



On August 9, 2011, SCOR SE, a global reinsurer with offices in more than 31 countries, acquired substantially all of the life reinsurance business, operations and staff of Transamerica Reinsurance, the life reinsurance division of the AEGON companies. The business of Transamerica Reinsurance will now be conducted through the SCOR Global Life companies, and Transamerica Reinsurance is no longer affiliated with the AEGON companies.

While articles, treaties and some historic materials may continue to bear the name Transamerica, AEGON is no longer producing new reinsurance business

The Messenger

Transamerica Reinsurance Risk Management Newsletter

The Emerging Value of Rx Databases

No recent underwriting initiative has piqued the interest of life insurers quite like prescription databases. For a per-case fee a company can run a quick search that provides the names of medications taken, when and how often they were filled, and the prescribing doctor. Even better, there's no additional client contact required – it's quick and invisible. With a knowledge of medications (or access to textbooks and websites), the information in a prescription report can do everything from verifying medication compliance to rooting out misrepresentation. Now that these databases have been in use for a while, it's time to reflect.

Production Time: Many Rx reports are short but some can be downright unwieldy. Has this impacted your per-case cycle time? Would some type of automated “first-review” technology help keep your underwriters from getting bogged down in pages of detail and drive some efficiency to the process?

Staff Knowledge of Medications: Medical records/APS typically reveal medications in context along with the diagnosis, usually as part of the treatment plan. The Rx report has the brand and generic names but not the reason the drugs are being used. There are tools available to help sort through the noise, but get ready to work a search engine to develop more details if you don't want to inundate your medical staff with every new cold sore medication.

Staff members who aren't comfortable with technology should be reminded that their 2007 Physicians' Desk Reference (PDR) will not cut it – modern pharmacology moves much too fast. Even if a medication is in the PDR, there may now be new indications for use, contraindications, side effects and even off-label uses.

Using the Information: Consistency is the key. Just telling the staff that you're now getting these Rx reports and to basically “have at it” will lead to inconsistency. You'll need to develop written procedures if you haven't already done so. Training for all staff members is also essential to ensure that everyone is on the same page. Training and support documentation should include:

- Guidelines on when to obtain reports. Do you get them on everyone for screening purposes or only certain ages and/or amounts?
- Details about any filtering systems. Do you want your underwriters to investigate all medications or only those of a certain severity category? Are you missing good risks because a medication is in a bad bucket while there are multiple uses for medications that vary by age, gender and condition?
- Guidance on ordering APSs and, if needed, from which physician.
- Significance of not finding Rx information on an applicant. Being in the system and not having a prescription is different from not being in the system at all. This is an important

Continued next page



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The Emerging Value of Rx Databases (cont.)

nance that should be explained in the training materials.

- Research resources. Do you have a list of preferred websites for research? RxList.com (part of the popular WebMd network) and Drugs.com are good resources. Include your medical staff when choosing which research sources to use.

Bang for the Buck?

It is important to study and understand the value of Rx data reports. How are the reports affecting staff production and risk assessment decisions? It is critical to verify that the data is being ordered as expected and that guidelines are being followed. Are quality checks part of your regular internal audits or performed as a separate study?

Tracking value is also paramount. It may take years to see value in the mortality results but you can track other types of performance measures.

- What requirements would have been ordered without the Rx data versus with Rx data? Did the data reveal undisclosed doctors, medications or medical conditions?
- Would the overall underwriting decision have changed if Rx data had not been available?
- Do you see nondisclosure patterns? By plan, face amount, or age band? By agent or brokerage office or any other marketing parameter? By medication or categories of medication?

Figure 1: Sample Rx Reports

10/29/2007	30	PLAVIX 75 MG TABLET
9/18/2007	30	PLAVIX 75 MG TABLET
8/6/2007	30	PLAVIX 75 MG TABLET
7/2/2007	30	PLAVIX 75 MG TABLET
5/1/2007	30	PLAVIX 75 MG TABLET
7/10/2006	30	PLAVIX 75 MG TABLET
5/2/2006	30	PIROXICAM 20 MG CAPSULE
1/10/2006	30	PIROXICAM 20 MG CAPSULE
6/15/2009	30	CLINDAMYCIN HCL 150 MG CAPSULE
5/10/2009	30	CIPROFLOXACIN HCL 500 MG TAB
4/5/2009	30	FLUTICASON PROPR 50 MCG SPRAY
3/3/2009	30	AZITHROMYCIN 250 MG TABLET
1/26/2009	30	LEVAQUIN 500 MG TABLET
12/23/2008	30	ASTELIN 137 MCG NASAL SPRAY
11/2/2008	30	IBUPROFEN 600 MG TABLET
10/3/2008	30	IBUPROFEN 600 MG TABLET
9/1/2008	30	DICLOFENAC SOD EC 75 MG TAB
7/31/2008	30	LISINAPRIL 40 MG TABLET
6/27/2008	30	LISINAPRIL 40 MG TABLET
8/19/2010	30	LISINAPRIL 40 MG TABLET
7/19/2010	30	LISINAPRIL 40 MG TABLET
6/18/2010	30	LISINAPRIL 40 MG TABLET
5/18/2010	30	LISINAPRIL 20 MG TABLET
4/19/2010	30	LISINAPRIL 20 MG TABLET
3/24/2010	30	LISINAPRIL 20 MG TABLET
2/17/2010	30	LISINAPRIL 20 MG TABLET
1/18/2010	30	CLOPIDOGREL BISULFATE 75 MG TB
12/18/2009	30	CLOPIDOGREL BISULFATE 75 MG TB
11/20/2009	30	CLOPIDOGREL BISULFATE 75 MG TB
7/15/2009	30	PLAVIX 75 MG TABLET
6/15/2009	30	PLAVIX 75 MG TABLET
5/13/2009	30	PLAVIX 75 MG TABLET
4/11/2009	30	PLAVIX 75 MG TABLET
3/9/2009	30	PLAVIX 75 MG TABLET
2/22/2008	30	PLAVIX 75 MG TABLET
5/24/2008	30	PLAVIX 75 MG TABLET
4/19/2008	30	PLAVIX 75 MG TABLET
3/22/2008	30	PLAVIX 75 MG TABLET
2/11/2008	30	PLAVIX 75 MG TABLET
1/2/2008	30	PLAVIX 75 MG TABLET

Rx Data is useful but underwriters can get bogged down in pages of detail.

Reinsurance Involvement

It is important to involve your reinsurance pool members in the process, particularly if you will be using Rx data in place of something else. In addition, reinsurers may have a different perspective on the data and how it's being used in the market.

If you are implementing prescription database reports for risk assessment, make sure you have a clear vision of what you want to accomplish with the information, understand the impact to production, develop materials and train your staff, monitor and study the information you are receiving, and involve your reinsurers in the process. This approach will ensure that you are maximizing benefits while avoiding the pitfalls of this promising new tool. ■

Underwriting Technology Receives Patent

Transamerica Reinsurance has been granted a patent for its VELOGICA® underwriting technology for non-medically underwritten life insurance. Designed for transactional sales, VELOGICA uses information from the life application, prescription drug databases, motor vehicle records and Medical Information Bureau reports to deliver virtually instant underwriting decisions.

“The awarding of a patent on the VELOGICA technology is an exciting event,” said Dave Dorans, Vice President of Mortality Solutions for Transamerica Reinsurance. “It highlights

the distinct advantages of the VELOGICA approach to underwriting non-medical, lower-face amount business, and allows our solution to stand entirely apart in its ability to reach an underwriting decision quickly while still achieving mortality objectives.”

As described in the new patent, VELOGICA technology uses multiple databases including ones that provide information on prescription drugs dispensed to the insurance applicant. Since its inception, VELOGICA has distinguished itself in its use of prescription drug data in a simplified issue underwriting process. “To maximize speed and still get protective value it is critical to use a sophisticated algorithm that puts the information from the Rx profile into context,” Dorans said.

VELOGICA does not simply rate a drug but, rather, uses all of the information at its disposal – the application information, the entire drug profile with dosages, prescribing doctors and other available data. The VELOGICA algorithm analyzes the data, then rates the applicant, not the drug. This approach produces a more accurate prediction of the underlying medical conditions of a proposed insured.

“Experienced underwriters do this all of the time, but with a system like VELOGICA, this analysis can be done instantaneously,” Dorans said. “To match this speed, many other programs must settle for a less informed decision. To match the sophistication, they must refer the case to an underwriter and wait for a decision,” he said.

In addition to the VELOGICA patented technology, clients also get the benefit of product pricing coupled with the availability of reinsurance that matches that pricing. ■

The End-of-Level-Period Balancing Act

Setting end-of-level-period (EOLP) term rates has never been an exact science in our industry. Two predominant schools of thought have emerged. One group espouses a high initial EOLP reset to induce policyholders to replace coverage. Another seeks to find an appropriate “fit” to encourage better risks to persist after the level premium period – if only for a couple of years. This article examines the potential advantages and challenges of each approach in more detail. For this discussion we have chosen sample pricing data for a 45 year-old male, best class, 10-year level premium term. Figures are illustrative only.

Pricing for the Level Period

The traditional approach to EOLP pricing has focused on resetting to yearly renewable term (YRT) rates for the duration of the policy. These reflect not only the attained-age risk but also the firm’s view that the mortality of the residual risk pool following the end of the level premium period will worsen. As a result the EOLP can be higher than the level premium by many multiples (Figure 1, next page). While some companies’ rates reflect an actuarially fair rate, in other cases companies use much higher multiples –15, 20 or even 30 times the level premium rate. The goal is to induce policyholders to replace their coverage with a more affordable, new level-premium term policy. Figure 2 on the next page outlines this approach.

A “shock” rate may benefit both parties. Replacing coverage with a new level term policy may result in lower premiums for the customer, even after factoring in a new attained age. In most cases, replacement allows the insurer to re-underwrite the policyholder and factor in any material changes to expected mortality.



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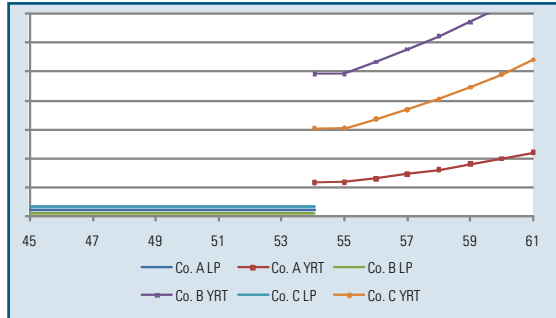


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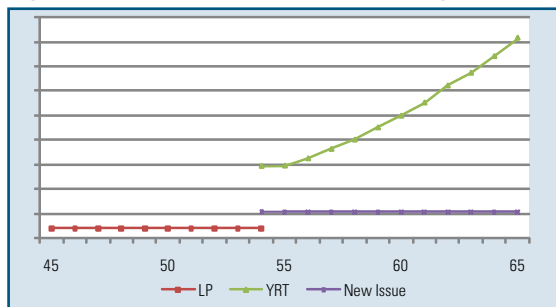
The EOLP Balancing Act (cont.)

Figure 1: Level Premium and EOLP Rates



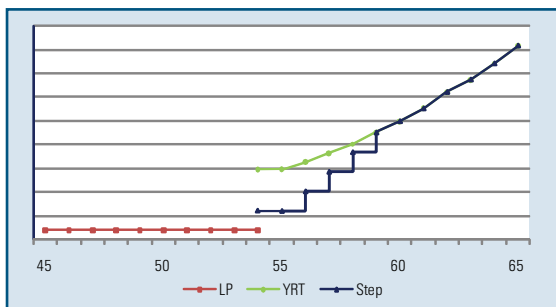
Companies manage EOLP risk differently. Company C is a mutual, which likely pursues a strategy of conversion.

Figure 2: YRT Rates and New Attained-Age Issue



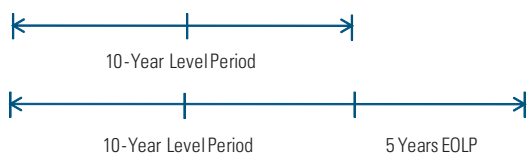
It would be advantageous for the insured to purchase a new term policy – if they can still meet the best-class ratings.

Figure 3: YRT vs. Step Rates



Step rates change much less in Duration 10 than with YRT; more policyowners may retain their coverage.

Figure 4: Managing for or beyond the Level Period



Each approach to managing the immediate EOLP can help life insurers maximize a block's profitability.

EOLP rates to induce high lapses may wish to reconsider potential profits they may forego by implementing such a strategy. Your reinsurer can help you assess your block of business and run scenarios on how changing your view on EOLP term may add both income and stability to your portfolio. ■

Of course, replacement poses a critical selection issue; policyholders with deteriorating health have more need to retain their original coverage, even at much higher rates. Selection issues are aggravated with the lapse of good risks. The law of large numbers potentially fails, leaving the company exposed to volatile and significant claims from the residual book, with serious cash flow implications.

The timing of lapse is also a cash flow issue. Premiums are usually paid monthly – but many companies price on an annual mode. While some policyholders will replace or lapse their policy at the end of the level term period, most do not make a decision for several months. Companies should track post level period lapses closely to keep their expected premiums (and the attendant DAC amortization) more in line with actual experience.

Lastly, there are new acquisition costs associated with replacement: commissions, underwriting and administration. This of course assumes that the policyholder uses the same carrier to replace the product.

Managing beyond the Level Period

The most significant challenge is the effect on the residual risk pool. Carriers have developed pricing schedules with increases that are modest enough to encourage the better risks to retain coverage for at least a couple of years following the end of the level-premium term. This helps maintain some integrity to the law of large numbers, reduce claims volatility and improve block profitability.

Some companies have introduced lower initial EOLP increases that accelerate and converge with YRT rates further out, say in five years. In many cases the initial EOLP rates compare favorably with attained-age replacement rates, without the need for re-incurring the acquisition costs and the risk of the customer walking. (See Figure 3.)

The key is attaining the appropriate EOLP rate (and increase) and retaining sufficient lives to meet profitability goals. Pricing actuaries should factor the impact of product features (e.g., ROP riders and conversion options) into their modeling. The more complex pricing will consume more resources. But as with the first scenario, this is a business decision that requires senior management input.

There Is Still Time to Reassess Strategies

Many companies have blocks of business that are reaching the EOLP term, which provides an opportunity to more actively manage lapse rates. The question is, how important is your term life portfolio to your business strategy? Companies that had planned to shock

Predictive Modeling in Life Insurance

Predictive modeling has been gaining attention in the life insurance industry for its potential to enable life insurers to use consumer data to augment APS and blood testing in assessing mortality risk. However, it's less recognized that predictive modeling has many other application potentials that can deliver immediate benefits to life insurers.

To better explain these potentials, it's necessary to distinguish predictive modeling from predictive models. Which of the following is a predictive model?

- A 2001 VBT tables
- B An underwriting risk classification manual
- C A fortune cookie that contains imaginative lottery numbers
- D All of the above
- E None of the above

A predictive model is an estimated non-deterministic (or random) relationship between some interested outcomes such as mortality and observable predictors such as applicants' age, sex, etc. By this definition, the correct answer to the above question is E. Predictive models may appear as math functions, spreadsheet tables, or other forms. Once a predictive model is created, many can acquire the same model and use it to serve the purpose that it is designed for. The mortality risk scoring algorithms promoted by some consulting or lab companies are good examples of predictive models.

Predictive modeling, on the other hand, refers to statistical methodology or processes for harnessing the non-random correlations between interested outcomes and possible predictors. Special statistical training is necessary to perform predictive modeling well. Experienced modelers can take advantages of embedded statistical and optimization procedures to create 'optimal' predictive models or to customize them for a variety of analytical tasks.

A New Paradigm

Under a traditional mortality study approach, actuaries strive to identify risk drivers through slicing and dicing data with pivot tables and to normalize multiple-variable impacts by calculating A/E's on a selected mortality table basis. As data is being sliced thinner, smaller sample sizes result in lower credibility. As more variables than those a mortality table covers need to be normalized for, normalization becomes much less systematic.

If designed properly, predictive modeling can overcome these shortfalls and deliver more credible and insightful analysis of the same data. In other words, in addition to pivot tables, predictive modeling may be used to estimate risk faster and/or better.

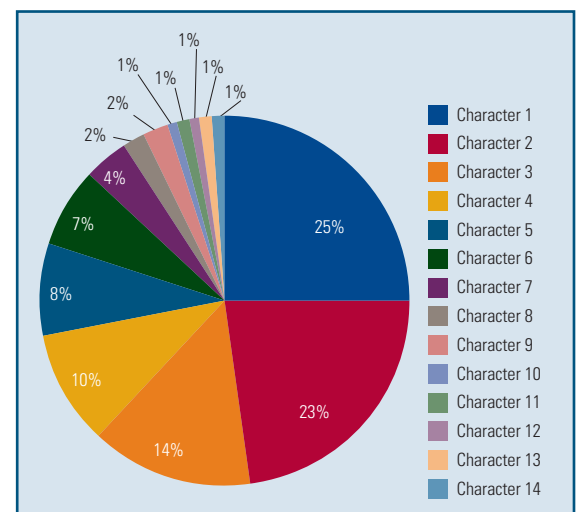
As a reinsurer, Transamerica Reinsurance has contact with multiple underwriting operations and expects that these operations contribute to the mortality experiences of the underwritten products. Using predictive modeling, we have systematically analyzed underwriting characteristics (e.g., preferred criteria, underwriting manual, distribution channel) and weighted their values in correlation with future outcomes. The level of learning credibility and learned insights is not easy to achieve by conventional experience studies alone.

Of the 40+ underwriting operation variables prepared for analysis, a handful were



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Figure 1: The Predictive Power of Select Underwriting Variables in Explaining Mortality Experience



Using predictive modeling, we systematically analyzed underwriting characteristics (e.g., preferred criteria, underwriting manual, distribution channel) and weighted their values in correlation with future outcomes.

Sampling Theory and Audit Confidence



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One function of the underwriting staff at Transamerica Reinsurance is to perform audits of our clients' recently issued business. Not only is this a good quality control practice but it also ensures that the policies we reinsure are being underwritten in the manner agreed upon when we priced the deal. When performing these audits, a common question is how many cases should the audit staff review so that results represent the client's overall book of business. To help provide an answer, we will review the statistics of sampling theory.

The Central Limit Theorem

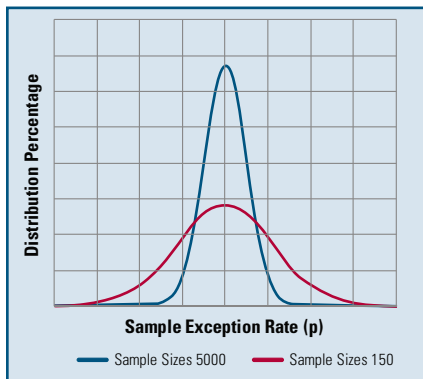
Given a large population from which to draw a random sample, we can use the Central Limit Theorem as the basis for determining the appropriate number of cases to review. Prior to describing this principle, we will first define some variables. Let: n be the sample size; p equal the percentage of the population having some characteristic that we want to measure; and have $q = 1 - p$ represent the percentage of the population not having the characteristic.

For an underwriting audit, p would be the percent of cases where an exception was made in underwriting (the characteristic to be measured). This could be anything from a business decision to a misinterpretation of lab results. We will call this the exception rate. The value of p measured from Transamerica Reinsurance's past underwriting audits is usually between five and 15 percent. The sample size n is simply the number of randomly chosen cases that we reviewed.

Given these definitions, the Central Limit Theorem says (in terms of our audit): If we draw multiple independent random samples of the same size n from a large book of recently underwritten cases and calculate the exception rate from each sample, then the pool of sample exception rates will be normally distributed with a mean equal to p and a standard deviation equal to the square root of $[(p * q) / n]$.

Figure 1 shows that the distribution of sample exception rates around the true population rate p is dependent upon the sample size. For a sample size of 5,000 there is only a small chance that a sample exception rate is very far off from the true rate shown by the value at the peak of each curve.

Figure 1: Sample Sizes



The larger your sample size, the more credible your sample.

Figure 2:
Largest Standard Deviation

p	q	Sqrt (p x q)
10%	90%	0.300
20%	80%	0.400
30%	70%	0.458
40%	60%	0.490
50%	50%	0.500
60%	40%	0.490
70%	30%	0.458
80%	20%	0.400
90%	10%	0.300

If you don't (or can't) know "p", assuming it is 50 percent is the most conservative approach.

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Confidence Interval and Confidence Level

Before proceeding, we need to explain what is meant by two key parameters that need to be chosen by the underwriter before deciding upon an audit's sample size. The *confidence interval* is a plus-or-minus percentage range surrounding the exception rate determined from the audit results. The plus-or-minus value is often called the sampling error. The *confidence level* is the likelihood that the true rate inherent in the client's entire book of business is somewhere in the confidence interval. For example, assume the results of an audit show a 15 percent exception rate. If the confidence interval is plus-or-minus two percent and the confidence level is 90 percent, then there is a 9 out of 10 chance that the book's exception rate is between 13 and 17 percent. In other words, there is only a 10 percent chance that the client's true exception rate is actually less than 13 or greater than 17 percent.

Determining the Sample Size

Now, we are ready to calculate the sample size. The "Z statistic" from a normal curve is used to determine the sampling error for a given confidence level. As a percent of sample size, the sampling error is equal to $[Z * \text{Sqrt}(p * q) / \text{Sqrt}(n)]$. Using a little algebra, we see that

sample size equals $[Z / (\text{sampling error})]^2 * p * (1 - p)$.

Unfortunately, this value depends on the exception rate p in the book, which we can't estimate until we perform the audit. One popular and conservative approach is to use a value of p that produces the largest standard deviation and, therefore, the largest sample size. Figure 2 demonstrates that the largest standard deviation is produced when p is 50 percent.

Our sample size formula is appropriate for populations of 20,000 and over. For smaller populations, an adjustment factor (beyond the scope of this article) can be incorporated into the formula. Figure 3 shows sample sizes for various combinations of confidence interval and confidence level for a large population using this approach.

If previous knowledge or experience is available, it may be used to "guesstimate" the value of p in our sample size formula. Later, after audit results are in, we can adjust our final metrics with the true rate. This approach may result in a smaller or more practical sample size estimate and is the method we will use in the next section.

An Example of Sampling Theory in Action

We want to audit a large client's book of recently underwritten business. The auditors want to review an appropriate number of cases so that they are confident the results are representative of the entire book. After discussions with client underwriters, the auditors want the exception rate determined by the audit to be within two percent of the client's true rate with a 90 percent confidence level. Based upon prior audits, they estimate that the exception rate is likely to be around 10 percent. Figure 4 indicates that the auditors should review 591 cases. Having an estimate of the exception rate greatly reduces the recommended sample size from the conservative value shown in Figure 3.

With pre-audit metrics in hand, the auditors proceed with their review but, due to time constraints, they only look at a random sample of 300 cases. The exception rate from these cases turns out to be 13 percent. We can now adjust the input parameters and determine the final audit metrics, shown in Figure 5.

Given that audit results show an actual exception rate of 13 percent, and knowing that we looked at 300 cases rather than the recommended 591, the confidence interval increases to a little over 3 percentage points. Thus, the auditors' report indicates that they are 90 percent confident that the exception rate for entire book of recently underwritten business is between 10 and 16 percent.

Conclusion

While this article has discussed sampling theory in regards to an underwriting review, the results are equally valid for many other applications. The same concepts used by insurance auditors are also used by pollsters, television program rating services, and quality control engineers. Understanding the limitations to measurements taken from a random sample gives us a better appreciation for why the results are always footnoted with a comment such as "sampling error is ± 1.5 percentage points." ■

Figure 3: Conservative Sample Sizes for a Large Population

Confidence Level	Confidence Interval (+/- indicated percentage)					
	1.0%	2.0%	3.0%	4.0%	5.0%	10.0%
85.0%	5,181	1,295	576	324	207	52
90.0%	6,764	1,691	752	423	271	68
95.0%	9,604	2,401	1,067	600	384	96
99.0%	16,587	4,147	1,843	1,037	663	166

Smaller sample sizes may mean widening your confidence level or interval.

Figure 4: Pre-audit Metrics

INPUT PARAMETERS	
Expected Response Rate	10%
Population Size	20,000
Confidence Interval (+/-)	2.0%
Confidence Level	90.0%

CALCULATION RESULTS	
Recommended Sample Size	591

Having a pre-audit estimate greatly reduces the recommended sample size.

Figure 5: Post-audit Adjusted Metrics

ACTUAL DATA	
Actual Response Rate	13%
Actual Sample Size	300
Actual Confidence Interval (+/-)	3.2%

Increase the confidence interval to keep confidence level high, if the sample is short.

The Messenger

The Messenger is produced by the Marketing Communications department of Transamerica Reinsurance. Matthew Hughes and Christian Kendrick are the editors. If you have questions or would like to be added to or removed from the mailing list for *The Messenger*, please send your inquiries with name, company name and mailing address to Matthew.Hughes@Transamerica.com or Christian.Kendrick@Transamerica.com.

Predictive Modeling (cont.)

confirmed as having statistically significant correlations with mortality experience. After normalizing for all study variables and limiting quantification only to a group of 14 underwriting variables, we derived “relative predictive values” of these variables (see Figure 1 on page 5). Based on the findings, managers and actuaries could confidently narrow their additional exploration to a few operational characteristics for potential intervention. They may also determine more precise adjustment factors if two or more underwriting characteristics were selected for adjustment.

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Future Best Estimates and Tail Risks

As new regulatory requirements (e.g., Solvency II and PBA) develop, an era is beginning when companies are given the choices of marking their assumed business risks as scripted by regulators or to the market. For companies to gain competitive advantage, it is no longer sufficient to simply assume best estimates of risks from the mean and variance of a pre-assumed distribution such as a normal distribution. More precise best estimates of risk drivers, risk distributions, tail risks, and impact correlation between drivers will need to be identified and quantified with better empirical data and more scientifically sound methodology.

To reach the objectives of Solvency II and PBA, the industry will gradually move away from just replacing one regulated risk control script with another and will evolve toward risk assessment activities that involve more advanced analytical methodology and significantly more data collection and management. New regulatory developments must support and speed up this evolution.

Predictive modeling has been used successfully in medical research, credit risk management, P&C claim prediction, consumer marketing, etc., as an advanced risk assessment tool. As a data-driven and statistical-analysis-based methodology, it has the potential not only to deliver scoring algorithms for mortality risk profiling but also to be tailored to reveal insights for a broad range of risk management practices including experience studies and portfolio valuations. ■



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