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Summary: This session presents information on two of the current research projects—The Macrodemographic Model and the General Agreement on Tariffs and Trade (GATT) Mortality Study. The modeling project is focused on an actuarial perspective of how policymakers project pension costs and new and interesting data that are being developed by economists and demographers. According to GATT, the Treasury Department must review mortality tables for current liability purposes after the year 2000. The SOA is studying significant issues on how mortality differs for different workforce types and other issues that may be of interest in reviewing these tables.

Mr. Christopher M. Bone: Allow me to give just a brief introduction as to how these topics wound up together in one session. Both Lindsay and I are current or former, in my case, members of the Society of Actuaries Retirement Systems Research Committee, which raises research money from the various sections and allocates research money to various researchers and projects within the retirement area. The point of this session is to review the emerging issues which may affect you in your practice now or a few years down the road, particularly work done with your Society of Actuaries dollars.

Lindsay is with New York Life Asset Management. He's the former chairman of the task force which developed the new group annuity reserving table for 1994 (GAR-94), which includes generational projection of mortality. Currently, he is a member of the Retirement Systems Research Committee of the Society, the Retirement Plans Experience Committee, and the task force which is gathering data on employer

plans in response to the GATT legislation. Under that legislation, the U.S. Treasury has an obligation to look at private sector data. The Society is cooperating in gathering that private sector data on uninsured plans.

I'm with Actuarial Sciences Associates. Last year, I chaired the research committee and, right now, I'm chairing a task force which is overseeing the research work of an economist and a group of actuaries who have teamed up to look at the models which are currently in use for modeling retirement income to see how they are used for public policy purposes.

Mr. Lindsay J. Malkiewich: As Chris said, I'm part of the retirement systems research committee which has sponsored, you might say, a study to be done on mortality documents in response to the GATT legislation. That research is being done by Frostburg State.

The mortality table which we will be looking at mortality on the uninsured experience plans, will hopefully answer and address the GATT legislation's directive of the IRS to study that.

Back in 1994 GATT legislation was passed. Section IRC 412 states that the treasurer-secretary, "Shall take into account results of available independent studies of mortality of individuals covered by pension plans."

The GAR-94 table which was just published and will be, hopefully, adopted by the NAIC in 26 states, is based primarily on covered insured experience and civil service retirement system experience.

The retirement plan experience committee (RPEC), does quinquennial studies of mortality. The last study covered experience for 1985-89, and was used in the preparation of the UP-94 and the GAR-94 tables. The five-year study, therefore, which we're doing now covers experience from 1990-94.

After a request for a proposal (RFP) process, Frostburg State was chosen for putting together this mortality study for us. They have compiled quite a bit of information, but there's still a lot more to be done. However, given that 1990-94 is a five-year period, the center year will be 1992. Comparing it to the UP-94 or the GAR-94 table is not too bad in regards to a reasonable actual to expected ratio. However, we don't know what we're going to get.

The 412 legislation makes reference to Section 807(d)(5). Section 807(d)(5) is a section states that when 26 states have adopted a group annuity standard for reserving purposes, that table can be used as a tax reserve standard. The 1983

group annuity mortality (GAM) table is the current standard; 26 states passed it in 1985. The hope and the intent is that the GAR-94 group annuity reserving table for 1994 will be passed soon. I know that the NAIC has proposed it as a table, but I'm not sure how far it has gone yet in regards to passing.

Section 415 and Section 417 have the same 807 language. Only Section 412 has language which I referred to earlier that asks for independent studies of an insured plan mortality. So the GATT project or the Retirement Protection Act of 1994 project was included in the GATT legislation which was designed to address that concern.

We aren't sure whether they can actually do that or not. Revenue Ruling 95-28 is a ruling which allows the 1983 GAM to be used. Theoretically, whenever this new study is performed and a new table is chosen, a new revenue ruling will be produced, and our hope is that they will at least look at the information we're putting together here to compare with the other tables.

I want to take a step back and review a 1994 table, to see what rates we're looking at, and what the actual-to-expected ratios which I'll be talking about a little bit later are referring to. Table 1 shows what I'm calling the 1994 Group Annuity Mortality Basic Table. This also is the UP-94 basic table. It shows males and females from ages 1–30, from 31–60, and from 61–90.

Now, I did not show ages 91 through 115. They're not much different from the 1983 table.

TABLE 1
1994 GROUP ANNUITY MORTALITY BASIC TABLE; GRADUATED—NO MARGIN
1994 BASE YEAR

Age	Male	Female	Age	Male	Female
1	0.000637	0.000571	16	0.000421	0.000261
2	0.000430	0.000372	17	0.000463	0.000281
3	0.000357	0.000278	18	0.000495	0.000293
4	0.000278	0.000208	19	0.000521	0.000301
5	0.000255	0.000188	20	0.000545	0.000305
6	0.000244	0.000176	21	0.000570	0.000308
7	0.000234	0.000165	22	0.000598	0.000311
8	0.000216	0.000147	23	0.000633	0.000313
9	0.000209	0.000140	24	0.000671	0.000313
10	0.000212	0.000141	25	0.000711	0.000313
11	0.000223	0.000148	26	0.000749	0.000316
12	0.000243	0.000159	27	0.000782	0.000324
13	0.000275	0.000177	28	0.000811	0.000338
14	0.000320	0.000203	29	0.000838	0.000356
15	0.000371	0.000233	30	0.000862	0.000377
31	0.000883	0.000401	46	0.001852	0.001111
32	0.000902	0.000427	47	0.002042	0.001196
33	0.000912	0.000454	48	0.002260	0.001297
34	0.000913	0.000482	49	0.002501	0.001408
35	0.000915	0.000514	50	0.002773	0.001536
36	0.000927	0.000550	51	0.003008	0.001686
37	0.000958	0.000593	52	0.003455	0.001864
38	0.001010	0.000643	53	0.003455	0.002051
39	0.001075	0.000701	54	0.004278	0.002241
40	0.001153	0.000763	55	0.004758	0.002466
41	0.001243	0.000826	56	0.005322	0.002755
42	0.001346	0.000888	57	0.006001	0.003139
43	0.001454	0.000943	58	0.006774	0.003612
44	0.001568	0.000992	59	0.007623	0.004154
45	0.001697	0.001046	60	0.008576	0.004773
61	0.009663	0.005476	76	0.043933	0.027231
62	0.010911	0.006271	77	0.048570	0.030501
63	0.012335	0.007179	78	0.053991	0.034115
64	0.013914	0.008194	79	0.060066	0.038024
65	0.015629	0.009286	80	0.066696	0.042361
66	0.017462	0.010423	81	0.073780	0.047260
67	0.019391	0.011574	82	0.081217	0.052853
68	0.021354	0.012648	83	0.088721	0.058986
69	0.023364	0.013665	84	0.096358	0.065569
70	0.025516	0.014763	85	0.104559	0.072836
71	0.027905	0.016079	86	0.113755	0.081018
72	0.030625	0.017748	87	0.124377	0.090348
73	0.033549	0.019724	88	0.136537	0.100882
74	0.036614	0.021915	89	0.149949	0.112467
75	0.040012	0.024393	90	0.164442	0.125016

Table 2 is the static table with a 7% margin. When our task force was looking at the 1994 table, it was felt that, because of different business characteristics, and the

different sizes of plans that were incorporated in the group annuity reserves that the various companies that contributed, a base table would not be conservative enough, and we arrived at a 7% margin. So this is the base table for the GAR-94 experience, which is loaded from the UP-94 table, ages 1–30, ages 31–60, and ages 61-90.

TABLE 2
1994 GAM STATIC MORTALITY TABLE
1994 BASE YEAR
VALUES OF q_x

Age	Male	Female	Age	Male	Female
1	0.000592	0.000531	16	0.000391	0.000242
2	0.000400	0.000346	17	0.000430	0.000262
3	0.000332	0.000258	18	0.000460	0.000273
4	0.000259	0.000194	19	0.000484	0.000280
5	0.000237	0.000175	20	0.000507	0.000284
6	0.000227	0.000163	21	0.000530	0.000286
7	0.000217	0.000153	22	0.000556	0.000289
8	0.000201	0.000137	23	0.000589	0.000292
9	0.000194	0.000130	24	0.000624	0.000291
10	0.000197	0.000131	25	0.000661	0.000291
11	0.000208	0.000138	26	0.000696	0.000294
12	0.000226	0.000148	27	0.000727	0.000302
13	0.000255	0.000164	28	0.000754	0.000314
14	0.000297	0.000189	29	0.000779	0.000331
15	0.000345	0.000216	30	0.000801	0.000351
31	0.000821	0.000373	46	0.001722	0.001033
32	0.000839	0.000397	47	0.001899	0.001112
33	0.000848	0.000422	48	0.002102	0.001206
34	0.000849	0.000449	49	0.002326	0.001310
35	0.000851	0.000478	50	0.002579	0.001428
36	0.000862	0.000512	51	0.002872	0.001568
37	0.000891	0.000551	52	0.003213	0.001734
38	0.000939	0.000598	53	0.003584	0.001907
39	0.000999	0.000652	54	0.003979	0.002084
40	0.001072	0.000709	55	0.004425	0.002284
41	0.001156	0.000768	56	0.004949	0.002563
42	0.001252	0.000825	57	0.005581	0.002919
43	0.001352	0.000877	58	0.006300	0.003369
44	0.001458	0.000923	59	0.007090	0.003863
45	0.001578	0.000973	60	0.007976	0.004439

TABLE 2 (CONTINUED)

Age	Male	Female	Age	Male	Female
61	0.008986	0.005093	76	0.040858	0.025325
62	0.010147	0.005832	77	0.045171	0.028366
63	0.011471	0.006677	78	0.050211	0.031727
64	0.012940	0.007621	79	0.055861	0.035362
65	0.014535	0.008636	80	0.062027	0.039396
66	0.016239	0.009694	81	0.068615	0.043952
67	0.018034	0.010764	82	0.075532	0.049153
68	0.019859	0.011763	83	0.082510	0.054857
69	0.021729	0.012709	84	0.089613	0.060979
70	0.023730	0.013730	85	0.097240	0.067738
71	0.025951	0.014953	86	0.105792	0.075347
72	0.028481	0.016506	87	0.115671	0.084023
73	0.031201	0.018344	88	0.126980	0.093820
74	0.034051	0.020381	89	0.139452	0.104594
75	0.037211	0.022686	90	0.152931	0.116265

Now, as we alluded to, the GAR-94 table is also associated with a projection scale. This will be the first time in which a reserving table, and I want to emphasize the words *reserving table*, will use projection as part of its mortality reserving process. That projection scale termed double A (Scale AA) is shown in Table 3 here for male and female from ages 1–30, from 31–60 and, again, from 61–90.

TABLE 3
PROJECTION SCALE AA
MORTALITY IMPROVEMENT FACTORS TO BE USED IN THE
NEW TABLE WHEN PROJECTING MORTALITY RATES BEYOND 1994

Age	**Male**	**Female**	**Age**	**Male**	**Female**
1	2.0	2.0	16	1.9	1.5
2	2.0	2.0	17	1.9	1.4
3	2.0	2.0	18	1.9	1.4
4	2.0	2.0	19	1.9	1.5
5	2.0	2.0	20	1.9	1.6
6	2.0	2.0	21	1.8	1.7
7	2.0	2.0	22	1.7	1.7
8	2.0	2.0	23	1.5	1.6
9	2.0	2.0	24	1.3	1.5
10	2.0	2.0	25	1.0	1.4
11	2.0	2.0	26	0.6	1.2
12	2.0	2.0	27	0.5	1.2
13	2.0	2.0	28	0.5	1.2
14	1.9	1.8	29	0.5	1.2
15	1.9	1.6	30	0.5	1.0

TABLE 3 CONTINUED

Age	Male	Female	Age	Male	Female
31	0.5	0.8	46	1.4	1.7
32	0.5	0.8	47	1.5	1.8
33	0.5	0.9	48	1.6	1.8
34	0.5	1.0	49	1.7	1.8
35	0.5	1.1	50	1.8	1.7
36	0.5	1.2	51	1.9	1.6
37	0.5	1.3	52	2.0	1.4
38	0.6	1.4	53	2.0	1.2
39	0.7	1.5	54	2.0	1.0
40	0.8	1.5	55	1.9	0.8
41	0.9	1.5	56	1.8	0.6
42	1.0	1.5	57	1.7	0.5
43	1.1	1.5	58	1.6	0.5
44	1.2	1.5	59	1.6	0.5
45	1.3	1.6	60	1.6	0.5
61	1.5	0.5	76	1.4	0.8
62	1.5	0.5	77	1.3	0.7
63	1.4	0.5	78	1.2	0.7
64	1.4	0.5	79	1.1	0.7
65	1.4	0.5	80	1.0	0.7
66	1.3	0.5	81	0.9	0.7
67	1.3	0.5	82	0.8	0.7
68	1.4	0.5	83	0.8	0.7
69	1.4	0.5	84	0.7	0.7
70	1.5	0.5	85	0.7	0.6
71	1.5	0.6	86	0.7	0.5
72	1.5	0.6	87	0.6	0.4
73	1.5	0.7	88	0.5	0.4
74	1.5	0.7	89	0.5	0.3
75	1.4	0.8	90	0.4	0.3

I've not showed the scale rates after age 91, partially because after these tables were prepared, the task force, before the final release of the paper, slowly changed the upper limits of those scales. However, Chart 1 shows how the male scale double A pattern looks. Ignore the ages from above 95 on because there's a slightly different smoothing at the end. Chart 2 shows the female scales. As you notice, there's a lot of noise there, so to speak. There's an underlying question which is raised that we purposely did not answer about why this scale is the best scale for mortality projection into the future. Also, is a scale of that sort even appropriate?

CHART 1
MORTALITY IMPROVEMENT FACTORS—MALE
SCALE AA

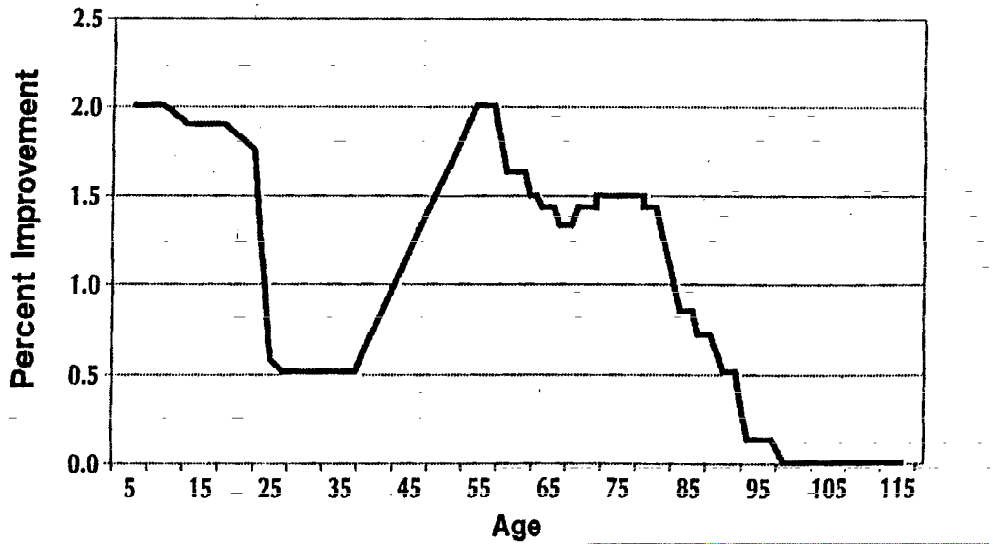
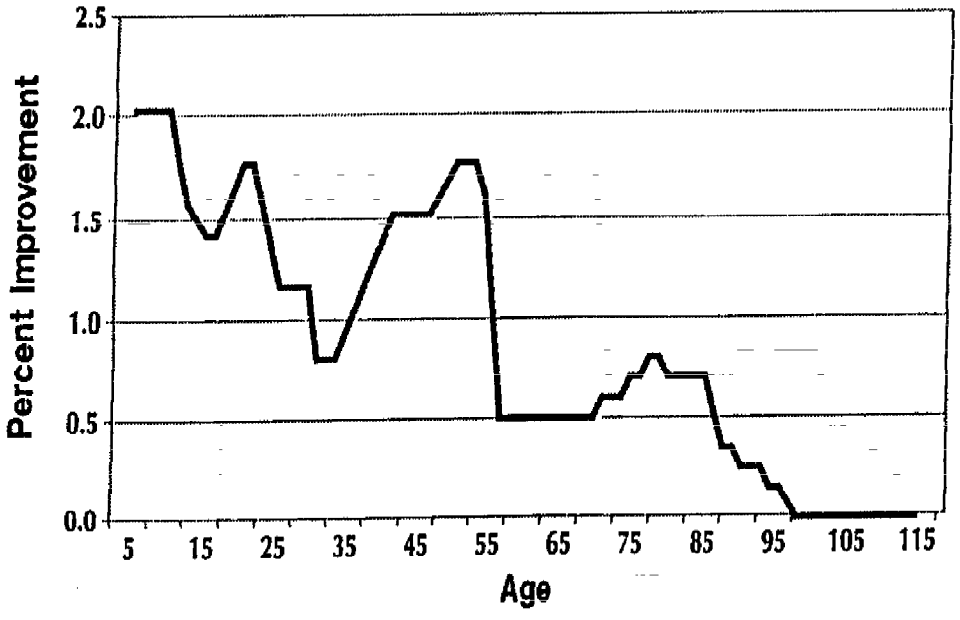


CHART 2
MORTALITY IMPROVEMENT FACTORS—FEMALE
SCALE AA



For current liability purposes, we're talking about funding plans of large corporations, small corporations, manufacturing industries, heavy industry, light industry, electronic manufacturers, book-end manufacturers, and paper manufacturers. There's a wide range of mortality influences, you might say, so this may not be quite appropriate to address. The argument was raised to the IRS when the GATT legislation was being developed that this UP-94/GAR-94 table may not be the most appropriate table for current liability development.

As I mentioned earlier, Section 415, which is the defined-benefit plan limits, and Section 417(e)(3), which is the lump-sum distribution determination, do not have the follow-up question on looking at future studies. So they're implying that when the GAR-94 table is adopted, the future 415 limits and 417(e)(3) lump-sum distributions will probably be based on that GAR-94 generational projection mortality table. There's certainly a debate as to whether that is the most appropriate. Our RPEC task force or study on the GATT mortality will hopefully address that concern by showing the mortality is quite varied between industries, and is not necessarily addressed by the UP-94.

The Retirement Plans Experience Committee Study, is being commissioned by Frostburg State. We have 13.5 million years of life exposure which has contributed to the study thus far. The UP-94, GAR-94 table from the insured plan market had about six million years of life exposure and this is excluding the Civil Service Retirement System (CSRS) exposure. I'm not sure how many life years, but certainly not in that range. This is a much more encompassing study than the UP-94 GAR-94 study dealt with. It should give us, what we would feel to be reasonable results.

We have 111 plans contributing to it. This includes the large auto manufacturers, several of the large communication industries as well as some large steel industries, and other manufacturing entities. Unfortunately, we do not have a complete study yet. In fact, what I'm going to be showing you is only about seven million life years worth of exposure which we have actually put together, actual-to-expected ratios, but it does give an idea of what we're already being presented with.

From the Floor: When you say the number of years, is it one year of experience for thirteen million lives? Or is it four or five years of experience?

Mr. Malkiewich: That's a good question. We're talking about counting years 1990–94. So if plan A contributed data for all five years, and if they contributed a 100,000-life-year plan, that would be a 500,000 life years of exposure if everybody in that plan lived all five years. But, a 100,000-life-year plan is probably not a small plan to be looking at experience for either. When you're looking at 13.5 million, it gives a reasonable expectation. When somebody lives five years, that says

something as well. I mean that five years of life is five years that you may or may not have been able to expect from that particular individual.

Table 4 shows the experience which was accumulated for the nonmanufacturing industries. I've listed them by size of lives exposed only to give it an order, not necessarily implying one thing or another. I also would like to restate that the plans which we have contributed to the study so far are both large and small.

TABLE 4
RPEC GATT MORTALITY STUDY
NONMANUFACTURING INDUSTRIES INVOLVED TO DATE

Industry	Lives Exposed	Current A/E Ratios*
Trucking	1,550,000	1.2–1.6
Insurance and Financial Services	650,000	0.8–2.3
Steel	570,000	1.2–2.1
Communications	560,000	0.9–1.3

* The Expected Table is UP 1994 - (Also GAR 1994 Basic)

When I show 1.2–1.6, I'm honestly not sure whether this is a large plan that had the 1.2 ratios to the UP-94 table, or if it was a small plan. So far, for the trucking industry, you have almost 1.6 million life years of exposure and we have a 1.2–1.6 expected ratio over the overall plan. These are preliminary numbers. These will change, additional data might modify the results, but it does seem to give an indication.

From the Floor: Does this include active as well as retired lives?

Mr. Malkiewich: Well, it does to an extent. It is a lot easier in any mortality study to collect retired lives than it is to collect active lives. We did collect active lives. They were contributed by the various consulting firms which oversee these plans. To the best that they could, they put together these active lives and smoothed out the data. I'll admit that the better data is from the retired population.

In the insurance and financial services, which would include companies such as New York Life, Prudential, and Morgan Stanley, 0.8–2.3 is a very wide range. The steel industry is at 1.2–2.1. The numbers for the communications industry are before some large communications companies contributed data, so we will have a lot more lives exposed in the communications industry which I'm sure will modify these ratios. As you can see in Table 4, with the half of a million which we have right now, communications has a 0.9 –1.3 ratio.

From the Floor: Do you have any actual expected for all industry groups?

Mr. Malkiewich: At this point, I don't. I do want to stress that this is still preliminary information. As you can see, where I got 1.6 million or the 1.2 rate and another 600,000 at a 1.2, my thought from what we have seen so far is that the overall actual-to-expected ratios right now are above one on an aggregate basis. I do want to stress that what I'm showing you is only a little bit more than seven million of the lives which have been collected. Almost half of the lives which they have collected information on need to be put through the process.

Next is nonmanufacturing industries (Table 5). Oil refining has a ratio of 1.0–1.1. Recreation industries have a very low ratio. Hospital and tax-exempt industries are at 0.4–1.1. In comparing some of the more manual intensive industries such as trucking and steel to the less manual intensive industries such as insurances, communications, recreation, and hospital, there's an already apparent divergence between the actual-to-expected ratios, depending on the kind of industry that you're in. That was part of the point which was being made when the UP-94 and GAR-94 table was proposed.

TABLE 5
RPEC GATT MORTALITY STUDY
NONMANUFACTURING INDUSTRIES INVOLVED TO DATE

Industry	Lives Exposed	Current A/E Ratios*
Oil Refining	220,000	1.0–1.1
Recreation	200,000	0.3–0.4
Hospital and Tax Exempt	40,000	0.4–1.1

* The Expected Table is UP 1994 - (Also GAR 1994 Basic)

This is preliminary information. They are looking at data which are good versus bad. At this point, it's hard to say how much of this is very good data. I would think that what we've already done is reasonable, but some of that can be thrown out. Once we get all our information, I don't think these ratios would change drastically.

Let's look at the manufacturing industries in Table 6. Office machines is another large block of data to expose at 1.1 million life years. It is almost right on the money with the UP-94 table. There are over 700,000 lives exposed for both electronic equipment and transportation equipment. Again, these are reasonable ratios to the UP-94 table. Chemical products are slightly higher at 1.1–1.2. As you can see, as you get to lower exposures, at least with the glass industry, you can see a 1.1–1.5 ratio. There's a much wider range of actual-to-expected ratios.

TABLE 6
RPEC GATT MORTALITY STUDY
MANUFACTURING INDUSTRIES INVOLVED TO DATE

Industry	Lives Exposed	Current A/E Ratios*
Office Machines	1,100,000	0.6–1.0
Transportation Equipment	720,000	0.9–1.4
Electronic Equipment	720,000	0.6–1.1
Chemical Products	230,000	1.1–1.2
Paper and Pulp	160,000	1.0–1.3
Glass	130,000	1.1–1.5
Textiles	100,000	0.9–1.2
Other Minerals	70,000	1.2–1.3

* The Expected Table is UP 1994 - (Also GAR 1994 Basic)

The manufacturing industry seems to be centering around the actual of one more so than the nonmanufacturing industries. When we get the additional seven million lives and see how they compare, the hope is that it will make more sense.

The auto industry gave us information which was split into several small categories, and hopefully, we were able to capture some of that, but I'm honestly not sure yet. Until we get all the data accumulated together, put it all in a pot, and start seeing what we have, those kinds of questions are going to be asked and, hopefully, will be attempted to be answered. Where we go from there, is hard to say.

What we're going to be doing with this study will be determined based on what the data we receive. I would have hoped that we could have gotten a little bit further on it, but the cut-off date for contributing experience is June 1, 1996. We wanted to capture the large auto manufacturers and the large communications industries. With 13.5 million years, obviously, we want to use as much as we can. We have a great opportunity to give the IRS information from the actuarial industry which can be used for potential legislation which would be beneficial and helpful to all of us.

A single table, such as the UP-94 or the GAR-94 table with complete projection is probably not the best idea for current liability for heavily manufactured industries. Obviously, what we're trying to do is to show that maybe we should have multiple tables, or maybe we should have an age set back, or an age set forward depending on the industry. Maybe the size of the plan should indicate a load or a setback. With all that information, we're going to be looking at what this report will actually show. We're hoping to produce a report, by the first half of 1998. That should give the IRS sufficient time to analyze it and determine whether they want to work with it for publication for plan years following 1999.

Before we get to that point, we'll be addressing the questions as to what kind of tables we want to show. Do we want to have a vector approach? How should we actually present it?

I would have felt that some industries would be right on the money with the UP-94 table. Intuitively, I would have also felt that some heavily manufactured industries, possibly some smaller plans, would have divergence both up and below. Certainly, on the manufacturing side, it would be above because it's a much more labor-intensive process than the UP-94 table which is based on individuals who have already retired, who are now basically set in their ways, and who have retirement to look forward to. They're doing whatever they are doing to be comfortable. That is a conservative approach to mortality, which is why the GAR-94 table is as conservative as it is.

When we're talking about current liability, which covers both active and retired lives, then maybe we're being too conservative. For some industries, I would have thought that it should have been right on the money. For others, as we're seeing, it seems to be following our prethought pattern.

Mr. Bone: I think that expectation is one of the areas of controversy which people were trying to work out. The base table for active employees, in particular, is based on Civil Service Retirement System mortality. There was a question as to whether that's representative of what's out there in the private sector. There are also a lot of questions about who is in the group annuity mortality data which was collected. Does that data tend to reflect more of a salaried workforce than average for industrial plans? So I think there's a lot of controversy. There are some of us that expect the numbers to be way above one, and others who think the numbers should be very close to one.

From the Floor: I'm having some trouble with the thought that manual laborers are not going to live as long after they retire than those who sit behind a desk all their lives. That's what these numbers seem to say.

Mr. Malkiewich: They seem to be implying it.

From the Floor: That seems to fly in the face of everything we hear. In terms of wellness, we hear that the people who are sitting behind the desk all day are not going to be living as long. I don't know if you have any thoughts on that. Also, has there been any attempt to slice the data between the retiree and the spouse. If the spouse hasn't worked in that industry, perhaps he or she would exhibit mortality of a different nature.

Mr. Malkiewich: There's a thought about splitting the data as far as we can split it, but it depends on getting an actual-to-expected overall ratio by industry. That gives us some information. Part of the reason that we chose Frostburg State was that they have a system which allows us to do a lot of finetuning breakdowns. How do the spouses of these manufacturing industries versus the principal compare to the spouses of a nonmanufacturing industry versus that principal? We'll be trying to do that kind of thing. However, it totally depends on how much data we have and how far they can go in segmenting it.

On the other side of the coin, yes, we're all being told to exercise more regularly, to eat right, to live healthily, yet every statistic which we seem to look at implies that if you sit behind a desk you will live longer than if you work every day of your life as a laborer. I'm not going to try to say I know why, but the statistics just seem to point that out. Maybe it's just the mental outlook on life which is different. I'm honestly not sure.

From the Floor: One of the things is the population you're looking at, especially the retired population, is from an industrial operation. It is a population which is working at a time when there wasn't the consideration we have now about exposure to substances. Also a significant part of that population, while they might have worked hard, also was not exposed to the ideas of eating right.

The second part of that is the population probably was significantly generated by people who retired prior to the Retirement Equity Act (REA) so there may be a fair number of fewer spouses in the population than you would expect.

Mr. Malkiewich: That's possible.

From the Floor: My question and I'm sure it has been answered a number of times in the past, is actually about the GAM 83 that's used by the IRS. Why did they change the female mortality?

Mr. Bone: The IRS uses the uncorrected version of GAM 83 except that they have corrected an error in a female mortality rate which shows up in the final table. The other differences in the rates are basically in the last rounded digit, and the issue is that the IRS has been using, apparently for years, the initial version of the table, not the final version which was printed in the SOA's *Transactions* and had some changes to the fourth digit of the mortality rates.

From the Floor: Are you expecting the next seven million to be considerably different?

Mr. Malkiewich: To be honest, no, I'm not. I'm expecting the next seven million to be very comparable to this. Yes, I think the actual-to-expected ratios will probably change, but not appreciably. However, there are bad data which will be thrown out which will have an impact. When we were doing the GAR-94 table study, there was an insurance company which contributed data that generated unreasonable results. Their actual-to-expected ratios were 0.6 or 0.5. They had made errors. We just had to throw the data out.

From the Floor: What is the approximate average age of these life exposures?

Mr. Malkiewich: I do not know that answer yet.

From the Floor: Two recently large Canadian groups show that consistently and incredibly that the surviving spouse mortality is worse than the spouse primary annuitant mortality, almost regardless of what kind of industry they're in. I'm just wondering if that's cropping up anywhere else?

Mr. Malkiewich: Is it cropping up anywhere else? I would think it probably is. Has it been noticed anywhere else? I can't say, but there have been, as you're all familiar with, several studies showing that when a spouse dies within the next three years, the surviving spouse has a much larger risk, you might say, of mortality than otherwise, and maybe that's what they're saying in explicit form. There has been, and there are, some ongoing studies of Canadian mortality being done by the Canadian Institute which is looking at overall experience. Right now, the information is implying that Canadian mortality may not be as good compared to the U.S. mortality as initially thought for retired lives. As with our study, the Canadian data are preliminary. There still is work being done on that.

The Society does biannual studies of group and individual mortality. It will certainly look at Social Security data. They'll probably look at Civil Service Retirement System data as well. If there are other industries, they are going to be prospecting and sending them information.

Mr. Bone: I'm going to address something which is a little further away from our topic, which is the range of models which are used to help policymakers make decisions in the pension area. That sounds vague. What types of decisions are we talking about? For instance, there have been the women's equity bills which have been introduced in every session of congress which form the Retirement Equity Act. These are the constant calls for decreased vesting which you saw. There's five-year vesting, and now we're hearing again that maybe we need three-year or one-year vesting. There are calls for changes in the way that you integrate pension plans with Social Security, calls for changes to the age discrimination and employment act,

nondiscrimination rules, vesting rules, and tax rules. All of these are examples of proposals which policymakers might analyze using the results of models of the American retirement system. Eventually we're hoping to generalize this to the Canadian Retirement System as well, and thereafter to other benefit areas.

How do policymakers use models? What models are they using? Do models reflect the issues that we, as actuaries, think are likely to be of concern? For instance, when we begin mandating common mortality tables, regardless of the pension plan, actuaries may have some concerns as to whether our experience and expertise is being reflected in how we set up funding for those plans since, in our experience, we may believe that the industry of employment affects retirement mortality.

Before I discuss the specific project, I'd like to just say a little bit about why I think actuaries should be interested. I thought I would start by talking a little bit about my own experience and why it is that I'm interested in this area. In 1985, my employer started meeting with the Treasury Department, the Department of Labor, and various congressional aides to talk about ways to get increased flexibility for sponsors who had excess pension assets. We could see an increased trend in legislation that said, if you revert excess pension assets, you're going to get hit with increasingly higher and higher penalty taxes. This was a proposal in 1985. It was actually proposed in legislation in 1987, and the final law was passed at the end of 1989.

In 1988 and 1989, I spent a fair amount of time working with revenue estimators in the private sector. Many of these people were previously employed in government at the Joint Committee on Tax, the Office of Management and Budget, or the Congressional Budget Office. Their job is to say, how does the tax revenue stream change when we make a change in pension law that does something; it gives employers more flexibility to revert assets, et cetera. Frankly, I was very concerned about what models were being built because these models were being built by graduates of the schools, as it were, that developed policy analysis for policymakers to use, and there were many items which were being done seemed contrary to actuarial principles and experience.

To be more clear, let's look at the concept of tax expenditure. This is how the federal budget accounts for the cost of employer pension plans? In the last two years, those of you who follow the Employee Benefit Research Institute (EBRI) publications, have seen some explanations of the method used to calculate the tax expenditure for pension plans, and how that's different from what you and I might commonly think. In essence, the calculation imputes a cost of the tax subsidy to individuals, and then imputes a cost of not taxing the assets which are currently in

plans. The treatment of contributions, which we think of as the deductions, go in and out of this equation in a counterintuitive fashion. Most of the tax expenditure is for people covered by entities which don't get deductions: like state and local governments and the military.

Another issue of concern is the currency of the descriptions of plans which are used by these models. Oftentimes, the models will be based on a database from a year that is a decade or more in the past. Furthermore, if you're looking at the current deduction, you'll see that the way costs are assigned to these plans is prorated to the benefit. We all know that you can get the same benefit out of a flat dollar plan and a final average pay plan, but the incidence of the tax deduction is going to be enormously different. When asked how you reflect these items, the answer is, they'll work out in the wash.

My own experience was that there was not a lot of knowledge of how employers adapt to changes in the law embedded in revenue models. Over time, I guess the question has been, how are employer reactions modeled in general? What is it that we see when we're looking not just at tax revenue models, but also at models which are used by the Department of Labor, by the Congressional Budget Office, or by the Social Security Administration? How do they use these models, and do they reflect what we, as actuaries, think is important? For instance, do the models reflect the sort of changes we expect employers to make based on what we actuaries tell them?

As actuaries, we tend to think that what we tell employers is important and they make changes based on it. If we say, "It's going to cost you a fortune," employers change the plan. Often, those sorts of perceptions don't appear to be reflected in models. At this point, we're looking at a project to say, what is out there, and how can we make sure that perspectives that are important to us are reflected? If those perspectives are not reflected, we will get legislation which does things that seem incomprehensible to us, or which have advertised effects we find unlikely.

The beginning phases of the project started around the time the health care reform debate came to a head, and more or less came close to an end. There were several people concerned with the lessons from the health care reform debate. One of the questions early on in the debate was, where were all the actuaries when the health care reform debate started?

It was not a surprise to actuaries that the health care reform debate was going to occur. We did a great job of playing catch-up and developing a number of responses to issues, but we were not, as a profession, prepared to answer questions at the start of the Clinton health care reform debate on how to model changes in the

health care marketplace, or what people will do, or what employers will do, or how marketplace participants will react.

The word was out from the current administration that we were going to have retirement reform next. Remember the health insurance purchasing cooperative (HIPC)? We were going to have people purchasing insurance cooperatives (PPICs) and they were going to be the latest thing that would make retirement available to the masses.

As the health care reform debate wound down, there was concern that there were many issues that we, as pension actuaries, have known about for years, but have not directly addressed in terms of the national debate. What are those?

- Why is only half the population covered by pension plans?
- Why is it there is a trend towards defined-contribution plans and is that trend appropriate?
- Do we, as actuaries, think that defined-contribution plans are the most appropriate way for people to receive their retirement income?
- Are there advantages and disadvantages of each?

There are many questions out there. We've asked many of these questions of each other. We haven't said much to the people who are building those models.

Next, there are things actually moving. There was an initiative from the Department of Labor. It gave the National Academy of Sciences a few hundred thousand dollars to answer the question, What do we need to know, in order to be able to make effective policy in the retirement area, particularly given the many questions arising in the health care reform debate regarding the role of employers and how people will react to changes? That study was funded and is nearly in its final stages; it will be coming out with a document sometime soon.

There was also an initiative from the President of the Society of Actuaries. This initiative asked if there was some way that we, as actuaries, could build the model so that we could actually come up with answers in these debates as opposed to putting out position papers. There was a question of whether we could have taken a more active role in health care reform if we had a model. This initiative asked if there was some way we could actually model what happens to retirement income and build a nationally representative data set. Finally, one saw employer groups and retiree groups announcing that they were going to issue new papers, new positions on the role of the employer, the role of the employee, and the role of the retiree. These papers would address Social Security and other items.

Based on that environment, we got approval to set up this project to go out and look at models of retirement income, and to ask, what's feasible for us, as actuaries, to do in this area? The process is a standard one in the research area. We issued an RFP and asked for teams of actuaries and economists working together to review current models and their uses, and to review whether they use the type of actuarial insights we're concerned with. The study has several phases. There's an educational phase; we need to know what's out there. Then there's a feasibility phase; if we know what's out there, can we add to it or construct something? Finally, there is a construction phase but not in this RFP. Should we decide to build or to add on to a model? (That, of course, would cost a lot of money.)

So far, this project itself has been funded by the Society of Actuaries Research Funds, the Pension Section Council, the Computer Science Section, the Conference of Consulting Actuaries, the American Society of Pension Actuaries, and it has participation from the Academy. It's a very high profile project because, once again, we're talking about how people look at modeling retirement and how they talk about retirement to policymakers. The project oversight group has a representative from each of those groups: the Society Vice President for Pensions, the President of the Conference, and representatives from each of the funding groups.

What do we expect to get from this project specifically? It has two phases. In phase one, we will have a description of the models which are out there in use. We intend to take this information and make it broadly available to members so that when you hear studies out there that say, we're going to have a horrible future for elderly women unless we do something to change joint-and- survivor rules, you will have an opportunity to say, is that based on something that reflects actuarial input or not? (I would argue that one of the key issues of actuarial input is does it reflect the cohort effects?)

Phase one will have an introduction or a report on one model. It will be reviewed by the oversight group. Then we'll go through and complete reports on other models.

Phase two will look at the feasibility of developing, adapting, or contributing to the model. That model would be used then by actuaries, either the Academy or individual members of the Society. One of the questions that would have to be addressed in this feasibility study would be how do you open it up? How do you make it accessible to people so they can say, this is important to me or to my client; let me use these data?

That is an overview of where we've been. As far as progress goes, the oversight group met with the research team. The research team is Ed Hustead from Huggins on the actuarial side teaming up with Joe Anderson of Capitol Research Associates. Joe Anderson actually wrote a couple of the prominent models in the area. He is an economist focusing mainly on simulation models. At any rate, the oversight group met with the research team to outline how we wanted to work this. We got a rough draft of explanations of models and a rough draft of the model. We've approved that rough draft and now we're starting to get reports, probably in the next month or two, on other models.

In the sample report there is a first chapter which is intended to be introductory. It explains what types of modeling approaches are used in public policy. It will be subject to some redrafting to make it more accessible to an actuarial audience so that we can all understand what the terms of the data are.

Chapter two looks at a specific type of model; micro-simulation. In chapter one, we really talk about the four different types of models. There are macroeconomic models, which we began to see development of before World War II. Those are the sorts of things which are quoted in the press all the time. Data Resources Inc (DRI) has a model, the federal government has a model, Brookings has a model, and Wharton has a model. These talk about the overall scope of the economy and how it reacts. Typically, these macroeconomic models apply to retirement, saying what's going to happen that is going to be an input to wages? How will productivity change? Those models can be affected by things like demographic change, and the aging of the baby boomers, but, overall, they're talking about large scale effects.

The second type of models are really transition matrix models. These are used by demographers and implicitly by actuaries. I'm not sure all of you recognize that you're using a transition matrix model. Oftentimes, you have a set of specified probabilities of transition from one state to another. For instance, transition from life to death, or transition from active employment to disability, and then from disability to retirement, death, or active employment. These sort of transition matrices are similar to the sorts of things we do.

Interindustry models don't concern me much. Finally, microanalytic simulation models usually referred to microsimulation models. Microsimulation models have a lot in common with actuarial work as well. In a microsimulation model, you take a bunch of units which might represent, for instance, employees, households, or individuals. Transition probabilities are then applied to the units to age the population and find out what could happen to the population in each of the following years.

That sounds very similar to what we do except—that typically these models do not produce a result for each fraction of a person. Instead, the aging of the work force is done on a stochastic basis. For instance, in a standard actuarial model, let's assume no turnover prior to age 50, and that at age 50, there's a 30% chance of retirement. There's also no mortality. The standard actuarial model looks at one person at age 50, he splits it into 0.3 of retirees and 0.7 active employees. These microsimulation models instead would say we're going to have 40,000 people. For each person, we draw a number between zero and one. If the number is between zero and 0.3, he becomes a whole retiree. If the number is between 0.3 and one, he becomes a whole active person, and moves on from there.

Now, the first model we're going to look at is Dynasim, which is the oldest of these models. Work on it began during the 1960s and continued during the time that ERISA was being formulated. Dynasim was not completed for the first time until 1975.

It was subsequently updated in the 1980s to what's called Dynasim II, although the update is also called just Dynasim. It's written in machine language and Fortran and runs on a mainframe computer. It's maintained by the Urban Institute. It is in the public domain, but the state of the documentation is such that it seems unlikely many people would be able to take it and use it outside of the Urban Institute due to the age of the documentation and the number of subsequent changes.

What I'd like to do is to review how the model works and what it's good for. Let's discuss the structure of Dynasim. It begins with a sample of the U.S. population. For that sample, they're using the 1973 current population survey, which is a sample of households. There's about 30,000 or 40,000 households.

Your first question may be, are you sure it's 1973? This was finished in 1975 and updated in the 1980s. Why are we starting with 1973? The reason for 1973 is that the census is of households for which we have data from the Social Security Administration which tells you the earnings history of each person in that sample. These data are compiled on an anonymous basis. But since then, in the U.S., privacy concerns have become much greater. This match was last done in 1978, and since that time, Social Security has not been willing to produce a matched history which people could use.

A key question might be why do we need this history of Social Security earnings? Well, if you're trying to answer questions about the population as a whole, you need to know when people were in and out of the work force, and how their earnings grew. Those of us who work mainly on employer plans have an advantage. We usually have as much of the employment history as we need for that

person and the jobs that person had in the past, or whether they had one is irrelevant to the employer pension plan, and so to our calculations. We're not concerned with issues about retirement policy in total. We're just concerned about the retirement they're going to get from that company. When you look at retirement policy across the country, you must have more data, which is why it's the 1973 data. This model, by the way, is still in use on an updated basis with pension information added. That's one of the reasons why I think it's important to know what some of these items are.

The 1973 sample has basically been rolled forward ("dynamically aged") by applying future changes in earnings, and then comparing the roll forward item with data we have about the general economy. We can project from this what the model says wages in the economy are for men, wages in the economy for women, and then they adjust those projections up or down. At this point, you're talking about projecting from a population in 1973 and then adjusting forward and back.

What does the model do? After aging this sample population, it really has three parts:

- the family and earnings history model,
- the jobs and benefits history model, and
- the cross-sectional imputation model.

These are the three key items in this model, and what they're designed to do is to give us enough data about the distribution of retirement wealth to be able to say, what happens if I change the Social Security rules? Will more people be in poverty or less? What happens if I change the age discrimination rules? Will more people be in poverty after retirement or less?

The process begins with the family and earnings history model. This contains 14 modules and is a full-fledged microsimulation model. In other words, it takes 14 events or characteristics and for each person, and for each year it models those events. What I would like to do, just so that you can get a sense of some of the strengths of these models (we've already talked about some weaknesses in terms of data) is read to you the events which are modeled.

For each of these 30,000 or 40,000 units, the model asks:

- Will they die?
- Will someone be born?
- Will someone marry?
- How will individuals, if they marry, select a mate in terms of age differentials and educational differentials?
- Will the household split up into separate units?

- Will the split home be due to divorce?
- Will people invest in education?
- Will they move from metropolitan area to metropolitan area?
- Will they experience the onset of disability or the recovery of disability?
- Will they change their labor force participation?

Those are the events that are modeled for each person in the sample, one by one, event by event, person by person, for the year. That sounds complicated to begin with, but it gets more complicated and realistic than that. For instance, if you look at death, mortality is modeled as a function of age, race, education, and marital status, and for married women between the ages of 45 and 64, the number of children is examined.

So just to determine the probability of that event occurring, you're looking at multiple items. This is a very sophisticated model of what happens to the population which is based on studies of how mortality correlates in the general population to each of these statistics: age, race, marital status, education and number of children. Birth, again, is modeled by age, marital status, number of previous children, race, and education. They also model multiple births and, of course, since you need it for your aging of the population, the sex of the newborn. Marriage is based on age, race, sex, previous marital status, income, education, region, weeks worked, hourly wage, asset income, welfare, and unemployment compensation. We have a whole list of the items that go into this model.

The issue here is that this is a very sophisticated transition matrix. Because of the level of sophistication, I think there is a lot of deference granted to this aspect of the model. To sum up the family and earnings history, the module goes through person by person, event by event, and year by year and produces a file. That file then has those households over periods of time.

The next major model component, the jobs and benefit history model, goes through and because it has already decided what the unit's labor force participation rate was in the prior module, it now models what their actual jobs were like, what sort of wages they had from those jobs, pensions, social security benefits, IRA accounts they may have set up, whether or not they decided to retire, and supplemental income for people in poverty. This model does not go through year by year. This model goes through and assigns these items once. It says, at this point, after I've modeled all these sorts of things, I'm going to go through and assign what their pension benefit was, and what their Social Security income was, etc.

Now, one of the questions you get to, at least if you're in our area, is, how do they assign that pension benefit? Well, the answer is that they have seven prototypical

pension plans which are based on the following data. They have a 1974 survey by the Bureau of Labor Statistics on pre-ERISA plans which gives them a sense for what types of plans are out there. The 1974 survey has been updated for a couple of changes. There was a recent survey in the 1990s on governmental plans and the types of benefits. They have also updated for the 1986 pension rules. For instance, they've updated the rule changes of ERISA and tax reform, but for the prevalence of plans, I don't think you're going to find cash-balance-type designs and other recent variations of plans.

Finally, in terms of who is receiving benefits from what type of plan, those data have been updated to 1983 based on the 1983 current population survey. What sort of data does it have on employer characteristics? We might think that the employer characteristics are going to have much effect on the types is pensions offered, bit it has none. Industry characteristics; none again.

From the Floor: What about level of benefits?

Mr. Bone: The level of benefits are updated through the 1993 current population survey. The level of benefits is, to some extent, going to be determined by these plans.

From the Floor: Is it like the flat dollar plan? In the flat dollar plan, the benefit unit goes out there every year. Will the modeling reflect current levels?

Mr. Bone: The good data you'll get will not be on plans. These plans are used primarily to say, here are the plan types. If in 1974, you had flat-dollar plans that were increasing with inflation, you'll have people assigned to a flat dollar plan which is increasing with inflation. The design of plans is primarily old. It does not reflect the types of things which are being done now.

On the other hand, there are many interesting questions you can answer with this type of a model. This is not the only model out there. It is first because it is the oldest—one that has been used most often. There are many sorts of questions you can answer. Some of them are because of structure. Let me just finish up with the structure, then I'll start talking about all the questions you can answer with this model.

The last model is the cross-sectional imputation model. It takes the current population survey data and imputes health status, activities of daily living, financial assets, home ownership, and eligibility for Social Security income. In other words, financial assets are not developed by saying, we assume a savings module over time. Financial assets are imputed at the end. Clearly, if you have issues such as

the increased prevalence of lump sums in pension plans, what do those lump sums do to asset incidence? Those are questions you won't be able to answer with this type of a model.

There are a number of other questions which you can't answer with this type of model. There are some important issues here. One is the data sources. There have been some significant problems in getting additional data to update it. Second, the data on employers and on what employers do, is not really modeled here. The focus is on individual and family behavior. As you heard in that first segment, we have a lot of good data in here; a good model of how individuals and families work.

The question is, what does that tell you about employer plans? There is no simulation whatsoever of the employer response to policy changes. As a matter of fact, it is not possible to do it with this model structure. We don't even have the ability for changes in pensions to affect employment histories because employment histories are generated before we even get to the issue of assigning pensions.

The model is theoretically accessible in that it's in the public domain. In terms of documentation, actual accessibility is low. So that's a whirlwind tour of Dynasim.

I wanted to finish up with two other items will show up in these reports. First we have policy matrices designed to say, can this model address certain questions on the effects of policy measures on employer pensions, for example?

Dynasim can address two things passively. We have another policy matrix which asks, can the model address the effects of policy measures on employees? Can it address the effects of policy changes on retirees? It can do a lot of that. It has a sophisticated model, and you're beyond the point where employers matter as much once people are retired. What does it say about industry outcomes? Nothing. What does it say about the effects of policy changes on the overall economy? Once again, nothing. What does it say about the effects of policy changes on government finances? It can give you some information on Social Security and how policy changes will change Social Security. It can't tell you much about other government finances. So for each of these models, we'll have a series of these policy matrices that we'll go through that will say, what can this model tell us about things? What questions can it answer?

Finally, there will be a summary description of the model and an actuarial critique. That critique will focus on the areas where we feel this model could use actuarial input or where it does not reflect the issues which we believe are critical. Personally, I hope that someday we'll have models which reflect the actual terms of plans and how they factor into employer-reported expense. If I tell someone, you

can do it this way, and it will cost you $5 million, or you can do it another way, and it will cost you $300 million, I can tell you, which one is more likely to be adopted. That is part of what I call my own actuarial model of how employers respond to retirement income, which is that they respond to what actuaries tell them about cost, price, and access.

This closes the update on this project. It is far removed from today's work, but it is not particularly far removed from tomorrow's work. These are the models which are being used to determine what will happen if we make changes.

I'd like to close with a recent example which demonstrates how having knowledge in this area could have helped us a lot. It pertains to the $150,000 cap on compensation. Many of us said, is that really going to have a big effect on pension funding? Are you going to get the deficit reduction you want? What's the point of a deficit reduction anyway? We're talking about putting money aside; deficit reduction is important so that the economy grows and people invest in productive assets.

One of the big questions at the time was, Are plans coming out of full funding? Did we know which plans? Did we know whether those plans were affected by salary increases? Did we just have data that said, some plans were coming out of funding and contributions were rising, perhaps, because they were underfunded flat-dollar hourly plans? Much of what it has done to us, in the name of revenues or in the name of policy, may reflect items for which we do not agree with the conceptual basis. Until we have an opportunity to review how that conceptual basis is derived, we can't change it.

From the Floor: How long is it going to be until we have models that are going to be able to answer the questions you just put forward. At what point are the models going to be completed? Do you expect we can get a partial answer?

Mr. Bone: Well, frankly, it's controversial as to whether the Society should build a model at all. There are a variety of views on the Oversight Committee. I am not convinced the Society needs to be in the business of building models. I think a lot of what is missing is a coordinated approach to how employers respond to changes. Perhaps one of the best ways we might affect these models is by helping to work on components of the models that model employer responses to policy changes. When will that happen? It's going to take a while.

There are a number of other issues in this area where there is just no good data. There's not a lot of good data on what employers do and why. You have data amassed by the consulting firms, but those data tend to rely quite heavily on their

own clients so that you don't have an overall approach. It's going to be a long process.

I can tell you about this specific report. Phase one should be finished so that we'll have reports on the various models probably in the fall. Phase two, the feasibility study, should probably move on thereafter.

From the Floor: How much coordination is there in working with various other interested parties or organizations?

Mr. Bone: Frankly, in the 1980s, one of the models I spent a lot of time looking at was the model EBRI was building, which is called Team. I spent a lot of time looking at what was going into that model. It was being built for EBRI by one of the accounting firms.

As far as moving ahead, I would expect that there will be coordination between modelers and EBRI; coordination with ERISA Industry Committee (ERIC), the Association of Private Pension and Welfare Plans (APPWP), the National Association of Manufacturers (NAM), and the other employer associations. It is something that I think may have to happen in order to have data sources. As far as this project itself is organized, it is focused primarily on saying, what are the policy drivers in getting that information well established within the actuarial community so we can then start to answer those questions?

Many actuaries are active in APPWP, ERIC, and EBRI. Until we have a well-defined basis for understanding what's in the models, or what's missing, and what it is we can bring to bear, I think it's a little premature to go into that.

From the Floor: How many of these sorts of models will we have to analyze to do that?

Mr. Bone: The current introductory chapter has a two-page list of models, and the idea is to look in-depth at between five and ten of the models, and to have some summary information on a lot of the other models. Many of them are not used in ways which are likely to interact with us as much as these do. Many expected Dynasim to be able to answer those types of questions because it's very similar to actuarial work. It applies transition matrices, etc. and generates cohorts of people over time. There is no employer response.

There's a more modern version of Dynasim which is being built at Cornell and is called Corsim. I believe they're doing it mainly in the programming language called C. It's intended to be a microcomputer application with a super computer

application as well for doing extended modeling processes. There has been some talk about the ability to integrate with that type of a model, especially one that is based on a more modern platform.

One of the problems with Dynasim is that it's mainly Fortran and machine code so that putting in new modules is difficult.

The representative from the computer science session is continually asking how would actuaries have access. As we go in the feasibility study, I think we'll look at that. We believe we need to review five to ten models with the idea that, as we move on into feasibility, we'll be looking exclusively at one to which we might be able to contribute.