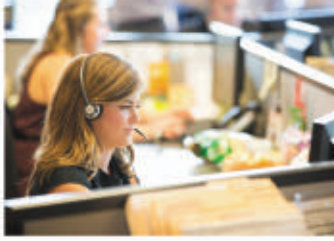
AMERICAN ACADEMY OF ACTUARIES ■ JAN | FEB ■ 2017

Contingencies

The Future Is Here

How telehealth, retail clinics, and more are changing the health care system



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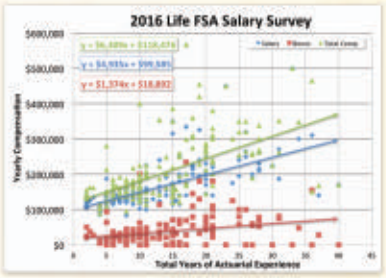

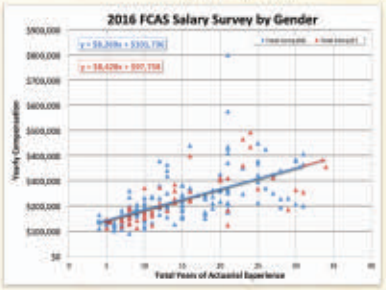

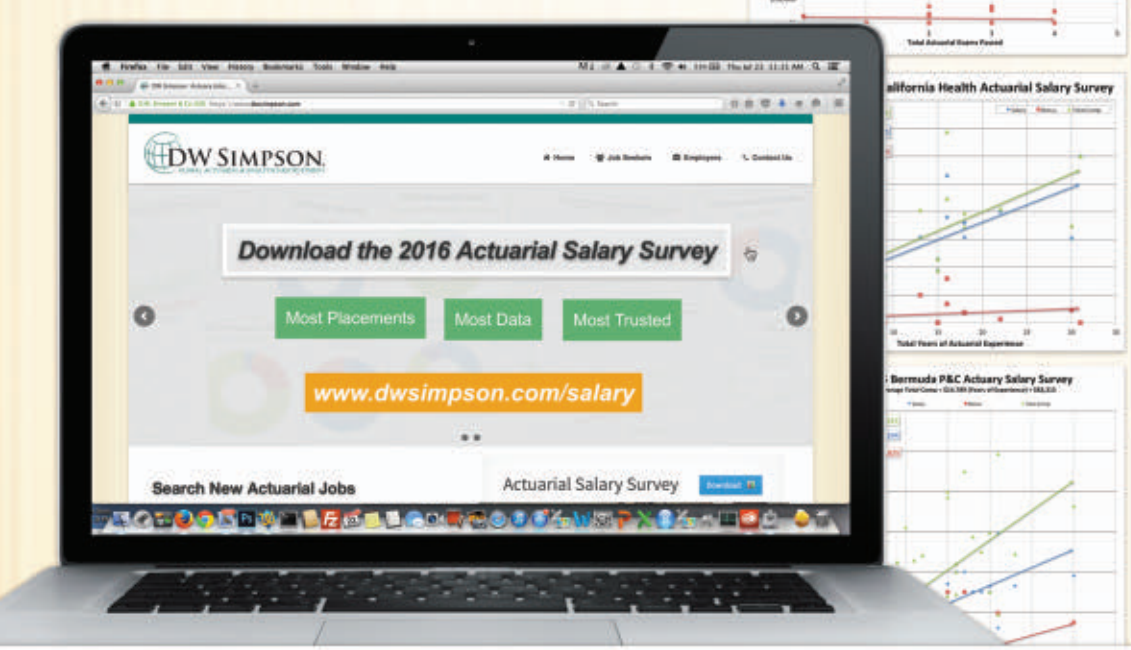

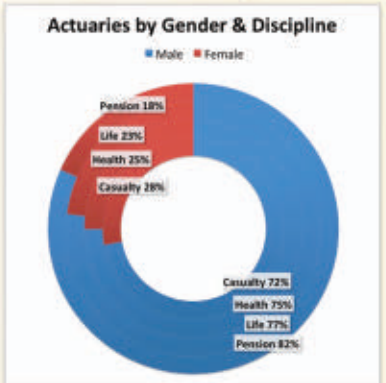

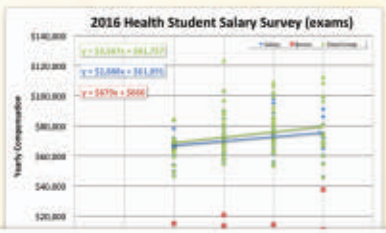

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For Position 73927, our Connecticut client is seeking an ACAS casualty pricing actuary. Compensation up to $150K. Requires at least five years of property and casualty actuarial experience, including some liability ratemaking experience.

MIDWEST USA – P&C CONSULTING ACTUARY
For Position 73729, a property and casualty consulting actuary is immediately sought by our Midwest USA client. ACAS or FCAS with 7+ years of property and casualty actuarial experience preferred. Pricing, product development, reserving, predictive modeling, statistical programming and other assignments.

NEW YORK – VP OF ANALYTICS
For Position 73581, a New York insurance company seeks a Vice President of Analytics. FCAS or ACAS sought. Must have management experience. Compensation up to $200K.

MIDWEST USA – P&C ANALYTICS
For Position 72352, this Midwest USA client seeks a Property and Casualty Insurance Analytics Actuary. FCAS or ACAS preferred. Must have outstanding statistical modeling expertise. Management experience required.

NEW JERSEY – P&C COMMERCIAL LINES ACTUARY
Commercial lines actuary at the ACAS level is sought by a New Jersey corporation for Position 73646. 5 to 10 years of property and casualty actuarial experience ideal. R or SAS or SQL programming skills a plus.

ILLINOIS – P&C DATA SCIENTIST
For Position 73653, our Chicago client has an immediate need for a Senior Property and Casualty Insurance Data Scientist. FCAS or ACAS actuary ideal for this role. Must have exceptional statistical modeling expertise. SAS or R programming skills required.

OREGON – LIFE MODELING ACTUARY
Life modeling actuary is immediately sought by our Portland, Oregon client for Position 73736. FSA with financial risk management experience preferred. SAS or GGY AXIS software experience a definite plus.

NORTH CAROLINA – LIFE PRODUCT DEVELOPMENT ACTUARY
For Position 73816, a life product development actuary is needed by a North Carolina life insurer. ASA or FSA sought to manage staff and product development process. Must have at least five years of life actuarial experience. This is an immediate need and our client will move quickly for strong candidates.

MIDWEST USA – LIFE VALUATION ACTUARY
For Position 73645, a life valuation actuary and managing Director is needed by our Midwest USA client. FSA with 10+ years of actuarial experience preferred. Strong Statutory and GAAP financial reporting and valuation expertise required.

OHIO – DIRECTOR OF HEALTH ACTUARIAL SERVICES
For Position 73510, our Ohio client is searching for a Director of Actuarial Services and Health Actuary. ASA or FSA with management experience sought. Manage staff. Data analysis, trend studies, financial forecasting, pricing, reserve analysis and special projects.

NEW YORK – MEDICARE ACTUARY
For Position 73818, our New York client has a just-opened high profile role for a Medicare Actuary. FSA or ASA with 6+ years of experience sought. This health plan will move quickly for strong candidates.

MARYLAND – HEALTH ANALYTICS
For Position 73828, our Maryland client seeks a health actuary and insurance analytics professional. FSA or ASA or M.S. or Ph.D. with at least six years of experience in the healthcare field ideal. Expertise in statistical modeling, predictive analytics, as well as SAS or R programming ideal.

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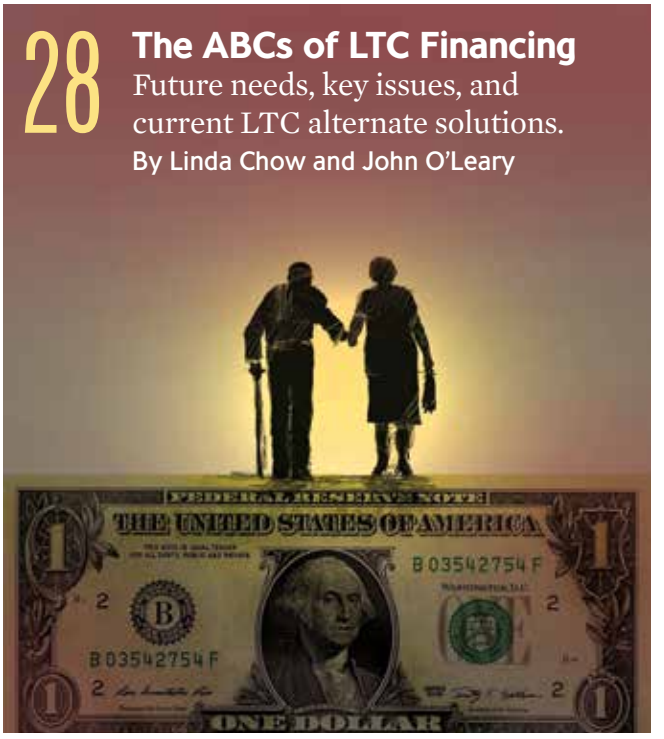

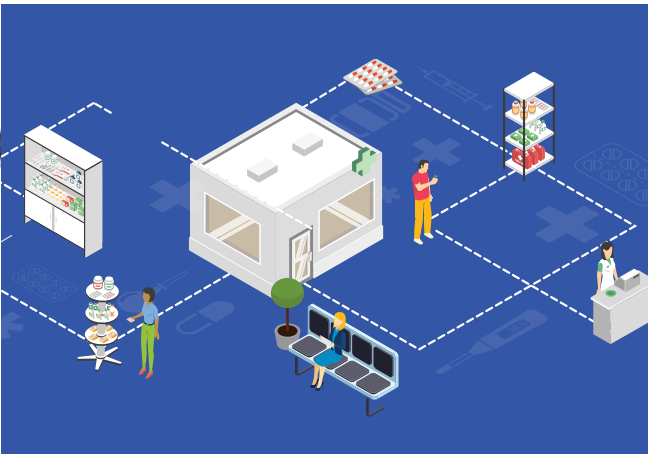

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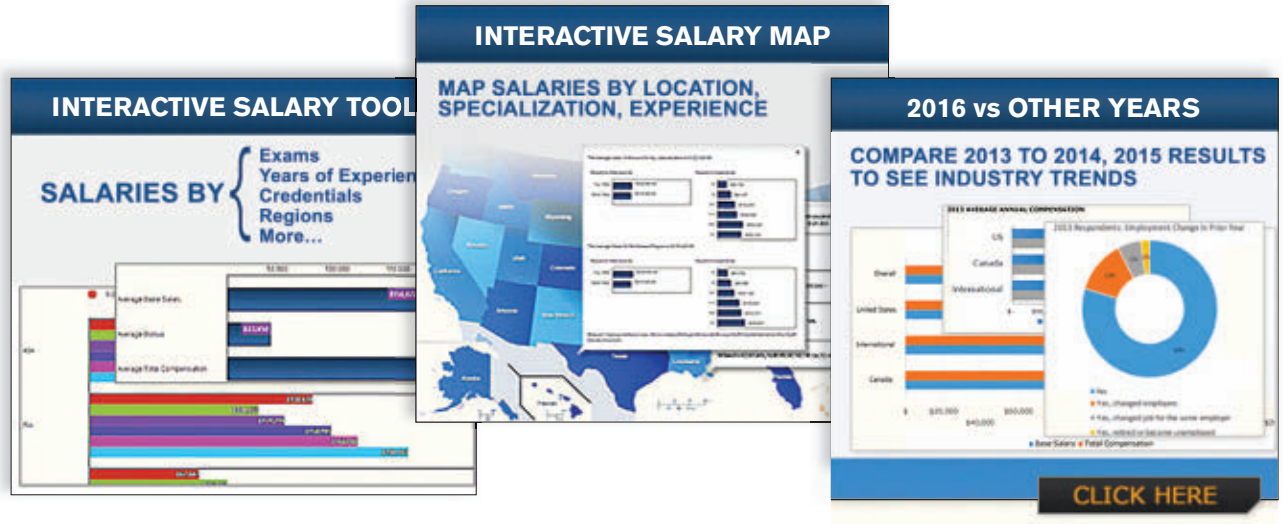
Our 2016 Salary Survey Questionnaire opens on November 1, 2016 and ends January 31, 2017.

Once again, we are calling all actuaries to fill out our brief 2016 Salary Survey Questionnaire. The survey results we publish on our website, www.actuarialcareers.com, are our way of helping you keep on top of trends in your profession.

In order to be included in our 11th Annual Holiday Drawing to win one of five $500 Amazon giftcards, simply complete the 2016 Salary Survey Questionnaire. Participating every year means you accumulate additional chances to win (i.e. three years = three entries in the drawing).

A link to the questionnaire appears on every page of our website: www.actuarialcareers.com. You will also find links in our Annual Holiday Drawing e-mail, and in our Facebook and LinkedIn posts.

Survey responses are always confidential, but statistics will be available on our unique, online, interactive charting system, which allows you to easily compare your skills, experience, education and field of expertise to others' in the actuarial marketplace.



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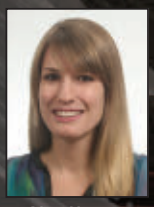
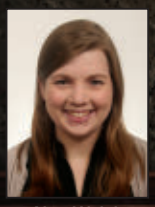

Alex Harper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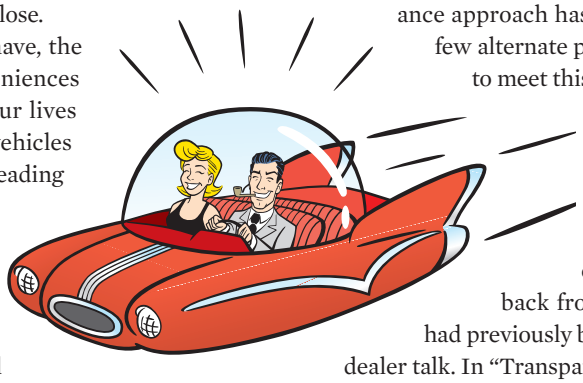
ALL TOO OFTEN, WE LOOK AROUND AND LAMENT THE FACT THAT the future we were promised in our youth has not yet come to pass. "It's 2017," you hear, "where are the flying cars?"

And it's true that technology hasn't quite kept pace with the utopian fantasies that are the stock and trade of pop magazine columnists and pulp novelists. We still have to cook and eat food, rather than acquire sustenance in capsule form. We haven't yet figured out how to harness the power of robots to afford everyone a life of leisure. And the long-hoped-for eradication of all diseases? Not even close.

But setting aside what we *don't* have, the modern world is chock-full of conveniences and tech advancements that make our lives better every day. Semi-autonomous vehicles can help keep drivers in their lanes, heading off crashes before they happen. Most of us carry around a computer in our pockets that can connect us to the world's information in an instant. (In fact, because this will be printed after Christmas, I can reveal that my household will soon be home to an ever-ready digital assistant, which will probably mostly be used to answer such important queries as, "Who would win in a fight, Iron Man or the Hulk?") And advancements in genomic and biologic therapies are giving doctors new weapons to use against tenacious maladies.



Yes, it's 2017, and the future is here. And that's the theme of this issue's features.

In our cover feature, "How Telehealth Will Transform the Industry" (page 20), the authors take a deep dive into the promising field of distance medicine. They survey the current state of play, including how, when, and where telehealth is being deployed today; highlight challenges and opportunities in implementing a wider telehealth system; and envision a future that revolutionizes the way health care is delivered. The feature also examines how actuaries can contribute to this effort—now and in the future.

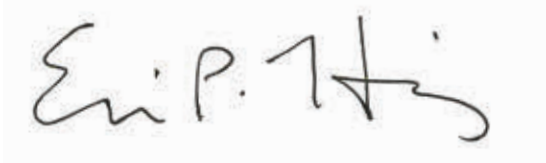
In "The ABCs of LTC Financing" (page 28), Linda Chow and John O'Leary examine the looming challenge of long-term care—and how to pay for it. As our population ages, the need for long-term care (LTC) services and supports is on the rise. But currently, private LTC insurance isn't a cost-effective option for many Americans, leaving them vulnerable to costly episodes of care. Chow and O'Leary highlight projected future drivers and costs of LTC, explore why the private LTC insurance approach has thus far fallen short, and offer a few alternate products that have been developed to meet this current and growing need.

Most of us have shopped around when mulling a new purchase. Online retail has made bargain shoppers of us all, and services like CarMax claim to have pulled the curtain back from car-buying experience, which had previously been shrouded in secrecy and slick dealer talk. In "Transparency—The Untapped Tool" (page 38), the authors explore how that idea—if consumers have accurate information about costs and quality before a medical procedure, they'll make better choices that lead to better outcomes—is already coming to fruition. The feature ends with an exploration of how actuaries can apply their acumen to help increase the success of transparency efforts.

In our final feature, "Shop While You Wait" (page 44), author Dave Dillon looks at retail health clinics—nontraditional models set up within pharmacies, for example—and how they're reshaping the delivery of health care. These clinics are being used now for minor ailments that are not serious enough for a trip to the emergency room but require attention before you may be able to get in with your family doctor. And as major health systems begin to rely on retail clinics as a primary point of care, their prevalence is only going to increase.

So as the New Year dawns, rather than bemoan the lack of flying cars, recognize the amazing reality of the present—because let's be honest, someone cutting you off on the Z-axis would be a pain, anyway. □

ISTOCKPHOTO



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BOB BEUERLEIN

What's Your Big Data Opportunity?

IT IS DIFFICULT TO PICK UP A NEWSPAPER OR MAGAZINE THESE DAYS and not read something about Big Data. Big Data seems to be the buzzword that permeates not only business journals but also general interest periodicals. It is characterized by descriptors such as Volume, Veracity, Velocity, Variety, and Value.

When you think about it, these descriptors might apply to anything new and complex in our actuarial work. Think of recent topics that actuaries are dealing with, like the Affordable Care Act or principle-based reserving. Aren't these areas of practice changing rapidly (Velocity), with multiple applications (Variety), with enormous data requirements (Volume), in situations that may have unknown outcomes (Veracity), all in the interest of providing benefit (Value)?

The complexity of Big Data requires that people work in teams to accomplish the task at hand. It is common for the team to be composed of some non-actuaries, such as skilled statisticians and expert computer scientists, who might be led by an actuary—the quarterback—who incorporates actuarial skills and leadership skills in a complex project. And, as with any team, we need to know both what the goal is and what the rules are to reach it so that our actions are fair and we agree on where we're going.

On a football team, a quarterback not only knows what he should do on each play, but also understands what each of the players on his team should be doing. The quarterback may not be able to block as well as the linemen or run as fast as the receivers, but he understands the role of each player on each play. And a skilled quarterback can see what the defensive players are doing when he "reads" the defense. Thus, by connecting the dots from all of this information, the quarterback can make last-second changes—audibles—to optimize the outcome of each play. He has learned this through knowing the game of football, countless hours of practice and game experience, and continuously updating his knowledge through watching videos.

As actuaries, we can be like quarterbacks and add value to situations by being able to see and understand the big picture. In dealing with new and complex situations, we are able to understand the context of these situations and professionally address them with our actuarial skill sets. Similar to a quarterback, we may not be able to execute each step of a project. We may not be able to perform certain functions as well as the experts. But, we are able to connect the dots so that we understand what is being accomplished in the project and fit it into the big picture—and that leads to the value we seek to provide. And we have acquired this skill through studying, real-life experience, and continually updating our knowledge.

And to overlay this, we have earned the public trust from the many times that we have performed and will continue to perform actuarial services with integrity and competence and in a manner to fulfill the profession's responsibility to the public. We have to have some familiarity with what is appropriate and acceptable in our public policy framework, and that may be contained in laws and regulations and even company policies.

So back to the initial question: What is your Big Data Opportunity? You may not be working at all with "Big Data," per se, but it is very likely that you are performing actuarial services in areas that are much different than they were five years ago. Let's call this your Big Data Opportunity. Let's say that you have developed your expertise in this area through studying, hands-on experience, and ongoing education. Now you have the opportunity to connect the dots by applying your unique actuarial skillset in a manner similar to that of a quarterback. If you understand the project and the pieces of the project, and the rules that apply, you can professionally and effectively work with and lead the experts to successfully achieve the goals of your Big Data Opportunity. □

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Peer Review—Small Investment, Big Return

THE COMMITTEE ON PAPERS of the Royal Society of London is traditionally credited with establishing editorial peer review in 1752 to oversee the review and selection of texts for publication for its nearly century-old journal, *Philosophical Transactions*—hence the use of the word "peer," referring to the English peerage system of nobles. For purposes of this article, peer review will be defined as *an evaluation of a professional work product, typically a draft report communicating actuarial findings conducted by a peer of the responsible actuary*. A peer reviewer may or may not be an actuary.

The purpose of a peer review is to assist the preparing actuary in assessing the quality of his or her work product. The Code of Professional Conduct (Code) does not require actuaries to obtain peer review of their work products. There are also no such requirements in the U.S. Qualification Standards or in any of the actuarial standards of practice (ASOPs). But even though it's not codified in the profession's guiding documents, peer review is a powerful tool that can help assess whether a work product meets the expectations established by the Code. Specifically, a peer review can provide assistance in fulfilling the following Precepts of the Code:

JOE SUTLIFF

- **Precept 1:** "An Actuary shall act honestly, with integrity and competence, and in a manner to fulfill the profession's responsibility to the public and to uphold the reputation of the actuarial profession." Annotation 1-1: "An Actuary shall perform Actuarial Services with skill and care."
- **Precept 4:** "An Actuary who issues an Actuarial Communication shall take appropriate steps to ensure that the Actuarial Communication is clear and appropriate to the circumstance and its intended audience, and satisfies applicable standards of practice."

An actuary will typically perform a detailed check of calculations before initiating a peer review.

- **Precept 8:** "An Actuary who performs Actuarial Services shall take reasonable steps to ensure that such services are not used to mislead other parties." Annotation 8-1: "An Actuarial Communication prepared by an Actuary may be used by another party in a way that may influence the actions of a third party. The Actuary should recognize the risks of misquotation, misinterpretation, or other misuse of the Actuarial Communication and should therefore take reasonable steps to present the Actuarial Communication clearly and fairly and to include, as appropriate, limitations on the distribution and utilization of the Actuarial Communication."

The scope of a peer review can include the selection and application of methodologies and assumptions used in the determination of the findings and communications, determining compliance with the Code of Conduct, ASOPs, and Qualification Standards; determining whether the actuarial findings appear to be reasonable and well supported; and assuring that the results are communicated with clarity and professionalism. In my view, reproducing the underlying calculations is not typically included in the concept of peer review. An actuary will typically perform a detailed check of calculations before initiating a peer review.

To assure objectivity, the selected peer reviewer is generally not associated with the project or report. The peer reviewer needs to have the qualifications to perform a high-level review of the assignment to make sure that it is logically consistent, and that the report is in compliance with the Code, ASOPs, and the Qualification Standards. While there is no requirement that the peer reviewer be an actuary, many firms prefer to select an actuary who is qualified and has familiarity with the practice area in question.

Most actuarial communications would benefit from a peer review. The structure of the peer review can vary significantly depending on the size of the firm, the availability of qualified peer reviewers, and time considerations. Larger firms will tend to have a standardized peer review process that spells out exactly what types of documents need to be reviewed, what the review typically consists of, and the required qualifications of the peer reviewer. Solo practitioners, on the other hand, would be wise to have arrangements in place to make sure that their work is being reviewed in an appropriate manner. Arrangements with other solo practitioners or other actuaries can be made to ensure that a peer review can be done in an appropriate and timely manner. While this process may be cumbersome for a solo practitioner to arrange, the ultimate benefits of having a fresh pair of eyes to review the work product could be well worth the effort.

After completing the peer review, the reviewer communicates the results to the preparing actuary. If the comments are nonsubstantive in nature, the preparing actuary may decide which of the peer reviewer's suggestions he or she wishes to incorporate.

The structure of the peer review can vary significantly depending on the size of the firm, the availability of qualified peer reviewers, and time considerations.

For more substantive issues, the peer reviewer and the preparing actuary would typically have a direct discussion related to the issues. While this conversation may be somewhat uncomfortable for both parties, it is much better to resolve these issues before the report goes to the ultimate end-user.

The peer review process helps actuaries produce better work products. It gives the preparer an extra level of comfort knowing that someone knowledgeable has reviewed the report. It helps in identifying and resolving issues and problems before the results are presented to the end-user. It emphasizes the importance placed by the preparing actuary on complying with the Code, the ASOPS, and the Qualification Standards. Through the use of a peer review mechanism, preparing actuaries are likely to provide a better product to their clients, increase their own knowledge, and thus be prepared to service new clients and enhance their firm's reputation. When appropriate, the clients will usually appreciate being made aware that such a review has taken place. These benefits more than offset the additional time and cost of the peer review.

Peer review is a great practice tool—and practice makes perfect. □

DEBBIE ROSENBERG is a member of the Actuarial Board for Counseling and Discipline.

TOM WILDSMITH

Editor's note: This is the fourth in a four-part series on the key elements of the professionalism infrastructure of the U.S. actuarial profession. The first in the series covered the Code of Professional Conduct, the second covered the U.S. Qualification Standards, and the third covered actuarial standards of practice.

The Academy and the Web of Professionalism

Part 4: Discipline

I WAS A BIG BROTHER. One of the reasons God created big brothers was to annoy little sisters. I was good at my job.

What frustrated Amy the most was when I managed to both annoy her and get away with it. As any big brother knows, the very best technique for this is "the look." It works especially well in the back seat of a car, where you're both confined to the same small space. The beauty of this trick is that it doesn't actually involve doing anything—so there's nothing specific to punish. Yet every parent with more than one child has heard "He's looking at me … make him stop looking at me!" Sometimes Mom or Dad would get frustrated enough that they would tell me to "stop looking at her!" But that's a weak response at best, and once things had escalated to that point, all it took was a quick furtive glance to keep the fun going.

I loved to win this game—but it wasn't good for me. The conflicts between brother and sister, older and younger, are a normal part of childhood. These interactions help us learn how to relate to others, and prepare us for healthy social relationships as adults. We learn that the way we treat others affects the way they respond to us, and that there are consequences to our actions. We learn about limits, and we come to understand the difference between honesty and cruelty, teasing and mockery. Parents have an essential role in guiding the process—and "winning" the game teaches the wrong lessons for the future. It suggests that if you're clever enough, you can do what you want and escape the consequences.

ISTOCK

As I told my own children when they were young, you have to learn how to control yourself—if you don't, someone else will do it for you. One way or another, you will be controlled. If we don't learn this lesson as children, with the help of parents and teachers, we'll learn it the hard way as adults, most likely from police and the courts.

This principle is true for professions as well as for individuals. In the mid-20th century, the financial security of tens of millions of Americans depended on the work of actuaries, but actuaries were largely unregulated. That had to change, because it put the public at risk. Our profession had a simple choice. We could regulate ourselves, or wait for the government to do it for us. We made the mature decision, to control ourselves by creating a self-regulating profession—and the Academy was established to create the framework for self-regulation in the United States.

The Code of Professional Conduct, the U.S. Qualification Standards, and the actuarial standards of practice are essential elements of our framework for self-regulation, our web of professionalism. But they aren't enough. They provide a structure for understanding what we should do as professional actuaries. "Do the right thing" is a worthy slogan. But sometimes people do the wrong thing—whether out of ignorance, carelessness, greed, or malice. A credible disciplinary process is essential to maintaining the public's trust—and the right to regulate ourselves.

Over the past few months, we've looked at the strands that the Academy has woven into the web of professionalism—the Code of Professional Conduct, the qualification standards, and standards of practice. This leads us to our fourth and

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last strand, the profession's discipline process for encouraging and monitoring compliance with those standards through the Actuarial Board for Counseling and Discipline (ABCD).

The leaders who established the Academy understood that things will inevitably go wrong at times, and that our profession must demonstrate that it can—and will—discipline its own when necessary. Because if we don't do it ourselves, someone else will inevitably step in and do it for us.

Early Discipline Efforts

In the Academy's early years, our Professional Conduct Committee answered "any inquiries with respect to professional conduct of Actuaries of the Academy."[1] By 1975 this committee had evolved into the Committee on Discipline, which considered "questions that arise about the conduct of a member in his relationship to the Academy or its members, or in professional practice, or affecting the interests of the profession."[2] Each of the other actuarial organizations had similar committees to enforce their standards and discipline their members.

Before the Actuarial Standards Board (ASB) was established in 1988, the profession had not yet developed a robust set of common practice standards. As a result, most investigations were focused on questions of qualification and conduct rather than practice, and were treated mainly as "ethical" matters rather than "practice" matters.[3] An actuary with a question about applying practice standards in a particular situation was usually referred to the committee responsible for developing such standards.[4] The development by the ASB of a more robust and comprehensive set of standards of practice intensified the need for both a counseling process that could help actuaries understand how to appropriately apply the standards and a discipline process to protect the public and ensure compliance.

A second concern arose from the often overlapping memberships of the various U.S. actuarial organizations, which sometimes resulted in multiple investigations of the same case by different organizations. Because of the sensitivity of the issues involved, these organizations imposed confidentiality requirements on their discipline committees. As a result, "Complaints of alleged violations had to be directed to each organization of which the actuary was a member. This often proved confusing to the public and regulators and, in some cases, resulted in a complaint being filed with only one of the several organizations to which the actuary belonged."[5]

In the Footsteps of the ASB: An Independent Structure

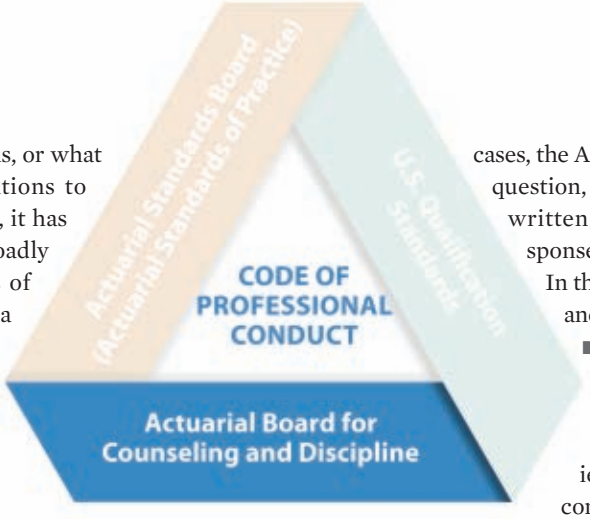
The Academy led a decades-long "standards movement," which culminated in the formation of the ASB on an interim basis in 1985. The ASB was established on a permanent basis through an amendment of the Academy bylaws in 1988. Once the decision to establish a formal standard-setting body had been made, the next logical step was to develop a body to counsel actuaries, investigate those who appeared to have violated the codes of professional conduct or standards of practice, and—when a thorough investigation confirmed that a violation had occurred—forward the results of the investigation and a discipline recommendation to each of the organizations of which the actuary was a member. As early as 1984, the Academy Board of Directors had indicated that the standards issued by the planned standards-setting body should be enforced.[6] The first ASB chairperson (and chairperson of the interim ASB), Ronald Bornhuetter, made the case for a professional discipline body more bluntly: "Unless the profession is prepared to enforce practice standards, the ASB is wasting its time."[7]

The realization that standards would mean little without an effective compliance and counseling mechanism was sinking in.

As we saw in the previous article in this series, the profession spent years discussing the structure of the ASB. Those discussions concluded that the optimal level of independence could be achieved by housing the ASB within the Academy, but providing its nine-member board with decision-making autonomy. When the time came to create the ABCD, the same considerations applied. Standards of practice—and judgments regarding whether they've been applied appropriately—must recognize the specific laws and regulations that apply in a country, so a national association is the most natural home. To be credible, any investigatory or disciplinary structure must be insulated from industry and commercial interests. As the national association for the United States, the Academy is not only free from such interests, but has an ongoing commitment to protect the independence and integrity of the ABCD's investigative and decision-making process. The ABCD operates as an autonomous entity within the Academy. But, it has no independent legal existence—it is a part of the Academy.

Like the ASB, the ABCD is housed within the Academy and receives Academy staff support. Like the ASB, its decisions are made autonomously; the Academy Board and staff do not make decisions for the ABCD regarding which complaints should be investigated, how to

conduct those investigations, or what disciplinary recommendations to make. Finally, like the ASB, it has nine members, who are broadly representative of all areas of practice and selected by a committee composed of the presidents and presidents-elect of the five U.S. actuarial organizations.



Key Responsibilities and Attributes

The ABCD was formally established in 1991 by a vote of the membership to change the Academy bylaws. By establishing a formal process for investigating actuarial misconduct and recommending appropriate discipline to the various U.S.-based actuarial organizations, the Academy achieved a key part of its mission—to gain widespread recognition that the U.S. actuarial community was capable of regulating itself effectively, and therefore was worthy of the public's trust.

The visionaries who established the ABCD wanted to do more than just strengthen the disciplinary process—they wanted to prevent problems before they occur by helping actuaries understand how to apply the standards and meet their professional obligations. They believed that counseling was essential. As one former ABCD chair put it, "Although discipline is appropriate in some cases, the ABCD believes that individual actuaries, the profession as a whole, and the public are best served by a process that focuses primarily on teaching good practice rather than on punishing unintended mistakes."[8] In addition to investigating potential violations and recommending discipline, the ABCD was also given the ability to respond to requests for guidance, mediate disputes, and counsel actuaries. Let's take a closer look at each of these.

- **Responding to requests for guidance (RFGs) from actuaries.** The ABCD provides guidance to actuaries who ask for help interpreting the Code of Professional Conduct, the qualification standards, or the standards of practice. In 2015, the ABCD responded to 96 RFGs, the most ever in a calendar year. In 2016, they were on track to set a new record. In most cases, RFGs are answered by an individual ABCD member, usually through a conversation. These conversations are completely confidential. In that case, the response represents the individual ABCD member's opinion, not necessarily the views of the ABCD as a whole. In other cases, more formal responses are requested. In such cases, the ABCD as a whole considers the question, and, if appropriate, provides written formal guidance. Most responses are provided in a few days. In this way, the ABCD offers guidance that is thorough and timely.
- **Mediating disputes.** The ABCD has the ability to mediate disputes between actuaries or between actuaries and members of the public concerning the professional conduct of the actuaries.
- **Investigating complaint.** The ABCD may investigate complaints concerning alleged violations of the Code of Professional Conduct—and, by extension, the standards of qualification and practice—raised against any actuary who is a member of an organization that has delegated authority to the ABCD to conduct an investigation on that organization's behalf. Shortly after the ABCD began operating, ABCD Chairperson Norm Crowder underlined the importance of this delegation of authority. "That delegation to investigate is the key. The ABCD simply makes the process more efficient, more uniform, more fair, and more coherent. And, it avoids duplicative investigations," he said.[9]

  After an investigation, the ABCD may dismiss the matter, counsel the actuary, or recommend disciplinary action to each organization of which the subject actuary is a member.
- **Counseling actuaries.** Counseling has always been one of the ABCD's most important functions. Counseling is not discipline, but is often used to educate actuaries who may have inadvertently violated the standards. Former Academy President Harry Garber explained the importance of the ABCD's counseling function: "Ultimately, counseling is a much more powerful tool than discipline. Discipline is what you want to apply when all else fails. We wanted to have the ability, when individuals had unknowingly violated standards, to make sure that they understood what they should be doing. If people who know better continue to violate standards, we can always resort to punitive actions."[10]
- **Recommending discipline.** If, after conducting an investigation, the ABCD decides discipline is warranted, it may recommend one of several types of discipline: private reprimand (if permitted by the bylaws or rules of the participating organization), public reprimand, suspension, or expulsion. The ABCD makes a discipline

recommendation to the organizations of which the subject actuary is a member, but does not impose discipline. It is up to the organizations to impose discipline, and they may implement the ABCD's recommendation as-is, modify it, or decline to impose any discipline at all.

ABCD investigations are conducted on a confidential basis. Confidentiality is important for several reasons. As former Academy President Lawrence Johansen wrote in 2001, "Confidentiality ... protects an actuary's professional reputation and allows the actuary to benefit from counseling or the dismissal of a complaint without suffering public embarrassment. Those benefits would be lost if all inquiries were conducted publicly."[11]

Confidentiality is maintained throughout the ABCD process. It is only when a case results in a recommendation of discipline that the ABCD passes information to the organizations of which the actuary is a member. It is then up to each organization to decide whether to impose discipline, and whether to make that discipline public. The Academy has long published brief discipline notices, but in 2009 it began publishing more detailed discipline notices to improve transparency and give actuaries more insight into the types of behavior or practices that may result in discipline.

Dealing with disciplinary matters is never pleasant, but it is an essential part of any self-regulating profession. It's also a shared responsibility. Precept 13 of the Code of Professional Conduct requires an actuary "with knowledge of an apparent, unresolved, material violation of the Code by another Actuary" to try to resolve it through discussion with the other actuary or to disclose it to the ABCD. Precept 14 requires actuaries to "respond promptly, truthfully, and fully to any request for information by, and cooperate fully with" the ABCD. In this sense, the Code makes each actuary the "cop on the beat" and "material witness," giving every actuary a role to play in the self-regulation of the actuarial profession.

The work of the ABCD is essential to help assure the public that actuaries are committed to providing professional services in an appropriate manner—and can be held accountable for their work. The ABCD's independence and integrity helps ensure that actuaries will be held to appropriate standards of conduct, qualification, and practice, strengthening the public's trust in the profession.

A Call to Action: Make Professionalism Your Culture

The Academy provides the professionalism infrastructure—the web of professionalism—for the U.S. actuarial community. This series has discussed each strand of that web in detail, finishing with the ABCD, the foundation for the profession's disciplinary process. Taken together, the interlocking standards and institutions that we've discussed address all aspects of our ethical responsibility to the public. They represent a common commitment to serving the public and provide the protections necessary to earn the public's trust.

The importance of the Academy's role in weaving a strong and resilient web of professionalism cannot be overstated. The vision of Academy leaders in past decades has given us a unified Code of Professional Conduct, standards of qualification that apply to any actuary issuing a statement of actuarial opinion in the United States, a strong standard-setting body and set of practice standards, and a counseling and investigatory body to help actuaries meet those standards—and to provide the foundation for disciplining them when they don't.

But standards and institutions are not enough. Professionalism is not just mechanical compliance with a checklist of technical rules, and it's certainly not something that can be "outsourced" to an institution in Washington, D.C. It's a personal recognition of the ethical responsibility we have to everyone who is affected by our work, and a moral commitment to doing the right thing. The standards and institutions are tools that help us live up to that commitment. Sometimes doing the right thing can be hard. That's why we owe it to each other to foster a culture of professionalism.

I'm proud of our profession—its history, its institutions, and most of all our commitment to honoring the trust the public has placed in us. This commitment is at the heart of our Code of Professional Conduct, the reason for our standards of practice, and the reason for a disciplinary process as well. It's what makes us professionals. □

TOM WILDSMITH is the immediate past president of the Academy.

Endnotes

1. *Yearbook;* American Academy of Actuaries; 1969.
2. *Yearbook*; American Academy of Actuaries; 1975.
3. *Actuarial Update*; American Academy of Actuaries; August 1988 (p. 4) and April 1990 (p.7).
4. *Structural Framework of U.S. Actuarial Professionalism*; American Academy of Actuaries; 2004 (p.23).
5. 2016 revision to *Structural Framework* paper (p.24).
6. Special Supplement to *Actuarial Update;* March 1984 (p.4).
7. *Actuarial Update;* American Academy of Actuaries; November 1989 (p.2).
8. Robert Sturgis, ABCD chairperson; *Actuarial Update;* American Academy of Actuaries; March 2001 (p. 2).
9. *Actuarial Update*; American Academy of Actuaries; June 1992 (p.2).
10. *Actuarial Update*; American Academy of Actuaries; September 1991 (p.4–5).
11. *Actuarial Update*; American Academy of Actuaries; March 2001 (p.5).

VISION IN ACTION

SCOR LAUNCHES ITS NEW STRATEGIC PLAN

Thanks to its accelerated development in Life and P&C reinsurance, SCOR now belongs to the top tier of global reinsurers. The Group's premium income will reach around EUR 13.7 billion in 2016, an increase of 34% since 2013. Shareholders' equity reached EUR 6.3 billion at 30 June 2016, up 33% over the strategic plan, after the distribution of EUR 781 million in dividends. SCOR's development has focused on the twofold objectives of profitability and solvency. All the targets of the "Optimal Dynamics" plan, which has come to an end, have been achieved. With the upgrade of its rating in 2015, SCOR is now rated AA–[1]. Plan after plan, the SCOR group demonstrates its ability to find solutions to all the challenges posed by a difficult and shifting economic and financial environment. SCOR absorbs loss event shocks thanks to its active, state-of-the-art risk management policy. Today, SCOR launches its new three-year strategic plan, "Vision In Action," which is fully aligned with "Optimal Dynamics."

Over the next three years, SCOR will pursue its dynamic combination of growth, profitability and solvency with ambition and determination, serving its clients and benefitting its shareholders.

2016–2019 TARGETS

HIGH RETURN ON EQUITY

ROE ≥ **800 basis points** above the five-year risk-free rate over the cycle[2]

OPTIMAL SOLVENCY RATIO

Between **185%** and **220%** of the SCR[3]

(1) Standard & Poor's and Fitch Ratings. (2) Based on a 5-year rolling average of 5-year risk-free rates. (3) Solvency Capital Requirement.

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IN TODAY'S TECH-DRIVEN AGE, we reserve a car through an app. We order McDonald's from a touchscreen rather than speaking to a cashier. In the U.K., a recent study showed that online transactions were 75 percent of all banking transactions.[1] It should not surprise us then to see massive increases in technology being used in the medical provisioning field. The new information and communications technologies we see elsewhere across the world are increasingly being used to break down barriers to care and to improve the way medical professionals connect with patients and each other.

The Future Is Here

How Telehealth Will Transform the Industry

By
Steve Abbs,
Joe Allen Allbright,
Yair Babad,
April Choi,
Carl Ghiselli,
and Zerong Yu

There have been various terms used for this type of health care delivery, including "telemedicine," "eHealth," and "telehealth." Most of the time they are used interchangeably. In this article we use "telehealth" because this term is most encompassing in the content of our discussion. Below is how the World Health Organization (WHO) defines "telehealth":

The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities." (World Health Organization, 2010)

Health care practitioners have been finding new and innovative ways to use communications technologies to overcome physical distances. In the 1920s, shipborne patients could receive medical care via radio.[2] Today, personal computers and mobile phones are able to facilitate real-time video connections between patients and medical professionals anywhere in the world.

To illustrate both a conundrum of the current state of technology in the current health care delivery system as well as shine a spotlight on its tremendous potential for growth, let us consider the following example: "At the end of 2015, 4.3% of the world population has regular internet access, but 4 billion people remain offline, around three-quarters of them in 20 countries."[3] To demonstrate this point, let us look at the following current reach of hospitals and universal health coverage (UHC)—defined as protection from financial risk, access to quality health care, and

DAVID PETERS / ILLUSTRATION SOURCE

FIGURE 1

Hospital Bed Density by Country

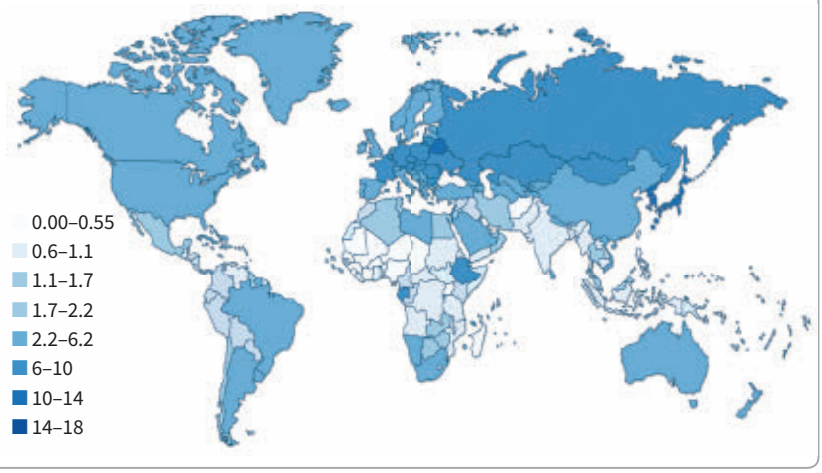
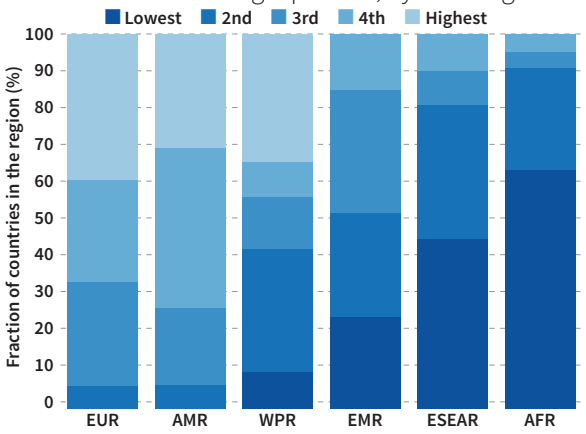


FIGURE 2

UHC service coverage quintiles, by WHO region



From "Universal Health Coverage – at the Center of the Health Goal", chapter 4 of the "World Health Statistics 2016" by the World Health Organization (WHO)

access to safe and affordable essential medicines and vaccines for all—compared to availability of communication technologies as shown in Figures 1 and 2.

Here we see that Africa has the lowest UHC level. Much of it is due to the lack of hospitals, clinics, and medical professionals. The geographical reach of African countries, combined with lack of roads and transportation infrastructure, adds to the scarcity. On the other hand, consider the extensive availability of personal phones in Africa, including the ever-spreading use of smartphones and monitoring and health-related applications (see Figure 3). One way to address the lack of coverage is the use of telehealth as the world becomes more and more connected.

This article will survey some telehealth achievements in a number of countries, as well as other recent advances in the field. Following this survey, we offer what we believe to be a feasible view of a worldwide, telehealth-based health care system and how it promises to truly revolutionize the health care industry, despite current implementation barriers. We conclude the article with the impacts of telehealth on actuarial practice.

Telehealth in a Developed Country

Israel

As may be expected, many telehealth initiatives have been deployed in the developed world, with its plethora of technical, communications, and medical advances. In the developed world, it is not so much a question of access to basic health care; rather, it is an issue of how quickly and efficiently health care can be delivered while being mindful of the need for regulation and legislation to ensure security and compliance with evidence-based practice.

Israel is largely geographically isolated from the balance of the developed world and thus has had to develop its own self-contained telehealth solutions. Israel has a population of about 9 million, of which about 40 percent are concentrated in the economically and health-developed central metropolitan region, whose area is less than 10 percent of the country. Consequently, health care access issues, and provision of quality health care to the periphery, are major telehealth drivers in Israel.

There are many telehealth initiatives and programs in Israel, including the 2012 Telemedicine Program of the Health Ministry, which virtualizes hospital physicians' offices and enables them to work with patients over the internet. The major obstacles to such programs are the development of regulations for web security, office procedures, and specializations training.[4] At the same time, Israel does not have restrictive telehealth-oriented legislation that would hinder or obstruct implementation of telehealth services and regulations.

Israel National Health Service is based on four HMOs that provide medical services during the population's entire lifespan. These HMOs, as well as Israeli hospitals, have various telehealth services, such as Pediatrician Online[5] and remote conferencing. Effectively, all medical providers and hospitals can be reached through public communications networks, including transfer of audio and visual data, as well as monitoring data. In addition, all health care institutions in Israel are currently involved in a national electronic medical record project, which will make the medical information of patients available to all service providers.[6]

Telehealth in Developing Countries

Moving to the developing countries of the world—where resources are scarce, medical care infrastructure is inadequate, and economic conditions are challenging—telehealth is often the only solution for some remote communities to get basic health care. Additionally, communicable diseases are more prevalent in many developing economies, and individual high-speed internet is a privilege in many of these pockets of the world. Patients often do not have medical care options and will go without care if there is no telehealth available. Therefore, telehealth serves a critical role in meeting the most basic medical needs of many of these populations.

The scarcity of medical staff, a lack of standards governing medical information, and legal issues with regard to distance medical advice are often cited as major impediments to telehealth growth, but some developing countries have recognized the enormous benefits that telehealth can bring. Various governments and non-governmental organizations (NGOs) have begun initiatives tailored to their unique challenges and needs.

India

There is currently a severe imbalance in access to medical care between India's urban and rural populations. Over 50 percent of the rural population would have to travel over 100 kilometers to reach medical care.[7] Telehealth can improve access to health care and can help to bridge the gap between urban and rural areas. Roughly 150,000 people in India are already benefiting from telehealth annually, and this number is expected to grow 20 percent in the next five years.[8]

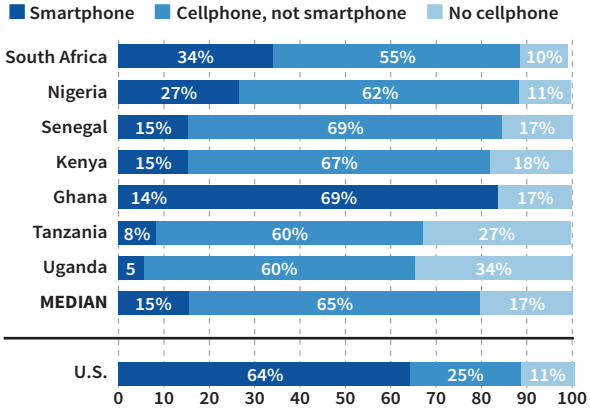
India has widely available mobile networks and has recently become the world's second-largest market for smartphones.[9] This presents a unique opportunity for telehealth innovation. Since 2001, numerous initiatives have been developed through the collaboration of various private and government entities both within India and across national boundaries. Some models are showing promising signs of meeting the local health care needs.

■ **DISHA Mobile Tele-Clinical Van:** Distance Healthcare Advancement (DISHA) is a telehealth initiative by Apollo, Philips, ISRO, and the DHAN Foundation. This project uses a mobile tele-clinical van to reach the most remote areas of the country at an affordable cost. The van is equipped with imaging technology such as ultrasound and X-ray, as well as a defibrillator, an electrocardiogram sensor, and similar equipment. Doctors and medical staff are onboard, and specialists are available remotely for consultation. The advantage of this tele-clinical van is its mobility: It can change location at a moment's notice and reach far corners of the country lacking health care infrastructure.

■ **Community-Based Odisha E-Health Program:** This community-based delivery model led by the state government of Odisha provides preventive health care and disease management telehealth services. The three-tiered system includes regional centers, district nodal centers, and facility centers linked at the village level. An assistant at each facility center serves as the facilitator, setting up tele-consultations. The servicing doctor can be any doctor within the network of hospitals, and basic medical tests can be done at the center—with referrals being made if further medical management is needed. A study shows only 15 percent of patients treated with tele-consultation actually had to go to hospitals for further treatment.[10] This community-based model has been successful with its bottom-up approach, reliable connectivity, and ability to deliver care in a cost-effective manner.

FIGURE 3

Cellphone ownership in Africa



Note: percentages based on total sample. U.S. data from December 2014 Pew Research Center surveys. Median percentage excludes the U.S.

Source: Spring 2014 Global Attitudes survey, Q68 & Q69

China

China's health care system has historically severely underfunded primary care. This lack of systematic funding means patients in many parts of the country do not have a reliable first point of diagnosis and care. As a result, patients are driven to seek care at large public hospitals in major cities, causing severe strain on first-tier public hospitals. China's government sees telehealth as a potential solution that can redirect certain patients from seeking critical care at the current hospital setting. This trend toward telehealth is in part driven by China's economic boom in the past decade, which has spread mobile technology to the masses. It is estimated that 83 percent of Chinese citizens access the web through a smartphone.[11]

Research shows that by the end of 2014, 42 percent of the overall primary hospitals and 50 percent of the total provincial-level hospitals in China had their own telehealth center.[12] Continuing this trend toward increasing adoption of telehealth, early in 2015 the National Health and Family Planning Commission issued a document outlining an ambitious plan to develop a uniform, national telehealth services network, linking fragmented existing systems that currently lack interconnectivity. The following programs are examples of the many telehealth initiatives that are currently under development.

■ **Cloud-based hospital:** The first cloud-based hospital was established in the city of Ningbo in 2015, a joint effort between government and the private sector. The hospital is equipped with advanced cloud computing technology, and an open platform connects with major hospitals, primary care institutions, specialists, pharmacies, and insurance companies. Patients can access care from home through cloud-based diagnostic rooms. Additionally, a dynamic health record is built for every citizen in Ningbo, which can be accessed by the patient via smartphone. Patients can also use an app for self-health management through wearable health devices that monitor blood pressure, pulse rate, and other vital signs.

■ **Telehealth after a major disaster:** After China's Lushan earthquake in April 2013, remote specialists from multiple disciplines, including orthopedics, cerebral surgery, and intensive care, were brought in through telehealth linkages to local rescue facilities. More than 110 patients were treated through real-time remote consultation and onsite operation guide, reducing wait time for treatment and increasing the chance of survival. This experience can serve as a blueprint for future catastrophes that may occur in other areas across the globe.

Other Telehealth Use Cases

Maternal and newborn health support: Pregnant women require extra care and monitoring, especially pregnancies classified medically as "high risk." Historically, health care practitioners provide this care through periodic in-person checkups with the mother-to-be.

There are areas, though, where pregnant women lack ready access to obstetricians and gynecologists. Mongolia, for example, is the most sparsely populated country in the world.[13] Many women reside in isolated rural communities and lack the funding needed to travel for expert, in-person medical care.[14] Consider the personal case of a young woman named Enkhtsetseg in Altai, Mongolia. Prior to the country's Telemedicine Network, she would have had to travel nearly two days to receive sufficient treatment if she had had serious pregnancy complications. Today, however, specialist care is available through a computer screen. Her personal testimony is heartwarming: "We are very happy this technology is available in our hospital, as it's something we really needed. ... It's comforting to know we can receive quality care in Altai without having to travel to Ulaanbaatar."[15] The success of the program is evidenced by all 21 provincial hospitals participating in the Telemedicine Network today, with the potential to reach up to 40,000 rural pregnant women annually.[16]

Increased focus and efficiency in treating mental illness: We end our survey of countries and current telehealth practices with a review of one specific aspect of care that has received heightened focus recently—the treatment of mental illness. The North Carolina Telepsychiatry Network is an example of the positive impact that telehealth can have. The state's General Assembly formed this initiative in the summer of 2013 at least partly driven by the lack of a psychiatrist in 28 of the state's counties.[17] Since going live in January 2014, early results are extremely promising, including a 33 percent decrease in the number of involuntary commitments to hospitals and/or psychiatric facilities and an 88 percent approval/satisfaction rating by patients who utilized the services of the network.[18] Additionally, a number of telehealth companies—including MDLive, Teledoc, and American Well—are now offering access to therapists and psychologists by way of mobile devices. Access to these services is becoming increasingly important as U.S. rates of opioid addiction, suicide, and other serious mental health conditions are on the rise.[19] Furthermore, the American Psychological Association is developing legal and ethical guidelines for practicing remote therapy.[20]

The early success of multiple telehealth initiatives in various parts of the developing and developed world may be just a foreshadowing of what we will see as the technology matures. Evidence is beginning to show that it is a more economically sustainable way of delivering and receiving health care services, particularly in developing countries. Telehealth has shown it can be a viable and scalable solution that has the potential to overcome existing geographic, economic, and cultural barriers and to deliver health care to the world's most disadvantaged and hard-to-reach populations.

The Future of Telehealth and Its Revolutionary Opportunities

Changing our perspective from the present to the future, let's consider a vision of a tele-based health care system. As this vision relies heavily on the revolutions of the internet, networking and communications, Big Data, and information technology, we need to broaden our definition of what telehealth is. Telehealth is not only connecting people to one another but also facilitating the exchange of data (e.g., medical records, physician/hospital details, location, biometrics from smartphones or wearables). However, this vision still encounters barriers to implementation, which we discuss below. Finally, we present some of the impacts and opportunities of telehealth to actuaries.

Continual monitoring, regardless of location

The envisioned tele-based health care system extends the current face-to-face medical encounter and the hospital- and clinic-centered system in several ways. First and most critically, rather than treating a person at a place and time of care, it continually monitors the person throughout daily life, regardless of geographical location and health-related status, collecting and analyzing real-time medically related information, using personal sensing and communications devices. This, in turn, enables the system to identify early budding medical issues and thus provide early or preventive treatment. Cloud-centered processing of information allows real-time sharing of personal medical data. The personal medical data follows the patient and exposes every provider and hospital to the whole medical history, therefore helping to decrease health care costs by eliminating multiple tests and treatments. (One key challenge in this area will be assuring the security of patients' data in a cloud-based system.)

Telehealth appointments have enormous potential to reduce travel and waiting time, bridge gaps in care, make care more convenient for patients, expand preventive outreach, reduce medical costs and readmission, and better utilize medical staff. This is particularly true for Accountable Care Organizations (ACOs) with their mandate of concurrently improving patient

FIGURE 4

Health Care Delivery System

Health and Medical Applications	Clinical Medical Services	Health & Medical Education	Consumer Health Information
	In-Office Services	In-Classroom	In-Person
	Remote Medical Services	Distance Learning	Remote Health Information
Health Information Technology Components	Electronic Records Management Information Systems Network Management and Device Interface		

Source: ATA

care and reducing medical costs.[21] Many telehealth services relate to remote analysis services and monitoring devices, such as home monitoring of cardioverter defibrillators with automated wireless remote data access.[22] Even today, many technical innovations drive telehealth forward,[23] and many more are expected with the exploding technological advances.

More efficient population health management

Current technology enables health care systems and providers to help slow the transmission of diseases such as Ebola, severe acute respiratory syndrome (SARS), and the West Nile virus. In the future, population health management will likely be greatly enhanced as health care administrators—at both the government and facility level—consider population- and country-wide health care strategies and allocate resources more efficiently. A "net" of informational bulletins and other tips can be spread to virtually the entire population very quickly, accurately, and cheaply via mobile devices—informing, motivating, and influencing people and population segments on health-related issues and adoption of healthy lifestyles.[24] Armed with more timely and accurate information than ever before regarding disease outbreaks and other public health crises, people can take a more proactive approach toward keeping themselves and others as healthy as possible. This may include up-to-date data on the very latest clinical treatments or suggestions for specific dietary modifications.

Public education

We find significant evidence demonstrating that the public is insufficiently knowledgeable about medical and health issues. As reported by *Scientific American*[25] on a study related to searches of 1,300 websites dealing with pediatric issues, only 43.5 percent of these were in line with the recommendations of the American Academy of Pediatricians. Additionally, 28.1 percent contained inaccurate recommendations; 28.4 percent were not medically relevant; and only 8.5 percent of product review retail websites were medically accurate.

Technology provides many opportunities to remedy the spread of inaccurate or misleading information, especially because telehealth, networking, and communication can give medical practitioners access to large populations and directly to consumers. Figure 4, prepared by the American Telehealth Association (ATA), demonstrates the relationships between health information technology and telehealth.[26]

The key to effective use of the technology is direct access to the consumer. The extensive and expanding use of online and mobile education techniques can be directly used to enhance public and consumer education of health and medical information. Of course, not everyone learns in the same way, so the educational outreach will need to be personalized. For some, distance learning similar to in-classroom health and medical education is fine. For others, short video vignettes, podcasts, or even interactive games will be more effective. Still others will best absorb concise, hard-hitting articles packed with relevant, timely information. Whatever the educational method, telehealth technology is well-suited to quickly adapt and deliver accurate information to the masses.

Beyond this, the ability of modern communication systems to interact in different languages, and to translate speech and text between various languages, makes telehealth technology particularly suitable in multi-lingual countries and regions, as are often found in the developing world. Indeed, these technological capabilities have been found to be particularly effective in developing countries, such as India[27] or Brazil.[28] Brazil has over 200 living languages,[29] while India has 122 official languages (however, the People's Linguistic Survey of India counted 780 languages back in 2013).[30]

How will these enhancements in public education be successful? In large part, this will depend on cutting through the

inaccurate information that already is present in the system. Health care providers will be instrumental in directing their patients to sites and mobile apps that provide comprehensive, accurate, and timely health information. At the same time, people will need to take control of their own learning by having their apps and newsfeeds deliver real-time information to them in the manner best suited to their learning style. This will take time and will require a good amount of support at the technological, health care provider, and government levels. However, we envision a future in which people turn to sites and apps sponsored by such organizations as the Centers for Medicare & Medicaid Services and WHO rather than Wikipedia or WebMD. When this happens, the now-rampant miseducation will dissipate.

Barriers to Implementation

This all *sounds* good. Greater access, greater efficiency, and lower cost—who wouldn't want these? Yet a number of factors in the current health care delivery system act as barriers to implementation. Here we briefly survey four areas impeding the spread of this type of technology.

Technology

Health care is becoming more integrated with technology, but not all of the telehealth technology is compatible. There are a number of technology platforms, all run by companies inherently competing with each other. Consequently, a patient may have to interact with multiple technologies through their multiple care providers—potentially reducing the effectiveness and engagement of any single option. Telehealth also frequently depends on high-speed, wide-band internet connections, which can be spotty at times or missing in various geographical locations. As mentioned above, the need to assure privacy of patient data is also a concern, especially across various platforms and systems. Add to this the perception by some that technology dehumanizes the doctor-patient relationship, and you can see why some view technology as a barrier to implementation.

System

Payers—private and public insurers, e.g.—in the current health care delivery system are struggling to find the balance of incentives to providers that will reduce the cost of medical service while improving the quality of care for the most people. Theoretically, technology enables providers to treat more patients in a more cost-effective and structured manner. In practice, there is likely an initial investment period, followed by an investment payback period, as the technology matures and is more accepted. Payers need to work with providers to devise a fair compensation mechanism that incentivises this more efficient way to deliver care.

The current system is also self-perpetuating in a couple of ways. First, human providers are usually not educated for new technology, nor are their facilities prepared for rapid adoption of such a change. Second, new insurance products and services that take advantage of technology are slow to penetrate the market. Providers are thus incentivized to use their current treatment plans until the new products are able to move the dial.

Culture

Most of the focus on culture has been on the provider side, where clinical buy-in is seen as the primary barrier to adoption. Providers need to be convinced of the benefits of a telehealth solution before they utilize it. Even a perception of lack of usefulness will reduce the adoption.

Based on a recent report from California researchers, this perception may not be entirely unfounded. The study, published in the journal *JAMA Dermatology,* found that telehealth services dealing with skin conditions often did not succeed in asking basic, necessary questions regarding symptoms—leading to repeated misdiagnoses.[31] In addition, despite the significant number of telehealth solutions already in place, each user is still an early adopter, as few of his or her colleagues or peers are using the same (or similar) technology.

Legislation and Regulation

Telehealth, when fully implemented, is a very different paradigm relative to the current health care system. It offers, in addition to its many benefits, new challenges—particularly in terms of patient privacy, data security and ownership, provider responsibility (which is complicated when multiple remote providers participate in a treatment to an individual or a population), transparency, and reporting. All of these challenges require upgrading the existing legislation and regulation. This is a particularly onerous task, when—as in the United States—multiple state and federal entities address each treatment, technical development, and telehealth activity.

Despite these (and other) barriers, we believe that a robust tele-based health care system will happen in time. It may take decades; however, the extent to which technology has pervaded everyday life seems as good a harbinger as any that the health care delivery system will catch up eventually in order to reap the benefits already being seen in many pockets of the world.

The Potential Contribution of Actuaries

Actuaries should realize the impacts that this reform and revolution will introduce to our practice. Undoubtedly, telehealth will leave its footprint in many areas that actuaries' work currently touches.

Pricing and reserving models

The initial emphasis naturally is on "traditional" health insurance (i.e., by insurance companies), public health insurance (i.e., by governmental agencies such as Medicare), and public health (i.e., as considered by the Centers for Disease Control and Prevention or by local government). The impacts are large and wide-ranging and affect all aspects—from pricing and rating to underwriting, product development, customer engagement, and the provision and cost of services. Actuaries will need to integrate dynamic real-time Big Data information and trends

on individuals and populations, as well as their treatments and behavior, in order to glean new insights from the related data, and incorporate those insights into their models, scenarios, and strategic and tactical projections. We believe it may have wider implications, to both life insurance and property/casualty coverages. Furthermore, new multi-morbidity techniques and tools will enable development of new prevention and treatment approaches and the related insurance products. In such an environment, many pricing and reserving actuarial techniques will have to be modified and adjusted.

Regulatory support

Actuaries will need to develop expanded health information expertise and acquire networking and communication skills to enable them to function within the telehealth environment and its emphasis on the consumer. Naturally, these activities will be used in the private and collective insurance market. However, to a greater extent than they do today, actuaries will be able to support public and governmental activities, including their health system, as well as regulatory and legislative efforts.

Cost-effectiveness assessment

We anticipate that the wealth of personal consumer and patient information will result in actuarial development of models to assess the cost-effectiveness of personal-oriented health care, disease management, prevention, and well-being initiatives. In other words, we see an expansion of the actuarial involvement from the insurance company and large employer environment into individual health support.

In summary, it can be expected that the role of actuaries, particularly health actuaries, will expand considerably relative to their current position, where to a large extent they mostly act in technical roles such as pricing and reserving. They may contribute as strategists, designers, and assessors of individual as well as large-scale future health care systems, facilities, and resources. The world of health care delivery is changing, and actuaries are well-positioned to be at the forefront of this movement. □

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The ABCs of LTC Financing

Future Needs, Key Issues, and Current LTC Alternate Solutions

Editor's note: This is the first of a two-part series on long-term care financing in the United States.

By Linda Chow and John O'Leary

LONG-TERM CARE (LTC) FINANCING in the United States will face significant challenges over the next 50 years. It is clear the need for long-term care is on the rise as the Baby Boomer generation ages. For a host of reasons, private long-term care insurance only accounts for 3 percent of LTC funding in the United States today. Without change, the financial burden of long-term care will continue to fall increasingly on individuals' income and assets, and on the Medicaid system.

This first article in a two-part series will focus on the projected future drivers and costs for long-term care, why the private LTC approach has not worked to date, and some alternate approaches currently in the market today that appear to help address some of the current market needs. Part 2 of this series (which will be published later in 2017) will explore several innovative approaches to financing LTC that are currently in the early stages of development.

The Need for LTC Financing Is Rising

For some time now, we have known about the demographic trends that will be facing our country over the coming decades. Driven primarily by 75 million Baby Boomers who are living longer due to great medical advances but are not necessarily healthier, the aging U.S. population is facing a major long-term care crisis.

According to the U.S. census, there were approximately 45 million people over age 65 in 2014. By 2055, that number is projected to double to almost 90 million. Half will be over 75, and the number of people age 85 and older will also more than double. As we know, the risk of needing long-term care grows with age and is higher for people over age 75. Individuals over age 85 have the highest levels of need.

The Urban Institute, a think tank based in Washington, and Milliman, an actuarial firm, recently conducted a landmark economic modeling study that provides further information on how much the need for LTC will increase over the coming decades, what the costs are likely to be, and the implications for the over-65 population and for state and federal governments.[1] That study is part of a larger initiative funded by the SCAN Foundation, AARP, and LeadingAge aimed at creating new analytic information that compares various insurance options to address the LTC funding challenge. What follows is an overview of that study's key findings as well as other work products from the larger initiative.

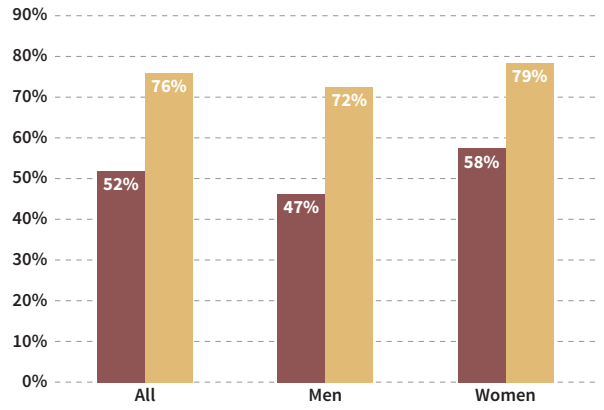
What will the future need for care be?

The Urban-Milliman study projects that while over 70 percent of seniors will need some long-term care, about half of seniors will need significant long-term care help in the future (Figure 1, page 30). Using a definition of care that is familiar to those in the

GARY WATERS / ILLUSTRATION SOURCE

FIGURE 1

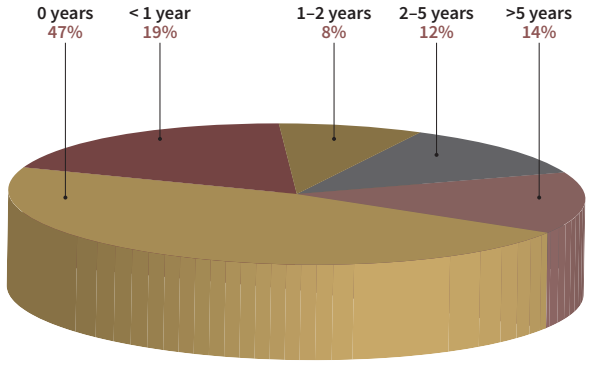
Percent over age 65 who will incur LTC needs



Source: *Long-Term Services and Supports for Older Americans: Risks and Financing Research Brief*; U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation; July 2015.

FIGURE 2

Duration of LTC need will vary widely



Source: *Long-Term Services and Supports for Older Americans: Risks and Financing Research Brief*; U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation; July 2015.

long-term care insurance market, this group of people will need help with two or more activities of daily living (ADLs) or will experience significant cognitive impairment. This is the level of care that typically triggers paid care under LTC policies, and it represents a significant level of disability.

How long will individuals need long-term care?

The amount and duration of care that people need will vary widely. Figure 2 indicates that about a quarter of the senior population will require care for two years or less, but a significant number—one in seven—will need care for five years or more. This type of care, often called catastrophic care, results from conditions such as Alzheimer's or Parkinson's disease and typically requires high levels of very costly assistance, often in facilities. In effect, we might think about the length-of-care issue as having two distinctive segments: first, a large number of people needing care for a relatively short amount of time, and second, a smaller (but not insignificant) number of people who will need a lot of expensive long-duration care.

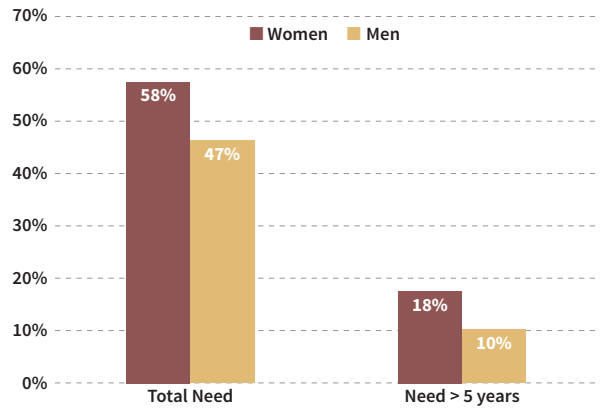
Who will need long-term care?

The study projects that the need for LTC will be significantly greater for women than men. Women will have an almost 25 percent greater likelihood of requiring long-term care than men, and they will have an 80 percent greater chance of needing long-duration care than men (Figure 3).

Similar to women's care needs, the study projects that those with lower incomes (+87 percent), those who are unmarried (+26 percent), and those with fair or poor health (+45 percent) will also be more likely to need long-duration care than their counterparts (Figure 4).

FIGURE 3

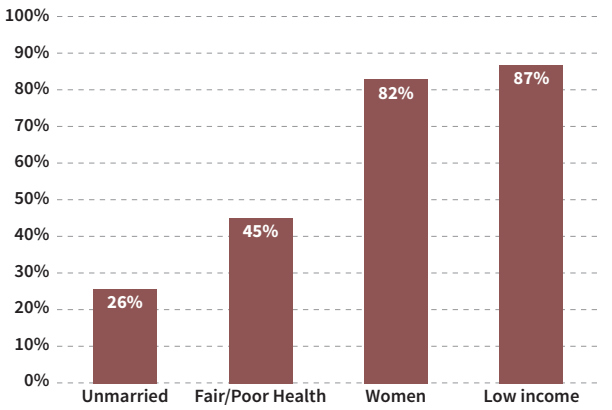
Women will be significantly more affected



Source: *Long-Term Services and Supports for Older Americans: Risks and Financing Research Brief*; U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation; July 2015.

FIGURE 4

Comparative likelihood of needing care 5 or more years



Source: *Long-Term Services and Supports for Older Americans: Risks and Financing Research Brief*; U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation; July 2015.

Who will pay the costs for long-term care?

In one of the more important new findings of this research, the model projects that over half of the projected costs for long-term care will be paid for out of consumers' pockets (Figure 5). Federal and state Medicaid programs are projected to pay about one-third of the anticipated expenditures. The federal Medicare program, which most consumers believe is the main payer for long-term care, will pay only about 10 percent of expenditures. Private long-term care insurance, often thought of as a major factor in long-term care payments, is projected to pay less than 5 percent of these costs without significant changes.

What will these costs be on a person-by-person basis?

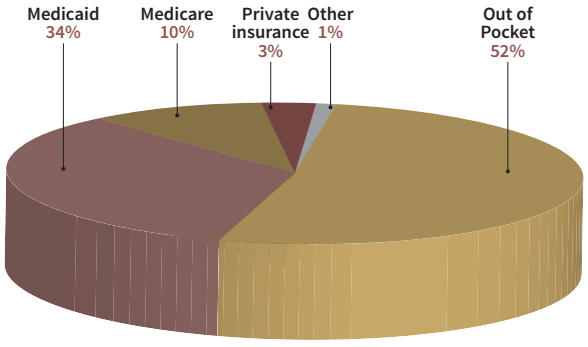
We know that long-term care can be expensive. This study provides a look at just how expensive it will be, both across the entire senior population and for those who actually use care. On average, the lifetime long-term care expenditures for all seniors is projected to be about $140,000. For those who are actual users of long-term care, the figure is much higher, at about $260,000 (Figure 6). The lifetime costs for women who use care are projected to be much higher than for men.

What type of care does out-of-pocket and Medicaid spending pay for?

On this question, the model projects that a higher portion of consumer out-of-pocket expenditures tends to go toward shorter-duration care (Figure 7). That care is often received at home or in community-based settings, and generally occurs in the earlier stages of a long-term care event. For many, this is all the care they will need, and theoretically, it could be covered by a less costly time-limited program.

FIGURE 5

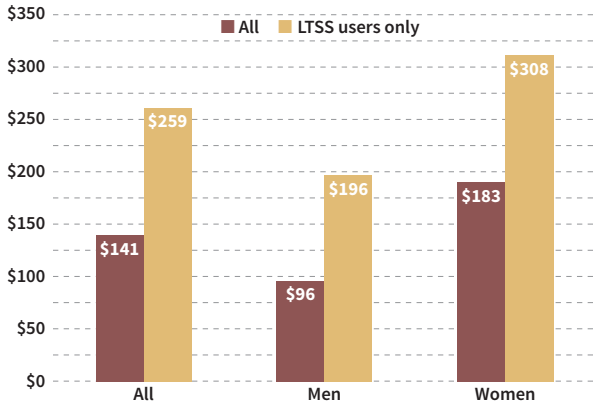
Future LTC expenditures will be paid mostly by individuals and Medicaid



Source: *Long-Term Services and Supports for Older Americans: Risks and Financing Research Brief*; U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation; July 2015.

FIGURE 6

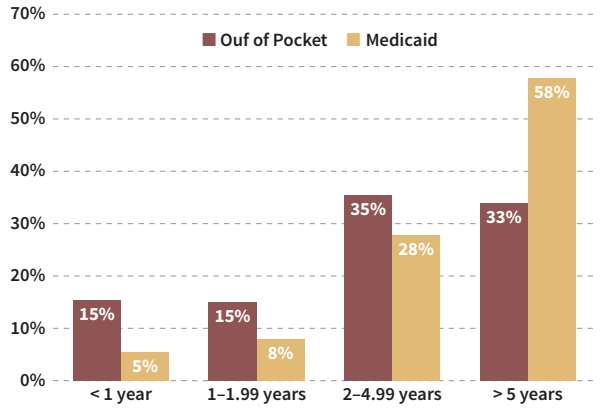
Lifetime LTC costs
(in thousands of dollars)



Source: Urban-Milliman Presentation; National Association of Social Insurance; January 27, 2016.

FIGURE 7

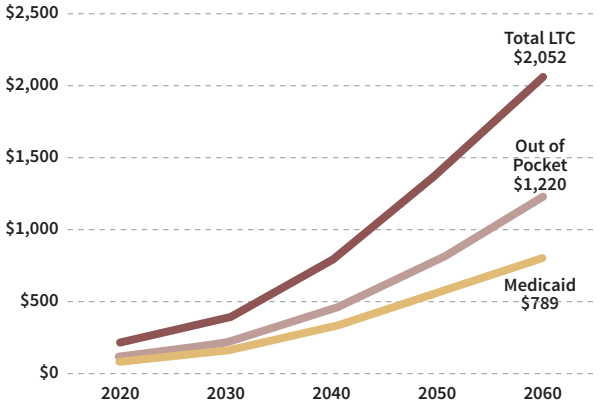
Percent spending by duration
Out of Pocket and Medicaid



Source: "Top Ten Learnings from LTC Financing Research," Anne Tumlinson presentation; Intercompany Long-term care Insurance Conference; March 2016.

FIGURE 8

Projected long-term care costs—2060
(in billions of dollars)



Source: *Microsimulation Analysis of Financing Options for Long-Term Services and Supports*; Urban Institute; November 2015.

The model also projects that a greater portion of Medicaid expenditures tends to go to long-duration care. This will often be the kind of expensive care that can have a catastrophic financial impact on families and ultimately, as care needs grow more broadly, on state and federal budgets. Even assuming efforts at changing its institutional bias toward more home and community care will be effective, Medicaid payments are projected to go more to facilities such as nursing homes. Medicaid will more frequently be paying for women's care due to the higher expenditures for long-duration care seen by them.

Overall, these findings reinforce the presumption that Medicaid is, and without changes will continue to be, the safety net for those with longest-duration care needs. The study also raises the question of whether approaches that specifically target this catastrophic problem, as opposed to a one-size-fits-all approach, will have merit.

What is the overall outlook for long-term care financing?

The model projects that long-term care expenditures will continue to grow as the Baby Boomer generation ages, increasing well into the trillions of dollars by the time we reach mid-century. With no changes, by the year 2060, total long-term care expenditures will grow to over $2 trillion, out-of-pocket expenditures will grow to over $1.2 trillion, and Medicaid expenditures will approach $1 trillion (Figure 8, page 31). This does not include the unpaid care provided by families, which accounts for an estimated $470 billion annually (as of 2013, the latest year available).[2]

Taken together, the magnitude of these numbers suggests that the long-term funding issue is both an unavoidable and likely unsustainable situation that needs to be addressed quickly. The remainder of this article looks at why, given the size of the emerging need, private long-term care insurance is not projected to play a more prominent role in future long-term care funding, and also current industry trends to address the emerging future need.

Key Obstacles

The private LTC insurance industry has been going through a period of turbulence over the past decade. The prolonged low-interest-rate environment and a number of other factors have caused the industry to suffer financially. Almost all of the major carriers have exited the market; only a relative handful of providers remain. In response to profitability challenges, premiums have increased significantly, and sales of traditional LTC insurance have declined precipitously.

In addition to low interest rates, a number of other fundamental and longstanding problems persist:

Lack of consumer understanding about the need for long-term care and its related costs

Consumers continue to exhibit a lack of understanding of the basics of LTC—how likely they are to need care; how much that care will cost; and what roles Medicaid, Medicare, private LTC insurance, and out-of-pocket spending play in financing those expenses. A 2015 study conducted by research firm RTI International reinforces the significant misconceptions regarding these issues.[3]

The survey found that fewer than 20 percent of consumers knew the costs of nursing home or home care, and only 25 percent correctly identified Medicaid as the primary government long-term care payer. (Consumers view Medicare as the primary source of LTC funding; in reality, it pays only a relatively small percentage of post-acute long-term care expenses. Medicaid does pay for long-term care, but only after virtually all personal assets are depleted.)

A compounding factor driving limited awareness relates to financial planning. Most consumers do not begin planning for retirement and older age (including potential future LTC needs) until they are within three to five years of retirement—and by then, the cost of private financing vehicles, including insurance, are too costly. The same RTI survey shows that over 70 percent of consumers agree that it's important to plan for LTC and would have family to help them, but only one in four have had this discussion with family, and only 12 percent have purchased private LTC insurance.

Existing products are too complex

Adding to the lack of understanding of the need for long-term care, its costs, and the potential risks from a financial point of view, long-term care insurance is too complex for many consumers to understand. This complexity takes many forms, including the use of unfamiliar terminology, a wide range of choices that are difficult to parse, and general language that is difficult to understand without significant context and product knowledge.

When considering an LTC insurance purchase, consumers find themselves confronted with an array of unfamiliar and confusing terms, such as elimination periods, informal care, custodial care, alternate care facilities, and potential rate increase disclosures. They then have to decide on daily benefit maximums, lifetime maximum benefits (in years, dollars, or both), automatic built-in inflation, guaranteed future purchase options, and nonforfeiture benefits that will be needed 20–40 years in the future. Asking consumers to work their way through this unfamiliar verbiage and make these decisions without appropriate context and education creates consumer confusion that often leads them to shut down during the purchase decision-making process and walk away.

While these significant hurdles can sometimes be addressed

by insurance agents and financial advisers, the middle-income consumer typically doesn't have access to this advice, leaving a large market underserved.

Lack of affordability, particularly for middle-income individuals

In addition to lack of awareness and knowledge, LTC products in the market today have become expensive, especially for middle-income people. According to the RTI survey, in terms of purchasing LTC insurance, a low price was by far the most important factor in the consumer decision to buy. Those who purchased tended to have assets and income of more than $100,000.

The RTI study projected that to achieve a 50 percent uptake, a basic LTC plan with a $100 daily benefit and three years of coverage (about $110,000 total coverage amount) would need to be priced at approximately $50/month.

Contrast that with the average premiums for LTC products of approximately $2,500 annually, or around $208 per month (according to a report by Limra, a financial services research firm), and the consumer disconnect begins to become obvious.[4]

Given the disparity between what consumers believe they need in terms of benefits and prices and what is actually being offered, it is easy to see why many buyers quickly reach the conclusion that this product is unaffordable and therefore not even worth consideration. Given that, it makes logical sense that the affluent have been the main customers for private LTC products, whereas the middle-class population has been severely underserved.

Use it or lose it

Another consumer obstacle to purchase of LTC insurance is that current products cannot be used as an investment vehicle to help accumulate assets because they are subject to legislation that does not allow the product to develop "cash values." Furthermore, if the consumer does not have an LTC claim (which most consumers doubt they will have), the belief, which is generally correct, is that their paid premiums will be forfeited without any benefit to them. This issue is commonly referred to as "use it or lose it," and it contributes to the negative consumer perceptions about the value of LTC insurance.

While it is true that a limited number of policies have been sold with a return of premium, limited sales success has not changed consumer perceptions that LTC insurance is a "use it or lose it" product.

The unanticipated difficulty of managing 'feature–rich' plan designs

In the past, stand-alone long-term care products have attempted to solve the LTC financing issue by covering as much of long-term care risk as possible, including anticipated future increases in the costs of care. While this was a desirable objective, it resulted in products with costly features such as 10-year or lifetime coverage, high daily benefits that tracked to nursing home costs (as opposed to other, less expensive sites of care), and built-in inflation protection that grew benefits at 5 percent a year. Supported by well-meaning regulators, agents, and carriers alike, the design forced carriers to accurately project interest rates, expected morbidity, and lapses over an extremely long period—a difficult and risk-laden exercise.

Claims experience, higher-than-expected lapses, and prolonged low interest rates have resulted in carriers across the board increasing reserves and increasing prices for many of these feature-rich products. All of this has resulted in private insurance options becoming even more expensive for the middle class.

Limited carrier supply

In addition to the concerns that are limiting consumer demand for current LTC products, there are issues on the supply side of the market as well. LTC is now deemed a high-risk product by carriers and has lost its appeal as a vehicle to generate premium and profit growth for their organizations. For many early-generation LTC products, the actual experience relative to the assumptions made when pricing the products has turned out to be significantly worse than was originally expected. Resulting profits dropped significantly, often requiring increases in reserves and capital.

LTC insurance products are traditionally funded by level, issue-age premiums. Because the costs of LTC benefits increase dramatically as a policyholder ages, this business model requires that large reserves be set aside in early policy durations to fund expected higher claims costs in

LTC products in the market today have become expensive, especially for middle-income people.

later durations. As a result, profits are extremely sensitive to fluctuations in interest rates, lapse rates, and morbidity assumptions. For example, a single-point drop in investment income can result in an increase in premiums of 7 to 11 percent in order to maintain the same profit level.[5] This sensitivity is often referred to as "assumption volatility."

A recent Society of Actuaries (SOA) study shows that the assumption volatility has been significantly reduced as the industry has become more educated regarding past data and experience, but carriers' negative views about the risk characteristics of the products are not easily reversed.

Several alternate product approaches are beginning to gain market traction to help address consumer needs.

Well-meaning consumer regulations result in consumer barriers

Over the years, the National Association of Insurance Commissioners (NAIC) has adopted a series of regulations intended to provide consumers with better protection. Two examples are the Long-Term Care Insurance Model Act, published in 2009, and the Long-Term Care Insurance Model Regulation of 2014. These were promulgated to provide a national standard for LTC insurance to guide state regulators on a wide range of issues, including loss ratio requirements, suitability, consumer disclosures, rate stability, inflation requirements, advertising, agent training, and many other elements important to protecting consumers. Taken together with the Internal Revenue Code section 7702B, which governs the tax treatment of long-term care and the long-term care insurance Partnership program that was initiated as part of the Deficit Reduction Act of 2005, these regulations create a complex web of interrelated rules that govern virtually all aspects of LTC insurance design.

These regulations, while well-meaning, are highly prescriptive as to exactly what should constitute a long-term care insurance offering and what an LTC insurance plan needs to include to enable favorable tax treatment or be Partnership-qualified. Unfortunately, by defining the product so specifically, these regulations have had the effect of somewhat limiting innovation and new product development and have encouraged a business environment that has proven to be extremely challenging if not impossible for carriers to effectively compete in. As a result, the desired objective of protecting the consumer against increasing premium costs has not been achieved.

Several examples help demonstrate the problem. First, the intent of the product—to have a level premium structure over the course of the policy—while a worthy goal, has been extraordinarily difficult to achieve because of the challenge of predicting key assumptions over a 30- to 40-year time horizon. That difficulty is compounded by the requirement to build fixed automatic inflation protection into the product. Again, it is a worthy objective to aim to protect consumers from future increases in costs of care, but this is very difficult to do profitably when the specified default is a 5 percent annual increase at a time of prolonged low interest rates, significantly below that level. Last, the process for carriers receiving permission to increase premiums requires significant justification and a prolonged approval process at the state level. Again, on the surface this seems to be very justifiable, but the uncertainty of whether carriers will be able to count on the increases needed to remain solvent, in light of product requirements such as built-in inflation protection, has caused many carriers to exit the market, leaving fewer active competitors who have tended to be those with higher premiums.

For there to be a viable, innovative private LTC insurance market, there needs to be significant effort on revising the regulatory framework.

Alternate Solutions Today

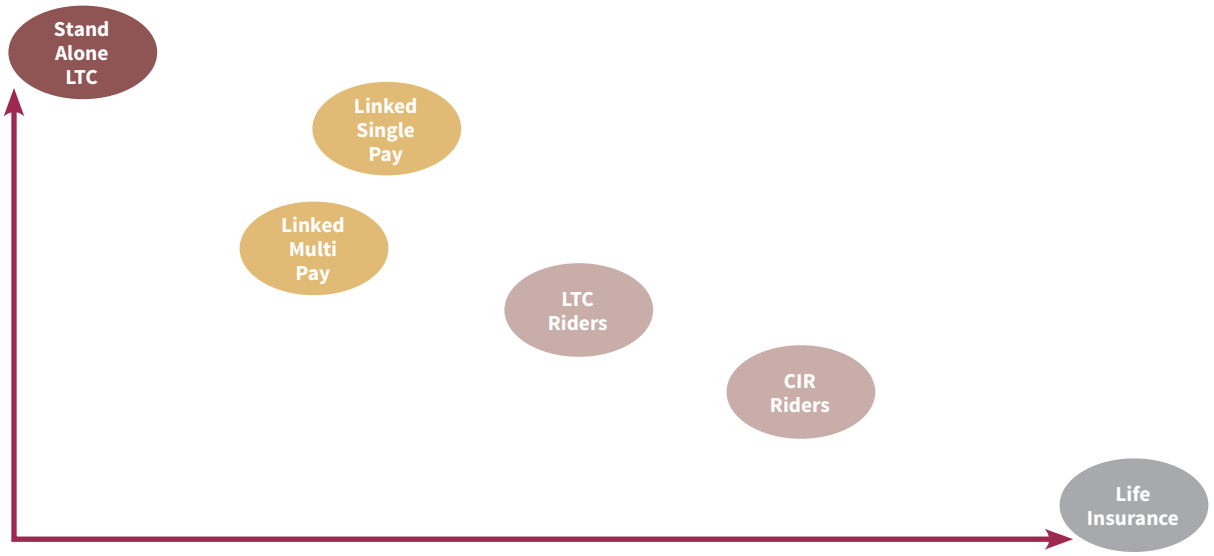
While traditional stand-alone long-term care products have been beset with the challenges enumerated above, several alternate product approaches are beginning to gain market traction to help address consumer needs.

Short-term care

Short-term care (STC) is not a new concept in the insurance industry, but it is a niche that has been growing as traditional LTC policy premiums become more unaffordable to many consumers. Similar to a traditional LTC policy, an STC policy can be structured to provide either comprehensive coverage (skilled nursing home, home health services, and assisted living facilities) or nursing-home-only coverage with or without home care.

FIGURE 9

Combo products meet a variety of consumer needs



Source: "Combo Products Meet A Variety of Consumer Needs"; Parag Shah; 2015 Limra Conference.

The product offers fewer options than traditional LTC insurance, and as such, it is easier for the consumer to understand.

Benefit durations for STC are usually one year or less; however, STC products use the same pool-of-money approach as LTC insurance, meaning that the total benefit may be able to be stretched to last longer. Carriers typically offer only two or three elimination period options, such as 0 days or 30 days. Reimbursement style is the most common payment structure among STC policies. Most STC policies are not tax-qualified, because they don't require a doctor's certification that the person's condition(s) would last for more than 90 days. That makes it easier for an insured to meet the benefit trigger but does not carry with it the imprimatur of either tax qualification or Partnership eligibility.

While the benefit period for STC products is usually one year or less, Figure 2 on page 30 shows that about a quarter of the population will only need LTC for two years or less, much of which could be addressed by STC products. Also, for consumers who have access to some family caregiving resources, an STC product can serve as an affordable backstop.

STC premiums average about $1,000 per year or $80 per month, which is generally lower than the premiums for LTC products, where the average is closer to $2,500 per year, or about $208 monthly. The STC premium level is closer to the consumer expectation of $50 per month from the RTI survey and offers potential appeal to the population with modest income and somewhat limited assets.

There is no uniform regulation for STC products. Some states regulate STC products under the limited health benefit standard, while others comply with NAIC LTC regulation. This makes the regulation somewhat less restrictive for STC, at least in some states.

Similar to LTC, STC products are priced with level issue-age premiums. Therefore, profits and premiums could still be somewhat sensitive to assumption volatility. The use-it-or-lose-it issue also applies to STC.

Based on a recent industry survey performed by Jesse Slome (executive director of the American Association for Long-Term Care Insurance), STC sales as measured by number of policies sold increased by 19 percent in 2015. However, with only six carriers providing the bulk of the policies, the STC market appears to be somewhat limited.

Currently, the product has not been widely recognized as an option in the current LTC market, as it has generally been marketed and sold by Medicare supplement agents, and commissions have been lower than for stand-alone LTC as well, therefore not attracting traditional LTC agents to the product.

Nevertheless, STC has been gaining in popularity, and based on the recent numbers regarding the future duration of LTC needs, it appears STC might be a viable partial solution for many in the middle class.

Combination products

The idea of incorporating LTC benefits into more mainstream products such as insurance is not new, and has been gaining significant traction and popularity with consumers. The combination concept addresses one of the major barriers to the purchase of stand-alone long-term care insurance—the common consumer belief that the premiums they pay for that protection will be wasted if they don't end up needing long-term care. At a time when many families are having a hard time making ends meet, they are less likely to purchase a product in which the benefit payout is uncertain. Combination products offer consumers an enhanced value proposition—life insurance and LTC protection in one product.

There are three common types of LTC combination products currently on the market. All three accelerate the cash value or the death benefit of the life insurance policy to cover LTC expenses.

The first type of design is referred to as an acceleration benefit or LTC rider. Like stand-alone LTC, this rider requires a benefit trigger of two of six ADLs or cognitive impairment. It pays out a specified proportion of the death benefit per month to help cover LTC expenses (typically 1 to 2 percent of the death benefit). The cash value is reduced proportionally. An acceleration benefit rider is governed by NAIC Model Act and can be treated as tax-qualified LTC under Internal Revenue Code section 7702B.

Acceleration benefit periods are typically two or three years. The incremental premiums for an acceleration benefit rider are relatively small because, in the early years, the LTC benefit is paid out of the insured's base life or annuity account value. The company is not at any additional meaningful risk beyond the existing life or annuity risk, making this a viable product option for carriers that are less comfortable with total LTC risks.

From an insurance carrier perspective, combination products generally carry lower risks than similar LTC benefits for a number of reasons.

The second type of product is referred to as a linked benefit product. Often, it includes both an acceleration benefit rider and an extension of benefit rider. An extension of benefit rider usually provides an additional two to four years of LTC coverage after the acceleration benefit is maximized. Having both an acceleration rider and an extension of benefit rider provides a meaningful level of LTC coverage. For example, a three-year acceleration rider and a three-year extension rider together would provide a total LTC coverage period of six years. Per Figure 2, only 14 percent of the population would need LTC care for more than five years.

The third product type, which is referred to as a chronic illness rider (CIR), is gaining market acceptance among traditional life/annuity carriers. The 2015 Limra study found that products with a chronic illness rider grew 38 percent in 2015 and represent 59 percent of the life/LTC combination product market. Mechanically, a chronic illness rider is similar to an acceleration benefit rider. However, a chronic illness rider is governed by NAIC Model Regulation 620 as opposed to Model Regulations 640 and 641. Five qualifying events are allowed for this type of rider, including clauses used to define a terminal illness, critical illnesses, older forms of chronic illness, permanent disability, and the typical LTC insurance benefit trigger (two of six ADLs or cognitive impairment).

The tax treatment of this type of rider is governed under Internal Revenue Code section 101(g). For a section 101(g) chronic illness rider, a lump-sum payment option is allowed. The use of benefits can't be restricted under a chronic illness rider, so informal care could be reimbursed. These types of riders are not allowed to be marketed as LTC riders. Typical LTC regulation requirements, such as LTC agent training, do not apply to chronic illness riders. This product is appealing to non-LTC carriers who would like to attract applicants looking for LTC coverage but who don't have prior LTC insurance experience.

Figure 9 illustrates the level of insurance protection provided by the various products. For example, if a consumer wants only comprehensive stand-alone LTC coverage, the stand-alone LTC product would serve this purpose well. If a consumer wants both life and LTC protection, the combination product would be a good option.

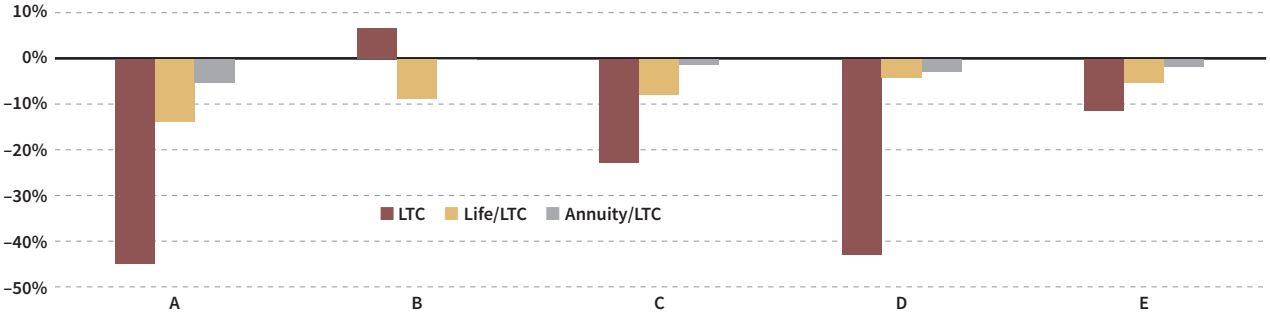
More than 80 percent of combination products in the market today are funded by a single premium. The single premium structure requires a relatively large amount of up-front policyholder assets, which, to date, has largely limited the customer profile to the affluent market (individuals with $100,000 to $1,000,000 of liquid financial assets).

From an insurance carrier perspective, combination products generally carry lower risks than similar LTC benefits for a number of reasons. First, the LTC benefits are initially paid out from the person's own policy account value. This significantly reduces carriers' financial risks during the acceleration period (usually the first two to three years). Second, a single premium structure enables carriers to better manage investment risks and insured lapsing behavior. An insured is less likely to lapse if the premium is paid in full. Third, benefit options are limited for combination products. Most carriers only offer one elimination period option. There are limited choices for acceleration benefit periods (usually two or three years) and extension of benefit periods (usually

FIGURE 10

Percentage change in IRR from best estimate by scenario

2 Year AB, 4 Year EOB, Without Inflation



	A	B	C	D	E
	115% of LTC Incidence	115% of Active Life Mortality	Decreased Investment Earnings	90% of Claim Termination Rates	50% of Standard Lapse by Plan
LTC	–45%	6%	–22%	–42%	–11%
Life/LTC	–13%	–3%	–9%	–4$	–5%
Annuity/LTC	–5%	0%	–1%	–3%	–2%

Source: *Quantification of the Natural Hedge Characteristics of Combination Life or Annuity Products Linked to Long-Term Care Insurance*; Milliman/Society of Actuaries and ILTCI Conference Association.

two, three, or four years). Rich benefit options, such as lifetime benefits, are not typically offered by combination product carriers. Last, many of the key pricing risk factors for the riders and the base policy offset each other, which creates natural risk-hedging characteristics when the base policies and the riders are combined. For example, an increase in incidence rates would hurt LTC profits. However, because the LTC benefit is first paid out from the policyholder's own account value during the acceleration period, the company is not at meaningful risk. The profit sensitivity to increased incidence rates under a combination structure is therefore reduced. Figure 10 shows that a 15 percent increase to the incidence rates would reduce stand-alone LTC profit (measured by internal rate of return, or IRR) by 45 percent. The life/LTC combination plan only shows a 13 percent profit reduction under the same scenario.

Additional details regarding the combination product's natural hedging characteristics can be found in a 2012 SOA report, *Quantification of the Natural Hedge Characteristics of Combination Life or Annuity Products Linked to Long-Term Care Insurance*. Figure 10 (taken from the SOA study) shows the profit sensitivities to change of the key pricing assumptions for stand-alone LTC, life/LTC combination product, and annuity/LTC combination product.

Combination product designs continue to evolve to address consumer and carrier demands. There has been significant thought invested by the industry regarding ways combination products could be designed to more affordably address middle-class needs.

Looking Forward

There are several innovative product initiatives in the marketplace today, including short-term care products and combination products that hold promise for addressing the future long-term care needs of our society. However, questions remain about whether such incremental changes to the basic LTC insurance business models will make enough of an impact to reduce consumers' out-of-pocket expenses, limit future state and federal government expenditures, and address the future care needs of our aging generations.

Part 2 of this series will examine several "disruptive" approaches that are currently on the drawing board. It will provide guidance on the potential impact that some of these different approaches might provide and suggest some new areas of exploration—not just for long-term care insurance, but also for other approaches to make future long-term care more affordable and accessible in the coming decades. ■

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Transparency

THE UNTAPPED TOOL

Implications for Health Care Costs and Quality

By Karen Bender, Gayle Brekke, April Choi, Brad Dirks, Shiraz Jetha, and Scott Katterman

IN THE UNITED STATES, health care services account for over 17 percent of gross domestic product—meaning more than $1 of every $6 spent in the United States is goods or services related to health care. For such a relatively large sector, however, patients (i.e., consumers) historically have had little or no access to comparative prices among providers of care at the time services were needed, nor has quality-of-care information been available. Likewise, physicians traditionally did not have cost and quality information available to them as they prescribed care and made referrals.

This lack of availability of cost and quality information has not heretofore been a significant public issue. More recently, however, continual and significant cost-of-care increases have driven a shift to high-deductible plans (including those with health savings accounts, health reimbursement arrangements, and others); thus, more of the population is being exposed to higher out-of-pocket costs.

To help their members realize greater value, most major health plans have started offering secure online access to cost information and, in a growing number of cases, also providing some quality information for providers available in their network. This information is typically specific to the member's cost-sharing and network options.

In its initial stages, the availability of the information was not widely known, its access was not user-friendly, and it was not readily actionable; hence, consumer utilization of this resource was poor. With advances in information technology, however, the information provided has improved (albeit slowly) to the point now where more comparative quality and/or cost information is available.

In the past several years, more software and analytical vendors have entered the price transparency market, initially directing sales to health plans or self-funded employers and now including providers as well. Some vendors have made their tools available to the public for free, enabling the consumers to search for fair prices in their local area.

Government agencies have also pursued promoting price transparency via legislation and other efforts. The Government Accountability Office has published two reports on health care transparency. Some states have also focused on publishing the cost of services using an all-payer claims database or other data with a view toward facilitating availability of cost information.

This article is a product of an initiative from the Academy's Transparency Work Group, which is part of the larger Health Care Delivery Committee. The authors are members of the work group. It is largely based on information gathered through online research, interviews with several individuals from payer organizations, the Health Care Cost Institute (HCCI), the Centers for Medicare and Medicaid Services (CMS), peer-review colleagues, and consulting companies. Our work group acknowledges the valuable input we received and convey our thanks for it. The opinions expressed here are those of the authors and not attributable to the American Academy of Actuaries.

For this article, transparency generally refers to the easy access of accurate information about cost of health care services that a patient will receive from a specific provider, with the cost information available before the service is provided. Ideally, quality of care information by provider should also be available so the patient can assess the value of the provider's quality for the needed service. By having both cost and quality information across all providers, patients can then make meaningful comparisons and select the provider who best meets their care needs.

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As providers, payers, and individuals adopt and act on transparency measures and tools, we may see downward pressure on health care costs. And as these initiatives are developed and implemented, actuaries will have several key roles to play.

Overview

It is argued that the asymmetry of information between those seeking and those providing care, given that price variation exists, generally results in higher overall prices within the system, even over short geographical distances.

The case for transparency in health care is essentially derived from economic theory—the ready availability of price and quality information in free and competitive markets allows market forces to come into play, which inject fairness and efficiency into the sector. After all, in most economic markets, consumers generally shop for the best value prior to purchasing goods. This is especially true when patients have "skin in the game" through cost-sharing obligations. The increasing awareness of true health care costs, plus consumer acclimation to the relative ease and availability of other online shopping experiences, will likely increase the demand for a similar experience with health care services.

There is often significant variation in the costs of medical services, even within a locality or its near-vicinity. For example, Guroo.com, a website that provides local, state, and national ranges in its database for 295 bundles of care, shows that the national average price for a knee replacement is $35,543, with a range from $26,834 to $45,803 for an "apples to apples" bundle that includes a visit with the surgeon before the surgery, 12 visits with a physical therapist after surgery, and two visits with the surgeon after surgery.[1]

HealthSparq, another transparency tool vendor, performed a study for one of its large clients that examined health care services for digestive conditions, women's health, and hernia conditions. They found that if all the "non-tool" receivers of care had made similar place-of-service selections as the patients who did use the transparency tool in advance, the total savings realized over a two-year period would have been $49 million for 26,200 cases (an average per case of $1,870). For these groups of services, the average cost difference between the low-cost and high-cost providers ranged from 180 percent to 250 percent.[2]

A variation to the individual shopping utility of transparency is reference pricing, which establishes a reimbursement level reflective of best values in the market; this practice has also been shown to help lower costs. In 2011, the California Public Employees' Retirement System (CalPERS) introduced reference pricing for knee and hip surgeries at a maximum of $30,000; if a provider charged more than $30,000, the enrollee paid the full amount above that $30,000 reference level. In the nine months through September 2012, the average price for the procedures dropped from $42,000 to $27,148. This reduction generated savings of $5.5 million during the first two years,[3] with a significant portion coming from price reductions and the balance from enrollees choosing the higher-value facilities.[4]

Health Care Consumerism

"Ultimately, this kind of health care consumerism might be part of a generational shift. Young people—who use their phones to choose restaurants and buy airplane tickets—might be predisposed to use price transparency tools," says Brent Parton, director of health policy and programs at SHOUTAmerica, a nonprofit aimed at engaging young people in health care system reform. But, he says, price information must be made available at "teachable moments," such as when people are seeking out routine or planned services, and must be integrated into their health care experience (e.g., through mobile apps or as part of physician visits). "Health care data is not following us as much as it should be; the onus can't be on the consumer to dig it up," Parton says.

Source: "Health Care Price Transparency: Can It Promote High-Value Care?" *Quality Matters;* The Commonwealth Fund; April/May 2012.

A variation to the individual shopping utility of transparency is reference pricing, which establishes a reimbursement level reflective of best values in the market; this practice has also been shown to help lower costs.

With compelling examples like these, one may wonder why transparency initiatives are not fully developed. One reason is the personal nature and urgency (real or perceived) of accessing health care services. Shopping online for material goods does not carry the same urgency as seeking medical care for the sudden onset of chest pains, for example. In an emergent situation, economic theory may not be as applicable.

Additionally, certain aspects of care delivery are not conducive to deriving full benefits from transparency. Some of the impediments include:

- The presence of a third-party payer for a substantial part of the cost blunts the incentive to seek and act on cost and quality information.
- Precise advance cost information is not always possible. Care often involves services from multiple providers (surgery requires a surgeon, anesthetist, and nurses, etc.), potentially including some non-network providers. The specific set of services to treat a condition varies also by providers and by patients due to co-morbidities or complications arising during treatments.
- In the case of referrals, a patient's choices for providers of subsequent care are often influenced by the initial provider.
- Health care costs can vary dramatically by geographical area and by individual providers.
- Confidentiality clauses in insurer-provider contracts often prohibit open sharing of specific information.
- Maximum out-of-pocket costs limit the value of transparency of higher-cost services; because the amount the patient may pay is limited, the patient's portion of the cost may not vary based on provider chosen.

For transparency to result in economic benefits, there must be provider competition at the local level, which will not be the case in some markets, such as rural areas. Increasing consolidation within the health care sector—within both the insurer and the provider markets—also could hamper competition.

Patients sometimes do not have much choice. Although there has been some movement to lower costs of care, as evidenced by the continual shift from expensive brand drugs to cost-effective generic drugs, it has not been the case when it comes to specialty drugs that are used for treatments of severe conditions. Specialty drug cost increases have been largely uninfluenced by transparency initiatives except at times when there are public outcries in response to outrageous cost actions. For example, a price increase for Cycloserine, a drug used for treating tuberculosis, was reversed in September 2015 following a public backlash. Instead of increasing from $500 to $10,800 for 30 capsules, it was increased to only $1,050. However, in the case of Sovaldi (for hepatitis treatment) and Daraprim (for serious parasitic infections), high prices remained despite public outcries.

Effectiveness and Potential Value

Transparency initiatives require information conveyance tools, and overall effectiveness is contingent on three factors: the efficacy of the information provided by the tools, the ease of use of the tools, and a sufficient volume of users who act on the information. Ideally, an effective tool would include the following elements:

- Costs based on the most current credible data, including member out-of-pocket costs and amounts borne by payers (insurers, employers, or government);
- Quality measures, including clinical outcomes and patient experiences;
- Measurement assumptions and methodology that are widely accepted by the provider communities, academics, the government, insurers, and other key players;
- Individual provider network participation status; cost estimates for out-of-network providers may be included but the information would probably not be very accurate;
- Average annual volume of the procedures performed by the providers;
- Patient reviews that include accuracy of the cost estimate, perceived quality of care, experience with provider and associated staff, etc. To be sure, the subjective nature of patients' input should be recognized; however, consistent patient experiences one way or the other can be more indicative of an issue; and
- Periodic transparency tool improvement surveys for users to complete; constructive user input will lead to better tools, increased tool usage, and better results.

Over the years, insurers and public databases have improved the quality and presentation of information on their tools. Because both quality and price are important to the member, one without the other can significantly reduce the utility of the tool.

Member awareness of the tool could be evaluated from usage data. Based on input provided by one insurer, tool usage by consumer-driven health plan members was twice that of a comparable sample from a preferred provider organization (PPO). Overall, from our research, it appears that 10 to 20 percent of users who have access to transparency tools currently use them.

Transparency could also be used by physicians—as patients become more value-sensitive, physicians could incorporate costs and quality as additional variables when deliberating alternative treatments with patients, or when making simple referrals for lab tests and screening procedures. As provider payment reform

progresses and providers are put at risk for spending, transparency tools would be utilized more frequently by physicians.

Another measure of effectiveness is savings generated for the member and/or employer. One insurer indicated that users of its tool on average saved $170 (with savings on "allowed claims" averaging $610) for the top 34 procedures included in its study.

The potential for significant savings does exist. In its March 2016 Issue Brief #11, "Spending on Shoppable Services in Health Care,"[5] HCCI found that, at most, around 43 percent of the $524.4 billion of health care spending in 2011 in employer-sponsored plans was on so-called shoppable services. However, with transparency tool usage still relatively low, it may take time to achieve a significant impact on health care costs.

West Health Policy Center projected an upper bound of $4.6 billion in annual health care savings potential for 2023 through patient use of information; this was estimated to be 0.4 percent of health spending on privately insured medical services.[6]

As indicated, members have been slow in utilizing the available cost information for their health care needs. However, with improvements in tools and messaging, annually increasing member cost-shares, health plan member support, and employer incentives to select better-value service providers, utilization of the tools is reported to be increasing. For transparency tools to be an important resource, the messaging should be readily accessible, clearly presented, accurate, easy to understand, and actionable. Increased usage of these tools would amplify the impact of transparency.

Implications of Transparency for Health Care Stakeholders

Health care stakeholders include individuals (patients and other insureds), payers (insurers, employers, employees and other individuals, and federal and state governments), providers (professional and institutions/facilities), and manufacturers (drug companies, medical device manufacturers, etc.; the potential impact of transparency for manufacturers is beyond the scope of this article).

While the benefits to the individual have been discussed, payers can also benefit. Anything that can favorably alter the cost trend is of interest. It is a "win-win" for payers and patients when the latter are enabled to seek the best value while reducing the overall cost of care.

Self-imposed competitive pressure may also result in providers competing to provide the best value, with either the aim of maintaining/enhancing market share and/or a sense of prestige associated with offering a high quality of service. This effort would also align with the contemporary goals of many specialty organizations (see sidebar, "ABIM Foundation Charter").

The American Hospital Association's July 2014 issue of *TrendWatch*[7] noted that the availability of price and quality information encourages providers to benchmark and improve their performance against their peers. Even in the U.K.'s National Health System, McKinsey found evidence of the "peer pressure" benefits of quality measures, including in choices made, productivity, quality, and accountability.[8]

Transparency tools provide one way to empower and engage patients to use health care resources effectively through informed decisions, manage their own health, and find the best value for needed care—especially as they fund significant portions of costs and/or insurance premiums.

There is a general lack of actual cost information on hospital services; even hospitals themselves struggle with this kind of information. If transparency and the resulting competitive fallout that may occur forces facilities to better understand their costs (which would then enable them to look for controls), there may be potential for some moderation, if not reduction, in the growth of providers' own costs and consequently the prices charged to their patients.

According to an article in *The New York Times*,[9] University of Utah Health Care began tracking its cost of service in a meaningful way, which helped to reduce its hospital cost. For example, it is able to differentiate among the cost per minute in the emergency room ($0.82), surgical intensive care unit ($1.43), and the operating room for an orthopedic surgery case ($12.00). With this added information, the hospital reduced excess expenses and managed to reduce its costs by 0.5 percent a year over the past few years while other academic medical centers in the area increased 2.9 percent a year over the same period.

Transparency may have unintended consequences. Until quality scores are widely available and fully credible, higher-cost providers will say their prices reflect the best quality. Also, once quality metrics are consistently available, some lower-cost providers may raise their prices if such an action would be supported by their quality scores.

Federal and state governments have a large financial stake in Medicare and Medicaid. As with commercial health insurers, any effort in transparency that could potentially affect costs and enhance the health care experience for its members may be welcome.

Actuarial Role

Actuaries can be important resources for increasing the success of transparency efforts. Among the areas where actuarial expertise—perhaps as part of interdisciplinary teams—could be helpful include:

- Complex provider payments through newer models (accountable care operations (ACOs), patient-centered medical homes (PCMHs), full capitations, shared savings, etc.); actuaries can help evolve transparency information built on fee-for-service models to the newer models;

ABM Foundation Charter

Among other things, the American Board of Internal Medicine Foundation's Charter requires its physicians to commit to a "just distribution of finite resources," and states that "they should be committed to working with other physicians, hospitals, and payers to develop guidelines for cost effective care."

- Quality of care measures (e.g., designs of benchmarks, indices, etc.), including establishing the underlying methodology, ensuring credibility and statistical significance along with risk adjustment, assessing cost and quality levels, and simplifying the presentation of the metrics;
- Product pricing driven through transparency outcomes;
- Outcome analysis (e.g., "like-to-like" comparisons with other data sources, analysis of estimated costs from tool to actual patient experience to improve accuracy);
- Analysis of provider issues arising from transparency data (provider quality, evolving case-mix changes generated at the provider level, etc.); and
- Cost accounting systems for providers and payers.

The Future of Transparency

Patients and payers are seeking more value for their health care dollar. With the health care sector representing over 17 percent of the economy, more accountability of costs and quality is desirable. Patients need efficient outcomes at lower and predictable prices, as well as accurate health care data provided in real time and at their fingertips. Although price transparency has come a long way during the internet age with abundant data and ubiquitous mobile apps, it still has a long way to go.

Increasingly, patients not only want to be more knowledgeable about their health but also be involved in their care choices and options. Transparency tools provide one way to empower and engage patients to use health care resources effectively through informed decisions, manage their own health, and find the best value for needed care—especially as they fund significant portions of costs and/or insurance premiums.

Will transparency lower health care costs and, if so, will it be a meaningful reduction? Health care has always been thought of as a "local market"; thus, depending on the price/quality variation found at a specific market level, and the extent of patients' cost-sharing obligations, transparency data may help lower costs by encouraging patients to choose providers showing the best value.

It is indeed worth noting that transparency by itself will not address all of the problems (financial or otherwise) in the health care system, nor will it happen within a short time frame. As a piece of a larger reform effort, however, transparency shows promise from both an intuitive standpoint, as evidenced by the existing range of prices for health care services and from early reports of success.

The following paragraph from "Transparency—the most powerful driver of health care improvement?" the McKinsey publication mentioned earlier, perhaps best sums up the value of transparency in health care:

> "Transparency has the potential to enhance accountability, productivity, and quality of service delivery; increase patients' involvement in their own care; and drive economic growth. Even if it achieves only some of these goals, it will significantly improve health system performance." □

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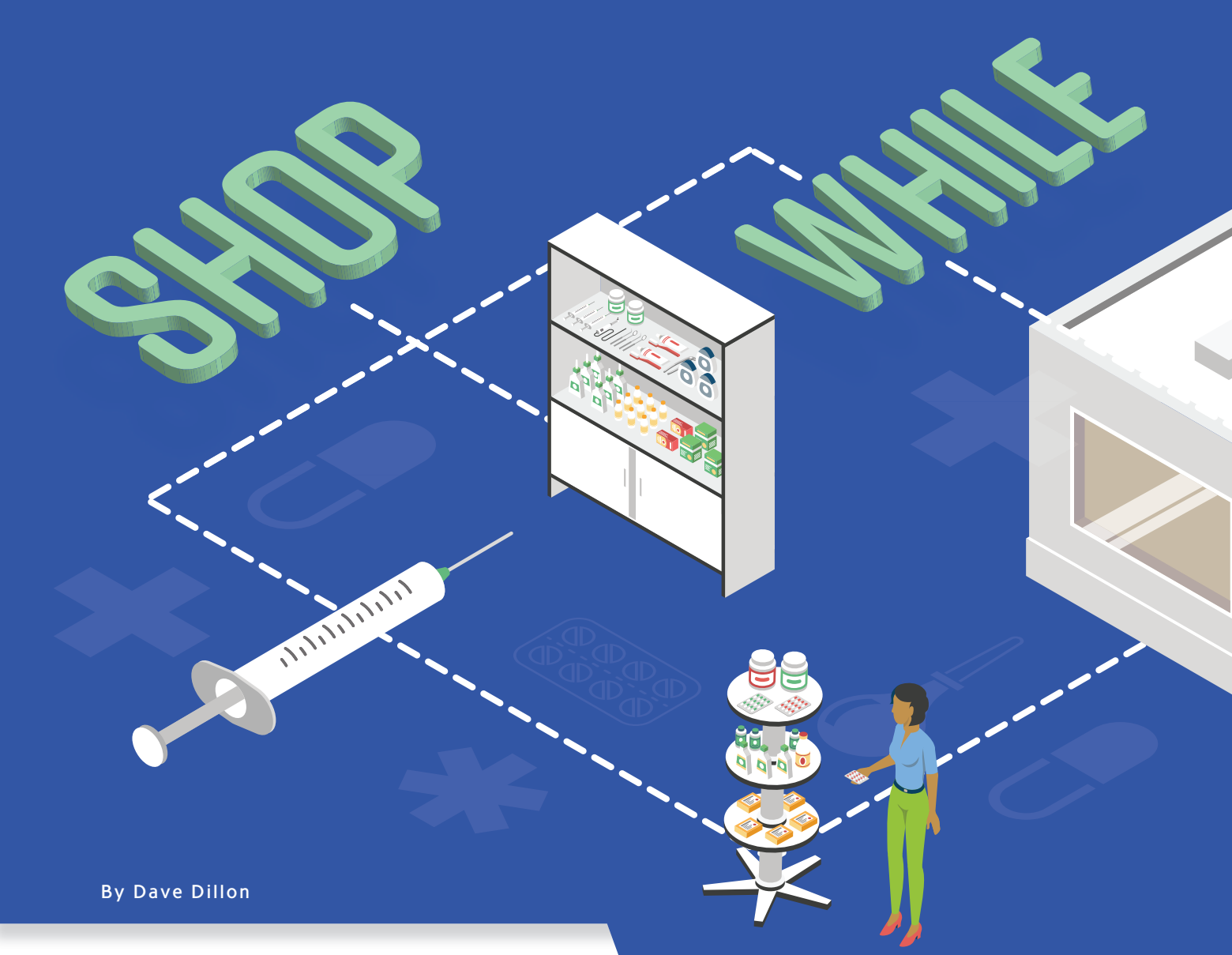

By Dave Dillon

Retail health clinics are reshaping the delivery of health care

THE HEALTH CARE INDUSTRY is making way for an emerging new delivery system called retail clinics. Located primarily inside pharmacies and big box retailers, these clinics are attracting millions of consumers who like the convenience, speed, price transparency, and lower costs they offer. As they continue to pop up in cities across the United States and their popularity grows, some experts are referring to their emergence as nothing less than "disruptive."

Patients unable to book an appointment with their primary care doctor within a reasonable time frame or reluctant to pay a visit to a hospital emergency room due to the cost now have quick access to medical professionals without waiting. In one survey, the vast majority of consumers who used a retail clinic say they did so for the diagnosis or treatment of a new illness or symptom.[1] The second most common reason was to obtain a vaccination or obtain permission for a prescription renewal.

About 30 percent of the U.S. population lives within a 10-minute drive of a retail clinic, according to AMN Healthcare, a nationwide medical staffing agency. Typically staffed by nurse practitioners and physician assistants, the clinics prominently display their pricing so patients know their costs up front. And those costs are typically significantly lower than traditional options. A study published in the *Annals of Internal Medicine* found that the cost of care for three common illnesses in commercially insured patients was significantly lower in a retail clinic ($110) than in a doctor's office ($166), urgent care center ($156), and hospital emergency room ($570).[2]

ISTOCK / MACROVECTOR

A report published by the Robert Wood Johnson Foundation found that users cited the following reasons for visiting the clinics: 58.6 percent said the hours were more convenient; 55.9 percent said there was no need to make an appointment; 48.1 percent said the location was more convenient; 38.7 percent said the cost was lower; and 24.6 percent said they had no usual source of care.[3]

"As we expect employees to be more engaged consumers, they will demand more consumer-like experiences, such as convenience, after-hours care, and easy access that is cost effective," said Brian Marcotte, president and CEO of the National Business Group on Health. "Seventy-four percent of clinicians believe retail clinics have had a positive result on access to care.[4]

Who's Who

Who are the players in this space? CVS Health's MinuteClinics number more than 1,100 clinics (including 79 in Target stores) in 33 states and the District of Columbia. Minute Clinics are the largest and fastest-growing retail walk-in and represent more than half of all retail clinics in the United States.

Walgreens' Healthcare Clinics number more than 400. They're located inside the pharmacy giant's stores and at provider practice locations around the country. Little Clinics, which operate in Kroger grocery stores, make a connection between health and healthful food by engaging dietitians in their care model. This includes services such as weight management, diabetes care, food allergies, and other self-managed health issues.

RediClinic, which opened its first in-store clinic in 2005, operates 35 clinics inside H-E-B grocery stores in Texas and

52 clinics inside Rite Aid stores in the Philadelphia, Baltimore, Washington, D.C., and Seattle areas. In addition to treating common medical conditions and providing preventive care, the company's Weigh Forward weight management program is offered in the clinics. In the more than 100 retail clinics inside Walmart stores, customers can get a full physical for $40.

According to a report from Accenture, these clinics are expected to experience rapid growth—a 47 percent increase by 2017 from 2014 levels, when approximately 1,914 retail clinics existed. Next year the number is expected to exceed 2,800 retail clinics.[5]

Convergent Forces

The trend toward use of walk-up medical providers is a response to several factors that are reshaping the health care landscape. To the extent that the Affordable Care Act (ACA) added approximately 20 million more Americans to the nation's health insurance rolls, the new law is responsible for a surge in demand. Many of these new users are a direct result of the expanded Medicaid program and the Children's Health Insurance Program.

And this growing Medicaid population is having an increasingly difficult time finding primary care physicians who will take them as patients. A study by Merritt Hawkins and Associates shows the number of doctors accepting new Medicaid patients has fallen significantly since 2009. The survey results show, for example, that 38.6 percent of physicians in Dallas accepted Medicaid in 2009, but only 23 percent accepted Medicaid in 2013, the most recent year for which data were available.[6] Nationally, only 45.7 percent of doctors across a range of specialties accepted Medicaid in 2013, a decline of roughly 10 percentage points from 2009.[7] Retail clinics may be able to help fill this provider gap.

The Association of American Medical Colleges says there is a shortage of 21,800 physicians today, and projects the number could grow to 90,400 by 2025.

A shortage of primary care physicians is exacerbating provider access problems, and that shortage is expected to worsen. The Association of American Medical Colleges says there is a shortage of 21,800 physicians today, and projects the number could grow to 90,400 by 2025. Moreover, a 2014 survey found 82 percent of physicians described themselves as at capacity or overextended and unable to take on new duties.[8]

At the same time, our population is getting older. With thousands of Baby Boomers reaching the age of 65 every day, their demand for health care services will increase as they age. Meanwhile, employees with company-sponsored coverage are taking on a larger share of the health care cost burden and becoming more active and engaged in managing their health. Finally, the national epidemics of obesity, diabetes, and other chronic illnesses mean that more people need more care to manage their diseases.

In response to these changes, retailers are increasing their services to include health screenings and chronic care programs. They may have started by treating coughs and runny noses, but now they're thinking bigger.

Continuum of Care

To provide patients an integrated continuum of care, retail clinics are forming affiliations with hospitals and clinics. More than 100 such partnerships have been established so far. For retailers, engaging health systems helps fulfill physician oversight requirements while providing co-branding with a high-profile system, which can bolster their reputation as a trusted provider and drive more individuals into the store. CVS's MinuteClinic, for example, collaborates with several health systems across the country, including Henry Ford Health Systems in Detroit. The contract allows patients of the Henry Ford Medical Group to use MinuteClinics as if they were one of 27 Henry Ford-owned medical centers and nine affiliated physician offices.

"Our physicians serve as medical directors to meet with nurse practitioners at MinuteClinics on a regular basis to review quality," said Paul Szilagyi, Henry Ford's vice president of primary care and medical centers. "They are a phone call away if the nurse practitioner has a question about a patient." CVS has more than 40 such clinical affiliations, including partnerships with the Cleveland Clinic, the University of Chicago Medical Center, the University of Michigan Health System, UCLA Health, and Emory Healthcare.

For health systems, the partnerships mean extending their primary care networks to new patient populations and increasing access to after-hour care for existing patients. Technology integration, particularly the sharing of electronic medical records, helps prevent fragmented care.

Some delivery systems are using retail clinics to reduce unnecessary visits to their emergency departments.

"When a patient is seen at a MinuteClinic and identifies a UCLA primary care physician, that physician automatically obtains a copy of the patient's encounter from MinuteClinic directly into the UCLA EHR [electronic health records]," said Bernard Katz, medical director of UCLA Primary Care and Specialty Care Network. Katz said once that flow of information becomes two-way, UCLA can start adjusting care by having patients obtain a follow-up appointment at a MinuteClinic. The provider will be able to offer MinuteClinic as an alternative to primary care and emergency room visits, thereby reducing its need to expand other service sites that may be more expensive.

Insurance companies also have begun to integrate retail clinics into their provider networks. For them, it's a means of putting downward pressure on the health care cost chain as they grapple with the enormous cost of managing chronic disease, which accounts for 86 percent of our nation's health care costs.[9]

Today more than four in five visits to clinics operated by major pharmacy retailers are covered by health insurance[10] (although consumers typically bear some costs in the form of co-pays and deductibles).

Insurer Geisinger Health System of Danville, Pa., launched Careworks Convenient Healthcare in 2006 inside Weis Markets, a regional chain of supermarkets. The company established Careworks to provide low-cost primary care services and act as an extension of the Geisinger primary care medical home program.

Geisinger operates in a largely rural region of Pennsylvania, with large areas lacking access to basic primary care, resulting in congested emergency rooms. Its Careworks clinics share electronic health records; they notify clinicians when a mammography, cholesterol screening, or other intervention is needed. As a result, Geisinger has reduced the strain on emergency rooms while establishing 3,000 new patient relationships a year with individuals who previously had not established a relationship with a primary care physician.

Higher Utilization

Recent studies have explored whether convenience has a cost. PwC's annual report on the state of health care in the United States suggests it does: "The proliferation of convenient ways to get care—such as retail clinics and urgent care centers—has led to higher utilization."[11] The report goes on to say that even if higher use of these alternative sites reduces spending in the future, the savings may not reduce the short-term costs of more visits. The report calls 2017 "a tough balancing act for the health industry," which must increase access to consumer-friendly services while decreasing per-unit cost.

Another study, conducted by the Rand Corporation and published in the journal *Health Affairs,* also suggests retail clinics do not trim medical spending, but instead may drive it up. The reason: The clinics encourage people to use more services.

The researchers found that 58 percent of retail clinic visits represented new utilization and not substitution for costlier primary care or emergency department visits. The net cost of this new utilization was determined to be $14 per person per year.[12] "Retail clinics do offer benefits such as easier access to medical care," said senior author Dr. Ateev Mehrotra, associate professor at Harvard Medical School and adjunct researcher at Rand, "but the widely expected cost savings may not be realized."

A Culture of Health

As the United States navigates the massive changes brought about by passage of the ACA, retail clinics, physicians, hospitals, and other providers are working toward the widely accepted "Triple Aim" of health care: enhanced patient care, improved population health, and reduced cost. By offering chronic disease management, weight control programs and nutrition services, retail clinics are taking a prominent role in promoting population health.

Notably, they are out front in providing vaccinations. About 50,000 adults die annually from vaccine-preventable diseases in the United States. Before the swine flu pandemic of 2009, few pharmacists administered flu vaccines. By 2013, more than 200,000 pharmacists (70 percent of the workforce) had been trained to administer the vaccines.[13] All 50 states, the District of Columbia, and Puerto Rico authorize pharmacists to administer vaccines. Almost one in five adults now receive a vaccination at a pharmacy or retail store, second only to a doctor's office.

On Aug. 1, 2016, Walgreens began offering vaccinations that provide protection against most strains of bacterial meningitis at all of its pharmacies. Walgreens collaborated with the Alaska Department of Health and Human Services on a diphtheria, tetanus, and pertussis vaccination when cases of pertussis in that state spiked. CVS, in collaboration with Direct Relief, provided $1 million in flu shot vouchers to patients in underserved communities. Walmart has worked with local health departments in Albany, N.Y., to administer flu clinics at its stores.[14] Immunizing Americans against life-threatening illness will continue to be an important way the clinics are expanding their footprint.

As retail health delivery proliferates, it is expected to evolve, moving from episodic treatment centers to fuller integration into the U.S. health care system. Retail health clinics will likely be fully linked to primary care physicians, insurers, and hospitals. Because they provide convenient, affordable, and quick access to health care, they can be expected to play an increasingly vital role in our culture of health. □

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Catastrophic Medical Claims: Trends Impacting Managing Risk Associated With Value-Based Reimbursement

ISAAC NEWTON WAS WRONG; what goes up sometimes keeps going up. The past, the present, the future cost of total U.S. health care can be chronicled as follows:

	2009	2014	2021 (projected)
Total cost	$2.5 trillion	$3.0 trillion	$4.8 trillion
% of GDP	16.6%	17.5%	19.9%
Per capita cost	$7,500	$9,523	$11,722

Source: OECD and World Bank Health Institute

To put this into perspective, health care costs have risen more than three times faster than salaries. If other consumer prices had grown at a similar pace since 1945, the following are what one would pay for various items today:

- One dozen eggs = $55
- One gallon of milk = $48
- One dozen oranges = $134

(Source: CPI estimates)

This article investigates several important market trends and developments and how they affect health care costs—and how stakeholders can mitigate health care cost risk.

Pricing and Payment Trends Driven by the Affordable Care Act

The Affordable Care Act (ACA) continues to have major impacts on health care systems and payers. Health care systems have to address readmission penalties on Medicare fee-for-service, causing a shift to value-based contracting by the Centers for Medicare and Medicaid Services (CMS). In addition, many health systems have or will set up accountable care organizations (ACOs), alternately referred to as clinically integrated networks, to have more control over financing and delivery of care.

Payers must adjust to exchanges promoting lower-cost plans because individuals are making purchase decisions. Most reports show significant losses in these programs due to antiselection. ACA-mandated medical loss ratio (MLR) thresholds, rate controls, and benefit designs are now the norm. These higher costs are causing payers to push for risk contracting to reduce high costs; i.e., shifting risk to providers and ACOs via capitation.

CMS defines ACOs as groups of doctors, hospitals, and other health care providers who come together voluntarily to give coordinated, high-quality care to their (Medicare) patients. They often involve a narrow network of high-performing hospitals and physicians to control costs and integrate care. In 2016, there were already 800 ACOs, including 397 Medicare ACOs and 21 Next Generation ACOs, which assume higher levels of risk.

The Medicare Access and CHIP Reauthorization Act (MACRA) was signed into law April 2015. MACRA will drive value-based reimbursement momentum, as payments are based on the quality of care physicians deliver rather than the quantity of procedures performed. Providers may earn built-in bonuses if they meet and exceed certain quality metrics.

In addition to changes in delivery and financing resulting from ACO development, other approaches are being utilized by payers to control rapidly rising costs. Reference-based pricing attempts to pay providers a fair price for services rendered. It is usually linked to Medicare-based pricing, with additional controls to limit providers' reimbursements to usual, customary, and reasonable (UCR) levels. UCR charges for services, treatment, and supplies will be held comparable to charges from similar providers in the area. To apply this cost control, a payer (or vendor) utilizes a cost-to-charge database with severity adjustments for complex cases.

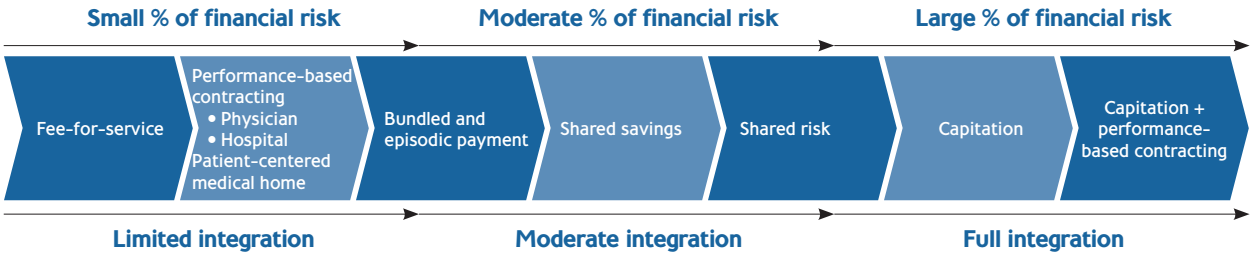
Medicare-based pricing represents a fundamental shift that targets out-of-network claims to be reimbursed at some multiple of Medicare charges, typically 125 to 175 percent. Medicare-based pricing has emerged in the following applications: preferred provider organization (PPO) replacement and narrow network wraparound programs, supplemental network replacement programs, and UCR maximum allowable claim reimbursement guidelines.

Value-based reimbursement, where cost and quality are more integral parts of the cost-quality-access equation, is now seen by many as the best replacement for traditional fee-for-service reimbursement in health care. The goal is to pay providers for delivering the best, most cost-effective care—not simply the most care. This shift to ACOs is predicted to bring a longer-term market shift toward value-based contracts and away from fee-for-service contracts. Instead of providers being paid by the number of visits and tests they order in the fee-for-service model, their payments are based on the

FIGURE 1.

Compensation Continuum

(Level of Financial Risk)



Source: Optum

value of care they deliver as determined by outcomes and results.

Many public and private payers and providers are moving in this direction, as evidenced by the following excerpts:

> "The Obama administration on Monday announced an ambitious goal to overhaul the way doctors are paid, tying their fees more closely to the quality of care rather than the quantity. ... The goal is for half of all Medicare payments to be handled this way by 2018."
>
> —*Washington Post,* Jan. 26, 2015

> "Aetna says 28 percent of its reimbursements are now in value-based contracts, and it expects that rate to jump to 75 percent by 2020."
>
> —*Washington Post,* Jan. 26, 2015

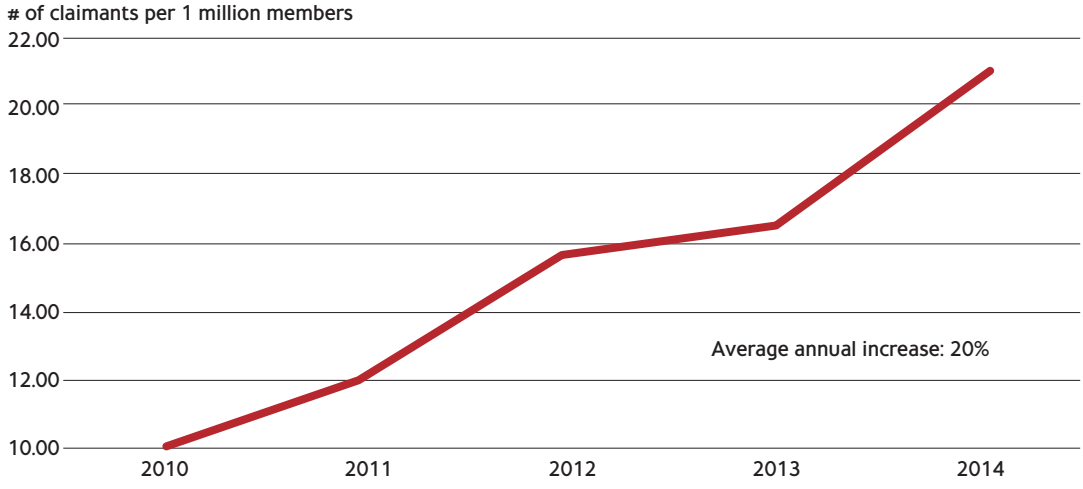
> "Healthcare merger and acquisition activity is likely to remain strong in 2016, driven by the growth of value-based payment models."
>
> —Beth Kutscher, *Modern Healthcare*, Jan. 1, 2016

A hospital system or health plan can participate in health care risk via any of the following strategies:

- A Medicare Advantage plan;
- Bundled payments;
- Medicare or Medicaid government program capitation agreements;
- Direct contracts with employers;
- Contracts with a large insurer (Blue Cross, United, Cigna, Aetna) for commercial, Medicare, or Medicaid risks;
- Participating in an ACO;
- Starting a health plan (e.g., a health maintenance organization (HMO) or insurance company); and

FIGURE 2.

Commercial Trend in Large-Claim Frequency Claims Over $1 Million



Source: Summit Re claims data.

- Adding assumed provider excess risk into a captive formed previously for hospital liability (medical malpractice) risk.

Entities employing an enterprise risk management strategy on these new risks should consider excess of loss protection for catastrophic claims. Decisions that used to be made at the health plan level are now being made in the executive suite of the hospital system. A risk-taking entity should contract with its insurer/reinsurer and external vendors to maximize the value of the coverage and reduce payments for inappropriate care or billing practices. Areas to address may include unbundling, adverse events, billing and coding errors, experimental and investigational treatments, room and board acuity level disparities, duplicate charges, and items not deemed medically necessary.

Catastrophic claim costs in total continue to escalate, as shown in Figure 2.

Reinsurance, or provider excess of loss insurance coverage, is a risk management tool to protect the budget of the entity assuming medical risk against unpredictable catastrophic claims. Following are two examples why enterprises buy such insurance or reinsurance coverage:

- **Case 1**—32-week premature infant with possible DiGeorge syndrome. Congenital anomalies include truncus arteriosus, atrial septal defect (ASD), hypospadias, polydactyly, syndactyly, hemi-vertebrae, ambiguous genitalia, hypocalcemia. Post-cardiac surgery truncus arteriosus and primary closure of ASD. The infant stayed in the neonatal intensive care unit (NICU) of a large teaching facility, which was out of network with no negotiated discount. While on a ventilator, the infant received nasogastric tube feedings, and genetic testing was performed to verify diagnosis of DiGeorge syndrome. A request was received by the treating team to transfer the baby to a facility in the Southeast for a thymus transplant for DiGeorge syndrome. Billed charges per day averaged $12,000.

Cost projections

- Stay at the current facility: 6.5 months (195 days) x $12,000/day = $2,340,000
- Air ambulance transport: $40,000
- Stay at Southeast facility, plus thymus transplant: $350,000

Total exposure: $2,730,000

- **Case 2**—Two-year-old boy diagnosed at five months with tuberous sclerosis and seizures. He started at a local children's hospital, but seizures were not controlled. He was referred to specialists in a facility in the Northeast who implanted electrodes to monitor seizure activity and resect the seizure-causing tuber. The facility and physicians were out of network with no discount. This type of procedure at this facility had historically demonstrated billed charges in excess of $900,000, with an average length of stay of 19 days. Total billed charges for this particular case reached $661,359. An outside negotiator was recommended prior to having services rendered, with the following results:

Negotiated discount

- Facility case rate for surgery and admission: $168,000, no floor
- Physicians paid at 150 percent of Medicare
- Billed rate: $661,359
- Total Paid: $178,139
- Gross Savings: $483,220
- Vendor fee: $3,500
- Net Savings: $479,720

Catastrophic Claim Trends by Type of Claim

Key health care cost drivers include specialty drugs, oncology, dialysis, transplants, neonatal intensive care, and cardiac ventricular assist devices (i.e., VADs).

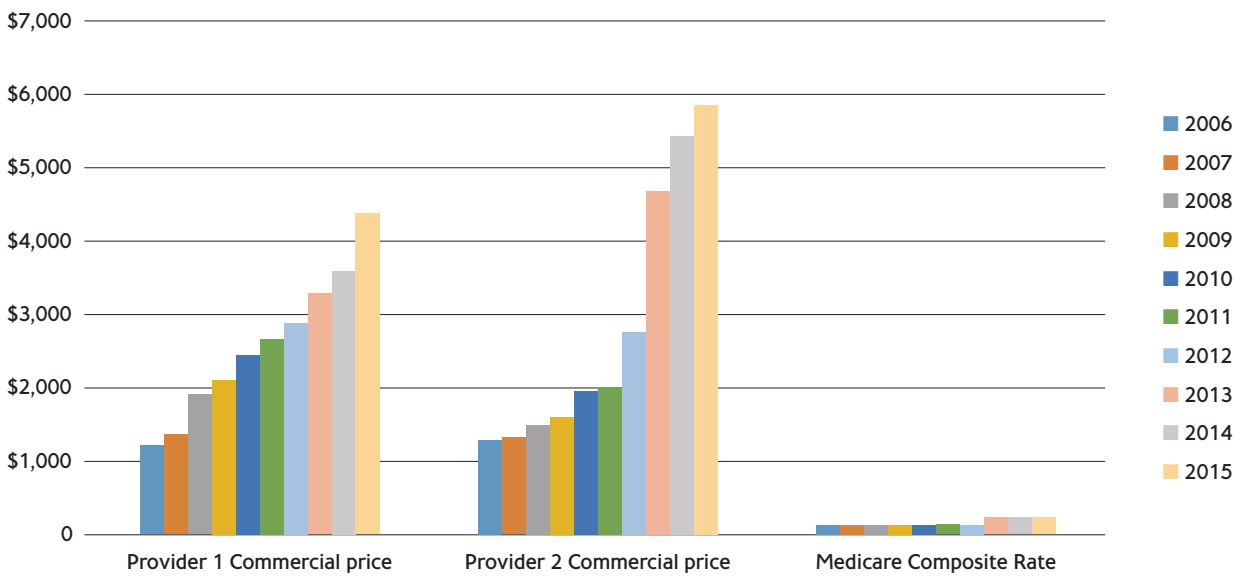
Specialty Drugs

With drug prices rising dramatically, the U.S. health care system is on an unsustainable path—a path that will continue to impose an unmanageable burden on individuals and families who need care. In 2014, U.S. spending on prescription drugs totaled nearly $379 billion, almost a third of which was spent on specialty drugs. Specialty drugs, which are generally understood to be drugs that are structurally complex and often require special handling or delivery mechanisms, are priced much higher than traditional drugs. (Source: *Medicines Use and Spending Shifts: A Review of the Uses of Medicines in the U.S. in 2014*; IMS Institute for Healthcare Informatics; April 2015.)

The rising cost of specialty drugs is driven by many factors, including the accelerated and growing pipeline of niche drugs, orphan drug pricing for non-orphan drugs, new innovations in commonly used therapy classes, cost inflation for compound medications, and drug industry consolidation.

Although drug trend may only be 5 percent overall, it is heavily weighted by the dramatic trend increase

FIGURE 3.



Source: Tracked by EthiCare Advisors, Inc.

in specialty drugs. The overall increase is the result of an 18 percent increase in specialty drug trend and flat traditional drug trend. Further, the 5 percent overall increase in trend is really 13 percent for plans without strong managed care, 6 percent for moderately managed plans, and 3 percent for tightly managed plans. (Source: *Express Scripts 2015 Drug Trend Report*; 2016.)

In 2014, 27 of the 51 drugs approved by CMS were specialty drugs. CMS projected a sustained increase in drug spending by 6 percent or more annually from 2014 to 2022 as both utilization and cost increase. Anti-competitive strategies used by drug manufacturers can lead to restricted access to less costly or generic drugs. In response, health plans are developing a number of innovative strategies to address unsustainable increases in drug prices. Examples include:

- Encouraging the most cost-effective site of care (e.g., often home or physician office);
- Creating more integration of pharmacy with other medical benefits;
- Increasing collaboration between the specialty pharmacies and the prescribing physicians;
- Promoting increased adherence to specialty drug use requirements through patient engagement;
- Executing contracts with specialty pharmacies for drug supply and care coordination; and
- Employing evidence-based medicine guidelines regarding the utilization of specialty drugs.

(Source: AHIP Issue Brief; July 2015.)

Oncology

More than 70 new cancer treatments to address more than 20 different tumor types have been developed in the past five years alone. This tremendous innovation has caused the global market for cancer treatments to now exceed $100 billion. Significant trends—including immunotherapy, targeted therapies, and a precision medicine—have resulted in increasing cancer survival rates. (Source: Express Scripts, commentary in *Pharmacy Times* online, April 27, 2016.)

In particular, immunotherapy is an important development in the treatment of certain cancers. Unlike traditional forms of chemotherapy that destroy cancerous cells directly, immunotherapy destroys a cancer cell's ability to avoid immune system responses and let the body's immune system take back the fight.

Dialysis

Hemodialysis price increases move skyward, as shown in Figure 3.

Figure 3 shows the tremendous difference between Medicare costs and those in commercial plans. This leads to the demand for Medicare reference-based pricing programs, as described earlier in this article. More than 700,000 patients are currently on dialysis in the United States, evidence of the major cost impact of end-stage renal disease (ESRD). (Source: Golden Triangle.)

TABLE 1.
Transplant Costs, Frequencies, and Waitlist

Transplant type	Billed charges	Number performed in 2014	Current waitlist candidates
Kidney	$334,300	16,107	100,269
Liver	$739,100	5,780	14,734
Pancreas	$317,500	150	1,023
Kidney/pancreas	$558,600	777	1,927
Heart	$1,242,200	2,338	4,144
Lung -Single -Double	 $785,000 $1,037,700	 685 1,229	1,464 (Single + Double)
Heart/lung	$2,313,600	29	42
Intestine	$1,547,200	54	270
Bone marrow transplant (BMT) - Autologous - Allogeneic	 $378,000 $930,000	 12,460 8,709	18,000 (Autologous + Allogeneic + Stem)

Sources: UNOS Transplant Pro, 2016, and Milliman *2014 U.S. Organ and Tissue Transplant Cost Estimates Report* for all but BMT estimate. BMT estimate from "Large waiting list for bone marrow transplants"; wcax.com; Aug. 22, 2014.

Organ Transplants

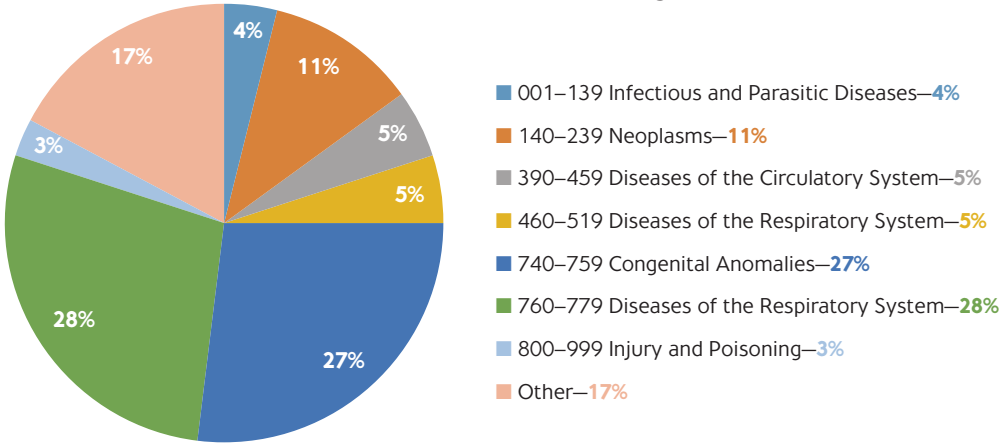
Average transplant costs, frequencies, and waitlist by transplant type are shown in Table 1.

The per-member per-month cost is estimated to be $7.26 under age 65 and $8.08 over age 65 (19 percent and 39 percent increases over Milliman's 2011 report). Cost trends range from -23 percent to 7 percent for utilization and -2 percent to 23 percent for charges. Compared to 2011 estimates, 2014 utilization estimates changed between -23 percent and +7 percent, and charges changed by -2 percent to +23 percent. These wide variations are due to the variation of solid organ and bone marrow transplant types. Hospital lengths of stay have not changed materially since 2011. Most payers do not pay full billed charges due to discounts from billed charges available through transplant networks. As such, transplants remain a significant category of catastrophic claim costs, particularly for commercial populations, in spite of the growing waitlist. (Source: Milliman *2014 U.S. Organ and Tissue Transplant Cost Estimates Report*.)

Neonatal Intensive Care

Pre-term births are predominantly prevalent in multiple births (e.g., twins and triplets). The incidence of pre-term births has decreased slightly since 2006. In 2013, approximately 3 percent of all births were pre-term. This represents approximately 10 percent of single births, 57 percent of twin births and 93 percent of births involving triplets. The most significant contributors to pre-term births have been women bearing children at older ages and the use of fertility drugs. (Source: Child Trends Data Bank; Centers for Disease Control and

FIGURE 4.
Medicaid Claims by Diagnosis



Sources: Summit Re claims data.

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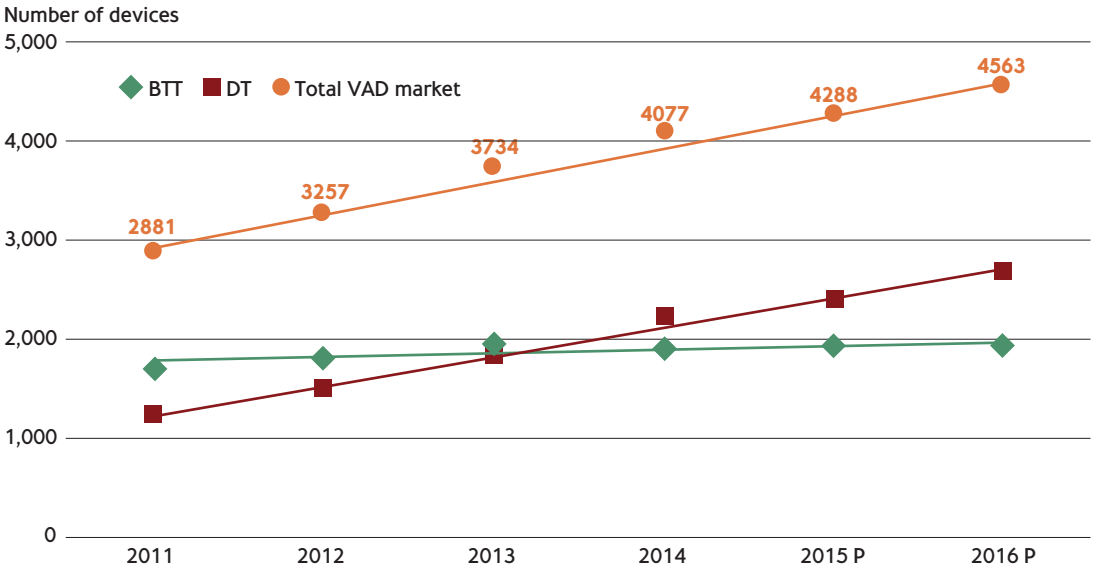
FIGURE 5.
Increasing VAD Utilization Trends



Source: *LVAD Market*; Oppenheimer, accessed by Optum.

Prevention's National Center for Health Statistics.)

Neonatal claims comprise 55 percent of all catastrophic claims for Medicaid populations, as evidenced by the following distribution of Medicaid claims by diagnosis as shown in Figure 4.

Ventricular Assist Devices (VADs)

Heart transplants are limited by the applicant selection criteria and the availability of organs from donors. A relatively new device and procedure for individuals with a weakened heart or heart failure is a Ventricular Assist Device (VAD), either as a bridge to transplantation (BTT) or as a longer term destination therapy (DT) treatment option.

The VAD is not a replacement for the heart, but rather a device to improve its performance and prolong its life by pumping blood from the lower chambers of the heart (i.e., the ventricles) to the rest of the body. Although not all patients are appropriate candidates for VAD implantations, VAD utilization continues to increase significantly due to their potential advantages, including improved pulmonary artery pressure and improved renal function due to improved cardiac output, early hospital discharge, and improved rehabilitation potential.

Notwithstanding this list of potential advantages, VADs also present added risks to patients, such as blood clots, bleeding, infection, and/or device malfunction. In addition to the added risks, VAD patients are likely to experience higher claim costs due to extensive and expensive post-discharge and device maintenance costs. A VAD patient surviving 10 years can cost from three times (for BTT patients) to five times (for DT patents) more than a non-VAD heart transplant patient. (Source: Optum.)

Managing the Risk of Catastrophic Medical Care

With health care costs continuing to rise at breakneck pace, protection from catastrophic medical claims can have a direct impact on not only the profitability of a health plan or ACO, but its survival. Risk-bearing entities may wish to not only perform population health management, but also consider engaging a professional reinsurer capable of accepting and managing catastrophic risk exposures in that population through reinsurance coverage and managed care services. Such programs may include transplant centers, consultative case management, and networks and services for other common catastrophic cases such as cancer, kidney, and congenital heart disease and neonatal case management.

In summary, the cost of catastrophic medical care continues to rise dramatically due to improvements and innovations in medical care. The health care industry is moving toward integrated delivery models with value-based practices and reimbursement. Entities assuming health care risk should consider the need to protect their financial balance sheet via enterprise risk management principles, including population health management programs and excess of loss insurance or reinsurance. □

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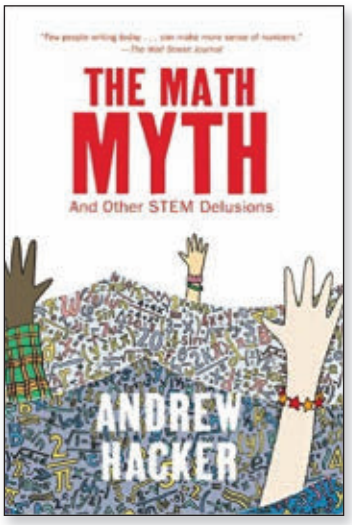
The Math Myth, *by Andrew Hacker*
Weapons of Math Destruction, *by Cathy O'Neil*

TWO BOOKS CRITICAL OF THE ACTUARIAL PROFESSION hit bookstores worldwide in the past few months. Although their critiques differ, neither book paints a flattering picture of the actuarial or insurance profession. And it's important to see and understand the criticisms, as that's the only way actuaries can work to improve our public standing going forward.

At first glance, *The Math Myth*, by Andrew Hacker, doesn't seem to concern actuaries at all. Hacker hypothesizes that algebra and other advanced math courses not only create a hatred of math among many students, but also prevent schools from giving students the needed mathematical foundations to excel in our complex world. According to Hacker, a professor at Queens College, high schools set up secondary and post-secondary mathematics classes with the assumption that students will go on to major in math at college. As math professors have excessive power in setting the curriculum, they focus more on theoretical inquiries than on real-world applications. For example, do most high school students need to know what the angles of a 3-4-5 right triangle are? Is it worth withholding degrees from community college students over not being able to divide polynomials? Is calculus the best way to weed out potential medical students? These are interesting questions, far more nuanced than they appear.

Of course, this same line of questioning leads us to actuarial exams, where Hacker makes the claim that the exams test mathematics at an unnecessarily high standard. Hacker hypothesizes that this high level of mathematical testing only exists to increase the prestige of the profession, not because these are needed on-the-job skills.

While I personally disagree with much of this line of thought, the real issue with the exams is not what topics are covered per se, but the level of



mastery required for each topic. For example, it's one thing to say each actuary should know how to set up a chi-squared test, but some chi-squared problems are straightforward and relatively simple, while others can be maddeningly complex. The difficulty of problems needs an audit more than the syllabus itself. However, it's clear that as a profession, we need to do a better job showing both prospective actuaries and the public why what's on the exams is important. It's not good enough to say that studying for exams shows dedication and commitment; the syllabus needs to be transparent and show that the time and resources taken to study actuarial exams directly help actuaries solve on-the-job problems.

The concept of transparency leads us straight to Cathy O'Neil's book, *Weapons of Math Destruction*. O'Neil, famous for her weekly Slate Money podcast, has a Ph.D. in mathematics from Harvard and previously worked at D.E. Shaw, a hedge fund. It's fair to say O'Neil has plenty of real-world and academic experience in mathematics. O'Neil's disillusionment at Shaw over the fact that the company's mathematical models systemically hurt the poor led her to quit her job and write this book. According to O'Neil, certain Big Data models, which she calls "Weapons of Math Destruction" (or WMDs), create inaccurate feedback loops that help exacerbate income inequality.

The crux of O'Neil's argument is that all mathematical models have moral opinions embedded in mathematics. In creating mathematical models, one must assure that the mathematics supports the results of the model, and not to use mathematics to reverse-engineer the results you wish.

For O'Neil, WMDs have three characteristics:

1. **Opacity:** Do people realize that they are being modeled, and do people understand how their choices impact the results of these models?
2. **Scale:** Are these models scaled exponentially, which likely leads to more inaccurate results than the model's original intention?
3. **Damage:** Do these models lead to many different groups of people suffering as a result of their use?

Throughout the book, the author shows that not all mathematical models are WMDs. An example of an effective model is how an NBA team evaluates potential players and free agents. Not only do such models let a team look at hundreds of statistics on every player, the model has an opportunity to learn. For

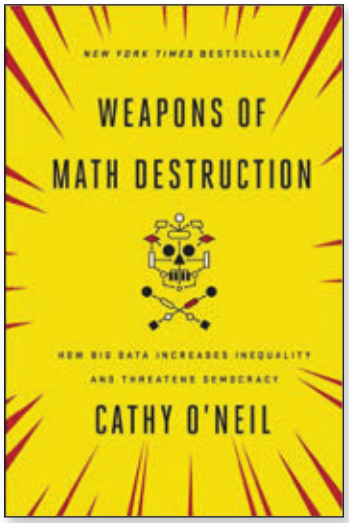
example, if the Utah Jazz decides not to make an offer to Luol Deng, the team can still see how well Luol performs with the Los Angeles Lakers. Hence, by evaluating Deng's future performance, the model can see whether it correctly or incorrectly evaluated that player, learn from its mistakes and successes, and make adjustments accordingly.

Compare that recursive loop to a bad model—say a company trying to figure out which actuarial student to hire. The problem with this model is that the company has no way of seeing how well the rejected job candidates would do on the job. If Jon takes a job at ABC Insurance Company because your company rejected him, your company has no idea how good an employee Jon is at ABC. Hence, the model cannot learn from its successes and mistakes, and the model creates its own false feedback loop.

Actuaries and insurance companies use modeling all the time to help predict risk. O'Neil does an excellent job explaining the unexpected moral issues that come up in some of these insurance models and brought about three issues that I believe are worthy of discussion.

The first is whether ZIP code or latitude/longitude should be allowed as a rating variable for insurance. The problem with using these variables is that in many states, if you know someone's ZIP code, you know someone's race with 99 percent accuracy. (Wisconsin is a prime example.) So if you price by using ZIP code—whether the model knows the policyholder's race or not—you are in effect using race as a rating variable. Yes, the concept of redlining gets covered in actuarial exams, but the exam materials never connected the dots about the very high levels of correlation between race and ZIP code. Even though use of ZIP code may indeed be predictive, it's a complex value question for society whether we should allow companies to use them when pricing insurance.

Next, let's consider drunk driving. We can all agree that drunk drivers should get charged more for car insurance than drivers without such an offense on their



records. However, even in this case, one has to be careful that using DUIs as a rating variable doesn't unfairly affect people who live in certain areas. More and more, police departments use computer models to determine where violent crimes are likely to occur and strategically place officers in those sections of the city. Of course, even in these high-risk areas, violent crimes don't occur all the time, so the officers stationed there patrol the streets more frequently and are more likely to catch citizens driving drunk in these areas than in the tonier parts of town. Hence, if you live in the "wrong" part of town, you are more likely to get caught driving drunk than someone who lives in the leafier section. Even if the occurrence of drunk driving is the same throughout the entire city, just by looking at the data itself you would tend to think that the more violent parts of town also have higher incidents of drunk driving.

(Of course, the question beckons—should insurers be concerned about this? One line of reasoning says yes—it's unfair that certain citizens get treated more harshly than others for the exact same offense. Another reasonable line of thought is that all of these people getting drunk-driving tickets endangered society and broke the law, and if you break the law you deserve the consequences. Hence, depending on how we answer this question imbeds another value judgment into our insurance models.)

The most interesting scenario O'Neil presented also involves drunk driving, but in a different context. Many P/C insurers now have telematics that people put in their car to monitor driving habits. Let's assume an insurance company correctly concludes that people driving on Buzzed Street at 3 a.m. get into a significantly larger number of accidents than average, and the insurance company wants to charge drivers more for insurance if they happen to drive on Buzzed Street at that specific time. Should we allow the insurance company to do this? First, notice that if the company does follow through, many people will see their rates increase, and they will have no idea why that's the case. This opacity doesn't help win the trust of the public. Second, looking at the city, it's clear why so many accidents occur on Buzzed Street at this specific time, because that's when the most popular bar in town closes for the night. Clearly, a significant number of patrons had too much to drink and get into accidents right after leaving the bar. So if you're driving on Buzzed Street, the model implicitly assumes you are a drunk driver and should get charged for it.

But this leads to many issues. First, not everyone is drunk at 3 a.m. Designated drivers get dinged just as much as intoxicated drivers. Maybe only 40 percent of people driving are responsible for the increased accident rate. If that's the case, no judge or jury could convict you of drunk driving if you happened to drive on that street at 3 a.m., whether by reasonable doubt or even by the preponderance of evidence standard. Convicting someone of drunk driving would require more evidence than just driving on that street. However, if we allow the model to exist, the model has already acted as judge and jury in assigning guilt. As one can see, this practice leads to an incredibly difficult moral choice. People driving on Buzzed Street are more dangerous on average, so a case can be made that they should get charged accordingly. On the flip side, by charging these drivers more, you basically

assign guilt to people who would be found not guilty in a court of law.

Three-quarters of the way through *Weapons of Math Destruction*, I was ready to call this the best and most important mathematical book of all time. However, the last couple of chapters were somewhat sloppily presented. Journalism 101 states that if you bash someone or some organization, you should interview the person or organization to let them respond to the charges. Unfortunately, it's unclear whether O'Neil did this in her book, as she makes at least three avoidable, basic mistakes about the insurance industry.

First, she blunders in her critique of credit scoring. Without any evidence to the contrary, O'Neil makes the argument that having a large bank account is immaterial in determining whether or not someone is a good risk. In making this argument, O'Neil confuses the concepts of wealth and income. One of the important facts about credit scores is that two people with identical income streams could have drastically different credit scores. For example, one actuary might put her yearly bonus in the bank, while another spends her yearly bonus living it up in Cabo. It's shocking how many high-income households literally live paycheck to paycheck. Looking at the Federal Reserve's *Report on the Economic Well-Being of U.S. Households in 2014*, more than 25 percent of households earning more than $100,000 a year cannot completely pay an emergency expense of $400 using cash or a credit card that they pay off by the end of the month. There's far less correlation to credit score and income than most people realize.

The second major mistake O'Neil makes is comparing the impact of credit scores versus drunk driving on insurance premiums. She quotes a July 30, 2015, *Consumer Reports* article that states that Florida adults with clean driving records and bad credit scores paid over $1,500 more for auto insurance than adults with excellent credit scores and a drunk driving conviction. There are many issues with this line of reasoning. Just looking at my own company's rating manual, it's clear that the number of driver points you have has far more of an impact on your insurance that what your credit score is. Second, the statistic doesn't say how long ago these drunk-driving convictions took place. Many companies look at your driving record for only the most recent three or 10 years, so a DUI conviction from 30 years ago might not hurt you if you've had a clean driving record since. And third, auto insurance in particular is very political in nature. Insurance companies have to abide by state rules—what rating variables they can and cannot use, yes, but also the maximum impact of each variable as well. Maybe the insurance company wishes it could charge a different amount, but under law it cannot do so. One can't just look at data and make the blanket assumptions that the author did.

Finally, O'Neil views the entire insurance industry as a cartel, gouging consumers whenever they can. Of course, she presents no evidence toward this claim, which on the face of it is fairly preposterous. The idea that all stock and mutual companies are all in cahoots with each other, and get the complicit go-ahead from state departments of the insurance and public advocates who purposely look the other way, seems ridiculously far-fetched. If insurance companies truly were unfairly discriminating against consumers with bad credit scores, why hasn't a new company launched to cater to this group of profitable, underserved customers? The most likely scenario—that people are charged high rates because they are indeed big risks—is a far more plausible picture of the industry. Insurance is one of the most regulated industries out there for good reason, and outsiders should think twice before making blanket claims, as regulators have likely already thought of and disproved them.

It's too bad O'Neil made these mistakes, as the majority of ideas in the book are unique and thought-provoking. Unfortunately, too many actuaries—especially those who hold different political views than the author—will likely dismiss the important parts of the book after seeing these errors. And that's a shame, because actuaries can learn a lot from this book.

Even if you disagree with the premise of these books, it's important for actuaries to understand that a huge segment of the population hates insurance companies with a (possibly irrational) passion. This hostility has gone well past the whining phase; incredibly smart people have become susceptible to it. From reading these two books, it's clear that a major cause of the loathing is due to the opacity of how insurance rates get calculated.

As actuaries, one way we can fight this is to do a better job communicating exactly what we do. Improving the way we communicate to customers to help them understand their rates, and what customers can do to lower their premiums, would go a long way to help turn the tide of opinion. While we can debate how much information we give to the public, everything we reveal will help improve people's opinions of the industry.

Further, we should consider the public's opinion on the moral issues regarding what rating variables companies can and cannot use. While actuaries should say that certain variables are predictive, and we should point out the consequences of not using predictive variables, once the informed public makes a decision on the matter, we should accept the people's voice. As long as all companies play by the same rules, every firm is still at a level playing field in the market.

The way things currently stand—possibly through no fault of actuaries—there is a huge amount of distrust and disdain among the public about insurance. One of the big jobs actuaries have going forward is to understand this public relations problem, realize that certain choices we make directly influence this perception, and work on improving the standing of the industry wherever possible. □

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Cryptic Puzzle

TOM TOCE

BINOCULARS

THERE ARE TWO DIAGRAMS and, with a few exceptions, a pair of clues for each numbered entry. Solving with no guidance as to which clue in a pair pertains to which diagram will be challenging. The hints below provide such guidance. If you're not using the hints, then Diagrams A and B are interchangeable. I've labeled them A and B just to keep things straight in the hints.

For each diagram, an eight-letter answer, a seven-letter answer, a six-letter answer, a five-letter answer, and a four-letter answer have no clues associated with them. Solvers will have to determine the answers from the context. There is a relationship between each of the answers in these pairs.

There are five proper nouns, one acronym, and one common foreign word. These seven answers are not playable in Scrabble; everything else is. Several other answers are also proper nouns but don't have to be. One answer is either two words or a proper noun if all one word. One of the answers at 22A is unusual for American English. All 26 letters appear in the answers. Ignore punctuation, which is designed to confuse.

Let me know if you used the hints in solving. Thanks to Eric Klis, Bob Fink, and Jerry Miccolis for test-solving and editorial suggestions.

Diagram A

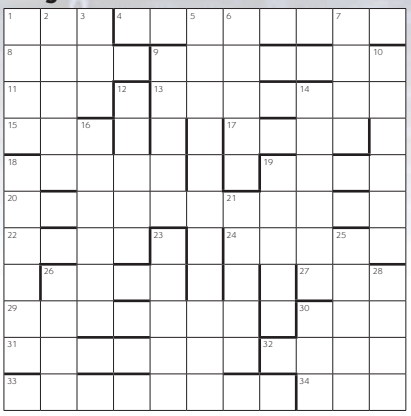
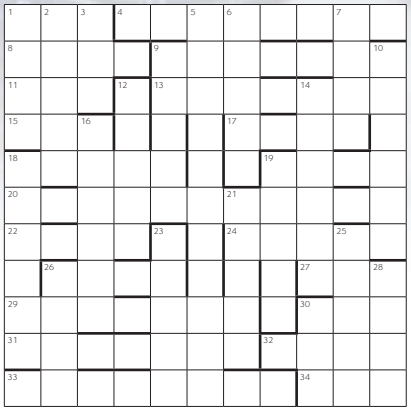


Diagram B



Across

1. Crock rock
The deed's singularly theirs

4. Ted, I came with a new order to prescribe drugs
One's rant, questionable but sonorous

8. Rise up and become morally corrupt hugging me
Say sayonara to heartless model

9. See instructions

11. Needing no introduction—"low energy" troll
Overly sensitive approach spelled out

13. Doctor, do a cure—it's zero degrees here
Cooked meatier portion for potentate

15 On the way back, overtake Buddy
Drink slowly: well-known ratio's reversed

17. Climax came unexpectedly
Tender pork, sir?

18. Boa carried by snazzy bloke
Made lemonade extract for pop star

19. Prepared tape for anti-fur activists
Narrate a very old work

20 Retrain teen dubiously to be a performer
Mass produce Bounce, Zest, and Raid

22. Pass thrown to suckers
Scottish heifer queerly abandoning the last ones of the gentler passel

24. Helper beheaded pillager
Burdened by ad featuring electroluminescence

26. Molé prepared for a little monster
Run around wrongful act

27. Proverb caught on
Before being overrun by Herefords

29. I'd corrupt Lily and could from the get-go like Paradise
It could be a sonata producing sighs heard from the back, dim at first

30. Bully turned around by Tarzan's son
An attempt in the past

31. Niles takes General Green for trifles
Ed and I initially brought the French fare

32. In that case, the first of never
Become hard to understand deaf stranger

33. See instructions

34. Spreading tar is in the eye of the beholder?
Okay classic rock band

Down

1. Siri turns up a hit by the Goo Goo Dolls
Originally just dogs pee around army vehicle

2. IRS agent heading off downsizer
Adjust the lamp upward gingerly

3. Hush money is business as usual
Merrymaking without end in Ipanema and environs

5. One making things less religious with zeal curries disorder
Exalts over my saint's exposés

6. Rudimentary seed formed by incomplete evolution through mutation
I laid out a long series of woe

7. Neonatal units well-lit but tawdry
Head of French state temporizes, essentially

Hints—Across
Clues where Diagram A comes first: 1, 4, 15, 17, 18, 19, 20, 26, 27, 29, 31, 32, and 34
Clues where Diagram B comes first: 8, 11, 13, 22, 24, and 30

Hints—Down
Clues where Diagram A comes first: 2, 14, 16, 18, 21, 23, and 28
Clues where Diagram B comes first: 1, 3, 5, 6, 7, 12, 19, 25, and 30

9. See instructions
10. See instructions
12. Bakes on undulating links
They call Joe essential but inane
14. Morning ends with restitution
I.D. required in disreputable bar's branch
16. Just now a telly exploded
On-line grocery service that delivers to the home of two like-minded individuals?
18. See Quinn singing with flourish
Fancy that, jerk! You heard me
19. Goodbye to a degenerate university
An IPO possible for a grand
21. The Donald's impersonator's obsolete herrings
Copiously collects licentious men
23. Tintinnabulation's taxes
Serviceable home for longhorns on French island
25. Rub out electrical engineer packing heat
Champing at the bit to agree indiscriminately
26. See instructions
28. Is not expected to practice
Leers from those approving by acclamation
30. Howl at Laurel with reddish-brown mouth
Sahara has contributed to awareness

Previous Issue's Puzzle—Compound Fractures

We'll take a liberal view of "no hints" this time. I needed ACTAEON, LASED (the back formation I was ashamed of), and maybe a few other words that are more the province of crossword puzzles than of cryptics. Several solvers said they used no hints, but did resort to Googling to check (or maybe to find in the first place) ACTAEON and some others. One person wrote, "Actaeon was the most difficult answer, requiring a word by word search of the dictionary's letter A." I'm not sure how to reconcile "used no hints" with conducted "a word by word search" of the dictionary. But for this puzzle, if you didn't use my hints, that's how I'm categorizing you. To quote JFK: "It's very hard . . . in personal life to assure complete equality. Life is unfair."

1. MIDST—Hidden in "humid stretch"
MESCAL—ESC ("Escape") inside MAL ("bad Mexican")
2. ISLA—ISLAM—M ("Religion without end")
3. DWARF—D + W ("deeply worried at first") + ARF ("Miniature dogs sound")
4. TYPABLE—Anagram of "be aptly"
5. STRUNG—Anagram of "grunts"
6. TUGS—Anagram of "guts"
7. RANT—(G)RANT—"concede after inaugural"
8. UNTRUE—UNTRU ("U-turn badly") + E ("executed on the West Side")
9. GUISE—Homophone of GUYS ("gentlemen")
10. SWAY—Anagram of "ways"
11. QUEEN-SIZE—Homophone of QUEEN'S EYES ("Elizabeth's eyes")
QUANT—Double definition
12. SLAB—BALS(A) reversed
13. BEFOG—Outside of "Before anything"
14. OFFPUTTING ("Disagreeable") and PUTTING OFF ("procrastinating"), with PUTTING anagrammed for entry
15. TURN DOWN ("Reject") and DOWNTURN ("recession"), with TURN entered downwards
16. CARE—Anagram of "Acre"
17. ESTRUS—Hidden in "modest Rushdie"
18. OFFBEAT—OF ("Outfielder") + FB ("fullback") + EAT ("devour")
19. ACTAEON—Anagram of "A one-act"
20. LOOKOUT ("Scout") and OUTLOOK ("point of view"), with LOOK anagrammed for entry
21. KNIT—Homophone of NIT ("insignificant detail")
22. OTHERS—Anagram of "throes"
23. RENT—Outside of "redundant"
24. TROPIC—R ("Run") inside TOPIC ("material")
25. DJINS—DJS ("Pancake turners") around IN
26. GESTALT—Inside "Suggest alternatives"
27. LASED—Anagram of "deals"
28. JIHADI—JI ("First letters of Jordan and Iran") + HAD ("carried") + I ("one")
29. AMAT—A ("One") + MAT ("piece of yoga equipment")
30. DIVE—Double definition
31. TACO—TA ("graduate student") + CO (from company for "association")
32. CASA—Anagram of "ACAS"
33. ITEMIZE—Hidden in reverse in "Inez; I'm etiolated"
34. UPSTART ("Whippersnapper") and STARTUP ("new venture"), with START entered upwards
35. OVERPASS ("Bridge") and PASSOVER ("festival every spring"), with PASS entered in reverse
36. BRAVE—B ("second-rate") + RAVE ("party with electronic music")
37. OXES—(F)OXES ("Pretty women showing up a little late")
38. SYSTEM—Hidden in "Missy's tempura"
39. BREAKDANCE ("Hip-hop movement") and DANCE BREAK ("a Broadway musical interlude with no singing") and either answer literally in "Hip-hop movement in a Broadway musical interlude with no singing!" with DANCE anagrammed for entry

1 M	2 I	3 D	S	4 T	5 S	6 T	7 R	8 U	N	9 G
E	10 S	W	A	Y	11 Q	U	A	N	T	U
12 S	L	A	13 B	14 P	U	G	N	T	15 T	I
16 C	A	R	E	A	17 E	S	T	R	U	S
A	18 O	F	F	B	E	19 A	T	U	R	E
20 L	21 K	22 O	O	L	N	C	23 R	E	N	24 T
25 D	N	T	26 G	E	S	T	A	27 L	T	R
28 J	I	H	29 A	30 D	I	A	31 T	A	32 C	O
33 I	T	E	M	I	Z	E	34 S	S	A	35 P
N	36 B	R	A	V	E	37 O	X	E	S	I
38 S	Y	S	T	E	M	39 N	E	D	A	C

Solvers at the Excruciating Level:

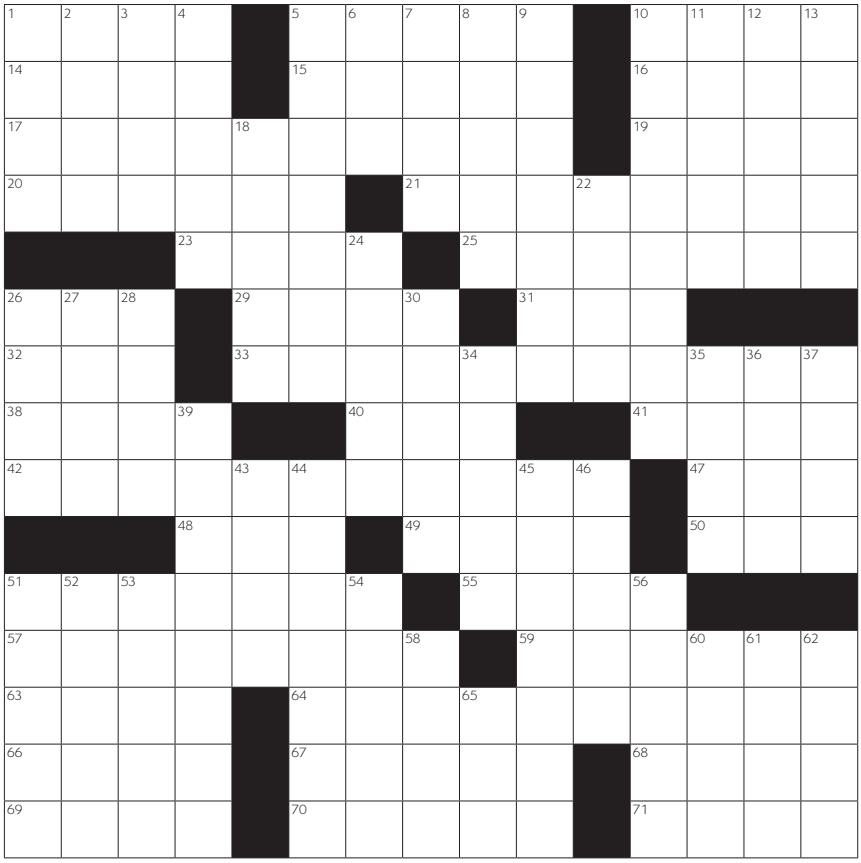
Michael Accardo, Steve Alpert, Dean Apps, Amjemistti Babobusczu, Jack Brauner, Bob Campbell, Lois Cappellano, Laura Cremerius, Todd Dashoff, Christopher Dickens, Deb Edwards, Bob Fink, Phil Gollance, J & J Holloman, Ruth Howald, Ruth Johnson, Eric Klis, Paul Kolell, Dave McGarry, Jerry Miccolis, John Murray, Jim Muza, David & Corinne Promislow, Andrew Shewan, Jon Turnes, Jim Wickwire

Solvers using some hints (or not saying):

Byron Corner, Pete Hepokoski, Ken Kudrak, Jon Michelson, Bill Scott, Tyler & Evelyn Somer

TOM TOCE is a senior manager for actuarial services with Ernst & Young in New York and is a member of the Jeopardy Hall of Fame. Solutions may be emailed to thomas.toce@ey.com. In order to make the solver list, your solutions must be received by Jan. 31, 2017.

Greed Is Good



Across

1. Fence feature
5. Chair part
10. Trick out
14. Caliph
15. Lingua franca
16. Anon's partner
17. Garner, with 51 down and 1 across
19. Revolt
20. African banana
21. Red Sox after 1919?
23. Grand slam foursome
25. Imitation in art
26. Young ___
29. Vedic god
31. Telecommunication mnmgt. location
32. [as written]
33. Carell
38. Zest
40. Poetic nightfall
41. Ratites
42. McGregor
47. New Deal org.
48. Indian deposit acct.
49. Bar or series opener
50. Greek spirit
51. Aids
55. Useful catchalls
57. Monaurally
59. Kvetch
63. So
64. Ribisi
66. Czech reformer
67. Stat. method
68. Place for pins
69. Curved letters
70. See the light
71. One way to go

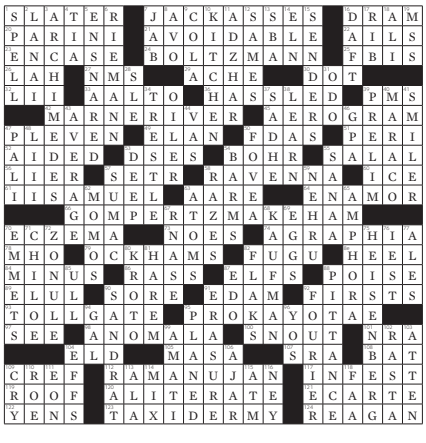
Down

1. Synonymous with 24 down
2. "____ who lives fully is prepared to die at any time": Mark Twain
3. Smears
4. Hot item
5. Abrupt scream
6. Taro dish
7. Canard maker
8. Per ____
9. What FSAs are good at
10. Dermatological condition
11. Prestigious octet
12. A god among us
13. Basketball strategy
18. Up
22. Doc blocs
24. Synonymous with 1 down
26. Topic of Beatles song
27. Hombre, once
28. Heroin (slang)
30. Floor support
34. Kind of rock
35. Siberian city
36. Red herring
37. Peter or Paul
39. Wee quality
43. Gaelic tongue
44. Carryall
45. Petition
46. Kitchen gadget
51. ___ Ballet: "A Chorus Line" song
52. Spore cluster
53. WC Fields persona
54. Mâcon's river
56. Bacchanal
58. A way to run
60. Wee bit
61. We, oui?
62. Express
65. Romans 8x7

Solutions may be emailed to cont.puzzles@gmail.com.

In order to make the solver list, your solutions must be received by Jan. 31 , 2017.

Previous Issue's Puzzle: Formulators



Solvers

Dean Apps, Bob Campbell, Marcus Cleary, Deb Edwards, Kenneth Klinger, Matt Kranovich, Kenneth Kudrak, Jim Muza, and Doug Szper.

Introducing the Actuaries Climate Index™

www.actuariesclimateindex.org

THE U.S. AND CANADIAN ACTUARIAL PROFESSIONS DEVELOPED THE

Actuaries Climate Index

(ACI) as a tool to inform actuaries, public policymakers, and the general public about climate trends in the United States and Canada. It is a joint effort of the American Academy of Actuaries, the Canadian Institute of Actuaries, the Casualty Actuarial Society, and the Society of Actuaries.

Measuring Changes in Extreme Weather and Sea Level

- The ACI provides quarterly measures of changes in extreme weather and changes in sea level, relative to the base period of 1961 through 1990.
- The index is based on six components: warm temperatures; cool temperatures; extreme precipitation; consecutive dry days; extreme winds; sea levels.
- ACI data is from neutral, scientific sources, and generates objective, evidence-based results.
- Increasing ACI values indicate higher incidence of extreme weather events and sea level change.
- Interactive maps and charts available at www.actuariesclimateindex.org illustrate how the index values are changing by component and by region.

ACRI: The Next Step

A second index, the Actuaries Climate Risk Index (ACRI), is in development to correlate ACI data with economic losses, deaths, and injuries.

ACTUARIES CLIMATE INDEX
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Group Roulette

A NEW CASINO OPENED RECENTLY in my state of Maryland. When the Gaming Commission was considering whether any new games would be added, the following game was suggested.

A group of n players each ante up the same amount of money, say $10 or $20, or even more. Then each player simultaneously, randomly, and independently selects one of the other players—this could be done by being dealt a card, by using a spinner, or by some other mechanism. A player cannot select him- or herself. Everyone selected drops out and the survivors split the pot evenly. If there are no survivors, the house gets the pot. For example, with four players in the $20 game, the expected house take is $8.89.

1. What is the expected house take for the $20 game with five players?

The casino thinks this take is too small, at least for the $20 game; it doesn't cover expenses, especially for the time of the dealer. So it decides that the game will be played in two rounds. As before, if at any stage there are no survivors, the house takes the pot. After the first round, if there is only one survivor, he or she gets the pot—otherwise the game is played one more time among just the survivors.

2. What is the expected house take for the $20 two-round game with five players?

The casino realizes that this game is unfair if there are exactly two survivors after the first round. So the game is modified again so that if there are ever exactly two survivors, they split the pot.

3. What is the expected house take for the modified $20 two-round game with five players?

Challenge: Does not count in the scoring. Suppose the game is modified yet again so that as many rounds as needed to get to only 0, one, or two survivors are played. The casino wants to know whether it can cover its expenses. Because the casino has developed its expenses on a per-round basis, it wants to know the expected take per round rather than per game. For example, the expected house take per round for the $20 multi-round game with five players is $5.80.

What is the expected house take per round for the modified $20 multi-round game with 6, 7, 8, and 9 players? (That is four different answers.)

Do you have any other interesting modifications or extensions to this problem?

Solutions may be emailed to cont.puzzles@gmail.com.

In order to make the solver list, your solutions must be received by Jan. 31, 2017.

Previous Issue's Puzzle: It's Cross-Country Season

What's the highest winning score possible in the cross country race? Prove your result. The highest possible winning score is 44, which can be achieved by Team 1 having runners finish in places 6, 8, 9, 10, 11, 12, and 13; Team 2 finishing in places 3, 5, 7, 14, 15, 16, and 17; and Team 3 having runners finish in places 1, 2, 4, 18, 19, 20, and 21. In this scenario, all three teams score 44 points, so Team 1 wins the meet because it had the best sixth-place runner. Let's assume a higher score is possible. The goal is to maximize the number of

"displaced" scorers, and the way to do that is to group as many runners possible in the middle of the race to increase the scores of the other two teams. Note that 7+8+9+10+11=45, so if a team scores 45 points, we want them to finish in places 7, 8, 9, 10, 11, 12, and 13. In this instance, if we want the other two teams to score 45 or more points, places 14 and 15 can NOT be a sixth- or seventh-place runner, or else a team's score will be well under 45. Finally, places 20 and 21 by definition will not feature a scoring runner.

Putting it all together, in the best-case scenario, the other two teams must have scoring places in positions 1, 2, 3, 4, 5, 6, 14, 15, 18, and 19. But that list of number sums to 87, which makes it impossible to have two teams score 45 or more. Hence, 44 must be the answer. □

Solvers

Rui Guo, David Promislow, Bob Conger, Yan Fridman, Eric Kovatch, Bob Byrne, Andrew Forgrave, Robert Bartholomew, Scott Parker, Al Spooner, Arlan Aakre, David Lovit , Eric Lascelles, Chi Kwok, Ben Bock, Steven Russ, Andrew Dean, Ronald Stokes, Don Onnen, John Snyder, Bernie Erickson, Mark Evans, Noam Segal, Doug Szper, Joel Smith, William Carroll, Robert Ellerbruch, and Daniel Wade.

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Neil Armstrong and Who?

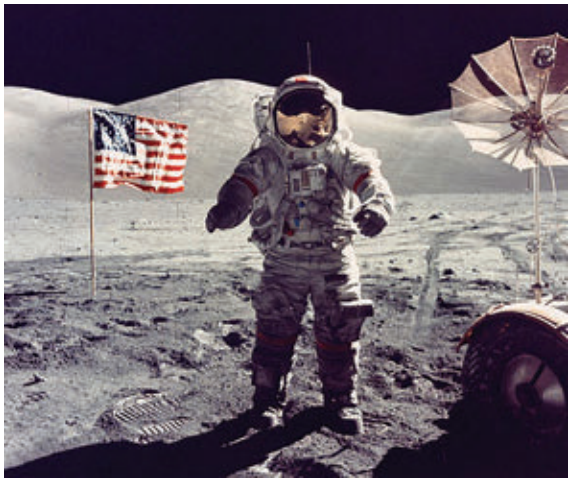
WE ALL KNOW THAT NEIL ARMSTRONG was the first man to walk on the moon, but who was the last man to tread the lunar surface? I recently saw a movie, *Last Man on the Moon*, that reminded me of my intense interest in the U.S. space program when I was a child, an interest that continues today.

My mother would wake me at 6 a.m. to watch the countdowns and takeoffs of all the Mercury launches, many of which were scrubbed after interminable holds. Most 12-year-old kids listened to Alan Shepard's launch, suborbital flight, and splashdown over their school's PA system. Not me. Mom knew that nothing I would have learned that day in school could match the impact of watching history live on our TV.

Everything seemed A-OK during the Mercury flights, as "Shorty" Powers, NASA's public affairs officer, would tell us. Christopher Kraft was a calming voice as flight director during the Mercury and Gemini missions. Only much later would we learn about all the near catastrophes during these early spaceflights and the difficult decisions that had to be made with limited information and even less time. Was a flashing red light in Mission Control correctly indicating a serious problem, or was it merely faulty instrumentation? The wrong decision could mean death for the astronaut.

But death did come to the U.S. space program during a launch rehearsal for Apollo 1. A fire in the test module spread rapidly due to the pure oxygen atmosphere and the combustible material inside it, killing all three astronauts. While the space program was grounded for almost two years, NASA learned from this tragedy. It became "tough and competent"—words that were written on every blackboard in NASA for over 10 years.

Gene Kranz documented these crises in *Failure Is Not an Option*, detailing his experiences as a flight director during the Gemini and Apollo flights. During the lunar descent of Apollo 11, the control panel flashed a "1202 error," which meant the computer was overloaded and couldn't keep up with the progress of the landing. Kranz had to quickly decide whether to ignore a possibly spurious signal or abort the landing, and he chose to continue. Neil Armstrong stepped off the Lunar Module ladder later that day, uttering those unforgettable words, "That's one small step for [a] man, one giant leap for mankind."



But people mainly remember Gene Kranz from *Apollo 13,* the movie starring Tom Hanks. After an oxygen tank exploded in the Service Module, the three astronauts had to live in the Lunar Module for almost four days. However, the Lunar Module's air filtration system was designed to support two astronauts for a day and a half. The astronauts took the square air filters from the Command Module and were horrified to discover that the Lunar Module had cylindrical air filters. Kranz really did tell the engineers to figure out how to fit a square air filter into a round filtration system, using only the items the astronauts had in space. Which they did.

My enthusiasm for the U.S. space program continued during the space shuttle era. I bought replica patches after every flight and sewed them onto my son's sweatshirt. He had quite a collection on that sweatshirt—24 patches in all—and wore it one year for his school picture. But that collection ended the day after his birthday in 1986. I cried when I watched Challenger explode a minute after liftoff. This couldn't be happening! But it was.

NASA retired the shuttle fleet in 2011 and no longer launches manned space flights. The three remaining shuttles are in museums across America, including Discovery at the National Air and Space Museum near Dulles International Airport. If you love aeronautics and space travel, it's worth the trip to see it.

Jeffrey Bezos and Elon Musk, among others, are attempting to continue in NASA's footsteps and resume manned space flights someday. Just like the early days of the U.S. space program, there have been successes and setbacks. I know that I'll be anxiously watching their first manned launch, just like I did in 1961. Maybe I'll watch it with a grandchild, and hopefully pass on my spaceflight enthusiasm to them.

By the way—the last man to leave his footprints in the lunar dust? Gene Cernan, in 1972.

Postscript, Dec. 8, 2016—Godspeed, John Glenn. □

BOB RIETZ is a retired pension actuary who lives near Asheville, N.C.

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