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What makes life longer? A population perspective

Economic Demography

Econ/Demog c175

Prof. Goldstein

Spring 2017

Week 13, Lecture A

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Agenda

- How to measure longevity
- Trends over time
- Differences across countries
- Putting it all together with the "Preston Curve"

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Measurement of mortality

- Crude death rate = D(t) / N(t)
- Age-specific death rate = D(x,t) / N(x,t)
- Life expectancy: the average length of life
  - according to period rates
  - according to cohort rates

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Crude Death Rate

- US example (2014)
  2.6 million deaths ; 320 million people
- What is crude death rate?
- Mexico (2013) has CDR of 5/1000
- As an individual, where would you survive the longest?
- Why is this (isn't this) consistent with CDR?

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Age-Specific death rates U.S. example (Males, 2014)

Age	Deaths	Pop (million)	M(x)
0-1	13,000	2.0	0.006
20-21	2,400	2.2	0.001
50-51	11,000	2.2	0.005
80-81	31,000	0.5	0.060

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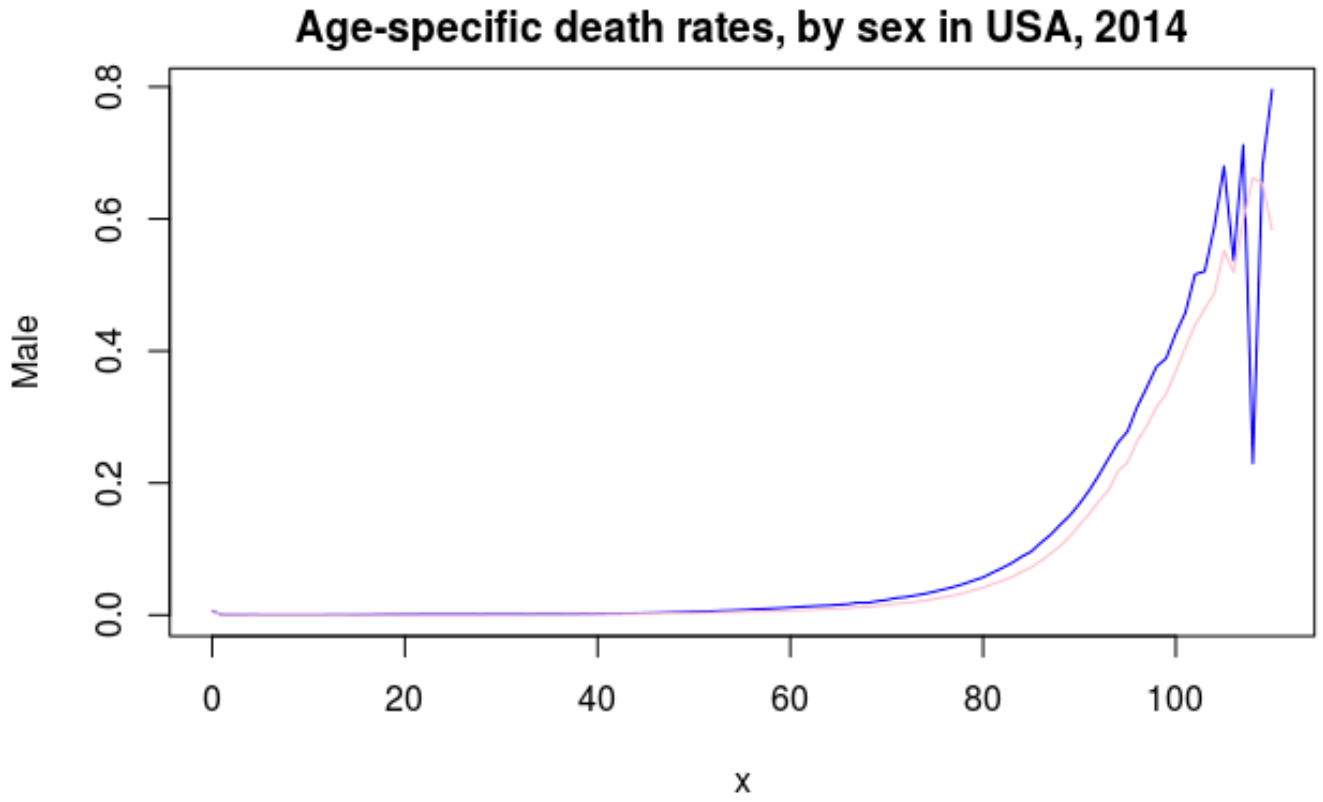
A picture of age-specific death rates by age



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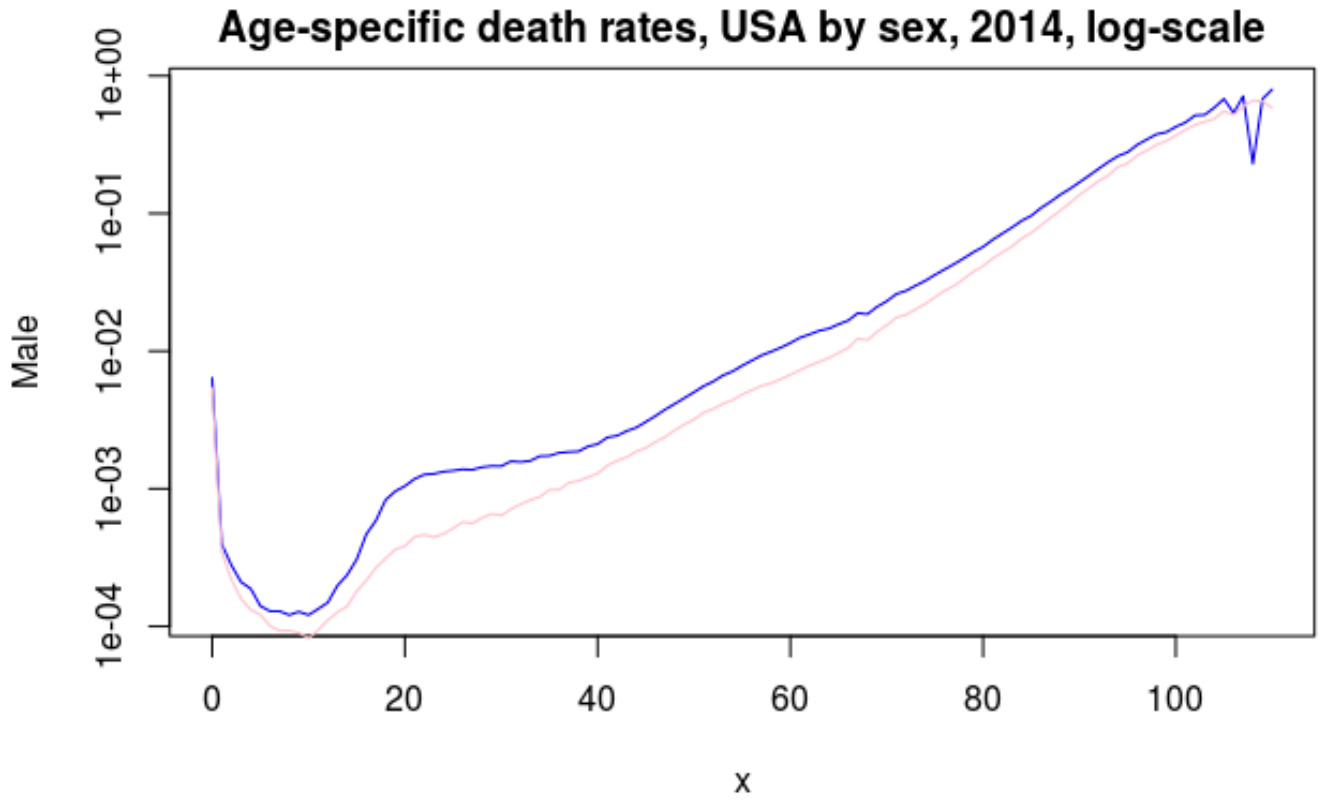
Log-scale allows us to more detail when mortality is low



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Life expectancy

- Expected additional years of life
- e(0) = average age at death
- e(65) = average remaining years, conditional on surviving to age 65

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Why did mortality change

- Earliest onset is still a mystery (end of plagues, end of little ice age, more food, ...)
- 19th century: important improvements in understanding of disease, water, hand-washing, contagion ...
- 20th century: more medical technologies
- Throughout, what is the role of rising incomes?

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Three important advances

- Children (diarrhea and water-born disease)
- Young adults (Tuberculosis , "TB")
- Middle-age and beyond (heart disease)
- A shift from contagious to chronic causes, an increasing role for $$?

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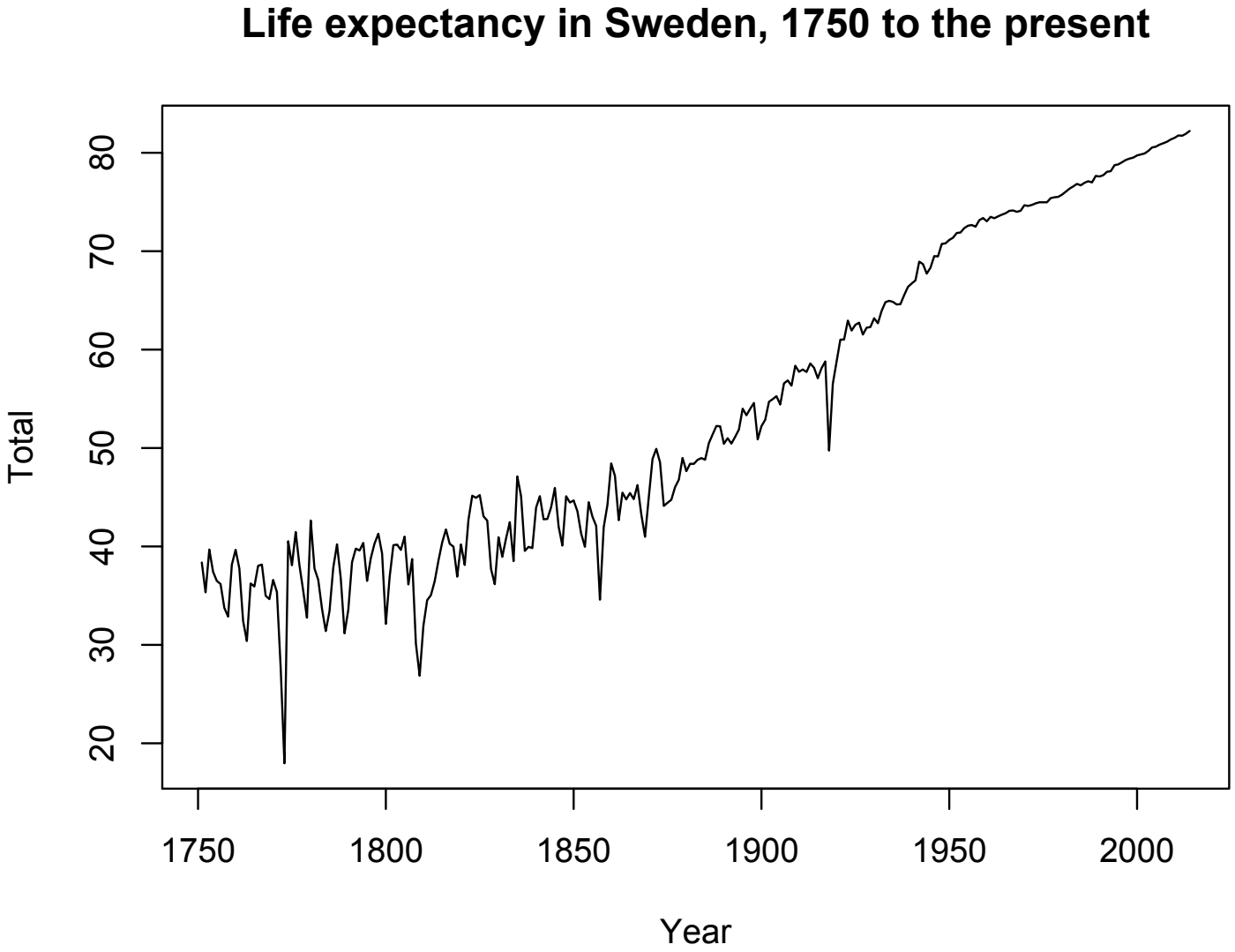

Stages?

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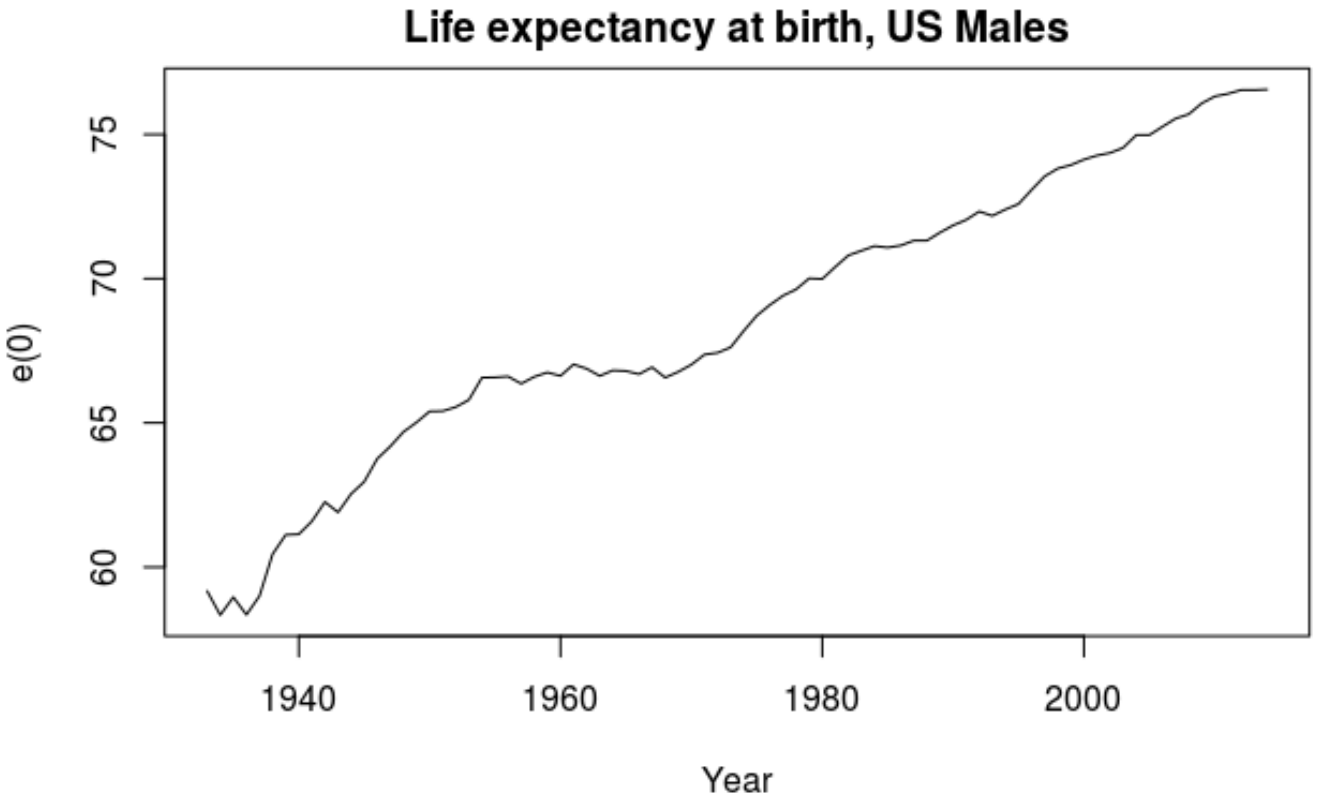
e0 over time in US



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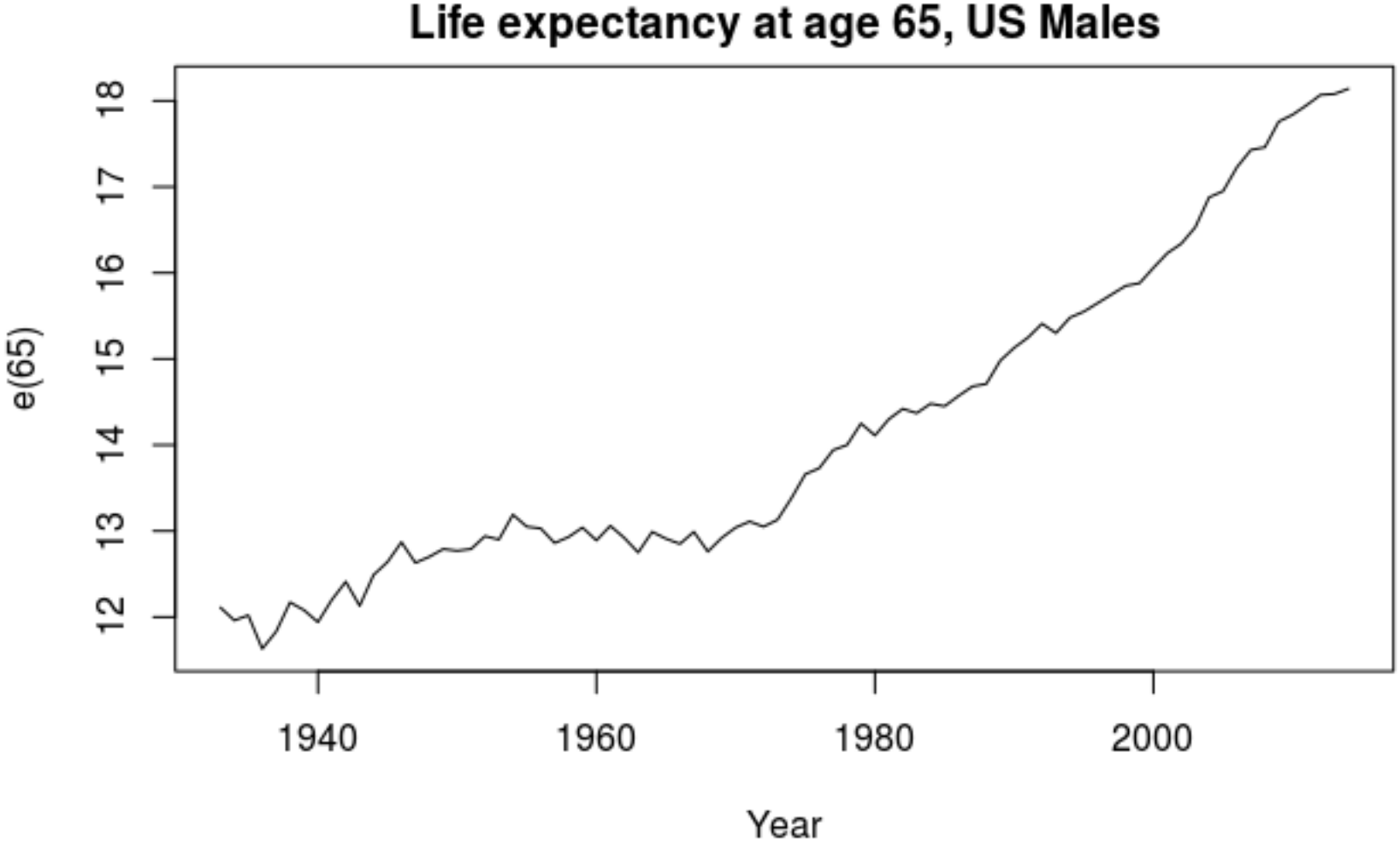
Recent extension of life at older ages



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Period and cohort

- Lexis picture on the board

- When we read that life expectancy today is 79 years, what does this mean? (A baby born today can expect to live to be 79?)

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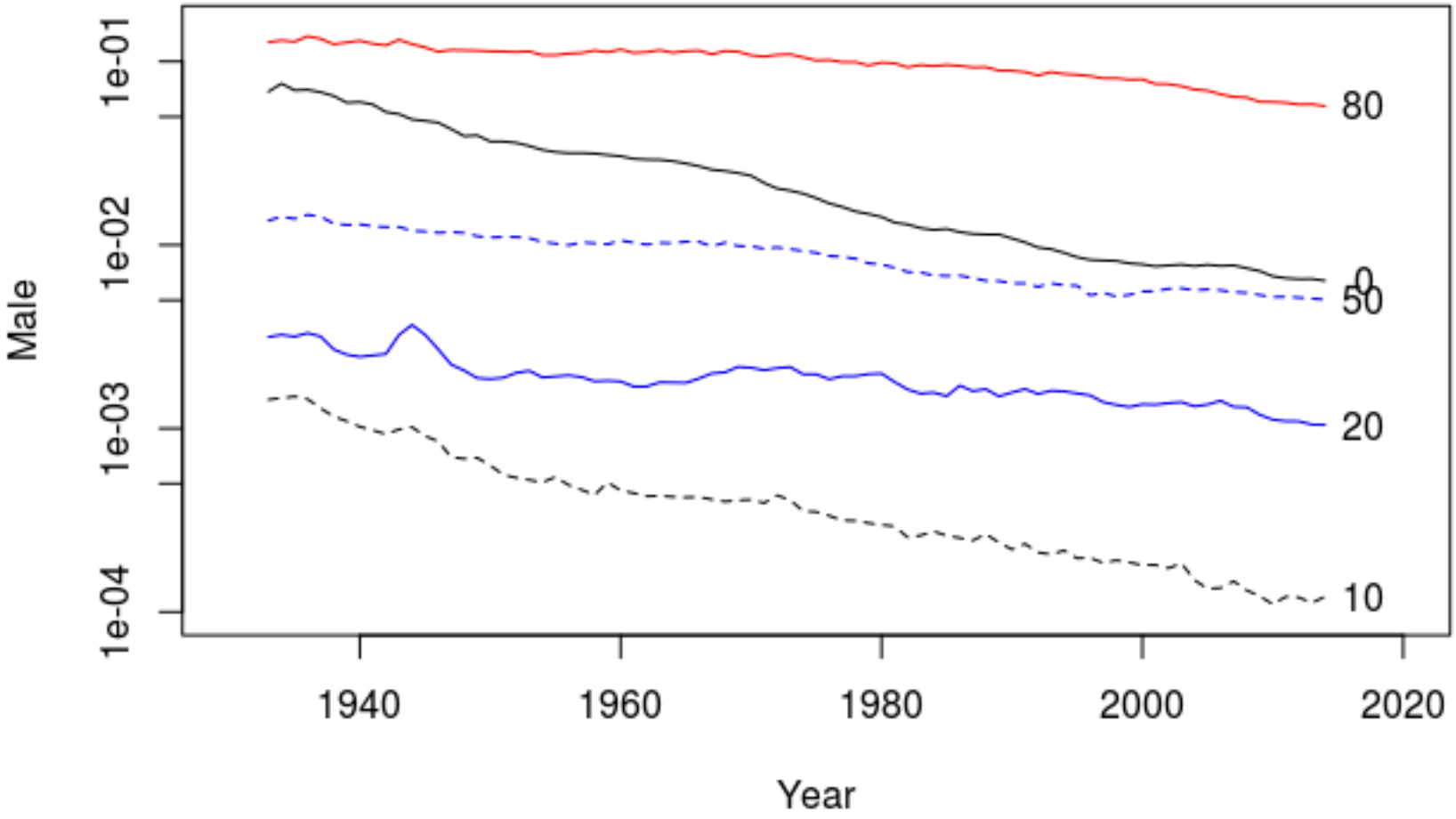
How does age-specific mortality change over time?



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An army of ants

- Mortality improvements were long limited to childhood
- As remaining deaths concentrated at older ages, we've seen progress made there

- The invisible hand?

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Differences across countries

The cross-section: A short video from Gapminder

- http://www.gapminder.org/answers/how-does-income-relate-to-life-expectancy/

- So is increasing income the secret to longer life?

A dynamic picture

- Google: gapminder Wealth & Health of Nations
- Notice
  - little gradient early on
  - early: little progress, despite income growth
  - later: more progress, faster than income growth

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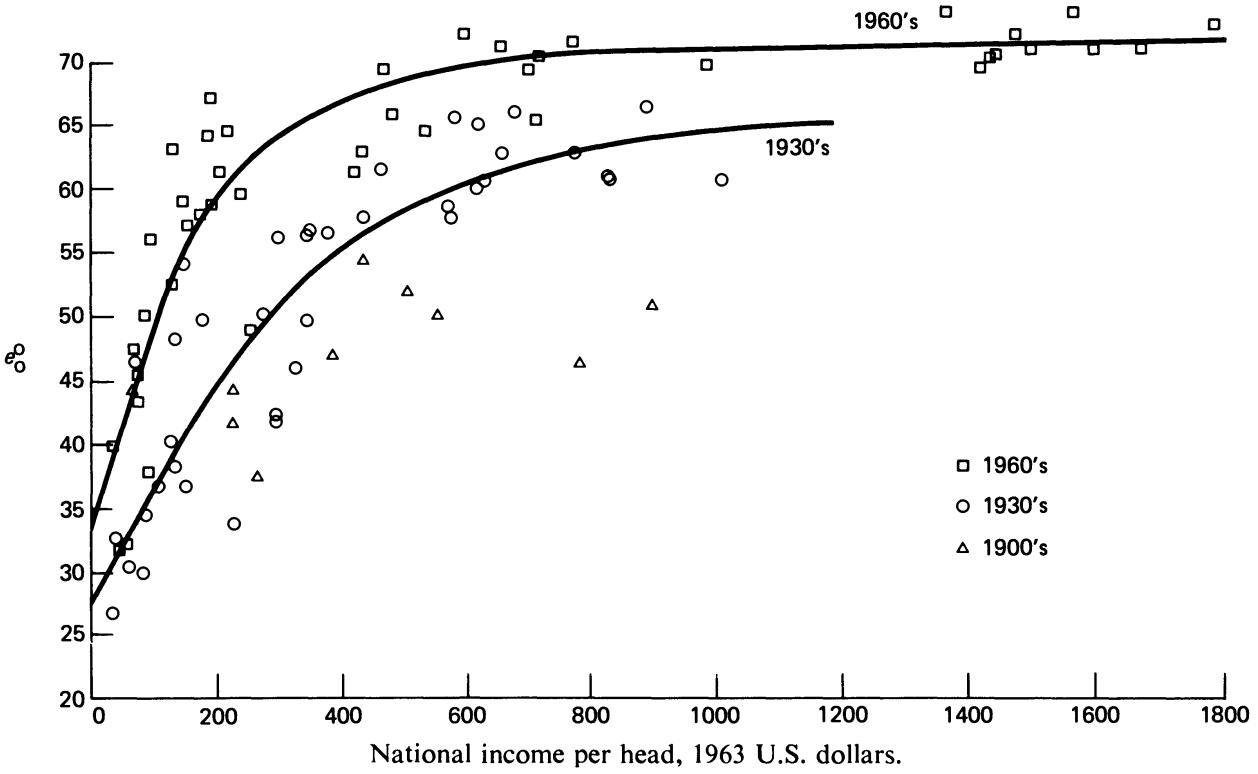
Putting it all together: Preston Curves

Scatter-diagram of relations between life expectancy at birth (e_0^0) and national income per head for nations in the 1900s, 1930s, and 1960s.



e0 vs. per capita GDP
by country and time period

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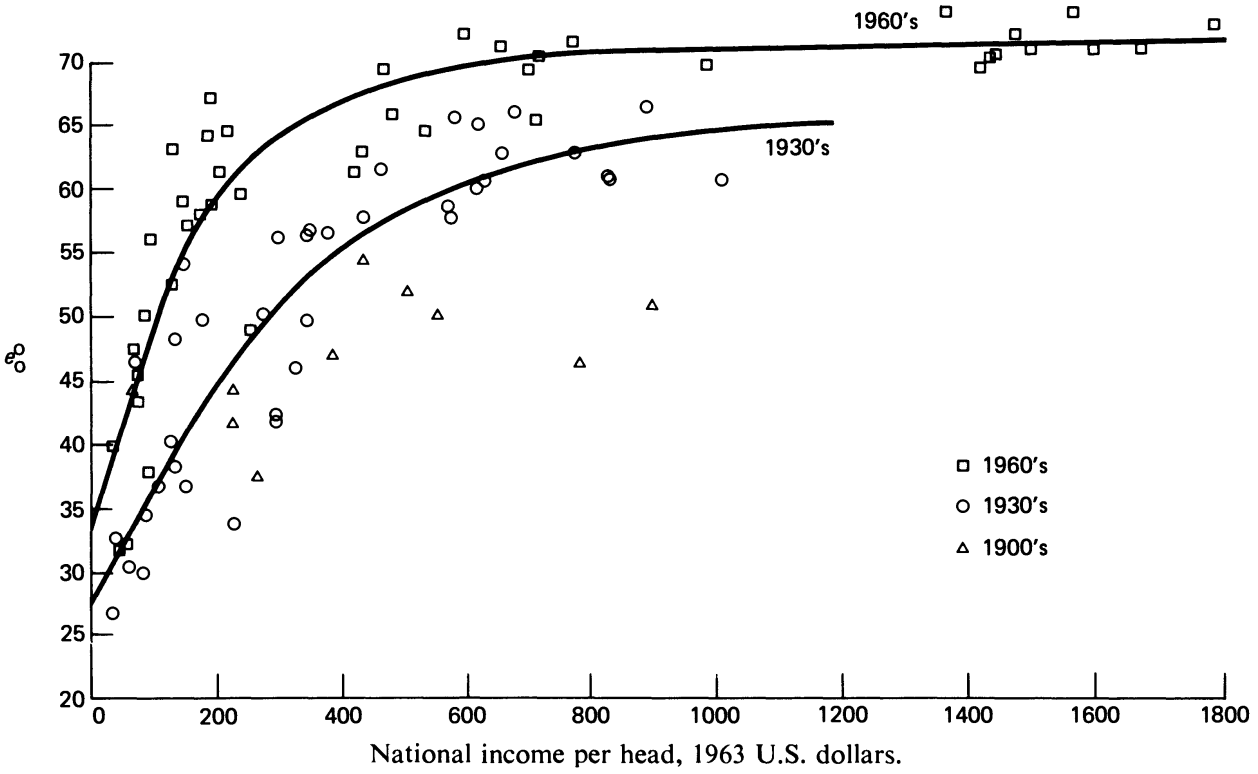
Diminishing returns

Scatter-diagram of relations between life expectancy at birth (e_0^0) and national income per head for nations in the 1900s, 1930s, and 1960s.



e0 vs. per capita GDP
by country and time period

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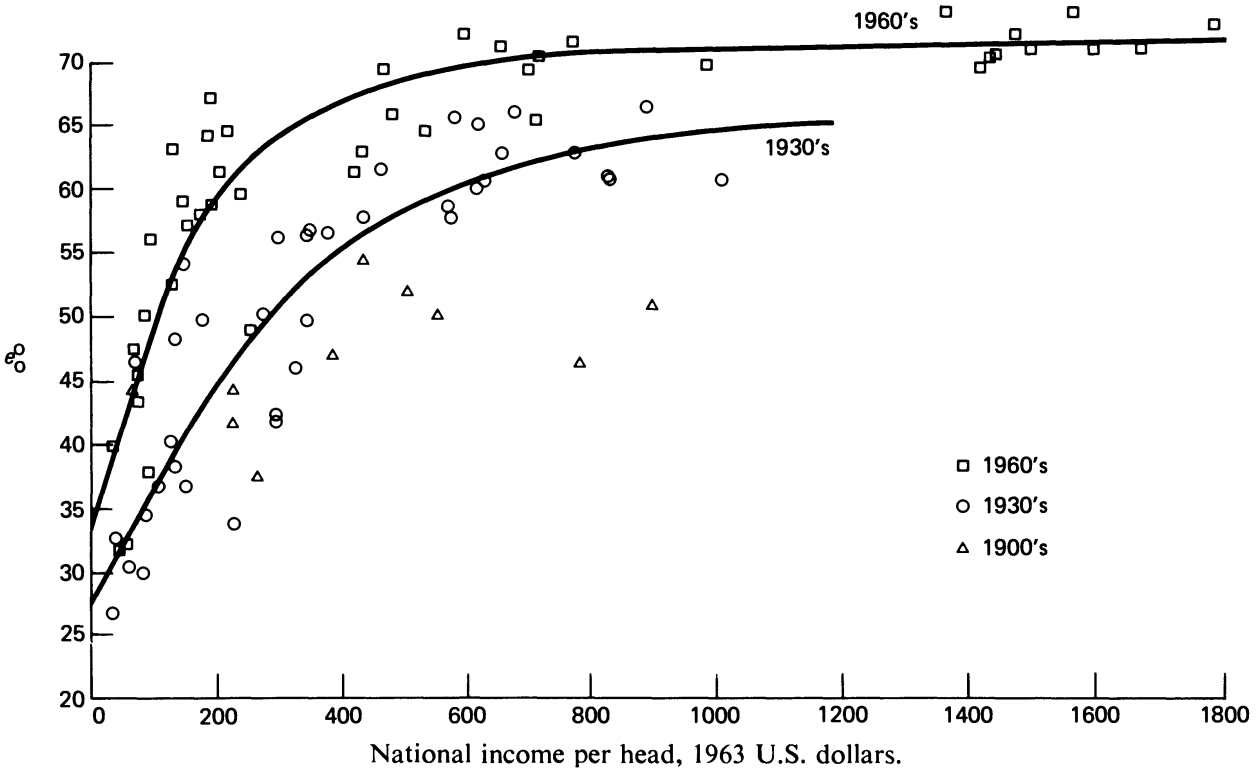
Progress: between curves, not along them

Scatter-diagram of relations between life expectancy at birth (e_0^0) and national income per head for nations in the 1900s, 1930s, and 1960s.



e0 vs. per capita GDP
by country and time period

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Preston conclusions

1. Starkly diminishing returns to income
2. Over time, economic growth only a small part of longer life (16% between 1938 and 1963?)
3. So what is responsible?

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Other factors

- Spread of medical technology
- Improvement in social and institutional organization

- Together they move the national health production function up and to the left

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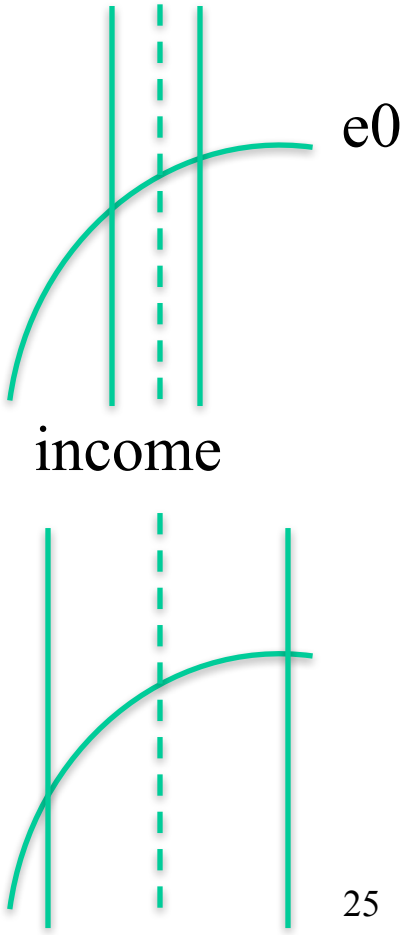
Inequality?

- If diminishing returns within countries, then more inequality reduces average.
- Imagine two people, each equidistant from the mean in terms of income. The farther apart they are, the lower average e0.



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Increasing importance of income?

- Curve becomes steeper at lower incomes ($$ matter more) and flatter at higher incomes ($$ matter less)
- Money is needed for technology in 1960 (drugs etc.), but wasn't so much in 1930?
- Outside helpers avoid poorest countries because interventions (malaria) don't help as much?

Conclusions from Preston

- Income alone is not enough
- Progress is possible by moving the whole technological frontier (institutional, medical, ...)
- US problems are probably the social and economic organization of health
- Recipe for mortality improvement changes by era
- We won't grow our way out.

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Next time (the last chapter)

- Course evaluations (bring laptop)
- Choosing your health: Grossman's micro-economic model of health investments
- Last lab will be *optional*, a follow-up to earlier lab
  - instructions will be posted
  - can make up a missed lab, or a low score