



SOCIETY OF ACTUARIES

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High Face Amount Mortality Study—April 2012

By Al Klein and Michelle Krysiak

The Society of Actuaries (SOA) engaged Milliman to complete a high face amount study based on data from a recently completed industry experience study called the Milliman Industry Mortality Study and Analysis (MIMSA). Among other things, MIMSA analyzed mortality and cause of death experience data provided by 29 companies covering 10 study years (2000 through 2009).

One of the purposes of this study, which was initiated by the Reinsurance Section, was to replace the old Manulife high face amount study. The Manulife study, last completed in 2002 using experience from 1997 and 1998, was based on face amounts of \$1,000,000 and higher. This 2012 SOA high face amount study was also based on face amounts of

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\$1,000,000 and higher but had a significantly larger amount of data, as shown in the table below.

High Face Amount Studies

Study	Exposure (\$Billion)	Claims	
		Number	Amount (\$Million)
Manulife 1997	64	168	77
Manulife 1998	77	353	101
SOA (Milliman)	7,600	7,700	15,000

Links to the last Manulife study and the current Milliman study are shown below.

Manulife

<http://www.soa.org/professional-interests/reinsurance/papers-presentations-research-and-resources/rein-2001-manulife-reinsurance-mortality-studies.aspx>

Milliman

<http://www.soa.org/Research/Research-Projects/Life-Insurance/research-high-face-amount-mortality-study.aspx>

The current high face amount study provided mortality and cause of death results in a number of different categories, including policy size, risk class, gender and product type. A few of the highlights of the study include:

- The overall actual-to-expected (A/E) ratio was 82 percent by face amount and 84 percent by policy count. The 2008 VBT primary tables served as the expected underlying mortality basis.
- Study years 2005 (89 percent A/E ratio) and 2008 (91 percent) had the worst experience.
- While there was substantially more male (78 percent) than female (22 percent) exposure by face amount, the average size was similar and actually slightly higher for females than males (\$1.58 million \$1.57 million). Males had a lower A/E ratio (79 percent by face) than females (89 percent), but

this is likely due to the fit of the underlying table rather than males having better mortality experience than females.

- Cause of death was studied by policy count, and results were based on the ratio of the number of claims for a specific cause to the total number of claims for all causes. The top five causes of death were cancer (37.1 percent), cardiovascular disease (21.8 percent), non-motor-vehicle-related accidents (6.9 percent), suicides (6.1 percent) and respiratory-related causes (6.1 percent). These results differed from the overall MIMSA results where the top five causes, in order, were cardiovascular disease, cancer, respiratory-related causes, other causes not specifically identified, and mental and nervous causes. Possible reasons for these differences include:

- The life insurance industry is better at underwriting cardiovascular disease than cancer.
- Higher face amounts receive more scrutiny.
- Those who can afford higher face amounts live riskier lifestyles, leading to more accidental deaths.
- Those who can afford higher face amounts live more stressful lives and commit suicides more frequently.
- Those who intend to commit suicide may buy as high an amount as permitted.

There were a number of other interesting findings from the study. The rest of this article will discuss a few of these.

A/E RATIOS BY POLICY SIZE

While the study focused on high face amounts of \$1,000,000 and more, the analysis by policy size grouping included amounts as low as \$100,000. The table below shows several measures by face amount groups. The A/E ratios used the 2008 VBT primary tables as the expected mortality.

The A/E ratios decreased with increasing policy size, as would be expected. However, the A/E ratios were relatively flat between \$500,000 and \$10 million. A few possible explanations for the pattern include:



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Actual-to-Expected Mortality by Policy Size

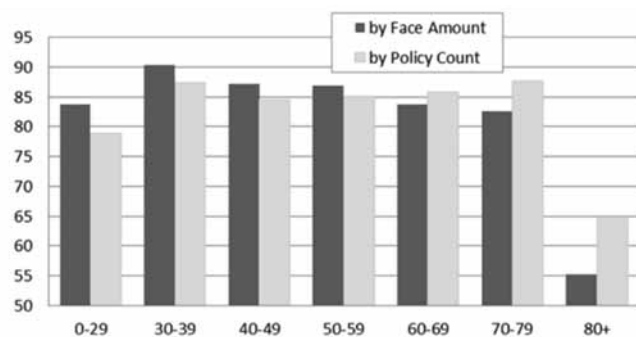
Policy Size	Exposure (\$Millions)	Average Face (\$Millions)	Actual Claims (\$Millions)	Expected Claims (\$Millions)	A/E Ratio (%)
\$100K To <\$250K	4,226,043	0.13	10,942	11,716	93
\$250K To <\$500K	4,668,454	0.29	7,294	8,499	86
\$500K To <\$1M	4,946,488	0.56	6,728	8,043	84
\$1M To <\$2.5M	5,241,775	1.20	8,026	9,527	84
\$2.5M To <\$5M	1,039,472	3.14	2,680	3,237	83
\$5M To <\$10M	730,796	5.70	2,418	2,933	82
\$10M+	622,315	14.09	1,705	2,373	72
Total	21,475,343	0.34	39,793	46,327	86

- Older individuals with higher and more uncertain mortality are included in the higher face amount bands disproportionately to the lower face amount bands.
- The additional underwriting done at the higher face amounts doesn't provide as much additional protective value as one might expect.
- Anti-selection occurs at the higher face amounts.

A/E RATIOS BY ISSUE AGE GROUPS

The chart below illustrates the A/E mortality results for seven issue age groups by face amount and policy count for the policy sizes of \$1 million and higher.

Actual-to-Expected Mortality by Issue Age



The A/E ratio comparison illustrates a pattern that was unexpected—the A/E ratio by face amount was greater than that by policy count up through issue age 59.

There are a number of possible explanations for this observation:

- The higher face amount policies have more volatility in mortality experience due to fewer claims.
- As previously mentioned, more anti-selection occurs at the higher face amounts.
- While additional underwriting requirements are added for higher face amounts, even more underwriting requirements are added for the older age, higher face amount applicants.
- Nonmedical deaths, the largest drivers of mortality under 50, are difficult to account for in the underwriting process.
- More suicides (as a percentage of all claims) by younger individuals occur at the larger face amounts possibly due to more stress from large financial losses during the economic downturn and fewer assets to buffer the losses.
- The younger, high face applicants are over-insured. Financial underwriting at the younger ages allows for a projected growth in need, often resulting in more insurance coverage than necessary in the early years.

// MEDICAL CAUSES INCREASED WITH AGE AND NONMEDICAL CAUSES DECREASED WITH AGE FOR BOTH THE HIGH FACE GROUP AND THE POPULATION DATA. //

CAUSE OF DEATH BY ATTAINED AGE GROUPS

The following graph illustrates cause of death percentages by attained age. The causes of death are split by Medical (Med), Nonmedical (Nonmed) and Other (causes not specifically defined which could be either medical or nonmedical). It also compares the high face amount (HFA) results to the Population (Pop) as represented by the 2006 National Vital Statistics Report.

Various comparisons were made, and the observations are discussed below.

Other Causes—High Face Amount vs. Population

Population cause percentages are higher than high face amount cause percentages because underwriting helps to reduce the number of claims of many of the “Other” causes. Note “Other” does not include unknown causes.

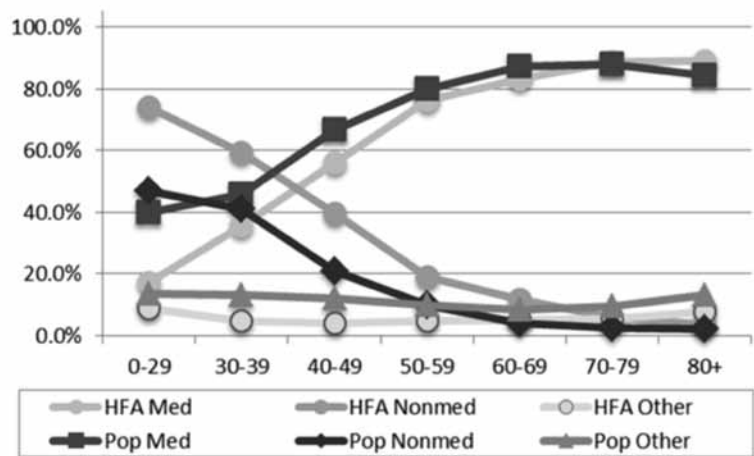
Medical and Nonmedical Causes—High Face Amount vs. Population

For Medical causes, the population percentages were higher than the high face percentages until the mid-70s. For Nonmedical causes, the population percentages were lower than the high face percentages but converge at about the same time. These patterns can be explained by the fact that the high face amount insureds are typically healthier than the general population due to good underwriting on medical issues while nonmedical issues (e.g., accidents) are more difficult to underwrite.

High Face Amount and Population—Medical vs. Nonmedical

Medical causes increased with age and Nonmedical causes decreased with age for both the high face group and the population data. The crossover point between Medical and Nonmedical percentages for the population data was in the early 30s. The crossover point for the high face amount group was in the early 40s. Thus, it appears Medical causes become more significant than Nonmedical causes for high face amount insureds approximately 10 years after those for the general population. Again, underwriting is responsible for producing an insured group that is healthier than the general

Attained Age: Percentage of Medical, Nonmedical and Other Causes of Death High Face Amount versus Population Data



population. Underwriting for medical risks lowers not only the Medical cause of death percentages, but also the Other cause of death percentages for the insured group. It was not surprising that this occurred later for high face amount insureds, but it was surprising to the authors how much later it occurred.

It is our hope that this article provides valuable insights for both direct writers and reinsurers in managing high face amount business. Those interested in learning more about the latest high face amount experience and other findings should click the link above to access the full report. ■