

SOCIETY OF ACTUARIES REPORT OF THE INDIVIDUAL LIFE INSURANCE VALUATION MORTALITY TASK FORCE, NOVEMBER 2001

2001 VALUATION BASIC MORTALITY TABLE

In a letter to the Society of Actuaries ("SOA") in November 1998, the SOA was asked by the NAIC to begin work on the development of new valuation mortality tables for life insurance and accidental death benefits. Through meetings and discussions with the NAIC and the American Academy of Actuaries ("AAA"), it was agreed that the SOA would create a valuation basic mortality table ("2001 Valuation Basic Table") to be used by the AAA in the development of a new valuation mortality table.

In order to meet its mandate, the SOA Individual Life Insurance Valuation Mortality Research Task Force ("Task Force") was formed by the SOA in July 1999 to create the 2001 Valuation Basic Table. A separate task force has been created by the AAA specifically to take the 2001 Valuation Basic Table created by the Task Force and create a new valuation mortality table.

The following report describes the methodology used to develop the 2001 Valuation Basic Table and its distribution has been agreed to by the SOA's Board of Governors.

I. BACKGROUND

The 1980 Commissioners' Standard Ordinary ("1980 CSO") mortality table is the commonly used mortality table for the valuation of standard ordinary life insurance in the United States. It was developed by a Committee of the SOA based on experience from the period 1970-75 and adopted by the NAIC in December 1980 (TSA XXXIII pp. 617-674).

Subsequent to the adoption of the 1980 CSO Tables a SOA Task Force effected a split of the 1980 CSO Tables into Smoker and Nonsmoker Tables using insurance and non-insurance data (TSA, 1982 Reports pp. 343-390).

The Task Force has created the 2001 Valuation Basic Table as a first step toward development of a new valuation mortality table to replace the 1980 CSO mortality table. In constructing the 2001 Valuation Basic Table, the following basic premises were set by the Task Force:

- The Task Force would utilize the SOA 1990-95 experience study as the primary source of experience.
- The Task Force would develop separate 2001 Valuation Basic Tables for, at a minimum, males and females, and smokers and non-smokers.
- The Task Force would look to supplement the SOA experience with experience from other sources where the SOA experience was limited or not available. Mortality experience above issue age 75 and attained age 90 were specifically noted as areas where the SOA should look to supplement the experience.

- The Task Force would consider such issues as mortality improvement, preferred risk underwriting, and the impact of AIDS in the construction of the 2001 Valuation Basic Table.

The following report describes the key steps used to construct the Valuation Basic Tables. These include the following:

- Construction of male/female mortality tables
- Construction of smoker distinct mortality tables for both males and females
- Consideration for mortality improvement
- Consideration for preferred risks
- Consideration for AIDS

A discussion of the key observations that the Task Force has regarding the 2001 Valuation Basic Table is included in the body of the report. The 2001 Valuation Basic Table and related comparisons can be found in the Appendices attached to this report.

The Task Force gives special thanks to Jack Bragg and Associates, the Railroad Retirement Board and the Veterans' Administration for their cooperation in providing the SOA with supplemental experience data that has been utilized in the development of the 2001 Valuation Basic Table. It should be noted that this experience data has been provided to the SOA solely for the use of this Task Force and cannot be distributed by the SOA.

II. CONSTRUCTION OF MALE AND FEMALE BASIC MORTALITY TABLES

II.A. BACKGROUND

In April 2000, the SOA Individual Life Insurance Experience Committee released the 1990-95 Basic Mortality Tables. Specifically, male composite (smoker, non-smoker and smoking status unknown experience combined) and female composite tables in age nearest birthday and age last birthday formats were released. The 1990-95 Basic Mortality Tables fulfilled the ongoing work of the Individual Life Insurance Experience Committee's charge of reporting on insured lives mortality experience over successive five-year periods. The raw insured life data was graduated with an extrapolation for issue ages over 72. The 1990-95 Basic Mortality Tables were designed primarily as experience tables, and as such, had a good fit to the underlying experience data. No effort was made by the Individual Life Insurance Experience Committee to adjust the table for large claims or other features inherent in the experience data.

The 1990-95 experience tables include experience from individually underwritten life insurance policies for the period 1990-1995. The experience studies specifications call for all standard, fully underwritten policies to be included in the studies. Policies with limited underwriting or no underwriting, such as simplified issue, guaranteed issue, ETI, and reduced paid up are excluded from the studies. Also excluded from the studies are

substandard policies. Preferred policies are included in the studies as are term conversions (however, term conversions are tracked from the original issue date).

In developing new 2001 Valuation Basic Tables utilizing the 1990-95 Basic Mortality Tables, the actuarial issues relevant to the creation of male and female tables for the Task Force included:

- Separate male and female mortality: The SOA has been reporting experience separately for males and females for many years. Consistent with this practice, separate male and female mortality tables have been created as part of the 1990-95 Basic Mortality Tables. A sample of male and female mortality for selected issue ages and durations is presented below:

1990-95 BASIC MORTALITY TABLE (ANB)				
<i>Age</i>	Duration 1		Ultimate	
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>
25	0.39	0.16	0.95	0.41
35	0.35	0.21	1.86	0.83
45	0.68	0.45	2.42	1.45
55	1.54	1.19	5.87	4.37
65	3.16	2.01	16.65	10.74

Based on current experience, the Task Force believes it prudent to also create separate 2001 Valuation Basic Tables for males and females. This is also consistent with the 1980 CSO Tables and current industry practice of having separate premium scales for males and females.

- Select period: The 1990-95 Basic Mortality Tables were created using a 25-year select period format. However, at younger (issue age 30 and younger) and older (issue age 70 and older) issue ages, the actual select period is less. The select period is consistent with the SOA 1985-90 Basic Mortality Tables and reflects insured lives experience from the study period. It should be noted that the majority of the experience underlying the 1990-95 tables was submitted on a 15-year select basis. However, the experience submitted on a 25-year select basis supported the development of a 25-year select period. In fact, at certain ages the underlying experience may suggest an even longer select period. The 25-year select period reflects the long-term impact of selection on mortality rates. The Task Force has utilized a 25-year select period format in the creation of the 2001 Valuation Basic Table, as the Task Force believes a 25-year select period is the best representation of current experience. It should be noted that the 1980 CSO mortality tables were created with no select period, and subsequently 10-year select factors (and 20-year select factors with the adoption of Regulation XXX) were developed.

- Age nearest birthday/age last birthday: The Task Force has created age nearest birthday (“ANB”) versions of the 2001 Valuation Basic Table. It is anticipated that the AAA will utilize the ANB 2001 Valuation Basic Table to create a new valuation mortality table and then use this table to create an ALB valuation mortality table.
- Smoothness: The 1990-95 Basic Mortality Tables emphasized fit of the underlying data. However, the Task Force believes that a valuation mortality table should emphasize smoothness over fit. If a valuation mortality table is not smooth, there is a risk that on an age-by-age or duration-by-duration basis, the table could produce inconsistent values.

The Task Force has utilized certain graduation techniques to ensure smoothness of the 2001 Valuation Basic Table. Also, after application of the graduation techniques, the Task Force utilized certain tests that were designed to ensure that the 2001 Valuation Basic Table met certain goals as described below:

1. Duration within issue age test: With a few possible exceptions where the experience clearly justifies, such as mortality at very young ages (less than 5), mortality for any given issue age should increase with duration since issue. That is,

$$q_{[x]} \leq q_{[x]+1} \leq q_{[x]+2} \leq \dots$$

2. Issue age within duration test: With a few possible exceptions where the experience clearly justifies, such as mortality at very young ages (less than 5), mortality for any given duration since issue should increase with issue age. That is,

$$q_{[x]+t} \leq q_{[x+1]+t} \leq q_{[x+2]+t} \leq \dots$$

3. Attained age test: Mortality for any given attained age should increase with duration since issue. That is,

$$q_{[x]} \leq q_{[x-1]+1} \leq q_{[x-2]+2} \leq \dots$$

- Older and younger issue age mortality: The 1990-95 SOA had no experience data above central issue age 72, limited data for attained ages over 85 and limited data for juveniles (attained ages 0 to 15) for use in the creation of the 1990-95 Basic Mortality Tables. The Task Force has utilized data from other sources (Jack Bragg and Associates and the Veterans’ Administration) to supplement its experience data at these ages. A description of how the extra data has been utilized is included herein.
- AIDS claims: Later durations (durations 6 and later) for males issue ages 20 through 30 spiked above 100 percent of the 1975-80 Basic Mortality Tables. The SOA Task Force believed that the high values at these durations were attributable to excess AIDS deaths, both identifiable and non-identifiable, and that these results overstate the impact of AIDS today.

II.B. OVERVIEW OF THE DEVELOPMENT OF COMPOSITE MALE AND FEMALE MORTALITY TABLES

The approach used to develop the composite 2001 Valuation Basic Tables for males and females is as follows:

1. We have used the 1990-95 Basic Mortality Tables as a starting point. However, as noted above, there was little older age experience data available for use in the creation of the 1990-95 experience tables. Graduation techniques were used by the SOA Individual Life Insurance Committee to create the 1990-95 Basic Mortality Tables where data was limited. To supplement the 1990-95 Basic Mortality Tables at older ultimate ages, male insured data from the Veterans Administration WWII table was obtained. Older female ultimate age data from the 1995 Railroad Retirement Board Table for Widows (from the 20th Actuarial Valuation of the U.S. Railroad Retirement Board Table S-7) was considered, but was considered and incorporated into the initial draft of the table; however, on further review of the data, the Task Force believed it too different from insured data to utilize in the construction of the table. Older issue age select data was obtained from a special Old Age Mortality study that was commissioned for this committee and performed by Bragg and Associates.
2. An initial graduation, utilizing a 2- dimensional Whittaker-Henderson Type B method, was performed to address smoothness concerns of the Task Force. The initial q_x s utilized in the graduation were the 1990-95 experience tables and the VA and Bragg data where appropriate. The Task Force believed it appropriate to begin with the 1990-95 experience tables in the graduation, instead of the raw q_x s, as the 1990-95 experience tables had a good fit to the underlying data.
3. Based on the results of the initial graduation, specific corrections for smoothness and older age mortality were made. Also, for males only, corrections were made at later durations (durations 6 and later) for issue ages 20 through 30 for AIDS.
4. We performed the duration within issue age test, the issue age within duration test and the attained age test on the graduated tables. The tests failed at certain age/duration values, and as such, the Task Force set a maximum of ultimate mortality at any attained age. This resulted in the preliminary composite valuation basic tables by male and female.
5. We multiplied the preliminary composite 2001 Valuation Basic Tables by mortality improvement projection factors and smoothed results to produce the composite 2001 Valuation Basic Tables for males and females.

II.C. DETAILS OF DEVELOPMENT OF COMPOSITE MALE AND FEMALE MORTALITY

1. Address the older ages by using a combination of data

The basis of the Valuation Basic Table is the 1990-95 Basic Mortality Tables. The Task Force had concerns over the lack of experience data used for older ages in the construction of the 1990-95 Basic Mortality Tables. To address these concerns, the Task Force made modifications to the 1990-95 Basic Mortality Tables using the deaths and exposures from other sources to replace certain 1990-95 Basic Mortality Table values.

To address the problem of lack of data at older issue ages in the 1990-95 Basic Mortality Tables, a special study was prepared for this Task Force by Bragg and Associates entitled "Report on Older Age Mortality". The Male Study had a total of \$132.4 billion exposure with \$1.4 billion of claims at attained ages 65 and up (experience for both select and ultimate durations) and the Female Study had total of \$46.1 billion of exposures and \$0.4 billion of claims at attained ages 45 and up. Results were provided for all lives split by non-smoker, smoker and smoking status unknown.

The source of male high age ultimate mortality was the graduated VA 93 Permanent plan mortality experience. In particular, the program used was the National Service Life Insurance ("NSLI") program that covered millions of servicemen from WWII. At that time, virtually all servicemen took out this insurance. At the end of 1993, 2,380,832 policies remained in force for a total amount of \$20.6 billion of insurance and an average attained age of 70.0 years. The issue age data on the policies is extremely accurate. In 1993, there were 1,743,806 Permanent policies in force. To ensure consistency with the 1990-95 Basic Mortality Table study period, the graduated VA 93 Permanent plan mortality experience (covering the period 1990-92) was selected. These graduated rates cover attained ages 58 through 95, and were extended to a value of 1 at age 120.

2. Address smoothness by using a 2- dimensional Whittaker-Henderson Type B method for an initial graduation.

A 2-dimensional Whittaker-Henderson method was used to graduate the tables, with third differences, a vertical smoothness component of .8 and a horizontal smoothness component of .06. The initial q_x s used in the graduation were the 1990-95 experience tables, and, where appropriate, the Bragg and VA experience. The graduation weights the experience based on the exposures.

The data used in the graduation were the 1990-95 Basic Mortality Table, the combined results from the Bragg and Associates "Report on Older Age Mortality" and the graduated VA 93 Permanent plan mortality experience for males.

3. Based on the initial graduation, correct for smoothness and older age mortality. For males only, corrections were made at later durations for issue ages 20 through 30.

In the initial graduation, smoothness was needed for younger ages. An adjustment for younger ages was made at issue ages zero, one and two within the first 3 durations. Additionally, mortality rates were changed by from 0.00001 to .00005 for smoothness.

The initial graduation resulted in an ultimate q_x pattern at older ages that did not meet the tests set out in II.A and, therefore, substitutions were made. For males, the VA 93 Permanent plan q_x s were substituted.

Later durations (durations 6 and later) of issue ages 20 through 30 spiked above 100% of the 1975-80 Basic Mortality Table. The Task Force believes these high values at the later durations were attributable to excess AIDS deaths. We believe these results overstate the impact of AIDS today given the advancement in the treatment of AIDS and the implementation of AIDS testing.

At other nearby durations, the ratios to the 1975-80 Basic Mortality Tables were around 85%, the Task Force believed this to be a reasonable upper bound for mortality at those

ages. As an initial step to address the AIDS spike, we set, for issue age 0/duration 1 and issue ages 2-30/all durations, $qx = \min(\text{Graduation } qx, 85\% \text{ of } 1975\text{-}80 \text{ Basic Mortality Table } qx)$. This initial step also eliminated an attained age 16 mortality ridge in the male data. This attained age 16 mortality ridge is present in the female data and other material available to the committee. It is believed that this attained age 16 ridge is due to new drivers at attained age 16. The attained age 16 mortality ridge was restored for males. The AIDS spike was then modified from a flat plateau of 85% to a slightly higher peak that reflected the shape of full AIDS mortality.

4. Perform duration within issue age test, issue age within duration test and attained age test. Based on results, use ultimate mortality to change younger issue age mortality and set a maximum of ultimate mortality at any attained age. The resulting tables are the preliminary composite 2001 Valuation Basic Tables for males and females.

For both male and females, the tests were not enforced for:

1. Ages near birth
2. Attained age 16 mortality ridge.

For males, the tests were not enforced for:

1. AIDS mortality spike at later durations of issue ages 20 through 30.
2. The decline in male mortality during their 20's.

It was observed that the younger age mortality was extremely low compared to the 1975-80 Basic Mortality Table and resulted in issues with smoothness. Results were modified to raise mortality and provide smoothness similar to that in the 1975-80 Basic Mortality Tables.

Modifications were also made to mortality at durations 11 through 25, at ages greater than 40 for males and females, to address smoothing concerns revealed in preliminary testing of the 2001 CSO valuation mortality table.

Numerous changes of small magnitude, from .00001 to .00005, were made to bring the rates into compliance with the smoothness tests. These minor changes typically took place at younger ages.

For females and males issue age 20 and over, modifications were made primarily by log linear interpolation. Most of the log linear interpolations occurred along attained age diagonals.

The result of this step were the preliminary composite valuation basic tables for males and females.

5. Multiply the preliminary composite 2001 Valuation Basic Table by mortality projection factors, and smooth results to produce the composite 2001 Valuation Basic Tables for males and females.

The preliminary composite 2001 Valuation Basic Tables for males and females were projected from 1992 to 2001 using mortality projection assumptions described in Section IV. The resulting product was not uniformly smooth based on the rules described in II.A. If the result was not smooth due to a corresponding lack of smoothness in the

preliminary composite table, no change was made. Otherwise, the resulting product was smoothed by:

1. Numerous changes of magnitude .00001 to .00005
2. Log-linear interpolations
3. At older issue ages, setting values equal to ultimate values along attained age diagonals.

The resulting tables are the composite 2001 Valuation Basic Tables for males and females.

III. CONSTRUCTION OF SMOKER DISTINCT MORTALITY

The Task Force was charged with developing 2001 Valuation Basic Tables that provided separate tables for smokers and non-smokers. This is consistent with the 1980 CSO Mortality Tables that have smoker distinct versions. In developing smoker/nonsmoker distinct tables, the Task Force has explored both insured and non-insured lives experience data and split mortality experience by smoking basis.

There are many challenges in developing smoker distinct mortality. First, the long-term relationship of insured lives mortality rates by smoking status is unknown. Separate smoking distinct classes have not been utilized in insurance products long enough to produce ultimate duration smoker distinct mortality. Second, the definition of smoking status has changed over time. For example, smoking status was initially defined as cigarette smoking. More recently, the use of cigars, pipes or smokeless tobacco products constitute "tobacco" usage for insurance purposes.

The largest obstacle to overcome is isolating the effect of smoking status by itself. Smoking is correlated with socio-economic status. In general, smokers are more prevalent in lower socio-economic classes and buy smaller policies. These smaller policies are screened with relatively fewer underwriting requirements.

These complications mean that we must look to include as much information as possible and be very careful to avoid attributing mortality differences to smoking status when other contributing factors may be present as well.

Section III.A contains relevant insured lives data including commentary on the work found in the 1982 Society of Actuaries Reports entitled "Report of the Task Force on Smoker/Nonsmoker Mortality". Section III.B contains relevant population trends and commentary on such. Section III.C contains final recommendations for nonsmoker/smoker splits of underlying data.

III.A INSURED LIVES DATA

The compilation of the SOA 1990-95 Basic Mortality Tables was the first time that nonsmoker/smoker experience was evaluated in the construction of SOA Basic Mortality Tables. The data that was compiled contains many of the biases alluded to above. While smoking status was segmented, it simply was not possible to isolate all other factors so that smoking was the only variable contributing to differentials in the relative risk of mortality. A primary variable not held constant in the study was policy size.

Assuming smokers buy smaller policies, the spread observed in the experience is wider than it might otherwise be if all other factors were held constant.

In addition, it is likely the underlying lapse rates for nonsmokers and smokers changed during this period of time due to the introduction and proliferation of preferred products that were primarily focused on non-tobacco/nonsmoker risks. It would not be unreasonable to expect that healthier nonsmoker risks migrated out of the nonsmoker pool faster than what might have occurred from the smoker population. As such, the nonsmoker mortality results may be worse than would have occurred if the population had stayed relatively unchanged through the entire exposure period. However, if much of the nonsmoker experience reflects the preferred nonsmoker or non-tobacco classes, then the differential observed by smoking habits is likely to be exaggerated.

With those caveats, however, it is still valuable to look at the graduated experience of the contributing companies. The following show the ratios of nonsmoker/smoker to composite experience from the 1990-95 Basic Mortality Tables, and the resulting smoker/nonsmoker ratio, and compares to the assumptions used to develop the 1980 CSO tables.

AGE 25 MALE SM/NS EXPERIENCE				
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS				
	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.86	0.90	0.89	0.83
Basic '90-95 SM	1.69	1.92	1.72	1.72
Ratio '90-95	1.97	2.13	1.93	2.07
Ratio 80 CSO Basic	1.41	1.41	1.43	1.54

AGE 35 MALE SM/NS EXPERIENCE				
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS				
	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.89	0.87	0.86	0.84
Basic '90-95 SM	1.94	2.03	2.00	1.93
Ratio '90-95	2.18	2.33	2.33	2.30
Ratio 80 CSO Basic	1.51	1.52	1.57	1.69

AGE 45 MALE SM/NS EXPERIENCE				
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS				
	Duration 1	Duration 2	Duration 5	Duration 10

AGE 45 MALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.78	0.85	0.87	0.89
Basic '90-95 SM	2.32	2.20	1.92	1.74
Ratio '90-95	2.97	2.59	2.21	1.96
Ratio 80 CSO Basic	1.89	1.90	1.94	1.95

AGE 55 MALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.83	0.80	0.81	0.85
Basic '90-95 SM	2.68	2.54	2.24	1.92
Ratio -90-95	3.23	3.18	2.77	2.26
Ratio 80 CSO Basic	1.94	1.92	1.86	1.74

AGE 65 MALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.90	0.90	0.89	0.87
Basic '90-95 SM	2.91	2.32	1.92	1.98
Ratio '90-95	3.23	2.58	2.16	2.28
Ratio 80 CSO Basic	1.72	1.69	1.60	1.45

AGE 25 FEMALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.82	0.84	0.81	0.82
Basic '90-95 SM	1.68	1.64	1.31	1.32
Ratio '90-95	2.05	1.95	1.62	1.61
Ratio 80 CSO Basic	1.18	1.20	1.23	1.31

**AGE 35 FEMALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS**

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.83	0.95	0.94	0.84
Basic '90-95 SM	1.84	1.84	1.62	1.57
Ratio '90-95	2.22	1.94	1.72	1.87
Ratio 80 CSO Basic	1.32	1.34	1.41	1.53

**AGE 45 FEMALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS**

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.87	0.97	0.82	0.75
Basic '90-95 SM	1.93	1.89	1.75	1.72
Ratio '90-95	2.22	1.95	2.13	2.29
Ratio 80 CSO Basic	1.54	1.55	1.56	1.54

**AGE 55 FEMALE SM/NS EXPERIENCE
SOA BASIC 1990-95 VS. 1980 CSO SCALING FACTORS**

	Duration 1	Duration 2	Duration 5	Duration 10
Basic '90-95 NS	0.90	0.87	0.74	0.69
Basic '90-95 SM	1.86	1.94	2.40	2.31
Ratio '90-95	2.07	2.23	3.24	3.35
Ratio 80 CSO Basic	1.53	1.53	1.49	1.42

The 1990-95 experience data introduces characteristics of the underlying business in addition to smoking status. At the younger ages, the pattern in the 1990-95 experience data is somewhat different than in the 1980 CSO scaling factors. These lives are most susceptible to replacement by preferred products as a small increase in premium due to increase in issue age is outweighed by a large decrease in premiums due to meeting preferred underwriting criteria. Assuming more preferred nonsmoker lives have re-entered the insurance population, this would cause the difference to narrow. Also, the difference between smoker and nonsmoker mortality with the 1990-95 experience data are widest at the earliest durations. The effect of underwriting does imply a strong select and ultimate approach to nonsmoker/smoker differences.

There are several sources of possible distortion in mortality experience among insured lives by smoking status. Primarily among these are:

- Underwriting standards used to screen and classify risk have varied and continue to vary from company to company in evaluating whether an applicant qualifies for nonsmoker rates. This can take many forms such as how long an individual must be smoke free to differences in minimum policy sizes (and thus underwriting requirements) for nonsmoker discounted policies.
- When companies began nonsmoker/smoker premium classes, some companies used criteria besides smoking habits to assure that a significant improvement in mortality could be expected among those qualifying as “nonsmokers.” As an example, nonsmokers may have had to satisfy certain build, blood pressure and/or other qualification criteria to be considered for “nonsmoker” rates that were more restrictive than the “smoker” category.
- New product innovations through time have been most advantageous to the healthiest of non-tobacco using individuals. It is likely that selective lapsation has taken place with these individuals as well as with former smokers that qualified for non-smoker rates.

The net impact of these issues is to significantly muddy the waters with respect to isolating the impact of smoking on insured lives mortality. In fact, these issues are among those discussed in the Report of the Task Force on Smoker/Nonsmoker Mortality article found in the 1982 Reports.

For completeness, in the Society of Actuaries Transactions of 1982 (vol. 32), data from four companies are presented. Those results are summarized below.

SMOKER/NONSMOKER MORTALITY							
Issue Ages	State Mutual Dur 1-5	State Mutual Dur 6-10	State Mutual Dur 11-15	Phoenix Mutual Dur 1-10	Home Life Dur 1-8	Sun Life <21 cigs	Sun Life >20 cigs
15-29				0.63	2.48	1.57	1.61
30-39	10.9	4.1	4.2	3.33	1.50	2.15	2.21
40-49	1.8	4.3	4.3	1.84	2.22	1.85	2.42
50-59	2.6	4.3	2.3	1.64	2.25	2.38	3.00
60+				2.37	0.72	2.04	2.25

The second piece of data to consider is the relative prevalence of smoking in the underlying population.

The 1990-95 experience data included 3 types of exposure by amount categories: smokers, non-smokers and smoking status unknown (“unknowns”). In the early

durations the percent of unknowns were generally in the 10-15% range. Unfortunately, in the later durations (13+) the unknown smoking status exposure often represented the bulk (50%+) of the total exposure.

Representative ages and durations of male exposure data are highlighted below.

MALE NS/SM/UNKNOWN EXPOSURE PERCENTAGES BASIC MORTALITY TABLES 1990-95				
	Duration 1	Duration 5	Duration 10	Duration 15
Age 25-29	77%/12%/11%	76%/10%/14%	72%/10%/18%	4%/6%/90%
Age 35-39	75%/12%/12%	76%/11%/13%	73%/12%/15%	7%/6%/87%
Age 45-49	75%/12%/13%	75%/12%/13%	71%/14%/15%	9%/5%/86%
Age 55-59	75%/11%/14%	77%/11%/12%	73%/13%/13%	13%/5%/82%
Age 65-69	78%/9%/12%	82%/9%/10%	76%/11%/14%	15%/6%/79%

The 1990-95 Basic Mortality Tables report shows the full pattern of exposures by duration among those that can be segmented into smoker, nonsmoker or unknown issues.

III.B POPULATION LIVES DATA

In addition to a review of published insurance studies, a literature search was undertaken to identify clinical studies that detail the relative mortality risk of smokers vs. nonsmokers. Two basic types of prospective population studies were identified in this search.

The first type of study followed individuals over a period of time and reported a summary relative mortality risk estimate for the entire period. Depending on the size of the study, estimates might have been stratified over one or two criteria such as age and gender.

A more limited subset of large prospective studies again followed individuals over a certain period of time and estimated relative mortality risk. In addition, they also published all-cause mortality risk prediction equations. These risk prediction equations calculated estimates of the probability of death over a given period of time. By comparing the probability of death in smokers vs. nonsmokers while holding all other variables constant, it was possible to derive a relative mortality risk estimate. The availability of these equations allowed for a range of risk estimates to be derived by varying one or more of the variables. However, the accuracy of the risk equation in predicting relative mortality risk differences can be expected to decline as the manipulated variables are moved further away from mean age and duration of follow-up of the study.

In contrast to the point estimates of relative risk available in some insurance studies almost all of the clinical studies report a summary relative risk over a varying follow-up time frame. For the purposes of our analysis, it was assumed that this period risk estimate was equivalent to a point estimate half way through the period. Some rounding up and down of follow-up periods was necessary in order to include as many data points as possible. The following discusses some of the key observations from the various studies:

- Age: By attained age 60, the magnitude of the percentage differential appears to decrease. The decrease may be a byproduct of an increasing mortality ratio in non-smokers and a possible decrease in the death rate of the remaining smokers due to a decrease in susceptibility to the deleterious effects of continued smoking or a cessation or cutback of smoking by some of those classified as smokers.
- Gender: Gender effects are complex, and prospective studies not controlling for magnitude of smoking exposure or age distribution have reported mixed results. Historically, smoking females consumed smaller quantities of cigarettes than males. The magnitude of tobacco exposure in women has increased resulting in overall increases in relative mortality risk differences compared to earlier periods (Thun 95). Most studies have found similar levels of relative mortality risk with similar levels of smoking exposure.
- Quantity smoked: Studies that distinguished the quantity smoked tend to find higher relative mortality differences between the heaviest smokers and non-smokers.
- Duration of follow-up: Longer term (30-40 years vs. less than 20 years) follow-up studies report greater relative mortality differentials with increase in period of follow up. In some studies this enlarging effect could be due to an increasingly unhealthy residual persistent smoking cohort.
- Co-morbidity status at time of study entry: Some studies of the relative mortality of smokers vs. non-smokers do not describe if they screened for pre-existing disease at the time of study entry. In the absence of such screening, it is likely that the prevalence of underlying disease in middle and older ages will be higher in smokers compared with non-smokers. This could inflate the relative mortality differences.
- Inclusion of ex-smokers not screened for prevalent disease in non-smoking cohorts: A small portion of individuals who stop smoking do so because of deteriorating health. If a study has included such individuals in a non-smoking cohort this would tend to decrease the relative mortality difference between continued smokers and the non-smoking/ex-smoking cohort.
- Secular period: Based on a Scandinavian study if degree of smoking exposure is held constant there appears to be no increase or decrease in excess mortality associated with smoking over different time periods.
- Ascertainment of continued smoking status: Individuals initially classified as smokers in long term prospective studies may have smoking discontinuance rates of over 50%. If the former smoking group continues to be analyzed as “smokers” the mortality risk differences between groups will be artificially reduced.

A summary of the clinical studies that provide relative mortality risk differences between smokers and nonsmokers are contained in Appendix A of this paper. From these data points a trend line was developed.

As discussed previously, in order to split any aggregate mortality assumption, not only are relative differences in mortality needed, but prevalence estimates are needed as well.

Epidemiologic literature from the general population on cohort specific smoking prevalence over time is not available. Therefore an important assumption was required about the prevalence of smoking in a general population cohort over long durations. In this exercise it was assumed that the prevalence of smoking in an aging cohort would resemble the prevalence in the next older cohort that was under-study. In general this meant that smoking status declined with increasing age, duration of follow-up and over successive secular periods.

The general population references consulted were published by Pechmann et al (1998) and the US Surgeon General. Pechmann's article was the primary resource utilized in the development of trended prevalence estimates of the general population. Pechmann included smoking prevalence estimates for males and females from 1974 to 1994 and trended prevalence estimates through 1999. His primary data source was 15 yearly administrations of the National Health Interview Survey. Figures detailing the actual data and trended estimates for the US population were included for 4 different age groups (20-24, 25-44, 45-64, 65-80). The most common pattern noted in these figures was a linear decline in smoking prevalence by time. Therefore, a linear extrapolation of the trended prevalence estimates was carried forward for purposes of this exercise. Three of the four age groups demonstrated convergence in gender specific smoking prevalence. Because of this and the relative unknown future prevalence of smoking, a blended gender smoking prevalence estimate was utilized in the forward trending.

The following table lists the gender specific prevalence estimates in the US population over time measured or extrapolated off of the figures included in Pechmann's article.

RAW SMOKING PREVALENCE FOR GENERAL POPULATION					
	Age Group				
Men	20-24	25-44	45-65	65-80	
1980	38.0%	43.1%	41.5%	21.3%	
1990	26.7%	32.9%	29.7%	15.8%	
2000	22.5%	25.1%	23.7%	11.0%	<i>Trended</i>
Women	20-24	25-44	45-64	65-80	
1980	33.2%	34.7%	32.6%	13.4%	
1990	23.7%	28.1%	26.1%	12.2%	
2000	22.5%	22.7%	16.6%	9.1%	<i>Trended</i>

This baseline data was used to develop smoking prevalence estimates, first by ten-year and then by five-year age group. Mid decade (1985, 1995, etc) smoking prevalences estimates were assumed to be an average of the boundary years (1980 & 1990 for 1985, etc.). The resulting matrix formed the core data used to estimate changes in smoking prevalence by age and duration. Prevalence estimates by duration were read diagonally off the final table. Two separate, and independent, modifications of this core general population data were made to adjust the prevalence rates for an insured population.

The first modification utilized information in the Surgeon General's report. This report contained information on the prevalence of smokers in the white population in addition to the prevalence of smokers who were college educated for the years 1965 thru 1995. This data was also extrapolated forward. The prevalence of college educated smokers divided by the prevalence of smokers in the general population created a ratio that could be observed for changes in magnitude over time. The ratio was noted to decline over the reporting period. This suggested that a decreasing percentage of current smokers were college educated, especially after 1990. Using an assumption that a greater proportion of insurance buyers were college educated and using the ratio as a guide, Pechmann's population smoking prevalence estimates were reduced. This reduction did not alter the pattern of declining prevalence after young adulthood and with increasing duration apparent from the original data.

The second modification involved lowering Pechmann's data by a direct percentage. The recommended percent reductions were typically between 10 and 20% of the original population data. Higher reductions were utilized at the oldest ages. Compared to the first modification, these prevalence estimates are similar but somewhat higher than the estimates that resulted from the first modification described above.

Both of these modifications were reviewed to produce prevalence rates in an issue age/duration format based on population data. These prevalence estimates are presented in the following tables for males and females. They should be viewed as trended approximations of contemporary smoking prevalence in an insured population.

ESTIMATES OF INSURED SMOKING PREVALENCE FROM PECHMANN'S DATA

	Duration						
Males	1	5	10	15	20	25	30
25	20.3%	18.6%	18.3%	16.4%	14.4%	12.9%	11.3%
30	21.5%	18.8%	17.5%	15.6%	13.5%	12.0%	9.8%
35	22.6%	17.4%	16.8%	14.7%	12.6%	10.3%	8.2%
40	22.1%	16.0%	16.0%	13.9%	10.8%	8.6%	6.8%
45	21.5%	14.6%	15.1%	11.9%	9.1%	7.1%	5.4%
50	20.8%	13.1%	13.0%	9.9%	7.5%	5.6%	5.6%
55	20.2%	11.4%	10.8%	8.1%	5.8%	5.7%	5.8%

ESTIMATES OF INSURED SMOKING PREVALENCE FROM PECHMANN'S DATA

	Duration						
60	17.2%	9.8%	8.8%	6.3%	5.8%	5.8%	5.0%
65	14.2%	8.2%	6.8%	6.4%	5.8%	5.0%	4.3%
70	11.5%	6.7%	7.0%	6.5%	5.0%	4.3%	3.0%
75	8.8%	6.1%	7.2%	5.7%	4.3%	3.0%	1.5%
80	9.4%						

ESTIMATES OF INSURED SMOKING PREVALENCE FROM PECHMANN'S DATA

	Duration						
Females	1	5	10	15	20	25	30
25	20.3%	18.6%	17.2%	15.2%	13.4%	11.9%	10.6%
30	20.4%	18.8%	16.0%	14.0%	12.2%	10.8%	9.2%
35	20.5%	17.4%	14.7%	12.8%	11.1%	9.4%	7.8%
40	18.9%	16.0%	13.4%	11.6%	9.6%	8.0%	6.5%
45	17.3%	14.6%	12.1%	10.1%	8.2%	6.6%	5.2%
50	15.7%	13.1%	10.5%	8.6%	6.8%	5.3%	5.0%
55	14.1%	11.4%	9.0%	7.2%	5.5%	5.0%	4.8%
60	12.3%	9.8%	7.5%	5.8%	5.1%	4.8%	3.9%
65	10.6%	8.2%	6.1%	5.4%	4.8%	3.9%	3.1%
70	8.9%	6.7%	5.6%	4.9%	3.9%	3.1%	2.2%
75	7.3%	6.1%	5.1%	4.1%	3.1%	2.2%	1.1%
80	6.6%						

III.C SCALING RECOMMENDATIONS

The final step was to take all of the above information and establish the relative risks and prevalence estimates for smokers and nonsmokers given all of the relevant data. The relative risks and prevalence factors for smokers and nonsmokers were then used to develop smoker/nonsmoker factors which were then applied to the composite 2001 Valuation Basic Tables for males and females respectively.

Graphs that contain relevant data discussed in III.A and III.B are located in Appendix A. The size of the points on the graphs represent relative amounts of data. Larger points represent relatively more data. Conversely, smaller points represent relatively less data. From these studies, trend lines have been developed and presented to determine relative risk estimates.

Prevalence estimates, derived from two different sources of data, indicate a decline in smoking with age and duration. The final prevalence estimates are based primarily on insured data for durations 1-10. At later durations, the rate of decline in the insurance data is somewhat flatter than what was projected for the general population. Prevalence estimates from the 1990-95 Basic Mortality Tables in the early durations are lower than what was postulated for an insured cohort from Pechmann's data. Trending of the SOA 1990-95 data experience resulted in lower late duration smoking prevalence estimates in middle aged and elderly females compared to the similar aged males.

The final prevalence estimates were computed into a 25-year select and ultimate format. A summary of these estimates are displayed below.

MALES – SMOKING PREVALENCE						
Age	Duration 1	Duration 2	Duration 10	Duration 15	Duration 20	Duration 25
25	14.4%	14.3%	14.1%	14.0%	13.9%	13.8%
35	13.7%	13.4%	13.2%	13.0%	12.8%	12.6%
45	12.9%	12.6%	12.3%	12.0%	11.7%	11.4%
55	12.2%	11.8%	11.4%	11.0%	10.6%	10.2%
65	11.5%	11.0%	10.5%	10.0%	9.5%	9.0%

FEMALES – SMOKING PREVALENCE						
Age	Duration 1	Duration 2	Duration 10	Duration 15	Duration 20	Duration 25
25	11.5%	11.5%	11.5%	11.4%	11.4%	11.1%
35	13.5%	12.8%	12.2%	11.7%	10.5%	9.7%
45	15.5%	14.2%	12.9%	10.7%	9.6%	8.3%
55	17.6%	15.1%	12.5%	10.3%	8.7%	6.9%
65	15.5%	13.7%	11.8%	10.0%	7.8%	5.6%

Nonsmoker/smoker factors were developed using the relative risk estimates and the smoking prevalence estimates described above.

The preliminary composite 2001 Valuation Basic Tables for males and females were then multiplied by the non-smoker/smoker factors. The resulting product was not uniformly smooth based on the rules established discussed in II.A. If the result was not smooth and a corresponding lack of smoothness existed in the preliminary composite table, no change was made. Otherwise, the resulting product was smoothed by:

- Numerous changes of .00001 to .00005
- Log-linear interpolations
- At older issue ages, setting values equal to ultimate values along attained age diagonals.

The resulting tables are the non-smoker and smoker 2001 Valuation Basic Tables for males and females.

IV. CONSIDERATION FOR MORTALITY IMPROVEMENT

In developing the 2001 Valuation Basic Table, the Task Force explored mortality improvement in both insured and non-insured populations. The Task Force put forth a recommendation as to how the mortality experience underlying the 1990-95 Basic Mortality Tables could be projected to 2001, the projected date at which the new valuation table will be released.

Mortality improvement up to the start date of the Valuation Base Tables has been considered by the Task Force for the following reasons:

- The experience underlying the table has a central year of 1992.
- Mortality improvement has been experienced in both insured and population mortality in recent years.

It is the Task Force's opinion that best actuarial practice is to assume some mortality improvement up to the start date of the 2001 Valuation Basic Table in its construction.

Consideration has also been given to projecting mortality improvement past the projected start date of the 2001 Valuation Basic Table. However, it is the opinion of the Task Force that the 2001 Valuation Basic Table should not reflect mortality improvement past its start date. Although some companies may anticipate mortality improvement past the start date of the 2001 Valuation Basic Table, life insurance mortality tables used in a regulatory environment (model illustration regulation, XXX) have not allowed the use of mortality improvement. A future event could have a significant negative or positive impact on mortality; this cannot be predicted. Therefore, no mortality improvement past the start date of the 2001 Valuation Basic Table will be utilized.

This section reviews trends in mortality improvement in both insured lives and non-insured lives and presents the mortality improvement factors used in the construction of the valuation base tables.

IV.A. INSURED LIVES

Mortality improvement in insured lives from the 1985-90 Basic Mortality Tables to the 1990-95 Basic Mortality Tables has been examined. Mortality improvement in this period has been considered for the following reasons:

- It is the most recent SOA experience available.
- The tables have similar structures (i.e., the same select and ultimate period).
- The 1990-95 Basic Mortality Tables is the basis of the 2001 Valuation Basic Tables.

The Task Force recognizes that there may be many reasons for differences in mortality between the two tables that is not directly related to underlying improvement in insured mortality, including:

- Changes in the proportion of smokers
- Changes in the proportion of medical/non-medical
- Changes in underwriting
- The impact of AIDS

However, the Task Force believes that it is reasonable to review the change in mortality between the two tables (in conjunction with a review of other non-insured sources), to determine an opinion as to how to bring the experience up to a 2001 table start date.

Mortality improvement between the two tables has been reviewed as follows:

- Separately for males and females
- Durations 1, 5, 10 and 20 for quinquennial issue ages beginning with issue age 0
- Ultimate mortality for quinquennial ages beginning with attained age 25

The following is a summary of the experience:

Implied Annual Mortality Improvement – SOA Male Experience (1985-90 to 1990-95)						
Issue Age	Duration 1	Duration 5	Duration 10	Duration 20	Attained Age	Ultimate
15	2.7%	2.9%	2.4%	-2.6%	25	4.0%
25	5.0	2.0	0.4	-2.1	35	-2.7
35	5.4	3.4	2.6	2.0	45	-1.0
45	8.4	5.5	1.8	-0.3	55	1.5
55	3.1	6.4	1.9	2.2	65	0.7
65	9.1	0.7	2.1	1.1	75	1.7
75	0.5	-0.4	1.2	-2.6	85	0.9

Implied Annual Mortality Improvement – SOA Female Experience (1985-90 to 1990-95)						
Issue Age	Duration 1	Duration 5	Duration 10	Duration 20	Attained Age	Ultimate
15	-1.5%	5.0%	4.9%	-1.6%	25	5.8%
25	1.7	6.3	-2.4	1.3	35	-2.1
35	2.9	2.9	3.9	0.3	45	1.3
45	1.7	3.3	3.2	-0.9	55	-0.8
55	-1.1	1.3	3.7	-0.7	65	-1.1
65	-2.6	3.5	-2.4	-0.2	75	-1.1
75	-0.4	0.3	2.6	1.0	85	-0.5

There appears to be much wider variance in the change in mortality between select mortality and ultimate mortality. This may be due in part to the impact of changes in underwriting and the impact of AIDS. If separate mortality improvement factors were utilized for select and ultimate experience, this could result in a material change in the slope of the table. We also believe that the experience in the ultimate durations is more heterogeneous and therefore is more representative of the underlying change in mortality. The Task Force's intent in utilizing mortality improvement was to recognize underlying trends in overall mortality improvement and not to project how changes in underwriting will affect the slope of mortality between the experience period (1990 – 1995) and 2001. For these reasons, we have not utilized changes in select mortality in deriving a recommended mortality improvement factor.

IV.B. NON-INSURED LIVES

We have compared levels of mortality improvement from various non-life insurance sources. Non-life insurance sources provide an indication of the underlying level of mortality improvement in the population as a whole. The sources we have reviewed are as follows:

- General U.S. population over the period 1989-1998
- RP-2000 Study data
- Social Security data for the period 1990-1994
- Federal Civil Service data for the period of 1988-1996
- SOA Group Annuitant Mortality for the period 1988-1994

It should be noted the last four sources were obtained from the documentation of the RP-2000 tables. The following tables provide a summary of annual percentage improvement in mortality from the different sources.

Annual Improvement in Male Mortality – Various Sources					
Attained Ages	Population	RP-2000	Social Security	Federal Civil Service	GAM
25-29	3.4%	-1.1%	1.0%		0.0%
35-39	3.6	2.2	-1.4		0.7
45-49	1.2	2.0	0.6		1.7
55-59	2.0	4.5	1.8	1.1	1.8
65-69	1.6	1.5	1.0	0.9	1.2
75-79	1.0	1.1	1.1	1.6	2.3
85-89	0.5	0.2	-0.5	0.8	1.3

Note: Population mortality improvement is between the 1989-91 decennial tables and the 1998 table.

Annual Improvement in Female Mortality – Various Sources

Attained Ages	Population	RP-2000	Social Security	Federal Civil Service	GAM
25-29	4.7%	13.9%	0.0%		0.9%
35-39	0.0	-7.5	-2.2		0.8
45-49	1.1	-4.6	0.6		1.9
55-59	1.2	5.3	1.1	0.9%	0.8
65-69	0.6	0.4	-0.1	0.4	0.7
75-79	0.4	-0.9	-0.1	1.1	1.5
85-89	-0.1	-1.3	-0.5	0.3	0.9

Note: Population mortality improvement is between the 1989-91 decennial tables and the 1998 table.

IV.C. OBSERVATIONS AND RECOMMENDATIONS

It is difficult to infer a specific relationship between attained age and mortality improvement that is applicable to a mortality table. However, we have made the following observations regarding mortality improvement:

- Mortality improvement has tended to be higher for males than for females.
- Mortality improvement has tended to be less at attained ages under 45 and attained ages above 85.
- Mortality improvement for males ages 55 – 80 appears to be in the range of 1.0% for Social Security and Federal Civil Service data. Insured experience appears to be somewhat higher.
- Mortality improvement for females appears to be in the range of 0.5% for ages 55 – 80.
- In some of the studies, female mortality has recently deteriorated.

Based on the above observations, the following mortality improvement factors have been utilized to project the underlying data from 1992 to 2001, the start date for the 2001 Valuation Basic Table:

Annual Mortality Improvement		
Attained Age	Male	Female
0-45	0.0%	0.0%
grading to		
55-80	1.0	0.5
grading to		
85	0.5	0.5
grading to		
90+	0.0	0.0

V. PREFERRED RISK CLASSES

Throughout the 1990's, there has been an increased use of preferred risk classes. Preferred risk classes have been primarily used with term insurance products, however, preferred risk classes can also be found on universal life, variable universal life and other permanent life insurance products.

The following observations can be made regarding preferred risk classes:

- A preferred risk is an insured life that has satisfied certain medical and non-medical criteria that are stricter than those required for standard issues. Typical criteria assessed for preferred risks include, but are not limited to, build, blood pressure, cholesterol level, drug and alcohol history, personal medical history, family medical history and driving record.
- Today, there may be more than one preferred nonsmoker risk class (e.g., super-preferred nonsmoker and preferred nonsmoker). If there are preferred smoker risk classes, it is less likely that there will be multiple preferred smoker risk classes.
- The criteria for preferred risk classes vary greatly by company. There is no standard, commonly accepted definition of a preferred risk in the life insurance industry.

Life insurance companies will price preferred risk products with a mortality assumption that is less than the mortality assumption for a standard risk. Considerations that a life insurance company will use in setting the preferred risk mortality assumption include:

- Past mortality levels for standard underwritten risks

- The conservatism or liberalism inherent in the preferred risk criteria
- The proportion of insureds qualifying for preferred risk classes
- The view that the individual company has on the impact of preferred risk criteria on ultimate mortality levels

The Task Force has considered varying the basic mortality table by preferred risk class. As with smoker/nonsmoker distinct experience, experience with preferred lives is limited. However, there is no clear definition of preferred risk in the industry, as opposed to the definition of smoker/nonsmoker status, which is relatively consistent in the industry. Given that there is no clear definition of preferred risk in the industry, and the lack of experience, the Task Force believes it prudent to not have a separate mortality table for preferred risks.

VI. CONSIDERATION FOR AIDS

AIDS has had a material impact on the level of mortality in the general population and the level of mortality in the insured population. The impact of AIDS on insured and non-insured populations is focused on males in the age range of 25 – 49. Also, based on trends in AIDS mortality in the general population, it is reasonable to expect that there will be a decrease in reported deaths due to AIDS in insured experience in the period 1995 – 2000.

To adjust the 1990-95 Basic Mortality Tables for a decreasing trend in AIDS-related death claims, it would be reasonable to reduce the 1990 – 1995 experience by 50% of reported AIDS claims. This could be considered conservative, as it is generally believed that AIDS deaths of insured lives are under-reported and there appears to be an even greater decrease in the level of AIDS-related deaths in the general population over the period 1995 – 1998. Given that reported AIDS claims generally made up less than 2% of claims (with a maximum of 11% for male issue ages 20-29 in durations 6-10), this would result in less than a 1% reduction in mortality levels at most ages and a maximum reduction in mortality of 5%. It is the opinion of this Task Force that it is more appropriate to address AIDS claims implicitly in the graduation of the 2001 Valuation Basic Table as described in Section II.

VII. 2001 VALUATION BASIC TABLE

2001 Valuation Basic Table has been created and is applicable for use with ordinary life insurance. The 2001 Valuation Basic Table has a 25-year select period for issue ages 0 through 99 and the tables have a final age of 120. 2001 Valuation Basic Tables have been created for the following risk classes:

- Male Composite
- Male Nonsmoker
- Male Smoker

- Female Composite
- Female Nonsmoker
- Female Smoker

Consideration has been given for the development of a separate table for extended term insurance (“ETI”). The Task Force obtained information from only one company; this information indicated that there was not a material difference between ETI mortality and ordinary insured mortality. The Task Force believes that the increasing prevalence of universal life and variable universal life has reduced the importance of ETI as a non-forfeiture option and therefore the amount of ETI exposures. Given the ETI experience collected and the limited amount of ETI exposures, it was determined that a separate “ETI” table was not warranted.

A complete version of each of the tables and a comparison of the tables to the 1990-95 Basic Mortality Tables and the 1998 U.S. Population tables (ultimate only) is attached.

Some observations regarding the tables are as follows:

- Ultimate and later duration male mortality at attained ages 25 through 40 is materially lower than the 1990-95 experience tables. This is a result of the adjustment made to the table in areas where experience was significantly higher than the SOA 1975-80 experience table.
- Early duration female mortality is relatively close to male mortality at issue ages 45 through 55. This is representative of the experience at these ages, for example, in the 1990-95 experience table, issue age 50, duration 4 female mortality is 99.7% of male mortality at the equivalent issue age and duration.
- There was no reasonable insured experience for older age ultimate female mortality, as opposed to male ultimate mortality where VA experience was utilized. The Task Force observed that the gap between female and male mortality widened at these ages. However, no modification was made as the Task Force focused on the smoothness of the tables at these ages for females instead of applying a strict relationship between male and female mortality.
- The ratio of smoker mortality to composite mortality in the tables is less than that observed in the 1990-95 experience tables. The Task Force was concerned that differences in the average size of smoker and nonsmoker policies was impacting the 1990-95 experience and utilized techniques to reflect only differences due to smoking status.

VIII. ACKNOWLEDGEMENTS

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