

# RECORD Volume 30, No. 3\*

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Annual Meeting and Exhibit

New York, NY

October 24-27, 2004

## Session 25 PD

### Factors Affecting Retirement Mortality and Their Impact on Pension Plans and Products

**Track:** Retirement Systems Practice Area, Product Development

**Moderator:** Robert L. Brown

**Panelists:** Robert L. Brown  
Victor Modugno

*Summary: This session discusses two recent SOA research initiatives called FARM I and FARM II. FARM stands for Factors Affecting Retirement Mortality.*

**MR. ROBERT L. BROWN:** I'm part of the research process behind Factors Affecting Retirement Mortality, which has taken on this wonderful acronym, FARM. We'll talk today about Phase I and Phase II of FARM. All of this material is available in detail on the Society of Actuaries' Web site at: [www.soa.org/ccm/content/research-publications/research-projects/top-research-/](http://www.soa.org/ccm/content/research-publications/research-projects/top-research-/)

The genesis for this work started with the RP-2000 Mortality Tables Report, which sparked a debate on the use of color of collar and income in setting pension mortality assumptions. The Society of Actuaries, through its Committee on Social Security and the Committee on Retirement Systems and also the Committee on Life Insurance Research, decided that we should determine what factors do, in fact, affect retirement mortality. The goals of the research were threefold: first, to identify the factors affecting retirement mortality and to study the impact of these factors on mortality; second, to determine how best to measure the effect of a factor on mortality; and third, to study the correlation between factors. There are two areas in which we hoped that this information would be used. One would be in

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the pricing of retirement income annuities, and the other would be in the valuation of pension benefits and other retiree benefits evaluated by actuaries.

It was recognized very early that there existed a large amount of literature regarding the research topic, and Phase I was actually a literature review. That was my direct involvement. The actual work was done by Joanne McDaid, an actuarial student from the United Kingdom, who had just finished her degree and had been given a scholarship to go work and study wherever she decided. Part of the evidence of her wisdom is that she decided to go to the University of Waterloo. She read 46 different papers and summarized the findings under the heading of "Factors Affecting Retirement Mortality." This was called Phase I, and I will be describing Phase I.

Phase II, which became known as FARM II, was handled by our second panelist, Victor Modugno. He looked at six Society of Actuaries' experience committees and their work. The 12 factors that Joanne and I found did, in fact, seem to affect retirement mortality. He had five objectives in his work. The issues that he considered were as follows: (1) The appropriateness of the factors as a basis for assessing the cost of the financial risk of mortality experience. (2) Methods for reflecting the factors in future mortality studies. (3) Difficulty in obtaining data for certain factors. (4) The correlation between the factors and the practical methods for reflecting the effects of the correlated factors in future studies. (5) Are there other factors, in addition to those listed, which may be important?

I want to start by giving you a summary of what Joanne McDaid and I found when we reviewed the 46 papers that were identified as having information with respect to factors affecting retirement mortality. First, we were motivated by some of the issues that were in a magazine that arrived at many of the doors in the hotel this morning. The baby boom is getting close to retirement, and at the moment, in the United States in particular, there's very little risk classification in the annuity market, except for structured settlements, for which you have to be seriously impaired. The industry basically assumes that voluntary annuitants—those who self-select to buy annuities—are healthy.

There are two reasons why we, the actuarial profession, may want to sharpen our pencils. First, if Social Security is privatized, which may depend on the outcome of the upcoming election, there will be more workers who are not as healthy as today's annuitants who will be looking for "fair market value" annuities. Therefore, we think we should be introducing more variables into risk classification for annuity pricing. Second, even without needs of Social Security, we'll have the massive baby boom retiring. We'll have a broad range of characteristics and demographic variables within the baby boom, and they also will be seeking financial security through the annuity market. That's on the pricing side. There are also issues on the valuation side. We tend to use one table—or have, historically—to evaluate pension

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liabilities, but we think we can also sharpen our pencils there because of the work that has been done in FARM I and FARM II.

We found that 12 risk factors were reported on in the literature, and we'll report on them in alphabetical order. The first one is age, then gender, race and ethnicity, education, income, marital status, occupation, religion, health behaviors, smoking, alcohol and obesity.

We'll start with age. Now clearly this is a factor that we use today, but when we look at age, there are still some interesting issues related to the use of age as a risk classification variable. In particular, the  $q_x$  values seem to level out at very advanced ages, when we have the strongest of the species still remaining. So the Gompertzian Assumption may not, in fact, fit after about age 95. But  $q_x$  by age is influenced by other factors, such as gender, race—we actually see crossovers in mortality at the very advanced ages—and socioeconomic status, although here I can report that the impact of socioeconomic status decreases with age. Obesity influences  $q_x$ , and again, the impact decreases at very advanced ages.

One good note that I want to report on in the review of the literature is that it would appear that while we have increased life expectancy, we have not increased the number of years of disabled life expectancy, so that active life expectancy has moved up with life expectancy. There still will be a lot more people going through some years of disablement, but the length of disablement has not increased with enhanced life expectancy. You will also notice in the list of the 12 factors that I'll review that socioeconomic status was not a variable in and of itself. We'll look at income, occupation and education, but socioeconomic status was not a variable that we studied.

Second in alphabetical order is alcohol use. Some researchers find that abstinence is good, while others say that moderate consumption reduces mortality. Heavy drinking is clearly harmful. This is a variable like almost every one of them—there are other variables that are interconnected. Depending on your socioeconomic status, you may, in fact, have a couple of drinks on a regular basis. What is it then that makes mortality look good? Is it having a couple drinks, or is it being in high socioeconomic status? You can do multi-variant analysis and back these cross-effects out, and it would appear from the literature that moderate consumption of alcohol is, in fact, good for your health. There's also a correlation between alcohol consumption and cigarette smoking, and this is harmful. If you have that correlation, you'll see an increase in mortality.

The third variable was education. This, the papers tell us, is one of the most important predictors of successful aging. It's still important, even after you adjust for other risk variables, such as income, that will be correlated with education, although there is not unanimity in the literature. (There's hardly any statement in here on which all 46 papers agreed totally. These are conclusions based on the

majority of papers agreeing.) One of the nice things about education is that you should be able to assess it if you want to use it for risk classification. The ratio of mortality from best to worst in education classes is more than 2-to-1. I was struck by this. I can remember, if you go back not all that far, that we did not classify for life insurance between smokers and non-smokers. Then we started to get data from some famous studies that were done in the 1970s and early 1980s, in which smoker/non-smoker mortality ratios were 2-to-1. The industry said, "We can't ignore this." Well, you have variables in the annuity marketplace for which the ratio of  $q_x$ s is 2-to-1, and that can be measured and verified—in fact, probably measured and verified better than smoking. At the moment, we tend not to use these variables in our pricing and valuation.

The impact of education differs for males and females. You'll find this in a number of areas. It is, in fact, highly correlated with income for males, so that having more education means they have more income, and that is what drives the mortality. But for females there is a separate protective effect, and we'll try to tell you why. I was fascinated by how many of the reasons that are given for lower mortality are "softer" reasons, and you'll understand that word as we move along. Education affects income, but it also affects information gathering, health behavior and the use of health services, and this is where men and women differ. Women will read more information about good health, and they'll react to it. They'll go to a doctor sooner and get earlier health services. Men tend to tread water in that famous river called "denial." Less educated people are more likely to smoke. Less educated people are more likely to be overweight. Less educated people are less likely to be physically active. We now have a situation in which, while life expectancy is improving for everyone, it's improving faster for the highly educated, so these differences are actually widening.

We do use gender as a risk classification variable where it is allowed by law. We certainly use it in the individual annuity marketplace. There's some growing evidence that the mortality gap, the life expectancy gap, is actually narrowing, and this seems to be because of smoking habits, unfortunately. I guess it depends on whether you're male or female, but the smoking habits have also become more common, so almost as many women smoke. In fact, in some areas now, more women than men smoke, and it seems to be the reason that the mortality gap is narrowing—although again, we do not have unanimity in the literature.

The education disparity is wider for men than women, and occupation has a greater impact on males than on females. We'll say more about this when we get to occupation. Also, as I pointed out, women use health services more and sooner than men. Marriage is more protective for males than for females. We'll see that females are more social animals naturally than males and that this is very important in mortality. Having social connections is very important for your life expectancy, and females tend to be better at this than males. Marriage brings a male into a circle with a female, and then the female has a group of friends, and

the male gets the benefits. As I pointed out, this is one of these soft connections, that females have better social interaction skills than do males, and this is important when it comes to mortality.

Health behaviors capture things such as cigarette smoking and alcohol abuse. There's a strong correlation here to socioeconomic status, but we did not do socioeconomic status as a variable. Also included in health behaviors is how often and how early you seek medical services. This is one of the differences between males and females. Obesity is negative and, by the way, is also strongly correlated with smoking and sedentary lifestyle. One study, I would point out, said that smoking and drinking are not separately important if you adjust for socioeconomic status. Here's another place in which marriage comes in—married people tend to behave better. They don't do as many reckless things. They don't drink as much. They don't drive while drunk as much. They don't drive late at night as much. Marriage enhances good health behavior. But we do have to point out that there are a lot of age/gender mortality differences in health behaviors.

Income is another strong predictor of mortality, and again, it should be something that you can get data on and verify. One way that I've thought about doing this is actually to use Social Security data. I think that there are some issues in the United States about whether you can ask questions about your Social Security benefit. But if you're pricing retirement annuities, it would be interesting to know evidence of the person's career wages by asking the person for his or her Social Security records. This impact decreases at advanced ages, but several of the studies said that the income impact remained, even after you did multi-variant analysis and adjusted for correlated variables, such as occupation and education. Again, there was not unanimity. We have a 2-to-1 ratio in the mortality rates, but it decreases at the very advanced ages. When you think about pricing an annuity at the very advanced ages, you have a big "v" to the "t" by then. You are really much more interested in the earlier years. By the time you get the "v" to the 30<sup>th</sup>, it doesn't matter quite so much. This is another area in which the mortality disparity is widening.

Here's another thing that was interesting to me. One of the reasons that income correlates with lower mortality is your ability to feel that you are in control—that you are secure. If something happens and you have to pay \$3,000 to fix it, it's not the end of the world. There are people in the world for whom if something happened and they had to pay \$3,000 to fix it, that would just be a calamity. It would be a catastrophe. They live with this sense of insecurity. "Oh, my heavens, what happens if I have to go to the hospital, and I get a \$3,000 hospital bill?" If you're rich, you have that sense of control and sense of security, and it's very important to mortality. There's always the argument that bad health causes low income. In fact, you can do the analysis to check that out. There are several studies that say, "No, that is not what is happening. The arrow is the other way. Income

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drives lower mortality. The explanation is not that being unhealthy drives low income. That's not the explanation."

Permanent income is more important than current income, again because of this sense of control and security. Income has more impact on men than women. Those in low-income categories also portray high-risk behaviors, such as smoking, alcohol abuse and sedentary lifestyle, and other risk events, such as driving late or driving under the influence. A couple of papers pointed out that national income disparity can have an impact on mortality—just feeling poor relative to other people. This helps to explain the low mortality in a country such as Sweden. I think it's pretty obvious that you can increase national life expectancy if you did away with poverty. Again, we did not have unanimity. Income is one of those that is correlated with other variables, such as race and education, so it's difficult to separate it out. Many of the studies did do multi-variant analysis, and at the advanced age, income is not as important. It's much more important prior to age 65, as a matter of fact. I leave you with this question with respect to income: Which is more important, relative or absolute wealth? You can feel poor even though you have a lot of money if you live in the United States and look around and everybody else seems to be richer.

Marital status, as we've talked about a little, has a positive protective impact. Males benefit more from this than do females. A lot of it is the social interaction, social support and social networks. Females do well at that, even if they're single and even if they're not married. Men need a wife to get into social support and social networks. The impact of marital status for women has more to do with economics. They will have a higher level of economic security if they're married than if they're single, divorced or widowed. Again, which way does the arrow go? Do we pick healthy people as spouses, and that explains the difference? The analysis says, no, that does not explain the difference. This is a very small effect, in fact, that we pick healthier people to be our spouses. The social network idea comes back again in family size. Having an extended family network lowers mortality.

We've recognized obesity in life insurance, so I'll go through this quickly. Hazard rates generally increase with body mass. It's normally correlated with low cardiorespiratory fitness, so that we have a correlation between obesity and fitness. It's also correlated with low education and low income.

Occupation is another important variable. Some papers say that it's the most important variable. Just as an aside, at this moment in the United Kingdom they have mandatory annuitization of part of your government-sponsored wealth at age 75. There are now annuity companies in the United Kingdom pricing on postal code. What they're really pricing on is occupation. This area has a lot of ex-miners. This area has a lot of ex-white-collar workers. This area has a lot of ex-farmers. They're pricing on postal code, but they're measuring past occupational history.

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Again, we have the internal correlation with education and income, which makes it difficult to measure occupation separately. Those who are economically inactive—those who are unemployed and disabled—have higher mortality rates. Why does occupation drive mortality? There are some dangerous jobs in which you might be exposed to chemicals, but a lot of it, again, goes back to social networking and your general living environment. Are you in a nice neighborhood? Do you get out? Do you have the money to do things? All of this is correlated, then, with your occupational background. The impact of occupation decreases at the advanced ages, and it does not explain the mortality differentials by gender. Occupation is a stronger indicator for males than for females. You still need to have gender in your pricing.

We would assume that we would be precluded from using race and ethnicity as pricing variables, but let's just go through some statements of reality. Blacks have higher mortality. Hispanics have lower mortality, but the lowest is in the Asian and Pacific Islander population. The black/white mortality gap has worsened as the economic gap has worsened. It improved for a while, then it stopped and now it's getting worse again. At the very advanced ages, you will find black mortality lower than white mortality just because of that selection of the fittest at the very advanced ages. Racial differences based on biological or genetic factors have been discredited, so it's not that you're black that causes this. Environmental factors are important. The neighborhood that you live in is important. The stress of your living environment is important. These are softer issues, but they can be found in measuring the variables that we are presenting to you.

Religion does have an impact. Being part of a religion and being part of a collective increases your social networking and increases your feeling of security, so it does have a protective effect. The environment is less stressful to the individuals. The impact, at least one study found, was stronger for women than for men. I think this goes back to this whole idea of social networking.

As for smoking, we do measure this for life insurance. We'll go through this quickly. Smoking approximately doubles the risk of death, and these differences remain even when you control for other variables. Absence of cigarette abuse is one of the most important protective factors for successful aging, and it's also explaining why male and female mortality differences are narrowing. This gender gap that is narrowing seems to be because of smoking habits. Smoking is concentrated among the lowest socioeconomic groups and among minorities. Volume of smoking is important, and all of you would know that from life insurance studies.

I'll leave you with a caveat. There are 46 papers, and there are summaries of each of them on the Society of Actuaries' Web site. Be careful how you use them, because if you use a different set of variables than the paper studied, you might come away with incorrect conclusions. There's so much interrelationship that you need to use the same set of variables as the paper on which you're basing your

assumptions before you can make your mortality assumptions. Also, remember that there can be anti-selection in pricing, and you'll open yourself up to some of that. I repeat that I think you can measure some of these more accurately with higher degrees of verifiability than smoking habits, and it doesn't seem to have stopped us from using smoking habits in the pricing of life insurance and in the valuation of life insurance liabilities. For more details, go to the SOA Web site. It's a good study, and there's a lot of interesting information there.

Our second speaker is Victor Modugno, who's a consulting actuary in California. He's a Fellow of the Society of Actuaries with more than 30 years of work experience in pension and investment products of life insurance companies. He also does expert testimony. Since 2000, he has been an independent consulting actuary and has worked on a number of pension issues. Between 1990 and 2000, he was vice president of institutional markets for Transamerica Asset Management. Prior to that, he worked at Executive Life, Pacific Life and MetLife. He achieved his fellowship in 1977. He has published more than 20 papers and one book. One of his papers, entitled "Terminal Funding," won an award for the best paper published on employee benefits in 1986. For the past 10 years, he served as associate editor of *Risks & Rewards*, the Investment Section newsletter.

**MR. VICTOR MODUGNO:** The Society contracted for FARM II with two basic objectives. The first was to review the existing SOA experience studies and determine which of the factors in Phase I could be added to those studies. The second was to determine the best method for reflecting those factors in mortality tables. The scope was expanded beyond retirement mortality to cover all of the Society's studies, including the life insurance studies. The SOA has six committees for mortality studies. Three of them are for group coverages, and three of them are for individual coverages. The Retirement Plan Experience Committee, the Group Annuity Experience Committee and the Group Life Insurance Experience Committee are for group coverages. The Individual Life Insurance Experience Committee, the Structured Settlement Valuation Committee and the Individual Annuity Experience Committee are for individual coverages.

The first thing I did was to review the factors in Phase I. Religion, race and ethnicity were dropped. Religion, which means the practice of religion, would be difficult to determine in any of the SOA studies. If you had a group such as a religious order, you might be able to use that. But relative to the Society studies, I didn't see any way to determine it. Race and ethnicity couldn't be used in underwriting in the United States. There was a thought that maybe they could be used in pension calculations that don't affect benefits, such as valuations, but data on race and ethnicity would not be available to the enrolled actuaries. They couldn't get it from the employers, so it wasn't used. Some of the factors wouldn't be available in group studies. Obesity and alcohol use would probably not be available in group studies. We added medical history and build, which, for example, would cover obesity and avocations for health behaviors. Geographic location was also added. There were



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some studies that show mortality variation by geographic region within the United States.

The first committee was the Retirement Plans Experience Committee (RPEC). This is the one of most interest to the enrolled actuaries. It does mortality studies of uninsured pension plans, and it developed the RP-2000 to replace the 1983 Group Annuity Mortality (GAM) in the calculation of the current liability and for other pension calculations. The RP-2000 uses factors beyond age and gender. It had healthy versus disabled annuitants, which are covered by separate tables; blue versus white collar, which have multiplicative adjustments; amount of annuity, which is also multiplicative; and standard industrial class (SIC) code, which turned out not to be a consistent indicator of mortality. Collar and amount adjustments could be used separately, but there wasn't a way to combine them.

The human resource databases of large employers contain many factors that affect the mortality, but the employers are unwilling to provide data beyond that which is needed for the valuations. It is both a resource issue—they don't want to spend the resources—and an issue involving privacy concerns. The RPEC study had about 100 large employers participating. The follow-up study had only 40. You can see that once the initial study was done, a lot of the employers dropped out. One factor that could be added is marital status by using a joint and survivor annuity (J&S) form as a proxy. ERISA requires the normal form of benefit for married participants to be joint and survivor annuities, so it's reasonable to use that as a proxy for marital status.

Geographic location could not be added. These were very large employers. We would have the location of the headquarters, but we wouldn't know the locations of the employees. Other factors would be available from governmental data. The U.S. Office of Personnel Management has 2.6 million active and 2 million retired civil service employees. The National Center for Health Statistics has mortality data by cause of death. So, there are other sources of data that could be used.

The next committee is the Group Annuity Experience Committee. This committee primarily develops group annuity rates for reserves, which are also used in pricing. For many companies, this is a closed block of business and there are not a lot of new sales, so we'll generally be constrained by the existing databases. The companies would not be willing to invest a lot of money into adding factors. One of the factors that could be added by most of the companies with their existing data is marital status, once again using J&S as a proxy. Another would be geographic location of the annuitants. That would also be available because most companies would have the address of the employees. Even for those people receiving electronic fund transfer, the company would have to have the address to send the tax forms. Also, collar and industry would be available. Many of the companies could determine this from plan level data. Once again, other data could be available from governmental sources.

The Group Life Insurance Experience Committee develops mortality studies for pricing, valuation and underwriting. Here, this issue was the same. The employers are unwilling to provide data beyond that needed for eligibility determination, ratings or claims adjudication. So, whatever data they have is all they can get. There are no other data available—no additional factors beyond age, gender and SIC code. Once again, the other factors can come from either governmental or individual life insurance data.

The Individual Life Insurance Experience Committee develops mortality studies for pricing, valuation and underwriting. This is the most comprehensive data request, including all of the factors. The total of all the data requests is 84 pages. The data requests from this committee are on the SOA Web site in the appendices to my report. RPEC's data request is also available on the SOA Web site. Newly underwritten cases would be at the younger ages, so this data is of limited use for retirement mortality.

The Structured Settlement Valuation Committee develops mortality studies of annuities issued to settle lawsuits, and this particular line of business has a significant amount of substandard issues. Factors included are age, gender, amount, form of annuity, zip code, and standard or substandard with age rating. The companies have not submitted enough data to do a study by impairment code. While the impairment codes were requested, not enough companies complied with that request. The companies don't have any incentive to provide that data because currently they can basically use whatever age rating is indicated by the medical report. They won't get more favorable reserve treatment from an impairment study. That may be part of the reason why additional data was not available.

The Individual Annuity Experience Committee is inactive. I actually had trouble tracking down members of this committee. The last study was 1976 to 1986. Only eight companies participated for that entire period. The prior study, which I think was in 1967, had about 21 companies in it, so you can see the drop-off in participation. The A2000 table, which is the current table for individual annuity reserves, was developed by projecting the 1984 individual annuitant mortality (IAM). It's not based on any type of experience data, and there's some evidence that it may be inadequate for reserves. There's no incentive for companies to participate. Mortality improvement leads to higher reserves. That's one of the reasons why there's a rapid falloff. Guideline 9C allows substandard reserves for individual annuities on the same basis as Guideline 9B allowed them for structured settlements. So, there is a possibility to use substandard reserves on cases in which you have a medical opinion. It would be something involving an extreme impairment for which you had a medical opinion indicating reduced life expectancy.

Regarding reflecting the factors in the mortality table, there are basically two approaches. One is separate tables, and the other is to use adjustments. The disadvantage with having a separate table is that you get very large array sizes. If

you keep adding factors, it starts getting very large. With computers you can perhaps do that, but looking at the RP-2000 as an example, they use separate tables for gender and for male/female, and then they have healthy annuitants, disabled annuitants, employees and combined. You have four categories there. Collar and the amount of annuity are done by multiplicative adjustments. The adjustments work best if they're relatively constant by age, so you can apply one adjustment either to all or to a large range of ages. The adjustments can be multiplicative (a factor times the mortality rate), additive (a number of deaths per thousand added to the mortality rate), which is the way structured settlement statutory reserves are adjusted, or age ratings (an age set-forward), which is the way structured settlement GAAP pricing and GAAP reserves are determined.

A lot of these factors are correlated. Once enough data has been accumulated, statistical tests can determine the effect on mortality and the correlation to the other factors. To determine what that correlation is, we have to do the studies first. There are a number of ways to handle the correlated factors. One is choosing one, and that's the way the RP-2000 works. You choose either amount or collar, but not both. They're both measures of socioeconomic status. They're too closely correlated, so there was no way to combine them. You just choose one or the other. Another method—and this would probably work if the correlation is weaker—is to have some type of joint adjustment factors, but that can get complicated. The other method would be to use a point system, which is similar to the way life insurance underwriting is done. Various factors score points, and then you add up all the points at the end to determine an age rating based on the total points.

Regarding the mortality studies of the Society of Actuaries, participation has been declining due to changes in the insurance industry. The insurance industry is more competitive. Companies are not willing to allocate resources to these studies. Also, they don't want to give an advantage to competitors by participating in these studies. In the annuity studies in which the mortality improvement actually works against them, you're seeing a very rapid falloff. The Individual Annuity Experience Committee is an extreme example in which there's nobody left, and the last valid data goes back to the 1960s. Even life insurance has seen a decline, and that's probably more due to resource issues.

There's a need to increase participation. One way to do that is to offer benefits for participation. That might be that if you participate, you get the report, and if you don't participate, you don't get that. The problem with this approach is that if you're going to use these mortality tables for reserves, they have to be published. The people who are not participating simply have to wait for the publication, so there's not a big advantage there. Another possibility is to require it in the NAIC filings. If you have a certain amount of business, you have to supply it. Another method is to make it a requirement for actuarial certification, similar to what you do with cash flow testing. So, if you are doing mortality studies, you have to provide

that data to the Society. If you're not participating, then how do you know what your mortality is? How do you justify using the mortality table?

SOA studies of some of these factors would be needed initially. This is what happened on the life insurance side. In the 1970s, we had smoker and non-smoker studies and the build and blood pressure studies. As a result, you have smoker and non-smoker mortality tables and also ratings for build and blood pressure. It would be useful to modify Guideline 9C to allow for rating based on these factors. Currently, Guideline 9C requires a medical opinion and a minimum of 25 percent excess mortality. But having a separate table—for example, something like smoker and non-smoker or allowing a different table for obese people or something like that—would result in lower reserves, and the pricing would follow the lower reserves.

Another thing that would help would be to rationalize the interest rates used in annuity reserves, particularly the statutory and tax reserves. The differences between the GAAP reserves, the tax reserves and the statutory reserves result in all kinds of capital requirements beyond the underlying reserves, beyond what's necessary in these products. If we had a reserve system that reflected the current market, rather than one that used trailing interest rate calculations, that would result in more accurate pricing of annuities. Finally, the elimination of discriminatory taxes on annuities—deferred acquisition cost (DAC) tax, the premium tax and tax on payouts—would help. This affects primarily the non-qualified annuities.

For political reasons, none of those suggestions is likely to be implemented. The lowering of taxes, particularly state premium tax, will not happen. The states are strapped for money. They won't lower taxes. Whether the statutory or the tax reserves could be rationalized, anything that results in lower revenue is very unlikely to happen, despite all the public policy arguments in favor of encouraging annuitization. If people run out of money, what happens? They end up on public assistance—Medicaid or Supplemental Security Income (SSI). There's strong public policy interest in encouraging annuitization.

One thought is to design a policy to cover the risk of living beyond life expectancy. Let's say a 65-year-old would budget money for 20 years, assuming he would live 20 years, and then purchase a deferred annuity to cover life beyond that point. This way, the annuity would be a relatively small piece, so taxes and all those other issues would be relatively minor. It would cover the risk of outliving his assets and yet minimize all the disadvantages of buying an annuity. Once again, this could include all types of bells and whistles. Survivor annuity, cost-of-living increases and nursing home benefits could all be included in that.

**MR. ROBERT E. CIRKIEL:** I was hoping you could comment a little more about the impact of heredity on mortality.

**MR. BROWN:** Certainly one of the important things in life expectancy is choosing the right parents, but I think that's also true for life insurance. I'm wondering if behind that question there's a motivation that we look at family history. There are a couple of papers that do refer to family history, but not with data analysis. I don't think we have annuity data that has been collected with the variable family history, but sure, it's important in the same way that it's important in life insurance.

**MR. DAVID DIMARTINO:** When people want to get life insurance, a healthy lifestyle is good for them and good for their pocketbooks. But it seems that when they want to buy an income annuity, what's good for their pocketbook is to show that they have an unhealthy lifestyle. They'll take up smoking right before they submit the application, for example. Has that been thought about or discussed as a way to get to the real underwriting when you ask people data?

**MR. BROWN:** The literature that we reviewed was not designed for the life insurance industry. Obviously, it will be perverse if you start to advertise, "Take up smoking, and we'll give you a cheap annuity." I don't think that's the sort of thing we'll want to do. As I did point out, you have to watch for issues where you can create anti-selection. You don't want to create an arbitrage possibility.

**MR. MODUGNO:** Regarding smoking, for example, people who buy annuities don't just pop out of the ground at age 65. Presumably someone who is a smoker at age 65 had a life insurance policy with a smoker status. If someone had life insurance policies as a non-smoker and, at 65, took up smoking just to buy an annuity, that wouldn't count. I think you need to have some type of verification of that. Would someone eat food and get fat in order to pass a test that allows the person to get a reduced annuity, and then go on a diet? I don't know if that would happen, but I think you need to have more of a medical history.

What was this person's life insurance rating? That's what I would look at. Where did this person come from? He suddenly comes with \$1 million to buy an annuity. What were you doing before that? Did you have a preferred life insurance policy because you were normal weight and low blood pressure, and then you were eating salt and smoking and putting on weight and taking pills to raise your blood pressure to pass the exam? Then, of course, after that you revert to your previous lifestyle? I think that's the way you'd have to control it.

Some people don't like the idea that you're rewarding people for doing bad things. In life insurance, you're penalizing them for smoking or being fat, whereas with an annuity, you're kind of rewarding them. That may be an issue for some people, but I think that you'd have to look at the person's history and not just the point in time. What are you doing now? But were you a smoker for your lifetime? That's the way you'd have to look at it.

**MR. MARK KINZER:** There seems to be a great divide between North American actuaries and U.K. actuaries, as far as the prospects for future mortality improvement. In North America, we think that 65-year-old male mortality rates will improve about 1.4 percent a year and female mortality rates will improve about 0.5 percent per year. In the United Kingdom, mortality improvement factors are in the range of 2, 3 or 4 percent a year, and they have cohort mortality studies that have demonstrated tremendous reserve increases for a lot of the companies over there. Who's right in this grand set of differences between the two sets of actuaries?

**MR. BROWN:** Iain Currie is a professor from Heriot-Watt University in Edinburgh. It's partly because of his methodological difference that the actuaries in the United Kingdom have gone back and re-evaluated their assumptions as to future mortality improvement. He basically disputed the projection methods and came up mathematically with what he claims is a superior method. The end result of that was faster rates of improvement for methodological reasons. So, I'm not sure that we necessarily disagree in terms of walking into the room and having a chat. I think that there has been some new methodological math put in front of the U.K. profession. In fact, the newspapers created some embarrassment for the government actuary around this, saying that even the government actuary wasn't using enough of a mortality improvement factor and that the United Kingdom needed to go back and re-evaluate everything, including social security.

**MR. MODUGNO:** I don't know anything about the United Kingdom, but if it's simply a methodology, I don't see how we'd get different answers. You're saying that mortality improvement is the same. We just use different methods of calculating it. So, the reserves are the same? It doesn't make sense to me.

**MR. JEREMY GOLD:** Vic, have you seen that annuity of yours, the deferred-to-85 annuity?

**MR. MODUGNO:** No.

**MR. GOLD:** Do you have any idea why not?

**MR. MODUGNO:** There are a number of reasons, and one of them probably is the nonforfeiture laws that may require a death benefit prior to that.

**MR. GOLD:** I believe that some people think they can get around that. Also, for what it's worth, there's an interesting pitch, although you may have to adjust the age 85 upward or downward a little. "Give us \$100,000 now, and we'll give you \$100,000 every year," which at least is a quick sale.

In terms of your "people don't pop out of the ground at 65," early commitment is an important idea for eliminating some underwriting. Obviously, group annuities are another way to do it. We happen to have sort of the opposite in many of our

defined benefit (DB) plans and, of course, in virtually all of our defined contribution (DC) plans where we have lump sums. Do you have any thoughts about the underwriting considerations regarding lump sums or whether society should be doing anything about lump sums since, in fact, the DB plan is one way to get an early commitment to an annuity if you don't have a lump sum?

**MR. MODUGNO:** Lump sums are a big problem. A lot of DB plans have lump sums now. First of all, anyone in bad health should take the lump sum, right? If you're terminally ill with cancer, what are you going to do? Take the lump sum. Another problem with that is people take the lump sum and spend it. If you took the lump sum and saved it, that would be one thing, but if you're squandering it, then you have no retirement income. I think lump sums are a big problem. They raise the anti-selection, and they end up with the money being squandered.

**MR. BROWN:** I wanted to add a couple of sort of academic comments. There have been papers in the literature that you've seen. What is the optimal time to annuitize? Moshe Milevsky has done a lot of work there, and there have been studies on the Florida defined benefit pension option. Do I take the package or not take the package? Again, it comes out being similar. You go to about age 80, and then you annuitize. I think there will be products in which you put two counter-risk benefits together, such as long-term care and annuities. If your long-term care will cost the insurance company a lot, your annuity won't, and if the annuity will cost the insurance company a lot, your long-term care won't. If you started to package these sort of "immunized" portfolios, you could actually price them less than the two products separately.

**MR. GEOFFREY E. MELBOURNE:** I think it was mentioned that the amount of smoking is an important indicator. I was wondering if there is any data on non-cigarette tobacco use, which, in fact, might be correlated with income rather than the other way around.

**MR. BROWN:** I know of no evidence.

**MR. WILLIAM R. ALBRIGHT:** I just wanted to mention that there is a subcommittee currently working on reconstituting, or reviving, that individual annuity payout study that you mentioned that stopped back in 1986. We have, I believe, about 13 companies that have expressed an interest in contributing data to that. Also, that group is looking at continuing the structured settlement data. I think the last published was probably in 1997. I'd encourage any companies that want to contribute data to let me know, or Phil Bieluch, the chair of that committee.

**MR. BROWN:** I'd like to ask the audience a question. In your own companies, without breaching antitrust, do any of you see evidence of sharpening of pencils in terms of increased risk classification in the annuity marketplace in the United States? No? Interesting. This is a huge marketplace, and it would boggle my mind if

the insurance industry and the actuarial profession within that industry wouldn't find ways of capturing a larger market share. This is the way we've always done it—property/casualty insurance, life insurance. You sharpen your risk classification pencil. It will be fascinating. In terms of public policy, I think if we don't, we'll have some nasty editorials written about the insurance industry and the actuarial profession because half the population can't get a fair value annuity.

**FROM THE FLOOR:** You've explained that we've outpriced annuities for half—it could even be 60 to 70 percent—of the population because we're underwriting for best risks. Notwithstanding that, why don't people buy annuities

**MR. BROWN:** Again on the academic side, there's a very interesting paper just out that says one of the reasons is U.S. health care. People don't want to put all their eggs into an annuity basket if they get a sudden shock in health-care costs. That really "can't" happen in Canada to the same extent, and you can understand that. But this is a very mathematical paper, and the modeling says that if you have this chance of a sudden contingent hit, then you won't annuitize all of your wealth. You'll hold back enough to cover the catastrophic event that is contingent and unknown.

**FROM THE FLOOR:** I have an easy test then. Do Canadians buy annuities more readily?

**MR. BROWN:** I would say so. My understanding is that the annuity market in the United States achieves only about 6 percent of its potential. I think that it's higher in Canada, but I can't give you the number.

**MR. MODUGNO:** I think another problem stems from the taxes in the United States. That's a big reason. The annuity is a bad value because of all the taxes on it.

**MR. NEIL J. DAVIDSON:** I wanted to point out that there is a product out there now, at least in Florida, that sells itself as longevity insurance. I don't fully understand it yet, but senior management at my company wants us to have the second one. So, it is out there.

**MR. MODUGNO:** The reverse annuity does work like that. When you buy a reverse annuity, they do a 20-year payout, and then they buy an annuity for that fraction after that.

**MR. DAVIDSON:** From what I've seen, the product is virtually identical to what you described.

**MR. MODUGNO:** So, there is one product out there.



**FROM THE FLOOR:** It seems to me that there's another reason why annuity purchases haven't been very prevalent. Back in the 1980s and early 1990s, interest rates were much higher. Financial advisors were telling people, "You can get so much interest on your money, you can live just as well and still have your principal when you're done." At the same time, commensurately, there was not a groundswell of huge mortality improvements. I don't represent any insurance companies. I'm a consultant. It would seem to me that if you piped into the terribly low interest rates and the prospects for very long life expectancy, publicized the financial results of that and compared life annuities with living off your IRA, maybe there would be a lot more interest. But there's the negative idea that when you go with one insurance company with your money, it's like putting your eggs all in one basket, and that's a problem, too.

**MR. MODUGNO:** There is that risk of putting your money with one annuity provider. The states do have guarantee funds that cover the first \$100,000, but that could be an issue for a large annuity. Regarding the interest rates, I think you're right. The low interest rates increase the benefit for survivorship, so that might make an annuity more attractive. If interest rates are really high, the interest component will be much higher and the mortality component lower.

**MR. BROWN:** I have an interesting little booklet here, *The New Retirement Challenge*, written by Jeffrey R. Brown for Americans for Secure Retirement. It shows graphically the benefit of annuitization. It graphs what you can get from a life annuity and what you'd be able to pay yourself if you kept payments going until age 100. You can do that in a couple of ways. You can just take the time from now to 100 and divide by one over n. Another way that has been put forward by some people is to take the wealth that you have and divide by one over x. That comes close to the annuity for a while, but you get into a mess when you get to the advanced ages. This sort of graphic is very powerful to show why a society should use annuities for longevity risk. It says it better than 1,000 words.

**FROM THE FLOOR:** I live in France, and in France there seems to be a reluctance against buying annuities. It seems to me that there is a cultural element.

**MR. BROWN:** There is this bequest motivation. A lot of people put a high value in being able to leave wealth, and there's this thing about annuities. I give my money to the insurance company, and if I die early, they confiscate it. They don't understand that you've entered a group, and you've grouped your risk. That's not an easy concept. Almost no one, other than an actuary, really understands that. The bequest motive is also very real.

**MR. CHRISTOPHER KOZLOW:** I'm curious to get your opinion on to what extent, if ever, DNA analysis would be used for predicting or affecting mortality.

**MR. BROWN:** I worry. If you know when someone will die, you can't have insurance. You can't have life insurance, and you can't have annuities. I think the whole industry is worried about, what if DNA provides us with that much information? It still has to be a contingent event. It still has to be probabilistic and with a fair bit of variance before the insurance process works.

**MR. MODUGNO:** If you know exactly when you'll die, you don't really need insurance or annuities. You can just plan the money out, so it's not needed. I don't know if DNA gives you more information that can result in better risk classification. If your DNA shows that you have a propensity to die of lung cancer, that could be a benefit on the annuity side. If the individual has the information and the insurance company doesn't, that creates a problem because you know when you'll die, and I don't. I can't sell you an annuity or life insurance policy.

**MR. BROWN:** The comment in the silence was, will we be able to get this information if privacy acts deny us the ability? This is DNA information.

**FROM THE FLOOR:** Unless you made it a requirement that if you wanted to purchase such a product, you did have to disclose it.

**MR. BROWN:** It's a possibility.

**MS. BEVERLY ORTH:** Your comment about marital status reducing mortality risk for males but not as much for females is consistent with everything that I've read on the topic. But I've been curious about something for a long time, and I have not seen anything on this. Maybe it's too new to have been studied, but what about the effects of same-sex marriage?

**MR. BROWN:** I believe that there are two elements to this, and I mentioned them both as I went through. To the extent that these two elements apply, then it should apply to same-sex unions. One is better social networking, and the other is a higher sense of a level of security. If those apply to same-sex marriages, then it should continue. In my mind, those are the number one and number two reasons for the impact of marital status. The third one is a diminution of risky lifestyle. Again, if that applies, then you'll get the same effect.