**The Production of Health
from a Historical Perspective**

ECON 40565
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Fall 2007

Mortality changes from a historical perspective

- **Surprisingly stable population/mortality rates over long period of history**
- **Graph on next page, world population**
  - **Time of Christ, 300 million**
  - **Vikings, 1000 years later, about the same**
  - **1700, 600 million**
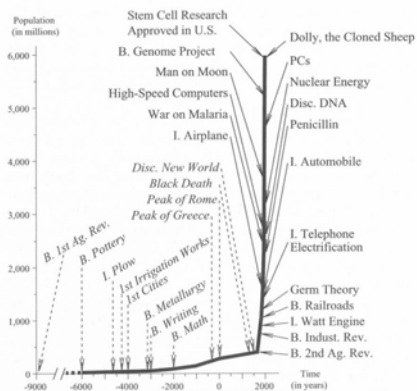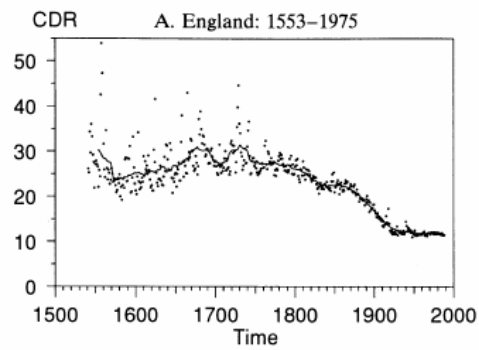 - **Today, 6 billion**

Figure 2.1 The Growth of World Population and Some Major Events in the History of Technology.

- **Population increases are driven by**
  - **Increasing births**
  - **Reductions in mortality**
- **Birth rates are high until industrialization, then they decline (demographic transition)**
- **McKeown argues that what drove the increase in population is a drop in mortality**
- **The major change has been in the past 100 years. What role did medicine play?**
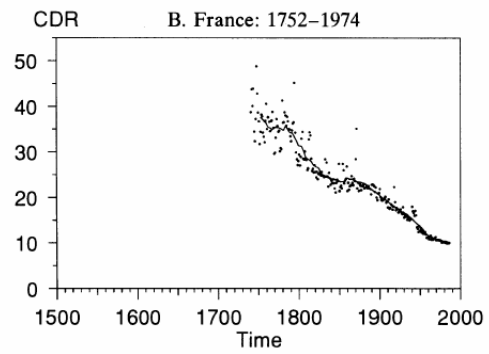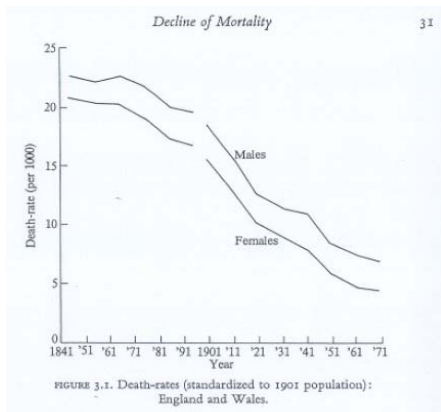
CDR   A. England: 1553–1975

Crude death rate: deaths per 1000 people

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CDR   B. France: 1752–1974

FIGURE 1. THE SECULAR TRENDS IN MORTALITY
RATES IN ENGLAND AND FRANCE

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FIGURE 3.1. Death-rates (standardized to 1901 population):
England and Wales.

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McKeown

- Why the rapid increase in population (declinen in mortality) in England/Wales?

- Key fact – most of the decline was due to a reduction in deaths from infectious diseases
  - 74% are attributable to microorganisms

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Table 3.2 Reduction in Mortality England/Wales 1850-1971

- **Conditions attributable:**
- **Airborne diseases**
- **Water/food borne diseases**
- **Other micro organisms**
- **Conditions not attributable to micro-organisms**

- **Percent of reduction**
- **40%**
- **21%**

- **13%**
- **26%**

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TABLE 3.3. *Standardized death-rates (per million) from airborne diseases: England and Wales*

	1848–54	1971	Percentage of reduction from all causes attributable to each disease
Tuberculosis (respiratory)	2,901	13	17.5
Bronchitis, pneumonia, influenza	2,239	603	9.9
Whooping cough	423	1	2.6
Measles	342	0	2.1
Scarlet fever and diphtheria	1,016	0	6.2
Smallpox	263	0	1.6
Infections of ear, pharynx, larynx	75	2	0.4
Total	7,259	619	40.3

36   *Determinants of Health*

TABLE 3.4. *Standardized death-rates (per million) from water- and food-borne diseases: England and Wales*

	1848–54	1971	Percentage of reduction from all causes attributable to each disease
Cholera, diarrhoea, dysentery	1,819	33	10.8
Tuberculosis (non-respiratory)	753	2	4.6
Typhoid, typhus	990	0	6.0
Total	3,562	35	21.4

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- **Big question: why are people dying from infectious diseases at lower rates?**
- **McKeown suggests it is:**
  - **NOT medical care (check out the next few graphs)**
  - **NOT public health (provided limited information**
- **Question to consider: What evidence does McKeown give to argue against a public health interpretation???**
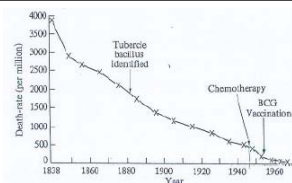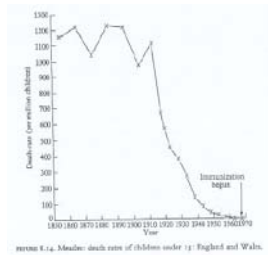
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FIGURE 8.1. Respiratory tuberculosis: mean annual death-rates (standardized to 1901 population): England and Wales.
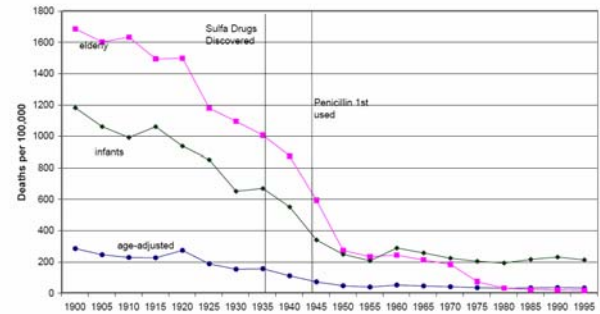
FIGURE 8.12. Whooping cough: death-rates of children under 15: England and Wales.

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Fig. 5: Pneumonia & Influenza Deaths[a]

a - pneumonia and influenza deaths not reported separately prior to 1965. Influenza accounts for less than 3 percent of total deaths in this category in 1965.

Fig. 6: Tuberculosis Deaths
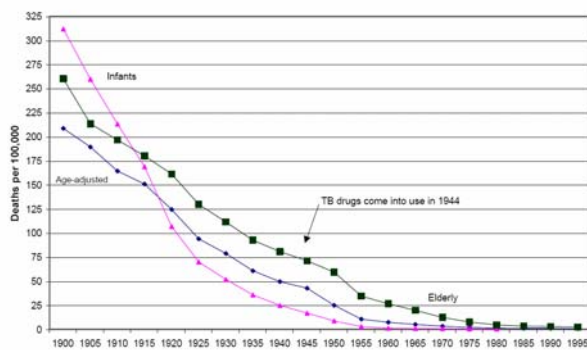
- **What might explain the decline in mortality?**
- **McKeown suggests the agricultural revolution**
  - **Limited food supply through 1850 generated 'small' humans**
  - **People with limited diets cannot ward off infections**
  - **The growth in agriculture productivity allows humans to grow and be healthier**

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Fogel

- **Nobel prize winning economist from Chicago**
- **Took McKeown's idea to heart and provided critical data**
- **At end of the 18th century, average height of adult in England/France was 5'4"**
- **Not much change throughout Europe until last half 19th century**
- **Height is an excellent predictor of disease incidence/mortality**
- **Height improved because of diet**

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TABLE 1—ESTIMATED AVERAGE FINAL HEIGHTS OF MEN WHO REACHED MATURITY BETWEEN 1750 AND 1875 IN SIX EUROPEAN POPULATIONS, BY QUARTER CENTURIES

Row	Date of maturity by century and quarter	Height (cm)					
		Great Britain	Norway	Sweden	France	Denmark	Hungary
1	18-III	165.9	163.9	168.1	—	—	168.7
2	18-IV	167.9	—	166.7	163.0	165.7	165.8
3	19-I	168.0	—	166.7	164.3	165.4	163.9
4	19-II	171.6	—	168.0	165.2	166.8	164.2
5	19-III	169.3	168.6	169.5	165.6	165.3	—
6	20-III	175.0	178.3	177.6	172.0	176.0	170.9

Sources: Fogel (1987 table 7) for all countries except France. For France, rows 3–5 were computed from M. A. von Meerton (1989) as amended by Weir (1993), with 0.9 cm added to allow for additional growth between age 20 and maturity (Benjamin A. Gould, 1869 pp. 104–5) (cf. Gerald C. Friedman, 1982 p. 510 [footnote 14]). The entry to row 2 is derived from a linear extrapolation of Meerton's data for 1815–1836 back to 1788, with 0.9 cm added for additional growth between age 20 and maturity. The entry in row 6 is from Fogel (1987 table 7).

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Calories available for work

- **Basal metabolic rate**
  - **Calories necessary to keep vital organs working**
  - **4/5ths of minimum calories**
  - **Function of body size**
- **Calories necessary to consume/digest food**
  - **1/5th of minimum necessary**
- **Amount above these limits, calories available for work**
- **1800-2600 calories available for work today in US**
- **In 1700 England, 1/3 to ¼ calories that are available today**

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Table 1.2 Secular Trends in the Daily Caloric Supply in France and Great Britain, 1700–1989 (calories per capita)

Year	France	Great Britain
1700		2,095
1705	1,657	
1750		2,168
1785	1,848	
1800		2,237
1803–12	1,846	
1845–54	2,480	
1850		2,362
1909–13		2,857
1935–39	2,975	
1954–55	2,783	3,231
1961		3,170
1965	3,355	3,304
1989	3,465	3,149

Source: Fogel, Floud, and Harris, n.d.

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Table 1.3 A Comparison of Energy Available for Work Daily per Consuming Unit in France, England and Wales, and the United States, 1700–1994 (in kcal)

Year	(1) France	(2) England and Wales	(3) United States
1700		720	2,313[a]
1705	439		
1750		812	
1785	600		
1800		858	
1840			1,810
1850		1,014	
1870	1,671		
1880			2,709
1944			2,282
1975	2,136		
1980		1,793	
1994			2,620

[a] Prerevolutionary Virginia.
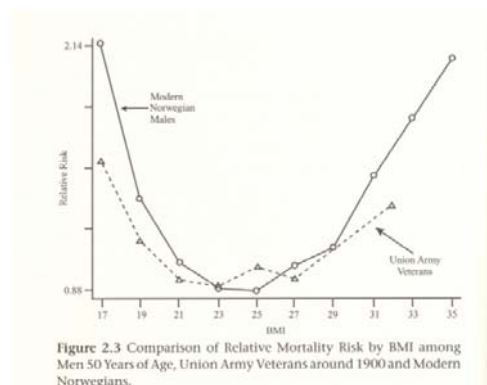
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Interesting facts

- **Caloric intake in early 18th century France similar to 1965 Rwanda, the most malnourished country on the planet at that time**
- **During 18th century England, 50-75% of income went to food**
- **Caloric consumption in 1885 England similar to modern day India**

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What is BMI?

- **Body mass index**
- **weight in kg/Height in meters squared**
  - **BMI < 20 underweight**
  - **BMI > 25 overweight**
  - **BMI > 30 obese**
- **To calculate BMI w/ inches/pounds**
  - **703*pounds/inches squared**
  - **5'9" and 165 pounds, BMI of 24.3**

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Figure 2.3 Comparison of Relative Mortality Risk by BMI among Men 50 Years of Age, Union Army Veterans around 1900 and Modern Norwegians.

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Relative
Risk

Waaler
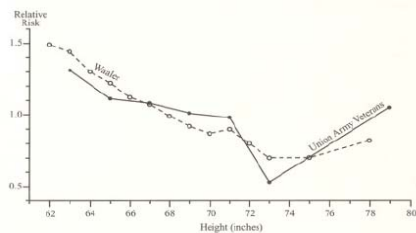
Union Army Veterans

Height (inches)

Figure 2.2 Relative Mortality Risk among Union Army Veterans and among Modern Norwegian Males.

Note: A relative risk of 1.0 means that the risk at that height was equal to the average risk of death in the entire population of males of the specified ages. Also note that the tallest data point, in both the Norwegian and Union Army cases, is not statistically significant.

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BMI vs Relative Risk of 5-year Deaths, US Males 40-55 1987-1990
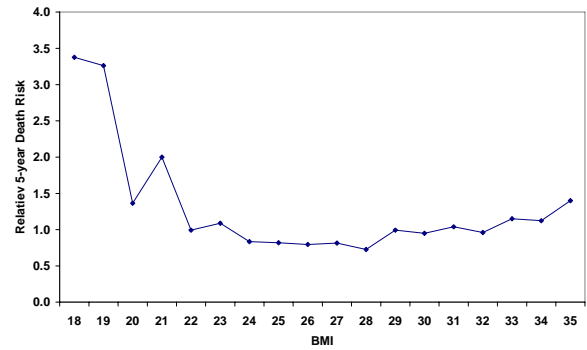
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- **Look at the next two graphs, and consider the following questions:**
- **What trends in the graphs are 'good' for Fogel's story**
- **What trends in the graphs are not so good for his hypothesis.**
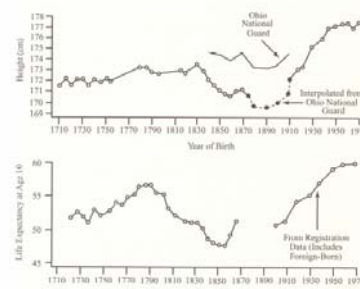
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Figure 1.2 Trend in Mean Final Height of Native-Born White American Males and Trend in Their Life Expectancy at Age 10.

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Slight problem for Fogel Theory

- Bones of exhumed remains can identify height
- Linear relationship between length of femur and height
- Need to know sex of skeleton

Whites: Height = 61.61 + 2.38 FL, N = 710, SEE = 3.27
Blacks: Height = 70.35 + 2.11 FL, N = 80, SEE = 3.94,

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- Need to know that the person stopped growing, identified by the fusion of certain bones
- Femur makes up ¼ of adult height – more in taller people
- U-shaped pattern over time, low point 1450-1750

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Table 1 Average heights in northern Europe estimated from adult male skeletons

Era	Place	Average height (cm)	Sample size	Source
9–11th centuries	Iceland	172.3	22	Steffensen 1958
9–17th centuries	Iceland	172.2	71	Steffensen 1958
10–11th centuries	Sweden	176.0	8	Gilberg 1976
11–12th centuries	Iceland	172.0	27	Steffensen 1958
11–17th centuries	Iceland	171.0	16	Steffensen 1958
12th century	Norway	170.2	42	Hanson 1992
12th century	Britain	168.4	233	Munter 1928
12–13th centuries	Norway	172.2	*	Huber 1968
12–16th centuries	Iceland	175.2	6	Steffensen 1958
13th century	Denmark	172.2	31	Boldsen 1984
13th century	Sweden	174.3	66	Gejvall 1960
13–14th centuries	England	171.8	*	Huber 1968
Middle Ages	Sweden	170.4	457	Steffensen 1958
Middle Ages	Denmark	172.0	190	Bennike 1985
Middle Ages	Denmark	172.6	43	Bennike 1985
Middle Ages	Norway	172.1	314	Holck and Kvaal 2000
Middle Ages	Denmark	175.2	27	Holck 1997
Middle Ages	Norway	167.2	1,792	Holck 1997
Middle Ages	Sweden	170.4	457	Werdelin 1985

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13–16th centuries	Holland	172.5	87	Maat et al. 1998
11–16th centuries	Holland	176.2	23	Janssen and Maat 1999
11–16th centuries	Sweden	172.8[a]	499	Arcini 1999
17–18th centuries	Iceland	169.7	17	Steffensen 1958
17–18th centuries	Holland	166.0	41	Maat 1984
17–18th centuries	Holland	166.7[b]	102	Maat 1984
18th century	Iceland	167.0	4	Steffensen 1958
18th century	Norway	165.3	1,956	Holck 1997
17–19th centuries	Iceland	169.2	21	Steffensen 1958
18–19th centuries	Britain	170.3	211	Molleson and Cox 1993

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Why health gains during middle ages?

- **Favorable weather…increases crop yields**
  - Temps 2º C warmer 900-1300
  - Extend growing season by 3-4 weeks/year
- **Little exposure to infectious/communicable diseases**
  - Smaller cities (London had <40K people)
  - Little trade between countries to spread
- **These trends change after 1200**
  - little ice age
  - Increase urbanization

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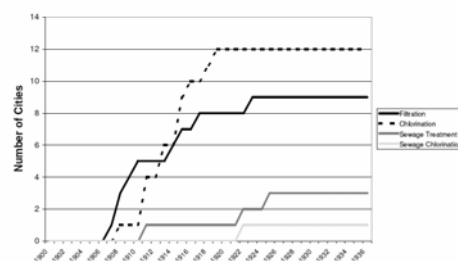## What about the role of public health?

- **McKeown dismissed the importance of public health**
  - Time period when there has been a big movement from more rural to urban population
  - Infections should have been more prevalent due to close proximity in people (TB etc)
- **Most persistent criticism of McKeown, he understates value of public health**
  - Sanitation
  - Water supply

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- **Data for US**

Year	Urban Pop	Rural Pop
1800	322K	4,986k
1850	354K	19,648
1900	30,160k	45,835
1950	96,400k	54,230k

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Figure 1: Cumulative Number of Cities Adopting Technologies by Year

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Detroit Typhoid Fever Mortality per 100,000

Baltimore Typhoid Fever Mortality per 100,000

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Fig. 1: All cause mortality[a]

a - Death rates shown are adjusted to standard population of U.S. in 1940

Figure 2. Trends in Life Expectancy at Birth, By Race and Sex, 1900 to 2003

White Females
White Males
Black Females
Black Males

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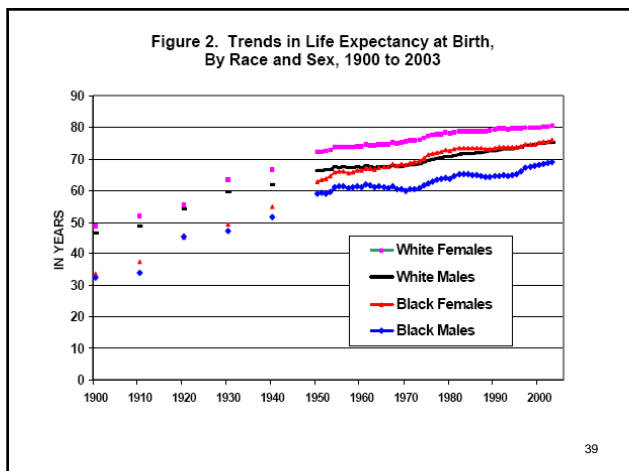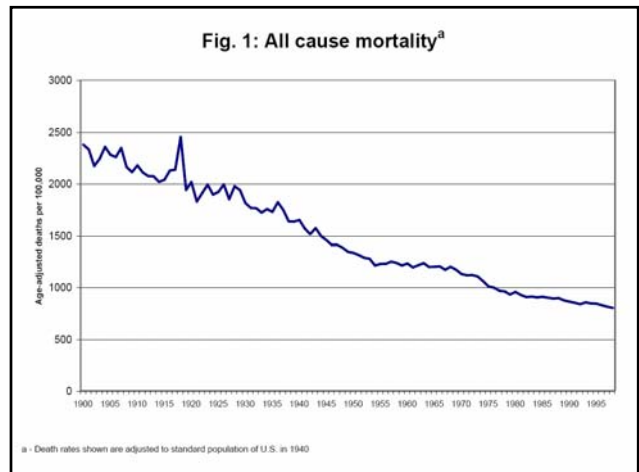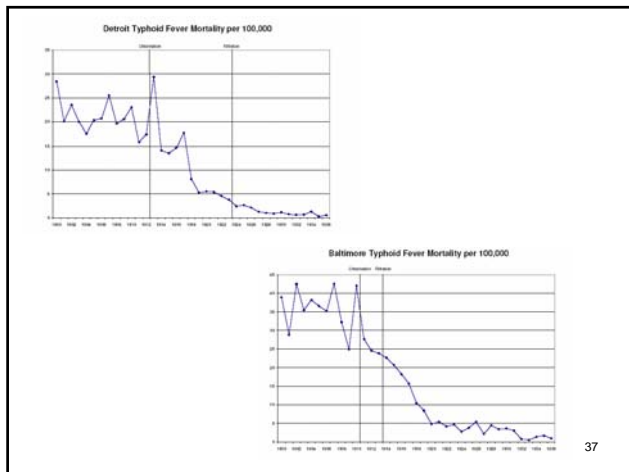
What role does medical care buy?

- **Easy to paint a picture that medical care has little impact on health outcomes**
- **In the developed world, US has**
  - **The highest spending per capita**
  - **Some of the highest mortality rates/lowest life expectancy**
- **Medicare adopted in early 1960**
  - **Provided health insurance to large fraction of population**
  - **Not discernable change in mortality**

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The Cost of a Long Life

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Life Expectancy vs. Spending
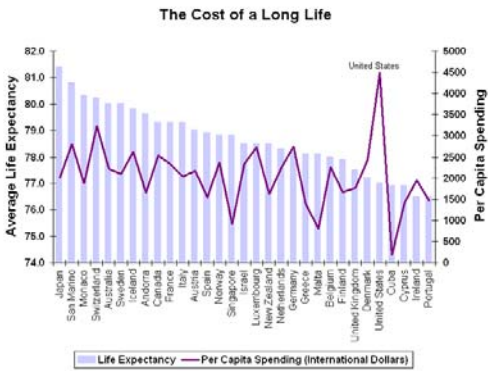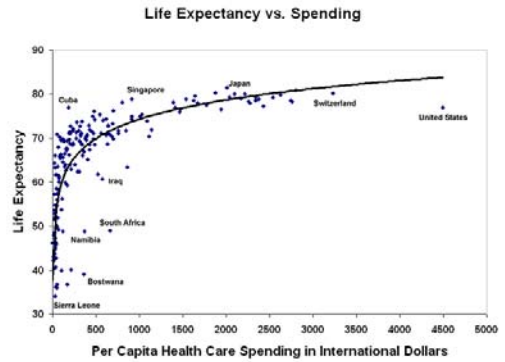
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Medicare

- **Started in 1965**
- **Federal health insurance program for**
  - **Those 65 and older**
  - **Disabled**
  - **End-stage renal disease**
- **Components**
  - **Part A: Hospitalization (mandatory)**
  - **Part B: Ambulatory care (voluntary)**
  - **Part D: Prescription drugs (voluntary)**

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Un-insurance rates

Age Group	1963	1970	1977
45-54	28%	18%	13%
55-64	28%	25%	13%
65-74	34%	2%	1%
75+	60%	4.6%	0.2%

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Figure 1: Health Insurance Coverage Rates by Age, 1992-2001 NHIS

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Figure 14. Age-Specific Death Rates by Sex and Race

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Figure 2: Mortality Rate Trends by Age Group

Source: Authors' calculation based on mortality data from the NCHS Multiple Causes of Death micro-data (1959-1975) and Vital Statistics (various years) for 1952-1958. Population estimates are constructed based on census data as described in text. Vertical line indicates 1966, the year Medicare is first in effect.

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