Mortality (Longevity): What's New Since January 2020? And What Isn't?

Steve Goss, Chief Actuary
US Social Security Administration

2023 Living to 100 Symposium
General Session VII: Mortality Projection from a Social Security Panel
January 18, 2023

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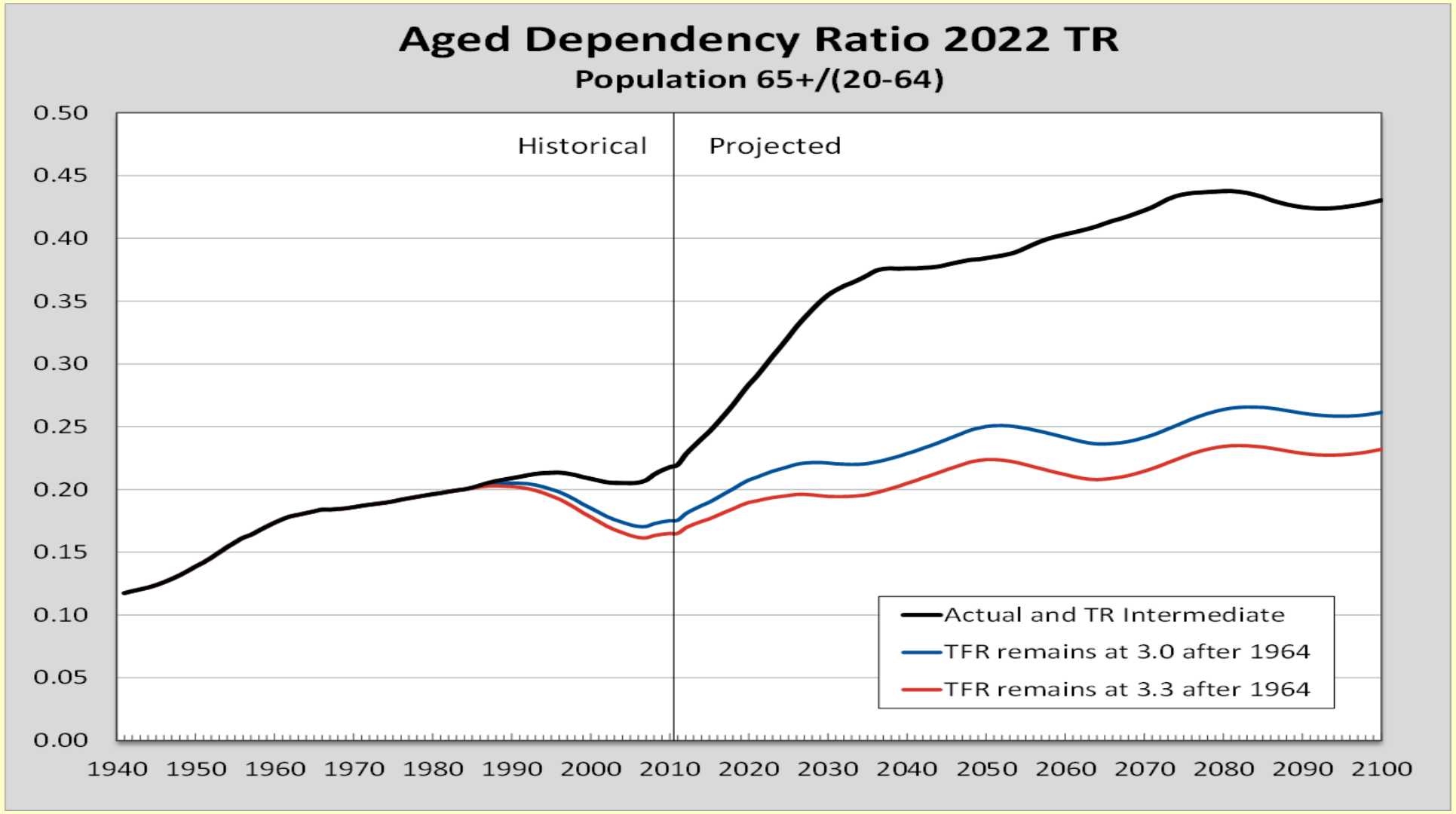
Perspective: "Aging" Not Mainly from Mortality

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



What's New? COVID-19; Pandemics

- COVID-19 swept across the globe and continues
  - Enhanced population mobility
  - Highly evolving virus
- Remarkable new MRNA vaccine; recent bivalent booster
  - But only about 16% of eligible in US have taken it
- New variants are arriving regularly; mitigations have waned
- Now endemic?
- Will post-COVID conditions constrain longevity in the future?

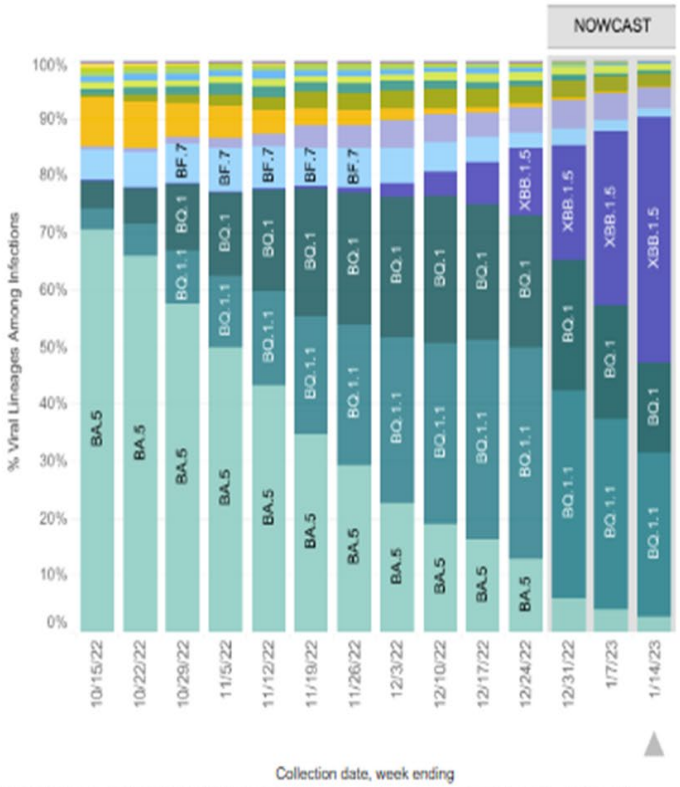
In the US, BQ Overtook BA in November; XBB Now Matches BQ, and Dominates in NY/NJ

United States: 1/8/2023 – 1/14/2023 NOWCAST

USA

WHO label	Lineage #	US Class	%Total	95%PI
Omicron	XBB.1.5	VOC	43.0%	26.4-61.1%
	BQ.1.1	VOC	28.8%	20.5-38.7%
	BQ.1	VOC	15.9%	11.0-22.2%
	XBB	VOC	3.9%	3.0-5.1%
	BA.5	VOC	2.6%	1.8-3.7%
	BN.1	VOC	2.1%	1.5-3.1%
	BF.7	VOC	1.4%	0.9-2.1%
	BA.2.75	VOC	1.3%	0.8-1.9%
	BA.5.2.6	VOC	0.5%	0.3-0.8%
	BA.2	VOC	0.2%	0.1-0.4%
	BF.11	VOC	0.2%	0.1-0.3%
	BA.4.6	VOC	0.1%	0.1-0.2%
	BA.2.75.2	VOC	0.1%	0.0-0.1%
	BA.1.1	VOC	0.0%	0.0-0.0%
	BA.4	VOC	0.0%	0.0-0.0%
	B.1.1.529	VOC	0.0%	0.0-0.0%
	BA.2.12.1	VOC	0.0%	0.0-0.0%
Delta	B.1.617.2	VBM	0.0%	0.0-0.0%
Other	Other*		0.0%	0.0-0.0%

United States: 10/9/2022 – 1/14/2023



* Enumerated lineages are US VOC and lineages circulating above 1% nationally in at least one week period. "Other" represents the aggregation of lineages which are circulating <1% nationally during all weeks displayed.

** These data include Nowcast estimates, which are modeled projections that may differ from weighted estimates generated at later dates

\# BA.1, BA.3 and their sublineages (except BA.1.1 and its sublineages) are aggregated with B.1.1.529. Except BA.2.12.1, BA.2.75, BA.2.75.2, BN.1,XBB and their sublineages, BA.2 sublineages are aggregated with BA.2. Except BA.4.6, sublineages of BA.4 are aggregated to BA.4. Except BF.7, BF.11, BA.5.2.6, BQ.1 and BQ.1.1, sublineages of BA.5 are aggregated to BA.5. Except XBB.1.5, sublineages of XBB are aggregated to XBB. For all the lineages listed in the above table, their sublineages are aggregated to the listed parental lineages respectively. Previously, XBB.1.5 was aggregated to XBB. Lineages BA.2.75.2, XBB, XBB.1.5, BN.1, BA.4.6, BF.7, BF.11, BA.5.2.6 and BQ.1.1 contain the spike substitution R346T.

HHS Region 2: 1/8/2023 – 1/14/2023 NOWCAST

Region 2 - New Jersey, New York, Puerto Rico, and the Virgin Islands

WHO label	Lineage #	US Class	%Total	95%PI
Omicron	XBB.1.5	VOC	82.7%	75.5-88.2%
	BQ.1.1	VOC	8.4%	5.6-12.5%
	BQ.1	VOC	4.8%	2.7-8.3%
	XBB	VOC	2.3%	1.7-3.1%
	BA.5	VOC	0.8%	0.6-1.0%
	BN.1	VOC	0.3%	0.1-0.7%
	BF.7	VOC	0.2%	0.1-0.5%
	BA.2.75	VOC	0.2%	0.2-0.3%
	BA.5.2.6	VOC	0.1%	0.0-0.2%
	BF.11	VOC	0.0%	0.0-0.1%
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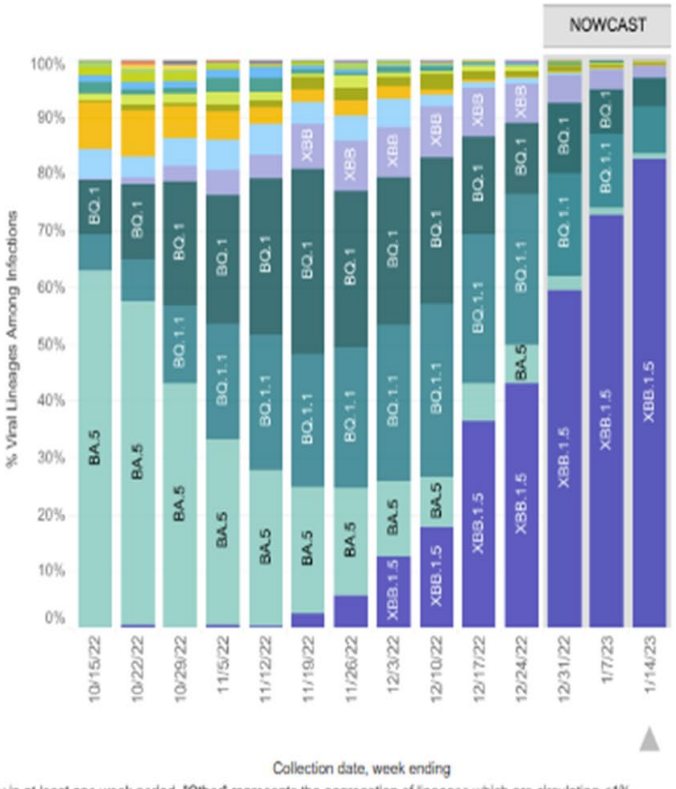

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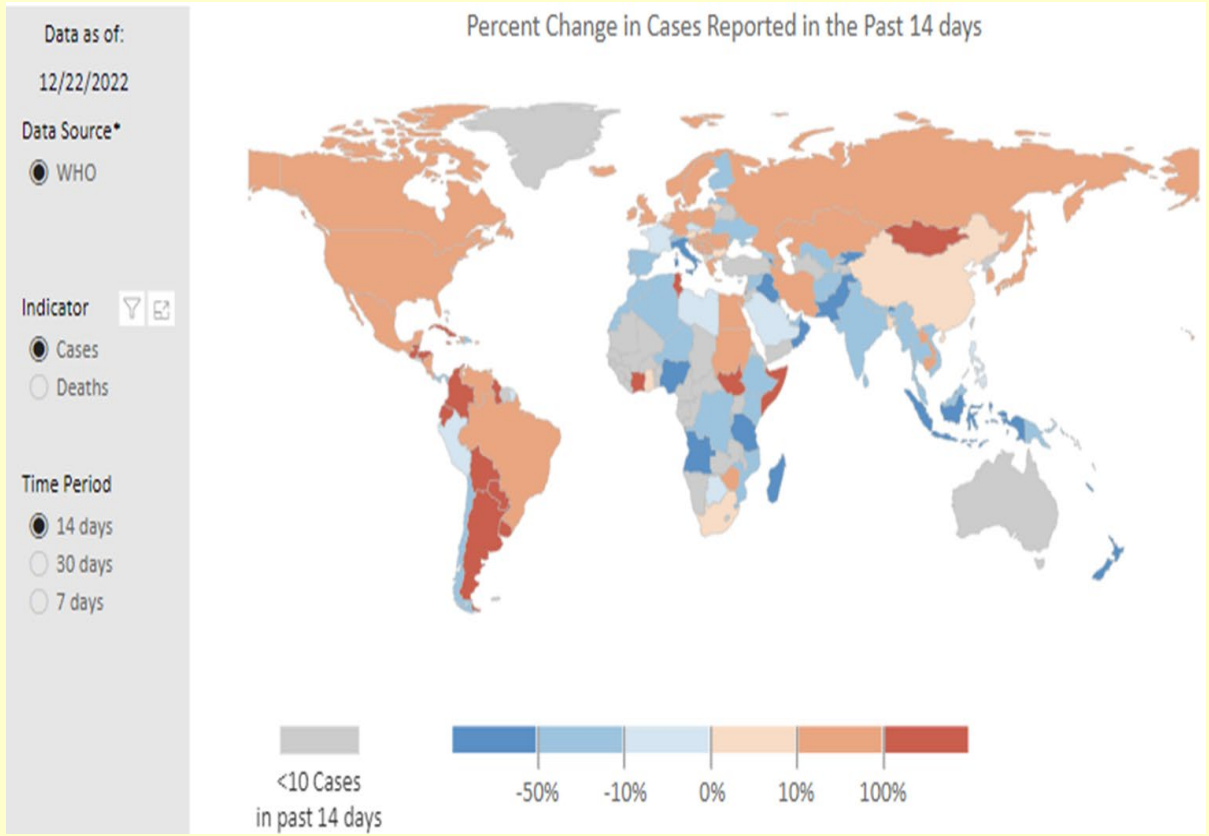
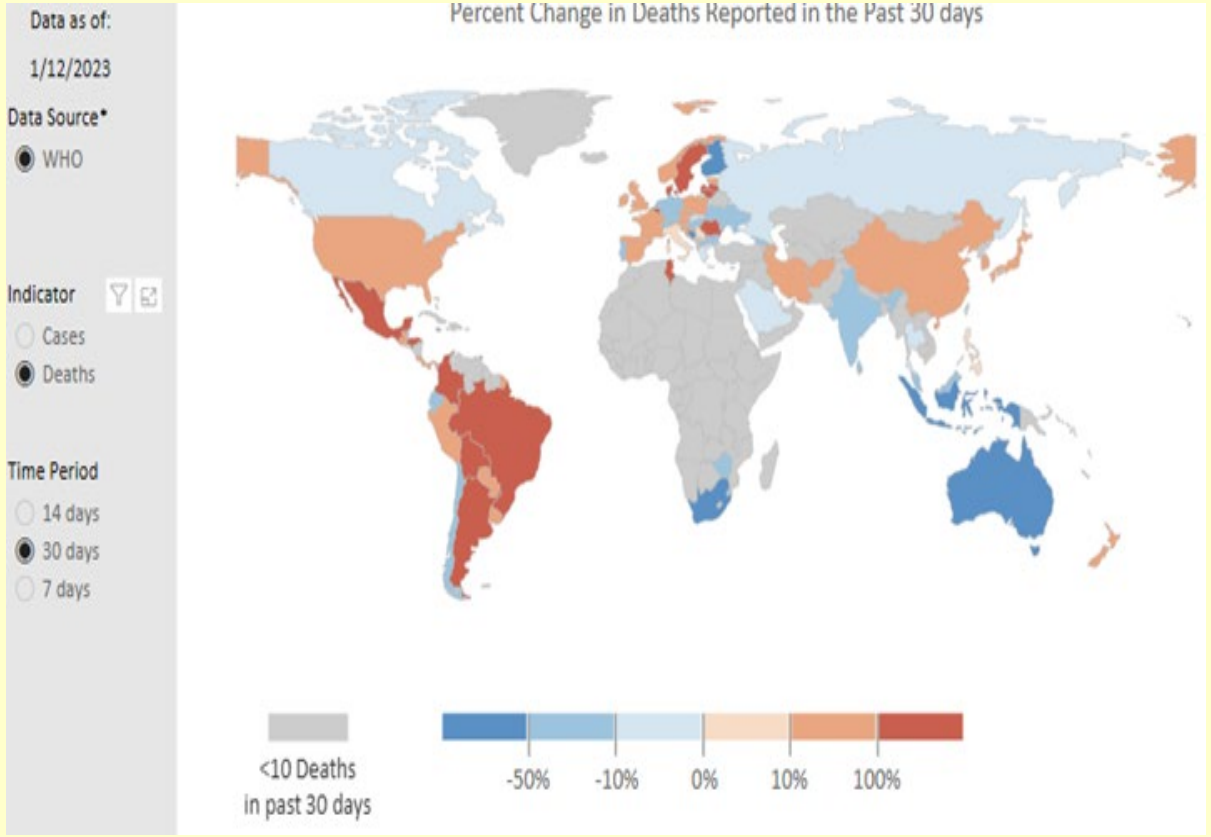
Across Europe and the Americas—
The Fall/Winter Wave Rising in December

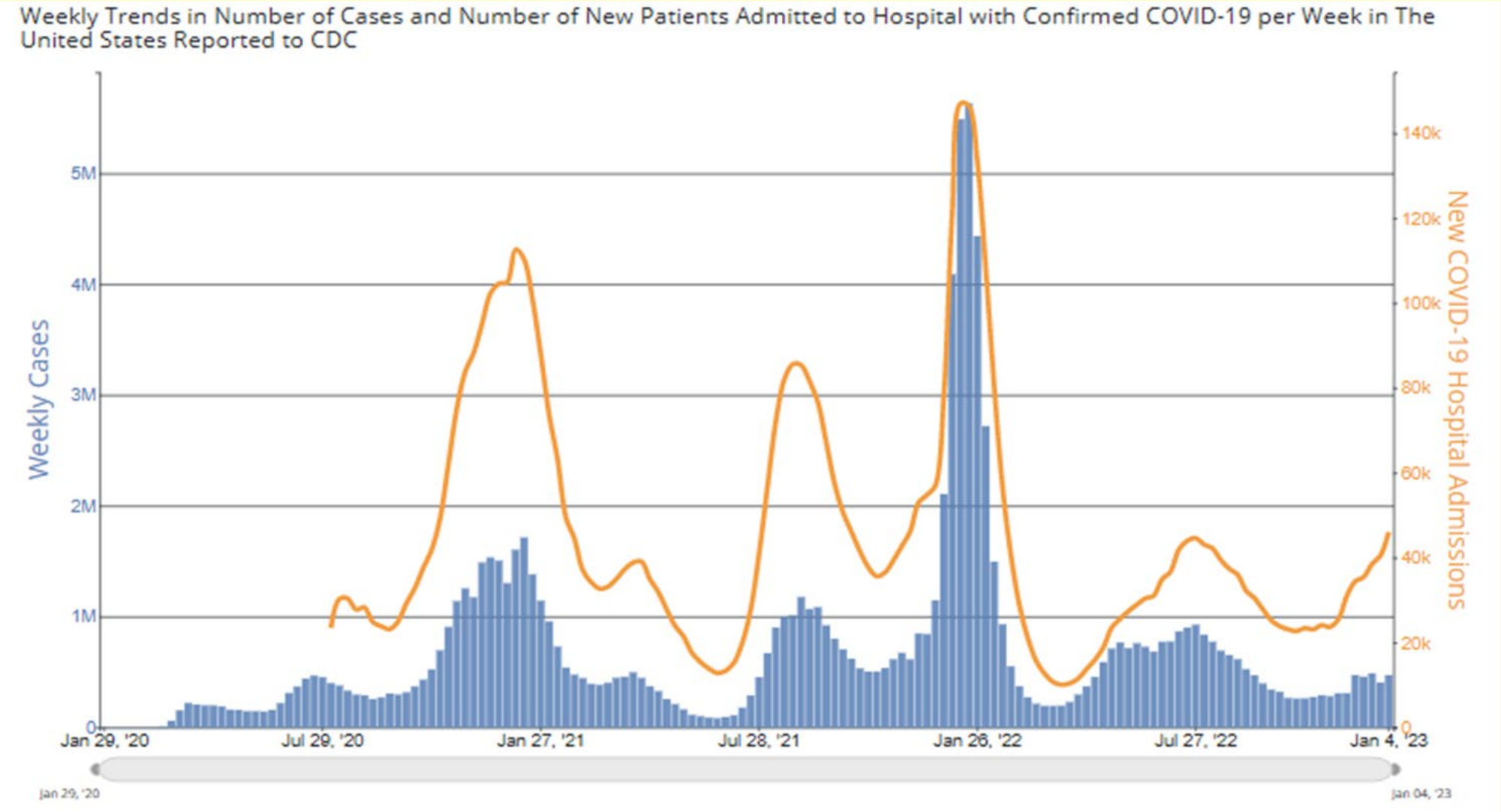
Reported Cases Rising



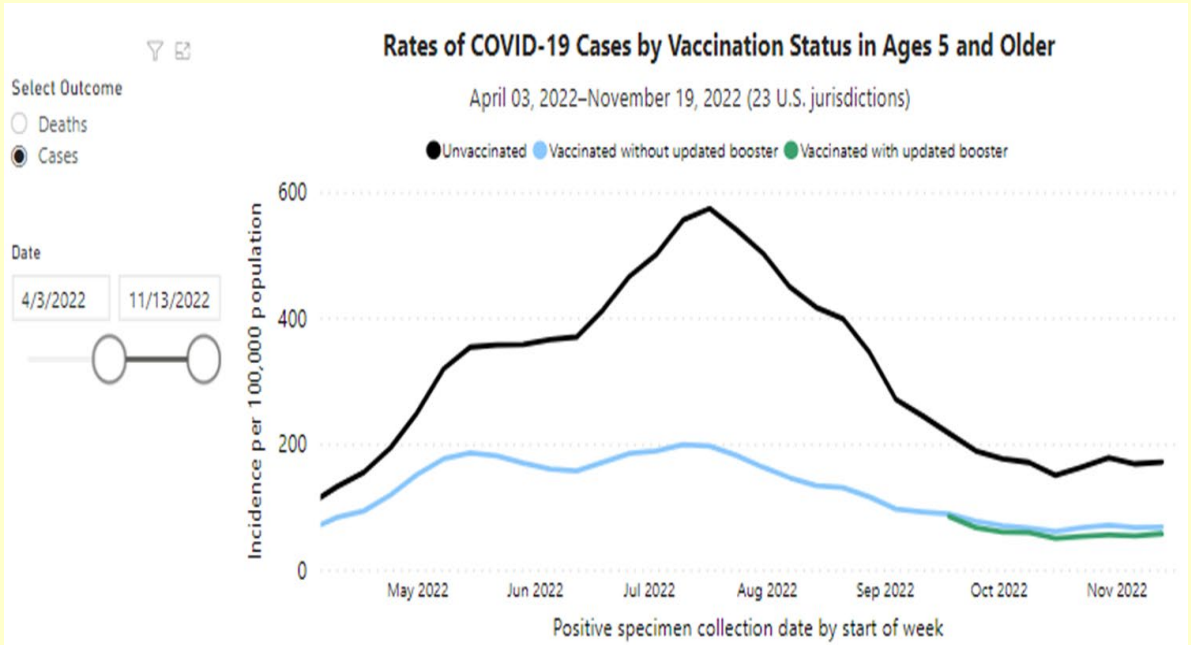
Reported Deaths Increasing in the New Year



Rise in Hospitalizations in January Makes Clear that New Cases are Increasingly Underreported

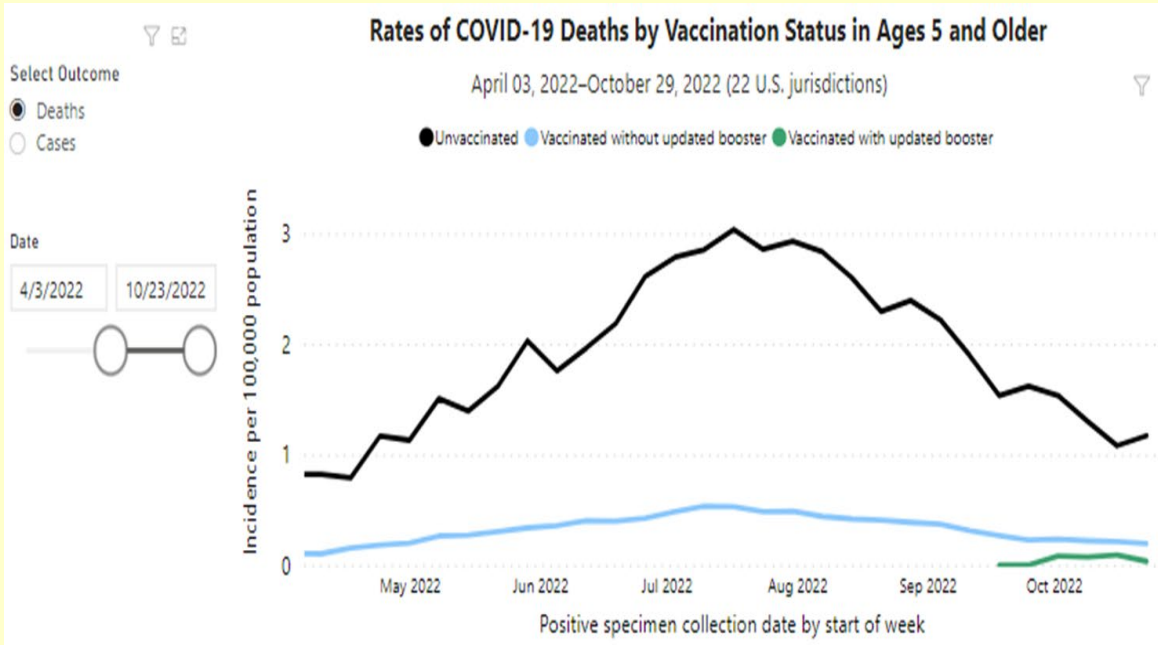


Cases and Deaths are Lower for Those Vaccinated, But How Much Due to Care and Greater Mitigation?



People aged 12 and older vaccinated with an updated (bivalent) booster had:

18.6X *lower risk of dying from COVID-19*	in October 2022, and
3.1X *lower risk of testing positive for COVID-19*	in November 2022, compared to unvaccinated people.



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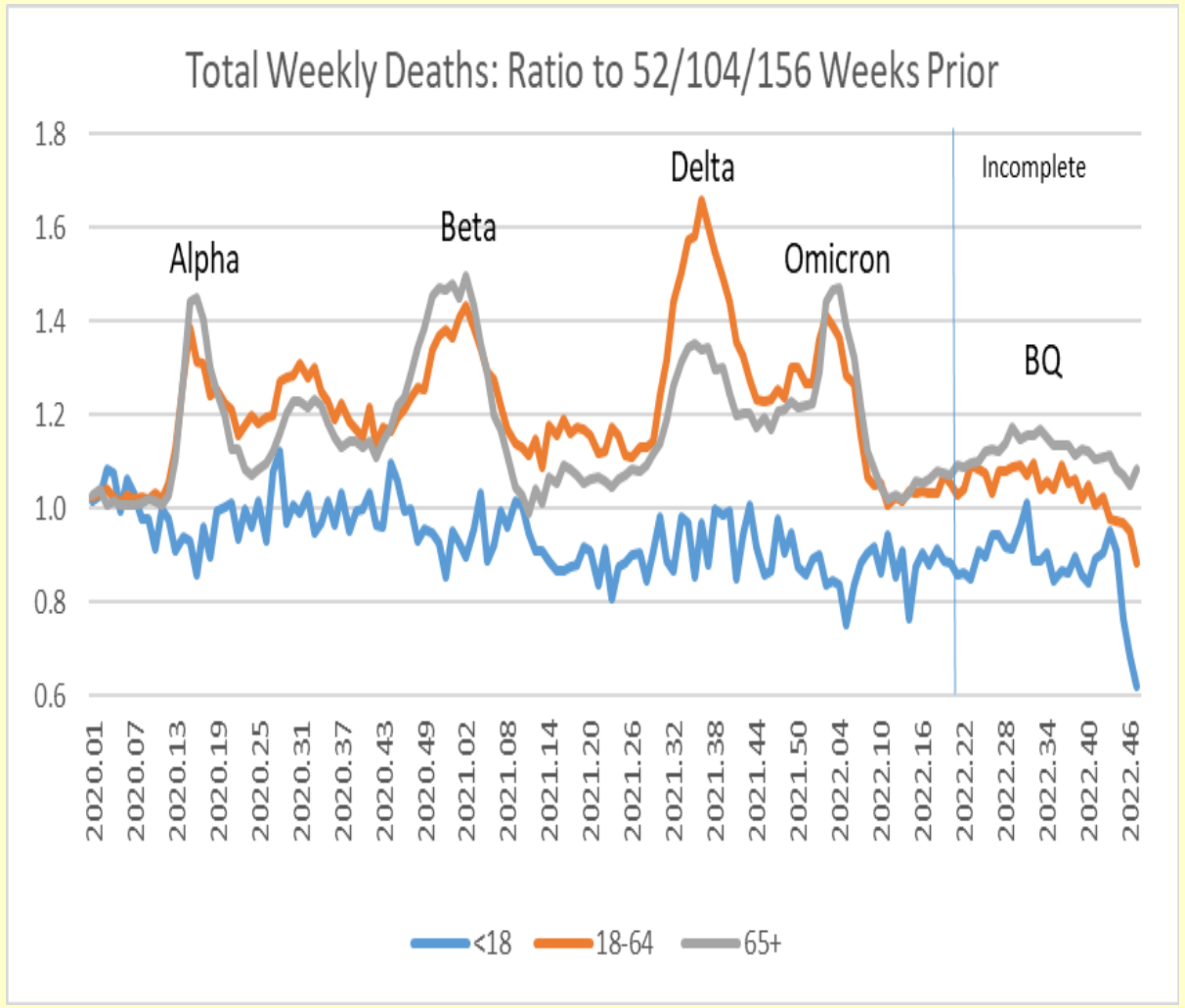
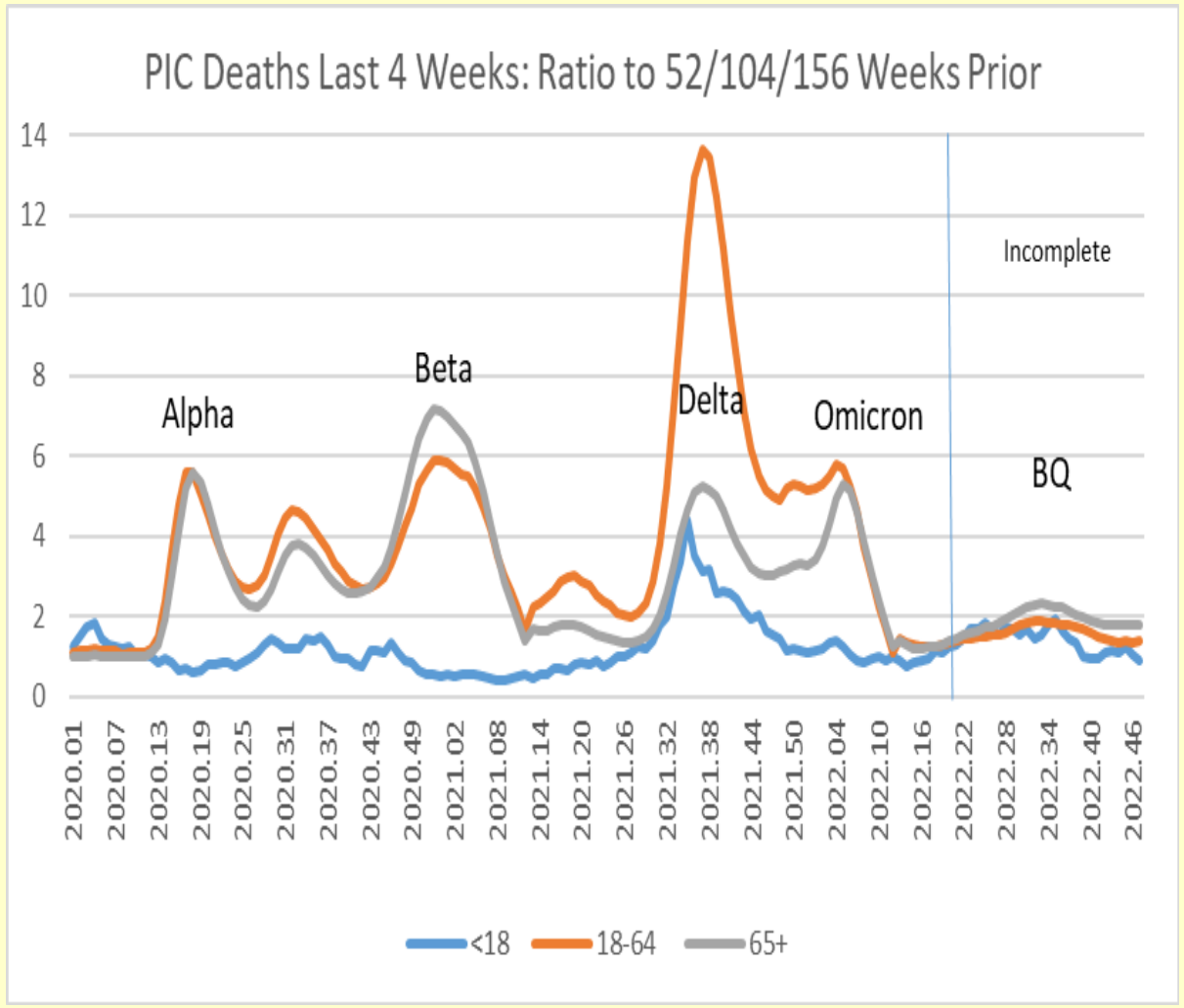
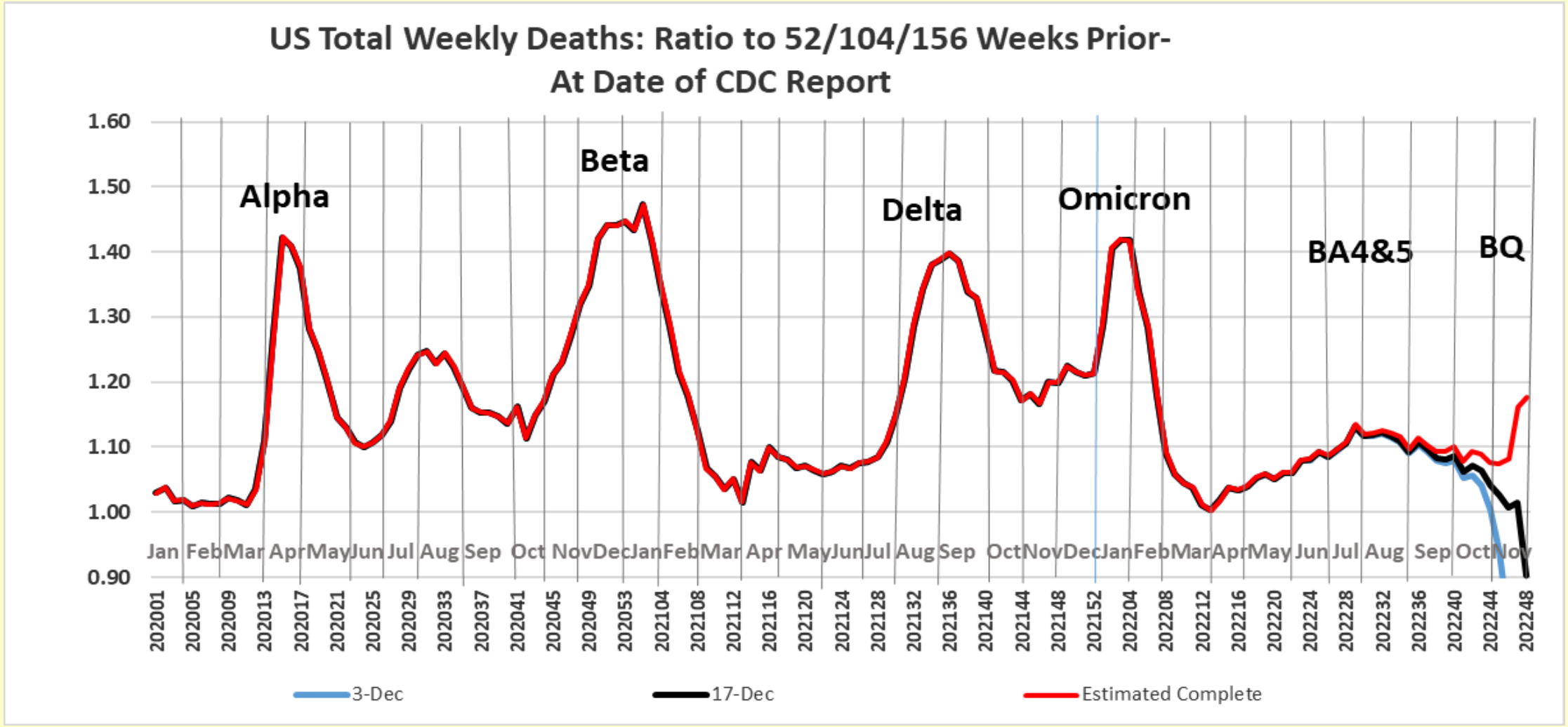
Relative Changes in Death Rates by Age, Total and PIC, Varied by Strain; Did Delta Reflect Earlier Vaccination for 65+?

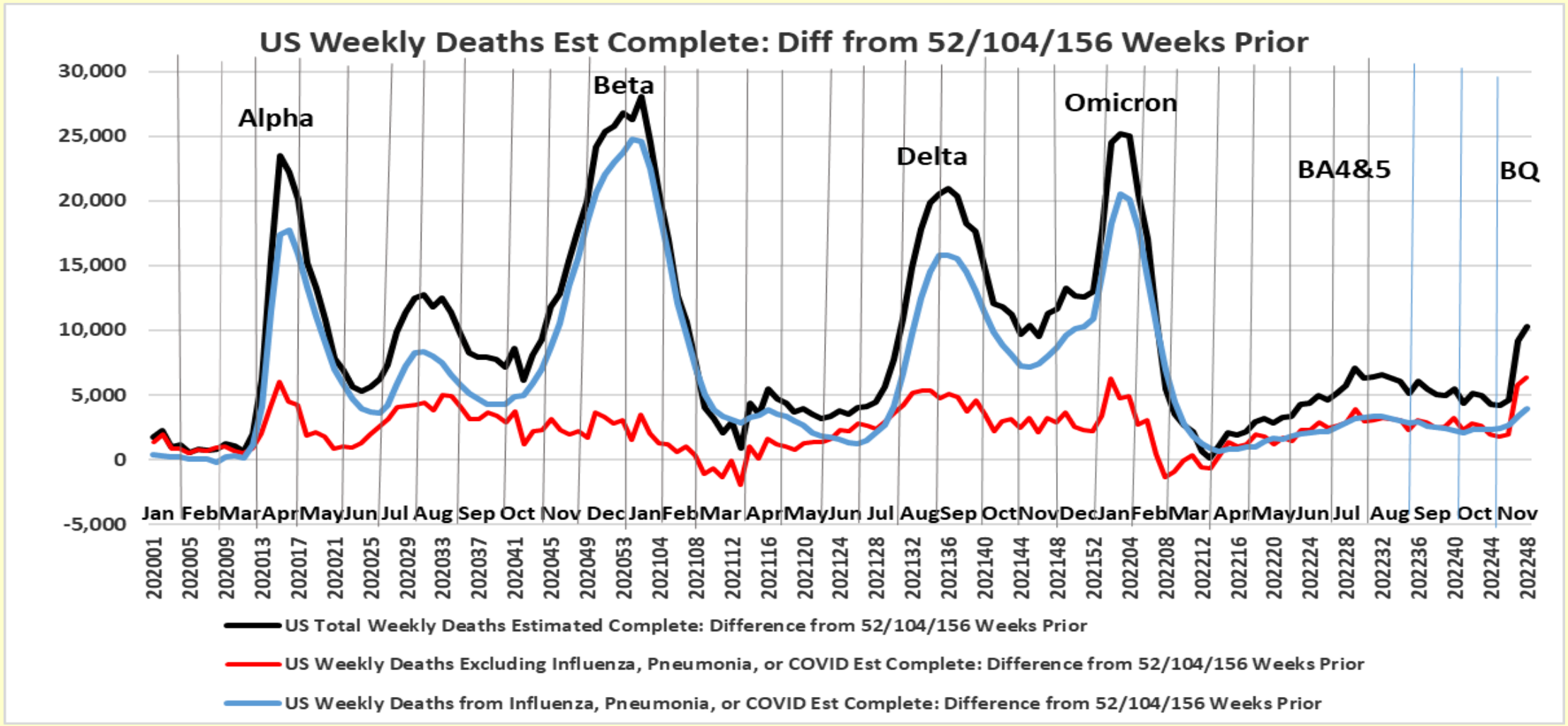




Note the Lag in Reporting of Deaths in the US; Estimated Excess Deaths Rising in Late November



But Excess Deaths Are Not All From COVID; Currently May Be Largely From Other-Than-PIC



For Latest Complete Provisional Quarter, Age-Sex-Adjusted Death Rates Are All Elevated Over 2019

NCHS Provisional Age-Adjusted Death Rates	2019Q3	2021Q3	Ratio 2021Q3/2019Q3
Alzheimer disease	27.6	29.7	1.08
COVID-19	#N/A	115.6	#N/A
Cancer	145.4	148.5	1.02
Chronic liver disease and cirrhosis	11.1	14.6	1.32
Chronic lower respiratory diseases	33.6	34.6	1.03
Diabetes	19.8	24.8	1.25
Drug overdose	22.4	33.5	1.50
Falls, ages 65 and over	64.2	75.7	1.18
Firearm-related injury	12.4	15.5	1.25
Heart disease	150.5	169.7	1.13
HIV disease	1.3	1.3	1.00
Homicide	6.4	8.7	1.36
Hypertension	8.2	10.3	1.26
Influenza and pneumonia	8.9	10.1	1.13
Kidney disease	11.7	13.1	1.12
Parkinson disease	8.3	9.6	1.16
Pneumonitis due to solids and liquids	4.1	4.9	1.20
Septicemia	8.7	10.2	1.17
Stroke	34.8	39.8	1.14
Suicide	14.7	14.7	1.00
Unintentional injuries	51.3	67.6	1.32
Total	**645.4**	**852.5**	**1.32**
Total w/o COVID	**645.4**	**736.9**	**1.14**

Now, Considerations in Projecting Mortality

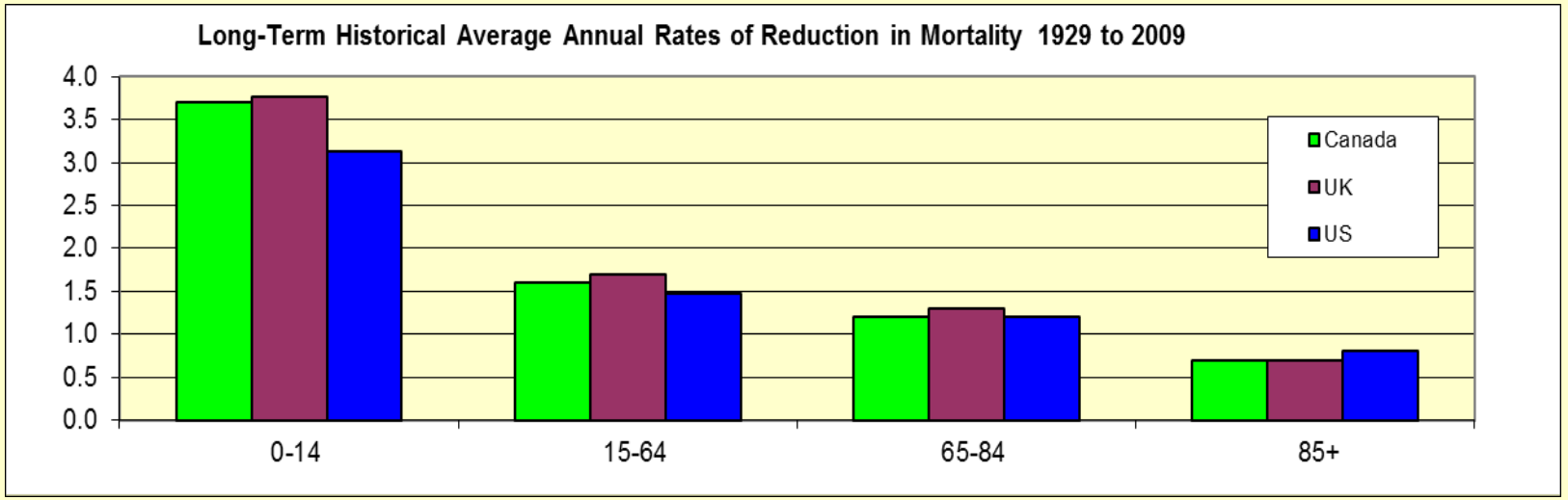
- Frequency of future pandemics?
- Variation by age and over time periods
- Variation by earnings level
- Changing causes of death
- Cohort considerations
- Health spending, obesity, smoking, opioids
- Is there a limit on human longevity?
- Our projections for the United States

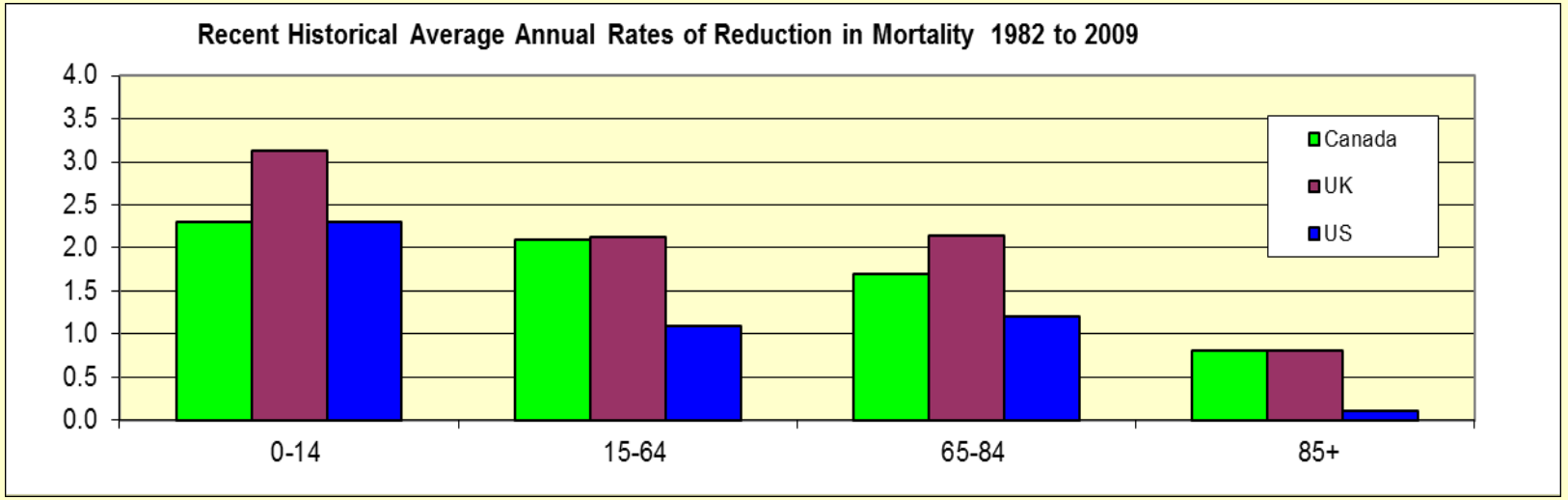
Pandemics in the Future

- Over the last 100 years, mortality has been about cause reduction
- But if pandemics raise deaths 15% for 2 years in every 20 years
  - Then the level of mortality would be raised by 1.5% per year on average
- But how about residual compromising effects—post-COVID?
  - How much will viability be diminished for the survivors?
- Earlier death later in life might be the larger factor
  - As with other compromising factors like smoking

Variation by Age Has Been Substantial

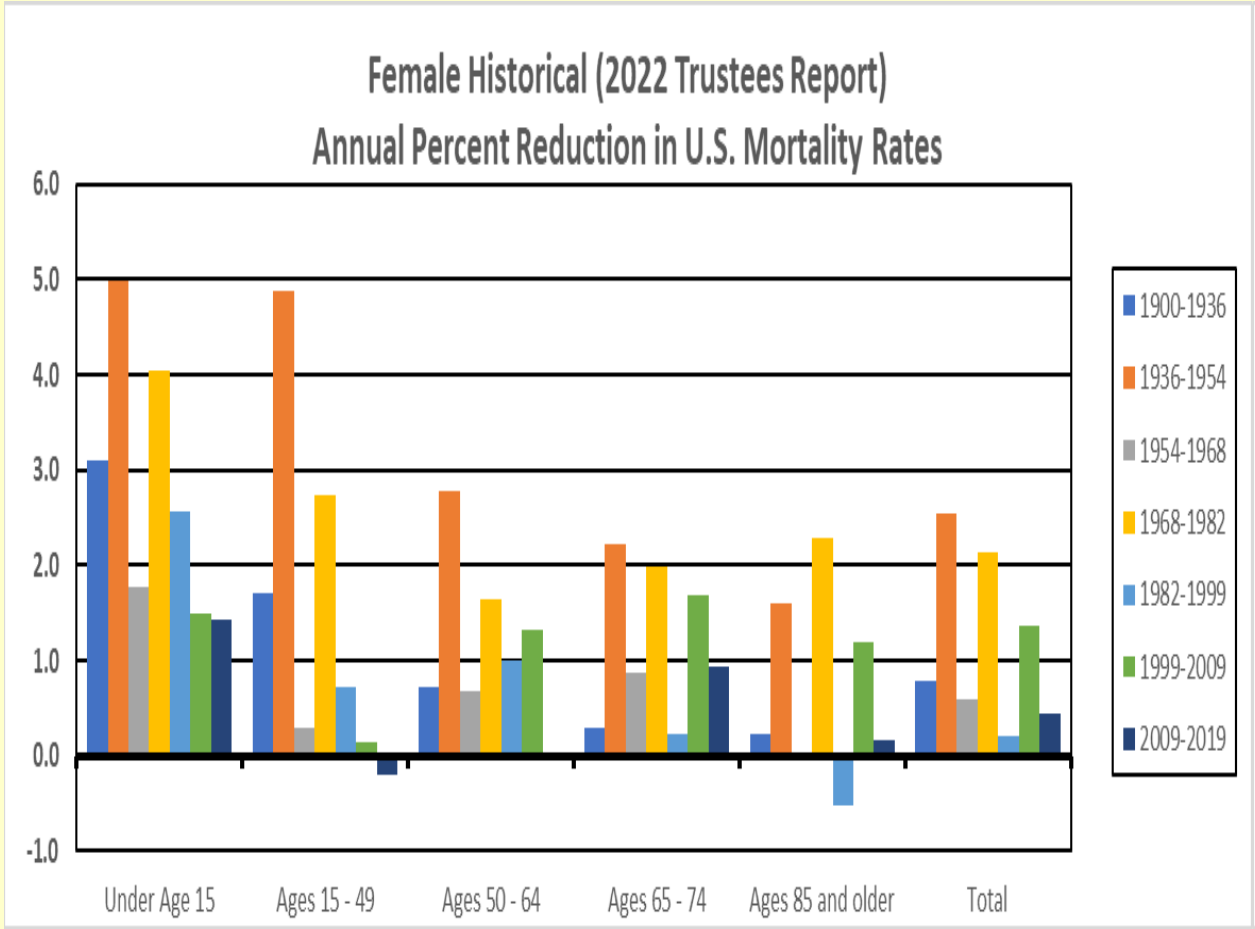
Reduction in mortality at higher ages is inherently more difficult

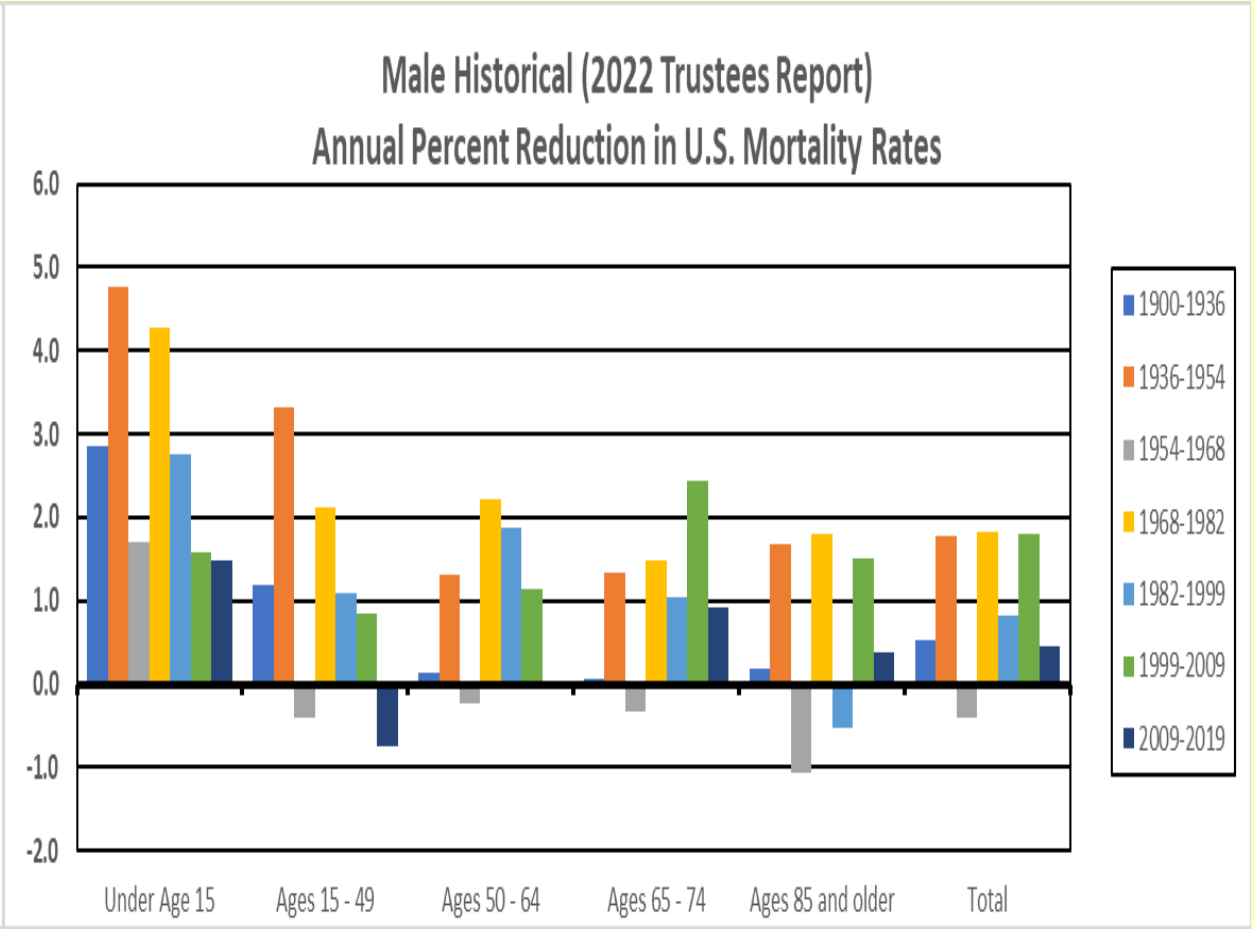




Mortality Decline Has *Varied* Over Time

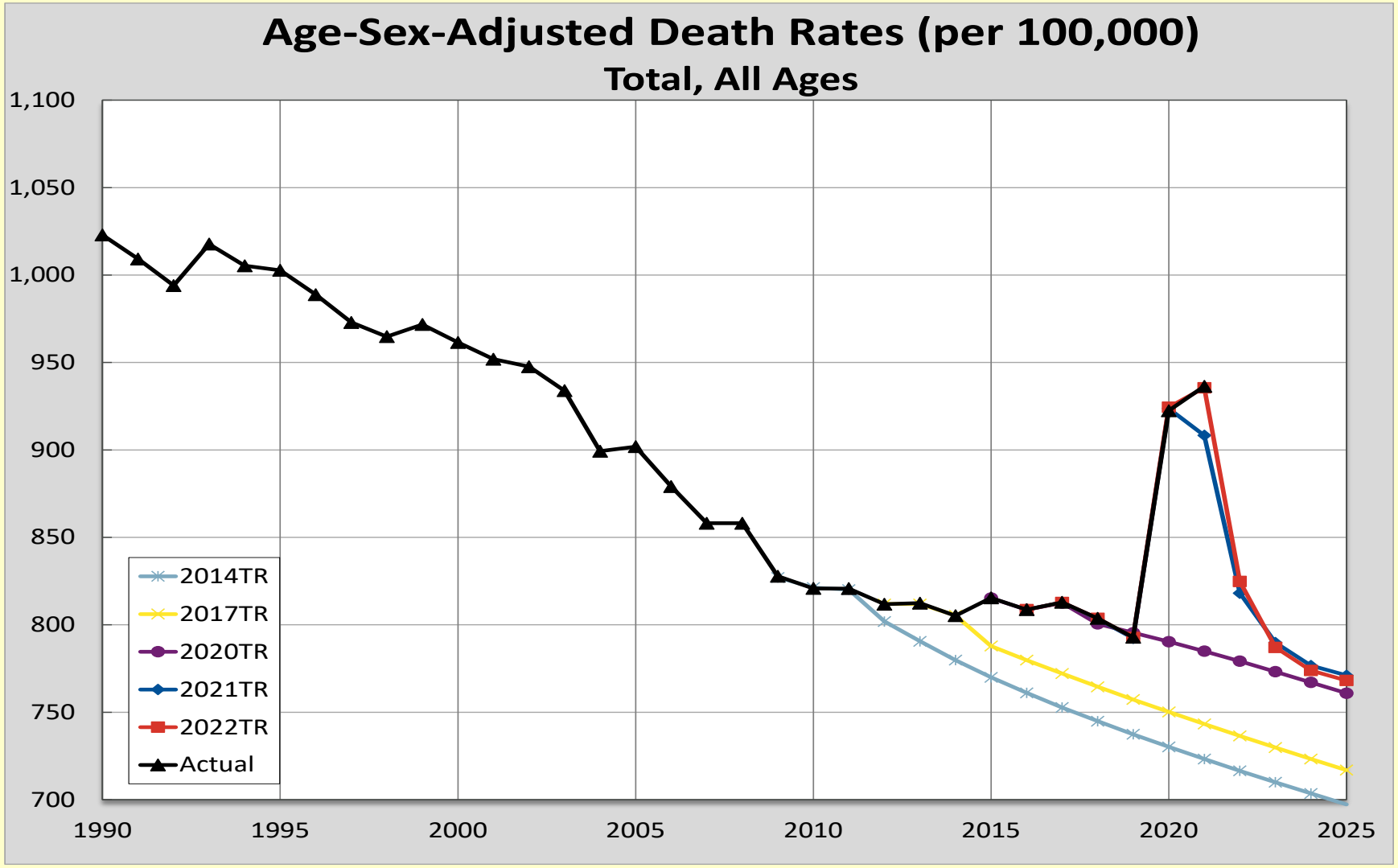
Conditions: Antibiotics/economy 1936-54; Medicare/Medicaid 1968-82





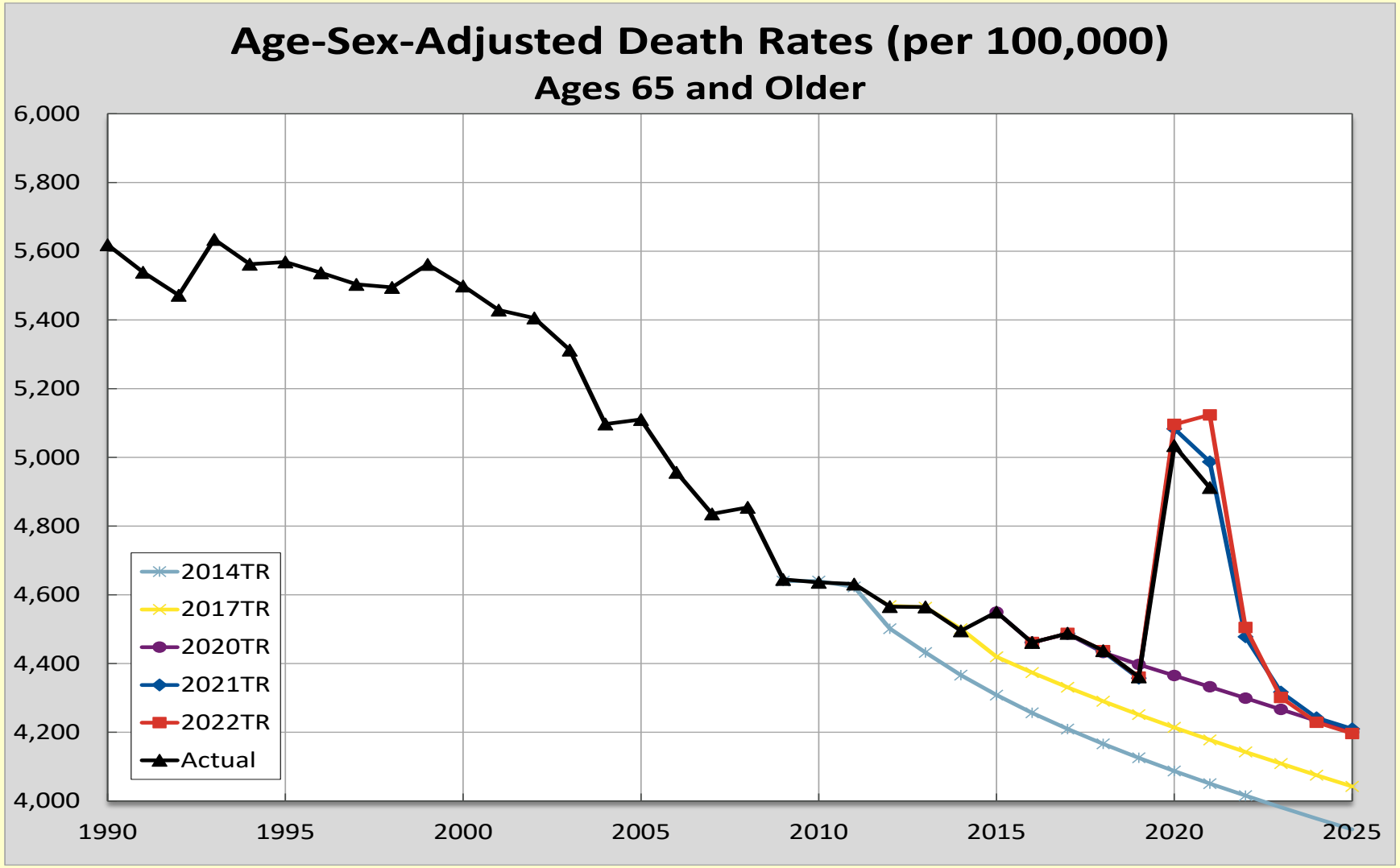
Mortality Experience: All Ages

Reductions falling short of expectations since 2009



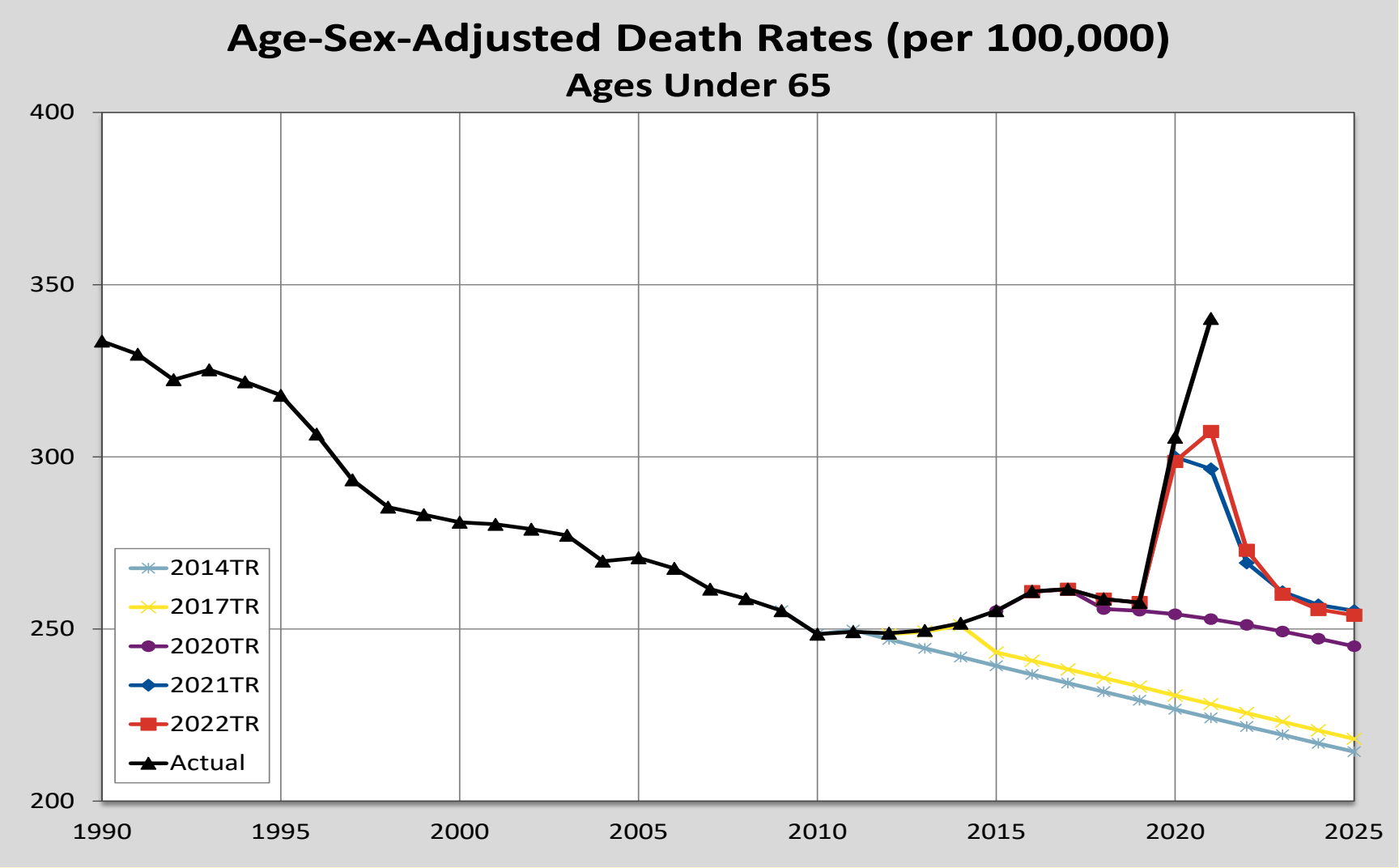
Mortality Experience: Ages 65 and Over

Reductions falling short of expectations since 2009



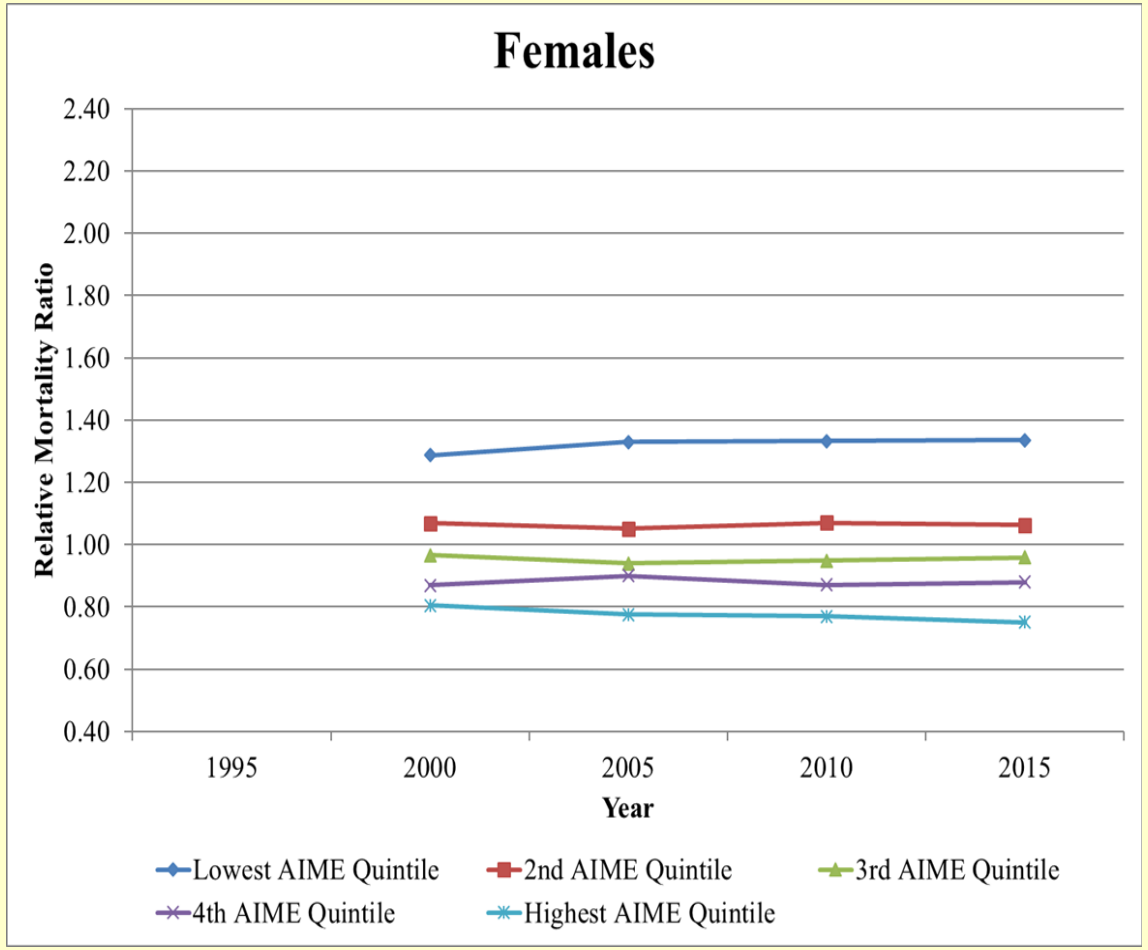
Mortality Experience: Under Age 65

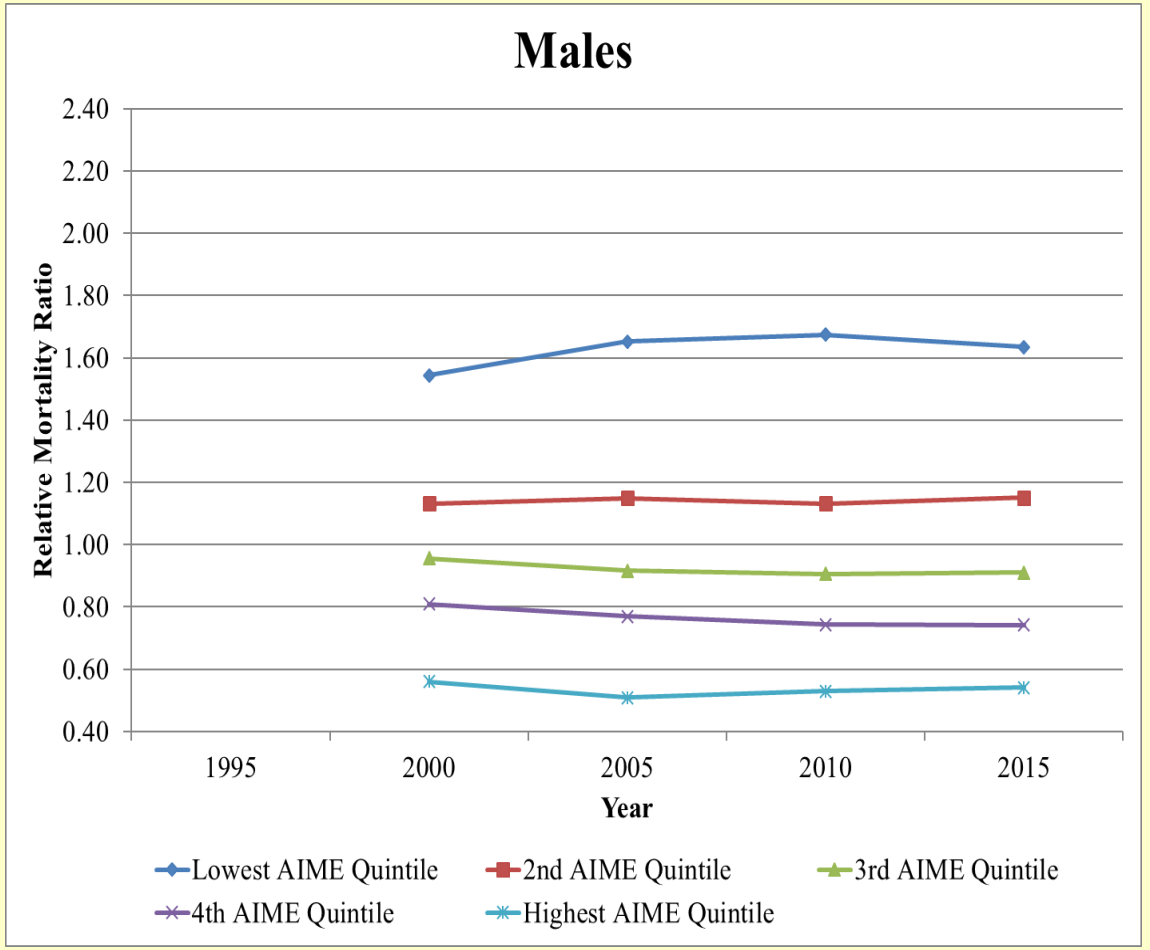
Experience far worse than expectations since 2009



Mortality By Career-Average Earnings Level: Actuarial Study #124

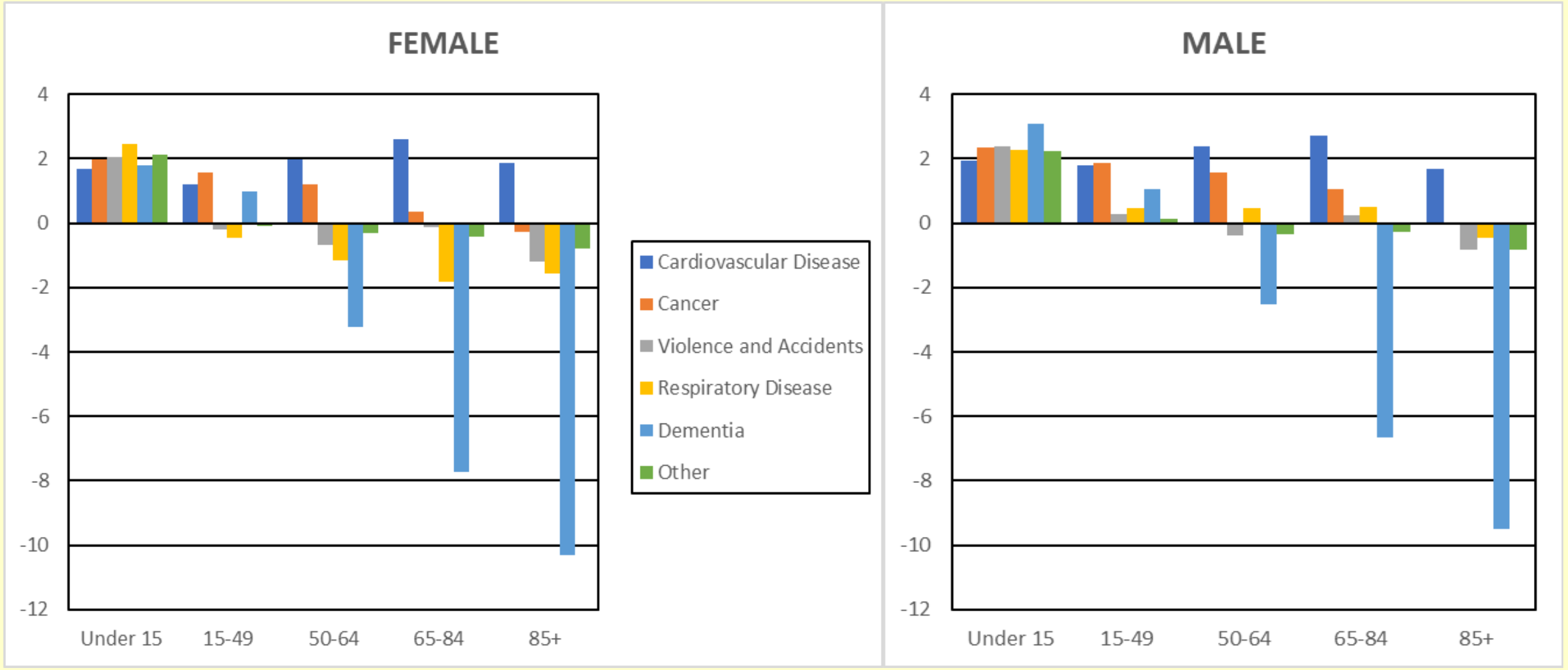
Age group 65-69 relative mortality ratios—not diverging?





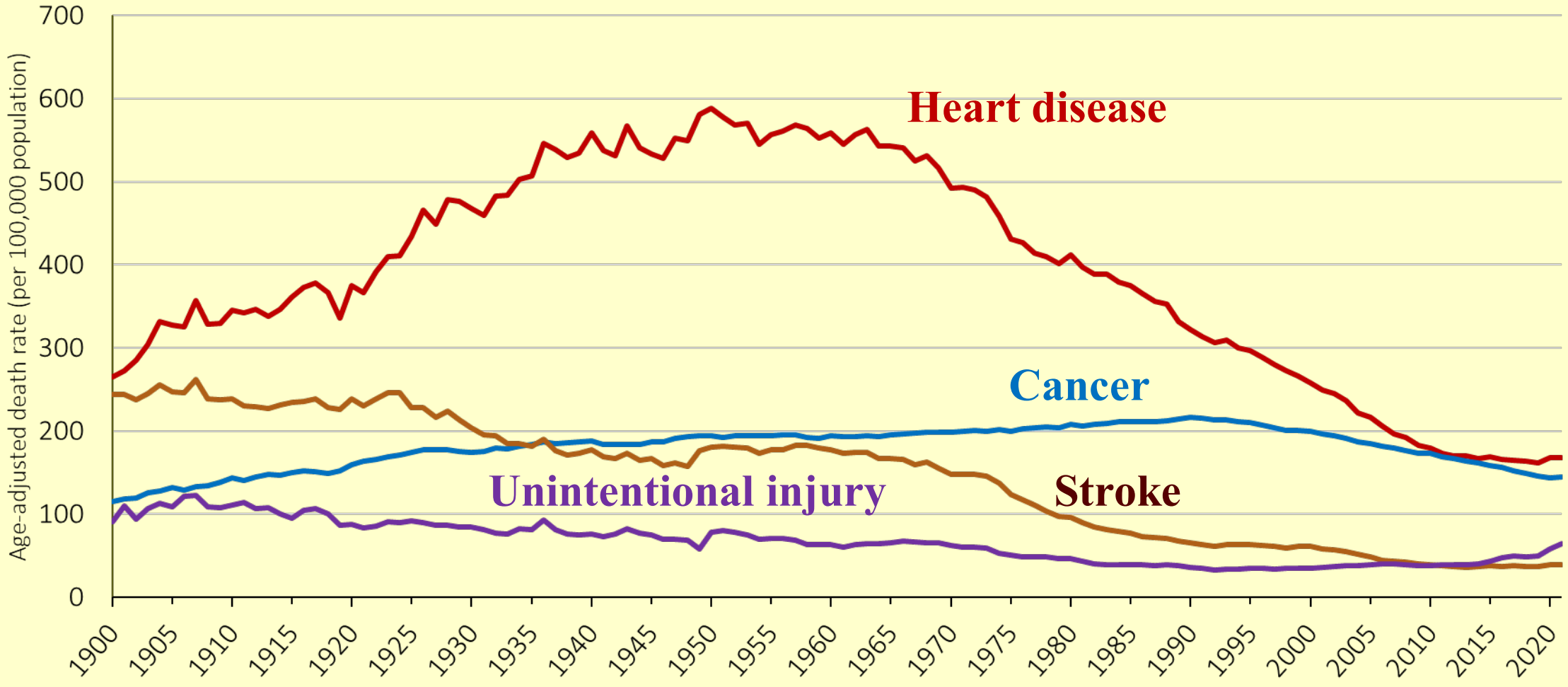
Mortality Decline by *Cause* of Death:

Annual rate of change from 1979 to 2019



Age-Adjusted Death Rates for Heart Disease, Cancer, Stroke, and Unintentional Injuries: United States, 1900-2021

(courtesy Robert Anderson, NCHS)



Notes: Data are from the National Vital Statistics System. Prior to 1933, data are for death-registration States only. Data for 2021 are provisional.

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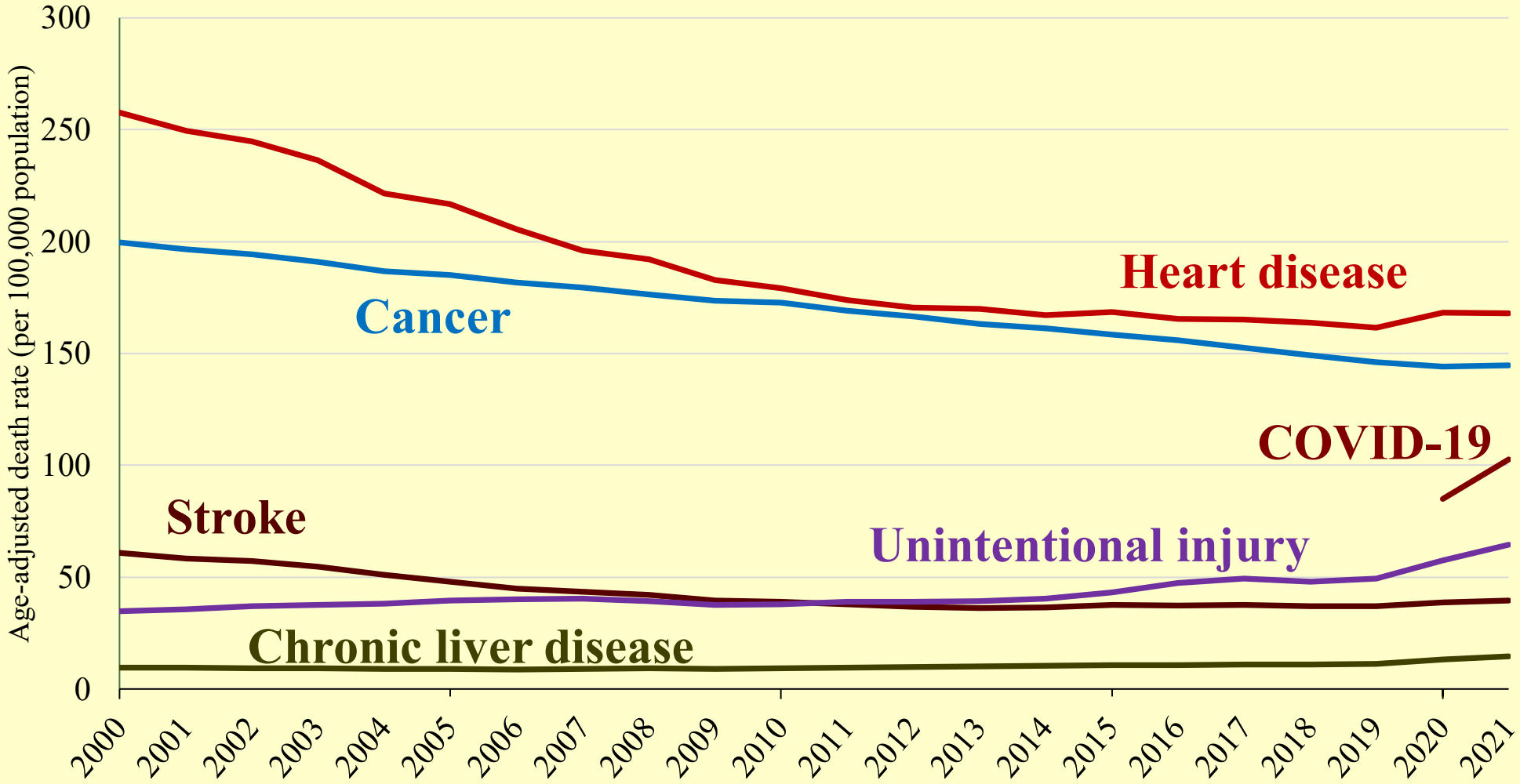
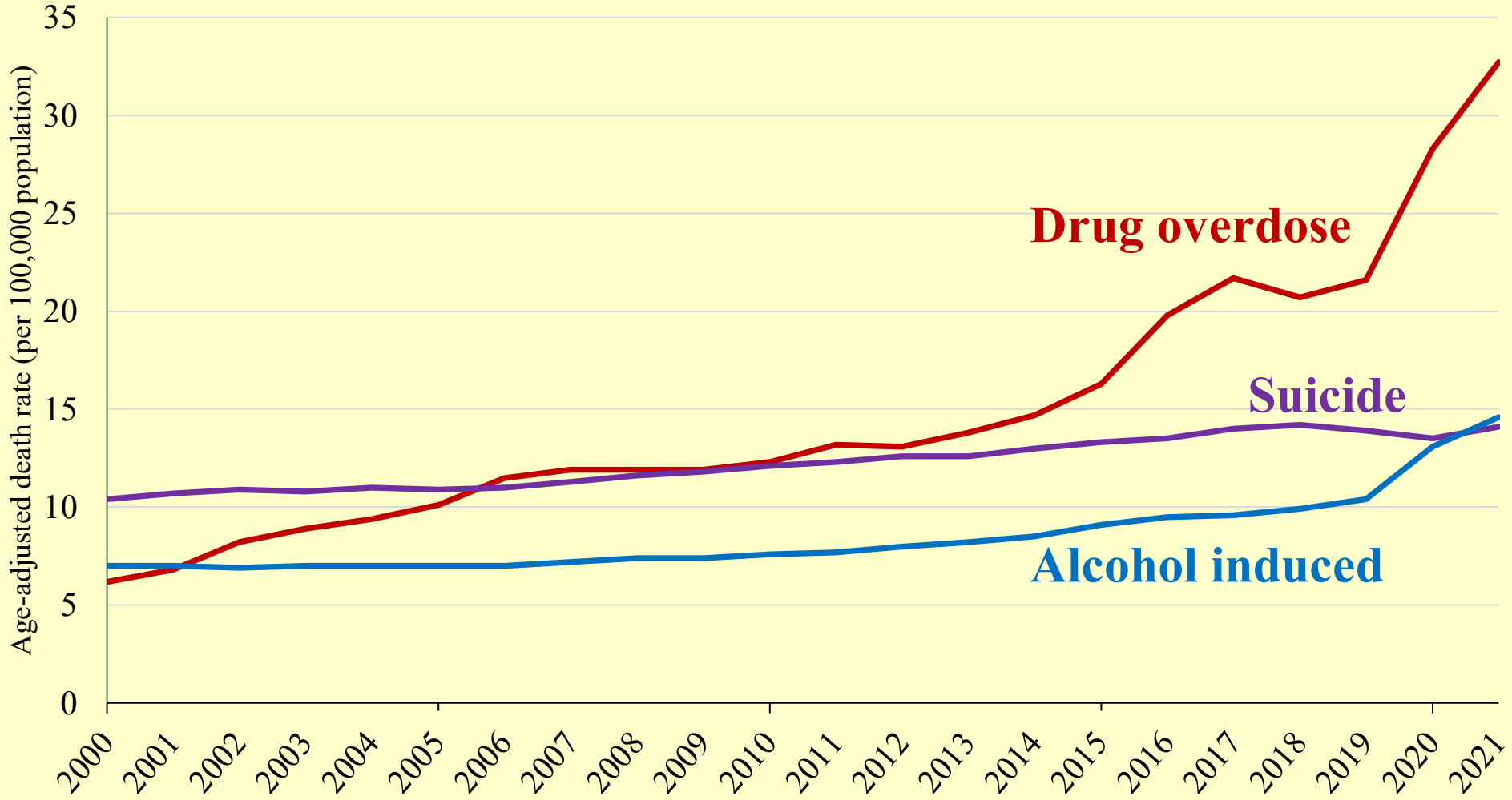


Age-Adjusted Death Rates for Selected Causes: United States, 2000-2021

(courtesy Robert Anderson, NCHS)



Developing Assumptions by Cause

- Scientific approach reflecting biology and epidemiology
- Trustees and SSA/OCACT develop in consultation with other experts
- CDC/NIH
- Johns Hopkins survey of medical researchers and clinicians

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?

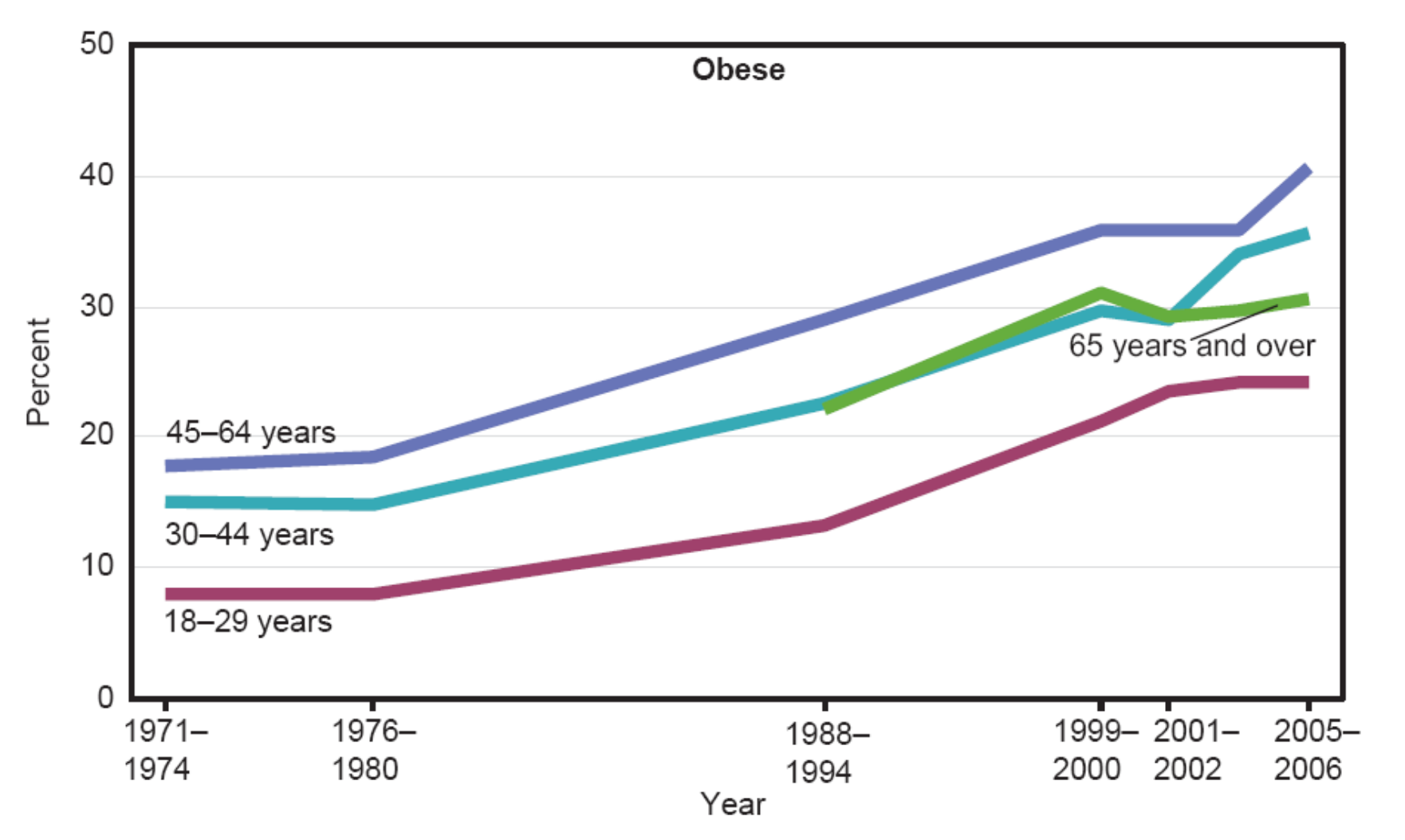
    Further changes depend on conditions, not trend

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

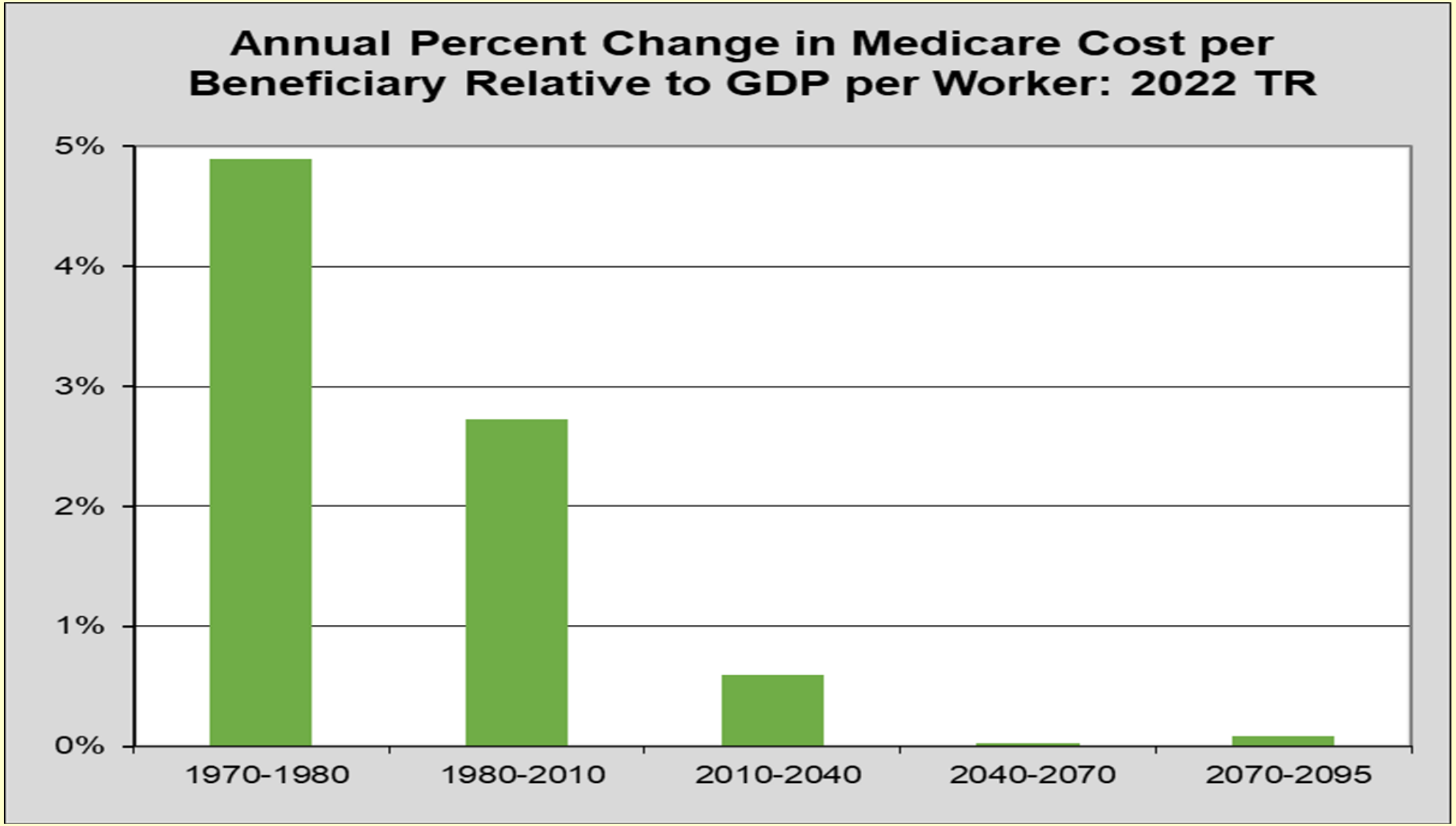
Trends in Obesity: US 1971-2006

*Sam Preston 2010—must consider **cumulative** effects; increasing duration of obesity for aged in future*



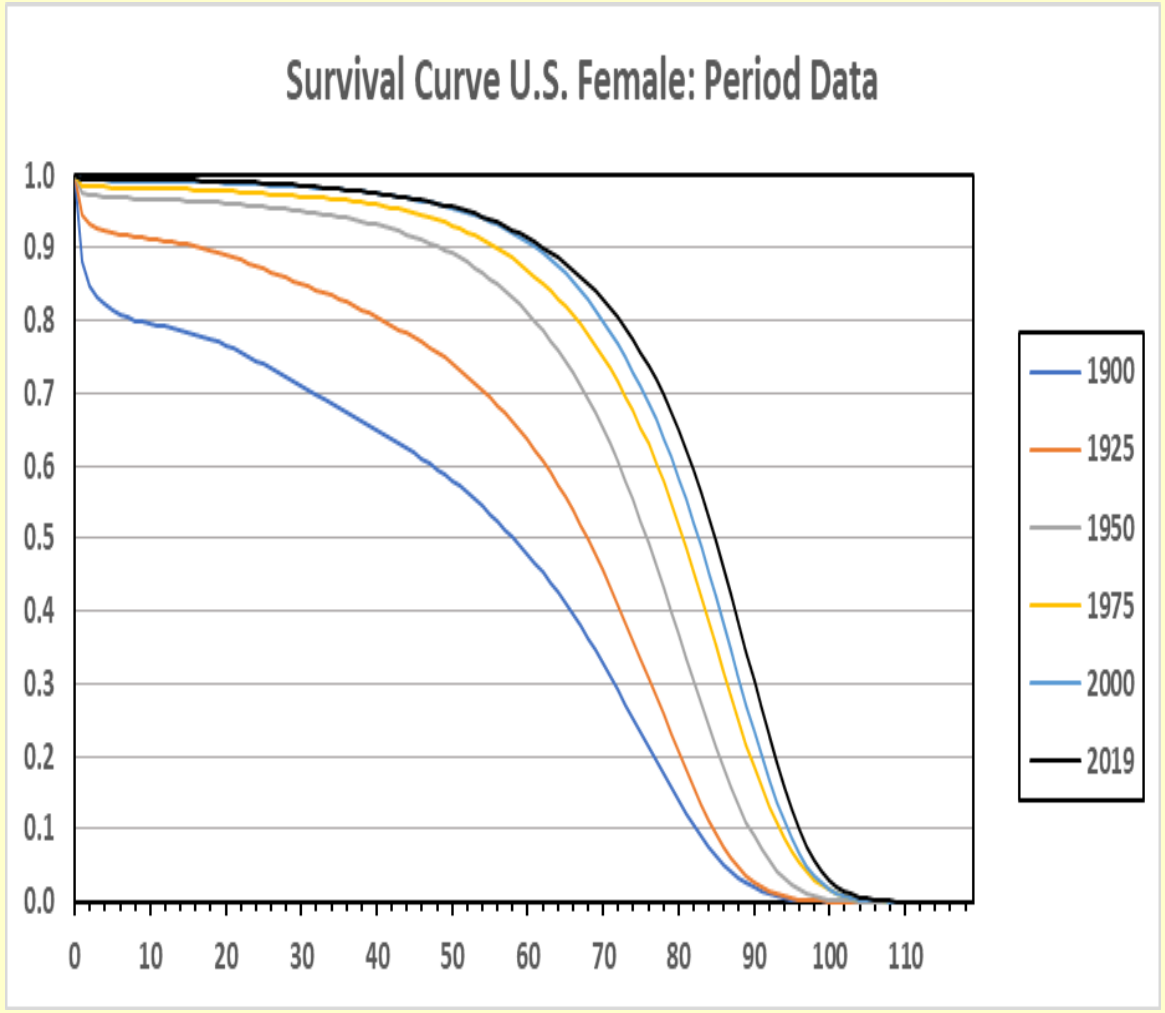
Health Spending Cannot Continue to Rise at Historical Rates

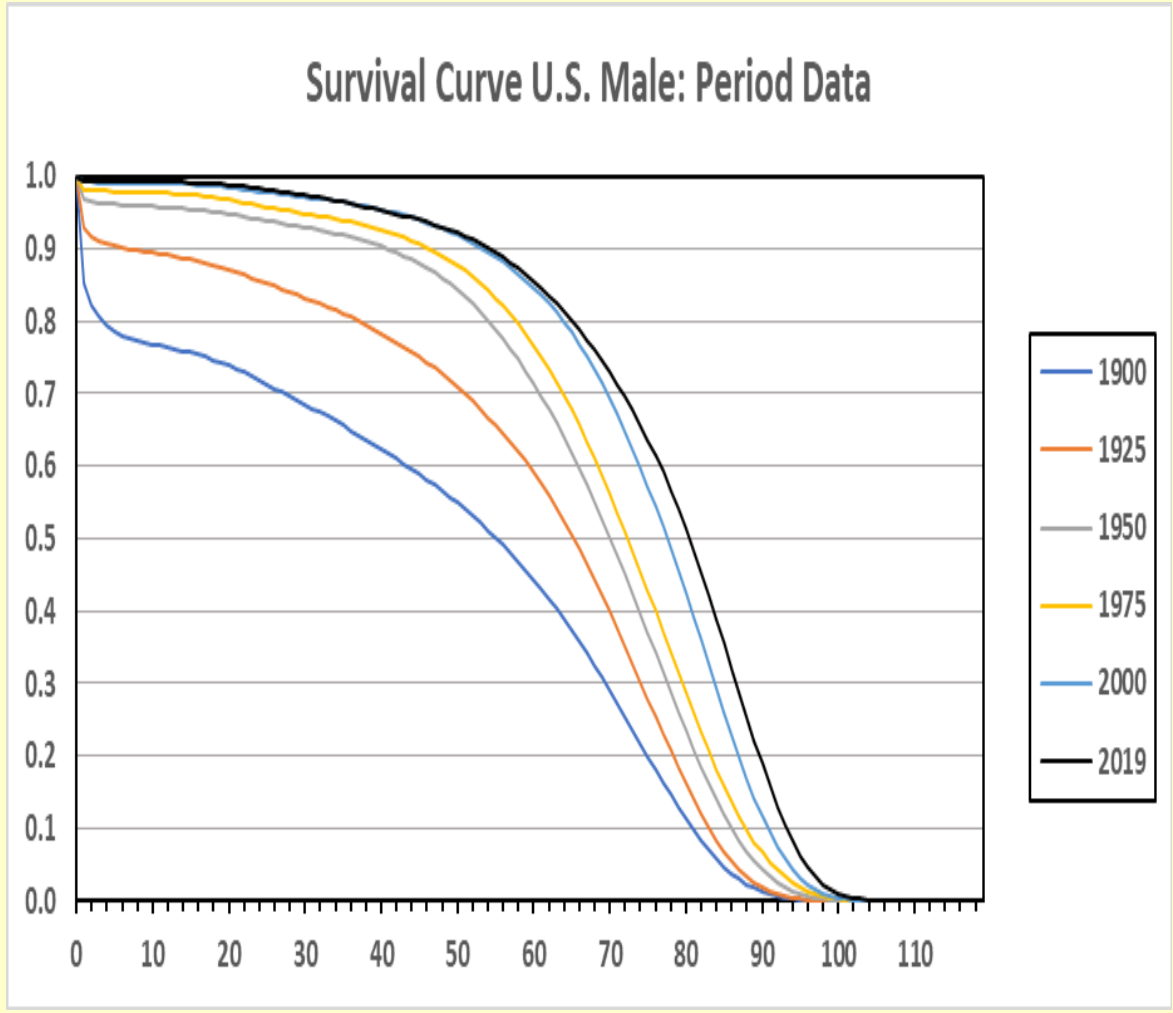
Note Trustees' deceleration



Is There an Omega?

It appears we are rectangularizing the survival curve; few actually live to 100

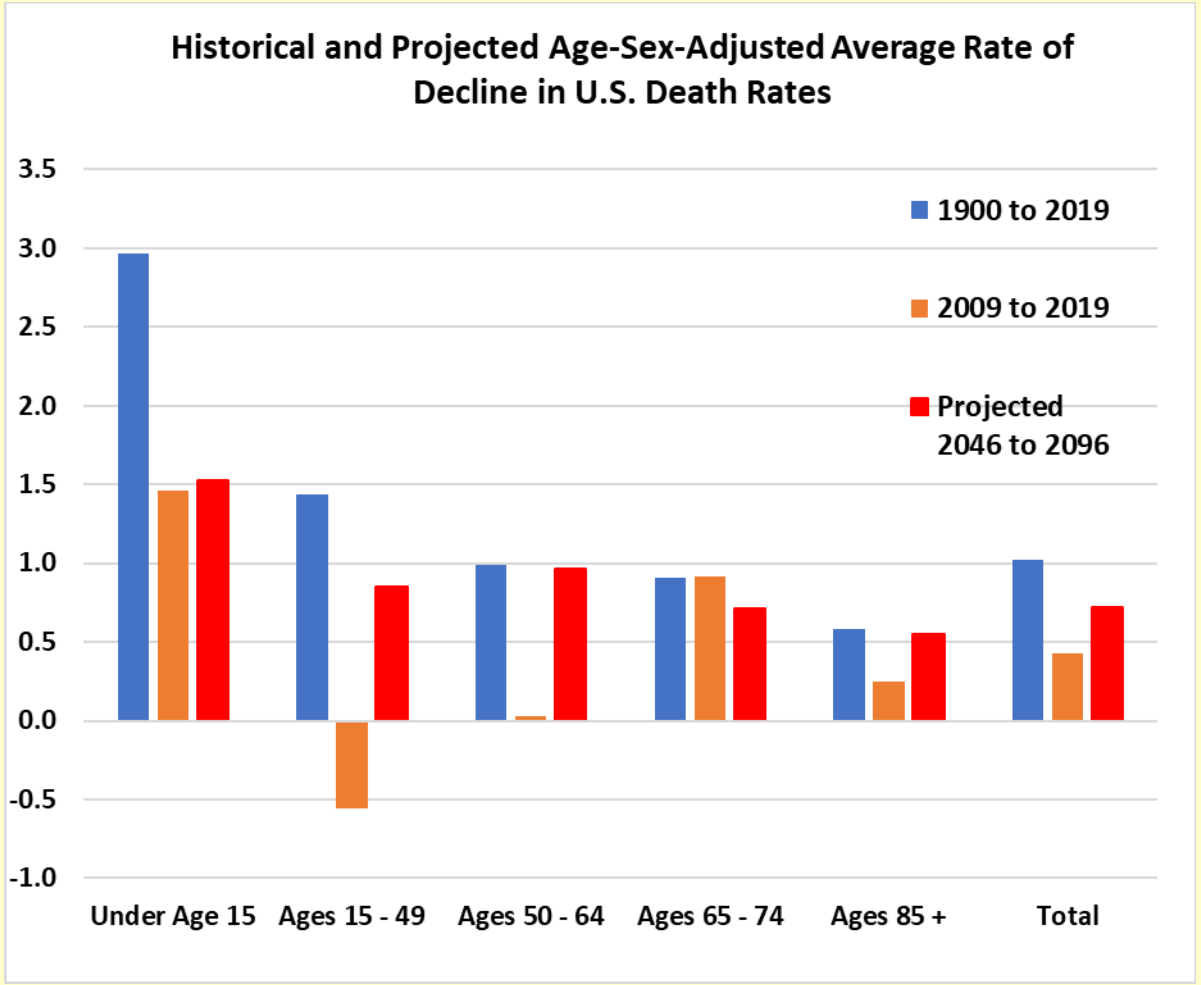




Death Rates Will Continue to Decline: But How Fast and for Whom?

- 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

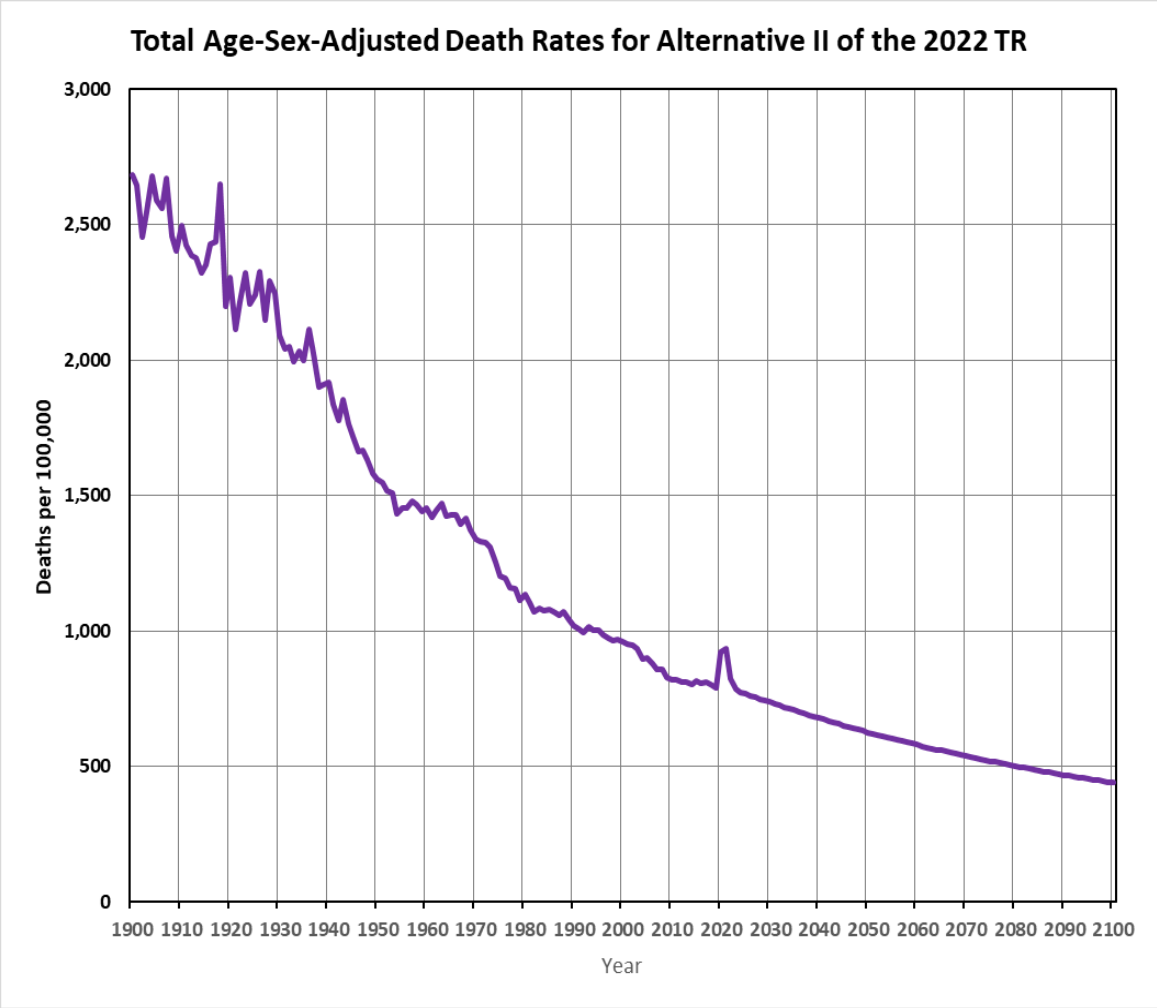
Ultimate (2046 to 2096) Projected Rates of Decline: Similar to Period Since 1900 for Age 50+

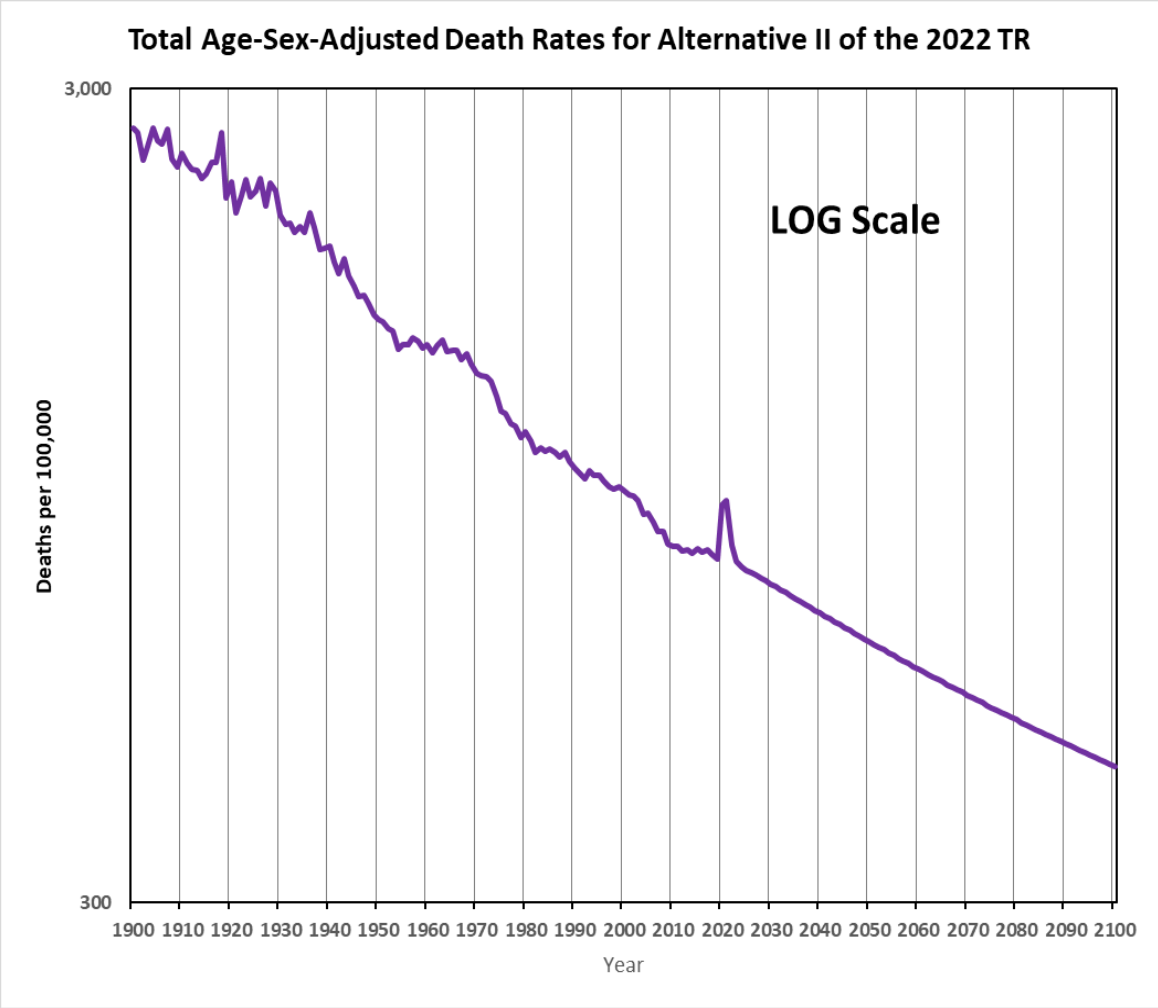


	1900 to 2019	2009 to 2019	Projected 2046 to 2096
Under Age 15	2.97	1.46	1.52
Ages 15 - 49	1.43	-0.55	0.85
Ages 50 - 64	0.99	0.03	0.96
Ages 65 - 74	0.91	0.92	0.71
Ages 85 +	0.58	0.24	0.55
Total	1.02	0.43	0.72

Projected US Age-Sex-Adjusted Death Rates, All Ages

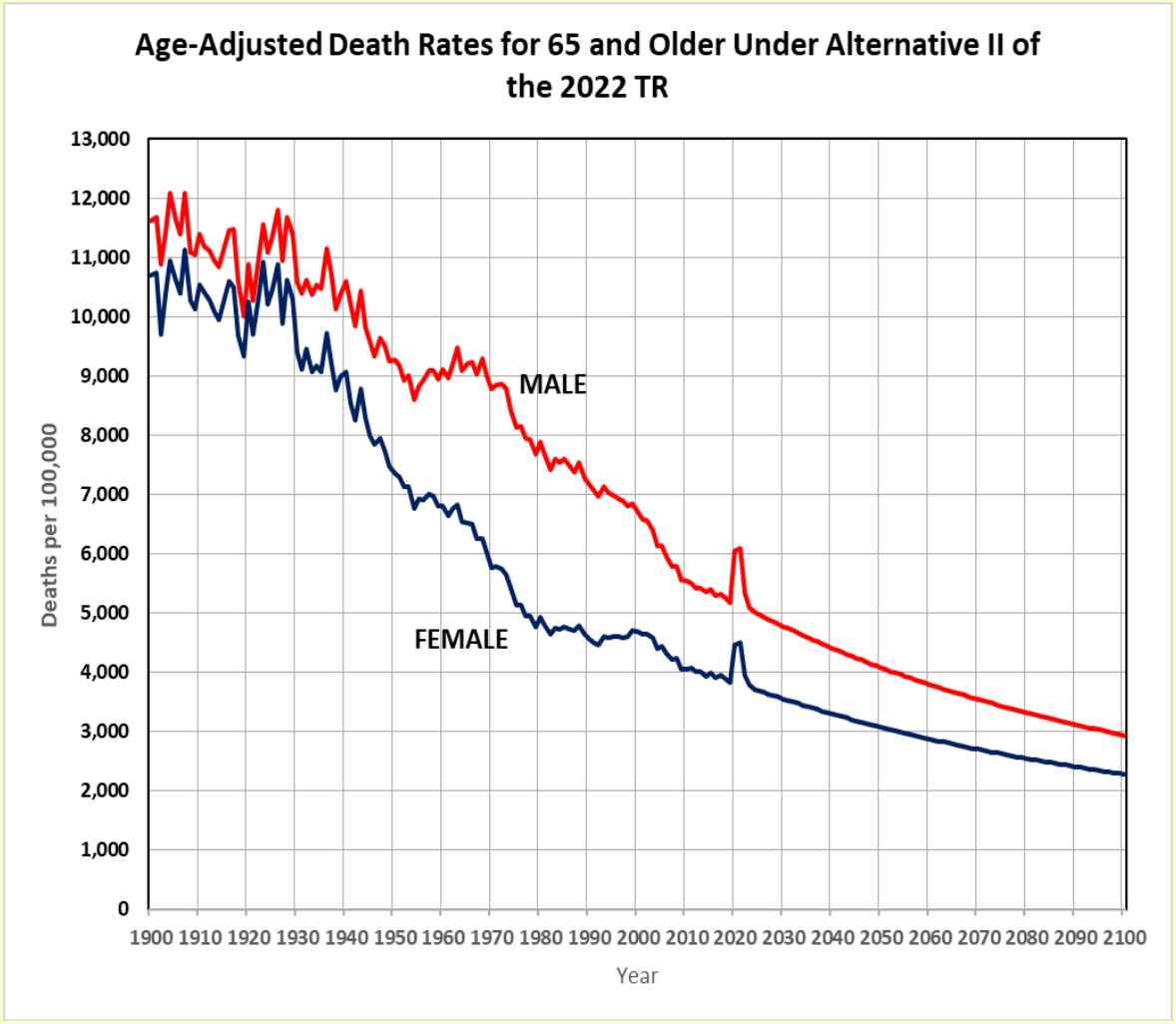
(Note importance of log scale)

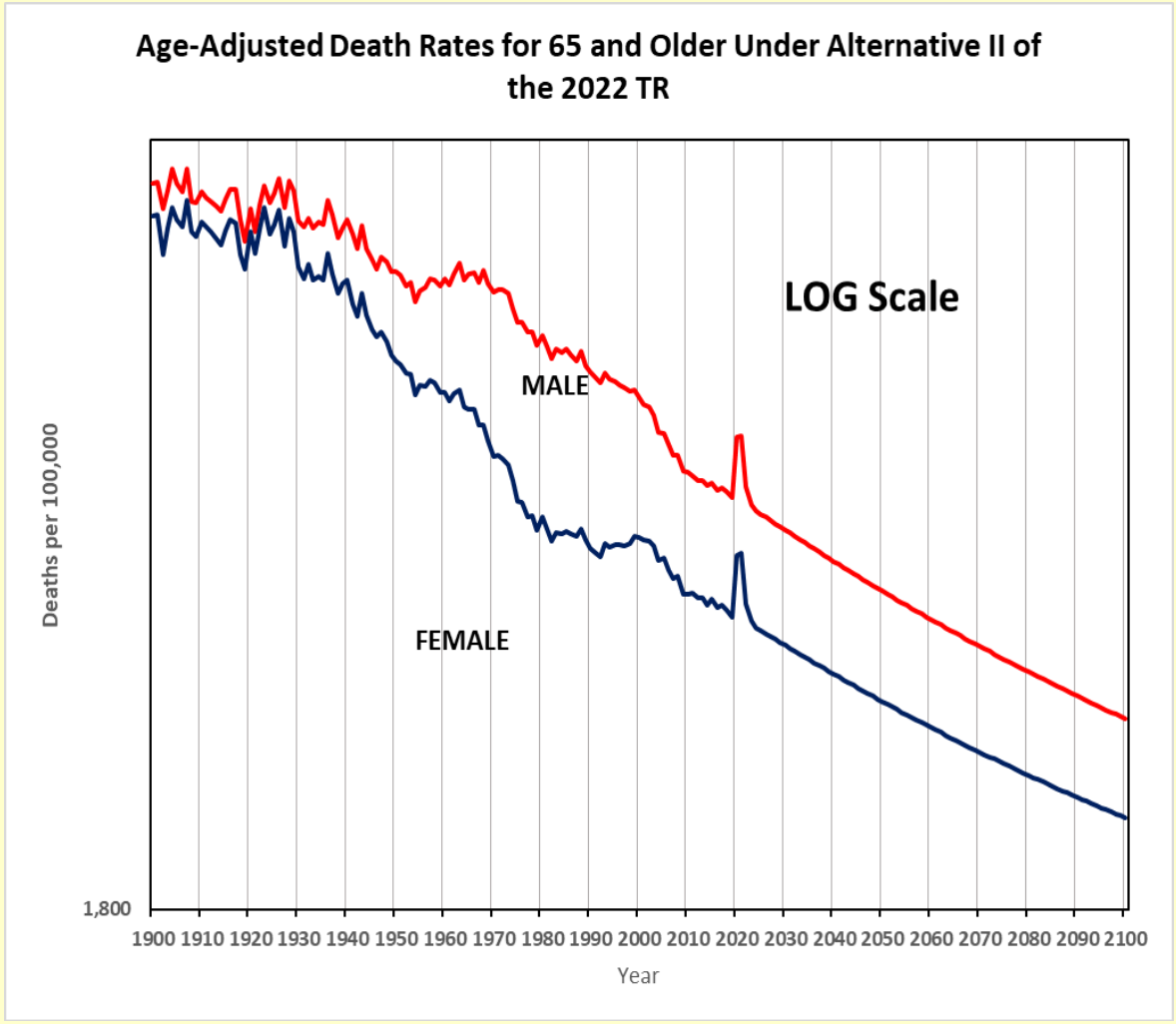




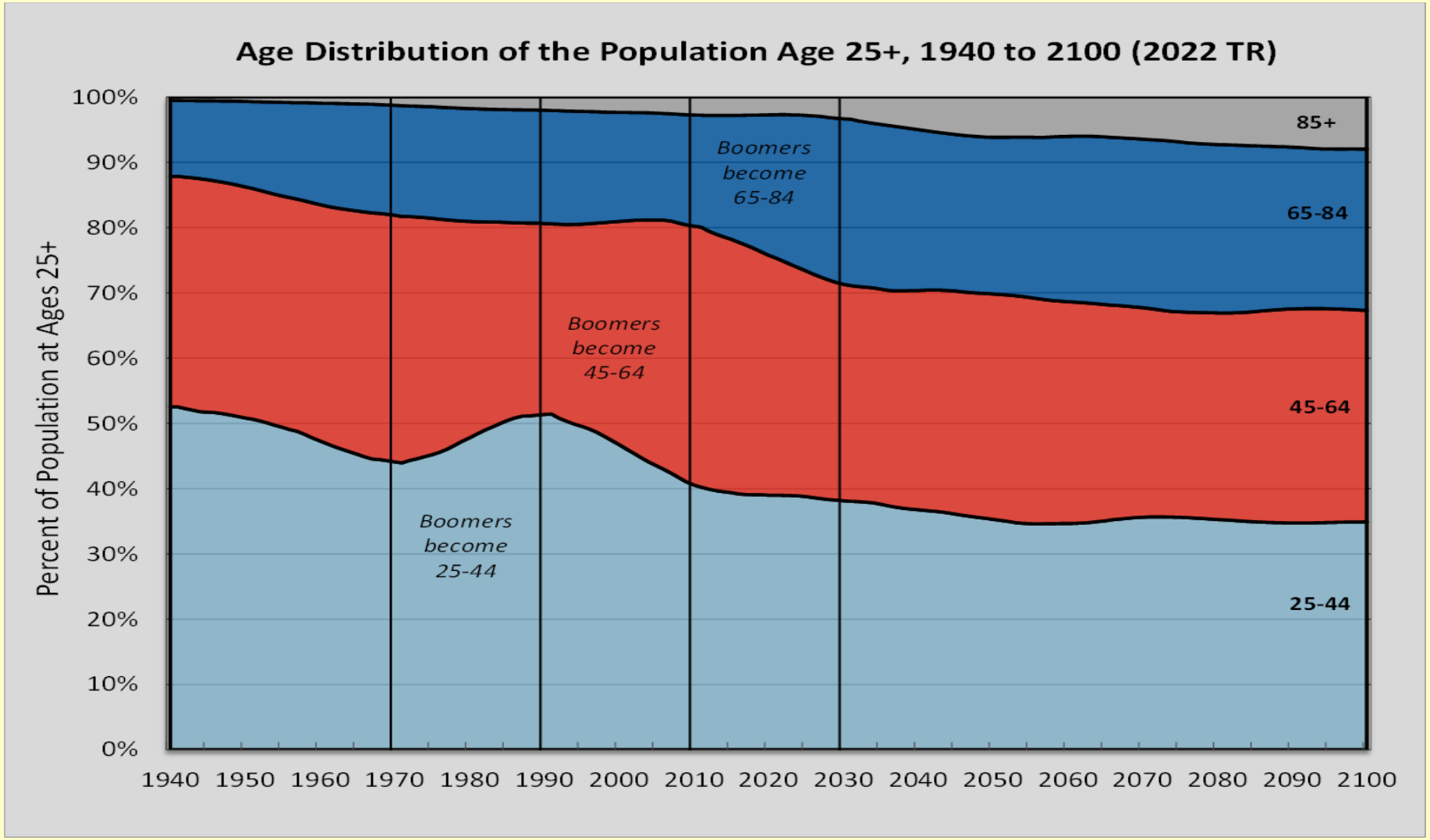
Projected Age-Sex-Adjusted Death Rates, Ages 65 and Over

(Note importance of log scale)





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



For More Information…

http://www.ssa.gov/oact/

- Documentation of Trustees Report data & assumptions
  https://www.ssa.gov/oact/TR/2022/2022_Long-Range_Demographic_Assumptions.pdf
- 2022 SOA ImpACT Conference, panel 13A with leading demographers
  https://www.ssa.gov/oact/presentations/scgoss_20221027.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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