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## Session 83PD
## Actuarial Pricing for Underwriting and Medical Advances: What Does the Future Hold?

**Track:** Reinsurance


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**Panelists:** STEVEN C. EKBLAD
ROSS MORTON†
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*Summary: If a cancer cure were found, what would that do to your pricing of new insurance products? If underwriters could now detect 100 percent of those at risk of a heart attack, could an actuary leverage that information to improve profitability and market share? To maintain profitability and international competitiveness, it is crucial to keep on top of current medical research that is affecting longevity. Also, new ways to process and underwrite policies will significantly impact the insurance company's bottom line. How does an actuary calculate the impact of these underwriting and medical advances in pricing today's insurance products? Topics include advances in medical diagnostics and therapeutics that will increase life span, risks like the obesity epidemic and new infections that could have a negative impact, new trends in underwriting that will significantly affect our future mortality experience, improvements in the processing of insurance applications that will dramatically impact our future success and how the pricing actuary of today best uses this qualitative information in a quantitative mathematical manner.*


**MR. PAUL A. SCHUSTER:** We have three speakers this afternoon. The first is Dr. Phil Smalley. Phil is an internal medicine specialist with 13 years of insurance medicine experience. He is vice president and medical director of RGA International. He has also consulted for a number of direct insurance companies in the past. He has lectured on subjects like this around the world. I think you'll find Phil's spin on




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medical developments fascinating. Phil is also managing director of the Longer Life Foundation, which is a partnership of RGA and Washington University in St. Louis. The foundation funds research into studying longevity and promoting quality and quantity of life.

Our second speaker is Ross Morton. Ross will be addressing some of the more practical underwriting issues that are emerging today. I will tell you Ross knows underwriting—and a lot more. He rose through the ranks of underwriting positions in life reinsurance and made the transition into management. His employment history is comprised of large international operations and Canadian entities that needed his management, reinsurance, technology, marketing and risk selection skills. He has given speeches and lectures in 34 countries around the world to a diverse audience, from producers to reinsurers. Recently, Ross has been used on various assignments around the world by RGA after his role as executive vice president of RGA Canada, CEO of RGA Technology Partners and as a marketing consultant in Asia. In the reinsurance business, most recently he has provided advice to the government of Canada regarding acquisitions and other subjects.

Our third speaker is Steve Ekblad, who is with Swiss Re. Steve is a Fellow of the Society and a member of the American Academy of Actuaries. Steve is the only FSA on the panel. Over the last eight years or so, Steve has been involved with Lincoln Life in some activities, but mostly over the last three-and-a-half years he has been involved with Lincoln Re/Swiss Re in their research and development department. Steve is going to be talking about some of the actuarial techniques that are perhaps applicable to some of these developments that you'll be hearing about.

**DR. PHILLIP S. SMALLEY:** I'm hoping some of this isn't too complicated, but I'm talking about some pretty complicated areas, maybe 5 percent of cases. Ross will be dealing with the practical 95 percent of the cases that are most important. Then Steve will be putting some numbers behind these facts we're presenting. I think you're going to find this interesting as we go through some of these medical advances.

Everybody here knows that we're pricing for, or looking at, an increasing longevity experience around the world, as we're seeing in many, many different countries, including the United States. What the shape of this curve is going to be going forward is why I think everybody here is interested in what we have to say today, for instance what's happening in the male rate versus the female rate. But what I want to talk about in my presentation is the common diseases that make up the causes of mortality, therefore, our trends for the future on longevity and morbidity risk. When we look at coronary heart disease, in many countries around the world over the last few decades, we've seen a significant improvement or a decrease in the heart disease mortality. There are a lot of reasons for that that I want to go through. But in some of the countries, particularly some of the past Eastern European countries, actually the trend has been opposite. Even looking at longevity

and life expectancy overall, there are some recent statistics that are a little worrisome.

Let's look at heart disease mortality. One study that was published out of the Hunter region of Australia said that all of the reductions in heart disease event rate could be explained predominantly by reductions in the lifestyle factors. That's very important. It's not just the medical advances that I'm going to be talking about today.

One lifestyle factor, of course, is the smoking trends. In North America, like many other countries around the world, we are seeing a decrease in the prevalence of smoking. The actual prevalence rate depends on the state, but I've heard some of my medical colleagues say that many a medical director's job has been saved by the falling cardiovascular heart disease mortality rate related to this decrease in smoking prevalence. That's definitely something that impacts both the heart disease and, of course, the cancer risk. Now, contrary to the trends that we've seen in the past with heart disease, there is a trend that is very worrisome. This trend in the abdominal obesity—and this leads to the diabetes epidemic that is happening around the world and here in the United States—is something that is very worrisome when we're trying to trend forward what's going to happen with heart disease mortality. I'm telling you the size of the food on your plates in the United States is a huge problem that I think we're going to have into the future, and there is lots of diabetes because of this. This is something that I think might be starting to reverse some of the heart disease trends we're seeing in North America.

I've talked a little about the diabetes risk with the epidemic. We're being a lot more aggressive in treating the lipids. A few years ago the National Treatment Panel for Cholesterol said that about three times more people are going to need anti-cholesterol medication because they're lowering the cutoff point at which time the doctors say you need to be on therapy. We're hoping that will improve the cardiovascular mortality rate for the future. Hypertension is interesting. A few months ago the new Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) criteria came out. In the past, normal blood pressure was below 140 over 90. Now we're labeling people who have a blood pressure between 120 to 140 and 80 over 90 diastolic with the disease "prehypertension." This could be an issue on application forms because these patients that in the past had normal blood pressures now will be told they have a disease. So, on the application form, whether they should be checking off "yes" or "no" is something to think about. But definitely we're treating blood pressure much more aggressively, like the way we're treating the lipids, and we're hoping that this is going to improve our cardiovascular as well as our stroke rates for the future.

A study that our foundation has funded on weight—you can go to www.longerlife.org and read a review paper by Dr. Racette—says that maybe we should be putting more emphasis not just on body mass index or height/weight but

on waist circumference. In other words, where the fat is is more important than just your absolute weight. This is one of the factors that they're putting into this metabolic syndrome (MS). It's this abdominal obesity. It's the apple-shaped figure compared to the pear-shaped figure that's associated with these other risk factors, associated with the MS and associated with about a fourfold-increased risk of cardiovascular disease. Doctors are being much more aggressive in treating people that have the MS and the abdominal obesity.

There's also a new blood test coming out called "C-reactive protein." A couple of years ago in Sydney, Australia, at the International Medical Directors' Group, one of my colleagues made quite a provocative statement by saying that C-reactive protein will be at least as important a cardiovascular risk factor in five years as cholesterol is now. Certainly some of the follow-up literature is showing that he might be correct. C-reactive protein is a measure of inflammation. I've talked already about some of these other factors, but inflammatory changes in the coronary arteries and even infections are now being shown to be related to cardiovascular disease. All C-reactive protein is is a measure of inflammation in the body, and it's being shown now to be an important predictor of cardiovascular endpoint. One study shows us that when we combine C-reactive protein with looking at MS, we can see that if you have both MS and elevated C-reactive protein, your risk is significantly increased compared to if you have none of the factors of MS and a normal inflammatory marker, C-reactive protein. It's already being used in clinical practice. Even some insurance companies are starting to look at this lab test to help us to better risk stratify or underwrite for the future.

I think you're aware that when you have a blockage in your coronary artery, we put a balloon inside the artery, and we open up the artery. About 30 percent of these patients will actually restenose; the blockage will come back. A new, exciting therapy is now being done where, instead of just ballooning open the blockage, we're putting in a stent, but the stent is coated with a medication to help prevent that restenosis rate, dropping that rate down from about 35 percent to about 3.5 percent. We're hoping this as well will start to improve cardiovascular mortality for the future.

Let's turn to cancer. We've seen a lot of changes in cancer. I want to talk a little bit about this and some of the reasons. Unfortunately, mortality has been fairly stagnant. We've been seeing a decrease in the lung cancer that may be related to smoking, particularly in the last few years. But just because we're picking up these cancers at an earlier stage or treating them more aggressively, doesn't mean we have really made a major dent in the cancer mortality. I asked one of the researchers we funded to come down and talk on cancer trends and genomics for the future. I asked him, "With all these medical advances and new therapies, what do you expect to be the reduction in cancer mortality over the next five years?" He said, "Only about 10 percent." I'm going to show you some exciting new therapies, but we're not talking about huge reductions, at least in the short term.

There have been a lot of cancer advances. A lot more prevention is being done. People are aware of the risks of smoking and of being out in the sun, etc. A lot more people are being screened for cancer. There are new non-invasive diagnostic techniques, better treatments, new cures and better ways to prognosticate people who have known disease. Screening is very important, but many people, even though they're at risk of developing cancer, don't take part in the routine or the medically approved screening maneuvers. Up to 70 percent of people who are at risk of colon cancer don't get screened. It is important, but it's an invasive test. One of the things that we have developed is a genetic test able to detect small amounts of cancer cells being sloughed off of these small little cancers at an earlier stage, so it's using genetic diagnostics to be able to pick up these cancers at a very early stage. This is something that we're hoping will really improve things for the future.

They've actually designed a toilet as well that analyzes the excrement, and it's hooked up to the Internet to the family doctor. This really has been done. I'm going to be talking a lot about medical advances, and I think it's very important we keep this in some practical perspective. These medical advances show some very good statistics, but remember I'm talking population, not insured population. We need to be careful when we start taking that jump from a medical advance to thinking about when or if we should be applying it to underwriting, or then to our future pricing.

One of the advances is prostate-specific antigen (PSA) screening. It's a blood test that you probably all know very well because in the United States, probably after you're over the age of about 50, you're getting this tumor marker test done. It started to be done around the late 1980s and early 1990s in the United States. We can see what happens to prostate cancer incidence when this tumor marker test started being done in the general population, but when you compare that to the U.K. data or to Canada, where PSA is not done so much, we don't see that kind of an increase in incidence rate. What's interesting is it seems to peak but then comes back down.

This is of importance to us. I don't know if you know how frequent prostate cancer is, and it's asymptomatic. Probably people in this room have a little focus of prostate cancer, you never knew you had it until you get some form of a living benefit and then you have a financial goal. You go and get your PSA screen, and you find out you have this little micro focus of prostate cancer. It's more common to die *with* prostate cancer than to die *of* prostate cancer. Now, PSA is pretty good. It picks up a lot of prostate cancers, but it's not perfect. It misses about one-third of all the prostate cancers. But we've now been able to use genetics, and we've designed a test where we can detect the abnormal protein that is made because of altered DNA. This is called proteomics. Our underwriters and the medical physicians as a community will be hearing a lot more about this because some of these tests have been approved by the FDA. Look at NMP48. It detects increased specificity and sensitivity for prostate cancer. It detects about 92 percent of the cancers that

PSA misses. What will happen if that test starts being used in clinical practice? We'll probably get another blip in incidence rate.

You might have heard about these whole-body CAT scans or ultra-fast CAT scans where we can see little bits of coronary artery calcification in your heart, or we're using this to pick up these little cancers at a much earlier stage, hopefully curable. This is the way we're hoping to improve some of the cancer mortality for the future. I'm not going to talk a lot about genetics, but it is important that we can now have these chips that detect a lot of the diseases to which we are predisposed. But remember that disease is a mix of genetics and environment. The same genetic defect could be a risk factor in smokers but not in non-smokers, or in women but not in men. It's very important when we're looking at genetics for the future that this is taken into account.

Where genetics is very important is on pharmacogenetics. We're already using its theories and techniques to be able to design perfect drugs where people won't have as many side effects. When we do a genetic profiling of somebody with a particular disease, we'll be able to match the right drug with the right cause of their blood pressure. Drug error or drug side effects are very important causes of morbidity and mortality in America and around the world. Also, we're using pharmacogenetics to block abnormal proteins that are made. One example that you might have heard about in the lay press is Gleevic. Chronic myelogenous leukemia is a blood cancer of the white blood cell. This is a very dangerous leukemia. Probably most patients die or need a transplant within five years of having this diagnosis. But because we understand the genetic defect that causes the cancer, we were then able to isolate the abnormal protein that is made from the abnormal genetic defect. Then we could design a perfect drug that only blocks this one protein. It's now been approved. All these patients with chronic myelogenous leukemia need to do is take a pill a day, and a cancer that used to be universally fairly fatal now can be cured. We're not sure how long this is going to last for the future, and it's quite expensive, but you can see how genetic research is being translated into pharmacogenetics that should help our longevity and morbidity risk for the future.

I'll finish up with some of the infection trends. I think you're all aware that over the last 70 years, pneumonia has been a huge success story with our development of all the different antibiotics. If you have a cold or a sore throat, it's very difficult to leave the doctor's office without getting a prescription in your hand. That's actually causing some problems because we're seeing that a lot of the bugs are really smart. They're starting to find ways of mutating to be able to be resistant to all of the drugs we can throw at them. This is starting to be a potential problem. The bugs are starting to win in a lot of these different infections, particularly the infections that are occurring in the hospital setting.

I think you're all aware that HIV is a huge epidemic around the world, certainly in South Africa, as well as in India. How the disease is transmitted is very interesting. I thought I understood a lot of this in working in a downtown hospital in Toronto,

but on one of my flights coming back from South Africa, I was with one of the head of the missionaries, and I was fascinated by what he had to say about why the disease is such an epidemic in Africa. He said it's not the classic things that we all think. Their circumcision practice is one of the things. They line up all the little boys about age 12 to 13. One little boy comes in for a circumcision. With the same knife the priests now do the next circumcision. But if the next child has HIV, the rest of them all come in, get circumcised with the same knife and become infected with HIV. It's also their marriage practice. When the husband dies, commonly of AIDS, the wife has to marry the brother of the husband. Fortunately, some of these new medications help control the infection. Maybe in the future it might even be a disease that we can possibly underwrite because we are extending the life expectancy significantly in people with HIV infection. But it's certainly no cure.

With hepatitis B, the success stories are vaccinations. Hepatitis C is a very important problem. Much of this came from blood transfusions or past drug abuse. It is an important cause of cirrhosis, end-stage liver disease and liver cancer. There is probably about a 20- to 30-year time lag before you start seeing all of these liver failures. This leads to a problem where we don't have enough livers to transplant them. Already hepatitis C is a major reason for liver transplantation. If I were in the stock market, I'd certainly be looking for about the next 10 to 15 years for anything to do with this type of transplantation therapy because what we're starting to look at now is not using humans, but using other species to transplant into people, or their parts, or even using stem cells. These are cells that circulate in our body or are in the umbilical cord of a baby. These cells can be injected into a person after a heart attack, and these cells can then be pushed to grow into or repair that scar that's on the heart. Stem cell therapy is being used to cure diabetes, where we can inject the cells that produce insulin into the body and they can be taken up, getting Type I diabetics completely off insulin. Another advance in diabetes is that they're now using inhaled insulin rather than a shot of insulin to improve control. Again, this is an important advance to improve mortality for the future.

The last infection I have to talk about is SARS. Obviously, this risk was a huge problem around the world. Was it taken out of proportion? That is something that's debatable. About 8,500 people in the world were infected. Over 800 people died of this disease. I think we learned a lot from this, but I think we still have a lot to learn to prevent this type of infection epidemic. Could the 1918 flu epidemic occur again? Should the complete amount of that spike of infection be put into our reserves for the future? When we look at the SARS prognosis, most people actually recovered from it within a week or two, although 20 percent of people needed admission to an intensive care unit. When we looked at the case fatality from SARS, most people actually did improve, particularly the young people. The ones who were affected the most were the older age group or the people with underlying co-morbidities—the heart disease, the diabetes, the cancers, etc.

Looking again to transplantation, the other thing that I think we're going to be seeing is this form of stimulating, sort of cloning, somebody's own cells to generate

the person's own organ that's missing. This is not just science fiction. It has been done with a little child who was born without a sternum. They took the cartilage and bone cells out of the child, grew them in a tissue plate to grow around and then transplanted that cloned sternum back on the child's chest. Now the heart is properly enclosed, and now the child is running around like a healthy child should be. There are very, very exciting areas of research that will be improving morbidity and mortality.

In summary, these medical advances are helping the underwriters to better prognosticate people with known disease and those people that will develop the disease. This should help us be more accurate with our overall pricing, particularly when we start looking even at the preferred-type products. Medical advances are going to lead to more screening and more prevention. New therapies are being designed, and certainly new cures are being designed that should help extend our life expectancy, but, importantly, it's not just quantity of life, but quality of life that we're going to be improving.

**MR. ROSS MORTON:** Phil gave you a lot of good information on where medicine is going, but in the end it only impacts about 8 percent of the business that we look at. However, 92 percent, ever since I started in this business in 1969, goes through standard or as applied for, and only around 8 percent, or in some countries 10 percent, gets rated or declined, not issued as applied for.

There are three things I want to talk about. I want to talk about how processing of the business today is different, and what I see as I travel the world. The beauty of underwriting is that it is all the same; everywhere you go it's the same issue. It's amazingly the same. It's probably the same for actuarial. I also want to talk about audit hilarity—how funny it's getting, and it is getting funny, sadly so. Lastly, I'll talk a little about requirements. When I started in the business, you got a medical for over $10,000 over age 45, and you got an electrocardiogram (ECG). The requirements were quite heavy, and we're all getting the benefits of that medical mortality today.

On processing, you have people who are shifting into a mold where they get a base salary, but more and more they're paid for how much they put through, not necessarily the quality. They get a base salary, then they get bonuses and stock options if they can move more through with less. That's different from when I started when it was a pure salary (and not a great salary). The "long term" for many people today is three years. My first boss in the reinsurance world in 1970, Ian Mickey, said, "Ross, you're working for the generation next and those afterward, and that's what you have to do in terms of quality. You're going to leave them your legacy." Today, you talk in terms of this quarter, this year or *maybe* three years. Long-term planning has gone from 10 years to five years to three years to sometimes a year. That's a whole change of mentality for the underwriter to adapt to who was used to having lots of time to do lots of things to underwrite very well for quality. We've changed.

Every year I do a survey of 10 people I know in the business. These are people who have moved and changed jobs. It runs anywhere from nine of them are quite happy and they're not looking or listening to job offers, to nine out of 10 are looking. Right now it's about two out of three are looking, again, because they feel moving on is the thing to do today. It's just that they feel no loyalty.

You see companies around the world getting bigger. Some companies in the U.K. have gone from 30,000 or 40,000 cases a year to 100,000 cases. There are two companies in the U.K. who are now writing 700,000 new individual life policies a year. Sixty percent of them have critical illness attached and 40 percent have total permanent disability attached. The average size is £250,000. Because of that change of these small companies disappearing, they get into these massive productions, putting pressure on underwriters. Again, you're used to running a shop of five or six, maybe even 20, underwriters. You're now looking at 100 underwriters and maybe 200 support people. It's a new era. Again, they're not used to doing this and keeping their quality up when all they're getting patted on the back for is the process—is it fast enough and cheap enough?

We used to do self-audits, but today the self-audit in the world has become one of looking if the person checked off all the right boxes. Move the case on. They're not a check of the underwriting quality as much as they are a check of the process quality. In other words, did it move through fast enough? As long as all the right signatures are in the right place, I don't care about the final outcome.

One of the things that I do on the side is mentor new people coming into our business. These are people who are generally very smart. They're generally from the finance industry, but they don't know anything about life insurance. They want to know how to ask the right questions of actuaries, underwriters and other people. They want to know things so they don't embarrass themselves. Generally in four or five months, they're smart enough to pick it up, and I'm out of work again until the next person comes along and wants mentoring. But they really don't understand risk selection. They don't understand that the basis of our industry and its success financially is based on very good risk selection. So you have to explain and walk it through. These are process people generally, people who come from an industry where moving numbers through was the most important thing. Now suddenly they ask me questions along the lines of, "Why do I pay people to send me business, and then I pay other people a salary to stop business?" They don't understand things like antiselection. You have to teach this. There's very little antiselection in the mutual fund business. They come from a transaction-based mentality, and they are bringing that to the life insurance world. They do not see the margins as being in mortality. Again, where I grew up, your margins were in mortality and that's where you could make some money. They see the margins in the administration. How do I shave the cost? How do I get rid of medicals and change them for paramedicals? How do I get rid of paramedicals and change that for non-medical? I often wonder, too, if today's pricing actuary is in tune with what's going on in

underwriting and risk selection and in tune with the person who's processing the business. It's not an easy job. I would not want to have to run the underwriting new business department of companies where you have 100,000 (or more) new applications. It's almost a no-win job, and the people who take that on should be applauded.

Then new owners, like banks or any large conglomerate, come in. Again, you can look at the U.K., Canada, the United States or Australia. When they come in they, too, are after the unit cost. How do I drive it down? How do I move the transactions through? They see selection of risk as nothing more than approving loans. Give the money away; make sure it qualifies; make sure there's collateral and get it issued. Don't say no. Again, they focus on the 80 to 92 percent. We were in a company where the error rate was over 20 percent. The only good part of that company was the stuff that was underwritten by non-underwriters. By "non-underwriters" I mean that in this particular company they have hired an organization that generally does quality control for companies like a Tupperware or a Mary Kay Cosmetics. They've hired these people to look at the business, and if all the answers are negative, absolutely negative, then it goes in this pile to be issued, up to $250,000. If there's something wrong, it goes in this pile to an underwriter. For the pile of approved cases, the error rate is under 0.5 percent because they don't think. They look at the case and if everything is "no," then it goes over there and it gets issued. There's no thinking. They tend to err conservatively. If there's even a squiggle the wrong way, they put it in that pile to go to someone to look at because they think there's a problem. In the other pile, the error rate is over 20 percent, and it's looked at by underwriters with an average experience of 20 years. They think. They don't think. I'm not trying to knock underwriters, but what happens is you can move a lot of stuff through fast if it's clean. You can get that 80 to 92 percent through really fast if it's done by people who don't have to think and if you leave the thinking to real underwriters for the problem cases.

If you look at this whole change in process, is the environment today conducive to quality? Do we make it in your companies? Unfortunately, in the companies that I get to audit and review around the world, the answer probably is "no," although people want to change. They would like to think that they can make it conducive to quality. Is it conducive to long-term mortality? Unfortunately, we're moving in this mentality that it's short term. It's today's mortality, this quarter's mortality, and if you look at today's mortality, it's too late to change it. It's underwriting that's been done a long time ago. Can you price for this new processing? Possibly. Put the price up, allow more to go through faster and we all win.

For a male, 40, non-smoker, in Canadian dollars, the cost of mortality built into typical term products is 85 percent less today than it was in 1975. It's a tremendous drop in the cost of our product. At the same time, we're getting faster. If you go back to those days, the underwriting was much stricter.

What's the solution? I say that it's automation. It's one of two things. It's automation, or you hire a lot of people who just go through, make sure there are no exceptions, make sure you stick to the rules that you used to come up with your price and people just move it. But in reality you can't do that, so automation is the solution. With automation you get absolute consistency in underwriting. You build the rules. Your reinsurer approves the rules. There's your price. The cases fit or they don't. If they don't, it's also easy to audit. In one of the best companies I've ever audited in the world, I went in and I said, "Put a list in front of me of all the exceptions. I want every case where you did not let the computer approve it. Those are the only ones I want to look at." We audited them. We even had a percentage. There were 1,000 cases and 92 exceptions. You look at the 92 and say you would have made those exceptions because they didn't fit, you can see good reason why the underwriter did a certain thing, and you then change your rules so probably you don't have to do it again.

Automation gives great pricing results, which means you get a better result and a better price for your consumers out there. You then take all of the talent off the vanilla cases, and you allow them to start doing the tough cases and to spend the time on them. In other words, give them the time to think. If you're sitting there with a pile of problem cases, you're almost being judged that you should handle them as fast as the vanilla cases. Give them the time. Double up on the time. There are smart companies out there who do allow it. They allow underwriters to have far more time on bigger and problem cases.

Now let's talk about audits. You start auditing the process. This is where you can have a lot of fun. Underwriters are very smart. They're smarter today than they ever were. Today's underwriters have a better education base. They know more about medicine. People like Phil have helped them. The textbooks are better. The course of study is better. But we're going from one point in time when an error rate was considered 1 percent. When I started in the business, under the old underwriting system where we learned seat-of-the-pants and we guessed and the only textbook we had was "Does It Make Sense?" by Charlie Will, 1 percent was the error rate. This was on old aggregate business, under tough medical requirements. An error back then was considered anybody that was misrated by plus 51 mortality points or more. These internal audits have fallen by the wayside. A lot of companies today don't have a number. They say that's the reinsurers' problem because they're taking the risk, or they're the only ones doing auditing because the company doesn't have time. You can't audit yourself thoroughly if you tell an underwriter, "Check another underwriter, the person sitting beside you. Take 10 of their cases and look at them." You can't do it. Not everybody is a good auditor. I know I've worked with some terrible underwriters whom we've tried to make auditors out of, but auditing is a real skill set. Not every accountant would make a good accounting auditor. We have to, as an industry, work better at training them.

As we get into preferred and elite, you see more and more of a gray area—the "wiggle room." As a reinsurer, you go in, you sit with pricing people, you state your

rules and you state the gray area. You absolutely cannot step outside the gray area, and the gray area should only be used occasionally for exceptions. We find companies—the highest I've heard is 29 percent—beyond the wiggle room. So, if you take an elite class of risks, we're finding that up to 29 percent do not belong in there. They belong in either the regular preferred or aggregate.

Where do you go? Reinsurers are looked on as these external auditors. Well, let me tell you, when I started, the audit was you took a person to lunch, you bought them a beer, you asked how everything was going, and then you went back to your reinsurance head office and said everything is fine. We became more sophisticated in our auditing when it became wine and a fine lunch, and we talked a bit about how things were going. We went from there to no drink, no food, maybe sandwiches brought in, and we looked at more cases, but we weren't sure what we were looking for; we had a hard time, and still do, with defining what an error is. If you don't know how to find an error and put it on paper, how can you tell the pricing actuary that we're meeting the expectations? Now we're at no food. We're looking at preferred cases, which should be very easy because they should fit into a very defined category. You're not looking at a diabetic as Phil talked about, where there have been changes, and you're asking if this is a plus 75 or a plus 125. You're looking at somebody in preferred or super preferred or super elite who should be dead-on. In other words, there shouldn't be any room for error. An underwriter shouldn't make an error but, as I said earlier, you probably shouldn't have an underwriter doing this work. You should have either a machine or people who are trained to just do black and white. We're a long way from being professional in our whole auditing approach.

What's a favorable audit? I'd love to see a definition. It was 1 percent. Then I saw it move to 2 percent. Then it went to 3 to 5 percent. Once you got into the preferred, what is an error and what isn't? I have samples of audits where they have seven major mistakes out of 62 cases or 20 mistakes out of 110 cases, and they are so bad that they all will have almost an immediate impact on mortality. But if you read the executive summary, the first wording is, "This was a favorable audit." It was not a "bad audit" or "needs improving." You ask why. One of the hardest things for any of us in reinsurance to do is to tell a ceding company, an insurer, "You need improvement." It's tough.

Let's go over types of errors. Here's an example. The owner was a hotel. The insured was joint life, first to die or first to have a critical illness, husband and wife, maximum income $14,000. Now, you could add in a little because they probably had free accommodation and food. The total insurance was for $500,000. You're starting to worry as an auditor when you're reading this case, and you say to yourself that the underwriter will find this. It probably is a stretch financially. Then you look at the beneficiary, and it's circled, and you think the underwriter found it. It's a problem. You can't wait to turn the page.

The beneficiary was a gambling establishment. I'm sure all of you would say to decline that case and find out the relationship between the betting establishment, the hotel and the two insureds. It's circled. You're probably optimistic. When you turn the page, you expect to see the letter saying "declined until you justify it." Instead, there's the e-mail to the agent, without a word of a lie, was, "Please let us know the address of the beneficiary so we know where to send the check if the person dies or become critically ill."

Again, the errors go on and on, and they're getting worse and worse. To be fair, the insurers are not sure if they're in error because we haven't defined it well as an industry, and they don't define it. Broadly, if 92 percent of the cases in the North American industry are issued as applied for, standard, and 8 percent are problem, how is it we can find 10 percent wrong in a hundred cases?

We've gotten very weak in requirements. We're giving them away. That's great, because it helps move them through fast. If you've all priced for that, compared to what you're using for mortality today, I see nothing wrong. Get rid of all the requirements and just issue faster. It would make a lot of people happy. But are we doing it for the right reasons? I have yet to see somebody hand me, as a reinsurer, a study of why the company wants to get rid of a particular test. In 34 years the reason has always been, "Everybody else is doing it. We have to follow."
There have been great strides in the requirements. We can get all these things through the Internet. We can search pharmaceutical databases, motor vehicle records (MVRs) and reinsurers. We can get lots of data, and all this can help us make a decision—if we use it without exception. It's all here. This is the future. It will only work and help us on pricing if we actually use it and don't start making exceptions when we get the data in. If we're going to forsake old-style underwriting for the new style of automated underwriting, then we can't make exceptions.

Get the right authorization. One of the problems it's creating in the industry for underwriters is: if you have an authorization, does it really give you the right to check everything? I gave a talk in August to academic actuaries. They were all teaching actuaries from universities. Their whole issue was ethics. I had to defend the industry. They were blaming today's insurance actuaries for getting rid of a lot of tests and delving into pharmaceutical databases, for example. They were saying it's not the right thing to do. I'm saying it is the right thing if you have an authorization. If the insurer doesn't ask, then, yes, there's a problem. I would agree with them. But they see us as an industry as being "Big Brother" and going into areas without any authorization. I don't think that's true.

I've already talked about the financial reasons for getting rid of a requirement. They're not there as much as marketing reasons, and I'd like to emphasize that. I'd love to see some studies. I'm not going to go through how we've changed and the giveaways. But underwriters are giving away far, far too much today because "it's the way we've always done it." One of the worst things you could do when you introduced preferred underwriting was to let underwriters do it. It should have been

done by a machine. Underwriters can do a great job on the requirement side, but you have to help them. You have to almost move actuarial into underwriting or put underwriting under actuarial, where you get more dollars and cents involved in the studies. The last decade has probably produced one or two papers only on how to come up with the right requirements. Then, they shouldn't be waived. We're finding more and more under pressure. HIV is a good example. We've seen examples where the agent says the sample was lost in the mail. So, it's waived. Now, once you start doing that, occasionally it becomes almost routine because it's so easy for the underwriter to say to waive it. We can't afford to waive them, not on a whim. You're giving away a lot of premium dollars.

**MR. STEVEN EKBLAD:** I was asked to quantify some of the things that Phil and Ross talked about here. My initial reaction after seeing their presentations in draft form was: How can I quantify that? The data isn't always present to work with for all of these. But what I will do is step you through some of the tools that we can use to analyze the impacts of some of the changes, especially for some of the things that Ross was talking about, such as changes in underwriting and so forth. I'll step you through some of the more common tools used in the industry today. This is not an exhaustive list, but five of the more common tools used are mortality studies split out by issue era, cause-of-death analysis, mortality study enhanced using lab values, protective value study and Monte Carlo analysis and other simulation techniques.

For a mortality study by issue era, the best technique to do that is to segregate your mortality experience by issue era, that is, by determining points in time where some significant changes in the underwriting process may have taken place. It's basically looking at a "before" versus an "after" picture. For instance, the actual-to-expected ratio in your mortality study went from 100 percent—you were right on—to 103 percent after some change took place. A change in the underwriting process, a change in their preferred criteria or age and amount requirements, a new chief underwriter or anything like that could impact the underwriting process, positively or negatively. We can use this tool to look at those impacts. Some of the things to consider when doing such studies is controlling for differences in the overall population mortality levels, things like secular improvement, accounting for duration and the slopes. If you're using the 1975-1980 Table, for example, you're not going to get a very fair comparison if you're comparing a duration one actual-to-expected ratio for the after picture to a duration four actual-to-expected ratio for the before data. You need to line it up, duration one versus duration one, and also account for some of the impacts of secular mortality improvement. You need to come up with some kind of an assumption there so you have more of an apples-to-apples comparison.

Another caveat here is credibility, where you draw the line on how credible it is. Often you just don't have the credibility in the experience, but it's still a good exercise to go through. Say you only have 20 claims for the before picture and 30 claims for that after picture. It still could be a valuable exercise to at least get some

clue as to the direction of the change. Whether or not it's statistically significant is another question that you can address. In the absence of credible data you can always guess. By "guess" I mean use actuarial judgment. Use what you know. Use what you know from theory to make a best guess about magnitude and direction of the change. I'll take you through a couple of examples of such guesses.

Table 1 is an example with the table shave program.

Table 1
Example – "Table Shave" Program

| Class | Distribution | Mortality (% of Standard) | Excess Mortality |
|---|---|---|---|
| Standard | 97.75% | 100.00% | 0.000% |
| Table 1 | 1.00% | 125.00% | 0.250% |
| Table 2 | 0.75% | 150.00% | 0.375% |
| Table 3 | 0.50% | 175.00% | 0.375% |
| Overall | 100.00% | 101.00% | 1.000% |

Ross had an example where there's pressure for taking anything under Table 4 as a standard risk. In the table above I have Tables 1, 2 and 3 defined as 25 percent, 50 percent and 75 percent, respectively, in additional mortality over and above what we would call the pure standard class. I assigned some hypothetical distribution prevalences into those three classes, as well as the remainder into the standard class just for this oversimplified example. There's an impact that's fairly significant in the mortality just by having this table shave program. For this amount of distribution we're introducing this extra risk, the extra mortality. The excess mortality is the product of the excess over 100 of these percentages (the 125 percent, 150 percent, 175 percent), times the distribution. So, for example, Table 1 is contributing 0.25 percent of mortality into your standard class because of the prevalence of risks in Table 1 and because of the 25 percent extra risk for those applicants.

In addition to the numbers, you also need to consider things like antiselection. If your competitors don't have a table shave program, they're going to be getting the risks that would have qualified for standard because they're not charging that extra 1 percent, whereas they are charging the extra 25 percent, 50 percent, or 75 percent possibly in some cases for those Tables 1, 2 and 3 risks, although it's not very common for Tables 1 and 2. But especially in Table 3, many companies, if they're not using a table shave program, are charging that extra 75 percent. People are going to shop around when they get their policies. They're going to pick the cheapest one, and you may be the cheapest because they're getting the standard rate with you if you're using a table shave program.

Another example is preferred exceptions. This is yet another overly simplified example, just for illustration purposes. Let's say we segregate the pool of applicants

into percentiles by how good a risk they are. We can't do this too well in practice, but let's say we have a theoretical distribution of risks. We're going to call the group that's in the 91st to 100th percentile the best risks. We're going to say, just for the purpose of this exercise, that they have about 60 percent of the aggregate mortality. So, 0.6 times the standard q would get applied there. The worst risks, the ones that are probably borderline substandard, are the first to 10th percentile, and they're getting—again, an assumed number here—140 percent, the other extreme. We divide out what we call our super preferred and our preferred classes. We define those when we set the premiums to be super preferred, we assume that we're going to get 30 percent distribution in that class, the next 30 percent in the preferred, and then the remaining 40 percent in the residual class. That's what we get in the anticipated distribution reflected in premiums. This is the assumption that the pricing actuary is making in setting premiums.

However, if the underwriters are making exceptions that weren't built into the pricing, you might end up with the actual distribution getting to be 40 percent super preferred risks. In other words, for the 61st to 70th percentile group, instead of being issued preferred, they're making an exception here and there. The blood pressure test might have come out a little off, so let's let that one go. In the cholesterol test, oh, you're right at the borderline, so let's let that one go. Suddenly you have this group of preferred risks that are getting the super preferred rate. Similarly, this group was not technically qualified for preferred, if you go by the book, but enough exceptions have been made such that the group is now getting the preferred rate. Table 2 below sums up the distributions we're seeing. Due to the exceptions, you're shifting 10 percent into the next class up.

Table 2
Example – Preferred Exceptions

| Class | Anticipated Distribution | Actual Distribution |
|---|---|---|
| Super Preferred | 30% | 40% |
| Preferred | 30% | 30% |
| Residual | 40% | 30% |

If you look at Table 3 below at the mortality, 75 percent is the average of the super preferred group, 98 percent is the average of the preferred group and then an average of the aggregate mortality is 120 percent, based on this anticipated distribution. Now, based on the actual, we end up with a different story. You can see what the ratio is going to come out to be. That's similar to an actual-to-expected ratio, but it's really an adjustment that needs to be made to the expecteds to account for the preferred exceptions.

Table 3
Example – Preferred Exceptions

| Class | Expected Mort Based On Anticipated Dist | Expected Mort Based On Actual Dist | Ratio |
|---|---|---|---|
| Super Preferred | 75% | 80% | 106.67% |
| Preferred | 98% | 102% | 103.39% |
| Residual | 120% | 125% | 104.17% |

The next tool I want to talk about is the cause-of-death analysis. This one can be kind of tricky. What you want to do is compare cause-of-death prevalences for a block of business to overall insured population, if you have that data. It's also important to look at internal trends where you have credible data for your own block of business that you're examining. These possible trends could include looking at them by issue era or by year of death. These would indicate different things. If you're getting differences from one issue period to the next, there may be some causal relationships between how the policies are being issued, how they're marketed, how underwriting is handling the cases and how policyholders are dying. There might be some correlation there. If you see trends by calendar year or quarter, those are less likely to be due to underwriting and more likely to be caused by changes in claims adjudication or general environmental changes such as medical technology, epidemics, natural disasters or other things that can't be controlled directly by an insurance company.

There are some difficulties with cause of death. First of all, attributing the trends to the correct source can be a difficulty. For example, if we have a trend by issue era, is it due to the underwriting process or is it due to the fact that you're marketing your product in a different set of magazines that tend to draw the worst risks or different types of risks? Another difficulty is percentages. You want those to add to a hundred, but if everything is going to go down, there's going to be one thing left over that's going to look like it's going up, but maybe it's not. So you need to look at it in conjunction with the overall incurred mortality. Look at those levels to see if that's holding steady and see if you are increasing the number of deaths or the claims rate for that particular cause of death.

Lab data can be looked at in conjunction with two different types of studies. One is looking at mortality study results. It can help support or refute preferred criteria cut points or definitions used for the standard class. Or you can look at it in conjunction with your placement studies. Are you losing those better risks, the ones that maybe just missed one or two preferred criteria? Like I said before, maybe you don't want to make an exception and get them the preferred. They're getting the standard rate instead of the preferred, and so they're going to Company ABC Life, where they're getting the preferred rate because they have their criteria set differently or perhaps they're making exceptions where you're not. The trick is striking a balance, knowing

what you have, knowing what you're doing and pricing for that. Then also look at the trade-offs that might be made with your criteria and so forth.

The examples of use of lab data vary widely as the array of lab values that may be collected and stored in the database. If I can just make a quick plug for the SOA, the Individual Life Experience Committee and the Life Insurance Marketing & Research Association (LIMRA) International are currently soliciting insured lives data that will include lab data from contributing companies. A confidential report, including an industry comparison, will be made available to each participant. If you have data sitting around, I think they'd appreciate getting that for the good of the profession and to help the SOA understand trends in mortality as it relates to lab data and underwriting.

In the protective value study, we're talking about how much a requirement is really worth. These can be used to ascertain the value of things like getting a blood test, an ECG or a treadmill. Trying to quantify the mortality cost savings that you have by doing those tests can help you determine the point in your age and amount requirements when you should get that test. At what point does it really have any benefit? At what point is it paying for itself? Unique value is defined as the measurement of how much a particular underwriting requirement alone saves in mortality costs by uncovering critical information that could help decide if it's a preferred, a residual or a substandard risk.

Shared value measures the savings due to the uncovering of that critical information that also may have been uncovered by other existing requirements. For example, you get a complete blood workup, and you get an ECG. They both contribute to the uncovering of the fact that the applicant has coronary heart disease. In some cases you can't pinpoint that one would have uncovered it or the other. Maybe you found something fishy in one so you look at the ECG, and you have to attribute this information to both. You attribute 50/50, or some other breakdown, in the study. As far as abandoning requirements, a protective value study would be a good way to determine if you should be abandoning a requirement if it's not paying off. Underwriting requirements shouldn't be dropped without properly evaluating the potential impacts on risk classification due to the loss of information from that requirement.

Let's talk about Monte Carlo analysis. We can't assume that things are going to continue the way they are as far as levels of mortality. We've seen a downward trend for a long time, but there have been spikes here and there which we need to include to identify potential weaknesses in mortality projections, whether it's a simple three-parameter model employed based on assumptions of the probability and severity of those spikes in mortality, along with the slope of the downward trend, or whether the model is made quite complex, whether it's rolled into the cash-flow testing or some kind of dynamic valuation model that you're using.

Some potential shocks that I'm talking about might include HIV, 9/11-type terrorist attacks, wars and conflicts and natural disasters. For a Monte Carlo analysis, one thing to consider is assuming a very small probability of a very large shock in mortality. However, as you can probably guess, there's a lot of sensitivity in doing so—how large that shock is, how small that probability is. It's a good idea to do some sensitivity testing with those assumptions and with those parameters. As far as the by amount versus by number, the by-amount confidence intervals are usually more pertinent to the bottom line for an insurer or reinsurer, and also, of course, they're more pertinent to pricing. That's how you're setting premiums. Typically a Monte Carlo, a Panjer or some other technique, can be used to determine confidence intervals by amount. You want to avoid things like the normal distribution when you're looking at by amount just because of the asymmetricity. However, using a by-number calculation based on if it's Poisson or, if you have large numbers working in your favor, using a normal distribution approximation, can be a good quick-and-dirty approximation for a by-amount confidence interval.

I'm going to sum up the main points I'd like everyone to take from my portion of today's presentation. Mortality studies by issue era are necessary to evaluate changes to the underwriting process. Cause-of-death analyses can help evaluate both the underwriting process and the claims practice. Lab data can be incorporated into mortality and/or placement studies to evaluate criteria. Protective value studies determine the value of underwriting requirements, and a Monte Carlo analysis can help establish upper and lower bounds on mortality risk.

**MR. ROBERT J. THIESSEN:** Ross, you talked about underwriters and how maybe the more simple underwriting or the preferred analysis can be done by machine. This was the normal way that underwriting training was done. If underwriters are just going to be looking at large and tough cases, are they going to be able to step into those as their first underwriting job? What's the training process going to be of underwriters who are only going to be looking at tough and unusual cases?

**MR. MORTON:** I don't think underwriters have to be trained in the traditional sense. In other words, you let them do 20,000 nice, simple, $10,000 cases, and then eventually they can move up to $20,000. In my experience over 34 years, some of the best underwriters in the world have been developed by throwing them right into complicated cases and teaching them how to handle it. Reinsurers have for years trained someone from scratch who has the right background and the right aptitude. They've become great underwriters. They've never seen small cases. I don't think you need all the traditional ways of training. In fact, it can slow down good people, and people leave. If you're doing those simple cases and you're smart, you'll get out of the business as soon as possible.

**MR. SCHUSTER:** I have a quick one for Phil. You made quite a comment about C-reactive protein. Do you have insights into, say, five years from now, what a test looks like? Would we abandon the lipids, the cholesterol? What insights would it

give us? How would we begin to think about quick adopters? Is there a competitive advantage to thinking about a better class using C-reactive protein measurements?

**DR. SMALLEY:** First, I don't have stock in any of the lab companies. It's just one of the markers. Just a couple of weeks ago, two new markers came out looking at predicting risk. There's a lot of research that's going on in these new markers, and it's not just C-reactive protein that the clinicians are going to be using in clinical practice. I think we will start seeing many of these used in the insurance world as well. I don't think it will necessarily be one test. If you ask me to look five years down the road, I think what we will probably see is not just one test taking over for the cholesterol or other true tests that we've used in underwriting for years. What I think we're going to be seeing is more indexes being used, that consider your cholesterol, your blood pressure, your blood sugar level with some of these newer tests and maybe even some of the genetic risk factors, and put them all together to calculate out a cardiovascular risk score. No, I don't think one of these tests like C-reactive protein will take the place of one of our true tests.

**MR. SCHUSTER:** Will it give a better class?

**DR. SMALLEY:** This is certainly being looked at. I do think some of these tests do. The electron-beam calcium score has been looked at, as well as some of the better ways of stratifying weight. I think we will be able to fine-tune our mortality prediction.

**MR. STEVE ANDREWS:** I believe I've read that the test for C-reactive protein has a fairly high rate of false positive results. Therefore, its usefulness is being called into question. Can you comment on that?

**DR. SMALLEY:** You're right. The C-reactive protein, like many of the other markers of inflammation, is very non-specific. Anything going on in your body can cause these markers to go up, like a bit of prostatitis, a bit of gingivitis or a bit of arthritis. I think the preliminary data have shown that the test, though at these very mild degrees of elevation, have been quite predictive of cardiovascular risk in men and in women who are not on hormone replacement therapy. These are the studies that are showing it as predictive, but you're correct. It's not 100 percent specific, and that's something the clinical doctors are looking at on how they use this test.

**MR. SCHUSTER:** I have a question for Ross. In this roomful of actuaries, some have serious reinsurance or direct pricing responsibility, and they're making decisions about the multiple underwriting classes. They probably never thought much about auditing their own underwriting area. Give us a hint of what major and minor exceptions are to underwriting guidelines. I struggle with this at RGA. I don't know what a big one is and what a small one is. I've said, for example, waiving an aviation guideline is a small one. I'm not that concerned about that. My

underwriters are trying to educate me. Help me a little bit, and maybe help the audience a little bit.

**MR. MORTON:** I wish I had a definite answer. There are procedural errors where you have rules, and you should get an aviation question there, but when you look at the case as an auditor, you say that the odds are it's not going to impact mortality. The underwriter made a decision, broke the rule, but mortality-wise it's not a big deal, and those you put down as trivial. You put them down as procedural issues. List them and hope that a company corrects them. We had one audit where we had over 20 procedural changes they should bring into the company. Some were to get rid of them. If they're not using a procedure, get rid of it. You see that a lot. A minor error to me is between plus 51 and plus 100 extra mortality that was knowingly omitted, knowingly waived or inadvertently waived on a routine basis. Over Table 4 to me is significant. Then you have what I call "disasters waiting to happen." We see cases where quite routinely in a company they have Table 6s and 7s. You find them all the time. They're pushed to Table 4s. Then they can go into the table discount program. They get issued standard. The agent complains and gets preferred. Then from preferred, because again the pressure goes higher up, it is then made into an elite preferred. We have seen many of those. Those are disasters waiting to happen. If I were a reinsurer, I'd walk away. I'd walk away because you won't get the price for it as a reinsurer. So why tolerate it? Yet as an industry we tolerate it, and these are happening quite frequently. Again, if you take disasters, you shouldn't find any as a routine practice, especially when you go and you ask the company if this is a routine practice and they say yes, they do this all the time. Major errors to me should be no more than 3 to 4 percent. Minor errors can be 8 to 9 percent. As far as procedural errors, I almost don't care how many, as long as the company corrects them. That's the critical thing. If I give them a list of 20, I hope next year when I come back 18 have been corrected. Then I'll give the company the gold star.

**MR. DAVID ORR:** I have a couple of observations. I think, first of all, the problem with multi-preferred starts with the fact that I don't think you're getting 92 percent cases issued as applied for. I think in general it's a lot lower than that on multi-preferred business because the field doesn't do a very good job in general of pre-classifying known things. Obviously, they might not know about cholesterol, but there's a tendency to put everything into the super preferred class, and you're going to end up with issued as applied for maybe down at 50 or 60 percent. That may be why on one of your charts you can get a 10 percent error rate, because you're not getting the 92 percent in that.

I have another observation. We've done a lot of work on internal and external audits. I would say this in an underwriting meeting. In general, regarding your point about favorable versus unfavorable, an underwriter always seems to want to see the good in other underwriters and is not willing to say that so-and-so has done something wrong. One of the things that we have done to try to overcome that is real-time audits. That way, the person doing the audit is putting his or her name on

the file before it goes out the door. We've only just started that, so I don't know the exact results of that.

I have a suggestion in terms of your favorable versus the unfavorable. In my experience with reinsurance audits, I don't think the actuaries have been involved enough, and instead of bringing it down to a "yes/no," a binary decision like "favorable/unfavorable," maybe if you got the actuaries involved and then classified it in terms of the effect it would have on allowances—it's not good or it's not bad, it would just have x percent change on allowances—I think that would tend to get everyone's attention.

**MR. MORTON:** I agree. I'll make three points. Preferred does change all the parameters we have. Your error rate can be higher, but it shouldn't be higher. As far as real-time auditing, yes. I think the companies that do that are very smart because then I have skin in the game. If I'm an auditor, I have to put my name on it before it gets issued. That's a lot better than six months after in an ivory-tower world. I also think having a good reward for quality, or a penalty, is worthwhile.