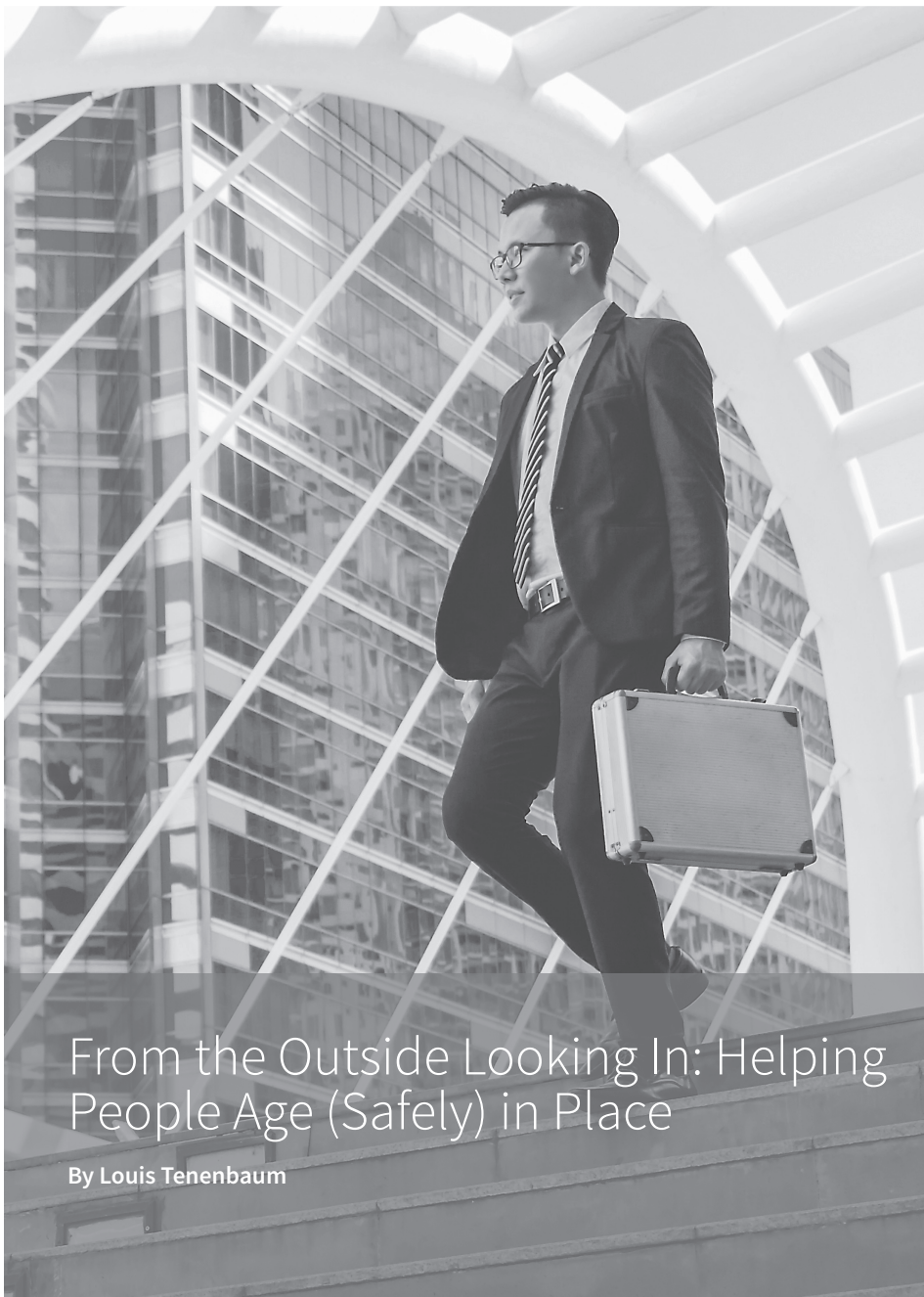


# Long-Term Care News



**SOCIETY OF  
ACTUARIES**

**LONG TERM CARE  
INSURANCE  
SECTION**



From the Outside Looking In: Helping  
People Age (Safely) in Place

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# Long-Term Care News

**Issue Number 47 • April 2018**

Long Term Care Insurance Section of  
the Society of Actuaries.

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To join the section, SOA members and  
non-members can locate a membership  
form on the Long Term Care Insurance  
Section webpage at <http://soa.org/ltc/>

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## **Publication Schedule**

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# Chairperson's Corner

By Robert Eaton

**T**he SOA LTC Section remains committed to providing thought leadership and educational outreach to our members. Our ongoing educational outreach includes:

- Producing LTC webcasts;
- Developing an LTC Regulatory Webinar Forum;
- Liaising with volunteers;
- Maintaining an up-to-date web presence ([www.soa.org/ltc](http://www.soa.org/ltc));
- Providing a Regulatory Resource with up-to-date actuarial and regulatory concerns (<https://www.soa.org/resources/regulatory-resource/ltc/>);
- Producing LTC content for six SOA or industry conferences; and of course
- Producing Long-Term Care News.

We've begun a concentrated effort to collaborate with other SOA sections. Please look for our LTC sessions at the 2018 SOA Health Meeting including work with the Medicaid subgroup of the Health Section, and a session jointly produced with the Predictive Analytics and Futurism Section.

We've begun a concentrated effort to collaborate with other SOA sections.

The LTC Think Tank continues with the help of our section volunteers. A marketing firm has assisted us with research on two key product ideas (coined "LifeStage" and "Retirement Plus"). You can find out the latest on the LTC Think Tank, and reach out to the folks leading this charge, at <https://www.soa.org/sections/long-term-care/lctthinktank/>.

The topic of fraud, waste and abuse in LTCI came up on numerous LTC Section Council calls. Members of the section council wrote a short project description which was accepted by the council. A team of volunteers will be putting together a survey with the help of industry participants. The SOA has agreed to aggregate these responses and a project group will develop a report summarizing the results of this survey. Please



keep an eye out for updates on this survey of LTCI fraud, waste and abuse, and reach out to me if you have any questions.

Finally, please recognize that all of the work described above (and everything else I've failed to mention!) is primarily led and produced by volunteers. Our section council, friends of the council, and other volunteers care a lot about the LTC industry, and donate their valuable time to help us out. If you see them around the office water cooler, at an industry meeting, or hear them on your conference call, please be sure to thank them! ■



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# Editor's Corner

By Paul Colasanto

**H**ello and welcome to the April 2018 issue of the *Long-Term Care News*. We have a load of great articles in this issue, by authors from a range of backgrounds—actuarial (of course), neurology and even one author who is a contractor by trade!

Topics range from technical, including articles on utilization and predictive modeling; regulatory, including articles on tax reform and targeted improvements; and other topics like the need for a reboot to the product, the effects of neurology on LTC claims, and an idea about how traditional home remodeling can be revisited to aid aging in place, ultimately resulting in lower long-term care costs.

We think you will find each of these articles interesting and thought provoking, and would love to hear back from you about ideas you'd like to see explored further in upcoming issues. And as always, if you would like to volunteer to write on an LTC topic that you are passionate about, we are always looking for authors.

We also wanted to update you regarding the LTC Section Council's recent survey. As you may remember, back in October, you were given the opportunity to participate in a survey regarding the section's goals and efforts. We had a solid response rate, with a very even distribution of experience levels of the respondents. About 30 percent had less than five years of LTC experience, 36 percent had six to 10 years of experience, and 34 percent had 16+ years of experience. Across all groups, some key themes were clear. About 93 percent of respondents thought our goals related to presentations at industry meetings were important or very important, and 84 percent had the same feeling regarding the section's involvement with the NAIC Innovation Subgroup.

As far as other industry efforts, over 90 percent rated the section's efforts in championing new research and supporting the SOA LTC experience study to be important or very important. Other roles or initiatives respondents suggested the section focus on included: public LTC coverage such as Medicaid or VA, hybrid products, CCRCs and continuing care at home as aspects of LTCI not now receiving attention, advancing modeling capabilities, and other external facing activities.



Additionally, knowledge sharing suggestions included:

- Education around the guaranty fund system
- Statutory reporting issues (including applying to Hybrid products)
- Public LTC coverage
- Trends in international LTC
- Policyholder behavior relative to features and when faced with rate increases
- Tax
- Consistency in justified rate increase approvals, rate increases and reserves, rate increase trend
- Claims and medical developments, fraud, cost of care
- Experience studies and assumption setting

Finally, nearly all respondents rated the section's new research on LTC as either very or somewhat valuable. Respondents also rated networking opportunities and exposure to or participation in special projects (e.g., Think Tank) highly.

We would like to thank everyone that participated, and hope that even more of you to participate in the future. ■



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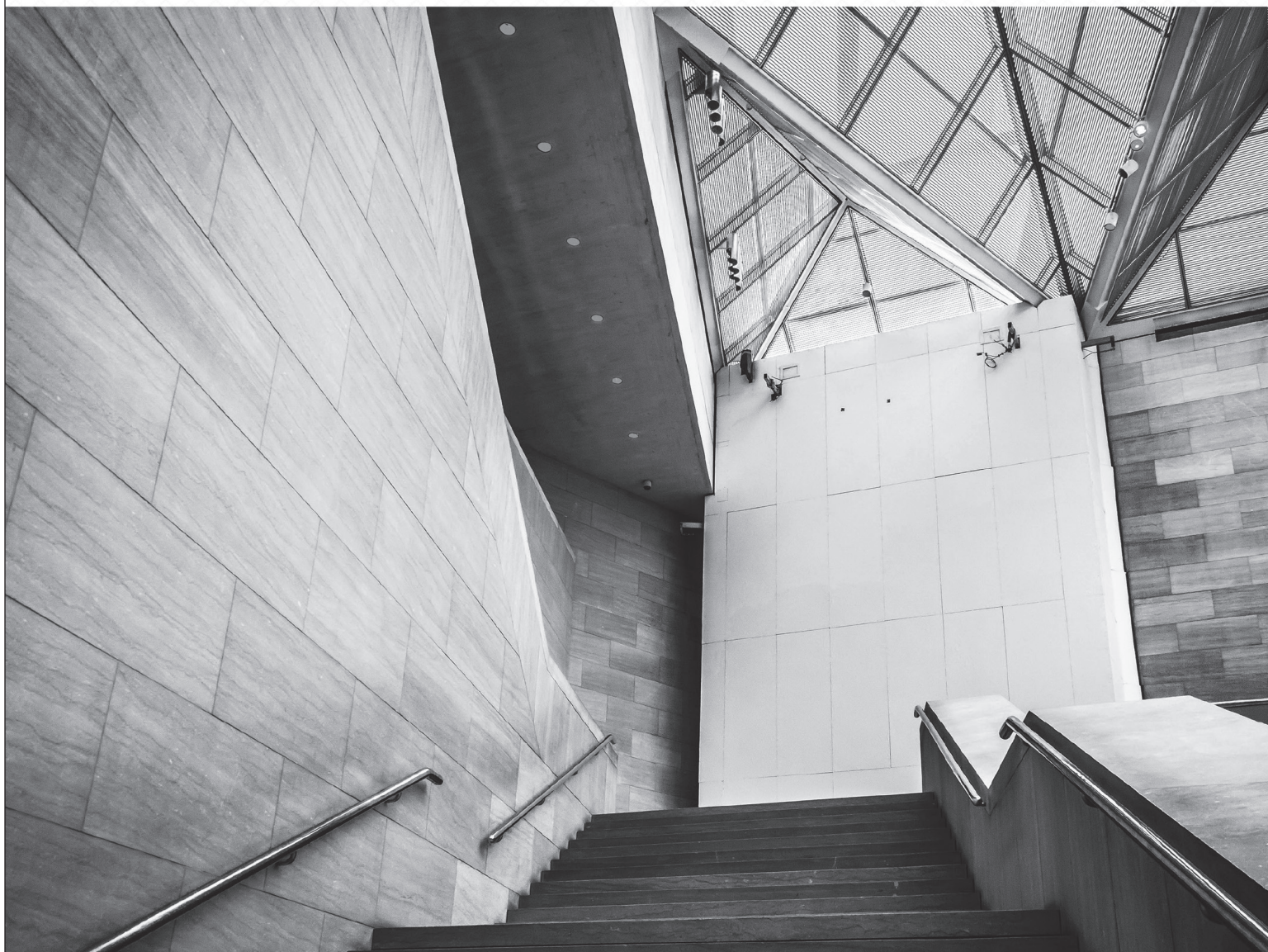
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# Up Front with the SOA Staff Fellow

By Joe Wurzburger

**W**ith this being the first issue of 2018, I thought it would be a good time to share an overview of Society of Actuaries (SOA) long-term care activities—both from my perspective working with the Long Term Care Section as well as with the SOA overall.

## LTC THINK TANK

You've read about the LTC Think Tank in the past several issues, and hopefully you've even heard a little bit about it at one of the many sessions in which it has been featured over the past year or two (SOA Health Meeting, ILTCI, etc.). Recall that there are many elements to the Think Tank, which we like to think has morphed from a think tank to a "do tank." The three platforms that are being worked on by subteams are:

- Data Driven Support
- Service Evolution and Expansion
- Paying for Care

We have reached an exciting milestone in the Paying for Care platform. An extensive research project that utilized actuarial modeling and consumer testing has recently wrapped up, and the final report's release is imminent.

The group's work doesn't end here. Next steps are already being analyzed in the hopes of keeping the momentum alive. This group has made significant progress so far, and they remain in good position to make a true impact in the industry.

Be on the lookout for more related to the Think Tank by checking in regularly at its landing page: [www.soa.org/ltcthinktank](http://www.soa.org/ltcthinktank).

## LTC EXPERIENCE STUDY

Most of you are familiar with the LTC experience studies that the SOA releases every few years or so. While it's too early in the process to share anything meaningful, I can assure you that a project team has convened to work on the next iteration of the LTC experience study. Be on the lookout for more to come as the year progresses. Check out [www.soa.org/research](http://www.soa.org/research) for information about this and other SOA research projects.



## LTC REGULATORY RESOURCE

The SOA's Regulatory Resource has been in existence now for more than a year. Feedback that I receive from users suggests that people find it very useful. Visit this resource to find a curated list of primary sources you can consult for significant regulatory information. And take advantage of its newest feature by signing up to receive email updates when changes are made to the site.

Visit [www.soa.org/regulatoryresource](http://www.soa.org/regulatoryresource) and click on LTC.

## MEETINGS

Once again in 2018 there will be no shortage of meetings available for LTC professionals to attend, both for continuing education purposes and for networking.

- I enjoyed seeing many of you in Las Vegas for the ILTCI Conference. Feel free to provide feedback for ways to make this event even better next year.
- The SOA's Life and Annuity Symposium takes place May 7–8 in Baltimore. For the first time there will be sessions at this event sponsored by the LTC Section! The registration deadline is fast approaching, so please sign up soon.
- The SOA's Health Meeting returns following a hugely successful rendition in 2017. Look for LTC sessions at this can't-miss event taking place June 25–27 in Austin.
- With a slightly different name but the same caliber of top-notch LTC-focused continuing education, you won't want to miss the Supplemental Health, DI & LTC Conference. The SOA is once again co-sponsoring this with LIMRA and LOMA. This year, it will take place in sunny San Diego on Aug. 6–8.

- Later that same month, LTC sessions will be featured at the SOA's Valuation Actuary Symposium. After last year's hurricane, I'm reasonably confident that this year's event should not be impacted by any tropical storms as it takes place in Washington, DC, on Aug. 27–28.
- Finally, don't miss the SOA's marquee event, the 2018 Annual Meeting & Exhibit, in Nashville on Oct. 14–17. Once again, it will be a great opportunity to get LTC continuing education as well as network with your fellow actuaries.

Find out more information about these events, as well as webcast opportunities, by visiting [www.soa.org/calendar](http://www.soa.org/calendar).

With so much going on at the SOA related to long-term care, it can be difficult to keep it all straight. So let us do the hard work for you. Bookmark [www.soa.org/ltc](http://www.soa.org/ltc), and come back regularly to see everything that you need to know about LTC and the SOA. ■



Joe Wurzburger, FSA, MAAA, is staff fellow, health, at the Society of Actuaries. He can be reached at [jwurzburger@soa.org](mailto:jwurzburger@soa.org).

# From the Outside Looking In: Helping People Age (Safely) in Place

By Louis Tenenbaum

I am not from your industry. My knowledge of long-term care insurance comes from the general media and reading a few issues of *Long-Term Care News* in preparation for writing this article. In very brief summary, my take is that the product, for the most part, is not working as insurers expected. Fewer companies offer policies. There are 7.3 million existing policies. In 2016, 280,000, or 3.8 percent of insureds were on claim, resulting in benefit payments over \$8 billion. This is a lot of money. When, not if, more policyholders are on claim, a huge amount of money will be going out. My conclusion is that every path that can help postpone or reduce paying out benefits (without compromising consumer health) is worth pursuing.

I come to this discussion to point out other sectors whose business interests align with what this industry needs. How do I describe that? The most common term is *aging in place*, meaning people continue to live in the homes they choose even as their health changes. It is what most people want and is pretty well recognized to be the most economical way to age. The biggest component is good health or at least, a very short period of poor health before death. Colloquially it means dying of a heart attack on the golf course or the ski slopes. Gerontologists call this the “compression of morbidity.” The more morbidity is compressed, the less expensive the long-term care is.

Of course your policyholders are also interested in staying healthy as long as possible. They don’t want to receive costly care anymore than you want to pay for it. My industry, remodeling, wants to grow our business. Increasing the number of homes updated for aging in place helps us both.

## WHAT SORT OF REMODELING AM I TALKING ABOUT AND HOW DOES IT HELP?

A recent John Hopkins University study, Community Aging in Place, Advancing Better Living for Elders (CAPABLE), achieved remarkable results. There were three components:

visits from a registered nurse, an occupational therapist and a handyman/carpenter authorized to carry out home repairs. Because home safety is the primary issue, repairs focus on allowing safe entry and exit from the home and for safe use of a bedroom and bathroom.

CAPABLE spent \$2,825 per person on interventions for older Baltimore Medicaid eligible citizens in poor health, with a \$1300 limit on home repairs. Over the next year, the study group netted \$10,000 per person in reduced medical costs compared to a comparison group. Similar studies that limited their interventions to more common nurse and occupational therapy visits did not see such stark results—illustrating the importance of home repairs. Unfortunately, the original CAPABLE study did not break out the savings from each of the interventions. Hopefully this data will become available as the program is replicated in additional cities. But the 3.5 times return on investment in the first year remains remarkable!

Where did CAPABLE achieve the savings? Just where you want them. Most of the savings occurred from reducing inpatient care and long-term care institutional costs both by 60 percent. The only increase was 30 percent in home health costs. In addition, it stands to reason that the savings (specifically the long-term care claims) would grow even more over time, since the long-term care facility claims will continue years into the future at a lower rate than if the program was not implemented, even with no additional future investment.

How does this help achieve the LTC industry goals? There are several ways:

1. One important area is reducing falls. There is no question that falls are a leading cause of injury, hospitalization, and expensive lingering decline. The more falls that are avoided, the less people move onto LTC claim.
2. Faster return to home from more costly care settings such as hospital or rehabilitation. No one wants to remain in the hospital or in rehab. The more quickly they can get into their home and be safe there using the bedroom and bathroom, the faster they will do so—at a lower cost of care.
3. Make caregiving safer. A well modified home is a better ergonomic environment for caregiving, meaning family members can carry out caregiving support safely. Sustaining and enabling family care also helps mitigate or reduce paid home health care expenses.

Because home updates are capital investments rather than therapies or counseling, improvements continue to provide ongoing value. Home updates completed years before the resident is at high risk make the home safer for years to come.

The challenge for LTC insurers is that they do not typically review or influence their client's living environment. They lack a mechanism to prevent the situation where their insured is in an unsuitable home environment that could be made safe and appropriate with a cost-effective investment. While industry may not have a vehicle for action within the confines of their policy contracts, they can help support a growing partnership with the remodeling industry and others working to address these challenges proactively.

## WHAT ARE THE MECHANICS OF THE PARTNERSHIP AND ENCOURAGEMENT?

Two suggestions are supporting education and incentives directed to consumers. There have been educational efforts in this sphere by AARP and others for years. (See Figure 1 for examples of the continuing and repeated AARP effort that has fallen on unhearing consumers). And while consumers typically cite AARP as a highly trusted source of information, the results of these efforts have been dismal. I have given over 200 consumer presentations myself. But this will not surprise those of you toiling away in the arena of LTC awareness and education—*what we say is not what consumers hear*. Education does not elicit action.

There is, however, good evidence from analogous situations that incentives work very well. Some private and public incentives are familiar to you. For example, non-smokers get premium breaks on health insurance; better drivers get favorable rates for auto insurance and homeowners get a break for a variety of home safety devices. Government incentives are also available to homeowners for weatherization and solar collectors. Other government subsidies or tax breaks are geared towards attracting businesses or encouraging transit-oriented development.

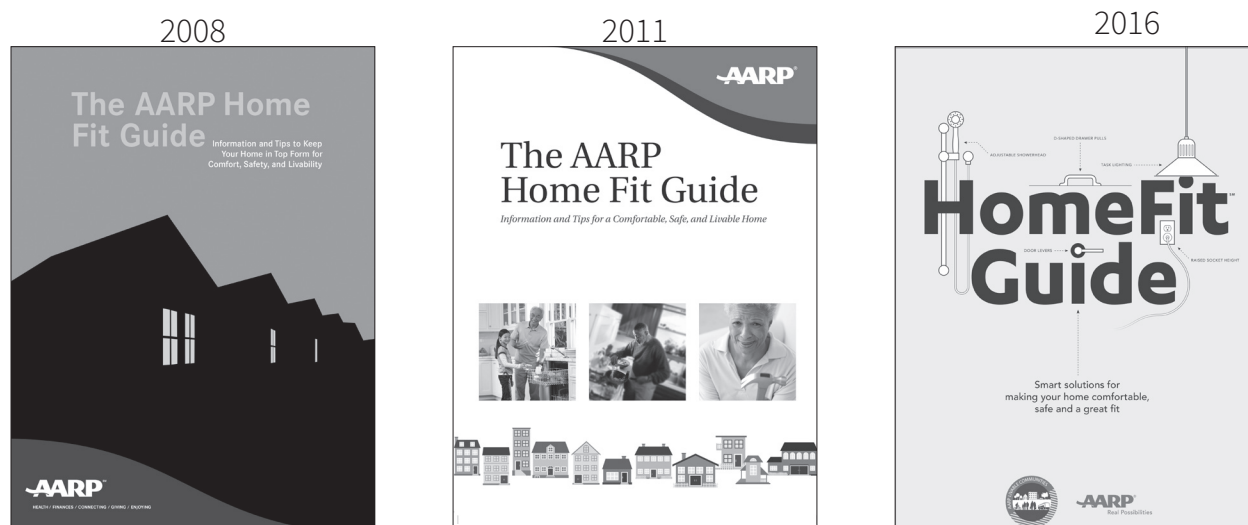
This is business as usual. Why shouldn't it be a model for the business of making homes safer for aging-in-place as well?

## HOW DO WE REFRAME THE DISCUSSION OF AGING AND HOME UPDATES?

By reframing the discussion of aging from one of preparing for frailty and decline to one of fairness to provide housing for America's citizens throughout their lifetime, two key messages need to be communicated. The first critical message consumers need to hear is: "Updating your home the right way is the most economical way to remodel no matter your age or health." (1) The "right way" to remodel is in a manner that helps avoid injuries, makes mobility safe and easy even with some disability and/or use of mobility aids, and makes caregiving safer for both client and caregiver. (2) The "most economical way" is that if you purchase and properly install qualifying components, you will save money on the remodeling project by means of a rebate, tax credit, or other financial incentive. (3) "No matter your age or health" means that you do not need to be a certain age, have health difficulties or a doctor's directive to qualify for these updates. You may create a stepless entry or install a curbless shower, for example, even though you do not use a wheelchair or walker or have a condition that increases your expectation of using one of those devices. This three-part statement vastly increases the market for home updates and, over time, will increase the supply of age-friendly residential infrastructure.

The second equally important message is: "It is fundamentally unfair to continue adding years to lives without also helping people have safe and suitable homes in which to enjoy those added years. We have updated homes for years, adding plumbing,

Figure 1



electricity, furnaces insulation, fiber optic cable and solar collectors. It is time to add updates for longer and better lives as well.” As you see, these messages do not rely on the more typical, rational messages used by the remodeling industry and the LTCI industry that appeal to preserving independence, avoiding frailty, or reducing burden on family. Those messages have not worked.

There is an important distinction between the CAPABLE study and how the results might apply to the demographic served by the LTCI industry. In the CAPABLE study, all costs were born by the payer, Medicaid. Although the per-person amount at under \$3,000 was fairly modest, to spend this amount for all Medicaid recipients would be very expensive. In contrast, the demographic you serve is financially better off to start with and even has the mind-set to plan for their long-term health and well-being. Many of them are already remodeling their homes anyway. Older consumers spend more on home remodeling than other population segments. According to a Harvard Joint Center for Housing Studies report,<sup>1</sup> baby boomers (born 1945–1964) and pre-baby boomers (born prior to 1945) account for about 62 percent of the ~\$200 billion annual home improvement spending. Encouraging your customers to carry out proactive home updates while remodeling will be even more cost-effective. Incentives reduce the cost of the project to the client, but as leverage they also cost the incentivizer less. The client pays for the remodel, the insurer may well share in the savings in terms of delayed or reduced claim costs.

#### HOW DO WE MOVE FORWARD WITH INCENTIVES?

There is currently a bill in Congress, H.R. 1780 that provides a \$30,000 tax credit for home updates by folks over 60. There are also a variety of local and state programs in place and in the works. Because the tax credit within H.R. 1780 is very expensive, that proposal is not likely feasible, but it demonstrates growing interest even at the federal level in supporting aging in place. One alternative could be to allow the use of 401(k) and IRA dollars without tax or penalty for these types of age in place home remodels as the incentive. This makes sense because it is already money that belongs to the consumer and is earmarked for their retirement. Update project costs are reduced because by using these pre-tax dollars, consumers can make their money go farther. The upper middle-income folks who have these savings are your clients.

There are alternative sources to finance the incentives or updates. Socially responsible investment vehicles (such as social impact bonds) may emerge to invest in home update efforts and reap the benefits of reduced medical costs. In the long run, the demonstrated value will encourage the government to find funding and mechanisms to encourage even more. Witness the smoke alarm case. They were once a new technology, then homeowner’s insurance provided incentives for policyholders to have them in place.

Eventually, regulations were enacted to require smoke detectors. The insurers no longer needed to provide incentives yet all homes have the claim saving safety devices.

Helping your policyholders by supporting incentives is also good for customer relations because you are helping your insureds get what they want—to age safely in place. LTC insurers, consumers and the building industry aren’t the only ones to “win” in this scenario. It is important to encourage other stakeholders to join the incentive bandwagon. Health care providers and health insurers also want customers to remain healthy in community rather than in institutional settings. Other important stakeholders include home health care agencies, in-home electronic monitoring, transportation, and meal delivery providers.

New coalitions of stakeholders are organizing to support incentives. Federal lobbying is just one tactic. Additional tactics are: 1) supporting state and local grassroots efforts to enact legislation to provide incentives, thereby educating consumers and demonstrating constituent interest; 2) publishing white papers showing costs and benefits of the impact home updates have on family, business and government spending; and 3) creating easy qualification and certification mechanisms that will kick-start this effort. This campaign is a full plate that requires a broad base of stakeholder support and funding, including the long-term care insurance industry.

#### IN CONCLUSION

It is important to increase the number of homes that are prepared for residents of the modern lifespan by encouraging small investments that can help people live longer, healthier and more economically with dignity in their own homes. This is an exciting opportunity to engage multiple stakeholders in a movement to update homes with positive impacts while simultaneously stimulating job growth and profits for the business sectors that serve them. As with other social change, this will be a marathon, not a sprint. And like any journey or race, it starts with one step. But the challenges of the journey can be best handled by a coalition of like-minded stakeholders who recognize they will reap tremendous value from making this important shared effort. ■



Louis Tenenbaum, CAPS, CLIPP, is the founder and president at HomesRenewed. He can be reached at [Louis@HomesRenewed.org](mailto:Louis@HomesRenewed.org).

#### ENDNOTES

- 1 [http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs\\_improving\\_american\\_housing\\_2015.pdf](http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs_improving_american_housing_2015.pdf)

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# Tax Reform Impact on Long-Term Care Insurance and Other Long-Tailed Health Business: An Actuarial Perspective

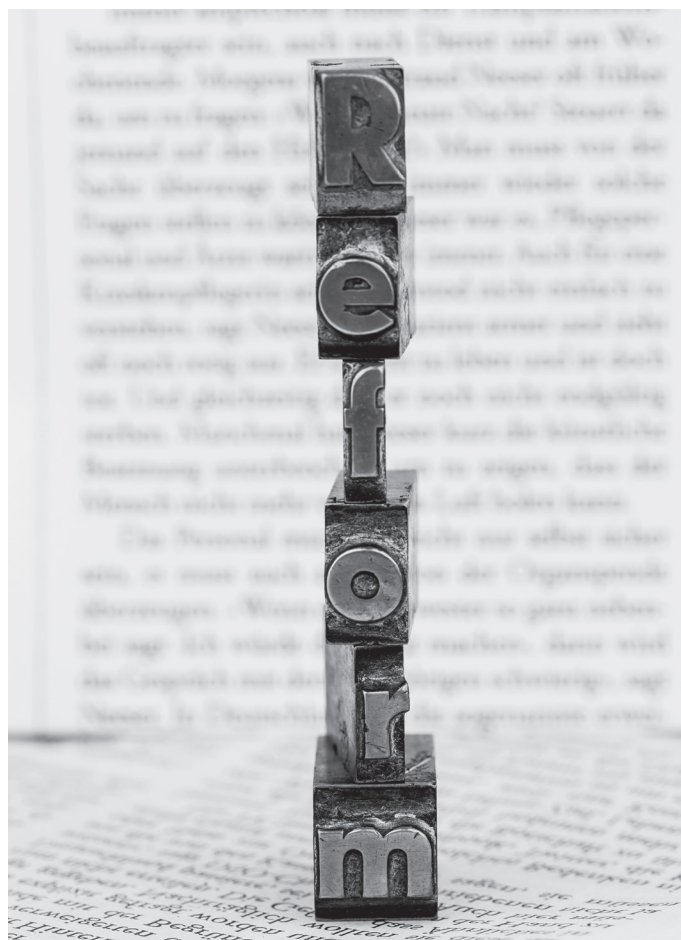
By Andrew H. Dalton and Allen J. Schmitz

**A**lthough tax reform was frequently discussed throughout 2017, the final provisions of the law materialized quickly toward the end of the year, leaving many actuaries scrambling to absorb the provisions of the new law and discern how they could impact year-end financial reporting. This article gives an overview of the key provisions in the new law, and provides an actuarial perspective on the effect the new law could have on long-term care (LTC) insurance and long-tailed health business generally. We focus on the immediate implications of the law, but also offer some longer-term perspective on how the new law could alter the LTC marketplace broadly over the coming years.

## OVERVIEW OF KEY PROVISIONS

The recently passed federal legislation (H.R. 1, 115th Congress) impacts many important aspects of life and health insurance taxation. The new law, effective with the first tax year beginning after Dec. 31, 2017, changes the corporate tax rate, the methods for calculating tax reserves for life insurance companies, and rules related to the proxy deferred acquisition cost (DAC) tax. Following is a brief summary of the key changes:

- The corporate tax rate is set at 21 percent of taxable income.
- Tax reserves are changed such that they may not exceed 92.81 percent of the amount determined using the tax reserve method otherwise applicable to the contract, following an eight-year phase-in period. The tax-to-stat reserve ratio amount required to be phased in over eight years is calculated as the difference between the tax reserve at Dec. 31, 2017, under prior law, and the tax reserve at



Dec. 31, 2017, under the new law. The difference is ratably taken into account in taxable income over the next eight years.

- Proxy DAC tax rules are changed as follows:
  - The capitalization percentage for non-group contracts is now 9.20 percent (previously 7.70 percent). The new rates are 2.45 percent for group contracts (previously 2.05 percent) and 2.09 percent for annuities (previously 1.75 percent).
  - The amortization period is extended from 10 years (prior law) to 15 years (new law). The amortization of the existing proxy DAC asset at Dec. 31, 2017, is unchanged.
- Small company rules are generally eliminated, except that the special five-year DAC amortization for small companies is retained.

Although these changes are not effective until after Dec. 31, 2017, and therefore do not directly impact reserves calculated at Dec. 31, 2017, the provisions will affect projections used by

many companies for cash flow testing projections. Although exact requirements of actuaries during this transition period remain uncertain, at least one state (New York) has clarified that the impact of the new tax legislation must be considered for year-end 2017 reserve testing. It is likely that other states will expect the impact of tax reform to be considered by the appointed actuary in some capacity—either in the baseline results or as a sensitivity test to previously completed work.

*The remainder of this article offers an actuarial perspective on the important aspects of the legislation, focusing specifically on LTC insurance and other long-tailed health lines of business. Milliman does not provide tax advice, and the commentary provided in this article should not be construed as such. Companies are encouraged to seek tax or legal counsel before pursuing any particular tax strategy.*

## IMPLICATIONS FOR LTC BLOCKS

Despite the lower federal income tax rate, the new tax law has an unfavorable impact on the tax position of some LTC insurers. The reduced federal income tax rate has little impact when profit margins, and therefore generally taxable income, are small. When profit margins are negative, the lower tax rate is, itself, unfavorable. The lower tax rate reduces the tax credit generated by a loss on a block of LTC business that can be used to offset positive taxable income elsewhere within a tax reporting entity. In some cases, the small, if any, reduction in cash tax payments caused by the lower tax rate is more than offset by the changes to the proxy DAC rules and the limitations on future tax-to-stat reserve ratios.

Changes to the proxy DAC rules both increase the amount that is capitalized to the proxy DAC asset and extend the period over which the insurer recovers this “interest-free loan” to the federal government. Our early modeling of this provision suggests that, for a “typical” LTC block, the change to the proxy DAC rules could increase the present value effective tax rate by approximately 1 percent, e.g., from 21 percent to 22 percent. The present value effective tax rate refers to the present value of federal income taxes divided by the present value of future statutory gains, calculated at a 4 percent discount rate.

The new limitation on the tax-to-stat reserve ratio can have a much larger impact on many LTC blocks, which generally carry large reserves relative to the amount of statutory profits and taxable income. Here, our early modeling suggests that the change in the limitation on tax reserves could increase the present value effective tax rate, perhaps even above the level that would have been projected under the prior law—e.g., as high as 35 percent to 40 percent at the upper end of the range—and therefore may make tax reform unfavorable overall to some LTC companies. Because the new law describes the phase-in of the tax reserve step-down as an annual increment to taxable income calculated under the old law, this conclusion,

and the effective tax rate that companies will realize, is materially dependent upon the tax-to-stat ratio under prior law. Indeed, some companies may see a favorable outcome from the new law. Ultimately, the tax-to-stat reserve differential is only temporary and is reversed as the block runs off. However, the tax reserve “step down” due to the new law is heavily weighted toward the early years and only slowly reverses for long-tailed business. The impact on a present value basis can be therefore quite material.

It is logical to expect that this situation could improve with higher profit margins and, for some blocks, this may be true. However, higher profit margins generally arise from higher statutory reserves, which, under the new law, come with a proportionately larger increment to taxable income over the next eight years, as the tax reserve phases down to the new 92.81 percent limit. Each company will want to separately consider the impact the tax law will have on its individual tax position.

Interestingly, although the tax law describes an eight-year phase-in to the 92.81 percent limitation, the prescribed mechanism for implementing the phase-in would appear to cause companies to reach the limit either before or after the eight-year period has expired. The law requires that “the difference in the amount of the reserve with respect to any contract at the end of the preceding taxable year and the amount of such reserve determined as if the proposal had applied for that year is taken into account for each of the eight taxable years following that preceding year, one-eighth per year” (italics added). A strict reading of the provision is that the dollar amount of the difference is reflected in taxable income each year for the next eight years. For a mature block of business that has reached the point where tax reserves decrease each year, the prescribed method will result in a tax-to-stat ratio that reaches 92.81 percent before the eight-year period has expired. For a block of business that is still building reserves, the opposite is true. In the former case, the impact of tax reform may be greater than initially envisioned.

It is unclear whether the limitation on the tax-to-stat reserve ratio applies to the disabled life reserve, or only the active life reserve. A conservative reading of the law would suggest that the limitation applies to both. The new law repeals the reference to the federally prescribed interest rate, which defined the difference between statutory and tax reserves under the prior law. In the absence of any formally prescribed method for calculating a disabled life tax reserve, the conservative approach would be to assume that the limitation applies to all reserves, including the disabled life reserve. Others have argued that disabled life reserves do not fit the definition of a “life insurance reserve,” as that term is used in the law, and therefore requires special treatment (presumably that the tax-to-stat limitation does not apply). We expect that formal

guidance will be forthcoming on this issue. In the meantime, our experience is that many companies are planning for the conservative approach, i.e., assuming that the limitation will apply to the disabled life reserve.

## TRANSACTION PRICING, CAPITAL ISSUES AND OTHER CONSIDERATIONS

The new law has the potential to shift the landscape for LTC mergers and acquisitions (M&A) activity or for reinsurance deals. Arguably, transaction tax benefits have motivated much of the activity in this area over the last several years. The only general statement one can make is that things have changed—the dollar amount of the transaction tax benefit and the party to which it accrues may have changed as a result of the new law. This statement applies equally to statutory and GAAP results—while statutory value may drive transaction activity, GAAP reserves and value of business acquired (VOBA) will be significantly impacted by tax reform as well. Early indications are that companies are thinking holistically about how tax reform reflects both accounting frameworks and economic values of deals. Additionally, given the meaningful consequences discussed in the preceding section, it seems that the new law could spur a strategic review of options for offshore reinsurance options. Offshore arrangements are often motivated by factors including tax and capital considerations. With a potential change in both of them, companies may take this opportunity to examine strategic reinsurance options.

Another potential opportunity exists with respect to combining different types of business. In large part, the unfavorable nature of the tax law for many LTC companies arises from the reserve-intensive nature of the business. Less reserve-intensive products—e.g., term life insurance or short-tailed health business—may have a markedly different tax profile. It may be possible, either within an existing corporate structure or through transactions, to pursue combinations of different blocks of business that maximize tax efficiency.

Because it becomes effective with the first taxable year beginning after Dec. 31, 2017, the new law has no immediate consequence on required capital as of year-end 2017. Looking forward, it is possible that the new law could impact the tax effect included in the National Association of Insurance Commissioners (NAIC) risk-based capital (RBC) calculation. This seems to be an area that would require the attention of, or at least clarification from, the NAIC within the next year. In the meantime, some companies are considering what capital requirements and RBC ratios would look like under the 21 percent federal tax rate. This could have a nontrivial impact on transaction pricing.

There may be opportunities for strategic tax planning to create value (or at least mitigate losses) from the change in the law. The new law does provide some opportunity in this respect.

As with the prior law, the new law does not permit deduction of asset adequacy or deficiency reserves for federal income tax purposes. However, the law does change the phase-in period for a change in method of accounting—for example, a strengthening of the valuation basis. Prior law allowed for such a strengthening to be phased in ratably over a 10-year period. The new law makes the treatment of a change in accounting method for life insurance companies consistent with the general provisions of Section 481(a), allowing a four-year phase-in of a reserve strengthening. This is potentially good news for LTC blocks with asset adequacy or premium deficiency reserves. The four-year phase-in allows for quicker recognition of the tax benefit than allowed under prior law, and may also offset some or all of the impact of the new limitation on tax-to-stat reserves.

Care is necessary, however, to distinguish between asset adequacy and premium deficiency reserves that are expected to be permanent (and therefore likely candidates for taking advantage of the tax deduction) versus those expected to be temporary. In the latter case, the tax benefit may not be large enough to compensate for locking in reserves on a more conservative basis than is used currently.

If the company has an existing asset adequacy or premium deficiency reserve, of which at least a portion is expected to be permanent, the adverse implications of the new law can be more than fully offset. We say “more than fully” because the reserve strengthening could be phased in more quickly (four years) than the new limitation on tax reserves (eight years).

## CONCLUSION

Overall, we expect that the next several months will be interesting times for actuaries as we deal with financial reporting during this transition period. Although there are certainly some provisions of the new law that will be viewed unfavorably by life and health insurers, we also see emerging opportunities for those who think strategically and proactively plan for the new tax landscape. ■



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# Case Study Part 2: Improving Financial Projections for Long- Term Care Insurance with Predictive Analytics

By Missy Gordon and Joe Long

**D**eveloping accurate financial projections of long-term care (LTC) insurance is easy—if you have a crystal ball. For those without one, it's no small feat! In this article, the second in our series on LTC projections and predictive analytics, we dive deeper into how predictive analytics can be used to help overcome some of the challenges. Our discussion includes how predictive analytics can help determine the amount of credibility we should give the historical experience, as well as how it can help navigate the complex interactions that underlie this experience.

In our first article<sup>1</sup> we set the stage by discussing the importance of giving the “right” amount of weight to a company’s experience when adjusting an industry benchmark in order to produce a projection assumption that generalizes well to future data. We then introduced the bias-variance trade-off, a concept in predictive analytics that highlights the importance when developing a model of not overreacting or underreacting to the data (i.e., choosing the “right” amount of data weight). We discussed how the traditional “actual-to-expected” or “A:E” study goes about doing this by using credibility weighting to adjust a benchmark. This typically includes a judgment-based decision in assigning the credibility of the data—for example, choosing 271 or 1,082 events as fully credible in limited fluctuation credibility. The American Academy of Actuaries does a great job of further discussing the intricacies of applying this and various other credibility methods to LTC experience in their Long-term Care Credibility Monograph.<sup>2</sup>

After setting the stage with the traditional A:E approach, we then discussed how predictive analytics can be used to remove this judgment-based decision of determining data credibility through techniques that focus on balancing the bias-variance trade-off in an automated fashion. To illustrate this we introduced the penalized generalized linear model (GLM), which



can automatically traverse the bias-variance trade-off by testing a range of penalties to determine the “right” amount of weight to give to company data versus an industry benchmark. This ability to test the credibility of the experience in a scientific manner is one of the great benefits of predictive modeling. Hugh Miller discusses this and provides additional benefits in his paper that links the penalized GLM approach to an actuarial credibility approach.<sup>3</sup>

Before jumping into the results of the case study there are a few more important items we would like to discuss in this article to further set the stage. Understanding how to automate the process of finding the “right” amount of weight when using a penalized GLM is an important concept. We will add detail on how to do this using a handy trick from the machine learning realm known as a  $k$ -fold cross-validation (CV), which helps us select the penalty. We will also introduce the gradient boosting machine (GBM) algorithm. GBMs are another predictive modeling technique that can take the automation one

step further by creating interactions among the variables in the model with little user input. Without this automation the process would otherwise consist of challenging judgment-based decisions.

To wrap things up we will close with a discussion on important items to consider when using one of these techniques, as there is no silver bullet when it comes to developing assumptions using predictive analytics. Depending on the intended use, you may find yourself utilizing simpler techniques or an approach that combines multiple techniques.

### DETERMINING DATA CREDIBILITY

In the prior article we discussed how the penalized GLM automatically traverses the bias-variance trade-off. However, we did not look closely at how one selects the penalty that determines the amount of credibility or weight given the data. The most common method for selecting the penalty to use in a penalized GLM is through a technique known as the *k*-fold CV. As you advance in your journey into using predictive analytics you will come across this technique more often than not, as it is frequently used in the machine learning realm to assess how a model might perform on future data independent from its construction. Modelers use this technique a lot because it's simple. This technique can be used across a variety of predictive modeling algorithms because it directly estimates expected model performance by testing the model on data that wasn't used to train the model (an out-of-sample test). This is in contrast to classical statistical tests of fit that typically rely on methods to adjust the test of fit that was calculated on data used to train the model (an in-sample test).

To conduct a *k*-fold CV, the algorithm randomly partitions the data into *k* equal-sized subsets and then iteratively trains and tests the model independently on each subset of the data. Each time the model is trained, it uses only *k* – 1 subsets of the data. The remaining *k*th subset is then used to test the performance of the model on unseen data (e.g., data that wasn't used to train the model in developing its predictions). A typical performance metric used is the mean squared error (MSE), which is the average of the squared difference between the actual and predicted value. Once the performance has been tested on each unseen *k* subset, we then average the performance to produce a single average expected performance metric.

This process gives an estimation of how well a model might generalize to new experience. Using such a technique allows us to use all the data we have for testing, which is important in cases where you cannot afford to withhold data to test the model. Figure 1 shows an illustration of how a 3-fold CV would be performed.

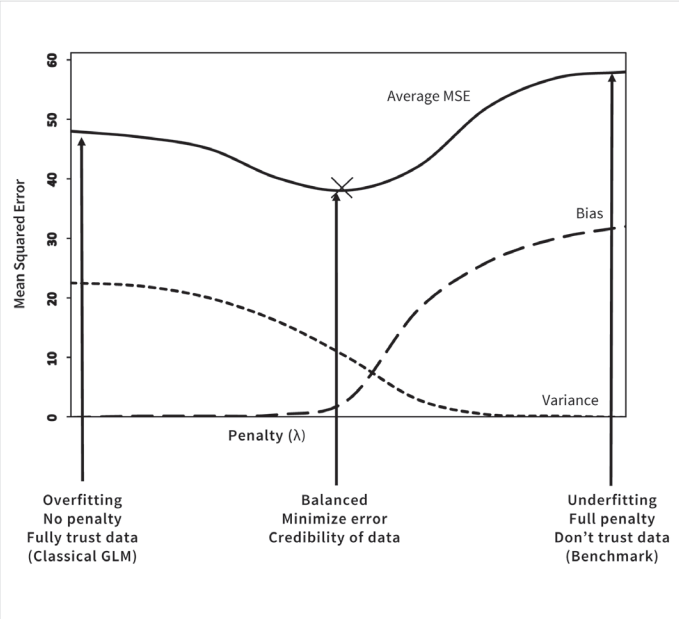
Figure 1  
3-Fold CV Performance

3-Fold	Test 1	Test 2	Test 3	MSE on holdout data	Average
1 33%	1 Holdout	1 Use	1 Use		Test 1
2 33%	2 Use	2 Holdout	2 Use		Test 2
3 33%	3 Use	3 Use	3 Holdout		Test 3
Calibration data	100%	100%	100%		

Returning to our example of using a *k*-fold CV to select the penalty for a penalized GLM, we typically test 100 penalties that range from no penalty (data has full weight) to a high penalty (data has no weight and uses only the benchmark). We then compare the average performance each penalty produces when tested on the unseen data to select the penalty that gives the “right” amount of weight to our company experience. This can be done by selecting the penalty that has the best performance (lowest error) produced by the *k*-fold CV. Figure 2 provides an example of this and also shows how this process balances the bias-variance trade-off to help us determine the “right” weight to give the company data.

In Figure 1 we showed an example of a 3-fold CV, but using 10 to 20 folds is typical. Therefore, when a range of 100 penalties

Figure 2  
Identifying the Penalty with the Best Performance



is tested, we are training 1,000 to 2,000 models and testing the prediction error with a few lines of code to assess which penalty will give us the “right” amount of data weight to minimize prediction error. This robust process is in contrast to the typically judgment-based decision in a traditional A:E study.

### NAVIGATING COMPLEX INTERACTIONS

LTC projection assumptions have complex interactions. For instance, claim termination rates vary significantly by age and duration. Often ages and durations are banded to increase credibility, which raises several questions: which are the right ages to band, which are the right durations to band, and are the duration bands the same for each age band? With a traditional A:E study or even a GLM, these decisions must be incorporated into the structure of the model. Such decisions can be tough to make and are usually based on analyzing high-level slices of data, which can be manually intensive to navigate.

A GBM doesn’t have a fixed structure like a GLM. It is a flexible, nonparametric algorithm that typically uses an ensemble of decision trees to develop predictions. This automatically creates key interactions of the independent variables in the model. At each decision point in the trees, the model cycles through each variable and chooses where to slice it to make a decision of the optimal data split that minimizes the prediction error. This process determines variable importance and how to slice variables such that the model has the ability to navigate complex interactions in an automated fashion.

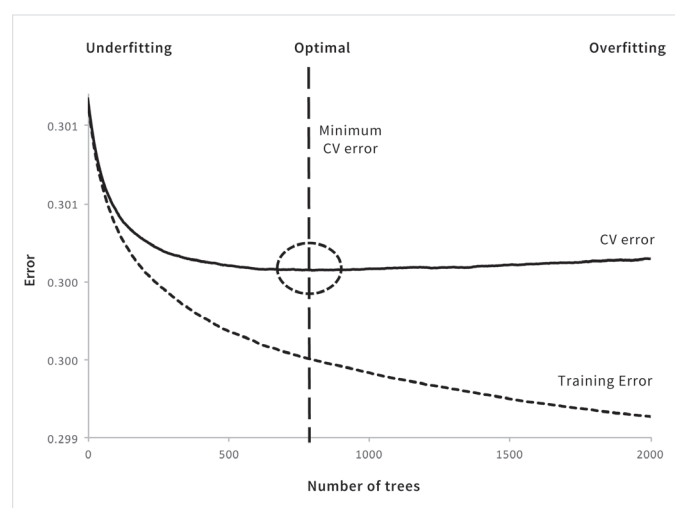
Using this state-of-the-art predictive modeling technique, one can replace most of the traditionally judgment-based decisions of this type of analysis with a more statistically robust and reproducible process. Similar to a penalized GLM, a GBM automates the decision of how much weight to give the historical experience versus the benchmark (i.e., the amount of data credibility). However, it also takes the automation a step further by determining what key interactions of variables should be used to adjust the benchmark. While the GBM automatically develops the interactions, it is critical that the resulting relationship be reviewed by an experienced actuary for reasonableness. If the relationships are not making sense, then additional feature engineering may be needed or it might be that a GBM isn’t the solution for a particular problem.

A GBM model includes a number of inputs that control the model’s complexity and its learning process (i.e., hyperparameters). These hyperparameters are similar to the penalty in the penalized GLM, in that they are used to help balance the bias-variance trade-off. Just like with the penalized GLM, a standard approach for tuning such hyperparameters is to use a k-fold CV. However, due to the increased number of hyperparameters to consider, this tuning process is more ambiguous than tuning the penalty in the penalized GLM. As

such, experienced practitioners will have different approaches for tuning the hyperparameters in a GBM.

In general, if the hyperparameters of a GBM are tuned properly, the final set of hyperparameters should produce a model such that there is little change in the k-fold CV performance metric around the last few hundred or so trees used in the model. The graph in Figure 3 shows this result, where the error around the location of the minimum k-fold CV is relatively flat when more or fewer trees are added to the model, as shown by the red circle in the graph. This produces a more stable model, which gives a wider safety net that guards against overfitting or underfitting. In practice, after reviewing this graphed output, one might tune the hyperparameter more, such that the green CV error line flattens out, making this range larger.

Figure 3  
Tuning Hyperparameters with CV Performance



When trained properly, a GBM helps remove most of the judgment-based decisions from the traditional process. However, a shortcoming of a GBM is that it does not extrapolate where there is limited or no experience. As with traditional methods, judgment is necessary when extrapolating results based on limited to no historical experience.

### GLEANING INFORMATION FROM A GBM

A single decision tree is easy to look at to see what is driving the predictions. It provides a nice map of yes/no questions one can follow to see the path taken to arrive at the final predictions. However, a GBM model typically contains hundreds to thousands of trees in it, making an exploration of the trees a daunting if not impossible process.

Luckily there are some nice tricks to gleaning information on what is driving the predictions in a GBM model. The simplest



is by looking at the variable importance measure, which identifies how useful a variable is at reducing the prediction error when training a GBM model. When using the GBM to adjust a benchmark, this variable importance can then be used as a measure to see what key variables were driving the most change in the benchmark used.

The GBM model also doesn't provide the nicely formatted factor adjustments of a traditional A:E study or a penalized GLM. Instead, the model creates a prediction by summing up thousands of predictions across all the trees in the model. We can get an idea of the marginal effect a variable has on the outcome, similar to how one interprets the coefficients in a GLM model, by using what is called a partial dependence plot. Through such an analysis we can explore the impact each variable has on the assumption and assess whether the relationships are reasonable.

## IMPLEMENTATION CONSIDERATIONS

When developing a new assumption it is very important at the start of the project to consider if your company has any implementation constraints. For example, a projection system may not have the ability to accept new variables, or it may be necessary to have the adjustments formatted in a specific way for management to review. As discussed in the previous section, a GBM doesn't produce nicely formatted adjustments

like a traditional A:E study or a penalized GLM model does. If a specific format is needed, a penalized GLM might be the best approach. In such situations, we tend to use a GBM to help us explore the data by looking at the variable importance measures and partial dependence plots to find the key variables and relationships driving the change in the experience. We then use those findings to help us construct penalized GLM models.

Another alternative is to output a new updated assumption on a seriatim basis. Or perhaps if the number of variables in a model is not too large, you can output every combination of variables in the GBM model such that you can format it into standard tables that your projection system might already be set up to accept.

## PUTTING ALL THE PIECES TOGETHER

We have discussed the importance of the bias-variance trade-off, introduced two popular predictive analytics techniques, and considered when you might reach for one over the other. In our next article, we will discuss a case study of how we used such techniques to develop LTC claim termination projection assumptions. ■



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## ENDNOTES

- 1 Published in the December 2017 issue of *Long-Term Care News*.
- 2 American Academy of Actuaries (August 2016). Long-Term Care Credibility Monograph. Retrieved Jan. 31, 2018, from [http://actuary.org/files/imce/LTC\\_Credibility\\_Monograph\\_08172016.pdf](http://actuary.org/files/imce/LTC_Credibility_Monograph_08172016.pdf).
- 3 Miller, H. (August 2015). A Discussion on Credibility and Penalised Regression, With Implications for Actuarial Work. Institute of Actuaries of Australia. Retrieved Jan. 31, 2018, from <https://actuaries.asn.au/Library/Events/ASTINAFIRERMColloquium/2015/MillerCredibilityPaper.pdf>.
- 4 Another common choice is to select the penalty that is one standard error away from the minimum  $k$ -fold CV error.
- 5 Figure 2 was adapted from Figure 6.5 on page 218 of the textbook *An Introduction to Statistical Learning*.

# Long-Term Care Insurance Needs a Reboot

By Bob Yee

*(Note: The view expressed herein is that of the author and not of his employer. This is the second of two articles regarding the issues facing the long-term care insurance industry. The first article, "Long-Term Care Insurance at a Crossroads," published in the August 2017 issue of Long-Term Care News, examined the forces that created the current state of long-term care insurance. This article describes several ideas to revitalize the industry.)*

The long-term care insurance (LTCI) industry is at a crossroads, as managing long-tailed LTCI risks has proven to be extremely challenging. The industry's predicament arose because premiums for most in-force policies, developed using optimistic assumptions, are not sufficient to pay future benefits. Consequently, large premium increases are necessary to cover future claims, but difficulty in obtaining state approvals for the increases has led to substantial financial losses for LTCI companies. Because experience develops slowly, insurance companies have been requesting multiple rate increases over time. Furthermore, experience may change in the future; thus, there is no guarantee that increases will subside. Although policyholders value their insurance protection, premium increases are becoming unaffordable for many who are retired and living on a relatively fixed income. Negative publicity from rising premiums has resulted in plummeting new sales in recent years. Lastly, few new product designs to reduce risks to the insurance companies have been forthcoming.

This article explores several ideas about in-force management and product innovation that may help the industry to reboot, in order to continue protecting Americans against the financial risks of long-term care.

## WHY NOW?

The current dire situation will only worsen until the industry takes corrective actions. Insurance companies have the contractual right to request premium increases and state insurance laws allow them, subject to approval by state insurance departments. The simple fact is, the longer it takes to implement

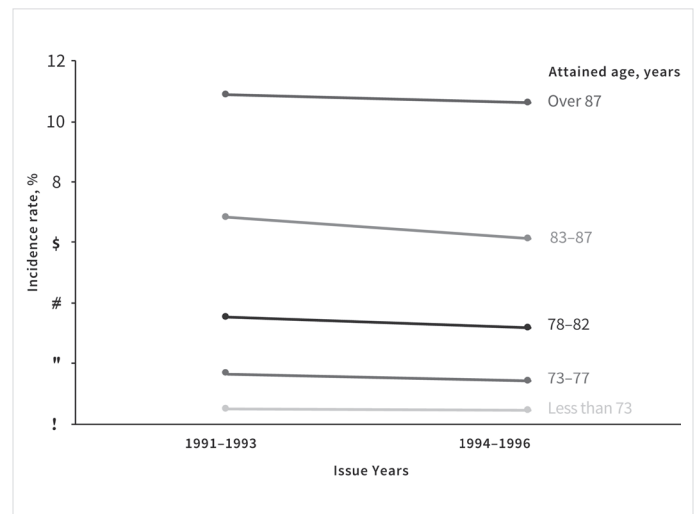
the necessary premium rate increases, the larger future rate increases will be. Dragging out the increases puts increasingly heavy burdens on future policyholders. As the amounts of approved premium increases vary materially by state, policyholders are being treated unevenly.

The costs of LTCI company insolvency are generally first distributed among health insurance companies, but ultimately passed on to their customers in the form of higher premiums. There is already one insolvent LTCI insurance company and industry experts are concerned that other insolvencies will occur in due course. It is unclear to what extent LTCI insolvencies will harm the entire health insurance industry, especially smaller health insurers.

A positive development in the face of uncertain future premiums and potential LTCI insolvency is that prediction of LTCI experience is now more reliable than before. In the past, the slow development of experience data (due to relatively low annual claims incidence rates during the early policy years) coupled with a scarcity of industry-wide information have resulted in the inaccurate projection of financial results and erratic demands for premium increases. With over thirty years of history, the industry now has accumulated sufficient credible claims data to better estimate future experience.

In particular, claims incidence experience appears to be stabilizing, perhaps because product features and underwriting standards have become more uniform. Figure 1 illustrates this finding.

Figure 1  
Society of Actuaries' 2000–2011 InterCompany LTC Study:  
Aggregate incidence rates for policy durations over 15 years





Based on over 4,500 claims from the Society of Actuaries' 2000–2011 Long-Term Care Experience Study, claims incidence rates for policy years 16 and over for two groups of policies issued between 1991–1993 and 1994–1996, respectively, by attained age group were compared. The incidence rates were level or slightly declining in all the attained age groups.

Besides incidence of claims, the LTCI industry has gained considerable knowledge of other risk factors that drive its economics, including claim termination, lapse, mortality, investment return, and expense. The rates of claim terminations have been steady as assisted living facilities are firmly entrenched as an alternative to nursing facilities. The ultimate lapse rate in later policy years, an important assumption in the estimation of future events, is turning out to be approximately one percent, which narrows the range of adverse variability. In a persistent low interest rate environment, prudent estimation of future investment returns would likely be conservative. The industry has learned that mortality experience, especially at older ages, is similar to annuitant mortality.

Future claims trends are still largely unknown, but advances in medicine (e.g., abatement of dementia) and technology (e.g., robotic aids for home health care) are likely to reduce future overall claims expenses rather than increase them. That said,

This newfound confidence in quantifying the risk factors, together with improved analytical techniques, has made future LTCI experience more predictable.

these slowly emerging trends may have little impact on the future experience of many policyholders who are now already in their 80s.

This newfound confidence in quantifying the risk factors, together with improved analytical techniques, has made future LTCI experience more predictable. With proper margins for adverse deviation, a number of insurance companies now can determine the premium increase sufficient to fund future liabilities with a low probability of additional increases.

#### IN-FORCE MANAGEMENT

The lifetime loss ratio requirement has been the standard by which LTCI financial obligations between insurance

Market growth is predicated on a delicate balance of mutual interests between insurance companies consumers.

companies and policyholders are demarcated. Under this requirement, 60 percent of the premiums (in almost all states) are returned to the policyholders in the form of benefits over the lifetime of a group of similar policies. This requirement has worked reasonably well for other forms of health insurance where credible experience develops fairly swiftly and premium rate adjustments are frequent. For LTCI however, slowly emerging unfavorable experience in later policy years that differed from what was originally expected has resulted in large increases in future premiums for existing policyholders. These large increases are the direct result of applying the loss ratio over the entire lifetime of the original group of policyholders. As a group, the number of policyholders shrinks every year due to lapse and death, but any premium deficits of the entire original group are allowed to be compensated by rate increases on the remaining policyholders. Thus, a small number of policyholders may shoulder premium rate increases many times over their original premiums. While it may be incredulous, this was the basis for how insurance companies and policyholders entered the insurance contractual agreement.

In retrospect, the use of unsubstantiated data to develop premiums and the rote application of the lifetime loss ratio formula have resulted in very undesirable consequences for insurance companies and policyholders alike. However, it is not particularly useful to dwell on the past. Although insurance companies and policyholders should fulfill their duties in accordance with the insurance contract, LTCI contractual provisions and the related rate regulations are not viable today. It is paramount for insurance companies and policyholders (with regulators acting on their behalf) to reach a new agreement on their respective shares of future financial responsibilities. The ultimate goal of the agreement is to establish a premium rate increase level at which policyholders are protected against onerous additional future increases and to gain greater assurance on future financial results for insurance companies.

The focus of this agreement should be on the currently in-force policyholders and not the entire original group of policyholders. A starting point for discourse could be the premiums that would have been developed if the current best estimates of risk factors were known at the onset. These are the premiums that the policyholders should have paid. The set of best estimates should include a margin for conservatism so that the probability of future premium increases is remote.

From the companies' perspective, they did not receive these premiums in the past to fund the higher level of future benefits. Thus, the current reserves, established based on assumptions that generated the original inadequate premiums, are unlikely sufficient to fund liabilities even with the premium increase. The starting point of negotiation for the insurance companies could be based on future financial result under the best estimate assumptions with a margin for conservatism. For example, the amount of premium increase can be determined to provide a specific ratio, positive or negative, of the present value of future distributable profits to the present value of future premiums. A ratio of zero would imply that no future gains or losses are expected. Different ratios may be set depending on the particular situation of the company, the current reserve level, or whether the block of business is open or closed.

If both parties are willing to make difficult but necessary choices, they can forge an agreement between the two starting points. The agreement should also include the following features:

1. Detailed disclosures by insurance companies of experience analysis and derivation of assumptions used in projecting future premiums, benefits and expenses;
2. Third-party independent review of the companies' financial projections and premium increase determination;
3. A guaranteed period during which premiums will not go up;
4. Full disclosure to policyholders of the amount of the ultimate premium increase, even though it may be spread over a number of years;
5. Expanded options for policyholders who desire to reduce their policy benefits or lapse the policies with extensive support on their decision-making; and
6. If premiums are proven to be excessive, refunds to existing policyholders who will pay for the premium increase or to their designated beneficiaries.

Early detection of premium inadequacy reduces the level of future necessary premium increase by spreading the burden to a larger group of policyholders rather than a smaller future group. It is therefore in the best interest of all policyholders to perform premium reviews on all policy forms for all companies. Reserve strengthening on many LTC blocks in the past is a strong omen that all stones should be turned over. After the premium increases, state insurance commissioners should require insurance companies to provide annual analysis of their experience, including the current margins of assumptions over actual experience. This practice would minimize unanticipated future discrepancies. Companies also should seek

ways to limit their risk exposures by employing interest rate, inflation rate, and mortality hedging strategies. The costs associated with these activities should be included in the financial consideration.

## PRODUCT INNOVATIONS

Market growth is predicated on a delicate balance of mutual interests between the insurance companies and the consumers. This balance was tilted when insurance companies' experience indicated that the risks inherent in LTCI were greater than they could manage. The lifetime coverage provision of the policies exposed companies to substantial variations from claim, investment, and persistency assumptions over a period of forty years or more. Moreover, the intended corrective mechanism for adverse experience has not worked because regulators have been reluctant to grant the necessary premium increases. To change these dynamic forces, the following non-traditional product designs may attract insurance companies to offer LTCI and consumers to purchase them.

- **Life and LTCI combination policies.** A logical step in LTCI product evolution is to reduce the number of risks for insurance companies. The recent life and LTCI combination policy design is such an attempt, where the death benefit is first paid to cover long-term care expenses before additional benefit is payable. This reduces the companies' claim exposure since a significant number of claims are of short duration (less than three years). Until recently, the vast majority of sales in life and LTCI combination has been single premium policies; there needs to be a lower cost, lifetime premium design in order to make these policies more affordable.
- **Universal LTCI.** In a similar fashion, an annuity with long-term care benefits design also can reduce insurance company exposure. This design is similar to universal life insurance, where periodic premium contributions are deposited into a policy fund, an annual cost of LTCI coverage is deducted from the fund, and interest is credited. The annual cost of insurance will increase with age. As with life and LTCI combination policies, the company assumes the morbidity and expense risks, while the policyholder retains the investment, lapse and mortality risks. This design would be quite attractive if the fund were embedded in a retirement saving account with the annual costs of insurance treated as tax-free and penalty-free withdrawals. However, there are several obstacles for such a product design. Since it provides a fund value, premiums would be higher than a comparable traditional LTCI policy. As interest credited to the policy is an important component in determining the premium contributions necessary to fund the policy, contributions would be relatively high in a low interest environment. Finally, state

regulations currently permit increasing annual insurance costs only for attained ages under 65.

- **Policies with refund feature.** Another product variation would retain the structure of the traditional LTCI, but set initial premiums above a mandated minimum level. This could significantly reduce the likelihood of future premium increases. The minimum premium would be consistent for all policies with similar product features. Experience on this product would be reported annually to regulators, and premiums would be adjusted promptly if necessary. If premiums were found to be excessive, policyholders or their designated beneficiaries would receive refunds. This design could incorporate a high deductible (for example, a two-year elimination period) that would make the product affordable. This feature would make the LTCI policy a protection against a protracted period of long-term care rather than the initial period of care.

## CONCLUSION

After years of uncertainty, the LTCI industry now has a greater understanding of the risks inherent in the product. The industry cannot be complacent, or it will continue to flounder and policyholders will continue to suffer. Moreover, there is no viable alternative to fund long-term care costs, and nearly all proposed public financing solutions involve the private market as complementary coverage. Thus, a vibrant private LTCI industry is vital to provide long-term care financing options for Americans. For the benefit of in-force policyholders and future customers, the LTCI industry needs innovative solutions. Now is the time to earnestly develop them. ■



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## ENDNOTES

- 1 One exception is the life and long-term care combination insurance policies. However, the majority of these combination sales that provide LTCI benefits comparable to traditional LTCI have been the relatively expensive single premium policies. Accordingly they have not yet supplanted the traditional products.
- 2 According to the National Association of Insurance Commissioners' Long-Term Care Insurance Experience Report for 2016, approximately 500,000 claims were reported from 2006 to 2016.
- 3 That is, the amount that can be distributed to shareholders of a stock insurance company. Specifically, it is the after-tax statutory profit net of cost of targeted surplus and refund, if any, to policyholders.

# FASB Targeted Improvements Will Affect Long-Term Care

By Bryn Douds

**T**he Financial Accounting Standards Board (FASB) is proposing significant changes (“Targeted Improvements”) to the valuation and reporting of GAAP financial results for long-duration insurance contracts. This article only focuses on changes affecting traditional Long-Term Care (LTC) contracts and reflects the proposals as of late January. **All proposals are subject to change until FASB votes to issue an Accounting Standard Update (ASU).** The ASU is likely to be issued mid-2018. The effective date is not known as of this writing. Table 1 compares and contrasts the key elements of the proposal.

There are other changes, such as those affecting the measurement of “market risk benefits” related to guarantees on equity-indexed or separate account products.

## NEW PROCESSES

If you are accustomed to developing and storing factors that are then applied seriatim to calculate reserves, you will need a new valuation system and new processes. Reserves will need to be calculated at least twice: once using at-issue discount rates and a second time using the same cash flows and net premiums but with current discount rates. When assumptions are updated, the impact will need to be identified in the new roll-forwards of present value of net premiums and present value of benefits.

A key change is the need to recalculate net premiums from issue (or transition date, if relevant) to reflect actual cash flows. This requires that historical cash flows be available to the valuation system, even for policies that are no longer in force. In general, this is easier to handle on a cohort basis. Net premiums are also recalculated when assumptions regarding future cash flows are updated, at the same time each year (unless facts and circumstances warrant an earlier update).

It is not clear from the standard whether the recalculation of net premiums to reflect actual cash flows should be done quarterly or should wait until assumptions are updated. When net premiums are recalculated, there is a beginning of period “catch up” adjustment to reserves. If the update process can be

automated, quarterly financials will be more comparable if the net premiums can be recalculated each quarter.

## COHORTS

Cohorts can be defined broadly or narrowly. Each approach has advantages. The proposed standard specifies that cohorts cannot include policies from different years of issue. Within year of issue, having a broad grouping reduces the number of cells that need to be managed but a narrower grouping, such as by product, may make it easier to explain results.

## “A” QUALITY DISCOUNT RATE

GAAP valuation will no longer depend on the yields on investments in the company’s portfolio. Instead, the valuation discount rate must reflect yields on upper-medium grade fixed-income instruments. In the U.S., this is interpreted as “A” quality bonds. A simple approach is to find an appropriate index that provides the average yield for “A” rated bonds. LTC has benefits payable at durations later than the maturity of any existing bond. You will need to decide whether and how to address this in the development of the valuation discount rate. Yield curves could be used or an equivalent level rate can be determined to ease storage and explanations.

In whatever way discount rates are developed, they need to be available quickly because the valuation can’t be run without them. Two sets of rates and reserves are needed. The income statement will reflect reserves discounted using at-issue (locked-in) rates. Balance sheet equity will reflect reserves calculated using the same cash flows and same net premiums but discounted using current rates. The difference goes into accumulated other comprehensive income.

## DAC AMORTIZATION

There are three changes to the amortization of acquisition expenses. There is no change as to which expenses are capitalizable. One change is that the unamortized DAC no longer accrues interest. Sums are used instead of present values. A second change is that a measure of in-force other than premiums is used as the amortization basis. For LTC, number of policies is a reasonable basis but measures such as maximum daily benefit may also be appropriate depending on the product design. The third change is that renewal deferrable acquisition costs cannot be considered prior to their incurrence.

The rule that reserves and DAC amortization must be based on the same assumptions remains in place. Unlike reserves, where the net premium is recalculated from issue when assumptions are updated, DAC amortization will be adjusted prospectively. The amortization rate will be adjusted to take into account the current unamortized DAC and the new projection assumptions.

Table 1  
Comparison of Selected Targeted Improvements to Current Accounting

Current Accounting	Targeted Improvement
Locked-in assumptions	Insurance assumptions updated annually at the same time each year. Discount rates updated quarterly with difference from at-issue discount rates reflected in Accumulated Other Comprehensive Income (AOCI).
Insurance assumptions include Provision for Adverse Deviation (PAD)	No PAD.
Loss recognition and deferred acquisition cost recoverability required	No longer necessary. Net premiums are capped at 100 percent of gross premiums.
For traditional long-duration products, policy grouping is only relevant for loss recognition and DAC recoverability testing	Policies may be grouped but groups cannot contain contracts from different issue years.
Except when unlocking is required due to loss recognition, the net premium for each policy is locked-in at issue	Net premiums are updated to reflect the substitution of actual for expected experience and for updates to insurance assumptions. This results in “catch-up” adjustments to reserves. Net premiums are not affected by after-issue changes in discount rates.
Discount rate is best estimate less PAD	Discount using upper-medium grade fixed-income instrument yield (“A” quality in U.S.) that maximizes the use of market observable inputs.
Increases in reserves are reported in “Change in provision for future policyholder benefits” in the income statement	The catch-up adjustment is reported separately from increase in reserve, such as in the Benefits line. Impacts of changes in discount rates after the year of issue affect Other Comprehensive Income.
Deferred Acquisition Costs (DAC) are amortized in proportion to premiums. Unamortized DAC accretes interest.	No interest accretion. DAC is amortized on a straight-line basis reflecting changes in in-force.
DAC amortization net premium considers future deferrals (and is locked-in at issue)	DAC amortization rate cannot anticipate future deferrals. Consequently, the amortization rate increases when there are additional deferrals.
Limited disclosures	Disclose roll-forwards for: DAC, present value of reserve net premiums and present value of benefits. Disclose information about significant assumptions.

## EXPERIENCE ASSUMPTIONS

Valuation assumptions will no longer include provisions for adverse deviation (PAD) and will need to be updated annually, at the same time each year. Discuss with your accountants the extent to which this needs to be coordinated across product lines and reporting entities. In the event of an unusual circumstance, if an earlier update would be appropriate it would, in fact, be required. “Updated annually” does not mean that every assumption needs to be changed annually, but an annual review process will be needed.

When assumptions are updated for pricing, besides the obvious impact on new business valuation, the effect on in-force valuation assumptions should be evaluated.

## THE PLANNING PROCESS WILL BE MORE COMPLEX

If your company’s business plan cash flows are not already related to best estimate assumptions, you should consider making the linkage because of the requirement that reserve net premiums be recalculated to reflect actual cash flows. When PADs are eliminated, the projected cash flows used to calculate reserves can also be used for business planning, with future new business then layered on. Future deferrals of acquisition expenses (new and renewal) must also be layered on. The challenge comes if aggregate premiums or benefits are adjusted in the plan for any reason because those adjustments should be recycled into the reserve calculation. Premium adjustments could imply a change to in-force that will affect future cash flow projections. Differences between

If you are accustomed to developing and storing factors that are then applied seriatim to calculate reserves, you will need a new valuation system and new processes.

Plan benefits and those expected by the reserve valuation should result in new net premiums (unless already capped at 100 percent of gross premiums) and a catch-up adjustment to reserves, which will offset a portion of the change in benefits. Theoretically, the adjustments need to be allocated to years of issue. For a multi-year plan, this allocation is needed because it affects the net premium for each year of issue and the growth in future years' reserves.

## TRANSITION

The default approach to transition is to start with currently reported balances as of the beginning of the earliest period presented and apply the Targeted Improvements prospectively. For example, suppose the guidance is effective for fiscal years beginning after Dec. 15, 2020. Further suppose that LTC Company uses calendar year reporting and it presents two prior comparative years. In this case, the first quarterly report in 2021 would compare to 2020 and 2019. Under the default approach, 12/31/2018 reserves and DAC would be used as the 1/1/2019 opening balances. If the reserve net premiums for any cohort would be negative or greater than 100 percent of gross premiums, then that cohort's 1/1/2019 reserve balances would be restated to equal the present value of benefits (discounted at "A" bonds yields) less the present value of capped or floored net premiums. Any differences between the old and new balance sheets will be taken as a cumulative adjustment to equity for a change in accounting principle.

Under the optional transition approach, LTC Company can use an earlier transition year provided it has actual data for the intervening years. No estimates are allowed. The transition year is an "accounting election" so check with your accountants for the extent to which all lines of business (including possibly in other legal entities) must make the same election. The opening reserve balances, by cohort, would be based on the reported transition date reserves, actual claims from there to the earliest period presented and "future" cash flows. Continuing the

example, suppose LTC Company chose 1/1/2015 as its transition date. The net premium for the restated Q1 2019 income statement would reflect actuals for 2015–2018 and projections thereafter using 2018 best estimate assumptions, as shown in Formula 1.

Present values are calculated using "A" bond yields from the later of the policy cohort's issue period and the transition date (1/1/2015 in our example), according to board decisions through January 2018. These net premiums would be capped at 100 percent of gross premium and floored at zero. Two reserves would then be calculated as of 1/1/2019. Both would be  $PV(\text{Benefits}) - PV(\text{Net Premiums})$  but the opening reserve for the income statement would use the same discount rates as were used to calculate the net premium while the reserve for the balance sheet would use "A" bond yields at 12/31/2018.

DAC must use the same transition date as reserves and the persistency assumptions for projecting future in-force or number of policies must be consistent with those used for projecting benefits and premiums. In our example, the initial DAC amortization rates by cohort would be calculated using the reported 12/31/2014 DAC balances and projected policy counts or in-force amounts using then-current best estimate assumptions. The amortization rates would be updated in successive periods to reflect additional acquisition costs incurred during the period and for assumption unlocking each year. Even though DAC amortization has been "simplified," it will be more work to roll it forward from the transition date to the first date presented. Any difference between this new DAC and the old DAC on the first date presented will be taken as a cumulative adjustment to equity for a change in accounting principle.

## NEW EARNINGS PATTERNS

The effects on earnings emergence deserves its own article. There is no more "release from risk." Whether there's a gain from interest on reserves will depend on how the portfolio's new money rate compares to "A" bonds. Overall, due to the removal of PADs from other assumptions, it's likely that a smaller portion of premiums will be required for reserves. This will increase early duration earnings, but may be more than offset by faster early amortization of DAC due to the lack of interest accretion. The effect on the entire block after transition will depend on your mix of business, whether the block

Formula 1

$$\text{Net Prem \% 1/1/2019} = \frac{12/31/2014 \text{ Res} + PV(\text{Actual benefits 2015–2018 and Projected future benefits})}{PV(\text{Actual gross premiums 2015–2018 and Projected future gross premiums})}$$

Table 2

Roll-Forward of Reserves		Dec. 31	
		20x2	20x1
<b>Present Value of Expected Future Policy Benefits</b>	Balance, beginning of year	4,220	4,150
	Beginning balance at original discount rates	4,160	4,090
	Change in cash flow assumptions	10	40
	Effect of variances from cash flow assumptions	(20)	80
	Adjusted beginning of year balance	4,150	4,210
	Issuances	260	245
	Interest accrual	205	210
	Benefit payments	(650)	(510)
	Experience adjustments	(5)	5
	Ending balance at original discount rates	3,960	4,160
	Effect of current discount rate assumption	50	60
	Balance, end of year	4,010	4,220
<b>Present Value of Expected Net Premiums</b>	Balance, beginning of year	2,740	2,900
	Beginning balance at original discount rates	2,715	2,830
	Change in cash flow assumptions	5	30
	Effect of variances from cash flow assumptions	(15)	65
	Adjusted beginning of year balance	2,705	2,925
	Issuances	240	225
	Interest accrual	105	120
	Less Premiums received	(590)	(560)
	Experience adjustments	(5)	5
	Ending balance at original discount rates	2,455	2,715
	Effect of current discount rate assumption	20	25
	Balance, end of year	2,470	2,740
Net liability for future policy benefits		1,540	1,480
Reinsurance recoverable		0	0
Net liability after reinsurance		1,540	1,480

Undiscounted Values	Dec. 31	
	20x2	20x1
Expected future gross premiums	4,370	4,900
Expected net premiums	2,670	2,990
Expected future benefit payments	4,580	4,915

Roll-Forward of DAC	Dec. 31	
	20x2	20x1
Opening DAC	900	860
Capitalization	100	100
Amortization	(70)	(60)
Ending balance	930	900

has been through loss recognition, and how the discount rates that get locked in compare to the current portfolio yield.

#### NEW DISCLOSURES

There are several new disclosures. Roll-forwards of unamortized DAC and reserves are required for both annual and interim statements. The normal rules apply with regard to aggregation/disaggregation of product lines and comparisons to prior period(s).

Additional disclosures include the weighted average duration of the liability and the weighted average discount rate.

For annual reports, for DAC and for reserves, disclose information about the significant inputs, judgments, assumptions, and methods used; changes in those significant inputs, judgments, assumptions and methods; and the effect of those changes on the measurement of DAC and reserves.■



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# Utilization: A Review of Two Projection Methods

By Jeremy Hamilton and Tim Kempen

## INTRODUCTION

As actuaries, often our role is to quantify future risk, which may involve estimating future claims. Usually estimating future claims entails using historical data as a starting point to develop an assumption about the future. However, historical data and trends may not be enough to develop an accurate projection. Also, historical data may not have been captured as cleanly or in as much detail as we would have liked. This can make our job a bit more challenging.

Developing financial projections of long-term care (LTC) insurance utilization is no different. The assumptions and methods used to develop utilization projections can have a significant impact on estimated future claims. Also, the quality of historical data may limit what the actuary is able to do.

This article serves as a follow up to the article “Utilization: Long-Term Care’s ‘Middle Child,’” published in the December 2017 issue of *Long-Term Care News*.<sup>1</sup> That article covered much of the background on what utilization is, how it’s calculated from historical data, and what it means for LTC insurance products. This article focuses on two methods for using current utilization levels to develop utilization assumptions for future durations: an “average utilization” method and a “distribution” method. Each method has its own advantages and disadvantages, with the trade-off between the two (not surprisingly) being simplicity versus accuracy.

## AVERAGE UTILIZATION METHOD

The more common method for projecting utilization in future durations is to simply trend the current average utilization level forward. Essentially, this method projects utilization for any given duration by multiplying the preceding duration’s utilization by a cost of care inflation assumption and dividing by the amount benefits grow by. For example, if the current level of utilization for a block of LTC policies is 75 percent, benefits inflate by 5 percent per year, and cost of care is expected to grow by only 3 percent per year, then the projected utilization for the following year would be:

$$75\% \times 1.03 / 1.05 = 73.6\%$$



Continuing with the same benefit inflation and cost of care assumptions, the projected utilization for the next five years is shown in the table in Figure 1.

Figure 1  
Projected Utilization, 5% Inflation Protection

Year	Utilization
Current	75.0%
1	73.6%
2	72.2%
3	70.8%
4	69.4%
5	68.1%

Similarly, if there is no benefit inflation, the average utilization would increase each year by 3 percent and the projected utilization for the next five years would be as shown in Figure 2.

Figure 2  
Projected Utilization, No Inflation Protection

Year	Utilization
Current	75.0%
1	77.3%
2	79.6%
3	82.0%
4	84.4%
5	86.9%

One advantage of using this method to project utilization is that it is fairly simple to implement. Also, to develop the starting utilization assumption, this method relies on paid claims data, which is generally readily available.

While this method may seem simple enough, there are a number of issues to consider. First is the calculation of current utilization. As the “Middle Child” article summarized, a number of nuances such as service periods, benefit payment types, care situs, etc., can affect how utilization is calculated from historical experience.

The second issue to consider is the theoretical limitations of utilization.

- For policies with no benefit inflation, will utilization increase until it hits 100 percent, or will it level off before then? Will policyholders “price shop” for care providers in order to preserve benefits as long as possible or in order to ensure their policies will cover actual expenses? The impact of policyholder behavior could consequently suppress average utilization.

For policies where benefit inflation exceeds the projected cost of care inflation, will utilization decrease indefinitely or reach a theoretical minimum?

- For policies where benefit inflation exceeds the projected cost of care inflation, will utilization decrease indefinitely or reach a theoretical minimum? If policyholders’ benefits far exceed the average cost of care in their area, will they gravitate toward more expensive care providers or use more home health services, because they have the policy benefits to pay for it? In this scenario, policyholder behavior could slow the decline in average utilization.
- How does plan design affect average utilization? One example of plan design that could impact utilization is “daily” versus “monthly” reimbursement. Policies with daily reimbursement may have a lower theoretical limit for home health care utilization (ex: 70 percent) than monthly reimbursement, because care may not be received every day.

A third issue to consider is that the average utilization method is simplistic in nature and relies on one average utilization assumption as a starting point. Underlying the average utilization for a group of policies are many policies with varying

levels of utilization. The change in utilization from one duration to the next for each of these policies will likely differ from the others.

Consider a group of policies with no benefit inflation, where half of the policies currently use only 50 percent of their available benefits while the other half use 100 percent. The average utilization for that group of policies would be 75 percent. Trending the average utilization forward by a cost of care inflation assumption of 3 percent will result in 3 percent higher projected utilization each year until a theoretical maximum is reached.

However, utilization for half of the policies is already at 100 percent and cannot increase in future durations. Only the utilization for the half of the policies at 50 percent utilization will increase. Thus, actual utilization will increase much more slowly than what was projected using the average utilization method.

The opposite is true for a group of policies with benefit inflation that exceeds the cost of care inflation assumption. Of the policies that currently have 100 percent utilization, it is unknown what impact benefit inflation or cost of care inflation will have on utilization. Those policies where the current cost of long-term care services exceeds policy benefits may continue to have 100 percent utilization in the future. For example, if the cost of care is \$200 per day but the daily benefit of a policy is only \$100, utilization will remain at 100 percent until the daily benefit catches up to the actual cost of care. However, if the cost of care is equal to or just above the daily benefit, current utilization will be 100 percent but will fall below 100 percent relatively quickly. Thus, it is difficult to project how utilization will change for the 100 percent utilizers. As with the group of policies with no inflation, the actual change in average utilization is likely to be slower than what is projected using the average utilization method.

## DISTRIBUTION METHOD

The distribution method, while more complex than the average utilization method, provides a more accurate depiction of how average utilization will change over time. As the name suggests, the distribution method relies on using a distribution of the underlying utilization rates for a group of policies, rather than a singular, average utilization as a starting point.

With the average utilization method, paid claims are subject to reimbursement limits, which prevents utilization from exceeding 100 percent even if billed charges exceed the maximum benefits available. As stated earlier, it is unclear what impact cost of care and benefit inflation will have on the 100 percent utilizers. The distribution method addresses this issue by calculating utilization differently. The observed utilization is developed by dividing actual billed charges, rather than paid

Figure 3  
Projected Utilization, No Inflation Protection

Original Utilization Bucket	Bucket Weight	Projection Year				
		Current	5	10	15	20
0% - 20%	5%	10%	12%	13%	16%	18%
20% - 40%	5%	30%	35%	40%	47%	54%
40% - 60%	10%	50%	58%	67%	78%	90%
60% - 80%	20%	70%	81%	94%	100%	100%
80% - 100%	60%	90%	100%	100%	100%	100%
Average		75%	84%	88%	91%	93%

benefits, by the maximum possible benefit. This results in a distribution that includes utilization rates above 100 percent.

MECHANICS OF THE DISTRIBUTION METHOD

In general, the distribution method requires a three-step approach:

- 1. Calculate observed utilization for each claim.
- 2. Develop a distribution of observed utilization.
- 3. Project average utilization by applying benefit inflation and cost of care assumptions to the distribution.

The first step of calculating utilization for each claim can be a bit more difficult than with the average utilization method, because it relies on billed charges rather than paid claims. As stated earlier, billed charges are used in order to develop a distribution with utilization rates above 100 percent. Because companies often do not track billed charges, paid claims could still be used to develop the distribution for utilization below 100 percent. However, other data sources and judgment would be needed to expand the distribution above 100 percent for the 100 percent utilizers in the second step.

The second step is to develop a distribution of utilization. Practical considerations, such as the credibility of historical data, should be taken into account when determining the level of precision of the distribution. A continuous distribution might be difficult to develop so a discrete distribution may be more appropriate. In practice, this refers to the number of buckets the current utilization is split into. For example, when using 5 percent increments, data would be divided into buckets of 0 percent to 5 percent, 5 percent to 10 percent, etc. In the absence of actual charge data, utilization near 100 percent would need to be extrapolated, using actuarial judgment, to develop the upper tail of the underlying actual charge distribution.

In addition to the level of precision to use for bucketing utilization, the actuary will need to determine what characteristics the utilization distributions should vary by (this also applies to the average utilization method). Obvious characteristics for using separate distributions would be care setting and inflation type. But gender, daily benefit amount, benefit period, and claim incurral age could also be considered, among others.

Another consideration for setting the starting distribution would be the impact of trend over the experience period. Unless a company has robust experience, the experience period used to set the starting distribution will likely span several years. This experience would need to be adjusted for historical benefit and cost of care trend to be used as the starting distribution.

The third step is to project each bucket within the distribution separately using the appropriate projection factors for cost of care inflation and benefit inflation. The average utilization for a given duration is then calculated as a weighted average of the resulting utilizations for each bucket and the weights for each bucket. The table in Figure 3 illustrates the resulting average utilization calculated using the distribution method for a hypothetical starting distribution with 3 percent cost of care inflation and no benefit inflation. As the higher utilization buckets reach 100 percent, the increase in average utilization slows.

COMPARISON OF TWO METHODS

As you can see from the examples provided earlier, the distribution method requires a bit more effort than the average utilization method, especially if billed charge data is not available. Often times the distribution method will produce substantially different utilization rates than the average utilization method. However, there may be instances where the difference between the two methods is immaterial (or nonexistent when the cost of care trend and benefit inflation rates are equivalent.) The shape of the distribution and starting average



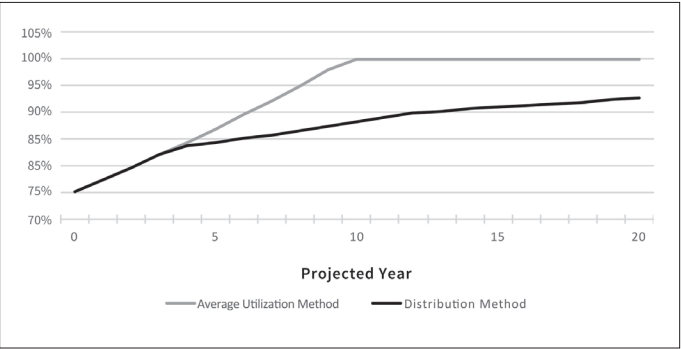
utilization will influence how large the difference in utilization rates is.

For example, cells with a uniform distribution will likely have a greater difference in projected utilization between the two methods than cells that have a more compact distribution. Likewise, cells with very low current utilization may not see materially different projected utilization for many years, whereas cells with high average current utilization may see differences between the two methods much more quickly.

The graph in Figure 4 compares the projected average utilization using each method and assuming the same distribution, starting utilization, and cost of care inflation assumption as Figures 2 and 3.

The average utilization method assumes that utilization increases by a constant factor until an upper limit is reached (in this case, 100 percent in duration 10). The distribution method projected utilization increases at a much slower rate because the portion of the distribution at or near 100 percent utilization no longer increases above 100 percent when projected forward. The resulting slower growth in utilization using the distribution method relative to the average utilization method leads to approximately 12 percent lower utilization in duration 10. The difference in utilization then slowly grades off over time. However, this difference in utilization does not translate to an equal difference in claims costs. The implied reduction to claims costs from the lower utilization may be partially offset by an extension of benefits.

Figure 4  
Project Average Utilization, No Inflation Protection



### IMPACT OF COINSURANCE

The distribution method can also be useful in analyzing the utilization impact of coinsurance features where X percent of actual cost is reimbursed, subject to a daily benefit maximum cap. To measure the savings associated with the coinsurance feature, the distribution of charges is more meaningful than an average charge. The table in Figure 5 illustrates the calculated impact of 10 percent coinsurance on a cohort with 80 percent average utilization using the two methods. For simplification, this example assumes half of the cohort has 60 percent utilization and half has 120 percent billed charges utilization (100 percent paid benefits utilization).

As expected, the resulting utilization using the average utilization method is 10 percent lower ( $8/80 = 10$  percent) after

Figure 5  
Utilization Impact of 10% Member Coinsurance

	Average Utilization Method	Distribution Method		
		60% Bucket	120% Bucket	Weighted Average
Distribution Weight	100%	50%	50%	
Average Charge	\$80*	\$60	\$120	\$90**
Daily Benefit (DB)	\$100	\$100	\$100	\$100
<b>Insurer Paid Amount (utilization)</b>	<b>\$80</b>	<b>\$60</b>	<b>\$100</b>	<b>\$80</b>
Member Coinsurance	\$8	\$6	\$12	\$9
Remaining Charge	\$72	\$54	\$108	\$81
<b>Insurer Paid After Coinsurance (utilization)</b>	<b>\$72</b>	<b>\$54</b>	<b>\$100</b>	<b>\$77</b>

\* Average utilization method uses paid benefits subject to daily benefit cap.

\*\* Distribution method uses average billed charges.

implementation of the 10 percent member coinsurance. The distribution method, however, accounts for the impact of the maximum daily benefit. The 10 percent member coinsurance effectively has no impact on benefits paid for the 120 percent utilizers, because charges net of coinsurance still exceed the maximum daily benefit. Consequently, the 10 percent member coinsurance only reduced utilization 3.75 percent ( $3/80 = 3.75$  percent) when using the distribution method.

### POLICYHOLDER BEHAVIOR

A question that often comes up when discussing future utilization is how policyholders will behave when it comes time to use their benefits. Will they price shop and look for care providers that fit within their policy benefits? Or will they look to preserve their benefits as long as possible? A byproduct of the distribution method is the underlying analysis of billed charges, which can shed some light on policyholder behavior.

A distribution of billed charge utilization that shows a high concentration near 100 percent, but very few above 100 percent, could indicate that policyholders price shop and actively look for care providers that cost less than their policy benefits. If this pattern persists when looking at multiple time periods, this may further strengthen the hypothesis of policyholder price shopping.

Similarly, if the distribution of billed charge utilization does not change much over time, and is not concentrated near 100 percent, this could indicate policyholders attempt to preserve benefits.

### CONCLUSION

The trade-off between simplicity and accuracy is something actuaries will always need to consider, particularly as the long-term care insurance industry matures and pays more attention to projected utilization. While in some instances the additional degree of accuracy of the distribution method versus the average utilization method may be minimal relative to the added complexity, in other instances the distribution method may produce materially different results. The analysis of utilization using distributions can also enhance an insurer's understanding of policyholder behavior and assist in the pricing of new product features. ■



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# A Neurologist's Deep Dive Into Insurtech

By Dr. Anitha Rao

**L**istening to Jane's story was painstaking. Her husband had visual hallucinations for the last three years. Every night he would scream out and sometimes hit Jane unintentionally during a fit of agitation. As a family caregiver, Jane was tired, overwhelmed, but most of all saddened by the fact that she was slowly losing her husband of 45 years. She was considering placing him at a nearby memory care unit and was coming to my clinic as a last resort.

My job as a dementia neurologist is to gather the neurological history, formulate a diagnosis, and carefully prepare a care recommendation plan. It usually takes me two hours to sift through all the intricate details of each patient's case. First I meet with the family to review the timeline of behavioral changes, then I study the patient's brain MRI, and then finally meet with the patient and family to discuss the diagnosis and next steps. It is commonly assumed that once you have a diagnosis of dementia there is nothing that can be done. In fact, it's quite the opposite. Clinical research has shown that appropriate care management strategies can slow down the process of dementia, thereby allowing seniors to age at home. In at least 10 percent of dementia and cognitive impairment cases, symptoms are reversible.

I recently learned that there are only 600 dementia neurologists like myself across the United States that provide an expert diagnosis and care plan, and approximately 1000 dementia neurologists globally. Research estimates there are roughly 10 million cases in the United States with dementia, thereby suggesting that neurologists like myself would have to see 17,000 patients individually to make a difference.

Dementia is costlier than heart disease and cancer, and limited access to dementia specialists prevents access to proper care, thereby prompting patients to file an accelerated claim and impacting bottom line for insurance carriers. In fact, a prospective 18-year study showed that providing family caregivers with expert care recommendations delayed LTC facility placement on average of 557 days.

The *New York Times* recently published an article to highlight the need for more geriatric neurology education in medical schools to meet the needs of tomorrow's societies. The Global Burden of Diseases, Injuries, and Risk Factors Study<sup>1</sup> reported the number one cause of disability and mortality worldwide in 2015 was neurological. The study, which was supported by the Bill and Melinda Gates Foundation, concluded that due to expanding aging populations, conditions such as dementia and stroke will be the most impactful on societies worldwide, further supporting the need for geriatric neurology education.

Despite this alarming trend in neurological disability, the supply of neurologists continues to dwindle. Last year, Neurocern Inc., created an index score to represent the supply-demand mismatch between the number of cases of dementia projected in 2025 by U.S. state compared to the number of projected neurologists by location. The research titled, "Dementia Neurology Deserts,"<sup>2</sup> was coined after the familiar concept of "food desert" and highlighted specific states. Wyoming had the largest index score, representing an area where patients and families are most in need for specialist care. Current wait time across the country to see a dementia neurologist is more than six months. Poor physician reimbursement in geriatric neurology remains one of the main barriers to attract medical students into a very high demand field. Until Medicare reimbursement provides sufficient reimbursement for fields such as neurology and geriatrics, physician supply will continue to be low.

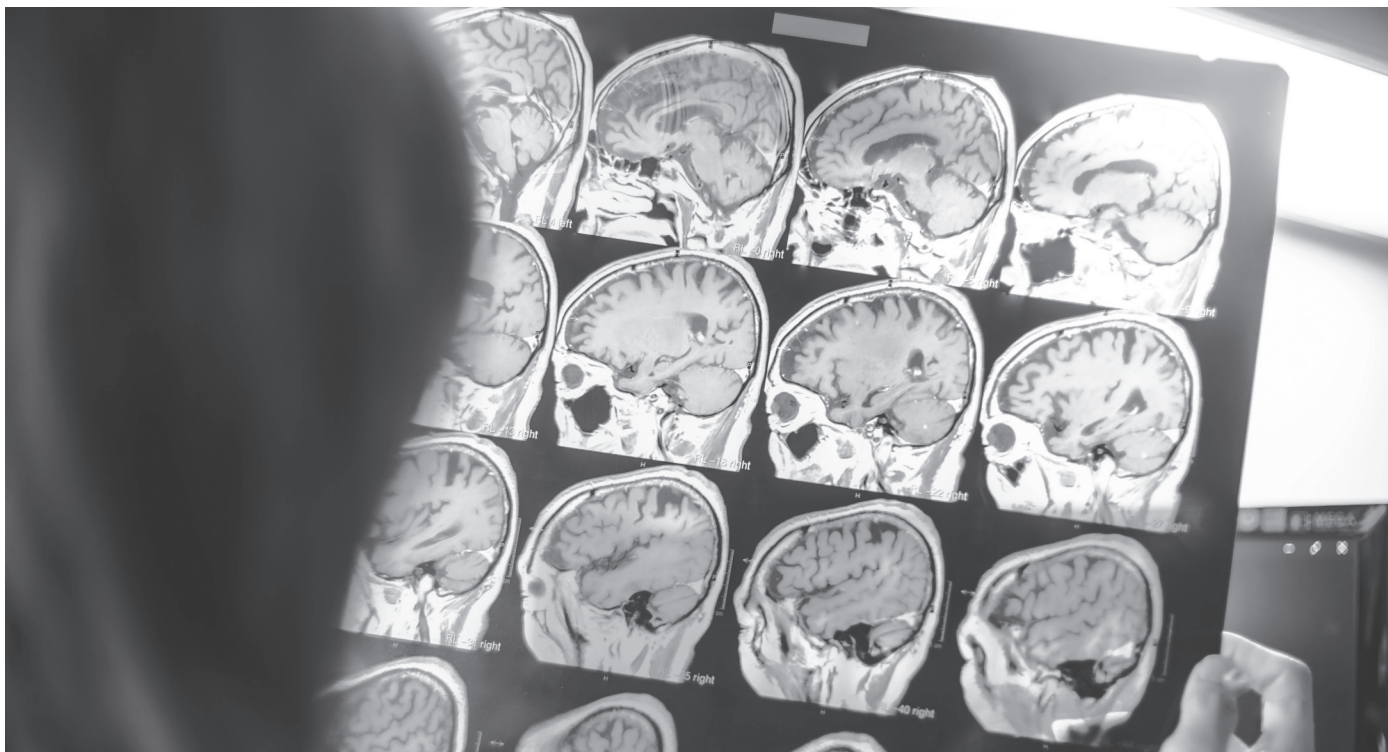
## THE IMPACT OF DEMENTIA ON THE INSURANCE BUSINESS

Studying insurance has been fascinating as a neurologist because the mind of a neurologist and actuary are very similar. We both make predictions based on a current set of assumptions. The following are a set of assumptions and macroeconomic trends to consider for any actuary in the space, as these findings will have implications in pricing, reserving, and cash flow testing.

### Diagnosis

In neurology, dementia is used as a higher-level term to mean someone has difficulty maintaining their activities of daily living (ADL). Under the term dementia, there are many subtypes of the disease. The most common subtype of dementia being Alzheimer's disease. Other subtypes include Dementia with Lewy body, Vascular, and at least fifteen other variations. Most brain autopsies have shown that 75 percent of cases are mixed pathologies. Correct identification of the dementia subtype is important, as care recommendations, mortality, and estimated cost of care differ among the various subtypes of dementia.

Current methods to evaluate cognitive dysfunction in a benefits eligibility assessment skim the surface in terms of diagnostic capability. Most long-term care insurance (LTCI) carriers use a mental status exam called the MMSE, MOCA, clock-drawing,



or verbal recall. These tests are helpful in understanding if the person has normal aging or dementia, however they do not delineate the subtype of dementia or provide any sense of risk, or how to care for someone.

Clinical research and data from the Alzheimer's Association estimates that 50 percent of all dementia cases are undiagnosed. I witness this first hand when a hospital consult for delirium in a patient with a hip fracture turns into undiagnosed dementia. Usually the story goes something like, Grandma lost her balance and fell because she wandered into another room during the family holiday party. Further probing during my clinical interview reveals that Grandma has been unable to keep up with her ADLs for years and her primary care physician (PCP) attributed her changes to normal aging.

For families, ambiguous terms to Grandma's aging translates into not knowing how to care for Grandma. Assisting dementia patients in ADLs is cited as the number one priority for eager family caregivers who are looking for ways to help their loved one. Without assistance from the health care system due to neurologist shortages, many family caregivers turn to the internet to do hours of searching with "Dr. Google," or turn to close friends for anecdotal solutions. For LTCI carriers, assisting family caregivers represents an opportunity to engage, educate, and bend the cost curve.

The 50 percent of undiagnosed dementia patients may also represent misclassified risk in a block of business. As with the earlier case, Grandma could file a claim for arthritis from her hip fracture, however may have undiagnosed dementia thereby representing higher claims paid as the duration of claim payment will be longer for dementia claims. As a neurologist taking a deep dive into insurance, I've realized that many carriers use a univariate model of accounting dementia risk in their block of business. There's a real value and opportunity for insurers to improve their assessment of dementia costs using a multivariate model that can adjust for the complexities around diagnosis and risk.

#### **Non-disclosure**

Non-disclosure rate of diagnosis to the patient and family is high. On average 45 percent of all doctors across the United States do not disclose the diagnosis of dementia to their patients. Qualitative research around nondisclosure performed last year by Neurocern Inc., matched what many other researchers have shown. Non-disclosure is attributed to physician attitudes around dementia, time constraints, and operational challenges of medical practice. When was the last time your doctor spent two hours to discuss a diagnosis and care plan with you or someone you know? Until last year, Medicare did not reimburse physicians to make a dementia diagnosis and care plan, thus physicians were not only emotionally disincentivized, but also financially disincentivized. Non-disclosure from physicians also translates into higher claims processing costs as many physician notes may be incomplete, and not reflective of true need.

Research has shown that 49 percent of dementia patients have five or more other chronic medical conditions. When patients have other chronic conditions, such as diabetes or chronic kidney disease, dementia exacerbates the costs of those conditions. For example, patients with diabetes and dementia have an 81 percent increase in total diabetes spend per year compared to non-dementia patients with diabetes. As a physician, I've often wondered why this is, and have hypothesized that many of these chronic conditions require self-management. As you may imagine, self-management instructions may not necessarily be followed by someone who has cognitive impairment.

### Challenges Around the Cure

The latest headlines in 2018 have shown that many big pharmaceutical companies are pulling out of neuroscience, and specifically from finding a cure for Alzheimer's disease and dementia. Pfizer recently announced a departure from the market, and in January 2018, a prominently funded biopharmaceutical company reported failed clinical trial outcomes to shareholders. Many of the same challenges around diagnosis, social stigma, and limited access to specialists impact Big Pharma's direct operations, bottom line, and race to find the cure. The grim future around finding a cure for dementia further highlights the need for a proactive care management tool to mitigate future LTC costs.

### THE FINANCIAL OPPORTUNITY FOR INSURERS

In medical school, I was fascinated by high impact diseases—diabetes, heart disease, and dementia. After my medical school training, I went on to pursue a degree in Medical Anthropology to study morbidity and mortality trends of the world's biggest predicted diseases in 2025. Dementia topped every predictive model as the number one cost to economies worldwide.

The 1984–2011 ILTCI Study by the SOA<sup>3</sup> estimated that dementia accounted for 40 percent of all historical claims paid by long-term care insurance companies. As dementia and other neurological conditions continue to climb the charts for disability and mortality worldwide, global insurers and reinsurers may want to adopt new strategies and technologies to engage, predict, and manage the growing costs around neurological claims.

Recent news regarding LTC reserve charges from General Electric highlight the need to better characterize current claims and predict future cost. The NAIC LTC working group has been charged to develop new guidelines around principle based modeling for the industry. One main point actuaries may want to consider is to further characterize current dementia/cognitive claims by subtype as each has varying degrees to cost of care, mortality and duration. In some cases the costs of care are five times more.

### A NEUROLOGIST IN INSURTECH

Inspired to help patients and families like Jane at a larger scale, I began focusing my career at the intersection of neurology, macroeconomics and innovation. You see, if Jane had access to a custom set of instructions on how to minimize her husband's hallucinations during the early phases of his disease, she may have been able to keep her husband at home longer, thereby delaying the claim.

Four years ago, I began a journey into the technology and innovation sector. I was inspired to take the knowledge base of 600 neurologists and use predictive analytics to impact millions of patients and families. Neurocern Inc. was born around the mission to engage and assist families with expert digital care recommendations. The name "Neurocern" was developed from taking family caregiver "concerns," to then help "discern" what to do.

I'm often asked which is harder—neurology or business. I've found that it all comes down to one thing: risk. In clinical medicine, often the practice of medicine involves mitigating all risk. Once a diagnosis is made, doctors follow pre-determined guidelines and protocols to "do no harm" and avoid all risk. In business, it's all about taking calculated risk, trusting your intuition, and aligning with the market to find win-win strategies.

Dr. Anitha Rao, MD, MA, is CEO and founder of Neurocern Inc., a web-based disease management platform that helps insurance companies reduce and manage the growing costs of their neurological claims by engaging claimants and families with real-time digital assessments and automated care plans. ■



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April 19–20, 2018 • Miami, FL

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