Report on the
Lapse and Mortality Experience
of Post-Level Premium Period
Term Plans

Sponsored by
The Product Development Section and
The Committee on Life Insurance Research
of the Society of Actuaries

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Project Overview

The Product Development Section Council and the Committee on Life Insurance Research of the Society of Actuaries (“SOA”) engaged RGA Reinsurance Company (“RGA”) to undertake a research project on level premium term life insurance products with a particular focus on the magnitude and impact of the “shock lapse” at the end of the level premium period.

The project was completed in two phases:

- Phase 1 included a survey of the mortality and lapse assumptions used by actuaries for pricing and modeling level premium term products at the end of 2008. A copy of this report can be found at http://www.soa.org/files/pdf/research-2009-post-level.pdf.
- Phase 2 includes a study of the mortality and lapse experience of level premium term policies as they transition out of the level premium period. Participating companies were asked to supply policy level inforce and termination records so that experience results could be analyzed at a granular level including, but not limited to, age, gender, risk class, premium jump, and policy size.

This report will analyze the results of the Phase 2 study in the following sections:

1) Analysis of shock lapse rate experience
2) Analysis of post-level period mortality deterioration experience
3) Comparisons of results between Phase 1 assumption survey and Phase 2 experience study
4) A proposed generalized linear model of shock lapse rates.

Supplemental pivot tables with the aggregated 10 year level-term (T10) lapse and mortality study results are also available for more customized analysis. These pivot tables enable multi-dimensional drilling of experience results. Due to potentially limited exposure in some of these drill-downs, users should exercise caution when considering the credibility of experience results at finer levels of granularity.

A list of the 26 companies who submitted data for Phase 2 can be found in Appendix A (p. 64).
Disclaimer of Liability

The results provided herein come from a variety of life insurance companies with unique product structures, target markets, underwriting philosophies, and distribution methods. As such, these results should not be deemed directly applicable to any particular company or representative of the life insurance industry as a whole.

RGA, its directors, officers, and employees, disclaim liability for any loss or damage arising or resulting from any error or omission in RGA’s analysis and summary of the results or any other information contained herein. The report is to be reviewed and understood as a complete document.

This report is published by the Society of Actuaries (SOA) and contains information based on input from companies engaged in the U.S. life insurance industry. The information published in this report was developed from actual historical information and does not include any projected information. Neither the SOA, RGA, nor the participating companies recommend, encourage, or endorse any particular use of the information provided in this report. The SOA and RGA make no warranty, guarantee, or representation whatsoever and assume no liability or responsibility in connection with the use or misuse of this report.

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Executive Summary

Shock Lapses

The total duration 10 shock lapse for all 10 year level term plans (T10) was 60.9% although there was a wide range of results by company, product structure, and policy attributes. The duration 10 shock lapse was 65.7% for T10 products structured with an annually increasing post-level premium scale. For 15 year level term plans (T15), the duration 15 shock lapse was 50.3%. The initial shock lapse at the end of the level period was followed by a smaller secondary shock lapse in the following duration. Lapse rates tend to grade down in later durations of the post-level period.

The policy attribute most highly correlated with shock lapse is the size of the jump in premium from the level period to the post-level period. This is especially significant since more recently issued products might experience higher shock lapses than those in this study due to larger premium jumps after the end of the level period. Shock lapses are higher for older issue ages although this is also correlated with the jump in premium rate. Shock lapse rates are higher for annual premium modes than for monthly premium modes, which might be due to the large dollar increase in the premium after the level period.

Lapses within the first year of the post-level period are more heavily skewed toward the beginning of the policy year, indicating a disproportionate amount of off-anniversary lapse activity compared to the level period.

Mortality Deterioration

The median of company-specific experience for T10 showed duration 11 mortality as 275% of the duration 6-10 mortality level, although there was a wide range of results by company. Mortality deterioration seemed to grade down by duration, although credibility in later durations is somewhat limited.

As with shock lapses, mortality deterioration seems to increase by issue age and by the size of the post-level period premium jump. These dimensions are important considerations when applying shock lapse and mortality deterioration assumptions for pricing new products.
Introduction

The Phase 2 data request was sent to companies who indicated a willingness to participate during the Phase 1 survey. A list of participants is included in Appendix A (p. 64).

Methods of Analysis

Participating companies were asked to provide a listing of each inforce and terminated level term policy, including exact issue dates and dates of termination. The collection of data in this manner allowed the researchers to ensure a consistent calculation of experience study exposures across multiple companies. This also enabled cells with relatively small exposure to be aggregated such that total credibility can be improved. This data was used to create a 2000-2008 anniversary year lapse study and a 2000-2008 calendar year mortality study. The anniversary year method was chosen for the lapse study to account for the skewness of lapses throughout the policy year. Since many lapses occurred on policy anniversaries, a calendar year study would potentially miss much of the anticipated lapse activity at the end of a policy’s most recent policy year. Since deaths were generally evenly distributed throughout the policy year, a calendar year method was used for the mortality study to increase the amount of fully completed experience that could be included in the study. Both studies were primarily performed on a policy count basis to help minimize the impact of volatility related to policy size. Results by face amount band are provided to help identify differences in experience at different policy sizes.

A process of data validation and cleansing was undertaken with each company’s submission. This process helped the researchers ensure that they had a good understanding of the data that had been submitted. In several cases, this process led to companies providing additional or corrected data.
**Grace Period Adjustments**

The most significant adjustment that was made during the data validation process was to account for differences in how companies captured the effective date of lapses. For terminations due to lack of premium payment, some companies submitted a termination date equal to the anniversary date plus the grace period. To ensure consistency across companies, the researchers adjusted these dates to be the true effective date of the termination. This adjustment effectively moved shock lapses that were reported 30 to 90 days into duration 11 to the end of duration 10 for 10 year term policies. After this adjustment, the results from these companies were much more consistent with those who reported the effective date of the termination (often on the policy anniversary). While other approaches may also have been appropriate, it was felt that this was the best way to report results in a manner most likely to be consistent with premium calculations and new business pricing model mechanics. An illustration of the impact of the grace period adjustments can be found in Appendix B. All displays in the remainder of the document exclude the grace period when appropriate.
**Lapse Study Specifications**

The lapse study covered policy anniversary in 2000 to policy anniversary in 2008. For the purposes of this study, any voluntary termination was considered a “lapse”. This includes terminations coded as “lapse”, “full conversion”, “term upgrade”, and some other miscellaneous values. Exposure was calculated for up to 8 policy years for each policy. Fractional exposure was calculated for policies in the year of death. A full policy year of exposure was credited to policies in the year of lapse.

**Mortality Study Specifications**

The mortality study covered calendar years 2000 through 2008. Fractional exposure was calculated for policies in the year of lapse. A full policy year of exposure was credited to policies in the year of death. Expected mortality was calculated using several industry standard tables: SOA 1975-80, 2001 VBT, and 2008 VBT. Actual/Tabular ratios were calculated as the ratio of the actual number of deaths to the tabular expected number of deaths.

Relative mortality ratios are also provided to compare the post-level period mortality to the level period mortality. These values are calculated as the ratio of 2008 VBT actual/tabular ratio for a given post-level period duration to the 2008 VBT actual/tabular ratio during the last 5 durations of the level period.
Lapse Experience

Overview

This section will present lapse experience from participating companies with a primary focus on the shock lapse at the end of the level period. Multiple companies have submitted credible data for T10 products and these results will be shown for all of the dimensions being analyzed. A smaller number of companies contributed T15 experience, so these results will only be shown when the dimensions being analyzed are credible and represent an appropriate cross-section of companies. Five-year term and 20-year term results will not be provided since there were not multiple companies contributing credible experience for these products.
Total Lapse Rates By Duration

**T10**

The following table and chart show the lapse experience for T10 by duration. The aggregate shock lapse at the end of the level period is about 61% with a smaller secondary shock lapse in duration 11. Lapse rates continue to drift down by duration thereafter.

### T10 Lapse Experience by Duration

<table>
<thead>
<tr>
<th>Policy Duration</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>917,272</td>
<td>63,382</td>
<td>6.9%</td>
</tr>
<tr>
<td>7</td>
<td>755,442</td>
<td>47,565</td>
<td>6.3%</td>
</tr>
<tr>
<td>8</td>
<td>614,434</td>
<td>38,821</td>
<td>6.3%</td>
</tr>
<tr>
<td>9</td>
<td>506,713</td>
<td>34,811</td>
<td>6.9%</td>
</tr>
<tr>
<td>10</td>
<td>349,253</td>
<td>212,528</td>
<td>60.9%</td>
</tr>
<tr>
<td>11</td>
<td>96,483</td>
<td>36,914</td>
<td>38.3%</td>
</tr>
<tr>
<td>12</td>
<td>31,492</td>
<td>4,573</td>
<td>14.5%</td>
</tr>
<tr>
<td>13</td>
<td>14,604</td>
<td>1,871</td>
<td>12.8%</td>
</tr>
<tr>
<td>14</td>
<td>9,062</td>
<td>958</td>
<td>10.6%</td>
</tr>
<tr>
<td>15</td>
<td>5,205</td>
<td>459</td>
<td>8.8%</td>
</tr>
<tr>
<td>16+</td>
<td>5,924</td>
<td>412</td>
<td>7.0%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>3,305,884</strong></td>
<td><strong>442,294</strong></td>
<td></td>
</tr>
</tbody>
</table>

### T10 Lapse Rates by Duration

![Diagram showing lapse rates by duration for T10](attachment://chart.png)
Total Lapse Rates by Duration (cont.)

**T15**

A large shock lapse is also evident on T15 products at the end of duration 15. A secondary shock lapse in duration 16 is followed by lower lapses thereafter, similar to the patterns observed in T10.

<table>
<thead>
<tr>
<th>Policy Duration</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>82,032</td>
<td>3,676</td>
<td>4.5%</td>
</tr>
<tr>
<td>12</td>
<td>60,484</td>
<td>4,238</td>
<td>7.0%</td>
</tr>
<tr>
<td>13</td>
<td>42,361</td>
<td>2,169</td>
<td>5.1%</td>
</tr>
<tr>
<td>14</td>
<td>31,253</td>
<td>1,515</td>
<td>4.8%</td>
</tr>
<tr>
<td>15</td>
<td>22,470</td>
<td>11,299</td>
<td>50.3%</td>
</tr>
<tr>
<td>16</td>
<td>8,072</td>
<td>1,889</td>
<td>23.4%</td>
</tr>
<tr>
<td>17</td>
<td>5,307</td>
<td>362</td>
<td>6.8%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>251,981</strong></td>
<td><strong>25,148</strong></td>
<td></td>
</tr>
</tbody>
</table>

**T15 Lapse Rates by Duration**

![Lapse Rates Chart](chart.png)

- Lapse Rate
- Number of Lapses (right axis)
Distribution of Results

T10

As mentioned in the Executive Summary, a wide spread of company-specific results was observed. The following table and chart plot the company-specific T10 lapse rates at different percentiles. Only companies with at least 100 lapses in a given duration are included in the display.

<table>
<thead>
<tr>
<th>Lapse Rate Range</th>
<th>6-8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13+</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Companies</td>
<td>25</td>
<td>24</td>
<td>24</td>
<td>21</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>20th percentile</td>
<td>5.8%</td>
<td>6.3%</td>
<td>53.2%</td>
<td>35.3%</td>
<td>10.6%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Median</td>
<td>6.8%</td>
<td>6.9%</td>
<td>59.8%</td>
<td>44.9%</td>
<td>18.4%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>6.5%</td>
<td>6.9%</td>
<td>60.9%</td>
<td>38.3%</td>
<td>14.5%</td>
<td>10.6%</td>
</tr>
<tr>
<td>80th percentile</td>
<td>7.7%</td>
<td>8.3%</td>
<td>72.3%</td>
<td>58.8%</td>
<td>21.8%</td>
<td>16.0%</td>
</tr>
</tbody>
</table>

![T10 Lapse Rates By Duration Distribution by Company](chart.png)
Post-Level Period Premium Structure

T10

Contributors were asked to describe the structure of the premium rates after the end of the level premium period. The two descriptions provided were “Premium Jump to ART” and “Premium Jump to New Level Period”. The dominant design is “Premium Jump to ART”, although there were multiple companies with credible lapse experience for the “Jump to New Level Period” structure through duration 13. Phase 1 Survey results indicate that the “Premium Jump to ART” design is overwhelmingly the predominant structure used for new products. In total, the products with a jump to a new level period experienced lower shock lapse rates than those jumping to a new ART scale.

<table>
<thead>
<tr>
<th>Policy Duration</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jump to ART</td>
<td>Jump to New Level Period</td>
<td>Jump to ART</td>
</tr>
<tr>
<td>6-8</td>
<td>2,052,029</td>
<td>235,120</td>
<td>135,772</td>
</tr>
<tr>
<td>9</td>
<td>450,652</td>
<td>56,061</td>
<td>31,573</td>
</tr>
<tr>
<td>10</td>
<td>301,690</td>
<td>47,563</td>
<td>198,116</td>
</tr>
<tr>
<td>11</td>
<td>70,621</td>
<td>25,862</td>
<td>32,841</td>
</tr>
<tr>
<td>12</td>
<td>18,482</td>
<td>13,010</td>
<td>3,688</td>
</tr>
<tr>
<td>13</td>
<td>9,889</td>
<td>4,715</td>
<td>1,535</td>
</tr>
<tr>
<td>Total (6-13)</td>
<td>2,903,363</td>
<td>382,330</td>
<td>403,525</td>
</tr>
</tbody>
</table>

(1) ART stands for “annually renewable term”, but is used more generally to describe any product with an annually increasing premium structure. The products often have premiums in the post-level period that are set as a fixed percentage of the ultimate period rates from an industry mortality table such as 1980 CSO or 2001 CSO.
Premium Jump Ratio

T10

Since the shock lapse is primarily driven by the dramatic increase in premiums that a policyholder would have to pay to keep his or her policy in force, it stands to reason that policies with larger premium jumps might also have larger shock lapses. To study this, the researchers asked participants to supply the level period and post-level period per-thousand premium rates for each policy record. Usable premium data was provided by 10 participating companies, representing approximately 39% of the T10 duration 10 exposure. For each policy, the researchers calculated a "Premium Jump Ratio" as the ratio of the duration 11 per thousand rate to the duration 10 per thousand rate. The lapse rate experience was then stratified into bands by premium jump ratio. For example, “1.01x – 2x” in the charts on the following pages represents policies with a duration 11 premium rate between 1 and 2 times the premium rate in duration 10.

It is clear that policies with lower premium jump ratios experienced significantly lower shock lapses than policies with larger premium jump ratios. This is particularly relevant when considering how to apply the results from this experience study to current pricing. As seen in the Phase 1 survey, a common current practice is to set post-level period premium rates at 200% of 2001 CSO or higher. This would generally lead to much higher average premium jumps than the policies in this study that have already entered the post-level period. As a result, the researchers expect the shock lapse experience that eventually emerges on recently issued business could be much higher than the aggregated totals from this study suggest.

The results on the following pages provide a calculation of the “Average Prem Jump Ratio” and the “Average Issue Age”. The average premium jump obviously ends up near the midpoint of each premium jump ratio band. As mentioned earlier, issue age is strongly correlated with premium jump ratio.


## Premium Jump Ratio (T10 cont)

<table>
<thead>
<tr>
<th>Premium Jump Ratio Band</th>
<th>Policy-Years Exposed</th>
<th>Duration 10 Lapses</th>
<th>Duration 10 Lapse Rate</th>
<th>Average Prem Jump Ratio (1)</th>
<th>Average Issue Age (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01x - 2x</td>
<td>15,557</td>
<td>5,980</td>
<td>38.4%</td>
<td>1.6</td>
<td>35.4</td>
</tr>
<tr>
<td>2.01x - 3x</td>
<td>26,498</td>
<td>11,678</td>
<td>44.1%</td>
<td>2.7</td>
<td>39.3</td>
</tr>
<tr>
<td>3.01x - 4x</td>
<td>28,777</td>
<td>14,892</td>
<td>51.7%</td>
<td>3.6</td>
<td>39.0</td>
</tr>
<tr>
<td>4.01x - 5x</td>
<td>26,908</td>
<td>17,222</td>
<td>64.0%</td>
<td>4.5</td>
<td>43.0</td>
</tr>
<tr>
<td>5.01x - 6x</td>
<td>11,004</td>
<td>8,257</td>
<td>75.0%</td>
<td>5.4</td>
<td>49.9</td>
</tr>
<tr>
<td>6.01x - 7x</td>
<td>4,760</td>
<td>3,938</td>
<td>82.7%</td>
<td>6.5</td>
<td>55.2</td>
</tr>
<tr>
<td>7.01x - 8x</td>
<td>3,169</td>
<td>2,693</td>
<td>85.0%</td>
<td>7.5</td>
<td>57.3</td>
</tr>
<tr>
<td>8.01x - 10x</td>
<td>2,849</td>
<td>2,351</td>
<td>82.5%</td>
<td>8.8</td>
<td>54.5</td>
</tr>
<tr>
<td>10.01x +</td>
<td>785</td>
<td>707</td>
<td>90.1%</td>
<td>11.5</td>
<td>54.7</td>
</tr>
<tr>
<td><strong>Subtotal Prem Data Available</strong></td>
<td>120,307</td>
<td>67,718</td>
<td>56.3%</td>
<td>3.9</td>
<td>41.2</td>
</tr>
<tr>
<td><strong>No Prem Data Available</strong></td>
<td>228,946</td>
<td>144,810</td>
<td>63.3%</td>
<td>n/a</td>
<td>40.7</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>349,253</td>
<td>212,528</td>
<td>60.9%</td>
<td>n/a</td>
<td>42.1</td>
</tr>
</tbody>
</table>

(1) Weighted Average premium jump by duration 10 exposure for policies with premium data available
(2) Weighted Average issue age by duration 10 exposure

### T10 Duration 10 Lapse Rate by Premium Jump Ratio

![Graph showing T10 Duration 10 Lapse Rate by Premium Jump Ratio](image)

- **Duration 10 Lapse Rate**
- **Duration 10 Lapses**
Premium Jump Ratio and Post-Level Period Premium Structure

T10

Both the “Jump to ART” and the “Jump to New Level Period” product designs have shock lapses that generally increase with the size of the premium jump. As seen earlier, the products with a jump to a new level period experienced lower shock lapses than those that jumped to an ART scale in total, although the shock lapse rates for those products were higher for all premium jump bands larger than 2 times. Within each premium jump band, the average issue age of the jump to new level period products is higher.

<table>
<thead>
<tr>
<th>Premium Jump Ratio Band</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Avg Prem Jump</th>
<th>Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jump to ART</td>
<td>Jump to New Level Period</td>
<td>Jump to ART</td>
<td>Jump to New Level Period</td>
<td>Jump to ART</td>
</tr>
<tr>
<td>1.01x - 2x</td>
<td>12,283</td>
<td>3,264</td>
<td>5,239</td>
<td>741</td>
<td>42.6%</td>
</tr>
<tr>
<td></td>
<td>44.8%</td>
<td>39.8%</td>
<td>2.7</td>
<td>2.5</td>
<td>39.1%</td>
</tr>
<tr>
<td>2.01x - 3x</td>
<td>22,684</td>
<td>3,814</td>
<td>10,162</td>
<td>1,516</td>
<td>51.4%</td>
</tr>
<tr>
<td></td>
<td>63.5%</td>
<td>70.0%</td>
<td>4.5</td>
<td>4.5</td>
<td>42.3%</td>
</tr>
<tr>
<td>3.01x - 4x</td>
<td>26,892</td>
<td>1,885</td>
<td>13,814</td>
<td>1,078</td>
<td>74.0%</td>
</tr>
<tr>
<td></td>
<td>82.1%</td>
<td>85.0%</td>
<td>6.5</td>
<td>6.5</td>
<td>54.4%</td>
</tr>
<tr>
<td>4.01x - 5x</td>
<td>24,796</td>
<td>2,112</td>
<td>15,744</td>
<td>1,478</td>
<td>74.0%</td>
</tr>
<tr>
<td></td>
<td>84.1%</td>
<td>88.1%</td>
<td>7.5</td>
<td>7.5</td>
<td>56.7%</td>
</tr>
<tr>
<td>5.01x - 6x</td>
<td>9,012</td>
<td>1,992</td>
<td>6,667</td>
<td>1,590</td>
<td>80.8%</td>
</tr>
<tr>
<td></td>
<td>88.7%</td>
<td>95.4%</td>
<td>8.7</td>
<td>8.8</td>
<td>53.8%</td>
</tr>
<tr>
<td>6.01x - 7x</td>
<td>3,802</td>
<td>959</td>
<td>3,123</td>
<td>815</td>
<td>83.3%</td>
</tr>
<tr>
<td></td>
<td>91.5%</td>
<td>95.4%</td>
<td>11.6</td>
<td>11.4</td>
<td>50.9%</td>
</tr>
<tr>
<td>7.01x - 8x</td>
<td>2,486</td>
<td>683</td>
<td>2,091</td>
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</tr>
<tr>
<td></td>
<td>99.9%</td>
<td>99.9%</td>
<td>16.4</td>
<td>16.4</td>
<td>50.9%</td>
</tr>
<tr>
<td>8.01x - 10x</td>
<td>2,385</td>
<td>464</td>
<td>1,926</td>
<td>425</td>
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</tr>
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<td>99.9%</td>
<td>16.4</td>
<td>16.4</td>
<td>50.9%</td>
</tr>
<tr>
<td>10.01x +</td>
<td>519</td>
<td>166</td>
<td>549</td>
<td>158</td>
<td>99.9%</td>
</tr>
<tr>
<td></td>
<td>99.9%</td>
<td>99.9%</td>
<td>16.4</td>
<td>16.4</td>
<td>50.9%</td>
</tr>
</tbody>
</table>

Subtotal Data Available 104,969 15,338 59,315 8,403 56.5% 54.8% 3.9 3.9 41.6 45.5
No Prem Data Available 196,721 32,225 138,801 6,009 70.6% 18.6% n/a n/a 40.5 42.3
Grand Total 301,690 47,563 198,116 14,412 65.7% 30.3% n/a n/a 40.8 43.3

T10 Duration 10 Lapse Rates by Premium Jump Ratio and Post-Level Premium Structure

<table>
<thead>
<tr>
<th>Duration 11/10 Premium Jump Ratio</th>
<th>Lapse Rate</th>
<th>Number of Lapses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01x - 2x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>2.01x - 3x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>3.01x - 4x</td>
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</tr>
<tr>
<td>4.01x - 5x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>5.01x - 6x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>6.01x - 7x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>7.01x - 8x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>8.01x - 10x</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>10.01x +</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

Jump to ART Lapse Rate
Jump to New Level Period Lapse Rate
Jump to ART Lapse Count
Jump to New Level Period Lapse Count
Average Premium Jump by Company

T10

A wide spread of shock lapse results was seen from company to company. This is attributable to a number of company-specific factors including product design, target market, age distribution, and policyholder retention programs. The following chart shows the impact of the premium jump ratio on company-specific shock lapse rates. This chart shows the company-specific duration 10 shock lapse as a function of the average premium jump ratio between durations 10 and 11 for each company that provided premium information. In general, companies with higher average premium jumps experienced higher shock lapses.
One possible concern might be that companies are represented disproportionately along different parts of the premium jump ratio spectrum. This is a valid concern given the wide spread of company-specific experience results and the differences between various companies’ gross premium rates and product structures. To determine whether company mix was creating the trends displayed in the prior pages, each company’s specific results were plotted by premium jump ratio. The two graphs below show the same data from different perspectives. The plotted points show company-specific data points with at least 100 lapses. The dark red line represents the total shock lapse rates across all companies. Although there are still significant company-specific differences at each premium jump level, it is clear that the general trend of increasing shock lapse rates with increasing premium jump ratios is persistent across all companies who reported premium data.
Lapse Skewness

The researchers were curious about how lapses were skewed by month before and after the shock lapse. While most companies in the Phase 1 survey did not explicitly adjust for differences in lapse skewness beyond the level period, five respondents indicated that their lapse assumptions were skewed more heavily toward the beginning of the year immediately following the end of the level period.

The tables and charts on the following pages show the proportion of T10 lapses within each policy month of lapse. Since the grace period adjustments discussed earlier that were made for some companies could potentially affect this analysis, the results for companies that had grace period adjustments are displayed separately from those without grace period adjustments. The results for these two groups are quite similar, despite the adjustments.

In total, it is clear that lapses in duration 10 are skewed heavily toward the end of the policy year. The most significant finding, however, is that duration 11 lapses are skewed heavily toward the beginning of the policy year. This is especially important when considering the portion of duration 11 premium that will be collected. To the extent that the distribution of off-anniversary lapses during the post-level period is different from the level period, this should be an important consideration in developing new business pricing assumptions.
Lapse Skewness (cont.)

The following displays cover all lapses in the study. Over 50% of duration 11 lapses occurred in the first 3 policy months following the policy's 10th anniversary, compared to less than 25% during durations 6-9.

The monthly distribution of lapses for durations 12+ is similar to the distribution during durations 6-9.

<table>
<thead>
<tr>
<th>Grace Period Adjustment?</th>
<th>Lapse Month</th>
<th>Number of Lapses</th>
<th>Proportion of Lapses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>within Pol Yr</td>
<td>Dur 6-9</td>
<td>Dur 10</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>9,209</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td>2</td>
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<td></td>
<td>3</td>
<td>12,502</td>
<td>1,731</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>6,863</td>
<td>1,053</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>6,533</td>
<td>1,101</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>13,341</td>
<td>2,304</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>6,246</td>
<td>1,477</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>6,170</td>
<td>2,592</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>10,223</td>
<td>6,363</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>6,952</td>
<td>12,222</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>9,438</td>
<td>21,692</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>38,304</td>
<td>105,215</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>133,950</td>
<td>158,085</td>
</tr>
</tbody>
</table>

| Yes                      | 1            | 3,425   | 510    | 4,439  | 376     | 7%     | 1%    | 32%    | 10%    |
|                          | 2            | 2,900   | 470    | 2,201  | 305     | 6%     | 1%    | 16%    | 8%     |
|                          | 3            | 4,467   | 629    | 1,886  | 361     | 9%     | 1%    | 13%    | 9%     |
|                          | 4            | 2,761   | 409    | 848    | 219     | 5%     | 1%    | 6%     | 6%     |
|                          | 5            | 2,616   | 407    | 676    | 206     | 5%     | 1%    | 5%     | 5%     |
|                          | 6            | 5,072   | 855    | 842    | 361     | 10%    | 2%    | 6%     | 9%     |
|                          | 7            | 2,638   | 527    | 389    | 186     | 5%     | 1%    | 3%     | 5%     |
|                          | 8            | 2,506   | 674    | 320    | 164     | 5%     | 1%    | 2%     | 4%     |
|                          | 9            | 4,010   | 1,978  | 396    | 283     | 8%     | 4%    | 3%     | 7%     |
|                          | 10           | 3,162   | 6,232  | 369    | 232     | 6%     | 11%   | 3%     | 6%     |
|                          | 11           | 3,409   | 8,711  | 378    | 275     | 7%     | 16%   | 3%     | 7%     |
|                          | 12           | 13,683  | 33,041 | 1,251  | 912     | 27%    | 61%   | 9%     | 24%    |
| Total                    |              | 50,629  | 54,443 | 13,995 | 3,880   | 100%   | 100%  | 100%   | 100%   |

Grand Total              | 184,579     | 212,528 | 36,914 | 8,273  |          | 100%   | 100%  | 100%   | 100%   |
Lapse Skewness – Annual Premium Payment Mode

Premium payment mode is also a fundamental driver of lapse skewness. The following displays cover business that was reported as having an annual premium payment mode. As expected, lapses during the level period are more heavily skewed toward the end of each policy year than for other modes, but a significant portion of duration 11 lapses still occur toward the beginning of the policy year.

<table>
<thead>
<tr>
<th>Grace Period Adjustment?</th>
<th>Lapse Month within Pol Yr</th>
<th>Number of Lapses</th>
<th>Proportion of Lapses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dur 6-9</td>
<td>Dur 10</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>982</td>
<td>162</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>895</td>
<td>130</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>983</td>
<td>165</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>701</td>
<td>103</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>629</td>
<td>105</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>868</td>
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<td>827</td>
<td>808</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>1,409</td>
<td>2,773</td>
</tr>
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<td></td>
<td>3,565</td>
<td>7,535</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>25,802</td>
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</tr>
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<td>Total</td>
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<td>51,769</td>
</tr>
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<td>61</td>
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<td>334</td>
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<td>8</td>
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<td>299</td>
<td>171</td>
</tr>
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<td></td>
<td>739</td>
<td>843</td>
</tr>
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<td>11</td>
<td></td>
<td>941</td>
<td>1,412</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>7,931</td>
<td>13,028</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>12,450</td>
<td>15,996</td>
</tr>
</tbody>
</table>

T10: Lapse Skewness by Month
Companies without Grace Period Adjustments
Annual Premium Payment Mode
Lapse Skewness – Quarterly Premium Payment Mode

The following displays cover business that was reported as having a quarterly premium payment mode. A spike in lapses is evident after each quarterly premium payment with a large shock lapse at the end of duration 10. Consistent with the other displays, duration 11 lapses are skewed toward the beginning of the policy year.

<table>
<thead>
<tr>
<th>Grace Period Adjustment?</th>
<th>Lapse Month within Pol Yr</th>
<th>Number of Lapses</th>
<th>Proportion of Lapses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dur 6-9</td>
<td>Dur 10</td>
<td>Dur 11</td>
</tr>
<tr>
<td>No</td>
<td></td>
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<td>1,415</td>
</tr>
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<td>173</td>
<td>683</td>
</tr>
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<td>6,448</td>
<td>869</td>
<td>2,032</td>
</tr>
<tr>
<td>4</td>
<td>829</td>
<td>163</td>
<td>306</td>
</tr>
<tr>
<td>5</td>
<td>849</td>
<td>165</td>
<td>177</td>
</tr>
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<td>857</td>
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<td>89</td>
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<td>536</td>
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</tr>
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<td>21,219</td>
<td>5,770</td>
</tr>
<tr>
<td>Grand Total</td>
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<td>49,001</td>
<td>12,492</td>
</tr>
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</table>

Lapse Skewness – Monthly Premium Payment Mode
The following displays cover business that was reported as having a monthly premium payment mode. Lapses during the level period are very evenly distributed throughout the policy year. In duration 10, lapses are skewed toward the end of the policy year. In duration 11, lapses are skewed toward the beginning of the policy year.

<table>
<thead>
<tr>
<th>Grace Period</th>
<th>Lapse Month</th>
<th>Number of Lapses</th>
<th>Proportion of Lapses</th>
</tr>
</thead>
<tbody>
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<td>No</td>
<td></td>
<td>Dur 6-9</td>
<td>Dur 10</td>
</tr>
<tr>
<td>1</td>
<td>6,822</td>
<td>829</td>
<td>3,662</td>
</tr>
<tr>
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<td>5,936</td>
<td>801</td>
<td>2,090</td>
</tr>
<tr>
<td>3</td>
<td>4,915</td>
<td>671</td>
<td>1,212</td>
</tr>
<tr>
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<td>5,158</td>
<td>766</td>
<td>1,006</td>
</tr>
<tr>
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<td>4,895</td>
<td>799</td>
<td>770</td>
</tr>
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<td>4,318</td>
<td>781</td>
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</tr>
<tr>
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<td>4,800</td>
<td>1,058</td>
<td>492</td>
</tr>
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<td>430</td>
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<td>11,903</td>
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</tr>
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<td>956</td>
</tr>
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<td>1,113</td>
<td>190</td>
<td>579</td>
</tr>
<tr>
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<td>418</td>
</tr>
<tr>
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<td>1,146</td>
<td>168</td>
<td>368</td>
</tr>
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<td>1,128</td>
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<td>239</td>
</tr>
<tr>
<td>7</td>
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<td>202</td>
</tr>
<tr>
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</tr>
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</tr>
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<td>1,162</td>
<td>2,799</td>
<td>173</td>
</tr>
<tr>
<td>11</td>
<td>1,169</td>
<td>3,061</td>
<td>179</td>
</tr>
<tr>
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<tr>
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<td>11,910</td>
</tr>
<tr>
<td>Grand Total</td>
<td>75,232</td>
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<td>17,325</td>
</tr>
</tbody>
</table>

T10: Lapse Skewness by Month
Companies without Grace Period Adjustments
Monthly Premium Payment Mode
Issue Age

T10

Shock lapse rates tend to increase dramatically by increasing issue age, although issue age is also correlated with increasing premium jump ratios. The columns on the right show the average premium jump ratios (calculated when available) and average issue age for duration 10 exposures.

Beyond the impact of the premium jump ratio, older issue ages may have less insurable need at the end of the level period. In addition, the dollar amount of the premium jump is also much larger which might be important independent of the percentage increase in the premium rate.

<table>
<thead>
<tr>
<th>Issue Age</th>
<th>Duration 6-9</th>
<th>Duration 10</th>
<th>Duration 11</th>
<th>Duration 12+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policy-Years Exposed</td>
<td>Total Lapses</td>
<td>Lapse Rate</td>
<td>Policy-Years Exposed</td>
</tr>
<tr>
<td>0-19</td>
<td>4,846</td>
<td>381</td>
<td>7.9%</td>
<td>460</td>
</tr>
<tr>
<td>20-29</td>
<td>279,819</td>
<td>26,440</td>
<td>9.4%</td>
<td>33,964</td>
</tr>
<tr>
<td>30-39</td>
<td>959,924</td>
<td>65,566</td>
<td>6.8%</td>
<td>131,241</td>
</tr>
<tr>
<td>40-49</td>
<td>895,195</td>
<td>52,631</td>
<td>5.9%</td>
<td>115,493</td>
</tr>
<tr>
<td>50-59</td>
<td>498,310</td>
<td>30,560</td>
<td>6.1%</td>
<td>53,729</td>
</tr>
<tr>
<td>60-69</td>
<td>135,330</td>
<td>8,046</td>
<td>5.9%</td>
<td>13,011</td>
</tr>
<tr>
<td>70+</td>
<td>20,322</td>
<td>953</td>
<td>4.7%</td>
<td>1,340</td>
</tr>
<tr>
<td>Grand Total</td>
<td>2,793,861</td>
<td>184,579</td>
<td>6.6%</td>
<td>349,253</td>
</tr>
</tbody>
</table>

* Insufficient Data

<table>
<thead>
<tr>
<th>Dur 10 Avg Prem Jump Ratio</th>
<th>Dur 10 Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>18.4</td>
</tr>
<tr>
<td>2.7</td>
<td>26.6</td>
</tr>
<tr>
<td>3.4</td>
<td>34.9</td>
</tr>
<tr>
<td>3.8</td>
<td>44.1</td>
</tr>
<tr>
<td>5.0</td>
<td>53.6</td>
</tr>
<tr>
<td>6.1</td>
<td>63.2</td>
</tr>
<tr>
<td>6.8</td>
<td>71.8</td>
</tr>
<tr>
<td>3.9</td>
<td>41.2</td>
</tr>
</tbody>
</table>

T10 Lapse Rates by Issue Age
The same general trends of increasing duration 10 shock lapse by issue age hold true for each company with credible data.

<table>
<thead>
<tr>
<th>Shock Lapse Rate Range</th>
<th>Issue Age</th>
<th># of Companies</th>
<th>20th percentile</th>
<th>Median</th>
<th>Aggregate</th>
<th>80th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>14</td>
<td>30.7%</td>
<td>45.7%</td>
<td>45.6%</td>
<td>30-39</td>
<td>58.2%</td>
</tr>
<tr>
<td>30-39</td>
<td>22</td>
<td>38.7%</td>
<td>51.5%</td>
<td>56.1%</td>
<td>30-39</td>
<td>67.0%</td>
</tr>
<tr>
<td>40-49</td>
<td>24</td>
<td>55.3%</td>
<td>61.7%</td>
<td>63.0%</td>
<td>40-49</td>
<td>73.1%</td>
</tr>
<tr>
<td>50-59</td>
<td>23</td>
<td>69.5%</td>
<td>77.1%</td>
<td>72.4%</td>
<td>50-59</td>
<td>82.0%</td>
</tr>
<tr>
<td>60-69</td>
<td>15</td>
<td>76.4%</td>
<td>83.5%</td>
<td>81.0%</td>
<td>60-69</td>
<td>88.5%</td>
</tr>
<tr>
<td>70+</td>
<td>5</td>
<td>83.8%</td>
<td>88.5%</td>
<td>82.6%</td>
<td>70+</td>
<td>89.4%</td>
</tr>
</tbody>
</table>
**Issue Age (cont.)**

**T15**

Similar trends are seen in T15 with generally higher post-level period lapse rates at the older issue ages.

<table>
<thead>
<tr>
<th>Issue Age</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Dur 15 Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-29</td>
<td>12,471</td>
<td>810</td>
<td>6.5%</td>
<td>1,525</td>
<td>228</td>
<td>14.9%</td>
<td>966</td>
<td>81</td>
<td>8.4%</td>
<td>828</td>
<td>29</td>
<td>3.5%</td>
<td>26.1</td>
</tr>
<tr>
<td>30-39</td>
<td>72,444</td>
<td>3,874</td>
<td>5.3%</td>
<td>8,216</td>
<td>2,801</td>
<td>34.1%</td>
<td>4,038</td>
<td>827</td>
<td>20.5%</td>
<td>2,768</td>
<td>195</td>
<td>7.0%</td>
<td>35.1</td>
</tr>
<tr>
<td>40-49</td>
<td>82,485</td>
<td>4,448</td>
<td>5.4%</td>
<td>8,384</td>
<td>5,095</td>
<td>60.8%</td>
<td>2,304</td>
<td>739</td>
<td>32.1%</td>
<td>1,297</td>
<td>110</td>
<td>8.5%</td>
<td>44.0</td>
</tr>
<tr>
<td>50-59</td>
<td>35,939</td>
<td>1,937</td>
<td>5.4%</td>
<td>3,267</td>
<td>2,351</td>
<td>72.0%</td>
<td>597</td>
<td>202</td>
<td>33.9%</td>
<td>292</td>
<td>26</td>
<td>8.9%</td>
<td>53.4</td>
</tr>
<tr>
<td>60+</td>
<td>12,785</td>
<td>528</td>
<td>4.1%</td>
<td>1,078</td>
<td>824</td>
<td>76.5%</td>
<td>167</td>
<td>40</td>
<td>24.0%</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>63.3</td>
</tr>
<tr>
<td>Grand Total</td>
<td>216,132</td>
<td>11,598</td>
<td>5.4%</td>
<td>22,470</td>
<td>11,299</td>
<td>50.3%</td>
<td>8,072</td>
<td>1,889</td>
<td>23.4%</td>
<td>5,307</td>
<td>362</td>
<td>6.8%</td>
<td>41.8</td>
</tr>
</tbody>
</table>

* Insufficient Data

---

**T15 Lapse Rates by Issue Age**

[Graph showing lapse rates by issue age for different durations: T15 Lapse Rates by Issue Age]
Gender

T10

Shock lapses are slightly higher for males than females, although they also have higher average issue ages and premium jump ratios.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1,817,138</td>
<td>122,142</td>
<td>6.7%</td>
<td>223,312</td>
<td>140,248</td>
<td>62.8%</td>
<td>58,430</td>
<td>49,152</td>
<td>62.8%</td>
<td>37,301</td>
<td>21,052</td>
<td>56.4%</td>
</tr>
<tr>
<td>Female</td>
<td>971,748</td>
<td>62,114</td>
<td>6.4%</td>
<td>125,234</td>
<td>72,063</td>
<td>57.5%</td>
<td>37,693</td>
<td>24,863</td>
<td>65.4%</td>
<td>28,724</td>
<td>3,275</td>
<td>11.4%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>2,793,861</td>
<td>184,579</td>
<td>6.6%</td>
<td>349,546</td>
<td>212,311</td>
<td>60.3%</td>
<td>96,123</td>
<td>36,914</td>
<td>38.3%</td>
<td>66,027</td>
<td>8,577</td>
<td>12.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dur 10 Avg</th>
<th>Dur 10 Prem Jump Ratio</th>
<th>Dur 10 Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>4.1</td>
<td>42.5</td>
</tr>
<tr>
<td>Female</td>
<td>3.5</td>
<td>38.8</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3.9</td>
<td>41.2</td>
</tr>
</tbody>
</table>

T10 Lapse Rates by Gender
The differential between male and female shock lapses is even more pronounced on T15 than T10.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Policy-Years Exposed</th>
<th>Total Lapses</th>
<th>Lapse Rate</th>
<th>Dur 15</th>
<th>Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>142,642</td>
<td>7,734</td>
<td>5.4%</td>
<td>14,578</td>
<td>8,138</td>
<td>55.8%</td>
<td>4,656</td>
<td>1,192</td>
<td>25.6%</td>
<td>2,957</td>
<td>1,192</td>
<td>7.8%</td>
<td>42.6</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>73,482</td>
<td>3,863</td>
<td>5.3%</td>
<td>7,892</td>
<td>3,161</td>
<td>40.1%</td>
<td>3,417</td>
<td>697</td>
<td>20.4%</td>
<td>2,350</td>
<td>131</td>
<td>5.6%</td>
<td>40.3</td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>216,132</td>
<td>11,598</td>
<td>5.4%</td>
<td>22,470</td>
<td>11,299</td>
<td>50.3%</td>
<td>8,072</td>
<td>1,889</td>
<td>23.4%</td>
<td>5,307</td>
<td>362</td>
<td>6.8%</td>
<td>41.8</td>
<td></td>
</tr>
</tbody>
</table>

T15 Lapse Rates by Gender
Risk Class

Respondents were asked to provide the underwriting risk class of each policy record. Due to differences in risk class structures and underwriting criteria, it is difficult to aggregate results across companies by risk class. In addition, these data fields presented some challenges from a data quality perspective. The researchers often combined the data “as submitted” with their independent knowledge of each company’s product structures and internal risk class definitions to cleanse and adjust the necessary fields to ensure consistency across companies.

Policies were mapped into the following risk classes based on the number of preferred classes and the rank of each risk class within the overall preferred class structure. The mapping used is as follows:

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super-Preferred NS</td>
<td>Best class in a 3 or more NS class structure</td>
</tr>
<tr>
<td>Preferred NS</td>
<td>Best class in a 2 NS class structure</td>
</tr>
<tr>
<td></td>
<td>or second class in a 3 NS class structure</td>
</tr>
<tr>
<td></td>
<td>or second or third class in a 4 or more NS class structure</td>
</tr>
<tr>
<td>Non-Preferred NS</td>
<td>Third class in a 3 NS class structure</td>
</tr>
<tr>
<td></td>
<td>or Fourth or worse class in a 4 or more NS class structure</td>
</tr>
<tr>
<td>Undifferentiated NS</td>
<td>Only 1 NS class</td>
</tr>
<tr>
<td>Preferred SM</td>
<td>Best class in a 2 SM class structure</td>
</tr>
<tr>
<td>Non-Preferred SM</td>
<td>Second class in a 2 SM class structure</td>
</tr>
<tr>
<td>Undifferentiated SM</td>
<td>Only 1 SM class</td>
</tr>
</tbody>
</table>
Risk Class (cont)

Super-Preferred classes experienced the highest shock lapses. This is correlated with premium jump since the post-level premium rates generally do not vary by risk class. Some of the differences across risk classes may also be driven by differences in company-specific experience that is not entirely explained by risk class or premium jump.
**Face Amount**

**T10**

Shock lapse rates and post-level period lapse rates increase slightly by policy size. This is correlated with premium jump ratio because companies generally have lower per $1000 level period premium rates at higher face amounts with a post-level period scale that doesn’t vary by size band. Additionally, larger face amount policies are generally sold at older issue ages.

<table>
<thead>
<tr>
<th>Policy Face Amount</th>
<th>Duration 6-9</th>
<th>Duration 10</th>
<th>Duration 11</th>
<th>Duration 12+</th>
<th>Dur 10 Avg Prem Jump Ratio</th>
<th>Dur 10 Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $50k</td>
<td>12,611</td>
<td>2,486</td>
<td>1,191</td>
<td>2,244</td>
<td>2.7</td>
<td>48.6</td>
</tr>
<tr>
<td>$50k - $99k</td>
<td>126,846</td>
<td>21,495</td>
<td>8,681</td>
<td>10,795</td>
<td>3.0</td>
<td>43.6</td>
</tr>
<tr>
<td>$100k - $249k</td>
<td>1,386,796</td>
<td>190,490</td>
<td>53,830</td>
<td>36,879</td>
<td>3.8</td>
<td>40.8</td>
</tr>
<tr>
<td>$250k - $999k</td>
<td>1,082,052</td>
<td>119,110</td>
<td>29,166</td>
<td>14,843</td>
<td>4.3</td>
<td>40.9</td>
</tr>
<tr>
<td>$1 M - $4.9 M</td>
<td>179,302</td>
<td>15,292</td>
<td>3,527</td>
<td>1,506</td>
<td>4.7</td>
<td>43.8</td>
</tr>
<tr>
<td>$5 M +</td>
<td>6,054</td>
<td>380</td>
<td>*</td>
<td>*</td>
<td>5.1</td>
<td>47.6</td>
</tr>
<tr>
<td>Grand Total</td>
<td>2,793,861</td>
<td>349,253</td>
<td>96,483</td>
<td>66,287</td>
<td>3.9</td>
<td>41.2</td>
</tr>
</tbody>
</table>

* Insufficient Data

**T10 Lapse Rates by Face Amount Band**

![T10 Lapse Rates by Face Amount Band](image-url)
The correlation between face amount and shock lapse is a bit more pronounced on T15 for policies above $50,000 than for T10.

<table>
<thead>
<tr>
<th>Policy Face Amount</th>
<th>Duration 11-14</th>
<th>Duration 15</th>
<th>Duration 16</th>
<th>Duration 17+</th>
<th>Dur 15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policy-Years Exposed</td>
<td>Total Lapses</td>
<td>Lapse Rate</td>
<td>Policy-Years Exposed</td>
<td>Total Lapses</td>
</tr>
<tr>
<td>&lt; $50k</td>
<td>8,645</td>
<td>465</td>
<td>5.4%</td>
<td>1,137</td>
<td>524</td>
</tr>
<tr>
<td>$50k - $99k</td>
<td>14,390</td>
<td>809</td>
<td>5.6%</td>
<td>1,742</td>
<td>667</td>
</tr>
<tr>
<td>$100k - $249k</td>
<td>120,074</td>
<td>6,308</td>
<td>5.3%</td>
<td>14,121</td>
<td>6,814</td>
</tr>
<tr>
<td>$250k - $999k</td>
<td>65,943</td>
<td>3,568</td>
<td>5.4%</td>
<td>5,086</td>
<td>3,022</td>
</tr>
<tr>
<td>$1 M +</td>
<td>7,075</td>
<td>448</td>
<td>6.3%</td>
<td>364</td>
<td>272</td>
</tr>
<tr>
<td>Grand Total</td>
<td>216,132</td>
<td>11,598</td>
<td>5.4%</td>
<td>22,470</td>
<td>11,299</td>
</tr>
</tbody>
</table>

*Insufficient Data*
**Premium Mode**

**T10**

The initial duration 10 shock lapse seems to decrease with increasing premium payment frequency. This is likely a function of the larger dollar amount increase in premium for the less frequent premium payment options. As discussed earlier, the distribution of lapses within the year varies significantly for different premium payment modes.

<table>
<thead>
<tr>
<th>Premium Payment Mode</th>
<th>Duration 6-9</th>
<th>Duration 10</th>
<th>Duration 11</th>
<th>Duration 12+</th>
<th>Dur 10 Avg Prem Jump Ratio</th>
<th>Dur 10 Avg Issue Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policy-Years</td>
<td>Total Lapses</td>
<td>Lapse Rate</td>
<td>Policy-Years</td>
<td>Total Lapses</td>
<td>Lapse Rate</td>
</tr>
<tr>
<td>Annual</td>
<td>778,367</td>
<td>50,324</td>
<td>6.5%</td>
<td>90,635</td>
<td>4,925</td>
<td>31.1%</td>
</tr>
<tr>
<td>Semi-Annual</td>
<td>136,719</td>
<td>9,188</td>
<td>6.7%</td>
<td>16,948</td>
<td>1,466</td>
<td>31.8%</td>
</tr>
<tr>
<td>Quarterly</td>
<td>561,674</td>
<td>47,788</td>
<td>8.5%</td>
<td>80,549</td>
<td>12,492</td>
<td>50.5%</td>
</tr>
<tr>
<td>Monthly</td>
<td>1,306,231</td>
<td>75,232</td>
<td>5.8%</td>
<td>158,520</td>
<td>34,068</td>
<td>21.8%</td>
</tr>
</tbody>
</table>

**T10 Lapse Rates by Premium Payment mode**

- **Annual**: Lapse Rate 6-9: 50%, Lapse Rate 10: 40%, Lapse Rate 11: 30%, Lapse Rate 12+: 20%
- **Semi-Annual**: Lapse Rate 6-9: 40%, Lapse Rate 10: 30%, Lapse Rate 11: 20%, Lapse Rate 12+: 10%
- **Quarterly**: Lapse Rate 6-9: 30%, Lapse Rate 10: 20%, Lapse Rate 11: 10%, Lapse Rate 12+: 0%
- **Monthly**: Lapse Rate 6-9: 20%, Lapse Rate 10: 10%, Lapse Rate 11: 0%, Lapse Rate 12+: 0%
Premium Mode (cont.)

T15

Results for T15 show a very similar pattern as T10. The shock lapse for annual pay business is much larger than for other modes.

<table>
<thead>
<tr>
<th>Premium Payment Mode</th>
<th>Duration 11-14</th>
<th>Duration 15</th>
<th>Duration 16</th>
<th>Duration 17+</th>
<th>Dur 15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policy-Years Exposed</td>
<td>Total Lapses</td>
<td>Lapse Rate</td>
<td>Policy-Years Exposed</td>
<td>Total Lapses</td>
</tr>
<tr>
<td>Annual</td>
<td>70,183</td>
<td>3,739</td>
<td>5.3%</td>
<td>7,115</td>
<td>4,747</td>
</tr>
<tr>
<td>Semi-Annual</td>
<td>19,952</td>
<td>1,123</td>
<td>5.6%</td>
<td>2,113</td>
<td>1,192</td>
</tr>
<tr>
<td>Quarterly</td>
<td>47,895</td>
<td>3,162</td>
<td>6.6%</td>
<td>5,364</td>
<td>2,873</td>
</tr>
<tr>
<td>Monthly</td>
<td>78,083</td>
<td>3,567</td>
<td>4.6%</td>
<td>7,878</td>
<td>2,487</td>
</tr>
<tr>
<td>Grand Total</td>
<td>216,132</td>
<td>11,598</td>
<td>5.4%</td>
<td>22,470</td>
<td>11,299</td>
</tr>
</tbody>
</table>

T15 Lapse Rates by Premium Payment mode

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Mortality Deterioration

Overview

This section will analyze the mortality experience from participating companies with a particular focus on the increase in mortality between the level period and the post-level period. The mortality increase can be primarily attributed to adverse selection of unhealthy policyholders choosing to persist after a large increase in their premium. A secondary component of mortality deterioration, which becomes increasingly significant for higher shock lapse rates, is attributable to normal mortality from policyholders who died during the grace period.

For T10, 24 companies provided experience that included at least one post-level period death claim, 16 companies provided at least 10 death claims, and 6 companies provided at least 50 death claims. Despite the cross-section of companies that contributed experience, the aggregated results are still somewhat dominated by a few individual companies. Post-level period mortality experience for T15 was primarily attributable to one company and is not included in the following displays.

The displays in this section include mortality ratios on three different industry-standard tabular bases: 2008 VBT, 2001 VBT, and SOA 75-80. In addition to this, a relative ratio is provided, which normalizes the 2008 VBT mortality ratio as a percentage of the ratio for durations 6-10. In this way, the post-level period mortality deterioration can be isolated as a multiple of the mortality during the latter part of the level period. These relative mortality ratios are alternatively referred to as “vs LP” or “Mortality Relative to Duration 6-10” on the displays.

There was significantly less anti-selective mortality seen in products with a jump to a new level period. As seen earlier, these products experienced lower shock lapses than products jumping up to an ART scale. In order to provide analysis that is most likely to be relevant to the readers of this report, separate displays will be provided for products with a jump to an ART scale.
Mortality by Duration

T10 All

In total, the post-level period mortality was roughly 182% of the level period (duration 6-10) mortality. For duration 11 alone, the mortality was 210% of the level period. As will be discussed later, there is significant exposure from a small number of companies with a jump to new level period product structure or with lower than average shock lapses and premium jump ratios. As a result, these aggregated results, while technically accurate, might understate the expected mortality deterioration for most companies – especially for more recently issued products.

Mortality results during durations 6-10 of the level period were very similar to the SOA 2005-2007 Individual Life Mortality Experience Study. For Term Insurance during durations 6-10, that study showed mortality ratios as 100% of 2008 VBT, 69% of 2001 VBT, and 49% of SOA 7580.

<table>
<thead>
<tr>
<th>Policy Duration</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>08 VBT</th>
<th>01 VBT</th>
<th>SOA 7580 vs LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>975,524</td>
<td>1,901</td>
<td>101%</td>
<td>75%</td>
<td>50% 102%</td>
</tr>
<tr>
<td>7</td>
<td>814,823</td>
<td>1,663</td>
<td>96%</td>
<td>69%</td>
<td>48% 98%</td>
</tr>
<tr>
<td>8</td>
<td>665,348</td>
<td>1,526</td>
<td>99%</td>
<td>70%</td>
<td>51% 101%</td>
</tr>
<tr>
<td>9</td>
<td>537,343</td>
<td>1,291</td>
<td>95%</td>
<td>67%</td>
<td>50% 96%</td>
</tr>
<tr>
<td>10</td>
<td>395,513</td>
<td>1,104</td>
<td>102%</td>
<td>71%</td>
<td>54% 103%</td>
</tr>
<tr>
<td>Subtotal 6-10</td>
<td>3,388,551</td>
<td>7,485</td>
<td>99%</td>
<td>70%</td>
<td>50% 100%</td>
</tr>
<tr>
<td>11</td>
<td>89,934</td>
<td>401</td>
<td>207%</td>
<td>139%</td>
<td>104% 210%</td>
</tr>
<tr>
<td>12</td>
<td>44,007</td>
<td>170</td>
<td>166%</td>
<td>110%</td>
<td>82% 168%</td>
</tr>
<tr>
<td>13+</td>
<td>48,034</td>
<td>192</td>
<td>150%</td>
<td>99%</td>
<td>76% 152%</td>
</tr>
<tr>
<td>Subtotal 11+</td>
<td>181,975</td>
<td>763</td>
<td>180%</td>
<td>120%</td>
<td>90% 182%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,570,525</td>
<td>8,248</td>
<td>103%</td>
<td>73%</td>
<td>53% 104%</td>
</tr>
</tbody>
</table>

T10 Mortality by Duration

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Page 36
T10 Jump to ART

When isolating the experience for the companies with a Jump to ART product structure, the aggregated mortality deterioration is much higher at 230% of the level period. Duration 11 experience alone was 257% of the level period.

<table>
<thead>
<tr>
<th>Policy Duration</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08 VBT</td>
</tr>
<tr>
<td>6</td>
<td>882,936</td>
<td>1,763</td>
<td>103%</td>
</tr>
<tr>
<td>7</td>
<td>733,710</td>
<td>1,510</td>
<td>97%</td>
</tr>
<tr>
<td>8</td>
<td>595,304</td>
<td>1,405</td>
<td>103%</td>
</tr>
<tr>
<td>9</td>
<td>478,104</td>
<td>1,160</td>
<td>97%</td>
</tr>
<tr>
<td>10</td>
<td>345,095</td>
<td>950</td>
<td>103%</td>
</tr>
<tr>
<td>Subtotal 6-10</td>
<td>3,035,148</td>
<td>6,788</td>
<td>100%</td>
</tr>
<tr>
<td>11</td>
<td>62,286</td>
<td>331</td>
<td>258%</td>
</tr>
<tr>
<td>12</td>
<td>26,569</td>
<td>142</td>
<td>238%</td>
</tr>
<tr>
<td>13+</td>
<td>24,615</td>
<td>137</td>
<td>180%</td>
</tr>
<tr>
<td>Subtotal 11+</td>
<td>113,470</td>
<td>610</td>
<td>231%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,148,618</td>
<td>7,398</td>
<td>105%</td>
</tr>
</tbody>
</table>

T10 Jump to ART Mortality by Duration

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Distribution of Results

T10 All

As has been indicated earlier, there is a wide spread of company-specific mortality experience. The following charts show this distribution for any company that provided at least 10 death claims in a given duration. The aggregated mortality increase is much lower than the median of the individual company results. The median levels might give a more realistic representation of the underlying experience.

<table>
<thead>
<tr>
<th>2008 VBT Ratio Range</th>
<th>6-10</th>
<th>11</th>
<th>12</th>
<th>13+</th>
<th>11+</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Companies</td>
<td>26</td>
<td>12</td>
<td>6</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>20&lt;sup&gt;th&lt;/sup&gt; percentile</td>
<td>91%</td>
<td>170%</td>
<td>131%</td>
<td>116%</td>
<td>116%</td>
</tr>
<tr>
<td>Median</td>
<td>99%</td>
<td>275%</td>
<td>280%</td>
<td>218%</td>
<td>238%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>99%</td>
<td>207%</td>
<td>166%</td>
<td>150%</td>
<td>180%</td>
</tr>
<tr>
<td>80&lt;sup&gt;th&lt;/sup&gt; percentile</td>
<td>113%</td>
<td>381%</td>
<td>292%</td>
<td>241%</td>
<td>272%</td>
</tr>
</tbody>
</table>
Distribution of Results

T10 Jump to ART

The median results are similar when excluding the products with a jump to a new level period, although the spread between the median and aggregate levels is smaller.

<table>
<thead>
<tr>
<th>2008 VBT Ratio Range</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-10</td>
</tr>
<tr>
<td># of Companies</td>
<td>24</td>
</tr>
<tr>
<td>20th percentile</td>
<td>92%</td>
</tr>
<tr>
<td>Median</td>
<td>99%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>100%</td>
</tr>
<tr>
<td>80th percentile</td>
<td>113%</td>
</tr>
</tbody>
</table>

T10 Jump to ART
2008 VBT Mortality Ratios By Duration
Distribution by Company

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**Premium Jump Ratio**

**T10 All**

The lapse rate experience showed a clear link between the size of the jump in premium after the end of the level period and the size of the shock lapse. The next logical question is whether or not this relationship extends to mortality deterioration. The experience results for mortality after the level period suggest a similar increasing relationship.

<table>
<thead>
<tr>
<th>Premium Jump Ratio Band</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality 08 VBT</th>
<th>01 VBT</th>
<th>SOA 7580</th>
<th>vs LP</th>
<th>Average Prem Jump Ratio  (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01x - 2x</td>
<td>21,860</td>
<td>30</td>
<td>111%</td>
<td>75%</td>
<td>55%</td>
<td>93%</td>
<td>1.6</td>
</tr>
<tr>
<td>2.01x - 3x</td>
<td>22,895</td>
<td>91</td>
<td>169%</td>
<td>113%</td>
<td>89%</td>
<td>150%</td>
<td>2.6</td>
</tr>
<tr>
<td>3.01x - 4x</td>
<td>17,490</td>
<td>66</td>
<td>190%</td>
<td>126%</td>
<td>96%</td>
<td>150%</td>
<td>3.6</td>
</tr>
<tr>
<td>4.01x - 5x</td>
<td>12,239</td>
<td>70</td>
<td>195%</td>
<td>129%</td>
<td>93%</td>
<td>167%</td>
<td>4.5</td>
</tr>
<tr>
<td>5.01x - 6x</td>
<td>3,585</td>
<td>48</td>
<td>300%</td>
<td>198%</td>
<td>147%</td>
<td>274%</td>
<td>5.5</td>
</tr>
<tr>
<td>6.01x - 7x</td>
<td>1,236</td>
<td>27</td>
<td>332%</td>
<td>224%</td>
<td>174%</td>
<td>326%</td>
<td>6.4</td>
</tr>
<tr>
<td>7.01x - 8x</td>
<td>717</td>
<td>25</td>
<td>459%</td>
<td>329%</td>
<td>270%</td>
<td>490%</td>
<td>7.5</td>
</tr>
<tr>
<td>8.01x +</td>
<td>938</td>
<td>25</td>
<td>318%</td>
<td>209%</td>
<td>159%</td>
<td>330%</td>
<td>8.8</td>
</tr>
</tbody>
</table>

Subtotal Prem Data Available: 80,962 382 202% 135% 102% 190% 3.1
No Prem Data Available: 101,013 381 162% 107% 81% 175% n/a
Grand Total: 181,975 763 180% 120% 90% 182% n/a

(1) Weighted Average by duration 11+ exposure for policies with premium data available

**T10 Post-Level Mortality Relative to Level Period by Premium Jump Ratio**

Duration 11/10 Premium Jump Ratio

- **Relative Mortality Ratio**
- **Deaths**
Premium Jump Ratio

T10 Jump to ART

Mortality also increases by premium jump ratio when looking just at the jump to ART products.

<table>
<thead>
<tr>
<th>Premium Jump Ratio Band</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08 VBT</td>
<td>01 VBT</td>
</tr>
<tr>
<td>1.01x - 2x</td>
<td>7,002</td>
<td>15</td>
<td>168%</td>
<td>114%</td>
</tr>
<tr>
<td>2.01x - 3x</td>
<td>14,279</td>
<td>61</td>
<td>201%</td>
<td>137%</td>
</tr>
<tr>
<td>3.01x - 4x</td>
<td>16,319</td>
<td>52</td>
<td>175%</td>
<td>116%</td>
</tr>
<tr>
<td>4.01x - 5x</td>
<td>11,463</td>
<td>59</td>
<td>190%</td>
<td>126%</td>
</tr>
<tr>
<td>5.01x - 6x</td>
<td>3,239</td>
<td>38</td>
<td>298%</td>
<td>195%</td>
</tr>
<tr>
<td>6.01x - 7x</td>
<td>1,154</td>
<td>23</td>
<td>325%</td>
<td>216%</td>
</tr>
<tr>
<td>7.01x - 8x</td>
<td>672</td>
<td>16</td>
<td>343%</td>
<td>243%</td>
</tr>
<tr>
<td>8.01x +</td>
<td>916</td>
<td>24</td>
<td>316%</td>
<td>206%</td>
</tr>
<tr>
<td>Subtotal Prem Data Available</td>
<td>55,044</td>
<td>288</td>
<td>218%</td>
<td>146%</td>
</tr>
<tr>
<td>No Prem Data Available</td>
<td>58,426</td>
<td>322</td>
<td>245%</td>
<td>167%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>113,470</td>
<td>610</td>
<td>231%</td>
<td>156%</td>
</tr>
</tbody>
</table>

(1) Weighted Average by duration 11+ exposure for policies with premium data available

---

![Graph showing T10 Jump to ART Post-Level Mortality Relative to Level Period by Premium Jump Ratio](image)
**Issue Age**

**T10 All**

During the level period, mortality is a fairly level percentage of 2008 VBT by issue age. Slope issues with the 2001 VBT and SOA 75-80 contribute to the increasing A/E patterns by issue age during the level period on those bases.

Mortality during the post-level period increases by issue age. A corresponding trend was also seen in the shock lapse experience results, which is also correlated with premium jump ratio. The impact of grace period mortality will also be more pronounced for older ages since the baseline mortality rates are higher.

<table>
<thead>
<tr>
<th>Issue Age</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08 VBT</td>
<td>01 VBT</td>
<td>SOA 7580</td>
<td>08 VBT</td>
<td>01 VBT</td>
</tr>
<tr>
<td>0-29</td>
<td>332,709</td>
<td>132</td>
<td>97%</td>
<td>64%</td>
<td>51%</td>
<td>27,903</td>
<td>22</td>
</tr>
<tr>
<td>30-39</td>
<td>1,151,893</td>
<td>791</td>
<td>96%</td>
<td>63%</td>
<td>40%</td>
<td>82,098</td>
<td>152</td>
</tr>
<tr>
<td>40-49</td>
<td>1,094,047</td>
<td>1,767</td>
<td>97%</td>
<td>64%</td>
<td>44%</td>
<td>53,816</td>
<td>247</td>
</tr>
<tr>
<td>50-59</td>
<td>615,301</td>
<td>2,309</td>
<td>98%</td>
<td>67%</td>
<td>48%</td>
<td>15,887</td>
<td>203</td>
</tr>
<tr>
<td>60+</td>
<td>194,599</td>
<td>2,486</td>
<td>104%</td>
<td>86%</td>
<td>65%</td>
<td>2,271</td>
<td>139</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,388,551</td>
<td>7,485</td>
<td>99%</td>
<td>70%</td>
<td>50%</td>
<td>181,975</td>
<td>763</td>
</tr>
</tbody>
</table>

**T10 Post-Level Mortality Relative to Level Period by Issue Age**

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Issue Age

T10 Jump to ART

Results for the “Jump to ART” products only show a similar increasing trend in post-level mortality by issue age, although the pattern is not quite as consistent.

<table>
<thead>
<tr>
<th>Issue Age</th>
<th>Duration 6-10</th>
<th>Duration 11+</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policy-Years Exposed</td>
<td>Total Deaths</td>
<td>Actual/Tabular Mortality</td>
</tr>
<tr>
<td></td>
<td>VBT 08</td>
<td>VBT 01</td>
<td>SOA 7580</td>
</tr>
<tr>
<td>0-29</td>
<td>314,177</td>
<td>126</td>
<td>98% 65% 51%</td>
</tr>
<tr>
<td>30-39</td>
<td>1,053,138</td>
<td>735</td>
<td>97% 64% 41%</td>
</tr>
<tr>
<td>40-49</td>
<td>955,595</td>
<td>1,595</td>
<td>99% 65% 46%</td>
</tr>
<tr>
<td>50-59</td>
<td>533,144</td>
<td>2,050</td>
<td>98% 68% 50%</td>
</tr>
<tr>
<td>60+</td>
<td>179,095</td>
<td>2,282</td>
<td>105% 86% 65%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,035,148</td>
<td>6,788</td>
<td>100% 72% 52%</td>
</tr>
</tbody>
</table>

T10 Jump to ART
Post-Level Mortality Relative to Level Period by Issue Age
Gender

T10 All

Post-level period mortality deterioration for males is slightly higher than females, which is consistent with the shock lapse experience. Males and females have similar mortality experience relative to their own mortality tables during the level period.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08</td>
<td>01</td>
<td>SOA</td>
<td>VBT</td>
<td>VBT</td>
</tr>
<tr>
<td>Male</td>
<td>2,212,417</td>
<td>5,882</td>
<td>99%</td>
<td>71%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,176,134</td>
<td>1,603</td>
<td>98%</td>
<td>69%</td>
<td>53%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,388,551</td>
<td>7,485</td>
<td>99%</td>
<td>70%</td>
<td>50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T10 2008 VBT Mortality Ratios

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Gender

T10 Jump to ART

Results are similar when excluding the jump to new level period products with a larger mortality deterioration for males than females.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08 VBT 01 VBT SOA 7580</td>
<td></td>
<td></td>
<td>08 VBT 01 VBT SOA vs LP</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1,962,141</td>
<td>5,293</td>
<td>101% 72% 51%</td>
<td>64,343</td>
<td>426</td>
<td>239% 163% 121% 238%</td>
<td>3.7</td>
</tr>
<tr>
<td>Female</td>
<td>1,073,007</td>
<td>1,495</td>
<td>100% 71% 54%</td>
<td>49,127</td>
<td>184</td>
<td>214% 142% 118% 215%</td>
<td>3.4</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,035,148</td>
<td>6,788</td>
<td>100% 72% 52%</td>
<td>113,470</td>
<td>610</td>
<td>231% 156% 120% 230%</td>
<td>3.6</td>
</tr>
</tbody>
</table>

![T10 Jump to ART 2008 VBT Mortality Ratios](image)
Risk Class

The following pages will display mortality results by underwriting risk class. For a description of the mapping process used, see page 29.

T10 All

During the level period, the results by risk class show the expected trend of lower mortality for preferred classes. The distribution of business by risk class is driven by the companies contributing to the study and isn’t necessarily representative of the current risk class structures of the broader industry.

Specifically, we expect that the products with only 1 or 2 NS classes are overrepresented in this study relative to currently issued products.

Super-Preferred classes (best NS out of 3 or more NS) have the lowest level period mortality and the highest post-level mortality deterioration, although the post-level period credibility is thin. Super preferred products generally have the highest premium jump ratios since the post-level period rates generally don’t vary by risk class.

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08 VBT 01 VBT SOA 7580</td>
<td></td>
<td></td>
<td>08 VBT 01 VBT SOA 7580</td>
<td></td>
</tr>
<tr>
<td>Super-Pref NS</td>
<td>372,657</td>
<td>590</td>
<td>72% 50% 33%</td>
<td>4,867</td>
<td>28</td>
<td>267% 174% 120% 370%</td>
<td>5.7</td>
</tr>
<tr>
<td>Preferred NS</td>
<td>1,407,563</td>
<td>1,926</td>
<td>82% 55% 35%</td>
<td>72,398</td>
<td>205</td>
<td>140% 89% 60% 170%</td>
<td>3.7</td>
</tr>
<tr>
<td>Non-Pref NS</td>
<td>864,150</td>
<td>2,186</td>
<td>119% 81% 54%</td>
<td>39,284</td>
<td>198</td>
<td>210% 136% 95% 177%</td>
<td>3.3</td>
</tr>
<tr>
<td>Undiff/Unknown NS</td>
<td>393,251</td>
<td>1,310</td>
<td>120% 87% 59%</td>
<td>45,757</td>
<td>163</td>
<td>196% 127% 86% 162%</td>
<td>2.7</td>
</tr>
<tr>
<td>Preferred SM</td>
<td>102,401</td>
<td>365</td>
<td>79% 67% 92%</td>
<td>3,540</td>
<td>32</td>
<td>180% 138% 196% 229%</td>
<td>4.2</td>
</tr>
<tr>
<td>Non-Pref SM</td>
<td>49,560</td>
<td>296</td>
<td>117% 103% 141%</td>
<td>1,292</td>
<td>19</td>
<td>269% 210% 303% 230%</td>
<td>3.8</td>
</tr>
<tr>
<td>Undiff/Unknown SM</td>
<td>198,969</td>
<td>812</td>
<td>106% 89% 121%</td>
<td>14,837</td>
<td>118</td>
<td>182% 139% 197% 172%</td>
<td>2.6</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,388,551</td>
<td>7,485</td>
<td>99% 70% 50%</td>
<td>181,975</td>
<td>763</td>
<td>180% 120% 90% 182%</td>
<td>3.1</td>
</tr>
</tbody>
</table>
Risk Class (cont.)

T10 All

T10 2008 VBT Mortality Ratios

T10 Post-Level Mortality Relative to Level Period by Risk Class
T10 Jump to ART

Similar experience is seen when looking just at the jump to ART plans. The preferred classes (Super-Pref NS and Preferred NS) have significantly better mortality during the level period, but show the highest post-level period mortality deterioration.

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Duration 6-10</th>
<th>Duration 11+</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Policy-</td>
<td>Actual/Tabular</td>
<td>Total Deaths</td>
</tr>
<tr>
<td></td>
<td>Years Exposed</td>
<td>08 01 SOA</td>
<td>Exposed</td>
</tr>
<tr>
<td>Super-Pref NS</td>
<td>364,181</td>
<td>575</td>
<td>73% 51% 33%</td>
</tr>
<tr>
<td>Preferred NS</td>
<td>1,190,680</td>
<td>1,726</td>
<td>86% 58% 38%</td>
</tr>
<tr>
<td>Non-Pref NS</td>
<td>798,762</td>
<td>2,010</td>
<td>119% 82% 54%</td>
</tr>
<tr>
<td>Undiff/Unknown NS</td>
<td>358,261</td>
<td>1,142</td>
<td>122% 88% 59%</td>
</tr>
<tr>
<td>Preferred SM</td>
<td>101,395</td>
<td>363</td>
<td>79% 68% 92%</td>
</tr>
<tr>
<td>Non-Pref SM</td>
<td>46,973</td>
<td>273</td>
<td>115% 101% 138%</td>
</tr>
<tr>
<td>Undiff/Unknown NS</td>
<td>174,895</td>
<td>699</td>
<td>110% 91% 124%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,035,148</td>
<td>6,788</td>
<td>100% 72% 52%</td>
</tr>
</tbody>
</table>
Risk Class (cont.)

T10 Jump to ART (cont.)

![T10 Jump to ART 2008 VBT Mortality Ratios](chart1)

![T10 Jump to ART Post-Level Mortality Relative to Level Period by Risk Class](chart2)
**Face Amount**

**T10 All**

During the level period, the smallest policy sizes have the highest mortality levels due to looser underwriting requirements and lower socio-economic conditions. As policy size increases, mortality generally improves, although the mortality is slightly higher above $1 million.

During the post-level period, the extra mortality does not seem to show any clear trends by policy face amount.

<table>
<thead>
<tr>
<th>Policy Face Amount</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>08 VBT</td>
<td>01 VBT</td>
<td>SOA</td>
<td>7580</td>
<td>08 VBT</td>
</tr>
<tr>
<td>&lt; $50k</td>
<td>16,890</td>
<td>124</td>
<td>137%</td>
<td>110%</td>
<td>93%</td>
<td></td>
<td>4,061</td>
</tr>
<tr>
<td>$50k - $99k</td>
<td>160,327</td>
<td>903</td>
<td>125%</td>
<td>99%</td>
<td>81%</td>
<td></td>
<td>21,891</td>
</tr>
<tr>
<td>$100k - $249k</td>
<td>1,669,416</td>
<td>3,729</td>
<td>98%</td>
<td>70%</td>
<td>52%</td>
<td></td>
<td>101,949</td>
</tr>
<tr>
<td>$250k - $999k</td>
<td>1,314,306</td>
<td>2,233</td>
<td>91%</td>
<td>63%</td>
<td>42%</td>
<td></td>
<td>48,282</td>
</tr>
<tr>
<td>$1 M +</td>
<td>227,612</td>
<td>496</td>
<td>99%</td>
<td>68%</td>
<td>45%</td>
<td></td>
<td>5,792</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,388,551</td>
<td>7,485</td>
<td>99%</td>
<td>70%</td>
<td>50%</td>
<td></td>
<td>181,975</td>
</tr>
</tbody>
</table>

**T10 Post-Level Mortality Relative to Level Period by Policy Face Amount**
Face Amount

**T10 Jump to ART**

For the Jump to ART products, post level mortality is higher for larger policy sizes.

<table>
<thead>
<tr>
<th>Policy Face Amount</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Policy-Years Exposed</th>
<th>Total Deaths</th>
<th>Actual/Tabular Mortality</th>
<th>Average Prem Jump Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $50k</td>
<td>15,701</td>
<td>119</td>
<td>137% 110% 93%</td>
<td>1,837</td>
<td>29</td>
<td>260% 182% 170% 190%</td>
<td>2.6</td>
</tr>
<tr>
<td>$50k - $99k</td>
<td>146,797</td>
<td>861</td>
<td>125% 100% 82%</td>
<td>10,953</td>
<td>81</td>
<td>214% 150% 136% 171%</td>
<td>2.8</td>
</tr>
<tr>
<td>$100k - $249k</td>
<td>1,515,761</td>
<td>3,358</td>
<td>99% 71% 52%</td>
<td>68,637</td>
<td>340</td>
<td>230% 155% 118% 233%</td>
<td>3.6</td>
</tr>
<tr>
<td>$250k - $999k</td>
<td>1,164,623</td>
<td>2,008</td>
<td>93% 64% 43%</td>
<td>29,474</td>
<td>144</td>
<td>237% 158% 111% 254%</td>
<td>4.0</td>
</tr>
<tr>
<td>$1 M +</td>
<td>192,266</td>
<td>442</td>
<td>102% 70% 46%</td>
<td>2,569</td>
<td>16</td>
<td>254% 168% 116% 250%</td>
<td>4.3</td>
</tr>
<tr>
<td>Grand Total</td>
<td>3,035,148</td>
<td>6,788</td>
<td>100% 72% 52%</td>
<td>113,470</td>
<td>610</td>
<td>231% 156% 120% 230%</td>
<td>3.6</td>
</tr>
</tbody>
</table>

**T10 Jump to ART**

*Post-Level Mortality Relative to Level Period by Policy Face Amount*
**Cause of Death**

**T10 All**

Companies were asked to provide the cause of death if available. This data was provided for roughly 37% of all deaths in the study and 36% of post-level period deaths. Cause of death codes were mapped into common groupings in order to aggregate across companies. The following chart shows the raw cause-specific mortality rates by duration for the companies that were able to provide cause of death. Since these rates are not age/duration adjusted, they generally increase by duration even during the level period.

The expectation is that policyholders with known impairments (such as cancer) might be more likely to anti-selectively persist beyond the level period. The data lends support to this hypothesis: the cause-specific mortality rate for cancer increases by more than any of the other medical causes of death.

![T10 Raw Mortality Rate by Cause of Death](chart.png)
Shock Lapse vs. Mortality Deterioration

Throughout this document, it has been suggested that there is a strong relationship between the size of the shock lapse at the end of the level period and the amount of mortality deterioration beyond the level period. The clearest way to illustrate this relationship is by looking at both of these metrics for each company on an XY scatter plot. The following chart shows the shock lapse in duration 10 and the 2008 VBT mortality ratio for durations 11+ for each company with at least 10 post-level period deaths.

Shock Lapse vs. Mortality Deterioration by Company
Comparisons to Phase 1 Assumption Survey

The following pages will provide a side-by-side comparison of the Phase 1 assumption survey results to the Phase 2 experience results. When comparing these results, it is important to note that there are significant differences between the product design characteristics of level term products issued today versus those contributing experience to the Phase 2 study that were issued over 10 years ago – particularly as it relates to the size of the premium jump at the end of the level period.

**Shock Lapse**

In total, the average shock lapse at the end of the level period for T10 was higher in the assumption survey than the experience results. This is in line with the expectation that newer products with larger premium jumps will exhibit higher shock lapses. The results in duration 11 are flipped the other way with the experience results showing higher average lapse rates than the pricing assumptions.

### T10 Annual Total Lapse Rates

**Phase 1 vs. Phase 2**

<table>
<thead>
<tr>
<th>Duration</th>
<th>Assumption Survey (Phase 1)</th>
<th>Experience Results (Phase 2)</th>
<th>Assumption Survey (Phase 1)</th>
<th>Experience Results (Phase 2)</th>
<th>Assumption Survey (Phase 1)</th>
<th>Experience Results (Phase 2)</th>
<th>Assumption Survey (Phase 1)</th>
<th>Experience Results (Phase 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>80th percentile</td>
<td>80th percentile</td>
<td>Median</td>
<td>Median</td>
<td>20th percentile</td>
<td>20th percentile</td>
<td>Aggregate</td>
<td>Aggregate</td>
</tr>
<tr>
<td>11</td>
<td>80th percentile</td>
<td>80th percentile</td>
<td>Median</td>
<td>Median</td>
<td>20th percentile</td>
<td>20th percentile</td>
<td>Aggregate</td>
<td>Aggregate</td>
</tr>
<tr>
<td>12</td>
<td>80th percentile</td>
<td>80th percentile</td>
<td>Median</td>
<td>Median</td>
<td>20th percentile</td>
<td>20th percentile</td>
<td>Aggregate</td>
<td>Aggregate</td>
</tr>
<tr>
<td>13+</td>
<td>80th percentile</td>
<td>80th percentile</td>
<td>Median</td>
<td>Median</td>
<td>20th percentile</td>
<td>20th percentile</td>
<td>Aggregate</td>
<td>Aggregate</td>
</tr>
</tbody>
</table>

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Shock Lapse by Issue Age

The most significant difference between the Phase 1 assumptions and the Phase 2 experience results seems to be in the shape of the shock lapse by issue age. Most company responses did not directly vary pricing assumptions by issue age, while the experience study results show a significant increase in shock lapse rates by issue age.

![T10 Duration 10 Lapse Rates By Issue Age Phase 1 vs. Phase 2](image-url)
Mortality Deterioration

The median level of mortality deterioration was higher in the experience study than in the assumption survey, although a small number of larger companies experienced lower mortality deterioration.

T10 Mortality Deterioration
Phase 1 vs. Phase 2

Mortality Deterioration (Relative to Level Period)

Duration

<table>
<thead>
<tr>
<th>Assumption Survey (Phase 1)</th>
<th>Experience Results (Phase 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>13+</td>
<td></td>
</tr>
</tbody>
</table>

- 80th percentile
- Median
- Aggregate
- 20th percentile
Shock Lapse vs. Mortality Deterioration

Both the assumption survey and the experience results showed a generally positive correlation between the size of the shock lapse and the amount of mortality deterioration. The relationship is much stronger in the experience results since several survey participants used a level 200% mortality deterioration assumption.

In general, it appears that for a given level of shock lapse, the average Phase 2 mortality deterioration experience is higher than the corresponding Phase 1 pricing assumptions.
**Shock Lapse Model**

This study has demonstrated that the shock lapse at the end of the level period varies by a number of factors including, but not limited to, company, premium jump ratio, premium mode, product structure, issue age, and risk class. A complicating factor is that many of these variables are correlated. For example, older issue ages have higher premium jump ratios because of the exponential shape of the mortality curve. Preferred non-smoker products tend to have higher premium jump ratios because post-level period rates often don't vary by risk class. Issue age is similarly correlated with risk class and policy size. Clearly this creates a complex web of potential interdependencies. As a first step toward unraveling this puzzle, the authors have developed a rudimentary logistic regression model to help control for each variable independently. None of the authors are statisticians by training or by practice; we are merely trying to suggest a first step toward a more robust approach to actuarial experience analysis. We hope that the research community is able to build and improve upon the simple methods that we have utilized.

**Overview**

A logistic regression model is a generalized linear model used to model the probability of the occurrence of a binomial event.

The probability of the event (i.e. T10 duration 10 shock lapse) is modeled as

\[ f(z) = \frac{1}{1 + e^{-z}} \text{ where } z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n. \]

The models developed were fit through a random sample of 70% of the policies with T10 duration 10 lapse rate exposure. Sampling was done on a policy-by-policy basis, so a similar mix of results by company should be seen in both samples. The remaining 30% sample was held back for the purposes of checking the predictive power of the model and to avoid over-fitting. For the sake of consistency and likely relevance to modern products, only policies with a “Jump to ART” structure were included.
**Predictors Included**

The first model was fit to the entire 70% sample and included the following predictors:

- Issue Age (0-29, 30-39, 40-49, 50-59, 60+)
- Super-Preferred NS Indicator (Y for Super-Preferred NS classes)
- Premium Mode (Annual, Semi-Annual, Quarterly, Monthly)
- Face Amount Band ($0-$49k, $50k-$99k, $100k-$249k, $250k-$999k, $1m+)

The second model was developed just for companies within the 70% sample where the premium jump ratio was provided. This model included the previous predictors as well as:

- Premium Jump Ratio (1.01x-2.00x, 2.01x-3.00x, … , 10.01x+)

The $x_i$ values used in this model are indicator variables that are set to 1 or 0 for each predictor. In other words, $z$ is the sum of the coefficients associated with each specific policy attribute modeled.
Model Results

The following pages will provide the results from the regression model. The following items should be noted regarding these displays:

- The “Model Coefficient” column provides the $\beta_i$ values at each attribute level for each predictor. These can be used to calculate the predicted shock lapse rate for a given model cell.
  - As an example, the predicted shock lapse rate from the first model for a $500,000 annual pay policy issued to a 45 year old, super-preferred non-smoker would be calculated as follows:
    \[ z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 = -0.278 + 0.848 + 0.095 + 0.984 + 0.077 = 1.727 \]
    \[ \text{Predicted Lapse Rate} = f(z) = \frac{1}{1 + e^{-z}} = 84.9\% \]
- The “Odds Ratio” provides the ratio of the modeled odds relative to the “reference level” for each predictor after controlling for other modeled variables.
  - As an example from the first model, the raw odds ratio for issue age 50-59 is the ratio of the odds of lapse for a 50-59 year old to the odds of lapse for someone less than 30 years old: \( \frac{.787/(1-.787)}{.483/(1-.483)} \).= 3.96. The model odds ratio of 3.76 represents a similar concept, except that the value has been controlled for other modeled predictors.
- The “70% Sample” columns show the exposure proportions and empirical lapse rates for the data that was used to fit the model. As expected, the empirical lapse rates from the data exactly match the predicted rates from the model at the levels of aggregation shown.
- The “30% Sample” columns show the proportions and empirical lapse rates for the 30% of the data that was randomly held back from the model. Note the close fit from the empirical lapse rates and modeled lapse rates for the 30% sample.
Model 1

The following table provides the model coefficients and validation for the first model. This model does not include premium jump ratio as a separate predictor since that data was not available for all policies. From this model, issue age is the most important predictor of shock lapse rates, but other variables are still significant.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model Coeff</th>
<th>Std Error</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(0.278)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Issue Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30*</td>
<td>-</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>0.427</td>
<td>0.02</td>
<td>1.53</td>
</tr>
<tr>
<td>40-49</td>
<td>0.848</td>
<td>0.02</td>
<td>2.34</td>
</tr>
<tr>
<td>50-59</td>
<td>1.326</td>
<td>0.02</td>
<td>3.76</td>
</tr>
<tr>
<td>60+</td>
<td>1.651</td>
<td>0.03</td>
<td>5.21</td>
</tr>
<tr>
<td>Risk Class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Super-Pref NS*</td>
<td>-</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Super-Pref NS</td>
<td>0.095</td>
<td>0.02</td>
<td>1.10</td>
</tr>
<tr>
<td>Premium Mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly*</td>
<td>-</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Quarterly</td>
<td>0.191</td>
<td>0.01</td>
<td>1.21</td>
</tr>
<tr>
<td>Semi-Ann</td>
<td>0.477</td>
<td>0.02</td>
<td>1.61</td>
</tr>
<tr>
<td>Annual</td>
<td>0.984</td>
<td>0.01</td>
<td>2.68</td>
</tr>
<tr>
<td>Face Amount</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50k</td>
<td>(1.033)</td>
<td>0.06</td>
<td>0.36</td>
</tr>
<tr>
<td>50k-99k</td>
<td>(0.624)</td>
<td>0.02</td>
<td>0.54</td>
</tr>
<tr>
<td>100k-249k*</td>
<td>-</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>250k-999k</td>
<td>0.077</td>
<td>0.01</td>
<td>1.08</td>
</tr>
<tr>
<td>1m+</td>
<td>(0.069)</td>
<td>0.03</td>
<td>0.93</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Reference Level for Predictor

| Model Parameters | 70% Sample | 30% Sample |
|------------------|--|---|---|
| Model Coeff      | Data Actual Modeled Lapse | Prop- Lapse Lapse |
|                  | Data Actual Modeled Lapse | Prop- Lapse Lapse |

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Model 2

The following table provides the model coefficients and validation for the second model. This model uses only the data from companies that provided premium information and uses premium jump ratio as a separate predictor. The overall shock lapse rate for these companies was lower, but the model shows the importance of premium jump as a predictor. Interestingly, the model suggests that the difference in lapse rates seen at super-preferred classes is driven by other modeled predictors since the Beta parameter for Super-Pref NS is negative even though the empirical shock lapse rates are much higher.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Model Parameters</th>
<th>70% Sample</th>
<th>30% Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coeff</td>
<td>Std</td>
<td>Odds</td>
</tr>
<tr>
<td>Constant</td>
<td>(1.461)</td>
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* Reference Level for Predictor
Special Thanks

The authors would again like to extend our thanks to all participating companies for making this project a success. Without your support, such research projects would not be possible. Your contributions have led to this broad industry benchmark of the experience results for term shock lapse rates and mortality rates beyond the level premium period.

We would like to thank the SOA and the following members of the Project Oversight Group and SOA Staff for their guidance and support on this research project. Their comments, feedback, and direction have greatly improved the value of this project.

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Doug Doll
Alex Faynberg
Christie Goodrich

Sebastian Kleber
David Wylde
Ronora Stryker
Jan Schuh

Finally, the authors express our sincere thanks to Jason McKinley of RGA for his significant contributions during both phases of this research project.
Appendix A: Companies Contributing Data

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<td>New York Life</td>
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Appendix B: Grace Period Adjustment

In order to develop a consistent approach to displaying lapse study results, an adjustment was made to some companies’ data submissions to account for grace period processing. Each individual lapse was adjusted X days where X varied by company (many companies were not adjusted at all.) The number of days used for this adjustment was based on each company’s specific grace period and was confirmed with contributing companies. An illustration of the impact of this is shown below. Notice for example Companies B, I, and K which would have had significantly lower duration 10 lapse rates and higher duration 11 lapse rates if calculated based on the termination dates provided. The cumulative lapse in duration 10-11 is relatively unchanged.