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Ask the Actuary: Credibility

Actuarial projections rely heavily on analysis of past loss experience. Oftentimes, the loss experience associated with alternative risk financing is not a large enough sample to give a complete picture of possible losses. The weight (credibility) that can be applied to this loss experience is based on factors such as the size of the program, amount of loss history, and the inherent volatility in the experience from one year to the next.

Q: Why is more better?

The more observations (claims), the closer the average of those observations will likely be to the true mean. For example, the following graph shows 20 years of potential average annual cost per claim for institutions of varying size (between 5 and 300 claims per year). The red line is the true expected cost per claim for the line of coverage. Each blue dot is the average cost per claim for a given year.
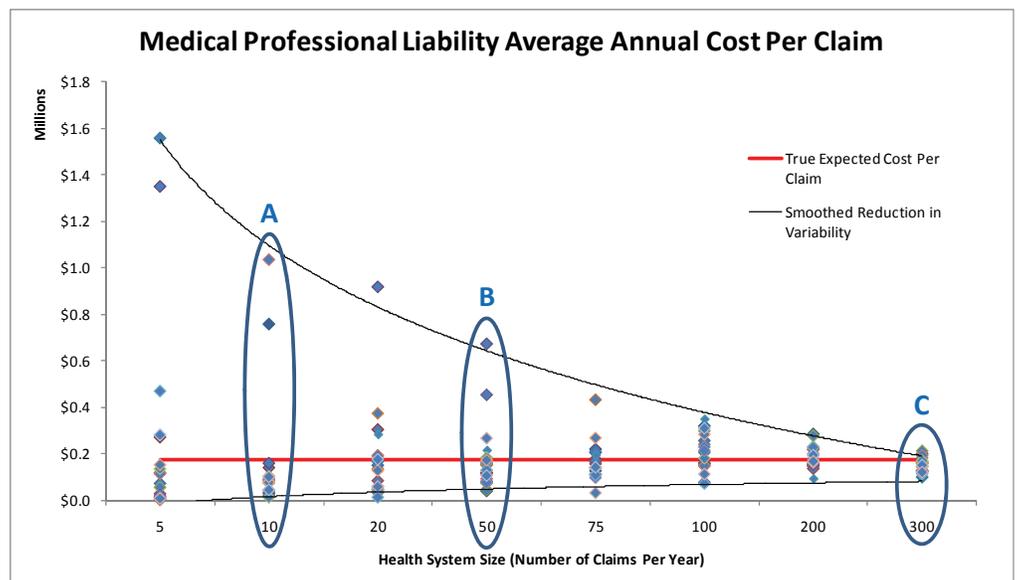
> As the number of claims per year grows, the variation in the annual average cost per claim tends to decrease.

Medical Professional Liability Average Annual Cost Per Claim

As the number of claims per year grows, the variation in the annual average cost per claim tends to narrow to a smaller band around the expected value.

For example, assume health system A is a small system with 10 claims per year, B is medium-sized with 50 claims per year, and C is a large system with 300 claims per year. For most years, A's average annual costs per claim end up below the red line because most medical professional liability claims are small. However, when there is a large claim it causes the cost per claim for that year to rise significantly. Health system A's annual costs per claim vary from $12,000 to $1,033,000. This volatility makes it difficult to accurately project losses based solely on their own claims experience.
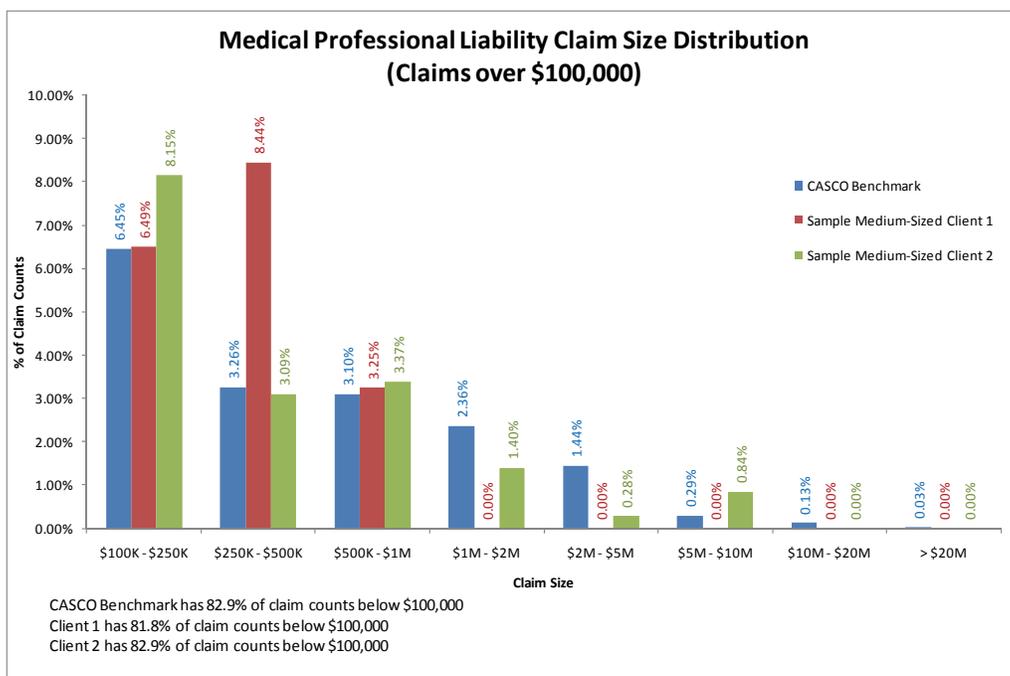
Health system B's annual costs per claim also vary from year to year, but not as much ($37,000 to $673,000). Health system C's annual costs per claim vary even less ($100,000 to $212,000). This reduced volatility allows for greater reliance on their own claims experience when projecting losses.

Ask the Actuary: Credibility (continued)

Q: What is missing from smaller data samples?

Smaller data samples provide an incomplete picture of claims of various sizes (especially large ones). Projecting future losses based solely on this information results in a prediction of this incomplete history repeating itself instead of allowing for the full range of possible losses. For example, the following graph shows the claim size distribution (claims over $100,000) for CASCO's benchmark compared to two sample medium-sized clients.

> Small to medium-sized systems typically do not have a complete distribution of claims of various sizes (especially large ones).

**Medical Professional Liability Claim Size Distribution
(Claims over $100,000)**

CASCO Benchmark has 82.9% of claim counts below $100,000
Client 1 has 81.8% of claim counts below $100,000
Client 2 has 82.9% of claim counts below $100,000

As reflected in the CASCO benchmark, claims over $1 million do not happen very often (about 1 in 25 are over $1 million), but they are possible. For a small to medium-sized system who does not experience a lot of claims per year, there is a good chance that they have not had many (if any) large claims in their history. For example, client 1 has not had any claims over $1 million. While client 2 has had a few larger claims, they have not experienced any claims over $10 million.

Actuaries must project the "best estimate" of losses (including the small chance of a large claim) and not the estimate based solely on the systems' limited past loss history. To more reliably estimate the chance of large losses, additional data is needed to complete the picture.

Q: What additional data should be used?

Good sources of additional data are published rating agencies, rate filings by commercial carriers, data available from similar institutions, etc. It is important to select data that is credible in and of itself, while selecting the most relevant available information.