REPORT

ON THE

SURVEY OF POST-LEVEL PREMIUM PERIOD

LAPSE AND MORTALITY ASSUMPTIONS AND EXPERIENCE FOR

LEVEL PREMIUM TERM PLANS

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Jeffery T. Dukes, FSA
Kathleen M. Dziedzic, FSA

Milliman, Inc. was engaged by the Society of Actuaries' Product Development Section to examine the experience in the years following the level premium period for individual level premium term products. This engagement was a result of a research request for proposals published by the Product Development Section Council.

The attached report presents the results of our survey on post-level premium period lapse and mortality assumptions and experience for level premium term products. The survey was conducted in mid-2006.

We received a response from 18 companies. One company provided separate responses by product to some of the survey questions. We have supplemented the lapse experience provided by survey participants with the experience from four other companies that did not participate in the full survey, but were willing to share their lapse experience.

The purpose of the survey was to obtain information that would help practicing actuaries answer the following questions:

- What is the general level of lapses and mortality expected for individual level premium term life insurance products for the period following the level premium period?

- What are life insurance companies actually experiencing for lapses and mortality for these products following the level premium period?

- What is the size of the premium increase at the end of the level premium period? What impact, if any, does the size of the premium increase seem to have on lapse rates and mortality?

Not every company had post-level premium period lapse experience and only one company had semi-credible mortality experience. Almost all experience was for products with a 10-year level premium period.

While we believe and hope that the survey results will be useful to practicing actuaries, we must make several caveats:

- Although a variety of companies participated in the study, their assumptions and experience are not necessarily representative of the entire industry.

- We have relied on the accuracy of the responses from the participants, particularly with regard to lapse and mortality experience and consistency between mortality anti-selection methodology and the resulting assumptions.

- Actual experience data was still fairly sparse, particularly for mortality.

We would like to thank each of the companies that participated in the survey or shared lapse experience with us.

Disclaimer

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

Jeffery T. Dukes, F.S.A.
Kathleen M. Dziedzic, F.S.A.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Some of the more significant items in this report are summarized below. We recommend reading the full report to fully appreciate the statements below.

- Three of the 18 companies do not look beyond the end of the level premium period except, perhaps, for illustrations. In other words, they essentially assume all business terminates at the end of the level premium period.

- One company assumes a lapse rate of 100% in the last year of the level premium period, L, for L=20 and 30, but not for L=10 or 15.

- Of the 15 companies that assume some business persists beyond year L for some or all values of L:

Lapse Assumptions

- Nine (9) companies do not vary their lapse assumptions for policy years L and later by issue age or level premium period (L), for level premium periods where they assume the lapse rate in year L is less than 100%. One of these companies does vary assumptions by risk class, however (e.g., preferred vs. standard).

- Three (3) companies vary lapse rates by level premium period (L) but, for a given value of L, assume the same lapse rates for all issues ages for years L and later.

- Two (2) companies vary lapse assumptions by issue age but not by level premium period.

- One company varies lapse assumptions by both issue age and level premium period.

The table below summarizes the preceding four bullet points:

Table ES-1
Variations in Lapse Assumptions

Lapse Rates Vary By:		
L	Issue Age	Number of Companies
No	No	9
Yes	No	3
No	Yes	2
Yes	Yes	1

Other observations on the lapse assumptions of these 15 companies:

- Thirteen (13) companies assume the lapse rate for year L, qw_L, is substantially greater than the lapse rate assumed for year L+5 whenever $qw_L < 100\%$. One of the other two companies assumed that the first shock lapse occurs in year L+1 rather than at the end of year L. The fifteenth company assumed a very high lapse rate in each of years L to (L+5).

- Six (6) companies assume lapse rates for both years L and L+1 that are greater than the lapse rate assumed for year L+5. In other words, six of the remaining 15 companies assume shock lapses in both years L and L+1. As mentioned above, one other company assumed a very high lapse rate in each of years L to (L+5).

Table ES-2 summarizes the mean lapse assumptions, after excluding the highest and lowest response for each of years L to (L+5). See Table 9 starting on page 14 for more detail.

Table ES-2
Summary of Mean Lapse Rate Assumptions
For Years L to (L+5)
Excluding the Lowest and Highest Assumptions Each Year

Level Premium Period (L)	Issue Ages	L	L+1	L+2	L+3	L+4	L+5
10	All	80%	29%	17%	15%	15%	15%
15	All	83%	29%	18%	16%	16%	16%
20	All	82%	27%	17%	14%	14%	14%
30	All	83%	29%	19%	15%	15%	15%

Mortality Assumptions

- Fourteen (14) of the 15 companies that do not assume all business terminates at the end of the level premium period (year L) said they assume mortality anti-selection after the level premium period.

- Of the 14 companies that said they assume mortality anti-selection after the level premium period, five said they use some version of Dukes-MacDonald methodology to calculate anti-selection, three said they use some version of Becker-Kitsos methodology and six use some other approach. Three of the "other" methodology companies use the same flat anti-selection multiple (200% or 250%) for all issue ages and level premium periods.

Table ES-3 summarizes mean assumptions for mortality anti-selection multiples for selected years L to (L+25), after excluding the lowest and highest assumption each year. Table 12 on page 24 has additional detail.

Table ES-3
Summary of Mean Mortality Anti-Selection Multiples
Excluding the Lowest and Highest Response for Each Year

Level Premium Period (L)	Issue Age	L+1	L+3	L+5	L+10	L+15	L+20	L+25
10	35	236%	229%	236%	208%	189%	182%	175%
	45	247%	248%	253%	216%	197%	185%	175%
	55	261%	260%	263%	292%	194%	188%	172%
15	35	254%	262%	269%	208%	193%	182%	174%
	45	267%	276%	282%	219%	199%	182%	172%
	55	270%	279%	297%	218%	206%	185%	170%
20	35	240%	229%	221%	198%	183%	174%	167%
	45	253%	242%	232%	210%	200%	177%	166%
	55	242%	233%	222%	190%	174%	169%	148%
30	35	232%	221%	211%	186%	172%	155%	154%
	45	225%	216%	205%	174%	159%	154%	154%

- **Lapse Experience.** The actual lapse experience appears to provide some support for variations in experience by:
    - Issue age (The year L lapse rate seems to be higher for older issue ages than younger ages.)
    - Gender (Male lapse rates are higher than female rates.)
    - Premium mode (Lapse rates are higher for annual mode than for monthly mode.)
    - Risk class (Lapse rates for the best nonsmoker class were higher than for other nonsmoker classes.)

It also appears common for experience lapse rates to be elevated in both years L and L+1.

Table ES-4 summarizes mean experience lapse rates for 10-year level premium term business. Table 13 on page 30 has additional detail.

Table ES-4
Summary of Mean Experience Lapse Rates by Amount
For 10-Year Level Premium Plans

Issue Ages	L	L+1	L+2	L+3	L+4	L+5	Cumulative L and (L+1)	Cumulative L to (L+2)
35	47%	53%	21%	17%	17%	14%	76%	82%
45	54%	63%	23%	20%	20%	17%	83%	87%
55	60%	74%	26%	15%	17%	17%	90%	90%
All	48%	51%	20%	15%	14%	14%	76%	82%

- **Mortality Experience.** Only one company provided somewhat credible mortality experience. Post-level premium period experience for that company was running about 224% of the experience multiples during the level premium period.

BACKGROUND

The survey was sent to the top 50 term writers based on face amount of 2004 term insurance sales, as tabulated in an August 1, 2005 statistical study published by A.M. Best. Seventeen of the top 50 companies and one additional company participated in the study. In total, the 18 companies represented about 34% of 2004 term sales (by face) and 31% of 2005 term sales. A copy of the survey is provided in Appendix A. Appendix B contains a list of the participants.

Distribution Channels

Participating companies were asked to provide information on the percentage of their 2005 level premium term sales (measured by face amount) by distribution channel.

Table 1
Number of Companies for Which the Percentage of 2005 Level Term Sales by Channel (by Face) Fell in the Indicated Range

Channel	0%	1-20%	21-40%	41-60%	61-80%	81-100%
Independent Agent	9	2	1	3	1	2
Managing General Agent	12	1	0	1	1	3
Captive Agent	9	0	2	0	1	6
Banks	17	1	0	0	0	0
Internet	15	3	0	0	0	0
Worksite	17	1	0	0	0	0
Financial Brokerage Firm	17	0	0	1	0	0
Other/Unknown	14	3	0	0	0	1

In aggregate, the estimated percentage of 2005 term sales (face) by channel for participating companies is shown in Table 2.

Table 2 Estimated Overall Percentage of Total 2005 Level Premium Term Sales (Face) by Channel for Participating Companies	
Channel	Percentage of Sales*
Independent Agent	30.3%
Managing General Agent	18.6
Captive Agent	44.7
Banks	0.4
Internet	0.4
Worksite	0.3
Financial Brokerage Firms	4.2
Other/Unknown	1.3
All	100.0%

* Adds to 100.2% due to rounding.

Situations Where Post-Level Premium Period Assumptions Are Needed

Post-level premium period lapse and mortality assumptions are only needed when companies price or project earnings beyond the level premium period. Companies were asked to indicate the situations/applications where they considered experience beyond the level premium period. Table 3 summarizes their responses.

Table 3 Situations Where Participating Companies Make Assumptions for Periods Beyond the Level Premium Period				
	Current Products		In-Force Products No Longer Sold	
Application	# of Companies	% of 2005 Term Sales*	# of Companies	% of 2005 Term Sales*
Pricing	13	78%	10	43%
Cash Flow Testing	10	62	12	73
Embedded Values	7	47	5	24
Illustrations	11	66	10	47
SAP Earnings Projections	9	52	11	70
GAAP Reserves & DAC	12	69	12	60
GAAP Income Projections	13	69	13	61

* For the 18 companies participating in the survey.

Primary Factors Affecting Post-Level Premium Period Assumptions

It is plausible to assume that companies might vary post-level premium period lapse or mortality assumptions by factors such as duration since the end of the level premium period or the magnitude of the premium increase from year L to year L+1. We provided companies with a list of possible factors and asked which they viewed to be primary factors in setting assumptions for currently sold products. Responses are summarized in Table 4.

Table 4
Primary Factors in Setting Post-Level Premium Period Lapse and Mortality Assumptions for Current Products

	Lapse Rates		Mortality	
Factor	# of Companies	% of 2005 Term Sales*	# of Companies	% of 2005 Term Sales*
Distribution Channel	0	0%	1	***
Premium Mode	0	0	0	0
Policy Size (Face Amount)	0	0	3	18
Percentage Increase in Premium**	5	17	2	***
Dollar Increase in Premium**	2	***	0	0
Risk Class	3	13	7	34
Issue Age	3	15	6	25
Gender	1	***	6	38
Length of Level Premium Period (L)	4	39	8	44
Duration Since the End of the Level Premium Period	10	57	8	37

* For the 18 companies participating in the survey.
** From year L to year L+1.
*** Not disclosed.

Premium Relationships

Companies were asked to provide sample premium rates for years L and L+1 for:

- ***Currently sold products*** – male, best preferred and standard (residual) nonsmoker (or non-tobacco) classes, face = $250,000, issue ages x=35, 45, and 55 and L=10, 15, 20 and 30.

  We also requested standard nonsmoker class rates for issue ages x+L.

- ***In-force products*** beyond the level premium period and for which lapse experience was provided – male, best preferred and standard nonsmoker (or non-tobacco) classes, face = $250,000, issue ages 35, 45, and 55 and L=10, 15, 20, and 30.

We used this information to calculate the ratios (R) of the premium in year L+1 to the level premium applicable to years 1 to L for both in-force and currently sold products. Many actuaries believe that lapse rates at the end of year L will tend to be higher if the premium ratio is high.

Table 5 summarizes the number of companies for which the premium ratios, R, fell within defined ranges. Not all responding companies had a current or in-force product for each combination of level premium period, risk class and issue age.

Table 5
Number of Companies for Which the Premium Ratio $R=GP_{L+1}/GP_L$ Falls Within the Indicated Range

Level Premium Period (L)	Nonsmoker Risk Class	Issue Age	Current Products			In-Force Products		
			R≤5	5<R≤10	R>10	R≤5	5<R≤10	R>10
10	Best Preferred	35	2	1	15	6	5	2
		45	0	4	14	6	6	1
		55	0	2	16	6	6	1
	Standard	35	5	11	2	13	3	0
		45	5	11	2	13	3	0
		55	0	12	6	10	6	0
15	Best Preferred	35	0	3	12	1	2	3
		45	0	3	12	0	3	3
		55	0	2	13	0	3	3
	Standard	35	3	7	5	2	4	0
		45	1	9	5	1	5	0
		55	1	7	7	1	3	2
20	Best Preferred	35	0	3	15	2	3	3
		45	0	1	17	1	2	5
		55	0	1	17	1	1	6
	Standard	35	1	10	7	2	6	1
		45	1	6	11	1	6	2
		55	1	5	12	1	4	3
30	Best Preferred	35	0	0	15	0	0	3
		45	0	0	15	0	0	3
		55	0	0	2	0	0	0
	Standard	35	0	1	14	0	0	3
		45	0	0	15	0	0	3
		55	0	0	1	0	0	0

Table 5 indicates that current products tend to have a steeper jump in premiums from year L to year L+1 than older, in-force products.

Another approach to looking at premium increases at the end of the level premium period is to compare the first non-level premium (i.e., for year L+1) for issue age x for *in-force* policies to the *standard class* level premium for the *current* product and issue age x+L. Assuming substandard rates are multiples of standard class premiums, this ratio (S) gives a rough, non-conservative measure of how substandard an insured could have become and still benefit by lapsing his/her current policy and paying substandard rates on a new policy. The measure is not conservative because premiums on the original policy would increase further after year L+1. Table 6 summarizes the number of companies for which S falls within the indicated ranges.

Table 6
Number of Companies for Which the Premium Ratio
$S = GP_{L+1}^{\text{IF Plan}}(x) / GP_{1 \text{ to } L}^{\text{Current Plan, Standard Class}}(x+L)$ Falls
Within the Indicated Range

Level Premium Period (L)	In-Force Plan's Nonsmoker Risk Class	Issue Age	$S \leq 1$	$1 < S \leq 1.5$	$1.5 < S \leq 2.5$	$S > 2.5$
10	Best Preferred	35	1	2	7	3
		45	0	3	9	1
		55	0	4	8	1
	Standard	35	0	3	6	7
		45	0	1	9	6
		55	0	2	10	4
15	Best Preferred	35	0	0	6	0
		45	0	2	4	0
		55	0	4	0	0
	Standard	35	0	0	6	0
		45	0	0	6	0
		55	0	1	3	0
20	Best Preferred	35	1	6	1	0
		45	2	2	0	0
		55	0	0	0	0
	Standard	35	1	3	5	0
		45	0	3	2	0
		55	0	0	0	0

LAPSE ASSUMPTIONS

Companies were asked to provide their pricing lapse rate assumptions for currently sold products for policy years L, L+1, …, L+5 for level premium periods (L) of 10, 15, 20 and 30 years and issue ages 35, 45, and 55.

The 18 responses can be categorized as follows:

- Three (3) companies always assume everyone lapses at the end of the level premium period.

  Note: One company assumes everyone lapses when the level premium period is 20 or 30 years but not for level premium periods of 10 or 15 years. Its assumptions for the 10- and 15-year level premium plans fall into one of the categories below.

- For eight (8) companies, lapse rates did not vary by issue age or length of the level premium period (L) whenever the lapse rate for year L was less than 100%. For one other company, lapse rate assumptions varied by risk class, but, for a given risk class, they did not vary by issue age or level premium period.

- For three (3) companies, lapse assumptions vary by L but for a given L they do not vary by issue age.

- Two (2) companies vary lapse assumptions by issue age but not by level premium period.

- One company varies lapse assumptions by both issue age and L.

Two other observations are:

- Six (6) companies assume lapse rates for both years L and L+1 are higher than the assumption for year L+5.

- One company assumed elevated lapses occur only in year L+1.

Table 7 gives a sense for the range of lapse assumptions for years L, L+1, …, L+5 for companies assuming a lapse rate less than 100% for year L. No results are shown for issue age 55 and a 30-year level premium period because only one or two companies sell the 30-year product at age 55. Note that the company with the high/low lapse rate assumption in, say, policy year L could be different from the company with the high/low lapse rate assumption in, say, year (L+1). In calculating means, each company's assumption is given equal weight.

Table 7
Summary of Lapse Rate Assumptions
For Years L to (L+5) When
The Lapse Rate for Year L Is Less Than 100%

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
10	35	Low	7%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	75%	30%	20%	18%	18%	18%
		# of Companies	15	15	15	15	15	15
	45	Low	7%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	76%	31%	20%	18%	18%	18%
		# of Companies	15	15	15	15	15	15
	55	Low	7%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	76%	31%	20%	18%	18%	18%
		# of Companies	15	15	15	15	15	15
	All	Low	7%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	76%	31%	20%	18%	18%	18%
		# of Responses	45	45	45	45	45	45
15	35	Low	65%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	82%	30%	22%	20%	20%	20%
		# of Companies	13	13	13	13	13	13
	45	Low	70%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	82%	31%	22%	20%	20%	20%
		# of Companies	13	13	13	13	13	13
	55	Low	70%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	85%	20%	20%	15%	15%	15%
		Mean	84%	32%	22%	20%	20%	20%
		# of Companies	13	13	13	13	13	13

Table 7
Summary of Lapse Rate Assumptions
For Years L to (L+5) When
The Lapse Rate for Year L Is Less Than 100%

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
	All	Low	65%	5%	5%	5%	5%	5%
		High	95%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	83%	31%	22%	20%	20%	20%
		# of Responses	39	39	39	39	39	39
20	35	Low	7%	5%	5%	5%	5%	5%
		High	95%	59%	40%	25%	25%	25%
		Median	83%	20%	20%	13%	13%	13%
		Mean	77%	27%	17%	14%	14%	14%
		# of Companies	14	14	14	14	14	14
	45	Low	7%	5%	5%	5%	5%	5%
		High	95%	67%	40%	25%	25%	25%
		Median	83%	20%	20%	14%	14%	14%
		Mean	78%	28%	17%	14%	14%	14%
		# of Companies	14	14	14	14	14	14
	55	Low	7%	5%	5%	5%	5%	5%
		High	95%	77%	40%	25%	25%	25%
		Median	85%	20%	20%	14%	14%	14%
		Mean	79%	29%	17%	14%	14%	14%
		# of Companies	14	14	14	14	14	14
	All	Low	7%	5%	5%	5%	5%	5%
		High	95%	77%	40%	25%	25%	25%
		Median	85%	20%	20%	14%	14%	14%
		Mean	78%	28%	17%	14%	14%	14%
		# of Responses	42	42	42	42	42	42
30	35	Low	7%	5%	5%	5%	5%	5%
		High	96%	54%	40%	25%	25%	25%
		Median	85%	20%	20%	17%	17%	17%
		Mean	77%	29%	19%	15%	15%	15%
		# of Companies	11	11	11	11	11	11
	45	Low	7%	5%	5%	5%	5%	5%
		High	96%	59%	40%	25%	25%	25%
		Median	85%	20%	20%	17%	17%	17%
		Mean	77%	30%	19%	15%	15%	15%
		# of Companies	11	11	11	11	11	11

Table 7
Summary of Lapse Rate Assumptions
For Years L to (L+5) When
The Lapse Rate for Year L Is Less Than 100%

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
	All	Low	7%	5%	5%	5%	5%	5%
		High	96%	59%	40%	25%	25%	25%
		Median	85%	20%	20%	17%	17%	17%
		Mean	77%	29%	19%	15%	15%	15%
		# of Responses	22	22	22	22	22	22

Table 8 is analogous to Table 7 but lapse rates for policy years L to (L+5) were excluded for (a) the company with the lowest lapse rate assumption in year L and (b) the company with the highest lapse rate assumption in year L.

Table 8
Summary of Lapse Rate Assumptions
For Years L to (L+5)
When the Lapse Rate for Year L Is Less Than 100%
Excluding Responses For Years L to (L+5) From the Companies
With the Lowest and Highest Year L Assumptions

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
10	35	Low	65%	5%	5%	5%	5%	5%
		High	91%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	79%	31%	22%	20%	20%	20%
		# of Companies	13	13	13	13	13	13
	45	Low	68%	5%	5%	5%	5%	5%
		High	91%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	80%	31%	22%	20%	20%	20%
		# of Companies	13	13	13	13	13	13

Table 8
Summary of Lapse Rate Assumptions
For Years L to (L+5)
When the Lapse Rate for Year L Is Less Than 100%
Excluding Responses For Years L to (L+5) From the Companies
With the Lowest and Highest Year L Assumptions

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
	55	Low	70%	5%	5%	5%	5%	5%
		High	91%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	80%	32%	22%	20%	20%	20%
		# of Companies	13	13	13	13	13	13
	All	Low	65%	5%	5%	5%	5%	5%
		High	91%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	15%	15%	15%
		Mean	80%	31%	22%	20%	20%	20%
		# of Responses	39	39	39	39	39	39
15	35	Low	70%	5%	5%	5%	5%	5%
		High	93%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	17%	17%	17%
		Mean	82%	32%	24%	22%	22%	22%
		# of Companies	11	11	11	11	11	11
	45	Low	70%	5%	5%	5%	5%	5%
		High	93%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	17%	17%	17%
		Mean	82%	33%	24%	22%	22%	22%
		# of Companies	11	11	11	11	11	11
	55	Low	75%	5%	5%	5%	5%	5%
		High	93%	80%	80%	80%	80%	80%
		Median	85%	20%	20%	15%	15%	15%
		Mean	84%	35%	23%	20%	20%	20%
		# of Companies	11	11	11	11	11	11
	All	Low	70%	5%	5%	5%	5%	5%
		High	93%	80%	80%	80%	80%	80%
		Median	80%	20%	20%	17%	17%	17%
		Mean	83%	33%	24%	21%	21%	21%
		# of Responses	33	33	33	33	33	33
20	35	Low	65%	5%	5%	5%	5%	5%
		High	93%	59%	40%	25%	25%	25%
		Median	83%	20%	20%	16%	16%	16%
		Mean	81%	27%	19%	15%	15%	15%
		# of Companies	12	12	12	12	12	12

Table 8
Summary of Lapse Rate Assumptions
For Years L to (L+5)
When the Lapse Rate for Year L Is Less Than 100%
Excluding Responses For Years L to (L+5) From the Companies
With the Lowest and Highest Year L Assumptions

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
	45	Low	70%	5%	5%	5%	5%	5%
		High	93%	67%	40%	25%	25%	25%
		Median	83%	20%	20%	16%	16%	16%
		Mean	82%	28%	19%	15%	15%	15%
		# of Companies	12	12	12	12	12	12
	55	Low	70%	5%	5%	5%	5%	5%
		High	93%	77%	40%	25%	25%	25%
		Median	85%	20%	20%	16%	16%	16%
		Mean	84%	29%	19%	15%	15%	15%
		# of Companies	12	12	12	12	12	12
	All	Low	65%	5%	5%	5%	5%	5%
		High	93%	77%	40%	25%	25%	25%
		Median	85%	20%	20%	16%	16%	16%
		Mean	82%	28%	19%	15%	15%	15%
		# of Responses	36	36	36	36	36	36
30	35	Low	68%	5%	5%	5%	5%	5%
		High	95%	54%	40%	25%	25%	25%
		Median	85%	20%	20%	20%	20%	20%
		Mean	83%	25%	21%	16%	16%	16%
		# of Companies	9	9	9	9	9	9
	45	Low	70%	5%	5%	5%	5%	5%
		High	95%	59%	40%	25%	25%	25%
		Median	85%	20%	20%	20%	20%	20%
		Mean	83%	25%	21%	16%	16%	16%
		# of Companies	9	9	9	9	9	9
	All	Low	68%	5%	5%	5%	5%	5%
		High	95%	59%	40%	25%	25%	25%
		Median	85%	20%	20%	20%	20%	20%
		Mean	83%	25%	21%	16%	16%	16%
		# of Responses	18	18	18	18	18	18

Table 9 is another variation of Table 7. For Table 9 we have excluded the high and low lapse rate assumptions for each of policy years L to (L+5).

Note that the company with the highest (lowest) lapse rate assumption for, say, policy year L may not be the same as the company with the highest (lowest) lapse rate assumption for, say, policy year (L+2).

Table 9
Summary of Lapse Rate Assumptions
For Years L to (L+5)
When the Lapse Rate for Year L Is Less Than 100%
Excluding the Lowest and Highest Assumptions
For Each of Years L to (L+5)

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
10	35	Low	65%	10%	7%	7%	7%	7%
		High	91%	57%	25%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	79%	28%	17%	15%	15%	15%
		# of Companies	13	13	13	13	13	13
	45	Low	68%	10%	7%	7%	7%	7%
		High	91%	57%	25%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	80%	29%	17%	15%	15%	15%
		# of Companies	13	13	13	13	13	13
	55	Low	70%	10%	7%	7%	7%	7%
		High	91%	61%	25%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	80%	30%	17%	15%	15%	15%
		# of Companies	13	13	13	13	13	13
	All	Low	65%	10%	7%	7%	7%	7%
		High	91%	61%	25%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	80%	29%	17%	15%	15%	15%
		# of Responses	39	39	39	39	39	39
15	35	Low	70%	10%	10%	10%	10%	10%
		High	93%	59%	27%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	82%	28%	18%	16%	16%	16%
		# of Companies	11	11	11	11	11	11

Table 9
Summary of Lapse Rate Assumptions
For Years L to (L+5)
When the Lapse Rate for Year L Is Less Than 100%
Excluding the Lowest and Highest Assumptions
For Each of Years L to (L+5)

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
	45	Low	70%	10%	10%	10%	10%	10%
		High	93%	66%	27%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	82%	29%	19%	16%	16%	16%
		# of Companies	11	11	11	11	11	11
	55	Low	75%	10%	10%	10%	10%	10%
		High	93%	76%	27%	25%	25%	25%
		Median	85%	20%	20%	15%	15%	15%
		Mean	84%	30%	19%	16%	16%	16%
		# of Companies	11	11	11	11	11	11
	All	Low	70%	10%	10%	10%	10%	10%
		High	93%	76%	27%	25%	25%	25%
		Median	80%	20%	20%	15%	15%	15%
		Mean	83%	29%	18%	16%	16%	16%
		# of Responses	33	33	33	33	33	33
20	35	Low	65%	10%	7%	7%	7%	7%
		High	93%	50%	27%	20%	20%	20%
		Median	83%	20%	20%	13%	13%	13%
		Mean	81%	26%	16%	14%	14%	14%
		# of Companies	12	12	12	12	12	12
	45	Low	70%	10%	7%	7%	7%	7%
		High	93%	50%	27%	20%	20%	20%
		Median	83%	20%	20%	14%	14%	14%
		Mean	82%	27%	17%	14%	14%	14%
		# of Companies	12	12	12	12	12	12
	55	Low	70%	10%	7%	7%	7%	7%
		High	93%	50%	27%	20%	20%	20%
		Median	85%	20%	20%	14%	14%	14%
		Mean	84%	27%	17%	14%	14%	14%
		# of Companies	12	12	12	12	12	12
	All	Low	65%	10%	7%	7%	7%	7%
		High	93%	50%	27%	20%	20%	20%
		Median	85%	20%	20%	14%	14%	14%
		Mean	82%	27%	17%	14%	14%	14%
		# of Responses	36	36	36	36	36	36

Table 9
Summary of Lapse Rate Assumptions
For Years L to (L+5)
When the Lapse Rate for Year L Is Less Than 100%
Excluding the Lowest and Highest Assumptions
For Each of Years L to (L+5)

Level Premium Period (L)	Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5
30	35	Low	68%	10%	7%	7%	7%	7%
		High	95%	50%	27%	20%	20%	20%
		Median	85%	20%	20%	17%	17%	17%
		Mean	83%	29%	19%	15%	15%	15%
		# of Companies	9	9	9	9	9	9
	45	Low	70%	10%	7%	7%	7%	7%
		High	95%	50%	27%	20%	20%	20%
		Median	85%	20%	20%	17%	17%	17%
		Mean	83%	29%	19%	15%	15%	15%
		# of Companies	9	9	9	9	9	9
	All	Low	68%	10%	7%	7%	7%	7%
		High	95%	50%	27%	20%	20%	20%
		Median	85%	20%	20%	17%	17%	17%
		Mean	83%	29%	19%	15%	15%	15%
		# of Responses	18	18	18	18	18	18

MORTALITY ASSUMPTIONS

Methods Used to Determine Mortality Anti-Selection

Three of the 18 companies participating in the survey essentially assume all business terminates at the end of the level premium period (L). One of the remaining 15 companies said that it did not assume mortality anti-selection even though it did assume a high lapse rate for year L. Fourteen companies, representing 79% of 2005 term sales by the 18 participating companies, said they assume mortality anti-selection after the level premium period. Table 10 summarizes the methodology those 14 companies said they used to quantify anti-selection.

Table 10
Mortality Anti-Selection Methodology

Method	# of Companies	% of 2005 Term Sales*
Becker-Kitsos	3	16%
Dukes-MacDonald	5	29
Other	6	34

* For the 18 companies participating in the survey.

One company said that it assumed anti-selection for 10- and 15-year level premium periods but not for a 20-year level premium period even though its post-level premium period lapse assumptions are the same for all three level premium periods.

Of the six companies using an "other" method to determine mortality anti-selection:

- One company said it used the Canadian method, which is defined and illustrated in Valuation Technique Paper #2 (1986) of the Canadian Institute of Actuaries. The Canadian method appears to be a version of Dukes-MacDonald. Excess lapses at any duration, s, are split into two groups – a group assumed to have fully select new issue mortality at its current attained age, x+s, and a group whose mortality is assumed to be identical to expected mortality assuming there were no excess lapses at duration s (or later). Mortality for the persisting group is solved for assuming conservation of deaths.

- Three assumed post-level premium mortality was a flat 2.0 or 2.5 times what it would have been without anti-selection.

Mortality anti-selection produced by the Dukes-MacDonald and Becker-Kitsos approaches depends on various parameters and the slope of the underlying mortality table. Both methods assume conservation of deaths.

For Dukes-MacDonald the key parameters are:

a) The so-called "effectiveness," which is the fraction of excess lapses assumed to have fully select (new issue) mortality for the attained age of the excess lapse.

b) The base lapse rates. Excess lapses are the difference between the total lapse rate and the base lapse rate. Other things being equal, higher excess lapse rates produce more anti-selection.

Effectiveness assumptions for the companies using Dukes-MacDonald methodology generally ranged from 60% to 80%, with 75% and 80% being the most common assumptions.

In one case, effectiveness assumptions varied by risk class and level premium period with the highest effectiveness assumption for the best preferred nonsmoker class and shortest level premium period and the lowest effectiveness assumptions for the tobacco class and longest level premium period.

Base lapse assumptions for Dukes-MacDonald ranged from 5% to 20% with 20% being the most common assumption.

Of the three companies that said they used Becker-Kitsos methodology, one said it used the formula:

$$qreverter([x+s] + t\text{-}1) = f*q([x+s] + t\text{-}1) + (1\text{-}f)*q([x]+s+t\text{-}1)$$

where,

- $0 \leq f \leq 1$
- x = original issue age

- s = duration at which an excess lapse occurs
- qreverter([x+s]+t-1) = mortality rate for an excess lapse for policy year t following an excess lapse at duration s since original issue
- Values of q( ) are expected mortality for the indicated issue age and duration assuming no anti-selection

Two companies said they used the version of Becker-Kitsos for which:

$$qreverter([x+s]+t-1) = q([x+s]+t-1)*\{1+G(t)*R*[(q([x]+s) / q([x+s]))-1]\}$$

Base lapse rate assumptions for companies using Becker-Kitsos ranged from 4% to 10%.

Summaries of Mortality Anti-Selection Assumptions

Table 11 summarizes the anti-selection multiple assumptions. Anti-selection multiples are the ratio of expected mortality with assumed anti-selection to expected mortality if no anti-selection is assumed. Three (3) companies provided assumptions that varied by risk class and Table 11 reflects the range of their assumptions. We did not receive information on assumed mortality anti-selection multiples from two (2) of the companies that said they assume anti-selection. Mean anti-selection multiples were calculated giving equal weight to each response.

Table 11
Summary of Mortality Anti-Selection Assumptions
For Companies Assuming Anti-Selection

Level Premium Period (L)	Issue Age	Description	L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
10	35	Low	128%	130%	131%	133%	135%	130%	112%	100%	100%
		High	856%	856%	856%	856%	856%	781%	705%	629%	554%
		Median	220%	219%	220%	220%	220%	200%	175%	171%	172%
		Mean	270%	267%	264%	269%	271%	241%	220%	208%	197%
		# of Responses	15	15	15	15	15	15	14	14	14
	45	Low	124%	126%	128%	130%	132%	130%	116%	100%	100%
		High	969%	969%	969%	969%	969%	860%	752%	643%	534%
		Median	220%	228%	248%	236%	227%	206%	181%	169%	170%
		Mean	287%	285%	288%	291%	293%	253%	231%	212%	195%
		# of Responses	15	15	15	15	15	15	14	14	14
	55	Low	122%	124%	126%	128%	129%	130%	100%	100%	100%
		High	1292%	1292%	1292%	1292%	1292%	1094%	895%	696%	497%
		Median	220%	227%	250%	237%	236%	220%	172%	169%	169%
		Mean	320%	318%	320%	322%	323%	334%	237%	218%	190%
		# of Responses	15	15	15	15	15	15	14	14	14
15	35	Low	165%	162%	158%	155%	152%	136%	100%	100%	100%
		High	843%	828%	813%	799%	784%	709%	635%	561%	486%
		Median	250%	245%	236%	231%	225%	200%	200%	200%	200%
		Mean	290%	293%	294%	296%	298%	241%	220%	205%	192%
		# of Responses	14	14	14	14	14	13	13	13	13
	45	Low	165%	162%	158%	155%	152%	136%	100%	100%	100%
		High	877%	857%	838%	819%	799%	702%	605%	508%	411%
		Median	250%	250%	250%	250%	245%	220%	200%	200%	200%
		Mean	303%	306%	308%	311%	310%	250%	222%	201%	185%
		# of Responses	14	14	14	14	14	13	13	13	13

Table 11
Summary of Mortality Anti-Selection Assumptions
For Companies Assuming Anti-Selection

Level Premium Period (L)	Issue Age	Description	L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
	55	Low	165%	162%	158%	155%	152%	136%	100%	100%	100%
		High	992%	962%	932%	903%	1117%	724%	576%	427%	278%
		Median	250%	250%	250%	250%	250%	210%	210%	200%	189%
		Mean	314%	314%	317%	321%	345%	253%	228%	198%	173%
		# of Responses	14	14	14	14	14	12	12	12	12
20	35	Low	127%	129%	130%	132%	134%	100%	100%	100%	100%
		High	718%	704%	690%	676%	663%	594%	525%	457%	388%
		Median	248%	240%	235%	229%	225%	187%	171%	170%	171%
		Mean	266%	261%	255%	251%	247%	219%	202%	189%	178%
		# of Responses	14	14	14	14	14	14	14	14	14
	45	Low	124%	125%	127%	129%	131%	100%	100%	100%	100%
		High	912%	889%	865%	842%	819%	703%	587%	471%	355%
		Median	250%	250%	242%	237%	237%	216%	200%	168%	169%
		Mean	291%	284%	278%	272%	267%	238%	220%	192%	175%
		# of Responses	14	14	14	14	14	14	14	14	14
	55	Low	118%	120%	122%	123%	125%	100%	100%	100%	100%
		High	873%	842%	811%	780%	749%	595%	440%	285%	250%
		Median	240%	238%	230%	223%	223%	180%	167%	165%	122%
		Mean	278%	273%	266%	259%	252%	212%	188%	172%	152%
		# of Responses	14	14	14	14	14	14	14	14	14
30	35	Low	124%	125%	127%	129%	131%	100%	100%	100%	100%
		High	305%	305%	305%	305%	305%	305%	305%	305%	305%
		Median	234%	223%	212%	201%	196%	174%	164%	121%	119%
		Mean	229%	224%	220%	216%	212%	189%	177%	163%	162%
		# of Responses	12	12	12	12	12	12	12	12	12

Table 11
Summary of Mortality Anti-Selection Assumptions
For Companies Assuming Anti-Selection

Level Premium Period (L)	Issue Age	Description	L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
	45	Low	121%	123%	124%	126%	128%	100%	100%	100%	100%
		High	305%	305%	305%	305%	305%	305%	305%	305%	305%
		Median	230%	224%	213%	202%	196%	158%	133%	120%	118%
		Mean	223%	220%	216%	211%	207%	179%	166%	162%	162%
		# of Responses	12	12	12	12	12	12	12	12	12

Table 12 is analogous to Table 11 except that for each illustrated duration, we have excluded the low and high responses.

Table 12
Summary of Mortality Anti-Selection Multiples
Excluding the Low and High Response for Each Duration Shown

Level Premium Period (L)	Issue Age	Description	L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
10	35	Low	155%	152%	145%	137%	135%	137%	116%	100%	100%
		High	439%	439%	439%	439%	439%	405%	371%	371%	303%
		Median	220%	219%	220%	220%	220%	200%	175%	171%	172%
		Mean	236%	232%	229%	234%	236%	208%	189%	182%	175%
		# of Responses	13	13	13	13	13	13	12	12	12
	45	Low	155%	152%	150%	147%	144%	133%	125%	100%	100%
		High	531%	531%	531%	531%	531%	477%	423%	423%	315%
		Median	220%	228%	248%	236%	227%	206%	181%	169%	170%
		Mean	247%	245%	248%	251%	253%	216%	197%	185%	175%
		# of Responses	13	13	13	13	13	13	12	12	12
	55	Low	155%	152%	150%	147%	144%	131%	100%	100%	100%
		High	632%	632%	632%	632%	632%	1018%	455%	455%	277%
		Median	220%	227%	250%	237%	236%	220%	172%	169%	169%
		Mean	261%	258%	260%	262%	263%	292%	194%	188%	172%
		# of Responses	13	13	13	13	13	13	12	12	12
15	35	Low	191%	175%	166%	158%	153%	136%	120%	100%	100%
		High	432%	425%	494%	600%	704%	372%	339%	339%	273%
		Median	250%	245%	236%	231%	225%	200%	200%	200%	200%
		Mean	254%	260%	262%	265%	269%	208%	193%	182%	174%
		# of Responses	12	12	12	12	12	11	11	11	11

Table 12
Summary of Mortality Anti-Selection Multiples
Excluding the Low and High Response for Each Duration Shown

Level Premium Period (L)	Issue Age	Description	L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
	45	Low	200%	195%	184%	179%	172%	142%	120%	100%	100%
		High	480%	471%	539%	640%	704%	395%	347%	347%	252%
		Median	250%	250%	250%	250%	245%	220%	200%	200%	200%
		Mean	267%	272%	276%	282%	282%	219%	199%	182%	172%
		# of Responses	12	12	12	12	12	11	11	11	11
	55	Low	200%	195%	190%	184%	178%	144%	120%	100%	100%
		High	485%	472%	539%	696%	873%	369%	305%	305%	250%
		Median	250%	250%	250%	250%	250%	210%	210%	200%	189%
		Mean	270%	272%	279%	286%	297%	218%	206%	185%	170%
		# of Responses	12	12	12	12	12	10	10	10	10
20	35	Low	170%	166%	163%	160%	156%	136%	121%	100%	100%
		High	332%	327%	322%	317%	312%	286%	260%	260%	250%
		Median	248%	240%	235%	229%	225%	187%	171%	170%	171%
		Mean	240%	236%	229%	226%	221%	198%	183%	174%	167%
		# of Responses	12	12	12	12	12	12	12	12	12
	45	Low	170%	166%	163%	160%	156%	133%	121%	100%	100%
		High	438%	428%	418%	409%	399%	351%	303%	303%	250%
		Median	250%	250%	242%	237%	237%	216%	200%	168%	169%
		Mean	253%	247%	242%	237%	232%	210%	200%	177%	166%
		# of Responses	12	12	12	12	12	12	12	12	12
	55	Low	170%	166%	159%	151%	144%	107%	100%	100%	100%
		High	397%	385%	373%	361%	349%	290%	250%	250%	250%
		Median	240%	238%	230%	223%	223%	180%	167%	165%	122%
		Mean	242%	238%	233%	226%	222%	190%	174%	169%	148%
		# of Responses	12	12	12	12	12	12	12	12	12

Table 12
Summary of Mortality Anti-Selection Multiples
Excluding the Low and High Response for Each Duration Shown

Level Premium Period (L)	Issue Age	Description	L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
30	35	Low	168%	161%	153%	149%	147%	133%	100%	100%	100%
		High	300%	293%	287%	283%	272%	250%	250%	250%	250%
		Median	234%	223%	212%	201%	196%	174%	164%	121%	119%
		Mean	232%	226%	221%	216%	211%	186%	172%	155%	154%
		# of Responses	10	10	10	10	10	10	10	10	10
	45	Low	156%	150%	142%	136%	131%	105%	100%	100%	100%
		High	300%	293%	286%	279%	272%	250%	250%	250%	250%
		Median	230%	224%	213%	202%	196%	158%	133%	120%	118%
		Mean	225%	221%	216%	210%	205%	174%	159%	154%	154%
		# of Responses	10	10	10	10	10	10	10	10	10

LAPSE EXPERIENCE

We asked companies to provide their actual aggregate lapse experience (both sexes and all underwriting classes combined). Thirteen companies responded to that request. One of the 13 companies provided useable experience for four different products. One of those four products had a 15-year level premium period. All other experience for that company and the other 12 companies was for products with a 10-year level premium period. We were able to augment that experience with experience studies from three other companies and with the results of a calendar-year total termination study that we did on a fourth company.

For the other five companies:

- Three had no experience yet.

- One only had experience for a 7-year level premium period.

- One only provided experience by risk class for some of its risk classes.

Table 13 summarizes the aggregate (male/female, all modes, all risks and other factors combined) lapse experience by amount for products with a 10-year level premium period. In general, results for "All" issue ages also includes experience for issue groups below "35" and above "55." For companies that participated in the full survey and for two of the other four companies for which we

only had lapse experience, only experience for cells with at least 50 lapses is included in Table 13. For the other two companies, we only included lapse rates that were not tagged as having low credibility. Mean lapse rates give equal weight to each experience lapse rate. Some other comments on the experience are:

- In almost every case, the lapse rates for year 10 for 10-year plans increase with issue age. That was also true for the 15-year product.

- For six (6) company/product combinations, the overall (all ages combined) lapse rate for year L+1 was higher than the lapse rate for year L. That difference was more than 40 percentage points in three cases. We were surprised to see experience lapse rates for year (L+1) that were much higher than year L experience lapse rates.

  For eight (8) companies and 10-year level premium products, the lapse rate for year 10 was greater than the year 11 lapse rate. That was also the case for the one 15-year product.

  In the other four (4) cases, we did not receive credible experience for both years 10 and 11.

- We received 10- or 15-year level premium lapse experience (all issue ages combined) supported by at least 50 lapses each for years L, L+1, and L+2 from nine (9) companies. For eight (8) of those companies, lapse rates in both year L and year L+1 were substantially higher than the year L+2 lapse rate. The exception had a very high lapse rate in year L+1 bracketed by much lower lapse rates in years L and L+2.

- In almost all cases, lapse rates by face amount were greater than lapse rates based on policy count. Overall differences appear to be mostly 5 percentage points or less (e.g., 30% by amount and 25% by count). This suggests that lapse rates increase slightly with policy size but since the survey did not request experience by face amount band, we cannot be more specific.

Table 13
Summary of Lapse Experience by Amount for 10-Year Level Premium Plans

Issue Age	Description	L	L+1	L+2	L+3	L+4	L+5	Cumulative Lapse Rates: All Experience L and (L+1)	Cumulative Lapse Rates: All Experience L to (L+2)	Cumulative Lapse Rates: Excluding Low and High Cumulative L and (L+1)	Cumulative Lapse Rates: Excluding Low and High Cumulative L to (L+2)
35	Low	10%	27%	16%	14%	14%	9%	52%	65%	58%	76%
	High	74%	83%	26%	21%	22%	19%	93%	95%	86%	88%
	Median	51%	53%	19%	15%	15%	14%	78%	82%	78%	82%
	Mean	47%	53%	21%	17%	17%	14%	76%	82%	77%	82%
	# of Products	12	10	7	5	3	3	10	7	8	5
45	Low	12%	38%	14%	17%	18%	14%	76%	80%	76%	81%
	High	87%	84%	28%	23%	22%	19%	93%	95%	89%	92%
	Median	63%	64%	25%	21%	20%	17%	86%	88%	86%	88%
	Mean	54%	63%	23%	20%	20%	17%	83%	87%	83%	87%
	# of Products	14	9	6	4	3	3	9	6	7	4
55	Low	18%	53%	22%	10%	14%	15%	83%	87%	86%	91%
	High	88%	93%	31%	21%	19%	20%	97%	93%	94%	91%
	Median	68%	75%	26%	15%	17%	17%	89%	91%	89%	91%
	Mean	60%	74%	26%	15%	17%	17%	90%	90%	90%	91%
	# of Products	14	8	3	2	2	2	8	3	6	1
All	Low	12%	23%	12%	8%	7%	11%	47%	67%	60%	73%
	High	83%	84%	26%	19%	19%	19%	92%	94%	88%	91%
	Median	49%	49%	19%	16%	16%	13%	80%	85%	80%	85%
	Mean	48%	51%	20%	15%	14%	14%	76%	82%	77%	83%
	# of Lapse Rates	18	15	9	6	5	3	14	8	12	6

Seven (7) companies were able to provide some "credible" experience (i.e., experience supported by at least 50 lapses) by sex for a total of nine (9) products, one of which had a 15-year level premium period. Male lapse rates were typically higher than corresponding female lapse rates. The overall (i.e., all issue ages combined) male rate for year L exceeded the corresponding female rate by 1 to 17 percentage points (mean difference = 9 percentage points – e.g., 65% male, 56% female). Table 14 summarizes the differences in overall lapse rates.

Table 14
Summary of Overall Male–Female Lapse Rate Differences
For Eight 10-Year Plans and One 15-Year Plan

							Cumulative	
Description	L	L+1	L+2	L+3	L+4	L+5	L and (L+1)	L to (L+2)
Low	1%	3%	1%	2%	1%	1%	3%	5%
High	17%	15%	15%	2%	9%	4%	14%	9%
Median	11%	9%	4%	2%	4%	3%	8%	8%
Mean	9%	9%	5%	2%	4%	3%	8%	7%
# of Products	8*	7	5	4	4	3	6	4

* Note: One company did not have experience for year L.

Four (4) companies provided experience by premium mode for seven (7) products, including one 15-year plan. With one exception, the year L lapse rate for annual mode was significantly higher than the corresponding monthly mode lapse rate. Where annual mode lapse rates were greater than monthly mode lapse rates, the differences in overall (all issue ages combined) annual vs. monthly lapse rates ranged from 13 to 46 percentage points. The sole exception was a regular monthly lapse rate that was 7 percentage points higher than the annual mode lapse rate. But the electronic funds

transfer monthly lapse rate for the same company was 20 percentage points *lower* than the annual mode lapse rate.

Six (6) companies provided some experience by risk class. In almost all cases, overall experience lapse rates for the better nonsmoker risk classes were higher than lapse rates for standard nonsmokers. Relationships were less clear cut between preferred and standard smokers for the two companies that had experience for those classes. Although these results are interesting and seem reasonable, we did not think we had enough experience to warrant detailed experience summaries.

These experience results suggest that actuaries should consider varying lapse assumptions for years L and later by:

- Issue Age
- Sex
- Risk Class
- Mode

Since the premium rates in years (L+1) and later are quite high, experience by mode should be analyzed to ascertain how many modal premiums are actually paid in each year to avoid mis-estimating profitability. It is also very important to handle grace periods correctly when doing lapse studies–if, for example, no premium is paid in year L+1, then lapse has occurred in year L even if the grace period expired in year L+1.

MORTALITY EXPERIENCE

Only one company had somewhat credible mortality experience for both policy years 1 to L and years (L+1) to (L+5). The ratio of the overall A/E by face amount for years (L+1) to (L+5) to the A/E for years 1 to L was 224%. The ratios by issue age group tended to increase with age. There did not appear to be a pattern in the ratios by year for years (L+1) to (L+5). Expected claims were based on the 2001 VBT, S/NS table.

RELATIONSHIP BETWEEN PREMIUM INCREASES AND LAPSE/MORTALITY LEVELS

As described in more detail below, we looked for correlations in several ways.

- Lapse assumptions vs. premium increases
- Lapse experience vs. premium increases
- Year L lapse assumptions vs. year (L+1) mortality anti-selection assumptions
- Lapse experience vs. mortality anti-selection experience

Lapse Assumptions vs. Premium Increases

For companies that participated in the full survey and assumed a year L lapse rate of less than 100%, we calculated the correlation coefficient for the current product's ratio (R) of the premium in year L+1 to the level premium and:

1. The lapse rate assumption for policy year L; and, alternatively,

2. The cumulative lapse rate assumption for years L and L+1.

Results are shown in Table 15. A "data point" is an issue age, level premium period, company combination.

Table 15
Correlation Coefficients Between Lapse Assumptions And the Current Product's Premium Increases

Level Premium Period	Issue Age	# of Data Points	Correlation Coefficient			
			Best Preferred		Standard	
			Year L Lapse Rate	Cumulative Lapse Rate For Years L and L+1	Year L Lapse Rate	Cumulative Lapse Rate For Years L and L+1
10	35	15	21%	27%	35%	38%
	45	15	15	28	29	40
	55	15	14	24	28	37
	All	***45***	***17%***	***26%***	***29%***	***37%***
15	35	13	7%	23%	6%	19%
	45	13	(13)	7	(15)	4
	55	13	(36)	(9)	(30)	(8)
	All	***39***	***(12)%***	***8%***	***(10)%***	***6%***
20	35	14	34%	29%	33%	27%
	45	14	21	15	21	15
	55	14	16	14	19	18
	All	***42***	***22%***	***19%***	***22%***	***19%***
30	35	11	55%	53%	54%	51%
	45	11	42	39	38	35
	All	***22***	***44%***	***42%***	***40%***	***38%***
All	***All***	***148***	***19%***	***20%***	***18%***	***18%***

Except for the 15-year level premium period, these results indicate the possibility of a weak positive linear correlation between the year L (and cumulative years L and L+1) *assumed* lapse rate and the ratio (R) of the premium in year L+1 to the premium in year L.

The correlations decrease as issue age increases because many companies assume the same lapse rates for all issue ages, while values of R generally increase with issue age.

Lapse Experience vs. Premium Increases

We also examined correlations between experience lapse rates and premium increases for 10-year products with "credible" lapse experience (i.e., at least 50 actual lapses). In this case, we looked at correlations for both year L and cumulative years L and L+1 lapse rates to:

1. The ratio (R) of the in-force product's premium in year L+1 to the level premium

2. The ratio (S) of the *in-force* product's premium in year L+1 to the standard class level premium for a new issue at age x+L on the *current* product

Correlations were calculated:

1. Using all available data (**None** excluded)

2. Excluding data for two companies that seemed to experience the first shock lapse in year (L+1) (**Group A** excluded)

3. Excluding the Group A companies and two other companies with low lapses but values of R in excess of 5 (**Group B** excluded)

Given the small number of data points, (i.e., issue age, level premium period, company combinations) one should not attach a lot of weight to the results shown in Table 16. But having

said that, there does appear to be a positive overall correlation between the magnitude of the first premium increase after the level premium period and experience lapse rates.

Table 16
Correlation Coefficients Between Selected 10-Year And 15-Year Product Lapse Experience for Year L and Both In-Force Product Premium Ratios (R) and the S Ratio (See Tables 5 and 6)

Excluded Companies	Risk Class	# of Data Points	Correlation of Year L Lapse with		# of Data Points	Correlation of Cumulative L and L+1 Lapses with	
			R	S		R	S
None	Best Preferred	21	36%	48%	12	4%	24%
	Standard	32	24%	9%	21	36%	41%
Group A	Best Preferred	18	29%	62%	9	7%	22%
	Standard	26	9%	16%	15	36%	22%
Group B	Best Preferred	12	54%	69%	6	84%	47%
	Standard	20	59%	44%	12	89%	43%

Year L Lapse Assumptions vs. Year (L+1) Mortality Anti-Selection Assumptions

We also calculated correlation coefficients between companies' year L lapse assumptions and their assumed year (L+1) mortality anti-selection multiple to see if higher shock lapses for year L correlated with higher assumed anti-selection.

Table 17 shows results for:

1. All responses
2. All responses except for one company with extremely high anti-selection multiples

Correlations became significantly more positive once the outlier was excluded.

Table 17
Correlation Coefficients Between Year L Lapse Assumptions and Year (L+1) Mortality Anti-Selection Multiples

Companies Included	Level Premium Period	# of Data Points	Correlation
All	10	42	13%
	15	39	(35)%
	20	39	14%
	30	22	62%
All But 1 Outlier	10	36	66%
	15	33	28%
	20	33	74%
	30	22	62%

Lapse Experience vs. Mortality Anti-Selection Experience

Since only one participating company had a material amount of mortality experience, we could not attempt to evaluate the hypothesis that larger premium increases are associated with higher levels of post-level premium period mortality.

REFERENCES

1. BECKER, DAVID N. (and KITSOS, THEODORE J.). September 1984. Pricing for Profitability in ART. *Best's Review.*

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3. DUKES, JEFFERY T. August 2005. Term Mortality and Lapses. *Product Matters!*

4. DUKES, JEFFERY T. and MACDONALD, ANDREW M. 1980. Pricing a Select and Ultimate Annual Renewable Term Plan. *Transactions of the Society of Actuaries* XXXII: 547-565.

5. Valuation Technique Paper #2, "The Valuation of Individual Renewable Term Insurance," Canadian Institute of Actuaries, September 1986

APPENDIX A

THE SURVEY

SOA POST LEVEL PREMIUM "SHOCK LAPSE" EXPERIENCE SURVEY

MAY 2006

QUESTIONS

Please answer as many of the following questions as possible. If you do not know the answer, please respond "Unknown". If you are uncertain about what is requested, please contact Jeff Dukes or Kathy Dziedzic at 312 726 0677.

Questions and requested information relate to fully underwritten, U.S., individual life "Level Premium Term". For purposes of this survey, "Level Premium Term" is term insurance with level premiums for 10, 15, 20 or 30 years followed by annually increasing premium rates.

1. Company Name

2. Distribution Channels

Please provide entries to the following table for each distribution channel through which your company sells material amounts of level premium term (i.e., 10% or more of 2005 face amount sales).

Channel	Percentage of 2005 Level Premium Term Face Amount Sales
Independent Agent	
Managing General Agents	
Captive Agent	
Banks	
Internet	
Other (Describe)	

3. Does Your Company's Pricing or Modeling Horizon Extend beyond the Level Premium Period?

If your answer to the question above is "yes", please indicate in the next table where assumptions for periods beyond the level premium period are used by entering "Yes" or "No". Enter "Unknown" if you do not know and enter "NA" (Not Applicable) if the Application is not applicable (e.g., if your company does not calculate embedded values, enter "NA" for those entries.)

Application	Current Products	In-Force Business No Longer Sold
Pricing		
Cash Flow Testing		
Embedded Values		
Illustrations		
SAP Earnings Projections		
GAAP Reserves & DAC		
GAAP Income Projections		
Other (Describe)		

4. What Factors Drive Post Level Premium Period Assumptions for Current Products?

Please put an "X" or other marker in each cell of the table below that describes a primary factor that impacts the indicated assumption. Factors #4 and 5 refer to relationships between the level premium and the first premium after the level premium period.

To clarify what is meant by a "primary factor", suppose the percentage increase in premium is a primary factor. The fact that the percentage increase will likely vary by gender, length of level premium period and issue age does not make them primary factors unless they independently influence the assumption.

Shock lapses are likely to occur at the end of and for the first years after the level premium period. Shock lapses are the difference between total lapse rates and expected base lapse rates consistent with less dramatic premium increases.

If the factors differ by Application (see #3 above), please provide separate responses for each Application.

Factor #	Factor	Assumption Shock Lapse	Mortality
1	Distribution Channel		
2	Premium Mode		
3	Policy Size (Face Amount Band)		
4	Percentage Increase in Premium		
5	Dollar Increase in Premium		
6	Underwriting Class (e.g., Super-Preferred Non-Tobacco vs. Standard Non-Tobacco)		
7	Issue Age		
8	Gender		
9	Length of Level Premium Period		
10	Duration Since the End of the Level Premium Period		
11	Other (Describe)		

5. Mortality Anti-Selection after the Level Premium Period

a. Do you assume mortality anti-selection after the level premium period?

b. If the response to (a) was "Yes", what methodology is used to determine the level of anti-selection?

Method	Yes, No (or Describe)?
(i) Becker-Kitsos	
(ii) Dukes-MacDonald	
(iii) Other (please describe)	

PREMIUM RATES

Gross Premium Information

Even if your assumptions or experience analysis do not vary based on the relationship between the level premium and the premiums after level premium period, we would like the information requested below.

Premium Rates Should be Per $1,000, Ignoring Policy Fees, for an Annual Mode $250,000 Policy

Male Premium Rates are Requested for Your Best ("Best Preferred") and Worst ("Standard") Non-Smoker Underwriting Classes

Respond "NA" Where Not Applicable (e.g., use NA for the 10-year level premium period if your company does not have a 10-year level premium product)

1. Premium Rates for Current Products

Male--Non-Smoker (or Non-Tobacco)--$250,000--Current Product					
Level Premium Period (L)	**Number of Non-Smoker Classes**	**Underwriting Class**	**Issue Age**	**Premium Rate per $1,000 for:**	
				Level Premium	**Year L+1**
10 Years		Best Preferred	35 45 55		
		Standard	35 45 55		
15 Years		Best Preferred	35 45 55		
		Standard	35 45 55		
20 Years		Best Preferred	35 45 55		
		Standard	35 45 55		
30 Years		Best Preferred	35 45 55		
		Standard	35 45 55		

2. Relationships between Level Premiums for Currently Sold Products and Post-Level Premium Period Premiums for In-Force Policies

The purposes of this request are (a) to provide some idea of the degree to which a policyholder who has become substandard might nevertheless benefit from terminating his/her current policy when it

moves out of the level premium period and then buying a new product at today's rates and (b) obtain some information on the magnitude of the premium increase from year L to year L+1 for in-force business.

Clarifying comments:

(i) For in-force business that is beyond the level premium period, please provide information consistent with the major product reflected in the Shock Lapse Experience worksheet.

(ii) To illustrate, suppose that a 10 year level premium term product was originally issued at age 45 to a male in the Best Preferred Non-Smoker class. Also, suppose that (a) the premium charged for the in-force policy for policy year 11 is $40 per 1,000, (b) the 10-year level premium rate for a Standard Non-Smoker issued today for the same face amount at age 55 is $5 per 1,000 and (c) the level premium that was charged for the in-force policy was $8 per $1,000. Then you would enter 40 in cell G79, 8 in cell F79 and 5 in cell I82.

Male--Non-Smoker (or Non-Tobacco)--$250,000								
Level Premium	**Issue**	**In-Force Plan Number of Non-Smoker**	**In-Force Underwriting**	**Original Issue**	**Current Premium Rate for an In-Force Policy in:**		**Current Plan Number of Non-Smoker**	**Level Premium Rate for Current Product Issued in the Standard Class at Age:**
					Year L	**Year L+1**		
10 Years			Best Preferred	35 45 55				NA NA NA
			Standard	35 45 55				
15 Years			Best Preferred	35 45 55				NA NA NA
			Standard	35 45 55				
20 Years			Best Preferred	35 45 55				NA NA NA
			Standard	35 45 55				
30 Years			Best Preferred	35 45 55				NA NA NA
			Standard	35 45 55				

SHOCK LAPSE ASSUMPTIONS

Pricing Total Lapse Rate Assumptions for Currently Sold Products

This sheet requests your PRICING TOTAL LAPSE RATE assumptions for CURRENT PRODUCTS for policy years where high shock lapses would be expected--generally at the end of the last year (L) of the level premium period and in the first few years (L+1, L+2, etc.) after the level premium period.

1. Verbal Description of the Way Shock Lapse Rate Assumptions are Determined.

If possible, please describe how total lapse rate assumptions are set. An EXAMPLE might be:

Total lapses vary only by the number of years since the end of the level premium period (L=length of the level premium period) and the ratio (R) of the first non-level premium to the level premium (R = GP([x]+L)/GP([x])) in accordance with the following:

R	***Total Lapse Rate for Policy Year:***			
	L	***L+1***	***L+2***	***(L+3)+***
R<=5	*50%*	*30%*	*20%*	*15%*
5<R<=10	*60%*	*40%*	*25%*	*15%*
R>10	*70%*	*50%*	*30%*	*15%*

Description:

2. Pricing Assumptions for Total Lapse Rates for Current Products

Please expand the table below as necessary to illustrate your total lapse assumptions for currently sold products for each primary factor identified in your response to #4 of the Questions sheet. If your company is not currently selling, say, 15 year level premium plans then leave those cells blank.

Primary Factor	Level Premium Period (L)	Issue Age	Total Assumed Lapse Rate for Policy Year:					
			L	L+1	L+2	L+3	L+4	L+5
	10 Years	35 45 55						
	15 Years	35 45 55						
	20 Years	35 45 55						
	30 Years	35 45 55						

MORTALITY ASSUMPTIONS

Pricing Mortality Anti-Selection Multiples after the Level Premium Period for Currently Sold Products

1. Parameters for Mortality Anti-Selection Assumptions

a. Becker-Kitsos

If you use Becker-Kitsos methodology to determine mortality anti-selection multiples, please provide:

(i) The formula used. The two versions of Becker-Kitsos that we have seen are:

(a) qreverter([x+s]+t-1) = f*q([x+s]+t-1) + (1-f)*q([x]+s+t-1), 0<=f<=1

(b) qreverter([x+s]+t-1) = q([x+s]+t-1)*{1+G(t)*R*[(q([x]+s)/q([x+s])) – 1]}

where:

x = original issue age

s = duration at which shock lapse occurs

qreverter([x+s]+t-1) = mortality rate for a shock lapser for policy year t following a shock lapse at duration s.

Values of q() are expected mortality for the indicated issue age and duration assuming no anti-selection.

Mortality rates for persisting policyholders are then solved for assuming conservation of deaths.

(ii) Values for any parameters used in the formula (e.g., f in formula (a) and G(t) and R in formula (b)).

(iii) The base lapse rate(s) used to determine shock lapses. Shock lapse rates are defined as the difference between the total lapse rates and the base lapse rates.

(iv) The underlying mortality table (e.g., 1975-80, 2001 VBT, internal company, etc.)

b. <u>Dukes-MacDonald</u>

If you use Dukes-MacDonald methodology to determine mortality anti-selection multiples, please provide your assumptions for:

(i) The fraction of shock lapses which are assumed to be fully select. Shock lapse rates are defined as the difference between the total lapse rates and the base lapse rates.

(ii) The base lapse rate(s) used to determine shock lapses.

(iii) The underlying mortality table (e.g., 1975-80, 2001 VBT, internal company, etc.)

c. <u>Some Other Method</u>

If you do not use either Becker-Kitsos or Dukes-MacDonald, please describe the methodology and thought process used to set anti-selection assumptions.

<u>Description:</u>

2. Anti-Selection Multiples

The table below assumes that multiples do not vary materially by gender, underwriting class or other factors. If that is not true and there are material differences, please provide additional tables with labels indicating the underwriting class or relevant factor. **Multiples should be 1.0 if there is no anti-selection.**

Level Premium Period (L)	Issue Age	Mortality Anti-Selection Multiples in the Post-Level Premium Period								
		L+1	L+2	L+3	L+4	L+5	L+10	L+15	L+20	L+25
10 Years	35 45 55									
15 Years	35 45 55									
20 Years	35 45 55									
30 Years	35 45 55									

SHOCK LAPSE EXPERIENCE

Total Lapse Experience for In-Force Level Premium Term Business That is beyond the Level Premium Period

Please provide the information requested in the table below, if available.

The table requests experience for both sexes and all underwriting classes combined for each of the indicated combinations of level premium period and issue age. If additional breakdowns are available (e.g., by sex or underwriting class or premium mode), please provide those, as well.

Level Premium Period (L)	Issue Age	Total Lapse Rate Based on Amount					
		L	L+1	L+2	L+3	L+4	L+5
10 Years	35 45 55 All						
15 Years	35 45 55 All						
20 Years	35 45 55 All						

Level Premium Period (L)	Issue Age	Total Lapse Rate Based on Policy Count					
		L	L+1	L+2	L+3	L+4	L+5
10 Years	35 45 55 All						
15 Years	35 45 55 All						
20 Years	35 45 55 All						

Level Premium Period (L)	Issue Age	Number of Policies Lapsing in Policy Year:					
		L	L+1	L+2	L+3	L+4	L+5
10 Years	35 45 55 All						
15 Years	35 45 55 All						
20 Years	35 45 55 All						

Level Premium Period (L)	Issue Age	Face Amount Lapsed in Policy Year:					
		L	L+1	L+2	L+3	L+4	L+5
10 Years	35 45 55 All						
15 Years	35 45 55 All						
20 Years	35 45 55 All						

MORTALITY EXPERIENCE

Mortality Experience for In-Force Level Premium Term Business that is Beyond the Level Premium Period

1. Distributions before and after the Level Premium Period

For business that has moved beyond the level premium period, please provide the information requested in the tables below, where available. The sum of the fractions for a given Level Premium Period (e.g., 10 Years), Issue Age and Policy Year (e.g., L) should be 1.000. For example, if N=3, then the sum of cells D34 to F34 should be 1.0 for Issue Age 45, 10 Year Level Term, Policy Year L.

The number of Non-Smoker classes should be the number when the in-force policies (currently in policy years L and L+1) were issued. We would typically expect a fewer number of non-smoker classes for business written 10 to 15 years ago as compared to currently written business.

Non-smoker underwriting class assignments should be the assignment made at issue in all cases. Assume 1=Best Class and class N is the worst non-smoker class.

If you have experience for longer Level Premium Periods, please provide that, as well.

If there is no in-force still in policy year L for products beyond the level premium period AND you do not have records of what that distribution was when there was in-force still in the level premium period, then please provide distributions for other comparable in-force business in year L.

Male--Non-Smokers												
Level Premium Period (L)	**Number of Non-Smoker Classes (N)**	**Issue Age**	**Policy Year L Fraction of Face Amount in Non-Smoker Class:**					**At the End of Policy Year (L+1) Fraction of Face Amount in Non-Smoker Class:**				
			1	**2**	**3**	**Etc.**	**N**	**1**	**2**	**3**	**Etc.**	**N**
10 Years		35 45 55										
15 Years		35 45 55										

2. Mortality Experience

a. Expected Basis

What is the expected basis for your company's mortality studies?

(i) 1975-80

(ii) 2001 VBT S/NS

(iii) Internal company table

(iv) Other (please describe)

b. Actual/Expected Mortality Experience

For both sexes and all non-smoker classes combined, please provide either:

(i) The A/E's requested in the table below, to the extent they are available; OR

(ii) RATIOS of the A/E's for Years L+1, L+2, etc. to the corresponding A/E for Years 1 to L.

If RATIOS of A/E's are provided, then code columns D and K of the first table as NA or 1.0.

Important Note: All Expected Claims should be calculated assuming no anti-selection.

Level Premium Period (L)	Issue Age	Actual/Expected by Amount for Policy Year(s):							Actual/Expected by Policy Count for Policy Year(s):						
		1 to L	L+1	L+2	L+3	L+4	L+5	*(L+1) to (L+5)*	1 to L	L+1	L+2	L+3	L+4	L+5	*(L+1) to (L+5)*
10 Years	35														
	45														
	55														
	All														
15 Years	35														
	45														
	55														
	All														
20 Years	35														
	45														
	55														
	All														

Level Premium Period (L)	Issue Age	Actual Face Amount of Deaths for Policy Year(s):							Actual Number of Deaths for Policy Year(s):						
		1 to L	L+1	L+2	L+3	L+4	L+5	*(L+1) to (L+5)*	1 to L	L+1	L+2	L+3	L+4	L+5	*(L+1) to (L+5)*
10 Years	35														
	45														
	55														
	All														
15 Years	35														
	45														
	55														
	All														
20 Years	35														
	45														
	55														
	All														

3. Comparison of Post-Level Premium Period Mortality and Gross Premium Rates

If possible, please provide ratios or actual paid premiums and death benefits for in-force business past the level term period.

The objective of this request is to try to get some measure of how profitable (so far) the post-level term business is.

Ratios or actual amounts can be provided in aggregate (total across all policy years L+1 and later) or by each policy year (L+1, L+2, etc.) separately. In addition, post-level term profitability may also be impacted by other factors such as the length of level term period. If so, ratios or actual amounts by product would be helpful. Please clearly describe any information provided.

APPENDIX B

SURVEY PARTICIPANTS

AAA Life Insurance Company

AEGON U.S.A. (Transamerica)

Allstate Life Insurance Company

Ameriprise Financial, Inc.

AmerUs Life Insurance Company

Farmers New World Life Insurance Company

ING US Financial Services

Jackson National Life Insurance Company

Jefferson Pilot Life Insurance Company

Legal and General America (Banner)

Lincoln National Corporation

Ohio National Financial Services

Protective Life Corporation

Prudential Insurance Company

Sammons Financial Group (Midland National Life)

Securian Financial Group

State Farm Life Insurance Company

Thrivent Financial for Lutherans

COMPANIES WITH LAPSE EXPERIENCE ONLY

Chase Insurance

NACOLAH (Sammons Financial Group)

New York Life

Principal Financial Group