

Setting Future Mortality Trends

Are we now in uncharted territory?

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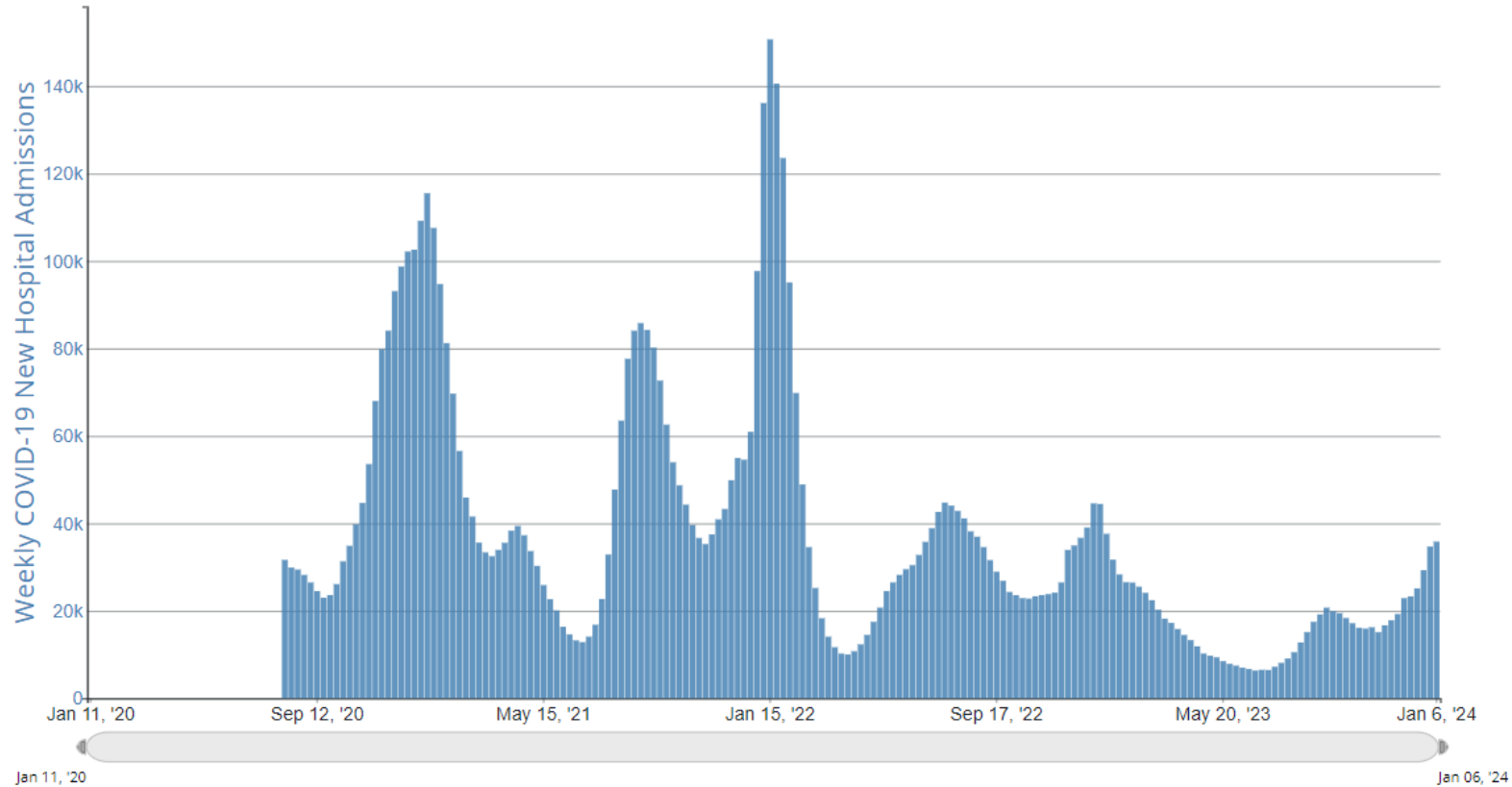
January 22, 2024

Agenda

- Introductions
- Status of COVID
- Determination of Mortality Trends
- Mortality Headwinds and Tailwinds
- Putting it all together
- Takeaways

Status of COVID - Hospitalizations

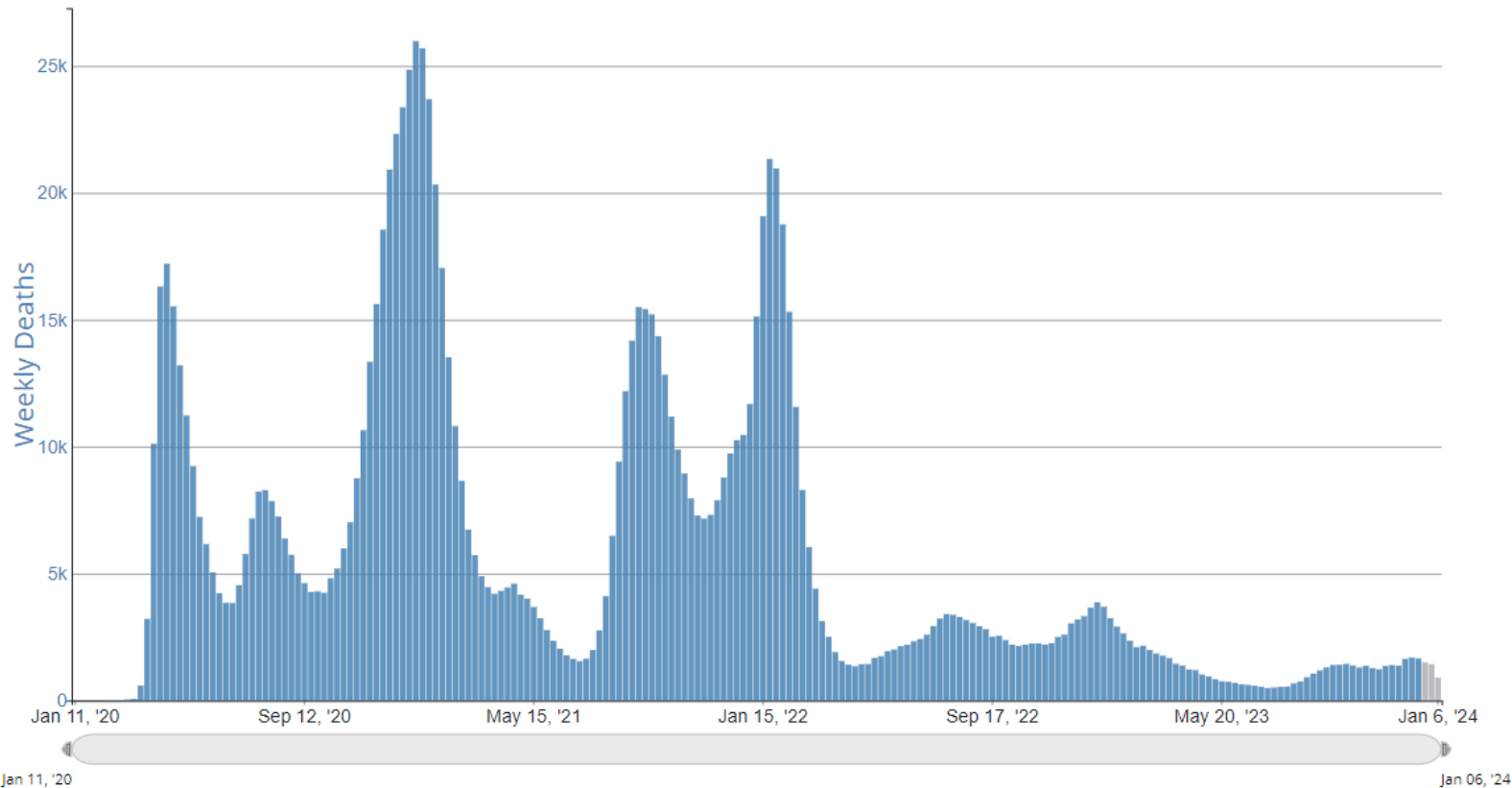
COVID-19 New Hospital Admissions, by Week, in The United States, Reported to CDC



CDC COVID Data Tracker, U.S. government, use allowed

Status of COVID - Deaths

Provisional COVID-19 Deaths, by Week, in The United States, Reported to CDC



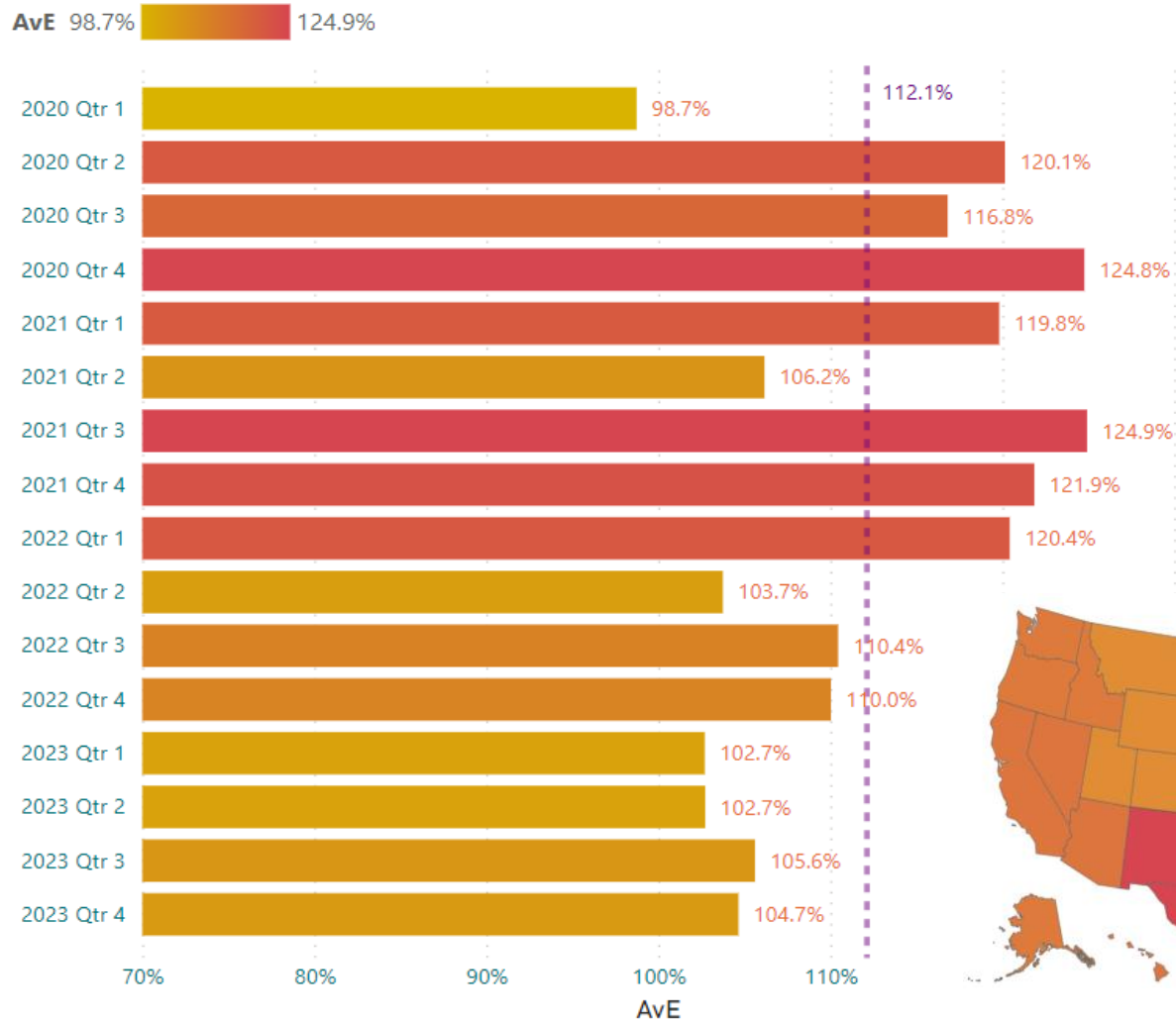
CDC COVID Data Tracker, U.S. government, use allowed

- **What is the endemic state? What does that mean?**
- **What ever happened to “herd immunity”?**
- **Why is this important to insurers?**
- **How does it impact historical and future mortality trend analysis?**

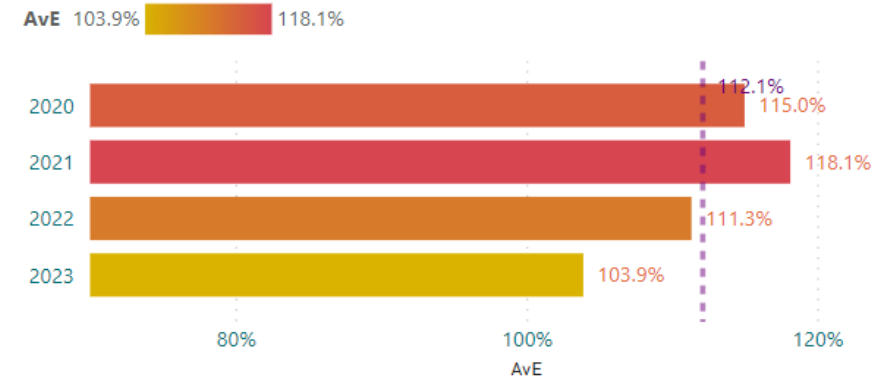
US Population Excess Mortality – Pandemic Overview

Snapshot of excess mortality from 2020-2023 (Q4-2023 represents a partial/early view so it may change materially)

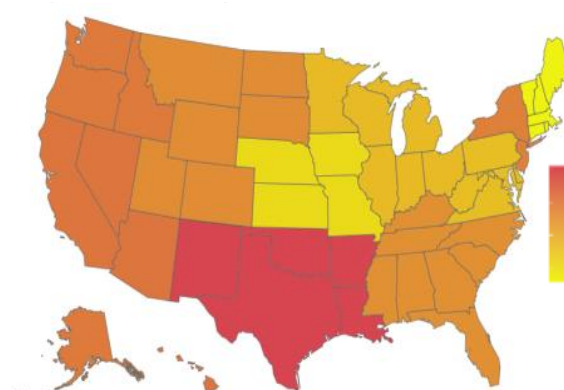
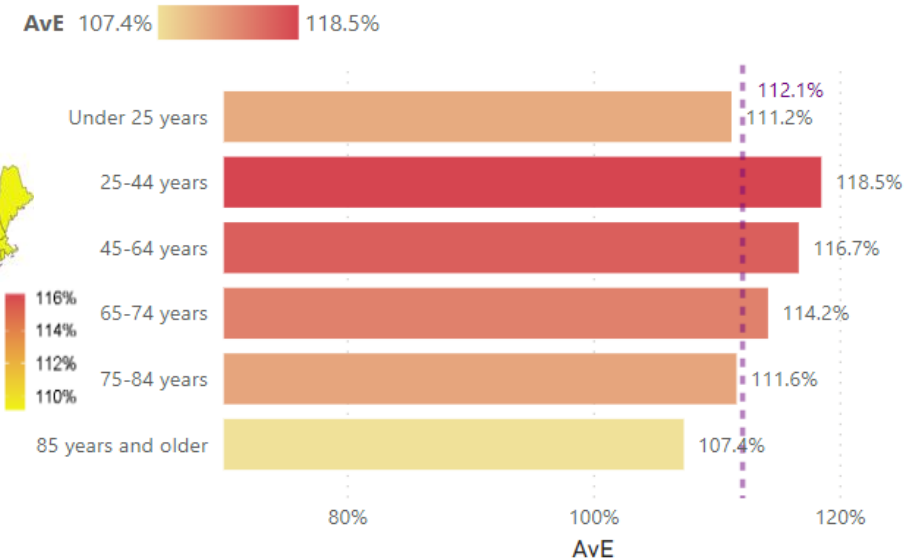
Population AvE by Year and Quarter



Population AvE by Year



Population AvE by Age Group



Source: CDC Wonder (Dec 16th) expected determined by SR trending 2015-19 and adjusting for normal lags

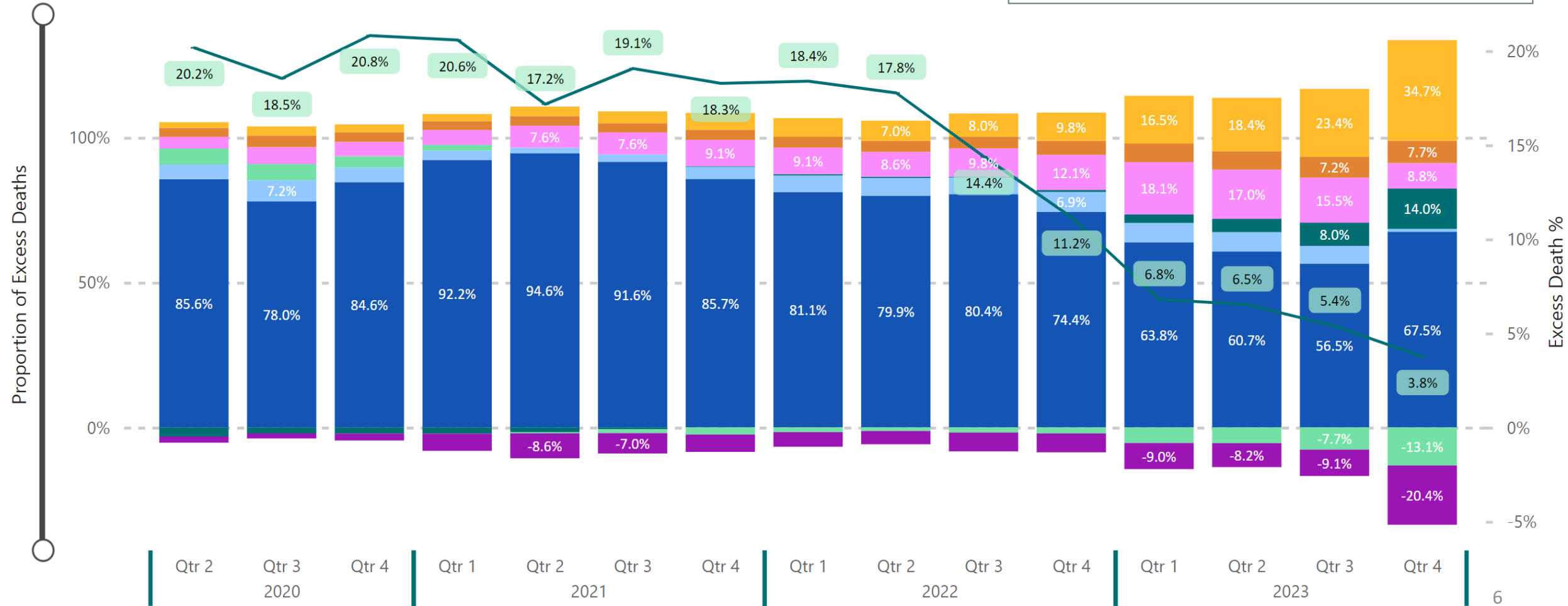
US Population Excess Mortality Split by Cause of Death – By Rolling Quarter

Moving to more non-COVID excess = Violent, Endocrine, Other, and more recently Cancer; Respiratory offsets persistent

Proportion of Excess Deaths by Rolling 4 Quarters-Grouped CODs

● COVID ● Circulatory ● Cancer ● Neurodegenerative ● Respiratory ● Violent ● Endocrine ● Other CODs — Excess%

Quarter shown denotes the last quarter of the rolling 4 quarters.
The most recent quarter includes a partial final quarter.



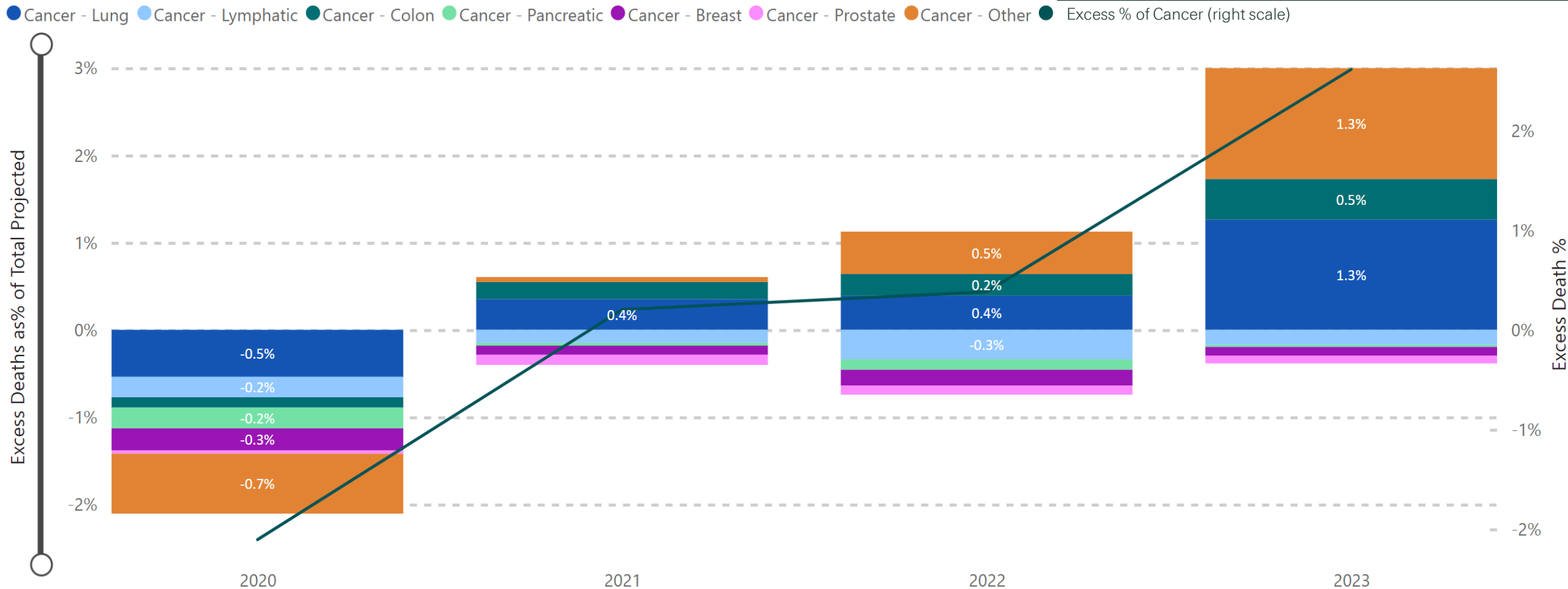
Source (Dec 9th): CDC Wonder – expected determined by SR trending 2015-19 and adjusting for normal lags

US Population Excess Mortality – Cancer

Increases in cancer deaths have been small but 2023 is showing elevations (from lung, colon, other cancers)

Distribution of Excess Deaths From Cancer as % of Expected Cancer Deaths

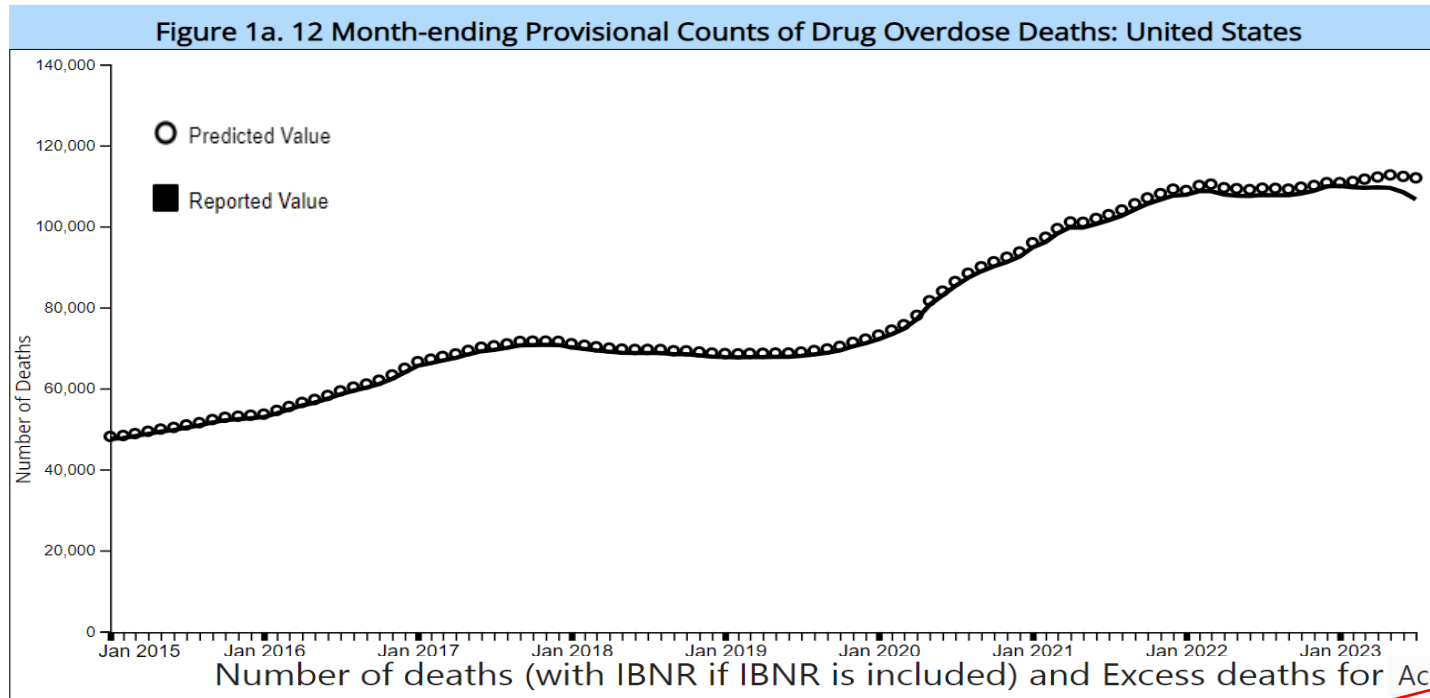
Positive = less improvement in cancer deaths
Negative = more improvement than recent trend



Source (December 9th): CDC Wonder – expected determined by SR trending 2015-19 and adjusting for normal lags

Drug overdose deaths contributing to non-covid increases

Potential peak in drug overdose occurring in the past year or so

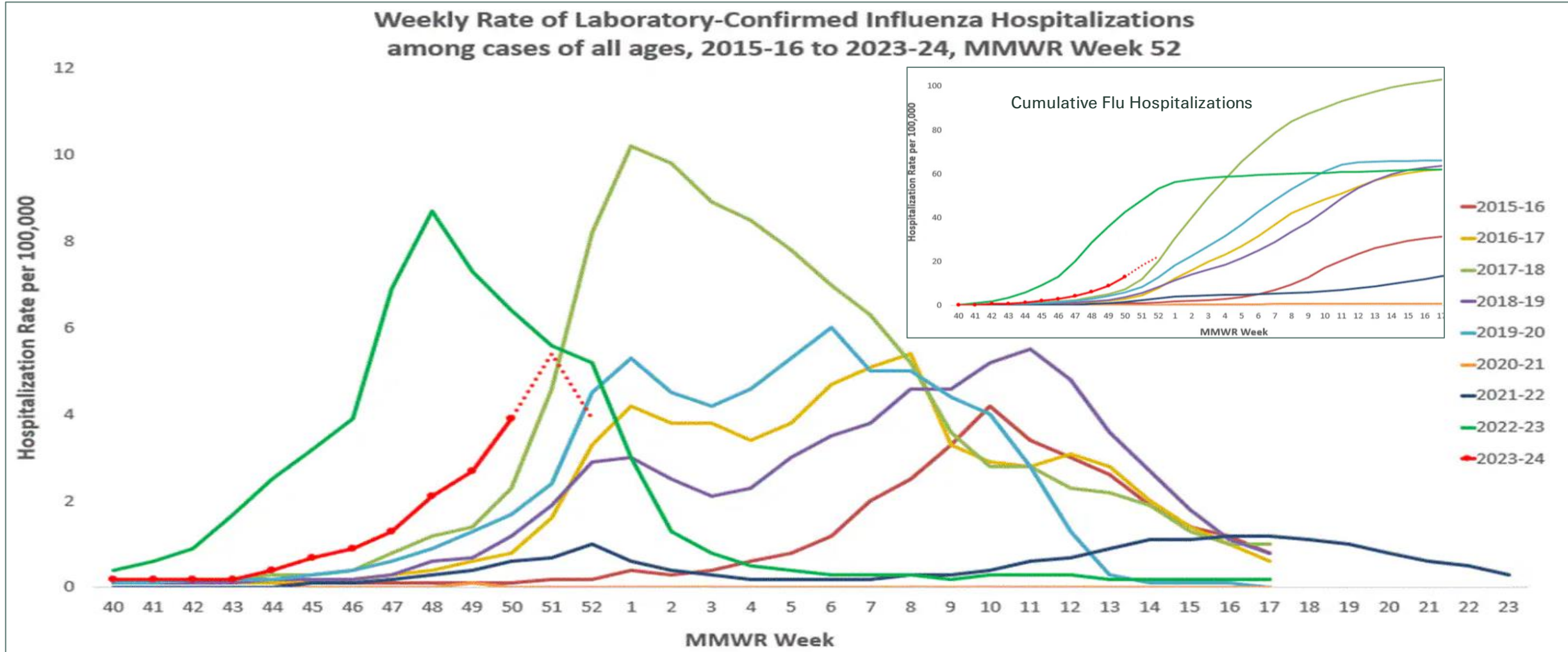


Quarter	Qtr 1			Qtr 2			Qtr 3			Qtr 4			Total		
Year	# Deaths	Excess #	Excess%	# Deaths	Excess #	Excess%	# Deaths	Excess #	Excess%	# Deaths	Excess #	Excess%	# Deaths	Excess #	Excess%
2020	18,823	1,731	10.1%	24,158	6,686	38.3%	22,733	4,847	27.1%	22,701	3,358	17.4%	88,415	16,622	23.2%
2021	22,768	6,362	38.8%	26,326	8,186	45.1%	25,966	7,271	38.9%	25,999	6,007	30.0%	101,059	27,826	38.0%
2022	23,578	6,439	37.6%	24,982	5,965	31.4%	25,838	6,214	31.7%	27,968	6,984	33.3%	102,366	25,603	33.4%
2023	23,668	5,744	32.0%	24,939	4,961	24.8%	25,282	3,246	14.7%	15,620	-137	-0.9%	89,509	13,815	18.3%
Total	88,837	20,276	29.6%	100,405	25,799	34.6%	99,819	21,579	27.6%	92,288	16,213	21.3%	381,349	83,865	28.2%

Source: CDC (December 3rd) & CDC Wonder (December 9th)– expected determined by SR trending 2015-19 and adjusting for normal lags

Recent Flu Impacts – US Population

Flu season starting off slightly higher than normal flu seasons but much better than last year



SOA COVID Expert Survey on Future Mortality

- Updated survey from August 2022 focusing on short/medium term impacts of COVID in collaboration with Swiss Re Institute
- Projected release date of June 2023 – responses primarily Feb/March 2023
- Expert panel – final respondents = 39 (vs. 59 previously) with 70% actuaries
- Non-actuaries much more pessimistic
- Direct impacts of COVID around 2%
- Insured excess better than general population
- Similar results as previous survey but increases in future mortality are about 2-3% higher

AVERAGE ALL-CAUSE EXCESS MORTALITY ESTIMATES WITH COVID-19 BY POPULATION AND AGE

U.S. Population (No. of Responses)	Current Age	2022 (%)	2023 (%)	2025 (%)	2030 (%)
Total Respondents					
General (N = 39)	25	17	13	9	6
	45	17	13	9	6
	65	14	10	6	4
	85	11	8	7	3
Actuaries Only					
General (N = 27)	25	17	13	8	4
	45	17	12	6	3
	65	13	9	4	2
	85	11	7	4	1
Total Respondents					
Life Insurance Industry Insured (N = 14)	25	10	7	5	3
	45	11	8	6	4
	65	10	7	5	3
	85	7	5	3	2
Actuaries Only					
Life Insurance Industry Insured (N = 9)	25	10	7	4	2
	45	11	7	4	2
	65	10	6	4	2
	85	7	5	3	1



Many factors could impact excess mortality going forward, *but the dominant driver will be direct impacts*



Direct Impacts

- Endemic COVID
- Misidentified COVID
- Short-term complications related to COVID



Indirect Impacts

- Delayed Cancer Screening



Long COVID

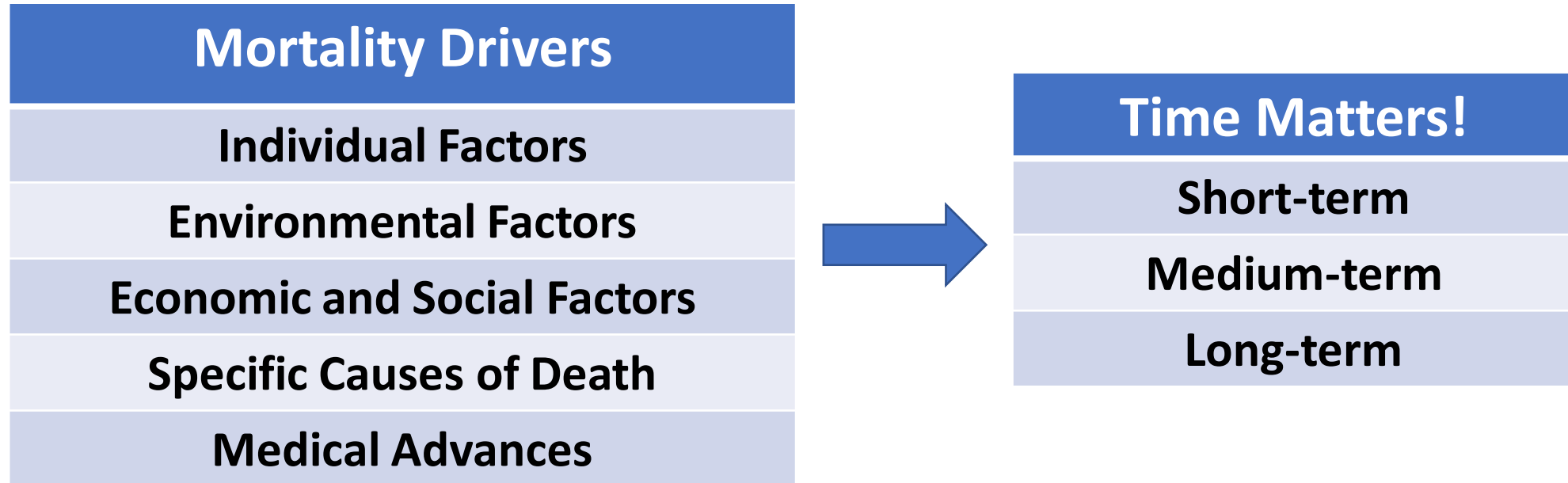
- Cardiovascular
- Respiratory
- Cognitive



Offsetting Deaths

- Reduced Flu/Seasonal
- Selection Effect

Mortality – Headwinds and Tailwinds



But first...what is aging?

“Aging is a fascinating but complex and dynamic biological process. It is characterized by progressive functional and structural deterioration of multiple cells, tissues, and organ systems.”

Luigi Fontana, MD, PhD, FRACP
The Path to Longevity, 2020

“Aging results from the impact of the accumulation of a wide variety of molecular and cellular damage over time. This leads to a gradual decrease in physical and mental capacity, a growing risk of disease and ultimately death.”

World Health Organization
October 2022

Is aging a normal or pathological process?

Underwriting Question #1

Is aging a disease?

- Yes
- No
- I don't know.

Is aging a disease?

Varying opinions – there is no “right” answer!

Yes

- Longevity science and geroscience
- Targeting aging pathways could address multiple disease simultaneously
- Potential to improve healthspan and lifespan
- ICD-11: attempted to classify “old age’ as a diagnosis

No

- Aging is a “normal” process experienced by all
- Chronological aging is heterogeneous
- Promotes ageism and age discrimination
- ICD-11: “age-related decline in intrinsic capacity”... caused by “biological” processes
- U.S. Food and Drug Administration does not recognize aging at a target

Healthspan vs. Lifespan

Key Questions

(For society and insurers!)

What led to the significant increase in life expectancy in the 19th-20th centuries?

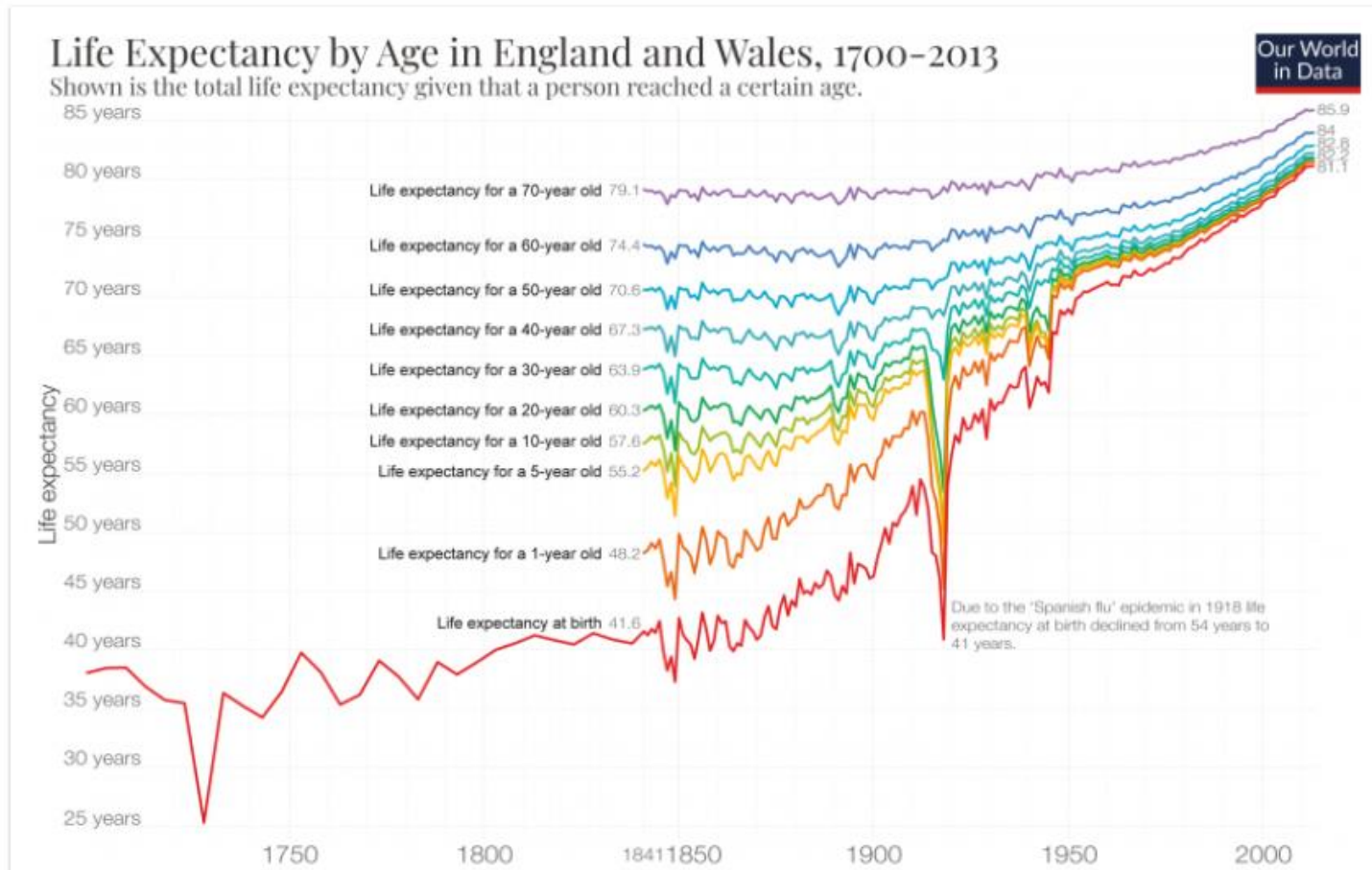
By treating individual diseases, can we extend the healthspan and life expectancy significantly?

Is there a maximum life expectancy humans can achieve?

“Death is a zero-sum game. When one disease declines, another must rise – known as competing risks.”

S. Jay Olshansky, PhD
University of Illinois

Improvements in Life Expectancy



- Not equal across ages
- Much reduced at upper age limits
- Does this support a maximum upper limit?

Underwriting Question #2

40-year-old female, life only, 5 million USD

- Physician assistant and works in a “functional” medical practice
- Admits to taking metformin and low dose naltrexone (self-prescribed)
- No history of DM/PCOS, drugs or alcohol
- Urine drug screen negative
- Statement from PI:
 - I don't really take these regularly.
 - They are for anti-cancer/anti-aging/immune modulation.
 - I basically just do a lot of things to stay healthy and at my peak.

How would you underwrite this case?

- Accept history and statement
- Apply a low-to-moderate rating
- Post-poner

Headwinds: Contribute to Mortality Deterioration

Headwinds	
Slowing CV improvement	Began approximately 10 years ago, will advances in prevention and treatment work?
Obesity, diabetes, physical inactivity	Will worsening trends stabilize or reverse? Impact of therapies? UPFs?
Climate change/environment	Heat/cold waves, microplastics, forever chemicals, “attribution” science
Infectious diseases	Antimicrobial resistance, Long COVID, emerging pathogens, change in vectors, water/food safety, vaccine hesitancy/refusal
Cognitive/neurodegenerative diseases	Impact of ageing societies, ? ability of therapies to make significant difference
Opioids and other drugs/vaping	Unfavorable, tragic trends continue. Impact on insured lives?
Deaths of despair	Multiple issues related to mental health and stress, greater political polarization, social isolation, burnout
Public Health	Pandemic a major set-back for public health system [especially U.S.]
Economics/population demographics	Greater socio-economic disparity, austerity, reduced access to care
Science “under the microscope”	Greater challenge to science and growing skepticism

Tailwinds: Contribute to Mortality Improvement

Tailwinds	
Genetics and all “-omics”	Now
Precision medicine – next gen CV therapies, biometric monitoring	5+
AI/GPT, machine learning - clinical medicine, research	5+
mRNA tech and universal vaccines	5+
Cancer – prevention, early detection/MCED, personalized treatment, recurrence surveillance	5+
Novel obesity and diabetes treatments – GLP-1 RA +++, reversibility of DM-2, impact on CVD	5+
Microbiome – all aspects of health	5+
Advanced therapeutics – AI driven drug and protein development, AD prevention/treatment	5+
Regenerative medicine +/- xenotransplantation	10+
Anti-ageing therapies – senolytics, stem cell rejuvenation, Targeting Aging with Metformin - TAME	>15 years

Dr. Z's takeaways...

- Assessing mortality trends is a complex process
- Need to balance drivers of mortality improvement and deterioration
- Requires judgment and expert opinion
- It's an exciting time to assess mortality (and morbidity) risk
- The next 5 years will be extremely informative!
- Remain optimistic!

Jeremy's takeaways...

- Our industry is at a very unique point as we transition out of a pandemic, tackle some material societal issues, and experience the benefits of technology and innovation
- Coordination across functions and leveraging many sources of data will be essential to accurately assessing risk
- Creative thinking to manage evolving risks will be at a premium

Elyssa's takeaways

- Actuaries look at data such as age specific mortality rates, vital statistics, census and health survey and make assumptions from their strong background in mathematics and statistics, creating models to forecast probabilities of events and life expectancies.
- Medical team looks at public health, considering lifestyle trends and how medical conditions interact synergistically. 2 plus 2 rarely equals 4. Medical directors tend to look at issues such as access to care, governmental policies that impact health, social trends, and how interventions may alter these trajectories of future mortality.
- Takes the collaboration of Actuary and Medical to make predictions in which the expected aligns closer to observed

M.U.D. Metropolitan Underwriting Discussion GROUP

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