

RECORD, Volume 31, Number 1*

New Orleans Life Spring Meeting
May 22-24, 2005

Session 85 Seminar Agile or Fragile? Underwriting and Mortality at the Older Ages: Part 2

Track: Product Development

Moderator: Richard L. Bergstrom

Panelists: Allen M. Klein
Christopher S. Shanahan
Richard L. Bergstrom

Summary: *An aging population is presenting insurers with an increased number of cases being sold at the older ages. For success in this market it is crucial that the methods of assessing the health of the insured, as well as the resulting mortality costs, are based on the best information possible. In this two-part seminar, industry experts share underwriting techniques used today in selecting and rating risks at the older ages, factors used in determining a preferred risk at these ages, industry data on the level of mortality being experienced by older issue ages and views on the wearing off of underwriting at the older ages versus the younger ages. The second session explores work that has been completed, as well as that which is currently in progress, to study the mortality experience of the older ages, the mortality costs to the insurer if the absolute level and shape of the pricing mortality curve is incorrect and the value of underwriting with regard to newly issued mortality versus attained age mortality.*

MR. RICHARD L. BERGSTROM: I'm with the life practice of Milliman in Seattle. I've been with Milliman now for 21 years. Prior to that I had a lifetime with J.C. Penney down in Dallas. I grew up at Mutual of Omaha in the 1970s learning how to do disability insurance. Currently I am the vice chairman of the SOA's Individual Life Experience Studies Committee. For the past seven to nine years, I've been heavily involved with mortality research and with underwriting assessments.

* Copyright © 2005, Society of Actuaries

Also on today's panel is Al Klein. Al is a senior consultant with the Tillinghast of Towers Perrin and the leader of the life practice in the firm's Chicago office. Al's experience and expertise include product development and pricing of individual life and annuity products; mortality research, including a focus on underwriting and medical issues; preferred underwriting issues; traditional reinsurance and enterprise risk management. Al's professional activities include chairing the SOA's Preferred Mortality Study Task Force, the Enhancements to Life Experience Studies Task Force and the Mortality and Underwriting Survey Committee of the SOA. Al is also a member of the Longer Life Foundation's advisory board. He's the past chair of the former Preferred Underwriting Task Force and served on the Mortality Studies Working Group and the 2001 CSO Task Force of the SOA.

Chris Shanahan is senior vice president of Scottish Re. His responsibilities include management of Scottish Re's research unit. Chris joined Scottish Re in January as part of Scottish Re's acquisition of ING Re's individual business. Chris spent three years with ING Re and was responsible for ING Re's mortality research team, including development of ING Re's mortality assessment system, as well as term product development, corporate-owned life insurance/business-owned life insurance (COLI/BOLI) and critical illness pricing. Prior to ING Re, Chris also served eight years with Lincoln Re, most recently as second vice president of pricing and product management. Chris is a fellow of the SOA and a member of the AAA, as are Al and I.

We will be taking a comparative look at three very recent mortality experience studies. I will address one from the Society of Actuaries. Al will address one from Tillinghast, and Chris will address one from Scottish Re/ING. We will close with Chris speaking on the impact of pricing and profitability based upon these mortality studies.

MR. ALLEN M. KLEIN: I imagine you're here because you want to see what mortality is like out to age 100 or 120. I'm going to talk about the tables that are currently available, focusing on the Society of Actuaries' tables that are available. There are also a number of Canadian tables that could be used, and there's a recent Tillinghast Older Age Mortality Study that was just released last week. I will first give you a brief idea of the prevalence of the use of these tables. Then I'll talk a little about each of the tables, trying to point out something that you may or may not know that I think you'll find interesting and helpful. Finally, I'm going to take a look at the mortality rates from these and do a little analysis at the older ages.

In terms of prevalence of the tables, according to the Society of Actuaries' 2002 Preferred Underwriting Survey, 50 percent of the respondents still use the 1975-1980 Basic Table as the basis for their expected mortality. Another 46 percent use either an internally created table from their company experience or from industry experience. Another 18 percent use either the 1985-1990 Basic Table or the 1990-1995 Basic Table. As actuaries, you know that adds up to more than 100 percent,

and that's because the survey said to "let us know any of these tables that you use." There were 48 respondents to the survey. One thing that surprised me initially was how low the 2001 Valuation Basic Table (VBT) was, at only 4 percent. But this was a 2002 survey and the VBT had just been released. I do think that the VBT has a good chance of becoming the next industry standard and of replacing the 1975-1980 table in time.

Let's start with the 1965-1970 table. The 1965-1970 had issue ages zero to 70, ultimate attained ages up to 99 and a 15-year select period. The thing that I wanted to point out about this table was that the values over 95 were approximated. Therefore, the data at the oldest ages in this table is not good data.

The 1975-1980 table has issue ages zero to 70, ultimate ages going out to 100 and a 15-year select period. I mentioned issue ages zero to 70. How are we using this table today if it only goes out to 70? I'm going to talk about the extensions in just a minute. Something you might not know is that the 1975-1980 table includes medical, paramedical and non-medical issues combined. For females, there were two large claims at ages 65 to 69 in the first duration that were removed. That may not have been a good idea because, as you're going to see, the later tables show that female mortality experience has been higher than the earlier tables. Also, with females at the younger ages, the ultimate was actually less than the select period. So they combined all the results and used a shorter select period. One other thing that was interesting in the report on the 1975-1980 table is that it was noted that the effects of selection seemed to persist more than 15 years for ages 45 and above.

I mentioned the extensions in the 1975-1980 table. There are a number of different extensions that are in use. Three of the more popular ones are Manulife, Milliman and Tillinghast. We're going to show you some of the numbers later. There are big differences between some of these extensions, so you need to know which one you're using and understand how it was developed.

The 1980 CSO table started with the 1975-1980 data and from that created attained ages zero to 100. The youngest ages were tweaked manually, and the values over 84 were adjusted by grading to 1 at age 100.

The 1985-1990 table has issue ages zero to 99, attained ages out to 110 and a 25-year select period (there is a shorter select period for the older ages). One thing that was done with this table, which is probably a good idea, is that all the identifiable AIDS claims were removed, since it was felt that underwriting would be able to remove those in the future. One other thing that you may not be aware of on this table is that there was one early-duration, \$30 million claim for a male smoker in his 40s that was spread out over about 10 ages and about five durations. I know there are some companies that use it, but, because of this adjustment, I'm not a big fan of this table.

The 1990-1995 table, like the 1985-1990 table, again, has issue ages zero to 99, attained ages out to 110 and a 25-year select period. The ages zero to 72 were based on individual experience, but ages 73 and beyond were extrapolated from the earlier ages. This is not published (I know some of you are aware of this), but the first seven durations of this table have underwriting experience that's based on the old underwriting done many years ago, and some underwriting based on the preferred underwriting of today. So there's a mix of experience in the early durations. When you combine this with the later durations, which are all the older experience, the slope of this table may be off versus what you might see ultimately using preferred today. You should to be aware of this.

The 2001 VBT has issue ages zero to 99. Ultimate attained ages went out to 121. It's a 25-year select table and we started with the 1990-1995 data. This data was augmented by older age mortality and smoker mortality from the Veterans Administration and also from Bragg. There was a question on this in the term session. Part of the reason we needed this augmentation was that the SOA data is somewhat limited beyond issue age 75 and attained age 90. The 1990-1995 data was brought up to 2001 with a conservative mortality improvement assumption.

The 2001 CSO table started with the 2001 VBT, so it has attained ages zero to 121. We developed what was felt to be an appropriate margin, a target of 15 percent mortality load. The female smokers are actually higher than the 1980 CSO table in a number of instances. Now, as many of you know, the 2001 CSO has some problems with it. It is insufficient for certain companies and for certain products, like final expense and pre-need, and it produces too high a reserve for preferred.

Chart 1 looks at some of the mortality rates from these tables that I just discussed. The chart shows the 1975-1980 table for males with three different extensions, 1985-1990, 1990-1995 and 2001 VBT. It shows issue ages 70 through 90, for durations 1, 5 and 10.

Chart 1

COMPARISON OF MORTALITY RATES - MALES

Duration 1						
Age	75-80 - Extensions			85-90	90-95	2001 VBT
	Manulife	Milliman	Tillinghast			
70	7.89	7.89	7.89	6.76	5.94	4.48
75	18.71	12.53	12.47	10.68	10.44	12.09
80	40.30	19.89	19.75	17.24	17.21	15.38
85	84.92	30.47	30.32	38.87	38.40	30.66
90	155.22		45.64	97.65	98.22	85.73

Duration 5						
Age	75-80 - Extensions			85-90	90-95	2001 VBT
	Manulife	Milliman	Tillinghast			
70	28.41	28.41	28.41	18.03	19.18	15.74
75	52.45	41.85	41.86	30.03	30.57	27.17
80	99.09	64.84	64.61	57.97	51.90	54.49
85	169.12	97.84	98.08	108.07	112.48	109.91
90	240.77		139.63	184.35	210.81	228.89

Duration 10						
Age	75-80 - Extensions			85-90	90-95	2001 VBT
	Manulife	Milliman	Tillinghast			
70	45.48	45.48	45.48	40.03	35.42	38.83
75	107.62	70.18	70.20	79.97	75.49	60.29
80	169.12	106.41	106.56	128.52	133.75	116.86
85	240.77	151.70	151.71	190.49	217.84	228.89
90	322.92		203.47	297.49	289.67	306.74

If you look at the extensions, you can see that the Milliman and Tillinghast extensions are pretty close. They had a little different methodology so they're off by a little bit, but if you compare them to the Manulife extension, there's quite a difference. As a matter of fact, from my understanding, Manulife doesn't use its own extension anymore. They are in the process of developing a new one.

Next, I'd like to compare the 1975-1980 to the other tables. When you do that, the 1975-1980 extensions are generally higher at ages 70 and 80 than the other tables, and they're generally lower at ages 80 to 90. There is an exception to this at duration 10, where they're virtually always lower.

Next I'd like to compare the 2001 VBT, which is all the way to the right, to the other tables. When we look at that, 2001 VBT is generally lower than all the other rates, except at the highest ages and durations.

I'd like to talk about one other interesting thing. On Chart 2, you can see that I took 25 percent of the Tillinghast extension. Twenty-five percent is a typical super-preferred class today. I compared that to the 2001 VBT, and I got percentages that ranged from 13 percent to 44 percent for duration 1; 15 percent to 42 percent for duration 5; and 17 percent to 29 percent for duration 10. Those are very low percentages.

I mentioned the Tillinghast Older Age Mortality Study. We have a number of breakdowns there, and one is for the preferred non-smoker class.

Chart 2

TEST OF PREFERRED CLASS ASSUMPTIONS - MALES

Agile or Fragile? Underwriting and Mortality at the Older Ages: Part 2

6

Duration 1					
75-80 Ext.					
Age	Tillinghast	25%	2001 VBT	25% TIII.	2001 VBT
70	7.69	1.97	4.48	4.4%	
75	12.47	3.12	12.09	26%	
80	19.75	4.94	15.38	32%	
85	30.32	7.58	30.66	25%	
90	45.64	11.41	85.73	13%	

Duration 5					
75-80 Ext.					
Age	Tillinghast	25%	2001 VBT	25% TIII.	2001 VBT
70	26.41	6.60	15.74	4.2%	
75	41.88	10.47	27.17	39%	
80	64.61	16.15	54.49	30%	
85	98.08	24.52	109.91	22%	
90	139.63	34.91	228.89	15%	

Duration 10					
75-80 Ext.					
Age	Tillinghast	25%	2001 VBT	25% TIII.	2001 VBT
70	45.48	11.37	38.63	29%	
75	70.20	17.55	60.29	29%	
80	106.56	26.64	116.66	23%	
85	151.71	37.93	228.89	17%	
90	203.47	50.87	306.74	17%	

For the male preferred non-smoker class, overall we were at 66 percent of the 2001 VBT. All of the percentages that I mentioned were much lower than this. Now we need to make one more adjustment as this is super preferred versus just the regular preferred that is coming out of the Tillinghast older-age study. Assuming that on average the preferred class would be 35 percent of the 1975-1980, I came up with 47 percent, still higher than a 25 percent assumption. Therefore, companies that use a flat percentage of the 1975-1980 may be making an overly aggressive assumption, and that doesn't even include mortality improvement on top of that. So be wary of this.

I'm going to go over the female mortality rates shown in Chart 3 because there are some differences.

Chart 3

COMPARISON OF MORTALITY RATES - FEMALES

Duration 1							
75-80 - Extensions							
Age	Manulife	Millman	Tillinghast	85-90	90-95	2001 VBT	
70	3.63	3.63	3.63	3.71	3.63	3.63	
75	10.32	6.02	6.01	6.69	6.84	7.75	
80	25.23	10.77	10.80	11.49	10.73	12.88	
85	59.59	18.56	18.58	23.61	24.26	26.69	
90	114.35		29.37	84.72	76.08	75.41	

Duration 5							
75-80 - Extensions							
Age	Manulife	Millman	Tillinghast	85-90	90-95	2001 VBT	
70	10.13	10.13	10.13	12.04	11.16	9.32	
75	31.97	18.10	18.08	19.58	19.26	17.01	
80	69.02	31.59	31.60	38.10	33.17	34.02	
85	123.55	50.78	50.77	73.82	71.44	66.76	
90	183.95		75.59	183.27	153.78	119.38	

Duration 10							
75-80 - Extensions							
Age	Manulife	Millman	Tillinghast	85-90	90-95	2001 VBT	
70	24.77	24.77	24.77	26.73	25.83	27.28	
75	74.28	43.30	43.29	49.10	43.13	47.80	
80	123.55	69.56	69.55	88.26	82.67	81.99	
85	183.95	103.56	103.56	165.26	155.68	132.98	
90	258.10		145.30	276.13	272.42	201.99	

In terms of the comparison of the extensions, these are comparable to what you saw on the males. On the extensions versus the other tables, the extensions were generally lower than the other tables for females. For the 2001 VBT versus the other tables, those were typically lower as well, except for ages 75 to 85 in the first duration.

In a similar comparison using super preferred, I came up with percentages of the 2001 VBT of 10 percent to 25 percent for duration 1; 16 percent to 27 percent for duration 5; and 18 percent to 23 percent for duration 10. Again, these are very low. Chart 4 shows that the Tillinghast Older Age Mortality Study did come in lower for females on the preferred non-smoker at 53 percent. When I adjusted that down to the best class, I came up with about 38 percent, much lower but still higher than all of the percentages that I just mentioned.

Chart 4

TEST OF PREFERRED CLASS ASSUMPTIONS - FEMALES

Duration 1				
Age	Tillinghast	25%	2001 VBT	25% Tillinghast / 2001 VBT
70	3.69	0.91	3.63	25%
75	6.01	1.50	7.75	19%
80	10.80	2.70	12.88	21%
85	18.58	4.65	26.69	17%
90	29.37	7.34	75.41	10%

Duration 5				
Age	Tillinghast	25%	2001 VBT	25% Tillinghast / 2001 VBT
70	10.13	2.53	9.32	27%
75	18.08	4.52	17.01	27%
80	31.60	7.90	34.02	23%
85	50.77	12.69	66.76	19%
90	75.59	18.90	119.38	16%

Duration 10				
Age	Tillinghast	25%	2001 VBT	25% Tillinghast / 2001 VBT
70	24.77	6.19	27.28	23%
75	43.20	10.82	47.80	23%
80	69.55	17.39	81.09	21%
85	103.56	25.89	132.08	19%
90	145.30	36.33	201.09	18%

How do you choose which table to use? There isn't an easy answer to that question. You need to understand how the tables were constructed and which are appropriate to your situation. There are a number of individual company factors that you need to use to make your decision. The next most important thing is to decide which table has the most appropriate slope for you. The last step would be to determine the level of mortality.

As Rick mentioned, each of us contributed data from our own mortality studies. We're not going to talk about each of our studies in this section, but we're going to

talk about different slices of the mortality. Chris is going to start off by talking about the early-duration experience at the older ages. Then I'm going to talk about the rest of the select period at the older ages. Rick is going to conclude with a discussion on the ultimate duration. The SOA study was based on approximately 774,300 total deaths over exposure years 1996-2001, the Tillinghast study was based on about 722,200 total deaths over years 2000-2002, and the Scottish Re study was based on approximately 1,400 total deaths over years 1997-2002. The exposure years are centered around 2000 among the three studies. What we're going to show you is actual-to-expected (A/E) ratios, with the expected being 2001 VBT from the three studies.

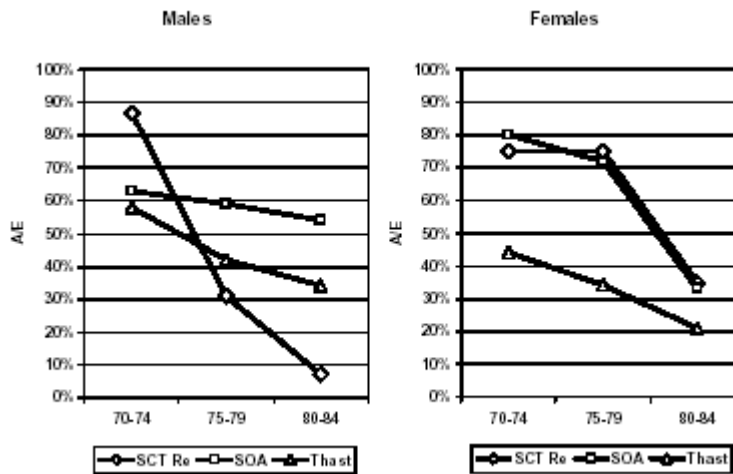
MR. CHRISTOPHER S. SHANAHAN: One reason I'm covering the early-duration piece of this combined discussion is that the most notable difference between the Scottish Re study versus the SOA and Tillinghast data is in information beyond duration 10. There's a sizable difference in the total number of deaths between the SOA and Tillinghast studies, which have an enormous amount of data, and the Scottish Re study. In the SOA and Tillinghast studies, there are around 500,000 deaths in the ultimate period out at the high-attained ages, which is great information for us to have. The Scottish study is limited very much to early-duration select experience. If you look at just duration 1 and 2 experience for both males and females, grouped into five-year issue age buckets, the Tillinghast study is the largest by total amount of exposure. Scottish has about half as much, and the SOA has about half as much of that. However, if you look at it by number of deaths, it's Tillinghast, SOA and Scottish.

The Scottish study obviously is based upon reinsurance experience. A lot of this business is first-dollar quota share, so it should mirror direct face amounts, but it tends to have larger average sizes, and it is reinsured business. That's another distinction. The other thing I'll note is that if you look at either number of deaths or exposure by issue age, you'll notice it's a declining amount, which I don't think is surprising. We have a lot more data for issue ages 70 to 74 than we do, for instance, 85+. One, there aren't as many people around to issue to, and two, not as many companies issue there and certainly have not historically.

Chart 5 shows duration 1 and 2 experience, males and females, in a couple of different age buckets. I didn't include the 85+ just because there's not a whole lot of data there. Often we look at number of claims as a proxy for the amount of experience. That's certainly a good way to look at it. I think it's also important to note, though, that as age goes up, the expected mortality goes up. And as expected mortality goes up, the confidence interval declines. Thus you don't need as many claims on 85-year-olds as you do on 70-year-olds to get some significant credibility.

Chart 5

DURATION 1 AND 2 EXPERIENCE
Expected Mortality VBT S&U



What do we see here? One thing you see is that it's a little bit all over the place. I think the most noteworthy thing that you take away from this is that there's a clear downward sloping pattern by issue age. In other words, the 80s are lower for the older issue ages than they are for the younger issue ages.

Now, if we were to look at this from ages 25 through 80, there is not any pattern we would see throughout that entire period. With regard to the development of the 1990-1995 and 2001 VBT, if you recall, the SOA data started to get scant around issue age 75 and attained age 90, which means the select mortality beyond age 75 in those tables is somewhat of an extrapolation. As issue age goes up, within the context of these oldest individuals, that extrapolation was, relatively speaking, somewhat conservative, or less aggressive than at the younger ages, whichever way you want to look at it. Hence, you see the downward sloping pattern. You can look at somebody's 70-and-up business, and on the surface one company looks better than another from an A/E perspective, but if one company only issues up to age 75 and the other company issues up to age 85, they could be exhibiting similar mortality. It's just that A/E is artificially lower because you'd expect a lower A/E at age 85 than at age 75, all other things being equal.

It is interesting to note a couple of other things. Again, the Scottish data is the outlier on the males, particularly ages 70 to 74. I don't have a complete explanation for that. If it were not for that, the parallel shift in those lines would be very similar. It's interesting that on the females, the SOA and Scottish data are

almost identical. So when you switch from males to females, it's a different two that are very similar ... and the Tillinghast data is lower and looks a little different.

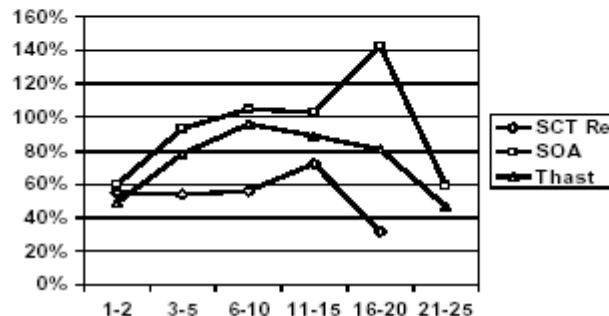
There are a lot of pieces to this puzzle, as far as connecting early durations to ultimate and how you grade to get there. We'll take this piece by piece and talk about what it means when you put it all together. We talked a lot in the previous session and this session around, for lack of a better term, hypothetical or theory, and this puts some actual hard numbers to some things.

MR. KLEIN: Chart 6 is the rest of the select period, for issue ages 70 to 89 for males. I'm going to say the picture here is a humpback to some degree. Basically at the lower durations, we have a lower percentage of the VBT, and again, at the highest durations, we have a lower percentage. It goes up and comes back down. It's kind of a humpback for all three of these studies for males. We believe that the VBT had some conservatism built in at the oldest ages, and this implies that the slope might be a little steeper than the VBT.

Chart 6

DURATIONAL MORTALITY — MALE AGES 70-89

AER (to Exped) = 201 VBT				Expense (\$ Millions)			# of Deaths				
Duration	Scottish	SoA	Tillinghast	Duration	Scottish	SoA	Tillinghast	Duration	Scottish	SoA	Tillinghast
1-2	55%	60%	49%	1-2	6657	4,099	13,998	1-2	164	669	735
3-5	54%	93%	78%	3-5	5,949	3,727	11,952	3-5	281	1,239	1,938
6-10	55%	103%	95%	6-10	2,244	4,503	9,394	6-10	188	3,398	3,990
11-15	72%	103%	89%	11-15	280	2,203	3,571	11-15	61	3,011	4,520
16-20	32%	143%	81%	16-20	3	284	981	16-20	1	749	2,561
21-25		65%	47%	21-25		33	64	21-25		125	283

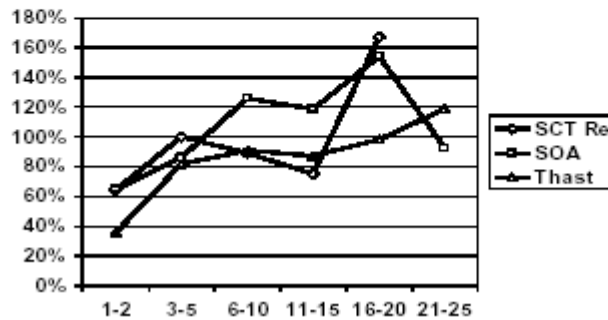


Looking at the same select period for females in Chart 7, you see more of an increasing pattern. It's all over the place, but, in general, by duration, as it relates to the 2001 VBT, you can see an increase.

Chart 7

DURATIONAL MORTALITY — FEMALE AGES 70-89

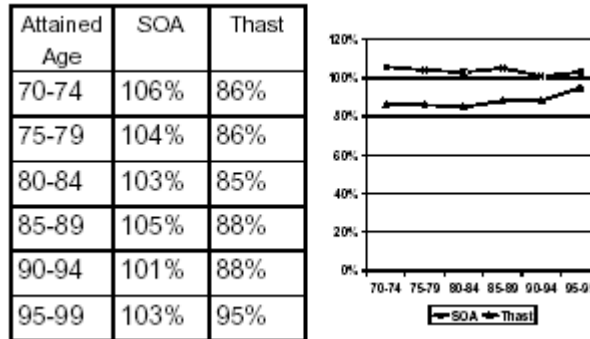
AE Ratio Expected=2001 VBT				Exposure (\$ Millions)				# of Deaths			
Duration	Scottish	SoA	Tillinghast	Duration	Scottish	SoA	Tillinghast	Duration	Scottish	SoA	Tillinghast
1-2	64%	66%	33%	1-2	7,570	5,793	17,018	1-2	148	606	465
3-5	100%	88%	82%	3-5	8,148	5,457	15,806	3-5	332	1,212	1,577
6-10	83%	128%	91%	6-10	3,833	6,889	14,433	6-10	160	3,071	4,318
11-15	75%	113%	87%	11-15	613	2,132	4,752	11-15	46	2,099	4,031
16-20	167%	154%	95%	16-20	2	201	757	16-20	1	813	2,431
21-25	93%	93%	113%	21-25		11	29	21-25		149	519



MR. BERGSTROM: I will cover the ultimate comparison. As Chris mentioned, Scottish did not really have any experience beyond about duration 20, so this compares the SOA 1996-2001 older-age study to the Tillinghast 2000-2002 study. Chart 8 is for males. The actual-to-expected ratios are done by face amount. You can see that in the SOA study, the ratios for all those various attained age groups are quite flat, just over 100 percent. The Tillinghast ratios are also flat, but they vary between about 10-20 percent lower than the SOA numbers for males.

Chart 8

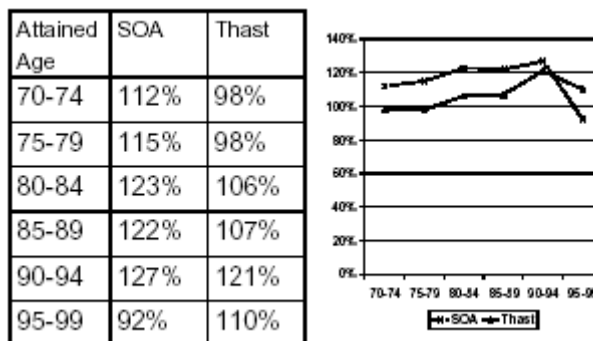
MALE COMPARISON OF A/E RESULTS
ULTIMATE DURATIONS (FACE AMT)
Expected Mortality = VBT Ultimate



If we look at females in Chart 9, the SOA data has a definite upward A/E ratio increase as attained age increases. The Tillinghast study also has an upswing in the A/Es as attained age increases. Again, they are about 15 percent lower on average, with the exception of attained ages 95 to 99.

Chart 9

FEMALE COMPARISON OF A/E RESULTS
ULTIMATE DURATIONS (FACE AMT)
Expected Mortality = VBT Ultimate



FROM THE FLOOR: To what extent were those two studies independent?

MR. BERGSTROM: The SOA study for the years 1996-2000 had about 11 contributing companies on average. In the year 2000-2001, that increased to 20. I did not look at the particular company names to see how much that overlapped.

MR. KLEIN: The Tillinghast study had 38 companies versus the 20 from the SOA, and there is some overlap between them. I don't know what percentage overlap it is, but I believe the exposure is fairly different.

FROM THE FLOOR: I haven't looked at the data that you're looking at, but the 1996-2001 ultimate data from the Society had it split between fully paid up and premium-paying, and then a total. The total obviously included some other stuff, because the A/E for the total was higher than either of the other two. There was some mysterious high-mortality stuff in there. Is that in the SOA data that you're looking at there as well?

MR. BERGSTROM: Yes, it is.

FROM THE FLOOR: What about the Tillinghast data? Is that part of the reason there's a difference?

MR. BERGSTROM: I'm not going to try to get into answering that. I know what you're talking about. You and I have talked about this. The point is whatever data was contributed for those participating companies on an attained-age basis for the ultimate are in those A/E ratios.

FROM THE FLOOR: What about Tillinghast?

MR. KLEIN: Everything that was contributed is in that as well.

MR. BERGSTROM: I'd like to recap some of the key observations of the comparison of these studies. The early duration A/E ratio for issue ages 70 and higher generally declines as issue age increases relative to the VBT. Female A/Es versus the VBT generally are higher than male A/Es. For select mortality at issue ages 70+, the pattern is steeper than the VBT. Ultimate age mortality generally follows the slope of the VBT, but for males it varies between about 85 percent and 105 percent (this is between the Tillinghast and SOA numbers). But the females are higher; between about 100 percent and 120 percent.

We will now look at just the SOA data. Chart 10 is for male non-smokers. This is only during the select period. Now for the SOA data, I decided to define "older age" as ages 60 and higher, not just 70 and higher. This is one of the reasons. If we look at issue ages 60 to 64, by duration and the grand total, we see there is a definite downward pattern of A/E ratios as duration increases. If we look at issue ages 70 and higher, that reverses itself for each of those issue-age groups. In total, the male A/Es for non-smokers is extremely flat and pretty consistent. We have four

98s and a 92, which averages out to be a 95 for all the select issue ages 60 and higher, and the total is 95 percent.

Chart 10

Male NS, 1996-2001, All Face Amounts
Combined, 2001 VBT Exp. Basis, Dur 1-25

Issue Age	1-2	3-5	6-10	11-15	16-20	21-25	Grand Total	Deaths
60-64	126%	88%	97%	86%	93%	62%	92%	11,899
65-69	107%	66%	107%	97%	104%	118%	98%	8683
70-74	55%	91%	97%	104%	128%	63%	98%	4086
75-79	52%	68%	122%	106%	57%		98%	1287
80-87	27%	139%	97%	101%	18%		98%	271
Total A/E	94%	83%	102%	93%	98%	74%	95%	26,226
Total Deaths	926	2228	7717	10,720	4473	162	26,226	

If we go to the female non-smokers for the same select period, we see different patterns, as shown in Chart 11. There are 6,000 deaths in here, so this is credible experience. For issue ages 60 to 64, we have a very high early-duration mortality, which tapers off all the way out through the first 25 durations. That leads me to believe that the actual experience is much flatter than what the VBT table shows. By the time we get down to issue ages 70 to 74, that turns around again. In fact, it goes from 76 percent in durations 1 and 2 to almost double that by duration 16. Let's look at issue age 75 to 79. This is very confusing to me, and I don't have an answer for this, but there are 1,400 deaths, so this is not necessarily just an anomaly. The early-duration mortality is 56 percent in durations 1 and 2, but we're up to over 200 percent by durations 16 to 20, which means that the VBT tables simply do not provide a very good pattern for the actual experiences we're seeing. The pattern is not steep enough. It certainly starts out too high, and the VBT table is simply too low by the later durations. In total, female non-smokers are 97 percent and are actually relatively flat when you combine all the issue ages together by duration group.

Chart 11

Female NS, 1996-2001, All Face Amounts
Combined, 2001 VBT Exp. Basis, Dur 1-25

Issue Age	1-2	3-5	6-10	11-15	16-20	21-25	Grand Total	Deaths
60-64	142%	100%	79%	81%	82%	66%	86%	6375
65-69	86%	78%	79%	86%	124%	73%	85%	5419
70-74	76%	74%	91%	106%	134%	116%	94%	3483
75-79	56%	106%	169%	158%	211%		144%	1398
80-87	35%	88%	113%	136%	117%		102%	439
Total A/E	82%	89%	100%	98%	107%	70%	97%	17,114
Total Deaths	781	1922	5646	5638	3040	87	17,114	

MR. SHANAHAN: I think it's very telling when you see the same trends across multiple data sources. The Scottish Re numbers shown are only on issue ages 70 and up. But based on the data on the same companies in our experience, which is about 15,000 claims, if you look at all issue ages, that pattern by issue age is very prevalent in the Scottish data as well. The early-duration experience numbers up to about age 55 or 60 are fairly flat as percentages of our reference table. Then when you go into the 60s, it starts to go up markedly. It's very similar to the very high early-duration numbers you see in the 60s in the numbers that Rick provided. Then, as you go to 70+, as we already showed, it starts to decline. However, those are early durations. The slopes are kind of the opposite effect. That very elevated early A/E on ages in the 60s grades back down as you play out over 20 or 25 durations, whereas at the older issue ages, while it started out as descending, it's a much steeper pattern than the VBT table. So it's a very similar effect.

MR. KLEIN: I wanted to add that the Tillinghast study also shows a pattern for females that isn't consistent with the 2001 VBT.

MR. BERGSTROM: Chart 12 shows the male non-smokers' A/E ratios for the select period by face amount. As you can see, at least for the early issue ages, we would expect the A/E ratios to be higher at the lower face amount bands. There's less underwriting; we have less evidence. At issue ages 60 to 64, that grades down as face amount increases. That same pattern holds for 65 to 69. It basically holds for 70 to 74. Something happened again at issue ages 75 to 79, and there is a fair amount of deaths in the early years there. I'm not sure why that number is where it is, but we see that for all issue ages above 75, for the \$100,000 face amount band.

Male NS, A/E by Face Amount Band
Durations 1-25

Issue Age		\$25-49K	\$50-99K	\$100-249K	\$250K+
60-64	A/E	115%	110%	93%	80%
	Total Deaths	2407	2193	1530	556
65-69	A/E	128%	112%	96%	87%
	Total Deaths	1729	1326	853	361
70-74	A/E	131%	118%	103%	86%
	Total Deaths	730	534	396	204
75-79	A/E	124%	113%	131%	85%
	Total Deaths	191	153	159	92
80-87	A/E	122%	95%	134%	90%
	Total Deaths	27	36	47	40
Total A/E		122%	112%	98%	84%
Total Deaths		5084	4242	2985	1253

I wanted to also show you the actual-to-expected by policy count, as shown in Chart 13. By policy count we see the same type of downward trends, up until issue ages 75 to 79. Then we see this spike again. There is not a lot of data at 80 to 87, but 118 percent (issue ages 75 to 79) is relatively close to 104 percent (issue ages 80 to 87). When the A/E ratios by policy counts are in excess of 100 percent and the A/E ratios by face amount are also in excess of 100 percent, that means too many bodies are dying, at least according to the expected table that we're using.

Chart 13

Male NS, A/E by Policy Count
Durations 1-25

Issue Age		\$25-49K	\$50-99K	\$100-249K	\$250K+
60-64	A/E	109%	104%	86%	84%
65-69	A/E	124%	106%	91%	89%
70-74	A/E	129%	114%	101%	90
75-79	A/E	124%	107%	118%	94%
80-87	A/E	104%	106%	104%	81%
Total A/E		117%	106%	91%	87%
Total Deaths		5084	4242	2985	1253

Looking at female non-smokers, Chart 14 shows the pattern we see by face amount. We see a nice downward trend as face amount increases, up until issue ages 75 to 79, in which case there isn't a trend other than too many deaths. Something is going on. There's a fair amount of deaths there. The subcommittee that will be writing up the SOA Older Age Study will be looking at this starting

around the middle of June, and we expect to have a report out to the group sometime in September.

Chart 14

Female NS, A/E by Face Amount Band
Durations 1-25

Issue Age		\$25-49K	\$50-99K	\$100-249K	\$250K+
60-64	A/E	120%	94%	91%	74%
	Total Deaths	773	463	325	130
65-69	A/E	131%	100%	88%	72%
	Total Deaths	642	429	278	132
70-74	A/E	124%	106%	102%	85%
	Total Deaths	408	304	220	167
75-79	A/E	142%	136%	134%	148%
	Total Deaths	118	140	163	149
80-87	A/E	126%	103%	135%	96%
	Total Deaths	43	44	81	91
Total A/E		126%	103%	101%	90%
Total Deaths		1984	1380	1067	669

Chart 15 is females by policy count. Again, there are downward trends, flat and lower, but well above 100 percent. Again, that indicates to me that the VBT table is not a good table to use for issue ages 75 to 79. It's too low.

Chart 15

Female NS, A/E by Policy Count
Durations 1-25

Issue Age		\$25-49K	\$50-99K	\$100-249K	\$250K+
60-64	A/E	118%	92%	84%	67%
65-69	A/E	127%	101%	82%	64%
70-74	A/E	126%	104%	89%	90%
75-79	A/E	112%	119%	120%	124%
80-87	A/E	118%	105%	136%	107%
Total A/E		122%	100%	91%	85%
Total Deaths		1984	1380	1067	669

When we look at the ultimate duration for males by count, they're very close, except that above attained age 90, the actual-to-expected by count is actually better than the A/E by face amount. However, in aggregate, these numbers are

very close. When we look at female ultimates for these attained ages, we see a very similar thing. The numbers are very close to each other.

The ultimate table starts at duration 26, but the average duration of experience in the ultimate table varies tremendously by the attained age. As shown in Chart 16, I combined both genders and the ultimate table. I do not have any smoking/non-smoking splits. Twenty-six years ago there wasn't that much data on smoker/non-smoker to make it worthwhile, so we have the smoker/non-smoker combined here. The average duration for attained age 60 is 37 years. By the time you get out to the older ages, the super, super seniors in the 90s, the average duration of that experience is in the high 50s, almost 60 years. That business out there was issued, folks, back in the 1930s and 1940s. Believe it or not, there's a fair amount of business out there. The average size is about \$1,500, but it's there.

Chart 16

1996-2001 Ultimate Ave. Duration
Combined Genders

Attained Age	Average Duration (yrs)
60-64	37.4
65-69	39.7
70-74	42.4
75-79	45.3
80-84	48.8
85-89	52.8
90-94	57.4
95+	58.9
Total	43.7

I want to give you an idea of how the 2001 VBT ultimate table compares to the 2001 U.S. Life Tables. Chart 17 shows attained ages from 40 all the way out to age 100. For the males, the VBT ultimate is about half of the U.S. Life Tables at age 40. By the time you get to age 90, they're identical. By the time you get to age 99, they're identical. For some reason the federal government likes to kill everybody off at age 100. That 32 percent is really the mortality rate for the VBT at age 100, which is 320 deaths per thousand. Looking at the females, we see different patterns. It's a lot flatter. It starts out higher, remains lower than the males, all the way out to age 100. It varies between about 70 percent and 85 percent compared to the U.S. Life Tables. The females are relatively flat all the way from about age 40 to age 100.

Chart 17

Comparison of 2001 VBT Ultimate to 2000 U.S.
Life Table Mortality

Attained Age	Male Ratio	Female Ratio
40	52%	70%
50	56%	78%
60	67%	87%
70	75%	81%
80	90%	78%
90	100%	80%
99	101%	85%
100	32%	25%

I'd like to make another comment to reinforce the importance of the limitations of data. Experience is definitely going to vary by the number of companies contributing, and it can actually be quite wide. It will vary by the mix of types of companies contributing. It will vary by the exposure years at which you're looking. We looked at 1996 to 2001 at the SOA. Tillinghast looked at 2000 to 2002. It will vary by the dynamically and constantly changing mix of risk classes. As we get more and more preferred in and less and less standard out, my guess is that we should continue to see mortality basically improving over the next five to 10 years or so. Experience can vary by the type of business you have, say the relationship between term and whole life. There can be, as AI pointed out, an influence of large claims. One of things we did with the basic 1996-2001 study was that we ran it two ways. This is for all ages, not just old age. We ran it with whatever the claim was that we counted, and the other way was that if a claim was over \$2.5 million, we capped both exposure and the claim to that to try to minimize the influence of large claims.

I don't know how much influence the reinsurers have when, starting back in the 1990s, they became the direct writer by taking 90 percent of the risk. How much influence does that have in what our actual experience is seeing? Did direct-writing companies get a little lax because they're only getting 10 percent? I don't know, but I wanted to bring that up as a possibility.

MR. ED HUI: As you've mentioned, the experience varies a lot by the type of mix of business, especially by gender. If you look at, say, a typical term product or even a universal life (UL) product, it might be that 70 percent by face amount is males, but when you look at the old ages, say issue ages 70 and over, what you find is the

exact opposite. I think in the SOA study something like 60 percent is female by issue ages, and it increases even more as the issue ages increase.

MR. SHANAHAN: That is certainly true for the Scottish study. For ages 70+ combined, the study was more than 50 percent female. The exact proportion escapes me.

Let's talk about pricing and profitability. I talked a little in a different context in the previous session about the older ages, but certainly the older ages are becoming increasingly relevant. Everybody knows about the aging of the American population. There are more and more people out there at these ages, and there's more and more willingness over the last five years to 10 years to issue insurance out at these ages, for a lot of different reasons. There's the need for it, as well as the potential growth opportunities associated with it. Just like the mortality ramps up kind of exponentially, the premiums become very large at the high ages, so there's a lot of pressure to place some of this business.

It is critical to get the assumptions correct. If you look at the present value of mortality by issue age, it increases, as everyone knows. But it's not just that it increases, it's that it increases dramatically. That's become even more so than was probably the case 25 or 30 years ago. If you think about a lot of the things you're seeing in these tables, and if you compare the tables from one to another, one of the general take-aways would be that mortality has improved a lot more over the last 10, 20, 30 or 40 years — whatever you want to pick — at core ages than it has at the oldest ages. Well, if you end up in largely the same place at age 100, but you're much lower at the ages before that, you're, by definition, flattening out. You're making it a sharper, almost a right angle at the end of the mortality curve. The result is that the increase in present value as you run out by issue age becomes all the more dramatic, so it's very important to get this business priced accurately.

Underwriting out here is hard, and there are a lot of different approaches to how to underwrite it. It's a very heterogeneous group. Until recently, there has definitely been a lack of insured data to help provide guidance on how to price this stuff. There's no question about that. Historically, there has been a lack of focus on it because it's perceived as a small amount of the business. There hasn't been a lot of data available, but increasingly data is becoming available. One of the good things about older ages is that they generate claims relatively quickly; you don't have to write it for that long before you have some experience of your own. But certainly, in what we've shared today and other sources, especially for the early durations, there's increasingly a lot more experience available. There are probably fewer sources of data for the attained-age piece, although I think that makes it, depending upon your perspective, good and bad news. What we've shown on the ultimate mortality are two sources that have a lot of data that show a consistent

picture. That's good news in the context of providing some guidance, but it may be bad news, depending upon your previous assumption.

I think the most common practice, although certainly not the only practice, is to use x percent of some table. One of the things we've shown, from the comparison of tables and the data, is that at these ages, there is no table for which x percent of that table works across the board. The slope of the mortality out here, based upon all available experience, is just too steep. Again, it gets back to that at the highest ages — ages 95, 100 and so on — there's not the evidence of the dramatic improvement that has occurred at the core ages, for all kinds of reasons. I try to approach this as if I'm pricing at x percent of 1975-1980 VBT, or whatever table, and invert that. If it's 40 percent that I'm pricing at, that means I'm taking a 60 percent discount relative to historical experience that's in the table I'm using. Why? Where does that discount come from?

That discount comes from a lot of places. There's general improvement since the exposure period. If you're using 1975-1980, it's 30 years out of date. If you're using 1990-1995, it's 10 years out of date. Make no mistake — the underlying population's mortality has improved significantly during that period. The general underlying mortality improvement in the population has not been level by gender or age. There's much less improvement in the oldest ages.

There are changes in underwriting practice. Blood testing came on the scene. Al talked about that a little in relation to the VBT and certainly relative to older tables like 1975-1980. We've developed some much better underwriting tools that were designed for the 45-year-old males and their cardiovascular issues, and that drove mortality down a lot at those ages. It has some benefit out at these ages, but it doesn't persist as long. In general, we've come a long way from an underwriting perspective.

There are issues about cohorts moving through the tables. Those are the reasons why you don't use 100 percent of the table at the core ages (I'm not saying you should use 100 percent of the table at the older ages, either). Again, you work through all these things, and it leads you to the realization that it's hard to imagine, at least on a slope basis, x percent of anything working that exists out there today.

To that end, looking at some of the things that we walked through in comparing the three studies, you can break this down into some basic building blocks. Where do you start? Where are you ultimately going? How do you get there? That's really all you have to do here. There's a lot of data that's out there to talk about. Like I said, there's early-duration experience that's fairly abundant. Granted, it varies a lot from situation to situation, but getting the early-duration part is not necessarily that hard, nor is it necessarily the most important piece. Where you go is very important, as is how you get there. It's generally accepted that underwriting wears

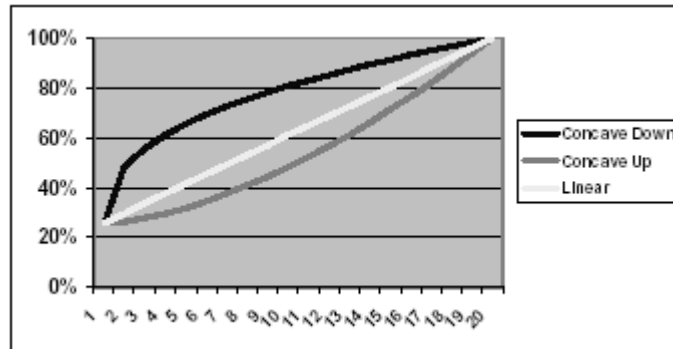
off, and I think it's generally accepted, based upon recent studies and tables, that that select period at the core ages is in the vicinity of 25, maybe 30 years.

However, when you look at the data that is available on the older issue ages, it's pretty clear that the period may be shorter. Certainly if you talk to a medical director or an underwriter, the notion of a 20-year select period or longer on issue age 75 or 80 would be fairly laughable. Again, you're wearing off much faster, and to the extent that you wear off faster, again, you're steepening the slope of mortality. Perhaps the right answer (not that I have the right answer necessarily) is a 10- to 15-year select period at age 75 and five to 10 years at age 85, at least via the traditional underwriting tools that exist today.

Again, the shape of those select factors is as important as the length of time you grade them off over. Chart 18 is completely hypothetical, but you can see that these are just three completely made-up, select-factor grading patterns that grade off over 20 years. You can see whether it grades off concave down, concave up or linear in between.

Chart 18

SELECT PERIOD AND GRADING



Those are fairly dramatic answers, even between the downward-sloped line and just straight-lining them off. The difference is very dramatic. If you think about the amount of mortality difference over a 20-year period between those lines, do you get the starting point right, the ending point right, and grade your select factors off during the right amount of time? You could get very different answers, just by the nature of the grading. When you talk about the dollar signs that are attached out here, you can create some significant differences.

I'd like to talk about another indicator of some of what we've talked about, including that quickly upward-sloping pattern on the select factors and the slope. This is a little different from what we've shown up until this point, but Chart 19 shows four different sets of data. The first two columns are the Scottish Re study, bifurcated into two groups of companies: the companies that had the best mortality and the companies that had the worst mortality in the early durations. The column labeled "SOA/Manu" is the most recent 1990-1998 Manulife older age study. The final column is a very large amount of data that was provided to us by one specific ceding company, but they had more than 1,000 claims out there. We've focused very much on VBT in our discussion today, but the expected basis here is the 1975-1980 Manulife table.

Chart 19

SLOPE IN OLDER ISSUE AGES

Durations	Better Scottish	Worse Scottish	SOA/ Manu	Add'l Client
1-5	34%	40%	27%	32%
6-10	47%	44%	44%	43%
11+	50%	55%	49%	53%

What is noteworthy about this is that if you look at the first five durations, you get very different answers. The best is 27 percent and the worst is 40 percent. That worst Scottish group has a mortality that's 150 percent of what was in the SOA/Manu group. That's a very wide range, and I think that's what you'd expect. We've certainly hit on that it's a very heterogeneous group of people, so what you're attracting in your marketing at these ages and underwriting practices varies widely from company to company. As Rick warned, you've got to be very careful about understanding what's in the table or the experience you're using. What's noteworthy to me is, as widely varying as those first five durations are, the way they come together and how quickly they come together. By duration 6-10 everything is between 43 percent and 47 percent. They're all within 10 percent of each other. The two take-aways for me here were everything coming together and also a much steeper slope than the 1975-1980 Manulife table would indicate.

With that discussion of grading aside, to where are we grading? Chart 20 shows a number of different tables and sources of information for mortality at ages 90 and 100. (To clarify, as Rick already mentioned, the 2000 U.S. population number at age 100, which is on here as 298 is actually the age 99 number because the age 100 number went to 1,000. If you were to continue the path that they were on, it would be something north of 298, but well south of 1,000.) It's interesting to me that if you look at age 100 and age 90, these tables are remarkably similar in terms of the rate. If you look at age 90, whether you're talking about the VBT, the 2000 population table, the Canadian table and so on, you're right in that 165 to 185

range. If you're talking about age 100, you're at 300-some-odd deaths per thousand. Think for a moment about pricing at x percent of some table. It may work at the core ages and a lot of durations. But, think about where you're headed if you price at 40 percent of 7,580 or 60 percent of VBT. Do I know the right answer? Do we know what the right answer is for age 100 and especially 10, 20 or 30 years down the road? Certainly not, but you can put some context around it depending upon what you're using and what kind of bet you're placing on it being different from. To drive that point home, somebody used the example of 25 percent to 35 percent, depending upon super-preferred or preferred.

A percent of the 1975-1980 table is a typical assumption. Chart 20 shows what these numbers look like if you're using 32 percent of the 1975-1980 table.

Chart 20

ULTIMATE MORTALITY

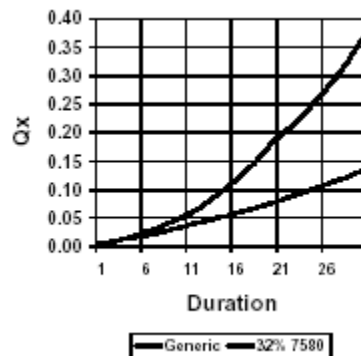
Males	1000qx Att. Age 90	% of VBT Ultimate	1000qx Att. Age 100	% of VBT Ultimate
VBT Composite Ultimate	172.250	100.0%	324.530	100.0%
1990-95 Basic Ultimate	163.710	95.0%	312.840	96.4%
2000 U.S. Population	169.600	98.5%	298.000	91.8%
86-92 Canada CIA Basic Ultimate	176.780	102.6%	390.000	120.2%
Survivors Federal Ees 1990-2000	181.880	105.6%	341.360	105.2%
RP2000 Healthy Annuitants	183.408	106.5%	344.556	106.2%
Ret. Fed. Employees 1990-2000	181.490	105.4%	366.740	113.0%
'94 US MGDB	180.886	105.0%	375.228	115.6%
32% of 1975-80 Basic Ultimate	58.435	33.9%	103.334	31.8%

Again, do I know that's the right or wrong answer, or do I know the right answer? I would never profess to know. But I do know that if I'm at 32 percent or, for that matter, 60 percent of the 1975-1980 table, when I get out to ages 90 to 100, I'm placing a pretty big bet relative to what a lot of available sources of data are saying. Keep in mind, again, with 500,000 lives in each, the Tillinghast and SOA studies point right around 100 percent of the VBT, so that's another source of data pointing right at the 300 deaths per thousand.

What does this look like in the end, from a pricing-type perspective? I compared two very basic assumptions for a male 75-year-old non-smoker. My first "generic" assumption was that duration 1 is 15 percent of the 1975-1980 table. I used a 20-year select factor to create the grading, and I graded ultimately to 78 percent of the VBT ultimate. Relative to everything we've shown to this point, it would be hard to label this as a conservative assumption. Fifteen percent is a pretty low proportion of the 1975-1980 table. A 20-year select at age 75 is probably pushing the envelope. If you graphed the Qx's that are generated by that, Chart 21 is basically what it looks like. The 32 percent of 1975-1980 line is a little higher in duration 1.

Chart 21

MALE NS ISSUE AGE 75



Just from a pictorial perspective, it's very dramatic what 32 percent or 50 percent or 60 percent of 1975-1980 looks like. To put a little quantification around that difference, the present value difference is about \$40 a thousand between the two assumptions. There are a couple of ways you can look at that. For every \$100 million of risk, there's a \$4 million mortality shortfall. Another way to look at it is if you recall what the present values of mortality in general were at the younger ages. At age 25, it was a couple bucks, at age 35 I think it was \$5. At age 45 it was \$13 — we're talking about a difference of \$40 a thousand between 32 percent of the 1975-1980 and what is arguably an aggressive assumption relative to some of the things we've talked about.

A final way to look at that goes back to that relationship of distribution of face amount and distribution of mortality. If 75 percent of the mortality, using the distribution I was talking about, is coming out of ages 60+, and if you're off 20 percent, which is about what this amounted to, at ages 60+, the entire block is off 15 percent ... just because of issue ages 60+. It's a dramatic statement. It's intended to be, certainly. I don't think anybody up here would profess to have exactly the right answers, but certainly I think there's some context around understanding what you are using and how it relates to some experience and its potential implications.

FROM THE FLOOR: On that last chart I must be missing something. In your line for the 32 percent of 1975-1980, if that's issue age 75 and you're at duration 30 of the 75-year-old, aren't you over 100?

MR. SHANAHAN: Yes, you are.

FROM THE FLOOR: So how come that doesn't look like there is an appropriate slope?

MR. SHANAHAN: That was done versus an internal table that kind of extrapolated out the 1975-1980. It probably would have been better to show it over 25 durations, but if you look at where you're at duration 25, you're right around 100 deaths per thousand. That's at 32 percent, implying that the 1975-1980 table is around 300-some-odd deaths per thousand. If you took it to 100 percent, it would shoot straight up.