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Session 63
Term Mortality and Persistency

Track: Product Development

Moderator: Keith A. Dall

Panelists: Jeffrey T. Dukes
George J. Hrischenko
Thomas E. Rhodes

Summary: Companies are continuing to monitor their mortality and lapse rates on term life insurance, especially in the years after the level premium period. Industry leaders discuss:

- Theories predicting the impact lapse rates have on mortality after the level premium period
- Recent industry studies on mortality and lapses
- The impact lapse and mortality rates have on profits

Attendees learn the relationship that exists between mortality and lapse assumptions for term life insurance and the availability of industry studies.

MR. KEITH A. DALL: We have three wonderful speakers today. I will announce them in reverse order as to how they will speak. George Hrischenko began again working in the insurance industry in 1986. He recently joined Transamerica Reinsurance as marketing actuary, and he is responsible for designing and implementing an innovative new business acquisition strategy. Hrischenko spent 18 years with Metropolitan Life, where he was responsible for the design and

administration of field compensation plans for the career agency sales force. Tom Rhodes has more than 25 years of experience in the life insurance business, including 15 years with a major life insurance company where he had major actuarial positions in management, reporting illustration systems and pricing. He is currently managing actuary of MIB's knowledge services, oversees experience studies, performs work for direct writers and reinsurers and develops new products and services separate from MIB's core fraud protection services. Our first speaker will be Jeff Dukes. Jeff is principal with the Chicago office of Milliman. He joined the firm in 1981. Jeff's experience has been concentrated in the pricing, modeling and valuation of individual life and annuity business. From 1998 to 2003, Jeff was based in Milliman's Tokyo office before coming back to the Chicago office. With that, I will invite Jeff to come to the podium.

MR. JEFFREY T. DUKES: I'll touch on the concept of conceptual models for select mortality. I won't spend a lot of time on that. Most of my time will be spent talking about "practical" models for estimating term mortality antiselection. The other speakers will talk more about actual experience and pricing considerations. I'll also talk about some considerations for setting the assumptions for these so-called practical models.

As far as conceptual models for select mortality, what I'm talking about is the notion of trying to explain why there is the slope in the select mortality tables. Part of it is just wearing off of underwriting effects—people getting less healthy. Even in a population table, mortality rates go up with age, but they go up more steeply in a select table because the people have better mortality to start with. There are various theories about that. I've listed some of these papers in Duke Slide 3, page 1. I've listed just three, and there are more than this. You will notice that there are pretty wide variances in terms of when they were published. You can even go back to Gompertz in the early 19th century and the idea of trying to come up with some mathematical/biological explanation for why mortality patterns are what they are. But they all deal with the concept that lives move from select status to nonselect over time as illnesses arise and health deteriorates. For a group of insured lives, the process might be accelerated by the slights of selective lapsation. Maybe antiselective would have been a better term. The problem with this is that it's hard to get good data to set the parameters for these theoretical models. So we have a real dilemma. The models look nifty, but they're only as good as the parameters you have to set them, and it's hard to get that information.

We'll talk a little bit about so-called practical models. There are four listed in Dukes Slide 4, page 2. The Dukes-McDonald method was written up in the Transactions in 1980. The Snyder-Shapiro method was published in 1981 in the Conference of Actuaries in Public Practice. I don't think that one has been widely used. An article about the Becker-Kitsos, which is listed next, appeared in *Best Review* in September 1984. I think it had just David Becker's name on it as an author, but Ted Kitsos was actually a co-author of that article. There's always the SWAG approach to setting assumptions. I was told by somebody who is doing a lot of

product work in term that that's probably the most popular way these days. Becker-Kitsos may be No. 2 and Dukes-McDonald No. 3. There's a little bit of a SWAG aspect to coming up with assumptions, even under Dukes-McDonald or Becker-Kitsos.

For Dukes-McDonald, the concept is basically that lapses in excess of some set of baseline lapse rates are antiselective. The baseline lapse rates are supposed to be consistent with the slope of the mortality table without these excess or additional lapses that engender the additional antiselection. If there was a current industry table for which you believe the slope of the mortality was correct and you knew what lapse rates were underlying that table—because there is a certain set of lapse rates that are associated with those mortality rates—those would be a good candidate for your baseline lapse rates. You could refine that to look at just term experience underlying that table or something like that, but that's the notion.

The main point of the paper was this notion of conservation of deaths, that when you have these additional excess lapses, that doesn't change the number of deaths that you have in total. What was happening at the time that we wrote the paper was that the pricing assumptions were more of a SWAG variety, and there wasn't even a semblance of any rigor in terms of conserving the number of deaths. The main contribution of the paper was this conservation of deaths notion. But you still need to make an assumption about the mortality rate for the so-called reverter group, which is the excess lapse group. We'll talk later in this presentation about some considerations for making those assumptions. Once you make that assumption, you can use the conservation of deaths concept to solve for the persister mortality, which are the people who are still around paying those high premiums after the end of the level term period.

The product designs were different when this paper came out. Increasing premium whole life was a pretty common pattern, and the reasons for those designs were a little bit different from the reasons for the level term and ART designs. They had ART-type premiums, select and ultimate, and then after 20 years or so, the premiums would level out at a pretty high rate for the rest of life.

Duke slide 7, page 3 is supposed to convey in terms of a concept that at the end of the 10^{th} policy year, you have some spike in the lapse rates. The top half of that first circle represents those people, those excess lapses, and the 11d sub-r 1 is the deaths associated with those people in the 11^{th} policy year, measured from the original issue. The bottom half are the people who didn't lapse. They have some number of deaths, but the total number of deaths from those two groups has to add up to what it would have been if it hadn't been split into two groups. It's just common sense, if you stop and think about it. If you go to the circle on the right, which probably should be a little smaller than the one on the left, there's been another split in the persister group. Another set of excess lapses has occurred, and so we now have two sets of reverters, one that happened at the end of year 10 and one that happened at the end of year 11. But again, the number of deaths from all

three of those groups must add up to what it would have been if there hadn't been any of these excess lapses. That's the pictorial concept involved here.

Becker-Kitsos is introduced as one refinement to the original Dukes-McDonald formulas. The Dukes-McDonald formulas in the paper assume that reverters were fully select for purposes of the formulas and the numerical illustrations, although the paper did talk about the likelihood that that probably wouldn't be true. It didn't delve into it to any great extent. But Becker-Kitsos sort of assumes that they aren't fully select. They're somewhere between fully select and point in scale. They also introduced the notion, which I think might have been in the Snyder-Shapiro paper, that accidental deaths aren't affected by this antiselection, that you should subtract out accidental death mortality and then do your antiselection calculations and add them back in to get a final mortality rate. At the higher ages, accidental death rates are pretty slow in relation to total mortality. This is a refinement that has almost no visible effect on the rates, but at younger ages, where they're a more significant percentage of the mortality rate, it does change things. We end up with nonaccidental reverter mortality to multiple fully select nonaccidental mortality, and you add back in the accidental death rate. But mechanically, it doesn't happen that way. It's all applied, as you'll see in a second, on a reverter calculation.

I put some information on the Becker-Kitsos formulas in Duke Slide 8, page 3, because they're not in the *Best* article. It's all words. There aren't any formulas there, so I tried to translate. This is partly based on Ted Kitsos' Visual Basic program that he wrote back then. The problem is that he didn't define all the variable names, so I had to make some guesses about what's going on. I tried to get him to review this before I put it up here, but he was busy. I think it's right, but if you want, I'll send you the whole thing, and you can make your own interpretations. The concept is they solved for this multiple, which depends on the number of years since the excess lapse occurred. They look at the ratio of a point-in-scale mortality rate to the fully select rate at the attained age where the excess lapse occurs, subtract one from that, multiply it by this R—they recommend without a whole lot of explanation that you pick a number between 0.2 and 0.4—and then you hit it with another scalar, which grades off usually over the select period, add 1 to that and then multiply that by the select and ultimate rates associated with the age at which the reversion occurs.

For example, if you have somebody who is sold a policy at age 40, and the excess lapse occurs at the end of year 10, you'd be taking a Q (40+10) divided by a Q (50-1), and calculate the multiple. Then you're multiplying by a Q (50+T-1). The formula, as written, doesn't have the accidental death adjustment that I mentioned that was one of the refinements. To do that, you subtract the accidental death rate in both the numerator and denominator of those Qs in the brackets, and then you apply the multiple to a select rate without accidental deaths. Then you add the accidental death rate back in—the accidental death rate

just varying by attained age—to get the reverter mortality. You don't need to worry too much about comprehending all this right now. Just follow the general scheme because if you want, I'll send you a spreadsheet that you can pore over to your heart's content and modify if you want. I've also seen an alternative version of Becker-Kitsos. It's a little bit simpler version, in which the reverter mortality is just a linear interpolation between the point-in-scale rate measured from original issue and a new select rate at the time the excess lapse occurs. All these formulas, this one and the prior one, are doing is telling you what the so-called reverter mortality is. Once you have that, you can apply conservation of deaths to solve for the persister mortality, which is what you're interested in for pricing or projecting or whatever you're doing.

I just want to mention a few things about setting assumptions. This is where the SWAG part of it comes into play or the WAG, depending on how sophisticated you think your assumptions are. What is the expected mortality experience without any excess lapses? It's relatively important that you try to get that pinned down within a reasonable degree of accuracy because if you use a totally different table, you'll get noticeably different results for the persister mortality multiples.

Another point is whether there's any difference between new issue and a fully select reverter. Usually in practice we don't assume there is, except that we assume that the reverters' lapse rates are just the point-in-scale base lapse rates measured from original issue. In fact, you don't care too much what the reverter persistency is. It's better just to assume that they have the same lapse rates. Otherwise you start dinking around with different lapse assumptions, and you have to be careful that you're keeping the group size—all the reverter types and the persisters—the same as it is under base assumptions. If you don't, conservation of deaths doesn't make any sense. If you add up all the pieces in terms of number of lives, and they don't add up to what they would have been under baseline assumptions, it won't be true that the number of deaths will be the same either. So, you have to be careful to do that consistently.

Another possibility you might want to think about is, suppose you have a superpreferred that is part of the excess lapse group at the end of the 10-year level term period and then that person is superpreferred again. Do you think they are sort of a supersuperpreferred who may have better mortality than a superpreferred for just a regular new issue? You can play lots of mind games that way if you want.

You also need to decide what the baseline lapse assumptions are. Back when we first were using this method and even today a lot of times, we don't have any experience. We try to gauge what we think might be a reasonable level of excess lapses based on a number of factors. For example, how big is the premium increase from the level period to the ART period, both in terms of a percentage increase and a dollar amount increase? The bigger the increase, the more noticeable it will be to policyholders and the more likely they will be to lapse. What's the relationship between the persister, the high premiums and a new issue premium for that

insured's attained age? If the persister premium is 20 times the residual premium, people with pretty high substandard ratings would theoretically have an incentive to lapse and be rated substandard rather than to continue paying those high premiums.

The original issue age, current duration and assumed persistency for prior years are important. If you talk to your underwriters, you might be able to get some sense as to what percentage of the group under those assumptions would be maybe fully select if they were underwritten today. Then you must decide what fraction of the excess lapses is fully select and the mortality for those nonselect excess lapses. That's how the current uses of the Dukes-McDonald usually work. For Becker-Kitsos, you needed to define, decide what RG and this A/B or the relation of the Qs is in the formula. Then you should think about whether that fraction or those assumptions change if you have multiple layers of excess lapses because in the first wave of excess lapses, you probably have more. At least it's plausible that most of the poorer select people would go in that one and then subsequent people would gradually wake up. But they might not be as fully select.

I have just a few examples (Slide 3, page 4). These are all for male at issue age 40, just so you can see what sort of results come out of this. Base lapse rates are 10 percent a year. Total lapse rates equal base, except for policy years 10 to 13. The total lapse rates on 11, 12 and 13 are 30, 20 and 15, respectively. I have some variations on the year 10 lapse rate, so in this chart you'll see a total year 10 lapse rate of 85 percent in the first two columns and 90 percent in the last one. Then there are differences in the percentage of the reverters that are fully select. So, if you assume 100 percent are fully select, you get high multiples. If you assume 80 percent, it scales it down a bit. It's sensitive to those kinds of assumptions.

By the way, I forgot to mention that you can get crazy answers if you make absurd assumptions. If they're absurd, it will be obvious because you'll get something like mortality rates greater than one. If you don't have select mortality rates at old ages because the table ends or something, and you're sticking ultimate rates in as place fillers, you might get resurrections—a negative mortality rate. You can usually tell when you're totally off the charts in terms of crazy assumptions, but it's the in-between that is a little hard to gauge sometimes.

I did a couple of Becker-Kitsos in which I used different Rs (Slide 3, page 5). I used the same basic assumptions, except that I used an 85 percent lapse rate in year 10 for all of these. In the first two columns, I go through the fancier treatment with the accidental death benefits, and in the third column, accidental deaths are treated like everybody else. You can see that with Becker-Kitsos, you can get results that are fairly close to Dukes-McDonald, which isn't too surprising. It depends on what your assumptions are. But you get some sense of how the R factor affects things and what the accidental deaths' refinement does to the calculations.

MR. THOMAS E. RHODES: I'll be talking today about term insurance from the perspective of the SOA mortality study and Life Insurance Marketing and Research Association (LIMRA) Lapse Study. It is appropriate to talk about both of them together because beginning with the 2000-2001 study, SOA and LIMRA joined forces in going out with one data call to accomplish both studies. We also increased the number of participants, and it's part of the ongoing effort by the SOA to increase participation and be more friendly in getting data. Specifically, I'll talk about progress and various plans into the future in SOA mortality studies, go over briefly what the term mortality study results are, cover the LIMRA Term Lapse Study results and talk about upcoming SOA and LIMRA studies.

In the last data call, we were successful by joining forces between SOA and LIMRA. The earlier study had limited data from 10 companies, and we've increased the number of companies that participate. We released the SOA mortality study in this format in the last annual meeting, and right now we've processed data from 18 of 20 companies for the 2001-2002 study. That will be reviewed further and is on schedule for release. So, part of the message is that we've increased participation, and we're getting out studies on an annual basis.

Also, we're on a pattern overall of looking at mortality studies and determining how to improve them. Part of that is what I call incremental improvement, from where we were with 10 companies with a portable document format (PDF) file, and then moving to 20 companies using Excel pivot tables, which I'll show you a bit later. Currently, we're going out for a current data call. We're asking companies to tell us what their preferred and standard classes are for mortality so that we can be responsive in terms of preferred and mortality classes based upon what the companies say the preferred classes are. From the LIMRA point of view, there's a lot of interest in level premium term lapse assumptions, so we're asking questions such as, "Could you please specify what the level premium term insurance policies are so we can do those studies?"

Also, a lot of activity is occurring under a task force headed by Al Klein, and this is under the FIRST concept. We want to get a lot of data about the different underwriting classes and assemble it all so that from the base underwriting data, you can determine what the preferred classes will be. This is in comparison to the one that currently is ongoing, in which we just asked you, "What did you call it?" We'll have more expansive data. A lot of committees are working on this. In the long run, we're looking to have something within a facility to do a remote query facility. Right now, we're at the Excel pivot table portion.

The 2000-2001 study covers policy years beginning in 2000 and ending in 2001 because actuaries like to look at mortality in terms of duration. As I mentioned, we had 20 contributing companies. One thing you have to consider when you're looking at these data is that the preceding four years had 10 to 12 companies, and you have some relatively large companies added to the study—USAA and Prudential, for example—which adds significant volume and can skew the results. You have to

expect some variability. As I mentioned, we don't have preferred and standard classes of data, so what I'm using as a substitute for what is better underwriting within this entire study are term plans with face amounts of $100,000 and more. With a pivot table approach, you can take that pivot table and use a different amount if you would want to.

In Rhodes Slide 2, page 8, we have two different term mortality. Here is something that I consistently see in many different mortality studies—a spike of mortality in duration three. The bold red line also indicates overall that there's more variation in the one-year study. In the five-year study there's less variation, so I don't find these results that surprising.

More interestingly to me is mortality by gender and smoking status (Rhodes Slide 3, page 8). One advance that was made with the 2001 DVT, as distinct from the 1975-1980 basic table, is that, in the 1975-1980 basic table, basically 200 percent was smoker mortality, and 100 percent was nonsmoker mortality. Here, we're comparing smoker mortality to smoker expectations and nonsmoker mortality to nonsmoker expectations. The yellow line in the center is the five-year study, and you'll note that the smoker mortality is more variable and also higher, even with its own expected basis, than overall. The nonsmoker mortality is good. Also notice part of the duration three spike in mortality can be attributed to smoker policies.

One of the things I'm emphasizing is that I wish I could show you what you wanted to see, which is 2000-2001 data by preferred and standard underwriting classes. We've done some work in that area, but we don't have detailed results we can show you, which is why we're having the current data call to look for risk class. In terms of risk class, basically what I'm asking is, "How many nonsmoker classes do you have? Please rank them." For example, to oversimplify it, if everyone had four nonsmoker classes, you would come back and rank them from one to four, one being your best class and four being your standard class. We would use that as a method of taking a first cut at different preferred and mortality classes.

Also, I've been meeting with the SOA, and we want to emphasize that we want to work with you in terms of contributing data. We would like to set up phone calls with individual companies and have an offer to assist you to get the data if that is needed. But for purposes of what I'm showing today, I'm stuck with $100,000 and over for better underwriting. We also have data on the older system of looking at underwriting by extent of underwriting, ranging from minimal underwriting and nonmedical up through more extensive underwriting and medical. The results in Rhodes Slide 2, page 9, shouldn't be too much of a surprise. The yellow line in the center is the 1996-2001 male nonsmoker experience. You have more variability and higher mortality ratios with less underwriting of the nonmedical and paramedical. There is a line below the yellow one consistently, which you can't see that well.

Basically, one of the things about the SOA mortality study is I'm trying to get away from giving 150-page PDF files, which, being chair of the Individual Life Experience

Committee, I can't understand and can't follow through. I'm trying to emphasize using pivot tables. I've shown a few graphs, but I find it useful when questions come up to work with the pivot table. If you're interested in your own company's mortality and—this is a bit of a promo—if you contribute to the SOA's study, you'll get your own pivot table, and you can play with your own assumptions.

I want to walk through this pivot table. I have this preset to term. Let's look at males, nonsmokers—I won't bother with medical basis—so this then gives me a view of nonsmokers and males and then by different issue ages. That's all well and good, but you wanted to look at the $100,000-plus, so a trick that you can do is drag this down here, and I'll basically unclick everything so I just have $100,000 and more up there. Then if I drag this back up here, I now have a view of all this mortality of $100,000 and above. You can always check that. You can do different sorts of looking at the mortality. If I just put issue age up here, you have your different amount bands here, so you have your actual to expected (A/E) ratio by amount bands, the actual deaths—if you look out here, you have a 60 percent mortality ratio, but only seven deaths—and down here at the bottom is the sum total. The point is not just to look at some charts, but to look at the pivot table and ask your own questions. "I don't want to look at overall." "I don't want to look at his term $100,000 and above. I want $1 million and above." This gives you the facility to look and ask questions. Again, if your company contributes data, you'll get one with your own experience.

I want to move on to the LIMRA portion of the study. These are some data I got from Maryanne Perashodum. They are data from 25 participating companies, and not all companies contributed to every part of the study. It's from the 2001-2002 study. Maryanne said it's preliminary only and subject to revision, which means she feels pretty good about it, but she wants to do some last-minute checking.

In Rhodes Slide 2, page 10, the data that I was given for term insurance shows lapse rates by duration. There's a general trend of higher lapse rates at the earlier duration going down. We're comparing 2001-2002 data to 1995 and 1996 data. I was struck that the duration two through durations six to 10 lapse experience was fairly close.

In Rhodes Slide 3, page 10, we're looking at term insurance. This is sort of a parallel slide to the earlier one we had breaking down mortality experience by gender and smoking status. There we showed higher mortality for smokers and lower mortality for nonsmokers, compared to the expected tables. Here we have the interesting results that for male smokers, you have higher lapse rates, which sort of ties in with some of the points raised in the preceding discussion. This tends to indicate that there's some relationship perhaps between the extent of lapses and the extent of mortality, which leads me to future studies.

I want to mention the joint study on interaction of term lapse and mortality. Maryanne Pershodum of LIMRA and I were talking and we agreed that based upon

these data, it would be interesting to do a rigorous study of the interrelationship of lapse rates and mortality, particularly in the term area, where there is a lot of concern with a level premium area. After the level premium period, what happens with lapses, and what happens with the residual mortality? Also, we're working on looking at the older issue age question and ultimate mortality. There's a meeting in a month to go over some of the data for that. We're hoping for results later this year or early next year. As I mentioned, there's the 2001-2002 SOA mortality study. We have 18 companies in the bag, so that will be coming out this fall. It has to go through all this committee review first.

I want to spend a few more minutes on the SOA/LIMRA data call for 2002-2003 and 2003-2004. Clearly, I've finished studying all the existing data, but I want to emphasize that we have flexibility in accepting data in any reasonable form. I work for MIB, which purchased some expensive new software to help us in the process of collecting data, to make it easier, so that if you give data in a different format, that isn't a problem for us. We're requesting data in the standard format, but we'll work with you in translating the format. We'll accept Excel spreadsheets, comma-separated values or anything that you want to throw at us. We'd like to work with you to increase the participation. The SOA is fully supportive of this effort, and we have various techniques to work with you. We'd like to set up meetings with companies if they have any questions.

The risk class for preferred and standard classes is extremely important. There has been an issue in the industry of AG38, the different levels of appropriate reserves for different preferred mortality situations. I'm personally supportive of the principle-based approach to insurance. However, there will be in practice a gap of time between when the AG38 sunsets and when the principle-based accounting fully takes effect. Trying to be supportive of that whole process, Mike Verner, Donna, Claire and I will be at the LHATF meeting in June to ask for a fast track to be able to work with the SOA and the Academy to come out with some multiple preferred mortality and standard classes. We're having to make an appeal, both through here and with the cooperation of LHATF, for companies to contribute the data. I've been in contact with all 20 companies from the last study, and I'll be going out now to your individual companies. It's extremely important for you to commit giving data and giving data early, hopefully by this fall, for us to continue the study. Again, we're working to make it simple for you. That's all I have.

MR. HODGES: Here you also have expected deaths by amount. Also, we have information by number of policies on a different sheet, so you can do the same technique. You're absolutely correct that there will be more deaths by smokers, and there's a higher proportion of deaths, as I said before, even adjusting for the fact that smokers have higher mortality, and it seems also related to lapse rates.

FROM THE FLOOR: How do you plan to add the various types of classifications together?

MR. HODGES: That's an excellent question. I would go back to what I call the incremental approach. The long-term approach and the best approach in the long-term, theoretically, would be to use all the underwriting classification, get that material together and use that. However, I believe that there's a sunset provision in about two years or less, and I want to be supportive of the principle-based approach. So, I'm using the approach of saying, "What is your mortality?" For example, let me make a simple assumption that everyone has four nonsmoker classes, and you rank them one through four, one being the best mortality, two being the second best and so on, to standard. You would aggregate all the mortality as a first cut and assume it's true.

What you would have is a mean of mortality with a distribution. You would then look at some of the survey material that has been done with preferred and standard mortality to get a sense of what underwriting criteria are there and to do a reality check as a first cut. Then using the incremental approach, you would do another study, get more data and start drilling down in successive times, saying, "This may surprise you, but Prudential's best class doesn't have the same mortality as Northwestern Mutual's best class." You would then use expected mortality, and you could do many different things. But to be responsive to the industry, it has to be an incremental approach—first, a straight line of association of classes using the different survey data to be responsive and then drilling more in the data and eventually going toward the first approach, where you can double-check the actual underwriting data, which would be the most accurate one. But that would be too long-term to be useful for the purposes that I'm trying to address with LaHeteff now.

I used a simple example of assuming everyone had the same classes. What you notice if you talk with reinsurers is that in practice, if you have four nonsmoker classes, the mortality is different among those three classes. If you have two nonsmoker classes, those two classes will be different. That will require a lot of study and work by the committee. I'd invite further comment on that, but I think we have other presentations, and I'd be happy to talk to anyone about this at the end. But keep in mind that right now we have a 2001 CSO table, which is representative, being used for preferred valuation. The idea here is to do something reasonable, which will be a first attempt and will be better than what we have. But year by year, it would be improved..

MR. GEORGE J. HRISCHENKO: Today I would like to talk about mortality and persistency—to keep that theme going—and pricing a product during a level period and what that does to the pricing. Maybe I'll throw out a question or two that we'll let you go home with. We'll look at mortality and persistency after the level period when we price a product today and what guesses have to go into that. Again, we'll leave you with some questions and talk about some recent studies. We pulled together some information with our array of data and have a few observations on that.

I'll just repeat some of what Jeff Dukes talked about. Basically, we all know select mortality tables show rates increasing with a duration for a given attained age. We know the select lives are healthier than the population as a whole, but that over time the selection does wear off. We have that conservation principle, which is important to what I'll say in a few minutes. For a given insured population, less healthy lives at lapse cause the average mortality rate for the remaining cohort to increase.

Under certain circumstances, it's reasonable to expect that the greater the lapse rate is, the more rapid the deterioration is. That's been shown by the recent term wars, during which direct companies were repricing every six months and lowering rates. The healthy lives, who were willing to be underwritten, could get lower prices, lower rates. But what I'd like to throw out here is, What if you have for that same mortality table lower lapse rates—lower than those built into the mortality table? Is it reasonable to expect that there is a less rapid deterioration? I think you have to know the reason for the lapse, the expected mortality and that interaction in the underlying mortality table. That's why I can't wait for Tom's mortality lapse interaction study to come out.

You have to understand why people are lapsing. There are a few reasons. Commission chargebacks are one. Sales reps get paid commissions, and if there's no commission chargeback, some of them will rewrite that policy, believe it or not. We're seeing affinity groups. Tom showed a slide that had 16 percent going down to 10 percent in a second year and down to about 6 percent way out. We're seeing some affinity groups with 6 percent lapse rates in the first year and leveling off at four.

An affinity group is a group of people who are part of some other group. AAA is an affinity group, for example. They get together and have special ways to get insurance. The secondary market, the viaticals, comprises people out there buying these things for a business reason, and they won't let that lapse. Estate planning involves sophisticated buyers who have accountants and other financial planners involved, and they'll buy instruments that will not lapse. Another reason is policies with inherent value. If you're 10 years into a 30-year term, it's a lot cheaper to keep paying that premium than to buy a new 20-year term. I looked randomly at some of the rates last week and found that that was so, especially if you cannot be reunderwritten. You have a valuable policy there. Some companies go out and have these replacement campaigns, so this is a company forcing replacement. A lot of companies don't do that. They want to keep these on the books.

Another thing that I think is important is the return of premium. If you have a return of premium rider on a term policy, once that hits a crossover point where it's more valuable to keep it, the value of the policy is worth more than the premium you're paying on it, and people will keep those forever, until they die or earlier.

How do we price a product during a level term period? This is from a reinsurer's perspective, but I guess it can be used by anybody. We will obtain the company's actual and recent mortality and lapse experience. To the extent it's creditable, we'll use both the mortality and lapse. To the extent it's not, we'll verify, adjust and usually have some sort of credibility-weighted mortality and lapse. But we're finding with these affinity groups that you have this lapse-supported product, and lapse rates are low, and we just can't meet the prices. The prices are way up there. People are sticking around. I'm saying that if the company's lapse rates are low on average, mortality is lower, and maybe we can give them the better price. I haven't convinced my management of that, so if you can help me out with that, that would be great. I'll throw this question out, but I won't answer it. When is the best time for a policy to lapse, from a company's point of view?

For pricing the level period, we have to be careful about what we assume with respect to the lapse, especially when the lapse rates are lower than what I call built into the mortality table. I submit that you will have better mortality, and you can adjust your pricing for that. The key is to get it right.

With respect to mortality and persistency after the level period, you have to price that today, as well. What will you do about that? For your pricing horizon, you can do it right to the end of the level period, or you can do it for the life of the policy, and it has different risk dimensions when you do that. Of course, if you're doing it over the life of the policy, it's much riskier, and you probably want to put in some padding.

Lapse rates are high at the end of the level term period, and it's difficult to predict policyholders' behavior. What will they do at the end of the level period? I guess that depends on a lot of things—change mostly—but are other products available? Maybe they don't need insurance anymore. Maybe it's the level of insurance premiums. What if they aren't so high? What if the current rates out there are not so bad? They might keep it, who knows. I'll throw another question out there. Does everybody who persists necessarily have worse mortality? I would say no. What if lapses are uniform over the whole mortality distribution? It's not just the select people. Again, those are questions that you have to answer to get it right. I suggest that lapse rates and mortality rates are two huge assumptions that will happen way out with respect to the tail premiums. Way back when, pre-XXX—I guess post-XXX as well—the x factor was set high to help manage the statutory reserves, and they weren't set primarily for mortality considerations. If we assume that the risks that can, leave, and those who can't, stay, are those premiums out there or not? Do we have guaranteed premiums out there to cover this excess mortality?

One thing that we notice when we price a product now is that we don't want to rely on those tail premiums. If you use high guaranteed premiums at the end, the value of those, you look like you have a profitable product. This is g that, again, is 20 or 30 years hence, and it's risky to use that. I would hat if you're pricing a product today, depending on how high those tail

M.E.: He spoke too quickly here and I couldn't understand him.

premiums are, you would use 98 percent or 100 percent as an estimate. It probably better characterizes an assumption. Again, it's because we don't know what will happen, and I wouldn't rely on those profits. It's a huge risk. If you get it right, that's great, but if you don't, you can be in a lot of trouble. Don't let the tail wag the dog. Don't use the tail profits to support a business decision today. I think there are some weird nonintuitive GAAP benefit reserve issues out there, as well, but I don't want to get into that today.

I find it amazing that we've had computers in the insurance industry for 50 years, and I'm amazed every day why we can't just go get those data. They're out there somewhere, right? You go get them, pull the information together, do your analysis and then we wouldn't be having this discussion. We would know what that interaction of lapse and mortality is. Our president said, "Let's find out what's happening at the end of level period." It was hard to collect the data for that. We still don't have everybody on this wonderful electronic reporting, so it's hard to pull it all together. But to the extent that we did, we got it, we looked at a study and said, "What's happening out there?" This study was for an embedded value analysis for profitability. What's going on there? What can we expect? We didn't separate the mortality and lapse. That's difficult to do, which is why I can't wait for the SOA study on that. But some of the findings were that 10- and 20-year term decrement behavior was alike. We lost about 80 percent of the business. It went away. With respect to five-year term, fewer policies left, and we think that's because of the smaller premium increases. The wire key business didn't have much relevance to the study at all.

FROM THE FLOOR: There's not much experience out there for 20 or 30 years.

MR. HRISCHENKO: That's right. That's another issue.

FROM THE FLOOR: Until they changed the law, people were just not issuing until about 2000, so you don't have that experience.

MR. HRISCHENKO: That's right, and without that experience, it's difficult to tell what's going on. One thing the study did suggest was, What data do we need for 10 years from now, 20 years from now? What do we want? What do we have to capture? They tell me the A/E ratios were huge on this and the question becomes, What is the effect on profits? This business is pretty profitable. We're seeing the people who do stick around. We're making money on it now, but who is to tell in three, four, five or 10 years? Again, what does this mean with respect to the assumptions for valuing that business? We have a research project now that you have to get under this to get it right. One question is, Why do people stick around when it's not prudent to do so? Why do they pay those high premiums? Again, from a reinsurance perspective, what options do cedants have to recapture this business? We find this to be profitable. Why aren't they seeing this? Why aren't they taking it back if they have the option to do so? This throws out all sorts of wonderful profitability and pricing implications with respect to this business.

Understanding the mortality and persistency interaction is essential to getting your pricing right. We have to understand why people lapse. It's mostly change. What happens? Why are they lapsing? All sorts of things are changing. We know it is difficult to measure. With respect to the current pricing, you can go ahead and guess if you want to. You have to do something, but I wouldn't rely on those tail profits at all. One thing that I'll leave you with is that we should, as actuaries, develop product features that are able to react to this emerging experience that we're seeing.

MR. DALL: Are there any questions now?

MS. MARY H. SIMMONS: On the SOA mortality study, are you picking up cause of death to be able to understand things such as that spike in duration three?

MR. RHODES: In the SOA study there are other fields that we are collecting, one of them being cause of death. We're currently looking into doing a cause-of-death study. One was attempted about seven years ago, but it wasn't followed through on. One of the problems is that not all companies contribute cause-of-death information. We have to be careful in analyzing the data to make sure that they're representative of the total and having enough companies there, so cause-of-death is the study that's being considered. Was there something about the third duration in particular?

MS. SIMMONS: I was just curious. I have one other question. You're planning to try to study the interaction between the lapses and the mortality. Have you thought about how you'll approach understanding that? Can you offer any ideas on how you'll approach that theoretically to try to get your arms around it, or do you plan to try to put graphs side by side and wing it?

MR. RHODES: We're not going to put graphs side by side or wing it. It's just that looking at the graphs side by side suggests there is a relationship there. If you think of mortality in the lapse study, we have essentially the same denominator in terms of exposure—there's a slight technical difference—and it's the numerator of the lapse in mortality that's different. So we would line up, for example, in term policies the same policies and look at the actual experience of those policies and the methodical method is the plan.

MR. HRISCHENKO: With respect to the third-year spike, we see that a lot, and that coincides with the end of the contestable period. No longer can the direct companies contest it. They usually take those out of the mortality studies.

MR. RHODES: I am bound by various confidentiality considerations, but I've heard much the same thing from different people as George just mentioned.

FROM THE FLOOR: For the lapse data, does that include or exclude decrements for conversions? For term policies that have conversion options and need to go to a permanent product or a different product, would they be considered part of those lapses that you've recorded, or would they be a separate decrement that is not included?

MR. RHODES: If I may rephrase it, if there is a policy provision that forces the policy no longer to be in force, that is not considered a lapse.

FROM THE FLOOR: What if it's a policyholder option to leave the policy to go to a different policy?

MR. RHODES: You mean like a conversion?

FROM THE FLOOR: Exactly.

MR. RHODES: We exclude conversions. To the extent that they're coded as conversions, they're excluded.

FROM THE FLOOR: Is this just U.S. experience? Do you have an indicator of where the business is written? There's much more globalization. Maybe the big companies have foreign subs. To what extent is non-U.S. business filtered out, or is it all included? Somebody asked about cause of death. What about AIDS? Do you have any indication of that? But primarily, is it all U.S. business?

MR. RHODES: What the SOA is doing is essentially a study of U.S. business. The Canadian Institute of Actuaries also does a study of Canadian experience.

FROM THE FLOOR: That specific question is asked in the data?

MR. RHODES: Yes, plus we do a feedback. We get data from some Canadian companies. There's a long scrubbing process with each company.

FROM THE FLOOR: The Japanese business of Prudential, for example, just hypothetically, is removed, or the Indian business from New York Life is removed from the data?

MR. RHODES: Correct. Was there a second part?

FROM THE FLOOR: No.

MR. DALE J. MENSIK: We have a sizable data set, as well, and I would just caution everybody that where they're going with these mortality studies, I think, is a great place, but they have a way to go to get there. Those data may not be representative of your pricing, for the obvious reasons, as well as the fact that you have a couple of different underwriting regimens that go through theirs. You go out

in duration. Blood testing came in the late 1980s or mid-1990s, depending on the company, so I would at least be looking at some other data sources as well at this point. Our data set would have some of those relationships—the third-year spike in a lot of instances and some other things—but some of those pictures we saw would be different from what our data show. That's just something to think about.

MR. RHODES: I agree with you. I think as part of the appeal that I'm making, I'm not saying that 20 companies' worth of data is sufficient to study this. I'm not even claiming that the first approximation is the most theoretically correct. But I am saying that to the extent, for example, that your company could contribute data in the upcoming data call, that would be helpful, and other companies as well.

FROM THE FLOOR: Many years ago I used Becker-Kitsos with the re-entrant term at higher ages and came upon the problem of resurrections and mortality greater than one, so I tried a Markov process. Instead of all the persisters having a homogenous mortality rate, I put them into states of totally healthy, one-foot-in the grave, nine toes in the grave, with transition probabilities for getting more or less healthy and, of course, death as an absorbing boundary. Once you're dead, you stay dead. I was able to reproduce selective mortality rates. It was great. Has anybody else done work in this area, or is it a dead end?

MR. DUKES: In that article by Jones I had in one of my slides, he was discussing a process similar to what you're describing. The problem is finding those transition probabilities for moving from one state to another.

FROM THE FLOOR: Oh, yes. Trial and error.

MR. DUKES: I suspect there are other people who are doing mathematical research on this. Yes, I guess you can do trial and error.

FROM THE FLOOR: To reproduce the select and ultimate.

MR. DUKES: Yes, but the problem is you're reproducing select and ultimate that don't necessarily have a bearing on what's being issued today or tell you what will happen when you hit those extreme lapse points and so on. There still is a certain amount of guesswork going on, but that's the concept behind some of the more theoretical models. In Vanderhoof and Tenenbein's paper, I think they wanted to get some more mathematical/biological concepts. As I recall, their notion was Gompertz works pretty well for starting around age 35 and going up to 75 or so. Then I think their notion was, if you do duration one select mortality, that will beat inaudible Gompertz, as well. If you just look at all the duration one data for every age and then you look at duration two, you get this pattern of Gompertz's curves that moves toward the ultimate Gompertz curve. That was the approach they were taking. There are a lot of ideas out there. It sounds like maybe you've come up with the right combination, I don't know, but it's hard to get the actual information necessary to come up with the parameters for those equations.

MR. RHODES: I liked your idea.

MR. DALL: Tom, I have a question on this particular graph that you showed, the 1996-2001 male nonsmoker table relative to the 2001 VBT table. I see this is the 2001 nonsmoker VBT table and the fact that it's already 70 percent of that table. Could you explain why it's 70 percent already, given a similar time period?

MR. RHODES: Basically you're correct that in every study we do, there are three 2001 VBT tables. There's the composite table, which means we don't know whether it was a smoker or nonsmoker. In your older issues, that's what it was. Then, we've also split it out between a nonsmoker and smoker. So, depending on which state the policy was in—whether it was a smoker or nonsmoker policy, or no smoker designation was applied because one didn't exist—we applied the appropriate table in all instances.

The construction of the 2001 VBT was based on 1990-1995 experience, which means the central point was 1992, let's say, and then it was projected forward for nine years. There are two different effects. One is, how good of a job did we do in estimating mortality improvement? We could have done a better job when we put together that table, but its purpose was a conservative valuation table, so that was fine. I would say this reflects the effect of different preferred and standard mortality. I think you're seeing the effect of preferred business, which only underlies the importance of starting to collect and report data on different preferred and standard bases.

MR. DUKES: One other thing that you'll notice if you look at the data is that the average policy size increases dramatically. Today's policies are much larger than policies issued 10 years ago, even for nonsmokers. By much bigger, I mean more than inflation would account for, so I think they're probably being underwritten more rigorously than they were 10 years ago, which might be driving some of that, as well.

Tom, I was a little bit confused by your description of the composite table. It's not just the unknown people who are in there. Isn't it smokers, nonsmokers and unknowns that are reflected in that composite table?

MR. RHODES: In the actual construction of the 2001 VBT table—I was involved in all phases of that—there was limited smoker/nonsmoker experience through the 1990-1995 study. Basically you only had 10 years of duration. The vast majority of the data then were composite data.

MR. DUKES: For durations one to 10, where you did have both smokers and nonsmokers and maybe some unknown, the composite table would reflect the combination.

MR. RHODES: Yes, you are correct that I did use all experience then current to create the composite table. In fact, if you go back and read the documents, that was the VBT based on information from the study for the smoker and nonsmoker. Based on other experience, the nonsmoker VBT and smoker VBT would be created. That's more or less the same sort of model that I would propose to use if we had to come out with our first cut at different preferred classes, to use what existing experience existed then, plus other sources of data and the results of different surveys, as Larry Gorski has been recommending.

FROM THE FLOOR: To try to understand what you both said, does that mean, Tom, that you came up with an ultimate table essentially and that the older experience, you didn't know. In other words, you knew the early durations—as Jeff said, what the nonsmoker/smoker stuff was—but you didn't know at the later durations?

MR. HODGES: Yes, in the 1990-1995 experience, we just had the same thing you referred to earlier. We only had so much nonsmoker and smoker experience.

FROM THE FLOOR: Broken down by smoker and nonsmoker?

MR. RHODES: Yes. At an earlier point in time, smoker differentiation did not exist. At a later period of time, you had different preferred classes, and so the experience there is not that far in durations.

FROM THE FLOOR: Then you combined it all because you came up with an ultimate table, although there is a select table, too.

MR. RHODES: In terms of the ultimate table, there were sketchy data. So basically for the ultimate data for males, I used the MSLI, the World War II insurance, as a basis for that, some data from the Bragg studies and some data from the 1990-1995 tables. The better mortality, more distinct mortality, was for the males. If you look at the data, those predictions have fared better than an educated guess we made for the females.