The Long-Term Care Medical Symposium

Views From Experts Outside of the LTC Industry

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The Long-Term Care Medical Symposium (the "Symposium") was a one-day conference intended to extract the thinking of leading experts on historical and future trends that will influence future long-term care insurance (LTCI) claims experience. The Symposium focused on ideas from experts outside of the LTCI industry for the explicit purpose of gathering fresh perspectives on the issues that LTCI companies face. The Symposium covered critical topics, such as the expected timing of new claim onset, length of claim, life expectancy and the cost of care. A few individuals from the LTCI industry were present to assist with keeping the discussion relevant.

The agenda for the Symposium included trends in cognitive impairment and Alzheimer's, medical advances impacting LTC experience, demographic and economic trends, the evolution of care delivery, and the role of technology. Appendix A includes a list of all attendees. The format of the Symposium was a moderated open discussion among the external experts. A dedicated note taker documented the discussion in notes that were displayed for all participants to see. Those notes were later circulated to the Symposium attendees to ensure their accuracy. The sections that follow the introduction below contain the formalized version of the notes taken during the Symposium. The sections represent the four broad agenda items of the Symposium, plus a section with concluding remarks.

- How will Alzheimer's and other dementia impact future experience?

- How will medical advances for other conditions impact claim experience?

- How will demographic and economic factors impact cost of care?

- How will care delivery change in the future?

- Concluding remarks: key points to consider

The Symposium and this report are not intended to quantify historic or future trends or to be prescriptive or specific about LTC assumptions. Rather, the Symposium and this report aim to provide the LTCI actuary with environmental context for considering morbidity and other macro factors that may impact LTCI experience in the long term. This report introduces the actuary to information and perspectives that could be considered when selecting assumptions and suggests additional reading material that may be further considered.

Introduction

The discussion included 11 experts from the fields of mortality, neurology, caregiving, economics, aging, geriatrics, biodemography and genetics. With a couple of exceptions, all experts were in attendance for all parts of the discussion. All participants contributed to the discussion at various points. This report does not attribute specific material to a specific participant. Rather, the full discussion is captured and relayed as closely as possible. As a result, some parts of the report may appear to contradict other parts on various points. This is likely due to contributions from different participants. The reader can conclude in these instances that there are differing views on this topic among the Symposium panel.

This Symposium and the resulting report reflect the complexity of the factors that influence LTCI claims experience. This complexity emphasizes the importance of considering a variety of factors when setting LTCI actuarial assumptions.

This report includes many highlights that the LTCI actuary may find interesting. As an example, LTCI actuaries may seek to understand how insured population experience relates to general population data. Parts of this report discuss the impact of lifestyle differences with respect to the timing of Alzheimer's onset. Further, actuaries seek to understand how claim experience may change over time. This report discusses the likelihood of a cure for Alzheimer's as well as potential drugs that may impact the aging process. While there are not definitive conclusions included in this report, it is our hope that actuaries will find it useful in expanding their thinking and research when making future projections.

Background and introduction by Shawna Meyer, FSA, MAAA, and Robert Eaton, FSA, MAAA.

How Will Alzheimer's and Other Dementia Impact Future Experience?

Clinical trials are being done to research the possible causes of Alzheimer's. Drugs may slow down the development of Alzheimer's for 40% of patients, but these drugs will not cure the disease. These trials focus on studying the antibodies and creating drugs that may be able to delay the progression of the disease. The majority of Alzheimer's patients are around age 80. Earlier detection is key in the treatment of Alzheimer's. Technology such as MRIs, CT scans and PET scans can help collect data on patients developing Alzheimer's.

Digital pens are pen and paper tests that neuropsychologists use to analyze and develop findings that determine if a patient has Alzheimer's or is prone to developing Alzheimer's. A digital pen can be used to analyze about 40 different measures, such as how long it takes patients to think through a test or how long they keep their pen on paper. Proteomics is the large-scale analysis of proteins, including structure and function.

Currently, the best methods to predict Alzheimer's are family history, PET scans and the amyloid peptide. Biomarkers can be used to predict the risk of a person developing Alzheimer's. An issue with biomarkers is that they must be paid out of pocket and can cost roughly $10,000. If doctors can detect these diseases and apply treatments earlier, then there will be a significant impact on patients with Alzheimer's. However, be careful with the assumption that delaying the development of Alzheimer's is an overall achievement, because this allows for more time to develop other diseases and medical conditions.

Even if drugs are developed to delay the progression of Alzheimer's, there is still uncertainty as to who will be able to take them. The process of developing these drugs is extremely complex and time-consuming, likely making them cost-prohibitive. The majority of patients are on Medicaid, which brings up the question of how these drugs will be paid for.

Now that we are able to more easily sequence people's DNA, there have been big pushes in the field to analyze DNA and determine what DNA markers correlate to the risk factors associated with Alzheimer's. This can be seen, for example, when looking at multiple genes and changes in genetic information. As researchers start to better understand this genetic information, new findings can be expected in the future.

No matter what is done with the time frame of Alzheimer's diagnosis and its connection to the impact on activities of daily living (ADLs), there is still a cohort of Alzheimer's patients who will get to the stage of needing their insurance benefits. Every patient will reach the point of meeting two out of six ADL requirements and therefore start receiving insurance benefits. Also, every patient will get to the point of severe cognitive impairment that requires supervision. Current potential treatments will delay, not avoid, claims. It is important to note that behavior changes cannot be detected by biomarkers. A lot of money is spent on delaying the progress of Alzheimer's, but there is not a lot being spent on the research of behaviors. Currently there are two medications on the market for Parkinson's and pseudobulbar affect, or PBA. These medications are very expensive and do not seem to work for Alzheimer's patients. There has also been an increase in psychiatric issues of Alzheimer's patients.

PET scans combined with family history, genetic testing and other biomarkers allow patients to be selected in a more pure way. Alzheimer's is more common in African-Americans than Caucasians. Protein signatures are most relevant. For example, there are roughly 15 to 20 proteins that indicate Alzheimer's. Another advantage to looking at protein signatures is that a large number of people can be screened. An issue with PET scans is that you cannot screen a large number of people. Another issue is that most patients are already showing signs of Alzheimer's before a PET scan is performed.

Adverse selection comes into play in purchasing LTC products. People who buy LTC insurance are those most likely to need it. Adverse selection could increase if there were more advanced ways of detecting Alzheimer's at an earlier stage, making it more difficult on insurance companies. Because of this, there has been an increase in combination

products that combine LTCI with life insurance and/or annuity products. The purpose of this is to attract people who do not think they need these types of insurance and therefore increase the number of insureds.

There has not been a huge focus on predictive modeling in Alzheimer's research. Researchers are trying to expand the population-level data available for research studies, such as the "All of Us" initiative[1] and the Million Veteran Program.[2] These initiatives aim to provide one of the largest databases for more comprehensive and informative research studies.

The number of patients with Alzheimer's is expected to double from 5.5 million to between 11.5 million and 12 million by 2020. If we see a five-year delay in people developing Alzheimer's, the number would stay flatter over time. Assuming there is a breakthrough within the next two years that delays the onset of Alzheimer's by five years, we would see 5.8 million Alzheimer's patients in 2030 and 6.6 million in 2040.

Another thing to consider is whether drugs such as Aricept (donepezil), rivastigmine and galantamine will have an impact on the behaviors of Alzheimer's patients. It is already known that these drugs do not cure Alzheimer's, but they may delay the progression. They may prevent the development of some of the behavioral issues seen by typical Alzheimer's patients. However, once the behaviors begin, the drugs will not have an impact on them. There is a bit of uncertainty with the new drugs that will enter the market. If Alzheimer's patients do not develop some harmful behaviors as early as they have in the past, there can be an increase in the amount of time that they can be cared for within their homes.

Two-thirds of Alzheimer's patients are women. This brings up the question of who the future caregivers will be. Of women over the age of 65, roughly one in five have Alzheimer's. Of men over the age of 65, the chances of developing Alzheimer's are one in nine, or 11.6%. The fact that women live longer is only a very small part of the component as to why they are more susceptible to Alzheimer's than men. If all else is held equal, women are more likely than men to develop Alzheimer's. *[Note: for other perspectives on this please consult The Alzheimer's Association Facts and Figures[3]]* The percentage by which women than men are more likely to develop Alzheimer's cannot be quantified. More research is currently being done to study this phenomenon. If women have hormone replacement directly after they go into menopause, this could aid in the development of dementia later in life. This is not known to be completely true. Countries such as Iceland and England are asking older citizens for information regarding this topic so that a more in-depth study can be completed.

If there is a breakthrough in the research of the development of Alzheimer's, then there would be a minimum time frame of 10 to 15 years to see the exact benefits of a new treatment. It is only beyond that time frame that researchers can begin to identify these reasons. There is a downside to biomarkers from a cost perspective. A positive is that they allow researchers to make quicker assumptions. Overall, biomarkers will be a significant aspect in developing a cure.

Trying to predict the likelihood of a complete breakthrough is almost impossible to do. There has been very small progress made in the understanding of the biological components of Alzheimer's patients. The research is very slow in figuring out why these components exist in the brain.

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[1] All of Us Research Program, *National Institutes of Health*, https://allofus.nih.gov (accessed January 24, 2019).
[2] Million Veteran Program, *U.S. Department of Veterans Affairs Office of Research & Development*, https://www.research.va.gov/mvp/ (accessed January 24, 2019).
[3] Alzheimer's and Dementia Facts and Figures, *Alzheimer's Association*, https://www.alz.org/alzheimers-dementia/facts-figures (accessed January 24, 2019).

Hypothetically, if everyone aged 85 is destined to have Alzheimer's, higher life expectancy is likely the primary driver of higher overall Alzheimer's incidence. If people avoid other health conditions, such as heart attack or stroke, they will live long enough to potentially develop Alzheimer's. Medical professionals and general physicians have done an outstanding job at prolonging and treating diseases. This is evident in the fact that life expectancy has increased so much.

Statistics show that baby boomers will be less susceptible to developing Alzheimer's. One reason for this could be their desire to live healthier lifestyles and overall taking better care of themselves compared with previous generations. This may reverse with the next generation as a result of obesity. Increased obesity rates in younger generations can be attributed to sedentary lifestyles. Metabolic syndrome is a combination of metabolic issues, diabetes and cholesterol. This has a huge impact in determining why an individual has a higher risk of developing Alzheimer's. If people avoid another health condition, such as heart attack or stroke, they will live long enough to get Alzheimer's. Baby boomers are less likely to get Alzheimer's because a healthy lifestyle delays the onset.

From an environmental standpoint, there are a lot of things that researchers do not know how to integrate into their studies. Some of these factors include lifestyle, environment and diet.

Some believe that there may be a decreased age-specific incidence in Alzheimer's moving forward. Others see the incidence, prevalence and severity of Alzheimer's rising dramatically in the coming decades—in part because of the reduction of the risk of death from other fatal diseases. Factors that overlap with cardiovascular risk factors include diabetes, smoking, depression, cognitive inactivity, physical inactivity, midlife hypertension, midlife obesity and another half dozen factors that people have hypothesized. There is a lot to consider when medical assumptions are altered. For example, some factors can be modified, such as diabetes and obesity, whereas others cannot, such as a person's age. A concern can be that people may die of or contract another disease or medical issue before cognitive impairment. Early detection gives the opportunity for families to prepare to care for their loved ones at home.

The overall trend for Alzheimer's may go down in the future, but when the population is segmented, different results are obtained. U.S. counties with the top 15% of income see much lower mortality rates from Alzheimer's than those with the lowest 15% of income. People who are insured are more likely skewed toward the top 15% of income.

The largest cause of death in the U.S. is heart disease, because it is often used as a default cause of death when there is not another more obvious cause. Alzheimer's is rarely written down as a cause of death.

There seems to be a clear correlation between Alzheimer's patients and socioeconomic status. People who have a healthy diet, exercise and are socially involved have similar risks in developing Alzheimer's. However, the onset of Alzheimer's is significantly delayed. The difference in high and low socioeconomic status is the most important in delaying Alzheimer's, and this disparity is getting worse. Researchers continue to see the gap widen between social classes, therefore making the problem worse rather than better. Socioeconomic status drives many medical issues, which is underrecognized in the data that are analyzed. For example, one needs a visit to the doctor's office in order to be diagnosed, and not everyone has equal access to this service.

Data show that the percentage of 85-year-olds who first develop severe cognitive disorders is expected to decrease 10 years from now because of the possibility of delaying them. The people who need the most help from wellness programs are those who are least likely to use them. There is new research that shows there are some factors in the inflammatory and immune system that trigger Alzheimer's. There was also a trial conducted regarding vaccines, but it was stopped early due to deaths within the trial. Since this, there have not been any new vaccines released for testing. These types of drugs are far from development.

The Alzheimer's Association has given $435 million to fund research. Pharmaceutical companies are hesitant to start new Alzheimer's research because of the expense and little information regarding the cause of Alzheimer's. A lot of pressure has been put on the drug industry in recent years. The Alzheimer's Association has asked for $2 billion in funding for research, with the claim that it will save the government money in the future by reducing expenditures on Medicare and Medicaid.

A clinical trial was conducted over a six-year timespan that revealed people who start taking Aricept early and take it consistently can delay the onset of Alzheimer's by two years. Clinically, it is difficult to say exactly who will benefit from this drug. There is no clear consensus on whether this drug is even helpful, but it is currently the best that researchers have to offer. An issue with this research data is that some patients do not see any changes, so they stop taking the medication. This brings up the possibility that patients could have been worse off if they had never taken the medication in the first place. In other words, the medication could help delay the onset of worsening symptoms but not aid in making a patient's condition better. This makes the data not as quantifiable compared with other drugs.

It is almost impossible to say how much of a role Aricept, rivastigmine and galantamine play in the decrease in incidence of Alzheimer's. Drugs do not seem to have much of an impact on prevalence or incidence.

Two U.S. studies provide encouraging results on the long-term trends in the prevalence rates for severe cognitive impairment and the incidence rates for dementia. The first, an SOA-sponsored analysis of the National Long-Term Care Survey, indicated that the age-adjusted prevalence rates for severe cognitive impairment (including Alzheimer's dementia) declined by more than 40% from 1984 to 2004.[4] The second, an analysis of dementia incidence rates in the Framingham Heart Study, indicated that the incidence of dementia (also including Alzheimer's dementia) declined by more than 40% between the period of 1977 to 1983 and the period of 2004 to 2008 among people with a high school or greater level of education. There appears to be evidence from the Health and Retirement Study for a continuation of these trends.

Contrariwise, LTCI carriers are experiencing more lengthy claims than they had anticipated. It is too early to tell if this contrary trend will continue. Moreover, any continuation of the declines in incidence or prevalence rates described above is not expected to be sufficient to counter the substantial future increases in the numbers of very old people who are at risk of severe cognitive impairment or dementia. Hence, the absolute incidence and prevalence counts for these conditions will increase substantially over time.

There is a difference between the treatment of cancer and the treatment Alzheimer's because of the nature of each disease. Catching cancer early can make a huge impact on not advancing to later stages. However, even if Alzheimer's is caught early, it is inevitable that the patient will reach stage 4. The only variable that can be affected is the amount of time it takes the patient to get there.

There is a two-year time frame of Alzheimer's disease in the end stage. Stage 4 presumes that patients need continuous care, meaning they have the inability to take care of themselves—for example, eating. This brings up the possibility of tube feeding. There are some unpopular opinions regarding tube feeding, but it is still done throughout the U.S. today. Behaviors are a huge indicator as to what stage a patient is in. Overall, home care results in a better quality of life for a patient compared with nursing home care.

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[4] Stallard, P.J. Eric, and A.I. Yashin. Table 2.16, Long Term Care Morbidity Improvement Study: Estimates for the Non-Insured U.S. Elderly Population Based on the National Long Term Care Survey 1984–2004. *Society of Actuaries*, July 2016, https://www.soa.org/research-reports/2016/2016-ltc-morbidity-improvement-study/ (accessed January 25, 2019).

There are seven stages of Alzheimer's, but they can be simplified into early, middle and late, with time frames of two, six and two years, respectively. In the early stage, a patient will have memory difficulties, will not be able to drive, and will have difficulties with some higher-level functions, such as taking medications or making a meal from scratch. This stage can begin as early as age 65 and usually runs a two-year course. Doctors are seeing more early-stage patients. In the middle stage, a patient needs more functional help. For example, patients cannot remember daily tasks, such as taking medication. Some behavioral symptoms are also seen at this stage and can lead to wandering. These patients may require adult day care, or they may be left at home during the day but not at night. Supervision needs can vary from patient to patient. This is the longest stage, at roughly six years. The last stage runs for about two years.

The longest claims seen are cognitive claims, and there has even been an increase in the trend of memory care. The trend may be less for the increase in earlier behavioral problems, but this could be attributed to selection bias. A severe cognitive impairment-based LTCI claim would likely occur somewhere near the latter portion of the middle stage. Therefore, the average Alzheimer's-related LTCI claim is longer than two years.

Another important element in the treatment of Alzheimer's patients is the caregiver. A patient can be delayed in needing care because a spouse may be able and willing to be the caregiver. If there is no spouse, the need for a caregiver is usually seen within the middle stage. Alzheimer's being diagnosed earlier is the single largest gain that can be hoped for. This allows for a comprehensive plan to be made regarding cardiovascular health, exercise and diet. There have not been many changes in the end stage of Alzheimer's patients.

Nonmedical drivers may be more responsible for increasing the length of a claim. Physicians want patients to receive care and payment from insurance companies, so it is important to notice the "buzzwords" used in order for a claim to be paid. LTC policies are usually two to three years. Insureds are running out of money in their policies because they use too much of it too soon. When they need the money the most is when the policies run out. Physicians are allowing patients to qualify a bit too early, and causing them to run out of funds when they need them the most.

How Will Medical Advances for Other Conditions Impact Claim Experience?

Functional impairment may not have anything to do with cognitive impairment. Traumatic brain injuries and other forms of trauma are seen as having a 50% to 60% primary diagnosis for dementia, and the other 40% are younger people with traumas. Trauma is a small issue in terms of LTCI. Younger people with traumas are unlikely to have LTCI, so this does not contribute much to the morbidity rate of the insured population. Intervention has had an enormous impact on treating heart disease, though doctors still see a lot of heart failure patients.

These medical conditions do not operate in isolation. If there is a breakthrough in other medical conditions, it could increase the risk and severity of Alzheimer's. Therefore, these diseases should be considered not in isolation but in combination. The progress in reducing heart disease, cancer and stroke has caused a dramatic increase in the onset of Alzheimer's disease. Aging is an underlying factor in all of these events. There has been a large infusion of money going into aging biology. The goal is to create longer, healthier lives for all by slowing the biological process of aging. This can be done by making cells divide less. Researchers at Mayo Clinic are attempting to cure the senescent stage that cells go into when they divide.

Depending on the development of new effective drugs, it could be seen 10 to 15 years from now. Billions of dollars are being put toward this research, and it will have a direct impact on LTC business and the quality of life of Alzheimer's patients. Five to 10 years ago, researchers did not anticipate seeing this drug so soon.

Research has really taken off by looking at the genes that could contribute to a person reaching an old age while remaining relatively intact. Superagers are considered those to be over the age of 80 while operating at the level of someone the age of 50. When they do die, they're in the same shape as someone with Alzheimer's, even though they do not have Alzheimer's. The money for this research comes mainly from the private sector in the form of companies, stocks and public offerings. The National Institutes of Health has researchers determining certain risk factors that are linked together regarding the biological factors of aging. Mortality associated with diseases of aging is relatively high for men, whereas women live with these diseases for longer periods of time. Researchers have yet to come up with a reason that women live longer with these diseases than men.

Obesity has been on the rise in recent years. However, the obesity epidemic has yet to play itself out, because there are obese children who have not yet experienced the delayed negative health effects of their early acquisition of body fat. There has been an increase in both strokes and mortality in people aged 20 to 30. It is predicted that obesity will level off in the coming years due to obesity saturation. This means that just about everyone who can become obese will have already done so. These cohorts of obese children have risk factors that have not been seen before. Obesity leads to issues such as cardiovascular disease and joint problems. Doctors are unsure of how these issues will play out in regard to LTCI. Something to consider is whether obesity will reduce the need for LTCI because it causes death at an earlier age. Relying on historical information when looking at this data can be problematic. It would be more beneficial to make forecasts of these health issues based on the observed and measurable health of younger cohorts alive today. It would require looking at data for people aged 55 today to get a sense of what will happen to 65-year-old people 10 years from now.

There is a height and weight table to see if a person fits within a preferred or standard category in the underwriting process of LTCI. An issue is that a person can become obese once the policy has already been written. Underwriting obesity for LTCI is not necessarily straightforward.

Policies such as wellness platforms and sugar taxes have been made in order to give people the opportunity to make healthier decisions in regard to the food they eat. Taxing has had little to no impact on the health choices people make. The posting of calories on food items is meant to make people more aware of what they are eating, but it has not had much of an impact. This is due to the fact that those who should be paying attention to this information are the least likely to. Depression and other psychiatric conditions also come into play when looking at obesity. Wellness

platforms have the most impact when long-term personal coaching is combined with a comprehensive plan to motivate an individual to live a healthier lifestyle.

Obesity was at 20% 50 years ago, and now it is just above 60%.[5] Diet recommendations are beginning to change. A person who is not obese and insured now probably will not be obese later either, because the issue is starting to be addressed now. Epigenetic factors can lead to obesity being passed down through generations. There are also behavioral and environmental factors to consider when looking at obesity.

Providing services within the home is less expensive than a nursing home. If a person is ADL dependent and benefit eligible, the policy will cover services in a person's home. An insurance company may offer benefits to make changes to a home to help the patient stay there longer but may not be doing a great job of educating caregivers and the patient about the various options available. Some policies provide caregiver training, but people are usually not familiar enough with their policies to even know whether such training is a benefit that is offered. Insurance companies are not doing a great job at recommending these benefits.

An adult day care can in some cases be used as a substitute for a nursing home. If a patient goes to an adult day care, there is more socialization, which can help maintain brain functions.

If cancer is caught in the earlier stages, there is evidence of seeing improvement. With Alzheimer's, it can be crucial to catch it before functional disability to treat it correctly.

A liquid biopsy is the idea of detecting signatures in the blood stream of cancer patients before the cancer would have been detected otherwise. A CancerSEEK test from researchers at Johns Hopkins is a blood test attempting to detect eight different types of cancer. Five of these eight cancers do not currently have an effective way of being screened. There is a growing field in medicine to determine how to properly choose drugs for patients based on their genetic makeup. Different patients respond differently to certain drugs simply because of their genetic makeup.

The field of biomarkers is moving in the direction of identifying a bank of biomarkers that can be used to inform predictions about survival to later ages. These tests utilize saliva, and they can be used to place people into the tails of the survival distribution (e.g., longer-lived or shorter-lived population subgroups). In the next year, these will be available directly to the consumer and be a bit more focused. A patient may want to get this done to see which side of the distribution they find themselves on. These tests are desirable because of the personalized information. Some researchers consider the science behind these tests to be very strong, making it mainstream. Being on the right tail indicates a long life, whereas being on the left tail indicates a short life. A person who is healthy and falls on the right side of the distribution is likely to live a long life, perhaps with lower overall medical costs. If a person is on the right side of the distribution and anticipates having high medical costs, it can potentially lead to financial hardship. The cost of these tests will go down as demand for them rises. It is important to note that these tests do not give an exact prediction but rather a probability of being in either tail of the survival distribution.

LTCI does not pay for dialysis itself, but a patient on dialysis may qualify for a caregiver. Hemodialysis is simpler than peritoneal dialysis. If the issue of frailty arises in a patient, a doctor may indicate that the patient has heart failure or another chronic illness that results in being put into a facility. There is also the risk of falls that can result in short-term disability.

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[5] Paragraph 3, Obesity in the United States, Wikipedia, *https://en.wikipedia.org/wiki/Obesity_in_the_United_States* (accessed January 25, 2019).

There are three cohorts of end of life. Cliff is the end stage of cancer, where a patient will live in hospice for a couple of weeks. Alzheimer's is a slow, progressive disease. A geriatric claim results in a patient's overall trajectory going downward. The patient will never completely recover, will experience various peaks and valleys, and is more susceptible to future illnesses and falls.

Assumptions made 25 years ago have different results from those anticipated. Cultural changes in the way parents expect to be cared for have happened. There has been a massive development in nonprofessional caretakers. Technology is starting to be relied on for care in the absence of a person. Robotics can cost $6,000 today but should come down within the next five to 10 years. There could be technological advances in the future that are not anticipated today.

How Will Demographic and Economic Factors Impact Cost of Care?

Going back 30 years, the growth of the medical services labor force was in the single digits. Today, it is in the double digits. The business sector is in the top three paid groups of the nine groups, according to the Bureau of Labor Statistics. Hospitals are a key driver to the increase in the medical services industry. The Affordable Care Act has also had an impact on the growth. Overall, there is a shortage of workers throughout the economy. The 25- to 34-year-old age group has not seen a recession in their professional careers. There are 45.3 million Americans between the ages of 25 and 34, easily surpassing the 43.2 million aged 15 to 24 and 40.9 million aged 35 to 44. The 18- to 24-year-old age group saw higher education costs, which can be seen as a constraint.

The labor market for nursing home care has been lagging because wages have not increased as they have in the hospital industry. They struggle to attract people with the necessary skills and interests due to the low wages that they offer. Human capital can take time to attract in this field because people want to feel a connection with their careers.

Robots could potentially take away the backbreaking part of the job that has historically burned out caregivers. This can help shift the caregiver's focus to actually caring for the patient. Nursing homes could market their job opportunities to their local community colleges to try to increase the supply of potential caregivers. The bar is set pretty low for a caregiver because the pay is usually $8 to $9 an hour. The labor market can expect a continuous shortage of caregivers.

The number of children willing to take care of their parents is declining. These children lack both the willingness and capability of caring for their parents. Millennials are noticeably more interested in this type of care because they have seen generations surviving and needing this type of service. However, millennials have been geographically pushed away from their parents due to the current economy. This brings up the issue of practicality rather than willingness, due to the economic, financial and geographic hurdles facing this generation. Millennials may also be more inclined to buy LTCI because they have seen older generations needing this type of care.

People currently aged 40 to 50 face the challenge of how to care for their parents. This leads to more people needing nursing home care. This causes prices to increase and salaries to increase and, therefore, results in more people willing to work. If there is some kind of economic failure and the market does not adjust as such, there will be a shortage.

Younger generations are looking for alternatives to college because of the high cost, leading to large student debt. There should be a focus on trying to develop programs that target these people. For example, there could be some level of training where people receive certificates that increase their salaries. Some people have proposed the idea of student loan forgiveness for senior care. However, there is a trust issue with this, because previous similar programs have fallen through. Students are less likely to buy into a student loan forgiveness program because they have seen them fail in the past. There is no security that the money will be there 10 to 15 years down the line.

There are some opportunities for public policy to interject in this situation. A company could hire a person with the promise that it will help pay for tuition. Another possibility is for a company to offer student loan relief to its employees.

Consumers cannot pay the $9,000 to $10,000 a month for the cost of care. Due to this fact, there is little reason to believe that the cost of care will increase further. A typical caregiver is in charge of anywhere from one to 30 patients, with each patient needing an hour of care per day. The time of day that a patient will need care is unpredictable. The costs associated with caregiving are much more than just the hands-on assistance—for example, the facility, room and board, and constant surveillance of making sure a patient does not wander away. There are regulatory requirements for staffing. A facility can go above the staffing ratio, but not below.

The cost of these facilities is not expected to go up too much in the future. They cannot charge more because there would not be enough people who could afford it. We don't expect to see any changes to the regulatory staffing model. For assisted living, there is no staffing ratio, making nursing home facilities the more stringent option. There is a ceiling on what facilities can charge people. If patients cannot afford care, they can be taken to Medicaid nursing facilities. There are very few available, because it is hard to generate revenue from them.

Adult day cares are facilities where an individual can be dropped off for usually eight to 10 hours. Transportation and meals can be included. An average cost per day is $20, but it depends on what services are offered. The cost can be much higher if more skilled care is provided. Most facilities are nonprofit, so they are subsidized. A lot of adult day cares offer services for people in the early stages of dementia who are still functional and require less supervision. Costs can be significantly lower if the transportation does not have to be provided by the day care center. It could be helpful if a family member would provide transportation rather than the day care itself. These programs keep the patient awake, alert and engaged in socializing with other people. Facilities can group together patients with similar cognitive functions in order to encourage brain stimulation.

From an insurance standpoint, few adult day care claims are seen. There is a lot of cost variation with adult day cares depending on the types of services that they offer. For example, a patient who needs to take medication requires a higher-skilled worker to distribute the medicine. Dementia patients could really see a benefit in adult day care because it allows them to socialize with others while they receive appropriate cognitive care at the same time.

Some adult day cares are nonprofit because they are good for the community and can be advertised.[6] Adult day cares can also be private for-profit or government-sponsored. There is a price point where adult day cares can tip over into the range of other high-cost care services. An adult day care center has to have a low enough rate when compared with other care services to make it attractive to consumers in the market.

The generation receiving care right now is focused on saving money. They have been hurt with lower interest rates and do not want to spend their savings. There is a new generation that may not have a robust savings when they get to the same age.

The cost of a facility is a big factor in determining what the customer pays. The consumer price index for nursing homes has been behind that of hospitals. Providers, insureds and individuals find themselves in a triangle of medical costs. Currently, the market is in a low-inflation environment. Medical inflation is running 2% to 3%, which is a little bit above the rate of other products.

Conversations need to be had between children and parents to prepare for the circumstances of needing care at an older age. Claims are often handled by the family members, not the insured. Most of the time, the family members do not understand the benefit triggers and what the policy provides. One can assume that these conversations are being had, but these are long-term events. A financial planner can be helpful throughout these conversations. There are a lot of moving pieces within these conversations that go beyond care—for example, what should be done with the house of an elderly person who can no longer take care of it.

There is a slight spike in claims after LTCI premium rate increases. This implies that children could be influencing their parents to handle things differently. Providers also help file claims, even more so than the children of the insured.

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[6] Paragraph 6, What Are Adult Day Centers? *The Senior List*, https://www.theseniorlist.com/adult-day-centers/ (accessed January 25, 2019).

Cultural attitudes regarding elderly care have changed over time. Some people have the means to pay for care but simply do not want to lose assets and instead rely on Medicaid. There are several options of care that have come into the market within the past 20 years. These options can be expected to improve even more in the future. Parents are starting to realize how busy their children are and do not want to burden them. Generally, there has been an increase in children buying policies for themselves as claims for their parents come through. In one survey, 80% of policies purchased were triggered by previous family experiences.

How Will Care Delivery Change in the Future?

There is a lot of private equity money being invested in the development of technology that allows homes to be safer for patients. This technology can learn the routine of a patient and warn the children if it seems that the patient is off of the daily routine. The sophistication and convenience of this technology is evident in how accessible it is to the children of patients. There have even been advances in more simplistic technologies, such as pill dispensers. Smart refrigerators can detect if the door has not been opened in a while and what food is inside. Stove burners can have timers that will turn off automatically after a certain amount of time if a person forgets to turn them off. Uber-like transportation systems can aid in the lack of independence that people feel once they are unable to drive themselves around.

Startup companies have gone into this line of business. Robots can do the heavy lifting that an older person is no longer capable of handling alone. Some say that a human will always need to be involved in the caretaking of the elderly. Looking to the future, patients can hope to see a more targeted delivery of home care through the use of a mobile app.

LaQ intuition robots are designed to interact with people to make them more active. Some can have cameras or follow the patient around. These are designed to make patients feel more comfortable by tracking them and providing more accurate information to their children and doctors. The details on how insurance will pay for these robots are still being developed. These types of products are usually very expensive. They are being marketed only to the elderly, even though there are plenty of other segments of the population that could benefit from this type of technology. Although companies are coming up with great innovative ideas, they may end up fading away due to their high costs and the inability to market them effectively.

The elderly begin to feel isolated when they can no longer drive themselves. Driverless cars will transform this radically by helping the elderly travel safely and independently. If people start using this technology sooner, they will feel more comfortable using it in the future when they are in need of care.

The Echo Dot can be modified to be helpful for the elderly. The Echo Show can activate a video camera if a patient calls. It will be nearly impossible for products like this to be HIPAA compliant.

Wearable sensors can be used for a broad range of things. If a patient goes in for an annual physical, it would be beneficial to have data regarding blood pressure and other medical information from the entire year. Doctors will be able to use this data and have it on hand at all times. Sensors have been used in nursing homes to pass information to the nurses. A biometric sensor in a hearing aid can pick up blood pressure readings.

There is the potential for technology to be paired with artificial intelligence. For example, artificial intelligence could tell the difference between a person sitting in a bathtub and falling in a bathtub. This could help protect and care for a patient who has fallen.

It would be beneficial to have an in-force block of business management before a claim even occurs—for example, knowing if a patient is progressing toward a claim and how to prevent it. If someone can intervene to prevent a fall from happening, it would then avoid a claim. This information can also be used to prevent hospital readmission. The structure of reimbursement allows for more access to data regarding claims.

Pharmacogenetics is interested in developing wellness programs to help LTCI companies. As people go on and off medications, there is more information regarding the consumer. Pharmacogenetic testing can determine how a person's genetic profile will react to certain medications. It will prove to be more useful as more research is done.

In the life insurance industry, companies provide incentives to encourage insureds to adopt healthier lifestyles. It can be difficult to incorporate this in the LTC industry, because the margins for profit are much lower when considering closed blocks. There is a long tail in completing a study that would prove wellness programs would benefit LTCI companies. On older blocks of business that have been mispriced, the question that comes up is whether the wellness program will pay for itself in the end. It is different on new blocks of business because the programs can be included in the price. Even when discussing older blocks of business, companies can still be more proactive in the conversations regarding the use of technology in transportation and medication management.

Overall, technology is increasing safety in the home. In the area of cognitive health, companies need to start developing the reputation that they have the consumers' best interests in mind. The challenge remains of convincing consumers that the money they pay now will reward them with extremely valuable benefits in the future.

Artificial intelligence can be personalized to help with medication management. The technology is here, but the issue remains of increasing user adoption. Creating more positive user experiences is key. There are monitors and sensors that can be placed throughout a patient's home to collect data. Now that companies have this data, the question remains of what will be done with the information to help improve the lives of the elderly.

Value-based care options are getting better through the creation of new vaccines. A tipping point is reached when the market changes for insurance companies to focus on value-based care. The way insurers get there is through newer managed care programs—for example, Medicare managed care plans. The tipping point is when the majority of patients are on a managed care plan. This is when the health systems are paid to prevent admissions, prevent ER visits, and provide more care outside of hospitals and other expensive environments. It turns into managing health instead of disease, or value-based care. Technology plays a large role in this process as health systems partner with insurance companies.

The physical movement associated with drinking is not the same as the physical movement associated with eating. This allows for these motions to be monitored to ensure that a patient is eating and drinking an appropriate amount. This technology comes in the form of a wristwatch. It can even distinguish whether someone is drinking wine, beer, water or other beverages. Even though this data can be collected, researchers must determine ways to help patients change their habits once they notice an issue.

If insurance companies can detect that something is going wrong, there must be a way to intervene to avoid it becoming a claim. They can focus on educating family caregivers so that they are able to give the insurance companies more helpful information. An in-person needs assessment with a patient and caregiver can be done by someone who is trained. There is technology that labels pills with devices that indicate when they have been swallowed. This can potentially be used in place of having an in-person professional distribute medications.

When a person cannot navigate at home anymore, an expert can go into the home to provide advice. It would be useful for both doctors and the family to know that this resource is available to be used under certain policies. It is preferable to have resources that are effective in keeping a patient at home longer. If it is not time yet for a patient to be put in a nursing home, preparation should still be done in regard to the next steps that need to be taken.

Nursing homes have tried rebranding to attract new clients. There seems to be a stigma that nursing homes have an isolating and depressing environment.

Telemedicine has become a part of the geriatric practice by avoiding up to 80% of hospital readmission. It can be a very cost-effective way of keeping people at home. Telemedicine is a cart with a large screen and webcam that allows the patient and doctor to interact. The patient can pull out a stethoscope for the doctor to hear lung, heart

and stomach sounds. Doctors are able to instruct patients throughout the exams to check their vitals. This helps avoid a large number of people being sent to the hospital. IV antibiotics can be used at home instead of going to the hospital. Kaiser has been using telemedicine on patients in their homes on a large scale. Currently, these machines are relatively expensive, but the cost can be expected to decrease as time passes.

Care.com first catered to those looking for babysitters for young children. Now it can be an effective way to find caregivers for the elderly as well. This service allows someone to easily manage payroll and taxes. LTC should try to focus on keeping people at home by using these types of services.

Recovery programs can help patients get transportation, Meals on Wheels, therapy and evaluations to aid in healing. Companies need to find effective ways to market these services to make patients feel that they are spending their money on valuable services. States are more hesitant to approve rate increases on LTCI. There is a desire for LTCI companies to be able to collect information from their insureds to help them stay healthier longer. There should be a one-time assessment of patients to monitor their health while they are still in the early stages of dementia. Companies see that they are getting this service done only after a bad incident takes place. If an assessment is done sooner, bad incidents can be avoided. Another way to increase quality of life is to improve a patient's sleep patterns.

After tracking programs like these over the past couple of years, it seems that they have beneficial results. It could be helpful for insurance companies to learn which states offer these types of programs so that they can send out information to their insureds. There should be an incentive, such as a discount, put in place to encourage people to lower their risks of a claim. Currently, insurance companies offer discounts if a patient receives a lifeline or cardiovascular screening. People should encourage states to develop these programs for all residents through Medicaid claims, not just LTC. Patients appreciate a follow-up call to have an interaction after a wellness program is started.

Employers may see productivity issues because their employees have to care for their parents. There is an incentive for employers to offer wellness programs to their employees for themselves or their parents.

It is difficult to determine how long a claim would have to be delayed for these interventions to pay for themselves. Spending money on a person about to go on a claim can have an extended timeline. Interventions that delay claims may pay for themselves, but the math has to be shown. For example, a six-month delay for most carriers can be potentially harmful. Depending on the block of business, insurance companies may hold roughly $20,000 to $30,000 per person in reserves, plus annual premiums. Spending money on people about to go on claim may be potentially harmful if the spending outweighs the savings of the delay.

Predictive modeling can be used to further analyze this claim experience data. There is a lot of sensitivity regarding the privacy of patients. Companies are trying to understand how receptive both regulators and consumers are in regard to this data. There is a lot of skepticism as to why companies want this personal data from patients.

Concluding Remarks: Key Points to Consider

Ultimately, consumers are looking for the same solutions as LTC actuaries. The alignment with consumer behavior and seeing where consumers are headed can be valuable.

Consumers and providers should work together to create an overall better customer experience, possibly through technology. The industry has struggled in the past with working together among all stakeholders for everyone to benefit.

In the modern era, everyone has the opportunity to live past the age of 65. The demographics of society favor a dramatic increase in the prevalence of frailty and disability. The advances in medical studies are extremely optimistic in regard to diseases. However, the price being paid can be seen as a problem for Alzheimer's and other neurological conditions. It is important to look at the competing risks associated with aging and Alzheimer's. Recognizing the negative and positive impacts of aging is significant. The shift in structure of the size of the population guarantees that the number of people who will deal with these diseases and disabilities will increase dramatically. Since life expectancy is increasing, more people will have to deal with frailty and disability. It is significant to notice the difference between postponing death and prolonging a healthy life.

In order for the most dire scenario to take place, an expansion of the time to be on claim for severe cognitive impairment would require a slow downward trend. Looking at the mortality of National Long-Term Care Survey participants following the 1984 survey compared with the 2004 survey, an interesting finding is that the survival of a severely cognitively impaired person in the later period is shorter than the earlier period. This suggests that people who are at a certain level of cognitive impairment who meet the criteria are somehow more neuropathologically advanced. This implies that they initially had a greater cognitive reserve. A higher-aged, more wealthy candidate may not benefit from differentials in initial cognitive reserve.

The process of aging is quite dynamic, and researchers find themselves in a totally different world from 20 to 30 years ago. Researchers would suggest not relying on the past to predict the future. It would be more beneficial to look at the health status of younger people today to get a better sense of where LTC is headed in the future.

Knowing the insureds who are not on claim is critical, valuable information. Do not use social media in underwriting. It is uncertain if lower incidence of Alzheimer's translates to a lower lifetime probability. The delay of Alzheimer's disease may not help insurance companies, because even though they are receiving more years of premium, the cost of care in the end may be more expensive.

The underwriting for Alzheimer's started roughly 15 years ago. Cognitive screening began in the mid-1990s. There is a possibility that the insured population's Alzheimer's prevalence does not converge with the general population's. Time will reveal the subgroups with the potential to live longer. Comparing centenarians with the general population can be a way to approximate insured incidence from the general population.

A drug that has an impact on the aging process will work by influencing all diseases, not just one. Evidence suggests that this drug will be more effective in older populations. These interventions have a lot to do with who has access to them and how they are provided with medications.

Parabiosis treatments are available in places like California and Washington. It involves older people buying blood from younger people. This also involves stem cells. Metformin and senolytics are also treatment options.

Increasing the population of those buying LTCI can be beneficial to both the insureds and the insurance companies. It is up to the insurance companies to make LTCI more appealing to a wider population to help them facilitate lifestyle changes.

Moving forward, the consumer is going to know more than previous generations about developing Alzheimer's. Keep in mind that people of the older-age population generally do not want to be monitored. They are not as open to some of the new technology that has been developed. There is a big difference between the population that doctors are treating now and the one that will be seen in future generations. The population seen in the next five to 10 years may be more comfortable with the new technology. As younger generations are more comfortable with technology, people become more wary of the implications of being monitored. Even though the technology is accepted, there is still some apprehension in regard to who is using this data.

Appendix: Biographies of Participants

External Experts

Mary Bahna-Nolan, FSA, MAAA, CERA, MBAHNA-NOLAN@scor.com. Mary Bahna-Nolan is executive vice president, head of life R&D for SCOR Global Life. Bahna-Nolan is responsible for driving key innovation initiatives at SCOR. As a member of the SCOR Global Life management team, she is responsible for mortality and policyholder behavior research and development, shaping the company's global direction for all the R&D activities, including use of predictive modeling and analytics in risk selection, predictive and risk modeling, best estimate derivation, and product development support.

Prior to joining the company in 2015, Bahna-Nolan served as senior vice president and chief actuary at Legal & General America, where she was responsible for valuation, financial modeling and forecasting, and experience analysis and assumptions. Prior to joining Legal & General, she was a director in PwC's actuarial and insurance management solutions life practice, where she provided audit and advisory services to life insurance and reinsurance clients. She also held several positions with North American Company for life and health insurance, including chief risk officer, chief actuary, chief product officer and head of underwriting policy.

In addition to being a frequent speaker at industry meetings and author of several papers and articles, Bahna-Nolan is active in various industry activities, serving on boards and committees of the Society of Actuaries, the Academy of Actuaries, NAIC and ACLI. She graduated from the University of Michigan, Ann Arbor, with a Bachelor of Science in actuarial mathematics and economics.

Concetta M. Forchetti, M.D., Ph.D., concetta.forchetti@amitahealth.org. Dr. Concetta Forchetti is board-certified in neurology, with a Ph.D. in neuropharmacology. Forchetti has been the medical director of clinical research at NSI for 17 years. She was the founder of the Memory Disorder Clinic at Alexian Brothers Neurosciences Institute.

Forchetti has over 30 years of clinical research experience, during which time she has conducted more than 150 Alzheimer's disease trials and well over 200 clinical trials in total, with interest in Parkinson's disease, migraines and multiple sclerosis.

With her leadership of the AMITA NSI Clinical Research Center, she has been recognized for several years as a national leader in clinical research. The AMITA NSI is sought after by major sponsors, and the site has been involved in most of the major innovative treatment trials for Alzheimer's, multiple sclerosis and Parkinson's, contributing to the successful approval of new therapies.

In addition to her research focus, Forchetti maintains a successful practice as the director of the Memory Disorders Center at the Alexian Brothers Neurosciences Institute. Forchetti serves on the scientific board of the Alzheimer's Association, and she is a nationally recognized speaker. Forchetti is frequently published in peer-reviewed medical journals, such as *Journal of Clinical Neuropharmacology* and *Neurology and the Dementia Review Journal*. Forchetti is truly one of the nation's foremost experts in Alzheimer's and dementia research.

Forchetti is a graduate of the University of L'Aquila Medical School, Italy; completed a three-year fellowship at the National Institutes of health in Bethesda, Maryland, at the Laboratory for Clinical Pharmacology; and completed two residencies in neurology—one at the University of Rome and one at Thomas Jefferson University in Philadelphia, Pennsylvania.

Char Hu, Ph.D., char@thehelperbees.com. Dr. Char Hu received his Ph.D. in molecular biophysics from Baylor College of Medicine, where he researched the underlying mechanisms for diseases like Alzheimer's. He went on to build and operate Georgetown Living, a certified Alzheimer's and dementia living facility known for its beautiful environment set on 15 acres, evidence-based design building, and pet therapy ranch animals. He is also a founder of a Medicare-accredited home health agency that uses skilled services to keep older adults independent at home. Hu

also founded and is CEO of The Helper Bees, a technology company in Austin that uses personality to match in-home caregivers with those who need nonmedical services.

Hu serves on related boards, including Family Eldercare, AustinUp, Texas Alzheimer's and A Gift of Time. He recently helped organize and host the ATX Aging & Innovation Summit at Dell Medical School to help raise awareness of the need for technological development for age-related issues and speaks at events such as SXSW and LeadingAge. He is the recipient of the 2018 SXSW Community Service Award.

Scott E. Murray, MURRAS3@nationwide.com. Scott Murray is a consultant and a financial market economist with Nationwide's Office of Economics. Most recently, Murray worked as a consultant for the Enterprise Risk Management team. Previously, he was a portfolio manager with the Ohio Employees Retirement System and an equity sector manager with JPMorgan & Chase. In addition, he is an adjunct professor in economics at Franklin University and a member of the Ohio Board of Motor Vehicle Repair. Murray earned his bachelor's degree from the University of Connecticut and his master's degree from Washington University in St. Louis, and he is a CFA charter holder.

S. Jay Olshansky, Ph.D., sjayo@uic.edu. Dr. S. Jay Olshansky received his Ph.D. in sociology at the University of Chicago in 1984. He is currently a professor in the School of Public Health at the University of Illinois at Chicago, research associate at the Center on Aging at the University of Chicago and at the London School of Hygiene and Tropical Medicine, and chief scientist at Lapetus Solutions Inc. The focus of his research to date has been on estimates of the upper limits to human longevity; exploration of the health and public policy implications associated with individual and population aging; forecasts of the size, survival and age structure of the population; pursuit of the scientific means to slow aging in people (The Longevity Dividend); and global implications of the re-emergence of infectious and parasitic diseases.

Olshansky is on the board of directors of the American Federation for Aging Research, is the first author of *The Quest for Immortality: Science at the Frontiers of Aging* (Norton, 2001) and *A Measured Breath of Life* (2013), and is a co-editor of *Aging: The Longevity Dividend* (Cold Spring Harbor Laboratory Press, 2015). In 2016, Olshansky was honored with the Donald P. Kent Award from the Gerontological Society of America and the Irving S. Wright Award from the American Federation for Aging Research, and he was named one of Next Avenue's Influencers in Aging.

Tom Perls, M.D., MPH, FACP, AGSF, FGSA, thperls@bu.edu. Dr. Tom Perls is professor of medicine at Boston University School of Medicine. Perls received his geriatrics training at both Mount Royal Hospital in Melbourne, Australia, and Harvard Medical School, and he obtained his master's degree in public health at Harvard. He is a senior physician in geriatrics and cares for patients at Boston Medical Center. He is a fellow of the American College of Physicians, the American Geriatrics Society and the Gerontological Society of America. In 1995, he began and continues to direct the longest-running and largest study of centenarians and their siblings and offspring in the world, the New England Centenarian Study. This study also includes more than 500 semi-supercentenarians (aged 105 to 109 years) and 150 supercentenarians (aged 110 to 119 years). Additionally, he is principal investigator of the Boston Center of the National Institute on Aging-funded multicenter Long Life Family Study, a longitudinal study established in 2006 of nearly 5,000 participants belonging to ~550 families demonstrating rare clustering for survival to extreme old age.

Perls sits on the editorial boards of the *Journal of the American Geriatrics Society* and the *Journal of Gerontology, Medical Sciences*, and he is a federal advisory board member for the National Advisory Committee on Racial, Ethnic, and Other Populations of the U.S. Census Bureau. He is also a vocal critic of the anti-aging industry, particularly its medical and legal misuse of growth hormone, testosterone and other drugs for "anti-aging." He has testified before the U.S. Congress about anti-aging quackery and is author of two educational websites: the Living to 100 life expectancy calculator (www.livingto100.com) and www.hghwatch.com. In 1999, Perls co-authored the award-winning book *Living to 100, Lessons in Maximizing Your Potential at Any Age* and is now working on its sequel, *Living to 110!*

Dave Rengachary, M.D., DBIM, FALU, FLMI, drengachary@rgare.com. Dr. Dave Rengachary is senior vice president and chief medical director for U.S. mortality markets at RGA Reinsurance Company. Prior to joining RGA in 2013, he was a general neurologist in practice at Missouri Baptist Medical Center, where he also served as medical director for its Primary Stroke Center.

Rengachary is the primary author and editor of *The Washington Manual: Neurology Survival Guide*. He serves on the board of directors of Memory Home Care Solutions, a Saint Louis-based nonprofit dedicated to Alzheimer's patient and caregiver support.

Rengachary is past president of the Midwestern Medical Directors Association, deputy director of the Longer Life Foundation, medical consultant for the Academy of Life Underwriting, and member of the Educational Committee of the American Academy of Insurance Medicine.

William D. Rhoades, D.O., FACP, william.rhoades@advocatehealth.com. Dr. Bill Rhoades has been a geriatrician in practice at Advocate Lutheran General Hospital since 1995. He completed medical school at Des Moines University, an internship at Chicago Osteopathic Hospital, a residency at Lutheran General Hospital, and a fellowship in geriatrics at Duke University. Rhoades is board-certified in internal medicine, geriatrics, and palliative care and hospice. Rhoades has been the chair of the Department of Medicine at Advocate Lutheran General since 2009 and vice chair of clinical science and director of medicine at Chicago Medical School at Rosalind Franklin University since 2011. His practice is limited to patients over 65 years of age, and he has special expertise in dementia, gait disorders and end-of-life care. Rhoades lives in an estrogen-rich environment with his wife and three girls, twins aged 25 and a 19-year-old.

P.J. Eric Stallard, ASA, MAAA, FCA, stall013@duke.edu. P.J. Eric Stallard is a research professor in the Social Science Research Institute and co-director of the Biodemography of Aging Research Unit at the Center for Population Health and Aging in the Duke Population Research Institute at Duke University. Stallard is a fellow of the Conference of Consulting Actuaries (CCA), member of the American Academy of Actuaries (AAA), and associate of the Society of Actuaries (SOA). He has served on the boards of directors of the CCA and the AAA. He has chaired the AAA's Long-Term Care (LTC) Committee and the LTC Reform Subcommittee. Previously, he served on the SOA's LTC Insurance Section Council.

Stallard served as a deputy editor at *Demography* from 2007 to 2010, with responsibilities for the demography of aging, actuarial science and mathematical demography. He also served on the Social Security Advisory Board's 2007 Technical Panel on Assumptions and Methods.

Stallard is currently serving as principal investigator on an Alzheimer's disease administrative supplement to a National Institute on Aging (NIA) P30 Center Grant at Duke and on an Alzheimer's disease research subaward to Duke from Columbia University funded by an R01 grant from the NIA. He has previously served as principal investigator on aging/health-related research grants from the NIA, the Veterans Health Administration, the National Council on Aging, the National PACE Association, InnovAge PACE, Bayer Corporation, Wyeth Pharmaceuticals and General Electric Capital Assurance Company. He also currently serves as senior investigator on three other grants from the NIA. Collectively, this research covers the areas of health, disability, LTC and mortality.

Stallard's research expertise includes modeling and forecasting for biodemography and health/LTC actuarial practice: His 1984 book, *Recent Trends in Mortality Analysis*, published by Academic Press with co-author K.G. Manton, provides in-depth and comprehensive models for the analysis of underlying and multiple-cause mortality data. His 2005 book, *Forecasting Product Liability Claims: Epidemiology and Modeling in the Manville Asbestos Case,* published by Springer with co-authors K.G. Manton and J.E. Cohen, covers the full range of epidemiological, demographic and actuarial issues in asbestos-related disease and mortality. His 2016 monograph, *Biodemography of Aging: Determinants of Healthy Life Span and Longevity*, published by Springer with co-authors A.I Yashin and K.C. Land, covers in-depth recent advances made by Stallard and his collaborators at Duke University's Biodemography of Aging Research Unit. His seven other books/monographs, 155 scientific articles and 84 actuarial publications span a broad range of topics in biodemography and health/LTC actuarial practice.

Avraham Stoler, Ph.D., astoler@gmail.com. Dr. Avraham Stoler is an assistant professor of economics at the Driehaus College of Business. Stoler has been with DePaul since 2009. He received both his bachelor's degree and master's degree in economics from Tel Aviv University in 1996 and 1998, respectfully. Stoler earned his Ph.D. in economics from the University of Chicago in 2005.

Stoler's research interests include health economics and applied microeconomics. His work has been published in journals such as *Health Economics* and the *American Journal of Transplantation*. He is currently working, among other projects, on researching incentive structures and other mechanisms that could increase the number of organ donor card signatures, with the goal of increasing total organ donations and saving lives. Stoler is collaborating with several prominent researchers, such as Al Roth (Nobel Prize laureate in economics, 2012), David Meltzer, Jacob Lavee and Judd Kessler.

Stoler also has substantial consulting experience involving important projects in both the Brattle Group and Keystone Strategy, including work with Nobel Prize laureate in economics Daniel McFadden and involving important cases such as the Master Settlement Agreement and many others.

Stoler is a recipient of the University of Chicago's Markovitz Fellowship for best thesis in the social sciences. He also served as a referee for the *American Economic Review*, *Journal of Forensic Economics*, *Journal of Political Economy* and *Insurance: Theoretical Analysis & Policy Implications*.

Stoler teaches courses in strategies and processes of negotiations, research methods, and economics for decision-making.

Brittany Szymaniak, Ph.D., CGC, brittany.szymaniak@nm.org. Dr. Brittany Szymaniak received her bachelor's degree in biochemistry from Nazareth College of Rochester in 2011. As an undergraduate, she had the opportunity to work on a research project characterizing prostate-specific antigen in normal, local and metastatic prostate tissue during an NSF-awarded internship at Roswell Park Cancer Institute. She then went on to complete her Ph.D. in genetics at the University of Rochester in 2016. Her doctoral research focused on better understanding the consequences of the loss of ATM on glial precursor cell biology in the pediatric neurodegenerative condition, ataxia telangiectasia (A-T). This work involved the development and characterization of a novel A-T murine model. Szymaniak was able to independently fund part of her research through a predoctoral training fellowship awarded by NYSTEM. Upon finishing her doctoral degree, Szymaniak went on to receive her master's degree in genetic counseling from Northwestern University in 2018. For her master's thesis, Szymaniak examined the evolution of the terminology used in the scientific literature regarding congenital conditions marked by atypical sexual development. Szymaniak is currently a genetic counselor at Northwestern Medicine in the Urology department as part of the Cancer Genetics Program. She focuses primarily on GU/GI-related hereditary cancer syndromes, with a particular emphasis on the genetics of prostate cancer.

Industry Experts

Fred Andersen, FSA, MAAA, frederick.andersen@state.mn.us. Fred Andersen serves as acting deputy commissioner of insurance of the Minnesota Department of Commerce. In this role, he oversees solvency, policy form approval, rate review and review of insurance transactions for insurance business conducted in Minnesota.

He also serves as the chief life actuary of the department. Besides reviewing financial models related to the reserves and capital of Minnesota's life insurers, Andersen leads activities in innovation, consumer protection and market efficiency at the National Association of Insurance Commissioners. Andersen currently leads an NAIC group examining morbidity improvement assumptions, along with other factors that affect long-term care reserves and premiums.

Before joining the department in June 2014, he served as assistant chief life actuary for the insurance division of the New York Department of Financial Services, where he worked for 16 years focusing on solvency of life insurers.

Robert Eaton, FSA, MAAA, Robert.eaton@milliman.com. Robert Eaton is a consulting actuary with Milliman in Tampa, Florida. He is a fellow in the Society of Actuaries and a member of the American Academy of Actuaries. Eaton focuses on long-term care insurance, life insurance, and combination life and health products. Eaton works in pricing, valuation, mergers and acquisitions, and predictive analytics. He was the 2018 chairperson of the SOA's LTC Section Council and serves on the executive committee of the ILTCI Conference.

Tim Kneeland, Timothy.Kneeland@ge.com. Tim Kneeland began his career in 1982 as a student intern selling life insurance and other financial products. Upon graduation from Iowa State University with a Bachelor of Business Administration in finance, Kneeland entered the financial services business with various insurance and securities (FINRA) licenses. Kneeland held various field positions with Life Investors Insurance Company of America (an AEGON company) and earned membership in various industry organizations, including Million Dollar Round Table, Association for Advanced Life Underwriting, Society of Financial Service Professionals and National Association of Financial Advisors.

Kneeland joined Aegon as president of life investors and moved on to hold positions director of business development and president of TransAmerica long-term care. In November 2018, Kneeland joined GE as president and CEO of North American Life and Health, a position he currently holds.

Kneeland has been a member of numerous industry and charitable boards and has been a frequent speaker on insurance industry topics.

Kneeland resides in Waterloo, Iowa, with his wife, Jolene, where he enjoys spending time with his two grown children and their families as well as spending time in the outdoors and cheering for the Iowa State Cyclones.

Kimberly Martin, k.martin@banklife.com. Kimberly Martin joined the long-term care department at Bankers Life, a subsidiary of CNO Financial Group in October 2014 as the senior risk management analyst. She has since led the business integrity team, working to identify and mitigate potential fraud, and currently leads a team managing risk for product approval and compliance for all product lines. While Martin has worked at Bankers Life for just over four years, she has a broad background in health care that includes both acute and long-term care settings. She has a total of 20 years of nursing experience followed by two years working as a consultant and associate attorney for a plaintiff's medical malpractice and personal injury law firm. Martin's primary role at Bankers Life is to identify opportunities to mitigate risks, assist with product development, monitor regulatory change and compliance, review and approve advertisements, monitor social media, and provide litigation support. She is an LPN and holds a B.A. in management and organizational development from Spring Arbor University along with a J.D. from Thomas M. Cooley Law.

Shawna Meyer, FSA, MAAA, meyes3@nationwide.com. Shawna Meyer has over 20 years of actuarial experience and a broad background in all aspects of insurance. Meyer is currently the CFO of life insurance at Nationwide Insurance Company. Prior to her current role, she was with New York Life, where she was LTC chief financial officer and LTC chief actuary. Meyer also worked in the Office of the Chief Actuary and the Office of Risk Management in the mergers and acquisitions area. She has experience with LTC products, Medicare supplement, disability, life insurance and annuities. Prior to New York Life, she worked at Actuarial Resources Corporation, Ceres Group and Physician's Mutual.

Meyer holds a Bachelor of Science from the University of Nebraska at Omaha. She is a fellow of the Society of Actuaries and a member of the American Academy of Actuaries. A frequent industry speaker, Meyer has chaired industry conferences and served on the SOA LTC Section Council. She is a frequent volunteer for both actuarial organizations and has participated in the writing of a couple of actuarial practice notes.

Support

Ladelia A. Berger, lberger@soa.org. Ladelia Berger is a section specialist at the Society of Actuaries. Her responsibilities focus on assisting SOA section councils.

Prior to working at the SOA, Berger worked with a national trade association as the assistant to the executive director, where her focus was special-interest divisions, regional affiliates and member services.

Berger received her B.S. in management information systems from Columbia College of Missouri.

Michaela Fossberg, michaelafossberg@gmail.com. Michaela Fossberg is a senior at DePaul University working toward receiving her B.S.B. in actuarial science in June of 2019. She has passed SOA exams P and FM and is currently studying for her third actuarial exam, Investments and Financial Markets. She also serves as president of DePaul's Actuarial Science Club and as executive vice president of Beta Gamma Sigma, a business honor society.

Chris Gorham, c_j_gorham@yahoo.com. Chris Gorham started his career at John Hancock Financial Services as a life insurance underwriter. He led teams there in the development of rules-based expert systems to automatically underwrite and approve life insurance applications. These automated solutions were the first ever implemented in the life insurance industry.

Gorham then joined Fidelity Investments to lead development of its customer relationship management architecture, which successfully integrated best-of-class rules-based trigger systems, customer activity databases, and state-of-the-art customer representative dashboards. These solutions were some of the first full-circle automated customer relationship solutions ever developed.

Gorham then founded Cyberport Consulting Group LLC to continue to provide strategic consulting and technical program and operational management expertise to the financial services industry.

Gorham holds a B.A. in business management from Boston College and a Master of Engineering Management from Tufts University.

R. Dale Hall, FSA, CERA, CFA, MAAA, dhall@soa.org. R. Dale Hall is managing director of research for the Society of Actuaries, a position he has held since December 2013. In his role, Hall coordinates the SOA's strategic research partnerships, oversees SOA experience studies, coordinates research across the SOA's wide variety of actuarial practice areas, and directs the SOA's data-driven in-house research initiatives. He is a frequent speaker at insurance and retirement industry meetings to highlight SOA research, including presentations to the actuarial task forces of the National Association of Insurance Commissioners and testimony to the House Ways and Means Subcommittee on Select Revenue Measures on pension plan mortality rates.

Prior to joining the SOA, Hall spent more than 20 years in the U.S. insurance industry, primarily as chief actuary for the life/health companies of Country Financial. While at Country Financial, he was active in the industry as a member of the American Council of Life Insurers' actuarial committee and was an adjunct professor in the actuarial science program at Illinois State University.

Hall earned his master's degree in business administration from Capital University and his bachelor's degree in mathematics from John Carroll University.

Rilley Schnelker, Rilley.Schnelker@milliman.com. Rilley Schnelker is an actuarial analyst in the Milliman Chicago-Milwaukee Health practice, specializing in long-term care insurance. She is a graduate of Ball State University and is currently studying to obtain her ASA.

Joe Wurzburger, FSA, MAAA, jwurzburger@soa.org. Joe Wurzburger has been the health staff fellow with the Society of Actuaries since 2014. In this role, Joe has a variety of responsibilities, including section development and support (specifically for the Health and LTC sections), actuarial practice advancement and thought leadership, exploration of growth opportunities for actuaries outside of traditional roles, internal SOA consulting, networking and leadership development, and actuarial knowledge development.

In his most recent role prior to joining the SOA, Wurzburger managed the health valuation department in the Chicago office of Bankers Life, primarily focusing on long-term care insurance and Medicare supplement. Prior to that, he filled a variety of actuarial roles in both consulting and insurance and has experience with pricing, valuation and projections.

Joe is a fellow of the Society of Actuaries, a member of the American Academy of Actuaries, and a member of the National Academy of Social Insurance.

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About The Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world, dedicated to serving 32,000 actuarial members and the public in the United States, in Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and nonactuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.