Mortality and Longevity

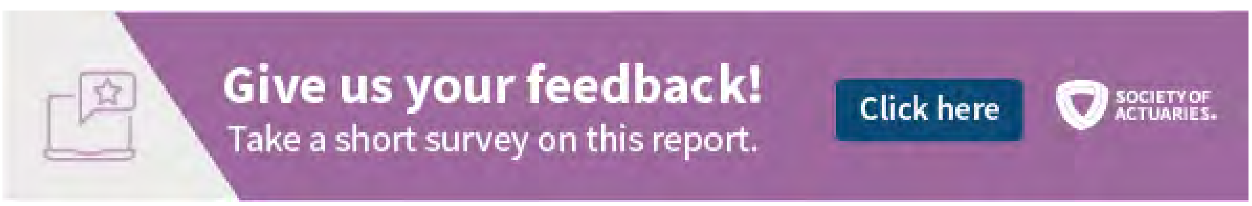
U.S. Post-Level Term Lapse and Mortality Experience

May 2021

U.S. Post-Level Term Lapse & Mortality Experience

AUTHORS
Aisling Bradfield, FSAI
Carolyn Covington, FSA, CERA, MAAA
Rebecca Reppert, FSA, CERA, MAAA
Julien Tomas, PhD

SPONSOR Society of Actuaries



Caveat and Disclaimer

This study is published by the Society of Actuaries (SOA) and contains information from a variety of sources. It may or may not reflect the experience of any individual company. The study is for informational purposes only and should not be construed as professional or financial advice. The SOA does not recommend or endorse any particular use of the information provided in this study. The SOA makes no warranty, express or implied, or representation whatsoever and assumes no liability in connection with the use or misuse of this study.

Contents

Executive Summary 6

Section 1: Background 8

Section 2: Disclaimer 9

Section 3: Introduction 10

3.1 Study Scope 10

3.2 Data Collection, Validation and Analysis 10

3.3 Data Adjustments and Exclusions 11

3.4 Lapse Study Specifications....................12

3.5 Mortality Study Specifications....................14

3.6 Distribution of Data 17

3.7 Statistical Analysis 20

Section 4: Lapse and Mortality Experience 21

4.1 Overview....................21

4.2 Comparison of Jump to ART and Graded PLT Structures 21

4.2.1 Shock Lapse and Initial Mortality Deterioration....................22
4.2.2 Deep Dive into Jump to ART and Graded Differences 23

4.3 Comparison by Term Plan 28

4.3.1 Lapse 29
4.3.2 Mortality 33

4.4 Company Variation....................39

4.5 Comparison of Other PLT Structures....................40

Section 5: Deep Dive into Lapse Experience 43

5.1 Overview....................43

5.2 Variable Selection....................43

5.3 Shock Lapse by Key Explanatory Variables....................46

5.3.1 Premium Jump 46
5.3.2 Attained Age....................48
5.3.3 Premium Mode 49
5.3.4 Billing Type 50

5.4 Shock Lapse by Other Explanatory Variables 51

5.4.1 Face Amount 51
5.4.2 Risk Class....................53
5.4.3 Gender 58
5.4.4 External Variables....................59

5.5 Lapse Skewness 61

5.6 All PLT Duration Lapses 66

5.6.1 Premium Jump 67

5.6.2 Cumulative Premium Jump....70
5.6.3 Attained Age....72
5.6.4 Billing Type....73
5.6.5 Other Variables....74
5.7 Lapse and Conversion Comparison....74
5.8 Comparison to 2014 U.S. PLT Study....78
Section 6: Deep Dive into Mortality Deterioration....81
6.1 Overview....81
6.2 Variable Selection....81
6.3 Key Explanatory Variables....84
6.3.1 Premium Jump....85
6.3.2 Billing Type....88
6.3.3 Attained Age....90
6.3.4 Risk Class....93
6.4 Other Explanatory Variables....98
6.4.1 Face Amount....98
6.4.2 Premium Mode....102
6.4.3 Gender....104
6.4.4 Conversion Option Available....106
6.4.5 Other Variables....108
6.5 Alternative Approach....110
6.6 Analysis of Deaths....114
6.6.1 Cause of Death....114
6.6.2 Timing of Death....117
6.7 Comparison to 2014 U.S. PLT Study....118
Section 7: Predictive Modeling....121
7.1 Lapse Modeling....121
7.2 Mortality Deterioration Modeling....122
7.3 Additional insights....122
7.4 Modeling Approach....122
Section 8: Survey Results....124
8.1 Overview....124
8.2 Rate Change Practices....124
8.3 Persistency Management....125
8.4 Billing Practices....126
8.5 Accelerated Underwriting....128
Section 9: Acknowledgments....130
Appendix A: Study Participants....131
A.1 Companies Contributing Data....131

A.2 Companies Contributing to the Survey 132
Appendix B: 2015VBT RR Table Analysis 133
Appendix C: Count Versus Amount Analysis 136
Appendix D: Lapse Rate Tables 141
Appendix E: Detailed Description of Variable Selection 147
Appendix F: USA Study 2021 vs Canada Study 2020 148
F.1 Lapse Experience 148
F.2 Mortality Deterioration 152
References 154
About The Society of Actuaries 155

U.S. Post-Level Term
Lapse and Mortality Experience

Executive Summary

U.S. Term Plans and Features

Term Life insurance is a popular product in the U.S. As a growing number of policyholders have been reaching the end of the level term period, the SOA has been committed to studying policyholder behavior in the post-level term (PLT). Shock lapse, post-level term lapse and mortality have previously been analyzed in SOA PLT studies conducted in 2010 and 2014. This study provides an update of experience and some valuable new insights.

PLT experience data were available for level term plans 10, 15 and 20 (T10, T15, T20). More lapse and mortality data were available than in prior studies, and T20 data were presented for the first time. A comparison of results by term plan showed lapse experience at the end of the level term period and lapse rates in PLT appear very similar between T10 and T15. Though only initial lapse and mortality experience was available for T20, the relationships were similar to the other term plans.

Prior studies focused on the Jump to ART PLT premium structure, which is the most common structure for the U.S. term market. Jump to ART is characterized by a large increase in premiums at the end of the level term period followed by premiums that increase annually on an ART scale. In more recent years, the Graded PLT premium structure has become popular. Graded PLT premium structures tend to have a linear grade between the level period and an ultimate ART premium scale over a defined number of years. This produces lower initial premium jumps but more significant jumps during the grading period. This is the first PLT study that provides lapse and mortality analysis for the Graded PLT premium structure.

Impact of Premium Increase

Shock lapse and initial mortality deterioration levels were higher for higher premium increases. Depending on the size of the premium increase at the end of the level term, shock lapses ranged from 27% to 96% for Jump to ART and from 31% to 80% for Graded. Mortality deterioration in the first year in PLT relative to level term mortality ranged from 154% to 1,066% for Jump to ART and from 127% to 247% for Graded. Graded structures are designed to have a lower initial premium jump with the objective to reduce the anti-selective lapses at the end of the level term period. The Graded design led to a lower range of premium jumps and, as a result, lower shock lapse and mortality deterioration.

For both premium structures, the highest lapse was the shock lapse at the end of the level term. While lapses remained high in PLT, a decreasing pattern by duration was observed. For the Jump to ART premium structure, data were available for 10 durations in PLT. For this premium structure, the lapse rates decreased by duration in PLT and began to level out after three to five durations to approximately 10%. The lapse and mortality experience by duration in PLT differed between the two PLT premium structures. Comparing the structures over the same premium jump range, shock lapses were similar, but higher lapses were observed for Graded in all four PLT durations for which Graded data were available. The results showed that larger premium increases in each year in PLT were consistent with higher lapses, and this subsequent duration premium increase information was key to explaining differences between PLT premium structures.

Jump to ART with larger premium increases showed a higher shock lapse and higher mortality deterioration in the first year in PLT. Over the lower premium increase ranges common to both structures, Jump to ART and Graded showed similar levels of mortality deterioration in the first year in PLT. Jump to ART showed a decreasing pattern of deterioration over time, while mortality deterioration stayed relatively level for the three PLT durations for Graded. The decreasing pattern of mortality deterioration for Jump to ART was investigated with

10 years of data in PLT, and the mortality deterioration was observed to reduce below 200% of level period mortality after three to five durations.

Impact of Other Factors

Analysis of company variation highlighted how widely PLT lapse and mortality experience can vary, even for a given premium increase. Additional factors were considered and statistical modeling techniques were applied to provide insights into the predictive value of each factor. Premium increase, attained age and billing type were identified as important factors in both the lapse and mortality analysis. Premium mode was also important for lapse analysis, while risk class was important for mortality analysis. A separate report entitled *U.S. Post-Level Term Lapse and Mortality Predictive Modeling* will be published subsequently covering more detailed statistical analysis with predictive modeling for lapse and mortality.

The attained age of the policyholder at the end of the level term impacted lapse and mortality with an increasing pattern observed with increasing attained age. This is partly explained by higher premium jump ratios at higher attained age, but further differences by attained age were evident after controlling for differences in premium jump ratios. The absolute level of PLT premium is also higher for older policyholders. Attained age as a predictor of PLT experience captures variation due to both relative and absolute premium increases.

Policies with a monthly premium mode showed a much lower shock lapse than policies with an annual premium mode even when premium jump ratios were the same. This pattern was also observed in the mortality analysis with higher mortality deterioration when premium mode was annual compared to monthly. When premium was paid monthly, more of the lapses in the first duration in PLT occurred in the early months of the policy year. The analysis of lapse timing showed a clear skew of lapses towards the end of the last duration of the level term period and the beginning of the first duration in PLT. Premiums were often paid for only part of the first year in PLT when more lapses tended to occur in the first few months. The extent of this skewness varied by premium mode and PLT structure.

Billing type was a new variable not available in prior studies. Policies that pay premiums under automatic payment showed lower shock lapses than policies that receive a bill for premiums due. Furthermore, when the billing type changed from automatic payment during the level term period to a bill sent for PLT premiums, the highest shock lapse and mortality deterioration were observed.

Analysis of lapse and mortality experience by risk class and face amount also provided some interesting observations. However, the main drivers of shock lapse are the premium increase, both relative and absolute, and the way the PLT premium is presented to the policyholder in terms of premium mode and billing type. There was a clear correlation between shock lapse and mortality deterioration as factors that lead to higher lapses also lead to higher mortality deterioration.

Section 1: Background

The Society of Actuaries ("SOA") engaged SCOR Global Life USA Reinsurance Company ("SCOR") to complete a research study on shock lapse, post-level term ("PLT") lapse and mortality experience for U.S. term life policies. SCOR engaged MIB as the data compiler for the study.

The objective of this research is to perform an experience study of shock lapse, post-level term lapse and mortality as an update to the prior studies released in July 2010 and May 2014.

The main goals of this study are to:

- Analyze the shock lapse at the end of level term and the lapse and mortality experience in PLT,
- Analyze experience on longer level term products where data are more credible than in prior studies (specifically 15- and 20-year level term),
- Deepen the understanding of experience in later durations in PLT where more credible data are available than in prior studies,
- Consider the impact that numerous variables, including premium increase, have on the lapse and mortality experience,
- Study other PLT structures that have become popular in the market, in particular Graded PLT premium structure, and
- Compare recent PLT experience with experience from the 2014 SOA PLT study.

The study includes a survey covering industry PLT practices and data analysis of lapse and mortality experience. These results are presented in section 8.

This updated study includes several enhancements relative to the prior studies:

- An additional five years of data now available and increased credibility in later durations.
- A first look at PLT experience for 20-year level term plans.
- A first look and credible experience for plans using a Graded PLT premium structure.
- A premium jump calculation based on total premium due in the first PLT duration relative to the level term premium. This differs from prior studies that used the premium rates per thousand, which did not include the policy fee.
- Billing type implications on experience.
- Mortality study based on the most recent industry mortality basis 2015 VBT.

Section 2: Disclaimer

This study is published by the Society of Actuaries ("SOA") and contains information from a variety of sources. It may or may not reflect the experience of any individual company. The study is for informational purposes only and should not be construed as professional or financial advice. The SOA does not recommend or endorse any particular use of the information provided in this study. The SOA makes no warranty, express or implied, or representation whatsoever and assumes no liability in connection with the use or misuse of this study.

SCOR, its officers, directors, employees and affiliates do not make any representation or warranty, express or implied, as to the accuracy or completeness of the contents of this study. SCOR disclaims liability for any damage or loss arising out of or resulting from any errors or omissions in SCOR's analysis, summary of the study results, or any other information contained in this study. In no case will SCOR be liable for any decision made or action taken in conjunction with the information in this study.

The study results are based on data received 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.

Section 3: Introduction

3.1 STUDY SCOPE

The study includes fully underwritten U.S. level term life policies with a specific focus on post-level term ("PLT") experience. The analysis was focused on level term plans 10, 15, and 20 for which credible PLT experience was available for a sufficient cross section of companies.

The data submitted were split by the main PLT premium structures:

1) **Jump to ART**: Premium increases at the end of the level term period follow an annual renewable term ("ART") scale in the PLT. This PLT premium structure is characterized by large increases in premiums at the end of the level term period, with initial premium jumps as high as 10, 20 or even 30 times the level period premium. After this large initial increase, premiums increase annually in smaller increments in line with typical age-related increases in mortality.
2) **Graded**: Premium increases at the end of the level term grade annually from the level premium until they reach an ART scale after a specified number of years. This PLT premium structure is characterized by generally lower initial premium jumps relative to the Jump to ART, usually no higher than five times the level term premium. A small amount of data with higher initial premium jumps is excluded from the study as it is not representative of this premium structure. After the initial premium increase, premiums continue to increase in subsequent years in significant step increases. This includes policies for which premiums were changed to Graded PLT premium structures and policies that had a Graded PLT premium structure from policy issue.
3) **Jump to New Level**: Premium increases at the end of the level term and then remains level for a new level term period or a series of level term periods.
4) **Decreasing Face Amount**: Premium remains level in PLT but the face amount of the policy decreases annually based on an ART scale.
5) **Expiry**: The policy expires at the end of the level term.

Most of the data in the study were on Jump to ART and Graded PLT premium structures. These were the primary focus of analysis. A high level analysis of data for Jump to New Level structure will also be discussed. Data for Decreasing Face Amount were not provided by a sufficient number of contributors to be considered for an industry study. Expiry policies were also not considered since PLT analysis is not relevant.

3.2 DATA COLLECTION, VALIDATION AND ANALYSIS

In March 2019, the SOA issued a data request for lapse and mortality experience data for U.S. term life policies from January 1, 2000 to December 31, 2017. A data request template was provided including a detailed description of the data being requested. Contributors were asked to submit data that had been made sufficiently anonymous prior to submission, such that the information provided did not identify any policyholders, contain any personally identifiable information or could not reasonably be associated with an individual.

In response to this data request, 25 companies contributed data for the study. Each data submission was sent to MIB for validation. The validation process consisted of two phases which required contributors to review, check for reasonableness and validate summary reports of their data submission. The syntax, validation and reasonableness report package contained a tool for identifying potential data issues and was critical towards ensuring that the data submission was accurate and complete. The lapse and mortality experience report included a summary of the contributor's experience results based on the data submission. The objective of this validation was to ensure the data to be included in the industry study accurately reflected the character of the company's actual business.

Some key data issues encountered during the validation phase included:

- Missing premium information,
- Inaccurate lapse date reporting due to grace period or reporting system lags, and
- Unreasonable results for earlier issue years.

If required, contributors resubmitted data after correcting issues or updating information. In some cases, subsets of the data submission were excluded when deemed unreliable by the contributor. With the 25 validated data submissions, MIB created aggregated datasets for analysis in this study.

After MIB securely transferred the aggregated datasets to SCOR, the data were stored on SCOR's Data Science platform on Azure enabling high-performance computing in a flexible and scalable system. SCOR incorporated the use of Databricks in Azure to further summarize the data for analysis. In addition, Tableau was used to provide interactive visual data analysis.

3.3 DATA ADJUSTMENTS AND EXCLUSIONS

Grace Period Treatment

As seen in prior studies, there is variation among companies in whether the grace period is properly excluded when recording the date of termination for non-death terminations. The data request template for this study explicitly outlined that the date of lapse should be recorded as the last premium paid through date and not the end of the grace period. During the data review process, each participant was asked to verify that termination dates were submitted in line with this definition. Specific follow-ups were conducted with individual participants where skewness of the lapse patterns over the policy year appeared unusual. In response, a number of participants resubmitted data after adjusting termination dates. Because of this robust process, no adjustment was required to correct for grace period treatment.

Non-Death Termination Date Adjustments

For non-death terminations occurring on an anniversary, or on a premium payment date if paid more frequently than annually, the date of termination was moved back by one day. This was done to ensure the lapses were assigned to the appropriate duration and, in particular, were not occurring on the first day of the post-level period if no post-level premiums were paid.

Anti-trust Adjustments

Adjustments were applied to eliminate anti-trust concerns where any one company contributed a significant proportion of the exposure in the study.

- Data for issue years pre-1990 were excluded as that information is dominated by a small number of participants.
- The Graded PLT premium structure has become widely used since 2013; however, prior to this, only a small number of study participants had experience data for this premium structure. To allow detailed analysis for this PLT premium structure, policies reaching the end of the level term prior to 2013 were excluded from the Graded analysis.
- Remaining anti-trust concerns were addressed by applying weighting factors to reduce the proportion contributed by any one participant. These weighting factors were applied equally to decrements, exposures and expected values and varied by the PLT premium structure and level term period.

ANB/ALB Treatment

The issue age and age basis of the policy were requested in the data submission. These items were then used when determining the appropriate mortality rate for the mortality study expected basis. No adjustments were made to the age based on the age basis.

Data Exclusions

Data outside of the scope of the study were excluded as follows:

- Policies issued pre-1990,
- Term plans other than T10, T15 and T20,
- A small amount of data for U.S. territories, and
- Policies issued with limited underwriting such as simplified issue.

An insignificant amount of data was excluded from the study. These exclusions had an immaterial impact on overall study exposure. Details are described below:

- Issue ages 0-17 since juvenile ages are uncommon for traditional level term business,
- Policies where face amount information was missing,
- Policies with errors in risk class and smoker information, and
- Denied claims.

Other Adjustments

Other adjustments were made to the data to accommodate errors and missing values.

3.4 LAPSE STUDY SPECIFICATIONS

Study Time Period

The lapse study covers issue years 1990+ and the study period 2000 to 2017. The lapse study is on a policy year basis with exposures calculated from policy anniversary to policy anniversary and only includes complete policy years within the study period.

Credibility

For lapse analysis, a credibility criterion is determined based on the Limited Fluctuation Credibility (“LFC”) Theory. Using the LFC approach, 271 lapses are required for full credibility, which is defined to be a 90% probability of being within 10% of the expected value. In the graphs shown throughout the report, lapse rates are only shown where LFC (90%,10%) criteria were fulfilled.

Lapse Decrement Definition

For the purposes of this study, the lapse decrement includes both lapse and conversion decrements. This is consistent with prior studies. This approach was used because some contributors were not able to distinguish between these decrement types. For the subset of data for which conversion decrements are separately identified, analysis of the individual lapse and conversion data is shown in section 6.6. Otherwise, the lapse rate discussed in this report is a combined lapse and conversion decrement.

Count versus Amount

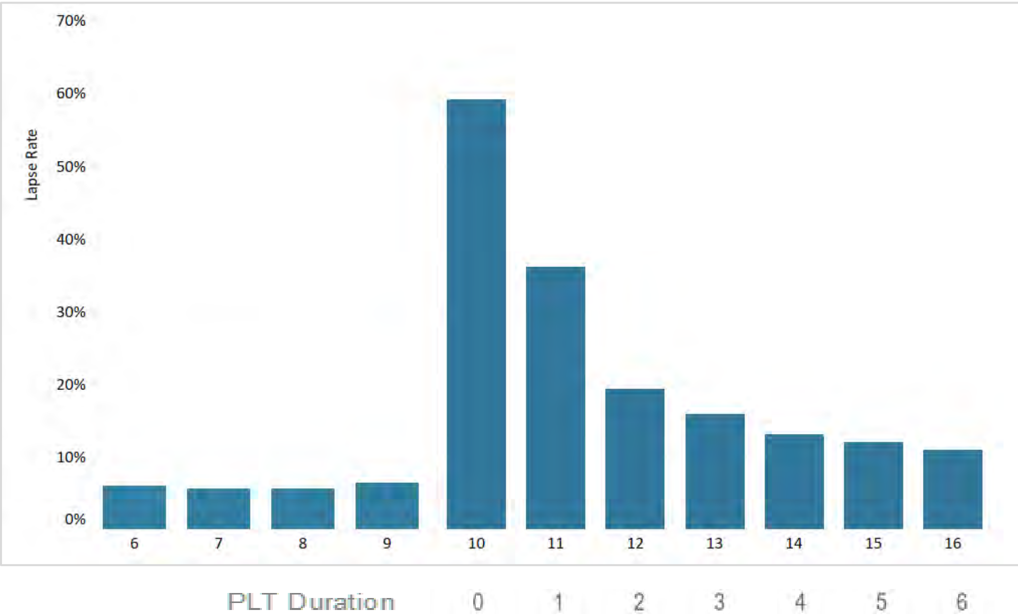
Lapse analysis is shown on a count basis throughout the report. This was based on comparing the number of policies lapsed to the policy count exposure for each view of the data. Analysis using an amount basis where the face amount of policies lapsed was compared to the face amount exposure was considered for comparison but did not provide a significantly different result. See details in appendix C which compares the shock lapse on an amount basis to shock lapse on a count basis across the range of premium jumps and suggests little difference in lapse rates.

Description of Calculations

For the PLT study, lapse analysis begins in the last duration of the level term period. A significant shock lapse occurs at the end of the level period before any PLT premiums are paid. For T10, lapse rates by duration are shown for Jump in ART in figure 3.4-1 below.

Figure 3.4-1

LAPSE EXPERIENCE BY DURATION – T10 ONLY, JUMP TO ART



In this report, the level term plans 10, 15 and 20 are frequently combined in the presentation of results. To accommodate this, PLT duration is defined as follows:

$$\textit{PLT Duration} = \textit{Duration} - \textit{Level Term Period}$$

PLT duration 0 will be equivalent to duration 10 for T10, duration 15 for T15, and duration 20 for T20. PLT duration is shown in figure 3.4-1 in addition to duration.

The lapse study was completed on a policy year basis where exposures start on the policy anniversary in the first calendar year that the policy contributes to the study and ends on the policy anniversary in the last calendar year that the policy contributes the study.

A policy year study is preferable for lapses which are not evenly distributed over the policy year. Instead, lapses tend to be clustered around policy anniversaries or premium payment due dates, and this pattern is exaggerated in the post-level term period. As a result, looking at partial policy years could misstate the lapse rates due to including a disproportionate share of lapses relative to the proportionate partial year of exposure. A policy year study includes observations from policy anniversary to policy anniversary so that only complete policy years are included in the study.

A full policy year of exposure was assigned for policies while in-force, and a full policy year of exposure was assigned in the year of decrement for lapse or conversion. Other decrements, including deaths and maturities, contributed to the exposure up to the termination date.

3.5 MORTALITY STUDY SPECIFICATIONS

Study Time Period

The mortality study covers issue years 1990+ and study years 2000 to 2017. The mortality study was completed on a calendar year basis.

Mortality Study Data Exclusions

The mortality study had one exclusion in addition to the exclusions applicable to the lapse study. Policies that had inconsistent substandard information or that were missing any piece of information relating to the table rating or flat extra (value or duration) needed for the calculation of the expected basis were not included.

Credibility

The mortality data were less credible than the lapse data in the post-level period with fewer than 100 claims at certain levels of granularity. In all exhibits, claim counts are provided as a high-level indication of the credibility of each result. Additionally, any cell that had fewer than 10 claims was not displayed in the exhibits. The fewer the claims, the more volatile the actual-to-expected ratios (“A/E”) can be, particularly by amount.

Count versus Amount

To reduce observed volatility, the mortality analysis in this report was completed on a count basis. In appendix C, a more thorough review of the count versus amount analysis is provided.

Description of Calculations

The exposure was calculated in the following manner for the calendar year study:

- Each policy received a full calendar year of exposure when inforce (except in the year of issue),
- The policy received the full calendar year of exposure in the year of death, and
- The exposure ended on the termination date in the year of a non-death termination.

The expected basis was calculated by first determining the appropriate mortality rate (“q_x“) from the relevant industry table. This was then multiplied by the table rating (when applicable) and the flat extra amount (when applicable) was added to the resulting number. The exposure was then multiplied by this adjusted q_x, resulting in the expected mortality. The formula is as follows:

$$Expected = Exposure \times ((q_x \times table\ rating) + flat\ extra)$$

The mortality deterioration was calculated as the actual-to-expected ratio ("A/E") in the post-level term period divided by the A/E ratio in the level term period. The durations of the level period used in the mortality deterioration calculation varied by the level term period as follows:

- T10 – durations 6 to 10
- T15 – durations 6 to 15
- T20 – durations 11 to 20

Below is an example of the mortality deterioration calculation using numbers taken from table 3.5-1 below.

$$Mortality\ Deterioration\ (Dur\ 11) = \frac{\frac{A}{E}15VBTCount(Dur\ 11)}{\frac{A}{E}15VBTCount(Dur\ 6-10)} = \frac{247.0\%}{100.3\%} = 246.2\%$$

Table 3.5-1

JUMP TO ART, T10 BY DURATION

Duration	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
6	1,526.5K	3,011	101.0%	100.7%
7	1,379.1K	3,059	99.8%	99.5%
8	1,250.7K	3,247	102.5%	102.2%
9	1,133.1K	3,192	98.8%	98.5%
10	987.9K	3,102	99.5%	99.1%
6-10	6,277.3K	15,611	100.3%	100.0%
11	263.5K	1,146	247.0%	246.2%
12	184.2K	635	191.9%	191.2%
13	135.4K	450	170.2%	169.6%
14	102.1K	382	174.8%	174.3%
15	77.5K	308	169.5%	169.0%
16	58.2K	220	150.0%	149.5%

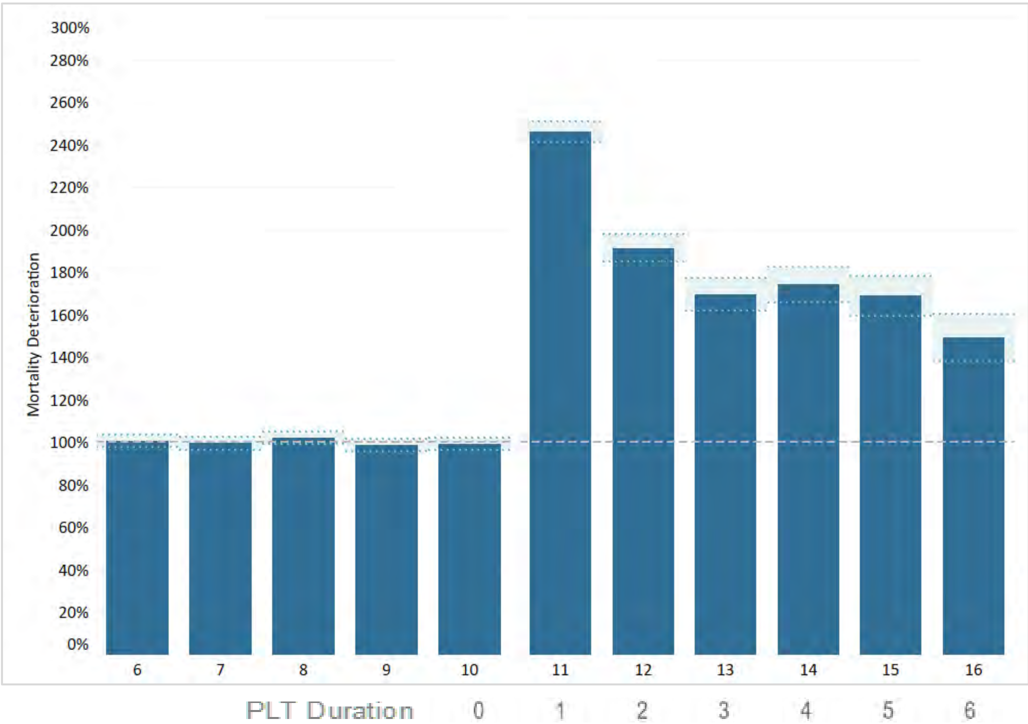
A graphical view of this example is shown in figure 3.5-1 below. One other item to note on this graph is the band around the top of each bar. This represents the 90% confidence interval for the mortality deterioration and is calculated as follows:

$$90\%\ Confidence\ Interval = Mortality\ Deterioration \pm 1.645 \times \frac{1}{\sqrt{Number\ of\ Claims}}$$

Each bar chart in the mortality section of this report will include this confidence interval calculation.

Figure 3.5-1

MORTALITY DETERIORATION BY DURATION, T10 ONLY AND JUMP TO ART



When reviewing the results by different variables, the level period mortality also varied by the factors shown with two exceptions. The first exception is the PLT structure. The level period base for Jump to ART and Graded were combined for companies with both structures. This was done because there were some instances where the claims seemed to be in a different structure than the exposures, likely due to a change in PLT structure at some point in the life of the product. When there was a change in structure for a product or company, claims that had occurred before the change of structure remained in the original structure while all the inforce policies (and therefore the majority of the exposure) moved to the new structure. This caused the level period A/E to be artificially high for the original structure and artificially low in the new structure. This approach is justified as the PLT structure should not impact the mortality results in the level period.

The second exception occurs when studying the mortality deterioration by premium jump. The premium information was not requested unless a policy had reached the final duration of the level period (e.g., duration 10 for T10). The result of this is that any deaths in durations prior to that final duration would not have an associated premium jump. The A/E in PLT by premium jump compared to the corresponding level term A/E would lack credibility. This was remedied by using all level period mortality as the base for each of the premium jumps. This approach is appropriate since the level period mortality should not vary by the post-level period premium jumps.

Throughout this report, unless stated otherwise, the three level term plans (T10, T15, T20) are combined for the presentation of mortality results, similar to the lapse analysis. To accommodate this, any view by duration uses the field, PLT duration. This is calculated as follows:

PLT Duration=Duration−Level Term Period

All level term durations will have a PLT duration of <1. PLT duration 1 will be equivalent to duration 11 for T10, duration 16 for T15, and duration 21 for T20.

Expected Mortality Basis

The majority of the mortality analysis in this report uses the 2015 Valuation Basic Table ("15VBT") to calculate the expected mortality. When "mortality deterioration" is referenced, it will be on a 15VBT count basis, unless stated otherwise.

The 15VBT has a series of relative risk ("RR") tables that are intended to be used for different risk classes. These range from RR50 to RR175 for non-smokers and RR75 to RR150 for smokers. For reference, the base 15VBT is RR100 for both non-smokers and smokers. The expected mortality was calculated using the RR table associated with the individual policy risk class and used when studying the mortality deterioration by risk class (appendix B).

The SOA's 2014 PLT study utilized the 2008 Valuation Basic Table ("08VBT") as its expected basis. To that end, section 6.7 of this report, which compares the mortality results of the 2021 study to the 2014 study, will use the 08VBT as its expected basis to provide a consistent comparison.

3.6 DISTRIBUTION OF DATA

The 25 study participants represent large, medium and small U.S. term writers. Each provided data submissions that differed in size. The largest contributor's data account for 17% of exposure overall. Three participants each account for over 10% of study exposure, six participants each account for over 5% of the study exposure, while the remaining 16 participants each account for 2% or less of the study exposure.

This post-level term study includes significant data for two PLT premium structures (Jump to ART and Graded) and three level term period products (T10, T15 and T20). A breakdown of the lapse and claim data available for the post-level term study is provided in table 3.6-1 below:

Table 3.6-1

STUDY DECREMENTS BY TERM PLAN AND PLT STRUCTURE

PLT Structure	Term Plan	Lapse Count	Death Count
Jump to ART	10	716,328	3,861
	15	108,576	710
	20	18,017	59
Graded	10	101,081	432
	15	42,993	242
	20	16,815	82

Lapse counts shown include lapses occurring in the last duration of the level term when the shock lapse is observed (PLT duration 0), as well as lapses in the post-level term period (PLT durations 1+). Claim counts represent claims in the post-level term period only (PLT durations 1+).

T10 and T15 plans had sufficient lapse and mortality data for an in-depth analysis. T20 data were less credible and provided some initial insights only. Sufficient data were available for both PLT premium structures, Jump to ART and Graded. This is the first industry study that provides insights into Graded PLT premium structures.

Post-level term experience was available for 10 durations for T10 and T15, although credibility was an issue after duration 7 for T15. T20 experience was available mainly in the shock lapse duration at the end of the level term, with limited data for two durations in the PLT period. Table 3.6-2 below shows the lapse counts by duration and term plan.

Table 3.6-2

LAPSE COUNTS BY PLT DURATION AND TERM PLAN

	Level Term Period		
PLT Duration	10	15	20
0	576,770	124,168	30,787
1	134,346	18,005	3,434
2	41,352	4,144	548
3	23,165	1,960	62
4	13,499	1,080	0
5	9,008	711	
6	6,069	527	
7	4,283	370	
8	3,007	269	
9	2,125	169	
10	1,489	110	

Claims were available over a similar period, although credibility was reduced in later durations for all term plans. Table 3.6-3 below shows the claim counts by duration and term plan

Table 3.6-3

CLAIM COUNTS BY PLT DURATION AND TERM PLAN

	Level Term Period		
PLT Duration	10	15	20
1	1,413	420	104
2	734	185	28
3	494	105	9
4	398	69	0
5	314	54	0
6	220	43	
7	200	24	
8	131	20	
9	131	15	
10	96	13	

Premium information was provided for over 60% of the data submitted. This varied by term plan, with premium information provided for just under 60% of T10 data and approximately 75% of T15 and T20 data. More exposure data were available for lower premium jump ranges where business more often persists into the PLT period. Table 3.6-4 below shows the distribution of the number of lapse exposures by premium jump. Lapse exposure shown includes the last duration of the level term when the shock lapse is observed and the post-level term period.

Table 3.6-4

DISTRIBUTION BY PREMIUM JUMP (LAPSE COUNT EXPOSURE)

	Level Term Period		
Initial Premium Jump	10	15	20
Not Available	43%	31%	25%
1.01x-3.00x	34%	16%	42%
3.01x-5.00x	11%	31%	19%
5.01x-10.00x	7%	15%	12%
10.01x-20.00x	4%	5%	1%
20.01x+	1%	3%	0%

Issue years were grouped into cohorts when analyzing the data with the most data available for issue year cohort 2000 to 2004. The longer-term products that contribute PLT experience for the study have earlier issue years as expected. Table 3.6-5 below shows the distribution of the study exposures by issue year cohort.

Table 3.6-5

DISTRIBUTION BY ISSUE YEAR (LAPSE COUNT EXPOSURE)

	Level Term Period		
Issue year group	10	15	20
1990-1994	7%	28%	15%
1995-1999	24%	39%	85%
2000-2004	49%	34%	
2005-2009	21%		

This post-level term industry study includes more data than prior studies as more business has reached the PLT period. Table 3.6-6 below compares the data available for each of the three industry PLT studies to date.

Table 3.6-6

COMPARISON OF HISTORICAL PLT STUDY DATA

		SOA Study		
Term Plan		2010	2014	2021
10	Lapse Count	257,715	694,337	817,409
	% with Premium Information	34%	63%	60%
	Claim Count	763	3,380	4,293
15	Lapse Count	13,550	39,037	151,569
	% with Premium Information	90%	97%	75%
	Claim Count	158	444	952
20	Lapse Count	0	0	34,832
	% with Premium Information	0%	0%	70%
	Claim Count	0	0	141

This view includes data for all PLT premium structures combined to be consistent across all three studies. The 2021 study provides additional lapse and mortality experience for T10 and T15, in particular, providing more data at later durations for these level term products. In addition, the latest study includes PLT experience data for T20 for the first time.

3.7 STATISTICAL ANALYSIS

In addition to the traditional analysis, which considers each variable independently, statistical analysis was also deployed to help better understand the relationships among the many variables impacting policyholder behavior. A variable selection process was used to identify the most important factors impacting policyholder behavior. The findings of this process are discussed in sections 5.2 and 6.2 with details of the statistical model covered in appendix E. As a follow-up, predictive models will be presented for both lapse and mortality experience. A high-level introduction to the models and learnings is detailed in section 7. A full report detailing the final models and findings will be published in a separate report, *U.S. Post-Level Term Lapse and Mortality Predictive Modeling*.

In the traditional analysis, each view was considered independently, and different filters were applied as required to remove segments where data were not credible or points were dominated by one participant's data. For statistical analysis, the same dataset was used for the whole analysis. Any restrictions required for one variable were applied to the overall dataset. For example, premium jump was a key variable. In the traditional analysis, data where premium jump information was missing were excluded from views that include premium jump as a variable but were included for other views where premium jump was not analyzed. In statistical analysis, the data missing premium jump information were excluded from the dataset. As a result, the statistical analysis was based on a reduced dataset.

Section 4: Lapse and Mortality Experience

4.1 OVERVIEW

This section of the report analyzes how shock lapse, post-level term lapse and mortality experience vary by PLT premium structures, term plan and company.

Different PLT premium structures are analyzed separately to compare the lapse and mortality experience and, in particular, the pattern by duration in PLT due to different premium increases in each subsequent year. Jump to ART and Graded are the two main PLT structures for which data are available in this study. Some high-level analysis of the PLT structure Jump to New Level is considered in section 4.5. Analysis in this section highlights reasons to study the PLT structures separately. In sections 5 and 6, further lapse and mortality analysis is shown separately for Jump to ART and Graded to provide analysis specific to each PLT structure.

PLT experience data were available for T10, T15 and T20 products. In section 4.3, the lapse and mortality experience for each of the three term plans is compared. Some apparent differences in lapse and mortality experience among the term plans are investigated in this section with the conclusion that the pattern of experience is similar among the three term plans. In sections 5 and 6, the three term plans are combined based on the findings of the comparative analysis.

Analysis of lapse and mortality experience by company in section 4.4 highlights a wide variation in results. This is investigated further in sections 5 and 6 with analysis by many variables that impact policyholder behavior such as premium jump, attained age, billing type, risk class, premium mode and other policy characteristics.

Throughout the analysis, the initial premium jump is defined as the ratio of the first PLT premium to the level term period premium. This is in line with the actual premium increase presented to the policyholder. The 2014 SOA PLT study calculated the initial premium jump as the ratio of the per thousand premium rate in the first duration in PLT to the per thousand premium rate in the level term period. This calculation did not include the policy fee. The impact of this calculation difference is more material for lower face amount policies and policies with lower premium rates such as younger ages or super-preferred classes.

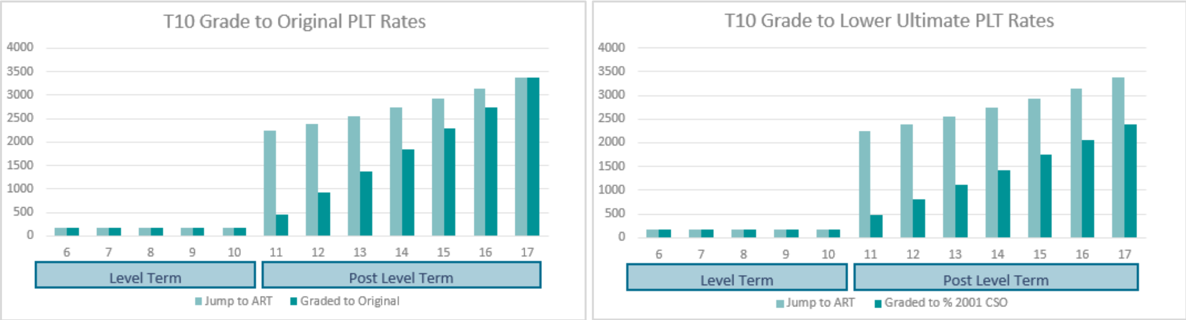
4.2 COMPARISON OF JUMP TO ART AND GRADED PLT STRUCTURES

In prior studies, analysis focused on the Jump to ART PLT premium structure with other structures combined in a ‘Jump to Other’ category. At the time, Jump to ART was the most common PLT premium structure in the U.S. term market. In more recent years, the Graded PLT premium structure has become popular and there are now sufficient data to analyze this separately.

Many companies have implemented a Graded PLT premium structure by changing the PLT premiums on inforce term business as it approaches the end of the level term period. Graded PLT premium structures are characterized by generally lower initial premium jumps relative to Jump to ART, followed by significant step increases in premium in subsequent years in PLT. The Graded premiums increase each year in PLT and can be designed to reach the original Jump to ART premiums (example below on left) or target a specified percentage of an industry table, often the preferred version of the CSO table (example below on right).

Figure 4.2-1

EXAMPLES OF PLT PREMIUM FOR GRADED COMPARED TO JUMP TO ART



These examples show a grading period of seven years, but the grading period varies from five to ten years.

In the data submitted for the study, Graded lapse and mortality experience data are available for a sufficient number of participants for study years 2013+. This includes policies for which premiums were changed to Graded PLT premium structures and policies that had a Graded PLT premium structure from policy issue.

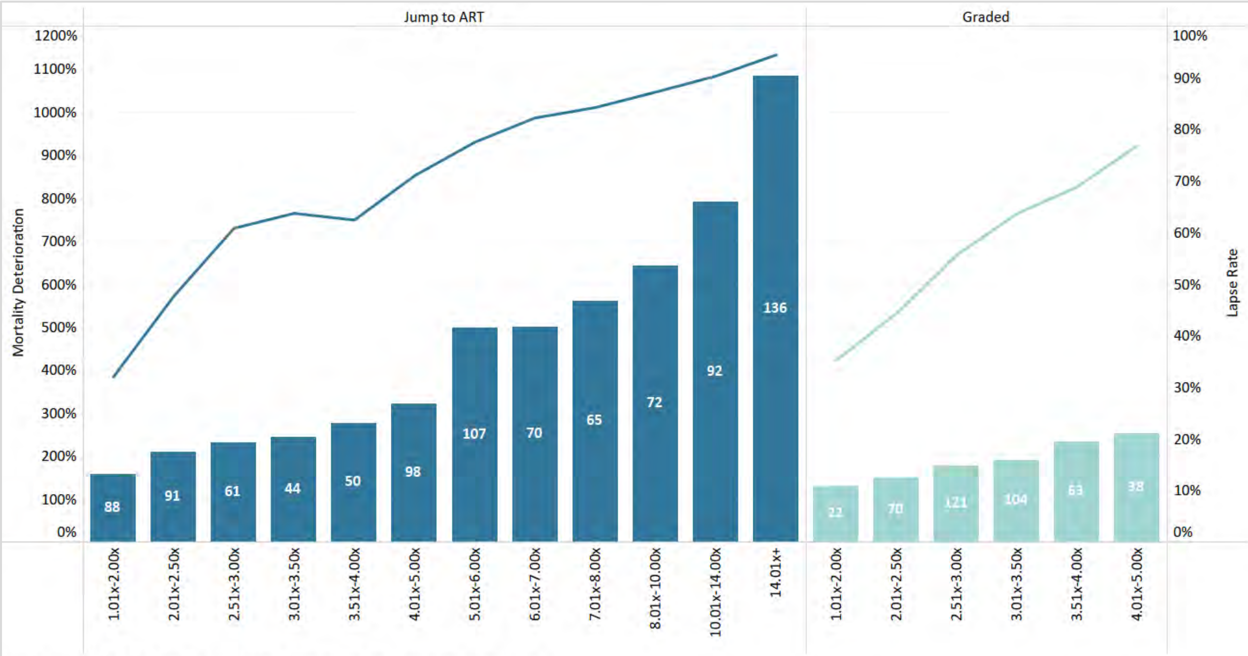
Due to these different PLT premium patterns, Jump to ART and Graded PLT premium structures are studied separately throughout this report (unless explicitly stated).

4.2.1 SHOCK LAPSE AND INITIAL MORTALITY DETERIORATION

For Jump to ART and Graded PLT structures, there is a similar well-defined relationship between initial premium jump, shock lapse at the end of the level term and initial mortality deterioration. Figure 4.2.1-1 shows the shock lapse in the last duration of level term plotted as a line and mortality deterioration in the first duration in PLT presented as bars.

Figure 4.2.1-1

SHOCK LAPSE IN PLT DURATION 0, MORTALITY DETERIORATION IN PLT DURATION 1 BY INITIAL PREMIUM JUMP AND PLT STRUCTURE



Results include T10, T15 and T20 combined. Numbers on bars represent claim count.

Shock lapse increases as premium jump increases with less policyholders willing to pay the higher premiums in PLT. As the shock lapse increases, the initial mortality deterioration in PLT also increases. The higher shock lapse leads to fewer remaining policyholders in the post-level term period. Mortality results confirm that the smaller this group is, the higher the mortality of those that remain.

For a given premium jump, a similar shock lapse at the end of the level term and initial mortality deterioration in PLT were observed for both structures. Policyholders were reacting to the initial premium increase only, and there was very little difference observed between the two structures over a similar initial premium jump range.

4.2.2 DEEP DIVE INTO JUMP TO ART AND GRADED DIFFERENCES

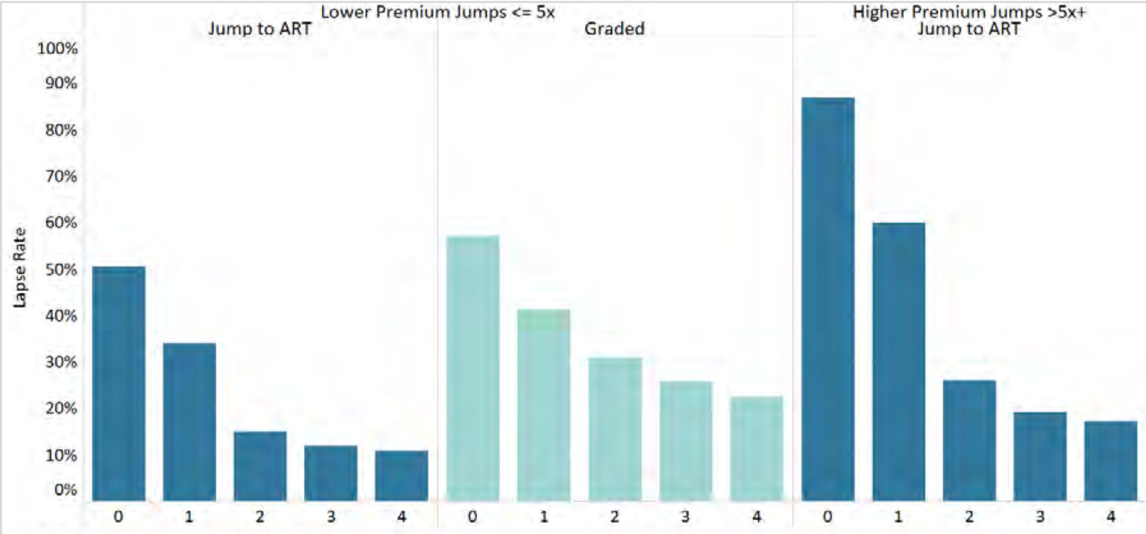
For Jump to ART and Graded PLT premium structures, shock lapse and initial mortality deterioration are comparable over the common premium jump range. However, the lapse and mortality experience in subsequent durations in PLT varies between the two PLT premium structures, driven by the differences in premium patterns.

To facilitate comparison between the two PLT structures, two premium jump groupings were defined. The lower premium jump group was defined as initial premium increases of less than five times the level term premium, and the higher premium jump group was defined as initial premium increases of five times or higher. The lower premium jumps align with the range of initial premium jumps that are common to both PLT structures, while the higher premium jumps are relevant only for the Jump to ART PLT structure.

Figure 4.2.2-1 shows lapse analysis by PLT duration and PLT structure separated into lower premium jump and the higher premium jump groups.

Figure 4.2.2-1

LAPSE BY PLT DURATION, INITIAL PREMIUM JUMP GROUP AND PLT STRUCTURE



Results include T10, T15 and T20 combined

Table 4.2.2-1

LAPSE BY PLT DURATION, INITIAL PREMIUM JUMP GROUP AND PLT STRUCTURE

		Jump to ART			Graded		
Premium Jump Group	PLT Duration	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Lower Premium Jumps <= 5x	0	282.1K	142,559	50.5%	198.2K	113,256	57.1%
	1	139.4K	47,470	34.1%	51.3K	21,201	41.3%
	2	90.2K	13,514	15.0%	19.3K	5,948	30.9%
	3	73.2K	8,705	11.9%	8.3K	2,142	25.8%
	4	60.4K	6,578	10.9%	2.8K	618	22.4%
Higher Premium Jumps >5x+	0	256.6K	222,648	86.8%			
	1	27.6K	16,616	60.1%			
	2	7.0K	1,813	26.0%			
	3	4.4K	846	19.1%			
	4	3.0K	516	17.3%			

As observed in section 4.2.1, the shock lapse in PLT duration 0 is similar between Jump to ART and Graded over a similar premium jump range. Jump to ART includes some very large premium jumps leading to higher lapses in PLT duration 0. Recall PLT duration 0 is the last duration of the level term, so no PLT premium is paid by these policyholders.

For Jump to ART, PLT duration 1 lapses are lower than PLT duration 0 shock lapses, but they are still significant. In subsequent years, the lapse rates are significantly reduced. For Graded, higher lapses are observed in all subsequent PLT durations 1 to 4 when comparing to Jump to ART over the same premium jump range. The higher lapses are attributed to the larger premium increases in each year in PLT for Graded compared to Jump to ART.

Comparing the two structures over similar premium jump ranges highlights that, while the initial shock lapse is similar, the lapse rates in subsequent durations in PLT differs between the structures.

The results over higher premium jumps for Jump to ART are also interesting to compare to the Graded results as some companies are considering a change from higher Jump to ART premiums to Graded structures with lower initial premium increases as outlined in section 4.2.

To facilitate comparison of the two PLT structures by duration, cumulative premium jump was defined as the ratio of the next duration PLT premium compared to the level term premium.

Taking initial premium jump group 3.01-4.00x as an example for both Jump to ART and Graded, the cumulative premium jumps can be compared by duration in PLT. To capture the higher initial premium jumps for Jump to ART, an initial premium jump group of 8.01-10.00x is also shown for this structure.

Table 4.2.2-2

LAPSE BY PLT DURATION, CUMULATIVE PREMIUM JUMP, PLT STRUCTURE AND INITIAL PREMIUM JUMP GROUP EXAMPLE CASES

PLT Structure	Initial Premium Jump	Cumulative Premium Jump	PLT Duration 0	1	2	3	4	5
Jump to ART	3.01x-4.00x	1.01x-2.00x						
		2.01x-3.00x						
		3.01x-4.00x	63.0%	42.9%	17.6%			
		4.01x-5.00x		45.4%	19.1%	14.9%	12.4%	
		5.01x-6.00x					14.7%	13.0%
		6.01x-7.00x						
		7.01x-8.00x						
		8.01x-10.00x						
		10.01x-14.00x						
		14.01x+						
	8.01x-10.00x	2.01x-3.00x						
		5.01x-6.00x						
		8.01x-10.00x	87.2%	64.0%				
		10.01x-14.00x		61.2%				
		14.01x+						
Graded	3.01x-4.00x	1.01x-2.00x						
		2.01x-3.00x						
		3.01x-4.00x	65.5%					
		4.01x-5.00x						
		5.01x-6.00x		48.6%				
		6.01x-7.00x		54.0%				
		7.01x-8.00x			37.7%			
		8.01x-10.00x			41.8%			
		10.01x-14.00x				34.6%		
		14.01x+						

For both structures, the premiums continue to increase by duration in PLT and, as a result, the cumulative premium jump is higher than the initial premium jump in later durations. The size of this difference varies between the two structures. Jump to ART policies with an initial premium jump in the range 3.01-4.00x could face a cumulative premium jump in the range 4.01-5.00x the level premium at the end of PLT duration 3. Graded policies with an initial premium jump in the range 3.01-4.00x face a cumulative premium jump in the range 10.01-14.00x the level premium at the end of PLT duration 3. The cumulative premium jump helps to explain the difference in lapse rates in PLT. In this example, PLT duration 3 lapse rates for Graded are more than double the lapse rate for Jump to ART. The higher premium increases in subsequent durations leads to a higher lapse rate for Graded policies compared to Jump to ART.

Comparing the initial jump of 8.01-10.00x seen for Jump to ART, to the Graded structure with an initial premium jump of 3.01-4.00x, is also of interest. Graded PLT with initial premium jump of 3.01-4.00x reaches a cumulative premium jump of 8.00-10.01x at the end of PLT duration 2.

To compare the two structures more concretely over different initial premium jump ranges, a persistency rate was calculated. In this case, persistency in PLT is calculated starting from the last duration of the level term. Persistency in PLT duration 1 reflects the proportion of policyholders remaining after the shock lapse. The calculation is cumulative and, in each PLT duration, the persistency reflects the proportion of policyholders remaining relative to those who have reached the last duration of level term. An example is shown below to illustrate.

Table 4.2.2-3

PERSISTENCY BY PLT DURATION, PLT STRUCTURE AND INITIAL PREMIUM JUMP GROUP EXAMPLE CASES

		PLT Duration						
PLT Structure	Initial Premium Jump	0	1	2	3	4	5	6
Jump to ART	3.01x-4.00x	100.0%	37.0%	20.9%	17.0%	14.5%	12.7%	11.2%
	8.01x-10.00x	100.0%	12.8%	4.7%	3.8%			
Graded	3.01x-4.00x	100.0%	34.5%	17.3%	10.5%	7.1%		

This persistency analysis measures the percentage of policyholders who are paying at least one PLT premium installment in each PLT duration after having paid the full year's premium in the prior duration. Comparing Jump to ART and Graded in the common initial premium jump group, persistency in PLT is higher for Jump to ART. This aligns with the lapse analysis above showing higher lapses in each duration in PLT for Graded due to higher premium increases.

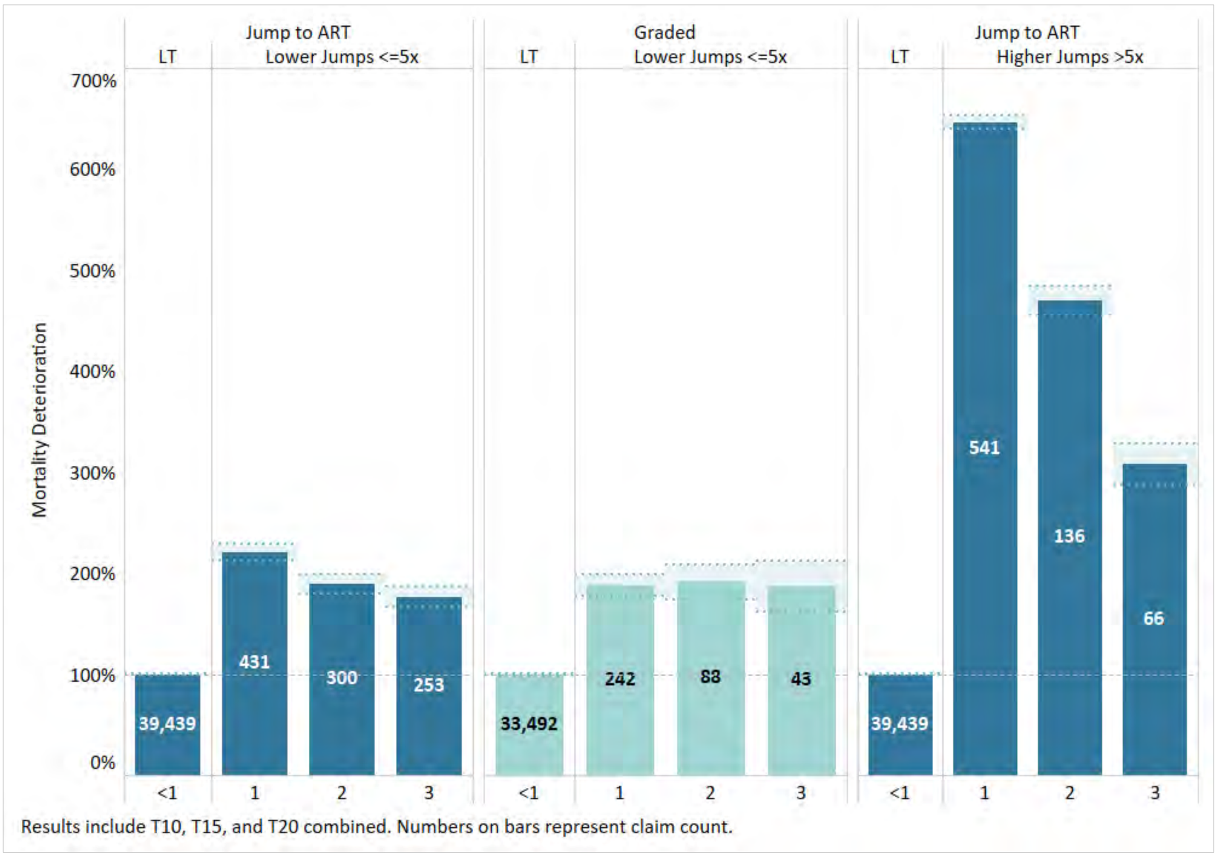
Persistency in PLT duration 1 for Jump to ART with an initial premium of 8.01-10.00x can be compared to persistency in PLT duration 3 for Graded with initial premium jumps of 3.01-4.00x that has cumulative premium jumps of 8.01-10.00x by PLT duration 3 (as shown in table 4.2.2-2). Few policyholders (12.8%) paid premiums of 8.01-10.00x their level term premium in PLT duration 1 for Jump to ART, and only 10.5% of policyholders paid premiums at 8.01-10.00x their level term premium in PLT duration 3 for Graded. The Graded structure shows better persistency over initial durations in PLT when cumulative premium jumps are lower than the higher initial premium jump for Jump to ART. Once the cumulative premium jump for Graded reaches the higher range (8.01-10.00x in this example), the persistency is similar to early PLT duration persistency for high Jump to ART premium jumps.

This persistency analysis was calculated on an annual basis. Given the large PLT premiums, the pattern of lapses over the policy year is also an important consideration. This skewness of lapses in each policy year is analyzed in section 5.5. In PLT duration 1, lapses are skewed to the start of the policy year. A significant proportion of the policyholders that reach PLT duration 1 will pay only one month of premium. This skew to the start of the policy year is less significant by PLT duration 3. The 10.5% of Graded policyholders reaching PLT duration 3 will persist for longer in that year paying the 8.01-10.00x premium than the 12.8% of Jump to ART policyholders reaching PLT duration 1. In this way, the skewness of lapses over the policy year needs to be considered to more directly compare the premiums paid under each structure.

In addition to differences in lapse experience by duration in PLT, different mortality patterns are also emerging between the two structures. Mortality deterioration by duration was compared between the two structures, using the same initial premium jump groupings (figure 4.2.2-2 below). The analysis only examines up through PLT duration 3 as the claim counts are very small for the Graded business past this point.

Figure 4.2.2-2

MORTALITY DETERIORATION BY PLT DURATION, PLT STRUCTURE AND INITIAL PREMIUM JUMP GROUP



Jump to ART with larger premium jumps show much higher mortality deterioration in each of the three PLT durations. There is a steep decreasing pattern by PLT duration for the higher jump group but, even by PLT duration 3, the deterioration remains higher than the two lower jump groups.

Lower jumps for Jump to ART and Graded show similar levels of deterioration. However, the pattern differs slightly with Jump to ART showing a decreasing pattern of deterioration over time (similar to the higher jump pattern), while Graded stays relatively flat. In fact, the Jump to ART lower jumps have higher deterioration than Graded in PLT duration 1 but lower deterioration than Graded in PLT duration 3. Note that Graded has fewer claims in PLT durations 2 and 3 and, as a result, the confidence intervals are wider in these durations. Table 4.2.2-4 below shows the underlying data for figure 4.2.2-2.

Table 4.2.2-4

PLT DURATION, PLT STRUCTURE AND INITIAL PREMIUM JUMP GROUP

PLT Structure	Premium Jump Group	PLT Duration	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	Lower Jumps <=5x	1	112.7K	431	207.5%	220.5%
		2	85.5K	300	178.6%	189.8%
		3	71.3K	253	166.1%	176.5%
Graded	Lower Jumps <=5x	1	34.9K	242	176.6%	187.8%
		2	13.0K	88	180.1%	191.6%
		3	6.3K	43	176.0%	187.2%
Jump to ART	Higher Jumps >5x	1	17.8K	541	608.3%	646.5%
		2	6.4K	136	442.2%	470.1%
		3	4.3K	66	289.5%	307.7%

4.3 COMPARISON BY TERM PLAN

U.S. term business with the feature of increasing premium at the end of the level term became popular in the early to mid-1990s. T10 and T15 plans have contributed PLT experience for the past two SOA studies, but T20 products have just started reaching the end of the level term period towards the end of the study period. Shock lapse at the end of the level term was analyzed in this section. Lapse and mortality by duration in PLT is not analyzed separately for T20 due to credibility issues but is included in the combined analysis in sections 5 and 6. T10 and T15 experience was available over a longer period in the study and, as a result, more detailed analysis was possible for these term products.

4.3.1 LAPSE

The relationship of increasing shock lapse with increasing premium jump was seen for all three term products. Figure 4.3.1-1 shows the shock lapse experience at the end of the level term for T10, T15 and T20 by initial premium jump.

Figure 4.3.1-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP AND TERM PERIOD

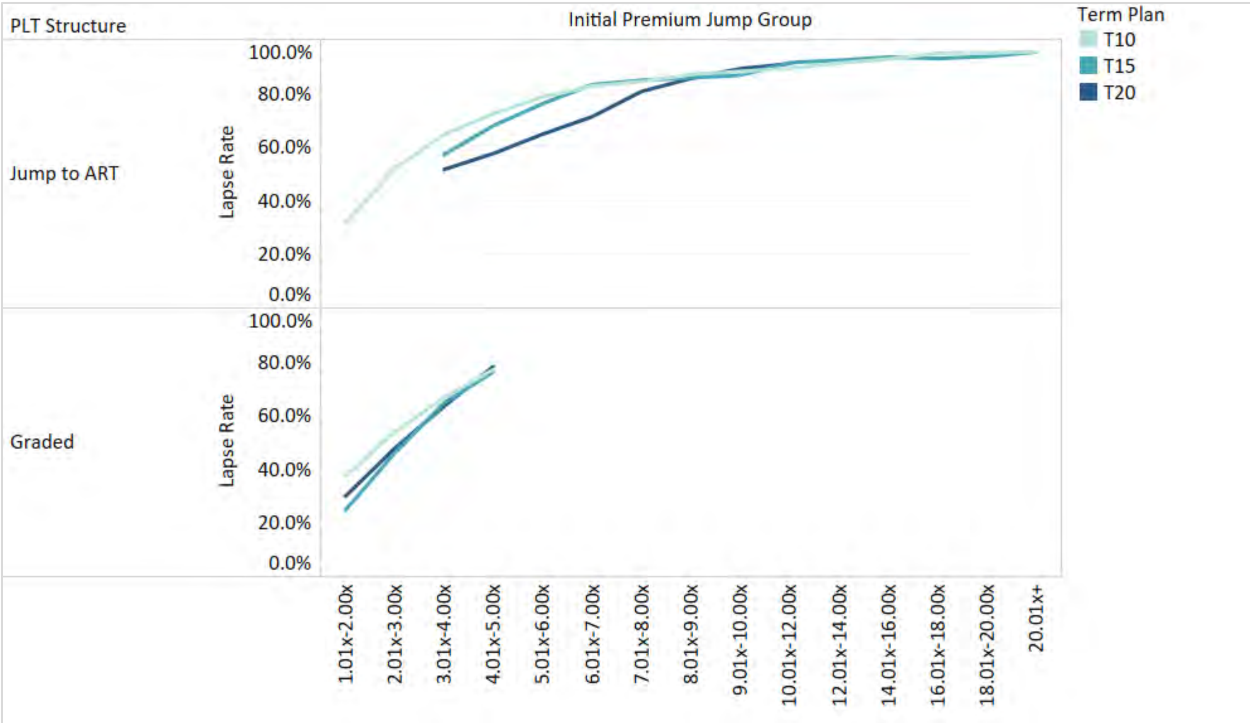


Table 4.3.1-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP AND TERM PLAN

PLT Structure	Initial Premium Jump Group	Term Plan T10 Exposure Count	T10 Lapse Count	T10 Lapse Rate	T15 Exposure Count	T15 Lapse Count	T15 Lapse Rate	T20 Exposure Count	T20 Lapse Count	T20 Lapse Rate
Jump to ART	1.01x-2.00x	95.6K	30,159	31.5%				0.1K	25	
	2.01x-3.00x	75.9K	39,422	51.9%				0.4K	131	
	3.01x-4.00x	42.8K	27,633	64.6%	10.4K	5,949	57.1%	0.7K	343	51.6%
	4.01x-5.00x	36.1K	26,129	72.4%	11.2K	7,581	67.9%	1.2K	666	57.5%
	5.01x-6.00x	28.9K	22,728	78.6%	11.2K	8,536	76.1%	1.3K	857	64.8%
	6.01x-7.00x	25.4K	21,000	82.6%	7.9K	6,556	83.2%	1.5K	1,084	71.2%
	7.01x-8.00x	22.6K	19,028	84.3%	6.1K	5,155	84.8%	1.7K	1,349	80.6%
	8.01x-9.00x	18.3K	15,935	87.0%	4.5K	3,866	85.7%	1.0K	892	85.5%
	9.01x-10.00x	15.1K	13,294	88.1%	3.6K	3,159	86.7%	0.8K	726	89.1%
	10.01x-12.00x	26.0K	23,231	89.2%	4.9K	4,515	91.4%	0.7K	658	91.0%
	12.01x-14.00x	16.6K	15,149	91.2%	3.5K	3,256	92.2%	0.1K	125	
	14.01x-16.00x	12.2K	11,346	92.7%	2.7K	2,489	93.4%	0.0K	22	
	16.01x-18.00x	8.5K	8,043	94.9%	2.0K	1,855	92.9%	0.0K	9	
	18.01x-20.00x	5.8K	5,516	95.0%	1.7K	1,561	93.7%	0.0K	7	
	20.01x+	13.9K	13,261	95.5%	7.8K	7,433	95.3%	0.0K	9	
Graded	1.01x-2.00x	16.0K	6,010	37.4%	1.7K	424	24.6%	3.3K	986	29.9%
	2.01x-3.00x	57.5K	30,920	53.8%	15.2K	7,015	46.0%	15.6K	7,442	47.7%
	3.01x-4.00x	37.0K	24,619	66.6%	23.6K	15,280	64.6%	8.0K	5,071	63.4%
	4.01x-5.00x	11.5K	8,873	77.1%	8.0K	6,101	76.3%	0.7K	518	78.2%

A similar pattern is observed for all three term plans with shock lapse rates increasing with increasing premium jumps. Shock lapse rates are also quite similar among the three term plans for a given premium jump.

For Graded, T10 lapse rates appear slightly higher than T15 or T20 for premium jumps less than three times with very similar lapse results among the three products for premium jumps 3.01-5.00x. For Jump to ART, more variation is observed over premium jumps 3.01-7.00x. T20 appears to have lower lapse rates than T10 or T15 over the 3.01-7.00x premium jump range but very similar shock lapse for 8.01-12.00x premium jumps. Over lower premium jumps, other variables have a more significant impact on the lapse rate as shown in section 5.

A smaller number of study participants provided data for T20. To further investigate the relationship among the term products, filtering was applied to only include participants that provided T20 data in the T10 and T15 shock lapse results. A similar pattern is observed confirming that the pattern seen by level term period is not impacted by company mix.

The shock lapse experience by attained age was also compared for the three term products.

Figure 4.3.1-2

SHOCK LAPSE BY ATTAINED AGE AND TERM PERIOD

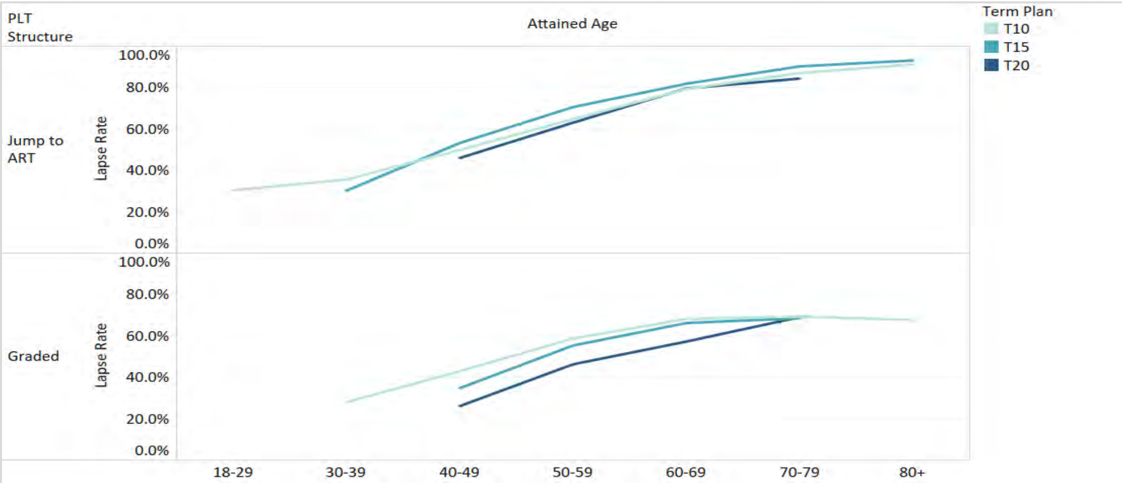


Table 4.3.1-2

SHOCK LAPSE BY ATTAINED AGE AND TERM PERIOD

		Term Plan								
		T10			T15			T20		
PLT Structure	Attained Age	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Jump to ART	18-29	5.6K	1,711	30.4%						
	30-39	132.3K	47,040	35.5%	1.5K	452	30.2%	0.0K	7	
	40-49	262.5K	130,825	49.8%	18.5K	9,840	53.2%	1.8K	816	46.0%
	50-59	248.0K	160,613	64.8%	43.6K	30,808	70.6%	9.2K	5,805	63.0%
	60-69	146.2K	116,018	79.3%	37.5K	30,657	81.9%	9.3K	7,367	79.6%
	70-79	41.6K	36,227	87.0%	16.2K	14,588	90.2%	2.8K	2,391	84.4%
	80+	5.1K	4,657	91.3%	4.3K	4,034	93.1%	0.2K	146	
Graded	18-29	0.8K	151							
	30-39	6.9K	1,931	27.9%	0.4K	73		0.0K	8	
	40-49	22.0K	9,448	43.0%	5.3K	1,845	34.7%	2.1K	534	26.1%
	50-59	44.5K	26,125	58.7%	19.0K	10,522	55.3%	13.4K	6,209	46.2%
	60-69	45.2K	30,791	68.1%	23.4K	15,489	66.2%	9.4K	5,382	57.2%
	70-79	13.6K	9,432	69.4%	7.5K	5,148	68.6%	2.9K	2,022	69.0%
	80+	1.1K	740	67.7%	0.2K	121				

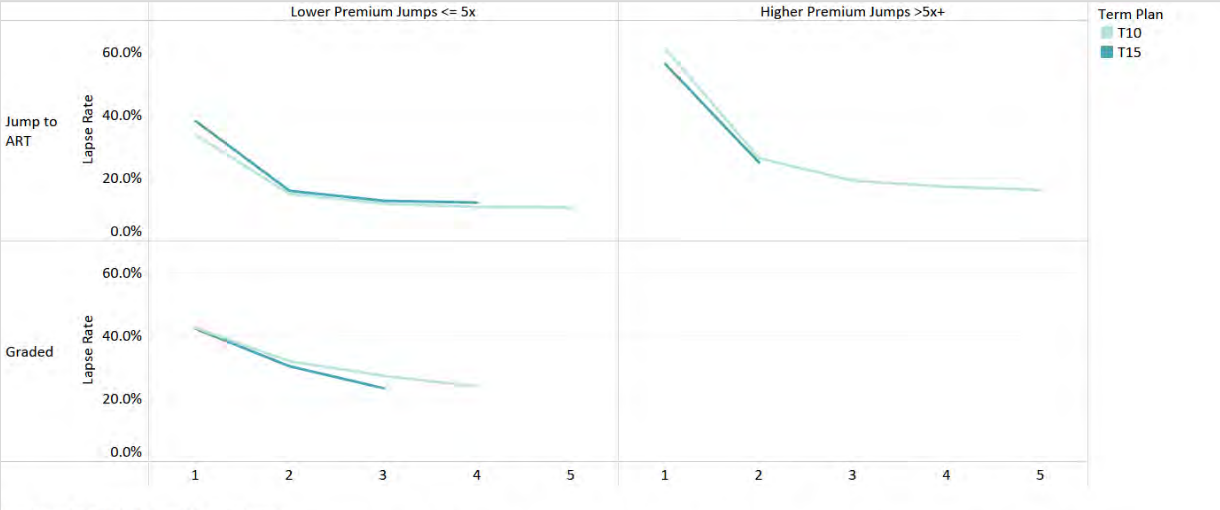
The pattern by attained age is very similar among the three products with increasing shock lapse as attained age increases. T20 appears to have somewhat lower lapse rates by attained age than the other two term products. Some variation is observed but results are broadly consistent for T10 and T15.

For shock lapse, the pattern by premium jump and attained age is consistent across all three term products. T20 appears to have somewhat lower lapse rates especially over lower premium jumps.

Lapse rates by duration in PLT are compared for T10 and T15 only as T20 does not have sufficient data available in the study period for further analysis. Figure 4.3.1-3 shows lapse rates by duration in PLT for T10 and T15 split into lower and higher premium jump groups as well as PLT structure.

Figure 4.3.1-3

LAPSE BY PLT DURATION, PREMIUM JUMP GROUP AND TERM PERIOD



Results include T10, T15 and T20 combined
Lapse rates are represented on the graph when a minimum of 271 lapse decrements is available. When sufficient data are available at one duration only, the lapse rate is represented by a dot. Otherwise, lapse rates by duration are represented by a line.

Table 4.3.1-3

LAPSE BY PLT DURATION BY PREMIUM JUMP GROUP AND BY TERM PERIOD

		Lower Premium Jumps <= 5x					Higher Premium Jumps >5x+				
PLT Structure	Term Plan	1	2	3	4	5	1	2	3	4	5
Jump to ART	T10	33.7%	14.9%	11.8%	10.8%	10.7%	61.1%	26.3%	19.1%	17.2%	16.2%
	T15	38.1%	15.9%	12.8%	12.2%		56.2%	24.8%			
Graded	T10	42.5%	31.8%	27.2%	23.8%						
	T15	42.1%	30.3%	23.3%							

Lapse rates decline by duration in PLT for both Jump to ART and Graded although, for Graded, the gradient is less steep and the lapse rates do not reduce as significantly by duration. The patterns and the levels of lapse rates are very similar between T10 and T15 for each of the groupings.

Lapse experience at the end of the level term and lapse rates in PLT appear very similar between T10 and T15. Though only initial shock lapse experience is available for T20, patterns are similar to the other level term products.

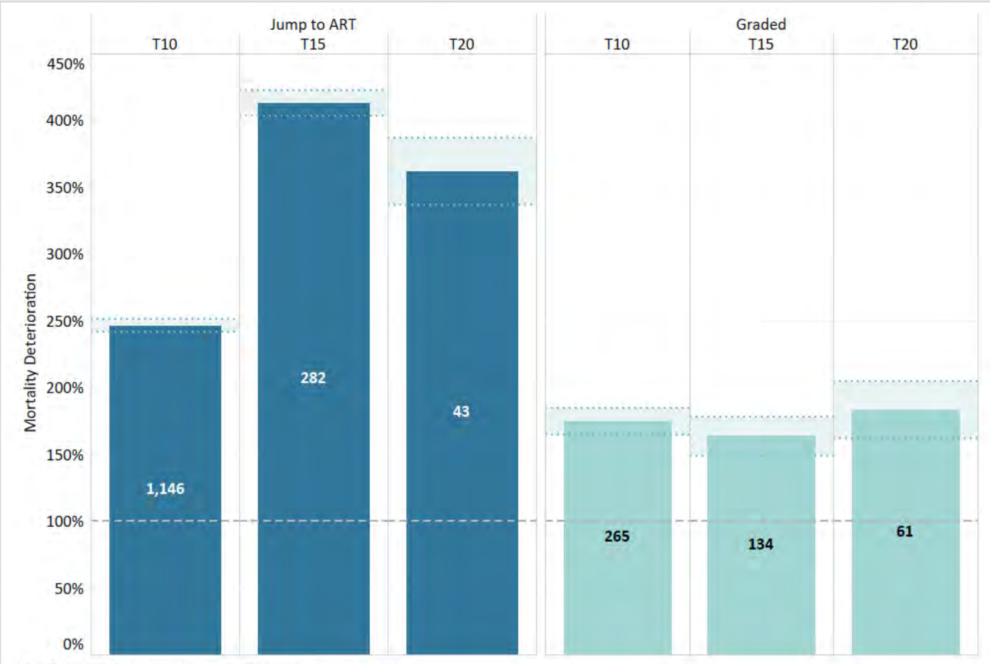
T20 contributes a much smaller proportion of PLT experience to the study. For the last duration of level term, T20 contributes 5% of lapse exposure, while T10 and T15 contribute 77% and 18%, respectively. Though there is some evidence of lower shock lapse for T20, including T20 in the combined analysis with T10 and T15 does not materially impact the overall result.

4.3.2 MORTALITY

The differences in mortality deterioration by term plan were also analyzed. The analysis in this section will continue to be split by PLT structure. Figure 4.3.2-1 displays the mortality deterioration by term plan for the first duration in the post-level term period.

Figure 4.3.2-1

MORTALITY DETERIORATION FOR PLT DURATION 1 BY TERM PLAN



Numbers on bars represent claim count.

Jump to ART saw differences in mortality deterioration among the three term plans with T10 being much lower than T15 and T20. T20 was also lower than T15. However, T20 only had 43 claims so this pattern may change in future studies that have more T20 claims. The Graded business showed very similar levels of mortality deterioration for all three term plans with T15 being slightly lower than the other two. Graded also had a low T20 claim count.

Table 4.3.2-1 below displays the exposure, death count, A/E, and mortality deterioration for each term plan for the two PLT structures during the level period and in the first duration of PLT.

Table 4.3.2-1

PLT DURATION <1 VS PLT DURATION 1 BY TERM PLAN

PLT Structure	Term Plan	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	T10	<1	6,277.3K	15,611	100.3%	100.0%
		1	263.5K	1,146	247.0%	246.2%
	T15	<1	3,846.6K	13,865	96.4%	100.0%
		1	20.0K	282	397.9%	412.9%
	T20	<1	6,846.2K	16,583	87.8%	100.0%
		1	3.1K	43	317.8%	361.8%
Graded	T10	<1	3,046.1K	10,393	100.6%	100.0%
		1	37.9K	265	175.7%	174.7%
	T15	<1	3,344.9K	12,478	96.7%	100.0%
		1	16.2K	134	158.2%	163.6%
	T20	<1	3,706.6K	10,621	85.8%	100.0%
		1	8.5K	61	157.1%	183.1%

The level period A/Es were somewhat different across the different term plans with T10 displaying the highest A/Es and T20 the lowest for both PLT structures. This pattern was not observed in the post-level period for Jump to ART but was for Graded. This indicates the mortality deterioration differences in Jump to ART were not driven by the level term A/E.

To explore the different results between T10 and T15, only companies that had business in both T10 and T15 were studied. Due to the low claim counts in the PLT period for T20 for both PLT structures, the remaining analysis will exclude T20. Figure 4.3.2-2 is similar to figure 4.3.2-1 but with only companies that had both T10 and T15 experience.

When only focusing on the common companies, T10 and T15 showed more similar levels of mortality deterioration for both Jump to ART and Graded, as shown in table 4.3.2-2 below.

Figure 4.3.2-2

MORTALITY DETERIORATION FOR PLT DURATION 1 BY TERM PLAN, ONLY COMPANIES WITH BOTH T10 AND T15

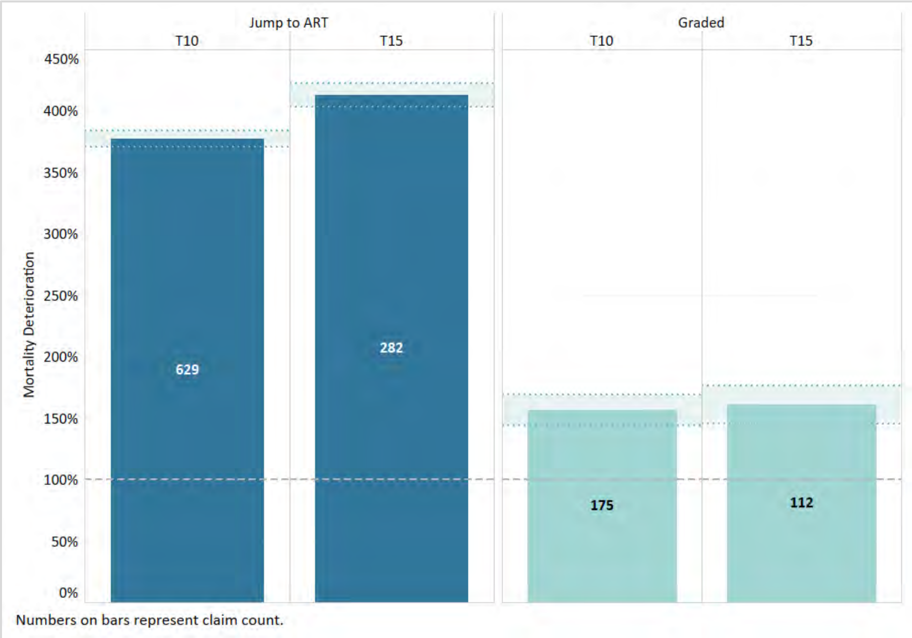


Table 4.3.2-2

PLT DURATION <1 VS PLT DURATION 1 BY TERM PLAN, ONLY COMPANIES WITH BOTH T10 AND T15

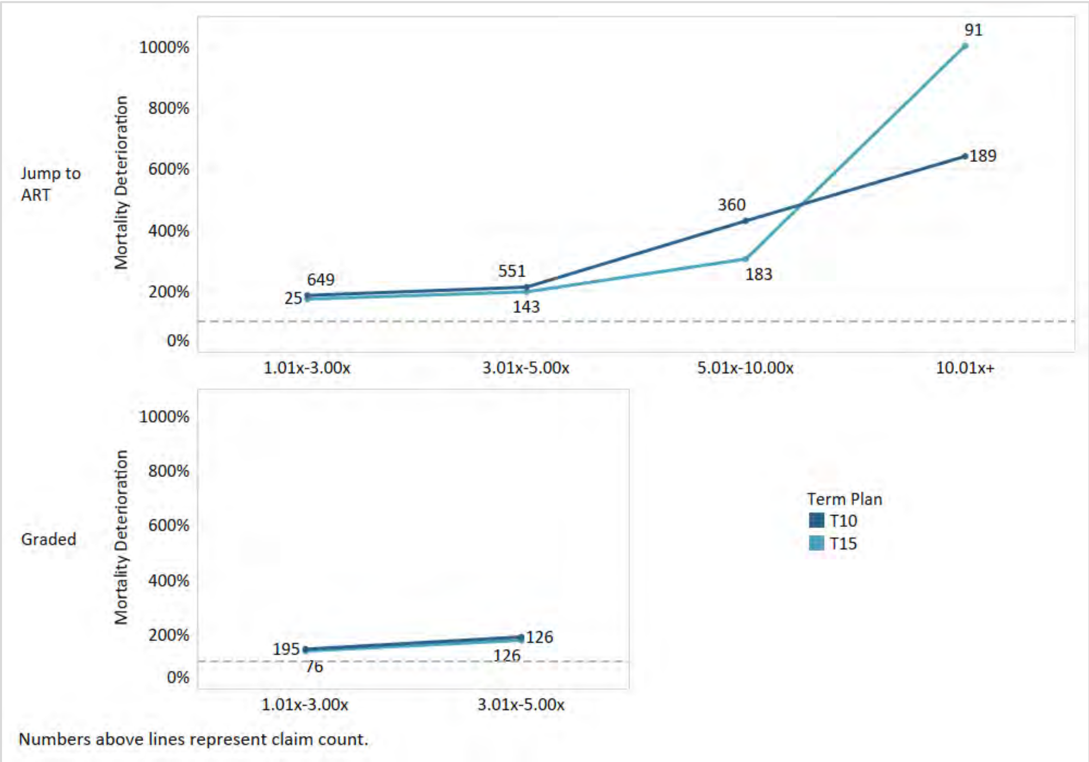
PLT Structure	Term Plan	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	T10	<1	3,175.4K	10,657	98.8%	100.0%
		1	72.2K	629	372.9%	377.5%
	T15	<1	3,690.9K	13,368	96.4%	100.0%
		1	20.0K	282	397.9%	412.7%
Graded	T10	<1	1,563.2K	5,906	101.9%	100.0%
		1	30.1K	175	159.4%	156.4%
	T15	<1	2,040.8K	8,194	99.1%	100.0%
		1	13.6K	112	159.4%	160.9%

The level period A/Es were now very similar for T10 and T15 for both structures. There were still slight differences in A/Es in the first duration of the post-level term period for Jump to ART, but the Graded PLT A/Es were even more similar for T10 and T15. The closer alignment now observed in the A/Es and mortality deterioration for T10 and T15 indicate that company mix differences were the main driver of the differences among term plans in figure 4.3.2-1.

The mortality deterioration for T10 and T15 was also reviewed for all PLT durations across all premium jumps using the common companies (figure 4.3.2-3).

Figure 4.3.2-3

MORTALITY DETERIORATION FOR PLT DURATION 1+ BY TERM PERIOD AND PREMIUM JUMP, ONLY COMPANIES WITH BOTH T10 AND T15

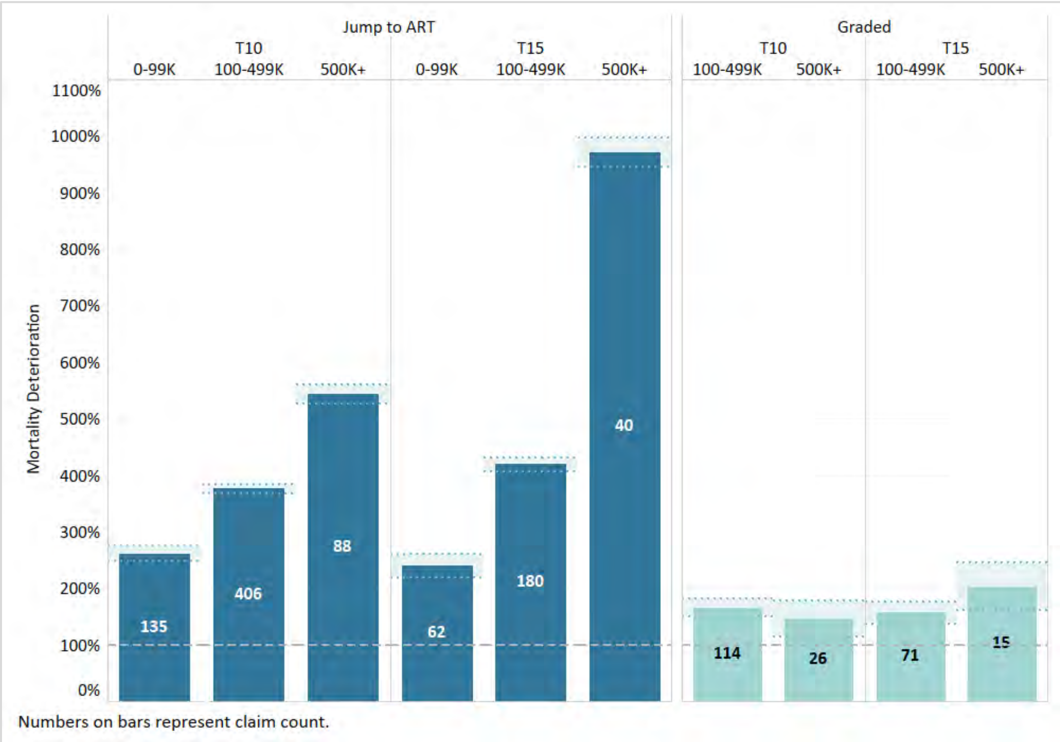


The small differences observed in the Jump to ART mortality deterioration between the two term plans in figure 4.3.2-3 seem to be driven by the higher premium jumps. T15 was lower than T10 for 5.01-10.00x jumps but much higher for 10.01x+ jumps. Lower jumps saw the same level of mortality deterioration for both structures.

Figure 4.3.2-4 below focuses on the impact of face amount on the mortality deterioration differences observed between T10 and T15.

Figure 4.3.2-4

MORTALITY DETERIORATION FOR PLT DURATION 1 BY TERM PERIOD AND FACE AMOUNT, ONLY COMPANIES WITH BOTH T10 AND T15



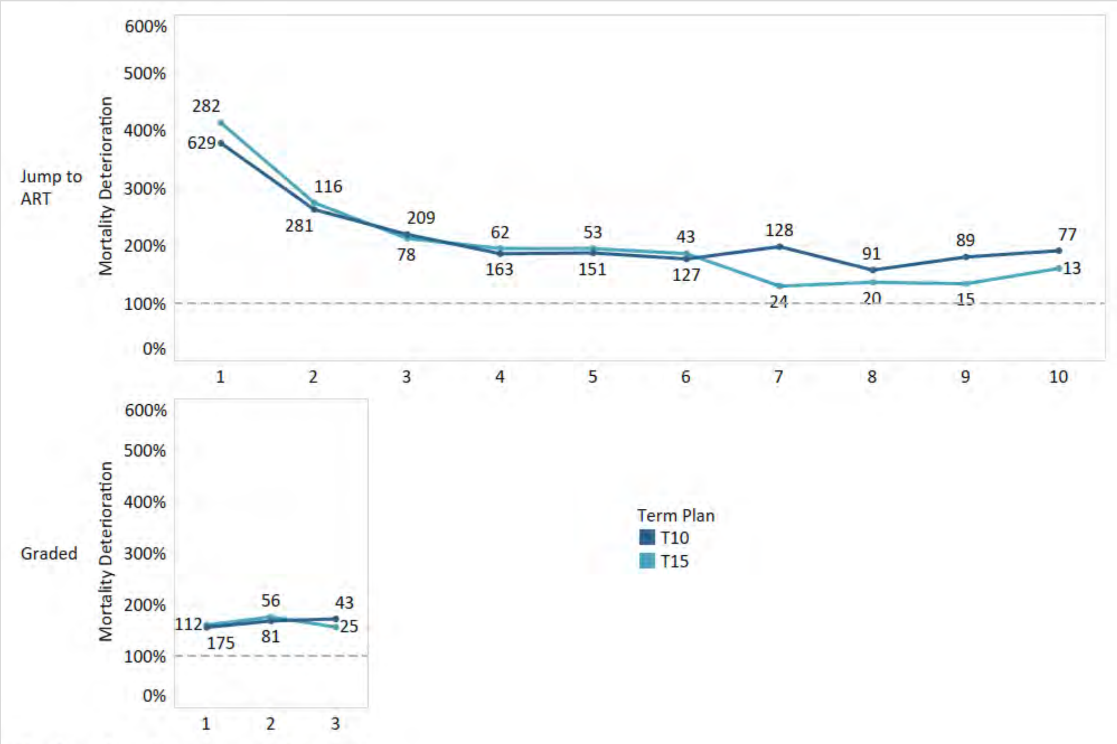
T10 and T15 showed similar levels of mortality deterioration for face amounts $0-99K and $100-499K for Jump to ART. However, the $500K+ bands are very different with T15 observing much higher levels of deterioration than T10. Please note that there are only 40 claims in this band. Face amount and premium structure were also studied with premium jump, but there were not enough claims to show the results. This analysis showed that the high level of T15 deterioration was concentrated in the highest premium jump group and that T10 did not observe this same level of deterioration in the highest premium jump group.

Graded did not show significant differences in mortality deterioration by face amount for T10 or T15, although it should be noted that claim counts were low, particularly for the $500K+ band.

Finally, the two term plans were compared across PLT duration (figure 4.3.2-5 below).

Figure 4.3.2-5

MORTALITY DETERIORATION BY TERM PERIOD AND PLT DURATION, ONLY COMPANIES WITH BOTH T10 AND T15



Numbers above lines represent claim count.

Across PLT durations, the two term plans showed very similar levels of mortality deterioration. The exception to this was when claims counts are low (less than 30 claims).

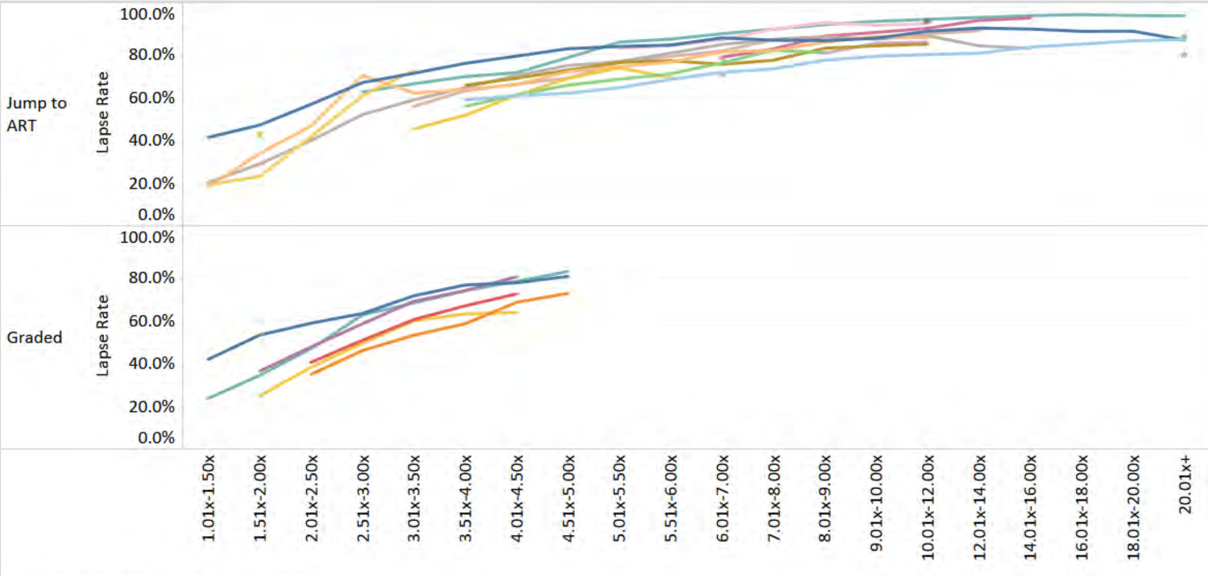
From the analysis in this section, it is evident that any differences between term plans can be explained by company mix, high face amounts in high premium jumps and lack of credibility in some cells. It can, therefore, be concluded that the length of term period is not a significant driver of mortality deterioration and the three plans (T10, T15, T20) can be combined in further analysis.

4.4 COMPANY VARIATION

While there is a well-defined relationship between premium jump and shock lapse, variation in the level of lapse among companies for a given premium jump was observed. Figure 4.4-1 shows the shock lapse by premium jump for each study participant represented by different colored lines.

Figure 4.4-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP AND STUDY PARTICIPANT



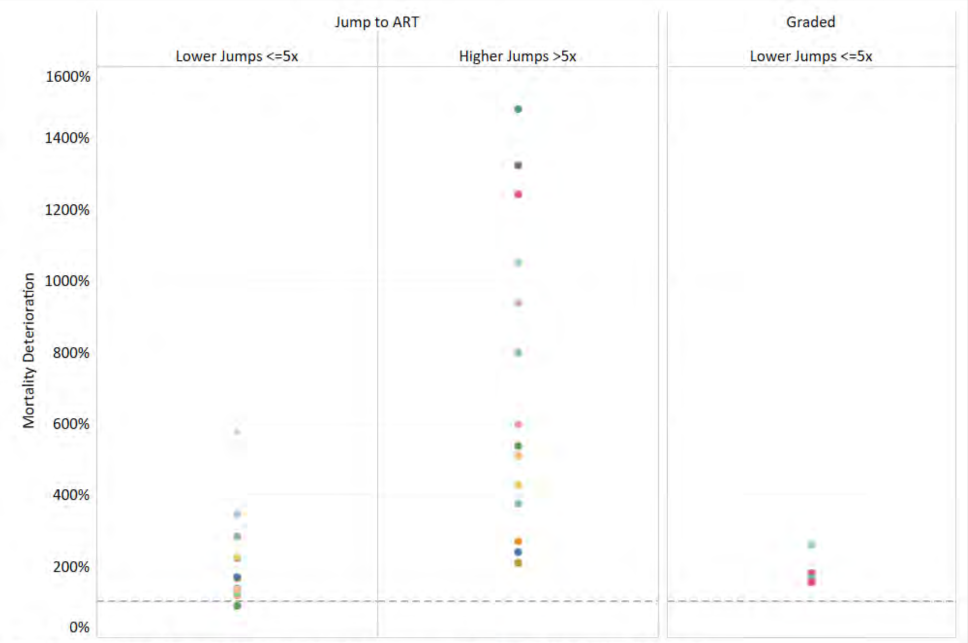
Results include T10, T15 and T20 combined
Lapse rates are represented on the graph when a minimum of 271 lapse decrements is available. When sufficient data are available for one premium jump group only, the lapse rate is represented by a dot. Otherwise, lapse rates by premium jump are represented by a line.

For all study participants, the pattern of increasing shock lapse with increasing premium jump is observed. However, differences between the highest and lowest lapse rates for a given premium jump range from 10% to 25%. This variation highlights that other factors in addition to premium jump are impacting the level of shock lapse.

The mortality deterioration results by company split by the low and high premium jump groups as seen in earlier sections are shown in figure 4.4-2. The companies shown had at least 10 claims in the post-level period. The colors displayed do not correspond with the colors shown in the lapse results in figure 4.4-1.

Figure 4.4-2

MORTALITY DETERIORATION BY INITIAL PREMIUM JUMP GROUP AND STUDY PARTICIPANT



Results include T10, T15, and T20 combined. Only companies with at least 10 claims in PLT shown.

The lower jumps for the Jump to ART business showed a larger spread of results than was observed in the Graded business (with the same jumps). The Graded business displayed a tight cluster. The higher jumps for Jump to ART show a particularly wide range of results. As shown in section 4.2, mortality deterioration varied significantly by premium jump group.

Analysis of company variation provided some insight into how widely lapse and mortality experience can vary in PLT. The PLT structure, premium jump and attained age have been identified in this section as just some of the variables that can explain lapse and mortality experience. Further analysis into other variables impacting lapse and mortality experience is considered in sections 5 and 6.

4.5 COMPARISON OF OTHER PLT STRUCTURES

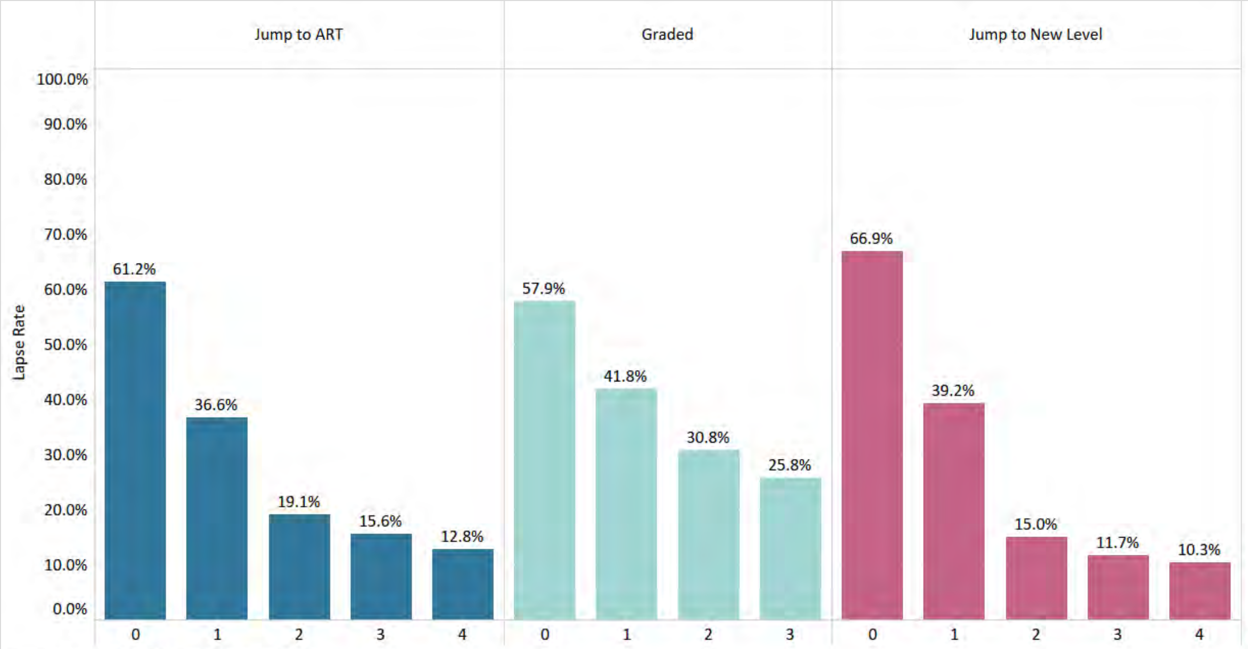
While less popular than Jump to ART and Graded, data were submitted for several other PLT structures that are applied in the U.S. Term market. Study participants submitted data with the following PLT structures in addition to Jump to ART and Graded:

1. Jump to New Level Period
2. Decreasing Face Amount
3. Expiry

Sufficient data were submitted to analyze lapse experience at a high level for the Jump to New Level compared to the Jump to ART and Graded PLT structures that are examined in more detail throughout this report. There were not sufficient data to analyze Decreasing Face Amount and by definition PLT data are not available for products with expiry at the end of the level term.

Figure 4.5-1

LAPSE RATES BY DURATION AND PLT STRUCTURE



Results include T10, T15 and T20 combined.
Lapse rates are displayed above the bars.

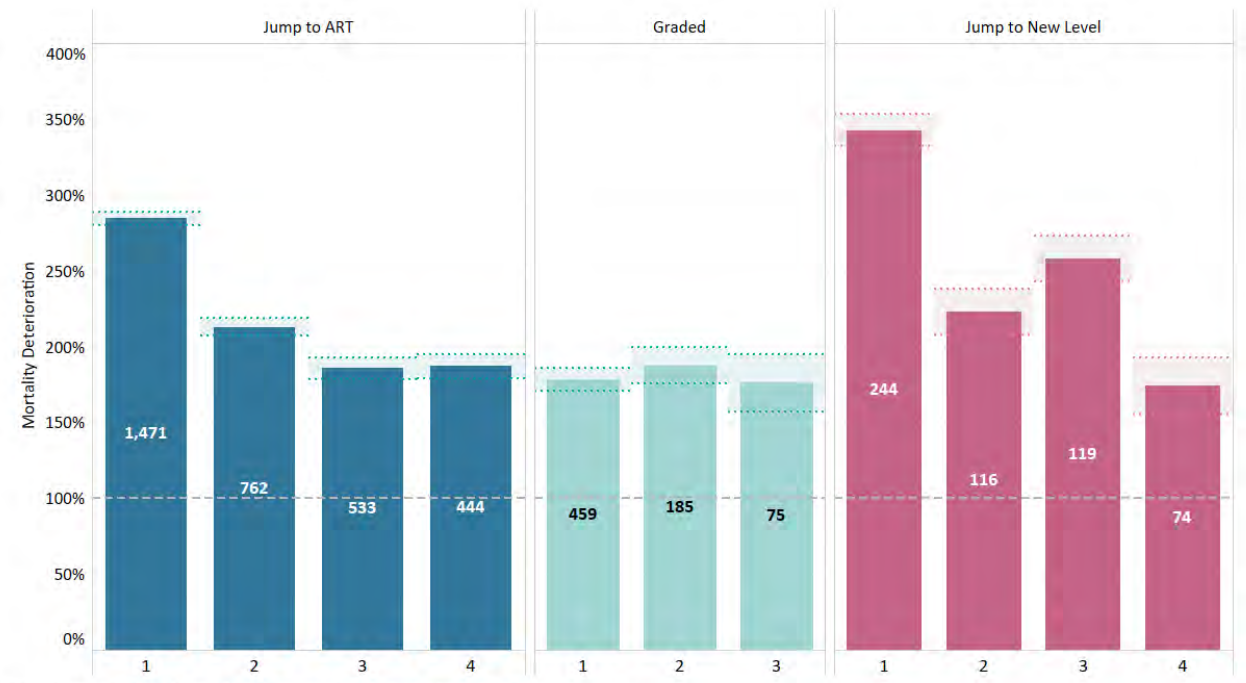
The shock lapse at the end of the level term is significantly impacted by the size of the premium increase for each of the PLT structures. For Jump to New Level, a similar pattern of increasing shock lapse with increasing premium jump was observed. The difference in overall shock lapse shown is a result of the mix of premium jumps in each structure. Graded has premium increases over a lower range, up to five times, while Jump to ART and Jump to New Level structures both have a full range of premium increases as high as 30 times. The lower shock lapse for Graded is attributed to this lower premium jump range.

The pattern of lapse rate by duration in PLT follows a different pattern for each of the PLT structures. Graded has the highest lapse rates in each PLT duration despite having the lowest shock lapse at PLT duration 0. As discussed in section 4.2, this is driven by higher premium increases in subsequent durations. Jump to New Level demonstrates a high lapse rate in PLT duration 1 but then has the lowest lapses in durations 2 and later. After the initial premium increase, premiums remain at the new higher rate for another level period. The lower lapses in PLT durations 2, 3 and 4 may be attributed to this level premium compared to an increasing premium for Jump to ART, which shows higher lapses in each duration.

Comparison of mortality deterioration by PLT duration among the three structures is shown in figure 4.5-2.

Figure 4.5-2

MORTALITY DETERIORATION BY DURATION AND PLT STRUCTURE



Results include T10, T15 and T20 combined. Numbers on bars represent claim count.

The mortality deterioration pattern by duration in PLT for Jump to New Level is similar to Jump to ART, characterized by higher initial mortality deterioration in the first duration in PLT and a decreasing pattern by duration thereafter. The difference in initial mortality deterioration is a result of the premium jump mix in each structure. Jump to New level showed higher mortality deterioration above, which is consistent with the higher overall shock lapse in figure 4.5-1. Similar to Jump to ART, there is a wear-off of mortality by duration in PLT after the high initial deterioration for Jump to New Level. For Graded, the initial level of deterioration broadly appears to be maintained, although data are only available for three durations in PLT. The pattern observed for Jump to New Level is not a smooth decreasing pattern by duration but claim counts by duration are lower which gives rise to volatility.

The Jump to New Level structure is the most popular structure for Canadian term business. A comparison of the detailed Jump to New Level results from the Canadian PLT study to the detailed Jump to ART results from the U.S. 2021 study is shown in appendix F.

Section 5: Deep Dive into Lapse Experience

5.1 OVERVIEW

Section 5 provides a deep dive into the shock lapse and post-level term lapse experience. Shock lapse and post-level term lapse rates were observed to vary by many factors.

Traditional experience analysis is limited to a one-way analysis where the impact of each individual variable can be investigated. This univariate analysis provides a view of how each factor impacts lapses but does not necessarily consider the interaction among variables. Multivariate analysis is much more powerful in identifying the true drivers of lapse experience. For this reason, statistical analysis techniques were considered to provide additional insights into the predictive value of each variable. Variable selection is a method in statistical analysis that is applied to identify the most important variables as a first step towards building a predictive model.

In this section, shock lapse at the end of term is analyzed with traditional analysis and variable selection applied to investigate the explanatory variables. Section 5.2 provides details of the variable selection process for shock lapse, and sections 5.3 and 5.4 investigate through traditional analysis the variables identified as most important for explaining shock lapse behavior at the end of the term period. The most important drivers of shock lapse identified are premium jump, attained age, premium mode and billing type. Other variables that provide interesting insights include face amount, risk class and gender.

Section 5.5 covers analysis of the timing of lapses over the policy year, showing that lapses are skewed to the end of the last duration of level term and towards the first months in PLT with some variation by premium mode and PLT structure. The post-level term lapse experience is reviewed with traditional analysis by key variables in section 5.6 giving insights into the decreasing pattern of lapse rates by duration in PLT. Section 5.7 provides an analysis of the impact of conversions. The final section, 5.8, compares the shock lapse and post-level term lapse rates observed in this study to those in the prior study published in 2014.

5.2 VARIABLE SELECTION

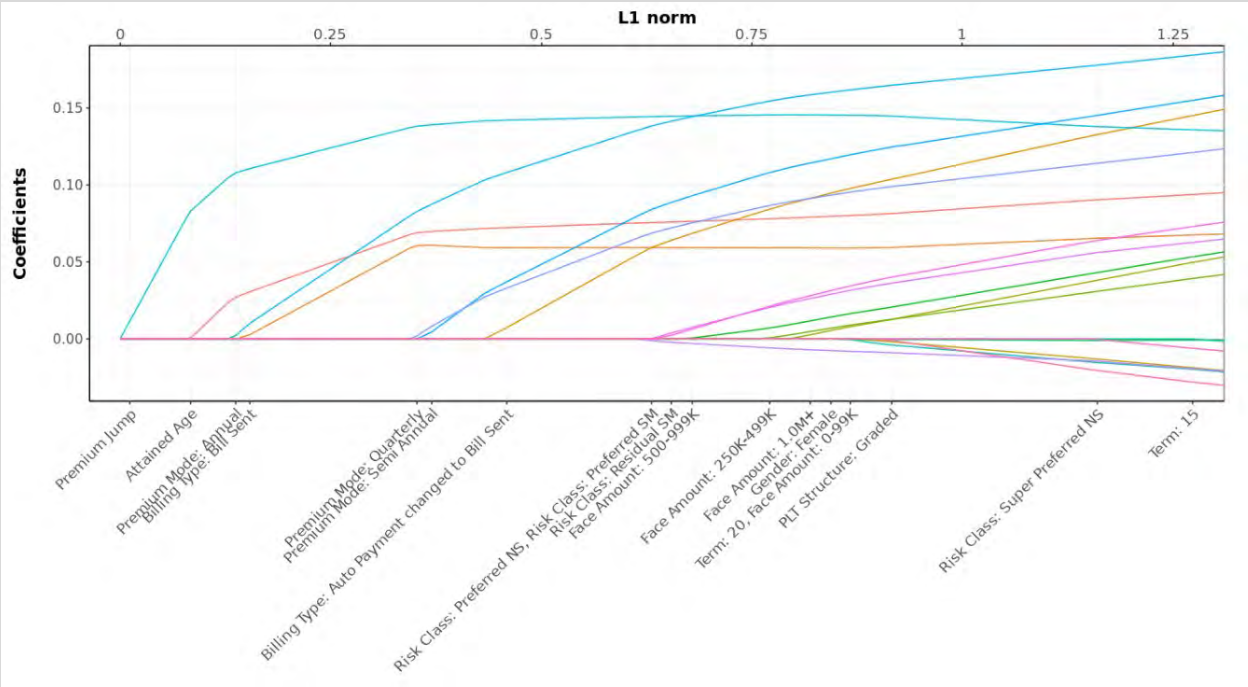
Shock lapse at the end of the level term period was observed to vary by many factors. Through a process called variable selection, statistical analysis was conducted to identify the key drivers of variation. For this analysis, term plan was considered as a variable with all three term plans, T10, T15 and T20, included. In addition, PLT structure was considered as a variable with both Jump to ART and Graded PLT structures included. Risk class was included as a variable, but the undifferentiated and substandard data were excluded for this analysis.

The goal of the variable selection process was to determine a reduced number of appropriate explanatory variables to describe the shock lapse from the available list of variables. Various approaches can be adopted to assess the variable selection. In the following, the Least Absolute Shrinkage and Selection Operator (“LASSO”) method is used to identify the key explanatory variables that influence the shock lapse. This method was first formulated by R. Tibshirani (1996). The approach was applied in a Generalized Linear Model (“GLM”) framework. The idea of the LASSO in a GLM is to model the shock lapse through a regularized logistic regression which allows for a selection of variables by selectively shrinking the coefficients to zero. See appendix E for more technical details. In addition, studying the profile of the coefficients provided an opportunity to assess how variables are correlated.

Figure 5.2-1 represents the profile of the LASSO coefficients plotted against the L1 norm, the sum of the absolute values of the model parameters. As more variables entered the model, the L1 norm increased.

Figure 5.2-1

VARIABLE SELECTION ANALYSIS – PROFILE OF LASSO COEFFICIENTS



The variables enter the model in order of their importance, from left to right. Each line represents the coefficient path of a variable, which is piecewise linear with respect to the L1 norm and only changes when a new feature enters the model. Categorical variables have a reference level which corresponds to the categories of the variables where the largest exposure is observed:

- Term plan: T10,
- Risk class: residual NS,
- Face amount: $100-249K,
- Premium mode: monthly,
- Billing type: automatic payment, and
- Gender: male.

Each of the other categories of a variable is represented by a coefficient path. Coefficient paths below zero indicate variables likely to lead to lower lapses relative to the reference, while coefficient paths above zero represent variables likely to lead to higher lapses. Numeric variables such as premium jump and attained age are represented by one coefficient path per variable. A coefficient path above zero indicates an increasing relationship, while a coefficient path below zero indicates a decreasing relationship.

The final value of the coefficients at the end of the process corresponds to the value of the parameters obtained in a classical logistic regression having all predictors considered here included. Section 7 provides more details on lapse predictive modeling that will be covered in a separate report.

The variables premium jump, attained age, premium mode and billing type appear very important. These variables enter the model first.

The blue line representing the premium jump enters near the start of the process indicating premium jump is an important variable in predicting shock lapse. The blue line has a coefficient above zero indicating that premium jump positively impacts shock lapse, confirming the relationship of increasing shock lapse with increasing premium jump already discussed in section 4.

The path of the blue line changes when other variables enter. The slope changes dramatically when premium mode: annual enters and, again, later when premium mode: semi-annual and premium mode: quarterly enter. This highlights the correlation between premium jump and premium mode, illustrating differences in shock lapse variations by premium mode when premium jump increases.

Attained age is the second variable to enter, underlying its importance in capturing the shock lapse variation. Attained age has a steadily positive effect on the shock lapse. This indicates a pattern of increasing shock lapse with increasing attained age.

Premium mode and billing type are also very important. Premium mode, specifically premium mode: annual, enters next. Premium mode: annual, semi-annual and quarterly all positively impact the shock lapse (relative to monthly premium payment mode). This indicates that policyholders paying premiums on a monthly premium mode are likely to have lower lapses than annual, semi-annual or quarterly payment modes.

Billing type: bill sent has a coefficient path above zero indicating higher shock lapse (relative to automatic payment). This highlights that, when the billing type is bill sent, shock lapse is likely to be higher than when the billing type is automatic payment. Billing type: auto payment changed to bill sent also positively impacts shock lapse indicating that, when the billing type changes from automatic payment during level term to a bill sent for PLT premium, the shock lapse is higher relative to policyholders that remain on automatic payment for PLT premium.

Further, premium mode and billing type appear to be correlated. The slope of the billing type: bill sent path (orange line on the chart) changes dramatically when premium mode: semi-annual and premium mode: quarterly enter. This interaction highlights that premium payment features impact policyholder behavior at the end of the level term, showing that both the billing type and the premium mode have an important impact on shock lapse. See section 5.3 for further investigation of the impact of premium mode and billing type on shock lapse.

Risk class, gender and face amount enter the process later and seem to be less important after considering premium jump, attained age, billing type and premium mode. These variables may be of interest in modeling the shock lapse by more than four variables and can still provide some insights as discussed in section 5.4.

PLT structure: Graded enters later in the process, indicating PLT structure is a less important variable for predicting shock lapse at the end of the level term. Analysis in section 4.2 also showed that shock lapse does not vary significantly between the structures.

The premium jump path has its trend reversed when PLT structure enters. This suggests there is some correlation between premium jump and PLT structure. The importance of premium jump is slightly reduced when PLT structure is considered, meaning the effect of premium jump is partially captured by PLT structure. However, premium jump remains high until the end of the process, confirming it is an important variable. Throughout the report, the two PLT structures are analyzed separately due to differences in post-level term lapses and mortality, but this analysis shows that shock lapse experience is similar for a given premium jump, irrespective of the structure.

Term plan enters later in the process suggesting it is less important. This supports the analysis in section 4.3 where the results were shown to be reasonably similar and supported combining T10, T15 and T20 for analysis.

5.3 SHOCK LAPSE BY KEY EXPLANATORY VARIABLES

Variable selection identified the most important explanatory variables for shock lapse as initial premium jump, attained age, billing type and premium mode. This section summarizes shock lapse results by each of these variables. PLT structures Jump to ART and Graded were studied separately for each variable. T10, T15 and T20 shock lapse experience was combined.

5.3.1 PREMIUM JUMP

Initial premium jump is defined as the ratio of the first PLT premium to the level term period premium. This is in line with the actual premium increase presented to the policyholder.

The 2014 SOA PLT study calculated the initial premium jump as the ratio of the per thousand premium rate in the first duration in PLT to the per thousand premium rate in the level term period. This calculation did not include the policy fee. The impact of this calculation difference is more material for lower face amount policies and policies with lower premium rates such as younger ages or super-preferred classes.

Figure 5.3.1-1 shows the shock lapse rates at the end of the level term for Jump to ART and Graded by initial premium jump.

Figure 5.3.1-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP AND PLT STRUCTURE

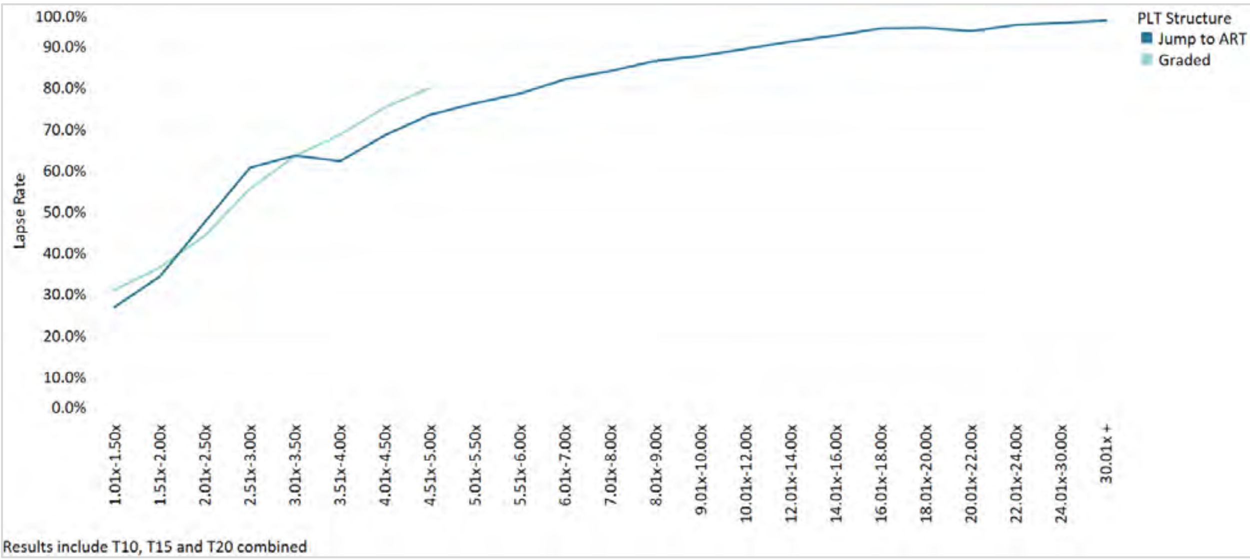


Table 5.3.1-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP AND PLT STRUCTURE

	Jump to ART			Graded		
Initial Premium Jump	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
1.01x-1.50x	32.5K	8,793	27.1%	5.5K	1,727	31.2%
1.51x-2.00x	65.8K	22,633	34.4%	15.5K	5,692	36.6%
2.01x-2.50x	51.5K	24,535	47.6%	33.5K	14,840	44.3%
2.51x-3.00x	30.1K	18,298	60.8%	54.9K	30,537	55.6%
3.01x-3.50x	24.5K	15,585	63.7%	43.0K	27,384	63.6%
3.51x-4.00x	29.4K	18,340	62.4%	25.6K	17,586	68.8%
4.01x-4.50x	26.0K	17,853	68.7%	14.3K	10,798	75.5%
4.51x-5.00x	22.4K	16,522	73.6%	5.9K	4,694	80.1%
5.01x-5.50x	22.2K	16,979	76.4%			
5.51x-6.00x	19.2K	15,141	78.8%			
6.01x-7.00x	34.8K	28,640	82.2%			
7.01x-8.00x	30.3K	25,532	84.2%			
8.01x-9.00x	23.9K	20,693	86.7%			
9.01x-10.00x	19.6K	17,178	87.8%			
10.01x-12.00x	31.7K	28,404	89.6%			
12.01x-14.00x	20.3K	18,530	91.3%			
14.01x-16.00x	14.9K	13,857	92.8%			
16.01x-18.00x	10.5K	9,907	94.5%			
18.01x-20.00x	7.5K	7,084	94.7%			
20.01x-22.00x	5.7K	5,325	93.9%			
22.01x-24.00x	3.5K	3,317	95.4%			
24.01x-30.00x	6.4K	6,140	95.9%			
30.01x +	6.1K	5,921	96.4%			

The shock lapse rates increase as the initial premium jump ratios increase. This increasing pattern is steepest for premium jumps up to seven times the level premium and continues to increase more gradually for the higher premium jumps. This illustrates the policyholder's reaction to a premium increase at the end of the level term, with fewer policyholders willing to pay for continued coverage when the premium increase is higher.

The increasing pattern and level of shock lapse are similar for both Jump to ART and Graded premium PLT structures for a similar premium increase. This illustrates that, in both cases, policyholders are reacting to the next premium due and not the pattern of premiums in the PLT.

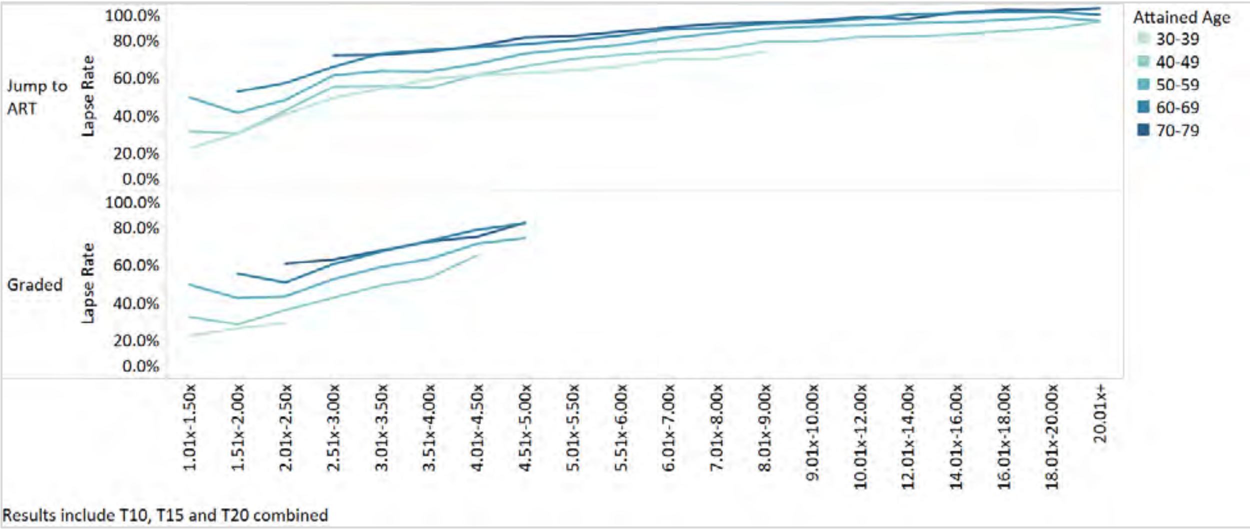
5.3.2 ATTAINED AGE

The attained age in this analysis reflects the age of the policyholder in the given duration. For shock lapse analysis, this is the age of the policyholder at the end of the level term. Since multiple level term period products are combined in this analysis, attained age provides a more comparable age measure than issue age.

There is a clear pattern of increasing shock lapse with increasing attained age. Figure 5.3.2-1 shows shock lapses by attained age and initial premium jump to investigate the interaction of these two variables.

Figure 5.3.2-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP, ATTAINED AGE AND PLT STRUCTURE



The table of values supporting figure 5.3.2-1 is shown in appendix D in table D.1.

The pattern of increasing shock lapse with increasing attained age can be seen across the full range of premium jumps. The variation in shock lapse is most significant over lower premium jumps, making it a particularly important variable for the Graded PLT premium jump structure analysis. Differences in shock lapse by attained age are observed up to the highest premium jumps for Jump to ART.

Differences by attained age may be explained by changing insurance needs at different stages of the life cycle. Policyholders in their 40s and 50s may have a greater need for continued coverage, while policyholders in their 60s and 70s are less likely to have dependent children or mortgage obligations, for example, and are not willing to pay the high cost for coverage.

In addition, a higher absolute premium dollar amount is a contributing factor as age increases. The premium jump in the figure above is the relative ratio to the level term period premium, but this would also be associated with a larger dollar amount increase for older policyholders paying higher level term premiums.

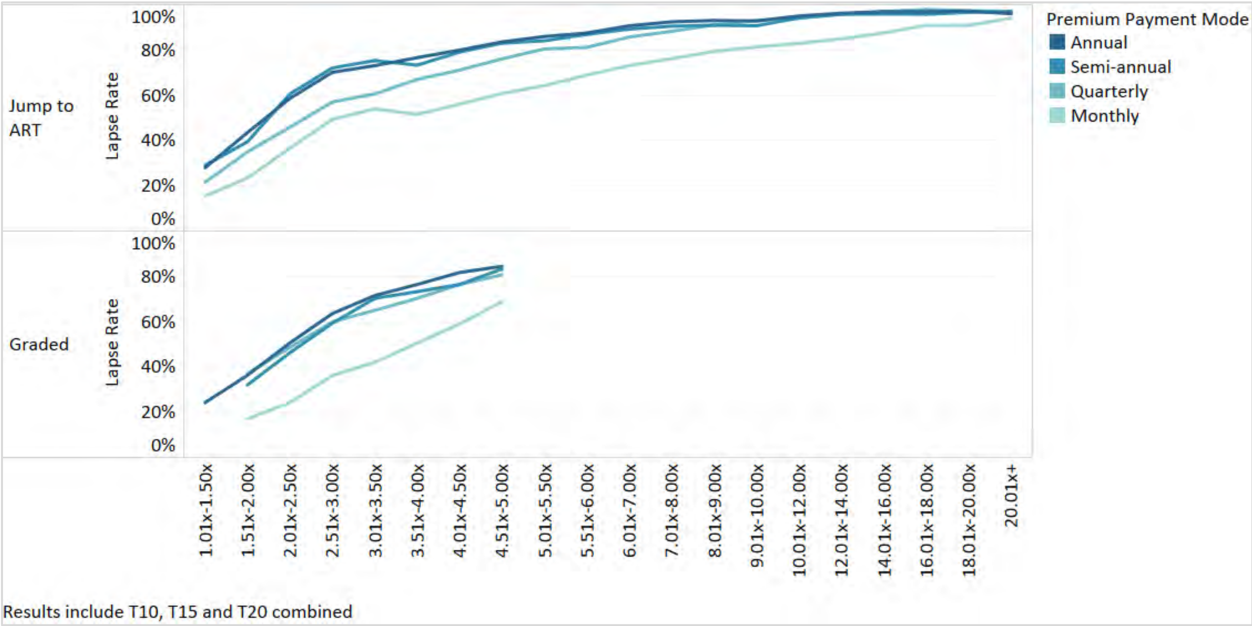
In addition to premium jump, attained age is a key explanatory variable for shock lapse behavior at the end of the level term for both PLT premium structures.

5.3.3 PREMIUM MODE

Premium mode is defined as the frequency of premium payments. Premium mode was provided for 94% of the PLT exposure data available for shock lapse analysis in the study. Most study participants confirmed in the survey (see section 8 for survey results) and in the data submitted that they do not change premium mode at the end of the level term. Policies that changed premium mode between the level term period and post-level term period were excluded from this view because an insufficient amount of data was available. Premium modes shown in figure 5.3.3 represent a consistent premium mode in level term and post-level term periods.

Figure 5.3.3

SHOCK LAPSE BY INITIAL PREMIUM JUMP, PREMIUM MODE AND PLT STRUCTURE



The table of values supporting figure 5.3.3 is shown in appendix D in table D.2.

Policies with a monthly premium mode show a much lower shock lapse than other premium modes for a given premium jump. This pattern is evident across the full range of premium jumps, with the shock lapse by premium mode only converging at premium jumps 20.01x+. Policies with quarterly premium mode also show a lower shock lapse compared to annual or semi-annual premium modes for premium jumps up to 6.01x-7.00x with less difference over higher premium jumps.

The lower shock means that more policyholders will pay PLT premium when premium is due monthly or quarterly. Shock lapse may be lower because, when the premium is spread over the year in monthly or quarterly installments, it is a smaller amount than when it is presented as one annual payment. In addition, when a premium is paid monthly, policyholders have the option to pay for the first few months of the year only and then lapse early. Further analysis of lapse skewness over the policy year and differences in lapse experience in PLT by premium mode is provided in section 5.5.

This shock lapse analysis highlights that policyholder behavior at the end of the level term is clearly impacted by the premium mode.

5.3.4 BILLING TYPE

Billing type refers to the method that the insurance company uses to collect the premium payment due.

Billing type was provided for 92% of exposure data available for shock lapse analysis in the study. Premiums are collected in two main ways:

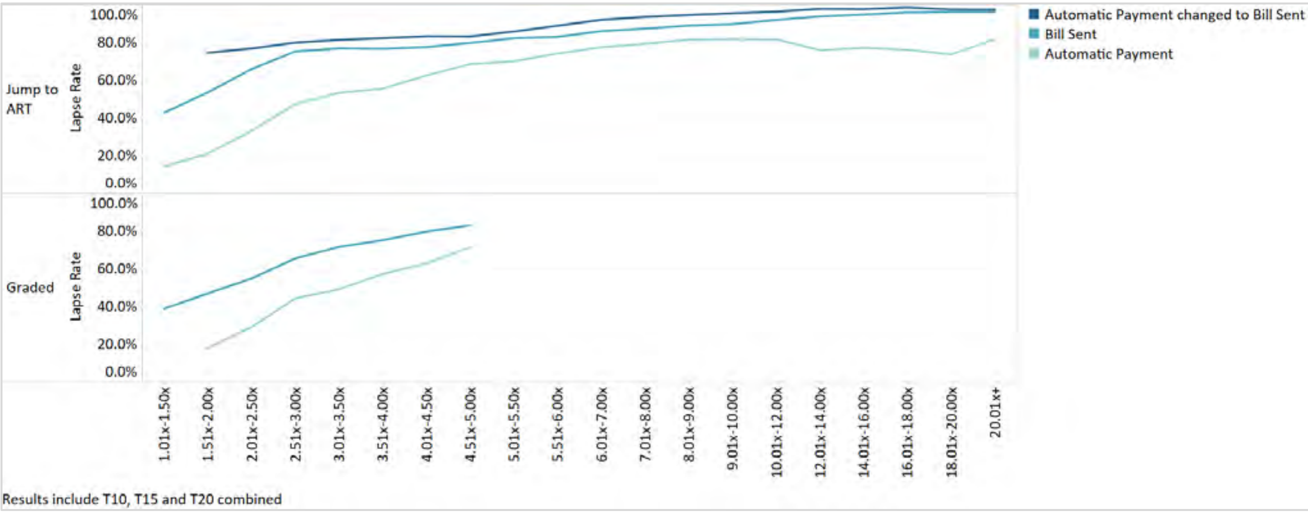
1. Sending a bill to the policyholder: bill sent
2. Collecting premium directly from the policyholder account: automatic payment

In the data submitted, there are some policies where the billing type at the end of the level term changes (6% of exposure in PLT duration 0), but for most billing types, it remains the same as the level period. For those that did change, the most common change was from automatic payment during the level period to sending a bill for post-level term premium.

For Jump to ART, policies that changed billing type are analyzed and compared with those that did not change. For Graded, there are insufficient data to study those with a change in billing type. As discussed in section 5.3.3, there was also a small amount of data for policies that changed premium mode at the end of the level term. These data are excluded from the figure below so that the analysis is focused only on the change in billing type.

Figure 5.3.4

SHOCK LAPSE BY INITIAL PREMIUM JUMP, BILLING TYPE AND PLT STRUCTURE



The table of values supporting figure 5.3.4 is shown in appendix D in table D.2.

Policies that pay premiums under automatic payment show lower shock lapses than policies that receive a bill for premiums due. This difference is seen across the range of premium jumps. This makes intuitive sense as the policyholder receiving a bill is reacting to a reminder of the higher payment, while the automatic payment policyholder does not need to take any specific action to continue paying premiums.

For Jump to ART, the shock lapse is highest when the billing type changes at the end of the level term from automatic payment to bill sent. When a policyholder who had been paying premiums automatically receives a bill for PLT premiums, the reaction is a higher shock lapse. A policyholder who had automatic payment set up for premium payment for the past 10, 15 or 20 years will, for the first time, need to take action to pay a bill in order to continue the policy. The additional effort required to pay a bill may lead to a higher shock lapse because of a failure to set up the logistics for a payment or because it becomes a more considered decision when specific action needs to be taken.

There is some interaction between premium mode and billing type. For the monthly premium mode, more policies were on automatic payment than less frequent payment modes. For monthly premium mode, 75% of exposure was on automatic payment compared to less than 20% for the other modes. The interaction of these two variables was investigated by reviewing shock lapse experience by billing type for each premium mode. A lower shock lapse for automatic payment compared to bill sent is observed when looking at monthly premium mode only. The pattern is less clear for other premium modes due to lack of data at the granular level.

This analysis confirms that billing type and, in particular, changes in billing type have an impact on shock lapse at the end of the level term.

5.4 SHOCK LAPSE BY OTHER EXPLANATORY VARIABLES

While most of the variation in shock lapse can be explained by premium jump, attained age, premium payment mode and billing type, other factors are also considered. The factors analyzed in this section include face amount, risk class and gender.

5.4.1 FACE AMOUNT

Face amount group was investigated as a variable to identify whether there are differences in shock lapse experience at the end of the level term for different policy sizes. Figure 5.4.1-1 below shows the pattern of shock lapse by face amount group for premium jump groups split into lower and higher premium jumps.

Figure 5.4.1-1

SHOCK LAPSE BY FACE AMOUNT, PREMIUM JUMP GROUP AND PLT STRUCTURE

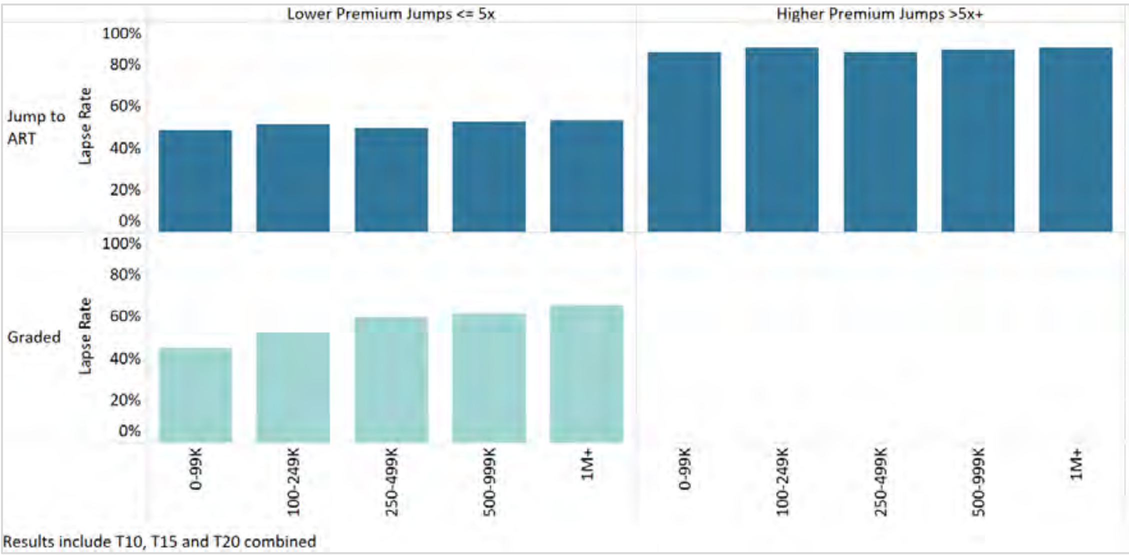


Table 5.4.1-1

SHOCK LAPSE BY FACE AMOUNT, PREMIUM JUMP GROUP AND PLT STRUCTURE

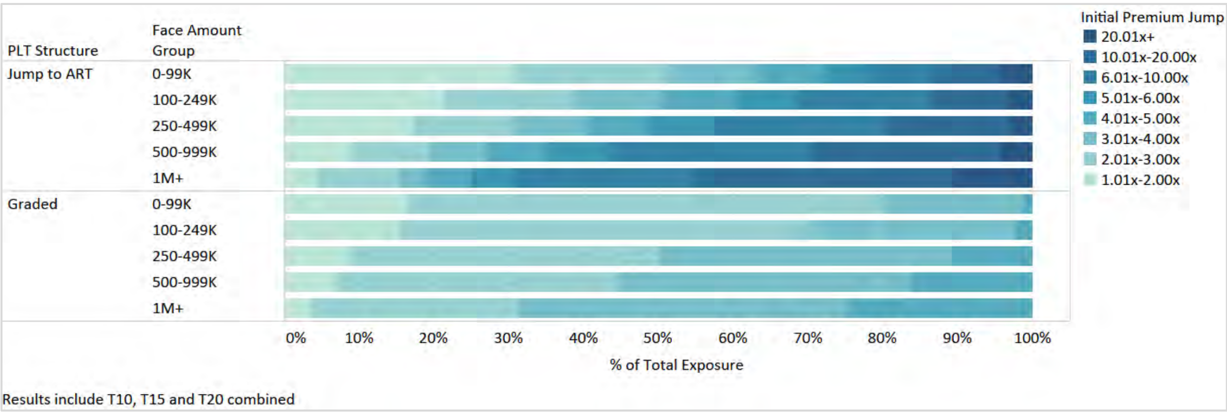
Premium Jump Group	Face Amount Group	Jump to ART Exposure Count	Jump to ART Lapse Count	Jump to ART Lapse Rate	Graded Exposure Count	Graded Lapse Count	Graded Lapse Rate
Lower Premium Jumps <= 5x	0-99K	37.8K	18,328	48.5%	8.5K	3,791	44.6%
	100-249K	138.1K	70,679	51.2%	70.8K	36,642	51.8%
	250-499K	69.5K	34,220	49.3%	55.8K	33,181	59.5%
	500-999K	25.5K	13,365	52.5%	37.9K	23,287	61.4%
	1M+	11.3K	5,968	52.9%	25.2K	16,355	65.0%
Higher Premium Jumps >5x+	0-99K	14.6K	12,466	85.6%			
	100-249K	89.3K	78,117	87.5%			
	250-499K	72.2K	61,895	85.7%			
	500-999K	46.6K	40,419	86.7%			
	1M+	33.9K	29,750	87.7%			

Jump to ART over the lower premium jumps shows a slightly increasing pattern with increasing face amount but Graded shows a much more defined increasing pattern with the highest shock lapse for the highest face amounts.

The distribution of exposure by premium jump varies by face amount group as shown in figure 5.4.1-2. Lower face amount groups tend to have a higher proportion of lower premium jump business, while higher face amount groups appear to have a larger proportion of higher premium jump business.

Figure 5.4.1-2

DISTRIBUTION OF EXPOSURE FOR FACE AMOUNT GROUPS SPLIT BY PREMIUM JUMP



The observed differences in shock lapse by face amount group can be explained by the different mix of premium jumps. Face amount appears to be a less important variable once premium jump has been considered.

In this study, the initial premium jump is defined as the ratio of the first PLT premium to the level term period premium. This is in line with the actual premium increase presented to the policyholder. The 2014 SOA PLT study included initial premium jump calculated as the ratio of the per thousand premium rate in the first duration in PLT to the per thousand premium rate in the level term. The difference is that this method did not include the policy fee. This difference is more material for lower face amount policies than larger face amount policies. Less variation by face amount is observed when the premium jump ratios capture the complete policyholder premiums rather than the per thousand premium rates.

Though the apparent differences in shock lapse by face amount are explained by premium jump differences, results by face amount group are helpful to understanding the mix of business by face amount group in PLT relative to level term.

5.4.2 RISK CLASS

There were several risk class structures provided by the study participants. To analyze the results on a consistent basis, the classes were grouped as follows:

- Super-Preferred NS: N1/3, N1/4, N1/5
- Preferred NS: N1/2, N2/3, N2/4, N2/5, N3/5
- Residual NS: N3/4, N4/5, N2/2, N3/3, N4/4, N5/5
- Substandard NS: All nonsmoker substandard business regardless of preferred risk class structure
- Preferred SM: S1/2, S1/3, S2/3
- Residual SM: S2/2, S3/3
- Substandard SM: All smoker substandard business regardless of preferred risk class structure
- Undifferentiated NS/SM: N1/1, S1/1

The undifferentiated risk class had a larger proportion of the substandard business than the residual classes. For this reason, the undifferentiated was excluded for all risk class analysis. Policies issued as substandard are filtered out of the preferred class analysis and considered in a separate view.

Variation in shock lapse by risk class was reviewed to identify any differences in policyholder behavior among different risk classes.

Figure 5.4.2-1

SHOCK LAPSE BY RISK CLASS AND PLT STRUCTURE

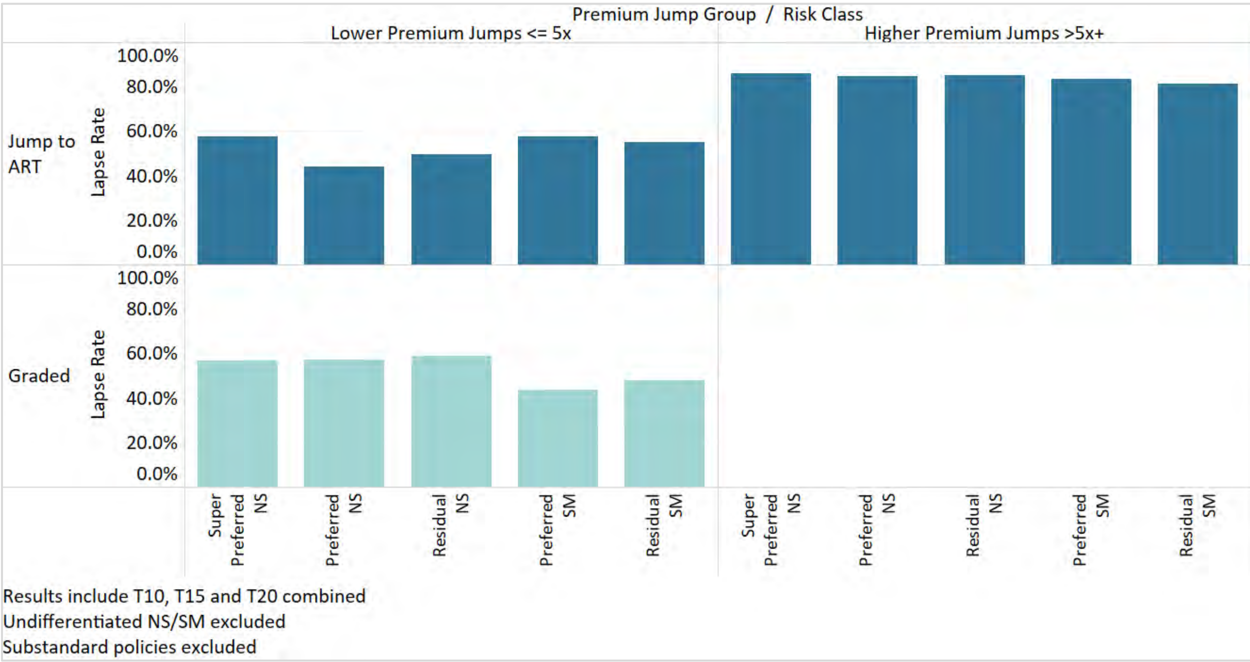


Table 5.4.2-1

SHOCK LAPSE BY RISK CLASS AND PLT STRUCTURE

		PLT Structure					
		Jump to ART			Graded		
Premium Jump Group	Risk Class	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Lower Premium Jumps <= 5x	Super Preferred NS	22.8K	13,095	57.5%	63.5K	36,107	56.9%
	Preferred NS	78.8K	34,877	44.3%	59.8K	34,304	57.3%
	Residual NS	69.5K	34,576	49.7%	48.3K	28,375	58.7%
	Preferred SM	11.6K	6,710	57.7%	7.8K	3,392	43.6%
	Residual SM	13.8K	7,612	55.1%	3.2K	1,513	47.8%
Higher Premium Jumps >5x+	Super Preferred NS	62.5K	53,650	85.8%			
	Preferred NS	61.2K	51,816	84.7%			
	Residual NS	52.1K	44,448	85.3%			
	Preferred SM	8.7K	7,235	83.4%			
	Residual SM	3.5K	2,870	81.3%			

The shock lapse by risk class shows a different pattern between the two PLT structures over the common premium jump range. Super preferred shows a higher shock lapse for Jump to ART than the other nonsmoker classes. Graded shows less of a difference between the nonsmoker classes but does show a slightly higher shock lapse for residual non-smokers.

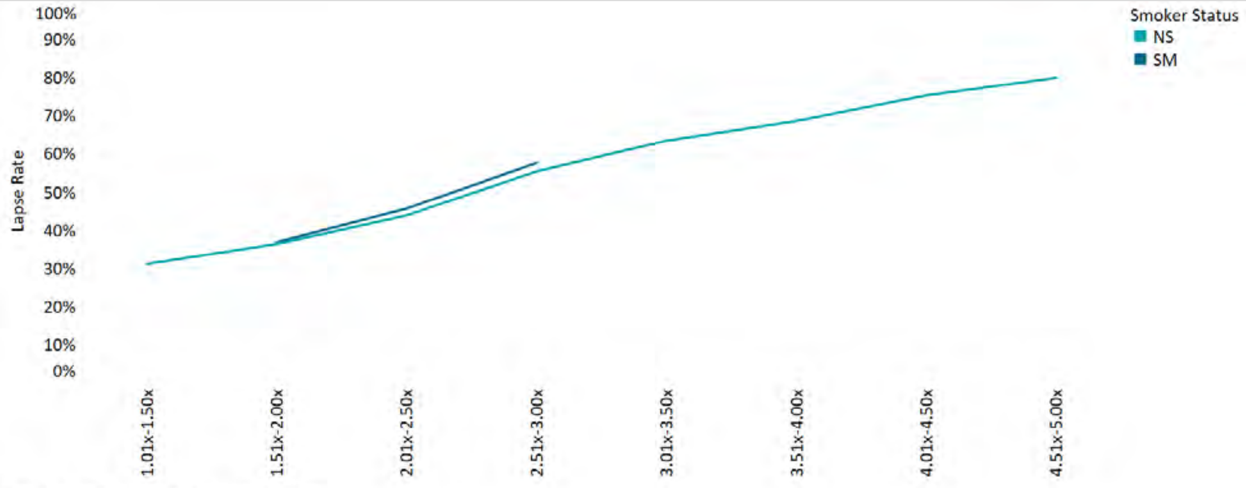
This pattern may be explained by the factors by which PLT premiums varied for each structure. Under Jump to ART, PLT premiums usually vary by smoker status only, whereas the level period premiums vary by preferred class. Graded PLT premiums most commonly vary by preferred class for at least the first five to ten years of the PLT period during the grading period.

As a result, a Jump to ART policyholder who was paying a super-preferred premium in the level term will experience a much larger jump to the PLT non-smoker premium than a policyholder who paid a residual class premium. The higher shock lapses for the super-preferred class under Jump to ART are likely driven by higher premium jumps due to the mismatch in risk classes between the level and PLT periods.

For Graded, smoker lapses appear lower than non-smoker lapses. However, this was determined to be a business mix difference by examining the shock lapse experience by premium jump and smoker status for Graded policies as shown in figure 5.4.2-2 below.

Figure 5.4.2-2

SHOCK LAPSE BY SMOKER STATUS AND INITIAL PREMIUM JUMP (GRADED ONLY)



Results include T10, T15 and T20 combined

Table 5.4.2-2

SHOCK LAPSE BY SMOKER STATUS AND INITIAL PREMIUM JUMP (GRADED ONLY)

	Smoker Status					
	NS			SM		
Initial Premium Jump	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
1.01x-1.50x	4.7K	1,484	31.3%	0.8K	243	
1.51x-2.00x	12.2K	4,473	36.5%	3.3K	1,219	37.0%
2.01x-2.50x	27.5K	12,120	44.0%	5.9K	2,720	45.8%
2.51x-3.00x	52.7K	29,297	55.6%	2.1K	1,240	57.8%
3.01x-3.50x	42.7K	27,165	63.6%	0.3K	219	
3.51x-4.00x	25.5K	17,563	68.8%	0.0K	23	
4.01x-4.50x	14.3K	10,794	75.5%	0.0K	4	
4.51x-5.00x	5.9K	4,690	80.1%	0.0K	4	

In fact, the smoker shock lapse appears slightly higher than non-smoker when considered by initial premium jump. The smoker lapse experience is only available for premium jumps up to 3.50x, while non-smoker lapse experience is available up to 5.00x. The apparent lower shock lapse for smokers for all jumps combined (see figure 5.4.2-1) can, therefore, be attributed to premium jump differences.

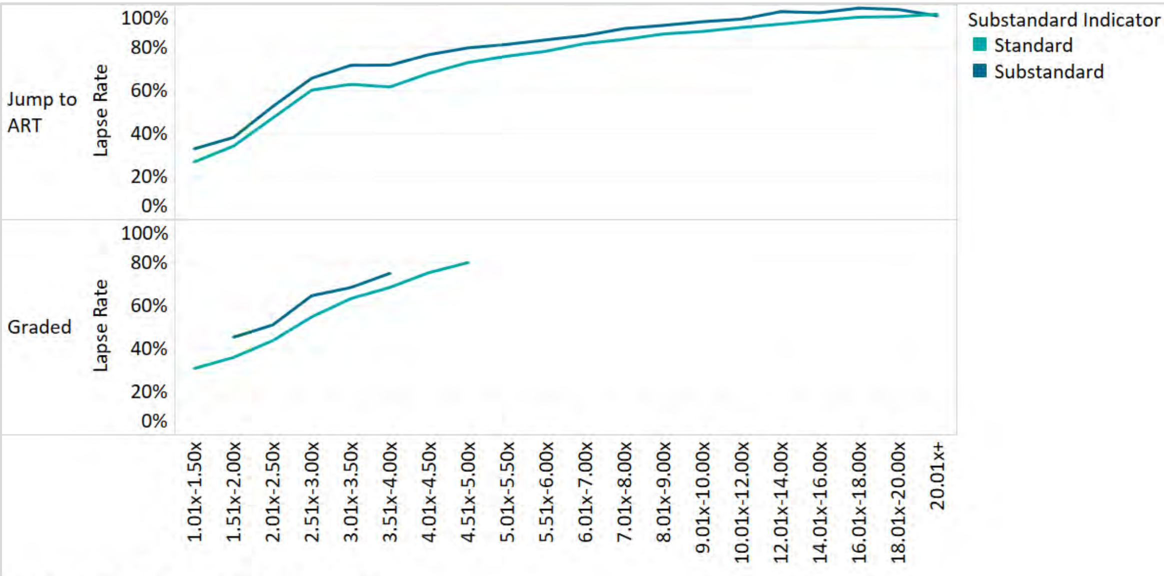
The risk class of a policy is not identified as a key driver of shock lapse experience as variation is explained by other factors, most notably premium jump. The analysis highlights the differences in mix of business by risk class in PLT relative to level term that can be expected depending on whether PLT premiums vary by risk class.

<u>Substandard Analysis</u>

The shock lapse experience for policies issued as substandard was analyzed in comparison to business issued at standard rates. Substandard shows a consistently higher shock lapse relative to standard, across all premium jump ranges.

Figure 5.4.2-3

SHOCK LAPSE BY SUBSTANDARD INDICATOR, INITIAL PREMIUM JUMP AND PLT STRUCTURE



Results include T10, T15 and T20 combined

Table 5.4.2-3

SHOCK LAPSE BY SUBSTANDARD INDICATOR, INITIAL PREMIUM JUMP AND PLT STRUCTURE

		Substandard Indicator					
		Standard			Substandard		
		Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Jump to ART	1.01x-1.50x	31.2K	8,364	26.8%	1.3K	429	32.9%
	1.51x-2.00x	62.5K	21,383	34.2%	3.3K	1,251	38.2%
	2.01x-2.50x	47.7K	22,526	47.2%	3.8K	2,009	52.5%
	2.51x-3.00x	27.1K	16,289	60.2%	3.1K	2,009	65.7%
	3.01x-3.50x	22.1K	13,930	62.9%	2.3K	1,655	71.7%
	3.51x-4.00x	27.4K	16,930	61.7%	2.0K	1,410	71.8%
	4.01x-4.50x	24.0K	16,335	68.0%	2.0K	1,518	76.7%
	4.51x-5.00x	20.5K	14,994	73.0%	1.9K	1,528	79.8%
	5.01x-5.50x	20.5K	15,550	76.0%	1.8K	1,430	81.4%
	5.51x-6.00x	17.5K	13,697	78.3%	1.7K	1,444	83.6%
	6.01x-7.00x	31.6K	25,872	81.9%	3.2K	2,768	85.6%
	7.01x-8.00x	27.5K	23,062	83.7%	2.8K	2,470	88.8%
	8.01x-9.00x	21.7K	18,770	86.3%	2.1K	1,923	90.3%
	9.01x-10.00x	18.0K	15,720	87.5%	1.6K	1,458	92.0%
	10.01x-12.00x	29.6K	26,400	89.3%	2.2K	2,004	93.2%
	12.01x-14.00x	18.8K	17,053	90.9%	1.5K	1,477	96.7%
	14.01x-16.00x	13.8K	12,800	92.6%	1.1K	1,057	96.2%
	16.01x-18.00x	9.5K	8,961	94.1%	1.0K	946	98.3%
	18.01x-20.00x	6.8K	6,418	94.4%	0.7K	666	97.7%
	20.01x+	19.6K	18,694	95.5%	2.1K	2,009	94.7%
Graded	1.01x-1.50x	5.2K	1,618	30.9%	0.3K	109	
	1.51x-2.00x	14.5K	5,215	36.0%	1.1K	477	45.4%
	2.01x-2.50x	30.8K	13,497	43.8%	2.6K	1,343	51.1%
	2.51x-3.00x	50.3K	27,582	54.8%	4.6K	2,955	64.7%
	3.01x-3.50x	40.7K	25,767	63.3%	2.4K	1,616	68.5%
	3.51x-4.00x	24.5K	16,770	68.5%	1.1K	816	75.1%
	4.01x-4.50x	14.0K	10,536	75.4%	0.3K	262	
	4.51x-5.00x	5.7K	4,602	80.1%	0.1K	92	

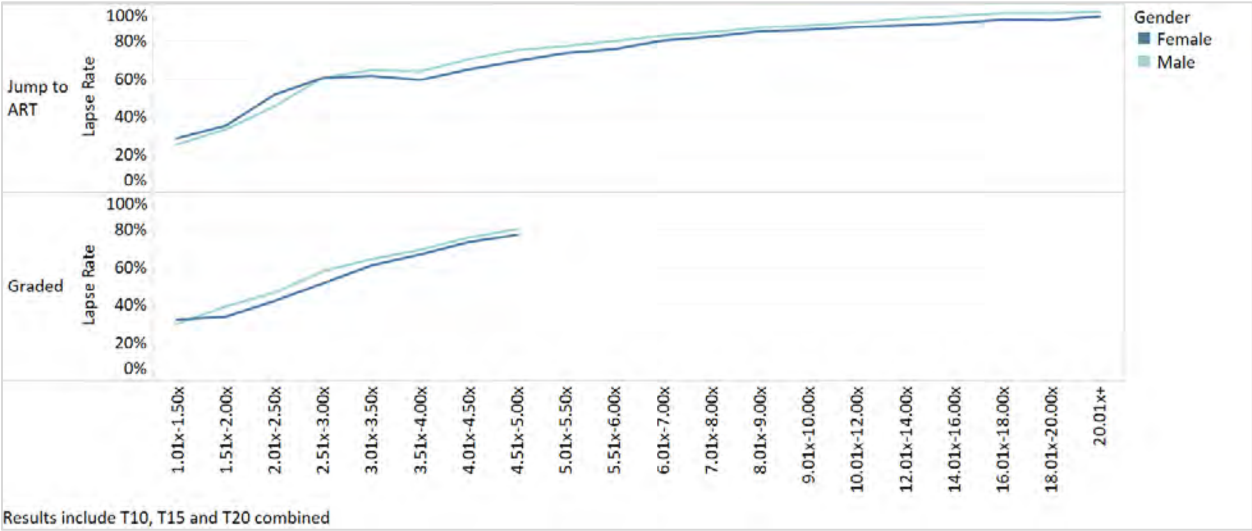
Substandard polices have higher shock lapse, which could be due to the larger dollar amount of premium increase. Noting these policies already pay a higher premium in the level term, the same PLT premium increase leads to a much higher absolute PLT premium for substandard policies.

5.4.3 GENDER

Gender was also considered as a variable to identify if there is any difference in shock lapse between male and female policyholders at the end of term.

Figure 5.4.3

SHOCK LAPSE BY GENDER, PREMIUM JUMP AND PLT STRUCTURE



The table of values supporting figure 5.4.3 is shown in appendix D in table D.4.

There is evidence of a slightly higher shock lapse for males, particularly for the Graded structure. The pattern for Jump to ART is less clear, showing higher shock lapse for females over the lowest premium jumps and higher shock lapse for males for jumps three times and higher.

Male premiums tend to be higher than female premiums for the same age. The corresponding higher dollar amount of increase may be driving the higher shock lapse.

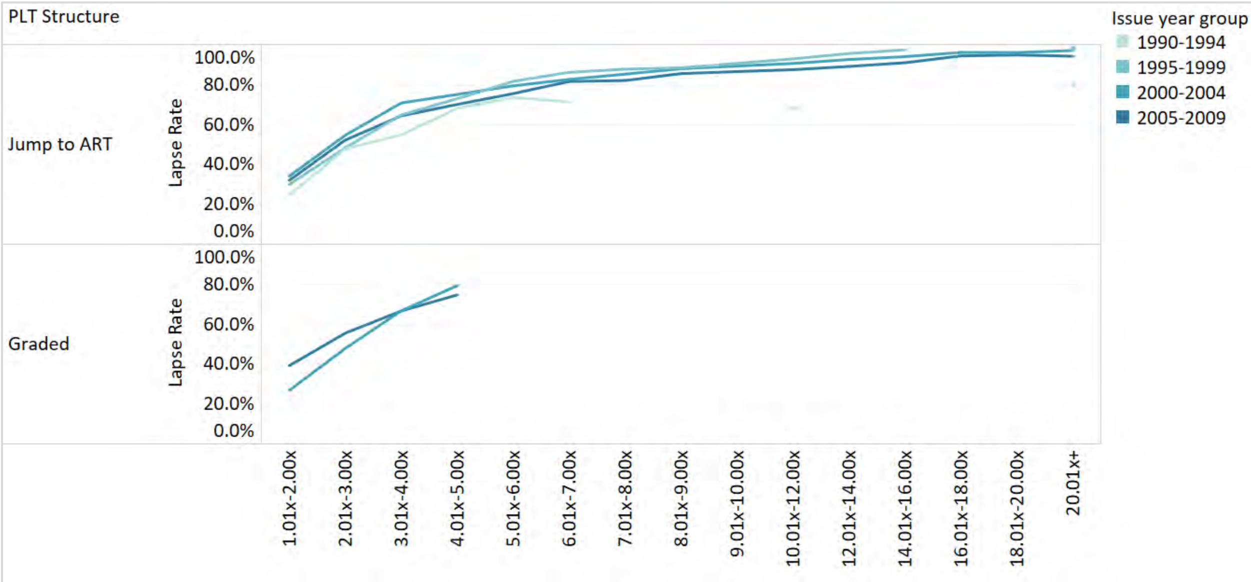
5.4.4 EXTERNAL VARIABLES

Issue Year

The shock lapse by issue year was reviewed to determine if there was any variation over time. To ensure a consistent cohort comparison, this analysis in figure 5.4.4-1 focused on T10 results only and results are shown by initial premium jump group. Shock lapse experience was available for T10 across a longer period of issue years than T15 or T20.

Figure 5.4.4-1

SHOCK LAPSE BY ISSUE YEAR, PREMIUM JUMP AND PLT STRUCTURE



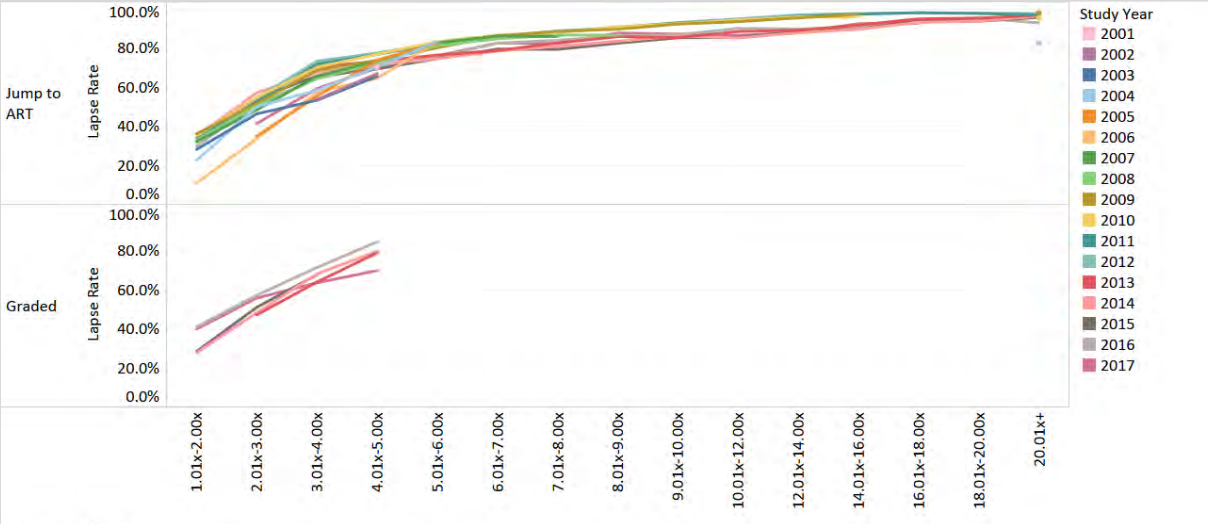
There is no distinct pattern across issue year groups. Small variations are attributed to other mix differences.

Study Year

Shock lapse was also reviewed by the study year to investigate if any differences could be identified over time. Analysis by study year is interesting to consider whether external factors such as economic conditions at the time the policy reaches PLT have an impact on shock lapse. Figure 5.4.4-2 focused on T10 results only, and results are shown by initial premium jump group to ensure a consistent comparison across years.

Figure 5.4.4-2

SHOCK LAPSE BY STUDY YEAR, PREMIUM JUMP AND PLT STRUCTURE



Results are T10 only

Lapse rates are represented on the graph when a minimum of 271 lapse decrements is available. When sufficient data are available for one premium jump group only, the lapse rate is represented by a dot. Otherwise, lapse rates by premium jump are represented by a line.

There is no clear pattern over time. In this view, it is difficult to identify if variation is attributable to the other variables impacting shock lapse. This will be further investigated through predictive modeling as noted in section 7.

Other Characteristics Not Studied

There were other variables that were included in the data submissions that were analyzed, but not discussed, in this report. These variables and the reasons they were not analyzed are discussed below.

- Distribution Channel: Data on distribution channel were provided by 16 of the 25 study participants and were available for 73% of exposure data at the end of the level term. However, no clear pattern could be identified as data for each distribution channel were dominated by the experience of one or two study participants. It was difficult to differentiate variation by distribution channel from company variation, and no learnings were available as a result.
- Commission Pattern: Data on commission pattern were provided by 15 study participants and commission pattern was available for 64% of exposure data at the end of the level term. Unfortunately, no clear pattern could be identified.
- Simplified Issue: The main focus of this study is fully underwritten business. The data request specified that fully underwritten business with PLT experience should be submitted for the study. Nevertheless, 10 study participants provided some data for term business written on a simplified issue basis. These data were excluded from the main study but were analyzed separately to determine whether a comparative analysis to the fully underwritten business could be carried out. Premium jump information was missing for a large portion of the simplified issue data and, where premium information was

provided, a single participant's data dominated the view in many premium jump groups. Due to inconsistent messages and credibility issues with the limited data provided, further analysis was not possible in this study. Future studies may consider specifically requesting simplified issue data to capture a more complete dataset for comparative analysis.

- Return of Premium: The impact of a Return of Premium option on shock lapse at the end of term was investigated. Of the policies in the study, 61% do not offer this option in the last duration of level term. A further 19% did not provide data on the availability of a Return of Premium option. Data were available for too few study participants and could not be analyzed further.

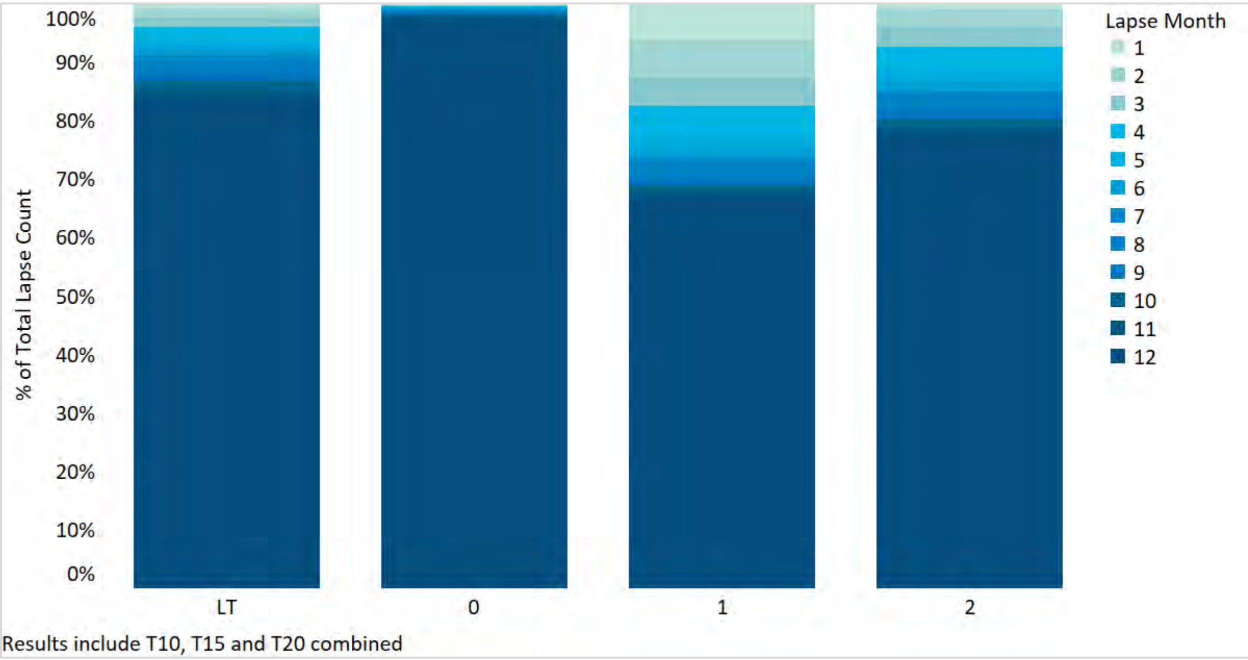
5.5 LAPSE SKEWNESS

The shock lapse analysis reviewed in preceding sections focused on the lapses occurring in the last duration of the level term. Before starting to review lapse rates in PLT in section 5.6, this section investigates the timing of lapses over the policy year. Skew lapses were a very significant finding in prior studies and, in this study, the same pattern of skew to the end of the last duration of level term and the first duration in PLT was observed.

For this analysis, Lapse Month was defined as the policy month when the lapse occurred within the policy year, where Lapse Month 1 is the first month after the policy anniversary and Lapse Month 12 is the last month before the next policy anniversary. Lapse skewness was reviewed separately for each premium payment mode because the degree of skewness varied by premium mode. The distribution of lapse decrements is shown in figure 5.5-1 for each duration group for the annual premium mode, comparing the level term (LT) pattern to the last duration of level term (0) and the first two durations in PLT (1 and 2). Results were reviewed separately for each premium payment mode. Results are combined for both PLT structures.

Figure 5.5-1

DISTRIBUTION OF LAPSES BY LAPSE MONTH AND DURATION FOR PREMIUM PAYMENT MODE: ANNUAL



For the annual premium mode, most lapses during the level term occurred in Lapse Month 12 (84%), the last month before the next policy anniversary.

In PLT duration 0, the last duration of the level term, this pattern was exaggerated with 97% of lapses occurring in Lapse Month 12. Most of the lapses contributing to the shock lapse occurred in the last month of the last duration of level term, just before PLT premium is due. This confirms that most policyholders pay the full year of premium in the last duration of the level term and then lapse before paying any PLT premiums.

In the first duration in PLT, a higher proportion of lapses occurred in the first policy month. Given the higher premiums in PLT, it is not unexpected that policyholders would seek alternative options and actively cancel the policies. A total of 17% of lapses occur during the first three months of the first duration in PLT.

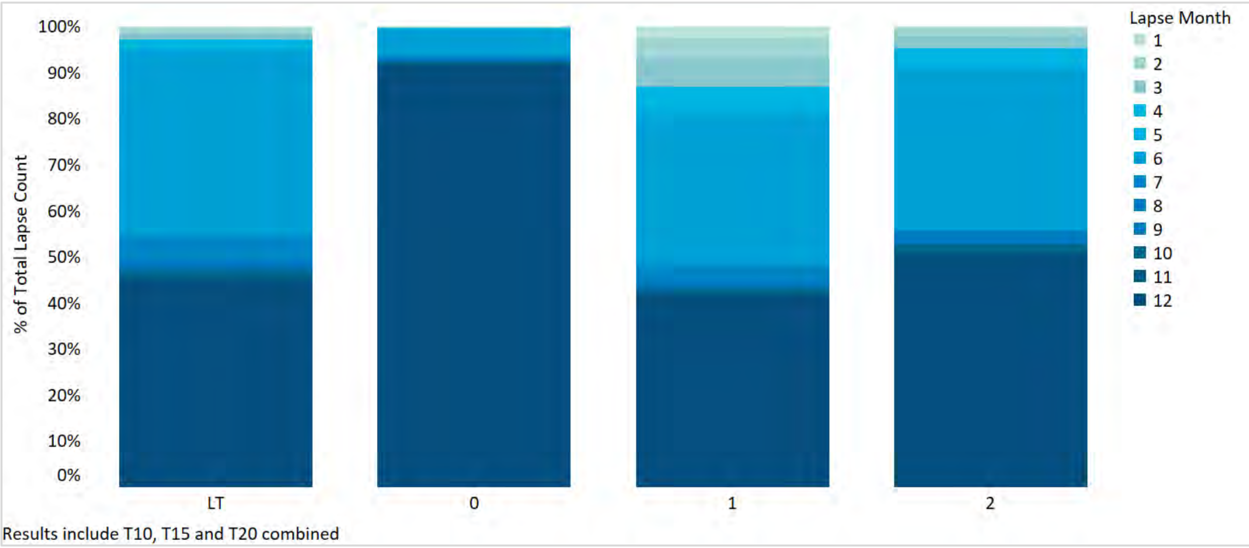
This is an important consideration for actuaries to take into account in modeling, because assuming the monthly pattern of lapses is the same in the PLT as in the level term would lead to signficiantly overstating the PLT premiums paid.

In PLT duration 2, the pattern reverted back to be more in line with the level term, although there was slightly more skewness to the earlier months, with 77% of lapses occurring in the last month.

A similar analysis was carried out for the other premium modes.

Figure 5.5-2

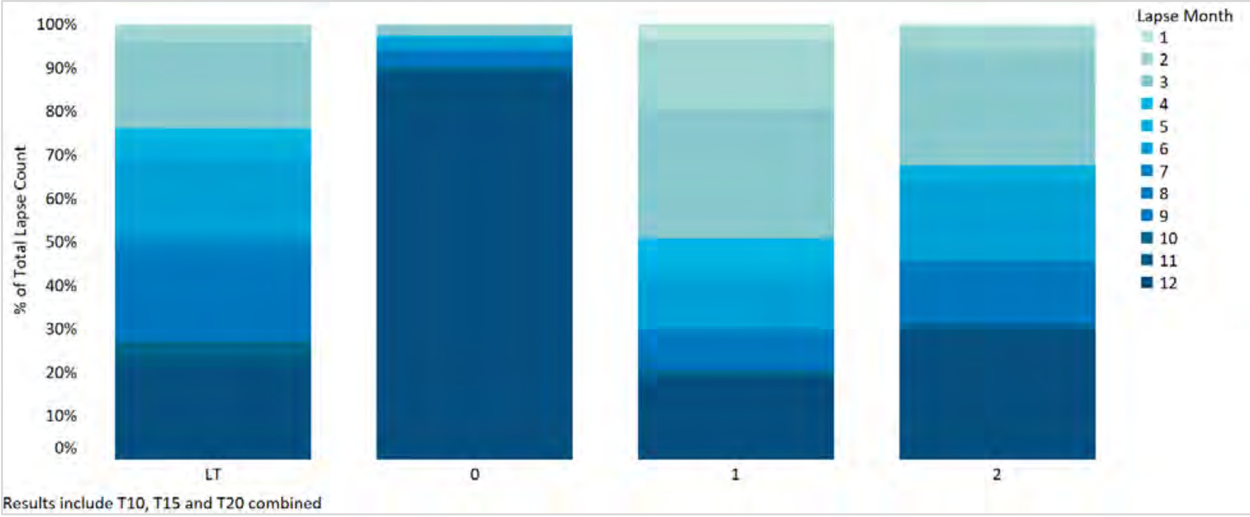
DISTRIBUTION OF LAPSES BY LAPSE MONTH AND DURATION FOR PREMIUM PAYMENT MODE: SEMI-ANNUAL



For semi-annual premium mode, lapses in the level period occurred mainly in Lapse Month 6 and Lapse Month 12, just before the next premium payment is due. However, in the last duration of the level term (PLT Duration 0), 91% of lapses occurred in Lapse Month 12, at the end of the last duration of the level term. In PLT duration 1, 13% of lapses occurred in the first three policy months. There is a clear skew of lapses towards the end of the last duration of level term and the beginning of the first duration in PLT.

Figure 5.5-3

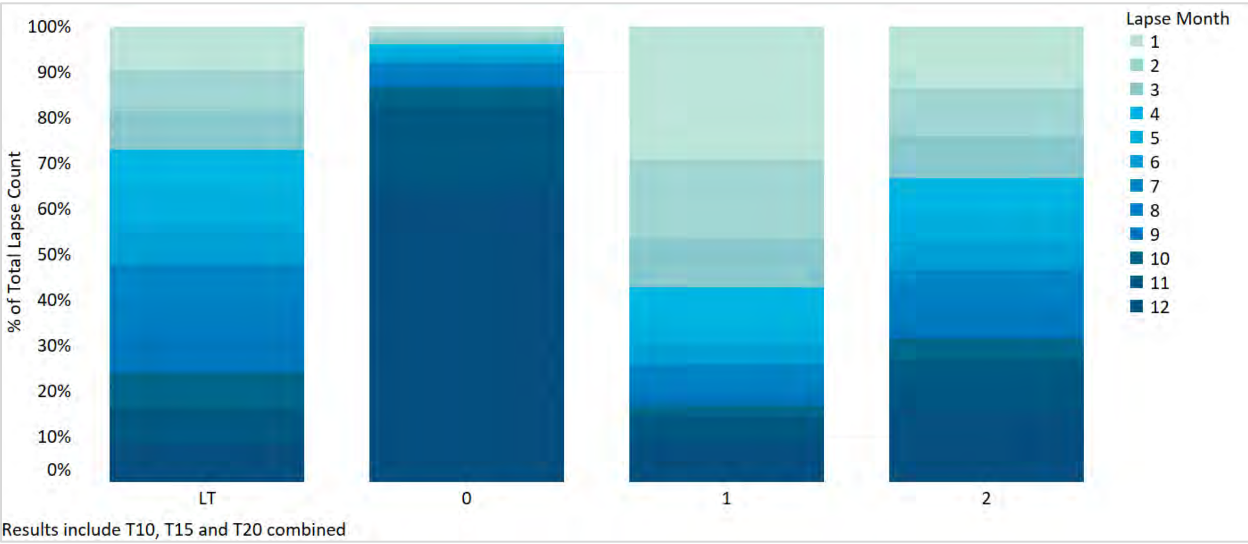
DISTRIBUTION OF LAPSES BY LAPSE MONTH AND DURATION FOR PREMIUM PAYMENT MODE: QUARTERLY



Quarterly premium mode lapses were seen predominantly in Lapse Months 3, 6, 9 and 12 during the level term period. In the last duration of level term, 88% of lapses occurred in Lapse Month 12. The skewness of lapses towards the start of PLT duration 1 is more significant than for annual or semi-annual modes. Half of all lapses occurred in the first three Lapse Months. Almost a third (30%) of lapses occurred in Lapse Month 3 just before the second PLT premium would be due.

Figure 5.5-4

DISTRIBUTION OF LAPSES BY LAPSE MONTH AND DURATION FOR PREMIUM PAYMENT MODE: MONTHLY



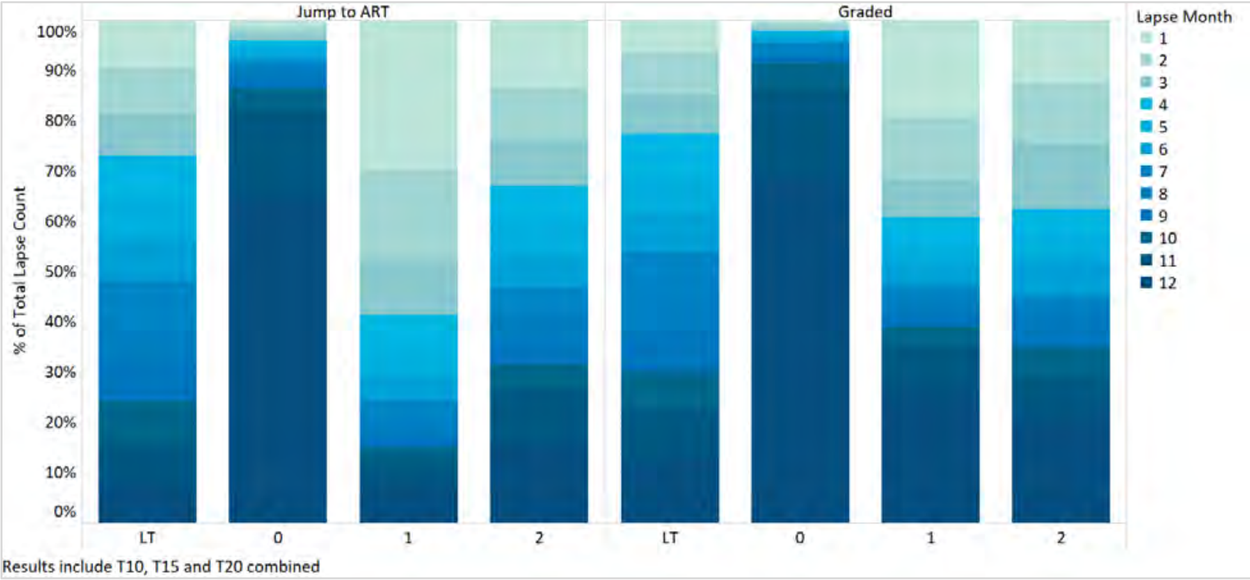
For monthly premium mode, lapses were evenly spread by month in the level term. In the last duration of level term, 66% of lapses occurred in Lapse Month 12, with a further 17% in Lapse Month 11. Then, 29% of PLT duration 1 lapses occurred in the first month, with 57% within the first three months.

There is a clear lapse skewness pattern with lapses occurring towards the end of the last duration in level term and the beginning of the first duration in PLT. This pattern is more pronounced for the more frequent premium modes.

The skewness analysis was also considered split by PLT structure for the monthly premium mode.

Figure 5.5-5

DISTRIBUTION OF LAPSES BY LAPSE MONTH, PLT STRUCTURE AND DURATION FOR PREMIUM PAYMENT MODE: MONTHLY



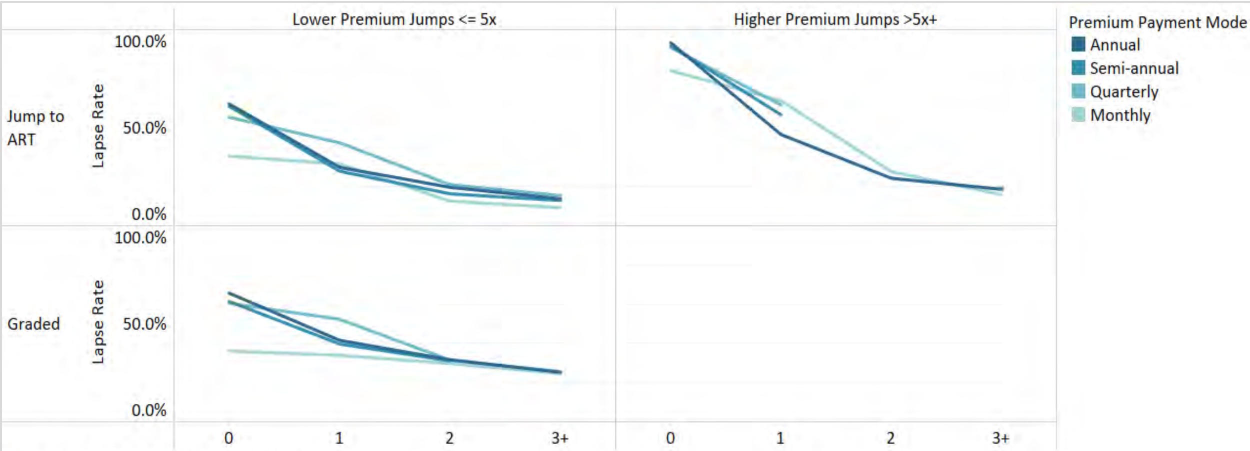
The pattern of lapse skew towards the end of the last duration of level term and towards the start of the first duration in PLT is observed for both PLT structures. However, in the first duration in PLT, there is a U-shape to the skewness for Graded that is not observed for Jump to ART. For Graded, there is a skew towards the end of PLT duration 1, with 26% of lapses occurring in Lapse Month 12, in addition to the skew towards the start with 19% of lapses occurring in Lapse Month 1. The skew towards the start of the first duration in PLT represents a reaction to the end of the level term premium increase and the skew towards the end of the first duration in PLT represents a reaction to the next premium increase which is also significant for the Graded structure. For the Jump to ART, the first quarter represents 59% of the lapse in PLT duration 1, while for Graded the first quarter represents 39%. The differences between the structures are less significant in the subsequent durations in PLT. The skew towards the end of PLT duration 1 for Graded is an important consideration in comparing the two structures as the timing of lapses over the year impacts the amount of PLT premium paid.

Lapse Rates by Premium Mode

In section 5.3.3, shock lapse analysis showed significantly lower lapses for monthly and quarterly premium modes compared to annual or semi-annual premium modes. Given the more significant skew towards the start of PLT duration 1 for the more frequent premium payment modes, an investigation into lapse by duration was considered.

Figure 5.5-6

LAPSE IN PLT SPLIT BY PLT STRUCTURE, DURATION GROUP, PREMIUM PAYMENT MODE AND PREMIUM JUMP GROUP



Results include T10, T15 and T20 combined
Excludes policies with no premium jump information

Table 5.5-6

LAPSE IN PLT SPLIT BY PLT STRUCTURE, DURATION IN PLT, PREMIUM PAYMENT MODE AND PREMIUM JUMP GROUP

PLT Structure	Premium Payment Mode	Lower Premium Jumps <= 5x				Higher Premium Jumps >5x+			
		0	1	2	3+	0	1	2	3+
Jump to ART	Annual	62.1%	29.8%	19.6%	13.7%	93.3%	46.5%	24.2%	18.6%
	Semi-annual	60.9%	27.8%	16.3%	12.9%	91.8%	56.6%		
	Quarterly	55.3%	42.3%	20.9%	15.4%	90.8%	61.6%		18.9%
	Monthly	35.5%	31.4%	12.6%	9.2%	79.1%	63.8%	27.6%	15.9%
Graded	Annual	65.6%	41.6%	31.6%	25.2%				
	Semi-annual	61.4%	39.7%	31.1%					
	Quarterly	60.5%	52.3%	31.4%	25.6%				
	Monthly	36.1%	33.9%	29.8%	24.6%				

For Jump to ART, monthly and quarterly premium modes experienced a lower shock lapse than annual and semi-annual modes but a higher PLT duration 1 lapse rate. In particular over the higher premium jumps, the lapse rate in PLT duration 1 is highest for monthly pay policies. The skewness analysis highlighted that monthly mode lapses are heavily skewed to the start of PLT duration 1. Policyholders paying monthly premiums had the lowest shock lapse at the end of term but many only paid premium for one month in PLT. For Jump to ART with lower premium jumps, PLT duration 1 lapse rates for monthly premium mode business are also higher than the annual or semi-annual premium modes, but the difference is less significant. For Graded, the monthly premium mode lapse rates are lower for all durations. Quarterly premium mode policies appear to have higher PLT duration 1 lapses for both structures. The higher PLT duration 1 lapse for the more frequent premium modes may represent some catch-up following the lower shock lapse.

Calculating a persistency rate confirms that monthly premium mode has lower lapses at the end of the level term, which results in better persistency in PLT for both premium jump ranges. Table 5.5-7 shows the persistency rate at the beginning of each PLT duration for each of the premium modes split by PLT structure and premium jump group.

Table 5.5-7

PERSISTENCY IN PLT SPLIT BY PLT STRUCTURE, DURATION IN PLT, PREMIUM PAYMENT MODE AND PREMIUM JUMP GROUP

		Premium Jump Group / PLT Duration							
		Lower Premium Jumps <= 5x				Higher Premium Jumps >5x+			
PLT Structure	Premium Payment Mode	0	1	2	3+	0	1	2	3+
Jump to ART	Annual	100.0%	37.9%	26.6%	21.4%	100.0%	6.7%	3.6%	2.7%
	Semi-annual	100.0%	39.1%	28.2%	23.6%	100.0%	8.2%	3.6%	0.0%
	Quarterly	100.0%	44.7%	25.8%	20.4%	100.0%	9.2%	3.5%	0.0%
	Monthly	100.0%	64.5%	44.2%	38.7%	100.0%	20.9%	7.6%	5.5%
Graded	Annual	100.0%	34.4%	20.1%	13.7%				
	Semi-annual	100.0%	38.6%	23.3%	16.1%				
	Quarterly	100.0%	39.5%	18.9%	12.9%				
	Monthly	100.0%	63.9%	42.2%	29.7%				

At lower premium jumps, persistency differences were most significant. For Graded, PLT duration 2 persistency is 20% for annual premium mode but 42% for monthly premium mode. Similar differences are observed for Jump to ART over lower premium jumps. For higher premium jumps, the percent of policyholders remaining at the beginning of PLT duration 2 (i.e., having paid a full year of PLT premium in PLT duration 1) is 7.6% for monthly premium mode compared to 3.6% for annual premium mode business.

The lower shock lapse for monthly premium mode business does not only lead to more policyholders paying one month of premium in PLT, but also better persistency in PLT overall for monthly premium mode business.

While persistency is better overall for monthly mode policies, the same is not seen for quarterly mode. For both structures, the percent of quarterly pay policyholders remaining at the beginning of PLT duration 2 is similar to annual or semi-annual premium modes and even slightly lower over the lower premium jump groups.

5.6 ALL PLT DURATION LAPSES

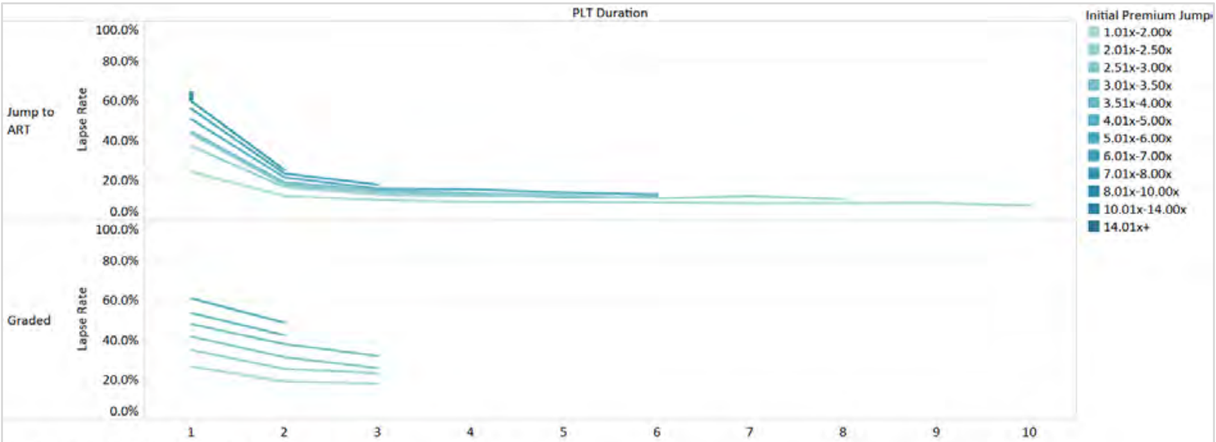
The shock lapse at the end of the level term was discussed in detail in sections 5.2, 5.3 and 5.4. In this section, lapses occurring in the post-level term period are presented. Traditional analysis was performed to identify the drivers of variation in lapse rates in PLT. This analysis is focused on PLT durations 1 to 10, starting in the first duration of PLT, and covers 10 durations of lapse experience in PLT. For Graded, data were available to PLT duration 3 only.

5.6.1 PREMIUM JUMP

The initial premium jump that was highlighted to have the most significant impact on shock lapse at the end of the level term continues to impact lapse rates in PLT.

Figure 5.6.1-1

LAPSE IN PLT BY PREMIUM JUMP, PLT STRUCTURE AND PLT DURATION



Results include T10, T15 and T20 combined
Lapse rates are represented on the graph when a minimum of 271 lapse decrements is available. When sufficient data are available at one duration only, the lapse rate is represented by a dot. Otherwise, lapse rates by duration are represented by a line.

Table 5.6.1-1

LAPSE RATES IN PLT BY PREMIUM JUMP, PLT STRUCTURE AND PLT DURATION

PLT Structure	Premium Jump Initial Shock	PLT Duration 1	2	3	4	5	6	7	8	9	10
Jump to ART	1.01x-2.00x	24.4%	12.3%	10.2%	9.3%	9.3%	9.0%	8.6%	8.6%	8.7%	7.6%
	2.01x-2.50x	37.2%	16.7%	13.0%	12.2%	12.6%	11.1%	12.1%	10.7%		
	2.51x-3.00x	43.4%	17.9%	14.3%	12.9%	13.2%					
	3.01x-3.50x	44.6%	18.8%	14.8%	13.2%	12.8%					
	3.51x-4.00x	44.3%	19.1%	15.1%	13.6%	11.5%	11.9%				
	4.01x-5.00x	50.8%	21.6%	16.0%	15.7%	14.0%	12.9%				
	5.01x-6.00x	56.0%	23.5%	17.9%							
	6.01x-7.00x	59.7%	25.3%								
	7.01x-8.00x	61.8%									
	8.01x-10.00x	63.4%									
	10.01x-14.00x	63.7%									
	14.01x+	61.2%									
Graded	1.01x-2.00x	26.8%	19.2%	18.1%							
	2.01x-2.50x	35.0%	25.6%	23.5%							
	2.51x-3.00x	41.8%	31.4%	26.0%							
	3.01x-3.50x	48.0%	38.1%	32.1%							
	3.51x-4.00x	53.6%	42.5%								
	4.01x-5.00x	60.9%	48.8%								

Results include T10, T15 and T20 combined

For Jump to ART, the lapse rate in the first duration in PLT (PLT Duration 1) ranges from 24% for the lowest initial premium jumps to approximately 60% for the highest initial premium jumps. As the durations increase, this range narrows and less variation is observed. The lapse rates decrease by duration in PLT but the decreasing pattern becomes less steep around PLT duration 3. The pattern by initial premium jump is still maintained, where a lower initial premium jump corresponds to a lower lapse rate across all later durations, though varying over a much narrower range. In PLT duration 3, lapse rates are within the range of 10% to 18% where data are available.

The variation in lapse rates among premium jump groups is more significant for Graded, and the difference remains significant in PLT duration 3 ranging from 18% to 32%. Since Graded is newer to the market than Jump to ART, there is no information available beyond PLT duration 3.

When comparing structures, the lapse rates in PLT are higher for Graded than for Jump to ART for a given premium jump. This is because the Graded PLT premiums are generally steeper than Jump to ART, which results in higher premium jumps each subsequent year. For example, see initial premium jump 3.01-3.50x in table 5.6.1-2 below.

Table 5.6.1-2

LAPSE IN PLT FOR PREMIUM JUMP 3.01-3.50X, BY PLT STRUCTURE AND PLT DURATION

PLT Structure	Initial Premium Jump	PLT Duration 1	2	3
Jump to ART	3.01x-3.50x	44.6%	18.8%	14.8%
Graded	3.01x-3.50x	48.0%	38.1%	32.1%

The premium continues to increase each year in PLT for both structures. Though the initial premium increase at the end of the level term is the largest increase, the premium increases in subsequent years also have an impact on lapse behavior. The next premium jump is calculated as the ratio of the PLT premium due in the next duration compared to the PLT premium paid in the current duration. For Jump to ART, the PLT premiums increase annually on an age-rated ART scale so the next premium jumps are in the range 1.01-1.20x in each future year.

Figure 5.6.1-3

LAPSE IN PLT BY NEXT PREMIUM JUMP AND PLT DURATION FOR JUMP TO ART

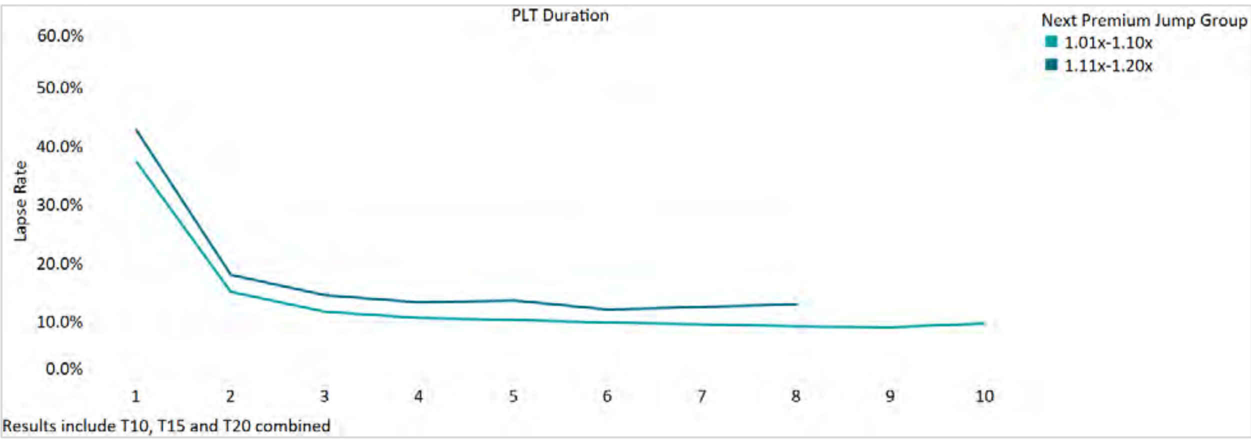


Table 5.6.1-3

LAPSE IN PLT BY NEXT PREMIUM JUMP AND PLT DURATION FOR JUMP TO ART

	PLT Duration									
Next Premium Jump Group	1	2	3	4	5	6	7	8	9	10
1.01x-1.10x	37.4%	15.2%	11.8%	10.8%	10.4%	10.0%	9.7%	9.3%	9.2%	9.8%
1.11x-1.20x	42.8%	18.1%	14.7%	13.4%	13.8%	12.2%	12.7%	13.1%		

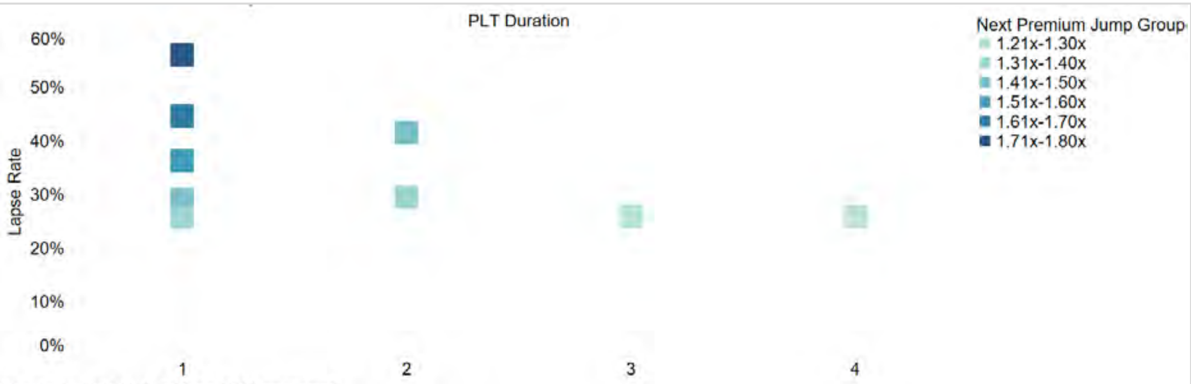
Results include T10, T15 and T20 combined

Even though the relative increase in each subsequent year falls within a narrow range, lapse rates vary by the size of the next premium increase at each duration. Lapses are higher for the higher next premium jump group. The difference is 6% for PLT duration 1 and reduces to 3% to 4% for later durations. Both the initial premium jump and the subsequent duration premium increases in PLT impact the lapse rates by duration in PLT for Jump to ART.

The Graded PLT structure is designed to have lower initial premium increases followed by premiums that increase in significant steps each year over a specified grading period before reaching an ART scale. The grading period ranges from five to ten years, and the size of the subsequent duration premium increases will differ depending on the grading period. The next premium jumps range from 1.21x-1.80x for the first PLT duration with lower jumps in each subsequent year.

Figure 5.6.1-4

LAPSE IN PLT BY NEXT PREMIUM JUMP AND PLT DURATION FOR GRADED



Results include T10, T15 and T20 combined

Table 5.6.1-4

LAPSE IN PLT BY NEXT PREMIUM JUMP AND PLT DURATION FOR GRADED

	PLT Duration			
Next Premium Jump Group	1	2	3	4
1.21x-1.30x			26.2%	26.0%
1.31x-1.40x	26.0%	29.7%		
1.41x-1.50x	29.3%	41.7%		
1.51x-1.60x	36.5%			
1.61x-1.70x	44.8%			
1.71x-1.80x	56.2%			

Higher subsequent duration premium increases lead to higher lapses. In PLT duration 1, the lapse rate varies between 26% and 56% depending on the size of the next premium jump. In PLT duration 2, the lapse rate ranges from 30% to 42% based on a next premium jump range of 1.31x-1.50x. For PLT durations 3 and 4, lapse data are only available for next premium jump 1.21x-1.30x, making this factor less interesting. The range of next premium jump reduces each year in PLT because, as the PLT premium increases, the relative premium jump each year is smaller. For PLT duration 1, in particular, next premium jump is an important factor in addition to initial premium jump. The skewness pattern for Graded shown in figure 5.5-5 highlighted a U-shape for PLT duration 1 lapses, with a skew to the first month and a skew to the last month. Lapses in the first month represent a reaction to the initial premium jump, while lapses in the last month represent a reaction to the next premium jump. This confirms the importance of considering both premium jump metrics.

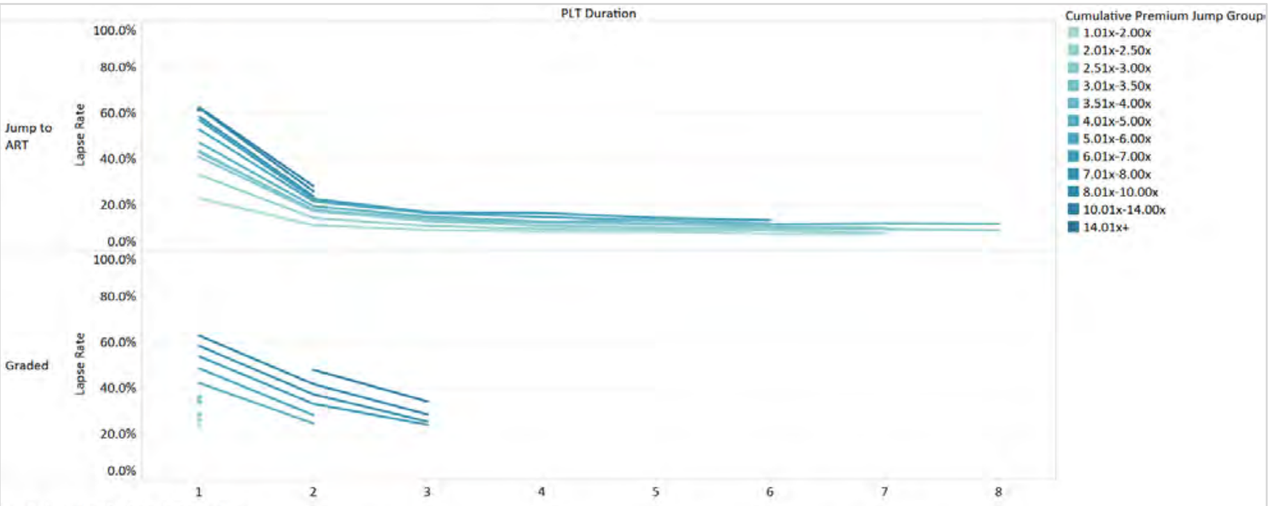
Jump to ART and Graded show similar shock lapses at PLT duration 0 for a given initial premium jump, but the lapse rates by duration in PLT differ among the structures due to the differences in the subsequent premium jumps. Next premium jump is an interesting factor in explaining PLT lapse differences between Jump to ART and Graded, as well as helping explain PLT lapse differences within each structure.

5.6.2 CUMULATIVE PREMIUM JUMP

Initial premium jump refers to the premium increase from the level term premium to the first PLT duration premium. The cumulative premium jump is calculated as the ratio of the next duration PLT premium compared to the level term premium. This measure helps to capture the fact that premium continues to increase in each duration in PLT for both PLT structures.

Figure 5.6.2

LAPSE IN PLT BY CUMULATIVE PREMIUM JUMP, PLT STRUCTURE AND PLT DURATION



Results include T10, T15 and T20 combined
Lapse rates are represented on the graph when a minimum of 271 lapse decrements is available. When sufficient data are available at one duration only, the lapse rate is represented by a dot. Otherwise, lapse rates by duration are represented by a line.

Table 5.6.2

LAPSE IN PLT BY CUMULATIVE PREMIUM JUMP, PLT STRUCTURE AND PLT DURATION

PLT Structure	Cumulative Premium Jump Group	PLT Duration 1	2	3	4	5	6	7	8	9	10
Jump to ART	1.01x-2.00x	22.8%	11.1%	9.0%	8.3%	8.2%	7.3%	7.3%			
	2.01x-2.50x	33.0%	14.2%	10.8%	9.5%	9.2%	8.8%	7.6%			
	2.51x-3.00x	40.8%	17.2%	12.9%	10.8%	10.1%	9.6%	9.3%	8.9%		
	3.01x-3.50x	43.4%	17.4%	14.1%	12.2%	11.7%	10.4%	10.1%			
	3.51x-4.00x	42.9%	17.8%	12.9%	12.5%	13.2%	11.2%				
	4.01x-5.00x	47.1%	19.3%	14.8%	12.6%	11.4%	11.5%	11.9%	11.6%		
	5.01x-6.00x	52.8%	21.4%	16.3%	14.6%	13.1%	11.8%				
	6.01x-7.00x	56.9%	22.5%	16.6%	16.4%	14.2%	13.2%				
	7.01x-8.00x	58.4%	23.7%								
	8.01x-10.00x	62.1%	25.8%								
	10.01x-14.00x	62.4%	28.1%								
	14.01x+	61.6%									
Graded	1.01x-2.00x	23.8%									
	2.01x-2.50x	25.9%									
	2.51x-3.00x	28.3%									
	3.01x-3.50x	33.9%									
	3.51x-4.00x	36.1%									
	4.01x-5.00x	42.1%	24.5%								
	5.01x-6.00x	48.5%	28.1%								
	6.01x-7.00x	53.8%	33.1%	24.0%							
	7.01x-8.00x	58.4%	37.2%	25.3%							
	8.01x-10.00x	62.9%	41.7%	28.4%							
	10.01x-14.00x		47.9%	34.1%							
	14.01x+										

For Jump to ART, this graph shows a similar pattern to that seen for initial premium jump analysis in figure 5.6.1. Cumulative premium jumps do not differ significantly from initial premium jumps for Jump to ART as the premium increases by duration in PLT are approximately 101-120% of the prior year's premium based on age-related increases. As these increases compound by duration, cumulative premium jump increase captures additional variation in PLT. This variation is observed over a relatively narrow range from PLT duration 5.

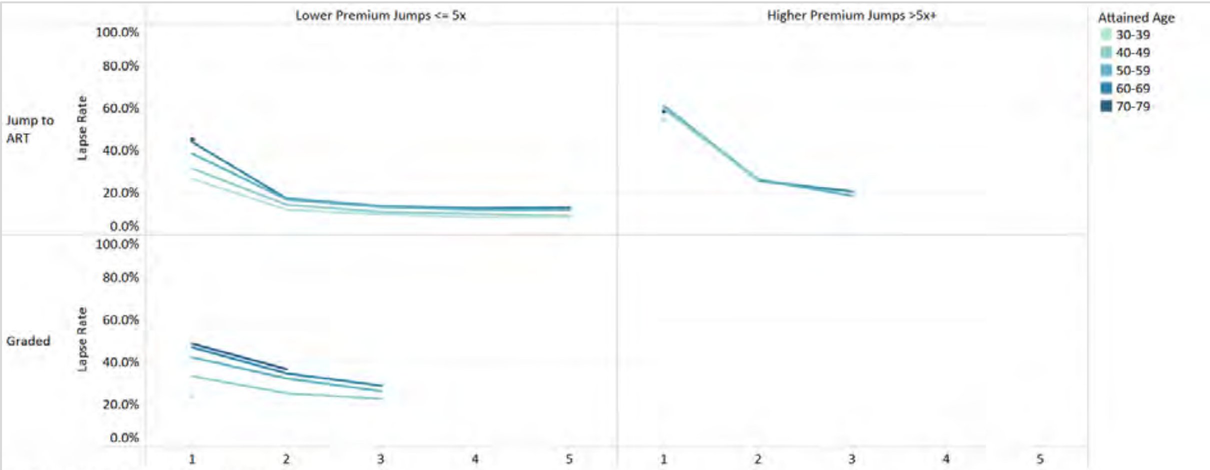
The Graded PLT structure shows more variation in lapse rates in PLT and cumulative premium jump increases can help explain this variation. For example, policies that experienced an initial premium increase of 3.01x-3.50x will face a cumulative premium increase of 5.01x-6.00x at the end of PLT duration 1 and an increase of 7.01x-8.00x by the end of PLT duration 2. Observe the darker colored lines on the graph representing higher cumulative premium jump increases appearing at later durations. The higher lapse rates in PLT for Graded can be better explained by cumulative premium jump increases which reflect the significant increases in each duration in PLT.

5.6.3 ATTAINED AGE

Attained age continues to have an influence on the lapse rates observed in durations after the end of the level term.

Figure 5.6.3

LAPSE IN PLT BY ATTAINED AGE, PREMIUM JUMP GROUP, PLT STRUCTURE AND PLT DURATION



Results include T10, T15 and T20 combined
Lapse rates are represented on the graph when a minimum of 271 lapse decrements is available. When sufficient data are available at one duration only, the lapse rate is represented by a dot. Otherwise, lapse rates by duration are represented by a line.

Table 5.6.3

LAPSE IN PLT BY ATTAINED AGE, PREMIUM JUMP GROUP, PLT STRUCTURE AND PLT DURATION

		Lower Premium Jumps <= 5x					Higher Premium Jumps >5x+				
		1	2	3	4	5	1	2	3	4	5
Jump to ART	30-39	26.5%	12.0%	9.7%	8.3%	8.4%	54.5%				
	40-49	31.4%	14.3%	10.9%	10.0%	9.0%	59.5%	25.8%			
	50-59	38.5%	16.8%	13.3%	12.0%	11.9%	60.7%	26.2%	18.6%		
	60-69	43.9%	17.1%	13.7%	12.6%	12.9%	61.0%	25.6%	20.5%		
	70-79	45.1%					58.5%				
Graded	30-39	23.7%									
	40-49	33.3%	25.3%	22.6%							
	50-59	42.2%	32.3%	26.3%							
	60-69	47.0%	34.6%	28.9%							
	70-79	48.7%	36.6%								

For lower initial premium jumps, a similar pattern can be seen for attained age, as in the shock lapse analysis where a higher attained age results in a higher lapse rate. This pattern is observed for both PLT structures over the common initial premium jump range. Lapse rates in PLT duration 1 range from approximately 24-27% for attained ages 30-39 to 45-50% for attained ages 70-79. Moving further into PLT, the differences by age narrow for Jump to ART, but variations remain significant for Graded. In PLT duration 2, lapse rates range from 12%-17% for Jump to ART and 25%-37% for Graded.

For Jump to ART higher initial premium jumps, attained age does not appear to have an impact on lapse rates in PLT. PLT duration 1 lapses range from 60% to 61% for attained ages 40 to 69, and a similarly narrow range of 25-26% is seen in PLT duration 2. The highest attained age group, 70-79, appears to have a slightly lower PLT duration 1 lapse rate. The clear increasing pattern by age that is seen at the lower initial premium jumps is not evident at the higher premium jumps for Jump to ART.

Attained age is an important driver of lapse rates in PLT for lower initial premium jumps, and especially for Graded where differences by age remain significant in PLT durations 2 and 3.

5.6.4 BILLING TYPE

Another factor that continues to have an impact in PLT is billing type, where lapse rates are lower when premiums are paid by automatic payment than when a bill is sent to the policyholder for payment.

Figure 5.6.4

LAPSE IN PLT BY BILLING TYPE AND PLT DURATION

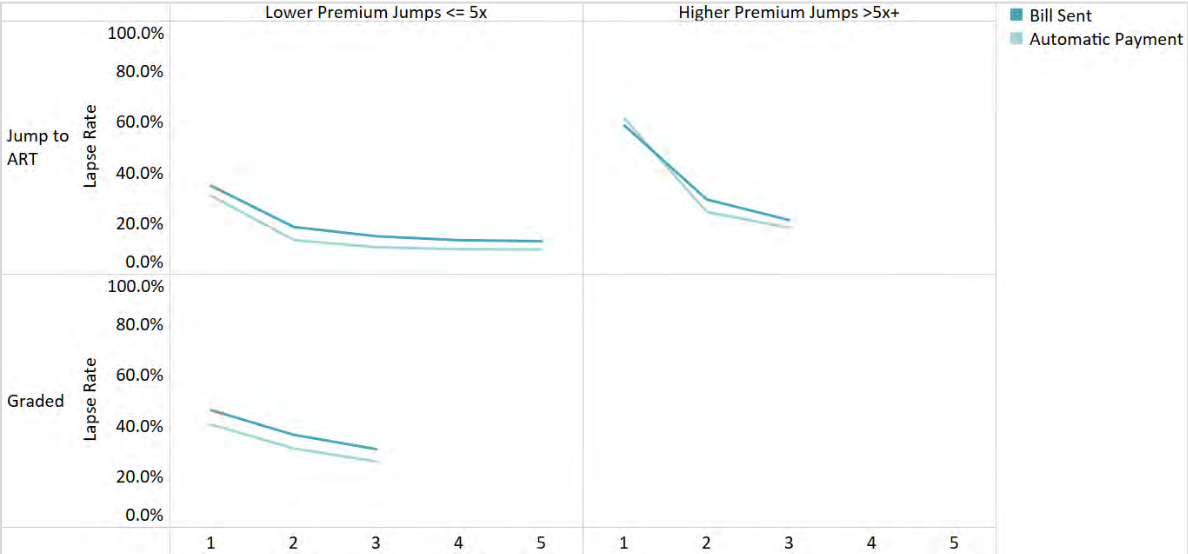


Table 5.6.4

LAPSE IN PLT BY BILLING TYPE AND PLT DURATION

Premium Jump Group	Billing Type LT PLT		Jump to ART 1	2	3	4	5	Graded 1	2	3	4
Lower Premium Jumps <= 5x	Bill Sent	Exposure Count	32.7K	20.2K	15.9K	12.9K	10.3K	17.7K	5.3K	2.2K	0.6K
		Lapse Count	11,394	3,762	2,376	1,728	1,342	8,182	1,931	664	174
		Lapse Rate	34.9%	18.7%	15.0%	13.4%	13.0%	46.3%	36.5%	30.9%	
	Automatic Payment	Exposure Count	90.4K	60.7K	49.8K	41.1K	32.4K	11.7K	4.0K	1.7K	0.5K
		Lapse Count	28,017	8,185	5,311	4,057	3,168	4,754	1,258	453	106
		Lapse Rate	31.0%	13.5%	10.7%	9.9%	9.8%	40.6%	31.2%	26.0%	
Higher Premium Jumps >5x+	Bill Sent	Exposure Count	13.4K	2.6K	1.6K	1.0K	0.7K				
		Lapse Count	7,870	768	332	194	115				
		Lapse Rate	58.8%	29.5%	21.4%						
	Automatic Payment	Exposure Count	11.9K	3.6K	2.3K	1.5K	1.1K				
		Lapse Count	7,326	881	423	252	177				
		Lapse Rate	61.5%	24.6%	18.3%						

Results over lower premium jumps show higher lapse for bill sent compared to automatic payment for all PLT durations. Though lapse rates in all durations are higher when a bill is received, the difference between billing types is not as large as differences seen for shock lapse in PLT duration 0 shown in section 5.3.4. For Jump to ART over higher premium jumps, the pattern is reversed in PLT duration 1. The shock lapse in PLT duration 0 was higher for all premium jumps when the policyholder was sent a bill, as shown in section 5.3.4. The higher lapse in PLT duration 1 for automatic payment may reflect some delayed reaction to the premium increase after lower lapse at the end of term. In PLT durations 2 and 3, lapse rates are higher for bill sent.

5.6.5 OTHER VARIABLES

Other factors confirmed to have an impact on shock lapse at the end of the level term, as outlined in section 5.3, continue to have an impact on lapses in PLT. Face amount, risk class and gender all show similar lapse patterns in PLT as at the end of the level term. The variation is most significant in PLT duration 1 for Jump to ART and continues to be impactful in all PLT durations for Graded. In addition, for all three factors the variation is most notable for lower initial premium jumps of less than five times and appears less significant for Jump to ART over higher premium jumps.

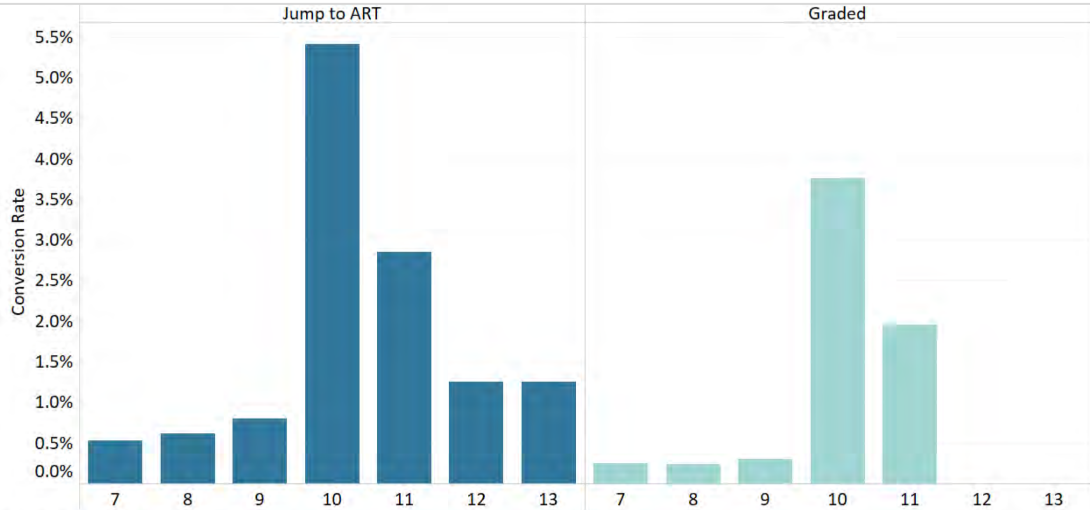
5.7 LAPSE AND CONVERSION COMPARISON

Throughout the report, the lapse rates analyzed include decrements due to both lapse and conversion. Some study participants were unable to distinguish between the two decrement types in the data submission. For participants that did provide this split, some analysis on conversions at the end of level term and in PLT was considered. Conversion data were credible for T10, with more limited data for T15 but no data available for T20.

In each duration, the conversion rate was calculated as the ratio of policies that exercised the option to convert to the number of the policies that had a conversion option available. Figure 5.7-1 shows the conversion rates for T10 by duration, focused on durations just before and after the end of level term.

Figure 5.7-1

CONVERSION RATE BY DURATION AND PLT STRUCTURE, T10 ONLY



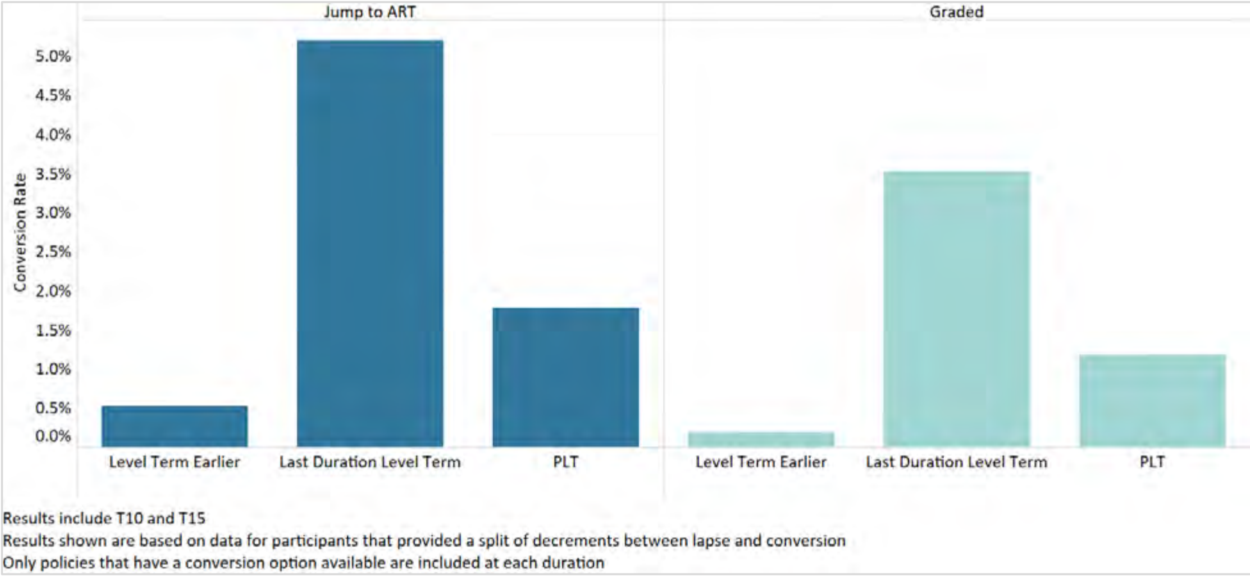
Results include T10 Only
Results shown are based on data for participants that provided a split of decrements between lapse and conversion
Only policies that have a conversion option available are included at each duration

Conversion rates increase in the last duration of level term and remain high in the first duration in PLT. For Jump to ART, conversion rates in the level term are below 1% in all durations with the exception of the last duration of level term when the conversion rate increases to 5.5%. Conversion rates are also high in the first duration in PLT and reduce with each duration in PLT while remaining higher than level term conversion rates. For Graded, conversion rates are lower than Jump to ART. The pattern by duration is similar to the Jump to ART pattern in durations where data are available.

A similar pattern was observed for T15. Figure 5.7-2 shows T10 and T15 combined based on analysis by duration group where the conversion rates were compared across three groups: the level term earlier durations, the last duration in level term and PLT.

Figure 5.7-2

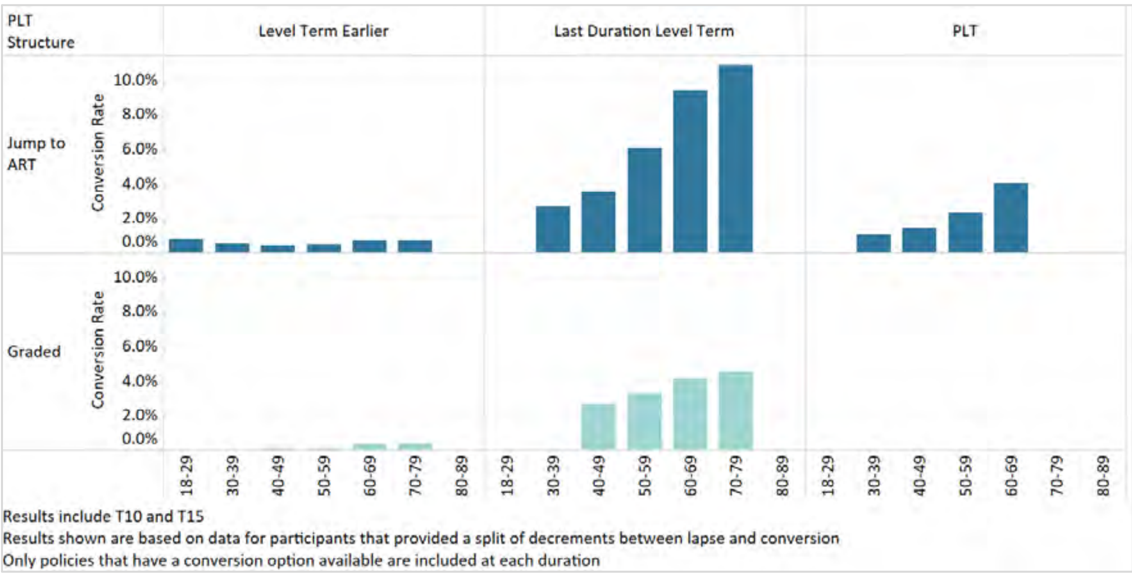
CONVERSION RATE BY DURATION GROUP AND PLT STRUCTURE, T10 AND T15 COMBINED



Conversion rates are highest in the last duration of level term and remain higher in PLT than in earlier durations in level term. Other factors were considered to identify variation in conversion rates. Figure 5.7-3 shows conversion rates by duration group for T10 and T15 combined, split by attained age group.

Figure 5.7-3

CONVERSION RATE BY DURATION GROUP, ATTAINED AGE AND PLT STRUCTURE

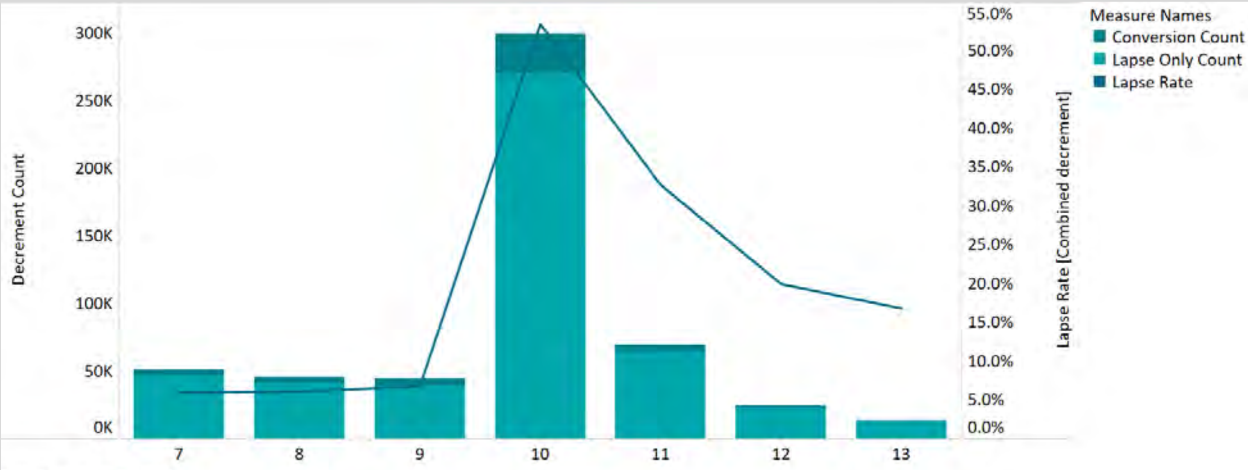


Analysis of the conversion rate by attained age shows a higher conversion rate for older policyholders. This is most pronounced in the last duration of level term but is also observed in PLT for Jump to ART.

This pattern of increased conversion rate is in line with the pattern of increased lapse identified. Further analysis was conducted to compare the breakdown of decrements between lapse and conversion by duration. Figure 5.7-4 shows the lapse and conversion decrement counts by duration for T10 Jump to ART along with the lapse rate based on the combined decrement on a dual axis graph. Only T10 Jump to ART is considered here as this segment had the most data available.

Figure 5.7-4

BREAKDOWN OF DECREMENT TYPES AND LAPSE RATE BY DURATION FOR T10, JUMP TO ART ONLY



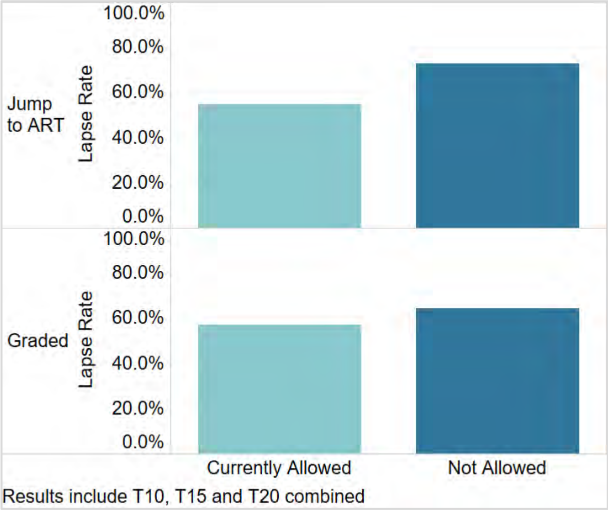
Results include T10 only
Results shown are based on data for participants that provided a split of decrements between lapse and conversion
Only policies that have a conversion option available are included at each duration

The conversion rate and lapse rate are increased in the last duration of level term. The percentage of decrements that are conversions is, in fact, similar by duration. The conversion rate is higher in durations where the lapse rate is also higher.

Analysis was carried out to determine if the availability of the conversion option impacted the shock lapse at end of the level term. Figure 5.7-5 shows the shock lapse based on the combined lapse and conversion decrement. This view includes only data where information was provided on availability of a conversion option, and the indicator shows when conversion was currently allowed or not allowed at the last duration in level term.

Figure 5.7-5

SHOCK LAPSE BY PLT STRUCTURE AND CONVERSION OPTION AVAILABILITY



The availability of a conversion option does not lead to a higher shock lapse. In fact, lapses appear lower when a conversion option is still available at the end of the level term period. Lapses appear to be higher when a conversion option is not available. Some policyholders may be retaining their policies into PLT when a conversion option remains available as this option is valued.

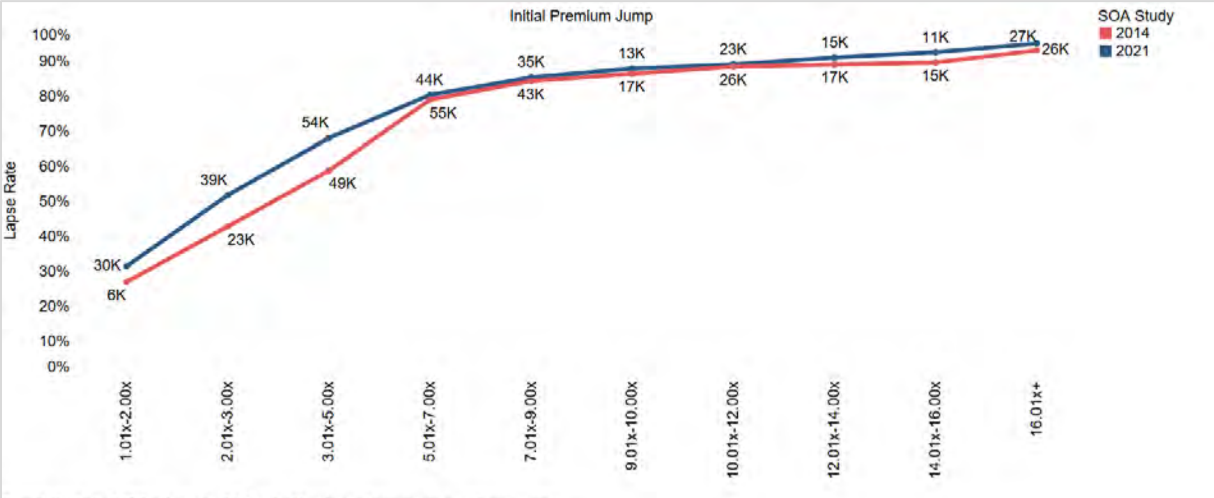
Exercising of the conversion option, where available, is increased in the last duration of level term and this contributes to the shock lapse calculated based on the combined decrement. There is no evidence that availability of a conversion option leads to increased shock lapse at the end of the level term.

5.8 COMPARISON TO 2014 U.S. PLT STUDY

The previous SOA industry study on U.S. Post-Level Term was completed in 2014. The study focused on the Jump to ART structure and included predominantly T10 experience. A comparison of the latest 2021 study results to the previous study was carried out. Figure 5.8-1 shows the shock lapse experience for duration 10 of T10 with a Jump to ART structure for the two studies.

Figure 5.8-1

SHOCK LAPSE RATES BY SOA STUDY AND INITIAL PREMIUM JUMP GROUP



Results include T10 for Jump to ART only. Numbers shown represent lapse counts.
Premium Jump definition varies between the studies. Issue ages 20+ included.

Shock lapses in the 2021 study follow a similar pattern to the 2014 study and the shock lapse levels are generally similar across premium jump groups. The shock lapse rates align closely for premium jumps five times and higher. Over lower premium jumps, the 2021 study appears to show somewhat higher lapses compared to the 2014 study. Note the newer study has more exposure in lower premium jump groups.

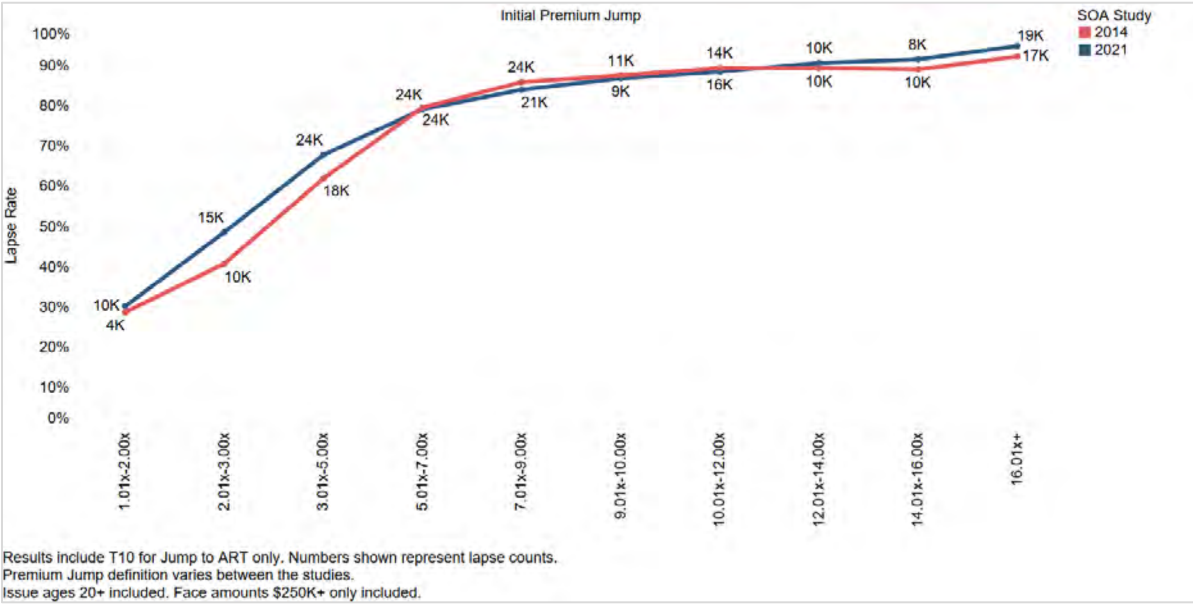
In the 2021 study, the initial premium jump is defined as the ratio of the first PLT premium to the level term period premium. This is in line with the actual premium increase presented to the policyholder. The 2014 SOA PLT study included initial premium jump calculated as the ratio of the per thousand premium rate in the first duration in PLT to the per thousand premium rate in the level term. The difference is that using the per thousand rate does not include the policy fee.

Including the policy fee assigns policies a lower jump in the 2021 study compared to the rate per thousand premium group under the 2014 study. The policy fee has more of an impact when the absolute premium amount is smaller and, as a result, could explain the wider variation over the lower premium jump range. The somewhat higher shock lapse observed for lower premium jump groups in the 2021 study could be due to this difference in premium jump definition.

Given the policy fee is more impactful for lower premium dollar amounts, the difference in premium jump definition would impact the premium jump grouping less for higher face amount policies. Figure 5.8-2 shows the same comparison graph as in figure 5.8-1 filtered to include face amount $250,000 or higher only.

Figure 5.8-2

SHOCK LAPSE RATES BY SOA STUDY AND INITIAL PREMIUM JUMP GROUP, FOR FACE AMOUNTS $250K+



Focusing only on higher face amounts, the differences in shock lapse experience between the studies is reduced. Since the policy fee impact is more material for lower face amount policies than larger face amount policies, this suggests that the premium jump definition was contributing to some of the variation identified in figure 5.8-1.

There is also a different mix of participating companies between the studies. Some companies that submitted data for the 2014 study did not submit data for the 2021 study. There are also some new participants in the 2021 study that were not included in the 2014 study. This leads to business mix differences between the studies. The analysis by premium jump ensures the comparison is not impacted by premium jump mix differences between the studies, but other business mix differences such as age, premium mode and billing type are not accounted for. As a result, an exact alignment of lapse rates between the studies is not expected.

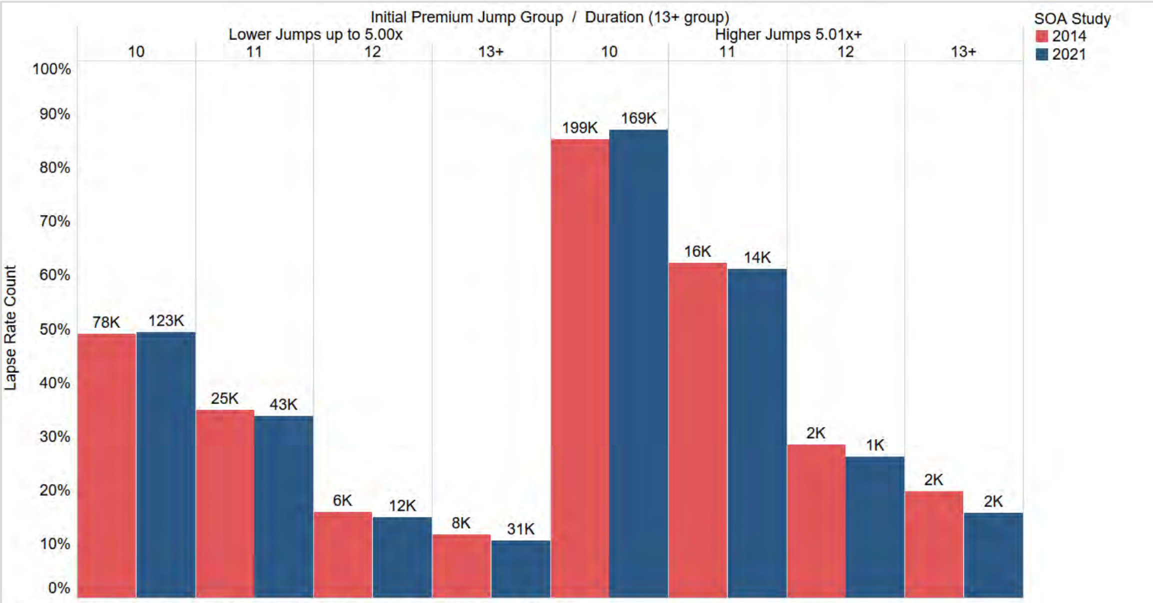
In addition to premium jump, other variables impacting shock lapse were compared between the studies. While the pattern by attained age is similar between the studies, shock lapse does not vary as significantly by face amount in the 2021 study. The different results by face amount can be attributed to the difference in the premium jump definition. Less variation by face amount is observed when the premium jump ratios capture the complete policyholder premiums, rather than the per thousand premium rate as explained above.

Premium mode and billing type are new variables investigated in the 2021 study that were not part of the shock lapse analysis in the 2014 study. See sections 5.2.3 and 5.2.4 for more details.

A comparison of lapse rates by duration was also analyzed between the studies. Figure 5.8-3 shows T10 lapse rates for durations 10, 11, 12 and duration group 13+, which was grouped in line with the grouping applied for the 2014 study. The analysis is split by broad premium jump groupings to minimize business mix differences.

Figure 5.8-3

LAPSE RATES BY SOA STUDY, DURATION AND INITIAL PREMIUM JUMP GROUP



Results include T10 for Jump to ART only. Numbers shown represent lapse counts.
Premium Jump definition varies between the studies. Issue ages 20+ included.
Data with unknown premium jump is excluded.

The lapse rate pattern by duration is similar between the studies and the lapse rates for each duration within each premium jump grouping closely align. For the lower premium jump groups, the 2021 study includes significantly more data by duration in PLT compared to the 2014 study. The exposure in duration group 13+ is over four times larger in the 2021 study compared to the 2014 study. This is due to more PLT data at later durations emerging over time. The duration 13+ group includes more later durations in the 2021 study than in the 2014 study. The duration 13+ lapse rate was 10.5% in the 2021 study compared to 11.7% based on the 2014 study. Despite the increased amount of data in later durations, the lapse rate is not significantly lower. This suggests that the lapse rate is reducing only marginally by duration in PLT after duration 13.

For the higher premium jump groups, the exposure in later durations is not very different between the studies. In the 2021 study, there was not a significant increase in the available data by duration in PLT for higher premium jump groups. Though more business has been reaching PLT over time, the very high shock lapse at the end of the level term for higher premium jumps leaves a smaller amount of data in PLT.

The lapse rate for duration group 13+ in the 2021 study is lower, at 16%, compared to 20% in the 2014 study. This suggests that lapse rates are continuing to reduce by duration in PLT after duration 13. Section 5.5.1 includes more details on the 2021 study lapse analysis by duration in PLT.

Overall, both the pattern of T10 shock lapse by premium jump and the observed lapse rates by duration in PLT are consistent with the findings of the 2014 study.

Section 6: Deep Dive into Mortality Deterioration

6.1 OVERVIEW

Section 6 provides a deep dive into the mortality deterioration experienced in the post-level term period. Mortality deterioration in PLT was observed to vary by many factors.

Similar to the approach used for shock lapse analysis described in section 5, statistical analysis techniques were used in mortality deterioration analysis to provide additional insights into the predictive value of each variable. Variable selection was used to identify the most important variables driving the initial mortality deterioration in PLT duration 1.

Section 6.2 provides details of the variable selection process for initial mortality deterioration and sections 6.3 and 6.4 investigate through traditional analysis the variables identified as most important for explaining mortality deterioration in PLT. The most important drivers of mortality deterioration identified are premium jump, billing type, attained age, and risk class, while analysis by face amount, premium mode, and gender also provide interesting insights. The analysis of mortality deterioration includes views focused on PLT duration 1, as well as mortality deterioration for all PLT durations with different levels of granularity available for each variable.

Section 6.5 includes mortality deterioration analysis using an alternative baseline mortality benchmark. Section 6.6 covers a comparison of the cause of death between level term and PLT and an investigation of the timing of PLT deaths relative to the grace period. The final section, 6.7, compares the mortality deterioration observed in this study to the prior study published in 2014.

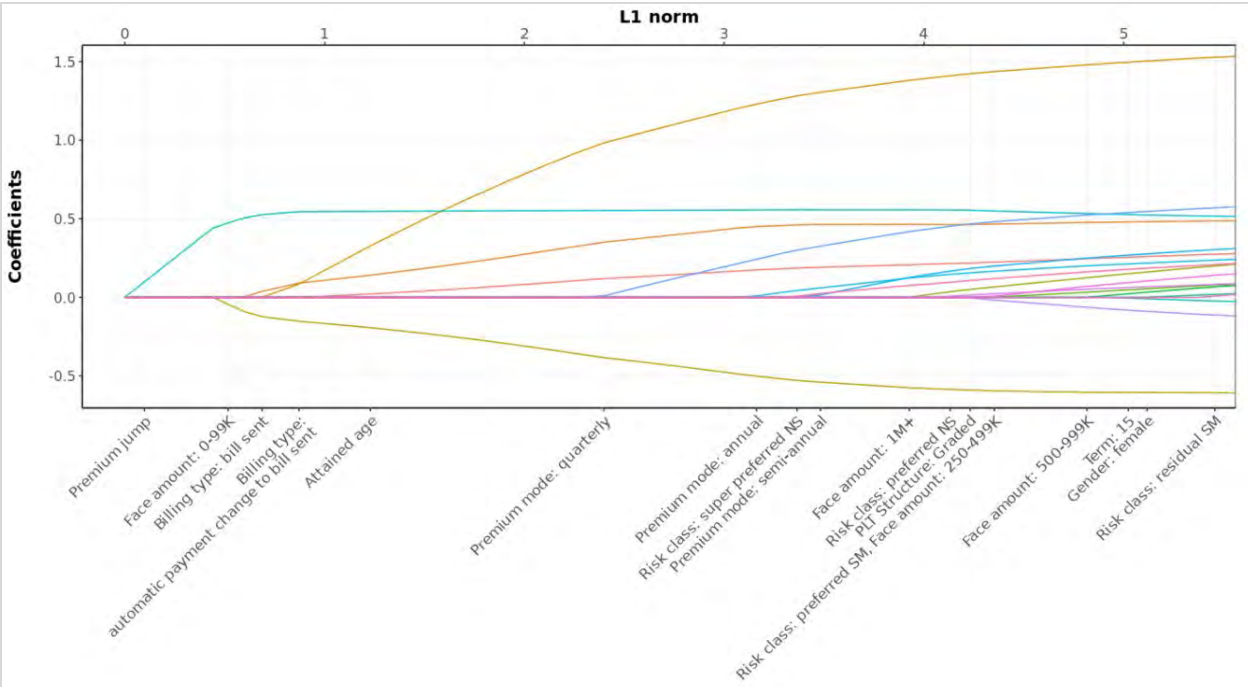
6.2 VARIABLE SELECTION

Initial mortality deterioration was observed to vary by many factors. Through a process called variable selection, statistical analysis was conducted to identify the key drivers of variation. Analysis focused on the initial mortality deterioration in PLT duration 1. Term plan was considered as a variable with T10 and T15 included. T20 was excluded for this analysis because data were less credible. In addition, PLT structure was considered as a variable with both Jump to ART and Graded PLT structures included. Risk class was included as a variable, but the undifferentiated and substandard data were excluded for this analysis.

The goal of the variable selection process was to determine a reduced number of appropriate explanatory variables to describe the mortality deterioration from the available list of variables. Similar to section 5.2 regarding the shock lapse, the LASSO in a GLM framework was used to support the variable selection and study the profile of the coefficients. In the following, mortality deterioration was modeled in two steps. First, the A/E ratio in the level term period was estimated. The death count in the level term period was modeled with a Poisson distribution where the expected deaths according to the 15VBT were included as an offset. Second, mortality deterioration was modeled through a regularized Poisson regression. The death count in the post-level term period was assumed to be Poisson distributed where the estimated A/E ratio in the level term period times the expected deaths in the post-level term period was used as an offset. With this approach, the mortality deterioration is modeled as the A/E in the post-level term period divided by the A/E ratio in the level term period, as defined in section 3.5. More technical details can be found in appendix E. By selectively shrinking the coefficients to zero, the regularized Poisson regression in the second step allowed for a selection of variables.

Figure 6.2-1 displays the profile of the LASSO coefficients plotted against the L1 norm, the sum of the absolute values of the model parameters. As more variables entered the model, the L1 norm increased.

Figure 6.2-1
VARIABLE SELECTION ANALYSIS – PROFILE OF LASSO COEFFICIENTS



The variables enter the model in order of their importance, from left to right. Each line represents the coefficient path of a variable, which is piecewise linear with respect to the L1 norm and only changes when a new feature enters the model. Coefficient paths below zero indicate variables likely to lead to lower lapses relative to the reference, while coefficient paths above zero represent variables likely to lead to higher lapses. Categorical variables have a reference level which corresponds to the categories of the variables where the largest exposure is observed:

- Term plan: T10,
- Risk class: residual NS,
- Face amount: $100-249K,
- Premium mode: monthly,
- Billing type: automatic payment, and
- Gender: male.

Each of the other categories of a variable is represented by a coefficient path. Coefficient paths below zero indicate variables likely to lead to lower mortality deterioration relative to the reference, while coefficient paths above zero represent variables likely to lead to higher mortality deterioration. The final value of the coefficients at the end of the process correspond to the value of the parameters obtained in a classical Poisson regression having all predictors considered here included. Section 7 provides details on predictive modeling describing an approach to model the mortality deterioration using predicted shock lapse that will be covered in a separate report entitled *U.S. Post-Level Term Lapse and Mortality Predictive Modeling*.

The variables premium jump, billing type and attained age appear very important as these variables enter the model first.

The blue line representing the premium jump enters near the start of the process, indicating premium jump is an important variable in predicting mortality deterioration. The blue line has a coefficient path above zero, which indicates that premium jump positively impacts the mortality deterioration. This aligns with the relationship of increasing mortality deterioration with increasing premium jump discussed in section 4.

Face amount seems to be less important, even if face amount $0-99K enters near the start, since the other face amount bands enter towards the end of the process. This does not necessarily identify face amount as one of the most important variables but highlights that face amount $0-99K has a distinct behavior in terms of mortality deterioration. This distinct behavior is illustrated by its coefficient value compared to the magnitude of the other model coefficients. Face amount $0-99K has a coefficient path below zero, indicating that mortality deterioration is lower for this face amount group compared to the reference band and all the other bands. Mortality deterioration by face amount and, specifically, differences for face amount group $0-99K, is discussed in section 6.4.1.

Billing type: bill sent and billing type: automatic payment changed to bill sent, both positively affect the mortality deterioration relative to billing type: automatic payment. This suggests that, when the billing type is bill sent or when the billing type changes to bill sent for PLT, the mortality deterioration is likely to be higher than when the billing type is automatic payment. In addition, the category automatic payment changed to bill sent has a distinct behavior in terms of mortality deterioration compared to the other billing type categories as illustrated by its large coefficient value compared to the magnitude of the other model coefficients. See section 6.3.2 for further investigation of the impact of billing type on mortality deterioration.

Premium jump and billing type seem correlated. The path of the blue line changes when billing type enters.

Attained age has a steadily positive effect on the mortality deterioration. This pattern of increasing deterioration with increasing attained age is discussed further in section 6.3.3.

Premium mode seems important, while entering the process later. Premium mode: quarterly along with annual, semi-annual (entering later) all positively impact the mortality deterioration relative to monthly premium payment mode (which is the reference). Policyholders paying premiums on a monthly premium mode are likely to have lower mortality deterioration than more frequent payment modes. See section 6.4.3 for further investigation of the impact of premium mode on mortality deterioration.

The key explanatory variables for shock lapse identified in section 5.2 were premium jump, attained age, premium mode, and billing type. These four variables are also important in explaining initial mortality deterioration. Furthermore, the directions of the relationships are aligned, with variables identified as driving higher shock lapse also highlighted as leading to higher mortality deterioration. Due to this alignment, shock lapse can, in fact, be considered an explanatory variable when modeling mortality deterioration.

Risk class categories enter at the middle and towards the end of the process. While entering the process later, risk class still adds value as an explanatory variable.

PLT structure: Graded enters later in the process, indicating PLT structure is a less important variable for predicting initial mortality deterioration. Analysis in section 4.2.2 also showed that initial mortality deterioration is similar between the structures. The main difference between structures is in the pattern by duration in PLT.

Term plan enters later in the process, indicating that differences between T15 and T10 are less significant after accounting for the other explanatory variables.

Gender is the last variable to enter, suggesting it is less important for mortality deterioration modeling.

6.3 KEY EXPLANATORY VARIABLES

The variable selection analysis identified premium jump, billing type, and attained age as the most important variables that affect mortality deterioration. This section summarizes mortality deterioration results by each of these variables. Variable selection also identified premium mode, risk class and face amount among the explanatory variables for mortality deterioration. Due to the interesting insights identified through traditional analysis, risk class is also analyzed in this section as a key explanatory variable.

As seen in section 4.2.4, there is a clear correlation between shock lapse and mortality deterioration. When there are higher lapse rates, the mortality outcomes are worse for those policyholders who remain. This suggests that higher lapse rates are correlated with higher anti-selection from policyholders who elect to keep their policy. Shock lapse is an explanatory variable. However, the relationship between shock lapse and mortality deterioration cannot be captured directly through traditional analysis. Insights can be gained indirectly by analyzing variables that impact both lapse and mortality, but it is difficult to differentiate between variation driven by differences in shock lapse and variation directly attributable to the specific variable. The direct relationship will be investigated in predictive modeling as discussed in section 7.

All terms plans (T10, T15 and T20) are combined in all analyses in this section. Please note that, for Jump to ART, T20 is only available for the first three PLT durations and T15 is available through PLT duration 8. For Graded, data are only available for the first three PLT durations as Graded is newer to the market than Jump to ART.

Throughout this analysis, mortality deterioration will indicate the deterioration percent using the 15VBT count basis. All figures showing the mortality deterioration in bar graphs include a band at the top of each bar indicating the 90% confidence interval. The calculation method is described in section 3.5.

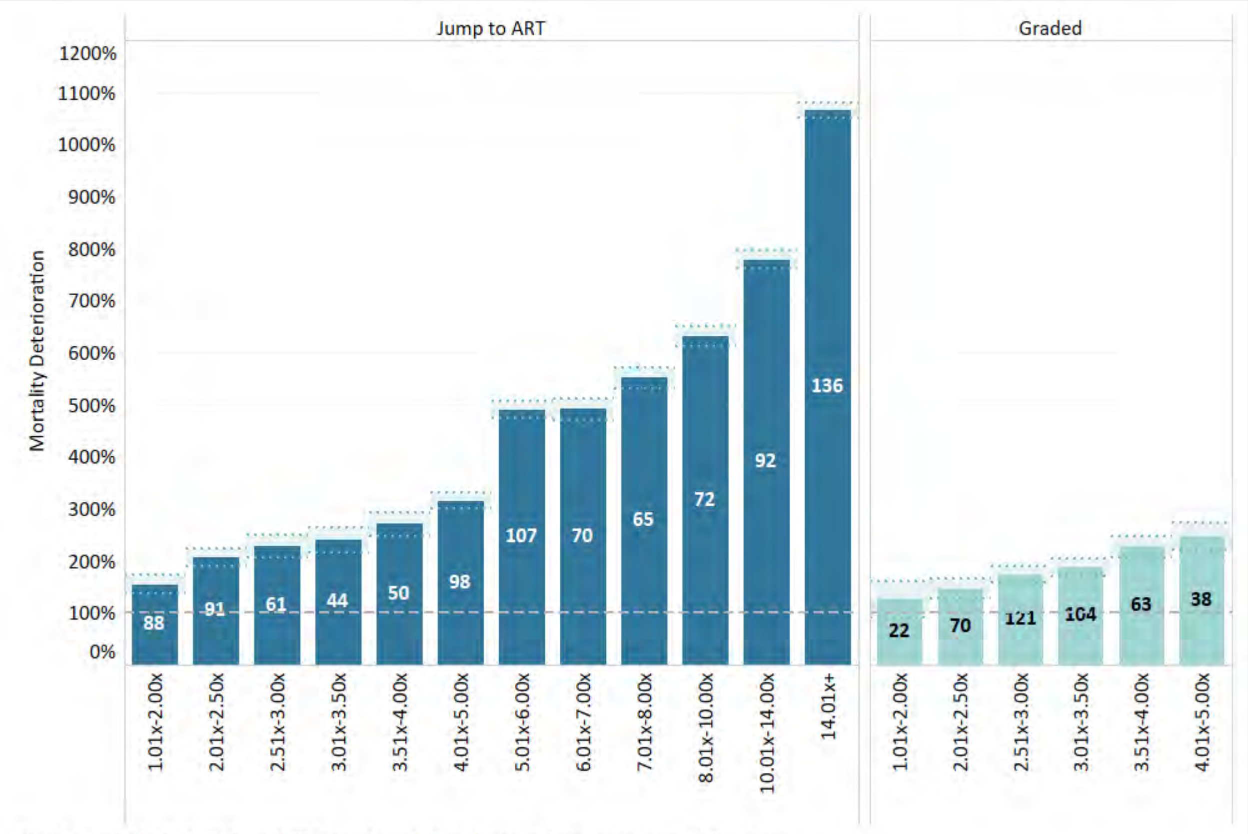
When using the RR table selection, the mortality deterioration patterns and levels were not materially impacted when compared to using the RR100 15VBT. As such, the final analysis used the base 15VBT (RR100) for all policies. For details on this analysis, please see appendix B.

6.3.1 PREMIUM JUMP

Premium jump is a key explanatory factor for mortality deterioration. Figure 6.3.1-1 below shows the mortality deterioration by premium jump for the first PLT duration.

Figure 6.3.1-1

MORTALITY DETERIORATION BY INITIAL PREMIUM JUMP, PLT DURATION 1



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

Note that the credibility is lower for this more granular analysis as shown by the claim counts presented on the graph.

Similar to shock lapse, mortality deterioration increases as premium jump increases. Focusing on Jump to ART, there is a gradual increase in mortality deterioration for jumps of 1.01 to 5.00x but then a sharp increase for 5.01-6.00x and a steeper increasing pattern across the higher premium jump groups. There is another large increase for the 14.01x+ group, which includes premium jumps as large as 30 times or greater.

While the increase in mortality deterioration by premium jump is seen in both the Jump to ART and Graded structures, it is slightly greater for Jump to ART than for Graded. This can be observed in table 6.3.1-1 below by focusing only on premium jumps up to 5.00x, which are common to both PLT structures. The mortality deterioration shown below compares the A/E for each premium jump to the level term period A/E.

Table 6.3.1-1

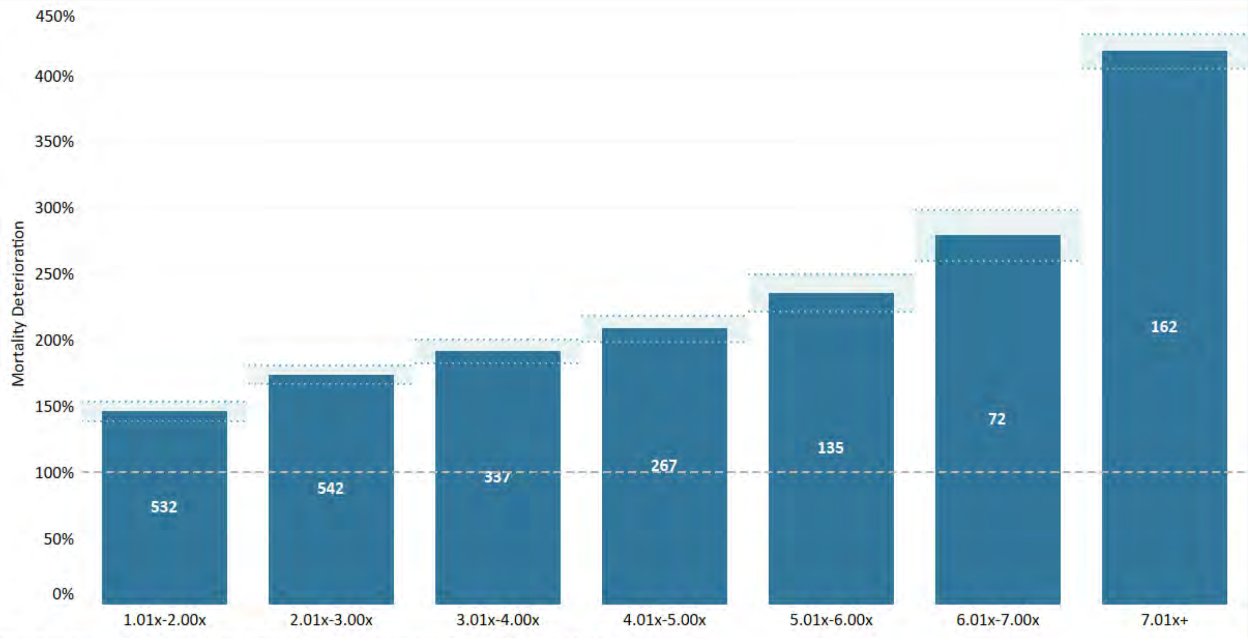
PREMIUM JUMP, PLT DURATION 1

PLT Structure	Initial Premium Jump	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	1.01x-2.00x	57.2K	88	145.3%	154.4%
	2.01x-2.50x	20.8K	91	194.0%	206.2%
	2.51x-3.00x	8.9K	61	214.3%	227.8%
	3.01x-3.50x	6.8K	44	225.7%	239.9%
	3.51x-4.00x	9.2K	50	254.7%	270.8%
	4.01x-5.00x	9.8K	98	296.8%	315.5%
	5.01x-6.00x	5.6K	107	461.0%	490.0%
	6.01x-7.00x	3.4K	70	461.9%	491.0%
	7.01x-8.00x	2.5K	65	518.5%	551.1%
	8.01x-10.00x	2.6K	72	594.4%	631.8%
	10.01x-14.00x	2.4K	92	732.5%	778.5%
	14.01x+	1.3K	136	1002.7%	1065.8%
Graded	1.01x-2.00x	9.4K	22	119.4%	127.0%
	2.01x-2.50x	13.2K	70	137.5%	146.3%
	2.51x-3.00x	16.9K	121	163.5%	173.9%
	3.01x-3.50x	10.7K	104	175.9%	187.1%
	3.51x-4.00x	5.0K	63	214.0%	227.6%
	4.01x-5.00x	2.6K	38	232.1%	246.8%

The initial premium jump continues to have an impact on mortality deterioration after the first PLT duration. Figure 6.3.1-2 shows the mortality deterioration for PLT duration 2+. This view focuses on Jump to ART as there were not enough credible data for Graded.

Figure 6.3.1-2

MORTALITY DETERIORATION BY INITIAL PREMIUM JUMP, JUMP TO ART, PLT DURATION 2+



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

The increasing pattern is still visible, but the overall level is lower, confirming mortality deterioration is reduced in later years in PLT compared to PLT duration 1. The corresponding values from the figure above can be seen in table 6.3.1-2 below.

Table 6.3.1-2

PREMIUM JUMP, JUMP TO ART, PLT DURATION 2+

Initial Premium Jump	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
1.01x-2.00x	238.6K	532	137.3%	145.9%
2.01x-3.00x	92.3K	542	163.1%	173.4%
3.01x-4.00x	55.4K	337	180.1%	191.5%
4.01x-5.00x	25.6K	267	196.1%	208.5%
5.01x-6.00x	9.5K	135	221.3%	235.3%
6.01x-7.00x	4.3K	72	262.4%	278.9%
7.01x+	7.5K	162	393.6%	418.3%

6.3.2 BILLING TYPE

The impact of billing type on mortality deterioration was also considered. Premiums are collected in two main ways:

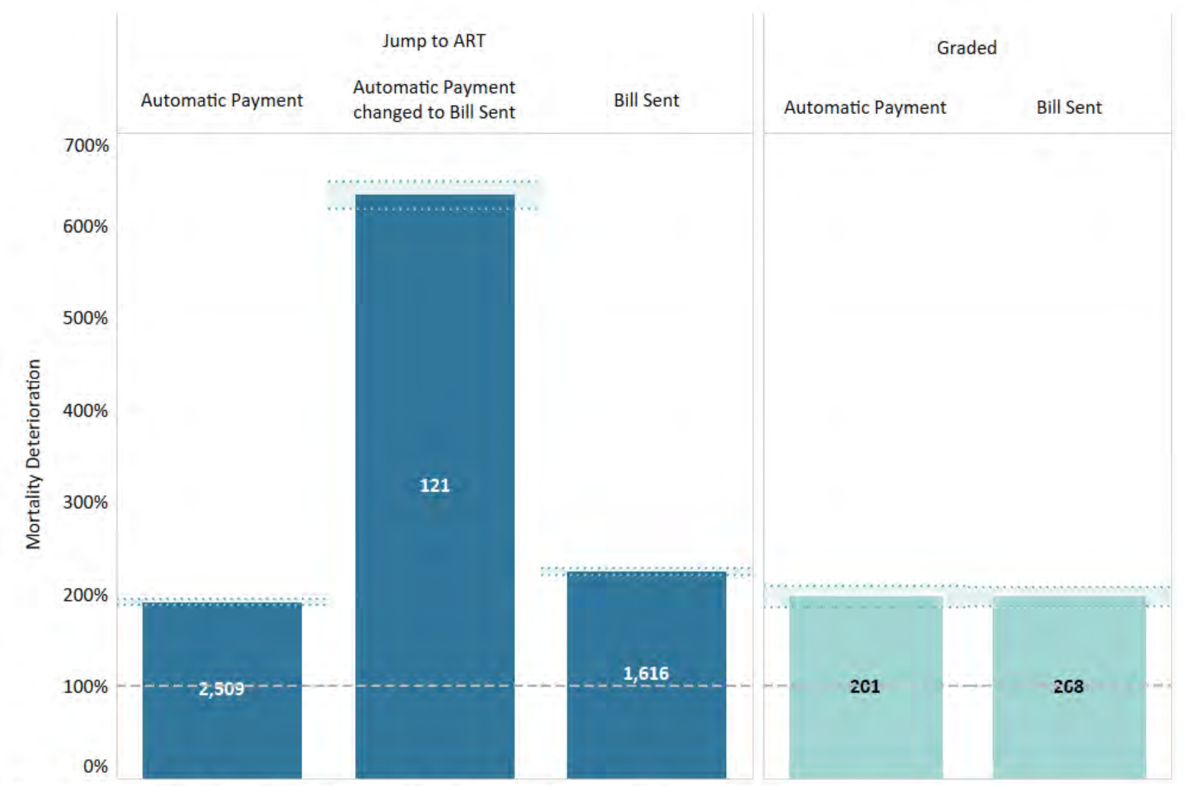
1. Sending a bill to the policyholder: bill sent
2. Collecting premium directly from the policyholder account: automatic payment

In the data submitted, there are some policies where the billing type at the end of the level term changed from automatic payment during the level term period to bill sent in the post-level term period. These are studied in the analysis for Jump to ART but not for Graded due to data constraints. Billing type information was provided for 94% of exposures in the post-level period.

See figure 6.3.2-1 below for the mortality deterioration by billing type.

Figure 6.3.2-1

MORTALITY DETERIORATION BY BILLING TYPE AND PLT DURATION 1+



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

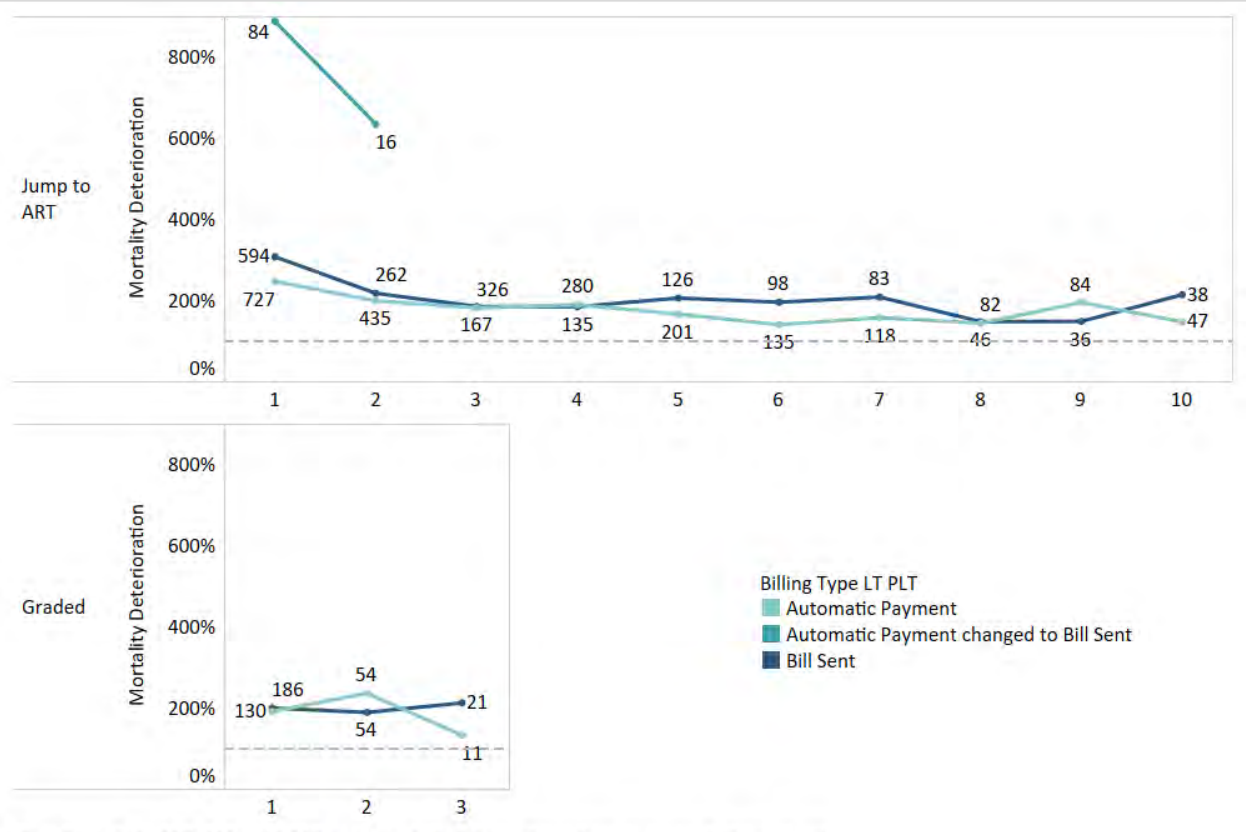
For Jump to ART, automatic payment changed to bill sent shows by far the highest mortality deterioration. The shock lapse analysis saw the highest level of lapses for this group as well. The data show those who chose to remain after they started receiving a bill were exhibiting more anti-selective behavior than those whose billing type remained the same.

Jump to ART shows a higher level of deterioration when a policyholder receives a bill than for the automatic payment. This is consistent with the pattern of higher lapses for bill sent observed in section 5. However, the difference observed for Jump to ART is not large and there is no difference in mortality deterioration between billing types for Graded. The pattern could be impacted by the business mix of other variables.

Figure 6.3.2-2 shows the billing type mortality deterioration across PLT duration.

Figure 6.3.2-2

MORTALITY DETERIORATION BY BILLING TYPE AND PLT DURATION



Results include T10, T15, and T20 combined. Numbers above lines represent claim count.

For Jump to ART, the deterioration for automatic payment changed to bill sent is much higher than the billing types that did not change for both PLT durations available. PLT duration 2 shows a lower level of mortality deterioration for this category, although there were only 16 claims. Automatic payment generally has lower mortality deterioration than bill sent across the PLT durations with some variability in the later durations where claim counts are lower.

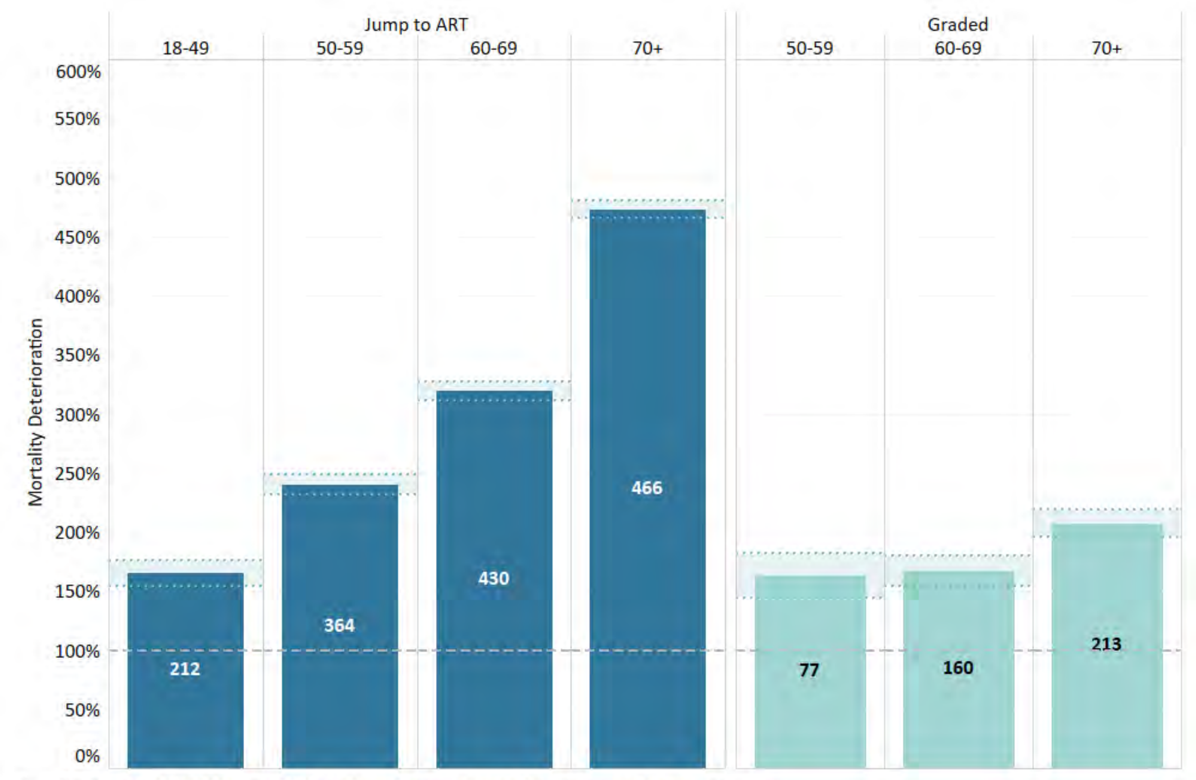
The Graded business shows a varying pattern by PLT duration for bill sent and automatic payment. It is noted that claim count is low for PLT durations 2 and 3 for the Graded business, which may contribute to some of the variation in pattern.

6.3.3 ATTAINED AGE

The attained age in this analysis reflects the age of the policyholder in the given duration. For mortality deterioration, this is the age of the policyholder in the first duration of the post-level period. Since multiple level term period products are combined in this analysis, attained age provides a more comparable age measure in PLT than issue age. Figure 6.3.3-1 below shows the mortality deterioration by attained age for PLT duration 1. In this figure, attained ages 18 to 49 are not shown for Graded as there was very little PLT experience.

Figure 6.3.3-1

MORTALITY DETERIORATION BY ATTAINED AGE AND PLT DURATION 1



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

The mortality deterioration shows an increasing pattern of deterioration as attained age increases. This is seen in both Jump to ART and Graded, although the pattern is less pronounced for the Graded structure. This pattern aligns with the shock lapse analysis and the lower initial premium jumps for Graded compared to Jump to ART. This indicates that older policyholders who retain their policies into the post-level period tend to have worse mortality outcomes than younger policyholders.

Table 6.3.3-1 below displays the exposure, death count, A/E, and mortality deterioration for each age group for the two PLT structures during the level period (<1) and PLT (1).

Table 6.3.3-1

ATTAINED AGE, PLT DURATION <1 VS PLT DURATION 1

PLT Structure	Attained Age Group	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	18-49	<1	6,487.3K	4,763	93.6%	100.0%
		1	172.7K	212	154.7%	165.3%
	50-59	<1	5,900.2K	10,809	90.8%	100.0%
		1	79.3K	364	217.9%	240.1%
	60-69	<1	3,591.1K	16,331	90.8%	100.0%
		1	28.8K	430	290.3%	319.6%
	70+	<1	991.6K	14,156	102.2%	100.0%
		1	5.8K	466	483.5%	473.0%
Graded	50-59	<1	3,683.6K	6,609	88.0%	100.0%
		1	22.7K	77	143.9%	163.5%
	60-69	<1	2,661.7K	12,191	90.5%	100.0%
		1	18.3K	160	151.5%	167.4%
	70+	<1	854.2K	12,523	102.2%	100.0%
		1	6.0K	213	211.9%	207.3%

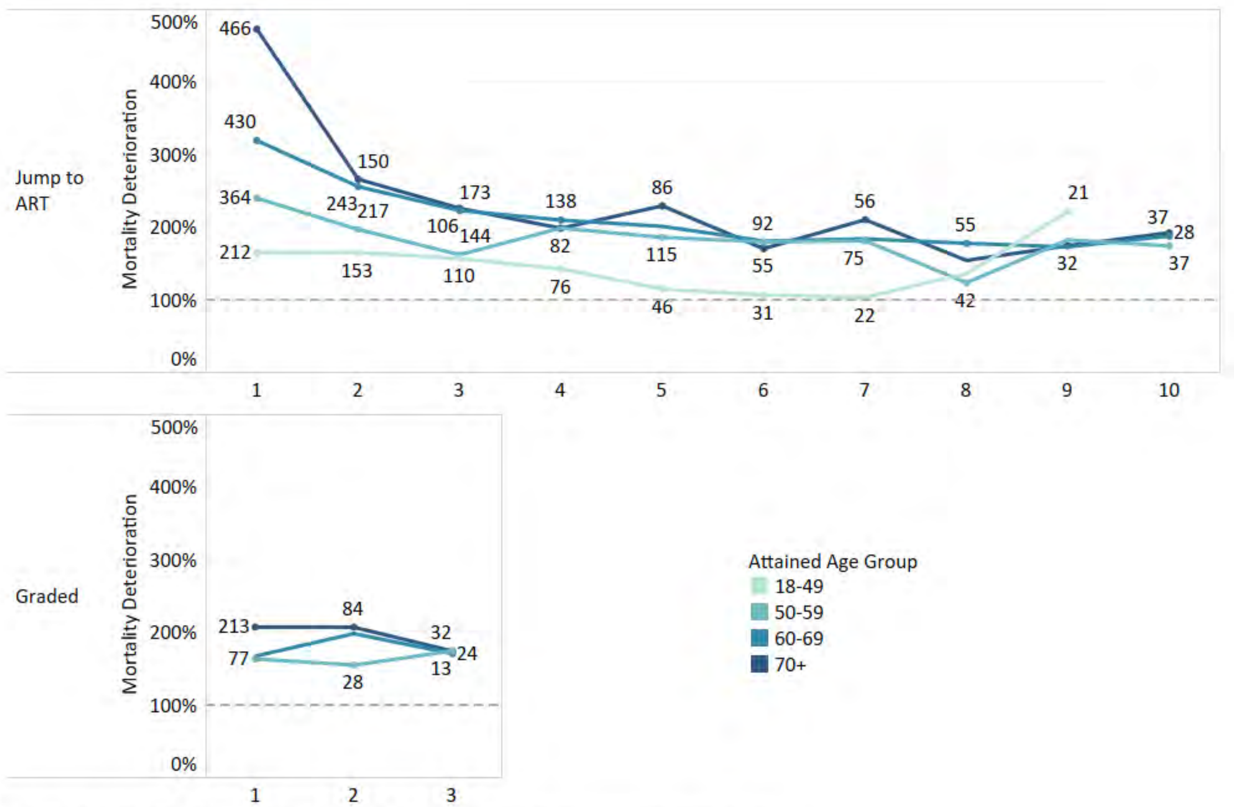
The level period A/Es are similar for both Jump to ART and Graded when looking at the same attained age group. Therefore, the observed differences in mortality deterioration between the structures are driven by the post-level mortality.

The A/Es for attained ages 70+ are higher than the A/Es for all three of the younger age groups for both structures. This indicates there was already higher mortality being observed in the oldest ages before the end of the level period. This difference is then exacerbated in the post-level period.

Figure 6.3.3-2 below displays the mortality deterioration by attained age and PLT duration.

Figure 6.3.3-2

MORTALITY DETERIORATION BY ATTAINED AGE AND PLT DURATION



Results include T10, T15, and T20 combined. Numbers above lines represent claim count.

The pattern of higher attained ages having higher mortality deterioration holds for both Jump to ART and Graded for the first several PLT durations. As the durations increase, this distinction becomes less prominent for some of the older age groups (50-59, 60-69, 70+). Age group 18-49 in Jump to ART continues to show much less deterioration, potentially wearing off completely by PLT duration 6. However, there is also a decreasing number of claims as the PLT duration increases, causing the mortality deterioration to become more volatile.

The three older age groups in Jump to ART see a much steeper reduction in mortality deterioration across the initial PLT durations than Graded. This drop is most noticeable in ages 70+. The long-term pattern continues to show decreasing mortality by duration with some volatility by age as claim counts are reduced in later durations.

6.3.4 RISK CLASS

There were several risk class structures provided by the various contributing companies. To analyze the results on a consistent basis, the classes were grouped as follows:

- Super-Preferred NS: N1/3, N1/4, N1/5
- Preferred NS: N1/2, N2/3, N2/4, N2/5, N3/5
- Residual NS: N3/4, N4/5, N2/2, N3/3, N4/4, N5/5
- Substandard NS: All nonsmoker substandard business regardless of preferred risk class structure
- Preferred SM: S1/2, S1/3, S2/3
- Residual SM: S2/2, S3/3
- Substandard SM: All nonsmoker substandard business regardless of preferred risk class structure
- Undifferentiated NS/SM: N1/1, S1/1

The undifferentiated risk class had a larger proportion of the substandard business than the residual classes. For this reason, the undifferentiated and substandard policies were excluded for all preferred class analysis.

Figure 6.3.4-1 shows the mortality deterioration by risk class with the exclusions mentioned above.

Figure 6.3.4-1

MORTALITY DETERIORATION BY RISK CLASS AND PLT DURATION 1

Results include T10, T15, and T20 combined. Undifferentiated NS/SM classes excluded. Substandard policies excluded.
Numbers on bars represent claim counts.

The pattern by risk class is different between the two PLT structures. For Jump to ART, super-preferred NS shows the highest level of deterioration and residual NS the lowest. This pattern can also be seen in the smoker classes. Interestingly, the opposite pattern is observed with Graded with residual NS showing the highest mortality deterioration and super-preferred NS the lowest. The smoker classes were combined for the Graded structure due to credibility concerns.

The different mortality deterioration patterns between the Jump to ART and Graded can be explained by the differences in the factors by which premiums vary in PLT. PLT premiums for Jump to ART generally only differentiate between nonsmokers and smokers, which results in larger premium jumps for the super-preferred risk class. PLT premiums for Graded generally vary by risk class even if they ultimately grade to nonsmoker/smoker premiums after a specified period. This results in lower initial premium jumps for the preferred classes for Graded, which could explain the lower mortality deterioration. In section 5.4.2, the shock lapse pattern by risk class is also different between the two PLT structures and the pattern of mortality deterioration is consistent with the shock lapse pattern.

It is noted that the smoker classes see less deterioration than the nonsmoker classes. For Jump to ART, the preferred SM class is in between the super-preferred and preferred NS classes, while the residual SM class is below the residual NS class. For Graded, the combined SM class is below all three NS classes. In section 5.4.2, a lower shock lapse is observed for smoker classes for the Graded structure and, with further investigation, this is attributed to lower premium jumps for smokers, which could also explain the lower mortality deterioration observed.

Table 6.3.4-1 below displays the results by risk class in a tabular form.

Table 6.3.4-1

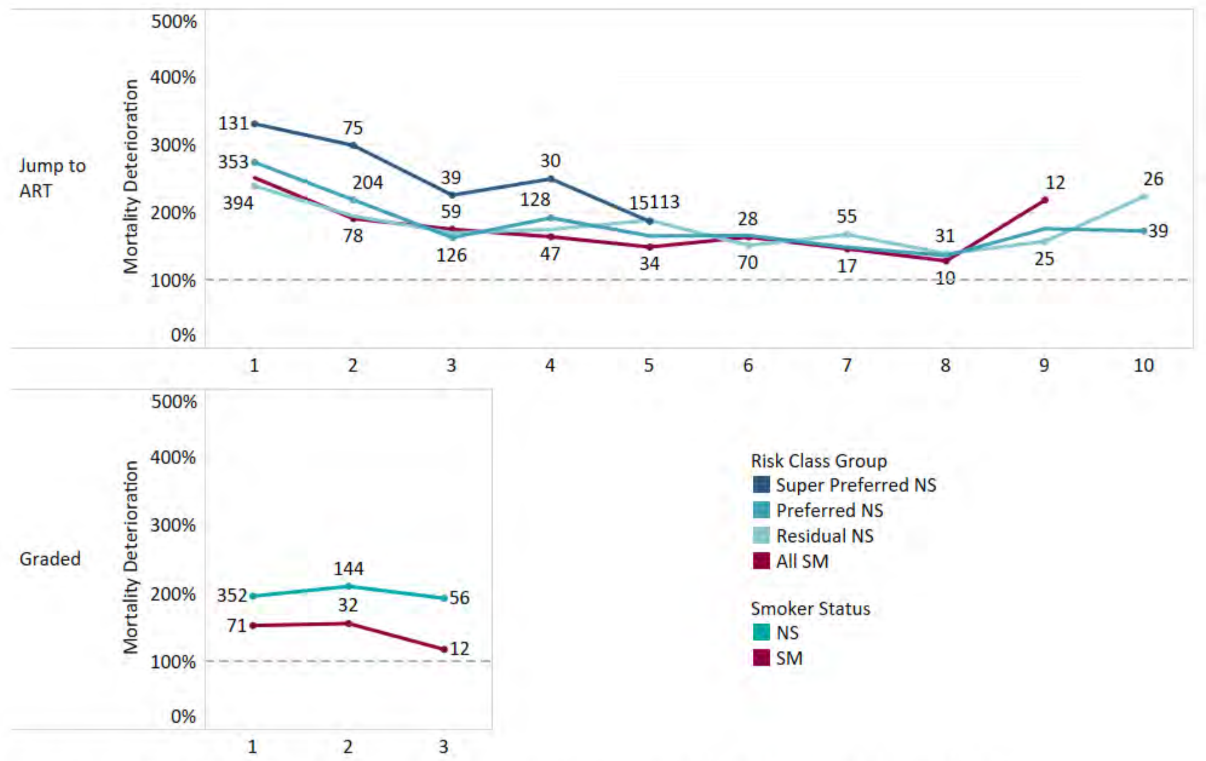
RISK CLASS, PLT DURATION <1 VS PLT DURATION 1

PLT Structure	Risk Class	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	Super Preferred NS	<1	4,176.9K	6,215	66.8%	100.0%
		1	39.9K	131	221.1%	330.8%
	Preferred NS	<1	5,238.6K	10,190	82.4%	100.0%
		1	102.4K	353	225.8%	274.1%
	Residual NS	<1	4,372.9K	12,815	112.5%	100.0%
		1	82.5K	394	269.0%	239.1%
	Preferred SM	<1	445.5K	2,249	89.8%	100.0%
		1	5.8K	68	273.9%	305.0%
	Residual SM	<1	477.1K	2,392	113.1%	100.0%
		1	11.3K	82	236.9%	209.5%
Graded	Super Preferred NS	<1	3,057.8K	5,297	67.0%	100.0%
		1	19.3K	74	126.4%	188.6%
	Preferred NS	<1	2,586.2K	6,693	81.5%	100.0%
		1	19.7K	135	159.3%	195.4%
	Residual NS	<1	2,240.3K	8,175	110.7%	100.0%
		1	15.2K	143	216.8%	195.8%
	All SM	<1	487.8K	3,069	101.3%	100.0%
		1	4.9K	57	148.8%	146.9%

Mortality deterioration by risk class and PLT duration was also analyzed (see figure 6.3.4-2 below).

Figure 6.3.4-2

MORTALITY DETERIORATION BY RISK CLASS AND PLT DURATION



Results include T10, T15, and T20 combined. Undifferentiated NS/SM classes excluded. Substandard policies excluded.
Numbers on bars represent claim counts.

For Graded, analysis was focused on comparing nonsmoker to smoker due to a lack of credibility when splitting by risk class. For all three PLT durations, nonsmoker business showed higher levels of mortality deterioration, though smoker business had fewer claims as the PLT durations progressed.

For Jump to ART, the preferred risk classes were compared with a combined smoker class grouping. Where available, the super-preferred mortality deterioration is consistently higher across the PLT durations than that of all the other classes. The other three classes (preferred NS, residual NS, all SM) are more similar across the PLT durations.

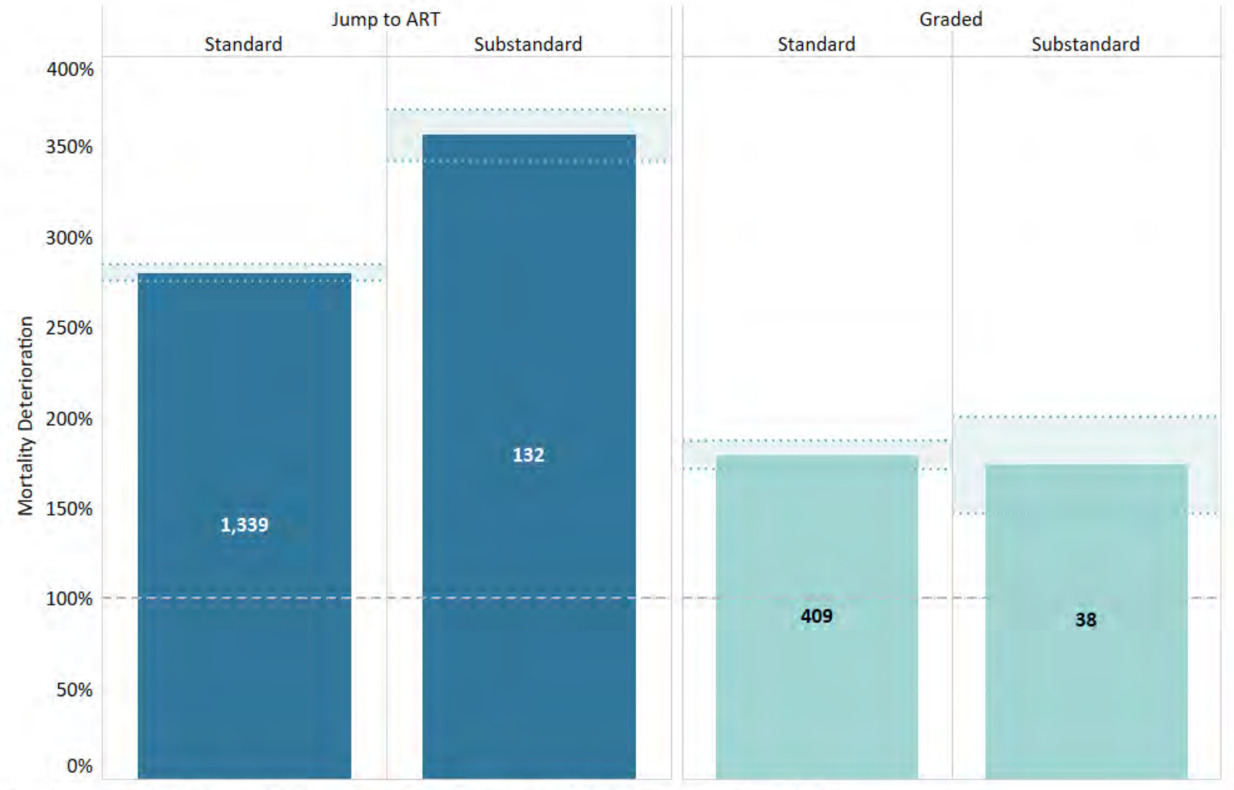
The pattern by PLT duration shows a fairly constant level of deterioration for the Graded business. For Jump to ART, a decreasing pattern was observed for all risk classes with some volatility across individual PLT durations. The preferred NS, residual NS, and all SM classes show deterioration levels below 200% for PLT durations 3+.

Substandard Analysis

Analysis was performed on substandard risks for all risk classes, including the undifferentiated class. The definition of substandard includes policies with table ratings and policies with flat extras. However, it is dominated by policies with table ratings. Figure 6.3.4-3 below displays the mortality deterioration for substandard risks versus standard risks.

Figure 6.3.4-3

MORTALITY DETERIORATION BY SUBSTANDARD AND PLT DURATION 1



Results include T10, T15, and T20 combined. Undifferentiated NS/SM classes are included.
Numbers on bars represent claim counts.

For Jump to ART higher mortality deterioration is observed for substandard risks than for standard risks. For Graded, the substandard data only have 38 claims and, as shown by the overlapping confidence intervals for standard and substandard, a significant difference cannot be observed.

The numbers behind the previous figure can be seen in table 6.3.4-2 below.

Table 6.3.4-2

SUBSTANDARD, PLT DURATION <1 VS PLT DURATION 1

PLT Structure	Substandard Indicator	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	Standard	<1	16,192.9K	40,897	93.1%	100.0%
		1	278.0K	1,339	260.7%	280.0%
	Substandard	<1	735.9K	5,027	107.2%	100.0%
		1	8.5K	132	382.0%	356.3%
Graded	Standard	<1	9,517.9K	29,061	92.2%	100.0%
		1	59.1K	409	165.2%	179.2%
	Substandard	<1	538.4K	4,296	110.2%	100.0%
		1	2.5K	38	191.6%	173.9%

The A/Es are higher for substandard in level term as well as in PLT. For Jump to ART, higher deterioration is observed for substandard even when allowing for the higher level term A/E. A higher shock lapse was observed for substandard business as shown in figure 5.4.2-3 and the higher mortality deterioration shown here is consistent with this message.

6.4 OTHER EXPLANATORY VARIABLES

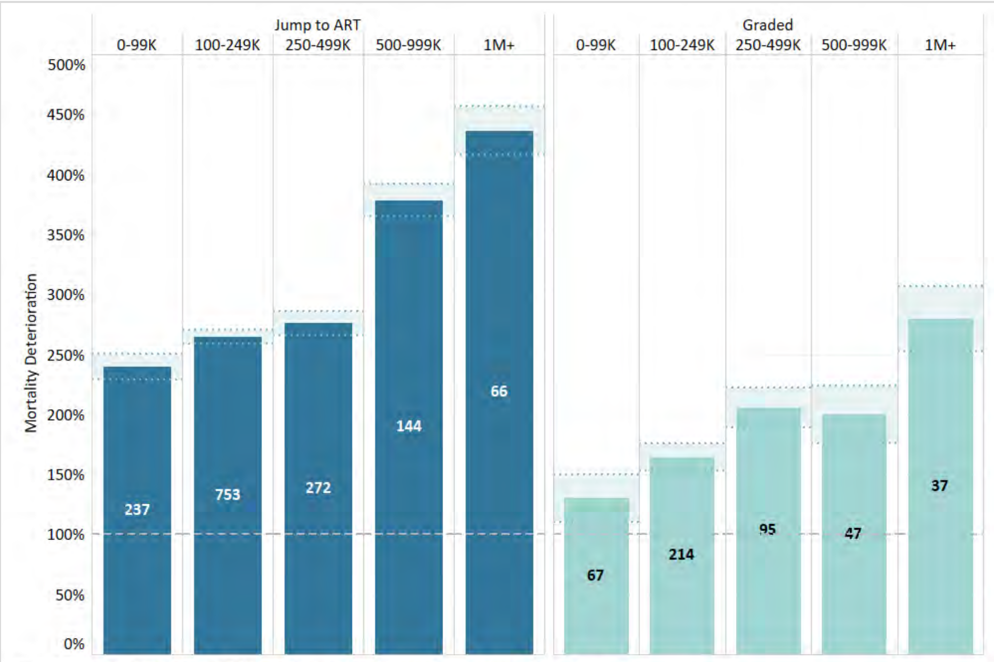
While most of the variation in mortality deterioration can be explained by premium jump, billing type, attained age and risk class, other factors were also considered. The factors analyzed in this section include face amount, premium mode and gender.

6.4.1 FACE AMOUNT

Figure 6.4.1-1 displays the deterioration by face amount for PLT duration 1.

Figure 6.4.1-1

MORTALITY DETERIORATION BY FACE AMOUNT AND PLT DURATION 1



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

For both Jump to ART and Graded, the mortality deterioration increases as face amount increases.

The exposure, death count, A/E, and mortality deterioration for each face amount group for the level period group (<1) and the first duration in the post-level period (1) are displayed in table 6.4.1-1.

Table 6.4.1-1

FACE AMOUNT, PLT DURATION <1 VS PLT DURATION 1

PLT Structure	Face Amount Group	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	0-99K	<1	589.8K	5,228	125.4%	100.0%
		1	20.6K	237	300.3%	239.6%
	100-249K	<1	7,065.6K	22,769	97.7%	100.0%
		1	158.0K	753	258.4%	264.6%
	250-499K	<1	4,945.3K	10,222	86.7%	100.0%
		1	70.3K	272	239.6%	276.4%
	500-999K	<1	2,770.4K	4,896	81.7%	100.0%
		1	27.9K	144	309.1%	378.2%
	1M+	<1	1,599.0K	2,944	82.7%	100.0%
		1	9.7K	66	360.9%	436.5%
Graded	0-99K	<1	485.4K	4,546	123.1%	100.0%
		1	4.3K	67	160.3%	130.2%
	100-249K	<1	3,684.2K	15,449	96.9%	100.0%
		1	26.3K	214	159.3%	164.5%
	250-499K	<1	2,899.4K	7,300	86.2%	100.0%
		1	16.2K	95	177.3%	205.6%
	500-999K	<1	1,852.7K	3,777	82.1%	100.0%
		1	10.1K	47	163.8%	199.6%
	1M+	<1	1,175.9K	2,420	83.0%	100.0%
		1	5.7K	37	232.1%	279.7%

The A/Es for the level term period are very similar across PLT structure when comparing the same face amount groups. These A/Es are highest for $0-99K and decrease as face amount increases. Interestingly, in the first post-level duration, the A/Es for $0-99K are higher than the A/Es for $100-249K for both structures and higher than $250-499K for Jump to ART. However, the deterioration is still lower for $0-99K than for the other face amount groups since level term A/E for $0-99K is higher.

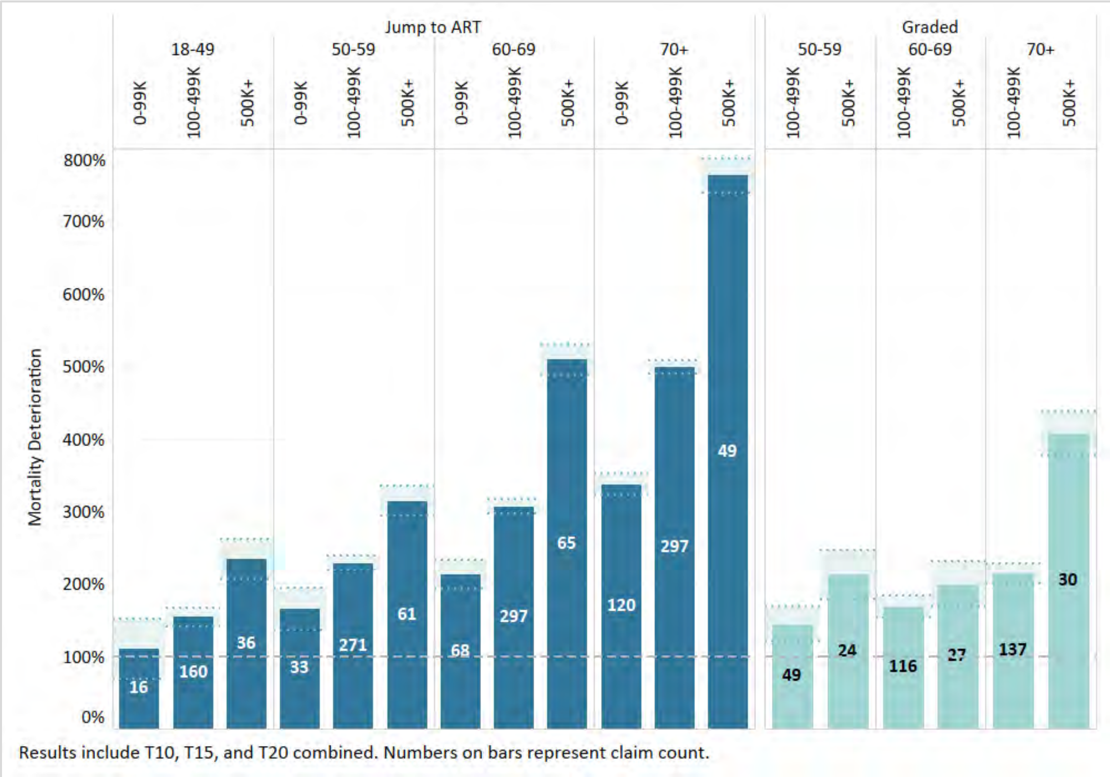
Face amount groups $500-999K and $1M+ were grouped for the remaining views for credibility purposes.

The impact of face amount was also analyzed in the presence of other variables, including premium jump and attained age. For all face amount groups an increase in mortality deterioration is observed as premium jump increases. The greater the premium jump the larger the difference among face amount groups.

The impact of attained age and face amount was also analyzed jointly. Figure 6.4.1-2 below contains the mortality deterioration for PLT duration 1 for these factors.

Figure 6.4.1-2

MORTALITY DETERIORATION BY FACE AMOUNT, ATTAINED AGE AND PLT DURATION 1

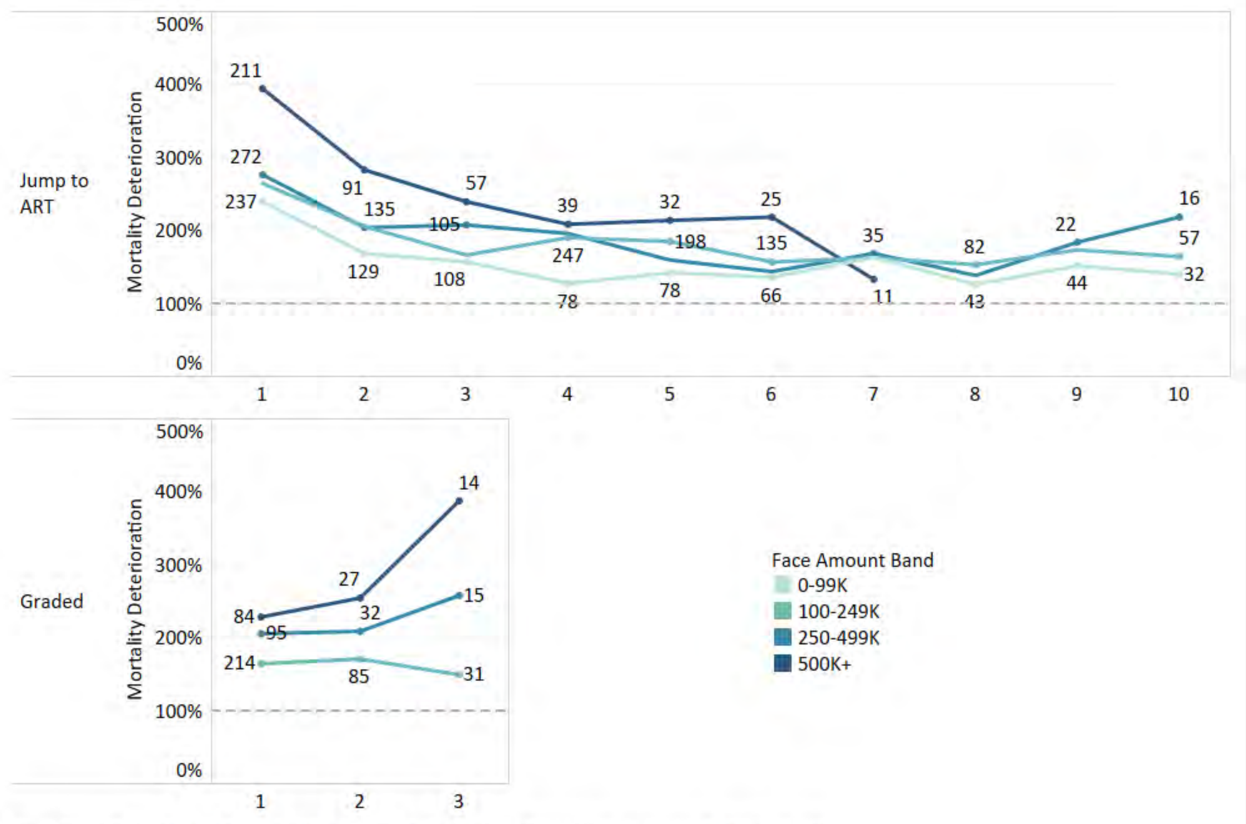


The mortality deterioration levels increase as attained age and face amount increase for both structures. Figure 6.4.1-2 captures the interaction of these two variables and shows a very interesting pattern across age bands for Jump to ART. As the attained age increases, the mortality deterioration is increased for all face amount groups, but variation by face amount can be observed within each age band. For Graded, a similar pattern can be observed, although the data are more limited when splitting by multiple factors.

The mortality deterioration by PLT duration was also studied by face amount (figure 6.4.1-3 below).

Figure 6.4.1-3

MORTALITY DETERIORATION BY FACE AMOUNT AND PLT DURATION



Results include T10, T15, and T20 combined. Numbers above lines represent claim count.

The Jump to ART business sees a decreasing trend by PLT duration for all face amount bands for the first few PLT durations with some leveling off at later durations, although there is still some level of volatility. The highest face amount band maintains the highest level of mortality deterioration across PLT durations.

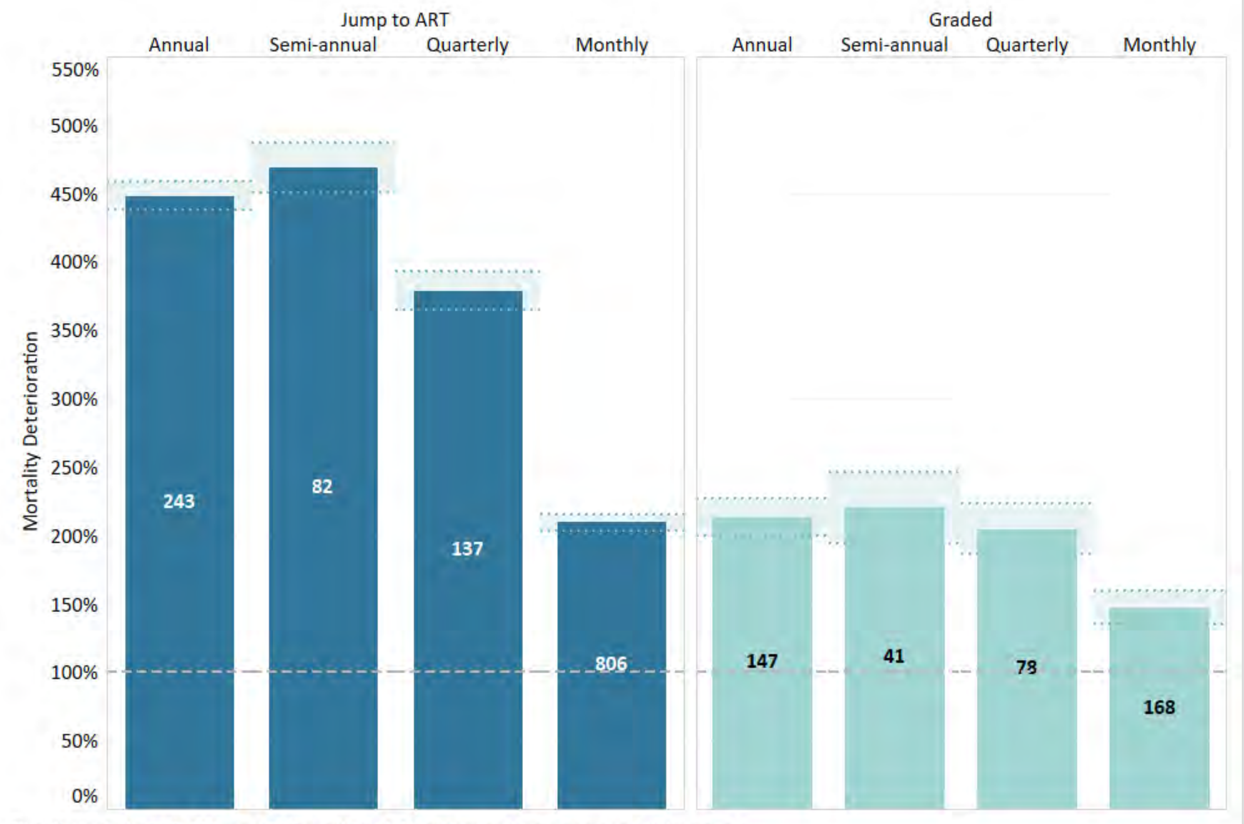
For Graded, the level of mortality deterioration is highest for the largest face amounts and lowest for the lowest face amounts across PLT durations.

6.4.2 PREMIUM MODE

Premium mode information was provided in 96% of exposures in the level period, 95% of exposures in PLT duration 1, and 92% of exposures in PLT duration 2+. Most study participants confirmed in the survey (see section 8 for survey results) and in the data submitted that they do not change premium mode at the end of the level term. Analysis was focused on premium modes annual, semi-annual, quarterly, and monthly, for which most data were available. An insufficient amount of data was available for policies that changed premium mode between level term and post-level term periods, and these were excluded from the analysis. Figure 6.4.2-1 shows the mortality deterioration by premium mode for the first duration in PLT.

Figure 6.4.2-1

MORTALITY DETERIORATION BY PREMIUM MODE AND PLT DURATION 1

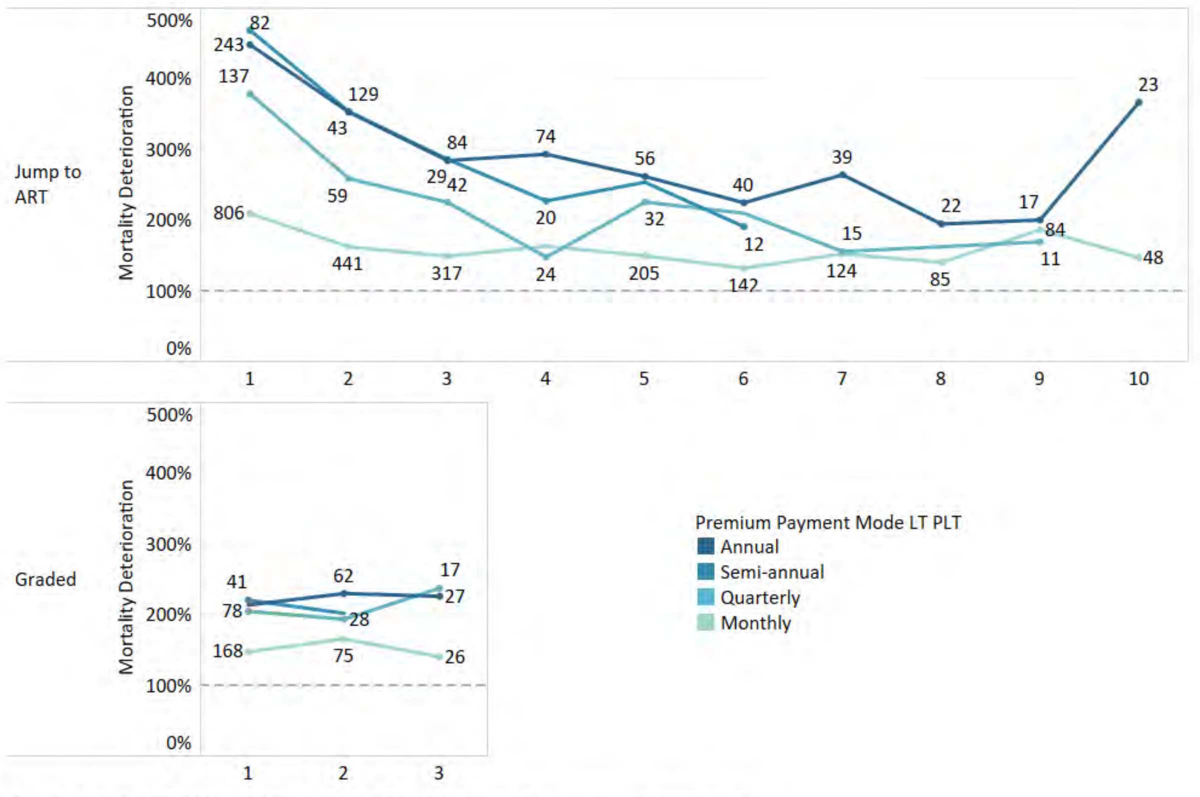


Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

For both Jump to ART and Graded, there is a decreasing deterioration pattern as the length of time between premium payments decreases. The exception to this is the semi-annual mode, which is slightly higher than annual. However, for both PLT structures, there are fewer claims in this mode than the other modes. As such, the 90% confidence intervals are much broader and overlap with the annual mode confidence intervals.

Figure 6.4.2-2

MORTALITY DETERIORATION BY PREMIUM MODE AND PLT DURATION



Results include T10, T15, and T20 combined. Numbers above lines represent claim count.

Across the PLT durations, Jump to ART is showing a fairly consistent pattern of higher deterioration in modes with less frequent premium payments (i.e., annual is the highest with monthly the lowest). Graded shows a similar pattern but with fewer claims in each group.

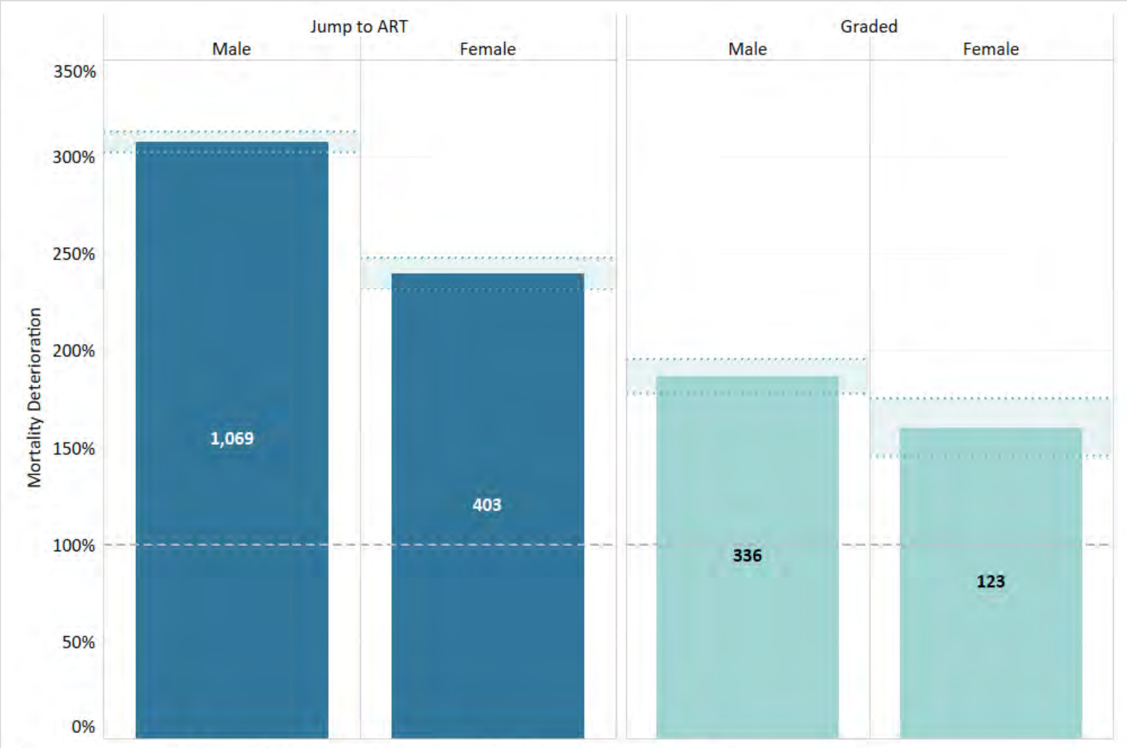
For Jump to ART, the mortality deterioration pattern decreases for all modes as PLT duration increases, with the monthly mode having the lowest mortality deterioration across all PLT durations.

6.4.3 GENDER

The impact of gender on mortality deterioration was also considered. Figure 6.4.3-1 below displays the results of this analysis for PLT duration 1.

Figure 6.4.3-1

MORTALITY DETERIORATION BY GENDER AND PLT DURATION 1



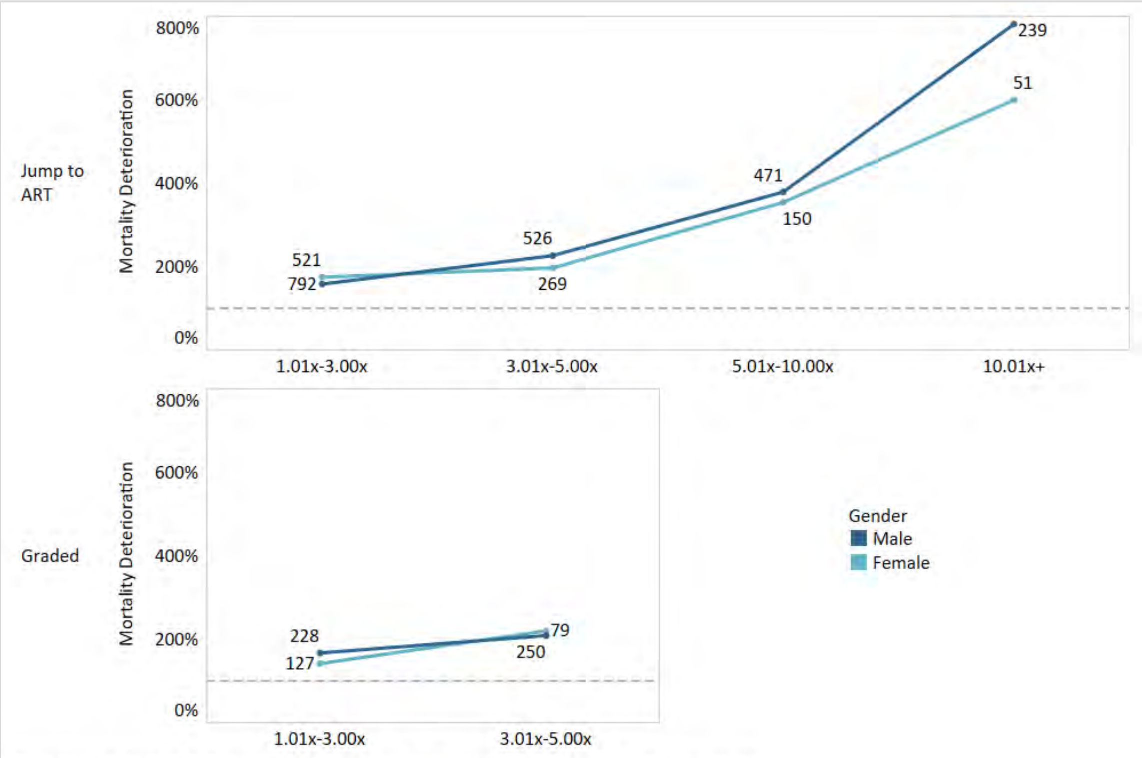
Results include T10, T25, and T20 combined. Numbers on bars represent claim count.

For both Jump to ART and Graded, the males experienced more mortality deterioration than the females. Both genders had higher levels of deterioration in Jump to ART than in Graded.

Figure 6.4.3-2 shows the mortality deterioration by gender across premium jumps for all PLT durations.

Figure 6.4.3-2

MORTALITY DETERIORATION BY GENDER, PREMIUM JUMP AND PLT DURATION 1+



Results include T10, T15, and T20 combined. Numbers above lines represent claim count.

Mortality deterioration is similar for male and female policyholders for both PLT structures. Female shows higher mortality deterioration for Jump to ART at premium jumps 1.01-3.00x but then reverses to lower deterioration in 3.01-5.00x, while the opposite pattern is observed in the Graded business. For Jump to ART, the relationship then continues with males having higher deterioration for the higher premium jumps but claim counts are lower, making results less credible.

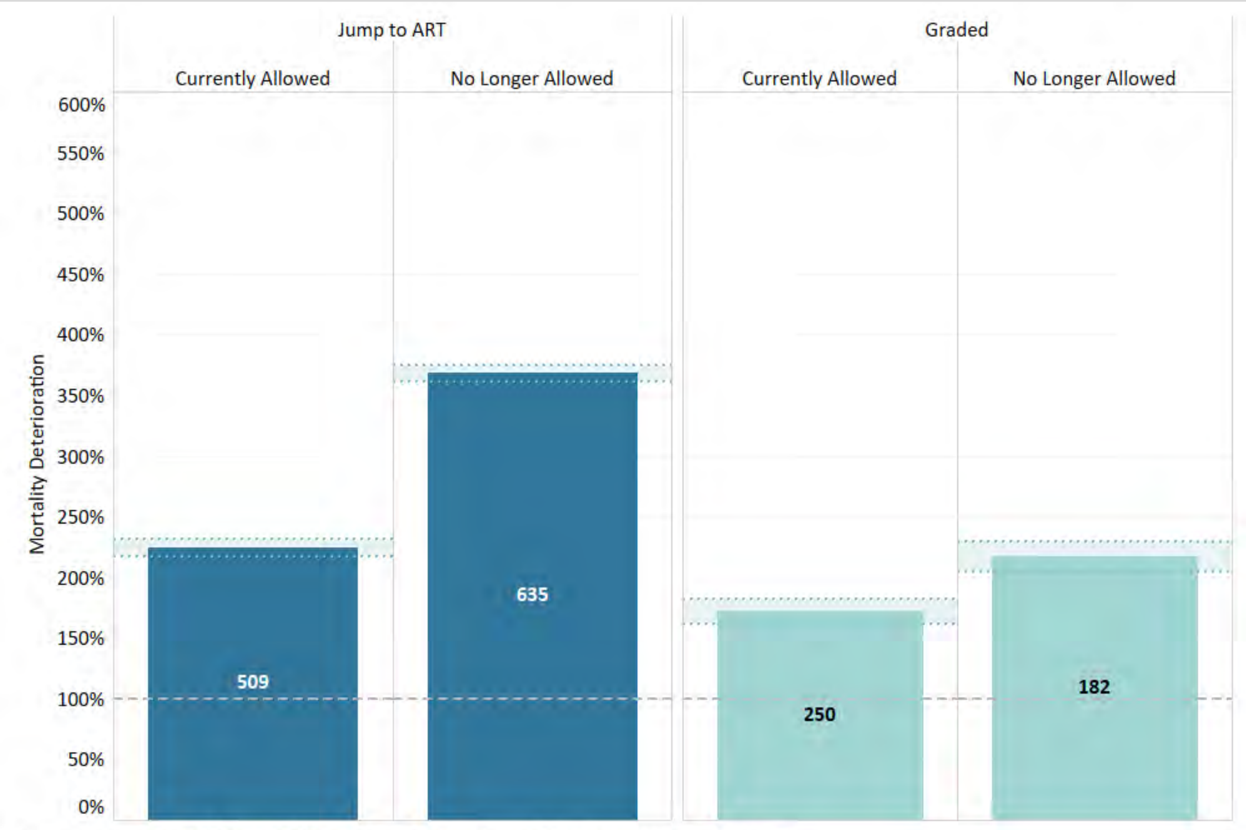
6.4.4 CONVERSION OPTION AVAILABLE

The analysis performed in this section considers the impact on mortality from policies that had an option to convert at some point during the life of the policy but did not elect to convert. Policies that did convert are not considered in this study. Conversion option availability information was provided in 88% of exposures in PLT duration 1.

Figure 6.4.4-1 below displays the mortality deterioration for the policies that currently have the option to convert (Currently Allowed) compared to those that had previously had the option but no longer have it (No Longer Allowed).

Figure 6.4.4-1

MORTALITY DETERIORATION BY CONVERSION OPTION AVAILABLE AND PLT DURATION 1



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

For both Jump to ART and Graded, those policyholders who still had the option to convert showed lower mortality deterioration than those who no longer had the option. This seems to indicate that having more options available to the policyholder decreases the anti-selective impacts with lower levels of deterioration observed in PLT. Note, if some of the reduction in mortality deterioration in the "Currently Allowed" category is due to policyholders converting, anti-selective behavior may lead to deterioration in the converted pool. This report only considers the impact of those who remained in the term pool.

Table 6.4.4-1 below displays the exposure, death count, A/E, and mortality deterioration for the two conversion option categories by comparing the level period group (<1) to the first duration in the post-level period (1).

Table 6.4.4-1

CONVERSION OPTION AVAILABLE, PLT DURATION <1 VS PLT DURATION 1

PLT Structure	Conversion Option	PLT Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
Jump to ART	Currently Allowed	<1	12,570.7K	27,835	89.7%	100.0%
		1	177.7K	509	201.2%	224.3%
	No Longer Allowed	<1	1,785.6K	9,446	96.5%	100.0%
		1	68.2K	635	355.4%	368.2%
Graded	Currently Allowed	<1	7,308.8K	18,911	86.1%	100.0%
		1	49.4K	250	147.8%	171.6%
	No Longer Allowed	<1	1,199.0K	7,679	95.2%	100.0%
		1	10.6K	182	206.9%	217.2%

The level period A/E was higher for the policyholders who no longer had the option to convert than the A/E for those who were still allowed to convert. This indicates there was already worse mortality outcomes before the policies entered the post-level period. However, this difference is exacerbated in PLT.

The mortality deterioration by premium jump for the conversion options continues to support what was observed in figure 6.4.4-1.

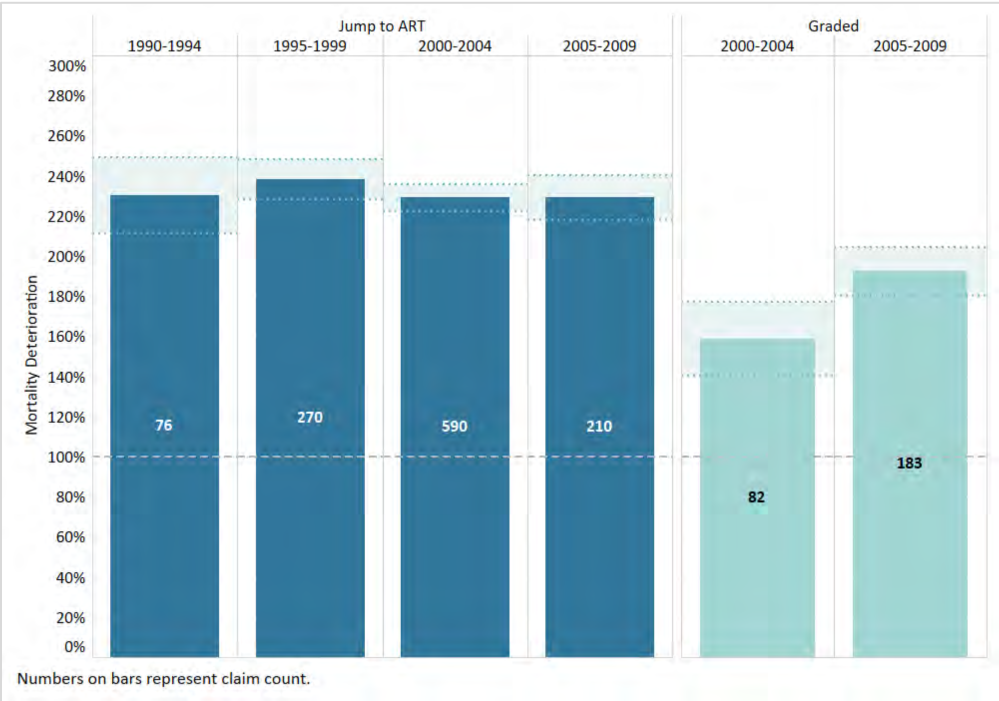
6.4.5 OTHER VARIABLES

Issue Year

The mortality deterioration by issue year was reviewed to determine if there was any significant differences across time. These results can be seen in figure 6.4.5-1. To ensure a consistent cohort comparison, this analysis focused on T10 only.

Figure 6.4.5-1

MORTALITY DETERIORATION BY ISSUE YEAR AND PLT DURATION 1, T10 ONLY



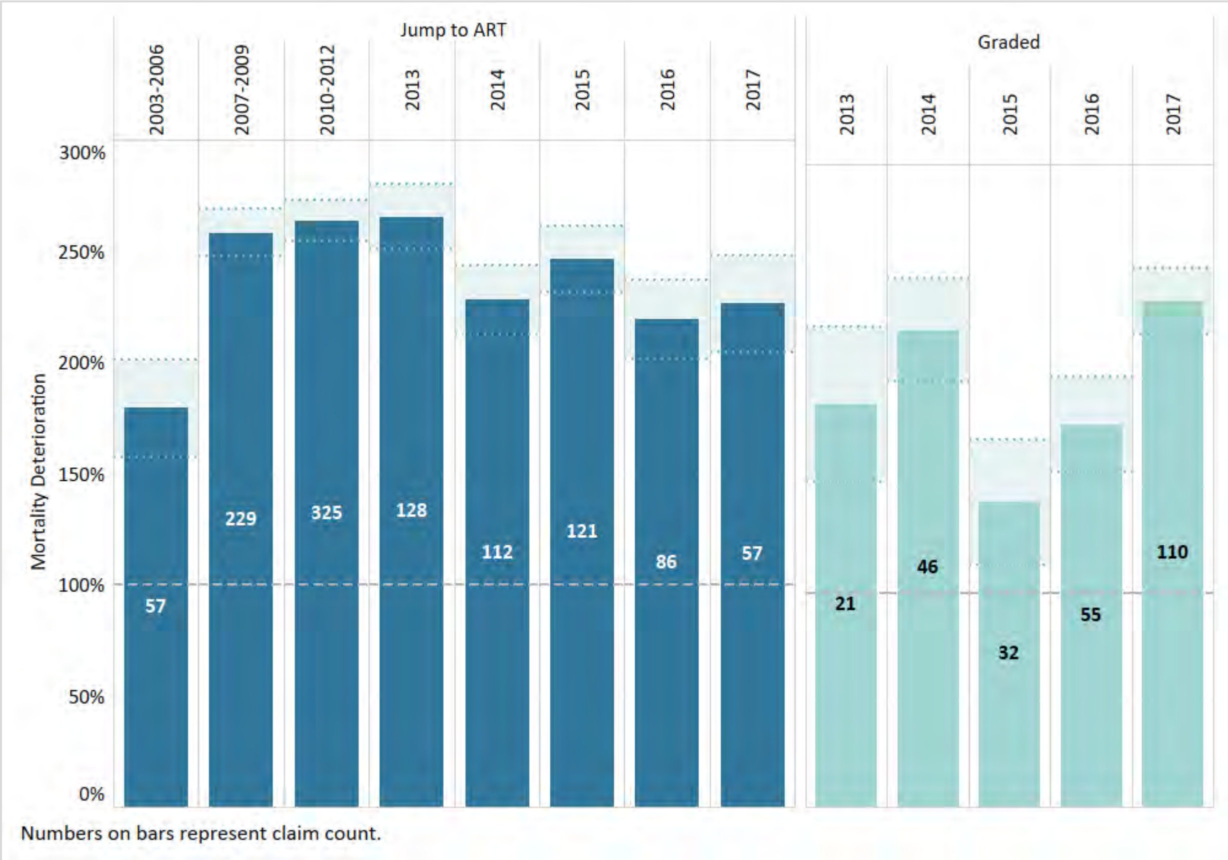
The Jump to ART business showed no difference in the mortality deterioration across issue years. Graded showed lower levels of deterioration for issue years 2000-2004 than for 2005-2009. However, the claim count is relatively low so it is difficult to make conclusions.

Calendar Year

The mortality deterioration by calendar year was reviewed to determine if there was any significant differences over time. These results can be seen in figure 6.4.5-2. To ensure a consistent cohort comparison, this analysis focused on T10 only.

Figure 6.4.5-2

MORTALITY DETERIORATION BY CALENDAR YEAR AND PLT DURATION 1, T10 ONLY



Jump to ART showed no major difference in the mortality deterioration across calendar years other than in the 2003-2006 group, but there were only 57 claims in this period. There is some variation across the more recent calendar years when individual years are shown. However, there is no trend observed and the number of claims is relatively low.

The mortality deterioration levels vary much more for the Graded structure than Jump to ART, most likely due to very low claim counts. No conclusions can be drawn on any changes in the level of deterioration over time.

Variation over time will be further investigated in section 7 on predictive modeling.

<u>Other Characteristics Not Studied</u>

There were other variables that were included in the data submissions that were analyzed, but not discussed, in this report. Below is a list of these variables and the reason they were not discussed:

- Distribution Channel: Data were provided by 16 of the 25 study participants and distribution channel was available for 70% of exposure data in PLT. However, no clear pattern could be identified as data for each distribution channel were dominated by the experience of one or two study participants. It was difficult to differentiate variation by distribution channel from company variation and no learnings were available as a result.
- Commission Pattern: Data were provided by 15 study participants and commission pattern was available for 53% of exposure data in PLT. Unfortunately, similar to distribution channel, no clear pattern could be identified.
- Simplified Issue: There were too few PLT claims to analyze.
- Return of Premium: No claims were available in the post-level period for policies with an ROP option.

6.5 ALTERNATIVE APPROACH

An alternative approach to calculating the mortality deterioration was also investigated. When using the standard approach (the method used elsewhere in this report), the later PLT durations are being compared to level term A/Es that had claims occurring up to 15 durations prior to the current duration (e.g., duration 20 of T10 is being compared to level term durations 6-10). This alternative approach seeks to remove this discrepancy by comparing policies in the same duration but that are still in the level period.

The mortality deterioration for this approach was calculated as the T10 actual-to-expected ratio (A/E) for a particular duration in the post-level period divided by the combined T20 and T30 A/E ratio for the same duration. Below is a formulaic representation of this alternative method:

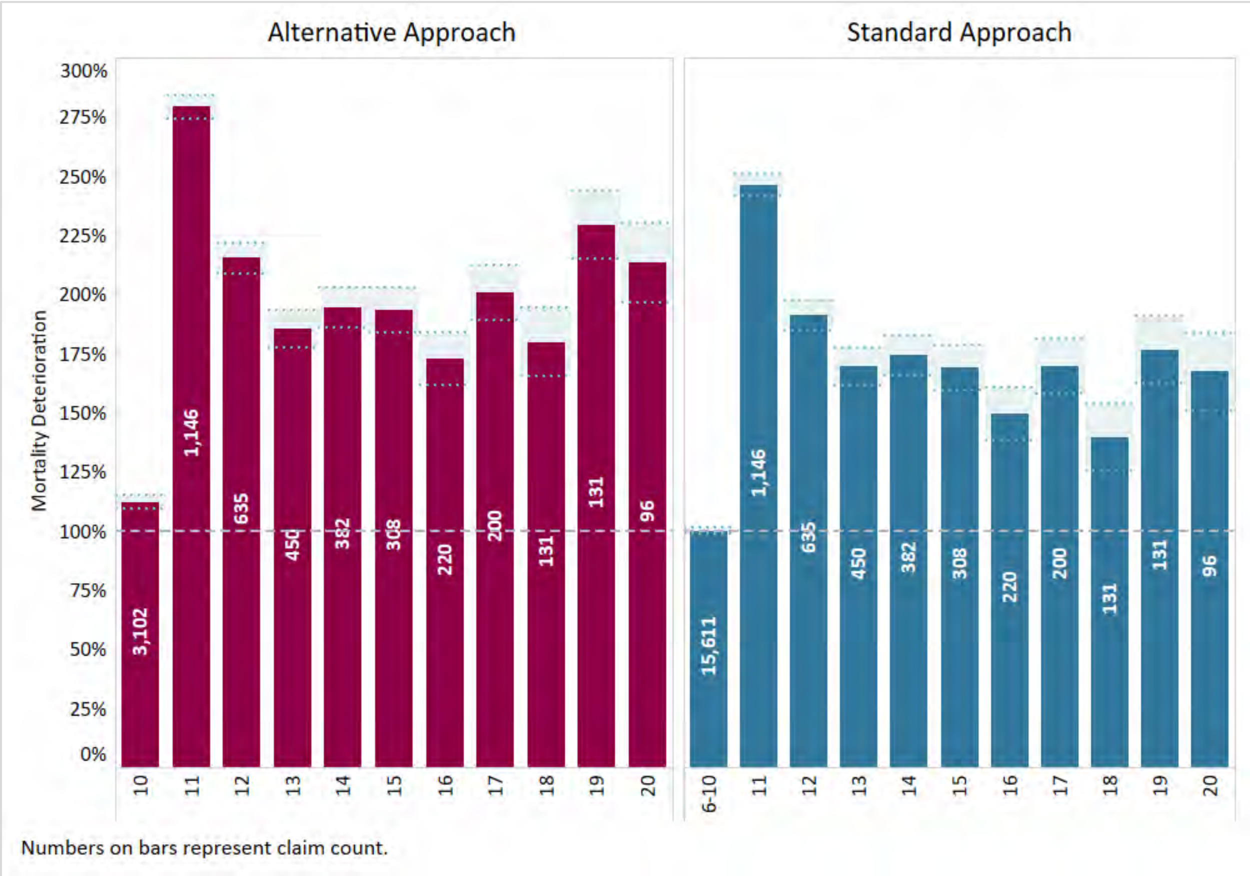
$$Mortality\ Deterioration\ (T10, Dur\ 11) = \frac{\frac{A}{E}15VBTCount(T10, Dur\ 11)}{\frac{A}{E}15VBTCount(T20\ \&\ T30, Dur\ 11)}$$

The calculation method for the standard approach is detailed in section 3.5.

Figure 6.5-1 compares the mortality deterioration pattern for these two approaches by duration. Due to the lack of later duration data in the Graded structure, this analysis focuses on Jump to ART.

Figure 6.5-1

COMPARISON OF THE TWO APPROACHES BY DURATION, T10 AND JUMP TO ART ONLY



The mortality deterioration is generally higher for the alternative approach than the standard approach. This is particularly apparent in duration 11 and durations 17-20. It is important to note that the ratio for duration 10 in the alternative approach is greater than 100%, indicating that the T10 A/E is higher than the T20 and T30 A/E even in the level period. This difference will lead to somewhat higher deterioration under the alternative approach as using T20 and T30 mortality data sets a lower baseline A/E.

While the standard approach shows a slight decreasing pattern over durations 13-20, the alternative approach shows a slight increase, particularly in durations 17-20. This higher deterioration in durations 17-20 indicates the level A/E base for T20 and T30 in those durations is lower than the T10 duration 6-10 A/E used in the standard approach. This also indicates there was a decrease in the T20 and T30 A/E for the later durations. This can be observed in table 6.5-1 below.

Table 6.5-1

COMPARISON OF THE TWO APPROACHES BY DURATION, T10, JUMP TO ART ONLY

Alternative Approach

Duration	Level Term Period Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
10	T20 & T30	527.1K	423	88.7%	100.00%
	T10	987.9K	3,102	99.5%	112.15%
11	T20 & T30	1,951.2K	2,991	88.5%	100.00%
	T10	263.5K	1,146	247.0%	279.21%
12	T20 & T30	1,631.7K	2,892	89.1%	100.00%
	T10	184.2K	635	191.9%	215.30%
13	T20 & T30	1,389.8K	2,899	91.8%	100.00%
	T10	135.4K	450	170.2%	185.33%
14	T20 & T30	1,163.4K	2,684	89.9%	100.00%
	T10	102.1K	382	174.8%	194.47%
15	T20 & T30	923.1K	2,331	87.7%	100.00%
	T10	77.5K	308	169.5%	193.26%
16	T20 & T30	680.0K	1,914	86.8%	100.00%
	T10	58.2K	220	150.0%	172.89%
17	T20 & T30	476.2K	1,489	84.7%	100.00%
	T10	43.4K	200	170.1%	200.89%
18	T20 & T30	320.9K	1,059	77.8%	100.00%
	T10	32.1K	131	139.9%	179.83%
19	T20 & T30	132.6K	478	77.3%	100.00%
	T10	23.3K	131	177.0%	229.14%
20	T20 & T30	59.3K	236	78.6%	100.00%
	T10	16.8K	96	167.7%	213.47%

Standard Approach

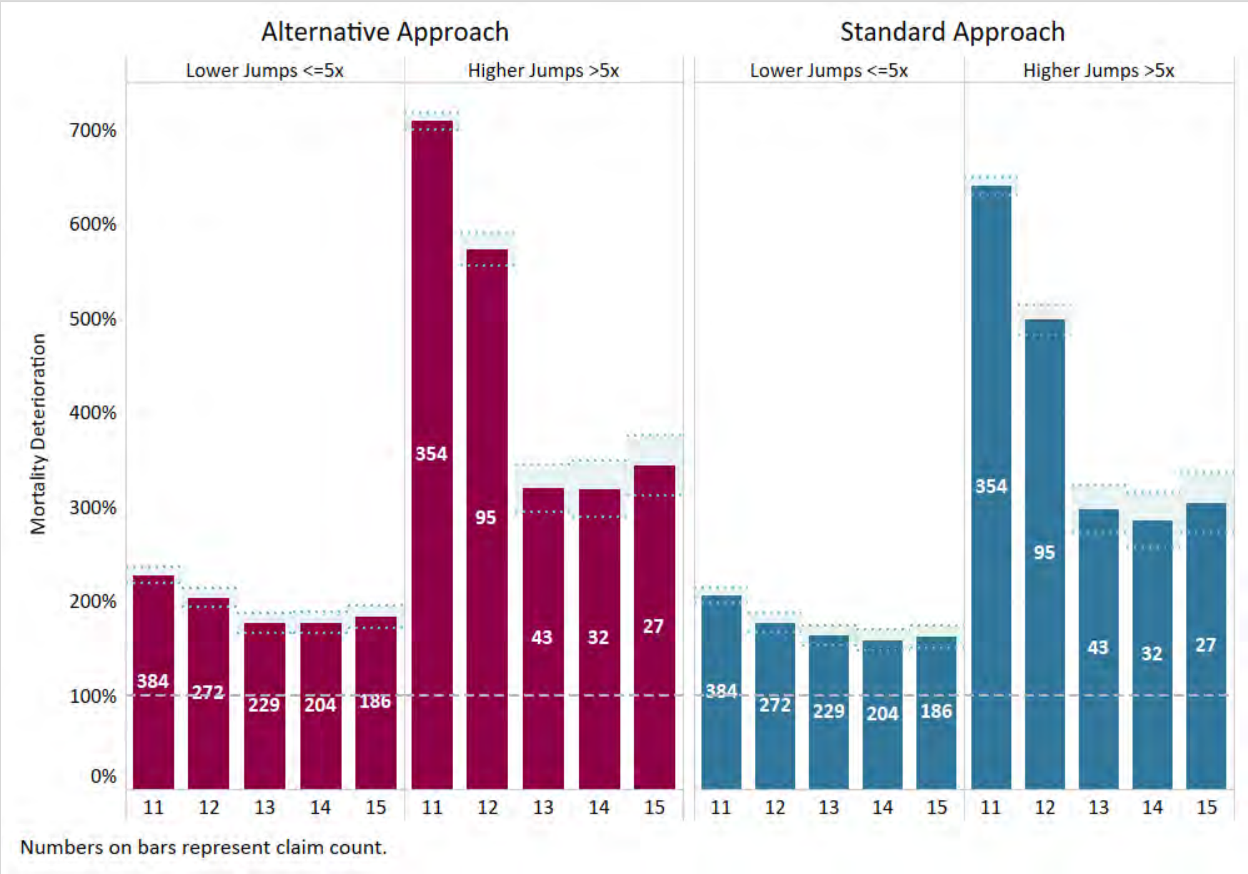
Duration Group	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration
6-10	6,277.3K	15,611	100.3%	100.00%
11	263.5K	1,146	247.0%	246.23%
12	184.2K	635	191.9%	191.23%
13	135.4K	450	170.2%	169.63%
14	102.1K	382	174.8%	174.27%
15	77.5K	308	169.5%	168.97%
16	58.2K	220	150.0%	149.50%
17	43.4K	200	170.1%	169.55%
18	32.1K	131	139.9%	139.47%
19	23.3K	131	177.0%	176.45%
20	16.8K	96	167.7%	167.18%

Note that duration 10 for the alternative approach does not show mortality deterioration for T10 as it is not yet in the post-level period. It does provide a comparison between the observed mortality in duration 10 of the level period for T20 and T30 and the observed mortality in duration 10 of the level period for T10. The standard approach displays durations 6-10 combined to represent the level period mortality used as the baseline for the mortality deterioration for this approach. The T20 and T30 A/Es were mostly stable for durations 10-14. They began to decrease after this and stabilized for durations 18-20 at a level 10 percentage points lower than the early duration levels. These later durations continued to have more than 200 claims in each duration, which means the duration 18-20 A/Es are based on credible data.

A comparison using the two premium jump groups was also reviewed for durations 11-15 (see figure 6.5-2 below). Durations 16-20 had very few claims in the higher premium jump group and were not studied. Further analysis of the mortality deterioration patterns by duration is investigated through predictive modeling.

Figure 6.5-2

COMPARISON OF THE TWO APPROACHES BY DURATION AND PREMIUM JUMP, T10, JUMP TO ART



The differences in the level of mortality deterioration between the two approaches are more pronounced in the higher premium jumps group than in the lower jumps group. However, the deterioration in the lower jumps group was still higher in the alternative approach than in the standard approach. The pattern between the lower and higher jumps groups was the same for both the alternative and standard approaches. This indicates that premium jump does not play a major role in the differences between these two approaches.

Both approaches have their merits. Using the alternative approach provides higher levels of mortality deterioration, particularly in the later durations, but provides a comparison to policyholders in the same duration. Using the standard approach provides a constant basis for comparison that is missing when using the alternative approach but may understate the deterioration at the later durations relative to mortality at a similar duration for longer term plans. This highlights the importance of applying a consistent approach in analysis and assumption application as deterioration is impacted by the choice of baseline.

6.6 ANALYSIS OF DEATHS

An analysis was performed on the distribution and timing of deaths across several factors.

Each of the figures in this section show the results by PLT duration split into the level period (<1), the first duration in PLT (1), and the remaining durations in PLT (2+). The colors on each figure are an indication of the number of claims, with the lightest color (teal) having 0-25 claims and the darkest color (navy blue) having 100+ claims. The numbers on the figures may not always add up to exactly 100% due to the rounding applied.

6.6.1 CAUSE OF DEATH

Study participants were requested to submit cause of death information. Several options for cause of death codes were permitted in the data submission and then, during data cleaning, were mapped to a common cause of death code (ICD-10). After data validation, cause of death was available for 64% of deaths in the level period, 56% of the deaths in PLT duration 1, and 51% of deaths in PLT durations 2+.

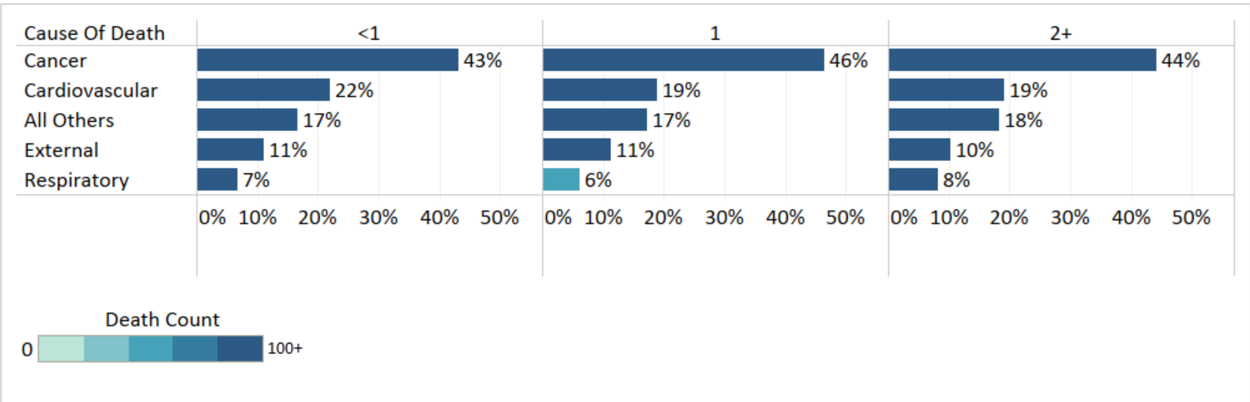
Throughout this section, the two PLT structures (Jump to ART and Graded) and the three term plans (T10, T15, and T20) will be combined. Analysis did not show any major differences by these factors.

The distribution by cause of death was reviewed for variables discussed previously in this report and results are displayed for the most informative views.

Figure 6.6.1-1 displays the distribution of deaths by PLT duration.

Figure 6.6.1-1

CAUSE OF DEATH BY PLT DURATION

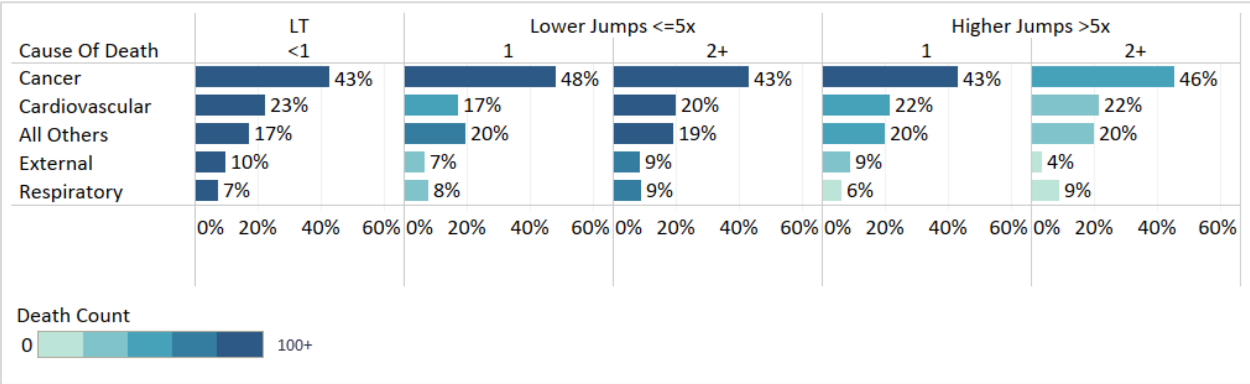


The proportion of cancer deaths increased from 43% in the level period to 46% in PLT duration 1. This suggests some anti-selective behavior at the end of the level period as deaths increased for cancer, a condition that policyholders are likely aware of as they make the decision to continue their policy past the level period. PLT duration 2+ still sees a slight increase in the proportion of cancer deaths compared to the level period. However, it decreased from PLT duration 1 to PLT duration 2+.

Premium jump was shown to be a major driver of both shock lapse and mortality deterioration. It was, therefore, of interest to see how cause of death interacted with premium jump. To provide enough claims to review this, the premium jumps were combined into two groups, lower jumps with less than five times premium increases and higher jumps with five times or greater premium increases. The cause of death distribution for this variable can be seen in figure 6.6.1-2 below.

Figure 6.6.1-2

CAUSE OF DEATH BY PLT DURATION AND PREMIUM JUMP



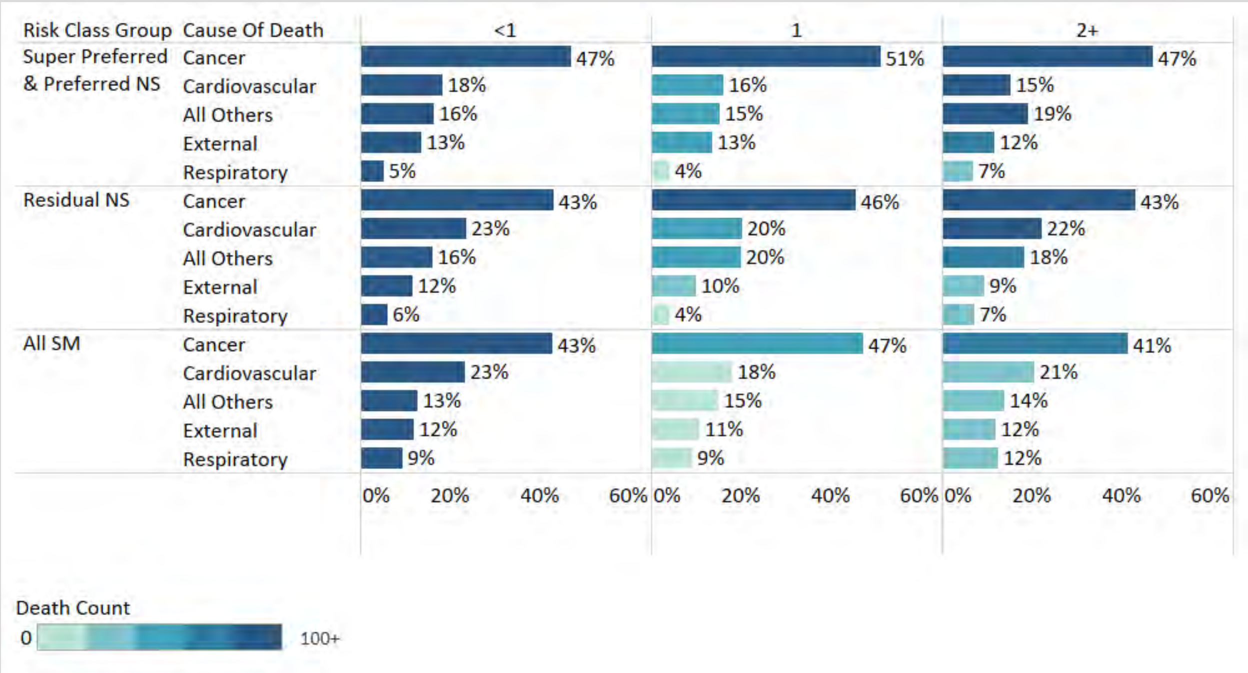
The lower premium jumps (<=5.00x) saw a clear increase in cancer deaths from the level period to the first duration in PLT. This reverted to the original level in PLT durations 2+. This premium jump group also saw a decrease in PLT duration 1 in deaths from cardiovascular and external causes.

The higher premium jumps (5.00x+) did not show any increase in the proportion of deaths due to cancer in PLT duration 1. However, it did show an increase in PLT durations 2+.

The next variable considered with regards to distribution of deaths by cause of death was risk class. Due to a lack of data, the super-preferred NS and preferred NS classes were grouped together. Consistent with the analysis in section 6.3.3, the undifferentiated risk class and substandard risks have been excluded for figure 6.6.1-3.

Figure 6.6.1-3

CAUSE OF DEATH BY PLT DURATION AND PREFERRED RISK CLASS



The first item to consider when reviewing the distribution of cause of death across different risk classes is how this distribution differs by risk class in the level period. The underwriting process is effective at identifying individuals who may have an increased risk of heart disease. As such, the super-preferred NS and preferred NS risk classes should see fewer cardiovascular deaths as a percentage of all deaths and an increase in causes that cannot be easily underwritten (cancer and external deaths). Indeed, this can be seen in the level period when comparing the distributions of the preferred NS classes with the residual NS class, with the preferred classes having a higher percentage of cancer and external deaths than residual, and a lower percentage of cardiovascular deaths than observed in the residual class. Unsurprisingly, the smoker classes saw a larger proportion of respiratory deaths than was observed in the nonsmoker classes.

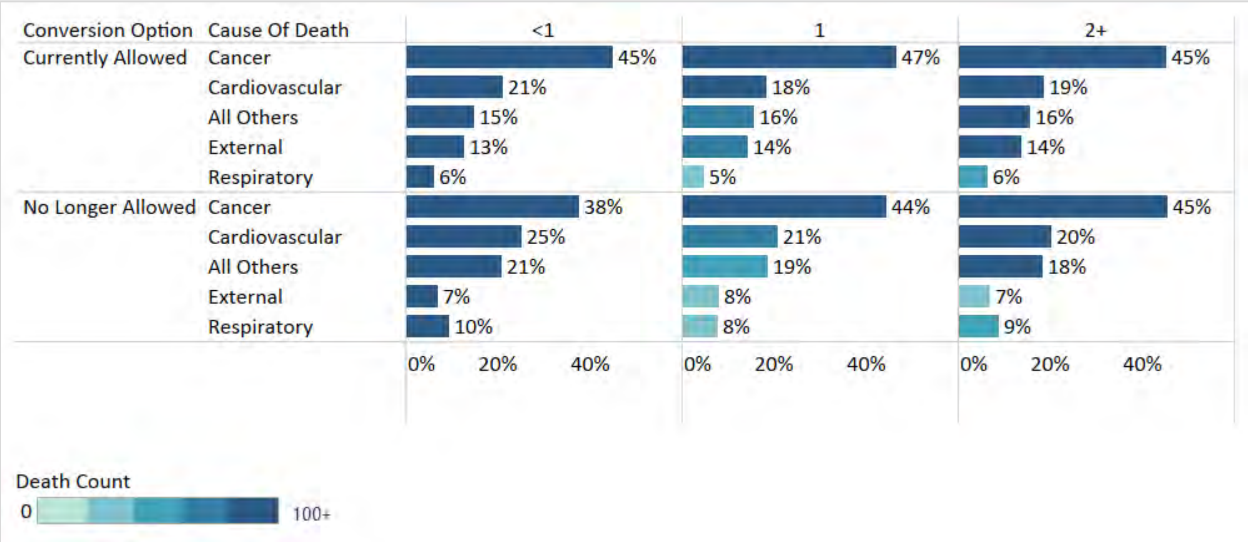
When comparing the results for the level period with the first duration in the post-level period, the preferred NS classes saw a larger increase in cancer-related deaths than was observed in the residual class. This seems to indicate more anti-selective behavior from the preferred risk classes than from the residual class.

The smoker class also saw a larger increase in the percentage of deaths from cancer in PLT duration 1, which indicates there is also some anti-selective behavior by smokers in PLT.

Finally, the availability of conversion option and cause of death distribution is shown in figure 6.6.1-4 below.

Figure 6.6.1-4

CAUSE OF DEATH BY PLT DURATION AND CONVERSION OPTION



Policies that no longer had a conversion option available displayed significantly more anti-selective behavior than those that still had the option to convert.

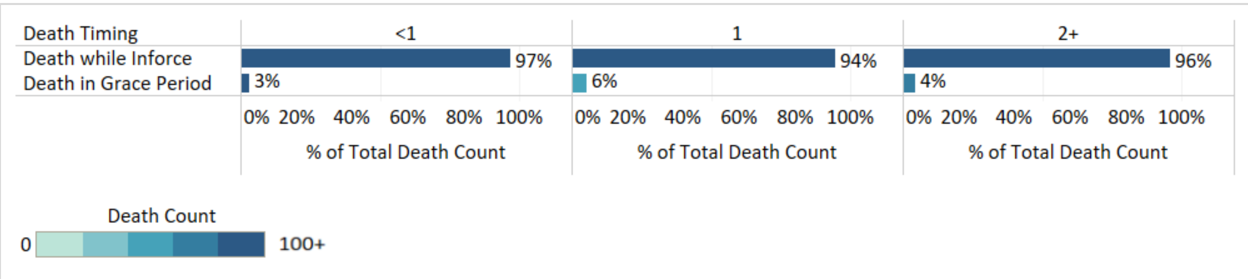
From this analysis, it is clear that the decision of whether to keep a policy into the post-level period is influenced by the health of the individual. Factors that lead to more lapses see higher mortality deterioration and, of those deaths, an increase in cancer deaths is frequently observed.

6.6.2 TIMING OF DEATH

For terminations submitted as deaths, the premium paid to date was requested in addition to the termination date. These two dates were then compared. If the date of death was after the premium paid to date, then death occurred in the grace period ("Death in Grace Period"). Otherwise, death occurred while inforce ("Death while Inforce"). The timing of death was available for 77% of deaths in the level period, 69% of the deaths in PLT duration 1, and 61% of deaths in PLT durations 2+. Figure 6.6.2-1 shows the distribution of these deaths by the timing of death.

Figure 6.6.2-1

TIMING OF DEATH BY PLT DURATION



An increase in the percentage of deaths in the grace period is observed in PLT duration 1 (6% of deaths) compared to that in the level period (3% of deaths). PLT durations 2+ continue to see a slightly higher proportion of deaths in the grace period (4%) than in the level period. While this increase in grace period deaths in the post-level term period is interesting, it should be noted that this still represents less than 100 deaths in each of the PLT duration groups (74 deaths out of 1,311 total deaths for PLT duration 1 and 90 deaths out of 2,097 total deaths in PLT durations 2+). Additionally, the level period still saw many more deaths in the grace period (1,131 deaths out of 34,788 total deaths) than occurred in PLT.

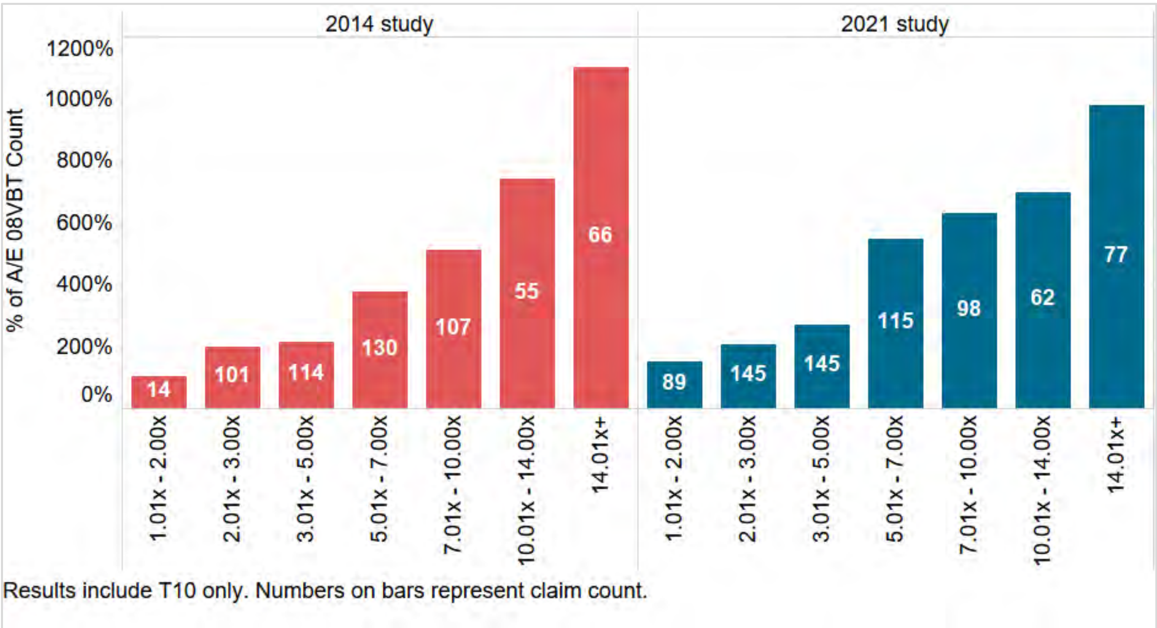
Due to this lack of claims, no other meaningful observations could be made from studying other variables.

6.7 COMPARISON TO 2014 U.S. PLT STUDY

The previous SOA industry study on U.S. Post-Level Term was completed in 2014. The study focused on the Jump to ART structure and included predominantly T10 experience. A comparison of the latest 2021 study results to the previous study was carried out. Figure 6.7-1 shows the mortality deterioration for duration 11 compared to durations 6-10 of T10 with a Jump to ART structure.

Figure 6.7-1

MORTALITY DETERIORATION IN DURATION 11 BY INITIAL PREMIUM JUMP GROUP AND SOA STUDY



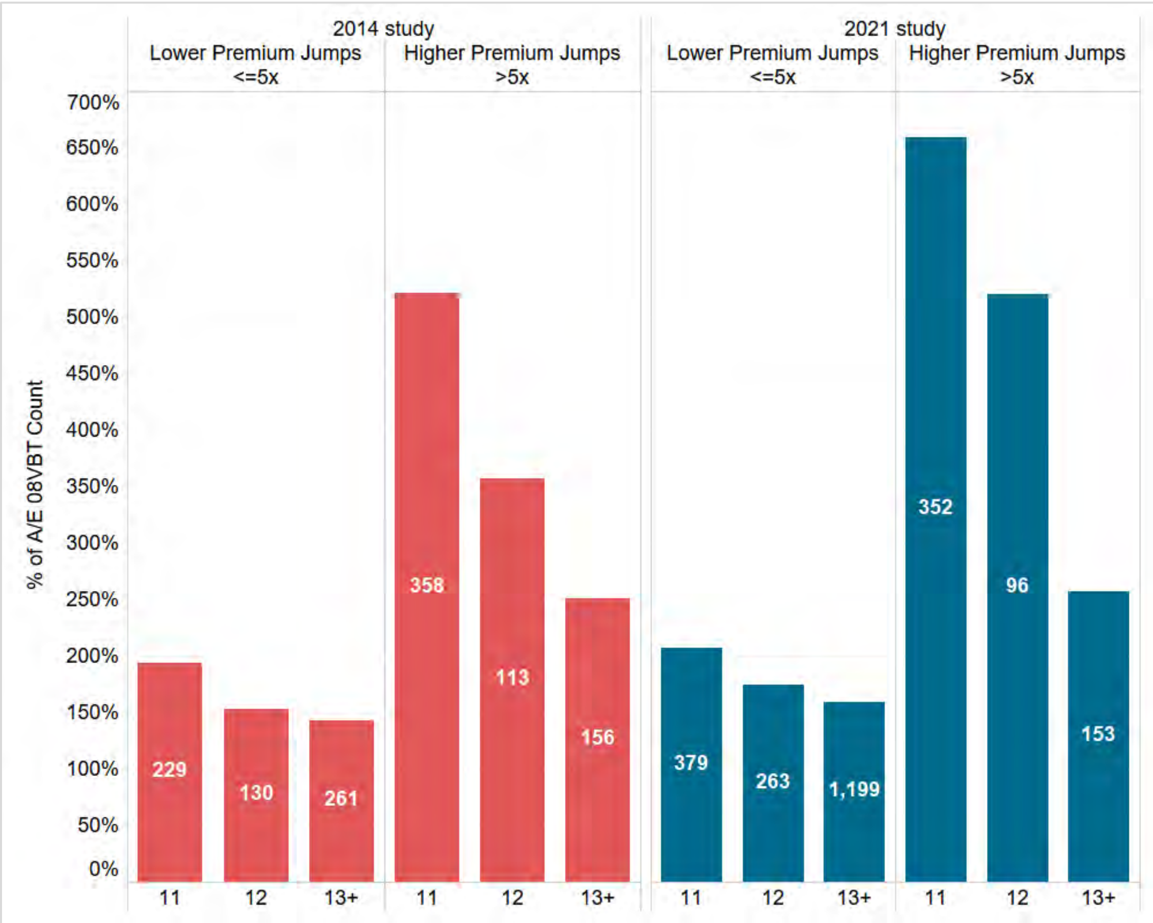
Mortality deterioration in the 2021 study follows a similar pattern to the 2014 study but with some variation in mortality ratios by premium jump. As discussed in the shock lapse comparison in section 5.8, the difference in premium jump definition between the two studies may explain some of the difference in level of deterioration. In the 2021 study, the initial premium jump is defined as the ratio of the first PLT premium to the level term period premium. The 2014 SOA PLT study included initial premium jump calculated as the ratio of the per thousand premium rate in the first duration in PLT to the per thousand premium rate in the level term. This method did not include the policy fee. This may explain the slightly higher deterioration observed for the 2021 study for a given premium jump over the lower premium jump range, where policy fee is more impactful.

Overall, the pattern of increasing mortality deterioration with increasing premium jump is aligned between the studies and the levels of deterioration observed are quite similar. At the higher premium jumps, the differences between the studies may be due to a difference in premium jump mix within each group.

The pattern of mortality deterioration by duration in PLT was also compared to the 2014 study. In the 2014 study, duration 13+ data were combined. A similar grouping is used for the 2021 study for the comparison. Analysis by duration was split into broad premium jump groupings.

Figure 6.7-2

MORTALITY DETERIORATION BY DURATION AND PREMIUM JUMP



The pattern of mortality deterioration by duration is aligned between the studies, where the highest mortality deterioration was observed in the first duration in PLT and mortality decreases in each duration thereafter. For the higher premium jump group, the pattern by duration is steeper than for the lower premium jump group in both studies, showing a more pronounced wear-off by duration after very high initial deterioration. Differences in the level of deterioration between the studies are attributed to business mix differences and, in particular, differences in premium jump mix between the studies within each of the two broad premium jump groups. For the lower premium jump group, the 2021 study includes more data in duration group 13+. The latest study provides more data in later PLT durations as more data are available over time. Note this is observed for the lower premium jump group only. The higher premium jump group still has limited data in later durations due to very high shock lapses at the end of the level term, leading to less business remaining in PLT.

Overall, both the initial mortality deterioration pattern by premium jump and the wear-off pattern by duration are similar between the two studies.

Section 7: Predictive Modeling

In addition to the traditional lapse and mortality deterioration analysis shown in this report, predictive modeling was used to provide further insights into policyholder behavior. The process involves modeling the lapse and mortality experience and deriving predictions based on relevant drivers. Statistical analysis aims at summarizing the relationship among the variables. It can be univariate as well as multivariate, and study interactions among variables. Statistical analysis techniques were discussed in sections 5.2 and 6.2 as part of variable selection for shock lapse and initial mortality deterioration analysis. Predictive modeling aims at making predictions or studying the relationships among the drivers while controlling the effect of other variables.

The policyholders who decide to remain after having a premium increase at the end of the level term tend to have higher mortality, substantially modifying the portfolio risk profile. The traditional analysis highlighted a relationship among the magnitude of the premium increase, the shock lapse and the mortality of the policyholders who did not lapse. Predictive modeling can be applied to build statistical models for lapse and mortality based on the study data to capture this relationship and provide further insights.

A full report entitled *U.S. Post-Level Term Lapse and Mortality Predictive Modeling* will be published separately. This section provides a preview of the predictive modeling analysis and discusses the additional insights that can be gained.

7.1 LAPSE MODELING

Predictive modeling of shock lapse provides the potential to capture additional features that impact lapse at the end of the level term in addition to the premium jump ratio. Significant variation by factors including attained age, term plan, risk class, face amount, premium payment mode and billing type can be investigated. The use of a predictive model offers the capability to model these factors and capture the interactions among the various drivers of shock lapse.

For premium increases below 3.50x, the slope of the predicted shock lapse rate is steeper than for premium increases above 3.50x. There are less variations at the largest premium jumps (premium increases 14.00x and higher) where shock lapses are very high irrespective of other factors. The shock lapse modeling allows for better understanding of how behavior differs over different premium increase ranges.

Predictive modeling also provides insight into the relationship among variables. For example, there is an increasing pattern of shock lapse by attained age. This was observed at an overall level, as well as within premium jump groupings through the analysis in section 5.3. The predictive modeling estimates the shock lapse variations by attained age and other factors such as risk class, level term, gender, billing type, face amount band and premium payment mode. The differences within each factor disappear at advanced ages. Modeling the relationship between attained age and other variables helps to capture this relationship more accurately than a one-way analysis allows by controlling the effect of the other variables.

Lapse in PLT can also be captured in a predictive model. The lapse rates decrease across the durations in the PLT period. The slope of the predicted lapse as a function of the initial premium increase becomes less steep for later durations in the PLT period. The pattern differs between Jump to ART and Graded PLT structures due to differences in premium increases in subsequent durations in PLT. This can be captured by carrying out separate modeling exercises for each PLT structure. Premium increase in subsequent durations in PLT can be considered as an additional variable for lapse modeling in PLT. The same advantages of predictive modeling apply where multiple variable effects can be captured simultaneously while appropriately allowing for interactions.

7.2 MORTALITY DETERIORATION MODELING

Mortality modeling can be designed to directly capture the relationship with shock lapse by including predicted shock lapse as a variable in the mortality modeling. This approach provides a more comprehensive understanding of the relationships among premium increase, shock lapse and mortality. Predicting by shock lapse rather than premium increase improves the parsimony of the modeling by capturing with a single variable the variation by all factors included in the shock lapse model.

In traditional analysis, the relationship between shock lapse and mortality deterioration cannot be captured directly. Insights can be gained indirectly by analyzing variables that impact both lapse and mortality. However, it is difficult to differentiate between variation driven by differences in shock lapse and variation directly attributable to the specific drivers. In predictive modeling for mortality deterioration, when shock lapse is included as an explanatory variable, additional factors can be considered through a further modeling exercise. This methodology provides insights regarding the additional factors needed to model mortality deterioration in PLT, after accounting for the key relationship with shock lapse. While the shock lapse summarizes most of the variation in mortality deterioration, additional variables are identified.

7.3 ADDITIONAL INSIGHTS

In addition to factors captured in the lapse and mortality modeling, the predictive modeling allows for further investigation into residual variation by other factors after fitting the models. This approach allows for analysis of variation by factors such as study year. Variation over time can be investigated by comparing actual PLT results for each study year to model predicted results based on the characteristics of the policies in that year. The use of predictive models helps to isolate residual variation by year to ensure a more consistent comparison. Similarly, data not used in fitting the model can be analyzed to identify if the model is a good predictor for this business. For example, where substandard business is not included in the modeling, the actual results for substandard business can be compared to the model predicted results to provide insights into the lapse and mortality experience for substandard business relative to policies issued at standard rates. Another interesting example is T20 actual lapse and mortality experience compared to model predictions based on T10 and T15 data only. In this way, predictive modeling provides insights into lapse and mortality experience for T20 relative to the other term plans, accounting for variation by other factors to ensure a consistent comparison.

7.4 MODELING APPROACH

The 2021 study includes T10, T15 and T20 experience. Due to limited experience data in PLT, the T20 data do not allow for a granular analysis of the relevant drivers of PLT experience and will be excluded from the predictive modeling. See section 3.7 for more details regarding the differences in scope between the traditional analysis and the statistical analysis. Jump to ART and Graded PLT structures will be modeled separately to investigate how the factors impacting policyholder behavior differ between these two premium structures. Three specific modeling exercises will be considered as follows:

1. Shock Lapse
2. Lapse in PLT
3. Mortality Deterioration

A logistic regression will be used to model the shock lapse experience. Factors including premium jump ratio, attained age, premium payment mode, billing type, risk class, term plan, face amount band, and gender will be considered in modeling the shock lapse. The lapse rates by duration in PLT will be modeled considering similar factors to the shock lapse model with consideration also given to subsequent duration premium increases.

Mortality deterioration in PLT will be predicted through a relational model, including mortality deterioration as a function of the shock lapse and the duration in PLT. Taking the mortality deterioration based on shock lapse and duration in PLT as a mortality deterioration reference, a Poisson Generalized Linear Model will be adjusted including this reference and introducing additional drivers of the mortality experience.

The main steps of selecting the covariates will also be described in the full predictive modeling report entitled *U.S. Post-Level Term Lapse and Mortality Predictive Modeling*.

Section 8: Survey Results

8.1 OVERVIEW

The survey was sent out in the spring of 2019 in conjunction with the initial data request sent to U.S. term insurance writers. A total of 25 companies completed the survey. The group of 25 companies that completed the survey were not the same 25 that contributed data to the experience study. Two companies that completed the survey did not submit data, and two companies that submitted data did not complete the survey.

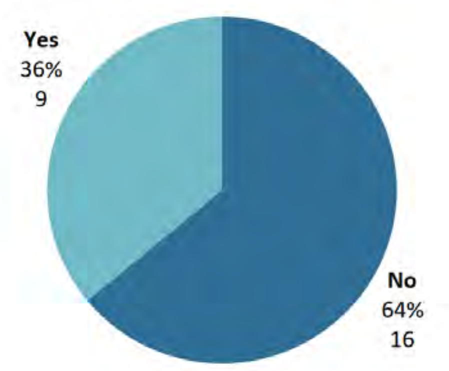
The survey included questions that supported the data validation process and questions that aimed to provide insight into how practices related to post-level term vary across the industry. The latter is the focus of the results presented in this section.

8.2 RATE CHANGE PRACTICES

The survey results provided insights into premium rate change practices that companies have adopted in the post-level term period. Key questions and responses are summarized here.

Figure 8.2-1

HAS THE COMPANY EVER CHANGED PLT RATES ON IN-FORCE BUSINESS?



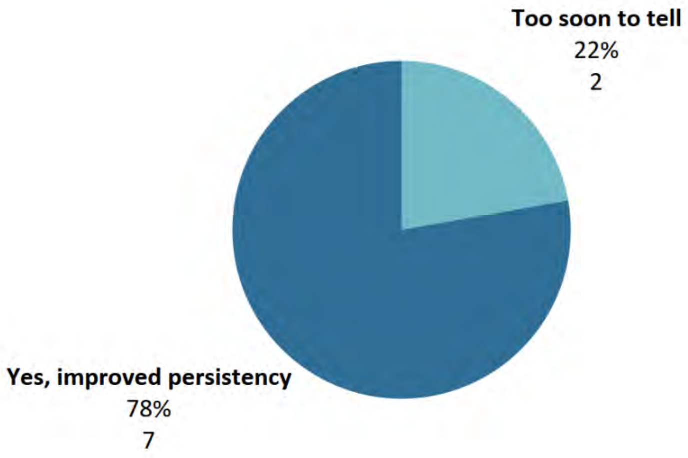
Nine companies confirmed changing post-level term rates, with all of them changing from a Jump to ART premium structure to a Graded premium structure. The Graded approach attempts to lower initial premium jumps with the intention to increase the proportion of policyholders continuing coverage in the post-level term period.

As a follow-up question, companies were asked how the rate change was communicated to policyholders. Common responses were as follows:

- Notice of rate change sent, generally 30 to 60 days before end of the level term period,
- Change was communicated to agents in addition to the notice of rate change to policyholders, and
- Varied by policy form and/or year.

Figure 8.2-2

HAVE YOU OBSERVED PERSISTENCY CHANGES DUE TO THE PLT RATE CHANGES IMPLEMENTED?



Most companies saw improved persistency by moving to a Graded post-level premium structure. Companies that indicated they had not changed PLT rates were asked why they had not made any changes. Common reasons for not changing PLT rates were as follows:

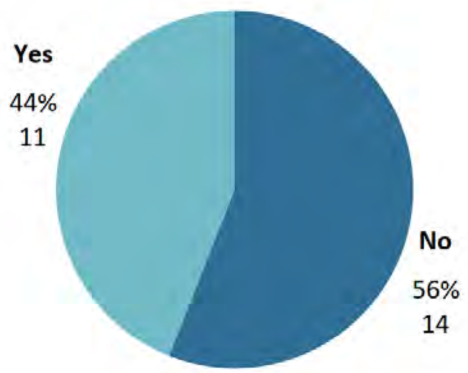
- Regulatory limitations,
- Need approval from legal,
- Need reinsurer support, and
- Limited data with which to make decisions.

8.3 PERSISTENCY MANAGEMENT

The survey asked a series of questions regarding communication at the end of the level term period and options provided to policyholders designed to encourage persistency. Key questions and responses are summarized here.

Figure 8.3-1

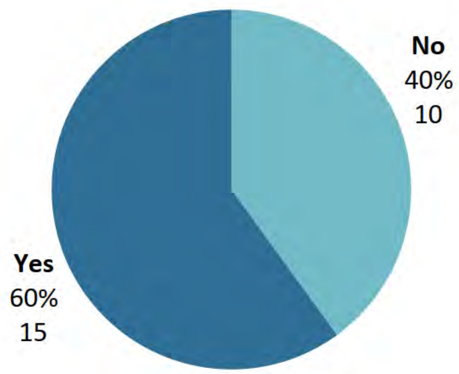
DO YOU PROVIDE OPTIONS TO APPLY FOR LOWER PREMIUM RATES AT THE END OF THE LEVEL PERIOD?



Companies indicated that common options for lower premium rates included offering a reduced face amount or a change to an alternate post-level term premium structure or product.

Figure 8.3-2

IS THERE AN ORGANIZED EFFORT TO PROMOTE PERSISTENCY AT THE END OF THE LEVEL TERM?



A majority of companies indicated they had an organized effort to promote persistency at the end of the level term period. Common efforts to promote persistency included:

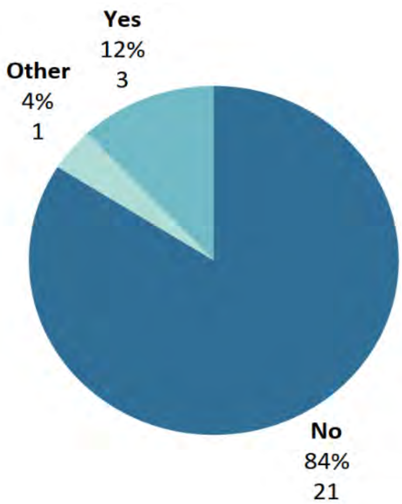
- Policyholder communication near the end of the level term (13 companies),
- Conversion or exchange encouraged with agent or policyholder incentives (5 companies), and
- Conversion or exchange encouraged without additional incentives (7 companies).

8.4 BILLING PRACTICES

The survey asked several questions regarding company billing practices in the post-level term period. Key questions and responses are summarized here.

Figure 8.4-1

DO YOU AUTOMATICALLY CHANGE ELECTRONIC FUNDS TRANSFER TO DIRECT BILL IN PLT?

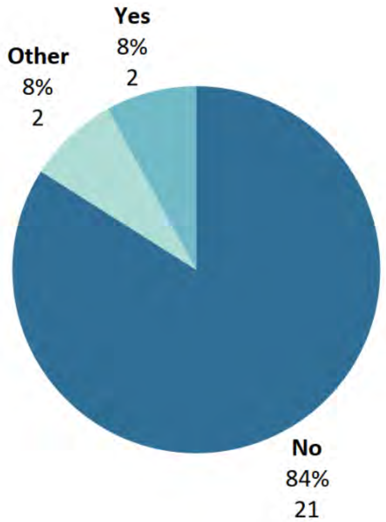


The majority of companies did not automatically change policyholders to direct bill when they reached the post-level period. However, several companies indicated policyholders using electronic funds transfer that were not automatically changed to direct bill were:

- Sent a letter notifying them of the premium increase at the next withdrawal, or
- Contacted by a customer service representative and presented with the option to change payment type to direct bill.

Figure 8.4-2

DOES PREMIUM MODE CHANGE IN PLT?



The majority of companies indicated they did not change the premium mode when the policy reached the post-level term period. Other responses were as follows:

- Depends on whether they have PLT changes, or
- Policyholders always have the option to change mode.

Of the companies that did change the premium mode in the post-level period, the monthly premium modes were changed to quarterly mode, while the other premium modes were unchanged.

8.5 ACCELERATED UNDERWRITING

The survey asked several questions regarding accelerated underwriting and the implementation dates. Key questions and responses are summarized below.

Figure 8.5-1

HAVE YOU STARTED USING ACCELERATED UNDERWRITING WHEN ISSUING NEW TERM POLICIES?

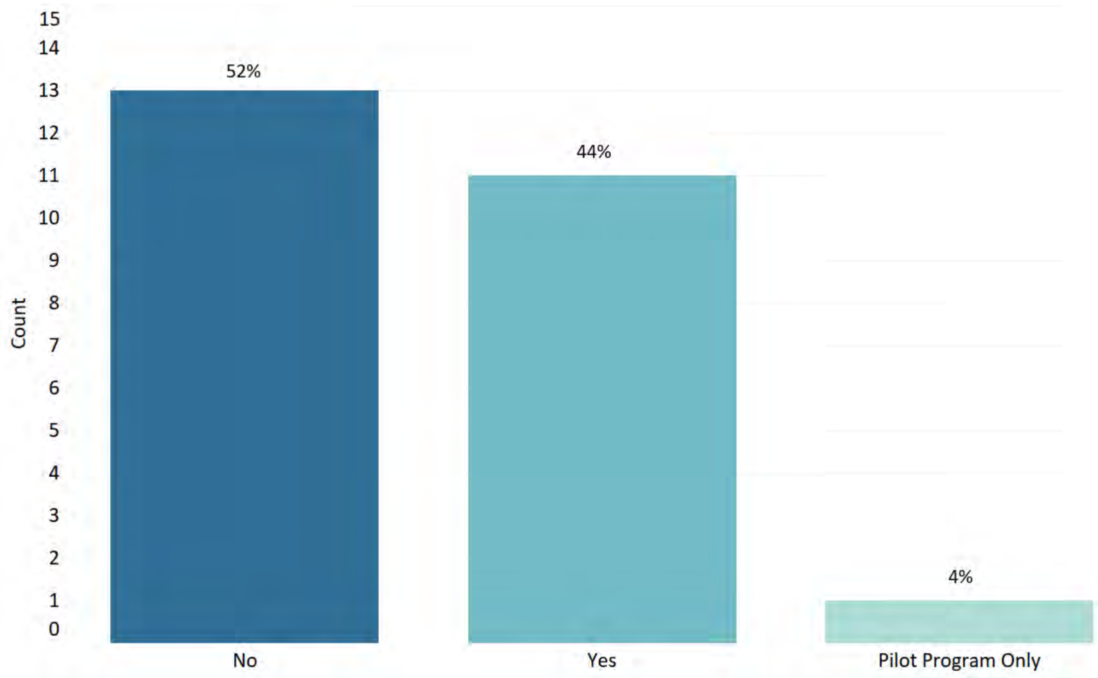
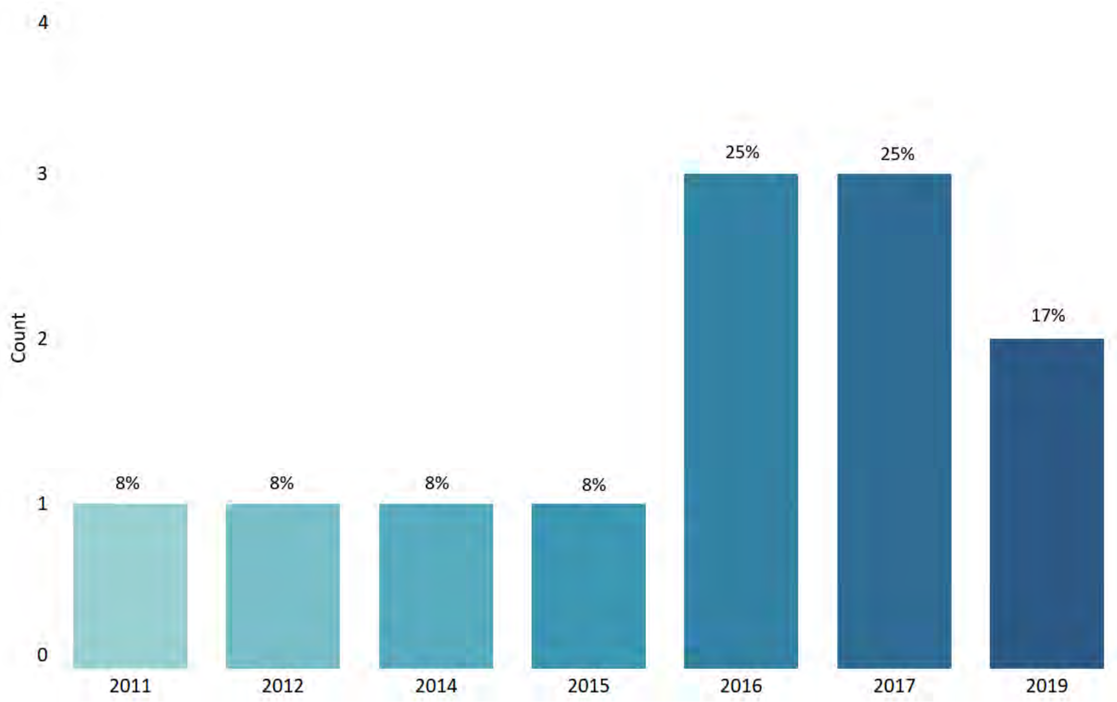


Figure 8.5-2

WHAT YEAR DID YOU START USING ACCELERATED UNDERWRITING WHEN ISSUING NEW TERM POLICIES?



Policies issued using accelerated underwriting are not in the data for this study given these programs only started in the last decade. However, it should be noted that the availability of accelerated underwriting may impact policyholder behavior when policyholders look to find alternative coverage as they reach the post-level term period.

Section 9: Acknowledgments

The researchers would like to express our gratitude to all the participating companies for making this project possible. Your contributions have led to a new industry benchmark of experience results for shock lapse and post-level term lapse and mortality experience.

We would like to thank the SOA, along with their staff, for their guidance and support on this research project. At the Society of Actuaries:

Korrel Crawford

Mervyn Kopinsky, FSA, EA, MAAA

Cynthia MacDonald, FSA, MAAA

The researchers' deepest gratitude goes to the following members of the Project Oversight Group (POG) for their diligent work overseeing the data request development, discussing data and results, and reviewing and editing this report for accuracy and relevance. Project Oversight Group members:

Brian Carteaux, FSA, MAAA (Chair)

Larry Bruning, FSA, MAAA

Jeff Dukes, MAAA

Brian Holland, FSA, MAAA

Donna Megregian, FSA, MAAA

Tony Phipps, FSA, MAAA

Mark Rosa, ASA, MAAA

Mary Simmons, FSA, MAAA

The researchers engaged MIB's Actuarial and Statistical Research Group to collect, validate, and compile the data underlying this report. MIB's experience in data collection and data validation helped ensure a high standard of data quality for this project. We thank the team at MIB:

Kate Baroud

Scott Fritsche, ASA

Tom Hogan

Meara Stack

Monica Yin

Lina Young

The authors produced this report with support from a dedicated project team at SCOR who contributed to the design of the project, the analysis and the peer review of the report. Without their expertise and commitment, this study would not have been possible.

Stephen Cameron, FSA, MAAA

Jonathan Deeny

Parker Foote

Andrew Hallsworth, FSA, MAAA

Vera Ljucovic, FSA, FCIA

Colleen Murray, FSA, MAAA

Jonathon Peoples

Ryan Rockey

Octavian Rosca

Marc Vincelli, ASA

Brad Williams

David Wylde, FSA, MAAA

Joanne Yang

Appendix A: Study Participants

A.1 Companies Contributing Data

American National Insurance Company

Americo Financial Life and Annuity Insurance Company, Inc.

Amica Mutual Insurance

Cincinnati Life

Farmers New World Life Insurance Company

FBL Financial Group, Inc.

Fidelity Investments Life Insurance Company

Genworth Financial

Kansas City Life Insurance Company

Knights of Columbus

Lincoln Financial Group

MetLife

Midland National Life Insurance Company

National Life Group

New York Life Insurance Company

Principal Financial Group

Protective Life

Prudential Insurance, Inc.

Securian Financial Group, Inc.

Southern Farm Bureau Life Insurance

State Farm

Symetra Life Insurance Company

USAA Life Insurance Company

Vantis Life Insurance Company

Voya Financial

A.2 Companies Contributing to the Survey

American National Insurance Company

Americo Financial Life and Annuity Insurance Company, Inc.

Amica Mutual Insurance

Cincinnati Life

Colonial Life and Accident Insurance Company

Country Life Insurance Company

Farmers New World Life Insurance Company

FBL Financial Group, Inc.

Fidelity Investments Life Insurance Company

Genworth Financial

Knights of Columbus

Lincoln Financial Group

MetLife

Midland National Life Insurance Company

National Life Group

New York Life Insurance Company

Principal Financial Group

Protective Life

Prudential Insurance, Inc.

Securian Financial Group, Inc.

Southern Farm Bureau Life Insurance

Symetra Life Insurance Company

USAA Life Insurance Company

Vantis Life Insurance Company

Voya Financial

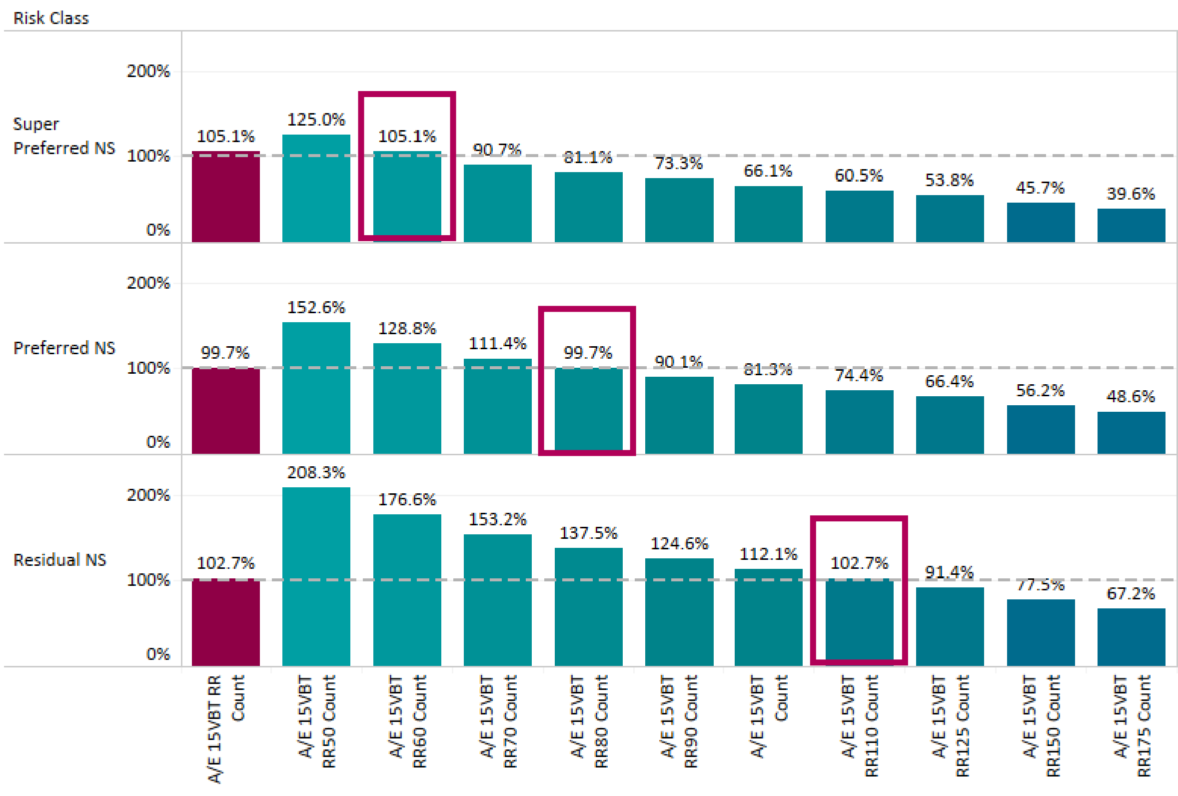
Appendix B: 2015VBT RR Table Analysis

An analysis was performed to determine if using 15VBT relative risk (“RR”) tables in the expected basis would have an impact on the pattern or level of deterioration compared to using the base 15VBT. To analyze this, each of the risk classes first needed an RR table assigned to them. Please note that, during this investigative stage, confidence intervals are not included.

Figure B-1 shows the analysis for nonsmoker preferred risk classes for both PLT structures (Jump to ART and Graded) and all three level term plans (T10, T15, and T20). The RR table selection can be seen in the red bars and the red boxes in the figure below.

Figure B-1

RR TABLE ANALYSIS, NONSMOKERS, PREFERRED RISKS ONLY, LEVEL TERM PERIOD ONLY



Results include T10, T15, and T20 combined. Undifferentiated NS/SM class excluded. Substandard policies excluded. Numbers above bars represent the relevant A/Es.

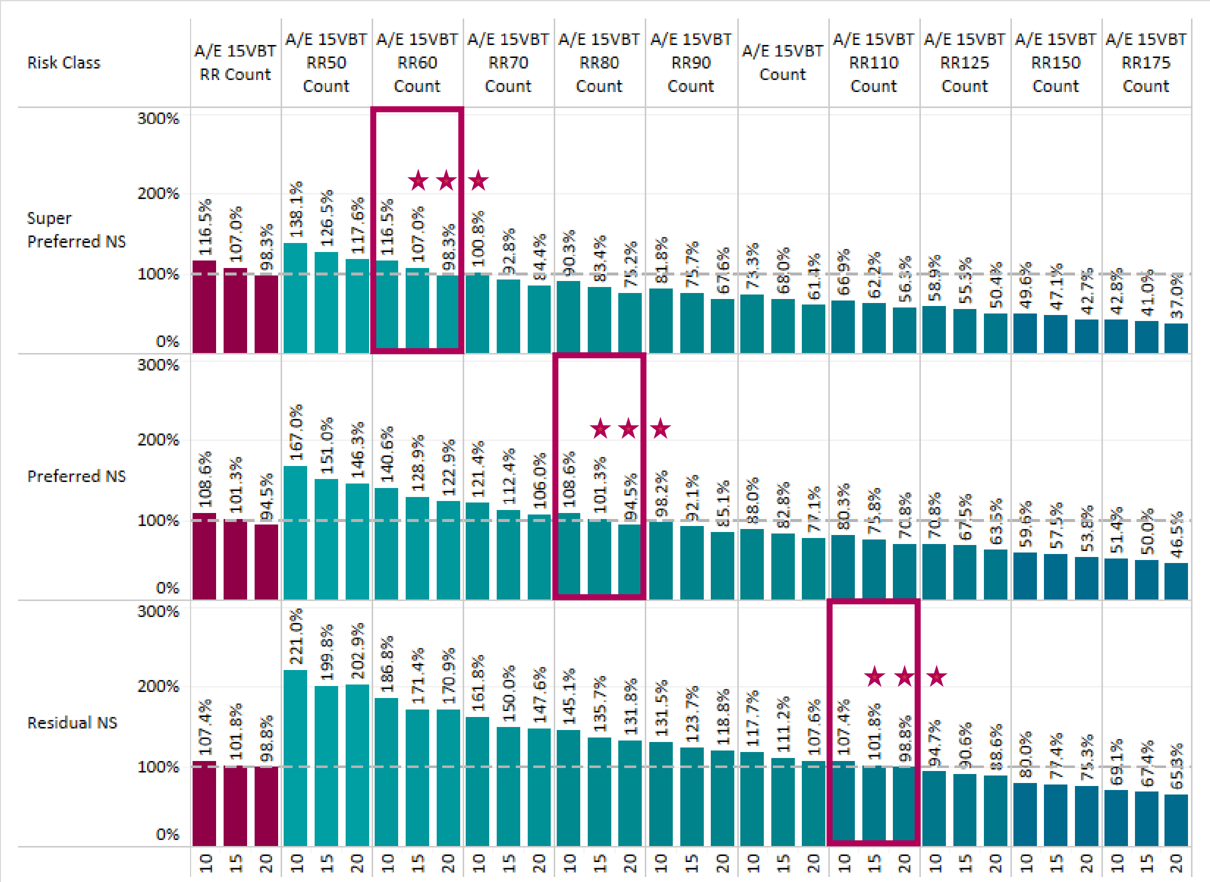
Super-preferred NS had the lowest RR table selection and residual NS had the highest. Each of the RR table selections was within 5% of 100%. The RR table selection was as follows:

- Super-preferred NS – RR60
- Preferred NS – RR80
- Residual NS – RR110

The choice of RR table from above was compared to the A/Es for each level term period to ensure that the RR table selection did not vary significantly by level period. This analysis can be seen in figure B-2 below. The best choice for each risk class and level term period combination is indicated by a red star, while the choice from the combined analysis is visible in the red rectangle and the red bar.

Figure B-2

RR TABLE ANALYSIS BY LEVEL TERM PLAN, NONSMOKERS, PREFERRED RISKS ONLY, LEVEL TERM PERIOD ONLY



Results include T10, T15, and T20 combined. Undifferentiated NS/SM class excluded. Substandard policies excluded. Numbers above bars represent the relevant A/Es.

The choice of RR table is the same for both T15 and T20 for all three risk classes and matches the choice from the combined analysis above. T10 is the only level term period where the RR table selection does not match the combined selection. However, the best options for each risk class for T10 (RR70, RR90, and RR125) are only one table worse than the options that were chosen from the combined analysis (RR60, RR80, and RR110).

This analysis did not investigate the differences between Jump to ART and Graded in RR table selection. This is because a similar level term base is being used for both structures. This is due to the exposure and claims mismatch in the level period by PLT structure discussed in section 3.5. For that reason, the RR table selection will not be impacted by PLT structure.

RR table selection was also performed for the smoker preferred classes. Once again, this analysis was for both PLT structures (Jump to ART and Graded) and all three level term plans (T10, T15, and T20). The same methodology was used to select the RR tables for the smoker classes. The RR table selections for the smoker classes are as follows:

- Preferred SM – RR75
- Residual SM – RR125

Once the RR table was selected for each risk class, a new expected basis incorporating these choices was created. The mortality deterioration using this new 15VBT RR basis was then analyzed by risk class and compared to the mortality deterioration using the base 15VBT basis.

Table B-1

RISK CLASS, 15VBT RR VS 15VBT, PLT DURATION <1 VS PLT DURATION 1

PLT Structure	Risk Class	PLT Duration	Exposure Count	Death Count	A/E 15VBT RR Count	A/E 15VBT Count	Mortality Deterioration RR Basis	Mortality Deterioration
Jump to ART	Super Preferred NS	<1	4,176.9K	6,215	106.3%	66.8%	100.00%	100.00%
		1	39.9K	131	350.3%	221.1%	329.70%	330.79%
	Preferred NS	<1	5,238.6K	10,190	101.1%	82.4%	100.00%	100.00%
		1	102.4K	353	277.0%	225.8%	274.02%	274.07%
	Residual NS	<1	4,372.9K	12,815	103.0%	112.5%	100.00%	100.00%
		1	82.5K	394	247.0%	269.0%	239.73%	239.07%
	Preferred SM	<1	445.5K	2,249	103.2%	89.8%	100.00%	100.00%
		1	5.8K	68	316.7%	273.9%	306.75%	305.04%
	Residual SM	<1	477.1K	2,392	102.6%	113.1%	100.00%	100.00%
		1	11.3K	82	211.9%	236.9%	206.56%	209.47%
Graded	Super Preferred NS	<1	3,057.8K	5,297	105.6%	67.0%	100.00%	100.00%
		1	19.3K	74	192.8%	126.4%	182.49%	188.55%
	Preferred NS	<1	2,586.2K	6,693	99.6%	81.5%	100.00%	100.00%
		1	19.7K	135	191.0%	159.3%	191.72%	195.37%
	Residual NS	<1	2,240.3K	8,175	101.5%	110.7%	100.00%	100.00%
		1	15.2K	143	200.2%	216.8%	197.21%	195.80%
	All SM	<1	487.8K	3,069	106.2%	101.3%	100.00%	100.00%
		1	4.9K	57	158.5%	148.8%	149.22%	146.86%

The deterioration patterns observed are very similar between the standard 15VBT and the 15VBT RR. The only difference between the two expected bases is a slight change in level, which is more prominent in Graded than in Jump to ART.

The mortality deterioration using the 15VBT RR basis was also compared to the premium jump analysis using the standard 15VBT basis. No significant differences were noted with this comparison.

Based on the above analysis, there is no difference in the mortality deterioration patterns and very little difference in the level of deterioration between using the standard 15VBT or a 15VBT RR basis. For this reason, the mortality deterioration analysis in this report (including the remaining analysis in this section) used the standard 15VBT for all analysis.

Appendix C: Count Versus Amount Analysis

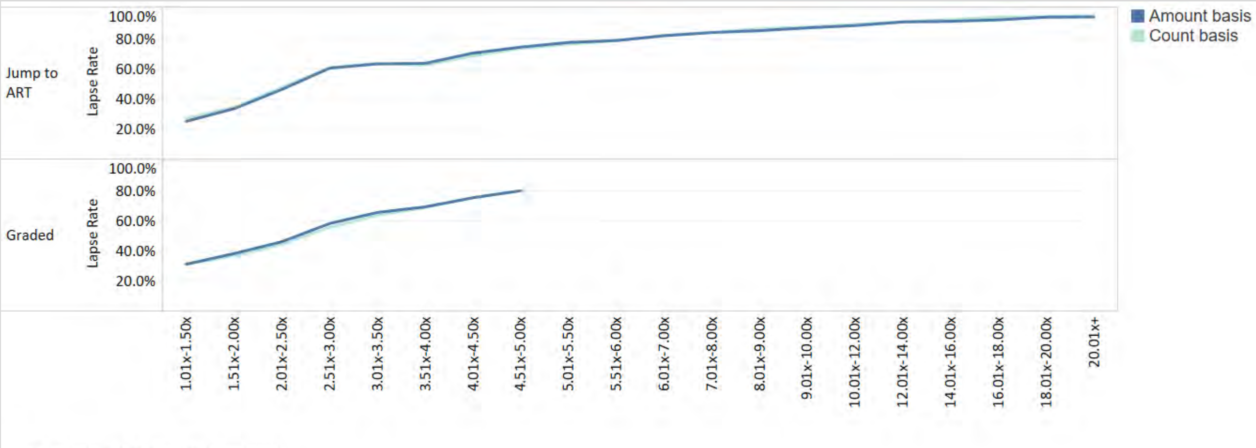
Throughout this report, analysis was performed on a count basis. This appendix compares shock lapse and mortality deterioration results on a count basis and amount basis.

<u>Shock Lapse</u>

Comparing the shock lapse on an amount basis versus a count basis across the range of premium jumps suggests little difference in lapse rates.

Figure C-1

COMPARISON OF AMOUNT AND COUNT SHOCK LAPSE BY INITIAL PREMIUM JUMP AND PLT STRUCTURE



Results include T10, T15 and T20 combined

Table C-1

COMPARISON OF AMOUNT AND COUNT SHOCK LAPSE BY INITIAL PREMIUM JUMP AND PLT STRUCTURE

	PLT Structure			
	Jump to ART		Graded	
Initial Premium Jump	Lapse Rate Cnt	Lapse Rate Amt	Lapse Rate Cnt	Lapse Rate Amt
1.01x-1.50x	27.1%	25.1%	31.2%	31.2%
1.51x-2.00x	34.4%	33.5%	36.6%	38.2%
2.01x-2.50x	47.6%	46.3%	44.3%	46.1%
2.51x-3.00x	60.8%	60.5%	55.6%	58.2%
3.01x-3.50x	63.7%	63.3%	63.6%	65.5%
3.51x-4.00x	62.4%	63.7%	68.8%	69.3%
4.01x-4.50x	68.7%	70.5%	75.5%	75.3%
4.51x-5.00x	73.6%	74.4%	80.1%	80.0%
5.01x-5.50x	76.4%	77.6%		
5.51x-6.00x	78.8%	78.8%		
6.01x-7.00x	82.2%	82.0%		
7.01x-8.00x	84.2%	84.2%		
8.01x-9.00x	86.7%	85.4%		
9.01x-10.00x	87.8%	87.2%		
10.01x-12.00x	89.6%	88.8%		
12.01x-14.00x	91.3%	91.2%		
14.01x-16.00x	92.8%	91.6%		
16.01x-18.00x	94.5%	92.6%		
18.01x-20.00x	94.7%	94.4%		
20.01x+	95.4%	94.5%		

Results include T10, T15 and T20 combined

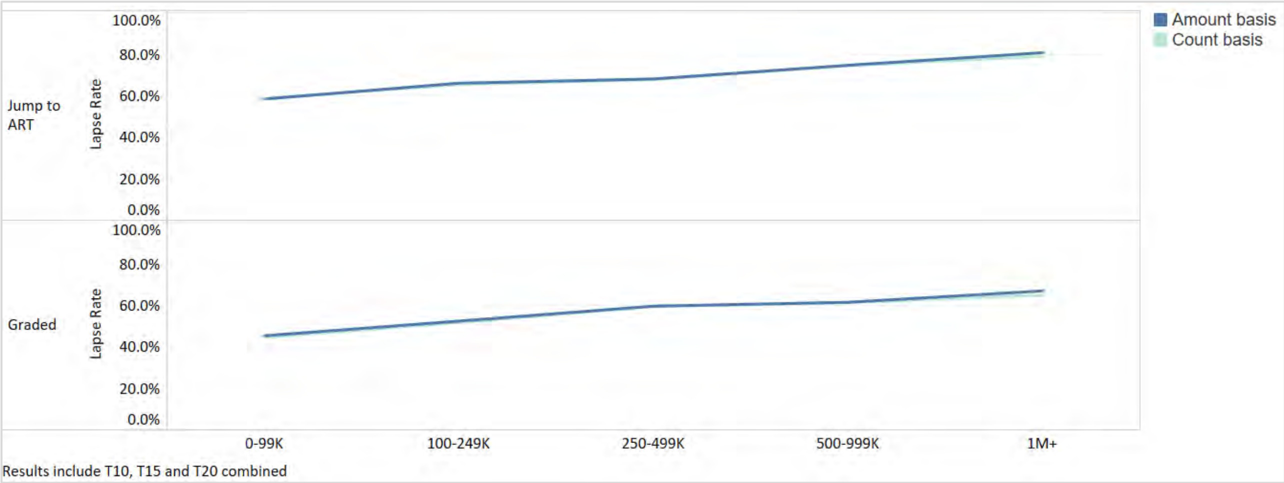
The fact that little difference is observed provides comfort that lapse analysis on a count basis provides a complete picture.

Lapse rates on an amount basis give more weight to higher face amount policies.

When comparing shock lapse by face amount group on a count basis and amount basis, there is also little difference observed.

Figure C-2

COMPARISON OF AMOUNT AND COUNT SHOCK LAPSE BY FACE AMOUNT GROUP AND PLT STRUCTURE



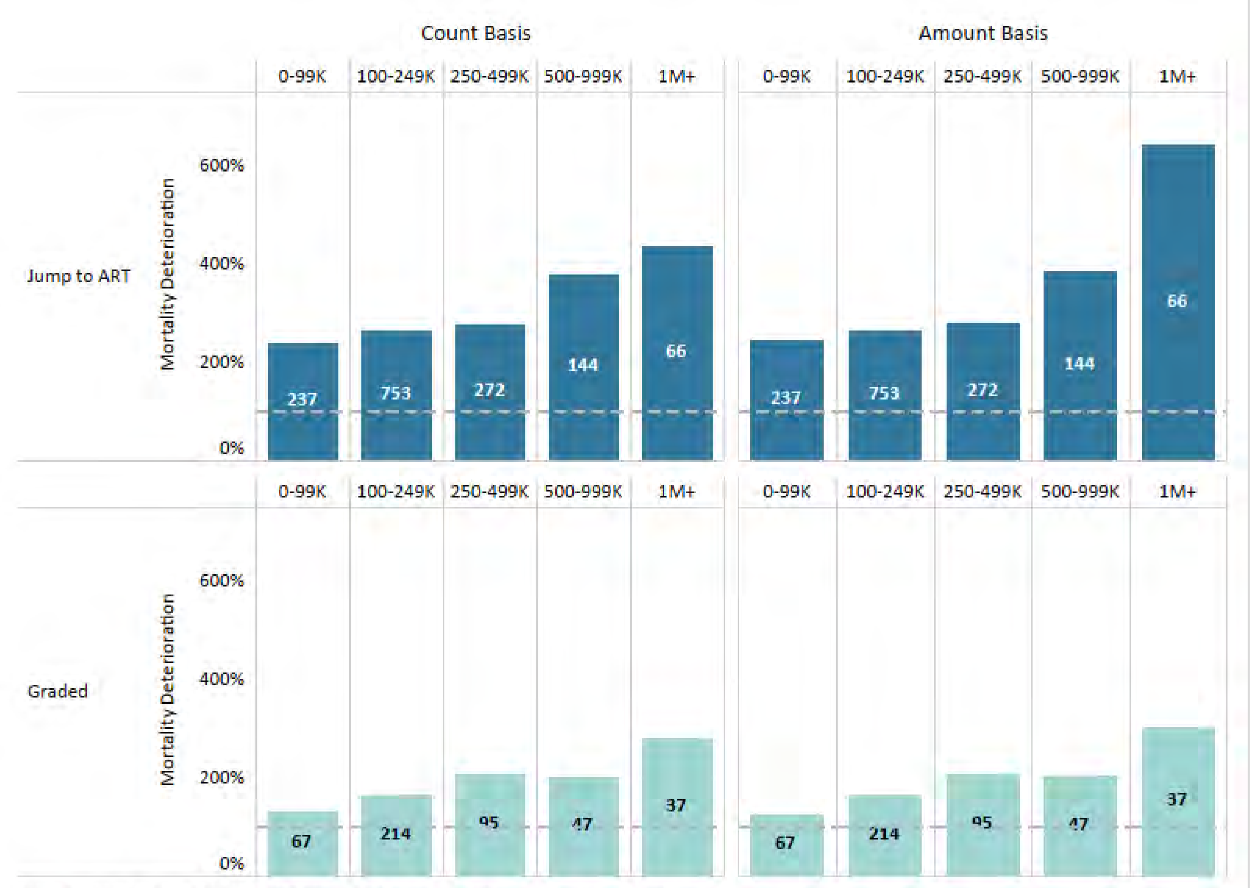
For face amounts of $1M+, the lapse rate on amount basis is slightly higher than lapse rate on a count basis. For Jump to ART, $1M+ lapse rate is 80.8% on amount basis and 79.1% on a count basis. Overall, lapse rates on a count basis capture the patterns in experience well. For higher face amounts of $1M+, some consideration of amounts basis would add value.

Mortality Deterioration

For mortality deterioration, amount A/Es are influenced by volatility in high face amounts. When there are fewer claims, this volatility is exacerbated. Figure C-3 displays the mortality deterioration by face amount band for PLT duration 1 for count and amount.

Figure C-3

COUNT VS AMOUNT, FACE AMOUNT, PLT DURATION 1



Results include T10, T15, and T20 combined. Numbers on bars represent claim count.

The mortality deterioration pattern and levels by face amount bands are the same for both count and amount for both PLT structures for all but face amounts of $1M+. While the pattern of increasing mortality deterioration is maintained, the level is higher when amount is used than when count is used. While it is only slightly higher for Graded, it is much higher for Jump to ART. This highlights the volatility observed in higher face amounts when using an amount basis.

The numbers associated with the figure above can be viewed in table C-2 below. The mortality deterioration numbers are in the red rectangles for easy comparison.

Table C-2

COUNT VS AMOUNT, FACE AMOUNT, PLT DURATION <1 VS PLT DURATION 1

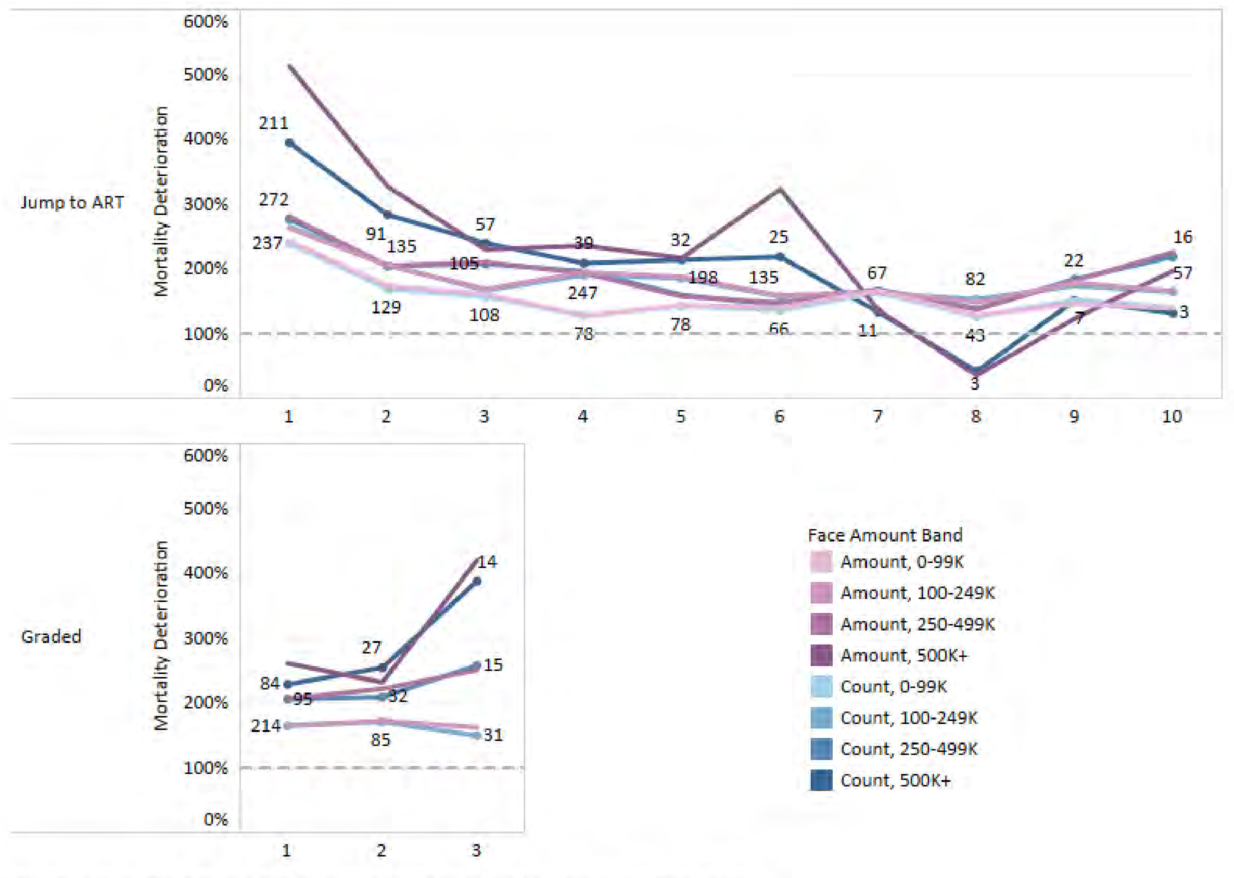
PLT Structure	Face Amount Group	PLT Duration	Exposure Count	Death Count	A/E 15VBT Count	Mortality Deterioration Count	Exposure Amount	Death Amount	A/E 15VBT Amount	Mortality Deterioration Amount
Jump to ART	0-99K	<1	588.2K	5,208	125.5%	100.0%	32B	276.8M	126.0%	100.0%
		1	20.6K	237	300.3%	239.2%	1B	12.1M	306.3%	243.0%
	100-249K	<1	7,051.2K	22,720	97.8%	100.0%	915B	2,837.8M	96.8%	100.0%
		1	158.0K	753	258.4%	264.2%	20B	91.0M	253.4%	261.8%
	250-499K	<1	4,932.3K	10,173	86.6%	100.0%	1,392B	2,858.8M	86.0%	100.0%
		1	70.3K	272	239.6%	276.6%	19B	75.7M	241.2%	280.5%
	500-999K	<1	2,762.8K	4,887	81.9%	100.0%	1,511B	2,645.2M	81.0%	100.0%
		1	27.9K	144	309.1%	377.5%	15B	77.9M	309.8%	382.6%
	1M+	<1	1,594.3K	2,937	82.8%	100.0%	2,374B	4,279.6M	78.1%	100.0%
		1	9.7K	66	360.9%	435.7%	12B	126.4M	500.3%	640.2%
Graded	0-99K	<1	485.4K	4,546	123.1%	100.0%	26B	241.8M	123.5%	100.0%
		1	4.3K	67	160.3%	130.2%	0B	3.1M	154.6%	125.2%
	100-249K	<1	3,684.2K	15,449	96.9%	100.0%	483B	1,940.7M	95.9%	100.0%
		1	26.3K	214	159.3%	164.5%	3B	26.1M	158.5%	165.2%
	250-499K	<1	2,899.4K	7,300	86.2%	100.0%	827B	2,060.2M	85.5%	100.0%
		1	16.2K	95	177.3%	205.6%	5B	26.7M	176.3%	206.3%
	500-999K	<1	1,852.7K	3,777	82.1%	100.0%	1,019B	2,053.6M	81.3%	100.0%
		1	10.1K	47	163.8%	199.6%	6B	25.7M	166.1%	204.3%
	1M+	<1	1,175.9K	2,420	83.0%	100.0%	1,815B	3,624.8M	78.7%	100.0%
		1	5.7K	37	232.1%	279.7%	8B	53.9M	236.4%	300.4%

The level period count A/Es are very similar to the amount A/Es for the same face amount band for all but $1M+. This is seen in both the Jump to ART and Graded business. This is a good indication of how volatility impacts the amount A/Es even before post-level behavior is considered.

The final figure in this section (figure C-4) displays the amount results layered over the count results for PLT duration.

Figure C-4

COUNT VS AMOUNT, FACE AMOUNT AND PLT DURATION



Results include T10, T15, and T20 combined. Numbers above lines represent claim count.

Like the premium jump analysis above, the count and amount bases provide the same level of mortality deterioration across PLT duration for the three lower face amount groups. Both Jump to ART and Graded see differing levels of deterioration for $500K+ when comparing count and amount. However, the patterns remain very similar. The amount basis mortality deterioration shows more volatility across the durations in both structures than the count basis.

The analysis performed above shows that the mortality deterioration patterns are mostly the same when comparing the count and amount bases. It confirms that the levels are the same for various types of analysis for the lower face amount bands. However, the levels are very different for the highest face amount band when comparing the two options. There is more volatility observed in the patterns across other factors when using an amount basis rather than a count basis. This confirms the decision to use a count basis for the analysis throughout this report rather than using an amount basis.

Appendix D: Lapse Rate Tables

Table D-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP, ATTAINED AGE AND PLT STRUCTURE

		Jump to ART			Graded		
		Count basis	Exposure Count	Lapse Count	Count basis	Exposure Count	Lapse Count
30-39	1.01x-1.50x	22.8%	18.6K	4,243	22.6%	2.3K	511
	1.51x-2.00x	30.7%	9.1K	2,779	26.6%	2.8K	755
	2.01x-2.50x	41.1%	4.4K	1,820	29.3%	1.2K	348
	2.51x-3.00x	49.6%	3.2K	1,582		0.4K	147
	3.01x-3.50x	54.6%	2.4K	1,321		0.0K	3
	3.51x-4.00x	59.9%	2.0K	1,217		0.0K	1
	4.01x-4.50x	62.1%	1.4K	898			
	4.51x-5.00x	63.0%	1.2K	747			
	5.01x-5.50x	64.6%	1.0K	659			
	5.51x-6.00x	66.7%	0.9K	621			
	6.01x-7.00x	70.7%	1.2K	813			
	7.01x-8.00x	70.6%	0.7K	487			
	8.01x-9.00x	74.3%	0.5K	336			
	9.01x-10.00x		0.3K	244			
	10.01x-12.00x		0.3K	251			
	12.01x-14.00x		0.1K	88			
	14.01x-16.00x		0.0K	20			
	16.01x-18.00x		0.0K	8			
	20.01x+		0.0K	3			
40-49	1.01x-1.50x	32.1%	11.1K	3,564	32.8%	1.3K	443
	1.51x-2.00x	30.7%	35.9K	11,026	28.8%	5.5K	1,587
	2.01x-2.50x	43.1%	16.6K	7,144	36.5%	8.0K	2,914
	2.51x-3.00x	55.8%	7.4K	4,118	43.0%	6.8K	2,904
	3.01x-3.50x	56.1%	6.9K	3,858	49.6%	3.3K	1,642
	3.51x-4.00x	55.2%	11.0K	6,048	53.5%	1.3K	719
	4.01x-4.50x	62.1%	6.9K	4,274	65.7%	0.5K	316
	4.51x-5.00x	66.7%	4.2K	2,802		0.1K	92
	5.01x-5.50x	70.5%	3.8K	2,706			
	5.51x-6.00x	72.8%	3.4K	2,504			
	6.01x-7.00x	74.6%	6.3K	4,683			
	7.01x-8.00x	75.8%	5.1K	3,899			
	8.01x-9.00x	79.6%	4.0K	3,171			
	9.01x-10.00x	79.8%	2.9K	2,277			
	10.01x-12.00x	82.3%	4.2K	3,421			
	12.01x-14.00x	82.4%	2.0K	1,667			
	14.01x-16.00x	83.5%	1.2K	1,011			
	16.01x-18.00x	85.3%	0.6K	517			
	18.01x-20.00x	87.0%	0.6K	541			
	20.01x+	90.6%	0.8K	712			
50-59	1.01x-1.50x	49.9%	1.2K	577	49.9%	0.9K	472
	1.51x-2.00x	41.7%	18.4K	7,663	42.8%	4.4K	1,882
	2.01x-2.50x	48.6%	21.9K	10,638	43.8%	13.7K	5,984
	2.51x-3.00x	61.9%	9.6K	5,954	52.9%	21.6K	11,437
	3.01x-3.50x	64.2%	7.8K	4,975	59.4%	14.4K	8,568
	3.51x-4.00x	63.9%	11.2K	7,131	63.7%	9.0K	5,748
	4.01x-4.50x	67.9%	9.9K	6,706	71.9%	5.2K	3,761
	4.51x-5.00x	73.4%	8.8K	6,458	74.9%	1.9K	1,443
	5.01x-5.50x	75.9%	8.4K	6,412			
	5.51x-6.00x	78.0%	6.9K	5,347			
	6.01x-7.00x	81.6%	11.6K	9,453			
	7.01x-8.00x	84.2%	9.6K	8,098			
	8.01x-9.00x	86.6%	7.8K	6,763			
	9.01x-10.00x	88.0%	6.4K	5,600			
	10.01x-12.00x	88.5%	10.2K	9,056			
	12.01x-14.00x	89.7%	5.7K	5,155			
	14.01x-16.00x	90.2%	4.0K	3,613			
	16.01x-18.00x	91.5%	2.0K	1,857			
	18.01x-20.00x	93.0%	1.5K	1,416			
	20.01x+	90.9%	2.7K	2,422			

Table D-1

SHOCK LAPSE BY INITIAL PREMIUM JUMP, ATTAINED AGE AND PLT STRUCTURE - CONTINUED

		Jump to ART			Graded		
		Count basis	Exposure Count	Lapse Count	Count basis	Exposure Count	Lapse Count
60-69	1.01x-1.50x		0.1K	41		0.4K	208
	1.51x-2.00x	53.1%	1.8K	974	55.9%	2.2K	1,215
	2.01x-2.50x	57.7%	7.9K	4,563	51.0%	9.0K	4,579
	2.51x-3.00x	66.4%	8.4K	5,593	60.9%	20.2K	12,306
	3.01x-3.50x	73.4%	6.3K	4,646	67.8%	19.1K	12,931
	3.51x-4.00x	75.3%	4.1K	3,060	73.4%	10.6K	7,781
	4.01x-4.50x	76.8%	5.8K	4,447	79.3%	6.1K	4,844
	4.51x-5.00x	78.4%	6.8K	5,353	82.7%	2.8K	2,325
	5.01x-5.50x	80.4%	7.1K	5,744			
	5.51x-6.00x	83.0%	6.2K	5,161			
	6.01x-7.00x	86.3%	11.9K	10,274			
	7.01x-8.00x	87.2%	10.3K	8,941			
	8.01x-9.00x	89.5%	8.2K	7,313			
	9.01x-10.00x	90.1%	7.1K	6,432			
	10.01x-12.00x	92.0%	11.7K	10,768			
	12.01x-14.00x	94.5%	8.5K	8,023			
	14.01x-16.00x	95.0%	6.0K	5,744			
	16.01x-18.00x	95.7%	4.7K	4,507			
	18.01x-20.00x	95.8%	2.5K	2,415			
	20.01x+	94.3%	4.9K	4,656			
70-79	1.01x-1.50x		0.0K	4		0.0K	1
	1.51x-2.00x		0.0K	4		0.4K	213
	2.01x-2.50x		0.4K	235	61.2%	1.6K	981
	2.51x-3.00x	72.4%	1.4K	988	63.4%	5.6K	3,549
	3.01x-3.50x	72.7%	1.0K	743	68.3%	5.9K	4,054
	3.51x-4.00x	74.5%	1.0K	783	73.0%	4.4K	3,179
	4.01x-4.50x	77.4%	1.8K	1,411	75.6%	2.4K	1,784
	4.51x-5.00x	81.9%	1.3K	1,056	83.1%	1.0K	791
	5.01x-5.50x	82.7%	1.6K	1,344			
	5.51x-6.00x	85.1%	1.6K	1,345			
	6.01x-7.00x	87.5%	3.5K	3,070			
	7.01x-8.00x	89.4%	4.2K	3,714			
	8.01x-9.00x	90.1%	3.2K	2,871			
	9.01x-10.00x	91.1%	2.6K	2,394			
	10.01x-12.00x	92.9%	4.8K	4,488			
	12.01x-14.00x	92.0%	3.5K	3,227			
	14.01x-16.00x	95.3%	3.4K	3,265			
	16.01x-18.00x	96.7%	2.9K	2,791			
	18.01x-20.00x	96.5%	2.6K	2,527			
	20.01x+	97.7%	7.9K	7,671			

Table D-2

SHOCK LAPSE BY INITIAL PREMIUM JUMP, PREMIUM MODE AND PLT STRUCTURE

Premium Payment Mode	Initial Premium Jump	Jump to ART			Graded		
		Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Annual	1.01x-1.50x	3.6K	1,010	28.0%	1.5K	358	24.2%
	1.51x-2.00x	10.3K	4,489	43.5%	4.8K	1,759	36.3%
	2.01x-2.50x	8.7K	5,097	58.6%	12.2K	6,148	50.6%
	2.51x-3.00x	5.1K	3,542	70.1%	22.4K	14,217	63.5%
	3.01x-3.50x	4.2K	3,043	73.1%	19.6K	14,023	71.5%
	3.51x-4.00x	4.5K	3,484	76.6%	12.1K	9,241	76.4%
	4.01x-4.50x	4.8K	3,825	79.9%	7.9K	6,474	81.7%
	4.51x-5.00x	5.1K	4,258	83.5%	3.1K	2,648	84.4%
	5.01x-5.50x	4.9K	4,225	85.9%			
	5.51x-6.00x	4.8K	4,235	87.5%			
	6.01x-7.00x	9.4K	8,490	90.7%			
	7.01x-8.00x	8.3K	7,657	92.4%			
	8.01x-9.00x	7.1K	6,577	93.0%			
	9.01x-10.00x	5.8K	5,425	92.8%			
	10.01x-12.00x	10.1K	9,561	95.0%			
	12.01x-14.00x	7.0K	6,713	96.2%			
	14.01x-16.00x	5.0K	4,825	96.9%			
	16.01x-18.00x	3.9K	3,801	96.9%			
	18.01x-20.00x	2.8K	2,738	97.1%			
	20.01x+	8.0K	7,674	96.0%			
Semi-annual	1.01x-1.50x	1.2K	352	29.0%	0.2K	31	
	1.51x-2.00x	3.1K	1,227	39.4%	1.0K	308	32.0%
	2.01x-2.50x	2.8K	1,704	60.6%	2.6K	1,199	46.3%
	2.51x-3.00x	1.9K	1,381	72.0%	4.4K	2,606	59.3%
	3.01x-3.50x	1.5K	1,115	75.3%	3.8K	2,638	70.3%
	3.51x-4.00x	1.1K	830	73.3%	2.1K	1,537	73.2%
	4.01x-4.50x	1.3K	1,020	79.1%	1.1K	821	76.4%
	4.51x-5.00x	1.2K	1,005	83.0%	0.4K	323	83.3%
	5.01x-5.50x	1.3K	1,065	84.0%			
	5.51x-6.00x	1.2K	1,030	86.9%			
	6.01x-7.00x	2.3K	2,070	89.2%			
	7.01x-8.00x	2.0K	1,804	90.5%			
	8.01x-9.00x	1.5K	1,375	90.9%			
	9.01x-10.00x	1.3K	1,143	90.7%			
	10.01x-12.00x	1.9K	1,799	94.2%			
	12.01x-14.00x	1.2K	1,174	95.7%			
	14.01x-16.00x	0.9K	866	95.9%			
	16.01x-18.00x	0.7K	632	95.7%			
	18.01x-20.00x	0.5K	468	96.6%			
	20.01x+	1.6K	1,580	97.0%			
Quarterly	1.01x-1.50x	1.8K	379	21.5%	0.3K	84	
	1.51x-2.00x	4.5K	1,591	35.0%	2.0K	730	37.0%
	2.01x-2.50x	4.6K	2,111	45.9%	6.7K	3,257	48.6%
	2.51x-3.00x	3.4K	1,947	57.0%	11.9K	7,152	59.9%
	3.01x-3.50x	3.1K	1,864	60.6%	9.4K	6,096	65.0%
	3.51x-4.00x	3.4K	2,288	67.0%	5.0K	3,525	70.3%
	4.01x-4.50x	3.7K	2,658	71.1%	2.1K	1,587	76.4%
	4.51x-5.00x	3.6K	2,757	76.1%	0.9K	720	80.7%
	5.01x-5.50x	3.0K	2,418	80.4%			
	5.51x-6.00x	3.0K	2,440	81.1%			
	6.01x-7.00x	4.8K	4,151	85.7%			
	7.01x-8.00x	3.9K	3,415	88.2%			
	8.01x-9.00x	3.1K	2,792	91.0%			
	9.01x-10.00x	2.5K	2,302	92.9%			
	10.01x-12.00x	4.2K	3,953	93.9%			
	12.01x-14.00x	2.9K	2,792	95.9%			
	14.01x-16.00x	2.2K	2,114	96.9%			
	16.01x-18.00x	1.7K	1,645	97.8%			
	18.01x-20.00x	1.2K	1,213	97.4%			
	20.01x+	4.3K	4,144	97.0%			

Table D-2

SHOCK LAPSE BY INITIAL PREMIUM JUMP, PREMIUM MODE AND PLT STRUCTURE - CONTINUED

Premium Payment Mode	Initial Premium Jump	Jump to ART			Graded		
		Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Monthly	1.01x-1.50x	17.3K	2,674	15.4%	1.8K	188	
	1.51x-2.00x	38.4K	8,999	23.5%	4.9K	836	17.0%
	2.01x-2.50x	28.2K	10,309	36.6%	9.4K	2,269	24.3%
	2.51x-3.00x	14.1K	6,981	49.4%	14.2K	5,137	36.2%
	3.01x-3.50x	9.3K	5,014	53.9%	9.3K	3,902	42.0%
	3.51x-4.00x	6.6K	3,401	51.6%	5.9K	2,973	50.5%
	4.01x-4.50x	6.7K	3,728	56.0%	3.0K	1,750	59.0%
	4.51x-5.00x	6.8K	4,124	60.8%	1.3K	905	68.8%
	5.01x-5.50x	6.9K	4,450	64.3%			
	5.51x-6.00x	6.9K	4,733	68.9%			
	6.01x-7.00x	12.8K	9,348	73.1%			
	7.01x-8.00x	11.4K	8,697	76.2%			
	8.01x-9.00x	8.5K	6,723	79.4%			
	9.01x-10.00x	6.6K	5,362	81.3%			
	10.01x-12.00x	10.5K	8,719	82.9%			
	12.01x-14.00x	6.5K	5,480	84.9%			
	14.01x-16.00x	4.5K	3,963	87.5%			
	16.01x-18.00x	2.8K	2,585	90.9%			
	18.01x-20.00x	2.0K	1,806	90.9%			
	20.01x+	6.2K	5,837	94.0%			

Table D-3

SHOCK LAPSE BY INITIAL PREMIUM JUMP, BILLING TYPE AND PLT STRUCTURE

		Jump to ART			Graded		
Billing Type	Initial Premium Jump	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Automatic Payment changed to Bill Sent	1.01x-1.50x	0.3K	221				
	1.51x-2.00x	1.8K	1,306	74.6%			
	2.01x-2.50x	2.1K	1,636	76.8%			
	2.51x-3.00x	1.4K	1,114	79.9%			
	3.01x-3.50x	1.1K	924	81.4%			
	3.51x-4.00x	1.0K	825	82.2%			
	4.01x-4.50x	0.9K	708	83.2%			
	4.51x-5.00x	0.7K	618	83.1%			
	5.01x-5.50x	0.8K	701	85.8%			
	5.51x-6.00x	0.8K	731	88.9%			
	6.01x-7.00x	1.8K	1,651	92.0%			
	7.01x-8.00x	1.9K	1,817	93.5%			
	8.01x-9.00x	1.9K	1,804	94.6%			
	9.01x-10.00x	1.7K	1,663	95.5%			
	10.01x-12.00x	3.4K	3,255	96.4%			
	12.01x-14.00x	2.8K	2,732	97.9%			
	14.01x-16.00x	2.3K	2,203	97.7%			
	16.01x-18.00x	1.9K	1,906	98.6%			
	18.01x-20.00x	1.4K	1,386	97.5%			
	20.01x+	5.6K	5,452	97.5%			
Bill Sent	1.01x-1.50x	12.4K	5,307	42.7%	2.7K	1,060	38.9%
	1.51x-2.00x	20.4K	10,938	53.6%	6.8K	3,214	47.0%
	2.01x-2.50x	17.0K	11,182	65.9%	13.5K	7,387	54.9%
	2.51x-3.00x	10.4K	7,856	75.3%	23.4K	15,362	65.6%
	3.01x-3.50x	8.1K	6,245	76.9%	20.3K	14,509	71.6%
	3.51x-4.00x	7.8K	5,951	76.7%	14.6K	10,959	75.2%
	4.01x-4.50x	7.9K	6,165	77.6%	10.7K	8,538	79.7%
	4.51x-5.00x	7.9K	6,300	79.7%	4.4K	3,634	83.0%
	5.01x-5.50x	8.2K	6,709	82.2%			
	5.51x-6.00x	7.9K	6,552	82.9%			
	6.01x-7.00x	15.5K	13,291	86.0%			
	7.01x-8.00x	14.3K	12,494	87.3%			
	8.01x-9.00x	11.8K	10,516	88.9%			
	9.01x-10.00x	10.2K	9,146	89.7%			
	10.01x-12.00x	17.5K	16,053	91.9%			
	12.01x-14.00x	12.5K	11,762	93.8%			
	14.01x-16.00x	9.1K	8,630	94.8%			
	16.01x-18.00x	6.6K	6,306	96.0%			
	18.01x-20.00x	4.8K	4,590	96.2%			
	20.01x+	13.3K	12,766	96.2%			
Automatic Payment	1.01x-1.50x	18.9K	2,710	14.4%	1.8K	195	
	1.51x-2.00x	40.2K	8,463	21.0%	4.0K	713	17.9%
	2.01x-2.50x	29.2K	9,711	33.2%	6.7K	1,954	29.2%
	2.51x-3.00x	15.5K	7,348	47.4%	10.7K	4,768	44.4%
	3.01x-3.50x	10.9K	5,829	53.3%	7.2K	3,550	49.2%
	3.51x-4.00x	8.7K	4,841	55.6%	5.1K	2,931	57.3%
	4.01x-4.50x	9.2K	5,722	62.5%	2.8K	1,748	62.9%
	4.51x-5.00x	9.3K	6,386	68.5%	1.3K	923	71.4%
	5.01x-5.50x	8.2K	5,747	70.0%			
	5.51x-6.00x	8.1K	5,972	74.2%			
	6.01x-7.00x	13.4K	10,392	77.5%			
	7.01x-8.00x	10.2K	8,079	79.2%			
	8.01x-9.00x	7.0K	5,724	81.5%			
	9.01x-10.00x	4.7K	3,811	81.7%			
	10.01x-12.00x	6.3K	5,165	81.6%			
	12.01x-14.00x	2.4K	1,847	75.9%			
	14.01x-16.00x	1.3K	1,034	77.1%			
	16.01x-18.00x	0.7K	501	76.1%			
	18.01x-20.00x	0.4K	280	73.7%			
	20.01x+	1.3K	1,036	81.8%			

Table D-4

SHOCK LAPSE BY INITIAL PREMIUM JUMP, GENDER AND PLT STRUCTURE

		PLT Structure					
		Jump to ART			Graded		
Gender	Initial Premium Jump	Exposure Count	Lapse Count	Lapse Rate	Exposure Count	Lapse Count	Lapse Rate
Female	1.01x-1.50x	18.3K	5,209	28.5%	2.8K	900	32.3%
	1.51x-2.00x	32.3K	11,450	35.4%	7.6K	2,581	33.9%
	2.01x-2.50x	17.1K	8,867	51.7%	17.1K	7,203	42.2%
	2.51x-3.00x	10.5K	6,382	60.6%	21.3K	10,983	51.7%
	3.01x-3.50x	9.0K	5,540	61.8%	10.1K	6,154	61.1%
	3.51x-4.00x	11.8K	7,026	59.6%	5.3K	3,532	66.9%
	4.01x-4.50x	9.1K	5,944	65.2%	2.5K	1,814	73.4%
	4.51x-5.00x	7.1K	4,985	69.7%	0.8K	597	77.4%
	5.01x-5.50x	6.6K	4,861	73.8%			
	5.51x-6.00x	6.4K	4,843	75.9%			
	6.01x-7.00x	11.1K	8,907	80.5%			
	7.01x-8.00x	9.2K	7,567	82.5%			
	8.01x-9.00x	7.6K	6,479	85.3%			
	9.01x-10.00x	5.4K	4,683	86.2%			
	10.01x-12.00x	7.9K	6,955	87.7%			
	12.01x-14.00x	4.8K	4,253	88.6%			
	14.01x-16.00x	3.0K	2,685	89.8%			
	16.01x-18.00x	1.8K	1,615	91.6%			
	18.01x-20.00x	0.9K	853	91.4%			
	20.01x+	2.4K	2,283	93.4%			
Male	1.01x-1.50x	14.2K	3,584	25.2%	2.7K	827	30.1%
	1.51x-2.00x	33.4K	11,183	33.4%	7.9K	3,111	39.3%
	2.01x-2.50x	34.4K	15,668	45.6%	16.4K	7,637	46.6%
	2.51x-3.00x	19.6K	11,915	60.9%	33.6K	19,554	58.2%
	3.01x-3.50x	15.5K	10,045	64.9%	33.0K	21,230	64.4%
	3.51x-4.00x	17.6K	11,315	64.2%	20.3K	14,054	69.3%
	4.01x-4.50x	16.9K	11,909	70.6%	11.8K	8,984	75.9%
	4.51x-5.00x	15.3K	11,538	75.4%	5.1K	4,097	80.5%
	5.01x-5.50x	15.6K	12,118	77.5%			
	5.51x-6.00x	12.8K	10,298	80.2%			
	6.01x-7.00x	23.8K	19,733	83.1%			
	7.01x-8.00x	21.2K	17,965	84.9%			
	8.01x-9.00x	16.3K	14,214	87.3%			
	9.01x-10.00x	14.1K	12,496	88.5%			
	10.01x-12.00x	23.8K	21,450	90.2%			
	12.01x-14.00x	15.5K	14,277	92.2%			
	14.01x-16.00x	11.9K	11,172	93.6%			
	16.01x-18.00x	8.7K	8,292	95.1%			
	18.01x-20.00x	6.5K	6,231	95.1%			
	20.01x+	19.3K	18,420	95.7%			

Appendix E: Detailed Description of Variable Selection

The variable selection process aims at choosing a reduced number of explanatory variables to describe the response variable.

The penalized regressions allow to fit a linear regression that is penalized by imposing a constraint to the equation for having too many variables in the model. These approaches are also called shrinkage or regularization methods.

The result of adding a penalty is to reduce or shrink the coefficient values towards zero. This allows the variables that contribute the least to the response variable to have a coefficient close or equal to zero.

Various approaches can be adopted to assess the selection of the variables. In this study, the LASSO method (Least Absolute Shrinkage and Selection Operator), first formulated by R. Tibshirani (1996), is used to identify the key explanatory variables that influence the PLT shock lapse and mortality deterioration in PLT.

The method reduces the regression coefficients toward zero by penalizing the regression model with a penalty term called L1-norm, which is the sum of the absolute coefficients. This penalty forces some of the coefficient estimates, with a minor contribution to the model, to be exactly equal to zero and, hence, performs a variable selection by reducing the complexity of the model.

The idea behind the LASSO is briefly presented below.

Let Y denotes the response variable that is linearly related to p potential explicative variables X_i, n observations are available. The variable Y is modeled as follow:

$Y^n = X^n \beta^n + \epsilon^n$,

where $\epsilon^n = (\epsilon_1, \dots, \epsilon_n)^{\mathrm{T}}$ is a vector of n independent and identically distributed random variables with mean 0 and variance σ^2, which corresponds to the variations not captured by the model. It can include all the explicative variables not considered in the model.

$Y^n \in \mathbb{R}^n$ is the n observations of the variable Y, X^n is a $n \times p$ matrix and $\beta^n \in \mathbb{R}^p$ is the parameter to estimate indexed by n to illustrate that its length might vary when n increases. p can a priori depend on n.

Since not all variables are relevant, the objective is to eliminate the unnecessary features that don't have a material impact. The idea of the LASSO is not to do a classical linear regression but to fit a penalized regression, which shrinks some of the coefficients to zero in estimating β.

It consists in estimating for $\lambda \in \mathbb{R}_+$:

$$\hat{\beta}^n(\lambda) = \underset{\beta \in \mathbb{R}^p}{\arg\min} \left(\frac{1}{2} \|Y^n - X^n \beta\|_2^2 + \lambda \|\beta\|_1 \right),$$

where $\|x\|_2^2 = \sum_{i=1}^n x_i^2$ and $\|x\|_1 = \sum_{i=1}^n |x_i|$.

The parameter $\lambda \geq 0$ controls the power of the regularization, i.e., the penalty on the coefficients. If $\lambda = 0$, the LASSO corresponds to a classical linear regression (if $p \leq n$). If $\lambda = \infty$, all the coefficients of $\hat{\beta}^n(\infty)$ are zero. The increase of λ leads to the decrease of some coefficients of $\hat{\beta}^n(\lambda)$ towards zero until they are exactly zero.

Appendix F: USA Study 2021 vs Canada Study 2020

The Canadian Institute of Actuaries (CIA) released the first ever Post-Level Term (PLT) Lapse and Mortality Study on Canadian Term plans in December 2020. The report included an extensive comparison of the Canadian results to the 2014 U.S. PLT Study (appendix C). An updated comparison reflecting the most recent 2021 U.S. study results is provided here, as well as an extended comparison to include T20 plans. T20 was available in the Canadian study and is new to the 2021 U.S. study. The Canadian study did not include results for T15 so that is excluded from comparison.

The product design between the two countries is fundamentally different in the post-level period, which is reflected in the experience results. The most prevalent design in Canada is Jump to New Level. The Jump to ART and Graded structures are the most prevalent designs in the U.S. and both are studied in detail in the U.S. 2021 report. There were also some data for Jump to New Level in the U.S. study, but analysis was limited due to the smaller number of participants that provided data for this structure. A high-level comparative analysis of the three PLT structures, shown in section 4.5, highlights some similarities between Jump to ART and Jump to New Level structures.

In this appendix, the focus is a comparison between the Jump to ART from the U.S. 2021 study data and Jump to New level from the Canadian study data. The experience at the shock durations is consistent between the two studies but diverges in later durations of the PLT where the designs differ.

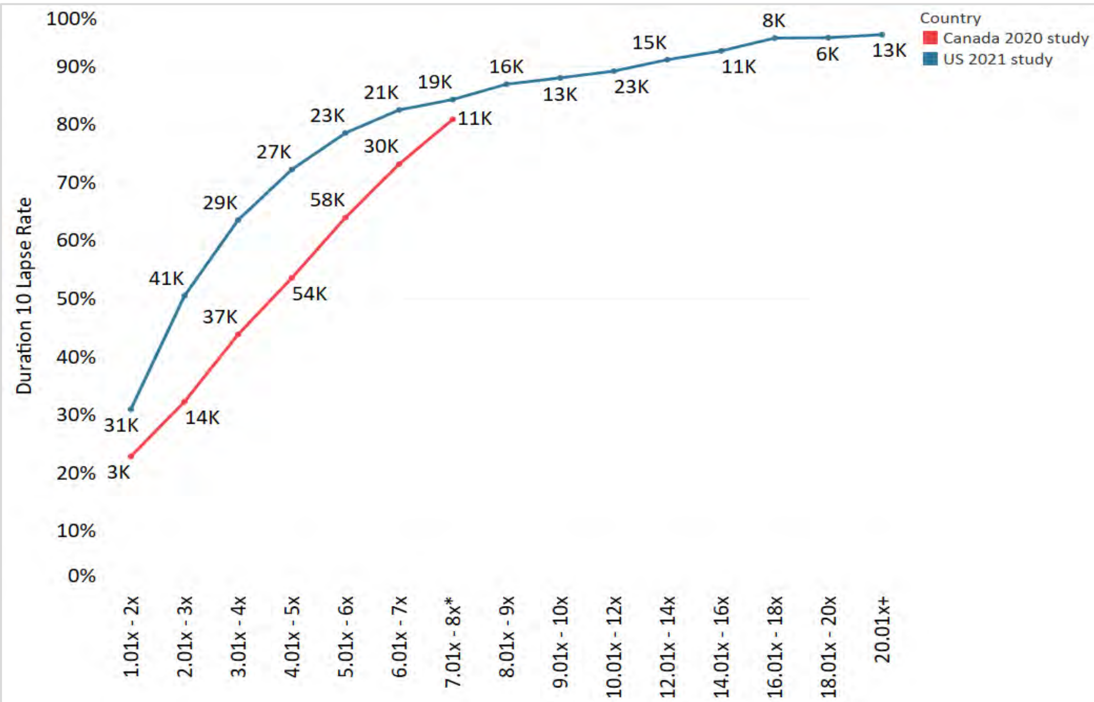
F.1 Lapse Experience

<u>Shock Lapse by Premium Jump</u>

Both the Canadian and U.S. studies indicate the most important driver of shock lapse experience is the premium jump ratio. Both show similar patterns of increasing shock lapses as the premium jump ratio increases.

Figure F.1

SHOCK LAPSE BY PREMIUM JUMP RATIO AND STUDY (T10)

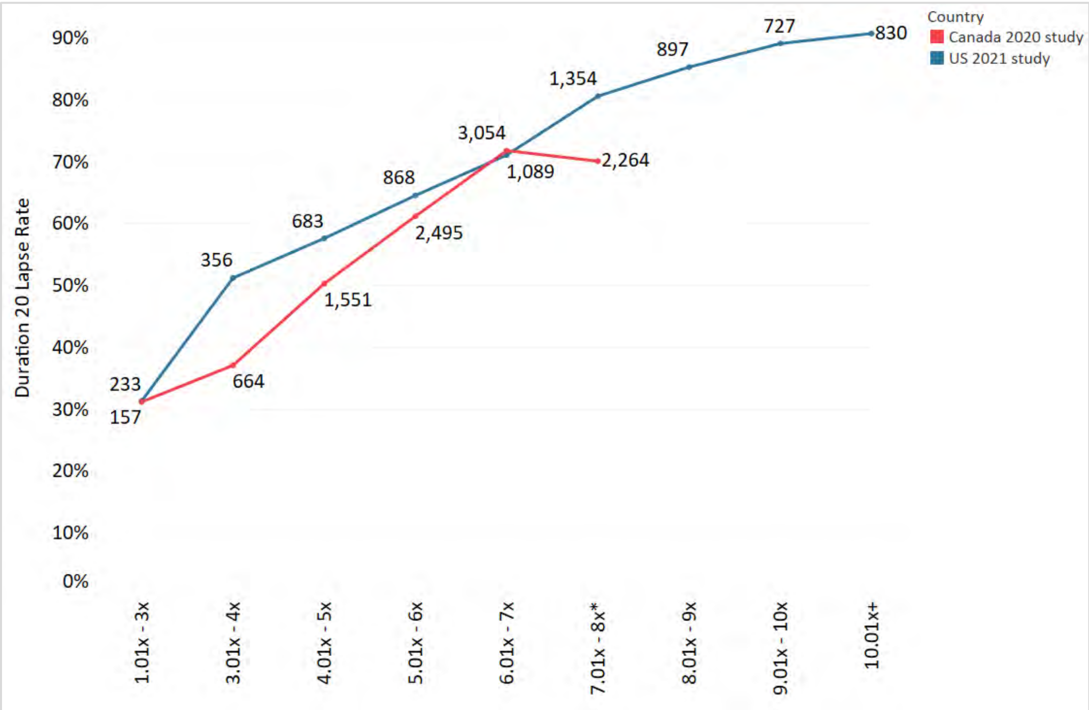


The premium jump ratios in the Canadian products are observed to be lower than the U.S., with the highest jumps in the 7.01-8x band. About a third of the U.S. exposures have premium jumps higher than 8x, with some higher than 20x. While the U.S. has double the number of lapses overall on the T10 plan, the Canadian study has more data in the 3.01-7x premium jump bands.

The duration 10 lapses in the U.S. T10 study are higher than the Canadian study, although the difference reduces towards the higher premium jumps. A similar result is observed in duration 20 for T20 plans shown below.

Figure F.2

SHOCK LAPSE IN PLT SPLIT BY PREMIUM JUMP RATIO AND STUDY (T20)



Both studies have considerably less data on T20 than T10, with similar total lapse counts between the two studies. However, the experience on T20 is credible and in line with expectations and provides valuable insight into longer term lapse behavior.

In the U.S. 2021 study, the initial premium jump is defined as the ratio of the first PLT premium to the level term period premium. This is in line with the actual premium increase presented to the policyholder. The Canadian PLT study, similar to prior U.S. studies, calculated the initial premium jump as the ratio of the per thousand premium rate in the first duration in PLT to the per thousand premium rate in the level term. The per thousand rate did not include the policy fee. The policy fee has more of an impact when the absolute premium amount is smaller and, as a result, could explain the wider variation in results between the two studies over the lower premium jump range.

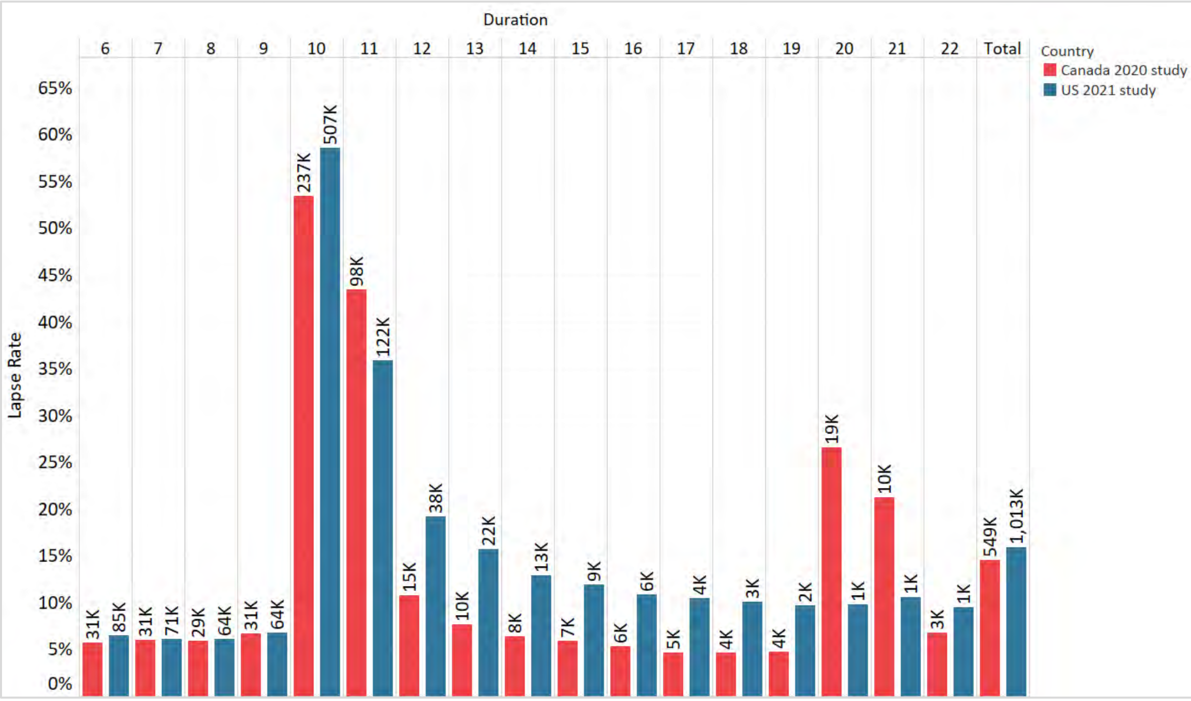
There are also business mix differences between the studies, which may contribute to the variation in results. Further discussion on business mix difference between the studies and, in particular premium mode mix, is included below.

Lapse Rate by Policy Duration

The comparison of experience by duration in PLT is shown for T10 only as there are limited T20 data after the shock lapse duration in the U.S. 2021 study.

Figure F.3

LAPSE EXPERIENCE SPLIT BY DURATION AND STUDY – T10



The Canadian and U.S. studies show similar patterns of a large shock lapse in duration 10, followed by a smaller secondary shock in duration 11, followed by declining lapses that eventually level off to an ultimate level. Lapse rates following the initial shock (i.e., durations 10 and 11) are consistently higher for the U.S. than Canada due to the increasing ART premium rate structure in the U.S. compared to level premiums in the Canadian plans (Jump to New Level).

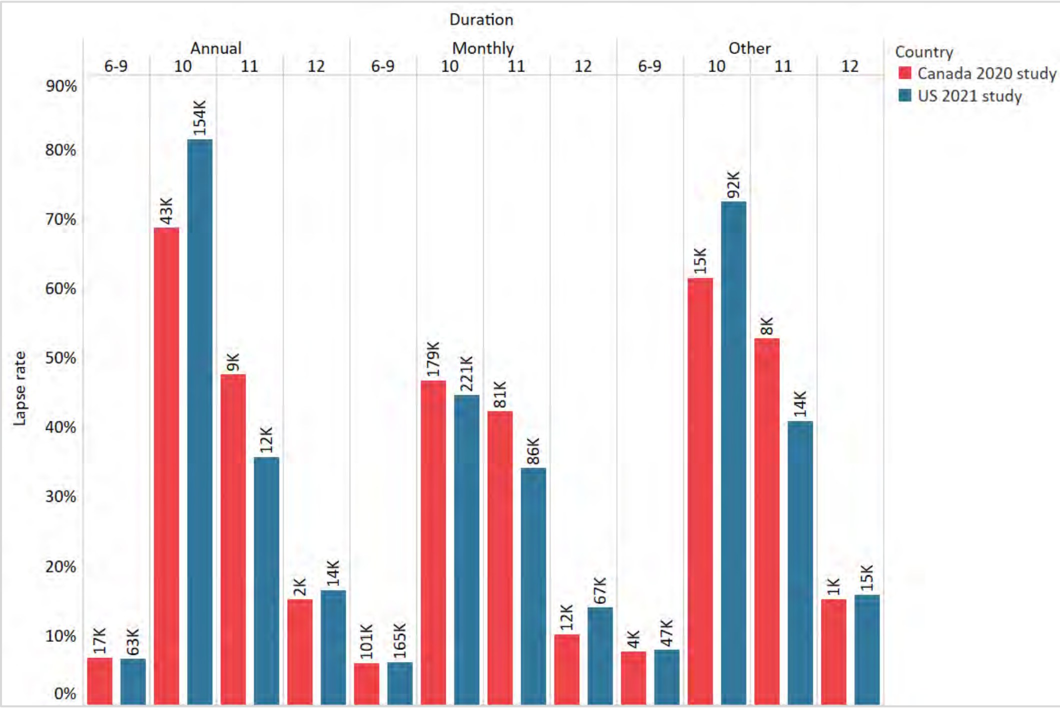
U.S. lapse rates are higher than Canada in duration 10 and lower than Canada in duration 11. As described in section 5.4, the pattern of lapse skewness in PLT durations 0 and 1 follows a different pattern than most other durations. Shock lapses are skewed to the later months of duration 10 and early months of duration 11 for T10. Skewness analysis in section 5.4 shows a different pattern by premium mode. Differences could be due to different proportions of monthly pay business between the two studies.

Lapse by Premium Mode

Both studies show that premium mode has a material impact on lapse in the year of shock, with less difference in other durations. This comparison is shown in figure F.4 below.

Figure F.4

LAPSE EXPERIENCE SPLIT BY PREMIUM MODE, DURATION AND STUDY



The "other" category includes quarterly and semi-annual premium modes as well as unknown.

The T10 shock lapse in duration 10 is significantly higher for annual premium mode than monthly. This is likely driven by the larger increase in dollar amount of premium under the annual mode compared to the monthly mode. These results are closer to the annual results. The difference in shock lapse by premium mode was also observed when reviewing shock lapse experience by premium mode and premium jump in the U.S. 2021 study. Section 5.2.3 shows that monthly premium mode business has a lower shock lapse than annual mode business for a given premium jump.

The Canadian study has more exposures in the monthly mode than the U.S. study. For T10, 82% of exposures are monthly in the Canadian study compared to 60% in the U.S. study, and 74% and 46% for T20, respectively. The higher proportion of monthly mode business in the Canadian study could explain the lower shock lapse for a given premium jump when comparing the studies in figures F.1 and F.2 above.

However, figure F.4 shows that the annual premium mode lapse rates still show a difference between the Canadian and U.S. studies where the U.S. study shows higher duration 10 lapses, but lower duration 11 lapses compared to the Canadian study. This was identified as an area of difference between the U.S. 2014 study and the Canadian 2020 study in the CIA Post-Level Term report (1).

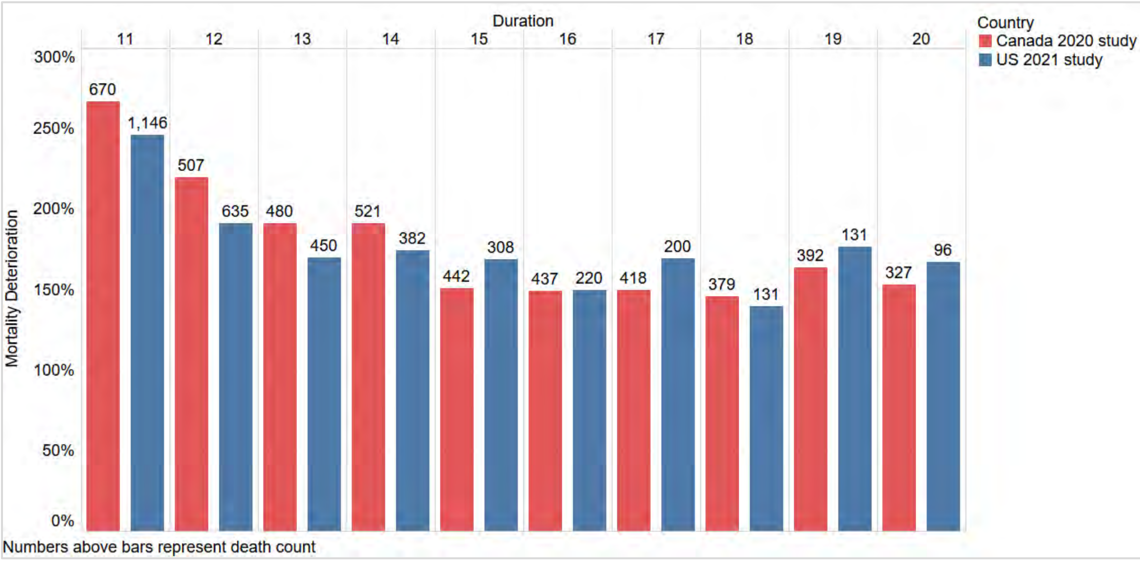
F.2 Mortality Deterioration

Mortality Deterioration by Duration

Both the U.S. and Canadian studies show an increasing level of mortality deterioration as the shock lapse increases.

Figure F.5

MORTALITY DETERIORATION SPLIT BY STUDY AND POLICY DURATION (T10)



The mortality deterioration is expressed as a multiple of the level period mortality, where level term mortality is based on durations 6 through 10 mortality (for T10) for both studies. The U.S. study uses the 15VBT and the Canadian study uses the CIA9705 table.

The pattern of mortality deterioration is consistent between the two studies across all durations. Duration 11 shows the highest mortality deterioration and mortality decreases by duration thereafter.

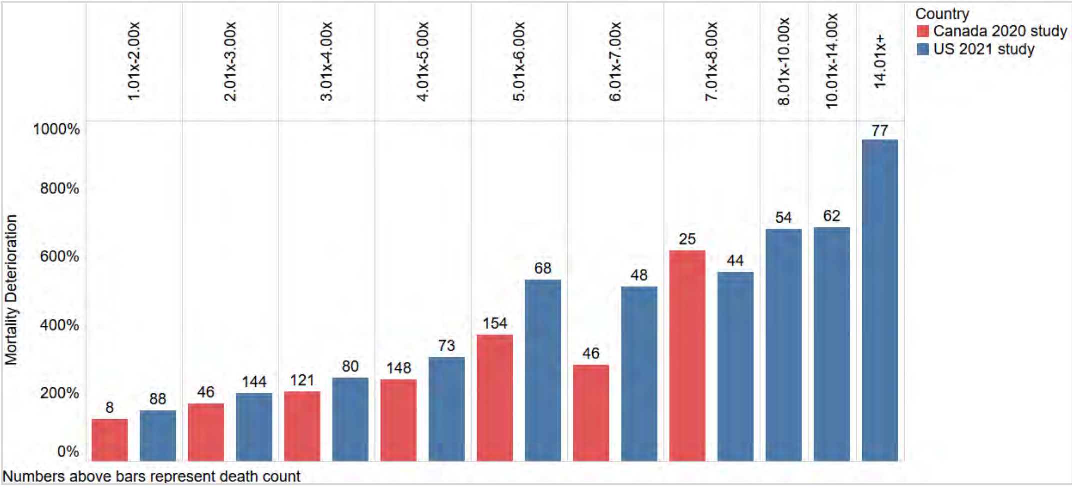
As illustrated in the lapse analysis, shock lapses and therefore mortality deterioration, is highly correlated with the premium jump. In the next section, the view is expanded across premium jumps.

Mortality Deterioration by Premium Jump

The Canadian study only presents results split by premium jump for T10 so the chart below shows the T10 mortality deterioration in duration 11 for the U.S. and Canada.

Figure F.6

MORTALITY DETERIORATION COMPARISON FOR T10 JUMP TO ART BUSINESS, DURATION 11 ONLY



The U.S. study has 1,188 deaths in duration 11 for T10 compared to 560 in the Canadian study. The U.S. has more deaths for premium jumps up to 3.00x and Canada has more deaths in the 3.01-6.00x bands. The U.S. study includes experience in higher premium jump groups where the Canadian study does not include any data above 8.00x.

Both studies show an increasing level of mortality deterioration as the premium jump increases. The level of mortality deterioration is also consistent between the studies across most premium jumps. Differences are observed for premium jump groups 6.01x-7.00x and 7.01x-8.00x, although the credibility is thin within the jump bands.

References

Prior SOA Post-Level Term Studies were published in 2010 and 2014. Links to studies as follows:

SOA Report on the Lapse and Mortality Experience of Post-Level Premium Period Term Plans (2010)
https://www.soa.org/globalassets/assets/files/research/projects/research-shock-lapse-report.pdf

SOA Report on the Lapse and Mortality Experience of Post-Level Premium Period Term Plans (2014)
(https://www.soa.org/globalassets/assets/files/research/exp-study/research-2014-post-level-shock-report.pdf

The CIA and SOA jointly published a study on post- level term for Canada in November 2020. Link to study as follows:

SOA CIA Report on the Lapse and Mortality Experience of Post-Level Premium Period Term Plans (2020)
https://www.soa.org/resources/experience-studies/2020/post-level-premium-period/

Tibshirani, R. (1996). Regression shrinkage and selection via the lasso. Journal of the Royal Statistical Society. Series B (Methodological). Vol. 58, No. 1, pp. 267-288.

About The Society of Actuaries

With roots dating back to 1889, the Society of Actuaries (SOA) is the world's largest actuarial professional organization with more than 31,000 members. Through research and education, the SOA's mission is to advance actuarial knowledge and to enhance the ability of actuaries to provide expert advice and relevant solutions for financial, business and societal challenges. The SOA's vision is for actuaries to be the leading professionals in the measurement and management of risk.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and nonactuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org