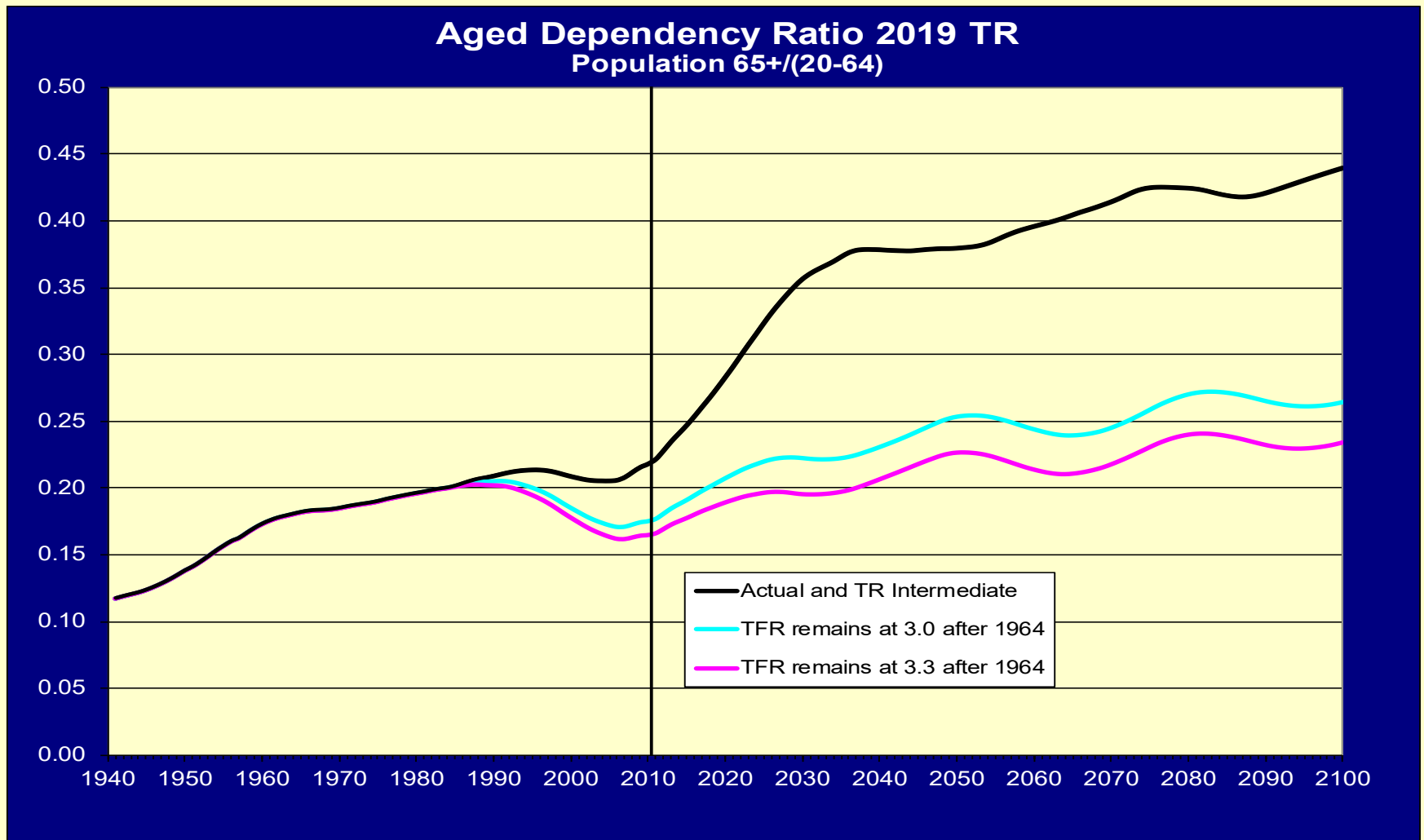# Declining Mortality (Increasing Longevity): At What Rate? At What Ages?

Steve Goss, Chief Actuary
US Social Security Administration

2020 Living to 100 Symposium
General Session IV - Mortality Projection from a Social Security Panel
January 14, 2020

Perspective: "Aging" Not Mainly from Mortality

Aging (change in age distribution) mainly due to drop in birth rates

Aged Dependency Ratio 2019 TR
Population 65+/(20-64)

Legend:
- Actual and TR Intermediate
- TFR remains at 3.0 after 1964
- TFR remains at 3.3 after 1964

Considerations in Projecting Mortality

- ◆ Variation over time periods

- ◆ Variation by age

- ◆ Variation by earnings level

- ◆ Changing causes of death

- ◆ Cohort considerations

- ◆ Health spending, obesity, smoking, opioids

- ◆ Is there a limit on human longevity?
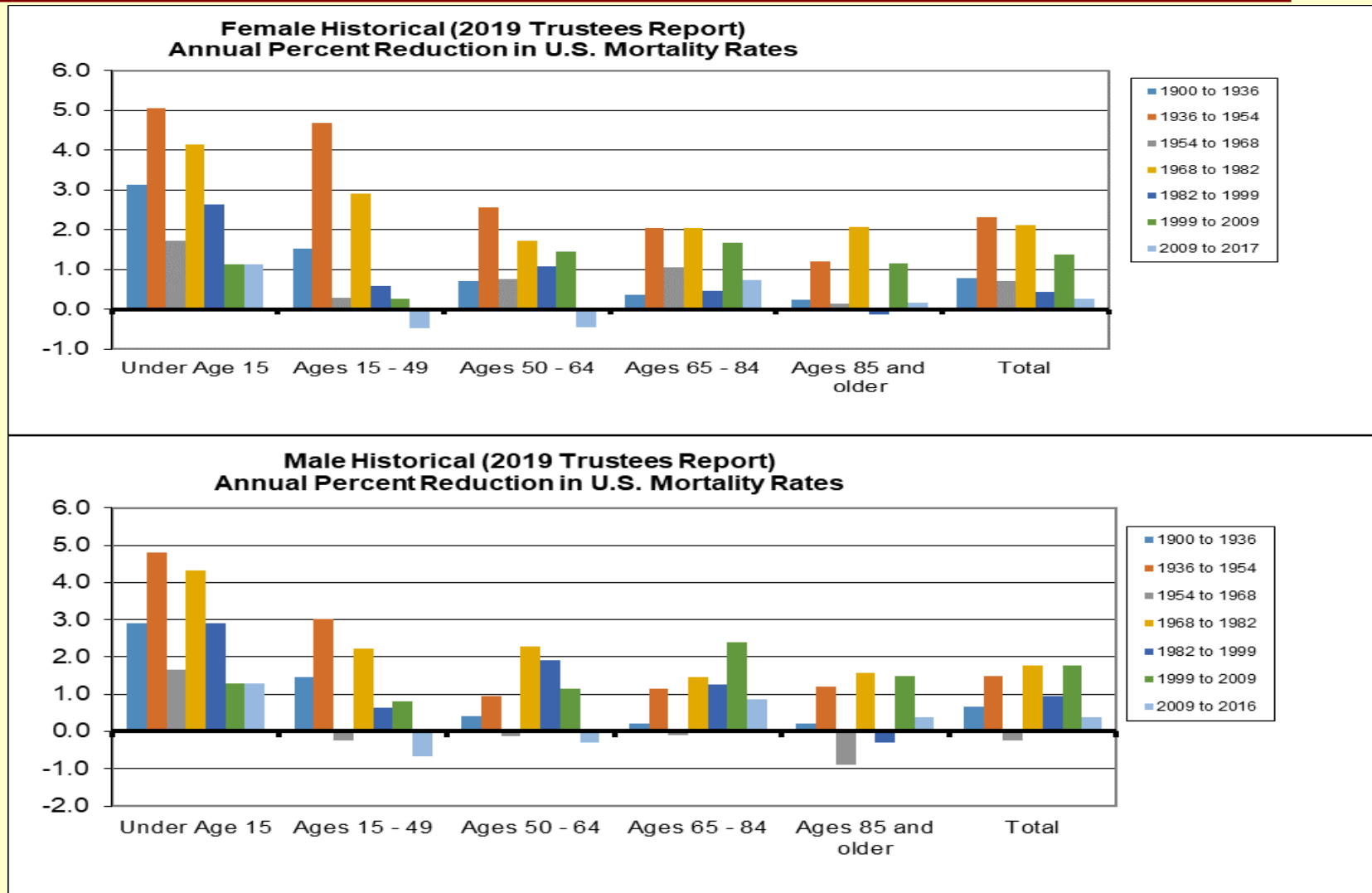
- ◆ Our projections for the United States

Life Expectancy at Birth Not a Useful Indicator; Age Distribution of Death Rates Most Important

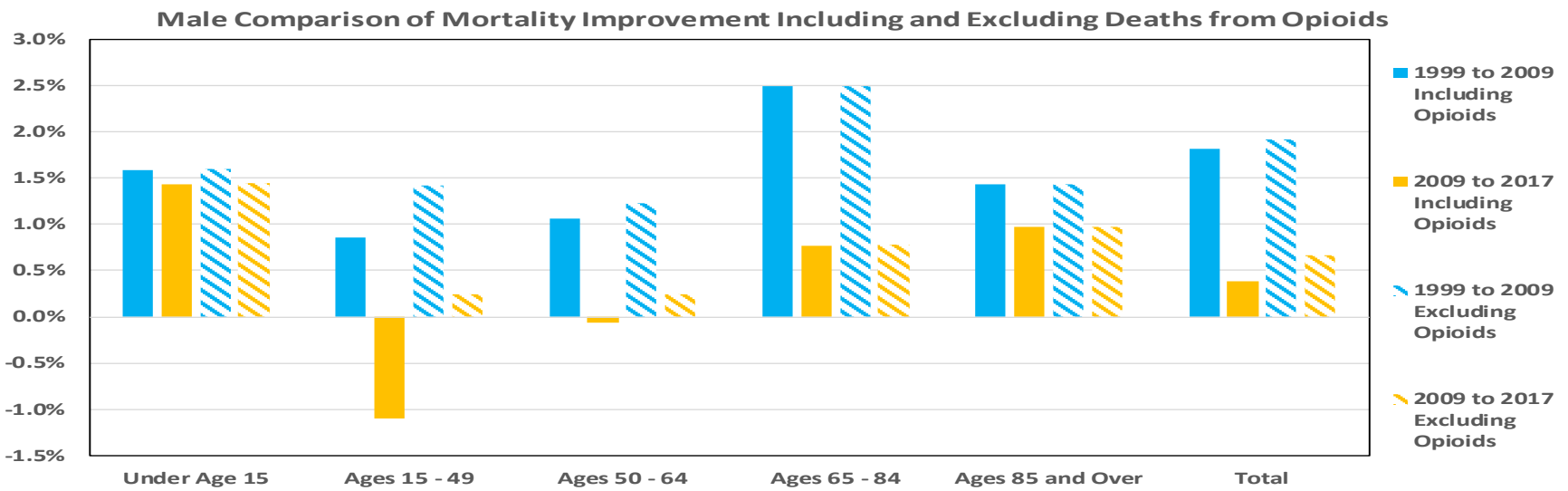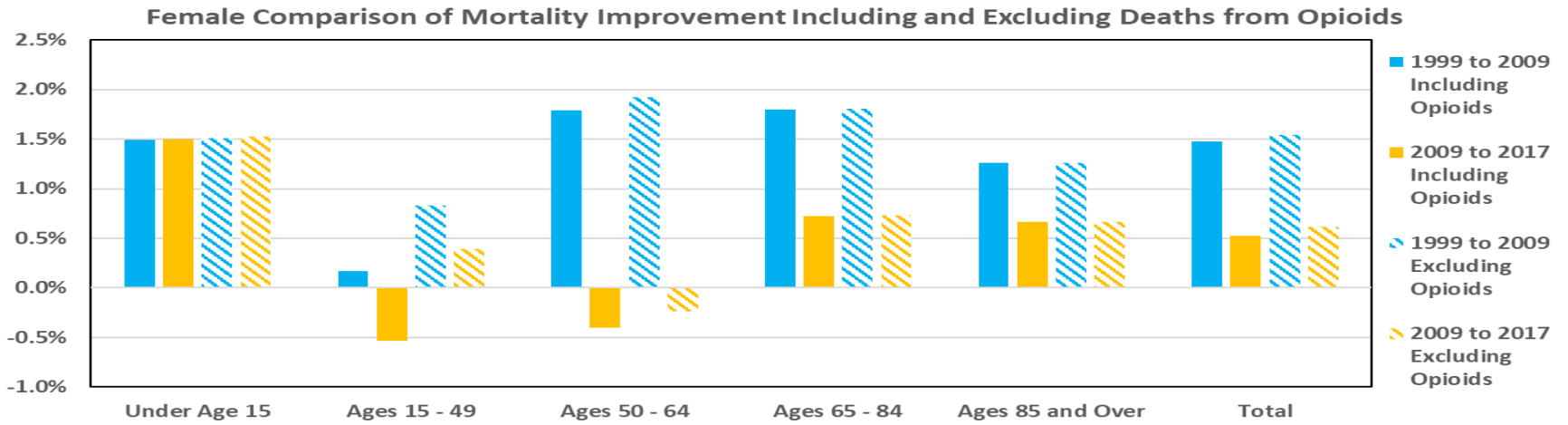Period Life Expectancy at Birth using the 2019 TR
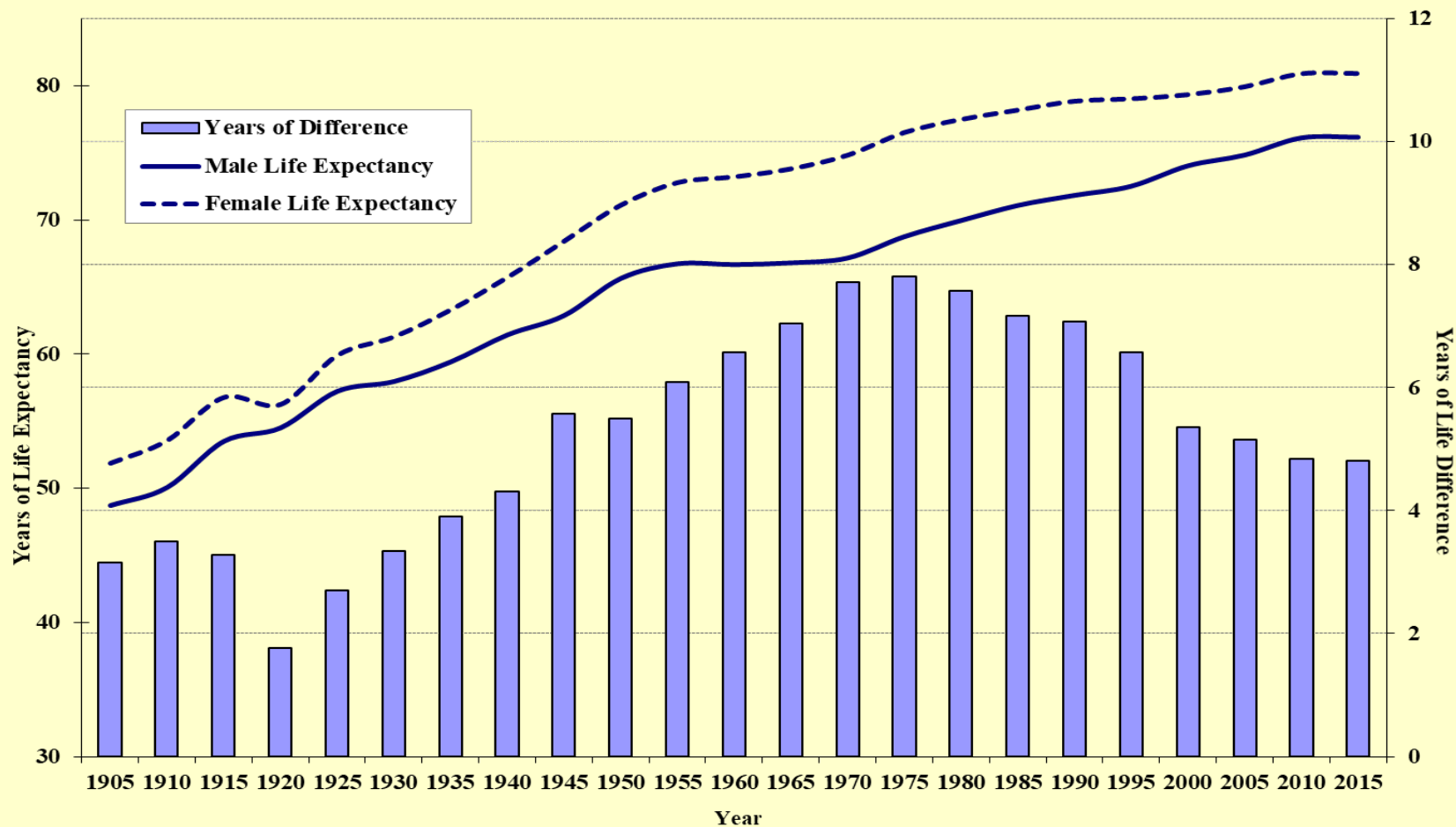
Mortality Decline *Varies* Over Time
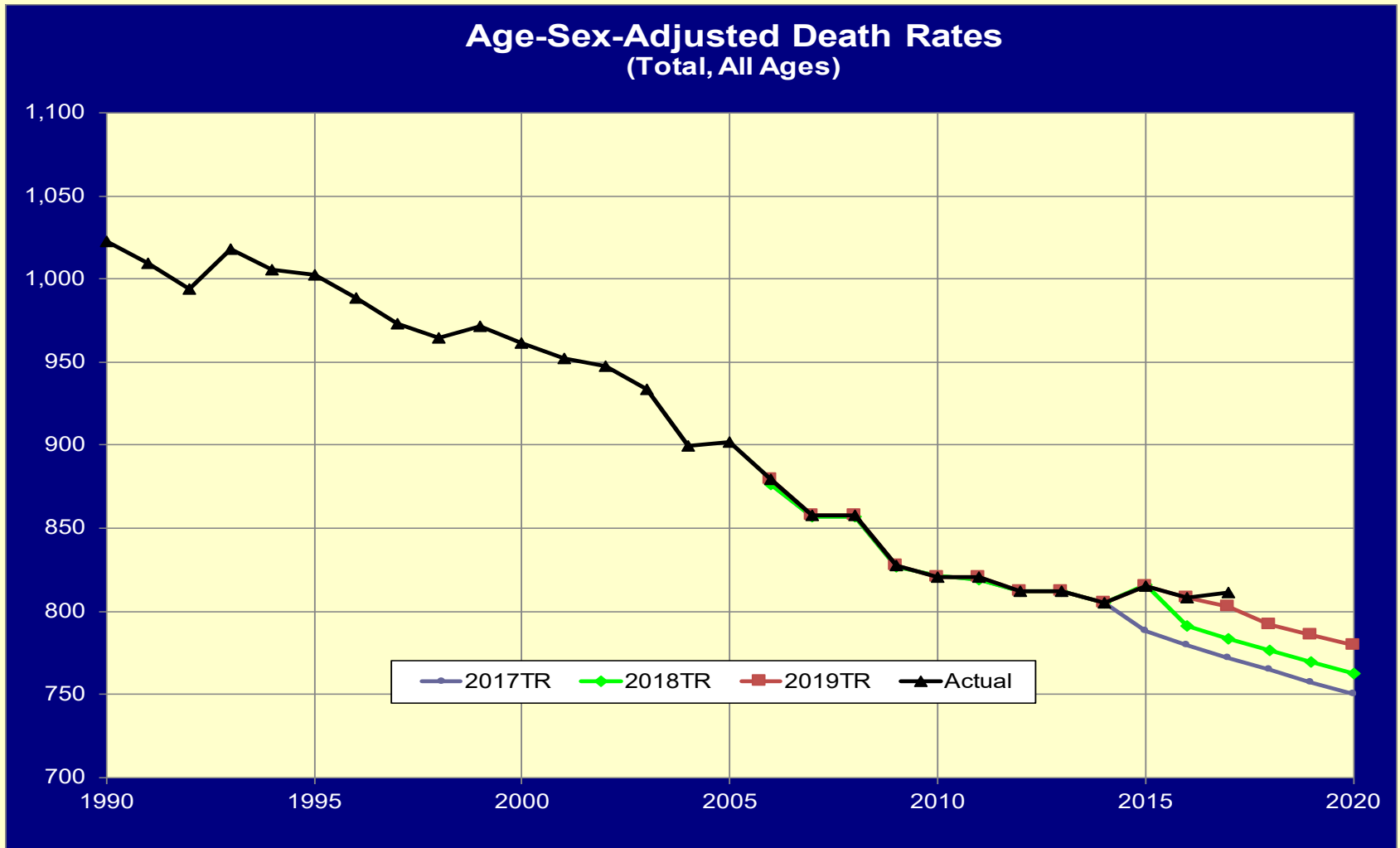*Conditions: Antibiotics/economy 1936-54; Medicare/Medicaid 1968-82*

# Opioids? Affected Age 15-64 Mortality Decline Since 1999, but Not the Deceleration Since 2009

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Mortality Experience: All Ages
Reductions falling short of expectations since 2009

Age-Sex-Adjusted Death Rates
(Total, All Ages)

Legend: 2017TR, 2018TR, 2019TR, Actual

Mortality Experience: Ages 65 and Over
Reductions falling short of expectations since 2009

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

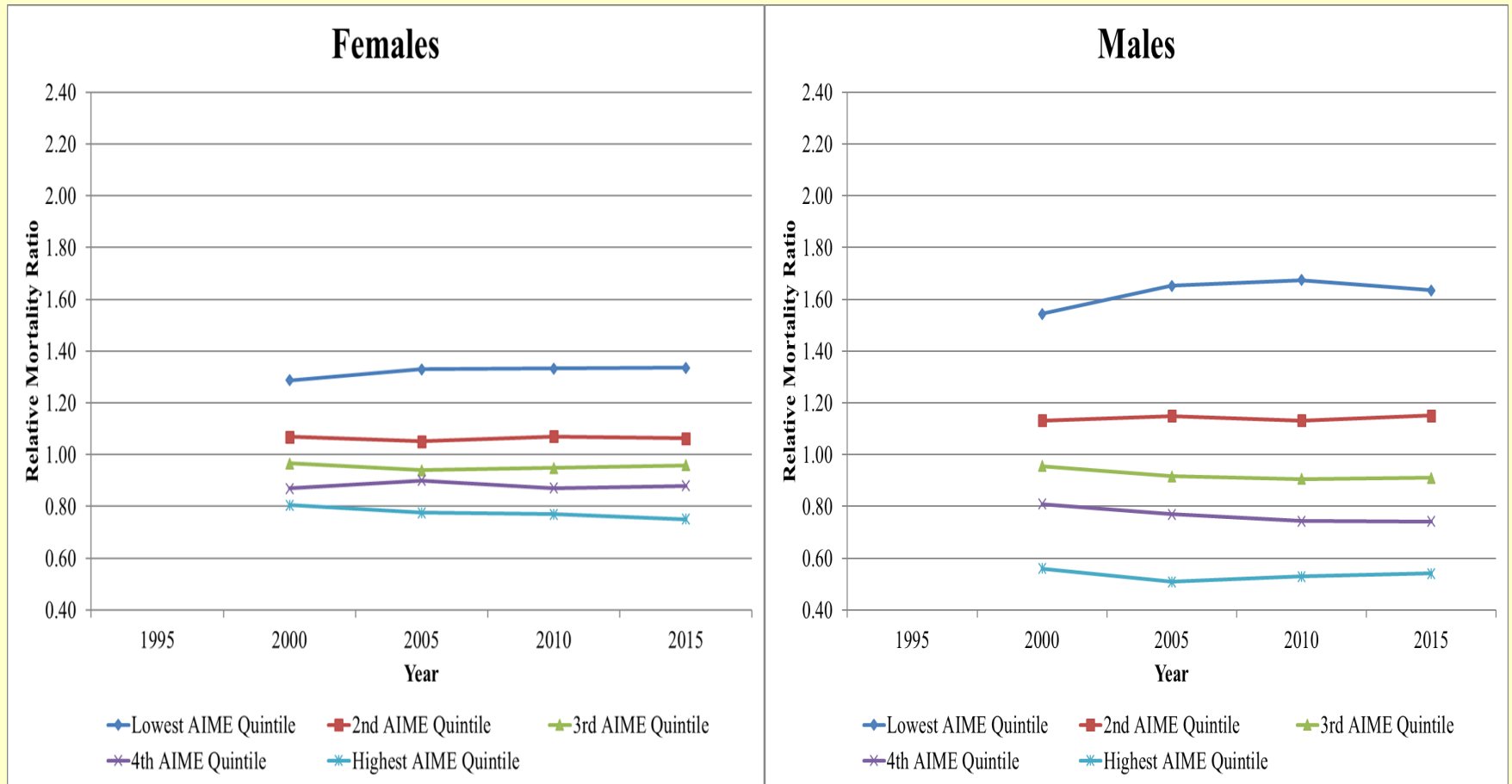Legend: 2017TR, 2018TR, 2019TR, Actual
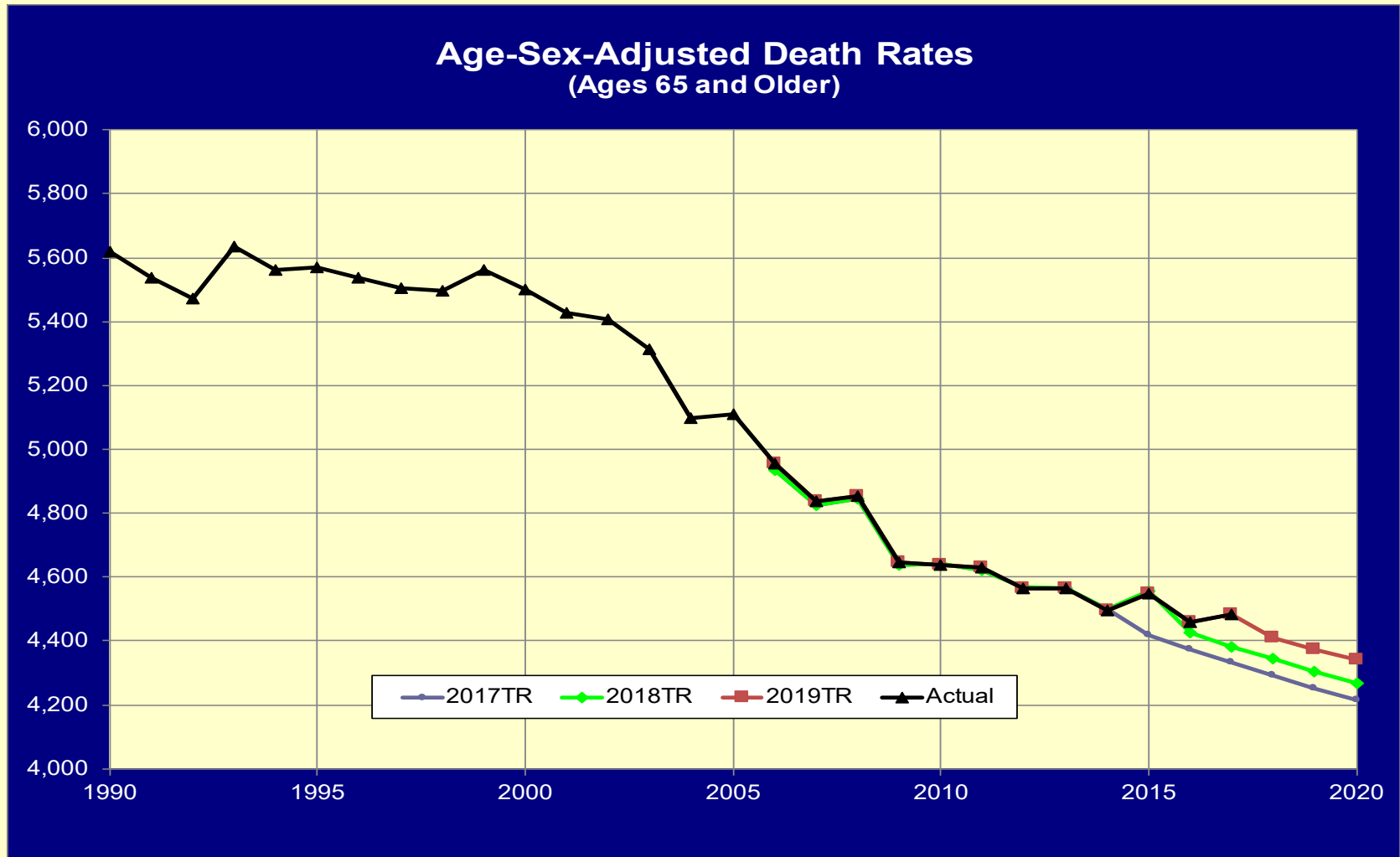
Variation by Age is Substantial
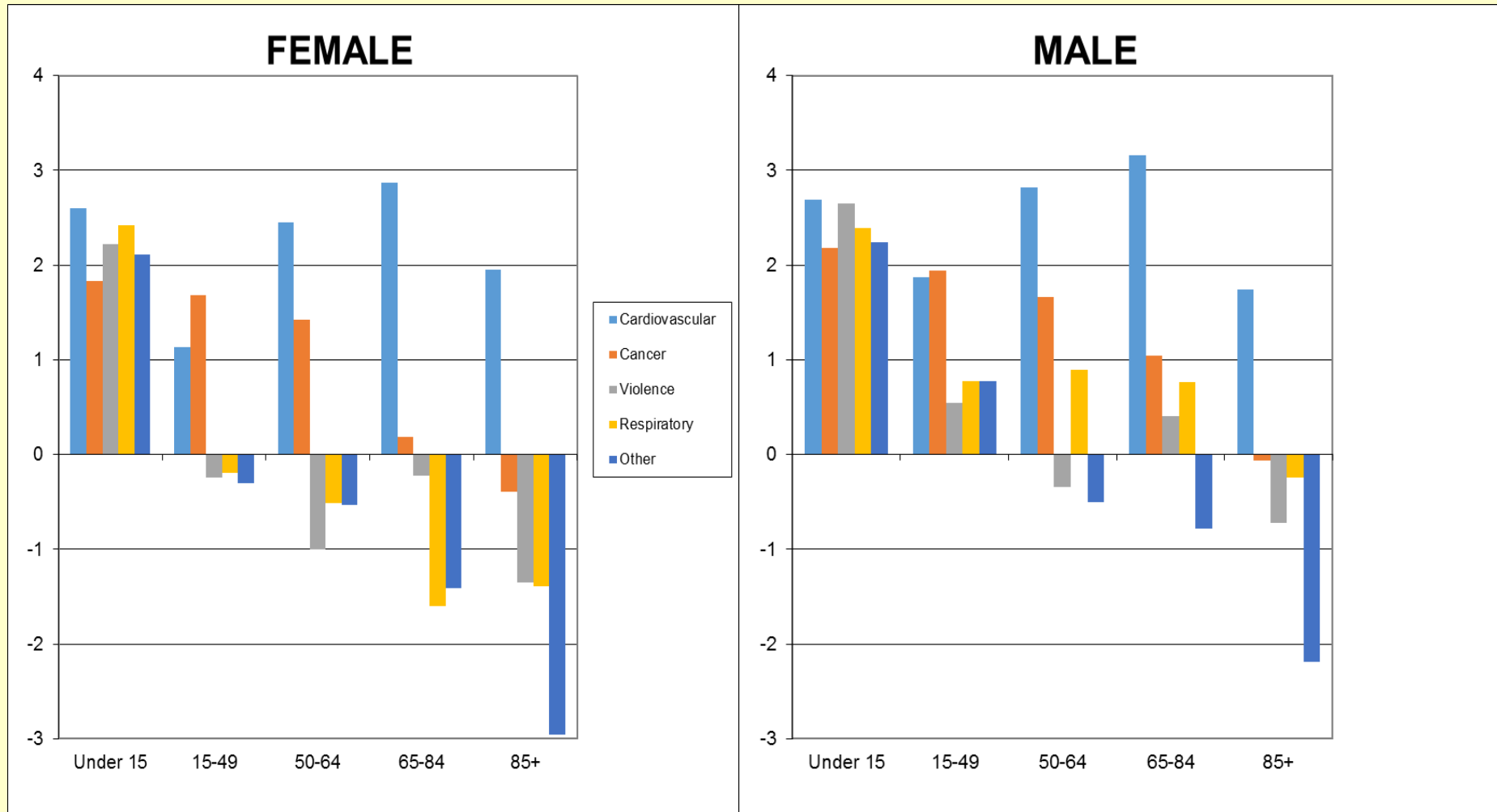
Age-gradient in past reduction is clear
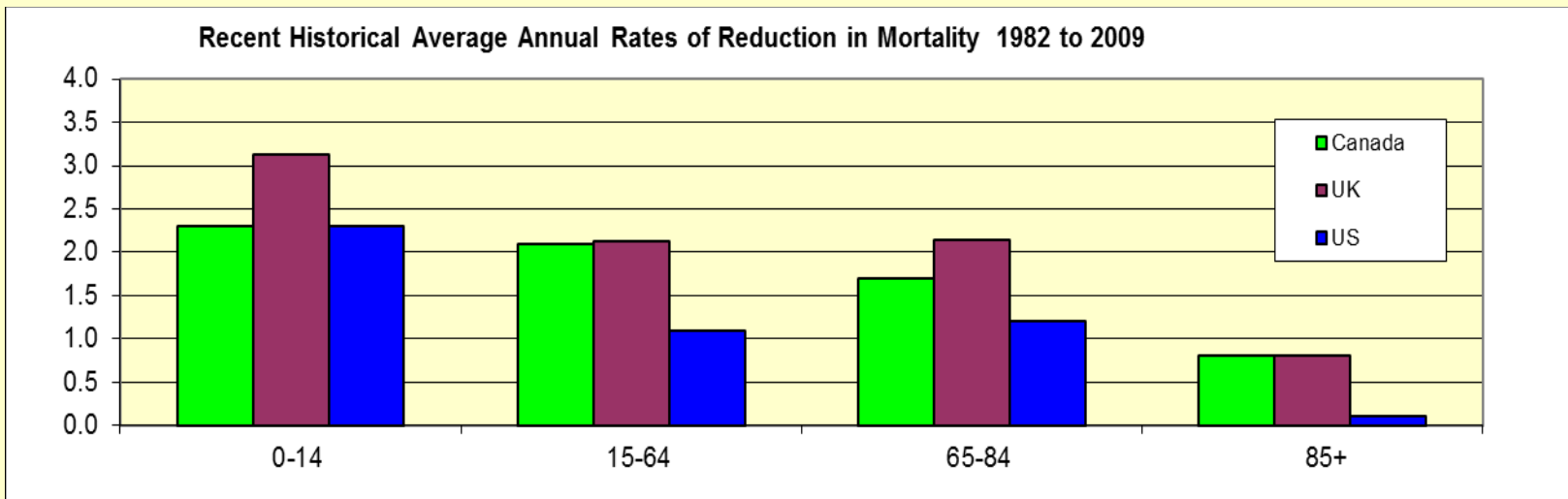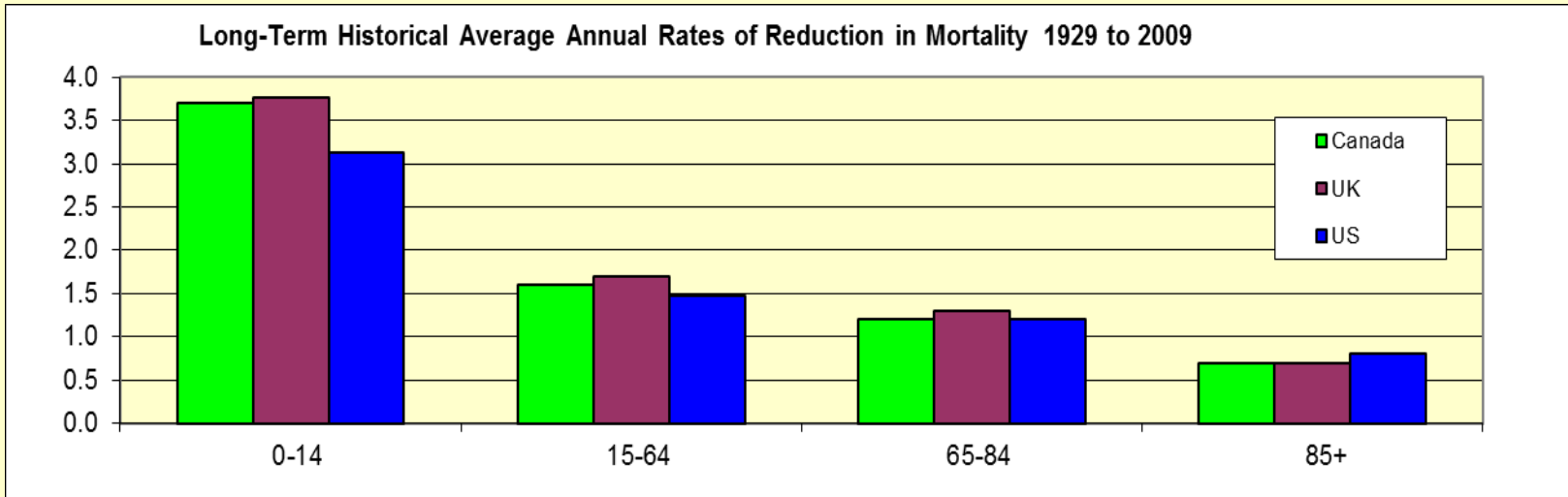
Mortality By Career-Average Earnings Level: Actuarial Study #124

Age group 65-69 relative mortality ratios—not diverging?
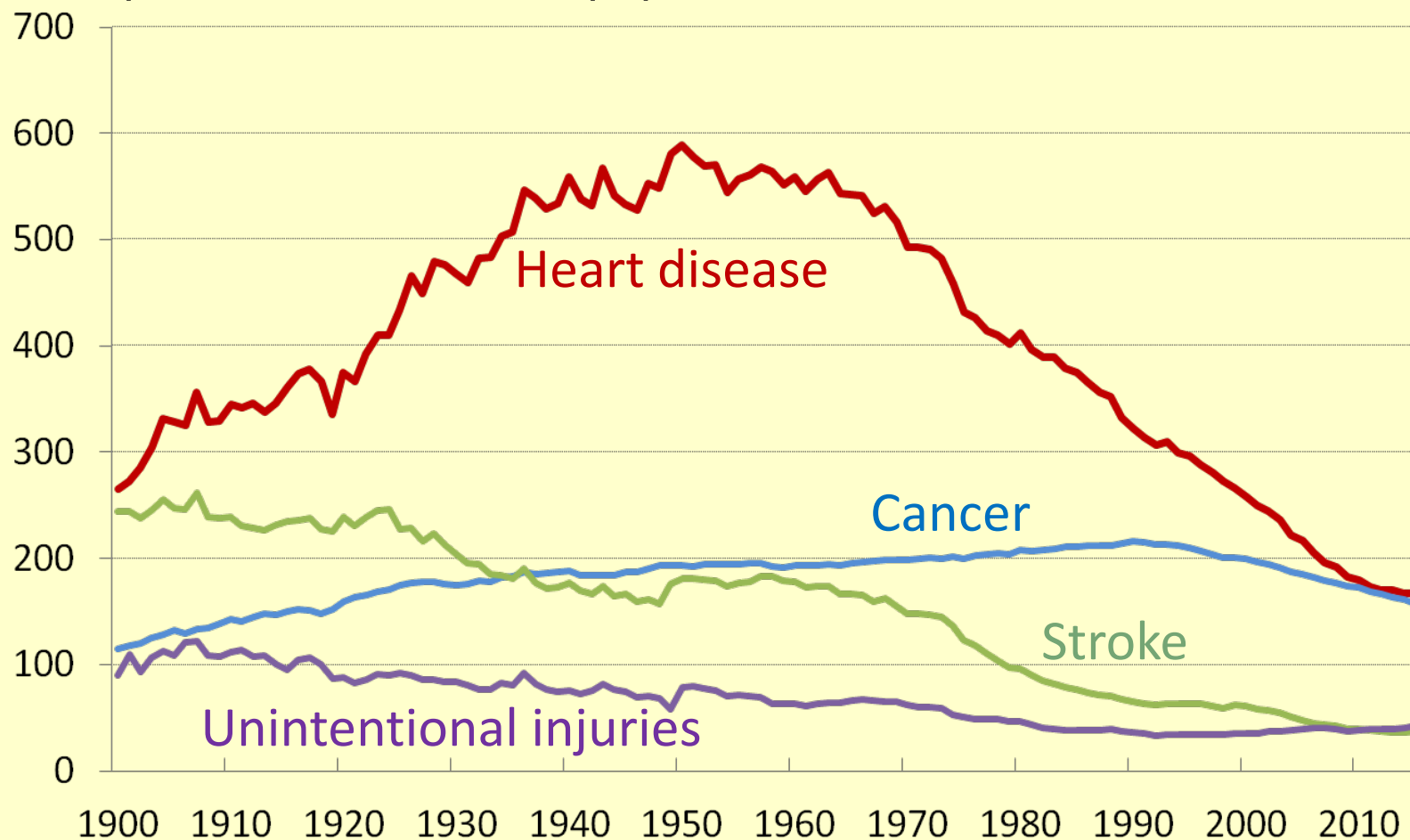
Mortality Decline by *Cause* of Death:
Rate of change from 1979 to 2017

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

(courtesy Robert Anderson, NCHS)

Rate per 100,000 standard population

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

Developing Assumptions by Cause

- ◆ Scientific approach reflecting biology

- ◆ Trustees and SSA/OCACT develop in consultation with other experts

- ◆ Johns Hopkins survey of medical researchers and clinicians came to very similar medium-term expectations—independently

  - – Trustees' medium-term rates by cause had not been published

Cardiovascular: JHU Less Optimistic than Trustees Over Age 50 for Next 30 Years
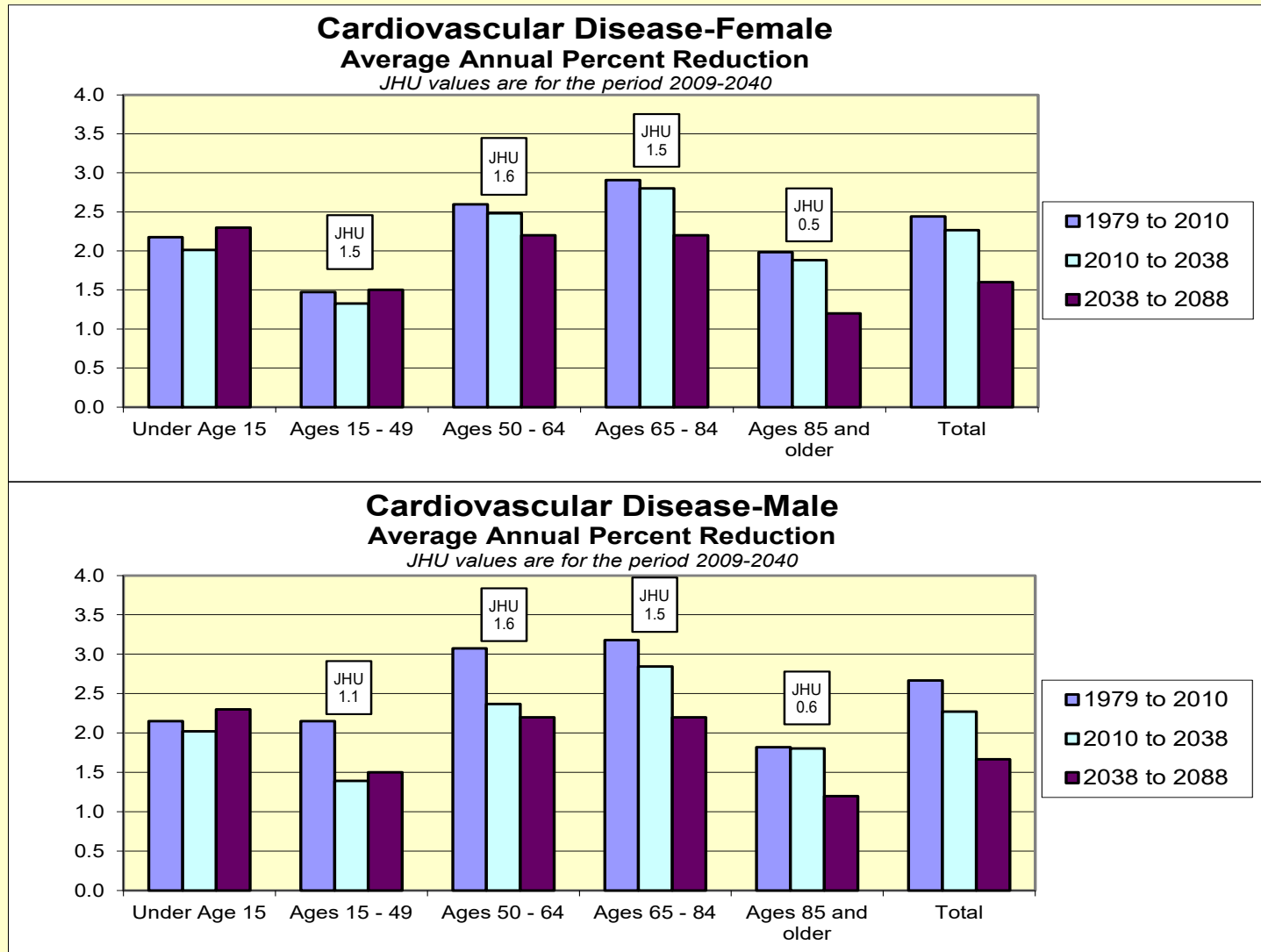
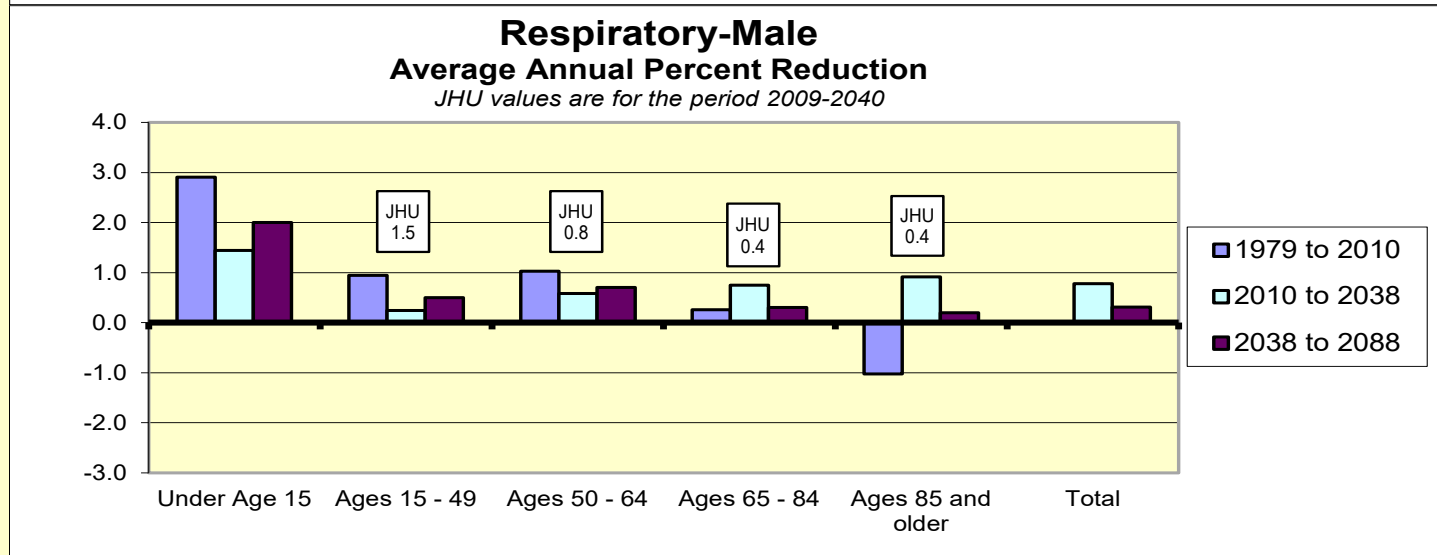# Respiratory: JHU More Optimistic Under Age 50, Less Optimistic Over Age 85

Respiratory-Female
Average Annual Percent Reduction
JHU values are for the period 2009-2040

Respiratory-Male
Average Annual Percent Reduction
JHU values are for the period 2009-2040

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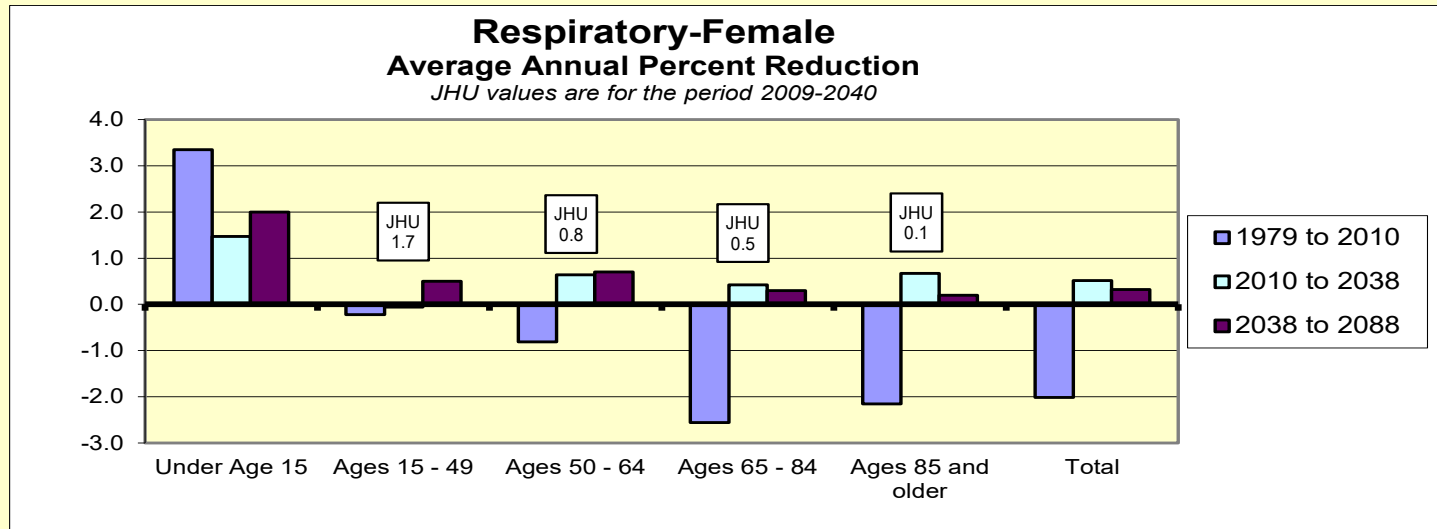
Cancer: JHU Very Similar to Trustees' Expectations

Cancer-Female
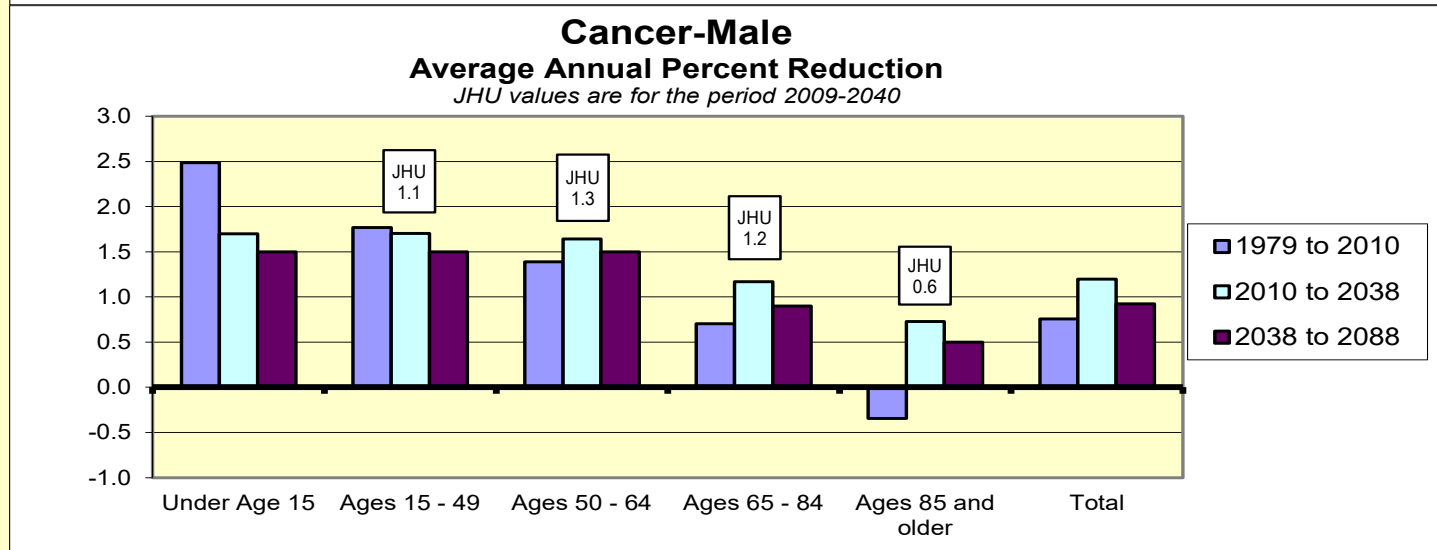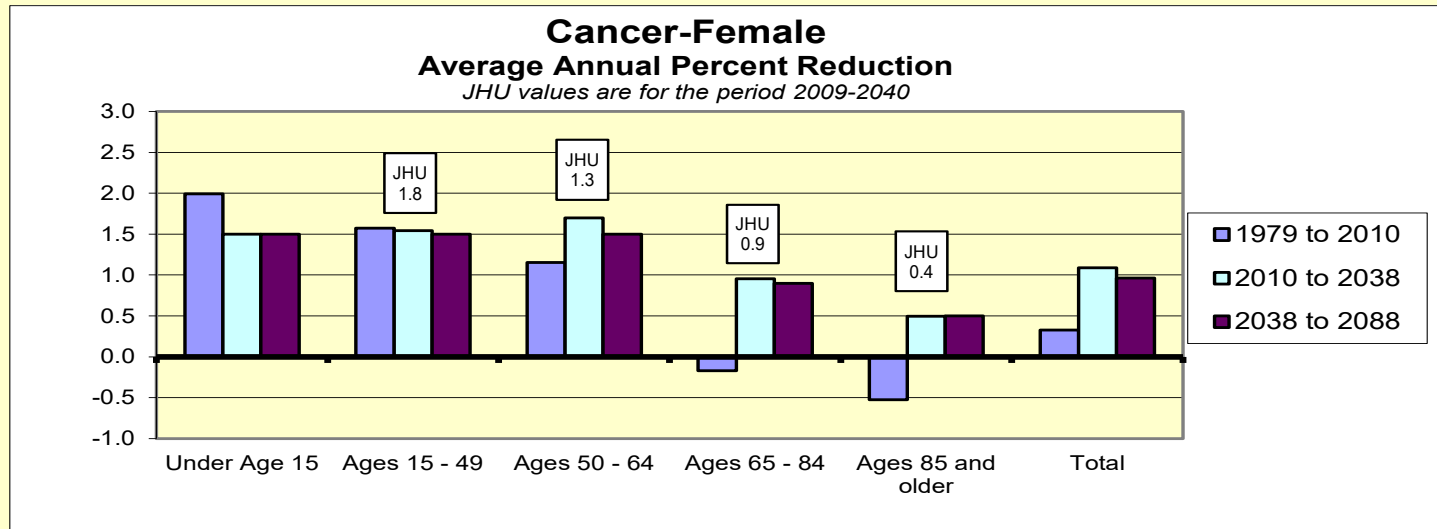**Average Annual Percent Reduction**
JHU values are for the period 2009-2040

JHU 1.8 (Ages 15 - 49)
JHU 1.3 (Ages 50 - 64)
JHU 0.9 (Ages 65 - 84)
JHU 0.4 (Ages 85 and older)

Legend: 1979 to 2010, 2010 to 2038, 2038 to 2088

Cancer-Male
Average Annual Percent Reduction
JHU values are for the period 2009-2040

JHU 1.1 (Ages 15 - 49)
JHU 1.3 (Ages 50 - 64)
JHU 1.2 (Ages 65 - 84)
JHU 0.6 (Ages 85 and older)

Legend: 1979 to 2010, 2010 to 2038, 2038 to 2088

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Cohort Considerations
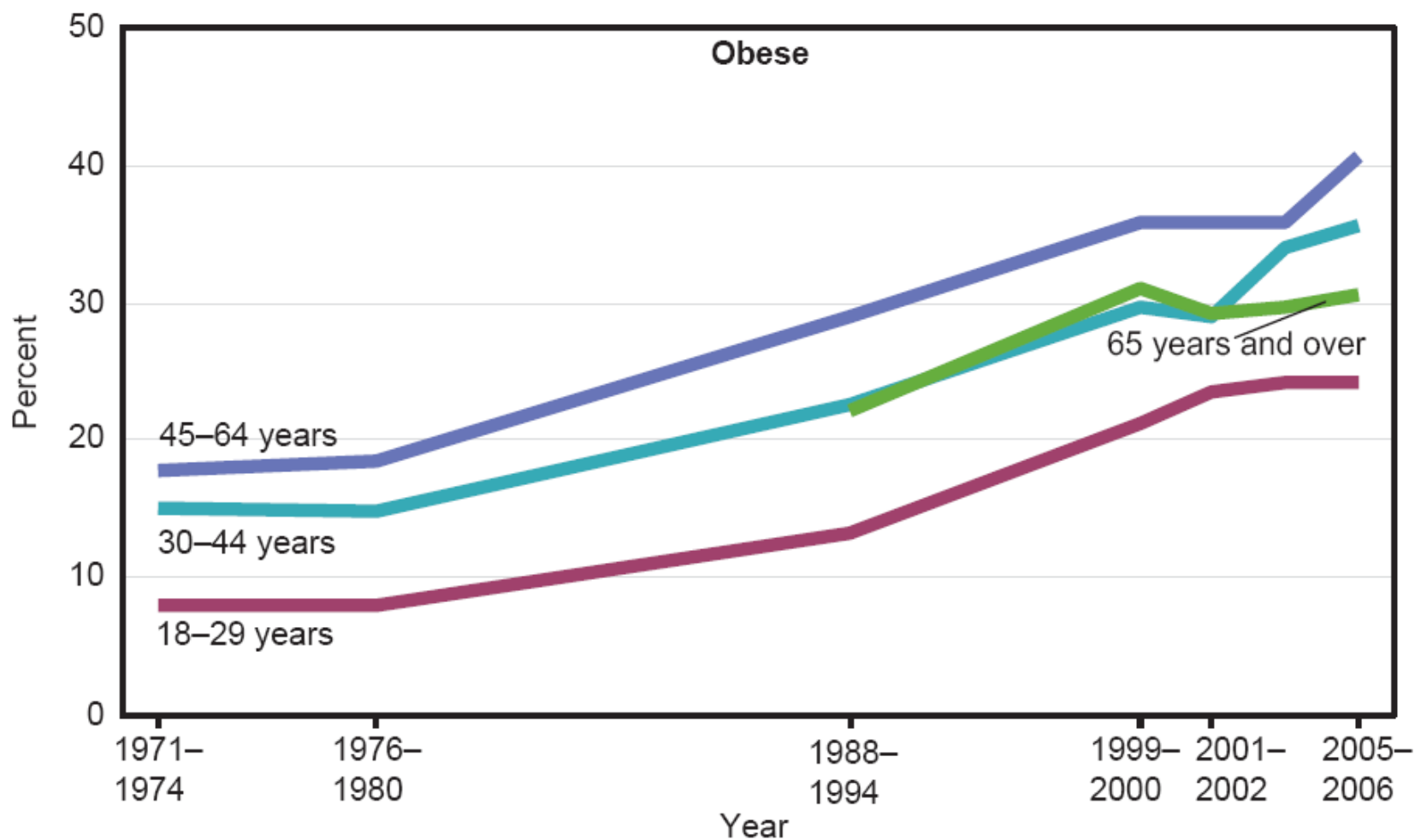
◆ Post-World War 2 births—special conditions:

– Antibiotics when young; statins, etc. later

◆ What does change up to age x say above age x?

– If cohort is fundamentally healthier at x:

   Then expect lower mortality over age x

– But if medical interventions have just reduced deaths:

   Then cohort mortality over age x could be worse, with increased numbers of impaired survivors

– What does one cohort imply for the next cohort?

   Further changes depend on conditions, not trend

How Future Conditions Might Change

◆ Smoking decline for women

– Started and stopped later than men

◆ Obesity—sedentary lifestyle

◆ Health spending—must decelerate

– Advances help only if they apply to all
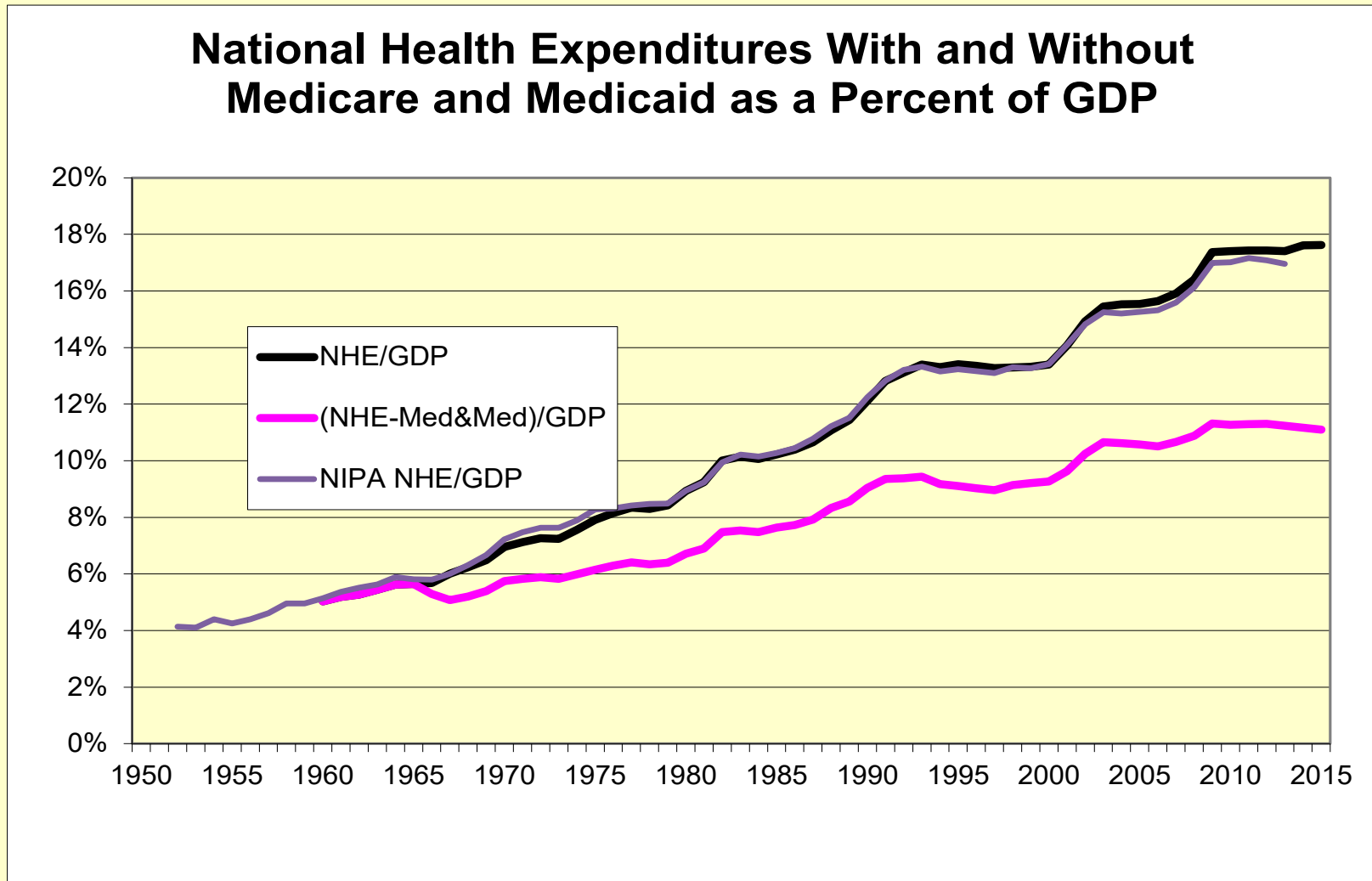
◆ Human limits

– Increasing understanding of deceleration

Trends in Obesity: US 1971-2006
*Sam Preston 2010—must consider **cumulative** effects*
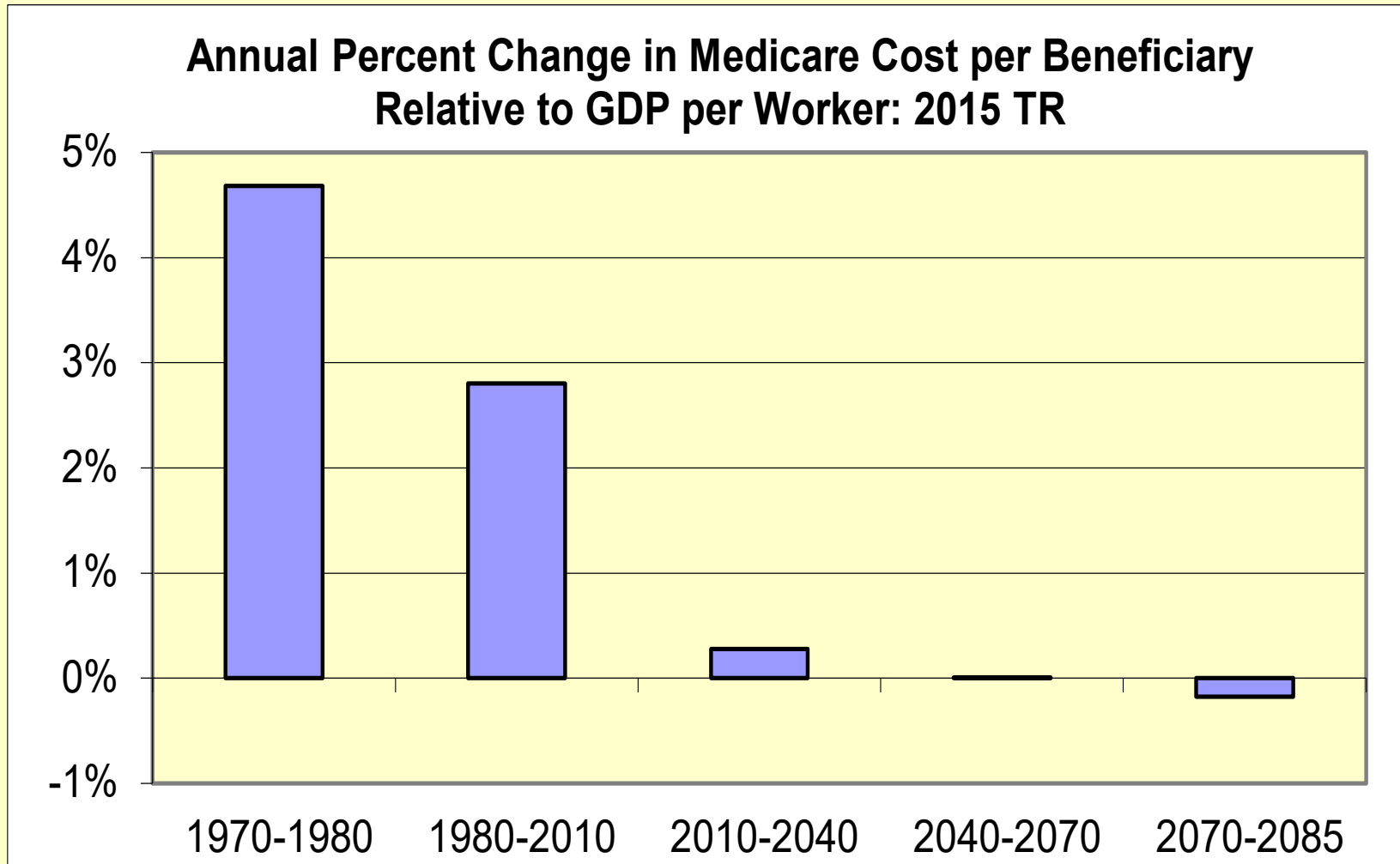*Increasing duration of obesity for aged in future*

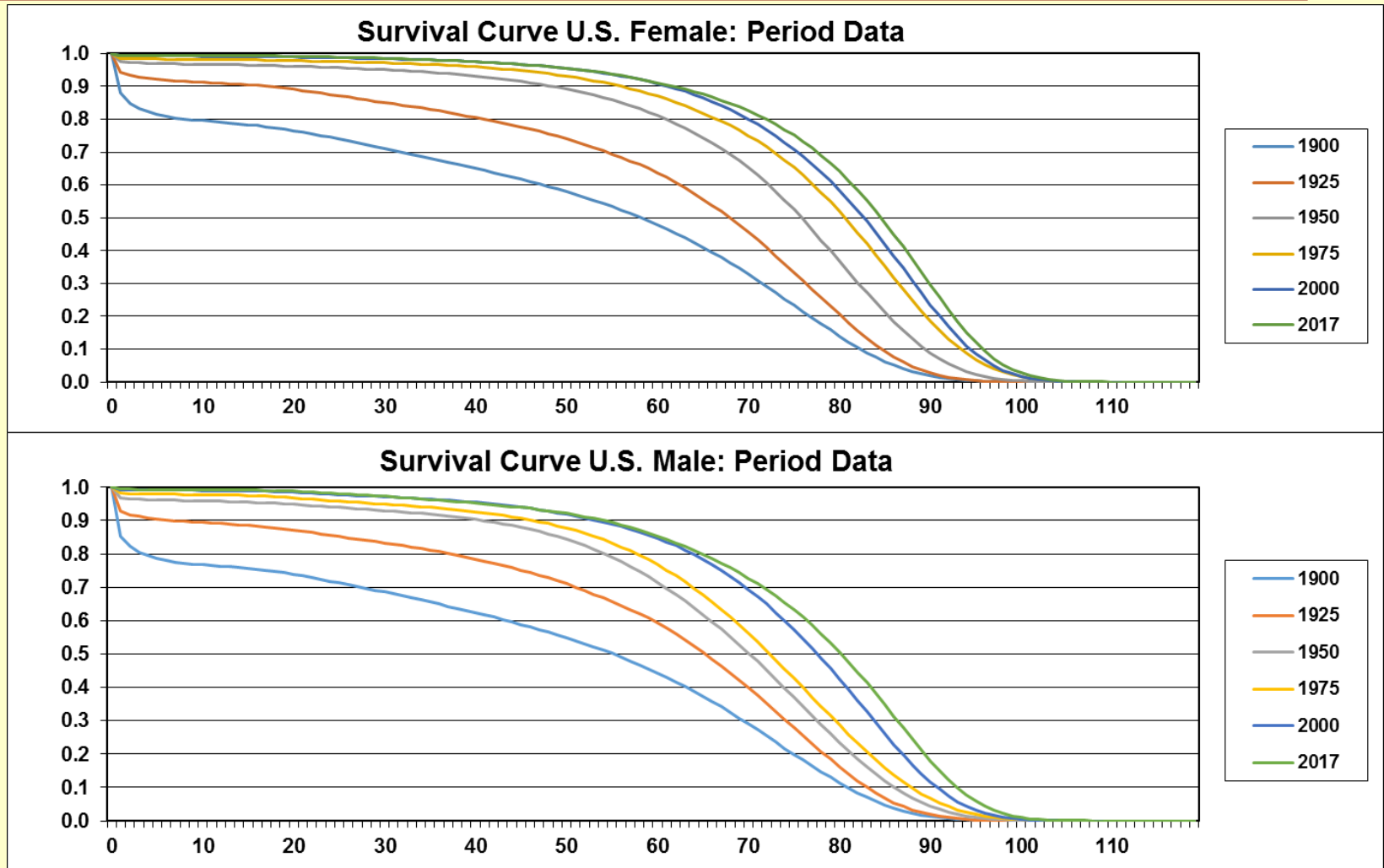# Does Health Spending Affect Mortality?

Note rise, at least through 2009

National Health Expenditures With and Without Medicare and Medicaid as a Percent of GDP

Legend:
- NHE/GDP
- (NHE-Med&Med)/GDP
- NIPA NHE/GDP

Health Spending Cannot Continue to Rise at Historical Rates
Note Trustees' deceleration

Annual Percent Change in Medicare Cost per Beneficiary Relative to GDP per Worker: 2015 TR

Is There an Omega?

It appears we are rectangularizing the survival curve

Survival Curve U.S. Female: Period Data

Survival Curve U.S. Male: Period Data

Death Rates Will Continue to Decline: But How Fast and for Whom?

◆ Must understand past and future conditions

– Persistent historical "age gradient"

– Avoid simple extrapolation of past periods

» Cannot ignore changing conditions

◆ "Limits" on longevity due to physiology

◆ Latter half of 20th century was extraordinary

» So deceleration seems likely

» Cause-specific rates allow basis for assumptions

– Results: in the 1982 TR, we projected LE65 for 2013 to be 19.0; actual was 19.1

Ultimate (2043 to 2093) Projected Rates of Decline: Similar to Period Since 1900 for Age 50+

Historical and Projected Age-Sex-Adjusted Decline in U.S. Death Rates
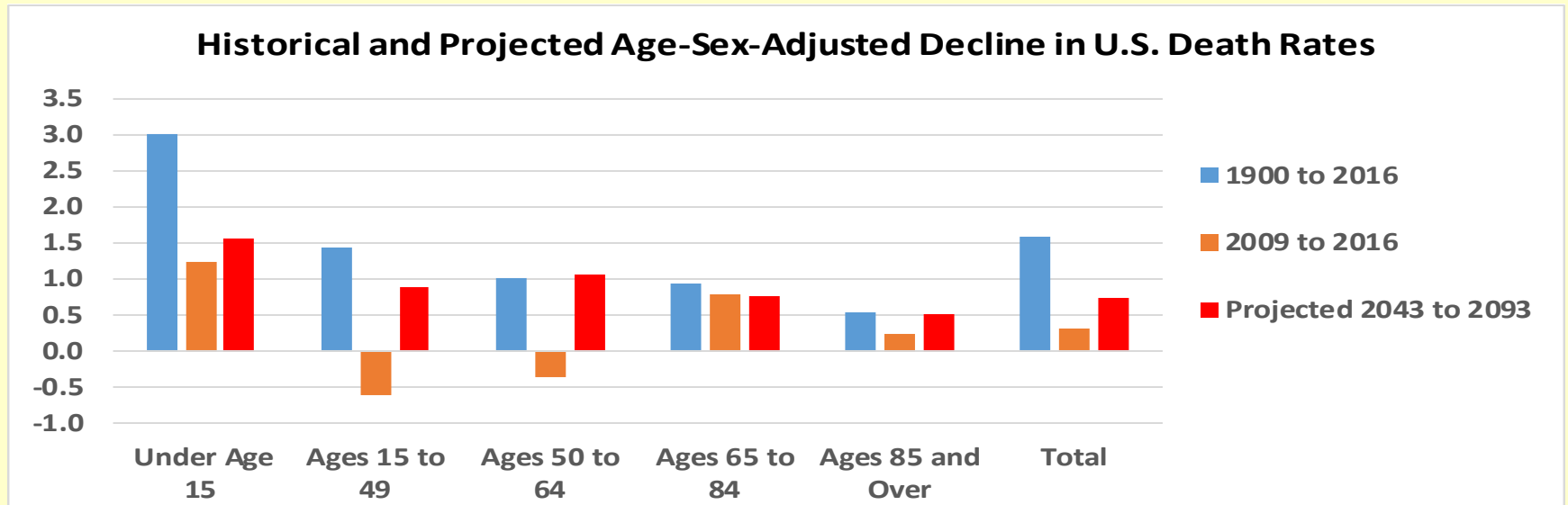
Historical and Projected Age-Sex-Adjusted Decline in U.S. Death Rates

|	1900 to 2016	2009 to 2016	Projected 2043 to 2093
Under Age 15	3.01	1.23	1.55
Ages 15 to 49	1.44	-0.60	0.89
Ages 50 to 64	1.02	-0.35	1.06
Ages 65 to 84	0.95	0.79	0.76
Ages 85 and Over	0.55	0.24	0.51
Total	1.58	0.31	0.73

Intermediate projections in the 2019 Trustees Report

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Projected Age-Sex-Adjusted Death Rates, All Ages

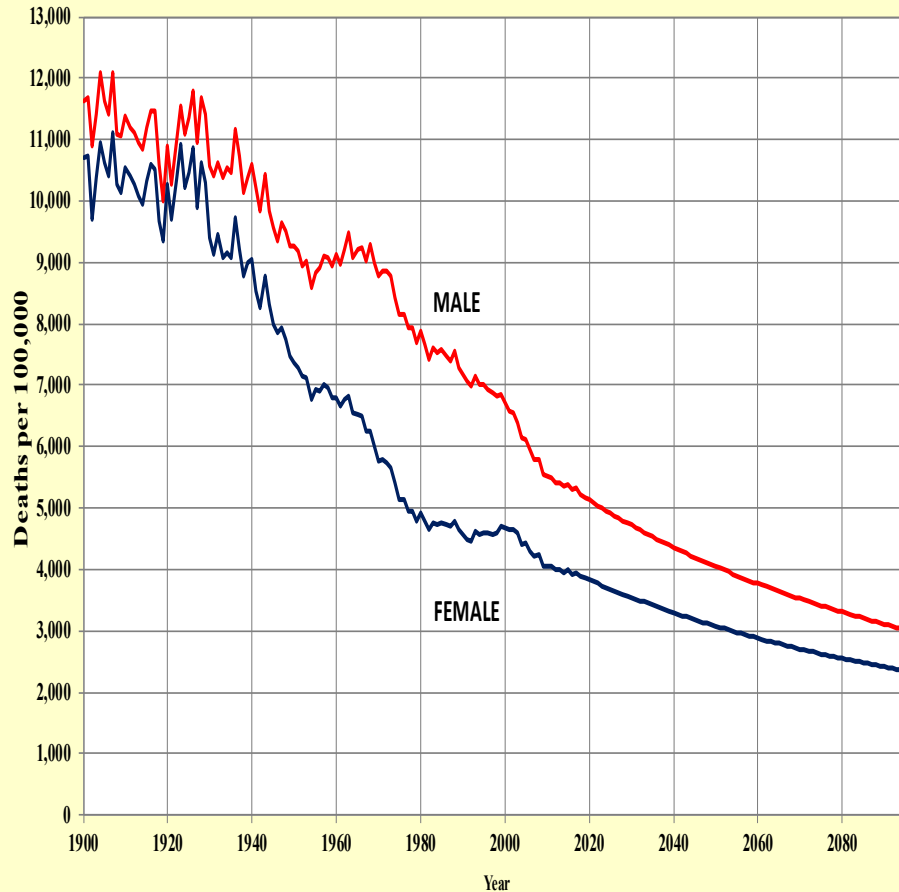**Total Age-Sex-Adjusted Death Rates for Alternative II of the 2019 TR**
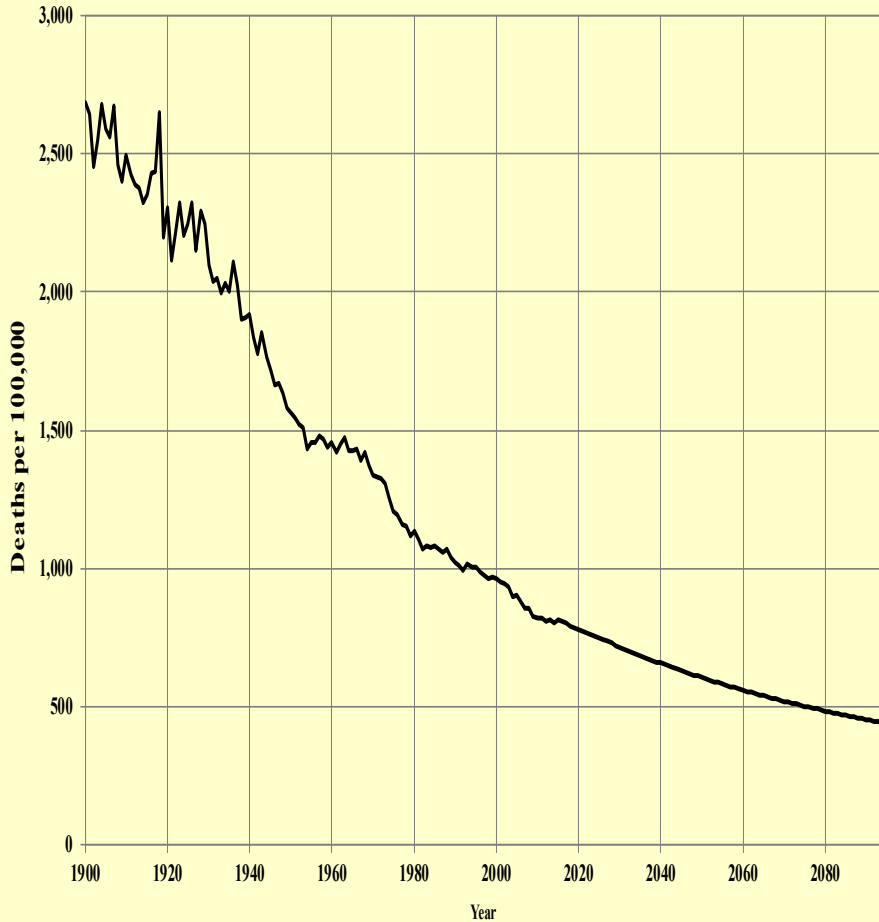
Total Age-Sex-Adjusted Death Rates for Alternative II of the 2019 TR
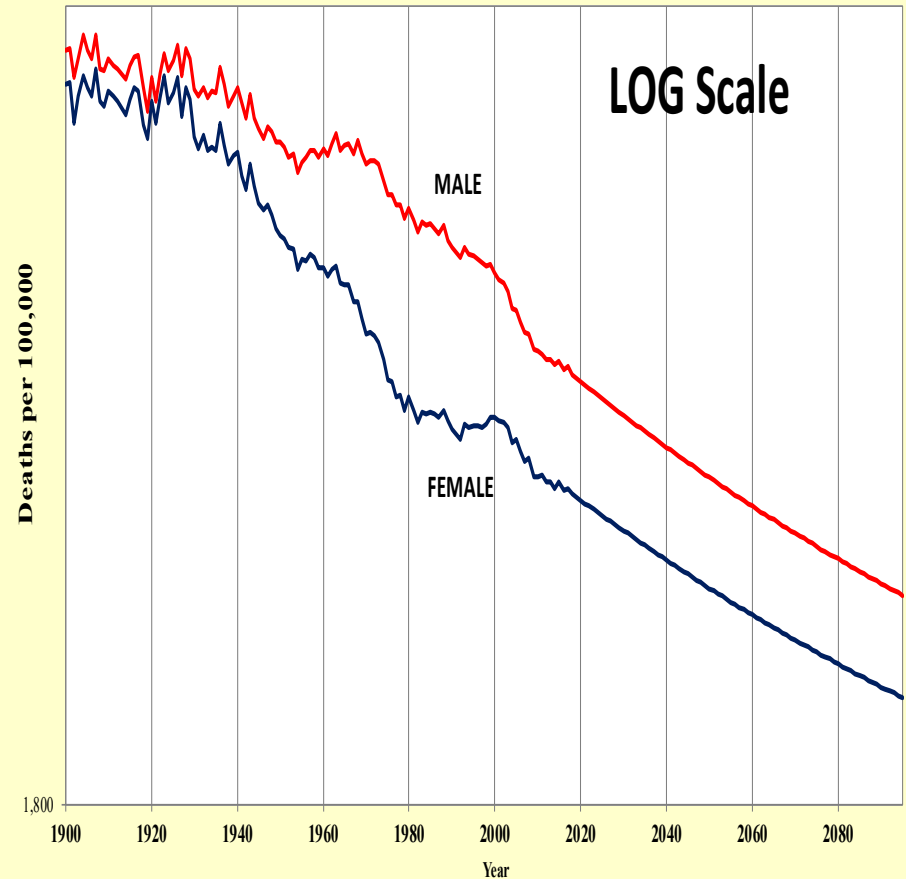

LOG Scale
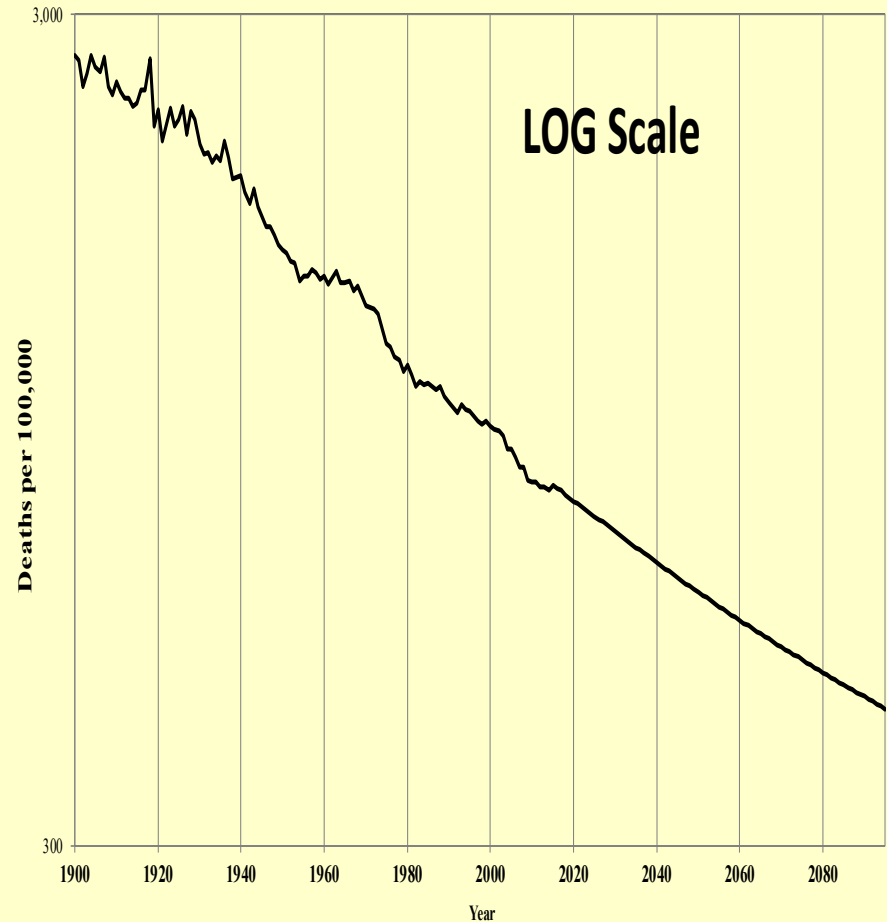
# Projected Age-Sex-Adjusted Death Rates, Ages 65 and Over

Age-Adjusted Death Rates for 65 and Older Under Alternative II of the 2019 TR

Age-Adjusted Death Rates for 65 and Older Under Alternative II of the 2019 TR

LOG Scale

Ultimately, the Changing Age Distribution of the Population is the Main Factor for Social Security

Age Distribution of the Population Age 25+, 1940 to 2100 (2019 TR)
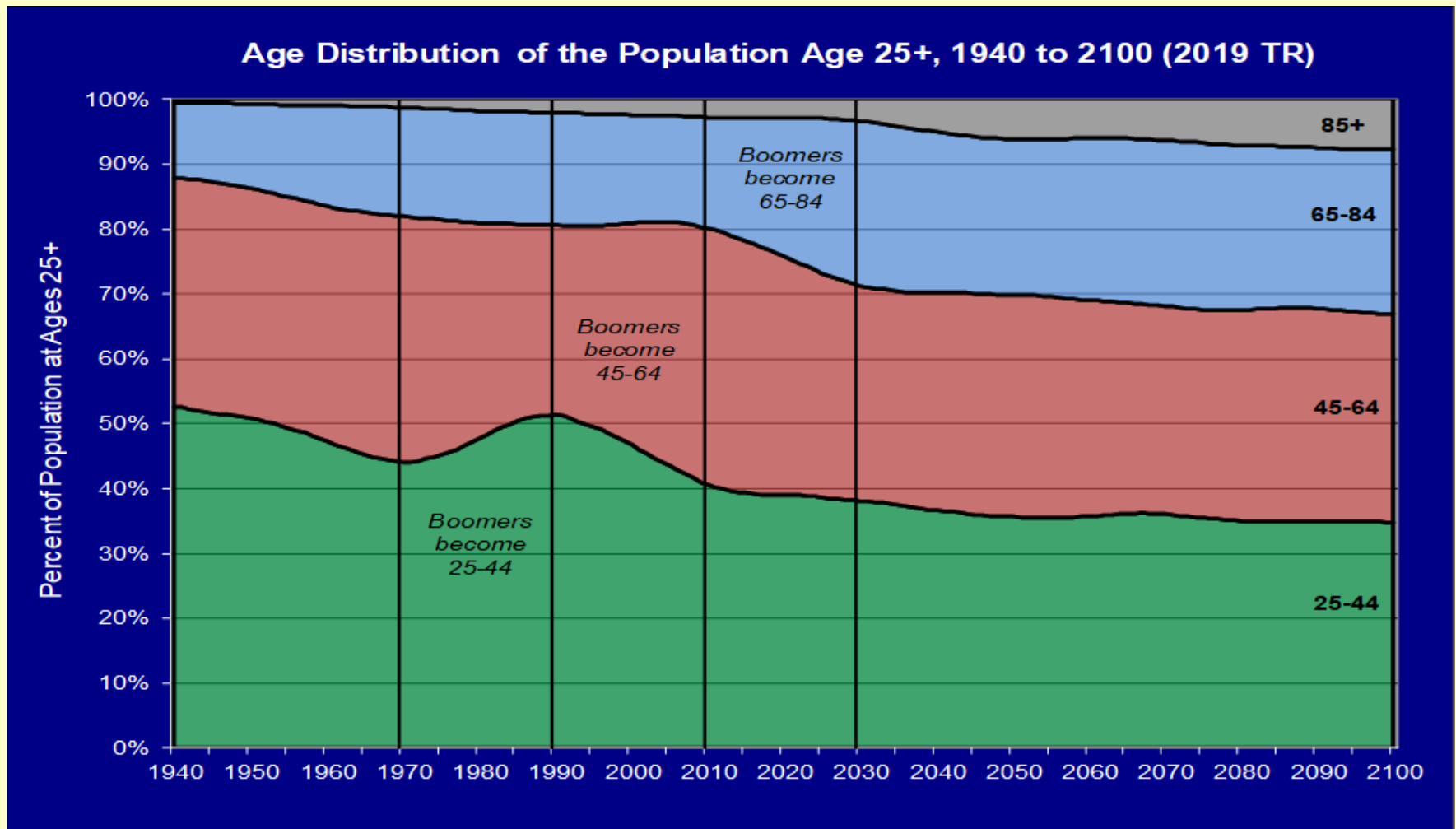
For More Information…
http://www.ssa.gov/oact/

◆ Documentation of Trustees Report data & assumptions
https://www.ssa.gov/oact/TR/2019/2019_Long-Range_Demographic_Assumptions.pdf

◆ Historical and projected mortality rates

https://www.ssa.gov/oact/HistEst/DeathHome.html

◆ Annual Trustees Reports
https://www.ssa.gov/oact/TR/index.html