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Pricing with Mortality Improvements

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Panelists: THOMAS L. BAKOS
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Recorder: RONALD L. KLEIN

Summary: Should mortality improvements be used in pricing of life insurance products as an Actuarial Standard of Practice (ASOP)?

Mr. Ronald L. Klein: This will be a debate format. Arguing for the pro side of pricing with mortality improvements is Rob Foster. He has been a director at CNA Insurance Companies in charge of pricing for about two years. Previously he was with Integon in North Carolina. Rob has been an FSA since 1988. On the con side of this issue is Tom Bakos. Tom has been an FSA since 1972. Coincidentally, Tom started his career at CNA. Tom made his way over to The Guardian and has been involved with individual life pricing and setting assumptions for most of his career.

I'm going to start this debate by taking a survey. Then we'll have two 15-minute opening statements. Of course, we'll start with the pro side. After the opening statements, I'll take another survey because I'm sure someone is going to be persuaded by these statements. Next we'll have a five-minute rebuttal, starting with the con side. Then we'll take some more questions and a final survey.

Mr. Robert W. Foster, Jr: I'm speaking in favor of a position that's been banned. One of the oldest stories that I heard when I first started in the industry was that a life insurance company is like a car. The president is sitting behind the wheel providing guidance on which way to go, marking posts, with his or her feet on the gas pedal; the underwriters have their feet on the brakes; and an actuary is looking out the rear window drawing a map. Part of the question is, what is the actuary

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seeing out that window? What he's been seeing is mortality going down for as long as anybody can remember. We know enough about what's ahead, now that the planes of Omega are down there somewhere, but we're not there yet. We're about where Omega is, so we've got a long way to go in terms of finally deciding where we're going to end up with mortality.

Let's talk about where we've been. In 1900, the life expectancy at birth was 45 years. Infant mortality at that time was 100 deaths per 1,000. Currently, we're at 76 years for life expectancy and 8 deaths per 1,000 for infant death mortality. The Census Bureau, where I got these numbers, says that by 2010 the life expectancy is expected to be 78. It's not all due to that change in infant mortality. In 1980 life expectancy beyond age 40, for example, was 33.6 years and in 1993 it had gone up by 1.3, so we're still getting mortality improvements. We saw that.

There was a presentation by Jack Luff on where experience has been and the preliminary results from the 1993 survey. That graph is going straight downhill. So I don't think there's any real question about the fact that we've had mortality in treatment at the time. I think the real questions we're facing are: (1) Is mortality improvement likely to go on in the future? and (2) Is it appropriate to use that in pricing? Those are the two questions I want to talk about.

When Ronnie first approached me about speaking, I thought this would be easy. What I'll do is break it up by cause of death, see whether or not that's going to go on in the future, and we'll just go from there. Well I did that, and it's not so clear-cut. There isn't a magic bullet that caused all the mortality improvement in the past, but there are hints and suggestions and it gives you some idea as to where things are likely to go. I looked at cause of death. The top five causes of death are: heart disease, cancer, accidents, strokes, and something called chronic obstructive pulmonary disease, emphysema, I think. The top two are the most significant. I've got some age-adjusted death rates. For 100,000 people, heart disease kills 144 people a year; cancer kills 133; accidents are a distant third at 29. Those are the three I'll focus on because it gets less and less significant after that point.

Two-thirds of heart disease deaths are ischemic heart disease. I'll focus on that one. Age-adjusted death rates on that have been declining 2.5–3% a year between 1980 and 94. There have been significant mortality improvements from heart disease, but I can't find anything in the literature that says there's one specific reason for that mortality improvement. What I found is a real focus on prevention. The risk factors associated with heart disease have been identified. Physicians are advising people, and we have lots of public information statements about the advantages of low-fat, high-fiber diets, quitting smoking, and being physically active in leisure time. The simple regimen of an aspirin a day is very significant in terms of impacting overall

heart disease. There was a recent study by the Centers for Disease Control (CDC) on the prevalence of aspirin use among men and women over age 40, and I think this is one of those areas where we may see significant improvement. Aspirin does seem to prevent a significant level of heart disease, yet only 16% of adults around age 40 were taking an aspirin a day as part of a health regimen. The aspirin a day regimen increases to a high of 30% of adults around age 80. I think a simple thing like that can and will impact mortality improvement in the future. Public education and information drives people into healthier lifestyles.

Another thing that's been published and discussed is the fact that moderate use of alcohol can lower the risk of heart disease, and there are studies and statistics to back that up. However, most physicians don't advise people about the advantages of moderate use of alcohol because of the dangers of excessive use of alcohol. I found that an interesting sideline as I was doing my research.

The story on cancer is completely different. I found this great quote, "When many people live long lives, many people die of cancer." If you look at the age-adjusted death rates for cancer, over the last 20 years, especially when you control for the impact of smoking and for AIDS, there's been absolutely no change. Cancer will continue to be a scourge for people trying to live a long time. One thing that's likely to happen is that as other causes of death or the death rate associated with the other causes of death decrease, cancer will not. In 2005, it's predicted that cancer will be the leading cause of death, replacing heart disease.

About half of all accidental deaths are motor vehicle accidents, which adds up to about 42,000 people in 1995. There's significantly good news there. Fatalities from automobile wrecks have declined, both in absolute number and in death rates per 100,000 significantly. The death rates dropped from 24 in 1970 to 16 in 1994, so there has been significant improvement. Seat belts are credited with lowering death rates. Seat belts in 1995 saved 9,800 people. The other safety equipment that's in cars these days is air bags. Seat belts saved 10,000 people; air bags saved about 500. Air bags are not a terribly effective safety device, even though they're being installed in more and more cars. I don't see real improvement coming from air bags. You know that there are fatalities associated with air bags too. Since 1993, air bags have killed about 100 people, 31 of them adults, so that's not a source of mortality improvement. That's a relatively small source of mortality anyway, in terms of death by car.

Forty-one percent of accidental deaths in 1995, or about 17,000 people, were due to drinking. That's another area where I think public education, the concerted efforts of the organizations that are fighting drunk driving, will continue to make an improvement in mortality against the future. Then we get to some of the "gee whiz"

stuff too. There really have been some significant technological and scientific breakthroughs.

I was reading recently about toxic shock syndrome. From when it first appeared, the epidemiology on that was handled within a year from when the first case started appearing, and within a year the research was done. The causes had been identified and the particular issues addressed. Legionnaire's disease unfolded the same way. It was isolated; good science was done; and progress was made. I think there are some interesting things that will be coming. The Human Genome Project has a great deal of potential.

As members of our company came back from a conference at a hospital in Ohio, an underwriter was telling me about the latest theories on heart disease. Perhaps arteriosclerosis, the clogging of the coronary arteries, was triggered by an infection. That's one of the theories that they're working on. If infection caused the plaque build-up inside the walls, then the general prescribing of antibiotics over the last 50 years has been a potential part of why we've been seeing mortality improvement. Perhaps the antibiotics have been fighting those infections and reducing the impact on the coronary vessels. I think there are plenty of opportunities here.

On the first question, while mortality has improved in the past, I think there are lots of opportunities for mortality rates to improve in the future. I think we are going to get there. The second question is, Is it appropriate to use mortality improvement in pricing? I think some of the people anticipated my next question, which is, how many people here do not use mortality improvement in pricing immediate annuities? I think that's it. We would say that it's appropriate to use mortality improvement there because the impact of better mortality is a risk to the company. What we're talking about here is not whether mortality improvement is right or wrong; it's really how conservative should we be in pricing. What sources of conservatism should we be putting into our pricing?

Let's say that we're wrong on lapses. Being a term writer and having listened to the term wars presentation earlier, I think that's a major place where we could be wrong. If we say we're wrong in lapses, why not have some mortality improvement that we predict is going to happen in the future? We'll just use that to offset our problem with lapses. I think that there are a couple of things wrong with that. The problem is big enough to notice, lapses being off. I think if you know that you've got a counteracting effect there, like mortality improvement, that might offset some of it, you tend to ignore the problem before taking action on it. If you do that, you don't know how much more you have in your pricing because you don't know what impact mortality improvement is going to have. If you just let it go, the problem will get worse rather than better, and it'll take more drastic action later to

correct the issue when it finally becomes clear that the gains from mortality improvement are not going to offset this problem. I think that in a lot of ways pricing a less-than-best-estimate basis can lead you to bad decisions.

There are 2 million theories to pricing these days. There's a traditional approach where you plug in all the assumptions and you get a profit margin which is your bogie, and you solve your margin. Once you fit your profit margin, you're done. The other approach is macro pricing. You know what rate you need to charge from the marketplace. All you're trying to do is determine what set of factors you need to use and what position your company needs to be in to successfully write that product. Same situation. I think the same issue applies to both of them: when you're pricing with built-in conservatism, you're not pricing in the best-estimate basis. You don't know what you're really working with, so I would think that the issue there is to provide the best knowledge, and information. What you price for is risk-based capital. You price for a specific contribution to surplus for a specific margin that would support the catastrophes. This will support the epidemics that might spread with the next outbreak of the flu. That is where you get your conservatism from, an explicit loading for either conservatism or for catastrophes or in the target surplus, but you don't try to build it in through, "well, we'll pad this assumption a little bit." But I think where you get your improvements and why you should price with mortality improvement is that it gives you a clearer picture of what's really going to happen in the future.

Mr. Thomas L. Bakos: Projecting mortality improvements is the subject of this debate. Apparently we are not here to argue the subject of projecting mortality in general, but to address specifically whether or not mortality improvements should be used in the pricing of life insurance products.

I've taken the mortality improvements being talked about and the question put to us to be those expected to occur in the future—not the ones we have already experienced. Clearly you'd want to include those. Of course, this means we have to be willing to project mortality improvements and give up on the idea that mortality might get worse. I hope that you realize that the form of the question we have been brought here to debate has required all of us to jump to a conclusion. Well, I posit that anyone can project mortality, even me, and therein lies the danger. You'll see just how dangerous I can be in a few minutes.

If we are going to accept the reflection of mortality improvements in pricing, then we are going to have to be careful about whose projections we use. That's why, I suppose, there are some suggestions of an actuarial standard of practice in the debate question that has been posed. But we'll talk more about that later.

Right now, let's consider the following. You can't price a life insurance product without making some assumptions about what the future mortality will be. You can substitute for the word "assumption" other words with similar meaning—projection comes to mind. In effect, you can't escape the need to make some kind of mortality projection when you price an individual life product.

Let's put this in perspective. We are not dealing here with projecting the positions of the planets on some future date, betting odds for a roulette wheel, or determining the probability that two people in this room have the same birthday. There is no underlying physical law that mortality follows (or at least we don't know what it is yet) that would allow us to predict with scientific accuracy future trends in mortality. We subconsciously recognize that we don't have this ability when we use words like "assumption" and "projection" to describe what it is we're doing. There are other words that could be used to describe this process, and these words better emphasize the unreliability of what we do when we make mortality assumptions.

These words were suggested to me by the Microsoft Word Thesaurus, my primary source for alternative words: " forecast", "prediction", "supposition", "conjecture", "opinion", "hypothesis", "belief", "guess", and "shot in the dark".

Ideally, the mortality used in individual life pricing should reflect the actual mortality we expect to experience. Those of us who price participating life insurance do reflect actual mortality experience retrospectively. We, in effect, re-price a product every year when we set a new dividend scale. Those of us pricing nonparticipating or guaranteed cost forms of life insurance don't have this option. In order to reflect actual mortality, we have to be able to predict the future. Because we can't do that, we ought to be cautious.

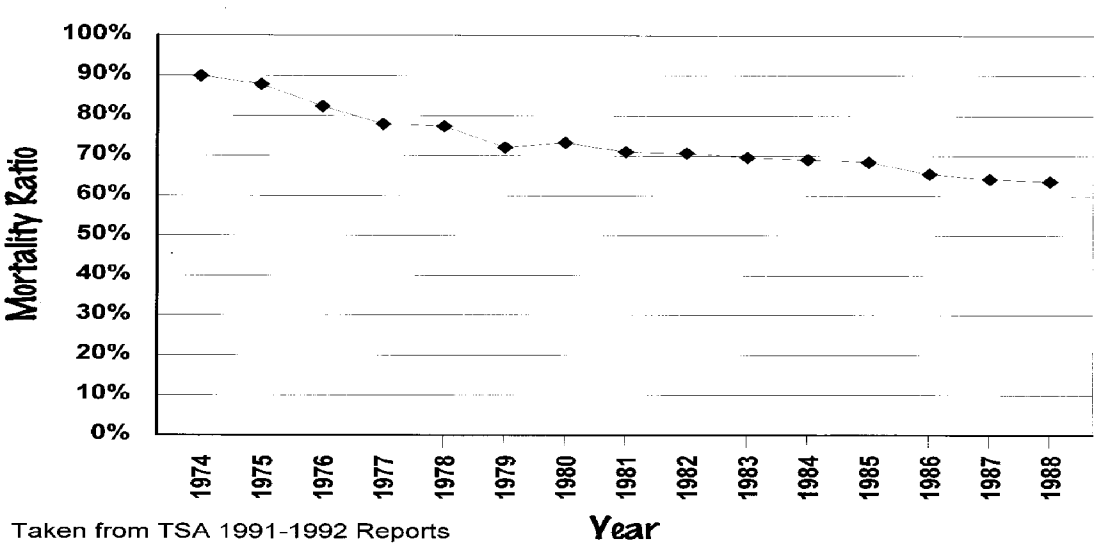
Let's set all that aside as I take a crack at projecting mortality. Typically we use historical data as a base for mortality assumptions. Table 1 is from the *TSA 1991–92 Reports*. Note that it shows mortality ratios for exposure years 1973–88.

In Chart 1, I graphed the combined ratios to the 1965–70 Select Basic Tables from the fifth column in the table. What I found interesting is that these results show almost monotonically improving results. So I took it upon myself to project this mortality improvement into the future by fitting a straight line to the data. The result is shown in Chart 2.

TABLE 1
AGGREGATE MORTALITY RATIOS BASED ON 1965-70 SELECT BASIC TABLES
(NUMBERS IN PARENTHESIS ARE MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLE)

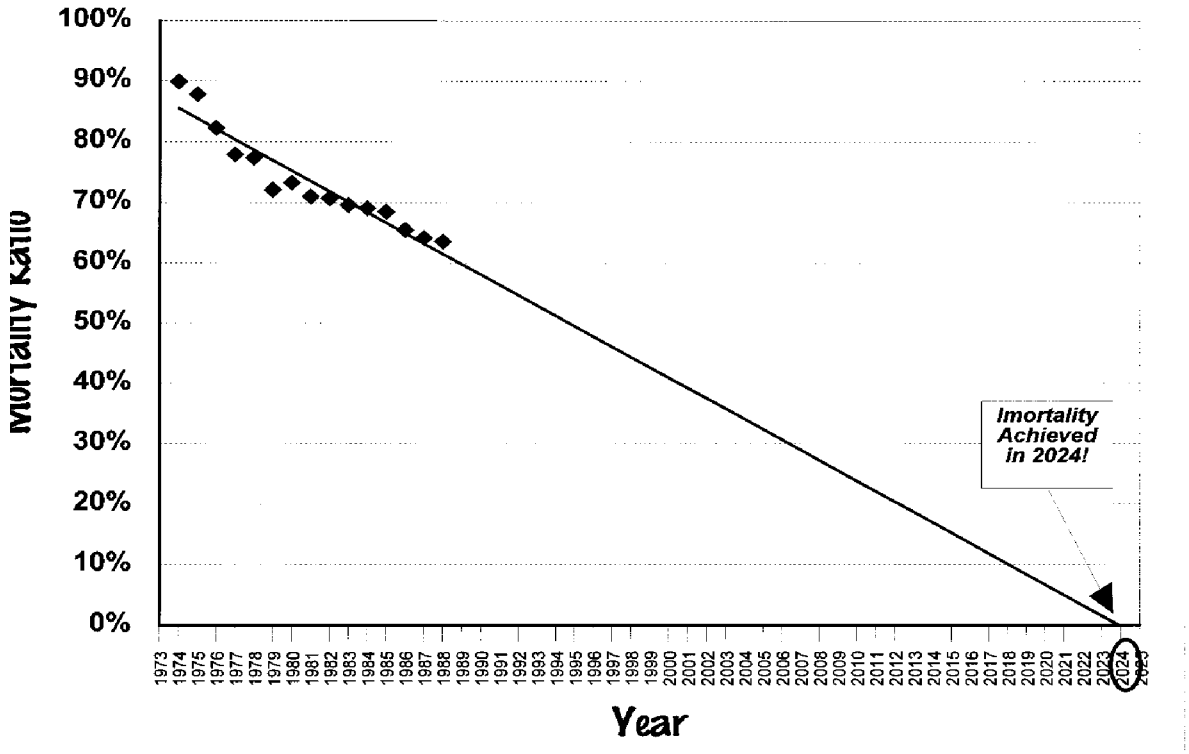
Exposure Year	Policy Years 1-15				Policy Years 16 and Over
	Medical	Paramedical	Nonmedical	Combined	
1973-74	88.0%	84.1%	99.1%	89.9%	93.4%
1974-75	85.1	85.5	94.9	87.8	87.1
1975-76	80.9	81.4	88.5	82.3	85.0
1976-77	75.5	78.0	87.9	77.9	82.0
1977-78	75.0	80.5	85.9	77.4	80.5
1978-79	68.7	74.5	84.9	72.1	77.0
1979-80	69.8	80.3	82.9	73.3	77.1
1980-81	69.5	70.1	79.8	71.0	75.2
1981-82	67.8	73.2	79.2	70.7	72.8
1982-83	68.0	69.9	74.2	69.6	73.2
1983-84	68.6(93.6)	68.8(92.2)	70.8(89.6)	69.1(92.4)	71.2(91.8)
1984-85	66.2(90.5)	69.9(94.3)	72.4(92.5)	68.5(91.9)	71.0(91.1)
1985-86	61.2(83.7)	67.9(91.8)	72.0(92.4)	65.5(88.0)	70.0(89.8)
1986-87	57.8(79.1)	68.0(91.9)	71.5(92.0)	64.2(86.3)	71.0(90.8)
1987-88	61.0(83.5)	64.3(87.2)	67.2(86.5)	63.6(85.6)	67.5(86.3)

CHART 1
MORTALITY RATIOS BASED ON 1965-70 MORTALITY TABLE



Taken from TSA 1991-1992 Reports

CHART 2
PROJECTED MORTALITY RATIOS TO 2024

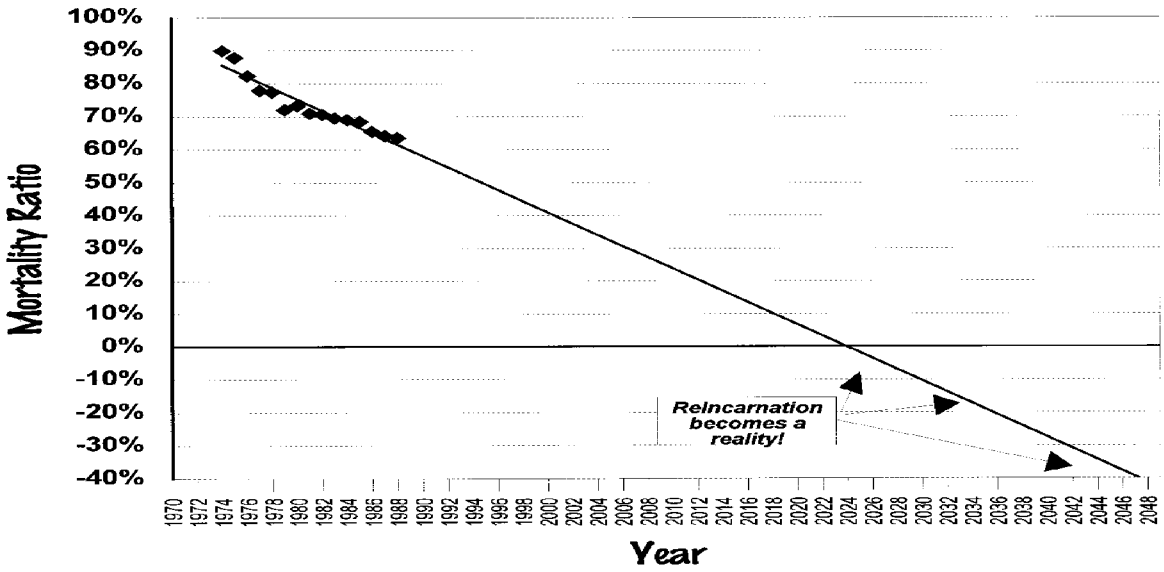


As you can see, at the rate mortality has been improving, the ratio to the 1965–70 Select Basic Table will be zero by the year 2024. This is good news for those of us who can manage to survive for just 27 more years. I should point out that the *1991–92 Reports* analyzes "insured life" mortality. Immortality is only assured for those of us who have had the foresight to be underwritten for and purchase life insurance. This is a fantastic marketing opportunity; however it does have a downside. As an old underwriting friend of mine once said, "When they stop dying, they stop buying." So along with the projected decline in mortality, one should also expect an increase in the lapse rate. My guess is the lapse rate would be close to 100% following 2024.

I went a little further in my projection. Chart 3 shows the obvious extension of Chart 2. Following 2024, reincarnation becomes a reality.

Am I wrong? Did my projected improvement in mortality go too far? I hope that at least some of you think it has. What makes my projection wrong? My worthy opponent might look at this and say, well, it's just utter nonsense. We won't be immortal in the year 2024 and we won't be experiencing reincarnation after that. So I guess he'd be saying that it's the result that makes it wrong.

CHART 3
PROJECTED MORTALITY RATIOS TO 2048



Can anyone here predict the future accurately? That is, can you tell me with certainty what the mortality of the lives you underwrite today will be in the future? Can you illustrate values based on your mortality assumptions with such confidence that you would be willing to guarantee them? If any one of you could do that, I don't imagine you would be sitting here. For one thing, your employer couldn't afford you and you'd already know the outcome of this debate. Maybe my projection is wrong, but the only basic difference between my projection and anybody else's is that mine is just more wrong than theirs. All projections are wrong.

In a text published in 1989 by the Actuarial Education and Research Fund (AERF) titled *Fundamental Concepts of Actuarial Science*, the author, Charles L. Trowbridge, says, "Predictions are often based on 'extrapolations' or the continuance of present trends, but neither can be expected to hold up for very long. The actuary is particularly aware that he has no crystal ball and that any prediction that he might venture will invariably prove to be wrong, in one direction or the other. He can be expected to resist the idea that the assumptions he uses are predictions, though the public often understands them as such."

Life insurance is meant to replace a financial uncertainty (the unknown date of an individual's death and its financial consequences) with the certainty that the proceeds of a life insurance policy will offset those financial consequences. A life insurance policy, in other words, provides financial security by transferring individual risk to the insurance company. With respect to the need to include conservativism and pricing processes, Mr. Trowbridge went on to say, "It is not in

the public interest for a financial security system, whatever its nature, to become insolvent."

That's kind of obvious. But what happens when an insurance company becomes insolvent? Or perhaps nothing so dire need happen. If a policyholder's originally illustrated nonguaranteed values do not hold up because the mortality assumption was not met, who absorbs the risk? The answer is the policyholder.

So what about our actuarial standard of practice? We already have one: *ASOP 24.* It addresses compliance with the NAIC Life Insurance Illustrations Model Regulation. With respect to mortality it states that, "The mortality experience factors should be based on the insurers' recent mortality experience. . . ." The standard expects changes in experience to be reflected promptly once they have been determined to be significant and continuing. Here is how it specifically addresses the reflection of improvements: "Historical experience may exhibit improvements from year to year. Such trends in improvement may not be assumed to continue into the future beyond the effective date of the scale underlying the illustration."

In summary, mortality improvements should not be used in the pricing of insurance products as an ASOP.

Mr. Klein: Now that the opening statements are concluded, I'd like to take a quick survey. Survey results: no changes.

From the Floor: Mr. Foster, haven't our underwriting criteria already taken account of mortality improvement by splitting smoking and preferred classes?

Mr. Foster: That's a very valid point. Most of the data that I've looked at, and the data that most people have looked at from the mortality improvements, are population data. The same thing is true, though, with insurance company data. *Contingencies* magazine recently published the studies from the Bragg Company in an article, I think in the June 1997 issue, that documented what the mortality improvement has been by smokers and nonsmokers. There still is continuing mortality improvement when you write the statistics down into the smoker and nonsmoker categories. So there has been past improvement, not just from quitting smoking.

Mr. Bakos: I think my worthy opponent is making the same point that I would make as well—mortality improvements have occurred. These mortality improvements have been reflected in the current mortality experience. The question is, Should we prognosticate, project, or assume that there will be

additional mortality improvements in the future? I think that's the question that was brought to us. Because there are fewer smokers in the population and general levels of mortality have improved, splitting a single underwriting class into a smoker class and a nonsmoker class and using different mortality for each class does reflect the improvements in mortality that have occurred to date.

Mr. J. H. Vernon Watts: When we speak of mortality improvements, do we attempt to differentiate between what might be a general or gradual 1% or 2% a year improvement versus a sudden type of improvement that is the result of a scientific or technological advance? Possible examples might be if there is suddenly a new type of seat belt, which hasn't happened yet, but is speculated from a technological or scientific point of view to save tens of thousands of lives. Or there's a new three-drug AIDS cocktail that eliminates the virus totally from the human body, which is suddenly confirmed by the Food and Drug Administration (FDA). Or if we're in a niche market and maybe in a more primitive society where one-third of newborn infants die before their first year and suddenly there's a cure for this. If we're not allowed to make mortality improvement assumptions based on the introduction of one of these advances in order to price a product where mortality appears to be affected by one of these sudden technological advances, are we not overcharging future customers at this time?

Mr. Klein: If I understand you correctly, Vernon, you're talking about a shift in the curve, as opposed to just gradually decreasing, as Tom showed on his chart? I'll pose that to Tom first because it seems to go more on the pro side than the con side.

Mr. Bakos: I think you are saying that treating AIDS will reduce deaths caused by AIDS or that wearing a seat belt may reduce deaths caused by auto accidents. You are talking about those things as mortality improvements. But what are you improving from? Fifty years ago people didn't die in auto accidents or, at least, not in as great a number as they do now. So you have seat belts to prevent or to at least make a dent in a new form of death. We have drugs now to treat a disease, they represents a new form of death. So how can you argue that these are mortality improvements? They're probably barely keeping even with the worsening mortality caused by the events they're directly addressing. So we're only looking at one side. We're always talking about mortality improvement.

At an earlier session, James C. Hickman talked about actuarial models. Something he said caused me to think about projections differently than I had thought about them before. He referred to modeling closed systems and modeling open systems. I think mortality is an open system, whereas planetary motion can be viewed as more of a closed system. You can make fairly accurate predictions about planetary motion, but you can't for mortality, because there are a lot of things affecting

mortality. As you brought out in your question, there are just as many things or perhaps even more, affecting mortality negatively than there are positively. I think we have to keep that in mind.

Mr. Watts: I would suggest that the situations that I have enumerated are among the major causes of death.

Mr. Klein: Vernon talks about mortality that is already occurring, and we're just having improvements in the mortality that's already occurring rather than saying there's going to be some new disease and then some new cure to that new disease.

Mr. Bakos: I'll just make a brief comment on that. I point out that we're talking about insured life mortality, so I would question whether or not, for example, AIDS is included. I don't think AIDS was a big contributor to insured life mortality, either 10 or 15 years ago or now.

Mr. Foster: Well, I guess there's a number of points to make there. I believe that you're absolutely right. First, AIDS has not really affected mortality in the insurance population. It has in the ultimate periods and that does show up in some of our company statistics, but certainly not as an issue for new policies. Most companies still are not writing people who are positive for HIV. But I think that you raise a valid point; it's a perfect example of what you see out the rear-view window not matching at all what's coming up in the road ahead.

Another example to go with what you're saying is kidney transplants. We're using mortality now from kidney transplants, which have emerged over the last 15 years. They've been doing kidney transplants since 1964, but in the last 5 years there have been some radical improvements in immunosuppressant drugs. The mortality rate is significantly changing among people who have had kidney transplants. So how should we approach one of those people now? It is a very different picture than this picture we have statistics on. So there I think you have to turn to other sources, like the medical community, and find out what those people say about rejected mortality of people who have been under this regimen. We have some limited information that says it's much different than what we saw in the past. In that case we're down to making our best estimate.

Mr. Larry H. Rubin: Sometimes that improvement has an opposite impact on what you would intuitively think. For example, the advent of air bags had the opposite impact of what a lot of people thought, mainly because a lot of people felt safer driving faster because they had the air bag, and, actually, in some instances it raised mortality. So a significant safety improvement to cars may have a perverse effect in

causing people to feel safer and therefore have an adverse impact on mortality, so just the intuition and the impression are not the way to price.

Mr. Acheampong Boamah: Assuming in a population the mortality was generally declining, would you not want to reflect that in your projection?

Mr. Klein: Yes, I think it's just that the basic question, you see the general decline, why wouldn't you throw that into your pricing? Tom?

Mr. Bakos: Well, I guess you could say that there's not enough information there for me to answer the question because I'd want to know why the mortality was declining. I assume we're still talking about pricing individual life insurance. It would also depend upon what kind of individual life insurance policy I was pricing. If I'm pricing a participating life insurance policy, I wouldn't be too concerned about it, because I know that I would be reflecting whatever improvement in mortality was actually realized in the dividend of that policy, and therefore, the policyholder would be treated fairly. If I were pricing, as I said in my opening remarks, a nonparticipating or guaranteed issue-type product, I think I would want to be a little cautious about the extent to which I reflected any mortality improvement. So it's a difficult question to answer. Being a naturally conservative individual and having just heard the luncheon presentation regarding Confederation Life, I think I wouldn't reflect that improvement.

Mr. Foster: He's right; I think you see a general trend and why that trend is occurring. And if you can project what will happen in the future, then you should be taking advantage of this in your pricing, using the best estimates and best information you have available to you. I think pricing on a conservative basis like that is fine if you're a mutual company and you can say, "I can simply increase my dividends later and treat my policyholders fairly that way."

Mr. Daniel Theodore: I was going to back up a couple of points. The question raised by Vernon seemed to be outside of this because it was talking about a new discovery that has already occurred and affects mortality, so that seems like that would be reflecting mortality to the current date, showing any improvement to the present date. So my question is, maybe to Vernon, was he intending to anticipate future discoveries that were going to change AIDS mortality?

Mr. Watts: Yes, my whole question was based on anticipation. The situation may be the new kind of seat belt, if it were invented and it's called the technology of science or otherwise, or in conjunction with the extreme hike in the price of gasoline that the number of traffic deaths could be expected to decline dramatically. But nothing to this day in that way of improvement has occurred.

Mr. Klein: Dan, I think what Vernon's saying is, he's not anticipating that things will occur. What he's saying is, we read in the paper that there was this new medical breakthrough for something that was causing death, so we know that this breakthrough has occurred; it just hasn't been reflected in the general population yet because the drug has not yet been available, but the FDA just approved it. Do you have a comment?

Mr. Theodore: Well, I read in the *Times* a few weeks ago that staph infection has been found to be resistant to all forms of antibiotic. Should I be reflecting that as a counterimprovement in the future, because I know there's a potential for large increases in the number of deaths from staff infection?

Mr. Klein: I'm going to give Vernon one last shot at it, and then we'll let the experts speak.

Mr. Watts: I likewise would have no objection to taking into account the possibility of adverse mortality, if that's occurring, that we're not reflecting in past experience. The same reason that in all cases what we're after is to properly price products issued today to reflect mortality risk likely to be experienced in the future, be it better or worse. I would not object to someone taking into account the possibility of stating the facts in the net offset if mortality is expected to be worse now than in the future because of the new bacteria that's expected to be the main killer in the future, which hasn't, as of today, killed anyone.

Mr. Bakos: I think this gets to the point that I made earlier that mortality is an open system. When the question is phrased—"If you knew mortality was going to improve in the future, would you use that mortality in your pricing?"—you are assuming a closed system. If I absolutely knew mortality was going to improve, then I would assume improvement in my pricing. But I can't absolutely know that, nor can anyone else. My worthy opponent refers to the use of best-estimate assumptions. Well, these are subjective decisions, and considerations, and his best estimate might be different than mine. Let me ask my worthy opponent the following: does CNA offer any product in which it absolutely guarantees mortality?

Mr. Foster: Your question is, do I absolutely guarantee the rate that I charge?

Mr. Bakos: Yes, you hopefully guarantee some mortality.

Mr. Foster: The only guarantee in mortality is one each. Wait a minute, that's wrong. I saw your chart to 2024. All bets are off. Well, the short answer to your question is, yes, CNA does offer a guaranteed cost contract, but that's not really the question here. I think the question is, what is pricing supposed to do? And I still

think pricing is your best estimate. I don't have any objection to loading it for conservatism, but I would rather see it be an explicit margin for conservatism so that we know what margin we've added. So that if we're trying to make a decision on how this product should be priced or what the likely profit impact is to the company, we know what we're dealing with, rather than some kind of implicit, well, we'll just know we've got something, probably a likely mortality improvement in the future, so we won't need to load any more margins for conservatism into it.

Mr. Kevin A. Seglem: I'm wondering if perhaps mortality improvements might lead to a declining insured mortality. Take your chart that goes to 0 in 2024. As that time approaches, perhaps genetic testing is available for insured policyholders to know whether or not they're going to be among those who die, and then the anti-selection comes in from the ones who aren't going to die leaving, and the ones that are going to die staying with them.

Mr. Bakos: Well, that could certainly happen, but we're getting into an area unrelated to projecting mortality improvements in the general population. You are talking about having some tool available that you can use to predict with a greater degree of accuracy an individual's likelihood of surviving. I think that if genetic testing ever progresses to the point that it is, in fact, widely used and if, in fact, it could be used to determine when a specific individual will die, then there won't be a need for life insurance. Life insurance will change. As I said, I think life insurance is provided by insurance companies to replace an uncertain financial risk with a certain financial benefit. If you take away the uncertainty from death, then you destroy one of the basic aspects of life insurance.

Mr. Foster: Genetic advances and all those things aside, I think there will still be a need to replace the uncertainty associated with early death with some guarantee of life insurance coverage, of financial replacement for the lost value of insured. So I don't think that we're going to be in the situation where everyone will lapse in 2024.

Mr. Klein: I think your question was, as your normal mortality spiral goes in one direction, this is going in the opposite direction. As that line continues down in Tom's chart, at some point, the good lives jump off and the bad lives continue on. If you project too much mortality improvement, that line is going to flatten out somewhat; by definition, it's going to have to flatten out somewhere. In other words, at some point you have to agree somewhat with Tom that you can't experience more mortality improvements because just by the nature of the product people would be jumping out, the worst lives continue, and mortality will have to level off somewhere. Is that pretty close to your question?

Mr. Bakos: I'm sorry I missed that point. Because we are talking about insured life mortality, we're not talking about mortality in the general population. So, I suppose you could use the argument of my old underwriting friend: when they stop dying, they stop buying. If you know you're not going to die, you'll have less of a need for life insurance. At least you'll think you will. And, if you know something adverse about your mortality that the insurance company may not know, then you'll buy insurance. So perhaps there's an indication there that insured life mortality will not necessarily improve as medical technology improves.

Mr. Foster: Sounds really "pie in the sky" to me. It sounds to me like you're talking about mortality improvement having gotten to the point where people say, I'm going to live 130 years, why should I buy insurance? I think that is so far into the future that it doesn't seem like a real concern to me.

Mr. Klein: The question was that we're talking about already insured lives, we're not talking about future insured lives, because we are projecting the mortality improvements, as Tom showed on the graph. That's the question. Do you close your block of business? I think that's where the question comes from. Still the same comments?

Mr. Foster: For some reason, there's a lapse spike and all the healthy people leave because of the lapse spike. That would fit my definition of a catastrophe, I think.

Again, you don't try to price for catastrophe. For level term, you do price for a spike at the end of the level-term period and that's reasonable, and you price for deteriorated mortality after the level period. But those are known and predictable. You have an unknown lapse spike that takes the mostly healthy people out of your population. That's not something that's reasonable. I would say that falls within catastrophe and you deal with catastrophes, with strong surplus and target surplus.

Mr. A. David Pelletier: I have two points. First, I think perhaps the question is somewhat unfair. I know we're going to be asked shortly to vote again; I started off in favor of pricing for mortality improvements. I think now I've turned into an "it depends."

Second, regarding the points that Tom made on participating and adjustable-premium product, I think it's somewhat unfair when pricing has incorporated mortality improvements, where mortality, in fact, stays level. And if a policyholder as a result is later faced with declining dividends or increased cost of insurance, I think that's hardly fair to expect the policyholder to understand that we were already anticipating future improvements in mortality. Given that, that would lead me to an "it depends" answer because certainly I think on guaranteed contracts, as

we're more accustomed to in Canada, I think Rob's point is well taken that you should be deciding what your best estimate is.

Tom, a little while ago you asked someone, are you certain that mortality will improve? And I could turn around and ask you, are you certain that the fixed mortality table you're using is going to be valid in the future? You are not certain that you will meet your mortality experience. I'm not certain I will meet mine. But I think our best guess would show some improvement in the future. There's nothing more magical about a fixed hypothesis based on some data in the past than there is about a slight improvement that is evidenced by recent improvement.

Mr. Bakos: Well, let me answer that with a question to you. For how many years do you think it would be appropriate to assume some improvement in the future?

Mr. Foster: That's a good question. As a practical matter, I would not extend it on a linear basis out to 2024.

Mr. Bakos: Well, I hope you realize that I wouldn't either; otherwise we'd have a term product that would beat yours.

Mr. Foster: Dave, I think you're exactly right. I think that has been part of the American situation, at the very least, in terms of illustrations that have taken place over the last 10 to 15 years. When universal life products first came out in 1981, our interest rate was 14.22%; now interest rates aren't 14% anymore.

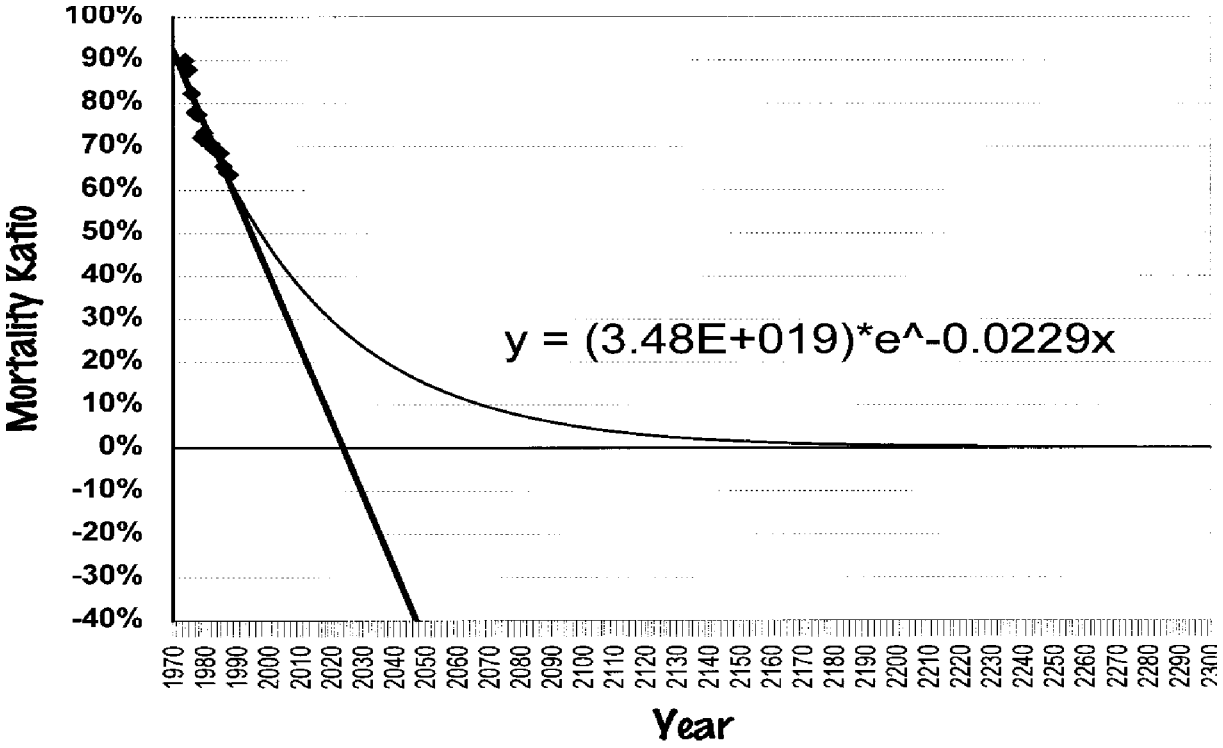
There have been significant issues with customer dissatisfaction with products that haven't performed as originally illustrated. I think that's within the driving force behind the new regulations in the U.S., that the illustration actuary must certify that this product meets the standard of a discipline current scale, which does not include mortality. I think that's a reasonable position. I'm in favor of the illustration rules in that regard. I think it does try to present to consumers a situation where they at least have some reason to believe that there's not embedded in the contract something that they may not realize is there.

Interest rates will still fluctuate, and there's not much you can do about that. I'm separating pricing and illustrated basis because pricing is done at the company level, and it's the internal reports to company management that I think would reflect that. I still think that on a regulatory basis you have to certify the scales in the U.S. by testing them without the mortality figured into the business.

Mr. Klein: We're going to go into our rebuttal arguments, which will also be the closing arguments before some more questions and a final survey. We will have our five-minute rebuttals and Tom will start off.

Mr. Bakos: I have a preliminary remark before my rebuttal. I want to redeem myself a bit. In case you're unwilling to believe that mortality will fall to zero by 2024, Chart 4 is a different kind of projection using all the tools available to me through Lotus and Excel. You can see that, although it may take longer immortality is still in our future.

CHART 4
PROJECTED MORTALITY RATIOS TO 2300



Let me address just a couple of points. I think to some extent Mr. Foster and I are saying the same thing, it's just a question of degree. I don't disagree that we should be using a best estimate when we're choosing a mortality assumption. I just have a different opinion about what that best estimate should be. That's where we have the difference. I think we need to recognize, however, that perhaps we're not choosing a mortality assumption, which is a best estimate, because we want to be perfect, and get the right number. We're talking about projecting mortality improvement, as opposed to just plain old projecting mortality, because we want to make the product illustrate better. That's probably the primary motivation for projecting mortality improvements. This best-estimate argument is a rationalization to give it some kind of legitimacy. At one point, in answering one of the questions,

Mr. Foster referred to catastrophe and said he doesn't price for catastrophe. Well, you can either price for catastrophe or ignore it, but he didn't really say he ignored it either. He said the costs of a catastrophic event come out of surplus. Well, where does surplus come from? It just doesn't magically appear, except in some companies.

If you get it the old-fashioned way, it comes from the profit-and-risk charge you build into your product. The more aggressive your mortality assumption is, the bigger risk charge you should build in. One way or another, you're recognizing and pricing for mortality that is perhaps a little closer to the current experience level than otherwise. If you were to actually use a mortality assumption of zero in 2024, I would suggest you have a large risk charge built into the pricing. When you look at it all together, you'll find that you are probably using mortality that was close to current experience levels of mortality.

Here's my final point. A question was raised earlier by my worthy opponent in regard to pricing for or making mortality assumptions for an annuity. The question was, is there anybody here who doesn't reflect mortality improvements when pricing an annuity? The answer was, essentially, everybody does who prices annuities because it is conservative to do that. I would suggest that you cannot argue that because you use mortality improvements in pricing annuities that it's also all right to use mortality improvements when you're pricing life insurance, because while that may be a conservative assumption for pricing annuities, it's not conservative for life insurance. If you want to do the same thing when you're pricing life insurance that you do when you're pricing annuities (that is, be conservative), you would not use mortality improvements when you're pricing life insurance.

Mr. Foster: Well, Tom kind of missed the whole point of the immediate annuity question. The point is not whether it's conservative to use mortality improvements in pricing. The point with immediate annuities was that it's there because to do so would not be conservative. It would be overly aggressive to price the immediate annuity. I think that would be the first point; when you're trying to do pricing, you're trying to do best estimate. When you're looking at mortality, best-estimate mortality has to be improvement. There are specific situations where you get nonimprovement points. You talked about how a large lapse spike can cause significant deteriorations in mortality. If you don't do underwriting on your products and your issues, you can get significant deterioration in your mortality. I liked Chart 1. I wanted to point out that there's a straight line that ends up with resurrection.

One of my favorite stories from high school was *Zeno's Paradox,* the arrow flies halfway to the target and then it flies halfway again and again, but never reaches the target, which is somewhat contradictory to common sense. Clearly mortality is never going to get to the point where it's zero. There are accidental deaths. I don't think that there will be improvements in cancer unless there's a radical event that we have not taken into account in pricing. There will still be accidental death, no matter how many air bags they put in a car. So, yes, I think that the issue is fairly clear. What is your approach to pricing? What are you trying to accomplish in pricing?

We've talked a bit about surplus. Surplus comes from profit. Profit is the result of the pricing process. You can't be a functioning insurance company without surplus and continuing to contribute to surplus. I think that's essential. But in terms of the pricing exercise, that's not what you're trying to accomplish. The pricing exercise is a best-estimate exercise.

Mr. Klein: Let's go over to the survey and then get a couple more questions. Has anybody changed his or her mind at all? Final survey: pro 46, con 46, undecided 8.

Mr. Greg McCormack: Just looking at this, as a worst-case scenario, there are two actions. Either we can price for mortality improvement or not, and the outcome is in the future—either mortality improvement is achieved, or it's not. Let's look at the worse-case scenario for both actions. If we price for it and mortality improvement is not achieved, the insurers face a lot more mortality than they thought. That's going to be a drain on surplus, possibly threatening solvency and issues like that. If it's a guaranteed product, the insurer can't go back and say, we're going to jump your mortality rates by 5% in the premium. However, if you don't price for it and mortality improvement actually is achieved, your healthy policyholders are going to go to newer products that are now priced with that improvement and you're going to have some selective lapsation in mortality deterioration, but it's not a sudden effect. It happens over time, and company management does have the ability to reduce the mortality charged in the in-force policies. Perhaps not likely, but it could happen.

Mr. Klein: I have to answer that one because there's one in the middle. The one in the middle is, if a lot of your competitors are pricing with improvements, your solvency might be threatened because you're not selling any products. Those who are pricing with them sell all the products.

Mr. Foster: Mutual Benefit didn't go down because of mortality problems. Executive Life didn't go down because of mortality problems. Confederation Life didn't go down because of mortality problems. Look at the history of insolvency.

I'm sure there was one with a mortality problem. It's not pricing with mortality improvements that's going to cause insolvency. It's the other things that can happen to a company in the investments or missing the pricing assumptions on future mortality that's going to make the difference. Projected mortality would not.

Mr. Mark E. Kinzer: Tom's comment in his closing argument drew some parallels in my mind. You talked about charging a risk charge; that is, if you're more aggressive in your mortality assumptions as a projection scale implies, then it requires a risk charge to offset those more aggressive assumptions. Is it not comparable to investment yields, which assume the purchase of triple B corporate bonds versus the purchase of Treasury bonds? Or a corresponding asset charge, which is used to offset the higher risk implicit in that? It just seems like a parallel.

Mr. Bakos: That was the parallel I meant to make. When you're working for a mutual life insurance company as I am now, you try to avoid the use of the word "profit." It doesn't seem right, so I call it a profit-and-risk charge, but I think that's actually what it is. It is a profit-and-risk charge and I think we need to think of it in those terms or maybe just a risk charge. Yes, I think there is some parallel. The riskier the business you sell, the higher the risk charge should be. Similarly, if you're investing in triple Ds or bonds about to default, you should have a fairly high risk charge built in.

Mr. Foster: I agree wholeheartedly. That's a fundamental tenet, that if you're taking on risk, you ought to be charging a price that's appropriate for that risk.

Mr. David L. Metzler: First, an answer to the question, when you ask how many years do you project improvements, I guess my answer would have been at least one year; that's not to imply there aren't certainly unreasonable approaches that anybody could take. But the distinction I wanted to make was between whether or not you expect mortality to improve in the future, in which case we all have assumptions. And if you look at the past, or whatever your reasons are and you don't expect that, certainly it would be wrong to project it in the future.

My question is, more mechanically, if you do expect that, say, your salary was tied to how closely you come to expectations and you truly expect mortality to be 15% lower in the future, are you philosophically opposed to the concept of pricing with that improvement? Not to say you would necessarily want to put in all 15%, but is it wrong, in that case, to put in, say, 5%. I would contend that leaves you your margin for conservativism, but I think philosophically there is nothing wrong with that approach, to start with your best guess, whether you load that assumption, whether you load it somewhere else, or whether you do sensitivities. But I guess if your best guess in the future is that it's going to be lower, that's not unreasonable

anymore than any other assumption that you start with. Make your best guess. Also, if it were doing the opposite and increasing, well, you shouldn't project that, or would you just arbitrarily say, we're going to be conservative, we will project increases, but not decreases. Then my question to you is, why don't you project increases now?

Mr. Bakos: Well, we don't have time for a complete answer. Let's see, I would answer yes, yes, no, no, yes. I think it's a question of degree and the extent to which you believe that mortality will improve or has improved that should determine your willingness to include that improvement in some future pricing. It's always hard to answer a question like yours, in general. I would have to say, if I believed to the extent that I was almost absolutely certain that mortality would be better in the future by 5%, then I would probably be willing to use that mortality in the assumptions I was using. But I can't imagine a situation where I would be able to say that I was absolutely certain that mortality would improve by some percentage in the future. I don't know how anybody can do that.

Mr. Foster: You're right, you can't be absolutely certain that mortality will improve in the future. You can't be absolutely certain that mortality will stay static in the future. You can't be absolutely certain of much of anything these days, certainly when it comes to mortality. So, yes, you have to look at where we've been and trend it forward. I think that's the only potential answer, to look at what's been happening in the past. Is there reason to believe it will continue to happen in the future? And if it will, then that's the best guess you can make and stick with that.