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A View From the Top With Neil Sprackling, president, US Life & Health, Swiss Re

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By *Christine Luzano*

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To join the section, SOA members and non-members can locate a membership form on the Reinsurance Section Web page at http://www.soa.org/reinsurance.

Call for articles for next issue of *Reinsurance News*.

While all articles are welcome, we would especially like to receive articles on topics that would be of particular interest to Reinsurance Section members.

Please email your articles to Ronald Poon-Affat (rpoonaffat@rgare.com) or Dirk Nieder (nieder@genre.com).
Some articles may be edited or reduced in length for publication purposes.

Publication Schedule
Publication Month: March 2018
Articles Due: Jan. 5, 2018

Chairperson's Corner

By Mary Broesch

As my time as chair of the Reinsurance Section Council comes to an end, I'm doing a bit of reflecting. In my reflections, I find it useful to think about what happened, and note what I learned from the experience.

So, here's a reflection I'd like to share. At last year's Annual Meeting in Las Vegas, the Reinsurance Section Council decided to switch things up and sponsor a luncheon session at a restaurant, instead of the typical hot breakfast session at the hotel. We wanted to provide an intimate and fun networking event for our members and the restaurant offered burgers and fancy, adult-themed milkshakes! The logistical challenges started when the event sold out, leaving several people, including officers of the Reinsurance Section Council, without a ticket. What made matters worse, is that it was not possible for people who wanted to attend and did not have a ticket, to use the ticket of someone who did not show up. And then, to top it off, the restaurant was so noisy that we could not make any announcements or share any information.

Even though I enjoyed myself and the milkshake, the logistical challenges keep me from categorizing the event as a success. Originally, we wanted to create a fun, networking event for our members that was different from prior events. The lesson

The lesson I recognized is to not let failure or fear of failure thwart your efforts. …

I recognized is to not let failure or fear of failure thwart your efforts, if you have a strong desire and belief in what you're doing. Instead of abandoning the luncheon idea after the first time and offering a hot breakfast again for the next time, we learned what could be done differently and applied those lessons to plan for a better luncheon the next time. I hope the second luncheon turns out better than the first, even though there won't be any milkshakes.

My reflection would not be complete without thinking about what has been accomplished over the past year. It's my pleasure to highlight our fabulous Council members and what role they played.

- Ronald Poon-Affat has been a fantastic editor-in-chief of *Reinsurance News*, our section's newsletter published three times each year. Ronald has worked tirelessly over the past three years to produce a high quality publication, including diverse articles, also available on podcast.

- George Hrischenko played a key role for the section as the research coordinator, where he led the facilitation of developing new research. Most of the money that the reinsurance section raises through webcasts and seminars is spent on topical research projects. In 2018, look for new research in the areas of accelerated underwriting and extreme events.

- Mike Kaster, as the vice-chair, provided great advice, support and leadership to the Council and section members over the past year. Mike contributed significantly to developing the Life and Annuity Reinsurance seminar that began a few years ago and is considered a success today.

- Jeremy Lane split his time over the past year between coordinating webcasts and populating the SOA volunteer database. The three webcasts offer section members opportunities for continuing education, while the database captures open volunteer opportunities for members to easily review and apply for online.

- Tim Paris took the lead and deftly coordinated the third annual Life and Annuity Reinsurance seminar, which had a record 84 attendees. This valuable educational program included top notch industry experts as presenters and opportunities to network with colleagues.

- Emily Roman was responsible for marketing to reinsurance section members, with a goal of increasing communications on relevant items of interest. She was instrumental in launching our section's new website, which will now be updated more frequently as things change.

- Katrina Spillane did an outstanding job as coordinator of all the reinsurance section sponsored sessions and activities at four key SOA conferences, including the Annual Meeting in Boston, where the second annual reinsurance section networking luncheon was held.

- David Vnenchak, last but not least, served the Council as secretary and treasurer over the past year. Keeping us organized as a Council is no small task and Dave's ability to do this and stay focused on our goals is greatly appreciated.

Beyond the Council members are significant others who also support reinsurance section members. The SOA staff, especially Jessica Boyke, Jim Miles, Sam Phillips and Ronora Stryker, for whom I'm particularly grateful, provides excellent support to the section and Council. Plus, I'm also grateful for our active Friends of the Council including Larry Stern, Marc Cagen and Olivia Yang. For years, Larry has been dedicated to directing, managing and expanding the LEARN educational program for regulators, which is sponsored by the reinsurance section.

Thank you for the opportunity to serve as your chair of the Reinsurance Section Council. I look forward to continuing my connection and service to the reinsurance section as a Friend of the Council and enjoying another milkshake the next time I'm in Vegas! ■

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Editorial: Why Long-Distance Running Makes Me a Better Actuary

By Ronald Poon-Affat

People who know me well are amazed at how disciplined I can be about not rambling on about my passion for long-distance running. Well, all good things must come to an end.

Yes, I am a running freak ... placing me far in excess of enthusiast, and well past fanatic. What entitles me to occupy this pigeonhole? Well: this year I am planning to run 30 half-marathons (13.1 miles) and two marathons, which means I am likely to accumulate more running mileage for the year (1,900 miles) than my car has on its odometer. I limit myself to only owning 10 pairs of running shoes at a time, have secured the coaching/mentoring services of a local elite runner and coach who won the Disney Marathon eight times, and most tellingly, was selected in 2014, by *Runner's World* magazine as having one of the world's 42 most awesome running-inspired tattoos.

Running challenges me on many levels. I compete hard, and race with the specific goal of placing in my age group; it's not just sheer love of the great outdoors and the camaraderie of sweaty, grunting strangers that gets me up at 4 a.m. on a Sunday morning to race.

Here is my top 10 list of the ways in which running has made me a better actuary … and vice versa:

TIME CONSCIOUSNESS AND METICULOUSNESS ABOUT PLANNING

Running competitively makes you very time-conscious. Turning up late for a race is not an option when competing to place. Even being late by two minutes makes a huge difference in one's race time. While I am never going to add Olympic gold to my medal collection, I can certainly arrive on time, whether for a race or for internal or client meetings.

Running can also heighten awareness of the need for meticulous advance planning. This year I will have run two marathons: one in Tobago, which I ran in May, and the second, the New York City marathon, in November. To be sure I was ready for these races, I started working on my training schedule in 2016.

If you can develop an effective marathon training plan, you can also develop an effective plan for a long-term work project. A long-term plan lets you know what needs to be done every day to achieve the goal. When you deliver a long-term project on time and in full, it may not be immediately obvious to your managers and colleagues how you achieved the goal. However, the quality of the plan's result—whether a work product or a respectable marathon finish—will reflect the quality of a meticulous, well thought-out and well executed plan.

READING AND RESEARCHING ABOUT WHAT YOU LOVE

Even when I am not running, I am thinking about it. For me, *Runner's World* is required reading, as well as the book *Born to Run* by Christopher McDougall, which deserves its accolades as one of the best running books in print today. As elite long-distance runner Bill Rogers says, "I always say that if the marathon is a part-time interest, you will only get part-time results."

Similarly, even when I'm not engaged in actuarial work, I'm still thinking about it. To pass the Society of Actuaries (SOA) exams requires plenty of study and preparation, and even after qualifying, actuaries still need to read and study in order to stay up to date with the industry trends and shifts. Staying up to date means you stay actuarially relevant, which is key to the continuing success of our profession.

VOLUNTEERING

As many of you know, I am an active volunteer for the SOA—it's work I truly enjoy, for it enhances me professionally while allowing me to pursue collateral interests (writing, editing … running). In running, volunteer roles are extremely diverse, ranging from helping to organize, administer, or support races to coaching and mentoring beginner runners (my personal favorite). Volunteering makes life so much more rewarding: it promotes personal growth and self-esteem, increases your network, lets you learn to work with a range of diverse individuals and teams, and allows you to assume roles and responsibilities outside of your day-to-day work. To me, volunteering is one of the few things in life with little downside and near-limitless upside. I would heartily encourage each of you to volunteer—whether for the SOA, for an interest of yours, or even to mentor a children's sports team. You won't regret it.

VISUALIZING THE RESULT

For my New York Marathon run, I am already visualizing the entire five-borough course—the streets, the bridges, the turn onto Fifth Avenue and finally, the grand entrance to Central Park. Visualizing can also be valuable for actuaries: I always recommend to actuarial students that they try to visualize the result they are trying to calculate before they finish a numerical task. This helps them think about the driving factors that determine an end result and develop a gut feel for errors. For both runners and actuaries, visualization can improve preparedness, reduce mistakes and anxiety, heighten focus, and increase the probability of achieving the goal.

CULTIVATING A "GROWTH MINDSET"

No one is born a competitive long-distance runner. Endurance and mental toughness can be developed with proper training, determination and being open to being coached, mentored and receiving critical feedback. All of this is part of what is known as the "growth mindset," which I wrote about in the March 2017 editorial. Dr. Carol Dweck, in her book *Mindset: The New Psychology of Success* (Penguin Random House LLC, 2006), distinguishes the growth mindset from what she calls the "fixed mindset" as follows: "In a fixed mindset, students believe their basic abilities, their intelligence, their talents, are just fixed traits. They have a certain amount and that's that, and then their goal becomes to look smart all the time and never look dumb. In a growth mindset, students understand that their talents and abilities can be developed through effort, good teaching and persistence. They don't necessarily think everyone's the same or anyone can be Einstein, but they believe everyone can get smarter if they work at it." For actuaries, a growth mindset might be the most important trait to develop for success.

STRIVING FOR MORE

The great thing about long-distance running is that if you're in reasonable health, you can progress from couch potato to running a 5K (five-kilometer race) in just three months, a 10K in six months, and then a marathon in 12 months. Once you have achieved your distance goal, you can then work on reducing your time. Running is one of the very few sports (perhaps the only one) that can deliver measurable results so quickly. The constant striving for improvement naturally crosses over to actuarial work. Can you deliver a better professional result? Greater accuracy, a deeper analysis, a strong, high-impact accompanying presentation, shorter delivery times, etc.? Yes, you can … as long as you are willing to strive for more, and do the work.

COMMUNICATING MORE

If two strangers are sitting next to each other dressed for a race—sneakers, shorts, singlets, wrist wearables—you can be sure that before long, they are going to start chatting about running. Long-distance running, at least in the U.S., is still a minority sport (just 0.5 percent of the U.S. population has run a marathon), so expect two runners, even if strangers, to strike up a conversation and share information. We can always learn something from one another's trials. By the same token, we actuaries—an even smaller population than marathon runners—can benefit from talking more with one another. I find I make the best improvements to my pricing models after discussing them face-to-face with other actuaries. In this day and age, it's so easy to sit in your home office with your laptop and smartphone and pretend you are connected with other people. My advice? Go out! Discuss the data you just received from an actuarial colleague, make new actuarial friends, talk about your challenges, and ... alienus non diutius (alone no longer).

Happiness, satisfaction and personal fulfillment can come from many different sources. ...

PUTTING MONEY IN PERSPECTIVE

One of Jerry Seinfeld's classic routines is about dogs and money. To quote: "Dogs have no money. Isn't that amazing? They're broke their entire lives. But they get through. You know why dogs have no money? No pockets." How does this relate to long-distance running and to our work as actuaries? In several ways. Some competitive runners might be wealthy from their running, but most run for personal satisfaction. Similarly, being recognized at work with raises and bonuses is great and can lead to a very comfortable life … but money isn't everything. Happiness, satisfaction and personal fulfillment can come from many different sources, and it's up to each of us to cultivate them.

THE DIVERSITY OF DIVERSITY

I believe that part of why running is such a popular spectator sport is its extraordinary diversity. Runners come from every continent and nearly every nation competes in amateur and professional events; the crowds at the Olympics, the IAAF World Championships and the major marathons attest to this. Diversity is also important for the SOA: In the 2017–2021 Strategic Plan, the SOA has committed to cultivating membership diversity. As part of the SOA Board's Insight & Influence objective, it has committed to establishing a standing SOA Inclusion and Diversity Committee, which will determine the investments and programs that will have the greatest positive impact on inclusion and diversity in our profession. I am positive this initiative will help the SOA to attract the best and brightest from a variety of educational backgrounds, cultures and experiences.

LOOKING THE PART

Most companies now permit casual dress Monday to Friday, but I think we all could benefit from dressing less casually. Just as one might not expect a world-class runner to show up for a race wearing torn sneakers, a stained t-shirt and ill-fitting shorts, actuaries can improve their self-presentation by dressing more professionally, especially if giving a presentation to a conference or for upper management. First impressions do count, and stellar work can only be enhanced when all presentation aspects are stellar.

In closing, I would like to quote Daniel Kahneman Behavioral Economist and co-author of *Thinking Fast and Slow*. He once told a journalist that laziness was the dominant characteristic of his friend Richard Thaler, the University of Chicago economist who coauthored with Cass Sunstein the book *Nudge*, and meant it as a compliment. His reasoning was that Thaler was only willing to work on things that are important. Thaler amended the observation by stating that he was only attracted to projects that were both important and fun. Both Kahneman and Thaler won the Nobel in 2002 and 2017 respectively for their contribution to Behavioral Economics.

I can readily identify with this characterization. I would probably not be as passionate about running as I am if I only ran in 5Ks or 10Ks. The marathon, for me, is an extremely important and extraordinary challenge—one that takes me out of my comfort zone and pushes me toward greater achievements.

I think we all entered the very challenging actuarial profession for similar reasons—that the work is both important and, for us, fun … and gives us inspiration to push ourselves toward greater achievements.

Based on my top 10 observations of the intersection where actuarial science meets running, there might be an emerging runner within each actuary (and, perhaps, a potential actuary within each runner?). The good news about testing this theory is that taking the first step means only lacing up your sneakers and taking a spin around the block. Enjoy the journey! ■

Ronald Poon-Affat, FSA, FIA, MAAA, CFA, is editor of the Society of Actuaries' *Reinsurance News* newsletter and is a recipient of a 2016 SOA Presidential Award. He can be contacted at *rpoonaffat@rgare.com*.

SOA Explorer Tool

Find Actuaries Around the Globe

The SOA Explorer Tool is a global map showing locations of fellow SOA members and their employers, as well as actuarial universities and clubs.

Explorer.SOA.org

SOCIETY OF ACTUARIES®

A View From the Top With Neil Sprackling, president, US Life & Health, Swiss Re

By Christine Luzano

Neil Sprackling is president of Swiss Re's Life & Health US Business and has held this position since early 2012. He is also a member of the firm's Americas Management Team. In his previous role, Neil was head of Swiss Re's Life & Health Australia and New Zealand (ANZ) business and a member of Swiss Re ANZ's management team. He was appointed to this role in 2009, having previously led Swiss Re's New Business Origination team in that market for two-and-a-half-years. With over 30 years' reinsurance experience spanning the UK, Spain, Latin America, Australia and New Zealand, Neil's background includes client management, underwriting and marketing. He managed Mercantile & General's Spanish branch office prior to moving to Australia in 1997 to join Swiss Re. Neil has led various business and industry programs on behalf of Swiss Re. Foremost among these is the protection gap initiative addressing the issue of underinsurance. Neil is currently a member of the ACLI CEO Steering Committee on Prudential Regulation along with a variety of additional ACLI Committees.

You've been in the reinsurance business for over 30 years. What key changes have you seen in the life and health space?

I think it is fair to say that the life (re)insurance industry has not been one of the fastest moving over the last three decades. I have worked in many different markets in my career, both developing and developed, and the most notable difference is the pace of change. The underlying fundamentals of life insurance hold good almost everywhere (e.g., products, distribution), however, the element that has the most influence in the degree and pace of change is how we engage with the end consumer. Slowly but surely we are seeing some significant strides in this area as the industry embraces new distribution channels and acknowledges the different buying preferences and behaviors of the consumer. I will be bold enough to say that I expect more change in the next five years than we have seen in my 30+ years to date. Where will this change occur? Firstly, in risk selection as we combine our knowledge of medical underwriting with the power and insight of consumer data sources. Secondly, in the widening of consumer access channels. The traditional intermediary will remain important, however, we will see (and already are to some extent) the emergence of diverse direct-to-consumer channels that respond proactively to the changing buying behaviors I referred to earlier. Prepare yourselves for the revolution.

What new technologies have the greatest potential to help our industry, and how can they help? How is your company using these technologies?

As with all industries, technology is impacting (re)insurance and those companies that quickly and successfully make the digital leap will prosper more than slower adopters. Advances in technology will change the (re)insurance business model in the future.

Catalysts for those changes include mobile-first preference from end consumers (e-distribution) and more natural interaction with computers. In combination, those technologies will have an impact on the whole of society and thus shift risk pools and create new opportunities. However, they will also make some current offerings of the insurance industry obsolete. We've already seen an exponential increase of data on people and objects. The digitization and analysis of data and the further development of cutting edge technology such as wearable devices will give us the power to understand and anticipate consumer needs like never before. Why is this so important in the world of life insurance and so different to other consumer goods and products that use data and technology? It's their combined ability to increase the relevance of life insurance to the average consumer. Despite its importance, few people actively seek life insurance. Together, data and technology can anticipate a consumer's needs and proactively conduct much of the risk assessment process. It's a powerful combination and can significantly enhance the relevance of life insurance.

As we gain a better understanding of the environment around us and how our clients, competitors and related industries are adapting and changing, we're also looking at how the technologies impact each part of the insurance value chain and what that could mean for Swiss Re and our clients. Swiss Re is actively seeking partnerships, making investments and exploring areas that will help us strengthen our "digital DNA."

We've established a global big data and smart analytics unit—currently the fastest growing team in the firm. This includes a team in our U.S. headquarters in New York that didn't exist two years ago. Combine this with our predictive modelling studies, like our non-smoking propensity model, and you can see that this is at the forefront of our strategic agenda.

How can the industry attract and develop the kind of employees it needs to be successful?

It's our goal as insurers to keep up with technology so that we can leverage it to build the ideal customer experience, to effect change, and to help build better lives. But to make change happen, to break into new markets and create new products, we need the right mix of talent. We need data scientists, technology gurus and behavioral experts to sit alongside the squadrons of existing insurance technicians. The challenge, however, is that we have allowed a generation gap to form. By 2030, nearly half of the current workforce in our industry will retire, largely in part because the number of insurance professionals aged 55 or older has increased by 74 in the last 10 years. By 2020, there will be 400,000 vacant positons. Add to this that in all industries—not just in insurance—organizations are fighting to attract a scarce technical talent pool. In the next year alone, global demand for technical and managerial talent will exceed supply by 50 percent to 60 percent.

With the tremendous shifts underway in our industry, we need to up our efforts in promoting the huge value of our products to consumers at large—just as much as we need to do a better job of "selling" the benefits of working in our industry as a whole to attract new talent.

At Swiss Re, we're making strides in recruiting future-ready candidates who demonstrate not only leadership or tech capabilities, but those who are attracted to limitless challenges and a desire to do good for society.

To attract the next generation of employees—millennials and Generation Z—Swiss Re offers attractive internships and training programs around the globe. We understand that they are looking for flexible working schemes, want to serve a larger purpose, have career opportunities with vast learning opportunities and technological progress—all of which our industry clearly offers. In fact, our fastest growing pool of talent are data scientists—a clear indication of the future direction of our industry.

We have an effective campus strategy and close collaboration with target universities, like St. Johns University in New York, in addition to holding career fairs, presentations at schools and in class, like the captive insurance program at Butler University where we've held sessions in the past. We're also a sustaining partner of Gamma Iota Sigma to support the investment in the insurance industry to ensure Risk Management Insurance courses are offered at various schools. As a result of our efforts, the amount and quality of candidates interested in job postings have increased exponentially.

What is your prediction for sales, premiums and profits for our industry as a whole in 2018? What products look particularly strong or weak?

While I don't predict rocketing sales and significantly higher profits in 2018, I do believe that returning consumer confidence and genuine strides to reach a wider population will continue the more positive trend that we have seen these past two years. We have a unique opportunity to bridge the protection gap—and I'm not talking about small, incremental growth, but growing the size of the insured pie in a big way. As predictive analytics and segmentation continue to evolve, this may impact our industry and may help us target consumers with greater precision. Moreover, as we move to a more consumer-centric approach to the way we market our offerings, we have the opportunity to reduce the friction of buying life insurance and increasing its relevance.

How can actuaries turn uncertainty into opportunity?

The Society of Actuaries has a slogan of "Risk is Opportunity." The core of actuarial practice is risk management, which involves working with events that are highly uncertain. External forces such as political, regulatory and economic environments adds to the uncertainty that Actuaries face in their day-to-day work. Actuaries have an important role to play in helping policymakers understand uncertainty and how it can be turned into opportunity if managed appropriately. The financial crisis and uncertainty in financial markets also brought a spotlight on enterprise risk management, and this has given actuaries the opportunity to lead the way in helping identify key risk areas, assess, quantify, propose mitigation measures, and monitor these risks that impact organizations at the enterprise level. Finally, the advent of big data and advanced analytical tools has provided the actuary with new ways (new data sources and tools) to evaluate, and price for risks in a more robust fashion. The key to success will be the increasing collaboration between the actuarial profession and the data science community. ■

Neil Sprackling, president, US Life & Health, Swiss Re.

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Microinsurance: Applying Actuarial Skills to Help Low-Income Communities

Q&A with Jeff Blacker and Mary Yang by Milanthi Sarukkali

Editor's note: This article was originally published in International News, *issue 68, May 2016. Copyright © 2016 by Society of Actuaries. Reprinted by permission.*

Actuaries are at the core of any conventional insurance company. However, little do we know about actuaries who work specifically to provide financial stability to low income groups. Jeff Blacker and Mary Yang, both microinsurance specialists, share their views on the actuary's role in the microinsurance space, its challenges, and product issues specific to this market segment around the world.

> According to the World Map of Microinsurance, microinsurance reaches nearly 265 million people.

WHAT IS MICROINSURANCE?

Q: How is microinsurance defined? Is the definition global, or does it vary by country or region? Are there any other terms used?

Mary: Microinsurance is often defined as insurance products that are accessible and used by low-income people. Opinions differ as to whether microinsurance should embody elements of low coverage and low premium. When one delves into the minute details, the target market for microinsurance may differ. Some argue that microinsurance is for the poor. Others believe that it is for anyone with limited access to financial services. Still, there are those who view microinsurance as an alternative to social security while others argue that the ability of the market to pay premiums must be present. Alternative terms include "mass insurance" and "affordable insurance" among others; the nuances are often driven by how different parties want microinsurance to be perceived by target markets.

Q: Could you please describe the global landscape of microinsurance in terms of geographical areas and risks covered?

Jeff: According to the World Map of Microinsurance (*http://worldmapofmicroinsurance.org/*), microinsurance reaches nearly 265 million people. The breakdown by region is: Latin America and Caribbean (49M covered lives), Asia (170M covered lives), and Africa (62M covered lives). You can select a region on the map, such as "Asia and Oceania," and drill down to countries in the region such as India. India has 111 million lives insured and $545 million (U.S.) in annual premiums. Keep drilling to see a breakdown by product, and you find that life and accident coverages are the most common microinsurance products in India. Results are also available for agriculture, health and property microinsurance.

Q: Why is microinsurance important?

Jeff: Low-income people are less likely to have access to savings and mainstream insurance. They rely on family, friends, community and sometimes lenders to offset financial loss in the event of an adversity, and they may need to sell assets that are their source of income. They may also have greater exposure to ill-health, accidents due to their types of work, and crop damage caused by droughts or hurricanes. Microinsurance is one tool that helps reduce their vulnerability.

Q: What are ideal markets for microinsurance?

Mary: Like mainstream insurance, microinsurance can only be provided on a sustainable basis in an environment that meets these certain pre-conditions including:

- Sound and sustainable macroeconomic and financial sector policies that inspire confidence;
- A well-developed public infrastructure to allow sustainable and efficient delivery;
- Effective market discipline in financial markets that offers sufficient consumer protection;
- Mechanisms for providing an appropriate level of protection (or public safety net); and
- Efficient financial markets.

Absent the above, a microinsurance product is often a short-lived project or one that needs to perpetually depend on donor resources.

Q: How popular is microinsurance among providers? Are providers willing to enter this space? Are there any concerns regarding profitability? Are there specialized microinsurance providers?

Mary: While microfinance institutions were one of the first providers of microinsurance, more not-for-profit institutions, banking institutions and commercial providers have entered into this space. Some specialized microinsurance providers such as ParaLife were launched to serve the low-income market. Lack of industry data and sustainability challenges remain major concerns. Over time, research, governmental support and access to insurance expertise would be able to address these concerns.

WORK OF THE ACTUARY IN MICROINSURANCE

Q: What skills are required in an actuary working in microinsurance?

Mary: In addition to technical skills, the ability to understand the mind-set and behavior of the target market as well as experience with the range of other insurance functions are valuable.

Jeff: Creative problem-solving skills and empathy are needed when meeting microinsurance constraints. One constraint is the need for small policy sizes and low administration costs. This constraint makes underwriting at the time of sale too expensive. Another constraint is the need for products with little or no policy exclusions, which can make the product more difficult to understand and reduce the trust you are attempting to build with the client. Yet another obstacle is the demand for quick claims settlement. Microinsurance actuaries can use policy design features to meet these demands while limiting the provider's exposure to anti-selection and fraud.

Q: What are the gaps in demand and supply of actuarial skills in microinsurance?

Mary: Providers that are not commercial insurance companies are sometimes not aware of or have difficulties accessing insurance expertise that includes actuarial skills. This is sometimes true of commercial insurance companies in developing countries as well. Difficulties accessing the necessary expertise often come in the form of high fees, distance, language barriers and/or lack of understanding of the target markets.

Q: What are the recent developments in expanding actuarial knowledge and skills in parts of the world where microinsurance is most prevalent or needed?

Jeff: Several examples come to mind. "Actuarial Sciences for Africa" provides a professional actuarial education program for West Africa in Benin. The UK's IFoA is considering a microinsurance training curriculum as well. The IAA's Actuaries Without Borders provides assistance to the actuarial profession in developing regions by creating volunteer opportunities, meetings and online exchanges. Free online courses in microinsurance are available at *www.theinfiniteactuary.com/mia_online*. One final example is the health microinsurance pricing toolkit developed by Milliman. The toolkit's spreadsheet and documentation help users understand how to price health microinsurance products.

Q: Are regulations applicable to microinsurance different from the regulatory environment for conventional insurance?

Jeff: Some countries, such as the Philippines, have regulations that are specific to microinsurance. Other countries, such as Jamaica, regulate microinsurance under the same framework as all other insurance products while being mindful of the special circumstances of microinsurance during the review and approval process. One challenge for inclusive insurance regulation is minimum capital, which could limit the establishment of small microinsurance providers. Another challenge is legislation requiring distributors to meet licensing requirements, which could prevent the sale of microinsurance through alternative distribution channels.

Q: What role do non-insurance organizations play in developing risk management tools for the microinsurance target customer segment? Are there any examples of programs developed and managed by non-insurance organizations?

Mary: Non-insurance organizations such as microfinance institutions and cooperatives often may be effective distribution channels. Non-insurance organizations such as SEWA have developed microinsurance programs for its members.

PRODUCT SPECIFIC ISSUES

Q: What are the most common distribution channels in microinsurance?

Mary: Microfinance institutions, cooperatives and other social service not-for-profits are common distribution channels. To reach low-income markets, providers continue to seek out potentially effective and low-cost distribution channels, including the use of technology.

Jeff: One distribution channel built around technology is mobile insurance. Clients may receive free insurance for a few months after the purchase of a mobile phone or other service, after which they have the option to continue the coverage for a premium. Transaction costs are low, because premiums are paid through small reductions in the client's mobile account or phone minutes. The small monthly premiums of many clients are aggregated by the mobile provider before transferring the premium to the insurer.

Q: What are some key challenges in developing and marketing microinsurance products?

Mary: There are numerous challenges with providing microinsurance. These include a lack of the target market's familiarity with insurance, ability to pay, low-cost distribution combined with the need to provide sufficient customer education/care and coverage.

Jeff: One of the first challenges actuaries face is a shortage of reliable data for pricing. Our book offers a table of online data sources, which can be helpful for initial pricing. Two other challenges we have already discussed are regulatory frameworks and sustainability/profitability for providers.

Q: Can a microinsurance provider reinsure some of their exposure? Are there reinsurers specializing in microinsurance?

Jeff: Similar to traditional insurance, microinsurance providers access reinsurance for various reasons. I priced microinsurance in Guatemala that included reinsurance of life and cancer benefits, but not other benefits built into the product that had higher frequency and lower payouts. It is common to see reinsurance of microinsurance that covers natural disasters such as hurricanes or drought. MiCRO is a reinsurer, specializing in microinsurance, for these risks in Haiti and Central America. ■

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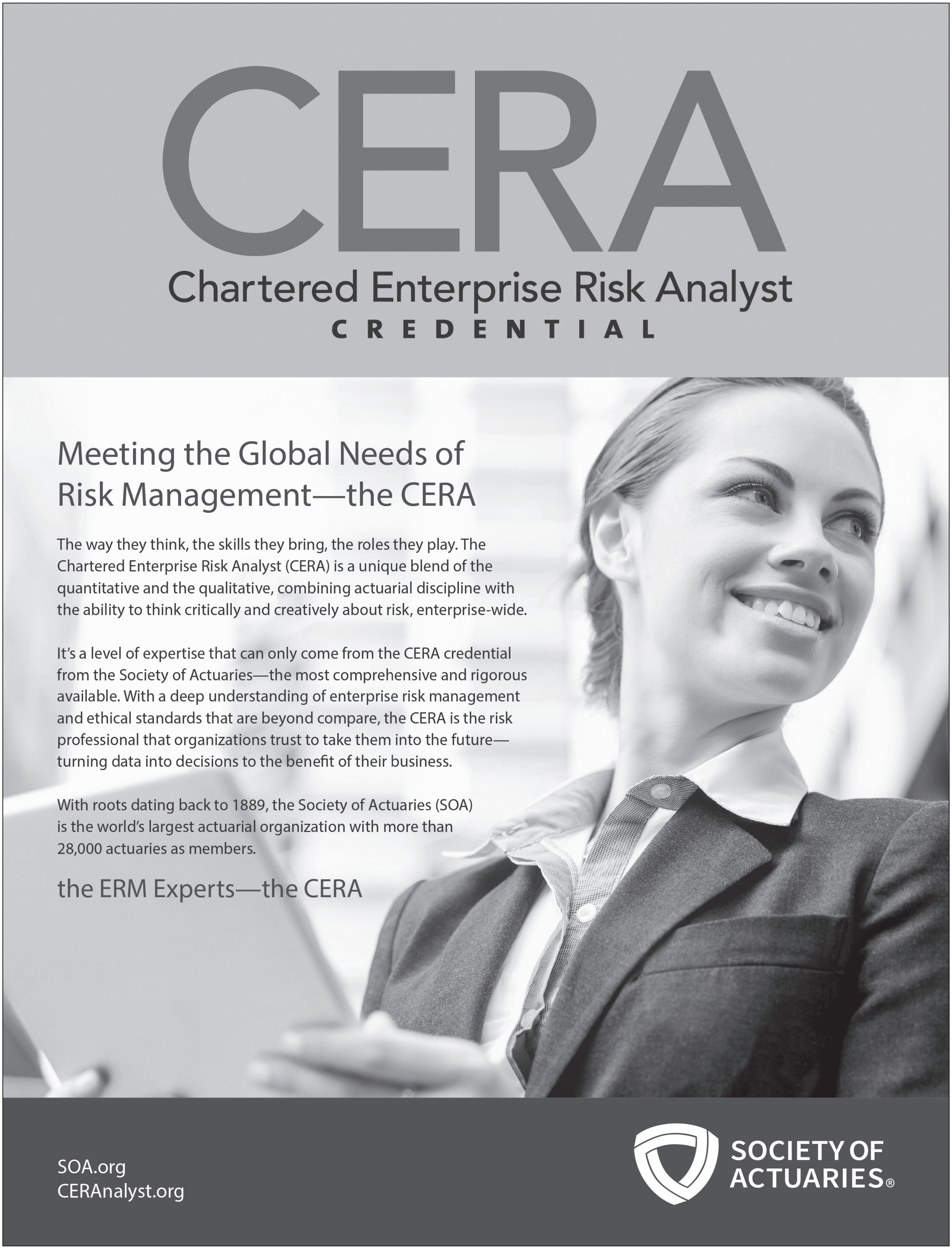
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Reinsurance Challenges And Opportunities Of The Future

By Marianne Lehnis

As the reinsurance industry enters a new era marked by shifting inner dynamics and fast-paced changes to macroeconomic conditions, industry experts have outlined the unique challenges and opportunities shaping the market of the future, naming key long-term determinants as demographic shifts, government policy decisions, macro-economic variables and technological innovations.

Technology, life insurance and a potential revival of macroeconomic growth represent major growth areas, while growth deterrents include low-interest rates, geopolitical and macroeconomic uncertainty, changing talent requirements, and climate change placing a question on the industry's long-term viability.

New technologies such as blockchain enabled smart contracts, could rewrite entire industry processes and transactions, creating more efficient business models and new platforms for reaching clients.

The full potential of these new integrated ecosystems and technologies is yet to be unleashed, as the industry rolls full-steam ahead into the fourth industrial revolution that is bound to make reinsurance available to an ever-increasing proportion of global clientele.

The global reinsurance sector's IT spending has been steadily increasing in response to the opportunities being unveiled with the rise of AI and blockchain, growing from $132 billion in 2011 to $185 billion in 2016, according to Ernst and Young (EY).

And if AI and blockchain have the potential to exponentially multiply the capabilities of reinsurers, it is emerging markets that hold the promise of a shifting demographic on a scale large enough to grab hold of the industry's improved possibilities.

While the saturated developed markets remain sluggish and intensely competitive, reinsurance growth is being driven by emerging markets with life insurance as the key demand—making this the line of business widely recognized as having the most potential for expansion.

Driving this demand for life insurance is a fast-growing customer base—economic growth means there's an emerging middle class which, EY said, "would open up opportunities for protection, savings and health."

Middle class growth has increased life expectancy—spurring demand for retirement and other longevity products.

In the life sector in 2016, China was responsible for much of the premium growth, contributing 2.4 percent of the global 2.5 percent growth in premiums, with the remaining 0.1 percent coming from all other markets combined, according to Swiss Re Institute's latest sigma study.

"The emerging markets will likely fuel improvement in life premiums in the coming years, with China and India being the main growth drivers. Non-life premium growth is expected to remain moderate, with stronger economic activity in the advanced markets supporting momentum," Swiss Re said.

Slowed growth in advanced economies was the main driver of reduced global insurance premium growth in 2016, although emerging market growth did contract in some areas as well.

It's clear that emerging markets, and in particular China, is driving much of the life and non-life global insurance premium growth as the China "growth engine steams ahead" with the country boasting the world's third largest insurance market in 2016, in terms of total insurance premiums written, compared with a ranking of 16th in the year 2000.

Additional opportunities for reinsurers are expected to emerge as governments come under fiscal pressure and take measures to "reduce social security obligations creating demand for private insurance and wealth solutions," creating a secular bear bonds market as "there are signals of this shift happening, which would open up opportunities for insurers," said EY.

The U.K. may be a prime example of this, with U.K. pension risk transfer to reinsurers predicted to reach £700 billion by 2032, according to Hymans Robertson.

Around one-third of current defined benefit (DB) pension risk schemes are expected to reach self-sufficiency over the next 15 years as UK firms increasingly look to offload this risk.

Demand for bulk annuity buy-ins is expected to quadruple over the next 15 years as defined benefit pension scheme liabilities are increasingly being passed onto insurers.

Cyber insurance has been hailed as one of the largest areas of possibility and growth for the industry, spurred by a growing sharing economy and potential revival of macroeconomic growth.

The recent global ransomware attack impacted 150 countries and was felt across a number of industries, sparking numerous debates about the need for adequate, affordable, and effective cyber insurance and reinsurance solutions.

Insurance industry focused cyber-security firm, Cyence, has pegged the WannaCry ransomware attack economic loss at an estimated $8 billion, although insurance and reinsurance protection is expected to cover just a fraction of this.

The WannaCry attack's global trail of losses demonstrated the real risks of systemic cyber attacks—which are set to become an increasing component of business risks and thus reinsurance cover.

The cost of restoring systems after a ransomware event is said to have tripled since 2016, leaving many businesses and reinsurers still unaware of their true cyber risk.

The General Data Protection Regulation (GDPR) to be implemented across the European Union (EU) next year, will provide a further catalyst for the cyber insurance market.

In the short-term, GDPR is expected to drive higher demand for cyber products as tougher data-breach reporting rules lead to many more reported breaches and greater awareness of cyber risk.

Consequently, as more reliable data on breaches becomes available and reinsurers translate this into more accurate pricing models, A.M. Best believes new products will appear on the market further spurring the supply/demand chain.

The opportunities ahead of the reinsurance world are significant, as they ride the promise of the Chinese economic miracle and the transformative powers of AI and blockchain-enabled technologies.

> Additional opportunities for reinsurers are expected to emerge as governments come under fiscal pressure and take measures to "reduce social security obligations. ..."

They could see it catapulted into a future where reinsurance penetration has spread out across a large proportion of Asia, Latin America, and even into far-reaching corners of Africa.

Within the developed market, massive improvements in speed and efficiency of processes and customer reach could see the market develop and grow into new social sectors and segments.

But the potential roadblocks ahead of industry growth are equally daunting; EY analysts noted that "structural growth is mostly restricted to emerging markets, but accessing it is expensive."

It's clear that the world's greatest opportunities are emerging in China, but also that access to this market is highly restricted for non-domestic players.

Low interest rates remain a major challenge, as well as competition from alternative products.

EY said in its 2016 market trends report, that political risks led by unsupportive regime changes in key markets may "prove to be the biggest inhibitors of insurance growth," adding that "the current macroeconomic uncertainty will continue to impact the sector's growth and profitability.

"The rise of protectionism among newly elected right-wing governments may impact global trade and premiums in certain lines."

In addition to geopolitical risks, reinsurers also risk falling behind if they fail to attract talent with skill sets to match the rise of technology, and cater to rising customer expectations—as people become used to simpler and more user-friendly experiences and products.

And while technology creates opportunities, it also poses challenges to lines of business such as motor—where "autonomous cars would substantially diminish motor premium volumes, transforming motor insurance from a personal to commercial line." Cyber insurance modeling also "acts as a bottleneck to delivering more comprehensive cyber offerings."

And looming above all other growth and impediment factors is climate change: EY analyst's pointed to climate change as an underlying factor set to be a key determinant of the future risks covered.

Catastrophe risk modeller AIR Worldwide compiled the latest findings of climate science on the potential impact of climate change to extreme weather, warning of an overall increase in frequency and intensity of severe weather phenomena globally.

AIR Worldwide said the impact of climate change is most evident for inland and coastal floods due to rising sea levels and changes to precipitation patterns: "There is relatively strong evidence in the historical record that precipitation-related quantities including heavy precipitation events, have been increasing."

Flooding is already one of the most costly perils for the reinsurance community and a recent report by AIR Worldwide shows flooding costs are set to skyrocket; it's the risk with the most evidence from climate science supporting forecasts of an increase in frequency and intensity of both coastal and inland flood events.

2017 has already brought South Asia's worst floods in a decade. In Brazil nearly one-third of Southern and Eastern cities have reported a state of emergency from both droughts and heavy downpours. Texas is still submerged by hurricane Harvey floods while one of the most powerful storms in recorded history, hurricane Irma, blazes across the Caribbean.

Although the vast majority of these losses have been uninsured—the question of how the world responds to climate change and increased severe weather events, and whether this will strengthen or weaken the role of reinsurers, remains a pivotal piece of the future's puzzle.

Climate change both shapes opportunity, but also brings the potential to shake the reinsurance industry's survival as it represents hidden and multi-dimensional challenges, often underestimated by reinsurers. ■

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Global Life Reinsurance Industry—A Brief Overview

By Rebekah Matthew

Despite ongoing challenges created by low interest rates, lower returns and an increasingly complex regulatory environment, several leading life reinsurers have experienced growth over the past few years. Factors expected to drive growth in life reinsurance include: an aging population in mature markets, progressive urbanization, ongoing formation of a stable middle class, and changing socio-demographics in emerging markets.

For more than a decade, market consolidation and declining growth rates defined the global life reinsurance sector, but these market conditions may have finally run their course. Cession rates for mortality lines, which had been shrinking in some major life reinsurance markets, appear to be leveling out, which could indicate more stable growth in the coming years. Although traditional mortality business remains at the forefront of the life[1] business, global reinsurers have begun to expand their business mix. Amid business diversification, geographic expansion, and investments in innovation and digital capabilities, a number of regulatory changes are taking place globally, providing both challenges and opportunities to primary insurers and reinsurers alike.

LIFE REINSURANCE MARKET OVERVIEW

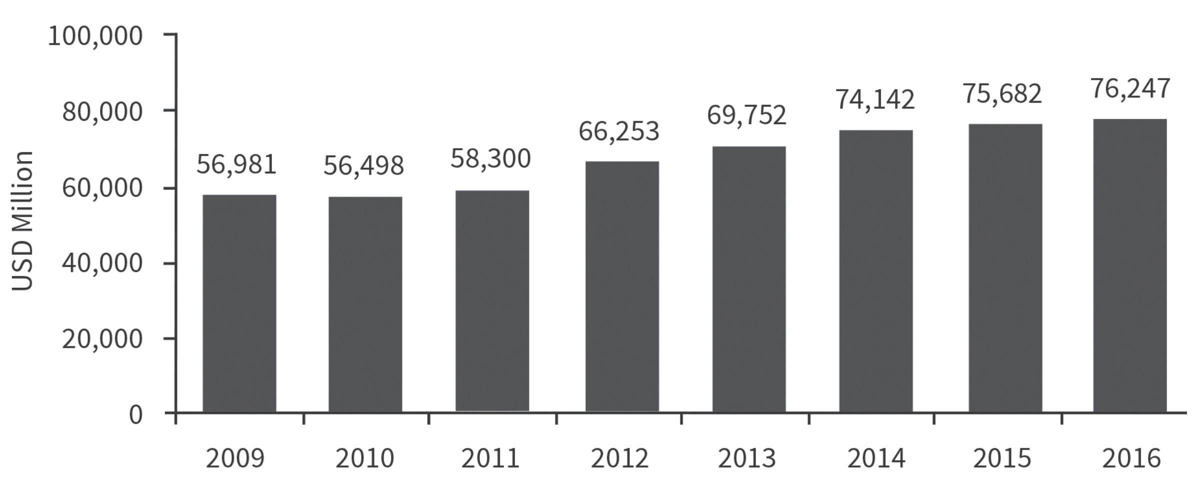
In 2016, gross written life reinsurance premiums[2] amounted to $76.2 billion globally, a 0.7 percent increase over 2015.[i], [ii] The compound annual growth rate (CAGR) was 4.2 percent between 2009 and 2016. The market is expected to grow by about 3 percent to 5 percent on a gross written premium basis in the next couple of years.[iii]

The top five players dominate the global life reinsurance landscape, holding over 71 percent of market share. They are likely to maintain their dominance, especially in the highly concentrated developed markets, despite growth opportunities for some smaller, new or regional players.

Among the top five players, RGA is the only pure life reinsurer. The other four, Hannover Re, Munich Re, SCOR SE, and Swiss Re, operate in both the life & non-life spaces. Trends in the life reinsurance industry are largely indicative of the relative competitive positions and operating performance of the top five players.

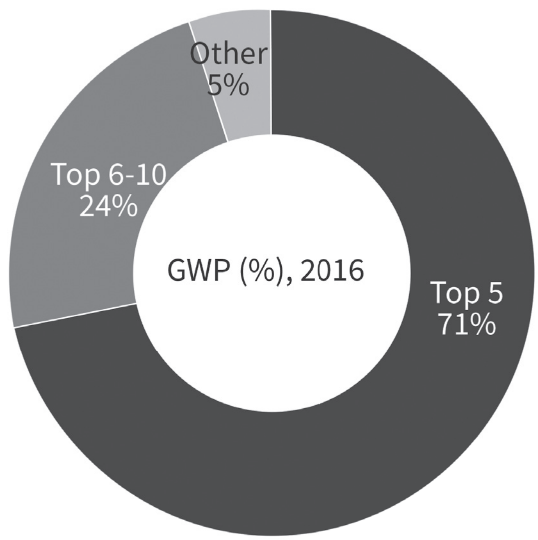
Gross premium written by the top five have increased despite a competitive and difficult market environment, mainly due to selective growth opportunities across a few product lines and demand emerging from the developing markets, especially Asia.

Chart 1
Global Life Reinsurance, By Gross Written Premium



Source: A.M. Best Data and Research, RGA Analysis

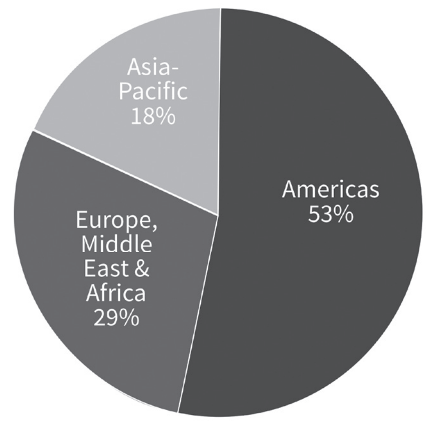
Chart 2 and Table 1
Global Life Reinsurance Premium—Top 5 Reinsurers [ii]



Source: A.M. Best Data and Research, RGA Analysis

GWP ($ bn)	2009	2016	CAGR
Top 5	41.5	54.4	3.9%
Top 6-10	11.4	18.1	6.9%
Others	4.1	3.7	-1.4%
Totel	57.0	76.2	4.2%

Chart 3
Life Reinsurance Premiums Top 5 (2016)



Source: RGA analysis, 10-k reports/Annual Reports /Presentations

Factoring in the share of premiums of the top five players, the life reinsurance industry is dominated by the North American and European markets. The two regions account for over 80 percent of the global market. The Asia-Pacific region currently represents about 18 percent of the global market, but this share of premiums has been steadily increasing over the years, and is expected to reach the 20 percent to 25 percent range by 2020.

From a broader geographical perspective, the future outlook of the top reinsurers is similar, with a focus on maintaining a strong position in North America, expanding presence across Asia and providing reinsurance solutions delivering capital relief in Europe.

In terms of product diversification, the top five reinsurers maintain a substantial share of traditional mortality business, which remains at the forefront of their reinsurance offerings and represents approximately 55 percent to 65 percent of premiums. At the same time, most reinsurers are diversifying into other growth areas such as longevity, health, living benefits and financial reinsurance.

AMERICAS: STILL THE PRIMARY SOURCE OF NEAR-TERM GROWTH

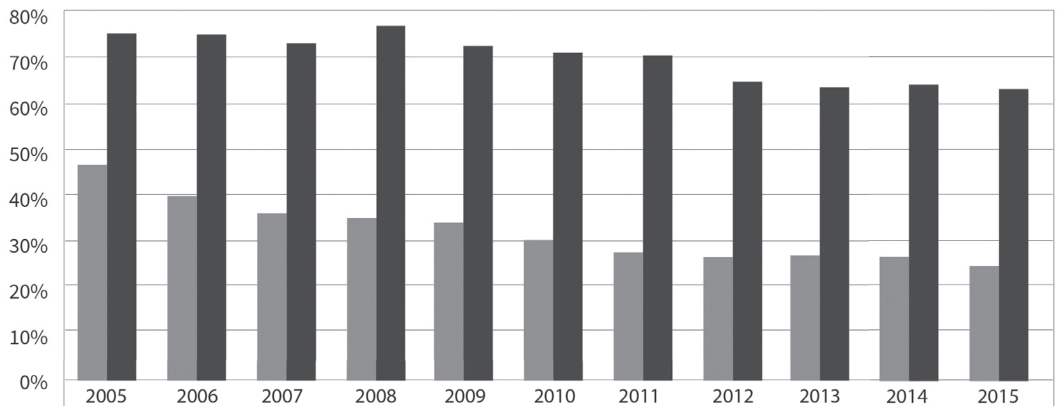
North America remains the largest direct life market in the world in terms of premium volume, and is expected to continue to be the primary source of near-term growth. Despite continuing challenges, life reinsurers have generated fairly consistent earnings. The industry has fundamentally changed over the past decade through consolidation, entry of significant new capital, declining cession rates and InsurTech innovations.

One positive development for the U.S. market is that cession rates seem to have levelled out around the 25 percent mark. This should help stabilize the market, which has been shrinking since 2002 when cession rates reached over 60 percent. In 2015, premium volume reinsured decreased 3.5 percent from the previous year, driven by a decrease in coinsurance business, which dropped by over 10 percent.[iv]

Factors driving down cession rates over the last decade or so include increased retention by direct insurers, the availability of alternative collateral to back reinsurance, mounting regulatory requirements for captive reinsurance, and more principle-based reserving of XXX/AXXX reserves.[v]

Although cession rates in the Canadian market declined from 75 percent in 2005 to 63 percent in 2015, the premium volume reinsured increased by 19 percent during the same period. The increase is mainly attributable to the growth of Canadian life insurance business, which increased by over 40 percent.[iv]

Chart 4
Stabilizing Cession Rates [iv]



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
U.S.	47.0%	39.9%	36.1%	35.2%	34.2%	30.2%	27.6%	26.5%	27.0%	26.6%	24.6%
Canada	75.0%	75.0%	73.0%	77.0%	73.0%	71.0%	70.0%	65.0%	64.0%	64.0%	63.0%

Source: Munich Re & SOA Reinsurance surveys 2005–2016

Consolidations

After the wave of consolidations over the last decade, analysts believe this trend in the life reinsurance market has run its course and do not expect any significant movements in the near to medium term. With the top five reinsurers now accounting for over 71 percent of reinsurance volume, the market is highly concentrated and competition is stiff.

The mortality market presents significant barriers to entry for new players. Long-established global life reinsurers are equipped with abundant capital, strong market positions and economies of scale to help navigate stringent regulatory requirements and make the long-term investments required. There have been no successful global entrants in the mortality space for the last several years.

Block deals

New entrants are primarily focused on annuity reinsurance and annuity block acquisitions. Long-term opportunity in this space is driven by the number of U.S. life insurance companies with subpar blocks of businesses challenged to reach new markets or earn acceptable returns. Moreover, the low interest rate environment is pressuring annuity returns, and several smaller and mid-sized companies are unable to take on additional investment risks, thereby disposing noncore businesses to release capital for deployment elsewhere. Regulatory uncertainty has contributed to large insurers disposing of capital-intensive or volatile blocks of businesses as well.

Future long-term opportunities exist in the longevity and long-term care reinsurance markets in North America, which remain relatively underpenetrated. However, global life reinsurers that expand their risk appetite too far from their core mortality business could have trouble maintaining their financial strength over time. Their long-term success depends on their ability to maintain a sizable base of profitable mortality business while prudently pursuing new areas of opportunity.

Innovation

Innovation continues to garner a lot of attention, with insurers and reinsurers exploring avenues to expand capabilities and close the protection gap. The industry is investing substantial time and money in exploring technologies such as cloud computing, big data, advanced analytics, Internet of Things (IoT), blockchain, digital platforms, new payment models and artificial intelligence (AI). The goal: to reduce cost, better engage with customers, reach a wider audience, improve overall efficiency and provide long-term value.

LATIN AMERICA

The Latin American reinsurance markets remain relatively undeveloped, but are growing rapidly. Despite an economic downturn in the region over the last couple of years, insurers have maintained profitability due to high interest rates, rising insurance penetration rates and improving disposable income. These factors, combined with relatively lower investment returns in mature markets, have generated increased interest in Latin America among global insurance and reinsurance providers.

The regulatory landscape in most Latin American countries is progressively changing in response to international guidelines around solvency and risk-based capital rules. Mexico has been in the forefront as the first country in the region to adopt a framework modeled after Solvency II. Brazil's regulatory body, Superintendência de Seguros Privados (SUSEP), is expected to implement the Own Risk and Solvency Assessment (ORSA) fully in 2017, making it effective by 2019. Other countries following suit include Chile and Colombia. Despite these restrictions, the anticipated growth in Latin America's economies is expected to increase the amount of insurance and reinsurance business, as well as the proportion of the population insured.[vi]

EUROPE, MIDDLE EAST & AFRICA: A DIVERSE PICTURE

Mature Western European markets remain the primary source of life reinsurance business in Europe. The U.K., France, Germany and Italy jointly account for over 70 percent of total life premiums. However, reinsurers have started to look at the smaller and less penetrated countries, such as those in Central and Eastern Europe, anticipating potential opportunities arising from expansion of direct insurance markets and increased demand for risk transfer.

The aging population, growth in direct pension business and decline in state protection indicate potential for long-term care, longevity and other nontraditional products, such as critical illness or disability insurance. Opportunities include:

- Exploring alternative products to traditional covers;
- Increased focus on biometrical products (term life, disability and health insurance), as well as on fee business and asset management; and
- Private pension market on the verge of exponential growth as retirement planning solutions of most major European Union countries are considered inadequate.

Since 2014, global life reinsurers have actively participated in longevity swap deals as pension funds and insurers started transferring longevity risks to external parties. While most deals are being carried out in the U.K., increasing demand for longevity deals has emerged in the Netherlands, continental Europe and North American markets.[vii]

Solvency II, which came into effect in Europe in 2016, is expected to create near-term business opportunities as reinsurance may be one of the few options available to insurers needing to improve their capital positions quickly. At the same time, the benefits of greater scale and diversification under Solvency II rules may reduce demand for reinsurance, especially if larger life insurers have more capacity and greater willingness to retain risks.

MIDDLE EAST AND NORTH AFRICA (MENA): The life insurance market in the MENA region is at its nascent stage of development. The region's very low insurance penetration rate, combined with significant economic growth (despite an overall challenging macroeconomic environment), has made it an attractive market to reinsurance companies. Between 2010 and 2015, total life insurance premium volume in the region increased from US$5.8 billion to US$8.2 billion, with an annual average real rate of 8.2 percent. The region's four largest insurance markets—Turkey, Iran, UAE and Saudi Arabia—account for about three-quarters of the total premiums.[viii]

Given the low penetration rates and robust profitability of primary insurers, reinsurers see significant income-generating potential in MENA. Insurers' dependence on reinsurance support remains high among companies, especially in providing capacity and technical expertise to local participants. Despite a gradual increase in premium retention from primary insurers, the markets are expected to remain dependent on foreign resources in the near future.

ASIA PACIFIC: STRONG GROWTH POTENTIAL, ONGOING CHALLENGES

Asian countries (excluding mature markets like Japan and South Korea) present major long-term growth opportunities for the global life reinsurance sector. Favorable conditions include low life insurance penetration rates and a rapidly expanding middle class with increasing protection needs. In absolute terms, direct life insurance premiums in Asia grew by over 25 percent between 2009 and 2015, while total global life premiums grew by 13 percent during the same period.[ix] Younger demographics, increasing wealth and improving mortality in the region are some of the contributing factors.

Despite ample growth opportunities in the region, challenges remain:

- Due to the predominance of savings products in Asia, local life insurers do not use reinsurance nearly as heavily as those in developed markets. Retention ratios remain in the range of about 50 percent to 90 percent across the region. However, the need for mortality life reinsurance is expected to increase as primary insurance markets mature and offer more high-risk products.
- Regulation remains a major challenge to reinsurers confronted with mixed trends across the region. While some countries are opening up, others are restricting external players. Thus far, this has not proven to be a significant obstacle as reinsurers continue to establish and grow their presence in these markets. Most global players have well-established offices within the region to support local insurers in product development, underwriting, claims and other value-added services.
- Another challenge is that most Asian markets, especially in Southeast Asia, are small in both absolute and relative terms, resulting in insufficient data for underwriting risk. However, global players with larger, more diversified portfolios can provide value by offering a lower cost of capital.[x]

The trends in the mature markets of Japan and South Korea differ from most other Asian countries, as they are seeing a saturation in terms of premium volume and growth. A number of Japanese insurers have embarked on an acquisition spree to grow the topline and diversify geographically. South Korean insurers have followed suit, although on a smaller scale.

As life expectancy and wealth accumulation improve, life insurers may be in a position to increase revenue in these markets. Expansion may also allow diversification of product portfolios in markets that are relatively underpenetrated. This also poses new challenges, however, in terms of risk management, new product development and corporate supervision. ■

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ENDNOTES

1 "Life" refers to "life and health coverage" and does not include property and casualty ("non-life") risks.

2 Occurrence of the term gross written premium (GWP) throughout the article refers to assumed reinsurance premium.

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The German Life Market: A Rearguard Action

By Bernd Heistermann and Kai Kaufhold

If the German life insurance market has been making the headlines at all in recent months, the news was almost certainly a report on which life company was the next to put its participating life business into run-off. The most spectacular such case last year was the Munich Re-owned ERGO Group announcing its intention to put its traditional business into run-off and use a separate company for its new unit-linked and protection business. The ensuing wave of speculation as to the exact consequences of this decision has rocked the market, including the job market for actuaries. Within an international context, this is old news, in some countries decades old. What makes the German situation somewhat different from the wave of in-force block transactions in the late 1990's in the U.S. which followed in the wake of many mutual companies demutualizing, is that this development is by no means voluntary, but has largely been brought about by a combination of heavy regulation, the financial crisis and the advent of Solvency II capital requirements. There is no more hiding from the fact that selling products with interest rate guarantees can become a very expensive proposition.

> An average life company in Germany will likely have up to 400 different products on its books today, of which only two or three dozen lines would be open to new business.

Challenging times do bring weaknesses in existing business models to light, it is true. However, they also offer the opportunity for creativity and rigorous review of those business models to find out what can be salvaged and what must be discarded. One could say that the German life market has been slow in facing these unwelcome facts. Another way of putting it would be that German life companies have become victim of their own success, and have long tried to avoid abolishing a business which is very attractive to consumers and which might have been redeemable if interest rates had not remained at their low level for such an extended period. Now that even the staunchest supporters of tradition have begun giving up on what is referred to as "classic life insurance," i.e., participating endowment life insurance, the question is: what to do with the legacy business?

BACKGROUND ON RUN-OFF IN GERMANY

A closer look behind the stage curtains reveals that run-off is by no means a new phenomenon in the German market. Since its de-regulation in 1994, the changes in tax rules at the beginning of the 2000's and the reform of individual pensions in Germany introducing the so-called Riester annuities shortly thereafter, numerous generations of new products have been developed and old, defunct product lines discontinued. An average life company in Germany will likely have up to 400 different products on its books today, of which only two or three dozen lines would be open to new business. However—and this is what gives the situation a mildly nightmarish touch—nearly all of those hundreds of different tariffs will include some form of increasing benefits and premiums, as well as requiring the rigorous administration of that part of the company's general account which represents accumulated profits for later distribution, lovingly referred to by actuaries as the "RfB.[1]" So, if administering lines of business in run-off is old news to the German market, too, what has changed? The change is really a far-reaching shift in paradigm driven by the realization that the life insurance business model must be changed for the industry to survive. The challenges are no longer simply administrative or driven by the need to stay competitive. They arise from the fact that shareholders, who enjoy a doubtful upside limited by mandatory 90 percent policyholder profit participation and are required to fund 100 percent of the cost of losses emerging from expensive guarantees, are no longer feeling the love for this particular investment. Solvency II has made it brutally obvious just how costly such guarantees really are, even if a gradual phasing-in or time-limited grandfathering has been granted. These exemptions, however, do not apply to new business, and so we are staring reality in the face for every new policy sold.

With the regulatory burden ever-increasing, and legacy systems being held together by thread and duct tape after the retirement of the last Cobol programmers, the cost of doing business continues to place a strain on what little bottom line might be eked out from those few long-term bond portfolios which some companies have managed to hold on to. Patching up the failing legacy systems and dealing with ever tighter quarter-end close schedules, few IT departments have the resources to spare to deal with the mounting challenges in a constructive and creative way.

Some companies are also considering run-off as a solution to either focusing their product lines on the few remaining profitable niches, or with a view to streamline their branding efforts. Many small to mid-size life companies to date still cater to all tastes and find themselves unable to offer all things to everyone anymore.

THE FOUR CATEGORIES OF RUN-OFF

Orderly as we Germans are purported to be, we do have a weakness for categorizing things, including business models. In addition to simply being quaint, this categorization may be helpful for actuaries in other markets to identify similarities and differences between their situation and the German market, and serve to help reinsurers identify opportunities to support companies in pursuing a run-off strategy which best suits their specific corporate challenges.

The ordering criterion, by which we suggest sorting the run-off categories, is how radically a company decides to break with the traditional business model:

1. Self-managed run-off within the existing company,
2. Administer run-off business in an existing company, but create new company for new products,
3. Create an isolated legal entity for run-off business within the group,
4. Sell the run-off business to an external third party.

In the first instance, a company may decide to focus on so-called "biometric products" which offer protection only, unit-linked or hybrid bank-style products. The legacy is still administered alongside the new products. The first step to really doing things differently is often to establish a new company for the new, modern, attractive product lines. Here, the emphasis is on the new and administering the old business is still left to the same systems and operational resources. One of the main reasons to keep run-off and new business within the same company will be funding acquisition costs for new products. Should there still be profits emerging from the existing book of business, it can serve as a source of liquidity to pay for production. As profits run dry, however, this opportunity will cease to exist. Then the potential branding and marketing advantage of a brand-new company for new business will likely outweigh the potential advantages of cross-funding generations of business. This especially applies to new types of business models, such as FinTech or InsurTech business, where the branding must emphasize the new tech-savvy approach.

The next level of commitment means establishing a specific vehicle for the run-off administration. This will include both a separate legal entity with run-off specific regulatory reporting requirements as well as building a team of experts focused on managing the run-off block as efficiently as possible. Some players have decided to take this route upon realizing that only a dedicated run-off operations team can hope to limit the losses which this business will bleed. Some have even decided to turn this necessity into its own business model and consider acquiring additional run-off blocks from external sources. Which brings us to the market for trading run-off portfolios between third parties. Such transactions are typically supported by life reinsurers, and in some instances the acquiring company is indeed the affiliate of a reinsurer. It is, however, important to note that reinsurance potentially has its role to play in each of the different categories, not just the external sale. Reinsurers can tailor their offering to the different needs of their clients. If the life company wishes to retain some of the branding and customer relationship benefits of the existing business, but wishes to operationally separate the two, ceding the business to a reinsurer and entering into an outsourcing arrangement for the operational aspects of the administration can already remove a large portion of the burden from the life company while retaining the benefits.

Which category the life company chooses will largely depend on its original motivation and which degree of separation between existing and new business best matches its marketing and brand strategy. Reinsurance will help offer some flexibility around implementation.

RISKS AND REWARDS

One of the main thresholds to overcome with respect to the most radical, and most reinsurance-like run-off category of trading portfolios, is German regulation relating to profit participation, which severely limits the upside potential for investors, including reinsurers. At the same time, the cost of providing interest rate guarantees and holding the required solvency capital is a strain on profits, too. German rules for participating business require investment and mortality gains to be shared at least 90/10 with the policyholder, while expense gains can be shared 50/50. This means that the most important source of earnings for a run-off specialist must be cutting administrative costs. At a high level, it would take at least a cost reduction of 30 percent to achieve a double-digit return on solvency capital. Such a cost reduction is only realistic, when the run-off business model offers economies of scale and enough scope for investments in systems innovation.

One risk which is particularly important for run-off business is the erosion of profits due to anti-selective lapsation. For most run-off strategies, customer service and crediting rates will be lowered to the bare minimum, leading to an increased tendency for policyholders who are healthy enough to qualify for life insurance at attractive new business prices to surrender their policies. The remaining lives will include those who hold on to their policy, because their health status has worsened. Even if anti-selective lapsation is only moderate, the portfolio will gradually decrease in size, leading to a substantial increase in the volatility of results. This is another opportunity for reinsurance to add value.

In summary, Germany has its very own flavor of run-off market. Its idiosyncrasies are mainly due to Germany's own brand of insurance regulation which even the EU-wide Solvency II initiative has not entirely thwarted. This also means that many companies have held on to flawed business models. Only time will tell, how many of these have drifted beyond the point of no return where even reinsurers will not be able to throw them the saving life-line. ■

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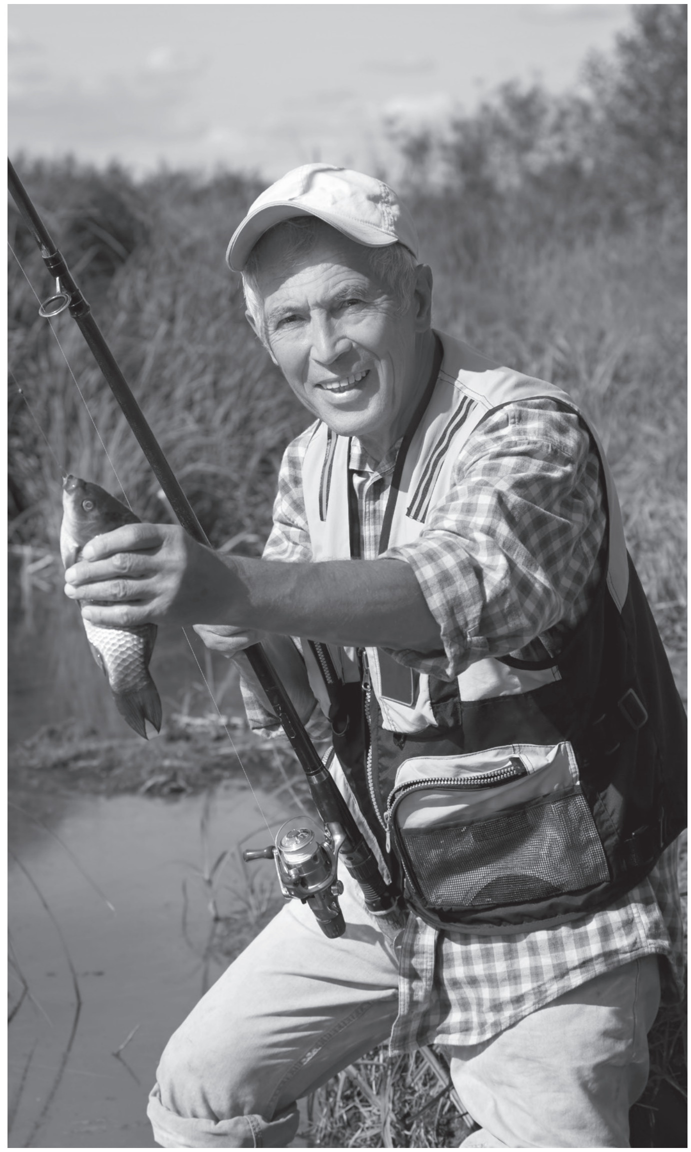
ENDNOTE

1 "RfB" stands for Rückstellung für Beitragsrückerstattung.

Long-Term Care—Are We Fishing in the Wrong Waters?

By Mick James



Globally, the insurance industry has spent quite a bit of time and energy building solutions designed to provide lump sums or income streams in order to help people who need to go into nursing homes.

These are the long-term care waters in which we insurers have long fished. We have built a myriad of plan types for this need: immediate needs annuities; whole-of-life plans with long-term care acceleration riders; standalone insurance plans and more.

However, is assisted care still the primary long-term need? Or have the health and care needs of older people evolved? What, indeed, are today's needs and demands? Have our energies been misplaced, and do we need to refocus?

Before we start, I'd like to pose a question: How much do we really know about aging?

As a middle aged man, one thing that truly keeps me awake at night is worrying about my 80-year-old mum. No one teaches us what to expect from aging parents, and no one teaches our aging parents what to expect either; we are simply left to get on with it.

This lack of knowledge about the physical, social and psychological processes of aging continually leads to poor outcomes. For example, when my mum calls to tell me that she can't cut her toenails any longer and can I help, that sounds innocuous right?

Wrong.

This is one of the classic signs that a person's capabilities have declined to such an extent that help may be needed. The scenario below, compiled from quotes in several physicians' statements, generally progresses like this:

> *"Once I can't reach down to cut my toenails, I can no longer reach [down] to keep my feet clean. I start to develop fungal infections which I then can't keep at bay and, as the health of my feet declines, I start to change the way I walk to compensate for the sore areas I have developed. As I change the way I walk, I become more unsteady and eventually I have a fall. As an 80-year-old my bones are [only] 70% as strong as a 50-year-old's[1], so my chance of a fracture is significantly raised. Once I've fallen once, I'll fall again and again and again."*

Any intervention at this early stage of advancing frailty might not halt my mum's decline, but it may help manage her risk factors, and it would definitely help her maintain a healthy, active and fulfilled life for a longer time.

The two things that strike me about this scenario are first, the blinding simplicity of some of the lead indicators of increasing frailty, and second, the lack of awareness of what those indicators actually are—not only for older persons, but also for their well-educated, middle-aged middle income children.

GONE FISHING

Historically, long-term care insurance products have been designed to deal with the costs and typical durations associated with the care (nursing) home element of the last years of life. In Britain, these costs are approximately £39,500[2] per annum if nursing care is required, and mean stays of all residents before death are 2.5 years.[3] In the U.S., nursing home costs average $92,000 per annum.[4]

The scale and global nature of this issue means the waters we are prospecting are vast. In 2015, there was 48 million Americans over age 65[5], but there was also 137 million Chinese over age 65.[6] As the impact of China's one-child policy (which did not conclude until early 2016) continues to filter through its population, it will create a unique set of additional tensions for the Chinese.

Despite the obvious need for final years care, in the last five years we have seen the U.S. long-term care insurance market collapse. Companies such as John Hancock have pulled out as they struggle with a legacy of past pricing[7], and Genworth sold itself to a Chinese buyer to re-capitalize following $2.5 billion of legacy LTC losses.[8] What undid the U.S. market has been the product structures, which did not allow companies to respond to the risks chronic older-age conditions such as dementia presented as sufferers started to survive well beyond original expectations.

The lack of long-term certainty around governmental social care policies in the U.K. and elsewhere, has also created a vacuum into which insurers are unwilling to step. Without governments assuming long-term care's tail risk, it is hard to see insurers rushing to stimulate markets.

Claims triggers that support LTCI have traditionally been designed only for the final years of life. Typically there are six Activities of Daily Living (ADL)-based definitions, with policyholders having to fail two or three in order for a claim to be accepted. Examples of ADLs language from current policies includes:

> In 2015, there was 48 million Americans over age 65, but there was also 137 million Chinese over age 65.

- *Feeding yourself—the ability to feed yourself when food has been prepared and made available.*
- *Maintaining personal hygiene—the ability to maintain a satisfactory level of personal hygiene by using the toilet or otherwise managing bowel and bladder function.*[7]

Usually policy language around claims triggers also includes a separate mental health definition. For example:

Irreversible mental incapacity due to an organic brain disease or brain injury supported by evidence of progressive loss of ability to:

- *remember;*
- *reason; and*
- *perceive, understand, express and give effect to ideas; which causes a significant reduction in mental and social functioning, requiring the continuous supervision of the person covered.*

In all cases, those who satisfy these criteria must be in a bad way indeed. It is also worth thinking about the real environment and the social stigma associated with U.K. care homes which was summed up by my wife's great aunt who, despite crippling frailty, was determined not to be moved to a care home. Being a forthright Yorkshire woman, her reasoning was simple, if not politically correct: "They are full of mental people, and I'm not mental." The unfortunate reality is, 80 percent of U.K. care home residents suffer from dementia or some other form of serious cognitive impairment.[9] For the 20 percent of sane but frail residents, this must be a difficult environment in which to spend one's final years.

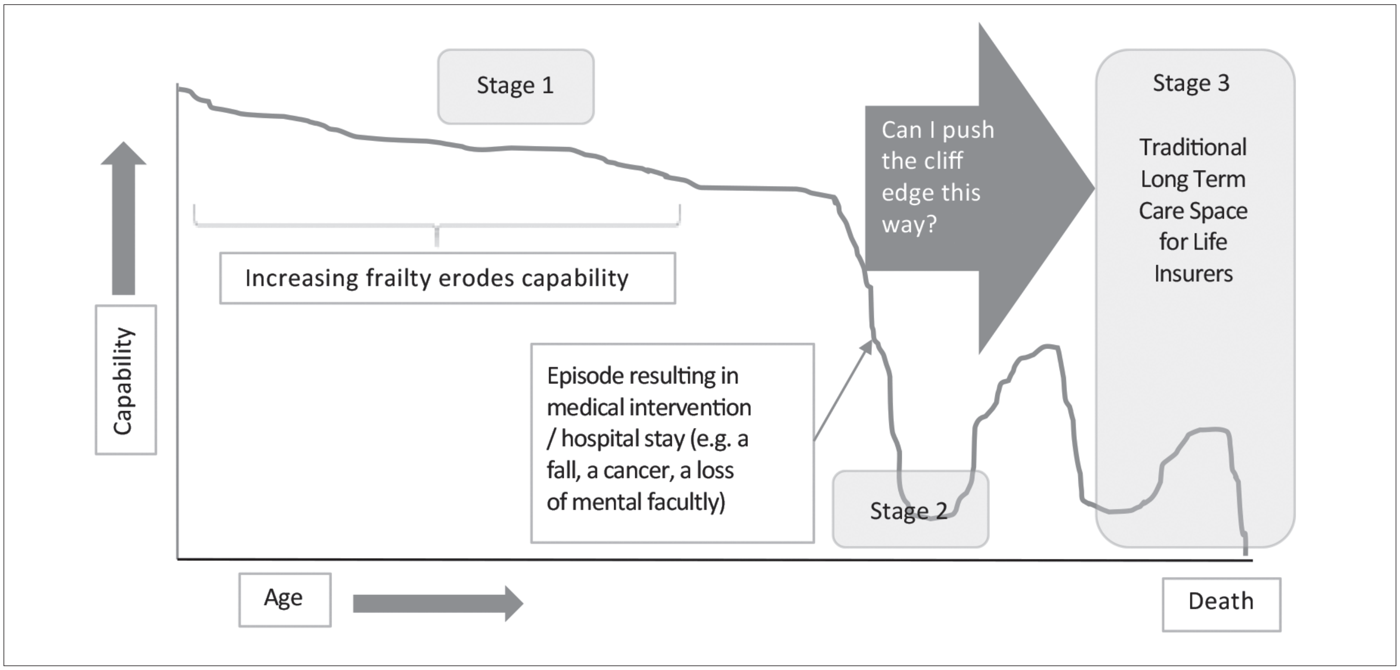
It is useful to also think about some of the behavioral biases at play here: people in the U.K., for example, know that one in four will likely need this kind of care support, but no one thinks it will be them. And in the U.S., the figure is one in three. Sobering, to say the least.

Nothing here makes long-term care as we know it an appealing customer prospect. No one I know is looking forward to not being able to dress or feed themselves, and no one is actively looking forward to dementia. It makes LTC, perhaps, the ultimate grudge purchase.

SHOULD WE FIND A NEW PLACE TO FISH?

Talk to older people, and they will tell you what they want: they want to grow old in their own homes, surrounded by their special possessions, their memories, and the community they know well, where they have friends, social ties and relationships. They want to feel safe, supported and socially valuable. They want to be independent for as long as they can. Look at your own life: isn't this what you want for your own parents

Figure 1
Capability declines through old age



and, ultimately, for yourself? Shouldn't we insurers therefore be building products that allow people to do just that for as long as possible? It's a much more positive sales message, but it will require some distinctly different thinking.

After age 65, people's physical and frequently mental capabilities inexorably decline until they die. Figure 1 tracks a path many will experience. Stage 1 shows capabilities declining as they age until an event occurs that moves them to Stage 2, during which capabilities decline sharply. Stage 2 could be triggered by a fall, illness, loss of a spouse, or a sudden reduction in mental capacity. At this point, most national health systems will kick in, providing critical care in an attempt to preserve life and return the patient home. Once in the health system, patients will start to gain access to different levels of recovery services, but their capabilities are unlikely to return to their original levels.

Looking again at Figure 1, much of the energy insurance companies have expended has been in providing help and cover for the final stage of life (Stage 3), while little energy has been expended on understanding the pre-collapse of capability stage (Stage 1) and finding supportive, insured structures to push back the cliff edge of the capability decline into Stage 2.

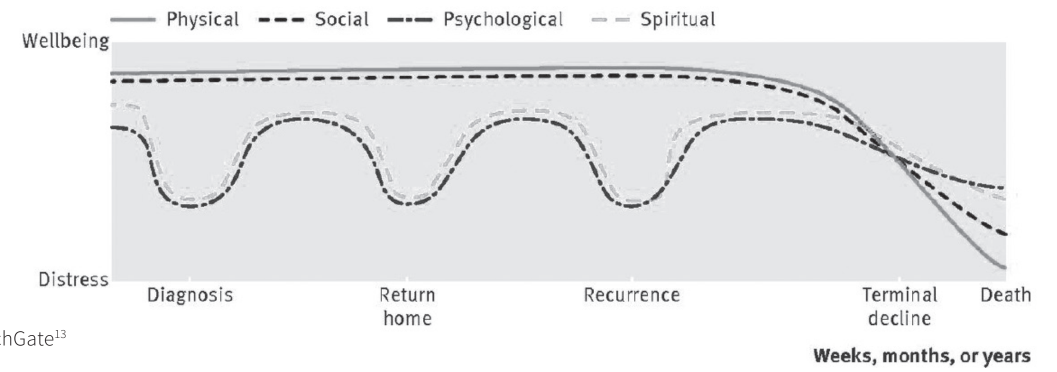
Now consider consumer demand. Everyone wants to live happily and healthily in their own homes for as long as possible. Would a proposition designed to push back the point of capability collapse prove attractive? And what would we need to get there?

First it would require a new set of claims triggers. Today's ADLs are too severe for earlier stages. It would also require new thinking around the measurement of frailty, which is all too often physically based, when we know the impact of social connection and loneliness can also be severe for longevity. (A 2015 study published by the Association for Psychological Science found that chronic loneliness can be as detrimental for longevity as a 15-cigarette-a-day habit.[9])

The concept of IADLs (Instrumental Activities of Daily Living) has been around since the late 1960s. Tools such as the Lawton Instrumental Activities of Daily Living Scale[10] provide a useful way to classify how people cope with day-to-day tasks such as laundry or shopping. These tools also help show when early interventions might be beneficial, but take no account of the complex picture of what really happens in the lives of older people.

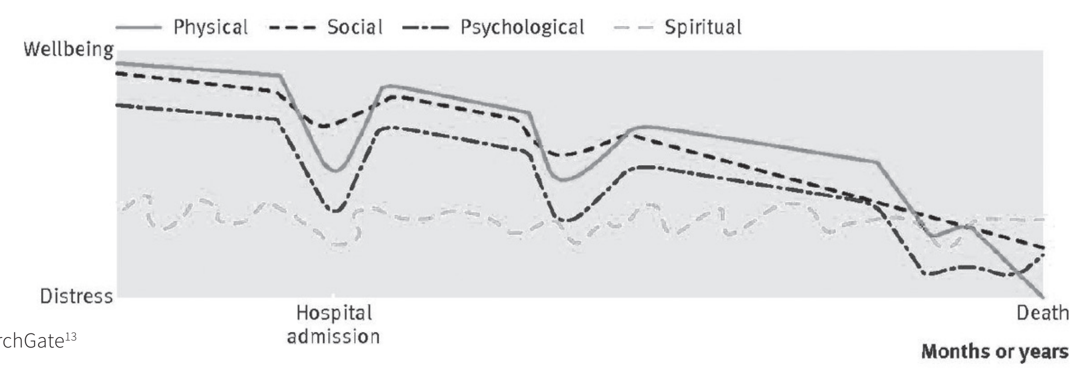
Scott Murray, Professor of Palliative Care at Edinburgh University in Scotland, has been using a four-dimensional model which looks at the physical, psychological, social and spiritual journey toward death. His well-being trajectories are drawn from the experiences of a large qualitative study group which was tracked through to death.[11]

Figure 2
Well-being trajectories in patients with conditions such as cancer, causing rapid functional decline



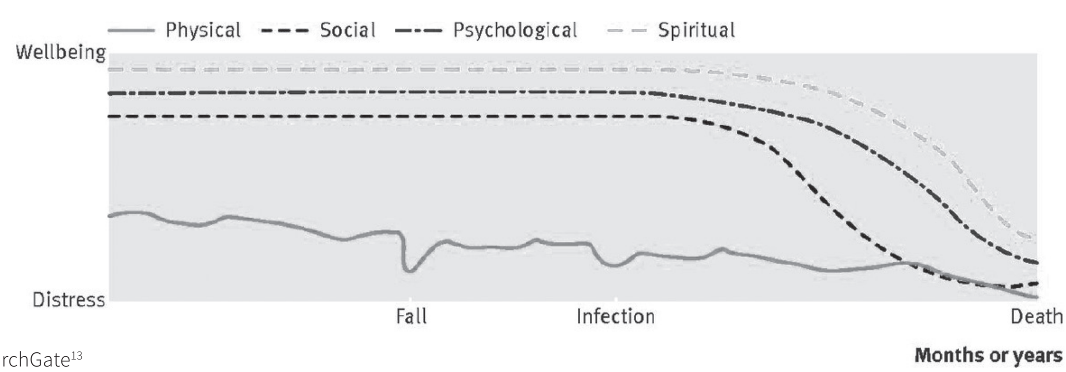
Source: ResearchGate[13]

Figure 3
Well-being trajectories in patients with intermittent decline (typically organ failure[s] or multimorbidity)



Source: ResearchGate[13]

Figure 4
Well-being trajectories in patients with gradual decline (typically frailty or cognitive decline)



Source: ResearchGate[13]

Here we see the deep stresses experienced by cancer sufferers due to episodes such as diagnosis and recurrence, whereas the cancer itself often causes only a gradual decline in physical and social capability.

The physical decline from sudden organ failure can be sharp and will trigger psychological lows, and often generates associated drops in social interactions. Spiritual distress is likely to be a function of a person's inner resilience and will fluctuate more over time.

The very gradual physical decline of frailty for people usually reaches a tipping point, at which life for them seems to start to lose meaning. Death is often preceded by warning signals such as a decline in social interaction, closely followed by psychological collapse and existential distress (i.e., knowing that it's time).

The interlinked nature of these four aspects—physical, social, psychological, spiritual—has begun to be built into modern frailty scores such as the recently developed Electronic Frailty Index[12] (eFI). These scoring systems start to take account of both the physical and social elements of aging and are a useful step forward from previous frailty scores, which typically concentrated only on purely physical aspects such as grip strength, or measuring the time it takes to get up from a chair, walk a few paces and sit back down.

The challenge we face as an industry is to use these kinds of learnings to create new benefit trigger points for our products. This can open up a market for frailty care products that can be designed to help support people living at home for as long as possible.

CATCH OF THE DAY

Insurance should be about creating socially useful outcomes at a time of great need for the individual. As our aging and increasingly frail populations expand and continue to want to live at home, we need to rise to the challenge by thinking imaginatively about long-term care claims triggers and the ways in which we would monitor and measure when claims occur.

We also need to think carefully about how to make claim benefits truly useful, because we know that most of our customers lack the skills and knowledge to understand the problems associated with frailty and to act in an appropriate way. The successful life insurers of tomorrow will have to provide benefits and service wrap-arounds to guide claimants and their families to the best outcomes. ■

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Epidemics: Past, Present and Future—What are the Risks?

By Paul Edwards

The uncontrolled, rapid spread of infectious disease still causes alarm in society today. In Medieval times it was called "Pestilence" and perceived as a mythical character firing poisonous arrows on victims as it rode alongside its companions War, Famine and Death. Indeed as epidemics have killed more people in human history than any other cause, it is little wonder it continues to hold such dread in our societal psyche.

Thanks to medical advances, particularly centered on vaccination and antibiotics, combined with efforts to improve the urban environment in the mid-20th century, it seemed that the era of widespread epidemics had passed. Yet, at the start of the 21st century we face a return to that era, made worse by both environmental degradation and overpopulation. In this article we will explore why we are seeing not only the potential return of epidemics from old infectious scourges, but also the emergence of new threats.

Table 1
Historic and recent epidemics/pandemics[1]

What	When	Where	Deaths
Black Death	1347–51	Europe	50,000,000
HIV	1980	Global	39,000,000
Spanish Flu	1918–20	Global	20,000,000
Asian Flu	1957–61	Global	2,000,000
Seventh cholera pandemic	1961	Global	570,000
Swine Flu	2009	Global	284,000
Ebola	2014	West Africa	4,877
Measles	2011	Congo	4,555
SARS	2002–3	Global	774

MICROBIAL ZOONOSES

Microbial disease is an illness or ailment caused by the introduction or infection with one of four types of microbes, namely (viruses, bacteria, protozoa or fungi). Of the millions of types that exist, only about 1,400 are pathogenic in humans[2] (but critically only 150 have both the capability of human-to-human transmission and the potential to cause epidemics).[3]

The emergence of pathogenic microorganisms appears to be accelerating with an average of three being identified every year.[4] Of all the agents that have been identified since 1980, 60 percent have zoonotic origin, i.e., pathogens that have spread from animals to humans, either as a result of interaction with a carrier or vector (e.g., the mosquito carrying Plasmodium protozoa or rat fleas carrying Yersinia pestis) or as a result of direct contact with the microbe, either through the air (influenza), from bites (rabies) or through contact with contaminated body fluids such as blood.[5] For example, HIV, which is now a purely human disease, probably evolved from a simian counterpart and SARS (Severe Acute Respiratory Syndrome) likely from a palm civet cat virus.

Table 2

An example of human pathogens with animal sources that have emerged since 1945[6]

Year	Pathogen	Origin
1952	Chikungunya virus	Mosquito
1959	Zika virus	Mosquito
1977	Ebola virus	Bats?
1977	Hantaan virus	Rats
1977	Legionnaires' disease (Legionella pneumophila)	Unknown
1982	Lyme disease (Borrelia burgdorferi)	Deer, sheep, cattle, horses, dogs
1983	HIV	Chimpanzees
1993	Hanta virus	Deer mouse
1994	Hendra virus	Fruit bat
1997	H5N1 flu	Chicken
1999	Nipah virus	Fruit bat
2002	SARS	Palm civet cat
2009	H1N1 flu	Pigs
2012	MERS	Camels?

EPIDEMIC VS. PANDEMIC

In the widest sense of the term, an epidemic is the presence of any disease in a large number of people, hence, for example, diabetes or heart disease can be said to be present in "epidemic proportions." In a stricter sense, however, it means the rapid spread of an infectious disease to a large number of people over a short timeframe.

Epidemics strike when and where microbes find a susceptible group of people to infect and have a means (or "agent") to pass from one person to another. In natural conditions an epidemic usually ends when all possible victims have been infected and either have become immune or, in the most lethal examples, have died. Epidemics can be classified as being "common source" outbreaks where those who get infected do so because they have been exposed to an infectious agent from the same source (e.g., Cholera usually occurs from an infected water supply) or "propagated" outbreaks where the infection passes from one person to another. The latter are the diseases that are perhaps most feared, and transmission can be directly contagious (e.g., through blood or other bodily fluids, touch or breathing in particles), vehicle-borne (e.g., needles) or vector-borne (mosquitos, fleas, etc.).

An epidemic does not necessarily have to cause death to be problematic; for example, while symptomatic infection by the Zika virus causes a relatively mild illness, the major cause for concern with Zika is the effect that it can have on the development of babies during pregnancy.

A pandemic differs only in that the epidemic disease has spread beyond its initial hot zone, i.e., it has become international or even intercontinental. All epidemics display a spectrum of effects—ranging from patients being asymptomatic carriers of infection or displaying mild illness to the extreme of catastrophic disability or fatal disease.

PATHOGENICITY, VIRULENCE AND INFECTIVITY

The severity of an epidemic's impact is determined by a number of factors, especially how pathogenic or virulent the underlying organism is. This refers to how capable the microorganism is of making a person ill and in the worst instances it is expressed as the case fatality rate.

In addition, when an epidemic strikes, epidemiologists will try to estimate the size and infective nature of an outbreak. One method for doing this and for monitoring the outbreak over time is to calculate the basic reproduction rate—the R0. This essentially calculates the average number of new people an infected person will spread the disease to. If the R0 is greater than one, it indicates that the number of infected cases will rise, and the higher the number the more contagious the pathogen. If, however, it is less than one, the infection is not sustainable.

While these two measures—virulence and infectivity—overlap, they are not the same thing. You can be infected but not ill. Polio, for example, is highly infectious yet only 5 percent to 10 percent of those infected get clinical disease.

Table 3

The R0 or infectivity of selected diseases[7]

Disease	R0
Measles	15
Tuberculosis	4–5
Smallpox	3–11
HIV	2–5
SARS	2–4
Ebola	2
Pandemic Flu	1–2

RECENT HISTORY AND WHAT HAS CHANGED

The speed and regularity of new epidemic disease threats that have emerged in the last 25 years is both concerning and, at first glance, bewildering. Of course, in part, this apparent rapid emergence masks successes; these include the ability of modern microbiology to quickly isolate and identify new pathogens and the achievements of the World Health Organization's Global Alert system, which is designed to organize

a rapid response and improve biosafety and biosecurity across the world.

However, other changes have also influenced the risk of epidemics and pandemics in less positive ways. The interconnected fast transportation links of the modern world now facilitate the rapid spread of disease in ways not previously seen. Taking SARS as an example, it spread from China to 17 countries across two continents in a mere week, with one infected individual passing on the disease to 22 of his fellow 119 airline passengers.[8] Contrast this to the Black Death, which took a year to reach England from Italy. [9]

One of the main tools in medicine's arsenal defending against epidemic outbreaks has been immunization against pathogens through vaccination. Vaccines expose the immunized person to a weakened or harmless version of the pathogen and thereby trigger the body's own immune system to create antibodies. However, for a vaccine to be effective, certainly against those diseases which are highly infective, a very large proportion of the population needs to be immunized. This is in order to create "herd immunity" where so many people in a community (or herd) are immune that it affords a degree of protection to those who are not. With measles for example, if 92 percent to 95 percent of a community has been vaccinated, it has a protective effect on infants, the immunocompromised or those born pre-vaccination. The last few decades have seen the rise of "anti-vaxx" movements, often spurred on by perceived infringement of personal liberty caused by compulsory vaccinations or by reports of (usually spurious) serious side effects, e.g., the Measles, Mumps, Rubella (MMR) autism debate. Subsequently, in some countries we have seen outbreaks of disease epidemics, long thought controlled re-emerge, such as the Californian and Italian measles epidemics of 2014 and 2017. [10,11]

Other very important factors are climate change and overpopulation.

The El Niño-Southern Oscillation (ENSO) cycle events in the 1990s and 2000s have triggered severe droughts in the Southern United States, and conversely heavy floods in South America. Consequently, the drought-hit zones have seen explosions in the populations of rodents with the appearance of Hantavirus, while the number of mosquitos in flooded areas has increased with epidemics of Dengue fever.[12]

Mosquito-borne diseases are particularly influenced by weather and climatic patterns, since most require humidity and moderate to warm temperatures to propagate. With global temperatures rising, it is easy to anticipate the spread of different mosquito species; indeed, we have already seen the incidence of Chikungunya and Dengue rise in Europe.[13]

Finally, poverty and overpopulation pressures mean that humans are increasingly moving to areas previously seen as impenetrable wildernesses. As a result of our invasion of new environments we become exposed to microorganisms against which we have little or no immunity. The tropical rainforests of the world are the prime example, and it is from these areas that HIV and Ebola emerged.

Governmental policies at the regional, national or international level can have a positive or detrimental effect in mitigating or worsening these factors. As ever, preventative measures, whether they are offering free mosquito nets, condoms or vaccinations, are much cheaper than the huge efforts required to combat an outbreak once it has started. In the case of Ebola, for example, the economic impact on the three countries effected (Guinea, Liberia and Sierra Leone) has been enormous and is estimated to have caused a reduction in their economies of USD 1.6 billion or 12 percent of GDP, and would require a staggering USD 4.5 billion spend to recover.[14] During the height of the Ebola outbreak of 2015, international contributions to combat the disease were USD 3.6 billion with the two largest contributors being the U.S. (65 percent) and the U.K. (10 percent). It is uncertain whether, following the political tsunamis of 2016 and the rise of more nativist sentiments in these countries and subsequent pressures on international aid budgets, such contributions would be made available again.[15]

CONCLUSION

The trend in the emergence, or re-emergence, of infectious diseases that could cause epidemics is likely to continue. While an apocalyptic pandemic causing millions of deaths is unlikely, one causing widespread disease inflicting deaths in the thousands is more probable. Indeed, reinsurers do "price" for such events in their reinsurance rates. As an industry, we need to be vigilant in monitoring this risk and ensure that guidance to underwriters is clear and up to date. At Hannover Re, as a global reinsurer with a variety of underwriting manuals and tools at our disposal, we stand ready to assist our clients in this regard. ■

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12 See HOWARD, C.R & FLETCHER, N.F.: Emerging virus diseases: can we ever expect the unexpected? Emerging Microbes & Infections (2012) 1, e46; doi:10.1038/emi.2012.47

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ReImagine Insurance—Technology and Customer Centricity

By Veronica Scotti

As we prepare for the close of the year, planning for the 2018 Canadian Reinsurance Conference (CRC) is underway. Each year the CRC brings together peers and key industry stakeholders to discuss key issues and trends impacting our industry. Next year's event will be held on April 19, 2018 and promises to be engaging and informative.

The 2018 event theme is *ReImagine Insurance*. All of us on the CRC organizing committee are intimately committed to the strong purpose of our industry—improving lives, providing financial support in the hardest of times—and we believe in the creative power of the transformation that is already taking place. A power that correctly harnessed will make the next decade the most interesting for us as insurance practitioners and business leaders, and for our clients, who crave peace of mind, but don't always think of us as part of the solution.

As new technologies and data continue to change how we engage with customers and conduct business, it's more important than ever that we come together to share ideas and best practices to reimagine the ways we're delivering the services and solutions our clients expect and need.

THE FUTURE IS NOW

Today's industry reality is forcing us to think about new approaches and new ways to be prepared. The digital world is challenging the way we do business and we should embrace that challenge as we look to build better partnerships with our clients and services for our customers.

Mobile devices are giving rise to new ways of communication and information sharing. The influx of data and solutions to analyze that data are helping us extract useful consumer insights. Advances in artificial intelligence and predictive analytics are also creating opportunities for innovation throughout the value chain.

Furthermore, it's no secret that technology has impacted customer expectations—individuals are now used to on-demand, digital experiences. They want simplified information and they want quicker answers to their questions. We need to make sure we're harnessing new advances that open the way we connect with customers, influence positive behaviors and more.

It's no longer enough to simply understand current trends, collectively we must be a few steps ahead to remain relevant: embrace the future now, or risk being left behind.

CRC 2018

As we explore what it means to *ReImagine Insurance* and focus on customer centricity, our 2018 program will offer something for everyone. In order to help us all imagine a future-ready industry and inspire on the journey to get there, we're in the process of securing brilliant professional leaders both from outside and within the industry to speak at the event—be sure to visit the CRC website for updates.

We'll have over a dozen breakout sessions that focus on timely topics such as accelerated underwriting, genetics/regulation, predictive analytics, behavioral economics and more. In the 2018 program, the breakout sessions will display the recommended level of expertise required by attendees, so delegates can choose wisely and conversations in the room can run deep.

This year, you can also expect to meet social entrepreneurs, scientists, innovators and disruptors that are passionate about the specific proposition they are working on, overcoming one customer pain point at the time to get to customer bliss and healthy living!

ABOUT THE CRC

The CRC, which today is one of the premier reinsurance industry conferences in the world, is dedicated to providing a forum for industry participants to learn about developments affecting our business and providing an opportunity to network with peers.

The CRC was first held in 1956, when representatives from several Toronto insurance companies met for a half-day meeting to discuss reinsurance matters in their mutual interest. At that time, companies were involved in reciprocal risk-sharing arrangements in order to facilitate placement of large face amount policies. The purpose of their meeting was to discuss how to expedite these transactions.

From this simple beginning, the CRC has evolved to a full-day conference format which now regularly attracts more than 500 insurers, reinsurers and retrocessionaires throughout North America and abroad. This continued strong attendance can be interpreted as a clear indicator that this conference continues to succeed in meeting its goal of delivering value to the industry. ■

Veronica Scotti is Swiss Re's president and chief executive officer of Canada and English Caribbean. She can be contacted at *veronica_scotti@swissre.com*.

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Integrated Analytics—The Next Generation in Automated Underwriting

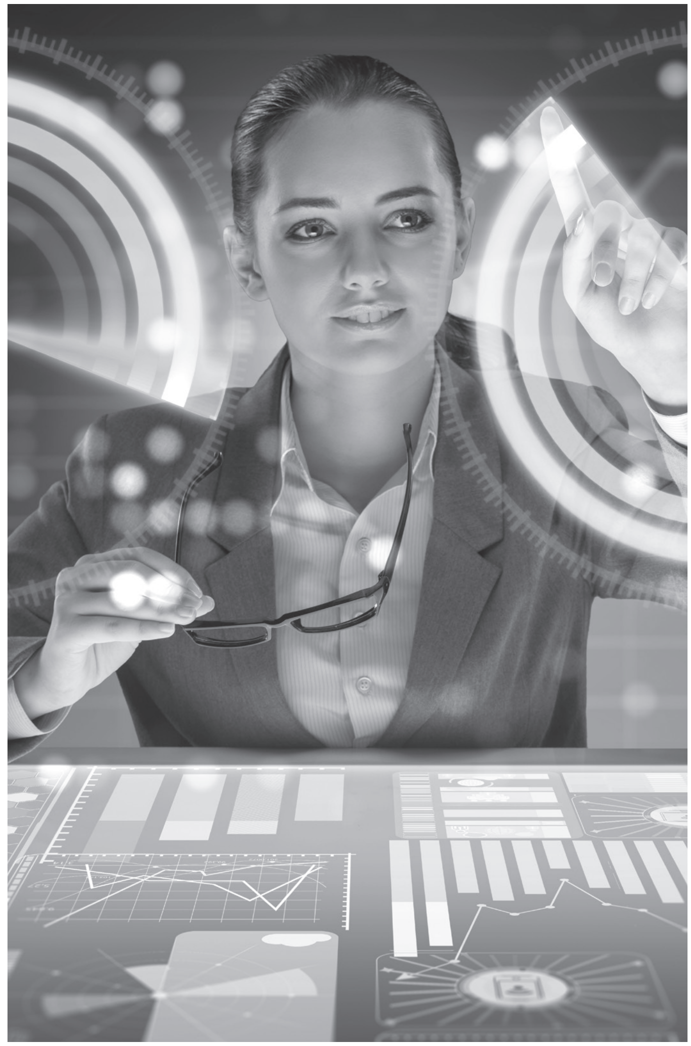
By June Quah and Jinnah Cox

We are experiencing the most rapid evolution our industry has ever seen. Incremental innovation has been underway for the last 10 to 15 years, but currently, the pace of change is truly frenetic. Today, we are competing with not only peer companies, but also start-ups, third-party solution providers and others from outside the life insurance industry, who recognize the potential to disrupt the industry we know so well.

Data is essential to advancing change. When fluids are removed from underwriting, optimizing the use of the remaining available information to manage the additional mortality from misclassified cases while achieving high straight-through processing (STP) rates is key. A data-driven approach using predictive underwriting models is the next phase in our evolution. Enabling high STP rates with objective decision-making to best manage the extra mortality risk from the streamlined process requires analytics to be competitive and ensure accuracy. No longer is pricing fluidless business using MIB, MVR and prescription drug histories enough. Predictive analytics is the new normal and allows more risks not only to be triaged, but also to assist carriers in a more refined stratification of the risks.

A data-driven approach using predictive underwriting models is the next phase in our evolution.

The following case study walks through the steps of a predictive modeling exercise to illustrate one way to use analytics to streamline the underwriting paradigm.



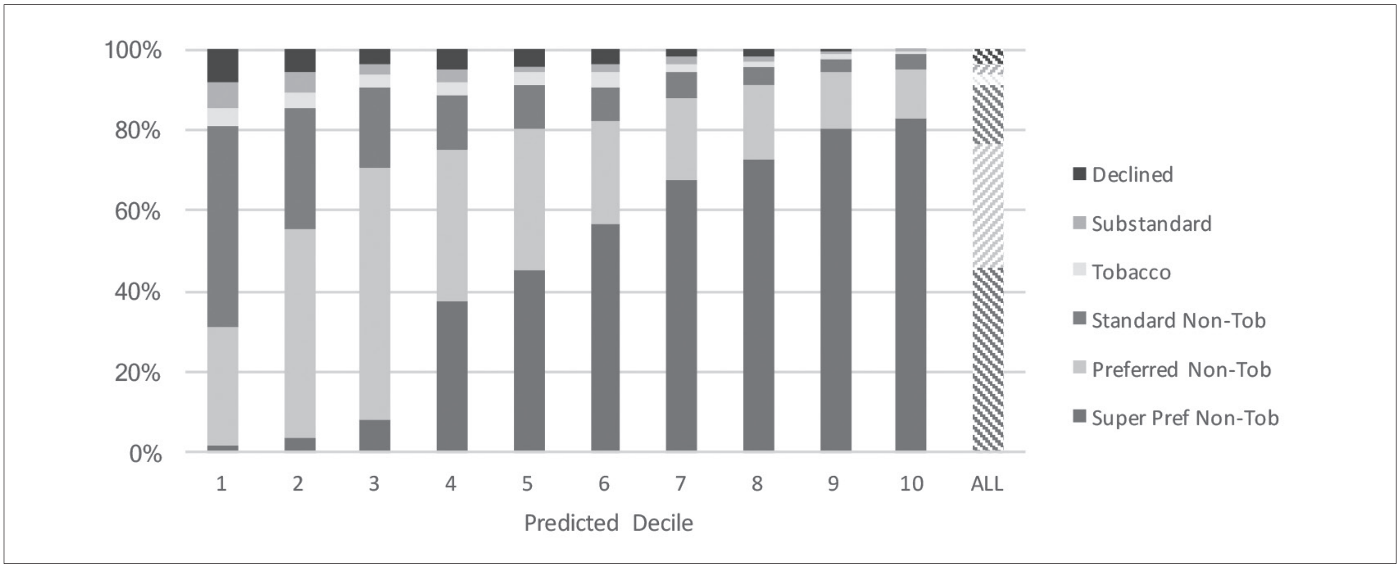
STEP 1: DEFINE THE PROCESS

The key objective for an automated underwriting analytic model is to meet a target straight-through processing rate with a limited impact on mortality. To accomplish this, the model must reliably predict risk class. In this case study, this was accomplished by developing a custom predictive underwriting triage model using historical data. The goal of this model was to accurately assign a subset of cases to an underwriting risk class without requiring medical exams, fluid testing or an attending physician statement (APS), but instead relying on other available data.

STEP 2: SELECT THE DATA

Application data (e.g., age, gender, and self-reported height and weight), tele-interview information, and third-party underwriting data (e.g., MVR, Rx and MIB) were available for each case. The actual final underwriting decision and risk class were also available. For our target issue age and

Figure 1
Distribution of Actual UW Class by Predicted Decile Test Data



face amount range, there were two years of applications with complete underwriting data. The data was able to be directly downloaded from the underwriting system, which saved the company significant time and resources.

STEP 3: DETERMINE PREDICTORS OF MORTALITY

While there were several hundred inputs into the model, about 100 were found to be predictors of underwriting risk class. These ~100 predictors included obvious things—such as gender and age, and not-as-obvious things, such as marital status and reason for weight loss.

While third-party data, such as credit-based mortality scores, is increasingly being used to predict and manage mortality, it has limited value in predicting medically-based underwriting classes. Generally, a starting point is evaluating these commercially-available tools, but also building a predictive model for underwriting triage. Thus, these tools can and should be used in tandem. In our case study, no commercially-available risk classifier was used as a predictor in the model, but rather, the score was used as an initial qualification criteria to help mitigate mortality risk.

STEP 4: BUILD THE MODEL

A multi-class classification model was used with the following categories as the target outcome: Best non-tobacco (NT), Second Best NT, Residual Standard NT, and Refer To Underwriter (UW) (tobacco, substandard, and declines).

The statistical/data mining software R was used to develop the predictive model. The final model is a multinomial logistic model, chosen due to its simplicity, transparency, interpretability and ease of implementation. Alternative models such as the lasso regularized generalized linear regression and gradient boosting were tested with comparable results.

STEP 5: VALIDATE THE MODEL

Using stratified random sampling, 70 percent of the available data was selected to train the predictive models, and the remaining 30 percent was set aside for later use to validate the models. Validating the predictive model on data that was not used to build the model is a crucial step in any analytic project. It gives us confidence that the predictive model will perform well on new cases.

One visual way to determine how well a model is fitting your data is to look at the decile analysis. A decile chart groups the data into 10 equal buckets, ranked according to the probability of a certain outcome. Here, the outcome is the probability of being the best risk, where the likelihood is very low, decile 1, and very high, decile 10. In reviewing a decile chart, you want to see the proportions for the various risk classes exhibiting a "staircase effect," with the best risk class representing the majority of the higher deciles and being insignificant in the lower deciles. The decile chart that follows (Figure 1) on the 30 percent of holdout test data shows that the model can accurately segment underwriting classes, as deciles 7 to 10 have a much higher proportion of Best NT cases.

Thus, our model seems to be meeting our goal to accurately assign risks to underwriting classes.

Figure 2
Model Predicted Probabilities

Case	Target Outcome: Actual UW Class	Best NT	Second Best NT	Resid Std NT	RUW	Class with Max Probability	Predicted UW Class Assignment using confidence thresholds
Case 1	Best NT	94%	5%	1%	0%	Best NT	Best NT
Case 2	Declined	2%	44%	30%	24%	Second Best NT	RUW
Case 3	Second Best NT	8%	73%	14%	5%	Second Best NT	Second Best NT
Case 4	Declined	70%	12%	11%	7%	Best NT	Best NT
Case 5	Residual Std NT	55%	8%	35%	2%	Best NT	Residual Std NT

STEP 6: EXTRACT OUTPUT FROM THE MODEL

The predictive model produces as output the predicted probabilities of each target underwriting class for any given case. Figure 2 illustrates some examples of the model output. For example, Case 1 is predicted to have a 94 percent probability of being Best NT. A simple assignment method would be to assign the class with the highest predicted probability as the predicted class. For Case 1, that is the Best NT class. However, there are cases where the highest predicted probability is not as high, indicating that there is less confidence in assigning a case to that class. For example, Case 2's highest predicted probability is the Second Best NT class at 44 percent, but it also has a 30 percent probability of being Residual Standard NT and a 24 percent probability of being Refer To UW. These probabilities indicate that there is less confidence in assigning a class to Case 2.

As such, confidence threshold rules were incorporated so that when the predicted probabilities fall below specific thresholds, the case is referred to underwriter instead of being assigned a predicted class.

We tested many combinations of threshold rules, varying the predicted probabilities from several classes. By definition, there is a trade-off for the number of accurately predicted versus misclassified cases and the number of cases automated versus referred to underwriter as the threshold varies. The thresholds were calibrated to maximize the number of automated cases, targeting our desired straight-through rate while managing the extra mortality to be in the target range.

STEP 7: COMPARE PREDICTED CLASS OUTCOME TO FULLY-UNDERWRITTEN DECISION

Comparing the predicted risk class to the actual fully-underwritten risk class yields valuable insight. This can either confirm that we are satisfied with the model outcome, or shed light on areas the model is missing. In our case study, this comparison showed that the model accurately predicted ~90 percent of the cases where Best NT was the actual fully-underwritten decision. Again, this confirms that the model is meeting its goal for fitting risk class.

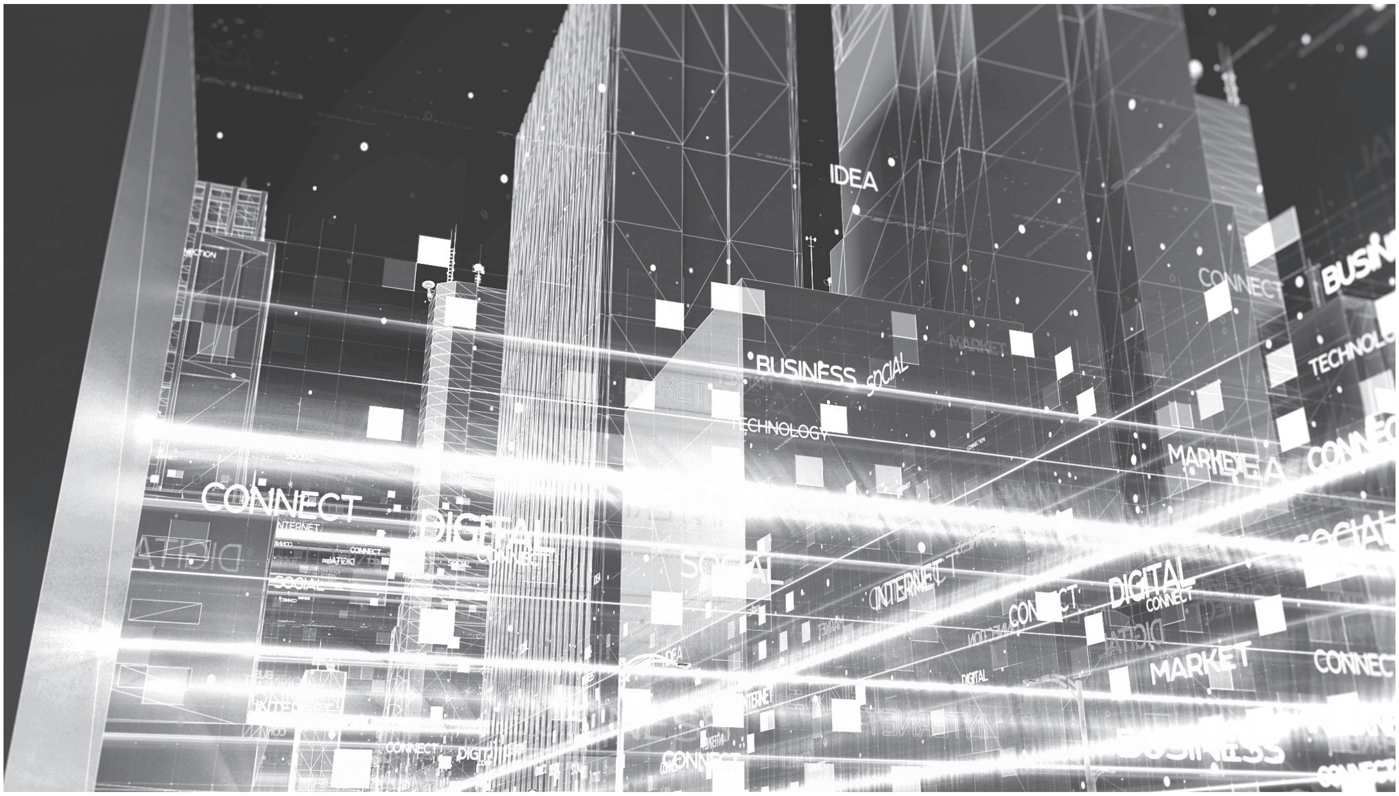
Class misclassification, resulting in additional mortality, occurs when the predictive model assigns a better underwriting class compared to what would have been determined using traditional medical underwriting. The misclassification occurs as the predictive model is developed using a subset of the most predictive underwriting data (~100 predictors) and not the complete underwriting information available for full underwriting.

STEP 8: CONSIDER MORTALITY COSTS AND PROGRAM BENEFITS

While mortality experience is not yet available, we can estimate the extra mortality for automated business by comparing the present value of death benefits for each risk combination between fully underwritten and the risk class predicted by the model.

Without fluid-testing, medical exams and APS, there will be some loss of information from potential misrepresentation of health status and undiagnosed adverse medical conditions. In addition, we expect there will be some increased mortality from the sentinel effect—the self-selection of unhealthy applicants to apply for coverage when testing is not done. This should be considered when setting the mortality expectation for this program.

However, there are also significant expense savings that should also be reflected in your pricing, including the elimination of fluid tests and exams and less time spent underwriting each case. It also enables appropriate underwriting focus and allows underwriters to focus their time on complex cases. There is also the potential to realize higher take-up and cross-sell rates. These expense savings and benefits can in many cases counteract the additional mortality expected from these programs.



STEP 9: INTEGRATE THE MODEL INTO THE UNDERWRITING SYSTEM

A predictive model has limited effectiveness if it cannot be fully integrated into your existing underwriting platform. In this case, the predictive model solution was able to be fully integrated into the underwriting engine. An automated solution was developed to capture the inputs to the models, perform the calculations, and make the predictive assignment available to the underwriter within the platform. A qualifying case that is not referred to underwriter can be issued with a risk class within minutes of full applicant information being received.

STEP 10: MONITOR RESULTS

The performance of the program should be carefully monitored and reviewed. Post-issue audits, such as ordering APS or medical records on a subset (e.g., 10 percent) of approved streamlined applications, helps to monitor and understand any material applicant misrepresentations and deviation of the model performance from expected.

Best practice for monitoring programs include reports to track and understand the before and after distribution of cases across various attributes and distribution channels. Other items to track include third-party hit rates, placement rates, and straight-through processing rates. This helps to better understand any changes in customer behavior and the impact of those changes on the underwriting decision and resulting mortality experience. For example, comparing self-reported weight data over time may reveal that applicants are understating their weight as they are now aware that not all cases require full underwriting.

> A predictive model has limited effectiveness if it cannot be fully integrated into your existing underwriting platform.

Any modification to the underlying underwriting philosophy and rules engine should also be closely examined to ensure alignment with the predictive model. Continued monitoring and feedback will guide the ongoing and future refinements to the predictive model.

CONCLUSION

With start-up activity well underway in Silicon Valley and innovation hubs around the globe, our evolution will likely continue at this rapid pace. Pure data is only part of the equation. Other advances, such as Electronic Health Records, wearable devices, wellness programs, and verbal and facial analytics, are rapidly emerging as new areas that will likely impact streamlined underwriting. Data analytics is, and will continue to be, the key in reaching that elusive balance between the convenience of fluidless underwriting and accurate risk classification. This paper highlighted an Underwriting Triage predictive model, which is only one of several available predictive model types that can deliver value in filling information gaps left by removing underwriting requirements, accurately placing risk and streamlining the process to enhance the customer experience. ■

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