U.S. Life Expectancy: Trends, Uncertainties, and Longevity Risk

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Meet Today's Speakers

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Agenda

- Mortality Trends in the United States
- Drivers of Change
- Current Approach to Mortality Risk
- Mortality and Socioeconomic Status
- How Can We Rethink This Problem?
- Q&A

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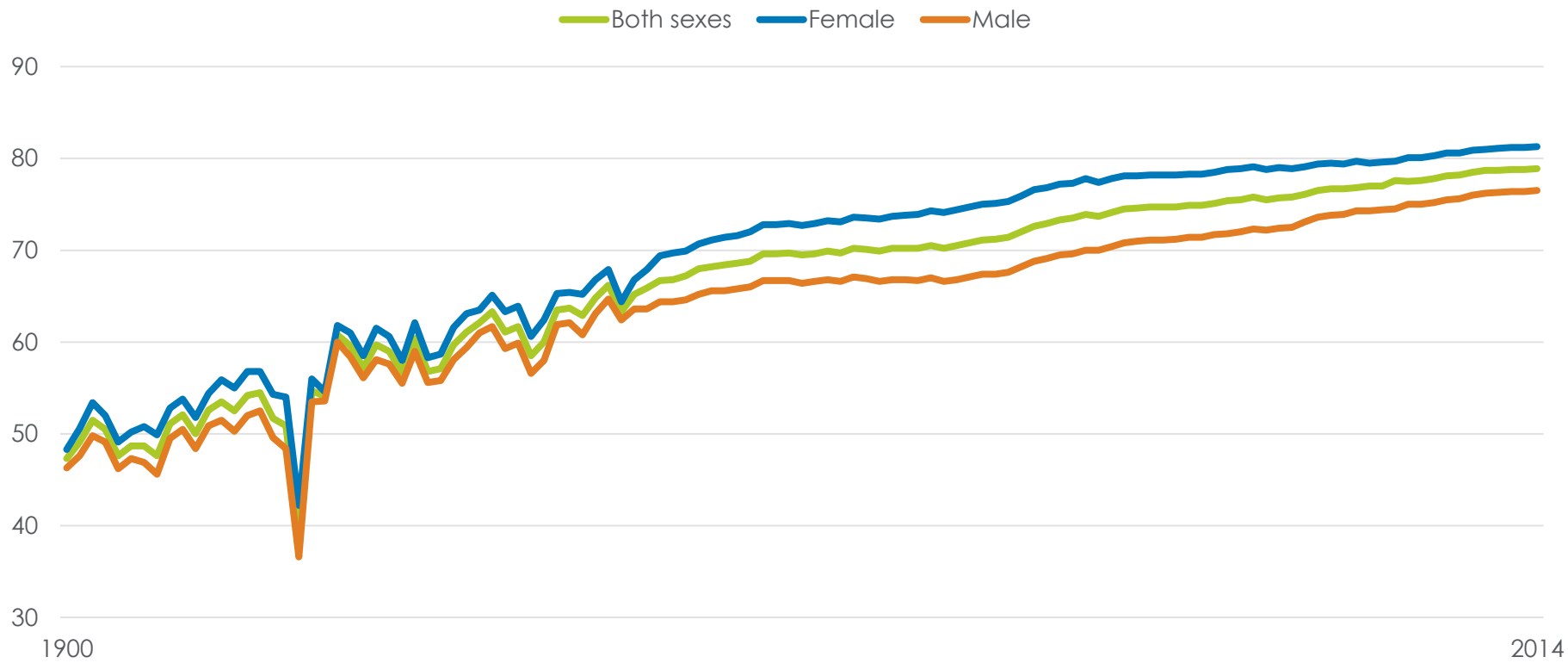
Years of Life Expectancy at Birth, 1900-2014



Capturing Future Life Expectancy Trends

Year	Life Expectancy
2014	78.84
2015	78.69
2016	78.69
2017	**78.60**

- While it is impossible to predict future trends with complete accuracy, we can significantly reduce the uncertainty
- Simple deviations relative to the best estimate (current data) have proven insufficient

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Annual CDC Report: Mortality in the United States

NCHS Data Brief ■ No. 328 ■ November 2018

Mortality in the United States, 2017

Sherry L. Murphy, B.S., Jiaquan Xu, M.D., Kenneth D. Kochanek, M.A., and Elizabeth Arias, Ph.D.

Key findings

Data from the National Vital Statistics System

- Life expectancy for the U.S. population declined to 78.6 years in 2017.
- The age-adjusted death rate increased by 0.4% from 728.8 deaths per 100,000 standard population in 2016 to 731.9 in 2017.
- Age-specific death rates increased from 2016 to 2017 for age groups 25–34, 35–44, and 85 and over, and decreased for the age group 45–54.
- The 10 leading causes of death in 2017 remained the same as in 2016.
- The infant mortality rate of 579.3 infant deaths per 100,000 live births in 2017 was not significantly different from the 2016 rate.
- The 10 leading causes of infant death in 2017 remained the same as in 2016 although 4 causes changed ranks.

This report presents final 2017 U.S. mortality data on deaths and death rates by demographic and medical characteristics. These data provide information on mortality patterns among U.S. residents by variables such as sex, race and ethnicity, and cause of death. Life expectancy estimates, age-specific death rates, age-adjusted death rates by race and ethnicity and sex, 10 leading causes of death, and 10 leading causes of infant death were analyzed by comparing 2017 and 2016 final data (1).

How long can we expect to live?

In 2017, life expectancy at birth was 78.6 years for the total U.S. population—a decrease from 78.7 years in 2016 (Figure 1). For males, life expectancy changed from 76.2 in 2016 to 76.1 in 2017. For females, life expectancy remained the same at 81.1.

Figure 1. Life expectancy at selected ages, by sex: United States, 2016 and 2017

NOTES: Life expectancies for 2016 were revised using updated Medicare data; therefore, figures may differ from those previously published. Access data table for Figure 1 at: https://www.cdc.gov/nchs/data/databriefs/db328_tables-508.pdf#1.
SOURCE: NCHS, National Vital Statistics System, Mortality.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

CDC

https://www.cdc.gov/nchs/data/databriefs/db328-h.pdf

Overall life expectancy **declined by approximately 0.1 year** from 2016 to 2017

- There was **a greater than 0.1 year increase** in mortality for people ages 25 to 44
- There was a **0.1 year improvement** in mortality for people older than 65

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Drivers of Change

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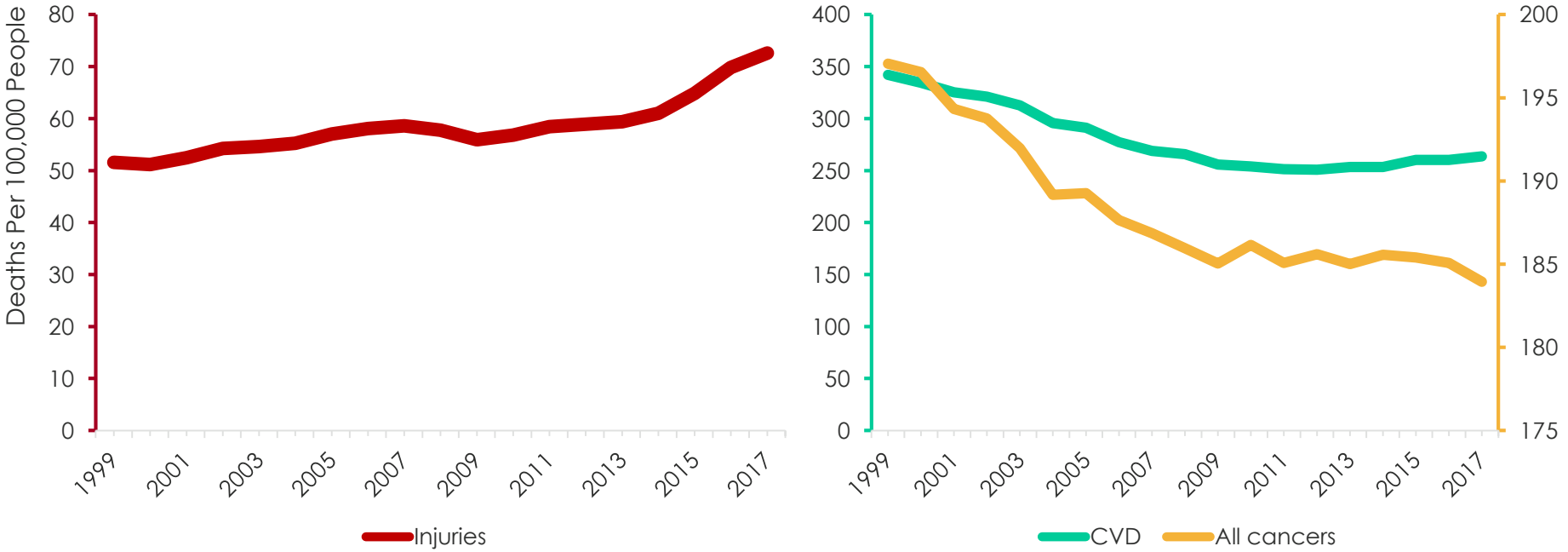
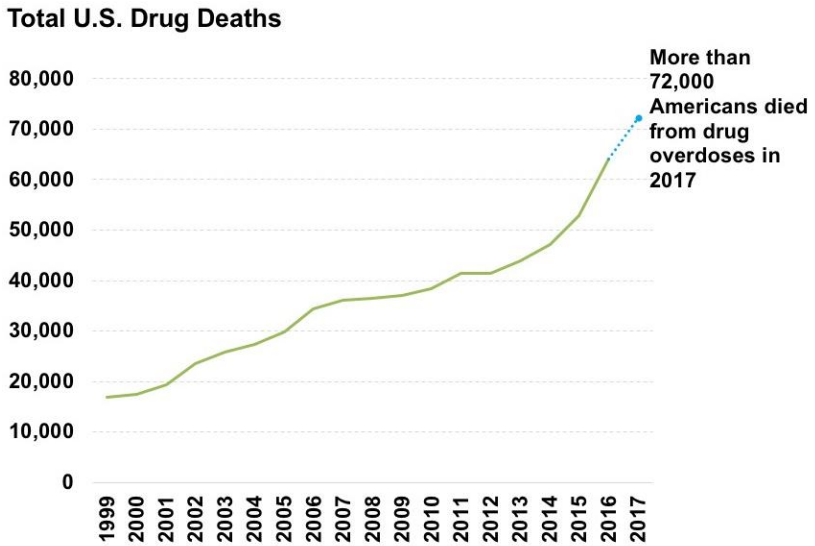
Mortality Trends Are Not One Size Fits All

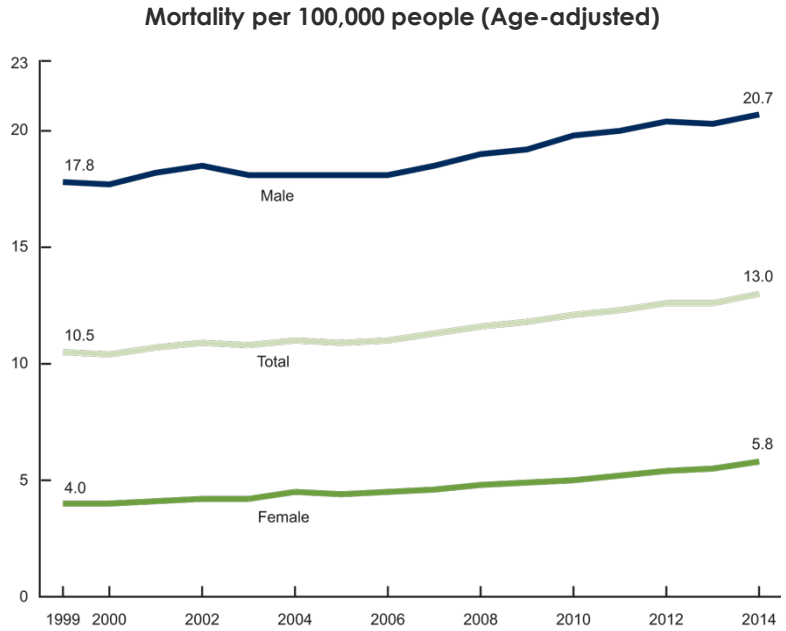


Mortality in People 20 to 44 Years Old

Rise in Deaths Due to Drug Overdoses



Suicide Among the 10 Leading Causes of Death



Source: CDC

Mortality in People 45 to 65 Years Old

Improvements:

- Cancer and CVD
  - Early diagnosis
  - Frequent screening
  - Effective treatments
  - Advanced technologies
  - Improved procedures

Degradations:

- Liver diseases
- Slowdown in CVD improvements
  - Diabetes epidemic (1980-present)

What about habits and lifestyle?

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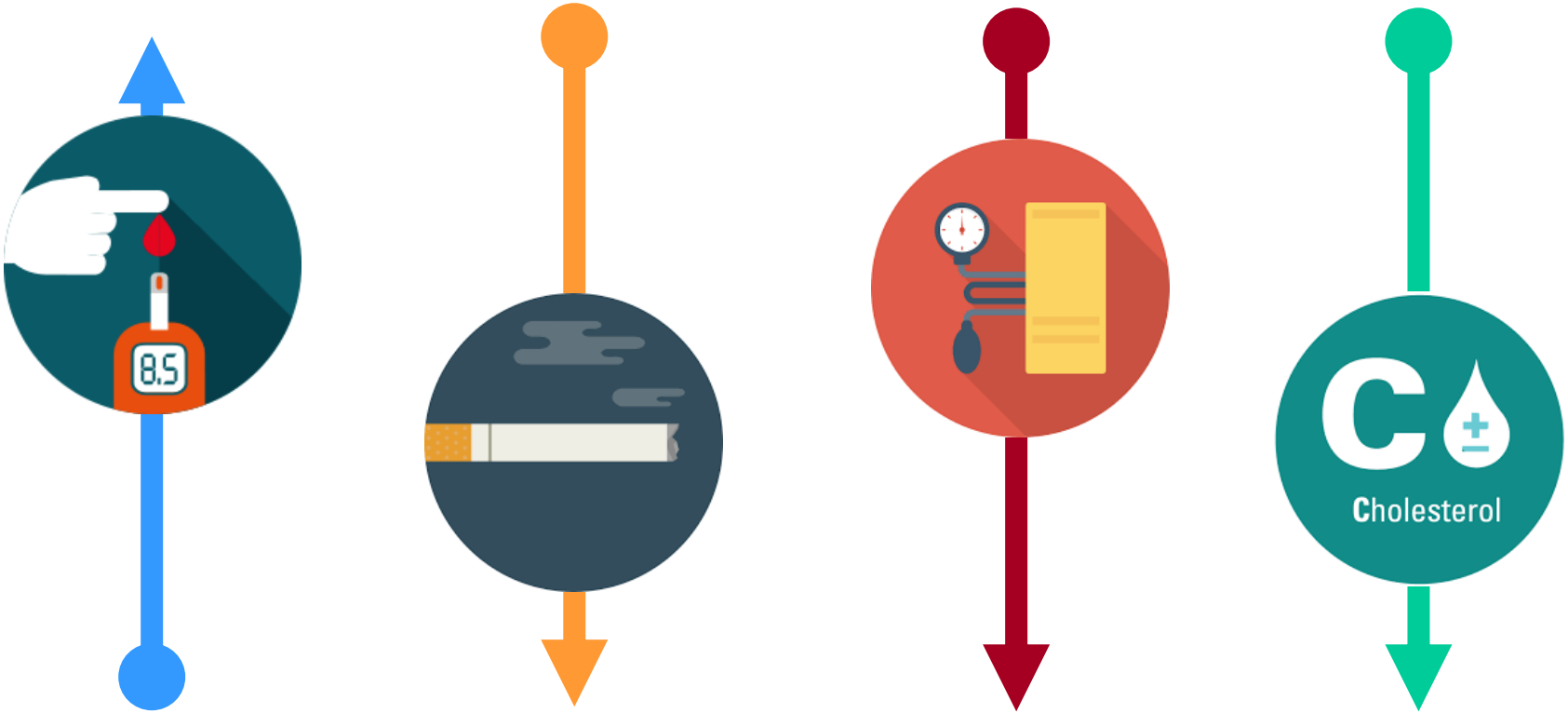
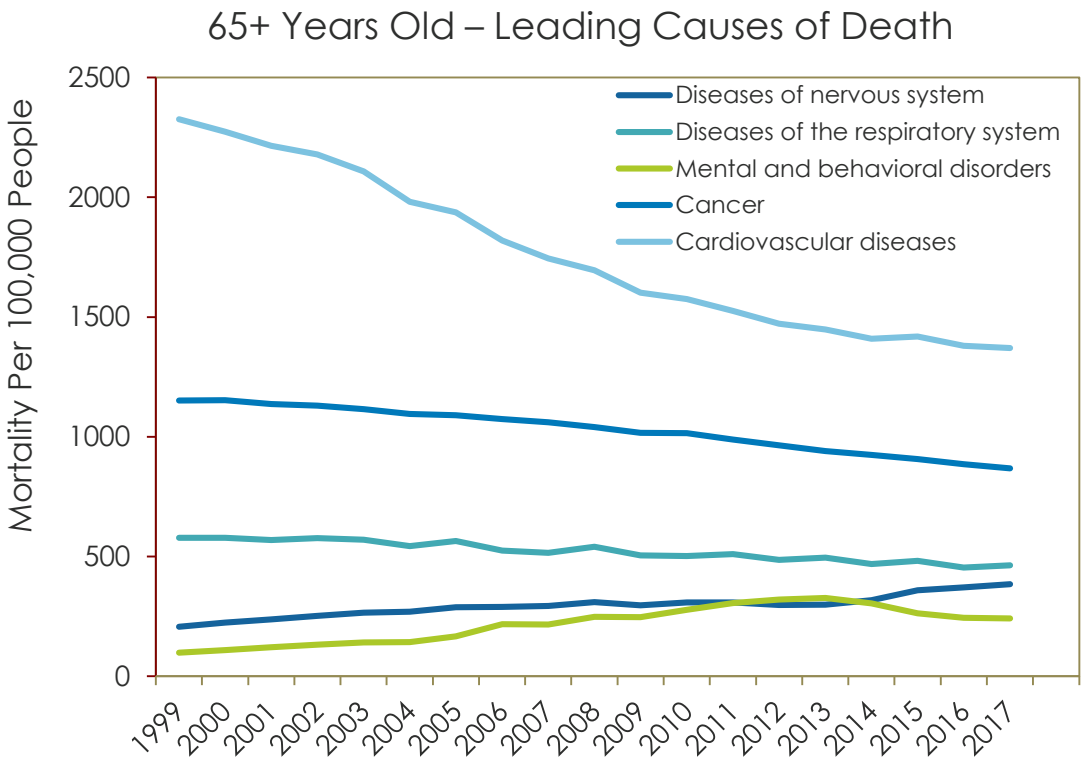
The Role of Lifestyle in Mortality Trends



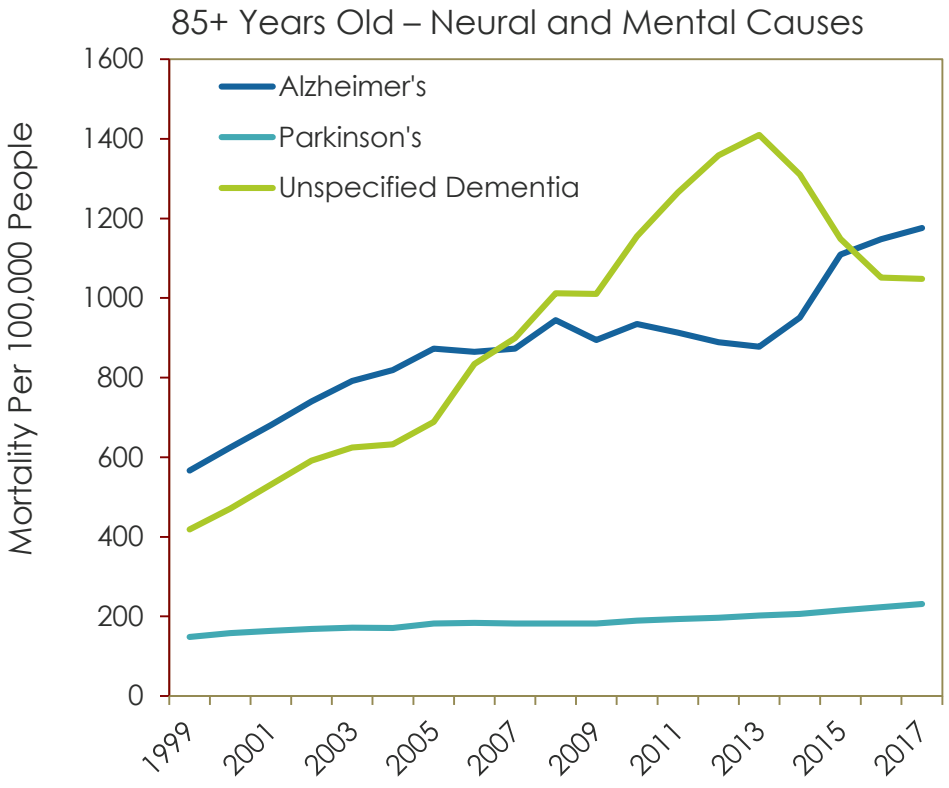
Mortality in People Over 65 Years Old

- Improvement in cancer and cardiovascular disease mortality
- Increase in diagnosis and mortality of dementia and Alzheimer's disease

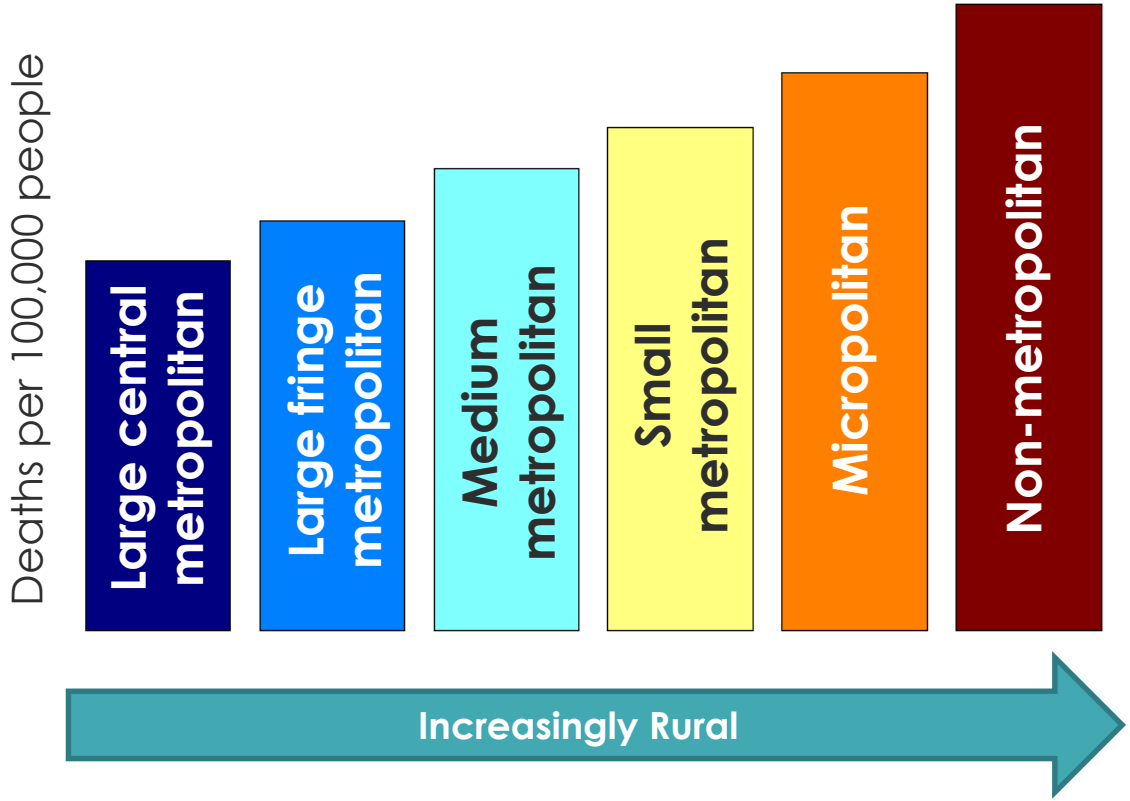


Mortality in People Over 65 Years Old

- 2060: More than 23% of the U.S. population older than 65
  - 10 million+ cases of dementia and Alzheimer's disease



Mortality in Urban vs. Rural Populations



Current Approach to Mortality Risk

Traditional Methods of Capturing Improvement Rates

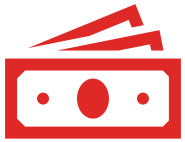
- 1950s to the early 2000s
  - Mortality improvements were based on aggregate data and varied by age and sex
- Post 2010
  - Mortality improvements were also adjusted temporally, trending to an ultimate rate of improvement

Advantages

Best estimate

Easy

Disadvantages



Missing socioeconomic status

Missing uncertainty

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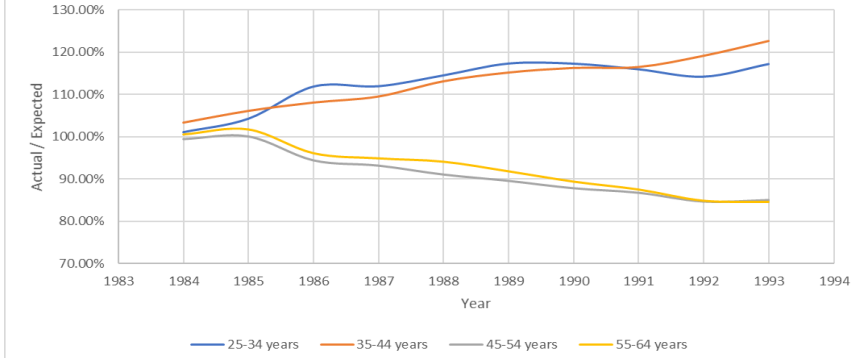
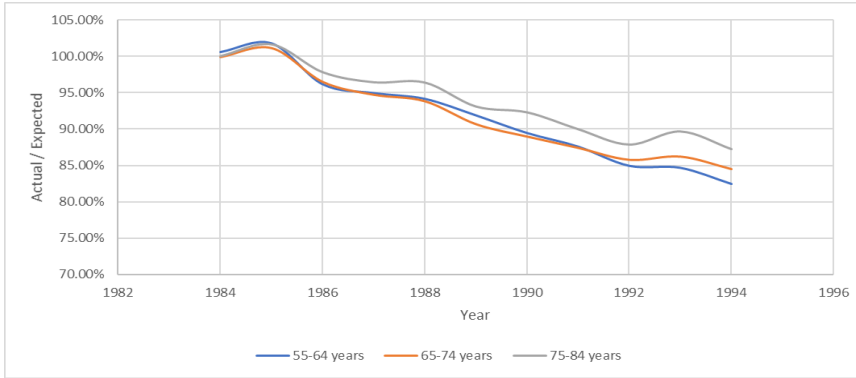
Actual-to-Expected Mortality Ratios by Age Group

Scale G

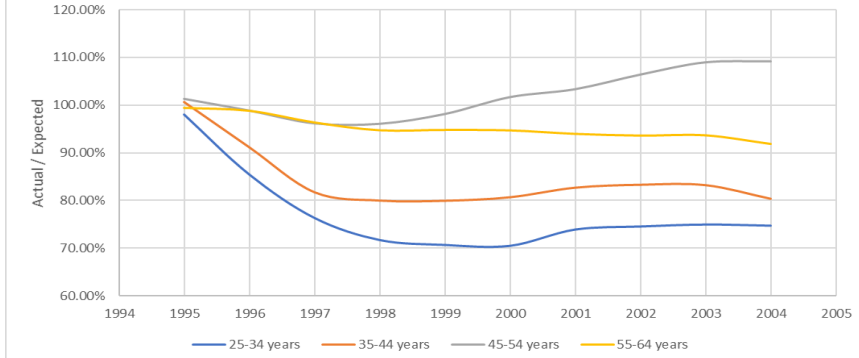
Traditional Age Groups: Life

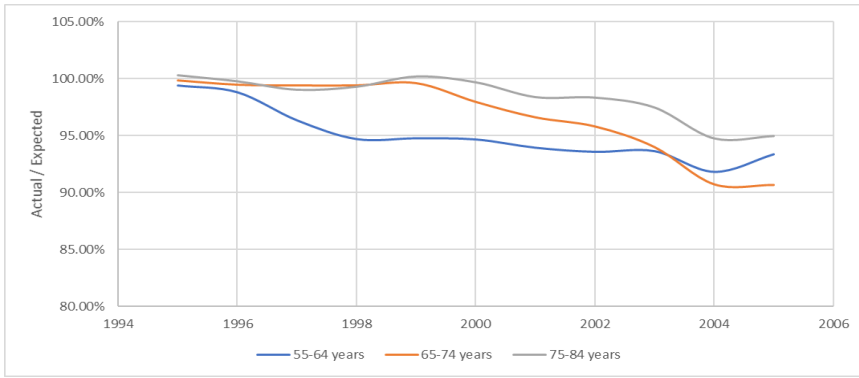


Traditional Age Groups: Annuity



Scale AA





Mortality Projection (MP) Methodology

AGE	1950	1960	1970	…	1990	2000	2010
0	%	%	%	%	%	%	%
…	%	%	%	%	%	%	%
50	%	%	%	%	%	%	%
…	%	%	%	%	%	%	%
110	%	%	%	%	%	%	%

Determine Long-Term Rates

Smooth Data

AGE	1951	1952	…	2010	2011	…	2030
0	%	%	%	%	%	%	1.0%
…	%	%	%	%	%	%	1.0%
50	%	%	%	%	%	%	1.0%
…	%	%	%	%	%	%	1.0%
110	%	%	%	%	%	%	0.0%

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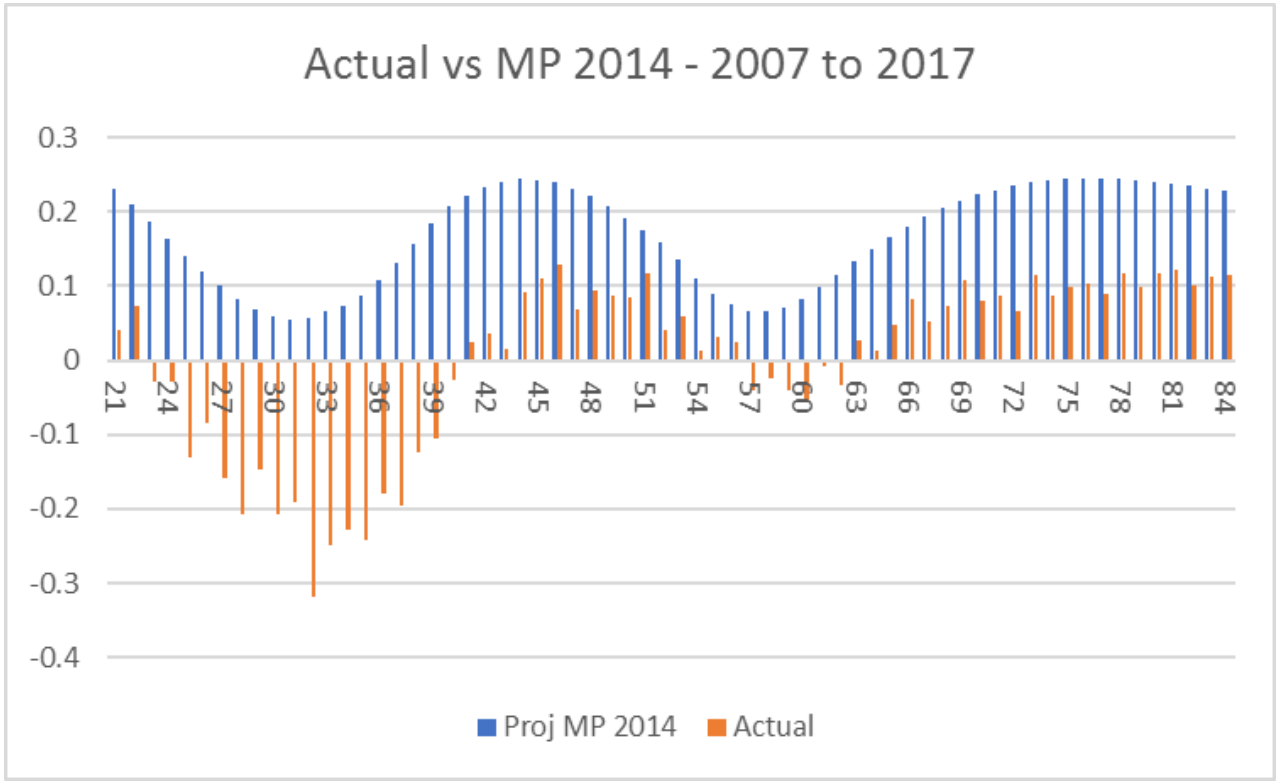
Mortality Projection (MP) 2014: Improvement Rates



Mortality and Socioeconomic Status

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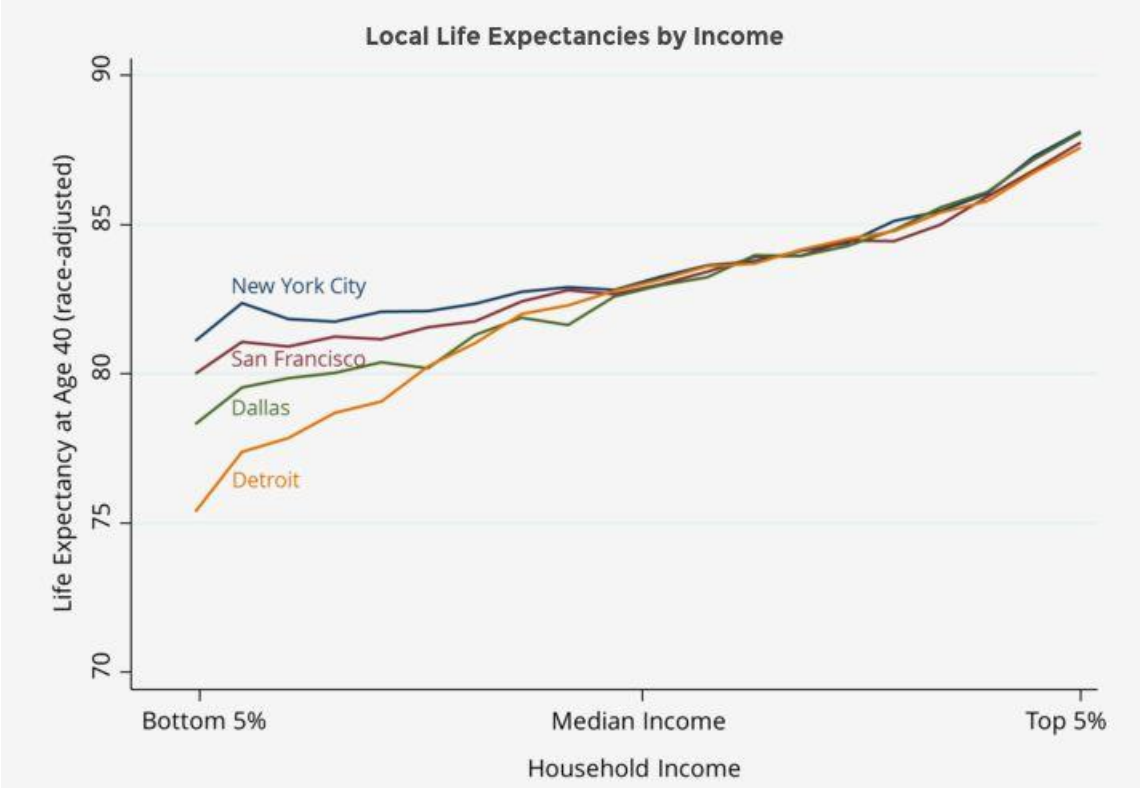
Improvement Rates Vary Across Demographics



Source: The Health Inequality Project

Mortality Improvements Are Not Simply a Function of Income

- Income is related to mortality, but income is also correlated with other factors:

- Breaking down biomedical information and using a multi-variable dynamic model provides a better view of risk

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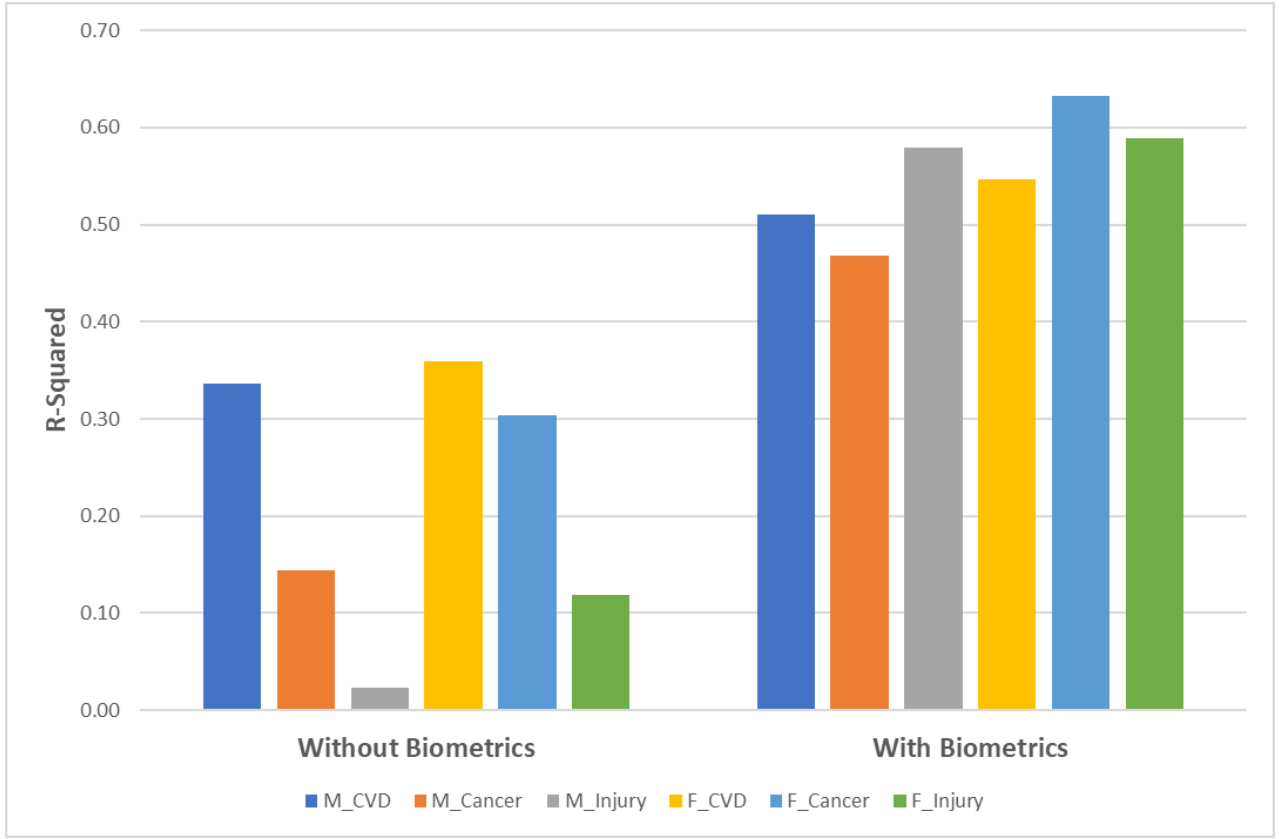
Biometric Data Enhances Understanding of Trends



Improvement by Cause and Time

Median annualized improvement:
Overall

2000-09	2009-15
1.90%	0.76%

Median annualized improvement:
Cancer

2000-09	2009-15
1.66%	2.21%

Median annualized improvement:
Heart Disease

2000-09	2009-15
3.95%	1.45%

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How Can We Rethink This Problem?

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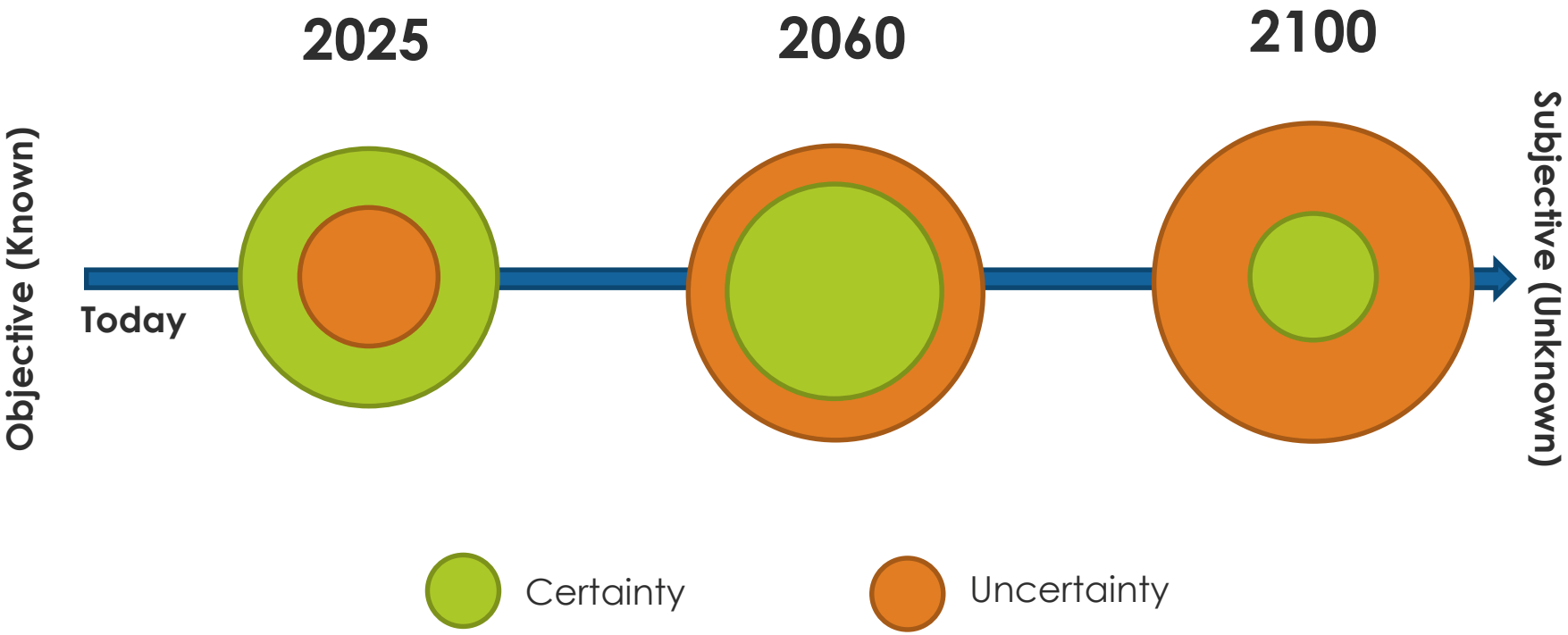
Uncertainty Increases Depending on Length of Projection



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Improving Our Approach to Longevity Modeling

Estimate and forecast mortality based on causes of death

Implement the change in trend of mortality over time

Adjust the model for individuals rather than groups

Focus on characteristics of insured individuals

Include short-term catastrophic mortality shocks

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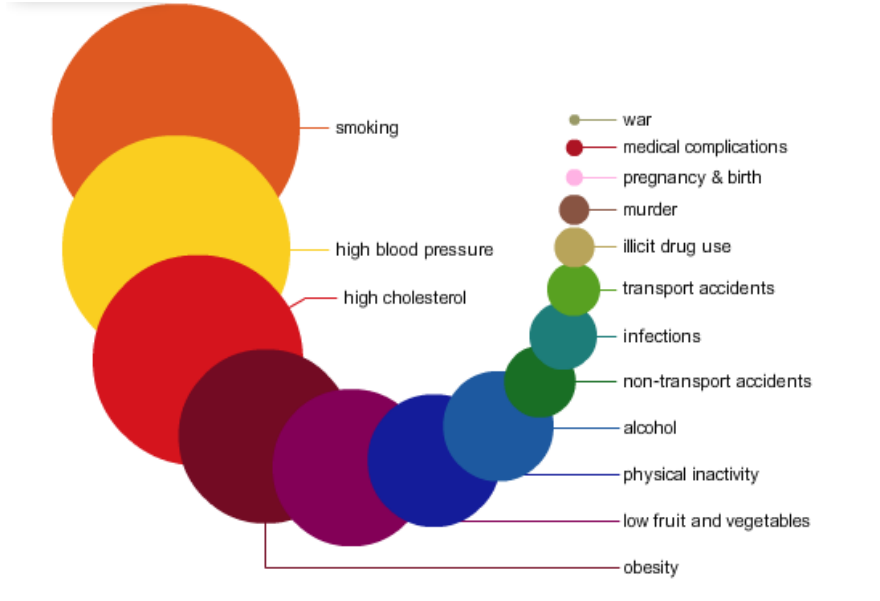
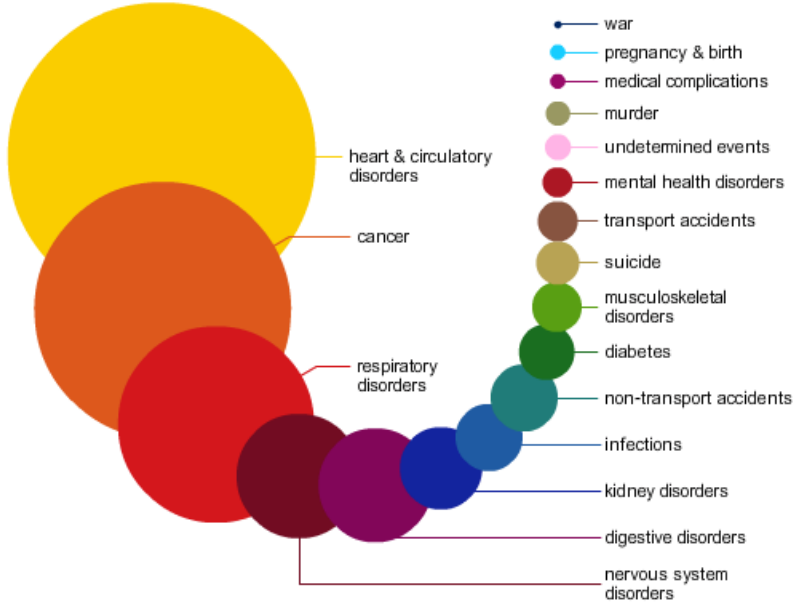
Lifestyle Impacts on Mortality

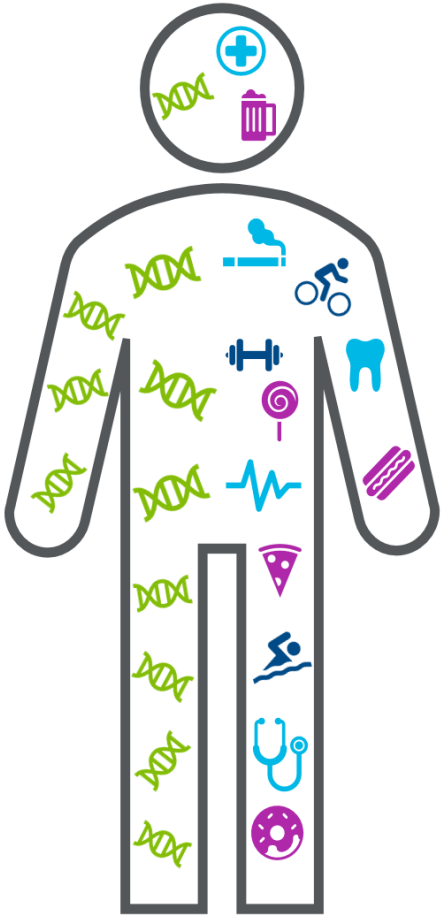
Mortality Risk Factors



Leading Causes of Death



Source: National Health Services - UK



Mortality is a function of

Habits

+

Genetics

+

Medical Advancements

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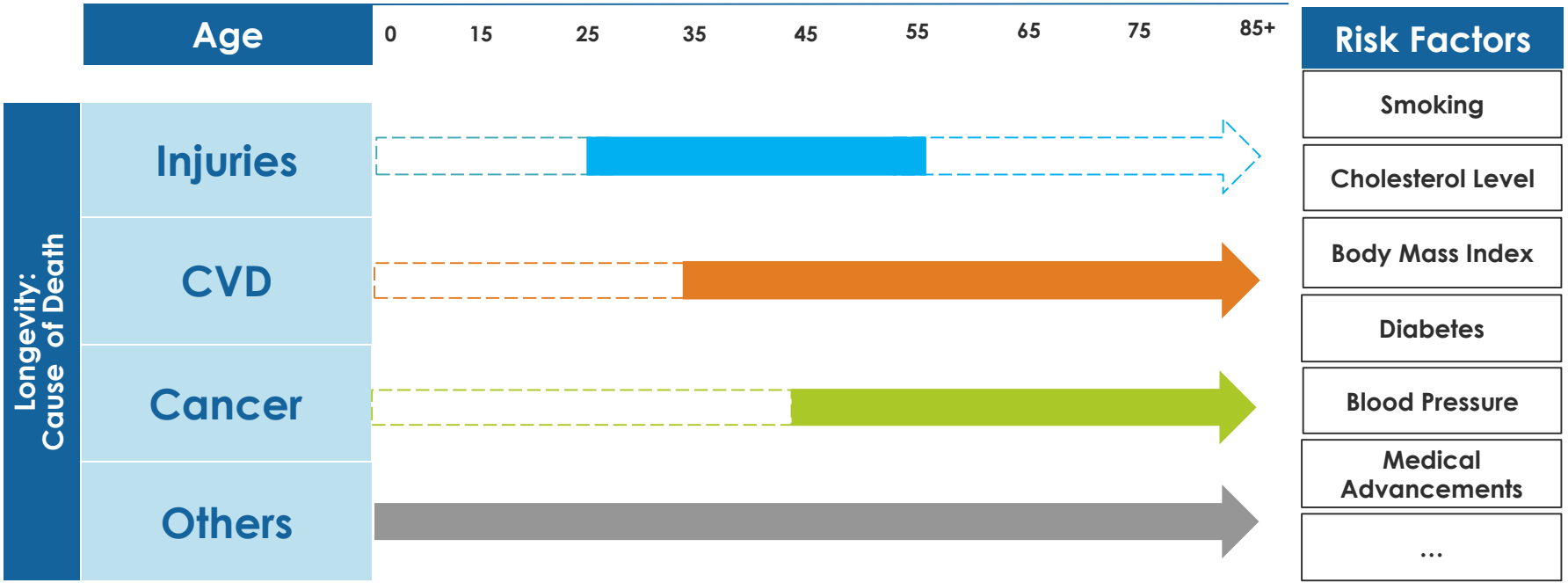
Risk Factors and Cause of Death Vary by Age



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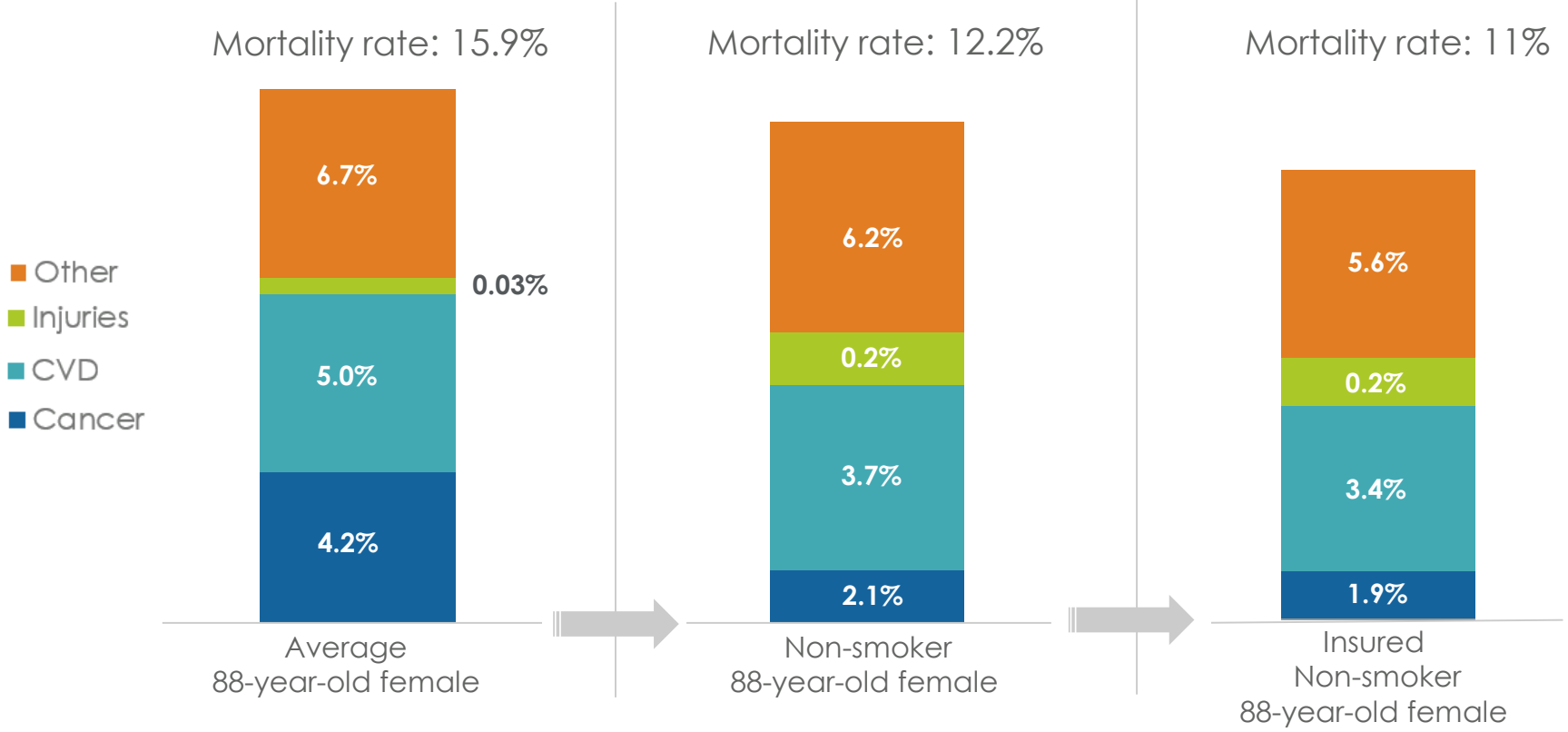
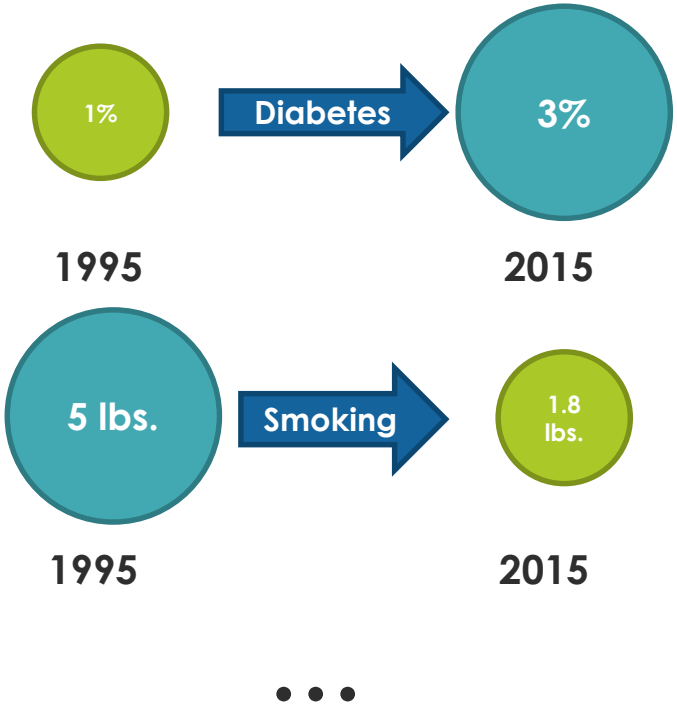
Mortality Adjustment for Insured Individuals

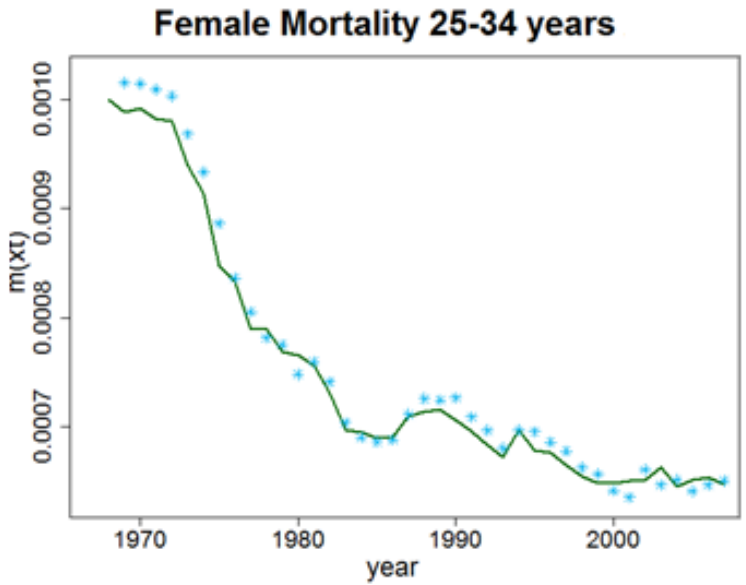


Measuring the Change to Generate Stochastic Mortality

1) Measure the change



2) Measure the impact



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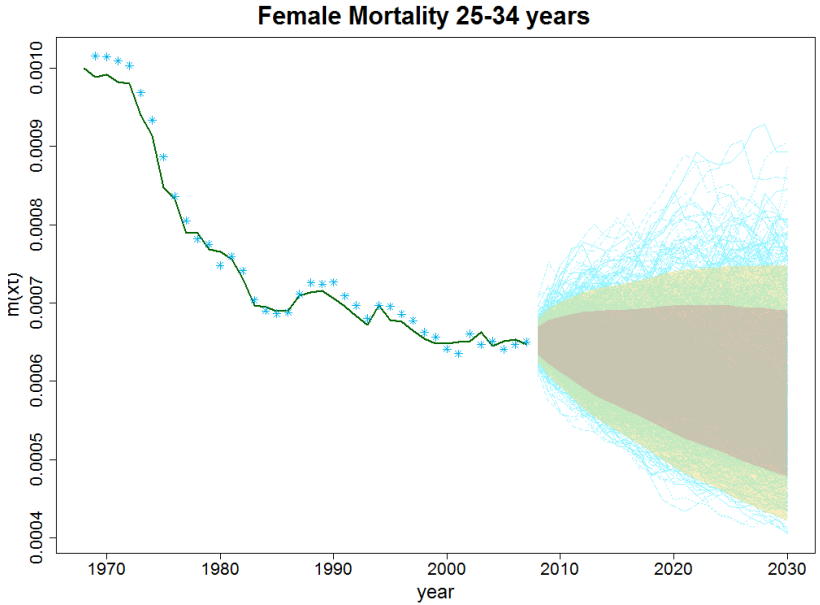
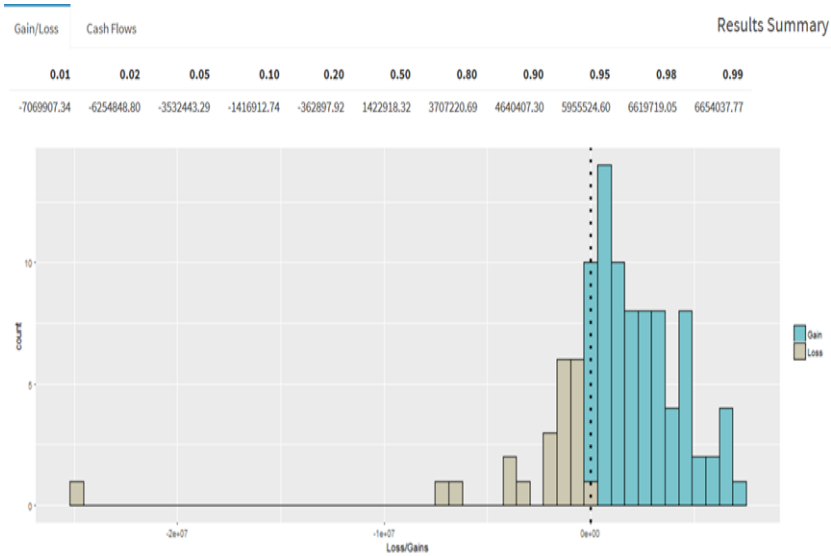
Measuring the Change to Generate Stochastic Mortality

3) Simulate mortality



4) Develop stochastic embedded value



Questions Answered by Stochastic Models

- Will I earn a fair value for the risk based on this price?
- Are my reserves adequate to account for uncertainty?
  - Will I earn enough profit to be solvent 99% of the time
- Is this risk a good fit in my portfolio?
  - Is this risk diversifying? Or is it correlated with my portfolio?

Thank you for attending!

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