

**Report  
of the  
Society of Actuaries  
Mortality Improvement  
Survey Subcommittee**

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## **Introduction**

The attached report presents the results of a survey whose purpose was to explore life insurance company practices regarding the use of a mortality improvement assumption in the pricing of life insurance products. The survey distinguished between updating base mortality tables for historical mortality improvement versus projecting mortality improvement into the future. The survey was conducted by the Mortality Improvement Subcommittee of the Society of Actuaries Life Insurance Mortality and Underwriting Survey Committee.

The survey was based on life insurance company practices in effect during the summer of 2000. Sixty-seven companies responded to our survey. A complete list of respondents is shown in Appendix A. The survey contained five sections. Since some of the questions were contingent upon the response to a prior question, some companies did not answer all of the questions. Companies also may not have answered all of the questions because they chose not to answer some of the questions.

Percentage results are shown based on the total number of companies who responded to each specific question, unless otherwise noted. Percentages may not add to 100% in some cases due to rounding or where the question allowed the Respondents to “check all that apply.”

The Subcommittee would like to thank all of the companies who took the time to complete the survey. We would also like to thank the staff of the Society of Actuaries, in particular, Korrel Crawford and Jack Luff, for their invaluable help in facilitating our meetings to develop the survey and analyze the results and for arranging to have the survey posted on the SoA web site.

We have provided insight where we felt we could; however, our main goal was to present the results in an easy to use format. We hope that you find the results of our survey both interesting and helpful. We welcome comments and feedback on the content of the report so that the next survey can be even more valuable to you. Please send your comments to Jack Luff at the Society of Actuaries.

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# Mortality Improvement Survey

## Results of the Mortality Improvement Survey

### Introduction

One of the most important parts of the life insurance product development process is deciding upon the appropriate mortality assumption to use in the pricing. In developing these assumptions, actuaries often use a wide variety of sources, which may include their own company's historical experience, Society of Actuaries Intercompany Studies, their reinsurers' experience, studies from the medical community, and professional judgment. An integral part of this process is looking at historical mortality experience and deciding (1) how to apply it to the current pricing era and (2) how to project the current mortality into the future.

The purpose of this Mortality Improvement Survey Report is not to show what, if any, is the appropriate method for setting mortality assumptions. Rather, it is to inform the life insurance industry of the various methods that companies currently use to factor mortality improvement into the development of their pricing assumptions.

Professional reinsurers were not asked to participate in the survey, except for those companies that perform product development duties for their clients. A separate survey specifically addressing reinsurance pricing may be sent to the reinsurance community at a later date.

### Definition of Terms

As you read this Survey Report, you will notice that it discusses two types of mortality improvement. These are referred to as *Generational Improvement* and *Durational Improvement*. While these two types of improvement differ in their application, their combined effect is to bring historical mortality experience up to the present time and then to extend these historical trends into the future.

*Generational Improvement*: Describes the process of bringing historical mortality experience up to the current era. 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 that has occurred from the observation period to the current projection date. Translation of these trends for use in new product pricing might take the form of an entire array of values varying by (for example) gender, underwriting class and issue amount.

*Durational 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 in each year may be lower than the table that was used in the original pricing. Future lower mortality might be indicated by medical advances in the treatment of diseases, continued research into the factors affecting the aging process and the general trend toward healthier lifestyles. *Durational* improvement may be thought of as a way of keeping the annual mortality rate of a cohort up-to-date with future trends or expectations.

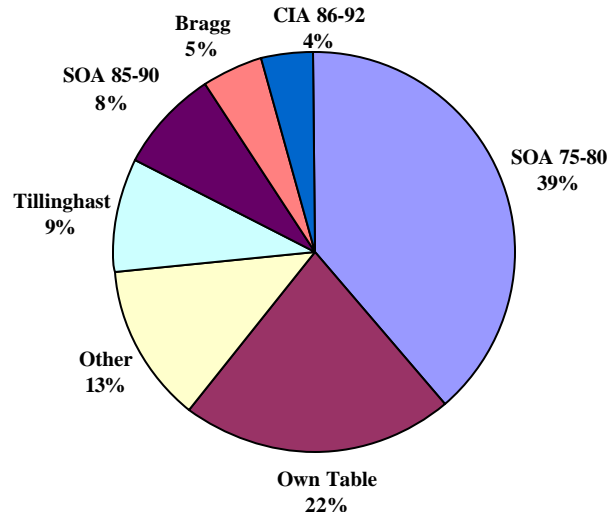
### Background

67 companies responded to the survey. All 67 indicated they represented a direct writing insurance company. 91% of these did business in the U.S. and 9% of these did business in Canada.

The Survey asked respondents to indicate the underlying table used for mortality assumptions. All 67 companies answered this question. Companies were allowed to choose more than one response. Chart 1 shows that 39% used the SoA 1975-80 Select & Ultimate Basic Tables as one of the underlying tables for mortality assumptions; 22% cited their own company's mortality experience as an underlying mortality table.

The 4% for the CIA 1986-92 was relatively small. We suspect this was due to the small number of Canadian respondents.

**Chart 1**  
**Underlying Mortality Table**  
**(Percent of Total Responses)**



Write-in responses were placed in the “other” category. They included:

- '79-81 US Population (2 responses);
- SoA 1975-80 Ultimate Basic modified by my company's experience;
- Our company's experience is analyzed in relation to the industry table;
- Lincoln Mortality System;
- A modification of the '75-80 tables;
- 1997 Lewis & Ellis Select & Ultimate;
- 1980 CSO;
- SoA '90-95 was used in our study this year;
- Bailey (a third-party consultant) Select/Ultimate smoker differentiated tables;
- CIA '82-88 adjusted for our company's experience; and
- We also subscribe to Bragg and do comparisons, but don't use it for construction – we have used Tillinghast tables in the recent past also, have gone away from them.

The Survey asked what type of products were priced or developed in the last 5 years. All 67 companies responded to this question. 84% of the respondents priced or developed a term product. 70% of the companies priced universal life, while 60% priced a whole life product. Less frequently priced products were joint second-to-die, joint first-to-die and variable life. Table 1 summarizes the results.

**Table 1**  
**Types of Products Priced or**  
**Developed in the Last Five Years**

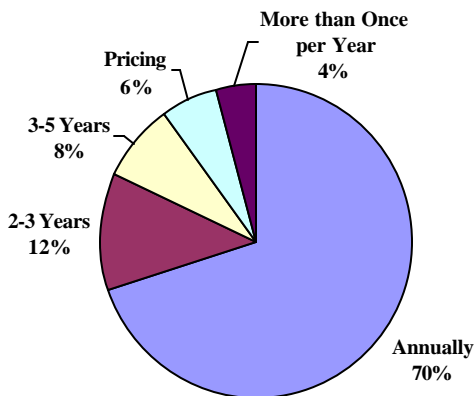
<b>Response</b>	<b>Percentage of Respondents</b>
Term Insurance	84%
Universal Life	70%
Whole Life	60%
Joint Second-to-Die	48%
Variable Life	40%
Joint First-to-Die	22%
Other	12%
<b>Number of Respondents</b>	<b>67</b>

Other products priced/developed included:

- *Modified Whole Life – Guaranteed Issue;*
- *Group Term Life;*
- *Current Assumption Whole Life;*
- *Prepaid Funeral;*
- *Senior Final Expense Whole Life and Worksite Universal Life;* and
- *Critical Illness.*

The Survey asked how often the mortality assumptions were reviewed. 66 companies responded to this question. 70% of the respondents indicated that they review their mortality assumptions annually. Only 4% of the respondents indicated that mortality assumptions were reviewed more than once per year. The remaining companies responded that mortality assumptions were reviewed either every 2 to 3 years (12%), every 3 to 5 years (8%) or at the time of product pricing (6%). Chart 2 displays the results.

**Chart 2**  
**Frequency of Mortality Assumption Review**



**Generational and Durational Mortality Improvement**

The Survey asked two separate questions with respect to company use of *generational* and *durational* mortality improvement. There were 67 responses for each question. 35% of the respondents indicated that *generational* mortality improvement was used by their company. 19% used only *generational* improvement. In contrast, 25% indicated that *durational* mortality improvement was used by their company. A comparison of the responses to both questions identified 16% that indicated both *durational* and *generational* mortality improvement were used. 55% of

the respondents indicated that neither *generational* nor *durational* mortality improvement were used. Table 2 summarizes the results.

**Table 2**  
**Use of *Generational* and/or *Durational***  
**Mortality Improvement**

<b>Use Response</b>	<b>Percentage of Respondents</b>
<i>Durational</i> Only	9%
<i>Generational</i> Only	19%
Both	16%
Neither	55%
<b>Number of Respondents</b>	<b>67</b>

The remainder of this section pertains to only those companies indicating they use *generational* and/or *durational* improvement. Unless otherwise indicated, responses in the *generational/durational* columns in the tables throughout this report are independent of each other. Where it made sense, the committee analyzed and reported on respondents who used both *generational* and *durational* mortality improvement.

The Survey asked companies to identify applications for which they used mortality improvement. Companies were allowed to choose more than one response for this question and were allowed to write in additional applications. The responses are summarized in Table 3.

**Table 3**  
**Applications Where Mortality Improvement Is Used**

<b>Response</b>	<i>Generational</i>	<i>Durational</i>
	<b>Percentage of Respondents</b>	<b>Percentage of Respondents</b>
Pricing	100%	94%
Financial Projections	75%	71%
Strategic Planning	46%	59%
Asset Liability Matching	63%	47%
Other	4%	6%
<b>Number of Respondents</b>	<b>24</b>	<b>17</b>

Write-in responses included:

*Generational:*

- *Disciplined current scale testing.*

*Durational:*

- *Used to evaluate reinsurance opportunities & to support ad hoc analysis – do not use on an on-going basis.*

The Survey asked companies to identify products for which they used mortality improvements. Respondents were allowed to write-in additional product types.

Term and universal life products were most frequently mentioned as products that use *generational* mortality improvement and/or *durational* mortality improvement. These products were selected at least 24% more often than whole life. Variable and multiple-life products were less often cited. Table 4 below summarizes the responses.

**Table 4**  
**Products Where Mortality Improvement Is Used**

Response	<i>Generational</i>	<i>Durational</i>	<i>Both</i>
	Percentage of Respondents	Percentage of Respondents	Percentage of Respondents
Term	92%	71%	73%
Universal Life	88%	71%	82%
Whole Life	63%	47%	45%
Variable Life	38%	29%	27%
Joint First-to-Die	29%	18%	18%
Joint Second-to-Die	50%	41%	36%
Other	8%	12%	9%
<b>Number of Respondents</b>	<b>24</b>	<b>17</b>	<b>11</b>

Write-in responses included:

*Generational*

- *Pre-need*; and
- *Group Term Life*.

*Durational*

- *Pre-need only*; and
- *Do not use on an on-going basis*.

The Survey asked companies to report the factors by which mortality improvement varies. Respondents were allowed to choose from product, smoker distinction, gender, issue age and underwriting class. Respondents could choose more than one response. Write-in responses were also allowed.

Based on the number of responses for each factor by which *generational* and *durational* mortality improvement varied, respondents indicated they tend to model *generational* mortality improvement at a more granular level than *durational* mortality improvement. The responses are summarized in Table 5.

**Table 5**  
**Factors by which Mortality Improvement Varies**

Response	<i>Generational</i>	<i>Durational</i>
	Percentage of Respondents	Percentage of Respondents
Product	59%	38%
Smoker Distinction	55%	13%
Gender	68%	19%
Issue Age	36%	31%
Underwriting Class	59%	31%
Other	14%	31%
<b>Number of Respondents</b>	<b>24</b>	<b>17</b>

Write-in responses included:

*Generational*

- *Constant*;
- *Guaranteed issue vs. fully underwritten*; and
- *Line of business (i.e. par/non-par)*.



Durational

- *Improvement factors applied across entire block;*
- *Constant (2);*
- *Policy duration (2); and*
- *Level premium period on term 5 – 10 years of mortality improvement for level term 10 and 15 years of mortality improvement for level term 15, 20 & 30.*

Companies were asked to identify the bases they use to develop their company’s *generational* and *durational* mortality improvement assumptions. Possible choices included population mortality studies, intercompany insured mortality studies, or own company (or family of companies) mortality studies. Respondents could also write in additional bases.

For the *generational* approach, the most frequently indicated response at 58% was own company mortality studies and the next highest response at 54% was intercompany insured mortality studies. Population mortality studies and “other” were indicated less frequently.

For the *durational* approach, the most frequently indicated response at 53% was intercompany experience mortality studies. Population studies at 47% and own company mortality experience studies at 41% were identified somewhat less frequently. The total percentage exceeds 100% because respondents were allowed to choose more than one response. Table 6 summarizes the results.

**Table 6**  
**Basis for Mortality Improvement Assumption**

<b>Basis</b>	<i>Generational</i>	<i>Durational</i>
	<b>Percentage of Respondents</b>	<b>Percentage of Respondents</b>
Intercompany insured mortality studies	54%	53%
Population mortality studies	25%	47%
Own company mortality studies	58%	41%
Other	21%	35%
<b>Number of Respondents</b>	<b>24</b>	<b>17</b>

Write-in responses included:

For *Generational* Mortality Improvement:

- *Actual to expected results from cash flow testing;*
- *Rule of thumb;*
- *Reinsurer’s recommendations;*
- *Tillinghast factors; and*
- *Reinsurer studies.*

For *Durational* Mortality Improvement:

- *Consultant advice;*
- *Reinsurer’s experience;*
- *I believe Lincoln uses all of the above to calibrate its mortality system;*
- *Chief actuary’s opinion; and*
- *Study from North American Actuarial Journal.*

The Survey asked companies to report the methodologies used to create mortality improvement factors. Respondents could choose a flat percentage per year or regressions based on historical experience. Write-in responses were also permitted.

A higher percentage of respondents chose a flat percentage per year at 70% for *generational* mortality improvement, compared to *durational* mortality improvement at 65%. Similarly, 22% of the respondents indicated that regression techniques were used to develop *generational* mortality improvement factors, compared to 12% indicating the use of regression techniques for the development of *durational* mortality improvement factors. Table 7 displays the results.

**Table 7  
Methodology Used to Develop Mortality Improvement Factors**

Methodology	<i>Generational</i>	<i>Durational</i>
	Percentage of Respondents	Percentage of Respondents
Flat percentage per year	70%	65%
Regression based on historical experience	22%	12%
Other	17%	24%
<b>Number of Respondents</b>	<b>23</b>	<b>17</b>

Of the respondents who use *generational* improvement, two indicated that they use both flat percentage and regression and one did not answer this question.

Write-in responses included:

*Generational*

- *Fixed ratio (e.g., 80% '75-80 Select & Ultimate);*
- *Tillinghast factors;*
- *Judgment based on historical annual improvement, most recent years' own experience, etc.; and*
- *Use mortality study done by valuation team.*

*Durational*

- *Consultant advice;*
- *We rely on Lincoln; and*
- *About half of past experience.*

The survey asked why companies did not use *generational* and/or *durational* mortality improvement. The respondents could choose more than one reason. Write-in responses were also allowed.

41 respondents indicated they did not use *generational* improvement. The results are summarized in Table 8a below. The most common response was the company believes that its experience table reflects current mortality assumptions or that its experience table is up-to-date. 15% do not believe that *generational* mortality improvement factors are needed. 10% do not believe it is appropriate to use *generational* mortality improvement.

**Table 8a  
Reasons *Generational* Improvement Was Not Used**

Reason	Percentage of Respondents
My company believes that its experience table reflects current mortality expectations or uses an experience table that is up-to-date	76%
My company does not believe it is needed	15%
My company does not believe that it is appropriate to use <i>generational</i> mortality improvement	10%
Other	32%
<b>Number of Respondents</b>	<b>41</b>

A number of other reasons were mentioned:

- *Improvement is based on changed underwriting standards;*
- *Small company, so experience for short period not credible to do generation projections;*
- *Experience tables are periodically updated to reflect change in mortality;*
- *We solicited help from our reinsurer (3);*
- *We do annual studies;*
- *We get periodic updated mortality from Lincoln’s mortality system;*
- *We use generational mortality improvement implicitly by a % adjustment to the basic table (to) reflect our current aggregate experience;*
- *Like the built-in margin;*
- *My company reflects current mortality by using percentages of the table – the percentages are based on current experience and vary by product, sex, smoking class, risk class, etc.;*
- *Mortality experience affected somewhat by persistency anti-selection; and*
- *I believe that available projection scales may not be applicable to underwritten insurance.*

50 respondents indicated that they did not use *durational* improvement. The results are summarized in Table 8b below. The most common response was that it creates problems with Illustration Certification at 62%, and the next most frequent response at 56% was the company does not believe *durational* improvement factors are appropriate.

**Table 8b**  
**Reasons *Durational* Improvement Was Not Used**

<b>Reason</b>	<b>Percentage of Respondents</b>
Creates problems with Illustration Certification	62%
Company does not believe <i>durational</i> improvement factors are appropriate	56%
Creates problems with XXX X-Factors	36%
Company does not believe <i>durational</i> improvement factors are needed	28%
Other	28%
<b>Number of Respondents</b>	<b>50</b>

A number of other reasons were mentioned:

- *Mortality studies are infrequently done;*
- *Any actual *durational* improvements will be reflected in dividend scale;*
- *Lack of supportable statistics;*
- *Any improvement provides some margin for adverse deviation (2);*
- *Basing a product’s design on future improvement makes no business sense;*
- *New York law self-support rules prohibit & it creates an expectation which may be unjustified &, therefore, misleading;*
- *Not appropriate due to voluntary anti-selection;*
- *Competitive issue (disclosure in Illustration Questionnaire) adds conservatism;*
- *Conservative;*
- *Pricing strategy is to reduce in force COI charges as mortality improves – however, when deciding on whether to reinsure business, we do take *durational* improvement into account;*
- *Too little exposure to use own experience;*
- *Reinsurance makes improvements less significant financially; and*
- *Lack of necessity (3).*

### **Generational Mortality Improvement**

The Survey asked, in using a *generational* approach to mortality improvement, to what point in time do you improve the underlying mortality table. As shown in Table 9 below, of the 24 respondents indicating they used a *generational* approach to mortality improvement, nearly all at 92% indicated the underlying base tables were improved to the current point in time. The other 8% indicated that the mortality table had been improved to a specified point in time in the past.

**Table 9**  
**Generational Mortality Improvement Date**

<b>Response</b>	<b>Percentage of Respondents</b>
The current point in time	92%
A specified point in time earlier than the current point in time	8%
<b>Number of Respondents</b>	<b>24</b>

### **Durational Mortality Improvement**

The Survey asked companies to identify the pattern of *durational* mortality improvement by policy year. There were 17 respondents to this question. The responses are summarized in Table 10.

47% of the respondents indicated that factors were non-zero for a specific number of years before grading to zero. The number of years over which the factors were non-zero ranged from 7 to 20 with 15 being the most frequently mentioned. Another 41% of the respondents indicated that non-zero factors were used for the entire pricing horizon.

One respondent varied mortality improvement by product type. For term plans, factors graded to zero by the end of the level premium period. For this respondent, non-zero factors were used for the entire pricing horizon for permanent plans. This response was counted in both categories. Therefore, the total across categories exceeds 100%.

**Table 10**  
**Application of Mortality Improvement Factors**

<b>Factor Pattern</b>	<b>Percentage of Respondents</b>
Factors are non-zero for N years and grade to zero	47%
Factors are non-zero throughout the entire pricing horizon	41%
Other	18%
<b>Number of Respondents</b>	<b>17</b>

Write-in responses included:

- *Our mortality from Lincoln used as our experience assumption includes mortality improvements by policy duration – the exact factors used to derive this are buried in the final numbers;*
- *Base mortality is used for policy years 1-15 – mortality declines 1% per year (100%, 99%, 98% ... 90%) in durations 16 – 25 and stays at 90% of base thereafter; and*
- *Durational improvement factors are non-zero for 15 years or the term period if less than 15 years.*

A series of questions was asked regarding the validation of previous *durational* mortality improvement factors. Companies were asked to indicate whether they had either validated or reviewed previous *durational* mortality improvement factors to determine if the anticipated results had been realized. 75% of the 16 respondents reported that validation or review had not been done and were directed to skip the questions regarding the validation results. 25% of the respondents indicated that previous assumptions had either been validated or reviewed. One other respondent indicated that they had not validated or reviewed their results because it was too soon to tell.

Three of the four respondents that did validate results indicated that the most recent validation was completed in 2000 (note that this Survey was conducted in 2000). Even though this section concentrated on *durational* mortality

improvement assumptions, one company responded to this question with information regarding their validation of *generational* mortality improvement.

The committee speculated as to why the number of positive responses was so small. The Survey indicated most of the companies had updated their assumptions in the previous two years. In that case, there may not have been enough credible experience to evaluate their assumptions.

The Survey asked how *durational* improvements were calculated when projected into future years. Respondents could choose either simple  $(1 - n * F)$  or compound  $(1 - F)^n$ , where n represents the number of future years of mortality improvement and F represents the annual improvement factor.

Of the 17 respondents, 53% indicated they used a compound discount projection, while 35% indicated they used a simple discount projection. 12% indicated “other” and did not provide a detailed response. Table 11 summarizes the results.

**Table 11**  
**Calculation of *Durational* Improvement Factors**

<b>Methodology</b>	<b>Percentage of Respondents</b>
Compound $(1 - F)^n$	53%
Simple $(1 - n * F)$	35%
Other	12%
<b>Number of Respondents</b>	<b>17</b>

Companies employing *durational* improvement factors were asked to provide the factor for a male issue age 45, best nonsmoker class (often called the preferred or super-preferred nonsmoker class) at specified durations. A total of 12 companies responded to this question.

For Policy Years 1-10, annual improvement factors were distributed as shown in Table 12, with the most common assumptions being 1.0% and 0.5%.

**Table 12**  
***Durational* Improvement Factors**

<b>Statistic</b>	<b>Factor for Policy Years 1-10</b>
High	2.00%
Average	0.89%
Low	0.50%
Mode	1.00% and 0.50% (tie)

For Policy Years 11 and 15, 4 respondents reduced or eliminated improvements, while 7 respondents kept the same non-zero factor as for Policy Years 1-10. For Policy Year 20, 8 companies eliminated their improvement factor or kept it at zero, while 2 others kept their non-zero assumption the same as for Policy Years 11 and 15.

All 67 companies responded when asked who makes the decision as to whether *durational* improvement will be used. Respondents were allowed to select from individual pricing actuaries, senior pricing actuary, chief actuary, chief underwriter, medical director and a committee. Respondents could also write in responses. Respondents were allowed to select more than one answer.

The chief actuary at 73% was the individual most involved, followed by the senior pricing actuary at 43%. Not surprisingly, actuaries were involved more often than other insurance professionals. Table 13 summarizes the results.

**Table 13**  
**Primary Decision-Maker for Using *Durational* Improvement**

Person	Percentage of Respondents
Chief Actuary	73%
Senior Pricing Actuary	43%
Individual Pricing Actuaries	18%
Chief Underwriter	4%
Committee	4%
Medical Director	1%
Other	12%
<b>Number of Respondents</b>	<b>67</b>

The “other” category included the illustration, valuation, experience study and corporate actuaries. Consulting, financial and appointed actuaries were also mentioned, along with committees and high-level executives.

Companies were asked who provides input into the development of *durational* improvement factors. Respondents were allowed to check all that applied.

Of the 22 respondents, 59% indicated that the chief actuary and 45% indicated senior pricing actuary most often provide input. It was interesting to note that the chief underwriter and medical director were rarely the decision-maker, but often provided input into the development of improvement factors. Table 14 summarizes the results.

**Table 14**  
**Who Provides Input into  
the Development of *Durational* Improvement**

Person	Percentage of Respondents
Chief Actuary	59%
Senior Pricing Actuary	45%
Individual Pricing Actuaries	41%
Chief Underwriter	27%
Medical Director	14%
Other	27%
<b>Number of Respondents</b>	<b>22</b>

The “other” category included reinsurer, consultant and risk research area.

The Survey asked participants what their conceptual justification for using future mortality improvements was and allowed them to check all reasons that applied. This question was unusual in that it also requested a response from those who did not utilize *durational* improvements. Those respondents were directed to select the three most significant justifications they might choose for using *durational* improvement. Table 15 summarizes the data.

The most frequently cited response from all respondents was improvements in medicine at 90%. Trend toward healthier lifestyles and technological advances tied in second place at 60%. Extrapolation from past experience and preferred underwriting effects were also often indicated. Of the 57 companies responding to this question, 30% used *durational* mortality improvement, and 70% did not use *durational* mortality improvement.

The companies using *durational* mortality improvement were asked to base their answers on the conceptual justifications their companies made when deciding to use *durational* mortality improvement. Of these companies, 82% indicated that improvements in medicine justified the use of *durational* mortality improvement. The next most often selected responses were technological advances at 65%, trend toward healthier lifestyles and extrapolation from past experience, both at 59%.

The companies not using *durational* mortality improvement were asked to base their answers on the three most significant justifications their company might use if *durational* mortality improvement were to be used. Of these companies, 93% indicated that improvements in medicine would justify the use of *durational* mortality improvement. The next most often selected response was trend toward healthier lifestyles at 60%. Technology followed closely behind at 58%.

**Table 15**  
**Conceptual Justification for Using *Durational* Mortality Improvement**

Reason	Percentage of Respondents		
	All	Those <u>Using</u> <i>Durational</i> Mortality Improvement	Those <u>Not</u> <u>Using</u> <i>Durational</i> Mortality Improvement
Improvements in Medicine	90%	82%	93%
Trend Toward Healthier Lifestyles	60%	59%	60%
Technological Advances	60%	65%	58%
Extrapolation from Past Experience	44%	59%	38%
Preferred Underwriting Effects	30%	29%	30%
Other Companies Are Using Them	18%	24%	15%
Other (Reinsurance Data)	2%	6%	0%
Globalization	0%	0%	0%
<b>Number of Respondents</b>	<b>57</b>	<b>17</b>	<b>40</b>

The Survey asked the respondents answering the prior question to indicate the single most significant conceptual justification for mortality improvement. Table 16 summarizes the responses.

Improvements in medicine at 58%, extrapolation from past experience at 14% and trend toward healthier lifestyles at 11% were the top three choices for the most significant justification.

Respondents not using *durational* mortality improvement factors placed relatively more weight on improvements in medicine as the most significant justification for using *durational* mortality improvement. Additionally, respondents not using *durational* mortality improvement identified other companies using *durational* mortality improvement factors as the most significant justification less often than those that do use *durational* mortality improvement.

**Table 16**  
**Most Significant Conceptual Justification for Using *Durational* Mortality Improvement**

Reason	Percentage of Respondents		
	All	Those Using <i>Durational</i> Mortality Improvement	Those Not Using <i>Durational</i> Mortality Improvement
Improvements in Medicine	58%	47%	63%
Trend Toward Healthier Lifestyles	11%	6%	13%
Technological Advances	5%	6%	5%
Extrapolation from Past Experience	14%	18%	13%
Preferred Underwriting Effects	4%	6%	3%
Other Companies Are Using Them	7%	12%	5%
Not Applicable	2%	6%	0%
Globalization	0%	0%	0%
<b>Number of Respondents</b>	<b>57</b>	<b>17</b>	<b>40</b>

Companies were asked to write in the sources of data used or that might be used to decide on appropriate future mortality improvement. 58 respondents provided 66 responses to this question. Table 17 summarizes the sources.

Reinsurers (24%), government data (17%) and medical literature (11%) were most frequently identified. Interestingly, one of the five companies that answered “none” indicated that they use mortality improvement.

**Table 17**  
**Sources of Data Used or That Might Be Used to Decide on Appropriate Future Mortality Improvement**

Source	Percentage of Responses
Reinsurer	24%
Government Data	17%
Medical Literature	11%
Actuarial Literature	9%
Actual Experience	8%
Consultants	8%
Industry Experience	8%
None	8%
Doctors	3%
Global	3%
Pension/Annuity	2%
Underwriters	2%
<b>Number of Responses</b>	<b>66</b>

**Personal Beliefs**

The Survey asked the respondents how many of their competitors, their reinsurers and the industry they believe used *generational* and/or *durational* mortality improvements in their pricing. The number of respondents varied by question, but there were at least 66 responses to each question. Table 18 summarizes these responses.



**Table 18**  
**Who Respondents Believe Use Mortality Improvement in Pricing**

Response	Their Competition		Their Reinsurers		The Industry	
	<i>Generational</i>	<i>Durational</i>	<i>Generational</i>	<i>Durational</i>	<i>Generational</i>	<i>Durational</i>
	Percentage of Respondents	Percentage of Respondents	Percentage of Respondents	Percentage of Respondents	Percentage of Respondents	Percentage of Respondents
None	2%	3%	5%	6%	0%	0%
Some	31%	45%	12%	18%	30%	57%
Most	28%	22%	21%	18%	44%	28%
All	17%	5%	39%	34%	11%	0%
Don't Know	22%	25%	23%	24%	15%	15%
<b>Number of Respondents</b>	<b>67</b>	<b>67</b>	<b>66</b>	<b>66</b>	<b>66</b>	<b>67</b>

The highest percentage of respondents believe:

- Some of their competition uses *generational* and *durational* mortality improvement;
- All of their reinsurers use *generational* and *durational* mortality improvement; and
- Most of the industry uses *generational* mortality improvement, while only some of the industry uses *durational* mortality improvement.

Recall from Table 2 that 16% of respondents used both *generational* and *durational* mortality improvement. All of these respondents believed that their competitors, their reinsurers and the industry used some type of mortality improvement.

Also recall from Table 2 that 55% of the respondents indicated that they didn't use either *generational* or *durational* mortality improvement. Of these respondents, two-thirds believed that their competitors and their reinsurers used mortality improvements, while closer to 80% believed that the industry did. The 80% is an interesting percentage because, personal beliefs aside, the reality of the situation is the survey shows that only 36% of the industry (as represented by the respondents) use *generational* improvements and 25% use *durational* improvements.

87% of the respondents believe that it is appropriate to use *generational* mortality improvement in their pricing and 52% believe that *durational* improvement should be used. 51% of the respondents indicated that they believe both *generational* and *durational* improvements should be used.

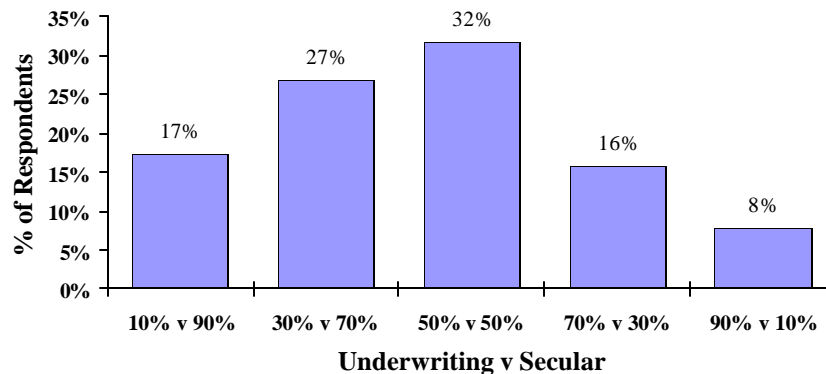
**Table 19**  
**Personal Beliefs in Using Mortality Improvement**

Response	<i>Generational</i>	<i>Durational</i>
	Percentage of Respondents	Percentage of Respondents
Yes	87%	52%
No	13%	48%
<b>Number of Respondents</b>	<b>67</b>	<b>67</b>

Table 18 summarized whom respondents believe use mortality improvement in pricing. Comparing these to the respondents' personal beliefs, the subcommittee found that, of the 51% who believed it is appropriate to use both *generational* and *durational* mortality improvements, three-quarters believed that their competitors, their reinsurers and the industry used some type of mortality improvement. Of the 12% who didn't believe it is appropriate to use either mortality improvements, just under half believed that their competitors, their reinsurers and the industry used some type of mortality improvement.

The Survey asked the respondents to provide the percentage of total mortality improvement they believe was due to improvements in the underwriting process versus improvements in the underlying secular mortality (due to medical advances, changes in lifestyle, etc.). 63 companies responded to this question. The responses were grouped and the underwriting versus secular percentages shown in Chart 3 indicate the midpoint within each group.

**Chart 3**  
**Total Mortality Improvement Split Between Underwriting Improvement and Secular Improvement**



The Survey asked whether the respondents believed that historical mortality experience was a realistic indication of future trends in mortality. 67 companies responded to this question. 55% of the respondents agreed that historical experience was a realistic indication of future trends. Table 20 summarizes the responses.

**Table 20**  
**Historic Mortality Experience Studies Represent**  
**a Realistic Indication of Future Trends in Mortality**

Response	Percentage of Respondents
Agree or Strongly Agree	55%
Neither Agree Nor Disagree	24%
Disagree or Strongly Disagree	21%
<b>Number of Respondents</b>	<b>66</b>

Of the respondents that believe extrapolation from past experience could be utilized as support for future mortality improvement (Table 16), 36% did not agree that historic mortality experience studies represent a realistic indication of future trends in mortality.

Respondents were further asked whether they thought there would be future medical advances to keep mortality improving at a similar rate or better as the past. 67 companies responded to this question. 54% of the respondents agreed that future medical advances would keep mortality improving at a similar rate or better as the past. Table 21 summarizes the responses.

**Table 21**  
**Future Medical Advances to Keep Mortality**  
**Improving at a Similar or Better Rate as in the Past**

Response	Percentage of Respondents
Agree or Strongly Agree	54%
Neither Agree Nor Disagree	21%
Disagree or Strongly Disagree	25%
<b>Number of Respondents</b>	<b>67</b>

Of the respondents that would utilize improvements in medicine as conceptual justification for future mortality improvement (Table 16), 59% agreed that future medical advances would keep mortality improving at a similar or better rate as in the past.

In summary, the Subcommittee found the following key observations about the life insurance industry's use of mortality improvement:

- Most respondents either use explicit *generational* improvement or believe their experience table implicitly reflects current mortality expectations.
- 25% of the respondents use *durational* improvement.
- While 80% of the respondents believe that the industry or their competition use mortality improvement, the survey showed that only 36% of the industry use *generational* improvement and 25% use *durational* improvement.

## Appendix A

### Companies Participating in Mortality Improvement Survey

Alfa Life Insurance Corp.  
American General Life Companies  
American National Insurance Company  
Ameritas Life Insurance Corp.  
Anthem Life Insurance Company of Indiana  
Canada Life Assurance Company  
Catholic Aid Association  
Catholic Knights Insurance Society  
Citizens Financial Corp.  
CNA Insurance Companies  
Columbia Universal Life Insurance Company  
Cotton States Life Insurance Company  
Country Life Insurance Company  
Erie Family Life Insurance Company  
Farm Bureau Life Insurance Company  
Farm Bureau Life Insurance Company of Michigan  
Farmers & Traders Life Insurance Company  
Fidelity & Guaranty Life Insurance Company  
First Variable Life Insurance Company  
Florida Combined Life Insurance Company  
Forethought Life Insurance Company  
Funeral Directors Life Insurance Company  
Government Personnel Mutual Life Insurance Company  
Great American Life Insurance Company  
Guardian Life Insurance Company  
GuideOne Life Insurance Company  
Highmark Life & Casualty Group  
Illinois Mutual Life Insurance Company  
Industrial Alliance  
Integrity Life Insurance Company  
Jackson National Life Insurance Company  
Kanawha Insurance Company  
Knights of Columbus  
London Life Insurance Company/Great-West Life Assurance Company  
Lutheran Brotherhood  
Massachusetts Mutual Life Insurance Company  
Mennonite Mutual Aid Association  
Metropolitan Life Insurance Company  
Midland National Life Insurance Company  
Modern Woodmen of America  
Motorists Life Insurance Company  
Mutual of Detroit Insurance Company  
New York Life Insurance Company  
Northwestern Mutual Life Insurance Company  
Pacific Guardian Life Insurance Company  
Pacific Life Insurance Company  
Phoenix Home Life Mutual Insurance Company  
Physicians Mutual Insurance Company  
Protective Life Insurance Company

Provident Mutual Life Insurance Company  
Pyramid Life Insurance Company  
Royal & SunAlliance Insurance Company of Canada  
Royal Neighbors of America  
SAFECO Life Insurance Company  
Security Mutual Life Insurance Company of NY  
Shelter Life Insurance Company  
Southern Farm Bureau Life Insurance Company  
State Farm Life Insurance Company  
Texas Life Insurance Company  
TIAA-CREF Life Insurance Company  
Transamerica Insurance & Investment Group  
United Farm Family Life Insurance Company  
USAA Life Insurance Company  
WEA Insurance Corp.  
West Coast Life Insurance Company  
Western & Southern Life Insurance Company  
Western Reserve Life Assurance Company of Ohio