Actuaries as Data Experts: Mortality... Measuring Trends... and Making Business Decisions

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@RDaleHall
Society of Actuaries Research Overview

- Focus on Actuarial Education and Research across current and growing practice areas:

<table>
<thead>
<tr>
<th>Area</th>
<th>Research Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life / Annuities</td>
<td>Predictive Modeling &amp; Analytics</td>
</tr>
<tr>
<td>Retirement / Pension</td>
<td>Climate / Resource Sustainability</td>
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<tr>
<td>Finance / Investment</td>
<td>Public Policy Research</td>
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<tr>
<td>Health</td>
<td>Insurance Regulation Research</td>
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<tr>
<td>Risk Management</td>
<td>Post-Retirement Needs / Risks</td>
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<tr>
<td>Property/Casualty</td>
<td>Academic Knowledge Extension</td>
</tr>
</tbody>
</table>
SOA Research Areas

- Experience Studies
  - Wide variety of life, health and retirement products across broad contingencies
  - Pension Mortality
  - 2017 Commissioners’ Standard Ordinary Table for Individual Life Insurance
  - Long Term Care Incidence, Claim Continuance, Claim Utilization
SOA Research Areas

- Practice Area Research

- Volunteer committees focusing on forward looking research for the profession
SOA Research Areas

- In-House Research
  - Internal staff focusing continuously on key actuarial practice areas
  - US Retirement, US Healthcare, Canadian Retirement, Climate Risk
The Sherlock Holmes Actuarial Perception Exercise (SHAPE?)

- Things that this Actuarial Demographic group likely enjoys
  - Puzzles / Mysteries?
  - Television / Movies / Streaming?
  - Texting?
Who Plays The Role of Sherlock Holmes?

downey
cumberbatch
benedict
cumberbach
robert
The Sherlock Holmes Actuarial Perception Exercise (SHAPE)
The Sherlock Holmes Actuarial Perception Exercise (SHAPE)

• Takeaways For Actuaries
  • Personal preferences influence our perceptions
  • Holmes: Some of the best data... is the data that is missing
  • Holmes: Be analytical of measuring trends
Trend examples: How fast can we run?

- If it’s 1970... what’s our estimate for 2010?
- It’s 2019... what’s our estimate for 2040?
- How far does it make sense to extrapolate?
- What other factors are missing that should be part of our estimation model?
Age at Death in 1900

Data: SSA Actuarial Study 120 – Periods 1900-2000, 50% male, 50% female

*13,283

Number of Deaths per 100,000 Deaths

Age

Life Expectancy

Age 65

Age 40

At Birth

*13,283

Data: SSA Actuarial Study 120 – Periods 1900-2000, 50% male, 50% female
Age at Death in 1950

Number of Deaths per 100,000

Data: SSA Actuarial Study 120 – Periods 1900-2000, 50% male, 50% female
Age at Death in 2000

Data: SSA Actuarial Study 120 – Periods 1900-2000, 50% male, 50% female
Data: SSA Actuarial Study 120 – Periods 1900-2000, 50% male, 50% female
Changes Over the Century

Number of Deaths per 100,000

Age

Data: SSA Actuarial Study 120 – Periods 1900-2000, 50% male, 50% female

*13,283
Trend examples: What is U.S. Population Mortality?

• If it’s 2009... what’s our estimate for 2018?

• It’s 2019... what’s our estimate for 2040?

• How far does it make sense to extrapolate?

• What other factors are missing that should be part of our estimation model?
Trend examples: What is U.S. Population Mortality?

• Holmes: Is it better to look at the information in front of us, or its components?

• Leverage off our math skills: Total function as an aggregation of component functions

• Total Population Mortality of Individual Causes of Death?
Trend examples: What is U.S. Population Mortality?
Trend examples: What is U.S. Population Mortality?

5.3 Cancer

5.3.1 Total Population Analysis

AGE-ADJUSTED MORTALITY 1999-2017

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<th>Female</th>
<th>Male</th>
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*includes both genders
Trend examples: What is U.S. Population Mortality?
Trend examples: What is U.S. Population Mortality?

6.4 Assault

6.4.1 Total Population Analysis

AGE-ADJUSTED MORTALITY 1999-2017

Table:

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<th>Age Group*</th>
<th>Annual Improvement</th>
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<tr>
<td>Male</td>
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<td>5 - 14</td>
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<tr>
<td>15 - 24</td>
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<tr>
<td>25 - 34</td>
<td>-0.8%</td>
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<td>35 - 44</td>
<td>-0.8%</td>
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<td>45 - 54</td>
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<td>75 - 84</td>
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<tr>
<td>85+</td>
<td>1.6%</td>
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*includes both genders
6.5 Opioids

6.5.1 Total Population Analysis

AGE-ADJUSTED MORTALITY 1999-2017

Trend examples: What is U.S. Population Mortality?

*includes both genders
**Less than 10 deaths. See section 3.
Trend examples: What is U.S. Population Mortality?

• Holmes: As we talk about causes of death, what information might be missing?

• In our actuarial estimations...

• Should we focus on the outcome or focus on the driver of the outcome?
Shifting from Mortality to Mortality Improvement

- Increase in mortality improvement studies has been a growing trend
- Population Data vs. Insured / Underwritten / Selected Data
  - US: CDC; Social Security Administration
  - Globally: Human Mortality Database
Shifting from Mortality to Mortality Improvement

- Calculus / Physics comparison to Mortality Improvement modeling...

  • Where are we now?
  • Where are we going to be?
What predicts future position?

Current position
Past position
Velocity
Acceleration
### Future Mortality Improvement

**Handing in My Report to My Boss: Show Me The Data!!!**

- **100% Accurate!!!**
- **10% Useful?**

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<td>0.0134</td>
<td>0.0129</td>
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</tbody>
</table>

Note: The table above shows the mortality improvement rates for different ages and years from 2003 to 2019.
The Actuary of Today: Data Visualization Artist

Top Actuarial Technologies of 2019

- Data visualization: 57%
- Predictive Modeling: 56%
- Cloud computing & storage: 51%
- Collaborative tools: 48%
- Artificial intelligence & machine learning: 31%
- Source and version control: 29%
- Robotic Process Automation: 21%
- Natural Language Processing & text analytics: 18%
Mortality Improvement Rates

Mortality for 65-year-olds improved (decreased) by 2.5% between 1974-1975.

Females: MI Rates

“Silent generation” enjoyed relatively high improvement rates

Medicare “Mountain Range”

Historical data source: US (SSA) Female 50-100; 1950-2005

Less improvement for baby boomers (esp. born ~1955)
Other Examples

• Actuarial Weather Extremes
• Extreme Rainfall from Hurricane Dorian
• September 2019
Other Examples

• Mortality by Income Level: Top 15% and Bottom 15%
• County Information
• Apply to Diabetes as a Cause of Death
• Homework!!!
Your Opportunity in The Actuarial Profession

- Great people
- Great creativity
- Great profession
Thank You!

Q&A

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