Morbidity Improvement

Measurement in Insured Populations

Vince Bodnar, Towers Watson
Tim Kempen, Milliman
Overview

• Introduction

• Present two methods used to measure incidence improvement in insured populations

• Considerations when assuming improvement

• Questions / open discussion
• Morbidity improvement
  – Theory that advancements in medical treatments decreases functional dependence
  – Similar to mortality improvement
• Duke University study appears to confirm this theory based on:
  – General population data
  – Observations from 1984 and 2004
  – Approximately 21,000 survey participants in 1984 and 16,000 in 2004
  – Prevalence based
Introduction

• Many carriers assume that this phenomenon has occurred in the past and/or that it will occur in the future

• It is important to measure it going forward so that assumptions can be validated or modified when necessary

• Not meant to be guidance – these are examples of how two consulting firms have attempted to measure improvement
Introduction

• Scope of this presentation is insured population incidence rates
• It does not address any changes in length of disability episodes
• It does capture an inherent salvage between persons who need or receive assistance with ADLs and those that claim benefits on an LTC policy
  – This salvage is greater at younger ages, but tends to diminish with age
Introduction

• Two methods presented:
  • The first measures actual and expected claim incidences rates from a certain policy duration by issue year
  • The second measures ultimate attained age claim incidence rates by calendar year
Actuarial

Trend Analysis of Incidence Rates
Long-Term Care Insurance
2000 - 2009

Tim F. Kempen, ASA, MAAA
Method 1 Overview

• Methodology of analysis
• Limitations to data / analysis
• Brief review of results
• Future outlook of incidence improvement
Method 1, Methodology

- Actual to Expected approach
- Issues with measuring just actual incidence rates
  - Data centered around core issue ages and policy characteristics
  - Not enough data for specific rating cell comparisons
  - Average age of five year age buckets increased over time
  - Incidence rates were dependent on duration
  - Datasets did not cover the same time periods
Method 1, Methodology

- Why A:E approach?
  - Multiple cells can be grouped together
  - Differences among companies can be normalized
  - Allows for analysis of varying populations over time
Method 1, Methodology

- Used Milliman *Long-Term Care Guidelines* to develop expected incidence rates
- Subset of Milliman *Long-Term Care Guidelines* data
  - 11.5 million life years
  - 100,000+ claims
Developed expected incidence rates by cell

Varied expected incidence by:
- Attained Age
- Benefit Period
- Elimination Period
- Gender
- Tax Status
- Benefit Trigger
- Coverage Type
Method 1, Methodology

- Normalized expected incidence rates to a common cell for each company
- Defined claim as episode of services not separated by more than 180 days and exceeded elimination period
- Measured ratios of actual incidence rates to expected incidence rates over time
### Method 1, Example

**Step 1**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
<td><strong>2001</strong></td>
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<tr>
<td>Attained Age</td>
<td>72</td>
</tr>
<tr>
<td>Benefit Period</td>
<td>5 years</td>
</tr>
<tr>
<td>Elimination Period</td>
<td>90 days</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
</tr>
<tr>
<td>Tax Status</td>
<td>TQ</td>
</tr>
<tr>
<td>Benefit Trigger</td>
<td>2 of 6 ADLs</td>
</tr>
<tr>
<td>Coverage Type</td>
<td>Comprehensive</td>
</tr>
<tr>
<td>Expected Incidence</td>
<td>1.0%</td>
</tr>
<tr>
<td>Actual Incidence</td>
<td>1.3%</td>
</tr>
<tr>
<td>Actual to Expected</td>
<td>1.3% / 1.0% = 1.3</td>
</tr>
</tbody>
</table>
Method 1, Example

Step 2

Year 2009
Attained Age 72
Same Policy Characteristics
Expected Incidence 1.0%
Actual Incidence 1.2%
Actual to Expected 1.2% / 1.0% = 1.2

Incidence Improvement:
1.2 / 1.3 = .923
.923^(1/8) - 1 = -1.0%
Method 1, Methodology

- Varied by marital status to remove impact of marital savings
  - Noticeable shift in data from single to married
- Analyzed by duration to limit impact of changes in underwriting
- Used only credible durations and rate cells
- Grouped by two year periods to increase credibility
Method 1, Limitations

- Rate Increases
  - Experience was not adjusted for adverse selection resulting from rate increases
  - Likely leads to understatement of incidence improvement

- Improvement in Underwriting
  - Companies trended towards tighter underwriting in recent years
  - Likely leads to overstatement of incidence improvement especially in early durations
Method 1, Limitations

- Claim Management
  - Changes in claim management could have positive or negative effect on incidence rates
  - Slight uptick in incidence rates around 2006/2007

- Environment
  - Changes in provider market
  - Economy – recent recession
### Results – Combined

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<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All Durations</td>
<td>-1.9%</td>
<td>-3.7%</td>
<td>-0.4%</td>
<td>-3.3%</td>
<td>-2.3%</td>
<td></td>
</tr>
<tr>
<td>Durations 5+</td>
<td>-2.7%</td>
<td>-2.1%</td>
<td>0.4%</td>
<td>-2.0%</td>
<td>-1.6%</td>
<td></td>
</tr>
</tbody>
</table>

*Earliest period with experience

Note: Later durations have less credibility and showed less improvement.
## Method 1, Results

### Results – Single

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<tbody>
<tr>
<td>All Durations</td>
<td>-3.1%                             -3.0%                                 -0.5%               -4.3%                 -2.7%</td>
</tr>
<tr>
<td>Durations 5+</td>
<td>-1.1%                             -3.6%                                 0.2%                -2.2%                 -1.7%</td>
</tr>
</tbody>
</table>

*Earliest period with experience

Note: Later durations have less credibility and showed less improvement
## Results – Married

<table>
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</thead>
<tbody>
<tr>
<td><strong>All Durations</strong></td>
<td>-1.3%</td>
<td>-4.0%</td>
<td>-0.4%</td>
<td>-2.7%</td>
<td>-2.1%</td>
</tr>
<tr>
<td><strong>Durations 5+</strong></td>
<td>-3.3%</td>
<td>-1.4%</td>
<td>0.4%</td>
<td>-1.8%</td>
<td>-1.5%</td>
</tr>
</tbody>
</table>

*Earliest period with experience*

Note: Later durations have less credibility and showed less improvement
Insured vs. General Population

• Past general population improvements linked to improved education and socioeconomic status

• Education and wealth are correlated

• Insured population is generally wealthier than general population
  – Probably better educated as well

• Less room for improvement?
Considerations for Future Improvement

- Can we expect incidence improvement to continue?
- Less room for improvement for overall population?
- Increased obesity --> increased diabetes --> increased dementia?
- Lower rates of smoking
- Increasingly better healthcare technology offsets increased obesity?
- Other components
  - Continuance
  - Cost of care
Ultimate Attained Age Incidence Analysis
Long-Term Care Insurance

Vince Bodnar, ASA, MAAA
Method 2 Overview

• Observe annual pattern of ultimate attained age incidence rates of an insured population set with common characteristics

• Incidence rate: new claims / active life years

• New claim = first claim for policyholder or subsequent claim separated by at least 6 months of care
Method 2 Overview

- What is ultimate?
  - Issued in a single marital status
  - Eliminates the long marital wear-off effect
  - Exposures are beyond the point where durational underwriting effects are observed
  - Ranges from year 5+ to 10+ years for most carriers
Method 2 Overview

• What are common characteristics?
  – Attained age
  – Gender
  – Benefit trigger
  – Claim adjudication process / protocols
  – Underwriting criteria
  – Elimination period
  – Unlimited v limited benefit periods
Method 2, Step 1

• Step 1: Determine ultimate period
• Pick a common characteristics population (e.g., highest amount of exposure)
• Pick a preliminary ultimate period as a starting point (durations 5+ for example)
• Calculate attained age incidence rates for those durations over several calendar years combined
• Compare actual incidence rates to “expected” incidence rates developed from prior step
• Revise the ultimate period to a point where selection wear-off is complete
Company XYZ Selection Curve
By Duration

Ratio to Ultimate Incidence Rate

- Female
- Male
- Ultimate Duration

By Duration
Method 2, Step 2

• Step 2: Review attained age curve
  A helpful step, but is generally inconclusive
  Plot the attained age incidence rates observed in each separate calendar year on a graph, compared to the rate for the average over all calendar years
  A calendar year force on incidence rates should reveal itself
  Generally, movement in the entire aging curve is difficult to observe
Company XYZ Incidence Rates by Attained Age and Year, Female Only

Calendar Year 1  Calendar Year 2  Calendar Year 3  Calendar Year 4  Average
Method 2, Step 3

- Step 3: Focus on most credible data points
- Select the most credible attained age cells
- For a binomial function, such as incidence:
  - Standard deviation = \((n \times p \times q)^{.5}\)
  - Example, 10,000 exposures and 500 claims:
    \((10,000 \times 0.05 \times 0.95)^{.5} = 21.8\)
- For each cell, plot observed incidence by calendar year
- Also plot standard deviations and weighted regression lines
Method 2, Step 3

• Regression analysis will provide:
  – Visual pattern of incidence rates
  – Slope of any pattern relative to calendar year
  – $R^2$ coefficient, showing importance of calendar year to incidence rates

• If incidence improvement exists:
  – Annual effect is quantified by the slope in the regression formula
  – An $R^2$ value that is close to 1.00 confirms that the passing of calendar time affects incidence
Company XYZ Incidence Rates by Year for Females, Age 82

Standard Deviation for All Years Combined: +/- 0.022

Slope: -0.0223
R Squared: 0.0690

The height of the cross on each data point represents the standard deviation of that data point.
Company XYZ Incidence Rates by Year for Females, Age 87

Standard Deviation for All Years Combined: +/- 0.020

Slope: 0.0007
R Squared: 0.0023

The height of the cross on each data point represents the standard deviation of that data point.
Company XYZ Incidence Rates by Year for Females, Age 92

Standard Deviation for All Years Combined: +/- 0.027

Slope: 0.0291
R Squared: 0.4032

The height of the cross on each data point represents the standard deviation of that data point.
• Usage in projections:
  • Morbidity improvement continues to be a widely used assumption in actuarial projections
  • The decision to use it should be fully disclosed to the intended users of projections
    – Suggestion: Disclose the effect of this assumption on projected values
• Efforts should be made to measure it in future years
• Ability to measure actual v. projected incidence in a calendar period is key
Considerations

• Decision to assume morbidity improvement should consider the following:
• Possible cures for Alzheimer's
• Do medical advancements that are prolonging life also reduce or postpone the incidence of functional disability?
• Emerging epidemics such as obesity, diabetes, fibromyalgia and multiple sclerosis
• Care delivery methods and settings are becoming more of a draw
• Attitudinal changes as Boomers use care
• Questions???