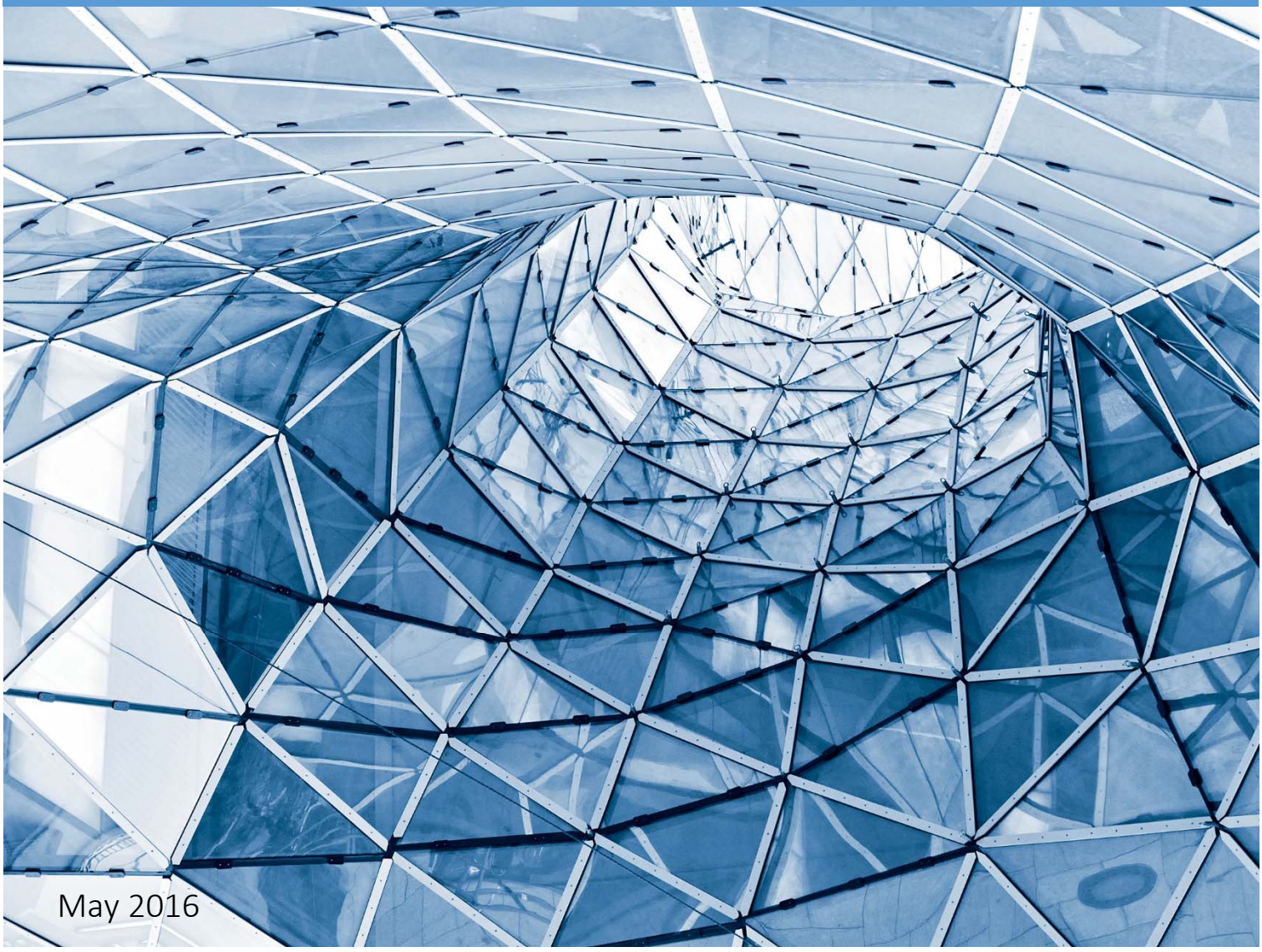
SOCIETY OF ACTUARIES

Older Age Analysis



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AUTHOR(S) Society of Actuaries

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The 2002-09 individual life experience data was the starting point for creation of the 2015 Valuation Basic Tables. All of the data from this period was used in the process. One area that proved difficult was mortality at the older ages, both the level of the select mortality and the join between the select and ultimate mortality. This report covers some additional analysis into this experience. As noted below, data in this area was validated against other data sources, although such data was not used directly in the table creation.

Additional analysis into the 2002-09 data is covered in one part of the report. Similar analysis using preliminary 2009-12 individual life experience data was also done. The report also looks at some of the select and ultimate issues.

The basis for the 2002-09 data analysis that follows is the 2008 Valuation Basic Table. The basis for this table was data from 2002-04.

This material is being presented at the 2016 Life and Annuity Symposium. The older age portion of the PowerPoint for this presentation will be referenced in this write-up.

Older Age 2002-09 Data

Mortality Patterns

Slide 4 of the PowerPoint highlights the issue with the level of the select mortality. The slide shows that early duration experience mortality A/E ratios decreased steadily over the retirement ages by amount of insurance and decreased almost steadily by the number of policies. The 2008 Valuation Basic Table was used as the expected basis for this graph. There was some concern that the highest age mortality rates in the 2008 VBT were too high, mainly because of the use of population data for a portion of the highest ages. However, the decreasing pattern shown in the slide is believed to be more than that found in the 2008 VBT. The issue ages 90-94 data is a little sparse, but there were over 8,000 policies exposed in the issue ages 85-89 group.

Slide 5 indicates the decreasing pattern of A/E ratios also occurs in durations 6-10. Only for durations 11-15 is the pattern of A/E ratios more level (and at about 100% of the 2008 VBT). As might be expected, there was minimal experience for issue ages 90-94 for durations 11-15 and not shown. There was a reasonable amount of experience for other cells in this display (and, where shown, throughout this report), with at least 35 deaths being the criteria for inclusion. For issue ages 85-98, there were nearly 2,600 policies exposed in durations 6-10 and over 400 in durations 11-15.

Slide 6 shows the pattern of A/E ratios for durations 1-5 and both smoking statuses. The combined pattern was also true for nonsmokers. The pattern for smokers was more irregular. The amount of the smoker experience was more limited.

Slide 7 gives the pattern for nonsmoking males and females. The issue ages 90-94 pattern is somewhat inconsistent with the prior slide. The male experience is somewhat limited at this point, but with mortality at a very low level. This resulted in the lower ratio in the prior slide.

That there was more female mortality data than male mortality data at issue ages 90-94 is, perhaps, unexpected. However, it will be seen to be a common facet in this data. As noted above, the experience at these advanced ages is limited.

Slide 8 presents male nonsmoker A/E ratios durations 1-5, 6-10 and 11-15. As was seen earlier, the decreasing pattern is true for durations 1-5 and 6-10, but not durations 11-15. Slide 9 presents similar material for females with a similar pattern.

These slides do indicate that, in retrospect, the 2008 VBT did a poor job of capturing the mortality of the first ten durations at these advanced issue ages.

Policy Size

Slide 10 presents the average policy size measured by exposure, by gender for nonsmokers and durations 1-5 across the retirement ages. It was surprising to see the steadily increasing pattern and the degree of the increase. For both males and females, the average policy size at issue ages 85-89 is more than 3.5 times the average size at issue ages 65-69. With the degree of underwriting increasing with increasing policy size, the pattern of decreasing A/E ratio with increasing issue age starts to make sense. Also, larger

amount policies are probably also correlated with higher socioeconomic status and people in the higher socioeconomic status, as a group, are believed to have lower mortality.

Slide 11 presents the policy size results for male nonsmokers for the three duration groups. That the increasing pattern is so significant for durations 1-5 suggests it is a relatively recent phenomenon. However, the durations 6-10 pattern for the highest issue ages shown does suggest a longer horizon for those issue ages.

Since the basis for this data is policies exposed in the period 2002-09, policies in durations 6-10 were generally issued five years prior to those in durations 1-5, and similarly for the durations 11-15 values.

Slide 12 presents the results for females. For females, there are sizeable percentage increases in average size, with increasing issue ages for all three duration groups, but the actual average sizes decrease as duration increases for a given issue age group.

Number of Policies

Slide 13 gives the exposure by number of policies by gender by issue age group. As might be expected, the number of policies drops off very sharply as issue age increases. What is surprising is the number of policies is greater for females over the issue age range given and by a factor greater than two in the two issue age ranges in the eighties. For younger issue ages (not shown), the number of male policies exceeds the number of female policies by wide margins. Even for issue age range 65-69, the ratio is four to three.

Widow Effect

It has been suggested that the increasing proportion of female policies at the higher issue ages may be a "widow effect." In most cases, estates pass tax free to the surviving spouse on the death of the first spouse. With husbands dying before wives in many cases, there is a ready market for estate planning for wives after their husband dies.

STOLI

One reviewer of this paper noted there was a period of time where there was a mismatch between the mortality risk and the premiums charged for older females. This may have resulted in some purchases of life insurance policies that were then sold to entities willing to take advantage of this mismatch. This phenomenon was characterized as "strange owner life insurance."

Larger Size Bands

All of the values given to this point are based on the whole 2002-09 dataset. Slide 14 gives the average policy size by gender considering only policies of at least $100,000. In general, the pattern is as seen above. What is surprising is the number of instances where the AVERAGE size is at least $1,000,000 or nearly so.

Slide 15 gives the number of policies by gender and issue age group where the amount is at least $100,000. When these values are compared to those of slide 13, initially it might be surprising how many

of these older age policies are at least $100,000. However, it is not surprising when the high average sizes are taken into account.

Slide 16 gives similar numbers for face amounts of $100,000 and $1,000,000. The high proportion of very large policies in the issue age 80-89 range is somewhat surprising.

Data Validation

As part of a check on the individual life insurance experience data, confidential conversations were held with the personnel associated with the Milliman and Towers Watson older age mortality studies. After looking at the sets of data in a few different ways, it was concluded that the results in the three sets of data were consistent and there was no reason to question the data being used for the VBT work.

Plan Type

Slide 17 gives the average policy size for durations 1-5, nonsmokers and $100k+ by major insurance plans. It will be seen that much of the large amount phenomena is related to universal life plans, even into the issue age 90-94 age band. Variable life and variable universal life plans contribute to some extent. (More detail within the universal life category is not available in this data.)

Slide 18 gives mortality results for durations 26 and over. It will be seen that the 2008 VBT tracked the experience reasonably well through issue ages 90-94. The issue age 95 and over results are somewhat anomalous since the 2008 VBT rate in this area was the result of a mathematical construct and not based on experience.

Older Age 2009-12 Data

The next individual life experience study will be based on data collected through the pilot statistical agent process by MIB. Data has been collected through New York State for calendar years 2009-13, and 2011-13 through the state of Kansas. In addition, "backfill" Kansas data was collected from prior individual life experience study contributors for 2009 and 2010. This analysis made use of a preliminary version of this data through 2012.

This analysis will look at this data in a similar fashion to what was done with the 2002-09 data and add analysis where additional data elements were available in the newer set of data.

Mortality

Slide 21 looks at the later set of data by number and amount for durations one to five on the two mortality bases, the 2008 and 2015 valuation basic tables. By amount, results follow a similar pattern, albeit at different levels as expected. By number, the results are somewhat different, especially for issue ages 85-89. Of interest is the consistent increase in mortality associated with issue ages 90-94.

Slide 22 looks at the two sets of data. By amount, the patterns are similar, except for the issue ages 90-94 spike. It might have been expected that there would have been more differentiation between these two sets of data, given the time difference between the two periods. By policies, there was more differentiation, but with an interesting cross over before and after issue ages 80-84.

Slide 23 gives mortality results for the three duration groups. For the first two duration groups, there is an irregular pattern by issue age. For durations 11-15, there was a steadily decreasing pattern by issue age. For durations 1-5, there was reasonable data, even for ages 95 and over. For durations 6-10, reasonable data cut off at issue ages 85-89, but had gone to issue ages 90-94 in the earlier data. Mortality is measured against the 2015 Valuation Basic Table from this point on in this section.

In the newer set of data, a preferred indicator was an integral part of the data set, while it had been in a separate file earlier. Slide 24 indicates nonsmoker preferred experience and "all" experience tracked closely. This is mainly a result of most of the data being preferred.

Slide 25 gives similar results for smokers, with smoker data being quite limited beyond issue ages 75-79. There is an interesting preferred vs. all differentiation at issue ages 65-69, but with essentially the same results in issue ages in the seventies.

Slide 26 gives mortality results by duration for male nonsmokers. The results are similar to the all results in slide 23.

Slide 27 gives similar results for female nonsmokers. The first two duration groups fall off for issue ages 85-89, but are at a reasonable level for other age groups. There is the downward trend by issue age for durations 11-15. This is similar to the all results in slide 23.

Slide 28 looks at the mortality pattern of durations 1-5 by gender. The pattern is somewhat more mixed than might be expected.

Number and Amount

Slide 29 presents the number of policies by gender by age group. There is an excess of female policies over male for issue ages 80-89, as with the earlier data, but the effect is less pronounced for younger issue ages.

Slide 30 gives the mortality of very large policies by gender. Male mortality ratios are noticeably lower for issue ages 75 and higher.

Slide 31 gives the number of very large policies by gender. The pattern is reminiscent of that in the older set of data, but without as significant a female effect.

Slide 32 gives average policy size data by plan type. Note the plan types are somewhat different than in the earlier set of data. Traditional universal life had the largest average face amounts, peaking around $2,500,000 for issue ages 75-84, and falling off for higher issue ages. As with the earlier set of data, there was reasonable universal life exposure for issue age 95 and over. The average face amounts are noticeably higher than in the earlier set of data.

Slide 33 shows the number of policies for term insurance and universal life with secondary guarantees. These plans were the most prevalent in the early retirement ages, but fell off after issue age 79. Slide 34 gives the data for the other plan types, with regular universal life being most significant, even for issue ages 80-84.

Slide 35 gives the mortality results for males for durations 26 and over. Results are available for permanent insurance and universal life. The mortality ratios on permanent life are almost flat at 100% and noticeably below the universal life values.

Select Duration Data

As part of the 2015 VBT development, the select period was graded down starting at issue age 55 through issue age 95. The values of the select period chosen are given in slide 39. Because of the issues outlined in the first section of this report, the experience data at the longer select durations, especially at the higher retirement issue ages, did not merge smoothly into the ultimate mortality rates. Slides 40-43, taken from the 2015 VBT table development work for issue ages 80-84, indicate the nature of the mismatch. These slides look at mortality rates per thousand for the various material shown.

Slide 40 looks at male nonsmokers. This segment had the most experience data. The experience table represented the experience reasonably, except for the last two or three durations where the experience mortality fell below the experience table. Slide 41 looks at female nonsmokers. The experience table was able to represent this data quite reasonably.

Slides 42 and 43 look at the smoker data for males and females, respectively. These segments had less experience data and were developed as a function of the male nonsmoker table. The male smoker experience table followed the experience through the first four durations, but the experience values were generally below the table thereafter. The female experience values were generally below the table throughout.

Slides 44 and 45 give the male and female nonsmoker data for issue ages 85-89, respectively. They do show a somewhat better fit to the experience data. The smoker data for these ages were too limited to show.

For the younger issue ages (not shown), the nonsmoker table fit the data quite well. The smoker data fit was more rough, reflecting the more limited data available.

2009-12 Experience Results

Slide 47 compares the 2009-12 male nonsmoker experience by individual durations against the 2015 VBT. The pattern is quite rough for the first few durations. Thereafter, the fit is quite good for issue ages 65-74 and 80-84. The pattern is more rough for the other issue ages. This might be expected for issue ages 85-89 because of more limited experience, but is a bit unexpected for issue ages 75-79.

Slide 48 presents similar results for females. The fit is quite rough for the first several durations, but quite good thereafter.

Average Face Amount Results

Slide 49 gives the average face amount by duration for the issue age bands for male nonsmoker preferred exposure. The issue age 90-94 results are irregular, probably because of limited data. For the other issue age bands, there is an increasing pattern with increasing issue age band for essentially all durations. Slide 50 gives similar results for females, with slightly more crossover between issue ages 80-84 and issue ages 85-89. The average amount for males tops out at $2,700,000, and at $1,900,000 for females.

The following individuals reviewed a draft of this material. The SOA thanks them for their suggestions.

Allen Klein

Edward Hui

Jeffery Dukes

About The Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world dedicated to serving 24,000 actuarial members and the public in the United States, Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement, and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and non-actuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

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SOCIETY OF ACTUARIES
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org