Society of Actuaries
Mortality Research: Implications for Insurers and Pensions

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Longevity 13
September 2017
Transition from Research to Application

• Actuarial Mortality / Longevity Research
  • Population Studies
  • Specific Subpopulation Analysis
  • Insured Life Studies: Individual Life Insurance, Individual Annuities
• Table / Scale / Model Creation
• Industry & Regulator Review
• Adoption & Application
• Industry Use / Opportunity
Society of Actuaries Population Mortality Research

• Increased focus on mortality and longevity analysis
  • Human Mortality Database project sponsorship
  • Internal research focus on CDC databases
  • Coordination with US Social Security Administration on population mortality updates

• Strategic Research Program Initiative
  • Board level initiative to increase further focus on key actuarial research program
Expanding the Human Mortality Database to include Cause-of-Death Information

February 2017

The Human Mortality Database is a unique open-access collection of detailed mortality and population data for 38 countries with complete and reliable vital registration and census data. The HMD currently covers the United States, almost all of Europe, including countries of the former U.S.S.R., Japan, Australia and other mostly high-income countries with rapidly aging populations. The Human Mortality Database (HMD) contains calculations of death rates and life tables for national populations (countries or areas), as well as the original input data used to construct these tables and an extensive documentation. This report overviews the development and completion of the HMD data series down to a cause of death level for an initial set of eight populations: Canada, Czech Republic, England and Wales, France, Japan, Norway, Sweden, and the United States.
Research Highlights


- Session later today on using COD information to decompose attribution of changing life expectancies and other population statistics
Research Highlights

- [https://www.soa.org/research-reports/2017/2017-us-pop-mort-age-cod-region/](https://www.soa.org/research-reports/2017/2017-us-pop-mort-age-cod-region/)

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**US Population Mortality Rate Study - Variation by Age Group, Cause of Death and Region from 2000-2015**

May 2017

This report covers US regional population mortality experience during the period 2000-2015. The Society of Actuaries pursued the research as part its ongoing longevity and mortality research initiatives. The purpose of the research is to produce an overview of the differences and similarities in mortality by age group, time, cause of death and region (geographic and urban-rural) to better aid in the understanding of future expected mortality rates and the management of public programs and policy.
Research Highlights

Figure 2
AGES 45-54 ALL CAUSES OF DEATH AND TOP FIVE COD 2000-2015

![Graph showing deaths per 100,000 for different causes over years 2000 to 2015.]

<table>
<thead>
<tr>
<th>COD</th>
<th>Deaths per 100,000</th>
<th>Total Change</th>
<th>Avg Annual Improvement*</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Causes</td>
<td>425.6</td>
<td>-5.1%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Cancer</td>
<td>127.5</td>
<td>-21.8%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Heart</td>
<td>94.2</td>
<td>-15.8%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Accidents</td>
<td>32.6</td>
<td>52.8%</td>
<td>-2.9%</td>
</tr>
<tr>
<td>Liver</td>
<td>17.7</td>
<td>16.3%</td>
<td>-1.0%</td>
</tr>
<tr>
<td>Self-Harm</td>
<td>14.4</td>
<td>40.4%</td>
<td>-2.3%</td>
</tr>
</tbody>
</table>

*Annual improvement is the geometric average rate of change between 2000 and 2015.
Research Highlights


July 2017

The Society of Actuaries (SOA) is pleased to present historical U.S. population mortality rates by gender and single year of age for calendar years 2000-2015. To develop these rates, the SOA relied upon data furnished by the Centers for Disease Control and Prevention, Centers for Medicare and Medicaid Services, and the Social Security Administration. A document summarizing key observations and the process used to develop the rates, along with a table of the rates themselves, can be found below.
Research Highlights


### Male Mortality Improvement - Broad Age Groups

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>20-to-44</td>
<td>-0.1%</td>
<td>-1.7%</td>
<td>-6.3%</td>
</tr>
<tr>
<td>45-to-64</td>
<td>-0.4%</td>
<td>-0.3%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>65-to-84</td>
<td>0.3%</td>
<td>0.8%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>85-to-100</td>
<td>0.1%</td>
<td>1.8%</td>
<td>-1.1%</td>
</tr>
<tr>
<td>All Ages</td>
<td>0.0%</td>
<td>0.6%</td>
<td>-0.9%</td>
</tr>
</tbody>
</table>

### Male Mortality Improvement - Under/Over 65

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Under 65</td>
<td>-0.4%</td>
<td>-0.6%</td>
<td>-1.7%</td>
</tr>
<tr>
<td>65 and Over</td>
<td>0.2%</td>
<td>1.2%</td>
<td>-0.5%</td>
</tr>
<tr>
<td>All Ages</td>
<td>0.0%</td>
<td>0.6%</td>
<td>-0.9%</td>
</tr>
</tbody>
</table>
Read / Listen / Watch

https://player.fm/series/society-of-actuaries-podcasts-feed

Search “Society of Actuaries” on iTunes
Impact on actuarial practice activity

• The road to proposed Internal Revenue Service mortality tables

• RP-2014 Mortality Tables released Oct 2014
  • Aggregate; Income Quartiles; Collars
  • 10 Million+ life years of exposure
  • 2006 central study year

• MP-2014 Mortality Improvement Scale / Model
  • Attained Age / Calendar Year / Gender model developed from US Population mortality 2006 central study year
Impact on actuarial practice activity

• Dec 2016: Proposed new tables for Jan 2018
• RP-2014 back to central year of study; brought forward with observed mortality improvement
• Minimum funding
• PBGC variable premiums
• Lump Sum distributions
• Credibility calculations to use plan-specific mortality
Impact on actuarial practice activity

• Current questions surrounding final regulations and applicable date
  • “Economically significant” discussion

• “...change is likely to increase (traditional or annuity-formula based) plan liabilities for funding requirements and Pension Benefit Guaranty Corporation (PBGC) premium calculations by 2% to 5%. ”

Impact on actuarial practice activity

• Pension Risk Transfer opportunities continuing with strong consideration in US market

• Corporate analysis of contribution strategy in light of PBGC premiums, current tax environment, future tax reform
  • Limitation of Interest Expense Deduction (?)
  • Overseas earnings
  • Lower Corporate Tax Rate
    • Prudential:
Impact on actuarial practice activity

• Updated Private Plan study underway – potential exposure 2019

• “Mortality Table (Transition) Risk”

• GAAP Financials vs. Regulatory Funding

• Public Plan study underway - likely exposure 2018
  • Multi-variate analysis to select distinguishing variables
  • Age / Gender
  • Occupation / Income / Geography
Impact on actuarial practice activity

• Individual Life Insurance Mortality
• US Statutory valuation transition to principles-based reserves in 2017 – 2019
• All companies under new valuation law starting 1/1/2020
Impact on actuarial practice activity

Impact on actuarial practice activity

http://www.circ.gov.cn/web/site0/tab5216/info4054990.htm
Impact on actuarial practice activity

• “The times they are a-changing...” – Bob Dylan

• Additional individual life studies
  • Pre-need Mortality
  • Simplified Issue Mortality
  • Guaranteed Issue Mortality
  • Estimation of Automated / Accelerated Underwriting Mortality

• https://www.soa.org/research/topics/indiv-mort-exp-study-list/
• https://www.soa.org/research-reports/2015/research-cso-impact-study/
Impact on actuarial practice activity

• Potential evolution of population mortality analysis to individual life insurance
• What is improvement rates for individually insured lives? Different that general US population
• Demographics: Income level, education level, geography
• Items to consider --- multiple coverages for one insured; select vs ultimate mortality
Impact on actuarial practice activity

• Draft example: 2012 – 2013 Mortality Improvement
Final thoughts: SOA Research to bring research into practical application

• Increasing use of mortality data in multiple ways
  • Actual / Expected Analysis
  • Table development
  • Mortality Improvement Trends

• Predictive analytics focus on data
• Data set flat files for research use