

Mortality Overview

Office of the Chief Actuary
TPAM 2019 Meeting
December 14, 2018

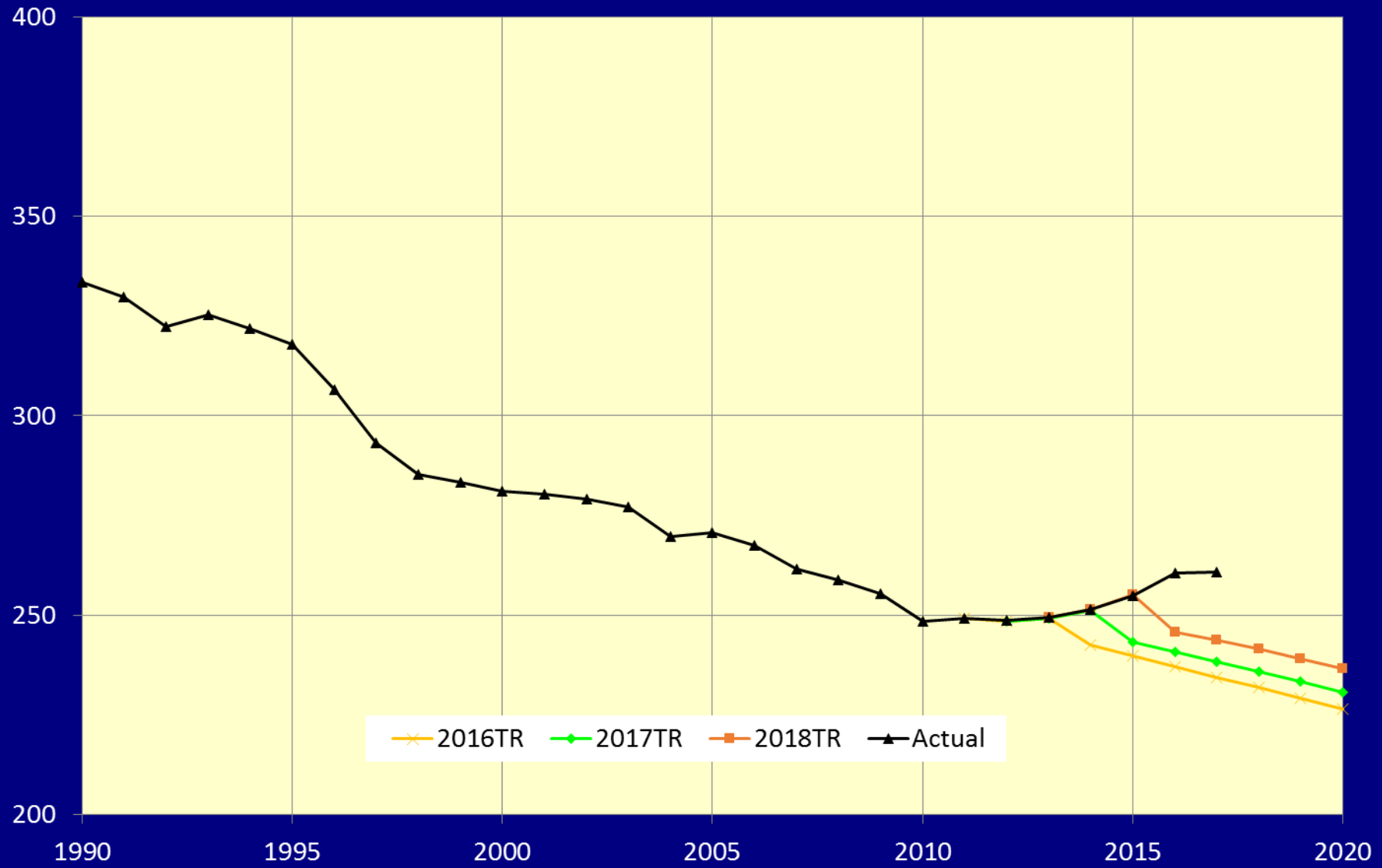
Projecting Mortality

- Mortality rates are assumed to decline in the future. But how fast?
- The annual Trustees Report (TR) uses three sets of (deterministic) projections:
 - Low cost (alternative I)
 - Intermediate (alternative II)
 - High cost (alternative III)

Age-Sex-Adjusted Death Rates (Ages 65 and Older)



Age-Sex-Adjusted Death Rates (Ages Under 65)



Trustees Assumptions: Ultimate Annual Rates of Decline

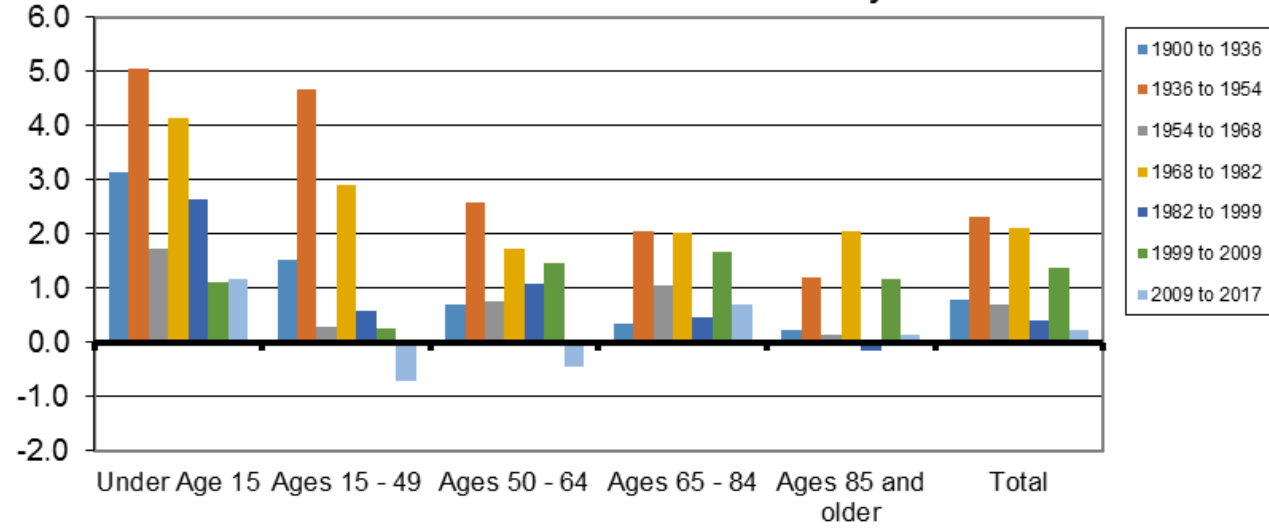
5 broad age groups:

1. Ages 0 – 14
2. Ages 15 – 49
3. Ages 50 – 64
4. Ages 65 – 84
5. Ages 85 and older

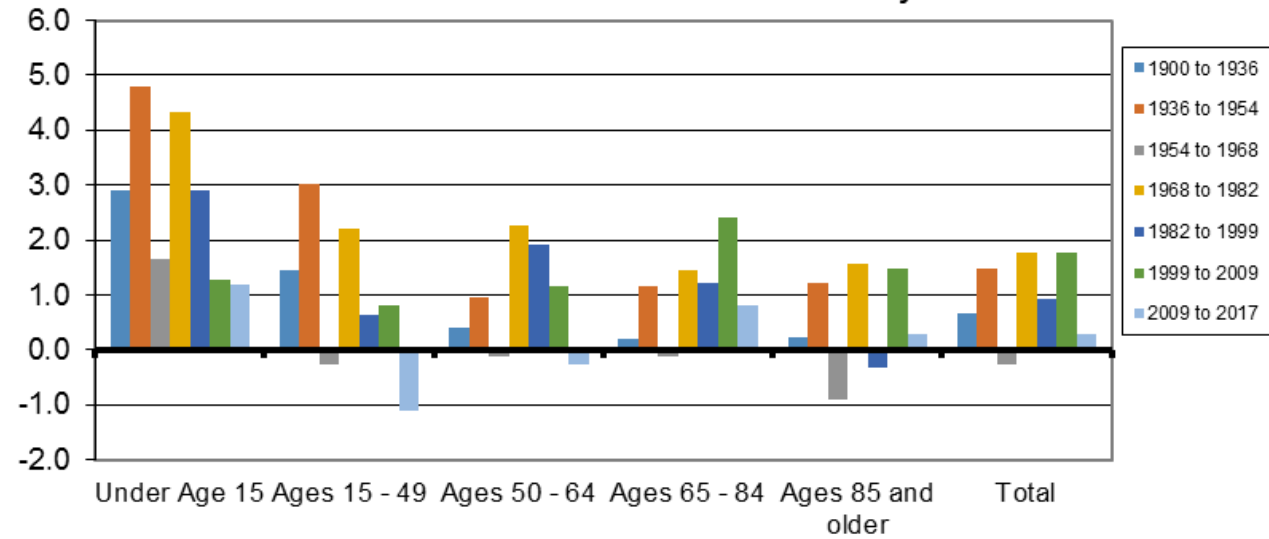
5 causes of death:

1. Cardiovascular
2. Cancer
3. Violence
4. Respiratory
5. All other

**Female Historical (2018 Trustees Report, Plus 2016 and 2017 Data)
Annual Percent Reduction in U.S. Mortality Rates**

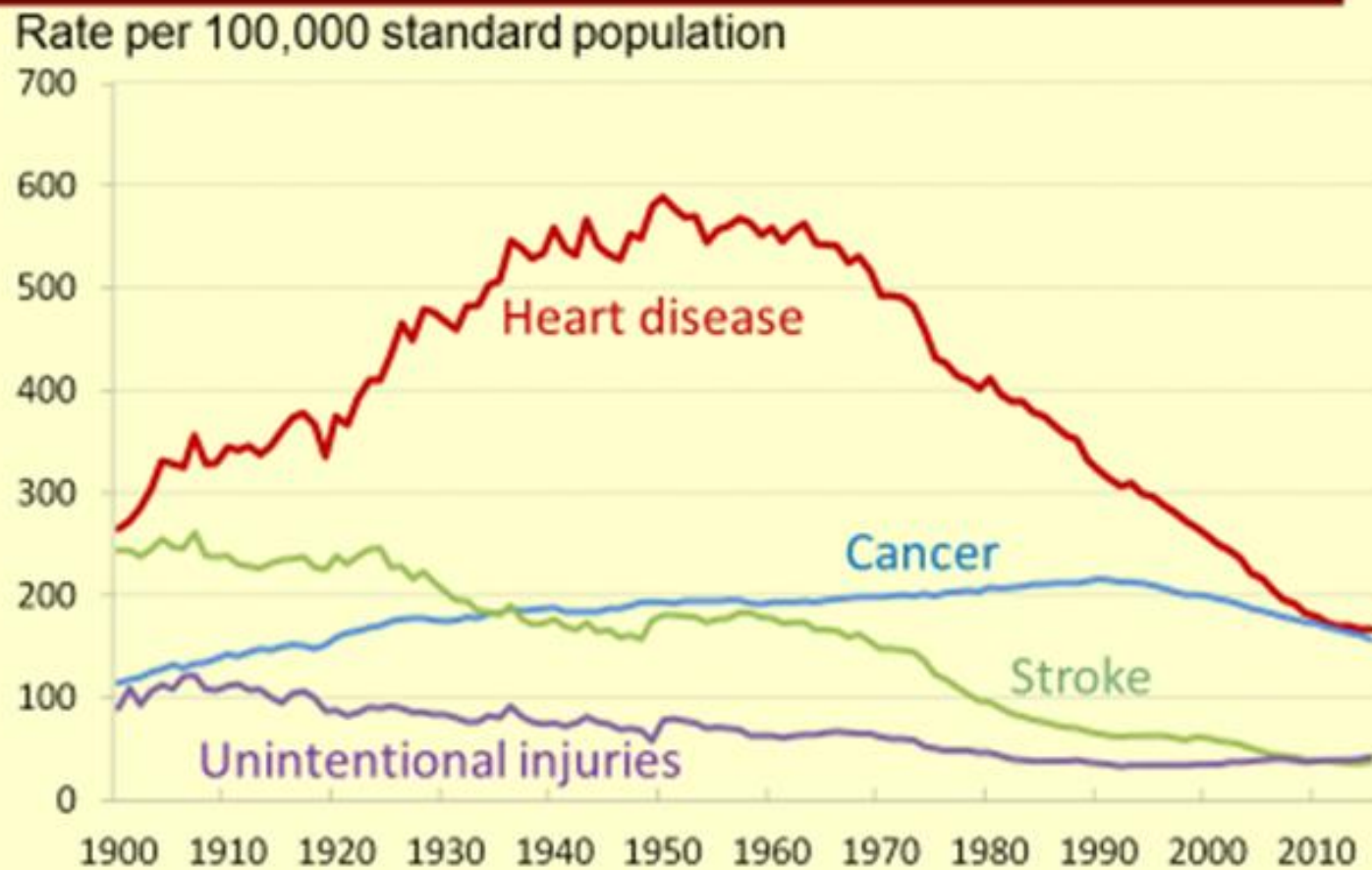


**Male Historical (2018 Trustees Report, Plus 2016 and 2017 Data)
Annual Percent Reduction in U.S. Mortality Rates**



Age-adjusted Death Rates for Heart Disease, Cancer, Stroke, and Unintentional Injuries: United States, 1900-2015

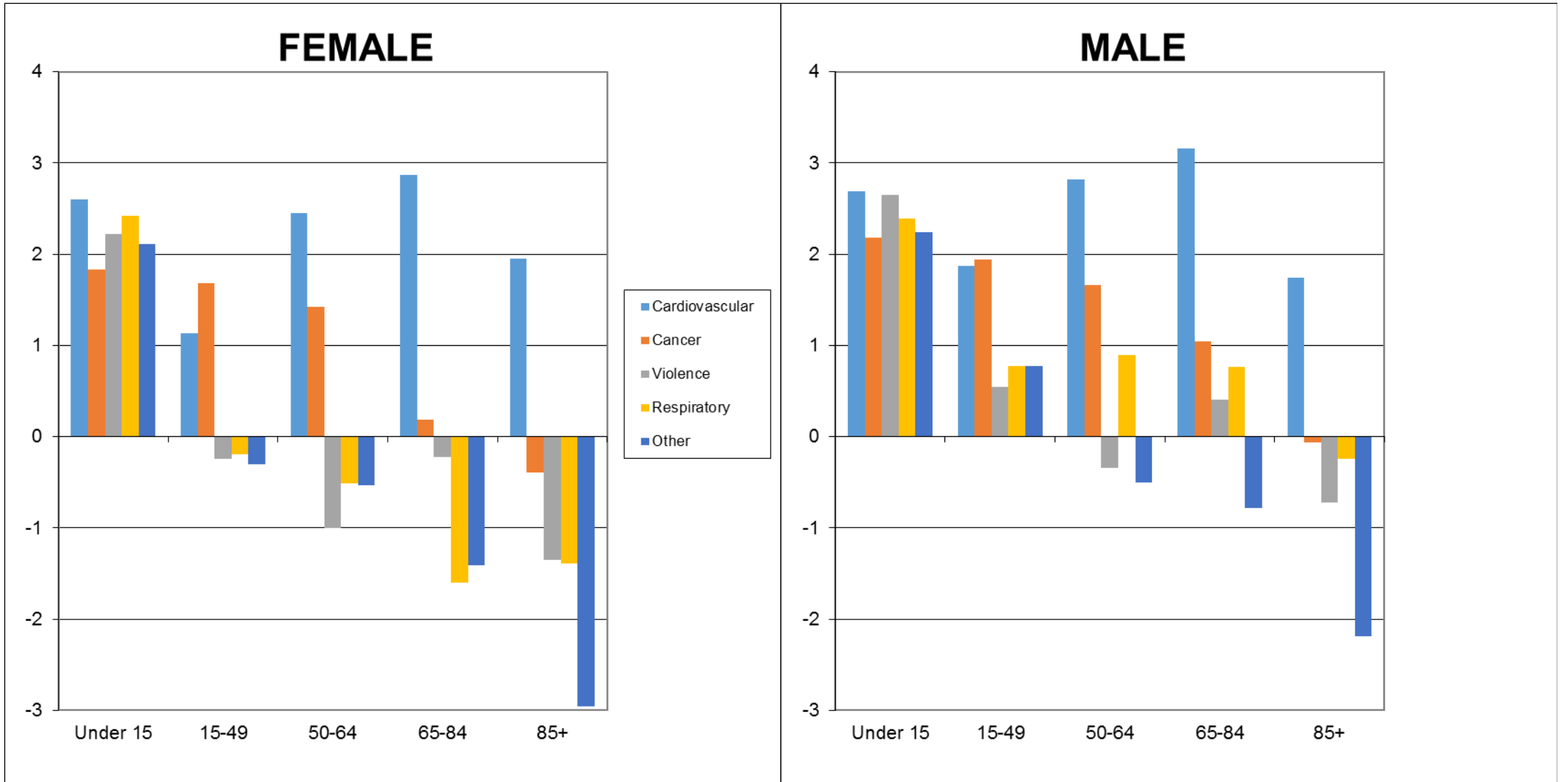
(courtesy Robert Anderson, NCHS)



NOTE: Data prior to 1933 contain death-registration States only. Data for 2015 is provisional.

Mortality Decline by Cause of Death:

Rate of Change from 1979 to 2017

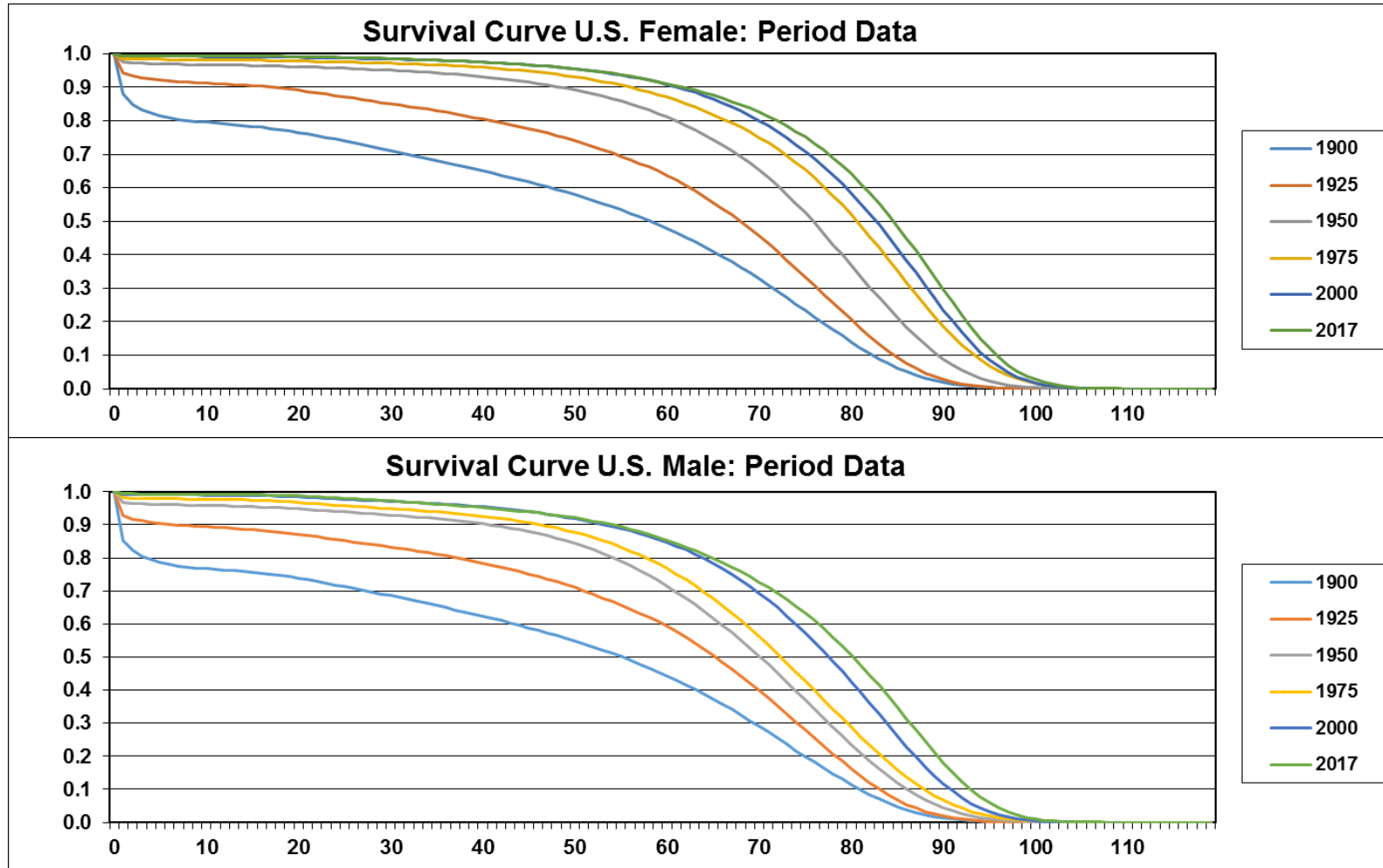


How Future Conditions Might Change

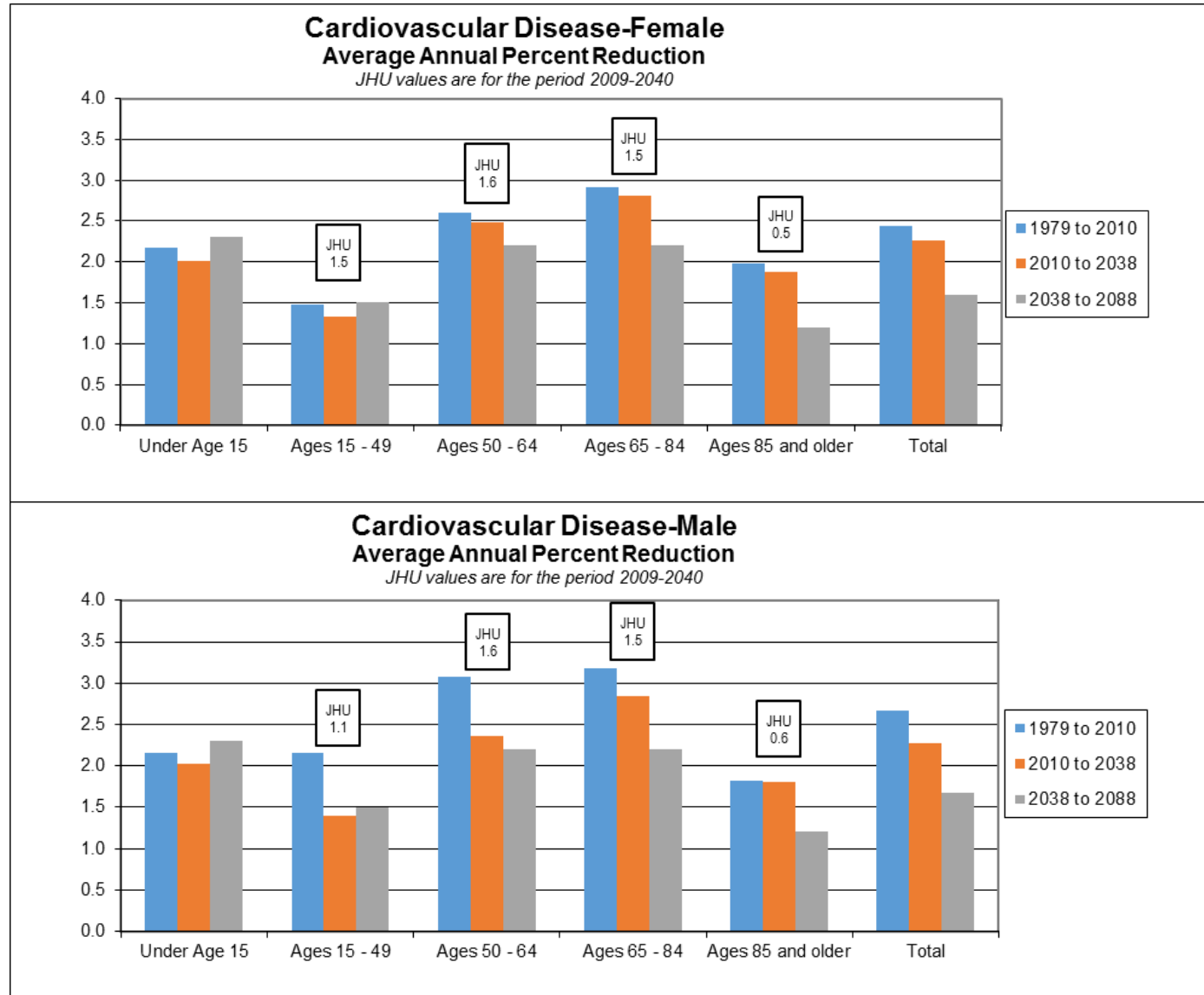
- Smoking decline for women
 - Started and stopped later than men
- Obesity – sedentary lifestyle
- Difference by income/earnings
- Health spending – must decelerate
 - Advances help only if they apply to all
- Human limits
 - Increasing understanding of deceleration

Is there an Omega?

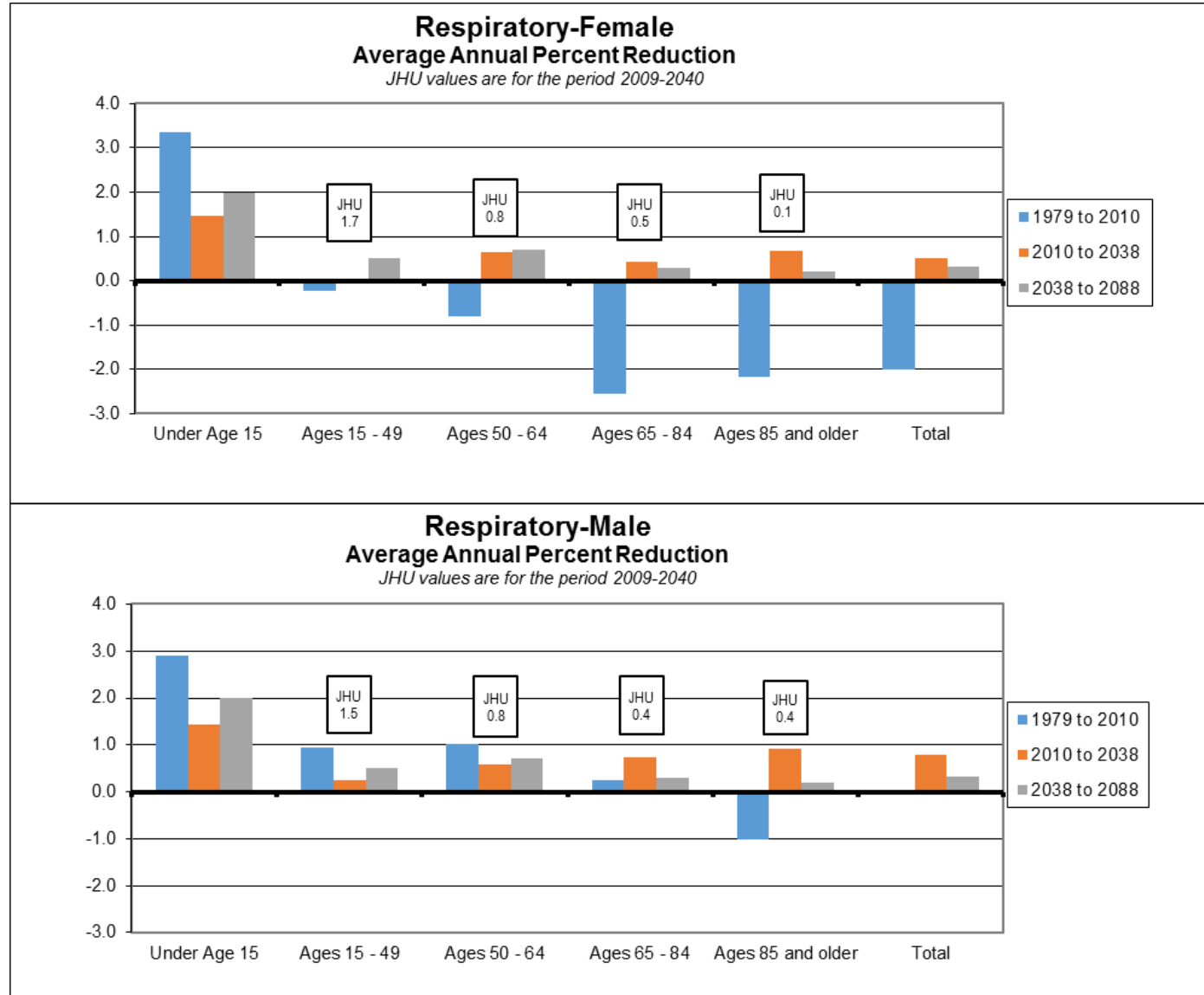
Rectangularizing the survival curve?



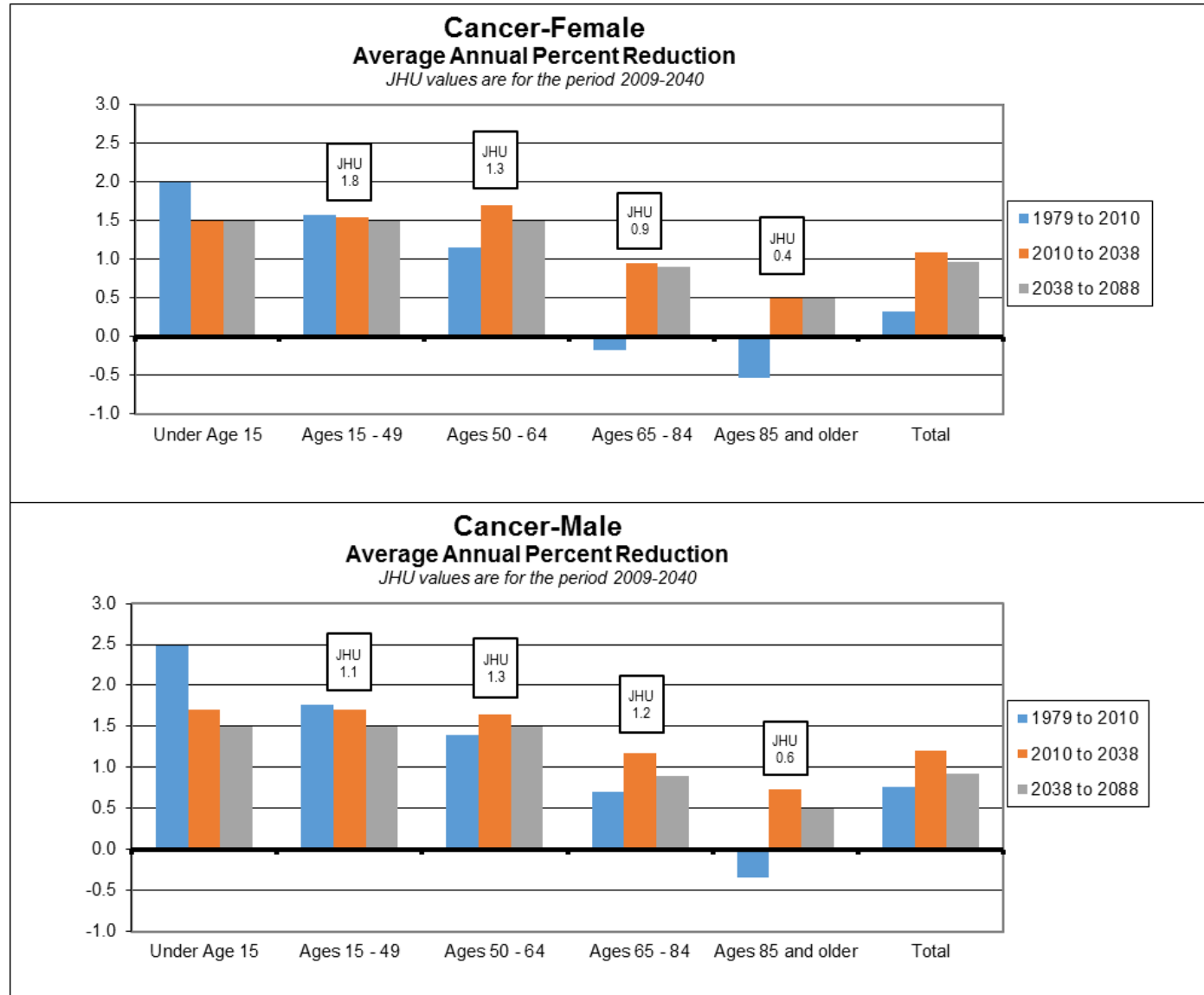
Cardiovascular: JHU Less Optimistic than Trustees Over Age 50 for Next 30 Years



Respiratory: JHU More Optimistic Under Age 50; Less Optimistic Over Age 85



Cancer: JHU Very Similar to Trustees' Expectations



For More Information...

<https://www.ssa.gov/OACT/index.html>

- Annual Trustees Reports:
<https://www.ssa.gov/OACT/TR/index.html>
- Documentation of Trustees Report data and assumptions:
<https://www.ssa.gov/OACT/TR/2018/2018 Long-Range Demographic Assumptions.pdf>
- Historical and Projected mortality rates:
<https://www.ssa.gov/OACT/HistEst/DeathHome.html>

Appendix

Various Alternative Projection Approaches Using Data

- Extrapolating past trends
 - Age setback (early method)
 - Mortality rate by age and sex (Lee/Carter)
 - Life Expectancy at birth (Vaupel/Oeppen)
 - Mortality rates by trend all ages (2011 Technical Panel, CBO 2013 – 2015)
- Or reflect changing conditions
 - Improvement by cohort (UK CMI, SOA)
 - Mortality rate by age, sex, cause (OCACT TR, 2015 Technical Panel)

Will Life Expectancy Rise Linearly?

Vaupel/Oeppen 2002; Best Nations

- Requires *accelerating* rate of decline in mortality rates if retain age gradient
- LE most affected by lowest ages – only so much gain possible
- Most disagree
 - Vallin/Meslé

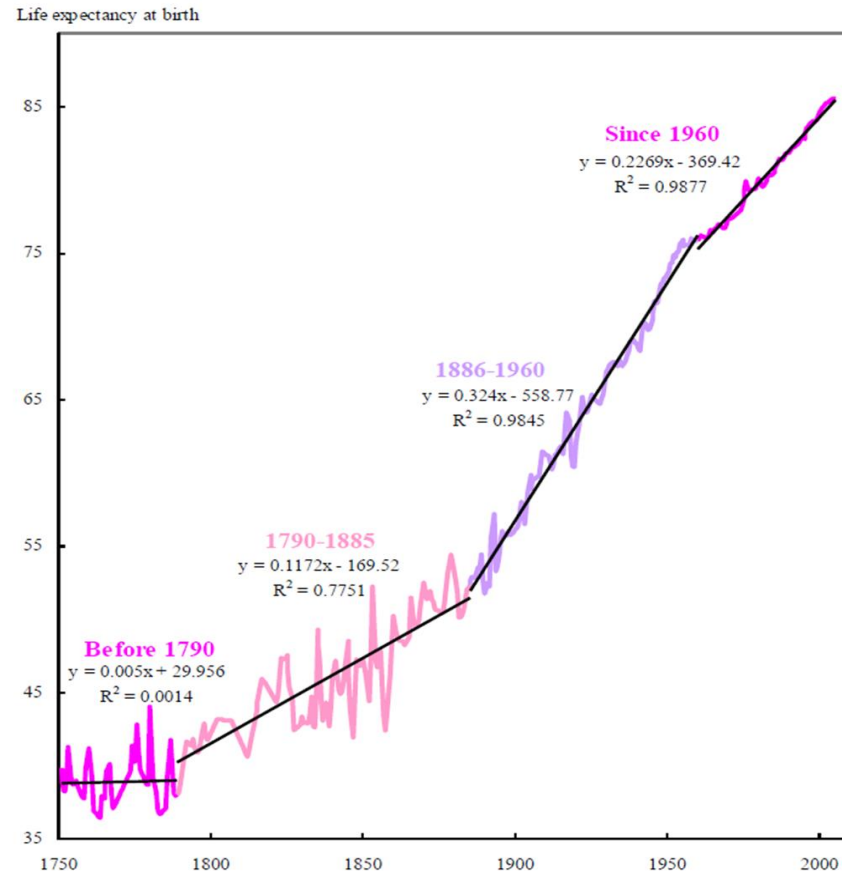
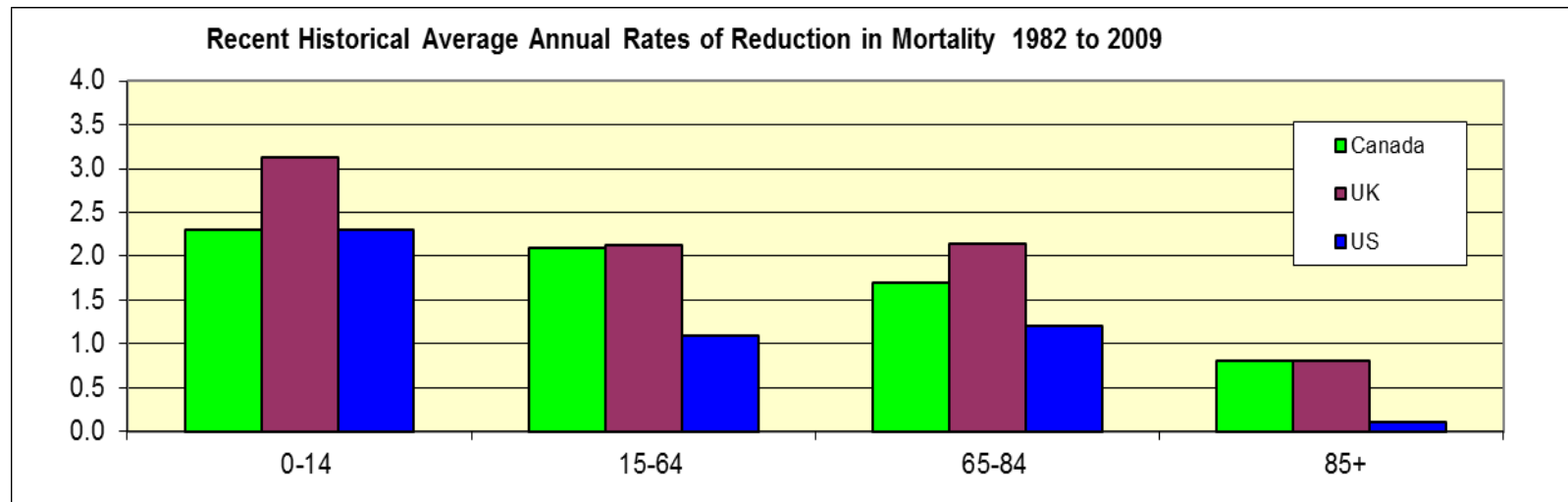
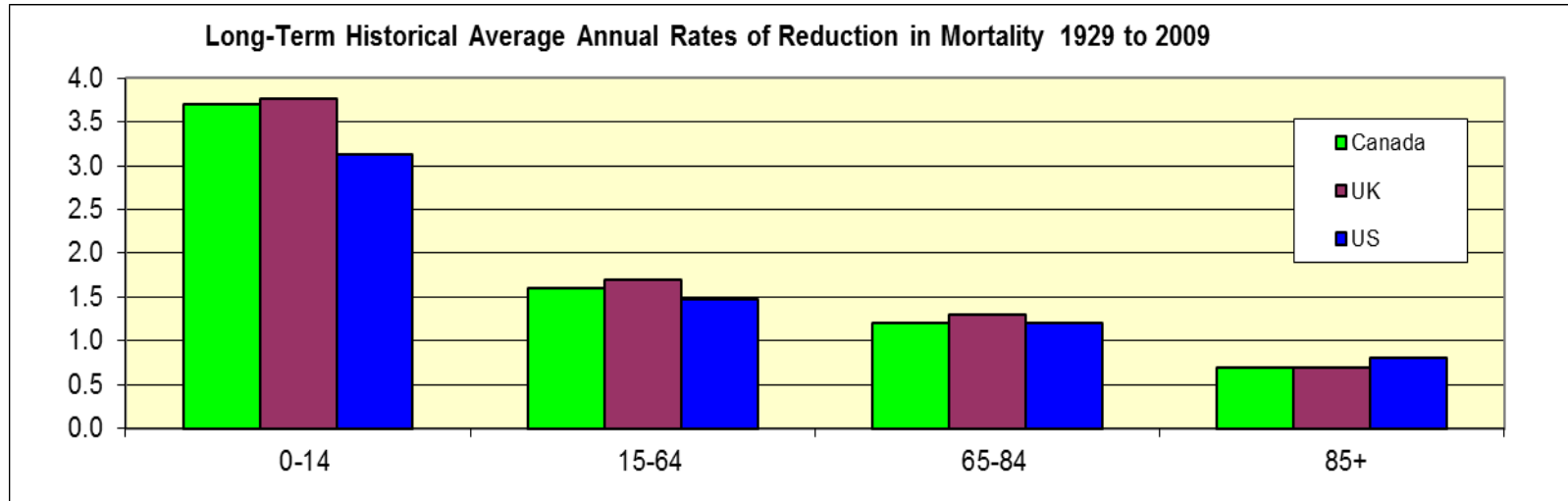


Figure 2. Maximum female life expectancy at birth since 1750 but excluding Norway (until 1866) and New Zealand
Source: Vallin and Meslé 2008

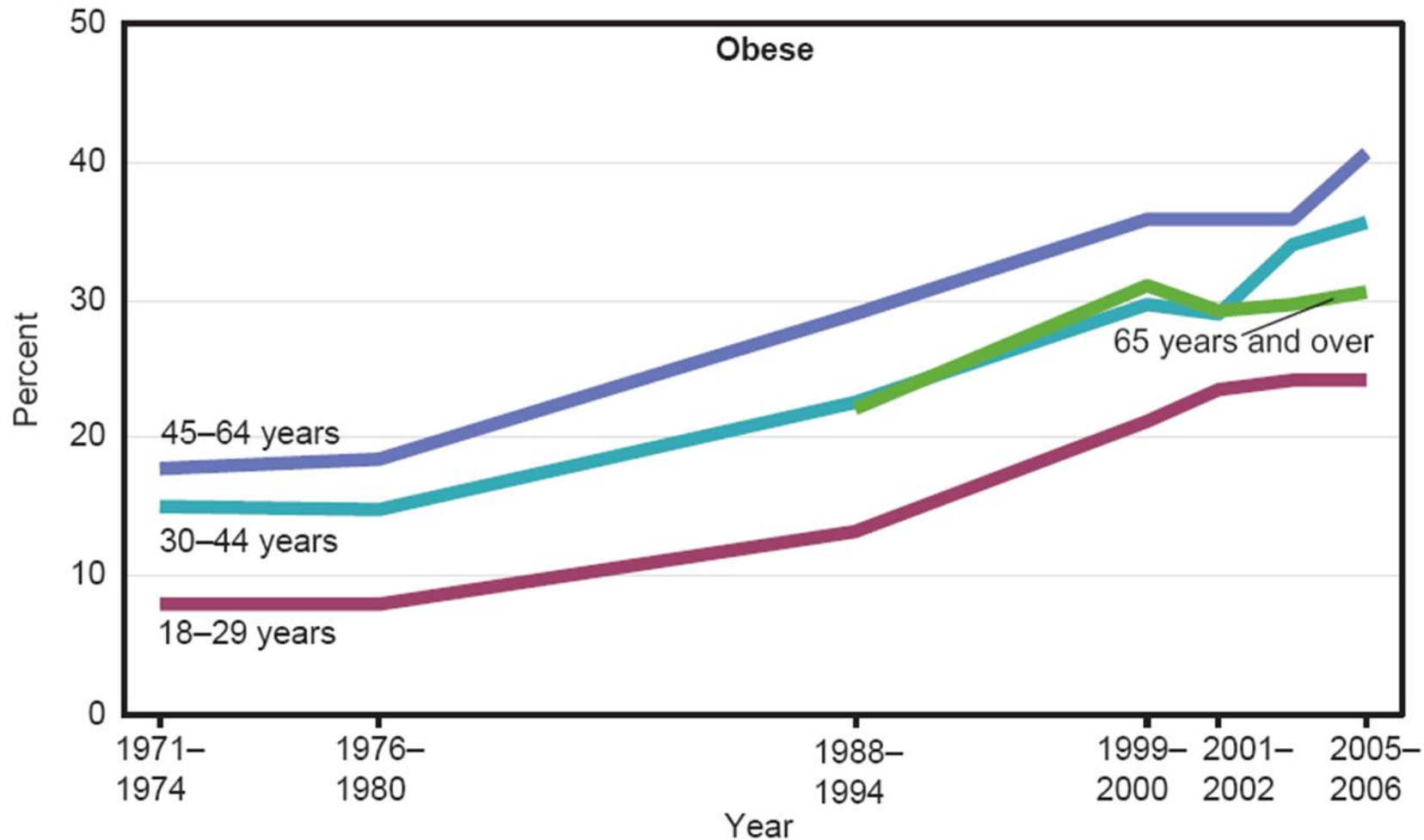
Appropriate Data: by Age Critical

Age gradient in past reduction is clear



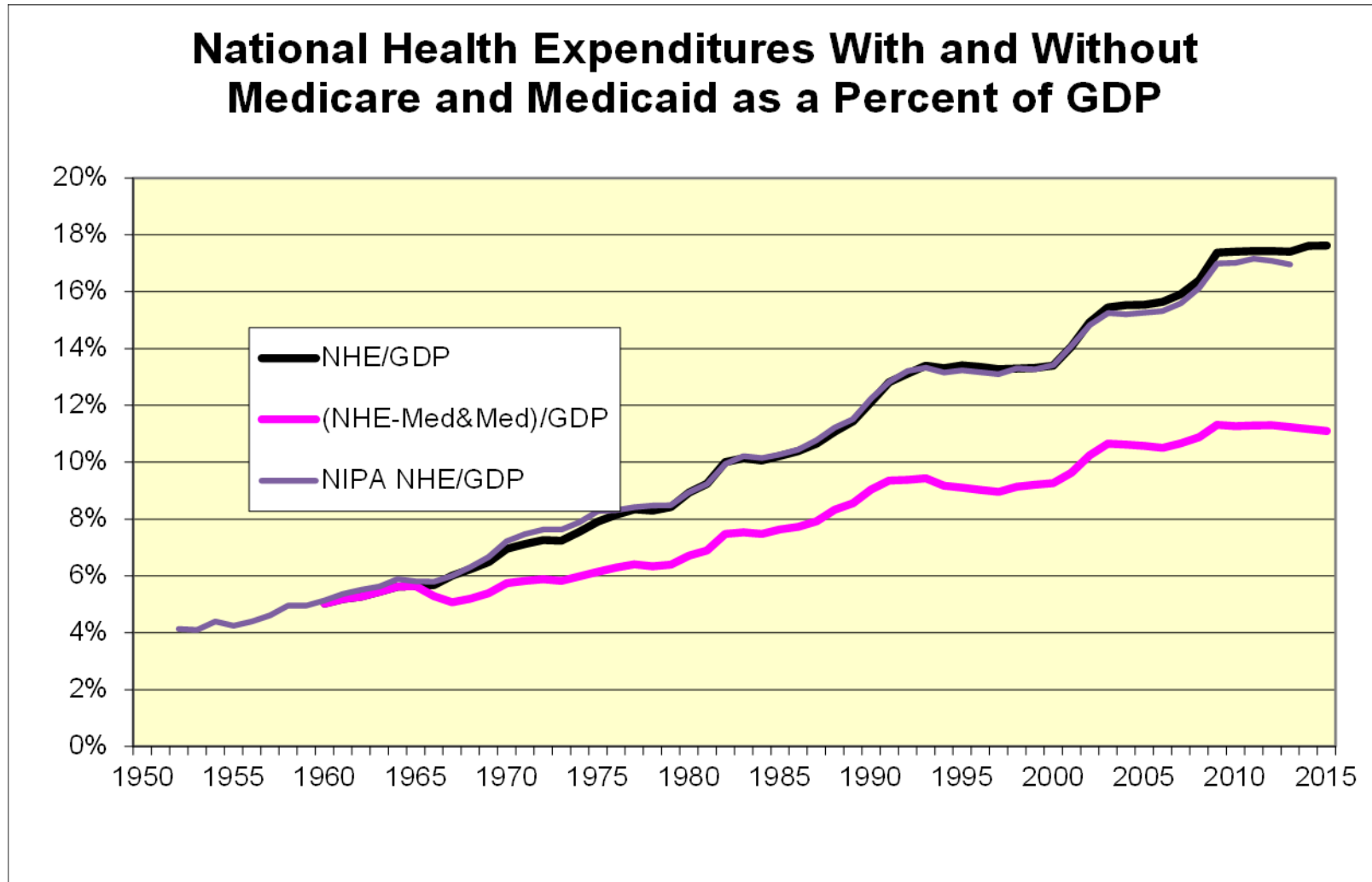
Trends in Obesity: US 1971-2006

Sam Preston 2010 – must consider **cumulative** effects
Increasing duration of obesity for aged in the future



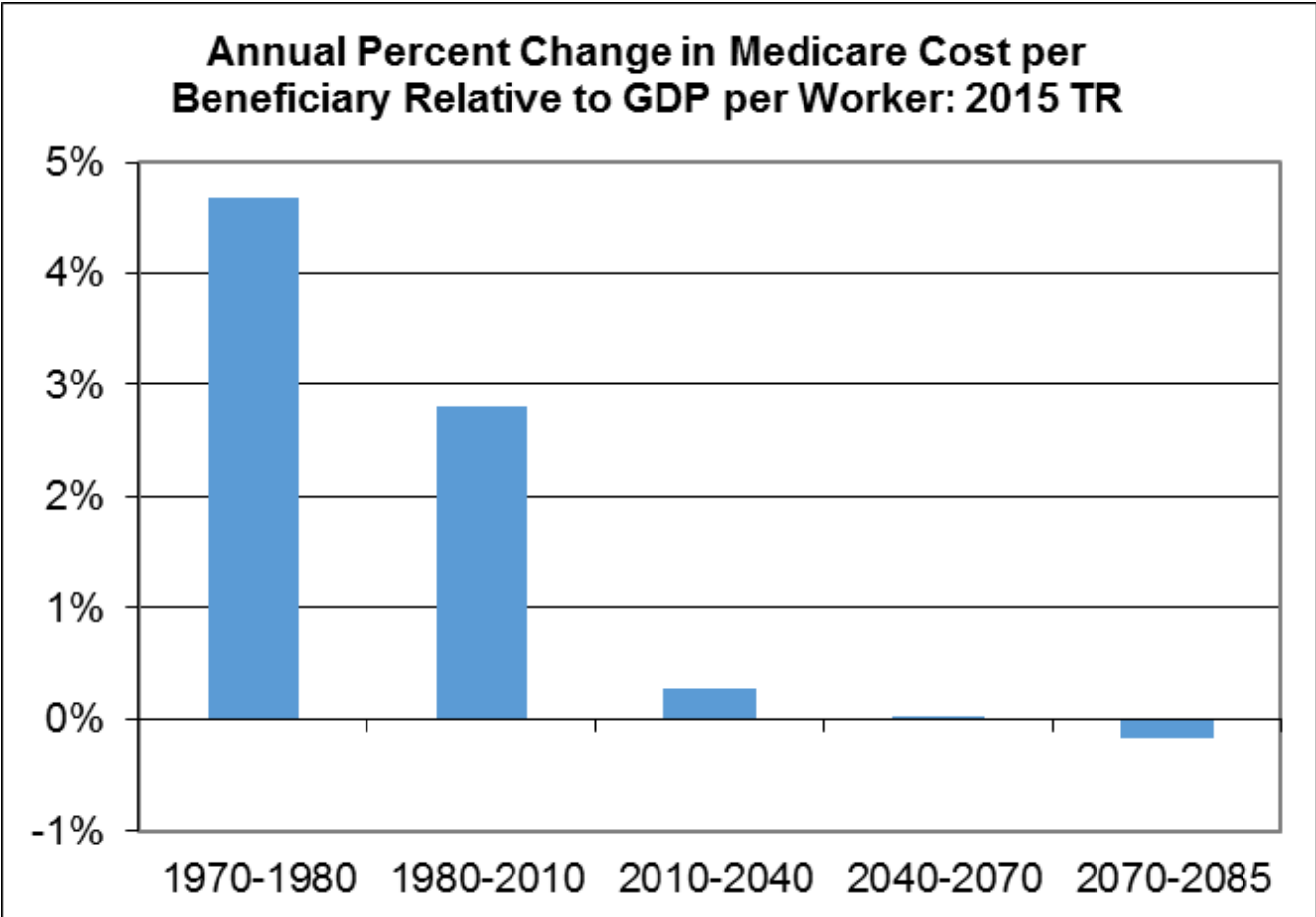
Does Health Spending Affect Mortality?

Note rise, at least through 2009



Health Spending Cannot Continue to Rise at Historical Rates

Note Trustees' deceleration



Mortality By Career-Average Earnings Level Actuarial Study #124

- Compared the death rates among retired-worker beneficiaries by sex, age group, and lifetime career-average earnings level (AIME) to the annual death rate among retired-worker beneficiaries for that sex and age group.
- For each sex and age group, we calculated the relative mortality ratios at various AIME levels.

Age Group 65-69 Relative Mortality Ratios

