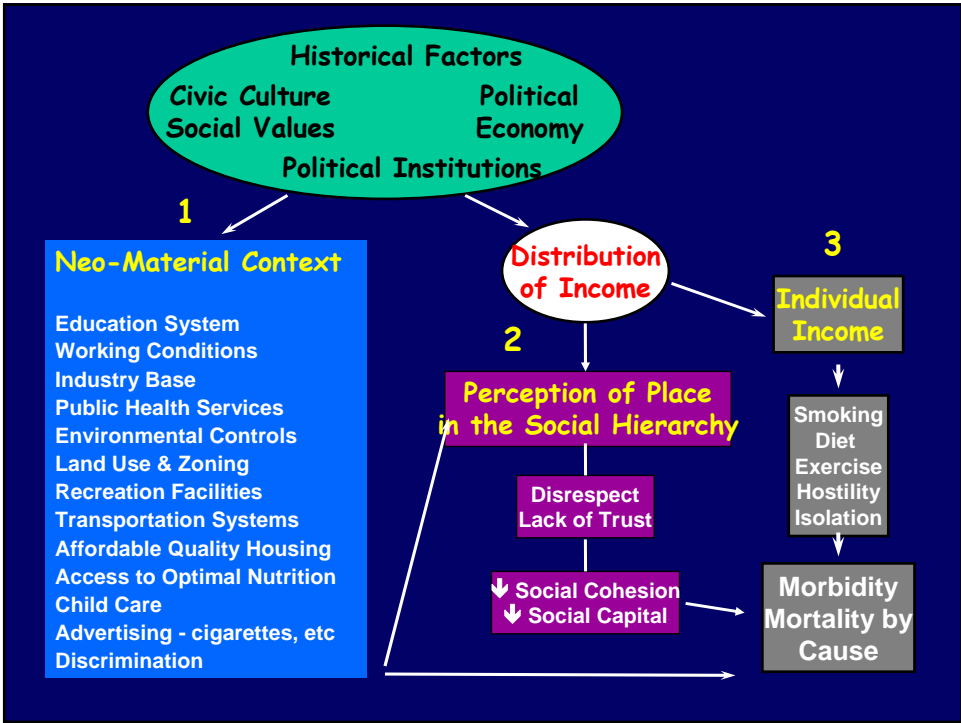
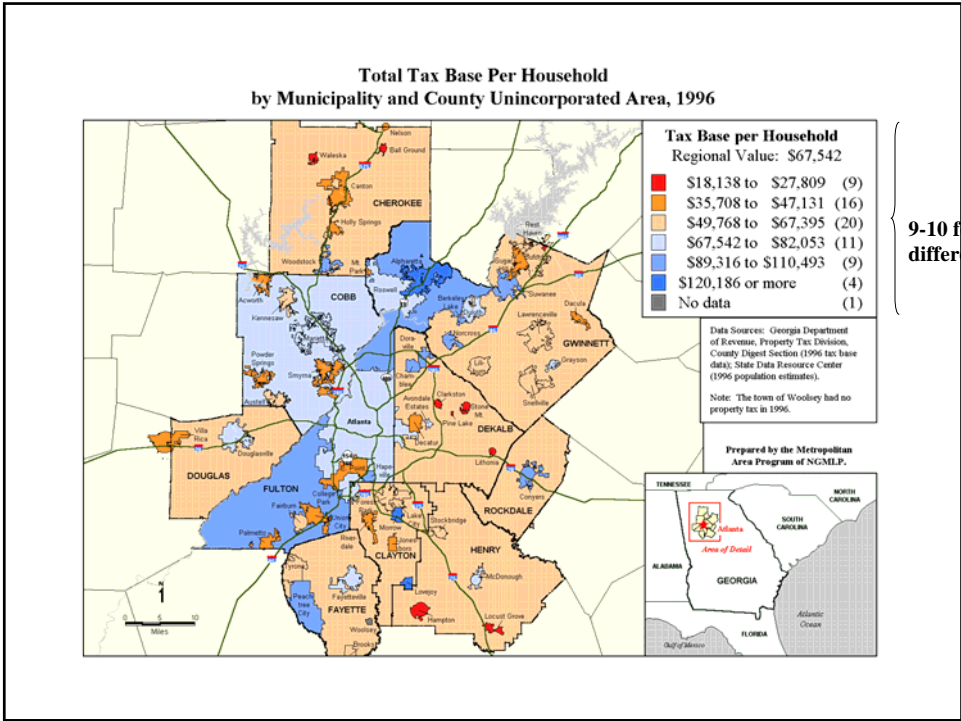
Map 4-1. Change in Property Value, Twin Cities Region,^a 1980-90



Interactions Between Neighborhood and Individual Risk Factors for Low Birth Weight



O'Campo et al. 1997



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 |

How large are these mortality effects ?

High Income Inequality
Low Average Income

925.8 per 100,00

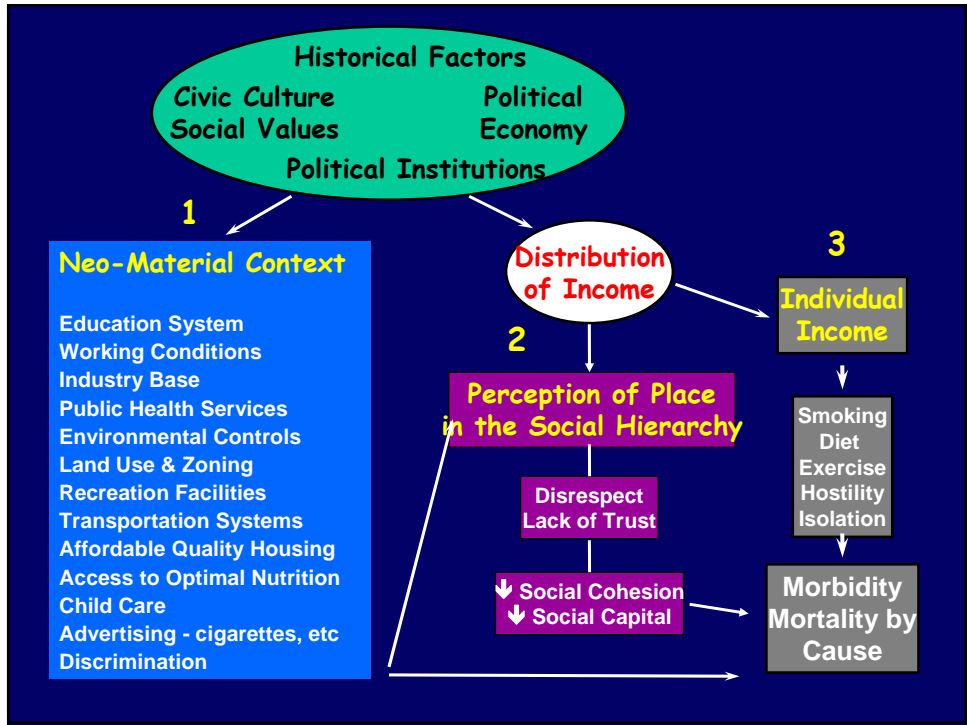
Low Income Inequality
High Average Income

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.

Lynch, Kaplan, Pamuck, et al, *AJPH*, 1998



Trends in Inequality and Child Poverty 1967-1992

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