



# U.S. Ordinary Mortality 'Improvements' and Their Interpretation

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*Editor's Note: This article is a response to the article "Current U.S. Ordinary Life Mortality," by Doug Doll and Mike Jones, which appeared in the December 1994 issue of Product Development News, pp. 9-12.*

Messrs. Doll and Jones are to be congratulated for encapsulating recent intercompany mortality study results. Their message—that product actuaries can be bullish on mortality assumptions—is also encouraging.

A casual review of that article, however, may lead to the inappropriate conclusion that sharp reductions in mortality found during comparison of data from the intercompany mortality studies for 1980-85 and 1983-88 can be interpreted as "mortality improvement" and then extrapolated to 1994 without understanding the forces that led to those reductions nor even the extent to which such forces might apply to any company's business or underwriting in particular.

If mortality is interpreted casually and ineffectively, surprising mismatches can occur between expectations and corresponding experience.

The authors extrapolated mortality "improvements" observed between 1980-85 and 1983-88 intercompany study results to 1994 without acknowledging the role of four contributing factors that are not associated with secular improvements in mortality. These factors include: (1) shift away from use of cigarettes, (2) changes in underwriting that took place during the mid-1980s, (3) reduced concentration of nonsmoker and preferred risks in companies' in-force business written prior to the mid-1980s, and (4) increased concentration of nonsmoker and preferred risks on more

recently issued business with such premium classifications available. Clearly, each of these factors contributed to observed reductions in mortality; however, none actually has much to do with secular improvements in mortality on business already classified as preferred or nonsmoker.

The following comments draw heavily from an article I've written that addresses the subject of analyzing mortality experience studies from risk-management perspectives [1].

An increased prevalence of nonsmoking, along with the use of better tools to select and classify risks since the mid-1980s, in part contributed to the appearance of sharp improvements in aggregate mortality among policies underwritten during the latter 1980s vis-a-vis those underwritten in the earlier 1980s. For example, if everyone quit smoking in the early 1980s, how should mortality improvements observed over the subsequent five-year period be applied to nonsmoker assumptions?

It's quite possible that observed "improvements" in the relative mortality risk over many years of issue and observation may reflect changes in the underlying risk selection and classification processes to a far greater extent than such "improvements" can be attributable to an underlying secular change in mortality. Care should thus be taken not to "double-dip" (that is, apply *all* the benefits of risk selection) by recognizing a lower starting

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level of mortality and then applying the discounts from nonsmoker classifications, preferred qualifications, and advancements in the underwriting process, when the starting level may already have benefitted from some combination of these factors.

In order to understand mortality experience, one needs to recognize the associated underwriting philosophies, requirements, and risk classifications employed during the period of study. Two examples follow:

- During the last decade, many new underwriting tools that emerged or became more fashionable changed and refined how insurers select and classify risks. Such tools include blood- or urine-testing for antibodies to HIV infection, cocaine, cotinine, liver enzymes, alcohol markers, ratio of total to high-density-lipoprotein cholesterol, and hepatitis.
- At about the same time, many companies began segmenting the traditional standard premium class by adopting one or more “preferred-standard” premium classifications. The vast majority of former standard risks that did not qualify for the preferred-standard class qualified on a “standard” basis.

Consequently, to effectively understand mortality results, it’s essential to revisit the thought processes, methodologies and tools used to underwrite the business being analyzed. Likewise, using data from both individual and intercompany studies can broaden the bases for resetting mortality assumptions and modifying underwriting processes.

Several factors, taken individually and collectively, tend to bias a company’s mortality experience relative to intercompany findings, thus distorting the comparability of a company’s results with industry experience and vice versa.

It’s desirable to compare a company’s experience with data from corresponding intercompany studies. However, it can be challenging to achieve a high level of comparability in that process. For example, mortality experience shown in “Mortality under Standard Individually Underwritten Life Insurance” in the *TSA 1991-92 Reports* [1], which is used to update industry mortality tables, is restricted to individually underwritten policies classified as a standard risk at issue (that is, “standard,” “preferred-standard,” and “non-preferred-standard”). In evaluating expected claims based on the 1975-80 Select Basic Tables, one needs to keep in mind that those tables were constructed from experience on nonmedical, paramedical and medical issues combined.

To further complicate the analysis of mortality studies, each of the standard classifications may be written on either a smoking-history-distinct or nondistinct basis. A company would similarly need to focus on its standard individually underwritten business to facilitate direct comparison. Otherwise, comparisons with intercompany experience may be blurred due to the confounding influence of business not included in the SOA study.

Interpreting experience on policies issued before the early 1980s can be challenging. Many new term and universal life products, which emerged during the late 1970s and early 1980s, reflected pricing mortality differentials that distinguished between smokers and nonsmokers as well as “preferred-standard” risks. This environment contributed heavily to the subsequent migration of in-force policyholders, who were nonsmokers and/or in relatively good health, to more competitively priced products. Such migrations left less favorable risks in force on the older blocks of business, particularly those not priced on a smoking-history-distinct basis.

Recently published intercompany experience by smoking habits is based on business issued during 1980-87 and traced between policy anniversaries in 1983 and 1988 [2]. These data heavily reflect the markets and socioeconomic mixture as well as the underwriting standards and requirements used by the contributing companies. The differentials observed between smoker and nonsmoker mortality may be somewhat exaggerated, in part, due to such factors as short follow-up periods in the study and larger policy sizes among nonsmokers than smokers. The latter factor infers that underwriters applied greater scrutiny to nonsmokers (for example, relatively frequent use of laboratory testing on nonsmokers in comparison to use of such testing on smokers, which have become even more commonplace since the mid-1980s).

In analyzing which factors likely contributed to mortality improvements, it is necessary to separate long-term secular trends from “improvements” that may have resulted from “statistical noise” attributable to changes in smoking habits and the underwriting process. For example, if roughly half of secular improvement in aggregate mortality can be attributed to cessation of smoking, allocating any improvement, much less the *full* improvement, to smokers and nonsmokers separately would be imprudent.

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Moreover, when the selection process is modified to become more effective in identifying preferred risks as well as in managing the risk of antiselection, the resulting experience is likely to produce more favorable experience than would have been likely to occur otherwise. The effect of such changes in underwriting by themselves could easily outpace the improvement otherwise attributable to secular trends in mortality. Without isolating the factors influencing underlying mortality "improvement," estimates of improvement could be pegged from 200 percent to 400 percent of the appropriate level.

Changes in which companies participated in SOA studies during the 1980s versus early 1990s also may influence the comparability of results on issues during the early 1980s versus 1980s and more recently.

The path towards understanding mortality experience varies from company to company and involves in-depth discussions among product development actuaries, underwriters, and medical directors to become sensitized to the changes/challenges that influenced the risk classification environment during the period of study. An understanding of subsequent changes in that environment provides an additional piece in the puzzle

needed to connect past experience with contemporaneous expectations. The actuary then has a firmer basis on which to take relevant variable into consideration and actually evaluate the extent to which any observed mortality "improvement" or "deterioration" can be expected to continue and, if so, to what extent. Moreover, the actuary is in a better position to determine which ages, durations, policy sizes, and risk classifications are affected.

## References

1. Jess L. Mast, "A Few Hints on 'Cracking the Tough Egg' of Mortality Analysis," *Reinsurance Reporter* 143 (1st Quarter 1995): 2-10.
2. Report of the Individual Life Insurance Experience Committee. "Mortality under Standard Individually Underwritten Life Insurance between 1987 and 1988 Anniversaries." *Transactions 1991-92 Reports on Mortality, Morbidity and Other Experience*, pp. 21, 28-38.