Welcome

Welcome to the December 2014 issue of RGA Quarterly: Europe, our last for this year. Within every issue, we aim to keep you apprised of new opportunities and provide you with insights on topics that matter most in the insurance industry. This is especially important in the current environment, given the economic, technological and social changes and trends that can have such an impact on our business. By providing timely information and new perspectives, we hope to assist clients prepare for what is ahead.

The first article covers a topic that has been much in the news lately: infectious diseases. Dr. Kamran Khan, an infectious disease physician at St. Michael’s Hospital in Toronto, takes an in-depth look at what factors are behind the globalization of these diseases, from SARS and MERS to the current Ebola outbreak in West Africa. Dr. Khan also offers a valuable outsider’s view on how the insurance industry, with the help of predictive analytics and big data, can better evaluate the mortality and morbidity risks arising from infectious diseases.

In this edition’s “Around the World,” we hear from our colleagues at RGA Reinsurance Company of Australia Limited, who discuss how claims assessors can use the Internet to gather more information on the activities and behaviour of claimants. With so many millions of people living their lives online, searching the Internet and social media for someone’s digital footprint is an easy and cost-effective tool to verify (or challenge) the facts of a claim.

Next up, Jonathan Hughes, Head of Strategic Development at RGA UK Services Limited, explains how improvements in underwriting can help insurers increase sales at profitable margins while still keeping distributors happy. This approach has already met with success in the UK market, and is well worth exploring.

Finally, we wrap up this issue with an introduction to tail longevity protection, a reinsurance solution that can improve an insurance company’s capital position under Solvency II. The costs of this financial instrument are relatively low, making it an attractive option for insurers.

From all of us at RGA, I want to wish you a Merry Christmas and all the best for a prosperous 2015.

Olav Cuiper
Head of EMEA and Emerging Markets
RGA International Reinsurance Company Limited
In 1999, a virus foreign to North America by the name of West Nile arrived in New York City and then spread across the continent. Four years later, a previously unknown virus of bats, now infamously known as SARS, infected humans in China and then spread to more than two dozen countries, killing 10% of the 8,000 people worldwide that became infected. In 2009, a pandemic strain of the influenza virus known as H1N1 emerged in Mexico, and then spread to every country in the world in just six weeks. And in the past year, a virus called chikungunya, normally found in Africa and Asia, hit the island of St. Martin, after which it rapidly spread across the Caribbean, and now threatens areas of the continental United States. Today, the largest outbreak of Ebola ever recorded continues to spread widely within three West African countries, recently reaching the large urban centers of Conakry, Freetown and Monrovia.

So why are all these outbreaks happening? Is there just more news of infectious disease outbreaks today, or are they actually increasing in frequency? Confronting these questions requires a look at factors that drive the emergence and international spread of infectious diseases.

Today, a number of global phenomena, from human population growth, to climate change, to surging international air travel, are converging. Foremost, the world’s population is expanding at a rapid pace. With more than 7 billion people in the world today — half of whom live in densely populated cities — there are simply more opportunities for humans to become infected with dangerous microbes. Consequent to population growth is the growing demand for food. Unfortunately, about three-quarters of all new infectious diseases observed in humans have their origins in animals — from SARS, to “bird” flu and even HIV. People tend to become infected with animal pathogens during the production or consumption of livestock or as wildlife ecosystems are disrupted. Furthermore, humans can acquire drug-resistant variants of animal microbes when livestock are fed antibiotics.

While climate change is known to the insurance industry for its impact on the property and casualty market, it sometimes may not be considered in terms of its effect on infectious diseases. Yet many insects from ticks to mosquitoes that can transmit infectious diseases like Lyme and dengue are increasingly able to survive and thrive in areas of the world where the climate is now suitable. In addition to outbreaks resulting from naturally occurring phenomena, the potential exists for microbes manufactured in laboratories to accidentally escape, or, more nefariously, for groups to deliberately release biological agents (e.g., as occurred when weaponized anthrax was dispersed via the U.S. postal system in 2001). And with more than 3 billion trips on commercial flights worldwide every year, humans are increasingly
becoming vectors for the spread of infectious diseases by inadvertently transporting dangerous microbes from one region of the globe to another.

The recent threat of Middle East Respiratory Syndrome (MERS)

Caused by a previously unknown coronavirus, MERS was first identified in the Arabian Peninsula back in 2012. Thought to have made the leap to humans from camels, there remains uncertainty as to just how this virus is actually infecting humans. Once humans are infected, however, they are able to transmit it from person to person. Fortunately, this virus is far less contagious than its ‘cousin’ of a decade ago, SARS.

Largely confined to Saudi Arabia and neighbouring countries, this outbreak has simmered over the past two years. But in the spring of 2014, transmission of this deadly virus — which kills about one-third of those infected — increased sharply.

While many new infections were related to viral spread within hospitals, the cause of other new infections was unexplained and thought possibly due to contact with camels or unrecognized contaminated areas in the environment. Following this surge in cases came the accelerated international spread of MERS to countries in Western Europe, North Africa, the Middle East, East Asia and even North America (two cases were imported into the U.S.).

What has been challenging with MERS is that there is an incomplete understanding of how it infects humans and, consequently, how best to prevent new infections. Furthermore, it has a broad spectrum of illness, with many of those infected displaying no symptoms at all (incidentally identified when investigating contacts of known MERS cases), others having mild respiratory illnesses that resemble those of common respiratory viruses and, at the other end of the spectrum, severe, life-threatening respiratory failure. While rapid diagnostic tests have been developed to identify the virus in respiratory specimens along with blood tests that can detect evidence of recent infection, not all countries have robust medical and public health systems that can readily detect MERS. Like SARS, what is especially concerning is that there is no vaccine or effective treatment protocol available (other than supportive management for those who require intensive care).

While many viruses possess the ability to rapidly evolve and take on new characteristics (e.g., become more contagious), fortunately, MERS remains quite limited in its ability to spread from person to person; however, public health officials around the world are also mindful that Saudi Arabia hosts the largest annual mass gathering in the world. Saudi Arabia, custodian of major religious sites in the Muslim world (the cities of Mecca and Medina), sees about 3 million pilgrims arrive annually from virtually every country in the world. While international pilgrims arrive throughout the year to perform a ‘lesser pilgrimage’ known as Umrah, numbers increase significantly during the holy month of Ramadan. In October 2014, pilgrims congregated to perform the Hajj, a mandatory ritual for all physically and financially able Muslims to perform at least once in their lifetime. Given that this congregation involves massive crowds, pilgrims could potentially become infected with MERS in Saudi Arabia, and then develop illness after they return to their home countries. While the recent surge in MERS activity across Saudi Arabia has momentarily subsided, public health officials around the globe, including the World Health Organization, closely monitor the situation leading up to, during and after the Hajj.

The power of predictive analytics

When infectious disease outbreaks with significant potential health risks arise, how does the insurance industry evaluate them? Is a systematic approach adopted that distinguishes a subjective and potentially emotion-driven response from an evidence-based, objective assessment of their expected impact? As an infectious disease clinician and scientist at an academic teaching hospital, my perspectives on emerging infectious diseases stem from personal
experiences that lie outside of the insurance industry. In 2003, after completing my clinical infectious disease and public health training in New York City, I returned to my home town of Toronto just before SARS made its way to Canada from Hong Kong. It was an eye-opening experience that demonstrated just how interconnected and interdependent our world is when it comes to the threat of infectious diseases. It was also an experience that revealed a major gap in our ability to make informed, time-sensitive decisions about infectious disease threats arising on the other side of the world. Responding to this unmet need, my colleagues and I began integrating our collective expertise in clinical infectious diseases, population and public health, big data, geographic information systems, predictive modeling and Web technology, to develop innovative tools that could help governments better prepare for and respond to the next big infectious disease threat facing their citizens.

After years of building a robust research program and integrating it with the technological know-how to produce timely, scientifically validated predictive analytics, my colleagues and I in academia were well-prepared for the H1N1 influenza pandemic of 2009. When we accurately predicted the global wavefront of this pandemic based on analytics of worldwide air traffic patterns (publishing these findings in the New England Journal of Medicine), it became clear that there was a strong interest in anticipating the impact of globally emerging infectious diseases from both the public and private sectors alike. Maintaining a strong desire for social impact, my colleagues and I founded BioDiaspora — a social benefit corporation — with a mission to prevent or mitigate the health and economic consequences of future infectious disease threats.

During the past five years, we have been partnering with key public health organizations in the world like the U.S. Centers for Disease Control and Prevention and the World Health Organization.

**An outsider’s view on the industry**

After meeting a variety of insurance industry stakeholders, it did not take long to realize that, when contemplating infectious diseases, a significant amount of time and energy is spent reflecting upon one historical event — the Spanish influenza pandemic of 1918. Even though it occurred almost a century ago — prior to the advent of antibiotics, intensive care units and other modern medical innovations that help keep people alive — it symbolizes a disconcerting and unexpected spike in morbidity and mortality that could have devastating implications to the health of populations worldwide. Thankfully, almost a century later, no other epidemics or pandemics have rivaled the estimated 50-100 million deaths that occurred globally as a result of the Spanish flu but the memory of this event continues to beg the question: Could history repeat itself?

From a biological perspective, it is entirely plausible that a pathogen comparable in its virulence to the 1918 Spanish influenza virus could emerge. But a pragmatist might also remind us that there are limits to supplies of antimicrobials and essential medicines, that significant delays still exist when producing vaccines even for the most common of pathogens such as influenza, and that the finite number of intensive care unit beds cannot easily be increased to respond to a sudden unexpected surge in demand.

With the enduring memory of the Spanish flu, it is perhaps not surprising that the insurance industry focuses much of its attention on influenza, a highly unpredictable virus that clearly deserves respect. However, it appears that pandemic influenza has become synonymous with the potential for large-scale morbidity and mortality. But in this subtle assumption lies a possible risk — could a high-impact event arise...
from pathogens other than influenza? Considering the accelerated emergence of so many previously unknown infectious diseases during the past few decades — many making the leap from animals to humans — it is possible that one of these could be the next “big one”. It is also possible that the world might experience more-frequent epidemics in the future, each with smaller impacts than a pandemic, but with cumulative effects on health that could be substantial (epidemics are considered geographically defined events, whereas pandemics are by definition epidemics that spread across the entire world).

Considering that present-day scientific knowledge — and future knowledge presumably for some time — is insufficient to anticipate where or when the next influenza pandemic will emerge, just how contagious and deadly it will be, and how well our modern medical and public health systems will be able to respond to it, an important question to ask is just how much energy should be consumed planning specifically for an influenza pandemic?

Infectious diseases are many things

The term infectious diseases may imply a homogeneous group of illnesses, but in reality it represents a diverse collection of microbes, each with their own unique characteristics, life cycles, and effects on human health. So rather than start with a pathogen — like influenza, for example — when evaluating risks to an insurer, perhaps it makes more sense to start with the type of insurance product being considered. For instance, some pathogens can cause chronic morbidity, which could be of interest to those with substantial disability exposure, whereas others are virulent and could pose risks from a critical illness or life perspective.

A geographically tailored method of evaluating risks to an insurer would be to relate its global exposure to a specific insurance product (i.e., life, disability, critical illness) with the global geographic footprints of infectious diseases relevant to that product, while taking into consideration global travel patterns from those infectious disease footprints. Moreover, understanding local context is critical. The observed health impact from an infectious disease is not just a function of the pathogen itself, but also the susceptibility and vulnerability of the population to that pathogen, as well as the suitability of the environment to facilitate pathogen activity. For example, when cholera was introduced into Haiti in 2010 after a devastating earthquake, access to clean water and enhanced sanitation was disrupted, and consequently hundreds of thousands of infections and thousands of deaths ensued. By contrast, if cholera were introduced into a city in the United States where access to clean water and enhanced sanitation was universal, the microbe would quickly be halted in its tracks. So one can see how a single pathogen could have two very different outcomes when context is taken into consideration. Although more complex than focusing on a single pathogen, tailored risk models could be developed that integrate knowledge of worldwide infectious disease activity, global patterns of travel, local population
vulnerability and environmental suitability to infectious diseases, as well as an insurer’s geographic exposure by type of insurance product.

Enabling smarter decisions
Imagining how big data and predictive analytics could inform smarter decision-making on infectious disease risks facing the insurance industry, it appears that there are opportunities across three time horizons. First, from a long-term perspective (months to years into the future), an insurer could benefit from risk modeling that holistically considers impacts from all relevant infectious diseases in relation to an insurer’s existing (or future anticipated) global insurance exposure (as discussed above). Since global leaders in public health use similar approaches to anticipate future epidemic risks, these methods could be adapted and re-purposed to meet insurance industry needs.

On a nearer-term basis (weeks to months into the future), industry stakeholders could benefit from early warnings of key infectious disease events emerging in the world. As the Internet evolves, it is increasingly used as a crowdsourcing medium for global epidemic intelligence. Since these signals are timely and often precede reporting from official government sources, they can offer valuable insights into potential near-term risks. For example, at the onset of the 2009 H1N1 influenza pandemic, a deviation from the usual seasonal pattern of flu-like illnesses in Mexico signaled that a possible threat was emerging several weeks before a pandemic risk was formally declared. Although insurers may be limited in their ability to mitigate risks from policies they already hold, timely infectious disease intelligence, coupled with tailored risk assessments, could help inform imminent decisions about new business ventures and opportunities.

Finally, all companies should have robust business resiliency and continuity plans to help them ‘ride the wave’ of an emergency as successfully as possible, whether related or unrelated to infectious diseases. During the midst of a major global infectious disease event, the health and welfare of human resources may be threatened, supply chains might be disrupted (given today’s global nature of business), and decisions about holding capital may arise if an increase in claims is anticipated. Similar to how government health agencies operate, frequent risk assessments based on the most current global information available could help inform short-term decisions (days to weeks into the future) during the midst of an epidemic or pandemic emergency.

Maintaining perspective
Infectious diseases currently account for about 4% of all deaths in the United States. Although there are far more significant causes of morbidity and mortality across the industrialized world, from vascular disease to cancer and obesity, newly emerging and re-emerging infectious diseases could have significant impacts on the health of populations worldwide over the next few decades. Given that risk assessments in the insurance industry are largely derived from historic data, it is not surprising that there is some discomfort when projecting future risks for major infectious disease events like pandemics, since there are few data points with which to work. This is further complicated by the fact that modern global forces that drive disease emergence and spread are countered by parallel advancements in health technologies that might prevent or mitigate impacts.

Since the recent past might not be predictive of the future when it comes to infectious diseases, the insurance industry may wish to keep key historic events — like the Spanish flu of 1918 — in perspective. Like a brief glance in the rear view mirror, this retrospective look back should not consume an excessive amount of time and energy, since the degree of precision and the answers sought after may simply not be attainable. But adopting a consistent evidence-based approach to evaluating infectious disease risks going forward
that makes creative use of leading-edge science and technology could help prevent costly inefficiencies that stem from either over-reaction or under-reaction to emerging threats.

Since SARS brought chaos to cities around the world a decade ago, tremendous scientific and technological advances have been made in preparing for the next major infectious disease event. Government health agencies, often in partnership with academia and the private sector, have taken advantage of advances in big data, predictive analytics, web-technology, and data visualization to anticipate the health and economic impacts of future threats. Because the insurance industry also counts lives and impacts to health, there are important opportunities for it to creatively adapt leading innovations to better plan for, become aware of, and effectively and efficiently respond to inevitable infectious disease threats of tomorrow.

The current outbreak of Ebola in West Africa is now larger than all other outbreaks of the disease combined, with more than 14,000 reported cases and over 5,000 deaths. First discovered in Zaire (now Democratic Republic of Congo) and Sudan in 1976, there is currently no vaccine or treatment known to be effective or safe, despite a mortality rate that can be as high as 90%. What makes the current epidemic unique is that while cases of Ebola are typically only found in remote areas, in this epidemic, cases have emerged in large metropolitan centers. This July, an individual infected with Ebola traveled by air from Monrovia, Liberia to Lagos, Nigeria, where a cluster of new cases emerged among his healthcare providers. These cases and their contacts are being monitored closely with the hopes of preventing further spread in Nigeria. Three U.S. citizens infected with Ebola, who were working in the region, were repatriated to the U.S. for medical care. Although this caused some anxiety in the general population, it is important to note that Ebola virus is spread only when uninfected persons come into contact with the body fluids of infected persons. In an industrialized country like the United States, where the risks of new imported cases of Ebola are generally low but not zero, this largely translates into possible exposures to frontline healthcare providers. Since medical and public health systems and hospital infection control practices in the U.S are highly robust, the probability of Ebola virus having an impact among the general population is exceedingly low. For insurers with critical illness or life exposure in industrialized areas of the world, this knowledge should be balanced against the widespread reporting of Ebola by the global media to avoid inflated perceptions of risk.
The rise of social media over recent years has changed the way in which we communicate not only with those close to us but also with a much broader audience.

The ability to post, tweet, share, poke, connect, like and check-in lets us share daily activities more easily, more quickly and to a broader audience than ever before (in 2013, Facebook reported that Australia had 9 million total daily active users). In doing so, a digital footprint is left and in many circumstances, following these footprints can be a relatively straightforward process.

Effective use of Internet searches in claims assessment is a quick, easy and cost-effective tool that all assessors should consider as part of their assessment strategy.

Searching the public domain can uncover information that can be used to verify, and, if inconsistent, challenge the factual accounts given by claimants about the impact of their illnesses or injuries on their daily activities.

There are a number of simple searches that an assessor can undertake, but before doing so, the assessor should consider the following points:

- What information do I already have on file?
- Is this enough to render a decision?
- Are there any inconsistencies/red flags?
- What is the chronology of events in the file?
- What information seems to be missing or does not make sense?

Once an initial assessment has taken place, the assessor should consider whether the type of information typically found on the web addresses these gaps. If deemed necessary, a range of searches can be conducted.

**Simple searches**

At the outset of the claim, a simple search of the member’s personal information can be carried out.

Full name, shortened name and maiden name — Search for various permutations of a member’s name.

Personal or employer email address — Using an email address provides a more refined search, e.g., joebloggs1234@hotmail.com.

Social media — Review member profiles on Facebook, Instagram, Foursquare, etc. Search the member’s partner’s pages also, if known.
Phone number search — There are 16 different formats that phone numbers can take, e.g., “0413895789” or “0413 895 789”. Results will be markedly different depending on how the number is entered into a search engine.

Address search — Search the Internet for member activity at both the residential and employer addresses.

Digging deeper
Following the initial search, there are additional techniques that can help to uncover information that is not readily obvious or can be used once further information is provided by the member.

Boolean Searches
AND — This is the default operation of internet search providers, therefore it is required to be typed only when being used with quotations or brackets, e.g., “police costume” AND “police car” AND “fancy dress”.

“..” Quotation marks — This aids in searches for a specific phrase.

OR — Including this operator aids in searches for pages with one of the two terms, e.g., dog OR cats.

Brackets () — Brackets MUST be used to group terms joined by OR when there is any other Boolean operator in the search, e.g., (“police costume” OR “police outfit”) AND fancy dress.

Other tips
Site: — This will search a site specifically for a term, e.g., site:www.facebook.com “john smith,” and will return all pages that contain the words john smith directly next to each.

What to do with the information?
The primary use of discovered information is to determine whether the functional restrictions or limitations reported by the member or his or her treating doctor match his or her real-world behaviours. Whether the material corroborates the account given or highlights inconsistencies, it should be immediately recorded, ideally with a timestamp and the URL, and plotted on a simple timeline.

Online material should not be relied upon in isolation to make a decision, but rather it is best used as a first step to prompt further investigations such as an independent medical examination (IME) or surveillance.

Things to remember:
- Do it sooner rather than later.
- Download, save, date, file, and always copy the URL address.
- Don’t go fishing for information not accessible in the public domain.
- Validate, validate, validate. It is vital that the information be verifiable.
- Be careful not to assume that the information you find has a greater weight than it actually does. Although Internet searches are useful, there are limits to their value, and a court may not agree that the information is as important to the determination of the claim as you do. So it is important to assess the value of the information carefully. If in doubt, seek advice of legal counsel.
- During phone calls, inquire on existence and usage of social media sites.
- Never have direct contact with the claimant through social networking sites.
Sometimes distance can help you see things more clearly. I have been working as part of a standalone team within RGA UK to identify ways of growing our market. Stepping outside the daily competitive pressures of a life (re)insurer has yielded many interesting observations. The one I would like to discuss today is an answer to the following question: How could our industry change the incentives within our own market to improve outcomes? To pick one area in particular, can we improve the dynamics between insurers and distributors to create more sales of underwritten mortality products?

Improvement is certainly needed. Taking the UK as an example, 10 years ago, the UK market sold around 1.3 million life-only protection products a year. Nearly 95% of applicants secured the standard rate initially quoted. Fast-forward to today, and sales were under 1 million in 2013, with only 80% of applicants receiving the standard rate.

We all know that correlation is not necessarily causation. Is underwriting the sole reason for the fall? Not at all. Many other factors have affected UK sales, including regulation (e.g. the Retail Distribution Review), distribution (e.g. the withdrawal of large numbers of bank advisers) and even tax (e.g. the removal of the ‘I-E’ rules). All of these factors may have had a greater impact than underwriting on the sales picture.

So why focus on underwriting? Because it is entirely within the control of market participants. We cannot dictate terms to the regulators or the taxman, but we should be able to control our own underwriting practices.

To help us think through the problem, consider this simple example:

- A distributor sells protection. Its motivation is to maximise sales for a given effort, as this maximises its commission and hence profit.
- The distributor uses a panel of five insurers. Using a panel ensures the insurers compete with each other to offer the best terms.
- The insurers want to maximise their own profits. Since it is a competitive panel, it is difficult to charge a higher-than-normal margin, so the insurers maximise their profits by maximising their share of the distributor’s sales.

In this example, if you are one of the insurers, how do you play this ‘game’ to optimise your outcome? Theoretically you have three potential variables to change, but in practice only the third will directly change the share of business you win:

1. **Product:** In principle, you could offer a better product than the others on the panel. But for mortality products in the UK, the core product is already pretty good, with well over 90% of all claims paid.
2. **Underwriting service:** Again, in theory, by providing a quicker, slicker service to the advisers you could win a higher proportion of their sales. But all competent UK insurers are able to offer instant electronic underwriting decisions in the majority of cases, and typically fewer than 20% of cases require medical evidence. Furthermore, the underwriting process is rather hard
to understand for the advisers, who will only learn of the subtle differences between insurers by processing many different lives.

3. Initial quoted price: This is the most transparent and hence effective of the three levers. With little opportunity to differentiate via the product and underwriting service, most cases will be placed on price. By reducing the initial quoted price, the insurer can capture a greater share of the business.

If price is the key variable, how can an insurer reduce its initial quote while maintaining profit margins? Since the quote is shown prior to underwriting, one way is to increase the selectiveness of the underwriting process — rate more lives, either by asking more questions or applying ratings more often to borderline cases. This reduces the number of higher risk cases in the standard rates pool, and hence the initial quoted price falls.

This is rational, competitive behaviour that meets the insurer’s objective of securing a higher share of the distributor’s business at acceptable margins. Yet the result for the distributor is sub-optimal:
- The underwriting journey has lengthened;
- There are more ‘surprises’ when the initial quote moves to a rated premium; and so
- Advisers’ lives become more difficult, making them more likely to focus on selling other products.

The overall result? A smaller protection sales ‘pie’ to share among the insurers on the panel.

This example is oversimplified to illustrate the point, but you can see this dynamic played out in the UK market stats: fewer sales, lower standard rates prices, and more ratings.

So how can we redesign the ‘game’ to give a better outcome to the participants? One solution being proffered in the UK is an aggregated underwriting model, where the applicant is asked the full universe of the panel insurers’ underwriting questions and then shown a final, guaranteed price from each one. This removes the ability of insurers to offer a cheaper initial quote at the expense of fewer lives getting the standard rate.

This should help — a bit. It certainly reduces surprises for the adviser. But the nature of an aggregated journey is that it becomes at least as long as the longest journey of the panel insurers. And the competitive dynamics still incentivise the insurers to improve their price for standard cases by adding further questions to the process. So the fundamental issues are not fixed.

There is a better way:
- Let the distributor specify the optimal journey length. Distributors know their customers and their advisers well, and so are best placed to specify process that will work best for them.
- Allow the distributor to experiment and evolve the process over time to find the perfect balance between speed, proportions rated and price. The initial design will not be optimal, so the system needs to adapt as all the parties learn more about what works.
- Have the panel insurers follow the distributor’s optimal underwriting process, rather than dictate their own individual journeys. This increases adviser certainty and removes the forces that push each insurer to an individually optimal, but collectively sub-optimal, outcome.

Taking this approach creates a more constructive competitive dynamic by making it rational for the insurers to compete in areas that add real value to the overall proposition: operational efficiency, capital management, and genuine product differentiation. By delivering a better overall underwriting process, one distributor in the UK increased its conversion rates by a significant amount, which illustrates how improvements in this area really can grow the ‘sales pie’ for all the insurers on a panel.

We cannot control all the factors impacting sales volumes in our market, but underwriting is certainly within our control. By re-engineering the competitive dynamics of an insurance panel, insurers on the panel can realise more sales at profitable margins. Surely that is a win for everyone?
Introduction

Solvency II (SII) imposes a Solvency Capital Requirement (SCR) for longevity risk. This article describes a reinsurance solution (tail longevity protection) that aims to improve an insurance company’s capital position under SII through transferring somewhat remote longevity risk and thereby reducing its longevity SCR.

As SII’s risk margin is based on projected future SCR, a reduction in longevity SCR also reduces the risk margin and thereby increases the insurance company’s available capital (own funds). As a result, the tail longevity protection has a positive impact on both sides of the solvency ratio.

Attractive tool to improve capital position

The longevity risk transferred via tail longevity protection is structured to be at the more remote end of the longevity risk shock scenarios relevant for SII’s SCR so that the costs of such arrangement are relatively low. Therefore, tail longevity protection can be an attractive tool to improve an insurer’s capital position relative to other available means that are more expensive.

Focus on capital versus risk

Tail longevity protection primarily focuses on improving an insurer’s capital position, though it naturally also transfers the relevant risks. This capital management objective is different than many of the longevity reinsurance transactions, also called longevity swaps, that have been (and still are) implemented mainly in the UK over the past decade, as their motivation was often pure risk management. Under these UK transactions, all longevity risk on a specified insurance portfolio is reinsured. As a result, the costs of these transactions are higher than the costs of tail longevity protection and higher than many pure capital alternatives.

Description of Tail Longevity Protection

Tail longevity protection is structured to transfer somewhat remote longevity risk through striking an attractive balance between the improvement in capital position and the cost of the transaction. The cost of tail longevity protection mainly depends on the amount of longevity risk transferred.

There are various ways to tailor the amount of longevity risk transferred: shorten the duration of the transaction, incorporate a threshold (retention) and/or impose a maximum benefit. The threshold and maximum benefit

\(^1\) Depending on how the tail longevity protection is structured, it will either be classified as reinsurance or a derivative.
can be linked to specified decreases relative to the insurer’s best-estimate mortality rates and are typically referred to as attachment point (AP) and detachment point (DP). The capital benefit of these transactions to the insurer under SII would naturally vary according to this tailoring.

Setting attachment and detachment points
The figure below contains different levels of decreases in mortality rates that could be used to set the AP and DP. For instance, the AP could be based on an instantaneous drop in best-estimate mortality rates of 5% and the DP on a 15% reduction in mortality rates (i.e., the leftmost curve in the diagram to the right).

Depending on how an insurance company is managing its capital position under SII, it might choose to detach at the 20% instantaneous drop in best-estimate mortality rates underlying the longevity SCR in SII’s Standard Formula (e.g., the other two curves in the diagram to the left).

Term of longevity protection
Another parameter used to manage the longevity risk transfer is the term of the tail longevity protection. A longer term transaction means more risk transfer and more capital benefit, but also a higher cost. Conversely, a shorter term transaction is cheaper. In addition, keep in mind that the longevity SCR is based on the full remaining term of the underlying insurance liabilities, so fully excluding the liabilities beyond the term (whether short or long) would significantly limit the reduction in longevity SCR (and thereby also the reduction in the risk margin). Therefore, the annuity benefits beyond the term of the tail longevity protection are taken into account, but only to the extent that the present value of these annuities has increased because of changes in the best-estimate mortality rates caused by mortality developments during the term of the tail longevity protection.

Benefit under tail longevity protection
The payout under the tail longevity protection is based on two components: (i) the annuity payments during the term, accrued over the term to maturity of the transaction (future value of past annuities) and (ii) the projected annuity payments beyond the term, discounted to maturity of the transaction (present value of future annuities). In the figure above these two components are represented by the blue arrows, assuming a
10-year term for the tail longevity protection. The sum of the future value of the past annuities and the present value of future annuities, together: the underlying longevity benefit (ULB) is compared to the AP and DP to determine the longevity benefit (LB) payable under the tail longevity protection:

\[ LB = \max \left( 0, \min \left[ ULB - AP, DP - AP \right] \right) \]

**Cash flows of tail longevity protection**

The cash flows of the tail longevity protection consist of periodic premiums that are fixed at the outset and paid by the insurance company. At maturity, the reinsurer pays out a longevity benefit depending on the development of the mortality rates during the term. If the underlying longevity benefit does not exceed the AP, the longevity benefit will be zero. As the tail longevity protection is structured to transfer remote longevity risk, this zero payout is expected to be the case. A longevity benefit would only be due in case of significant reductions in mortality during the term of the transaction (i.e., exactly those adverse cases relevant to capital requirements). The figure at left reflects the cash flows between the insurer and the reinsurer under the tail longevity protection.

The next section contains a numerical example to illustrate how a tail longevity protection transaction could reduce an insurance company’s longevity SCR.

**Impact on Longevity SCR**

To illustrate the benefit of tail longevity protection, we make the following assumptions.

**Underlying portfolio of annuity benefits**

We assume an underlying portfolio of annuity benefits per the diagram at the right. These amounts are accrued annual annuities, payable upon survival from retirement age, for insureds ranging from age 30 to 90. For example, the EUR 20 million for age 50 represents the total annuity payments that all 50-year-old insureds have accrued and that will be payable from retirement age upon survival of the insureds. For ease of calculation, we assume that all insureds are male with a retirement age of 65. Furthermore, we assume no increases or adjustment of the annuity payments for inflation (no indexation), no right to surrender, and no spousal benefits.

**Best-estimate mortality rates**

Subsequently, we assume that the natural logarithm of the best-estimate mortality rates follows a linear trend over time. The mortality model is calibrated up to age 98 based on the most recent 20 years of general Dutch population mortality data as published by the Dutch national statistical agency (Centraal Bureau voor de Statistiek, CBS). For ages 99 to 120, we assume linearly increasing mortality rates to 100% for age 120.
Tail longevity protection

We assume a tail longevity protection transaction with a term of 10 years, starting at the beginning of 2014 with an AP based on a drop of 5% of best-estimate mortality and a DP based on a drop of 15%. For determining the present value of future annuities beyond the term of the tail longevity protection as part of the longevity benefit, our hypothetical transaction uses the same model as that used to determine the best-estimate mortality rates. In addition, it uses a constant discount curve equal to the zero coupon curve as published by the Dutch regulator (De Nederlandsche Bank, DNB) as of the end of August 2014.

Numerical results

The below contains a first set of results of this example. For this annuity portfolio, the longevity SCR under Standard Formula equals EUR 739 million, which is determined as the difference between the present value of all future liabilities under the SII longevity stress (= €11,241 million) and the present value of all future liabilities under the best estimate mortality scenario (= €10,502 million).

<table>
<thead>
<tr>
<th>At inception (all amounts in EUR mln)</th>
<th>Best Estimate</th>
<th>SII Stress over Term Liabilities</th>
<th>Attachment Point</th>
<th>Detachment Point</th>
<th>SII Stress over Term Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>FV CF during Term</td>
<td>3,725</td>
<td>3,828</td>
<td>3,750</td>
<td>3,801</td>
<td>3,828</td>
</tr>
<tr>
<td>PV CF beyond Term</td>
<td>7,998</td>
<td>8,721</td>
<td>8,324</td>
<td>9,036</td>
<td>9,425</td>
</tr>
<tr>
<td>Total</td>
<td>11,723</td>
<td>12,548</td>
<td>12,074</td>
<td>12,838</td>
<td>13,253</td>
</tr>
<tr>
<td>PV of Total</td>
<td>10,502</td>
<td>11,241</td>
<td>10,816</td>
<td>11,501</td>
<td>11,872</td>
</tr>
</tbody>
</table>

The AP at maturity of the tail longevity protection is negotiated to be equal to €12,074 million and the DP to be equal to €12,838 million. The projected benefit of the Tail Longevity Protection discounted to the start of the transaction is equal to €684 million, which corresponds to the present value of the difference between the DP (€11,501 million) and the AP (€10,816 million). This is because under the SII longevity stress, the present value of the underlying longevity benefit is equal to €11,872 million (last column), which exceeds the DP. In this example, the tail longevity protection therefore reduces the longevity SCR at inception by 93% (= €684 million / €739 million).

To determine the impact of the tail longevity protection on the risk margin, the projected reduction in future longevity SCRs needs to be determined. This is done through similar calculations at different moments during the term of the transaction, assuming that up to the given moment mortality has developed in line with the best estimate and apply the SII longevity stress beyond that point.

The graph right contains the projected longevity SCR as well as the projected longevity benefit from the tail longevity protection together with the benefit expressed as a percentage of the longevity SCR (right axis), over the term of the transaction. The 93% corresponds to the results presented above.

During the first four years, the projected longevity benefit corresponds to the maximum benefit based on the DP. Beyond the fourth year, the projected longevity benefit decreases because the SII longevity shock is applied over the remaining term of the transaction, which is also decreasing.
Conclusion
This article gives you an introduction to tail longevity protection, including its benefits in terms of capital management.

For insurance companies that have a relatively large longevity SCR and that are comfortable retaining some of the longevity risk but wish to improve their capital position under SII, tail longevity protection can be an attractive tool.

There is far more to tell on these capital‐motivated longevity solutions than is included in this article. Please contact RGA if you are interested in improving your capital position through tail longevity protection. We are available to give you a detailed explanation of these transactions and to support you in structuring and implementing an attractive tail longevity protection for your portfolio.

2014 Third Quarter Results

On 27 October, 2014, Reinsurance Group of America, Incorporated (NYSE: RGA) reported financial results for the third quarter of 2014.

Greig Woodring, president and chief executive officer, commented, “We are pleased to report strong operating results this quarter, as our diversified source of earnings by geography and product line continues to serve us well. Operating income rose to $159.8 million, or $2.31 per diluted share, premiums grew seven percent over the prior‐year period and our annualized operating return on equity exceeded 12 percent this quarter. The trends in the quarter and nine months were fairly consistent in that our international segments and the non‐traditional business generated by Global Financial Solutions (GFS) produced very strong results, while the North American Traditional business has faced a period of higher claims. The nature of our business is such that we periodically experience volatility in claims in certain lines of business, but our global business model and diversified product base continue to deliver strong overall results. We are encouraged by the results overall and continue to be optimistic about future opportunities. We also are encouraged by the diversification benefits of our global business, which is paying off in terms of both top‐ and bottom‐line results.

*Regarding capital management, we have demonstrated a balanced approach toward deploying some excess capital into the business while also returning capital to shareholders. Our business generates sufficient capital to support our organic growth, with excess capital deployed into attractive block transactions and also returned to shareholders through share repurchases and dividends. In terms of block transactions, we announced a mortality transaction with Voya Financial during the quarter, and the acquisition of Aurora National Life Assurance Company on October 21. We repurchased approximately 263,000 shares for $20.9 million during the quarter, and have repurchased 2.5 million shares year to date, at an average price of $78.11 per share. At September 30, we had repurchased $197.7 million in shares under our current $300 million stock repurchase authorization, leaving $102.3 million of remaining capacity. Our excess capital position exceeds $600 million. Ending book value per share this quarter was $97.28, including AOCI, and increased $1.90 during the third quarter to $75.44, excluding AOCI.”

2014 Third Quarter Financial Results

• Net income of $158 million
• Net premiums of $2.2 billion
• Total assets of $43 billion at 30 September, 2014
## Contacts

### Europe

**Olav Cuiper**  
Head of EMEA and Emerging Markets  
RGA International Reinsurance Company Limited  
Gustav Mahlerlaan 50 B  
1082 ME Amsterdam  
Netherlands  
ocuiper@rgare.com  
T +31.20.333.9000

### France and Belgium

**Lionel Périnel**  
Managing Director  
RGA International Reinsurance Company Limited  
Branch Office for France  
31-33 rue de la Baume, 6th Floor  
75008 Paris  
France  
lperinel@rgare.com  
T +33.1.55.07.97.81

### Germany, Austria, Switzerland and Luxembourg

**Klaus Mattar**  
Managing Director  
Germany and CEE  
RGA International Reinsurance Company Limited  
German Branch Office  
Kaiser-Wilhelm-Ring 15  
50672 Cologne  
Germany  
k mattar@rgare.com  
T +49.221.964.998.21

### Netherlands and Nordic Countries

**Johan Tuijp**  
Managing Director  
RGA International Reinsurance Company Limited  
Branch Office for the Netherlands  
Gustav Mahlerlaan 50 B  
1082 ME Amsterdam Netherlands  
jtuijp@rgare.com  
T +31.20.333.9003

### Poland and Central and Eastern Europe

**Klaus Mattar**  
Managing Director  
Germany and CEE  
RGA International Reinsurance Company Limited  
Poland Branch Office  
Deloitte House  
Al. Jana Pawla II 19  
00-854 Warsaw  
Poland  
k mattar@rgare.com  
T +48.22.370.12.22

### Spain and Portugal

**Rosa Alegria**  
Managing Director  
RGA International Reinsurance Company Limited  
Sucursal en España  
Paseo de Recoletos, 33  
Planta 1  
28004 Madrid  
Spain  
ralegria@rgare.com  
T +34.91.640.4340

### Turkey

**Oscar Smith**  
Country Manager  
RGA Global Reinsurance Co. Ltd.  
Turkey Liaison Office  
Windowist Tower, 1006, Eski Büyükdere Caddesi No: 26,  
Maslak 34467, Istanbul  
Turkey  
osmith@rgare.com  
T +90.212.999.3722

### United Kingdom and Ireland

**Simon Wainwright**  
Managing Director  
RGA International Reinsurance Company Limited, UK Branch Office  
16th Floor  
5 Aldermanbury Square  
London EC2V 7HR  
United Kingdom  
swainwright@rgare.com  
T +44.20.7710.6700

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