

**Report
of the
Society of Actuaries
Mortality Improvement
(Life – Direct)
Survey Subcommittee**

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Introduction

This report presents the results of the Mortality Improvement Survey for direct insurers conducted by the Society of Actuaries (SOA) Committee on Life Insurance Mortality and Underwriting Surveys. The same survey was also sent to all reinsurers and a similar survey was sent to insurers and reinsurers on the pricing of annuities. Separate reports have been completed for these additional surveys.

The survey was conducted in February-March of 2011 and sent to direct companies in the US and Canada. Eighty-one companies completed the survey. Three companies provided separate responses for their Canadian and US operations, for a total of 84 responses (70 US, 14 Canadian).

The intent of the Survey was to examine mortality improvement practices with respect to life insurance pricing in both the US and Canada. A few questions were asked about functions other than pricing. The report compares US and Canadian practices.

The survey included sections on:

- Company Information
- Generational Mortality Improvement - the process of bringing historical mortality experience up to the current era.
- Durational Mortality Improvement - the process of projecting the current era's mortality into the future.
- Mortality Improvement Questions for Companies with Canadian Reporting Requirements

The report also includes the following appendices:

1. Durational Improvement factors Canada
2. Durational Improvement factors US
3. Comparison of Direct Writers and Reinsurers results
4. List of Contributing Companies

The Survey Subcommittee would like to thank all of the companies who participated in the Survey. We also thank those who helped us review this document and offered helpful suggestions and thoughtful comments. Finally, the Survey Subcommittee thanks the Society of Actuaries staff for their help in completing this project, especially Jack Luff and Korrel Rosenberg, without whose help this could not have been completed.

Comments about this report and suggestions for future surveys are welcome and can be addressed to the Committee on Life Insurance Mortality and Underwriting Surveys c/o The Society of Actuaries.

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Caveat and Disclaimer

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Executive Summary

Section I: Company Information

- Eighty-one companies responded. Three provided separate Canadian and US responses, for a total of 84 responses (70 US, 14 Canada).
- Fifty percent of the Canadian and 43% of the US companies had in-force of \$50B or higher.

Section II: Generational Mortality Improvement

- Generational mortality improvement was much more common in Canada (86% versus 44% US).
- Large companies are more likely to use generational mortality improvement.
- For Canadian respondents, the most common reasons for varying generational mortality improvement were tobacco distinction, followed by gender and issue age.
- For US respondents, the most common reasons for varying generational mortality improvement were gender, followed by duration, issue age and product.
- No Canadian companies varied their factors by product, but almost 50% of US respondents did.
- The most common basis used in setting generational mortality assumptions was their own mortality studies, followed by intercompany and population studies.
- The most common method used to create generational mortality improvement factors was a flat percentage by year.
- Respondents indicated the most frequent period of updating their assumptions was “at least yearly.”
- A wide variety of reasons were given by US companies as the reason for not using generational mortality improvement. The leading reasons were mortality tables already factor it in and limited experience or credible data.

Section III: Durational Mortality Improvement

- Seventy-nine percent of Canadian and 50% of US respondents indicated they use durational mortality improvement in life pricing (Similar to generational improvement, large companies are more likely to use than small companies).
- The use of both generational and durational mortality improvement is much higher in Canada than the US (72% versus 33%).
- Sixty-one percent of US companies use durational mortality improvement (all for Canada).
- The products where durational mortality improvement factors are most commonly used are term and UL; however, most companies do not vary durational mortality improvement by product.
- Durational mortality improvement factors varied most frequently by duration,

gender, issue age and tobacco distinction.

- The most common method of calculating the improvement factors was the compounded $(1-F)^n$ approach, where F is the improvement factor and n is the length of improvement.
- The majority (65%) of respondents applied the factors for a number of years only, compared to the entire pricing horizon, with 20 years being the most common. Usually, the duration was the same for all products.
- About 50% of Canadian, but only 33% of US, respondents indicated they used a maximum attained age for durational mortality improvement (usually 90-100).
- Ninety-one percent of respondents indicated they did not use a maximum cumulative improvement.
- All of the respondents indicated they did not set a minimum mortality below which that durational improvements could result.
- In most cases, companies' durational mortality improvement factors are the same between non-tobacco and tobacco, older and younger ages and preferred and standard risks. Only gender was noted as having higher durational mortality improvement for males versus females.
- The majority of respondents indicated applying durational mortality improvement to impaired risks and, generally, the factors were similar to standard risks.
- On average, Canadian respondents assume higher mortality improvement than US respondents.
- The mean durational mortality improvement factors are higher for non-tobacco risks at early durations, grading to close to the same as tobacco risks at later durations.
- For both Canadian and US respondents, the mean durational mortality improvement factors are higher for males than females (and higher for Canada than US).
- Canadian respondents use higher mean durational improvement factors for residual risks than preferred risks while there was no difference by class for US respondents.
- For Canadian respondents, extrapolation from past experience was the most important conceptual justification used to support the application of durational mortality improvement, followed by improvements in medicine, trends to healthier lifestyles and technological advances.
- For US respondents, "improvement in medicine" was number one, followed by extrapolation from past experience, technological advances and trend to healthier lifestyles.
- When asked about factors affecting mortality improvement, the chief negative effects were trends towards obesity, increased prevalence of diabetes and pandemics.
- The most common data sources used to develop durational improvement factors were published data from the insurance industry, own company data and published government data.
- The majority of both Canadian and US respondents indicated using a flat percentage to create durational improvement factors.

- In terms of how often companies update and review their factors, the most common responses were at least annually or no set schedule.
- Approximately 50% of the Canadian, but only 29% of the US, respondents indicated they had validated or reviewed previously developed factors.
- For those Canadian companies answering the question, 30% indicated using mortality improvements in their GAAP valuation, 50% for capital modeling and 78% for planning/forecasting (US numbers: 50%, 59%, 77%).
- For US companies that indicated they did not use duration mortality improvement, there were a variety of answers led by “do not believe appropriate.”

Section IV: Mortality Improvement Questions for Companies with Canadian Reporting Requirements who use Mortality Improvement:

- Ten of the 14 Canadian respondents completed this section.
- Four planned to reflect the maximum rate allowed in the new CIA standards, while six didn't know.
- Five indicated their pricing philosophy would not change, one said it would and four didn't know.
- Three companies expressed concern over the new professional standards.

Mortality Improvement as Applied to the Pricing of Life Insurance Products

Section I: Company Information

1. Please indicate if your company is Canadian or US.

Table 1

Company	#	%
US operating in the US only	64	79%
Canada operating in Canada only	8	10%
US operating in US and Canada	6	7%
Canada operating in Canada and the US	3	4%
Total # of Companies	81	100%

Eighty-one companies completed the survey. Sixty-four companies are US companies operating in the US only, whereas six are US companies with operations in both the US and Canada. Eight Canadian companies operate in Canada only, whereas three Canadian companies operate in both Canada and the US. Three companies provided separate responses for their Canadian and US operations, for a total of 84 respondents – 14 Canadian, 70 US.

Results were analyzed separately for Canada and the US.

2. What is the total face amount of your company's individual life insurance inforce?

Table 2

Inforce (Face)	Canada		US	
	#	%	#	%
\$50 billion and higher	7	50%	27	42%
\$15-49.9 billion	2	14%	17	26%
\$5.5-14.9 billion	3	22%	8	12%
Less than \$5.5 billion	2	14%	13	20%
Total # of Companies	14	100%	65	100%

There were 79 respondents to this question. Fifty percent of the Canadian companies had an individual life inforce greater than \$50 billion. For the US companies, this amount of inforce represented 42% of the respondents.

Section II: Generational Mortality Improvement

Generational mortality improvement describes the process of bringing historical mortality experience up to the current era. For example, if an actuary has an experience study from an observation period ending several years ago, he or she might want to trend that experience to account for any mortality improvement from the observation period to the current projection date. This can be accomplished by: (1) updating the entire underlying mortality table by building a new mortality table which considers generational improvement, or (2) simply applying generational mortality improvement factors to the existing underlying mortality table.

- Does your company currently use generational mortality improvement (either by applying improvement factors to its existing mortality table or producing an up-to-date mortality table which considers generational mortality improvement)?

Table 3

Use Generational Mortality Improvement	Canada		US	
	#	%	#	%
Yes	12	86%	31	44%
No	2	14%	39	56%
Total # of Respondents	14	100%	70	100%

The results showed that the use of generational mortality improvement is more common in Canada (86% of respondents) versus in the US (44%). Larger companies (those with inforce greater than \$15 billion) are more likely to use generational mortality improvement than smaller companies.

- Do your company's generational mortality improvement factors vary by: (Check all that apply)

Table 4

Reasons for Varying Generational Mortality Improvement	Canada		US	
	#	%	#	%
Gender	3	38%	19	76%
Duration	1	13%	13	52%
Issue Age	3	38%	12	48%
Product	0	0%	12	48%
Tobacco Distinction	4	50%	11	40%
Risk Class	1	13%	7	28%
Attained Age	1	13%	6	24%
Face Amount	0	0%	2	8%
Total # of Respondents	8		26	

Of the 12 Canadian respondents who answered yes to using generational mortality improvement, eight responded to this question, whereas 26 of the 31 US respondents provided an answer. For the Canadian respondents, the most common reason for varying generational mortality improvement factors was tobacco distinction (50%), followed by gender and issue age (both at 38%). For the US respondents, the most common reason for varying generational mortality improvement factors was gender (76%), followed by duration (52%), issue age and product (both at 48%). It was noted that whereas approximately half (48%) of the US respondents varied generational mortality improvement factors by product, none of the Canadian respondents did.

5. What basis does your company use for its generational mortality improvement assumption? (Check all that apply)

Table 5

Basis	Canada		US	
	#	%	#	%
Own Company Mortality Studies	7	58%	22	71%
Intercompany Mortality Studies	6	50%	19	61%
Population Mortality Studies	3	25%	15	48%
Other	0	0%	3	10%
Total # of Respondents	12		31	

All of the respondents who indicated using generational mortality improvement answered this question. The most common basis used by companies in setting their generational mortality improvement assumption was their own company mortality studies (58% Canada; 71% US), followed by intercompany and population mortality studies. Larger companies are more likely to use their own company mortality studies in setting their generational mortality improvement assumption, whereas smaller companies rely more on intercompany or population mortality studies.

Other sources provided by the respondents included using actuarial judgment, consultant or reinsurer advice.

6. What methods does your company use to create generational mortality improvement factors? (Check all that apply)

Table 6

Method	Canada		US	
	#	%	#	%
Flat Percentage per Year	9	75%	26	84%
Regression based on Historical Experience	3	25%	8	26%
Other	1	8%	2	6%
Total # of Respondents	12		31	

All of the respondents who indicated using generational mortality improvement responded to this question. A flat percentage per year was the most common response by both the Canadian (75%) and US (84%) respondents.

Other methods used by the respondents included smoothing by Whittaker graduation, using actuarial judgment and basing it on AAA/SOA reports.

7. How often does your company update or review its generational mortality improvement factors and / or the mortality produced by application of such factors?

Table 7

Frequency	Canada		US	
	#	%	#	%
At least annually	5	42%	11	36%
> 1 year, but at least every 3 years	1	8%	6	19%
> 3 years, but at least every 5 years	2	17%	5	16%
Less frequently than every 5 years	0	0%	2	6%
No set schedule	4	33%	7	23%
Total # of Respondents	12	100%	31	100%

The most common frequency indicated by the respondents for updating or reviewing generational mortality improvement factors was at least annually at 42% and 35% for the Canadian and US respondents, respectively. This was followed by no set schedule for both countries respondents (33% for Canada; 23% for US).

8. Why doesn't your company use generational mortality improvement?

Table 8

Reason	Canada		US	
	#	%	#	%
Believes it is not needed	1	50%	10	26%
Does not believe it is appropriate	1	50%	9	23%
Other	0	0%	20	51%
Total # of Respondents	2	100%	39	100%

Both of the Canadian respondents indicated that they either didn't believe generational mortality improvement is appropriate or that it is not needed, whereas only 49% of the US respondents indicated the same.

Respondents were asked to provide reasons why they believed generational mortality improvement is not appropriate and/or not needed. The answers have been summarized in the table below.

Table 9

Reasons	#
Mortality table already factors in experience	8
Limited experience / credibility	7
Method is already conservative	5
Specialized markets do not show generational mortality improvements	3
Simplified issue underwriting	2
Currently not developing new products	1
Illustration system does not handle generational mortality improvement yet – eventually plan to add it.	1
Participating products allow for future mortality improvement to be returned via dividends.	1
Pricing is adequately competitive without adding generational mortality improvement	1
Sales volumes too small to be worth it	1

Section III: Durational Mortality Improvement

Durational mortality improvement describes the process of projecting the current era’s mortality into the future.

As a cohort proceeds in time from policy year to policy year, the mortality rates applicable in each year may be lower than defined by the base mortality table selected for the project. Future lower mortality might be indicated by:

- medical advances in the treatment of diseases,
- application of research into the factors affecting the aging process, and
- trends toward healthier lifestyles.

Durational mortality improvement is a way of keeping the annual mortality rate of a cohort up-to-date by applying future trends or expectations for mortality improvement.

9. Does your company currently use durational mortality improvement in the pricing of life insurance products?

Table 10

Use Durational Mortality Improvement in Pricing	Canada		US	
	#	%	#	%
Yes	11	79%	35	50%
No	3	21%	35	50%
Total # of Respondents	14	100%	70	100%

Seventy-nine percent of Canadian respondents used durational mortality improvement in the pricing of life insurance products, whereas in the US only 50% indicated they used durational mortality improvement. Larger companies are more likely to use durational mortality improvement than smaller companies.

A comparison was made between the use of generational and durational mortality improvement.

Table 11

Use of Mortality Improvement	Canada		US	
	#	%	#	%
No Mortality Improvement Used	0	0%	27	39%
Both Generational and Durational	10	72%	23	33%
Durational Only	1	7%	12	17%
Generational Only	3	21%	8	11%
Total # of Respondents	14	100%	70	100%

Seventy-two percent of Canadian respondents use both generational and durational mortality improvement compared to 33% of US respondents. All Canadian respondents indicated the use of some mortality improvement, whereas in the US, 39% of the respondents do not use any mortality improvement.

10. For which products does your company use durational mortality improvements?
(Check all that apply)

Table 12

Products Used	Canada		US	
	#	%	#	%
Term	11	100%	27	87%
Universal Life	9	82%	27	87%
Joint-Second-to-Die	6	55%	17	55%
Variable Life	1	9%	17	55%
Whole Life	7	64%	13	42%
Joint-First-to-Die	6	55%	3	10%
Funeral Benefits	1	9%	0	0%
Total # of Respondents	11		35	

Term was the most common product in which companies use durational mortality improvements at 100% for the Canadian respondents, and 87% of the US respondents. This was followed by Universal Life at 82% and 87% for Canada and the US, respectively.

11. For those products that your company use durational mortality improvement factors, do these factors vary by product?

Table 13

Factors Vary by Product	Canada		US	
	#	%	#	%
Yes	1	9%	5	15%
No	10	91%	29	85%
Total # of Respondents	11	100%	34	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 34 of the 35 US respondents provided an answer. The majority of both Canadian (91%) and US (85%) respondents indicated that they did not vary durational mortality improvement factors by products.

Those who responded yes to varying their durational mortality improvement factors by products were asked to provide further details. Answers included:

- Guaranteed, simplified, partial and fully underwritten products all behave differently (3)
- ART is excluded
- Factors are different by product type, term versus UL

12. By which of the following do your company's durational mortality improvement factors vary? (Check all that apply)

Table 14

Reasons for Varying Durational Mortality Improvement	Canada		US	
	#	%	#	%
Duration	7	64%	28	82%
Gender	4	36%	22	65%
Issue Age	3	27%	15	44%
Tobacco Distinction	4	36%	11	32%
UW Risk Class	2	18%	3	9%
Attained Age	2	18%	2	6%
Other	2	18%	1	3%
Total # of Respondents	11		34	

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 34 of the 35 US respondents provided an answer. Duration, followed by gender, was the most common reason for varying durational mortality improvement factors.

Other responses included varying the durational mortality improvement factors by calendar year and medical versus non-medical. A comparison was made between the use of generational and durational mortality improvement. Duration and gender were the most common reasons given for varying durational mortality improvement factors for both the Canadian and US respondents as well as for generational mortality improvement factors by the US respondents, whereas duration was not considered as important for varying generational mortality improvement for the Canadian respondents.

13. How are your company's durational mortality improvement factors (F) calculated into future years (n)?

Table 15

Calculation of Durational Mortality Improvement Factors	Canada		US	
	#	%	#	%
Compounded $(1-F)^n$	10	91%	29	85%
Simple $(1-n*F)$	1	9%	3	9%
Table shift	0	0%	1	3%
Targeted longevity improvements over a period of time	0	0%	1	3%
Total # of Respondents	11	100%	34	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 34 of the 35 US respondents provided an answer. Most of the Canadian (91%) and US (85%) respondents used a compounded calculation to determine durational mortality improvement factors into future years.

14. How does your company apply the factors by policy year?

Table 16

How are Factors Applied	Canada		US	
	#	%	#	%
Factors are non-zero for X years, then become zero	9	82%	24	78%
Non-zero factors are used for the entire pricing horizon (or end of level term period)	2	18%	4	13%
Other	0	0%	3	9%
Total # of Respondents	11	100%	31	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 31 of the 35 US respondents provided an answer. The most common response for both the Canadian (82%) and US (78%) respondents was to apply non-zero factors for X years, then zero thereafter.

For those who responded that the factors are non-zero for x years, the most common number of years was 20.

Table 17

Value of X	Canada		US	
	#	%	#	%
10 years	1	11%	4	17%
15 years	0	0%	2	8%
20 years	4	44%	5	20%
21 years	0	0%	1	4%
25 years	1	11%	2	8%
30 years	0	0%	3	13%
Other	1	11%	3	13%
No response provided	2	23%	4	17%
Total # of Respondents	9	100%	24	100%

Other responses included:

- *Until attained age 70*
- *Based on attained age (30-90) with the factors being capped such that $(1-F)^n$ is capped at $n=20$ and remains at that level until attained age 90.*
- *Improvement starts at attained age 45 and no improvement assumed after attained age 90*
- *Level for 5 to 10 years, then grade to zero after 25, varies by age*
- *Non-zero for most attained ages, then grade to zero from attained age 75 to 90*

15. Is there a maximum duration at which your company would apply durational mortality improvement factors?

Table 18

Maximum Duration	Canada		US	
	#	%	#	%
Yes, same for all products	7	64%	22	65%
Yes, varies by products	0	0%	3	9%
No	4	36%	9	26%
Total # of Respondents	11	100%	34	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 34 of the 35 US respondents provided an answer. Approximately two-thirds of both the Canadian and US respondents apply the same maximum duration for all products.

For those who responded that the maximum duration was the same for all products, the most common duration was 20 years.

Table 19

Maximum Duration	Canada		US	
	#	%	#	%
9 years	0	0%	1	5%
10 years	1	14%	2	9%
15 years	0	0%	2	9%
20 years	4	57%	9	41%
21 years	0	0%	1	5%
25 years	2	29%	3	13%
30 years	0	0%	4	18%
Total # of Respondents	7	100%	22	100%

16. Is there a maximum attained age at which your company would apply durational mortality improvement factors?

Table 20

Maximum Attained Age	Canada		US	
	#	%	#	%
Yes, same for all products	6	55%	11	33%
Yes, varies by products	0	0%	1	3%
No	5	45%	21	64%
Total # of Respondents	11	100%	33	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 33 of the 35 US respondents provided an answer. For the Canadian respondents, the split between those using a maximum attained age at which to apply durational mortality improvement factors and not was approximately equal. However, the majority of the US respondents (64%) indicated not having a maximum attained age.

For those who responded that the maximum attained age duration was the same for all products, the most common age was 100 for the Canadian respondents (50%) and 90 for the US respondents (55%).

Table 21

Maximum Attained Age	Canada		US	
	#	%	#	%
Age 70	1	17%	0	0%
Age 85	0	0%	1	9%
Age 89	0	0%	1	9%
Age 90	2	33%	6	55%
Age 99	0	0%	1	9%
Age 100	3	50%	2	18%
Total # of Respondents	6	100%	11	100%

17. Is there a maximum cumulative improvement defined by your company's strategy?
Example: Compounded $(1 - F)^n$ cannot exceed 85%.

Table 22

Maximum Cumulative Improvement	Canada		US	
	#	%	#	%
Yes, same for all products	1	9%	3	9%
Yes, varies by product	0	0%	0	0%
No	10	91%	30	91%
Total # of Respondents	11	100%	33	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 33 of the 35 US respondents provided an answer. For both the Canadian and US respondents, 91% indicated that there was no company defined maximum cumulative improvement.

18. Is there a minimum mortality level below which your company would not allow durational mortality improvement factors to decrease mortality? (e.g., 20% of 1975-80 Basic Table)

All of the respondents who answered this questions (all of the Canadian respondents and 32 of the 35 US respondents) indicated that there wasn't a minimum mortality level.

19. Generally speaking, how are your company's durational mortality improvement factors by risk class?

Table 23

Factor	Canada			US		
	Same	Higher	Lower	Same	Higher	Lower
Preferred vs. Standard Risk	8	0	1	26	1	1
Non-tobacco vs. Tobacco	7	2	0	21	7	1
Older vs. Younger Attained Age	5	1	3	19	3	7
Male vs. Female	6	3	0	10	19	0
Total # of Respondents	9			29 (28 for preferred vs. standard)		

Of the 11 Canadian respondents who answered yes to using durational mortality improvement, nine responded to this question, whereas 29 of the 35 US respondents provided an answer. In most cases, companies' durational mortality improvement factors are the same between non-tobacco and tobacco, older and younger attained ages, and preferred and standard risks. Only sex was noted as having higher durational mortality improvement factors for males versus females among the US respondents. That said, of those that varied results by smoking status, more respondents used a higher assumption for non-tobacco than tobacco and for those that varied results by age, more respondents used a higher assumption for younger than older.

20. Does your company apply durational mortality improvement to impaired risks?

Table 24

Apply Durational Mortality Improvement to Impaired Risks	Canada		US	
	#	%	#	%
Yes	8	73%	26	81%
No	3	27%	6	19%
Total # of Respondents	11	100%	32	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 32 of the 35 US respondents provided an answer. Most of both the Canadian (73%) and US (81%) respondents indicated applying durational mortality improvement to impaired risks.

For those who responded that they applied durational mortality improvement to impaired risks, the factors generally were the same compared to standard risks.

Table 25

Impaired Risk Improvement Factors Compared to Standard	Canada		US	
	#	%	#	%
About the same	7	88%	25	96%
Less than standard	1	12%	1	4%
Greater than standard	0	0%	0	0%
Total # of Respondents	8	100%	26	100%

21. Please provide your company's durational mortality improvement factors for the following gender / issue ages / risk classes.

Respondents were also asked whether their company's durational mortality improvement factors varied by product.

Table 26

Improvement Factors Vary by Product	Canada		US	
	#	%	#	%
Yes	3	11%	21	60%
No	8	79%	14	40%
Total # of Respondents	11	100%	35	100%

All of the respondents who answered yes to using durational mortality improvement responded to this question. Most of the Canadian (79%) respondents indicated that applying durational mortality improvement factors did not vary by product. The US respondents were more evenly split with 60% varying their durational mortality improvement by product compared to 40% that didn't.

For those respondents who indicated that their company's mortality improvement factors varied by product, they were asked to use their highest selling product (by face amount) which uses mortality improvement.

Table 27

Highest Selling Product	Canada		US	
	#	%	#	%
Term	2	66%	10	50%
Universal Life	1	34%	7	35%
Whole Life	0	0%	2	10%
Joint Second to Die	0	0%	1	5%
Total # of Respondents	3	100%	20	100%

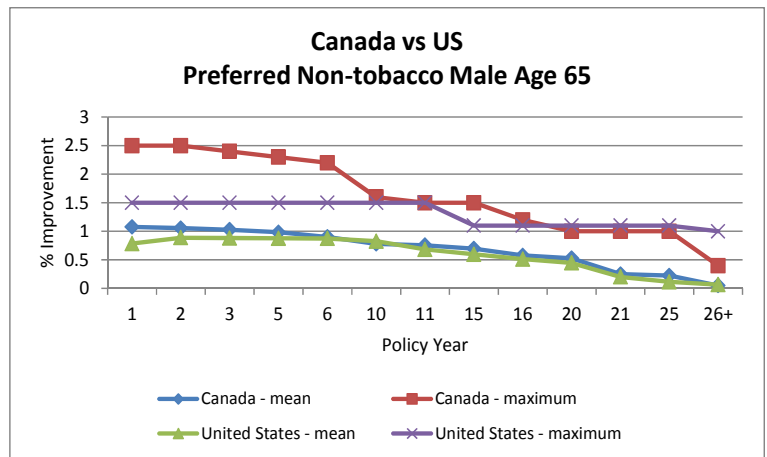
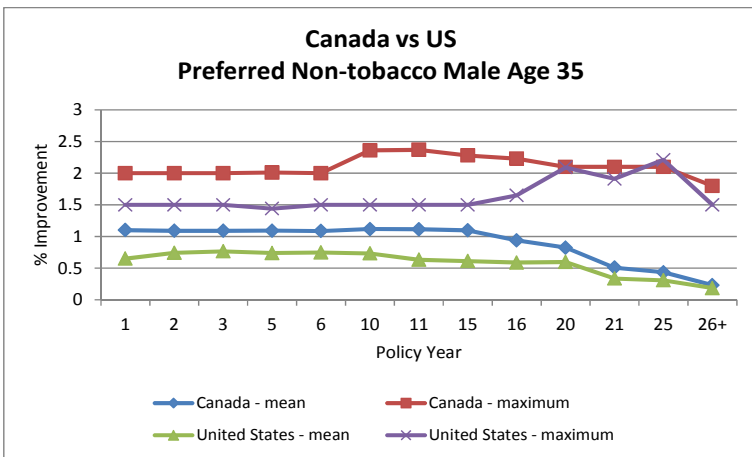
Both the Canadian (66%) and US (47%) respondents indicated that term was their highest selling product that used mortality improvement factors. This was followed by Universal Life at 33% for both the Canadian and US respondents.

Respondents were asked to provide durational mortality improvement factors by age (35 and 65), sex and risk class (preferred and residual). Nine of the 11 Canadian and 29 of the 35 US respondents provided data.

Below are several graphs showing some key comparisons (mean and maximum durational mortality improvement factors). Appendices 1 and 2 contain the data for all of the different groupings (gender / sex / risk class). It should be noted that some of the US respondents indicated negative improvement factors at the later durations.

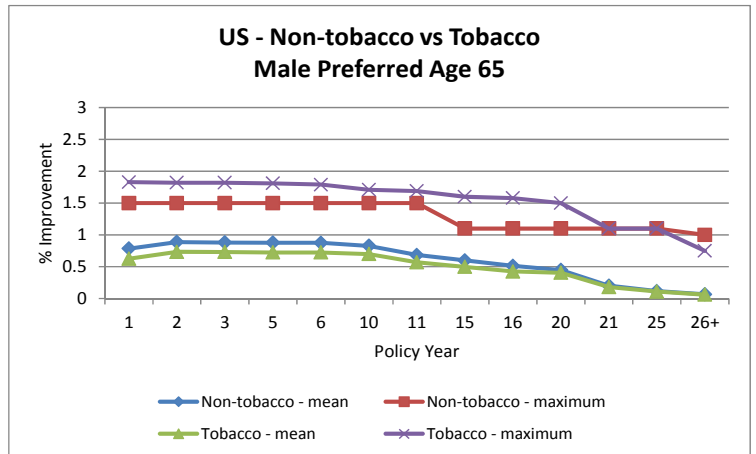
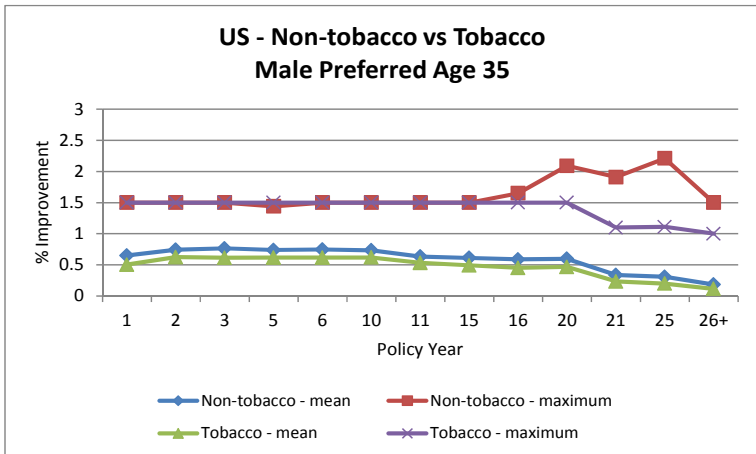
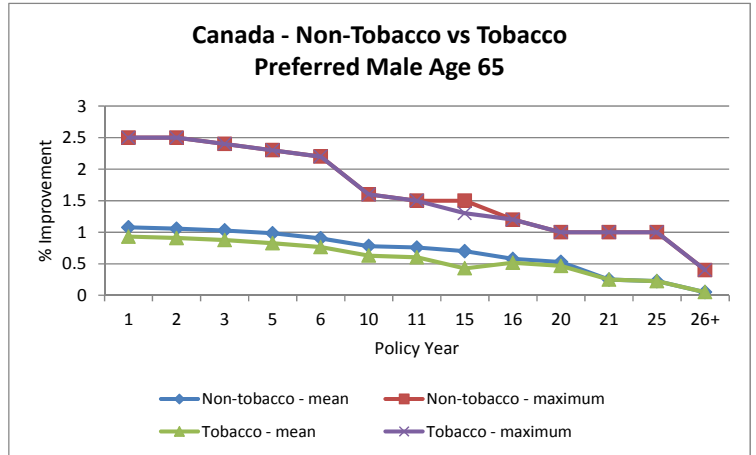
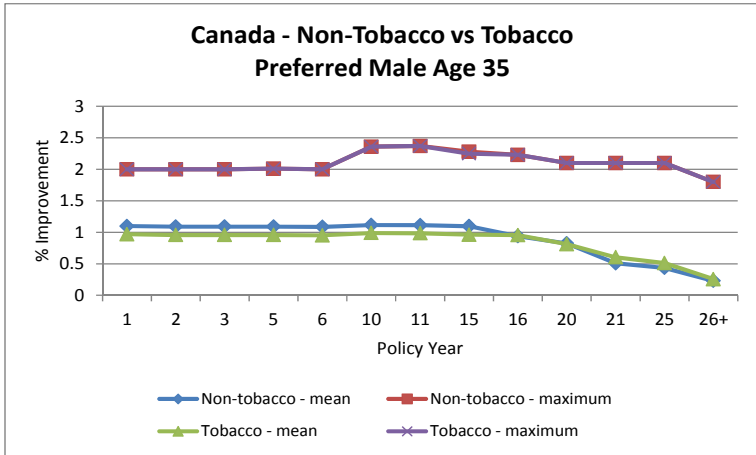
Canada versus US

- On average, Canadian respondent companies assume higher mortality improvement factors than their US counterparts.



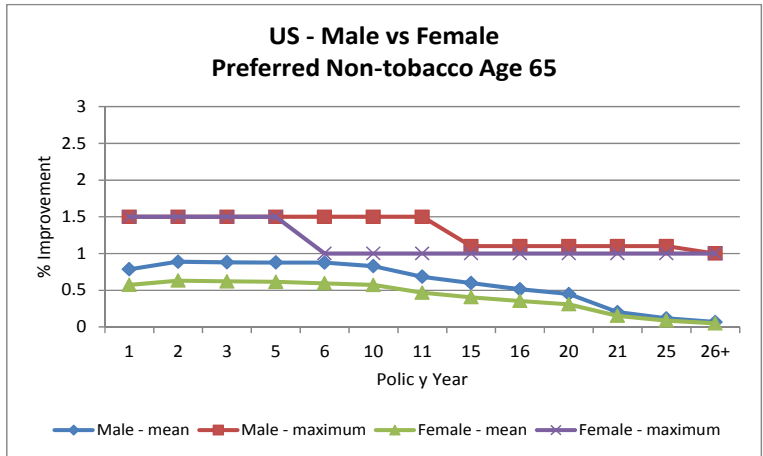
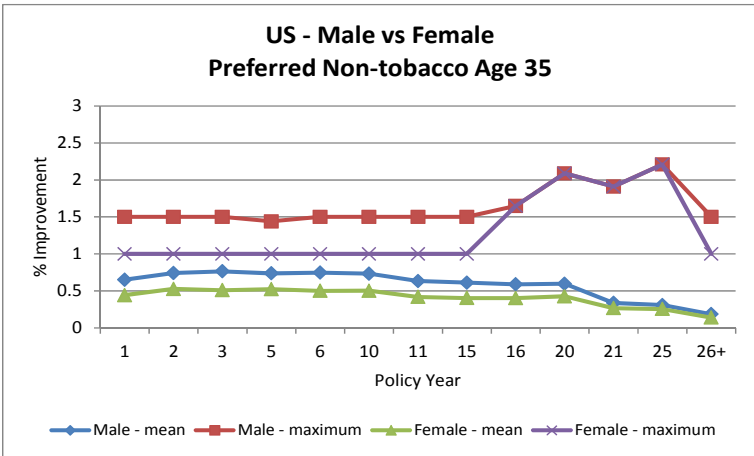
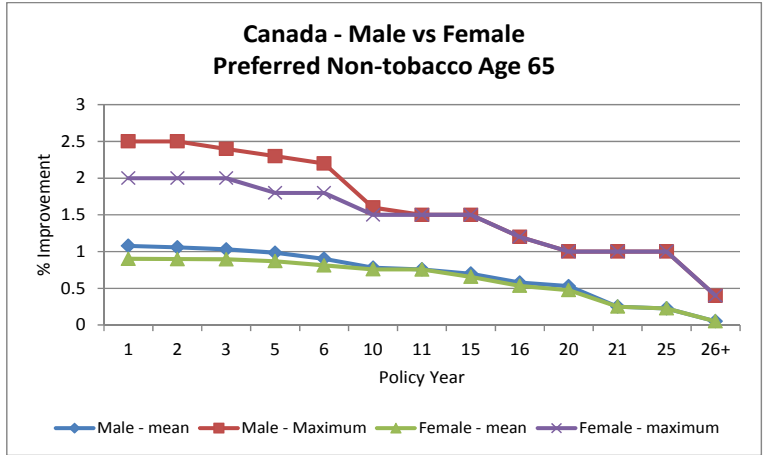
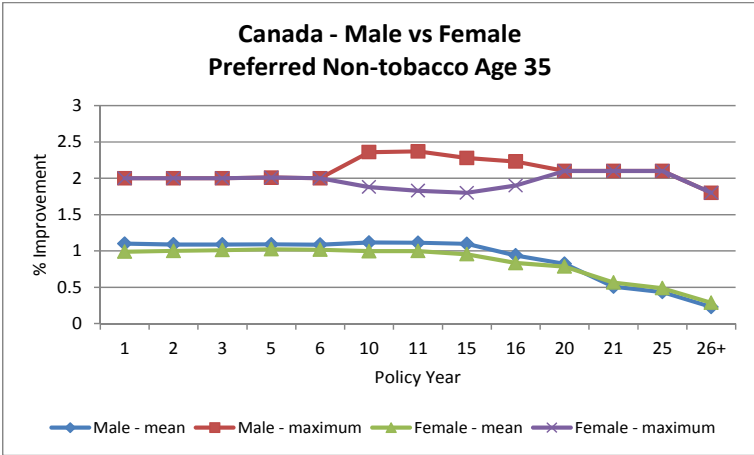
Tobacco versus Non-tobacco

- The maximum durational mortality improvement factors for Canadian respondents are the same for both non-tobacco and tobacco risks, whereas for the US respondents there are higher maximum durational mortality improvement factors for tobacco risks. For both ages 35 and 65, the mean durational mortality improvement factors are higher for non-tobacco risks at the early durations grading to close to the tobacco risks at the later durations.



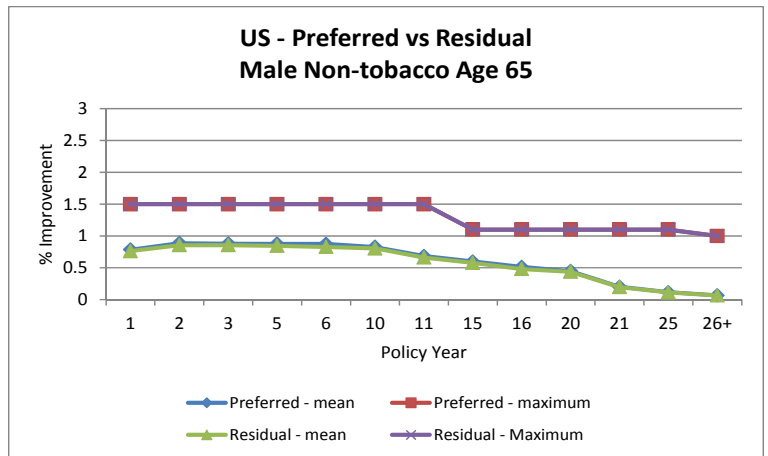
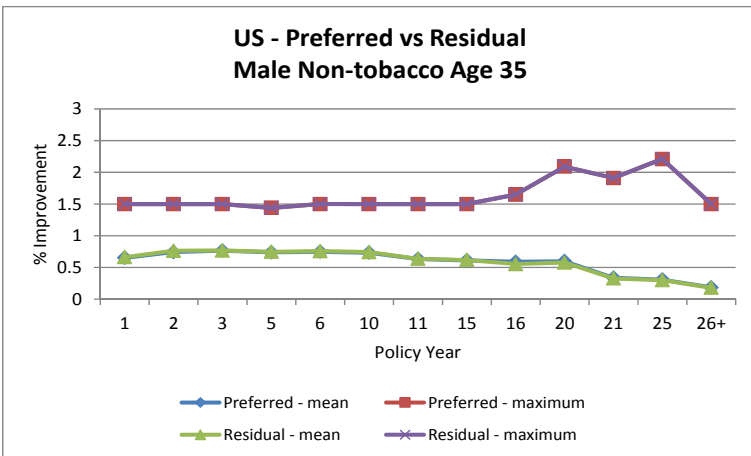
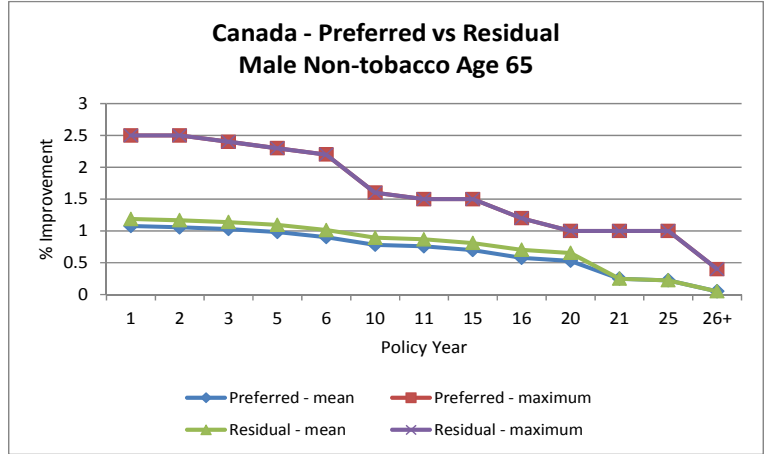
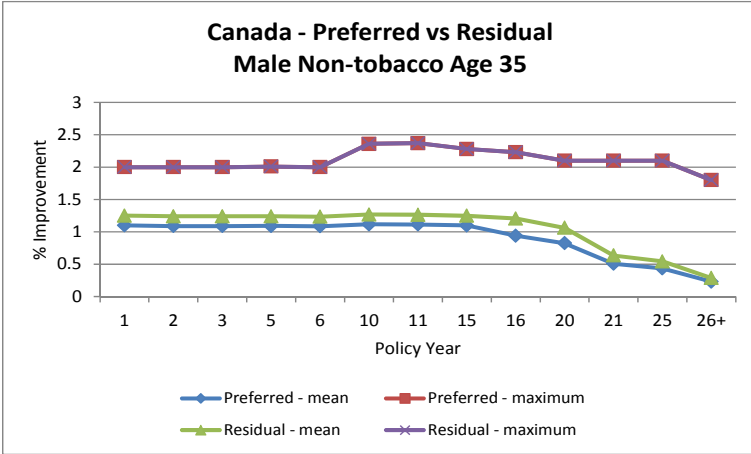
Male versus Female

- Canadian respondents assume higher durational mortality improvement factors for both males and females, ages 35 and 65, than US respondents.
- For both Canadian and US respondents, ages 35 and 65, the mean durational mortality improvement factors are higher for males than females at the early durations.



Preferred versus Residual

- For both the Canadian and US respondents, ages 35 and 65, the maximum durational improvement factors are the same for both preferred and residual risks.
- The mean durational improvement factors for Canadian respondents are higher for residual risks than preferred, whereas for the US respondents, the factors do not vary by risk class.



22. What conceptual justifications does your company use to support the application of durational mortality improvement? (Please rank your top 3 justifications)

Chart 1

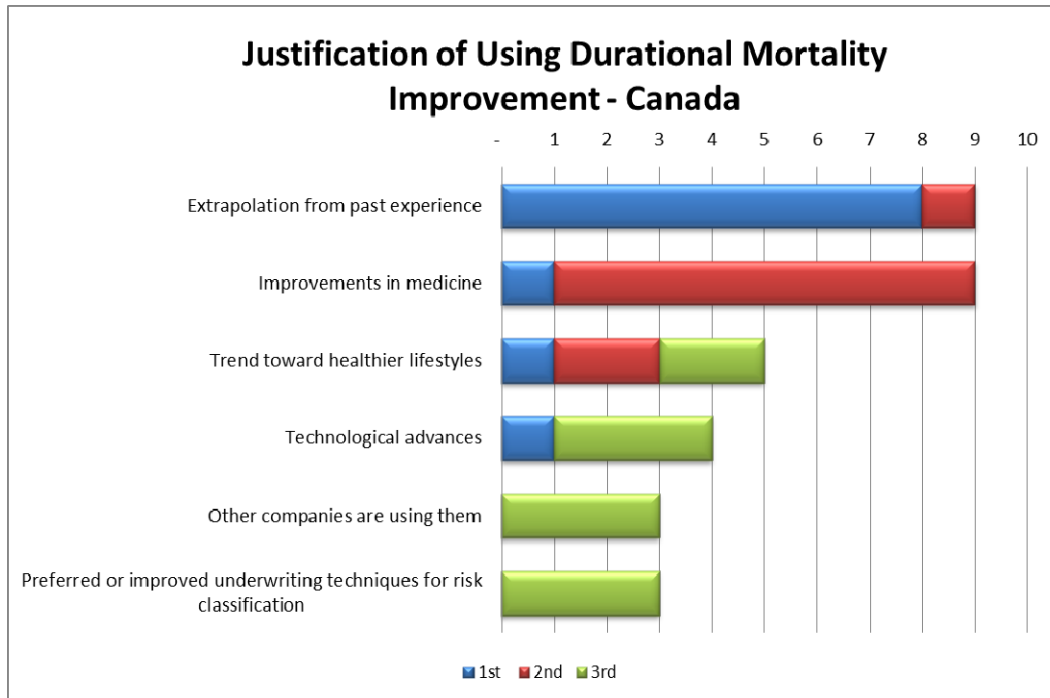


Table 28

Justification	Canada		
	1 st	2 nd	3 rd
Extrapolation from past experience	8	1	0
Improvements in medicine	1	8	0
Trend toward healthier lifestyles	1	2	2
Technological advances	1	0	3
Other companies are using them	0	0	3
Preferred or improved underwriting techniques for risk classification	0	0	3
Total # of Respondents	11		

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question. Extrapolation from past experience was the most important conceptual justification used by companies to support the application of durational mortality improvement followed by improvements in medicine, trend toward healthier lifestyles and technological advances.

Chart 2

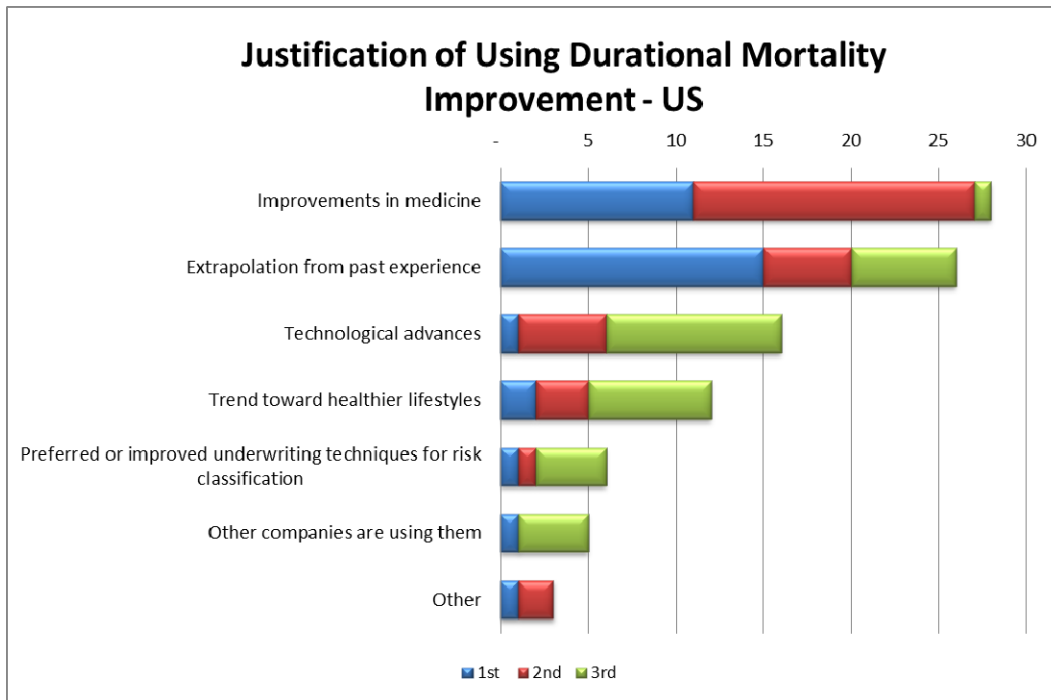


Table 29

Justification	US		
	1 st	2 nd	3 rd
Extrapolation from past experience	15	5	6
Improvements in medicine	11	17	1
Trend toward healthier lifestyles	2	3	7
Technological advances	1	5	10
Preferred or improved underwriting techniques for risk classification	1	1	4
Other companies are using them	1	-	4
Other	1	1	-
Total # of Respondents	32		

Of the 35 US respondents who answered yes to using durational mortality improvement, 32 responded to this question. Improvements in medicine was the most important conceptual justification used by companies to support the application of durational mortality improvement, followed by extrapolation from past experience, technological advances and trend toward healthier lifestyles.

Other responses included:

- *Improvement in industry experience*
- *Underwriting*

23. Please rank the top 3 factors that your company believes may affect mortality improvement negatively from most important to least important.

Chart 3

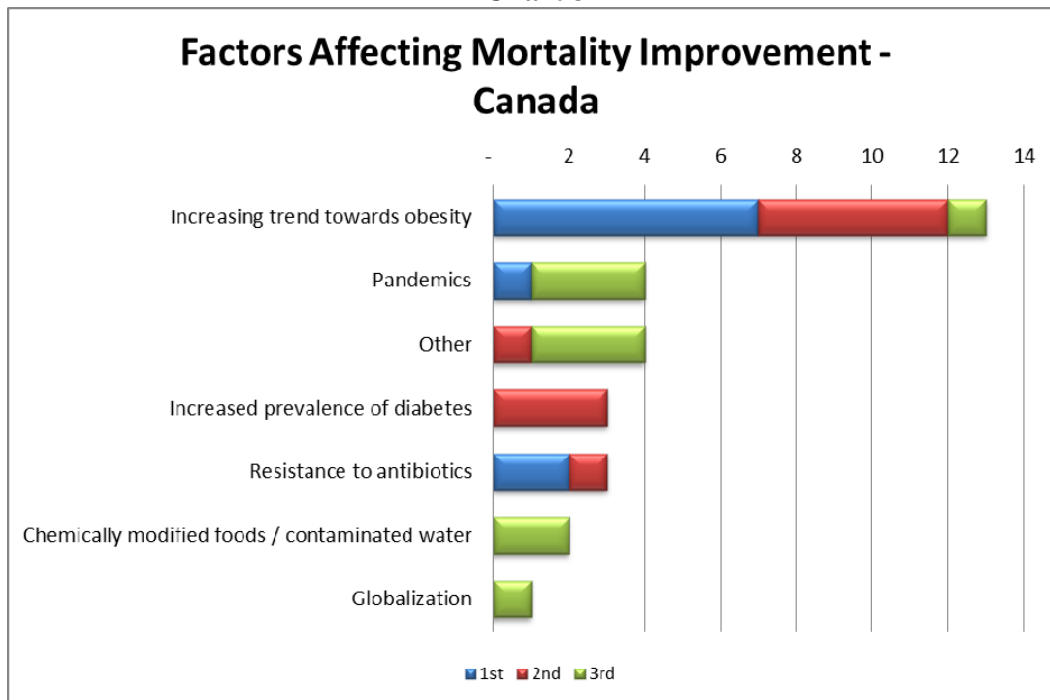


Table 30

Justification	Canada		
	1 st	2 nd	3 rd
Increasing trend towards obesity	7	5	1
Pandemics	1	0	3
Increasing prevalence of diabetes	0	3	0
Resistance to antibiotics	2	1	0
Chemically modified foods / contaminated water	0	0	2
Globalization	0	0	1
Other	0	1	3
Total # of Respondents	10		

Of the 11 Canadian respondents who answered yes to using durational mortality improvement, ten responded to this question. The increasing trend towards obesity was the top factor that may affect mortality improvement negatively. This was followed by pandemics.

Other responses included:

- *Pollution*
- *Return to steady state mortality*

Chart 4

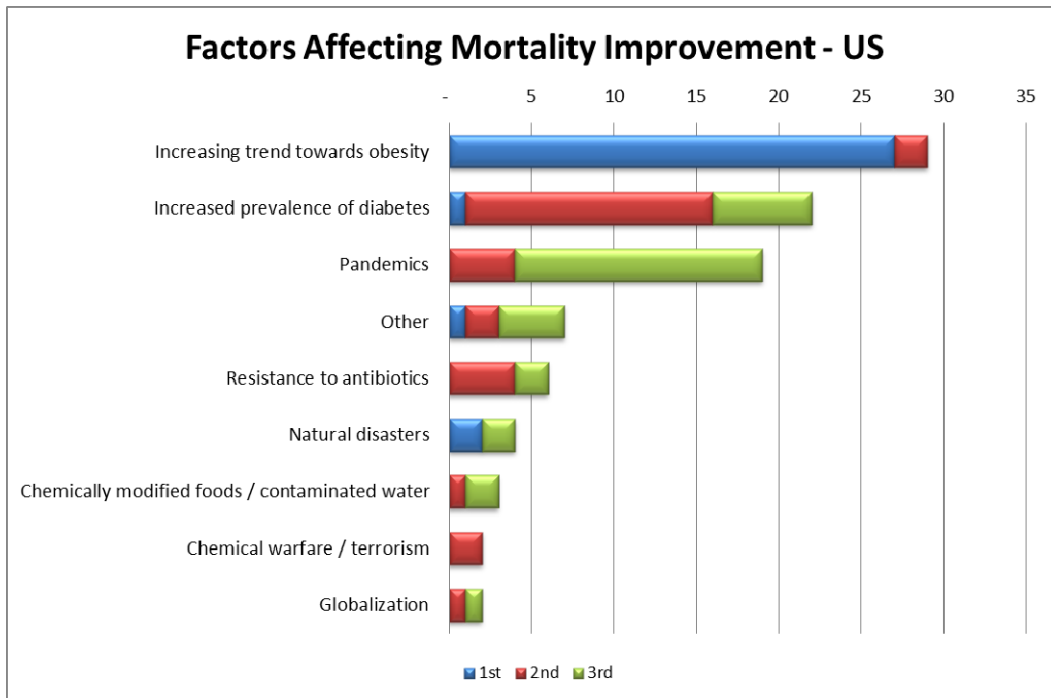


Table 31

Justification	US		
	1 st	2 nd	3 rd
Increasing trend towards obesity	27	2	0
Increased prevalence of diabetes	1	15	6
Pandemics	0	4	15
Resistance to antibiotics	0	4	2
Natural disasters	2	0	2
Chemically modified foods / contaminated water	0	1	2
Chemical warfare / terrorism	0	2	0
Globalization	0	1	1
Other	1	2	4
Total # of Respondents	31		

Of the 35 US respondents who answered yes to using durational mortality improvement, 31 responded to this question. One respondent noted two justifications as third most important. The increasing trend towards obesity was the top factor that may affect mortality improvement negatively. This was followed by the increased prevalence of diabetes and pandemics.

Other responses included:

- *Underwriting*
- *Misuse of prescription drugs*
- *Constraints on societal resources*

24. In developing durational mortality improvement factors or adjustments from available data sources and resources, which of the following does your company use? (Check all that apply)

Table 32

Data Sources	Canada		US	
	#	%	#	%
Published data from insurance industry	8	73%	24	75%
Published data from government	4	36%	18	56%
My company	6	55%	17	53%
Reinsurance	2	18%	17	53%
Consultant	1	9%	13	41%
Best Guess	2	18%	8	25%
Other	2	18%	1	3%
Total # of Respondents	11		32	

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas only 32 of the 35 US respondents provided an answer. Published data from the insurance industry was the most common response by both the Canadian (73%) and US (75%) respondents. This was followed by my company data and published government data.

25. What methods does your company use to create durational mortality improvement factors? (Check all that apply)

Table 33

Methods Used	Canada		US	
	#	%	#	%
Flat Percentage	8	80%	25	78%
Determined by outside source	0	0%	7	22%
Regression based on historical experience	3	30%	6	19%
Targeted longevity improvements by attained age over a period of years	1	10%	2	6%
Total # of Respondents	10		32	

Of the 11 Canadian respondents who answered yes to using durational mortality improvement, ten responded to this question, whereas 32 of the 35 US respondents provided an answer. Most of both the Canadian (80%) and US (78%) respondents indicated using a flat percentage to create durational mortality improvement factors.

26. How often does your company update or review its durational mortality improvement factors and / or the mortality produced by application of such factors?

Table 34

Frequency of Update/Review	Canada		US	
	#	%	#	%
At least annually	4	37%	8	23%
>1 year, but at least every 3 years	3	27%	6	18%
>3 years, but at least every 5 years	2	18%	6	18%
Less frequently than every 5 years	0	0%	2	6%
No set schedule	2	18%	12	35%
Total # of Respondents	11	100%	34	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 34 of the 35 US respondents provided an answer. Thirty-six percent of the Canadian respondents indicated that their company updated or reviewed its durational mortality factors and/or the mortality produced by the application of such factors at least annually; 27% more indicated reviewing every one to three years. This varied from the US respondents where 35% indicated that there was no set schedule to review the durational mortality improvement factors and 24% indicated a review at least annually.

27. Has your company validated or reviewed previous durational mortality improvement factors to see if the anticipated results have been realized?

Table 35

Validated/Reviewed	Canada		US	
	#	%	#	%
Yes	5	45%	10	29%
No	6	55%	24	71%
Total # of Respondents	11	100%	34	100%

All of the Canadian respondents who answered yes to using durational mortality improvement responded to this question, whereas 34 of the 35 US respondents provided an answer. Almost half (45%) of Canadian respondents have validated or reviewed previous durational mortality improvement factors as compared to 29% of US respondents.

28. Respondents were asked to indicate the results of their company’s most recent mortality validation exercise.

There were insufficient responses provided to assess the results of companies’ validation exercises.

29. If the previous assumptions have not been realized, what action has your company taken (or is it planning to take)?

There were insufficient responses provided to assess the actions taken.

30. In addition to pricing, does your company also apply durational mortality improvement for the following applications? If yes, indicate whether the improvement rates are the same, higher or lower, than those used in pricing and comment as required.

Table 36

Application	Canada					Total # of Respondents
	Yes - Same	Yes - Higher	Yes-Lower	No	N/A	
Planning/Forecasting	6	0	1	2	0	9
Capital Modeling	4	0	0	2	2	8
GAAP Valuation	1	1	1	6	1	10

For the Canadian respondents, 78% indicated using durational mortality improvements for planning/forecasting, 50% for capital modeling and 30% for GAAP valuation.

A comment provided by one of the respondents was “*Valuation and capital requirements on mortality improvement are defined by Canadian regulations (MCCSR and Standards of Practice).*”

Table 37

Application	US					Total # of Respondents
	Yes - Same	Yes - Higher	Yes-Lower	No	N/A	
Planning/Forecasting	21	1	1	7	0	30
Capital Modeling	16	1	0	11	1	29
GAAP Valuation	15	1	0	14	2	32

For the US respondents, 77% indicated using durational mortality improvements for planning/forecasting, 59% for capital modeling and 50% for GAAP valuation.

Comments provided by the respondents included:

- *GAAP - Benefit Reserves & DAC use the same improvement rates as pricing. There is also a 5% mortality PAD.*
- *GAAP valuation typically uses assumptions consistent with pricing at the time the business was sold which may vary somewhat from current pricing assumptions.*
- *In general, for products which have been introduced relatively recently, mortality improvement is applied for the applications above to the same extent that it is applied in the original pricing of the product. The application of mortality improvement for older blocks of business varies by block and application.*
- *Initial factor is higher with mortality improvement applied for fewer years.*
- *Recently finished a mortality improvement study. New improvement factors will be in place going forward for GAAP, Capital Modeling and Planning.*

31. Are there any other issues regarding the use of mortality improvement in life insurance pricing you would have liked to have seen covered in this survey?

Responses included:

- *If mortality improvement is used, what challenges arise in the IA Test, and how are they met or overcome? / 2) For companies that give back mortality improvement through COI repricing on inforce blocks of business, how is the original mortality improvement accounted for?*
- *Degree of conservatism used in selection of mortality improvement factors, and whether any offsets across products are taken into account in deciding the degree of conservatism required.*
- *Global differences: Variations by Regions/Countries - mature markets versus less socioeconomic developed.*
- *Hard to interpret mortality improvement rates without reference to a base table. Is the assumption that the base table is "up to date" for all companies?*
- *How do(es) mortality improvement vary: / -between medically underwritten versus non-medical business / -face amount.*
- *It would be interesting to see other companies' responses regarding mortality disimprovement factors, ie degradation of mortality experience due to lapses, shock lapses, etc. / / It would also be interesting to see if other companies are using stochastic mortality improvement factors and what assumptions they might be using for volatility, etc.*

- *More exploration of whether companies uses statistical models (& what types) including stochastic components to derive improvement rates.*
- *Would be interesting to get people's views on whether they thought improvement would continue or not. It will be interested to see reasons people think it will or won't continue, but which do they think will "win" long term.*

32. Why doesn't your company use durational mortality improvement? (Check all that apply)

Table 38

Reason	Canada		US	
	#	%	#	%
Does not believe appropriate	1	100%	15	44%
Creates problems with illustrations	0	0%	10	29%
Creates problems with NAIC XXX	0	0%	9	27%
Does not believe needed	0	0%	9	27%
Other	0	0%	10	29%
Total # of Respondents	1		34	

The one Canadian respondent who answered responded they did not believe it was appropriate to use durational mortality improvement. The top reason given by the US respondents was also that they did not believe it was appropriate to use durational mortality improvement.

Other reasons provided by the respondents included:

- Not yet decided (2)
- Low credibility
- Short duration product
- Prefer conservatism
- Aging impact offsets durational mortality improvement

Section IV: Mortality Improvement Questions for Companies with Canadian Reporting Requirements who use Mortality Improvement

The Canadian Institute of Actuaries is proposing modifying the valuation standard to allow for limited mortality improvement for life insurance liabilities and modify the existing projection scale for annuities.

Of the 14 companies who operate in Canada, ten responded to these questions.

33. Does your company plan to reflect the maximum rates allowed in its life insurance valuation?

Table 39

Reflect Maximum Rates in Valuation	#
Yes	4
No	0
Don't Know	6
Total # of Respondents	10

Four of the ten respondents plan on reflecting the maximum rates allowed in its life insurance valuation, whereas six responded that they didn't yet know.

34. Will your company's pricing philosophy and practice change as a result of the new standard?

Table 40

Will Pricing Philosophy and Practice Change	#
Yes	1
No	5
Don't Know	4
Total # of Respondents	10

Half of the respondents indicated their company's pricing philosophy and practice will not change as a result of the new standard. Only one respondent indicated that their company's pricing philosophy and practice would change. However, they noted that they still needed to determine to what extent this would be reflected in the prices.

35. Please identify any concerns from either a valuation or pricing perspective resulting from the proposed professional changes.

Concerns noted by the respondents included:

- *Potential disconnect between pricing & valuation*
- *Not enough insured data by: tobacco and gender*
- *CLIFR (Committee of Life Insurance Financial Reporting) intends to nullify the new rules by raising capital requirements which will hurt Canadian companies operating outside of Canada.*

Appendix 1 – Canada – Improvement Factors

Preferred Non-Tobacco Male 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.10	1.09	1.09	1.09	1.09	1.12	1.11	1.10	0.94	0.82	0.51	0.445	0.23
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.75	1.00	1.00	1.00
Mode	2.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	2.36	2.37	2.28	2.23	2.10	2.10	2.10	1.80
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
75th Percentile	1.88	1.80	1.80	1.80	1.80	1.73	1.70	1.58	1.42	1.18	0.97	0.54	0.00

Preferred Non Tobacco Male Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.08	1.06	1.03	0.98	0.90	0.78	0.76	0.70	0.58	0.53	0.25	0.23	0.05
Median	1.00	1.00	1.00	1.00	1.00	0.93	0.82	0.50	0.50	0.50	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.50	2.50	2.40	2.30	2.20	1.60	1.50	1.50	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.32	0.17	0.00	0.00	0.00
75th Percentile	1.50	1.50	1.50	1.50	1.42	1.00	1.00	1.00	1.00	1.00	0.25	0.20	0.00

Residual Non Tobacco Male Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.25	1.24	1.24	1.24	1.23	1.27	1.26	1.25	1.21	1.06	0.64	0.54	0.29
Median	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.13	1.12	0.25	0.25	0.00
Mode	2.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
Minimum	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	2.36	2.37	2.28	2.23	2.10	2.10	2.10	1.80
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
75th Percentile	2.00	1.90	1.90	1.90	1.90	1.80	1.76	1.60	1.70	1.29	1.18	0.71	0.13

Residual Non Tobacco Male Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.19	1.17	1.14	1.09	1.01	0.89	0.87	0.81	0.70	0.65	0.25	0.23	0.05
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.75	0.00	0.00	0.00
Mode	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00
Minimum	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.50	2.50	2.40	2.30	2.20	1.60	1.50	1.50	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.48	0.43	0.00	0.00	0.00
75th Percentile	1.50	1.50	1.50	1.50	1.42	1.00	1.00	1.00	1.00	1.00	0.25	0.20	0.00

Preferred Non Tobacco Female Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.99	1.00	1.01	1.02	1.02	1.00	1.00	0.96	0.84	0.79	0.57	0.49	0.29
Median	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.55	0.55	0.25	0.05	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	1.88	1.83	1.80	1.90	2.10	2.10	2.10	1.80
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
75th Percentile	1.50	1.50	1.50	1.60	1.60	1.70	1.76	1.60	1.23	0.86	0.77	0.68	0.13

Preferred Non Tobacco Female Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.90	0.90	0.89	0.87	0.81	0.76	0.76	0.66	0.53	0.48	0.25	0.23	0.05
Median	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.50	0.50	0.50	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	1.80	1.80	1.50	1.50	1.50	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.35	0.15	0.00	0.00	0.00
75th Percentile	1.50	1.48	1.45	1.42	1.40	1.32	1.30	1.00	0.70	0.70	0.25	0.20	0.00

Residual Non Tobacco Female Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.13	1.14	1.15	1.16	1.16	1.14	1.14	1.09	0.99	0.94	0.57	0.49	0.29
Median	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	0.86	0.64	0.25	0.05	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
Minimum	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	1.88	1.83	1.80	1.90	2.10	2.10	2.10	1.80
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00
75th Percentile	1.50	1.50	1.50	1.60	1.60	1.70	1.76	1.60	1.33	1.29	0.77	0.68	0.13

Residual Non Tobacco Female Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.01	1.01	1.01	0.98	0.92	0.87	0.87	0.77	0.66	0.60	0.25	0.23	0.05
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.60	0.55	0.55	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	1.00	1.00	1.00	0.50	1.00	1.00	0.00	0.00	0.00
Minimum	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	1.80	1.80	1.50	1.50	1.50	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.43	0.00	0.00	0.00
75th Percentile	1.50	1.48	1.45	1.42	1.40	1.32	1.30	1.00	1.00	1.00	0.25	0.20	0.00

Preferred Tobacco Male Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.97	0.96	0.96	0.96	0.95	0.99	0.99	0.96	0.96	0.81	0.60	0.51	0.26
Median	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.13	0.13	0.00
Mode	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.01	2.00	2.36	2.37	2.25	2.23	2.10	2.10	2.10	1.80	2.00	2.01
25th Percentile	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.00	0.00	0.00	0.13	0.13
75th Percentile	1.95	1.95	1.93	1.90	1.88	1.85	1.83	1.32	1.24	0.88	0.13	1.95	1.95

Preferred Tobacco Male Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.93	0.91	0.88	0.83	0.77	0.63	0.60	0.54	0.52	0.47	0.25	0.23	0.05
Median	0.75	0.75	0.75	0.75	0.75	0.72	0.66	0.50	0.46	0.37	0.00	0.00	0.00
Mode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.50	2.50	2.40	2.30	2.20	1.60	1.50	1.00	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.13	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.60	1.51	1.43	1.28	1.21	1.00	1.00	0.87	1.00	1.00	0.50	0.40	0.00

Residual Tobacco Male Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	1.05	1.03	1.03	1.04	1.03	1.07	1.06	1.04	1.03	0.89	0.60	0.51	0.26
Median	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.13	0.13	0.00
Mode	2.00	2.00	2.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	2.36	2.37	2.28	2.23	2.10	2.10	2.10	1.80
25th Percentile	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.00	0.00	0.00
75th Percentile	2.00	1.95	1.95	1.95	1.93	1.90	1.88	1.85	1.83	1.32	1.24	0.88	0.13

Residual Tobacco Male Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.99	0.97	0.94	0.89	0.83	0.69	0.67	0.60	0.58	0.53	0.25	0.23	0.05
Median	0.75	0.75	0.75	0.75	0.75	0.72	0.66	0.50	0.50	0.50	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.50	2.50	2.40	2.30	2.20	1.60	1.50	1.30	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.38	0.38	0.38	0.38	0.25	0.25	0.25	0.25	0.21	0.12	0.00	0.00	0.00
75th Percentile	1.60	1.51	1.43	1.28	1.21	1.00	1.00	1.00	1.00	1.00	0.50	0.40	0.00

Preferred Tobacco Female Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.83	0.84	0.86	0.87	0.86	0.84	0.84	0.79	0.74	0.69	0.54	0.46	0.26
Median	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.13	0.05	0.00
Mode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	1.88	1.83	1.80	1.90	2.10	2.10	2.10	1.80
25th Percentile	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.00	0.00	0.00
75th Percentile	1.65	1.70	1.75	1.80	1.78	1.75	1.78	1.60	1.34	1.04	0.97	0.73	0.13

Preferred Tobacco Female Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.73	0.73	0.73	0.70	0.66	0.60	0.60	0.49	0.47	0.42	0.25	0.23	0.05
Median	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.51	0.48	0.39	0.00	0.00	0.00
Mode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	1.80	1.80	1.40	1.40	1.30	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.13	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.25	1.24	1.23	1.21	1.20	1.16	1.15	0.80	0.80	0.80	0.50	0.40	0.00

Residual Tobacco Female Age 35

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.83	0.84	0.76	0.87	0.86	0.84	0.84	0.79	0.74	0.69	0.54	0.46	0.26
Median	0.55	0.55	0.50	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.13	0.05	0.00
Mode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.01	2.00	1.88	1.83	1.80	1.90	2.10	2.10	2.10	1.80
25th Percentile	0.13	0.13	0.06	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.00	0.00	0.00
75th Percentile	1.65	1.70	1.65	1.80	1.78	1.75	1.78	1.60	1.34	1.04	0.97	0.73	0.13

Residual Tobacco Female Age 65

	Canada												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.73	0.73	0.73	0.70	0.66	0.60	0.60	0.49	0.47	0.42	0.25	0.23	0.05
Median	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.51	0.48	0.39	0.00	0.00	0.00
Mode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	1.80	1.80	1.40	1.40	1.30	1.20	1.00	1.00	1.00	0.40
25th Percentile	0.13	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.25	1.24	1.23	1.21	1.20	1.16	1.15	0.80	0.80	0.80	0.50	0.40	0.00

Appendix 2 – United States – Improvement Factors

Preferred Non-Tobacco Male 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.65	0.74	0.76	0.74	0.75	0.73	0.63	0.61	0.59	0.60	0.34	0.31	0.18
Median	0.75	1.00	1.00	1.00	1.00	0.80	0.64	0.50	0.50	0.50	0.00	0.00	0.00
Mode	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.29
Maximum	1.50	1.50	1.50	1.44	1.50	1.50	1.50	1.50	1.65	2.09	1.91	2.21	1.50
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.25	0.20	0.00	0.00	0.00	0.00
75th Percentile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.05

Preferred Non Tobacco Male Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.78	0.89	0.88	0.88	0.88	0.83	0.68	0.60	0.51	0.45	0.20	0.12	0.07
Median	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.60	0.50	0.50	0.00	0.00	0.00
Mode	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.21	-0.40	-0.55	-0.59
Maximum	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.10	1.10	1.10	1.10	1.10	1.00
25th Percentile	0.50	0.75	0.75	0.75	0.75	0.65	0.50	0.24	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.78	0.50	0.10	0.00

Residual Non Tobacco Male Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.66	0.76	0.77	0.75	0.76	0.74	0.64	0.62	0.55	0.58	0.33	0.30	0.18
Median	0.75	1.00	1.00	1.00	1.00	0.90	0.67	0.58	0.50	0.50	0.00	0.00	0.00
Mode	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.29
Maximum	1.50	1.50	1.50	1.44	1.50	1.50	1.50	1.50	1.65	2.09	1.91	2.21	1.50
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.30	0.25	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.43	0.01

Residual Non Tobacco Male Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.76	0.86	0.86	0.85	0.83	0.80	0.66	0.58	0.48	0.44	0.20	0.11	0.06
Median	1.00	1.00	1.00	1.00	1.00	0.90	0.67	0.55	0.50	0.50	0.00	0.00	0.00
Mode	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	-0.21	-0.40	-0.55	-0.59
Maximum	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.10	1.10	1.10	1.10	1.10	1.00
25th Percentile	0.50	0.71	0.75	0.71	0.55	0.50	0.50	0.21	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.77	0.48	0.08	0.00

Preferred Non Tobacco Female Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.44	0.53	0.51	0.52	0.50	0.50	0.42	0.40	0.40	0.43	0.27	0.25	0.14
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.40	0.50	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.50	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.29
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.65	2.09	1.91	2.21	1.00
25th Percentile	0.00	0.50	0.50	0.50	0.50	0.50	0.05	0.20	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.75	0.75	0.75	0.75	0.60	0.60	0.56	0.56	0.50	0.50	0.50	0.50	0.05

Preferred Non Tobacco Female Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.57	0.63	0.62	0.61	0.59	0.57	0.47	0.40	0.35	0.31	0.15	0.09	0.05
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.47	0.28	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.21	-0.40	-0.55	-0.59
Maximum	1.50	1.50	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.40	0.24	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.75	0.75	0.75	0.75	0.75	0.65	0.50	0.50	0.50	0.50	0.25	0.07	0.00

Residual Non Tobacco Female Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.46	0.50	0.49	0.48	0.51	0.50	0.44	0.42	0.39	0.41	0.26	0.25	0.14
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.35	0.48	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.29
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.65	2.09	1.91	2.21	1.00
25th Percentile	0.07	0.50	0.50	0.50	0.50	0.50	0.34	0.25	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.71	0.71	0.60	0.60	0.71	0.60	0.55	0.50	0.50	0.50	0.45	0.43	0.01

Residual Non Tobacco Female Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.55	0.61	0.60	0.59	0.58	0.55	0.45	0.39	0.34	0.30	0.15	0.08	0.05
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.42	0.26	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.21	-0.40	-0.55	-0.59
Maximum	1.50	1.50	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.39	0.21	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.75	0.75	0.75	0.75	0.75	0.64	0.50	0.50	0.50	0.50	0.25	0.05	0.00

Preferred Tobacco Male Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.50	0.62	0.61	0.62	0.62	0.62	0.53	0.49	0.45	0.47	0.23	0.20	0.11
Median	0.50	0.63	0.60	0.63	0.63	0.63	0.50	0.50	0.46	0.50	0.00	0.00	0.00
Mode	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.14
Maximum	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.10	1.11	1.00
25th Percentile	0.00	0.35	0.35	0.35	0.35	0.36	0.00	0.15	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.75	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.64	0.64	0.50	0.28	0.00

Preferred Tobacco Male Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.62	0.73	0.73	0.72	0.72	0.70	0.57	0.50	0.42	0.41	0.18	0.11	0.06
Median	0.55	0.75	0.75	0.75	0.75	0.75	0.50	0.50	0.49	0.42	0.00	0.00	0.00
Mode	0.50	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	-0.20	-0.27	-0.29
Maximum	1.83	1.82	1.82	1.81	1.79	1.71	1.69	1.60	1.58	1.50	1.10	1.10	0.75
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.14	0.08	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.53	0.53	0.43	0.03	0.00

Residual Tobacco Male Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.53	0.63	0.63	0.63	0.63	0.63	0.55	0.51	0.44	0.45	0.23	0.19	0.11
Median	0.50	0.70	0.75	0.70	0.75	0.70	0.50	0.50	0.45	0.50	0.00	0.00	0.00
Mode	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.14
Maximum	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.10	1.11	1.00
25th Percentile	0.00	0.38	0.38	0.38	0.38	0.38	0.01	0.20	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.80	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.60	0.50	0.50	0.20	0.00

Residual Tobacco Male Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.62	0.73	0.72	0.72	0.72	0.69	0.57	0.50	0.41	0.39	0.21	0.11	0.06
Median	0.50	0.75	0.75	0.75	0.75	0.75	0.50	0.50	0.47	0.33	0.00	0.00	0.00
Mode	0.50	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	-0.20	-0.27	-0.29
Maximum	1.83	1.82	1.82	1.81	1.79	1.71	1.69	1.60	1.58	1.50	1.10	1.10	0.75
25th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.19	0.10	0.00	0.00	0.00	0.00	0.00
75th Percentile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.50	0.50	0.50	0.01	0.00

Preferred Tobacco Female Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.34	0.40	0.38	0.40	0.39	0.39	0.33	0.30	0.30	0.30	0.17	0.15	0.08
Median	0.44	0.50	0.50	0.50	0.50	0.50	0.48	0.25	0.25	0.25	0.00	0.00	0.00
Mode	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.14
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.82	1.05	0.96	1.11	0.50
25th Percentile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.26	0.18	0.00

Preferred Tobacco Female Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.41	0.45	0.46	0.46	0.46	0.43	0.35	0.30	0.26	0.24	0.12	0.08	0.04
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.23	0.20	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	-0.20	-0.27	-0.29
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.80	0.80	0.80	0.80	0.50
25th Percentile	0.00	0.38	0.44	0.36	0.38	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.53	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.00	0.00

Residual Tobacco Female Age 35

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.35	0.38	0.40	0.40	0.39	0.40	0.34	0.31	0.29	0.29	0.16	0.15	0.07
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.25	0.25	0.00	0.00	0.00
Mode	0.00	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.14
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.82	1.05	0.96	1.11	0.50
25th Percentile	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.17	0.00

Residual Tobacco Female Age 65

	United States												
	Policy Duration												
	1	2	3	5	6	10	11	15	16	20	21	25	26+
Mean	0.40	0.45	0.45	0.44	0.44	0.42	0.34	0.29	0.25	0.23	0.11	0.07	0.04
Median	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.20	0.20	0.00	0.00	0.00
Mode	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.10	-0.20	-0.27	-0.29
Maximum	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.80	0.80	0.80	0.80	0.50
25th Percentile	0.00	0.25	0.25	0.25	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75th Percentile	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.00	0.00

Appendix 3 – Comparison with Reinsurance Survey Results

Both direct writers and reinsurers completed the survey, with the results analyzed separately. Many of the responses were similar. However, there were a few areas where the reinsurers and direct writers varied in their approach.

- Reinsurers' use of mortality improvement was similar to Canadian direct writers where the majority of companies use both generational and durational mortality improvement in the pricing of life insurance products. For US direct writers, the responses were split evenly between using and not using both.
- For both generational and durational mortality improvement, the basis most used by the reinsurers in setting mortality assumptions was population mortality studies, whereas direct writers more often used their own company or intercompany mortality studies.
- While most direct writers indicated using a flat percentage per year to create both their generational and durational mortality improvement factors, most reinsurers used a flat percentage per year to create generational improvement factors. Regression based on historical experience was used by the majority of reinsurers to create their durational mortality improvement factors.
- Most direct writers review and update both their generational and durational mortality improvement factors at least annually or on no set schedule. Most reinsurers indicated updating both their generational and durational mortality improvement factors between every one and three years.
- Whereas both the reinsurers and direct writers were evenly split between having a maximum attained age at which to apply durational mortality improvement factors, the maximum attained age varied between reinsurers and direct writers. The maximum age for direct writers varied between ages 70 and 100 whereas for the reinsurers the range was between 89 and 120.
- Companies were asked to comment on how their durational mortality improvement factors varied by risk class. For many of the reinsurers and direct writers, durational mortality improvement factors were the same between non-tobacco and tobacco, older and younger attained ages, and preferred and standard risks. Sex was noted as having higher durational mortality improvement factors for males versus females among the US and reinsurer respondents. Canadian direct writers noted the factors between males and females as being the same.

Appendix 4 – List of Participating Companies

AFLAC
Allianz Life Insurance Company of North America
Allstate Financial
American Family Insurance
Americo
Aviva USA
Bankers Fidelity Life
Bankers Life and Casualty Company
Citizens, Inc
CNO Financial Group
Columbus Life Insurance Con
Combined Insurance Co of America (U.S.) *
Combined Insurance of America (Canada) *
CUNA Mutual Insurance Society
Desjardins Financial Security
Empire Life
Everence Association Inc.
Farm Bureau Life
Farm Bureau Life Insurance Company of Michigan
Federal Life Insurance Company (Mutual)
Federated Life Insurance Company
Fidelity Life Association
First Investors Life
Foresters
Forethought Financial Services, Inc.
Genworth Financial
Great West Life Co (Canada) *
Great-West Life & Annuity (U.S.) *
Guardian
Hartford Life Insurance Company
Humana
ING (U.S. Insurance)
Kansas City Life Insurance Company
Knights of Columbus
Liberty Life Insurance Company of Boston
Lincoln Financial Group
M Life Financial
Manulife Financial (Direct)
MassMutual Financial Group
MetLife
Midland National
Minnesota Life Ins. Co.

Motorists Life Insurance
Mutual of Omaha
National Guardian
Nationwide Life Insurance Company
New York Life
Northwestern Mutual
Ohio National Financial Services
OneAmerica
Oxford Life Insurance Co.
Pacific Life Insurance Company
Penn Mutual
Phoenix
Pioneer Security Life
Principal Financial Group
Professional Insurance Company
Prudential
RiverSource Life Insurance Company
Sagicor Life Insurance Co.
Scotia Life Insurance Company
Standard Insurance Company (U.S.)
Standard Life (Canada)
State Farm Life Insurance Company
Sun Life Financial (U.S.) *
Sun Life Financial (Canada) *
Symetra Financial
Thrivent Financial for Lutherans
TIAA-CREF
Transamerica Life of Canada
Trustmark Insurance Company
United Insurance Company of America
Unity Life of Canada
Universal American
USAA
Vantis Life Insurance Co.
Wawanesa Life
Western-Southern Life Assurance Co
Woodmen of the World Life Insurance Society
Zurich

*Separate responses were provided for US and Canada.