LONG-TERM-CARE VALUATION ISSUES

Moderator:	BARTLEY L. MUNSON
Panelists:	STEPHEN R. ATKINS
	MARK D. PEAVY
	JAMES M. ROBINSON
	WILLIAM C. WELLER
Recorder:	BARTLEY L. MUNSON

- Current industry practices
- Regulatory needs
- The challenges – theoretical and practical
- Status and plans of SOA Task Force on Valuation Methods for Long-Term-Care (LTC) insurance

MR. BARTLEY L. MUNSON: I'm with William M. Mercer and work on the life and health actuarial consulting side. And more relevant to this session, I chair the Society of Actuaries' Task Force on Valuation Methods for Long-Term-Care Insurance. The task force members and the charge are shown in the Society's 1992 *Yearbook* on page 75. We'll talk about the charge. The task force was formed in the fall of 1991, and we're working hard to get our work done responsibly but as quickly as possible.

There's a certain logic, we think, to the four items that are identified in our list of topics. They will be covered in the order stated. That is, we're first going to talk about the current industry practices on valuation methods for long-term-care insurance; second is the regulatory needs; third is the challenges, both theoretical and practical; and, finally, we'll discuss the status of our task force and our plans for the future. Each of our panelists is going to cover one of the topics. Bill Weller is senior actuary at the Health Insurance Association of America (HIAA). He is going to report on a survey that he has done on member and nonmember companies regarding their reserve practices and give us a feel for what is happening in the industry. He is the one member of the panel who is not a member of the task force. We thought we should have some independent, outside, honest perspective on us and we invited Bill to give us this first overview.

Next, Mark Peavy is going to talk about the regulatory perspective, the needs. Mark is life and health actuary with the National Association of Insurance Commissioners (NAIC). I was delighted when he agreed to serve on our task force, because we do need direct input from the regulators. Mark does continue to remind us of their needs and their desired time line. He will talk a little bit about that.

Then we'll hear from Jim Robinson, who's both a Ph.D. and an FSA. He's assistant professor in the Graduate School of Business at my alma mater, the University of Wisconsin. Jim has worked on subjects like this and he'll tell you a little bit about where some of the ideas he has on long-term-care valuation come from. I believe he will make reference to his National Science Foundation work on this subject. He'll talk to us both about the theoretical and practical. There are some pretty daunting theoretical underpinnings that we, as a task force, want to be reminded of and that we want to struggle with as we look at the practical side of our challenge also.

Finally, Steve Atkins, second vice president for long-term-care finance at UNUM Life Insurance Company and a member of our task force, will give you the overview of what we're doing, how we're going about it, and where we think we're going to go, including a meeting we are still going to have here in Las Vegas before the task force leaves town. There are several task force members in the audience and I would encourage them to participate in the discussion.

MR. WILLIAM C. WELLER: I want to thank Bart for giving me the opportunity to present some of HIAA's data.

In early 1991, we were looking at what we could do to add, from an actuarial point of view, to the studies that HIAA has been doing on long-term-care insurance. One of the things that we thought would make a lot of sense was to get some idea from the companies of what they anticipated their reserves would look like as the policies that they are selling moved into later durations. We had a lot of aspects that we would have liked to study. What I'd like to do is to go into some of the things that we couldn't study and why, so you understand why HIAA ended up with the finished product looking at ratios to gross premiums.

We would have preferred to have studied the actual levels of reserves that companies were going to hold. We quickly determined that there were too many plan variations to do that in a study. There were so many differences in things like eligibility criteria that trying to compare one reserve of a company with that of another company would be impossible. We would have liked to get the reserve basis assumptions that companies use and see how those compare. To a slight degree, Tillinghast has done that recently by talking to 12 companies about their assumptions. But to get actual reserves or some idea of what their reserves are likely to be, you have to get the morbidity assumptions, which even our members weren't willing to give HIAA, in spite of my promises of confidentiality. There is a concern for proprietary measures in this, and we also were concerned about the potential antitrust implications.

My next goal was to get reserving practices and what companies felt the premium effects would be of various levels of reserves. We, again, felt that we were unlikely to get that kind of information. To a certain extent we felt that the effect on premiums of reserves, particularly if you're talking about statutory reserves, is something with which the company has to live. You can't exactly argue that because statutory reserves increase the premiums; you shouldn't have to hold them. At least I don't think Mark would agree that that's a valid approach.

We decided that one result of our study should be results presented so that actuaries would have something which gave them some idea of where the industry was and with which they could compare their results. What we were able to do is provide some baseline information. The hope is that as you develop products and then create the reserves, based upon your pricing morbidity assumptions with some margin, that you will be able to say where you stand versus where the industry is as this product goes out into the 10th, 15th, and 20th year. Second, we thought that we could get some minimum proportion of premiums that would be used as the industry and regulators try to determine what is appropriate equity for policyholders in the event of lapse. Third, we wanted to see if there was any uniformity in the slope of the

reserve among companies, because the slope should have some relative relationship to the underlying morbidity. That's what we hoped to achieve.

The way the HIAA did this was to develop a set benefit package and ask that this package be the plan that we would like companies to relate. If they had several plans, we only wanted the plan closest to it (and make adjustments, if necessary, for that). The plan we picked was an $80-a-day nursing home benefit with $40 for home health or day care. We used an eligibility criteria of three Activities of Daily Living (ADLs). That's probably too high for the marketplace now, but that's what we used in the survey. We assumed a four-year benefit period, and a 20-day elimination period. We asked companies to adjust if they were using something other than a one-year full preliminary term reserve method. So they would move the issue age up or down one year, depending on whether they were using a two-year preliminary term or net level premium method. We sent the survey out to companies after it was reviewed by the HIAA Long-Term-Care Actuarial Subcommittee.

The survey went to 111 companies that were on the HIAA list of those selling long-term care. We received completed responses from 38 companies as well as one reinsurer who does turnkey operations for companies. We also received responses from 34 companies saying that they weren't really in the long-term-care business the way it would make sense to have reserves for it. A number of them said they offer accelerated benefits on life insurance, and while they hold some additional reserve, it's not related to the premium. Others said that they were selling LTC insurance, but it was a turnkey type of operation and that they weren't actually doing the reserves. When we backed those out, we ended up with a 51% response rate, which I guess is better than what the Society gets when it asks you to vote on things. We knew which companies were responding and were able to determine that the responses covered about 65% of the long-term-care marketplace.

We asked the companies to provide a ratio of the reserve at the third, eighth, thirteenth, and eighteenth duration to the initial premium. We thought if the benefits were a little bit different, it would still be a reasonable basis for comparing companies. It would also allow you to use these results because you would have your premium and your reserves and you could determine whether your ratios were consistent. We received good information from a fair number of companies, but out of the responses there were some that we had to exclude. For some of them, the reserve ratio never got over one. The assumption is that those companies were properly reserving but it was an attained-age product. There were some others that gave us just a few of the cells, and we didn't feel that it was appropriate to use those. We had a few companies where the eighteenth duration didn't seem to progress from the thirteenth in any reasonable form; I think that's probably because of some way in which they are building in persistency differently than other companies. It's also possible that they have done it with inflation protection in the policy when we asked that this be on a noninflation basis.

As I review them, you'll see the factors are for a noninflation-based policy. They are ratios of the reserve on a one-year full preliminary term method, to one premium.

When we got the results, rather than just presenting an average, given the way in which we hope the results will be used, we thought it made sense to break things

into three groups, those with low average ratios, those with medium averages, and those with high averages. I want to make it clear that even though we don't know what the premium is, the fact that a company may be in the low average from a ratio point of view does not mean that they have a low reserve or a high premium. It's just that the ratio is low. And that criterion was somewhat arbitrary. I did it looking primarily at the ratios for issue ages 65 and 75 at the eighth duration.

I'd like to discuss some of the results. There are four issue ages that were used. Chart 1 is issue age 55, the ratio of the reserve to gross premiums. For issue age 55 through duration 18, basically you are in an accumulation mode. It also shows that I was good at picking my low, middle, and high ratio companies.

CHART 1
Long-Term-Care Active Life Reserves
Ratio to Gross Premium -- Issue Age 55
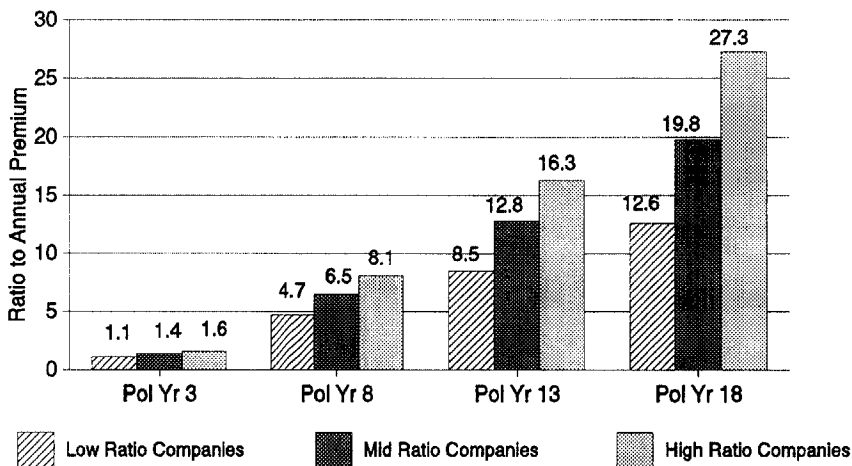
Charts 2 and 3 show issue age 65 and issue age 75, respectively. At the later durations, we're starting to reach the point where we're not accumulating reserves anymore. For the high and middle companies, they're staying relatively level and, as you can see, for the low companies, they actually reduced from the thirteenth to the eighteenth years. At issue age 80 (Chart 4), they never get very high, and they are definitely reducing for the low- and the middle-ratio companies.

The next thing that we did was look at the ratio of the thirteenth and eighteenth durations to the eighth duration, which we hoped would give us some idea of the slope of these various results and if there was any reasonable relationship there. I think the answer is, in the accumulation phase, there's a very good relationship because there's not much variation between companies. Charts 5-8 show each of the four issue ages. Charts 9-12 show the actual numerical values of the ranges.

CHART 2
Long-Term-Care Active Life Reserves
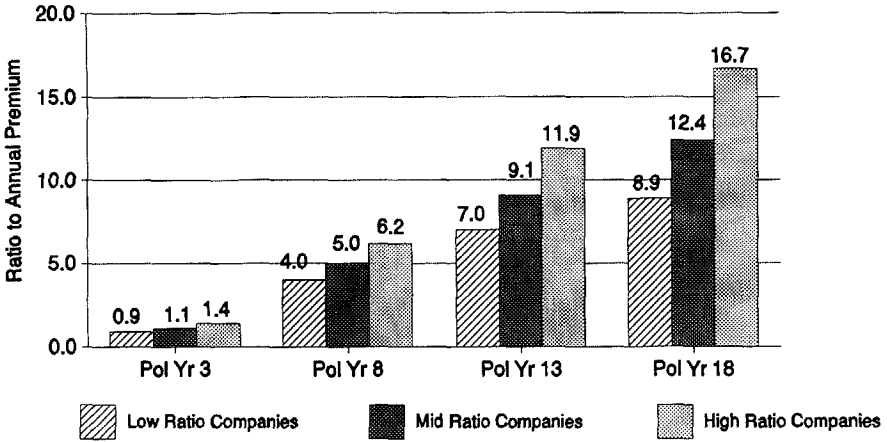Ratio to Gross Premium -- Issue Age 65

CHART 3
Long-Term-Care Active Life Reserves
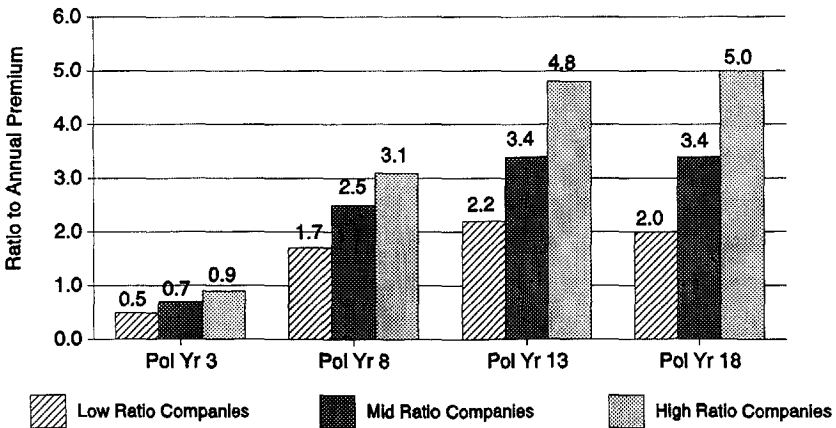Ratio to Gross Premium -- Issue Age 75

CHART 4
Long-Term-Care Active Life Reserves
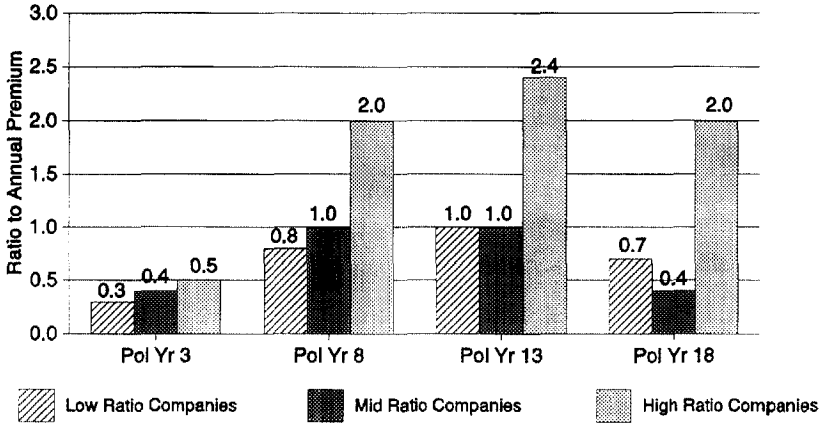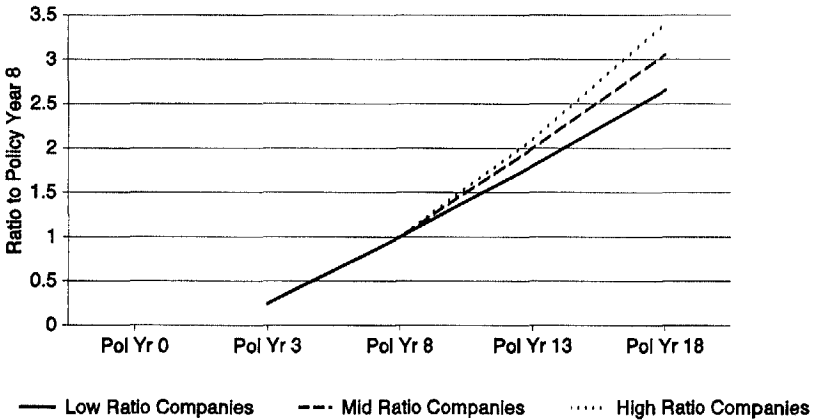Ratio to Gross Premium -- Issue Age 80

CHART 5
Long-Term-Care Active Life Reserves
Slope of Reserve -- Issue Age 55

CHART 6
Long-Term-Care Active Life Reserves
Slope of Reserve – Issue Age 65

—— Low Ratio Companies　　– – • Mid Ratio Companies　　· · · · · High Ratio Companies

CHART 7
Long-Term-Care Active Life Reserves
Slope of Reserve – Issue Age 75

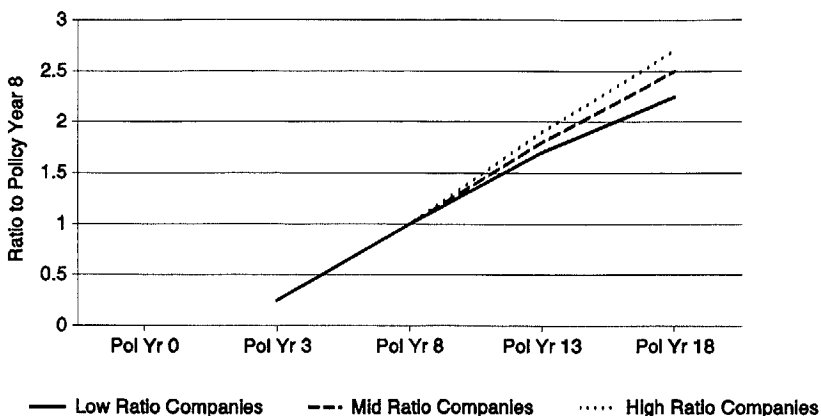—— Low Ratio Companies　　– – • Mid Ratio Companies　　· · · · · High Ratio Companies
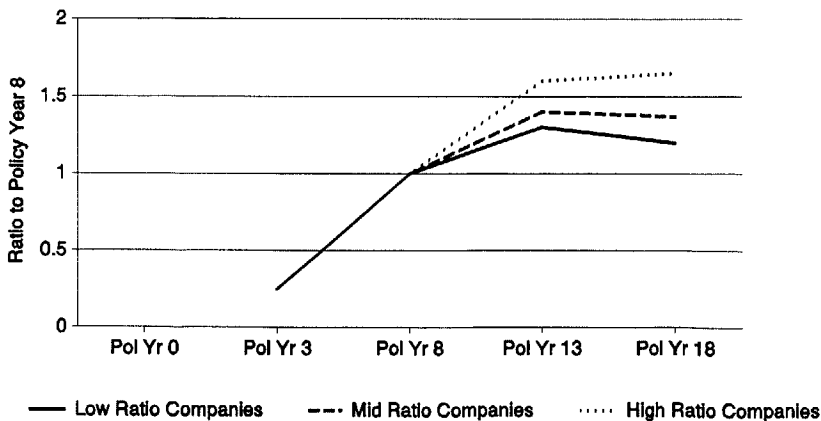
CHART 8
Long-Term-Care Active Life Reserves
Slope of Reserve -- Issue Age 80
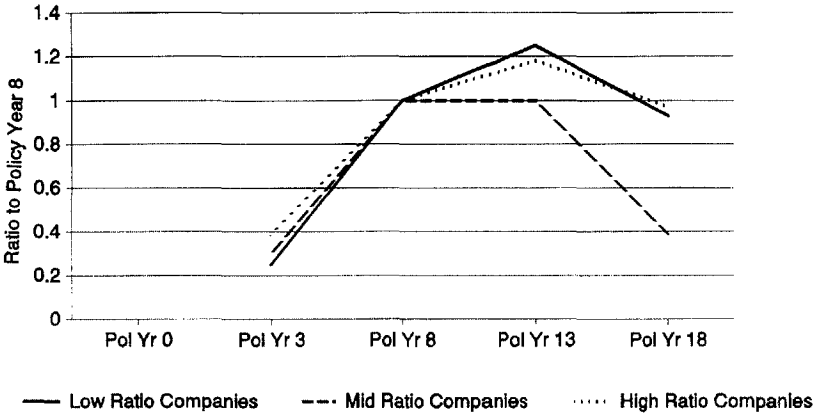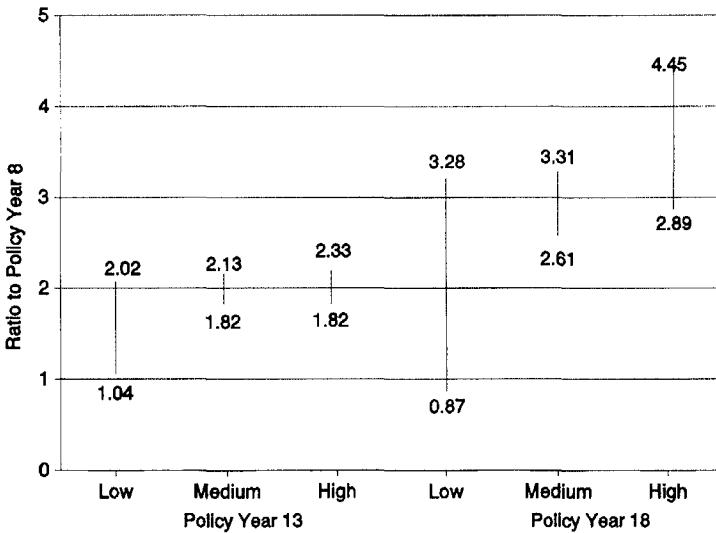

CHART 9
Long-Term-Care Active Life Reserves
Variation within Chart 5 -- Issue Age 55

CHART 10
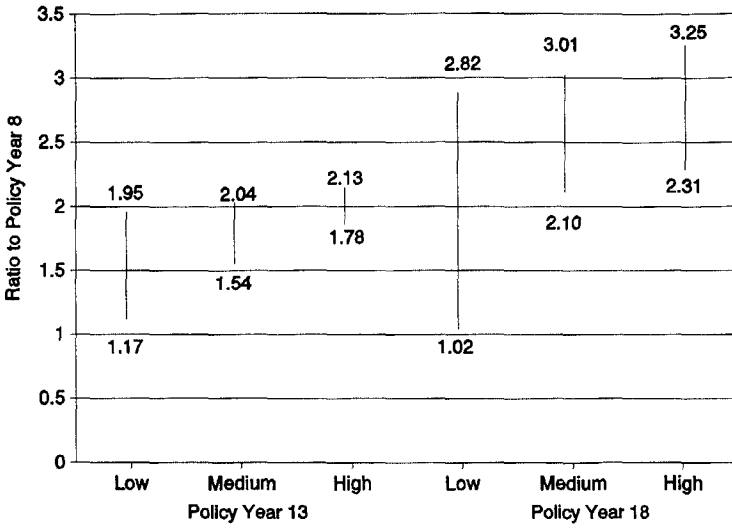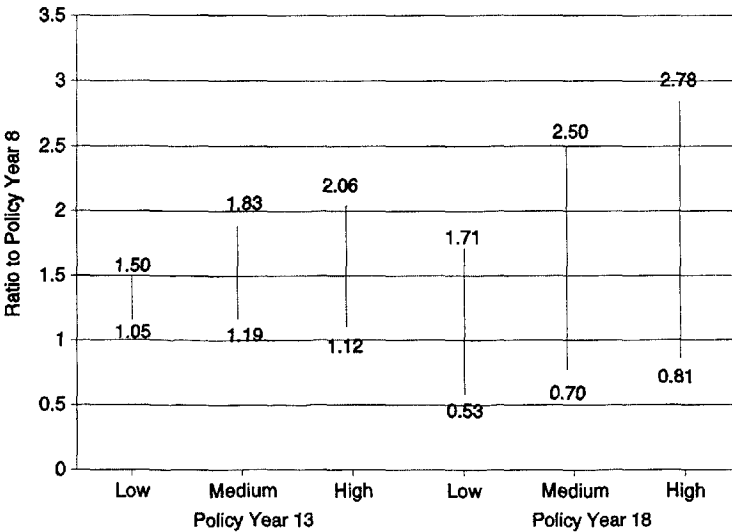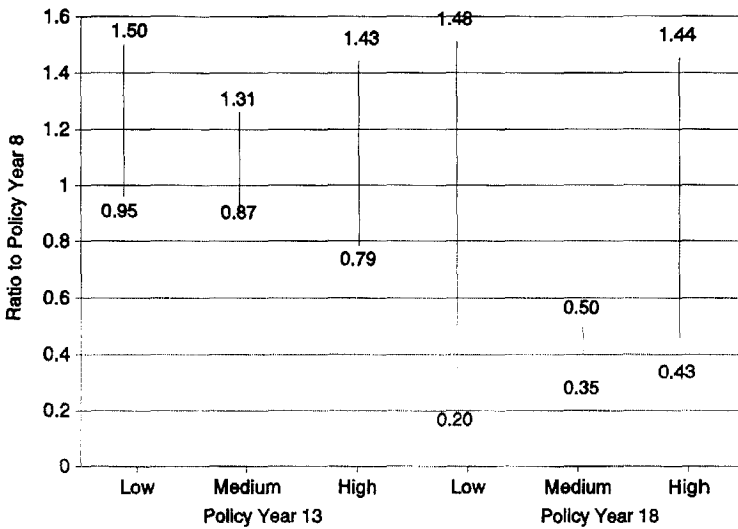Long-Term-Care Active Life Reserves
Variation within Chart 6 -- Issue Age 65

CHART 11
Long-Term-Care Active Life Reserves
Variation within Chart 7 -- Issue Age 75

CHART 12
Long-Term-Care Active Life Reserves
Variation within Chart 8 – Issue Age 80

For issue age 55, it's basically very consistent in the accumulation years. These charts give you some idea of the variation within the low, middle, and high companies in terms of the lowest reported ratio to the highest reported ratio. Recognize that these are the ratios of the thirteenth year to the eighth year on the first three bars and the eighteenth duration ratio to premium to the eighth duration ratios. So this is a ratio of ratios. At age 75, it starts to get a little wider. At age 80 the range for the medium companies is narrow because of a fairly small number of companies. We received less data for issue age 80 than any of the others, so it's not necessarily true that reserves inherently have a very narrow band.

One of the things that interested me about the responses was the number of companies which did not have different ratios based on sex. We asked companies to split their ratios for males and females, and only 26% (seven out of the 27 companies) actually split male versus female. I think that's because companies are using composite pricing assumptions for the morbidity. That may be realistic from a morbidity point of view, but I question whether it's appropriate from a reserve point of view for the continuation and the survivorship not to have sex-distinct results.

MR. KERRY A. KRANTZ: I just wanted you to talk about the difference in additional reserves between a strict statutory mid-terminal and the formula which takes the larger of zero and the mid-terminal plus the net. Which ones were the companies using or were they all using one or the other?

MR. WELLER: Okay, I believe what we asked for was the statutory mid-terminal without the unearned portion. This was basically to get the active life mid-terminal to premium.

MR. MUNSON: Bill has offered to share those results with our task force. I think we'd like to poke at them a bit and see what they suggest to us. They're certainly not a basis for setting any valuation standard or tables or factors that Steve will talk about, but we felt, as a task force, it would be very helpful to at least know as much as we could about what's going on in the industry.

MR. MARK D. PEAVY: Since I've joined the NAIC, I find I'm a lot more popular a participant on panels and in other sessions. I know it's because of my dazzling style at giving speeches as opposed to my connection with the NAIC. My interest in long-term care began in a real way when I was in the Florida Insurance Department. One day I found myself with about 30 or 40 long-term-care filings stacked on my desk. This was in late 1988, and early 1989, and I said, well, it would be interesting to try to cull from these filings some sort of consistency on the assumptions that were being used in terms of the pricing and the reserving. So I tried to pull comparable policies and compare the assumptions that were being employed. I got a little bit of the feel that Bill got as a result of his survey. I believe for similar-type products, the range in prices was about four to one. Bart's asking what the regulators are looking for. I think it's more of a comfort level, either that four to one is appropriate and there are rational reasons for it, or, if it's not, maybe the work of the Society of Actuaries Task Force can perhaps narrow that range. Perhaps we can get more of a comfort level with at least the reserve that is being set up for these long-term-care policies.

In establishing appropriate reserve standards, I guess there are a couple of places that we can point to as the fundamental references. In the NAIC model long-term-care regulation, as it currently exists, Section 15 refers to reserve standards. Basically, it breaks up the requirements or the guidelines into two components. The first section relates to long-term-care benefits provided through the acceleration of benefits under life policies. It refers to the standard valuation law as providing appropriate guidance there. It further mentions that it is most appropriate to use a multidecrement table when establishing these reserves; similar decrement approximations are appropriate if the calculation produces essentially similar results. It also goes into an extensive list of items that should be considered when establishing the reserves and considering the reasonableness. There are 19 items that were listed.

The other type of products mentioned are "all other" products -- basically stand-alone products. And there it refers to the NAIC Model Regulation on Minimum Health Reserves as being the appropriate standard. As you're all aware, at the NAIC last year, the minimum health insurance reserve standards were modified to reflect a one-year preliminary term approach to the reserving of long-term-care products.

I was interested -- and was urged -- to try to get a little better feel for what was going on at the state level in terms of reviewing the rates and reserve adequacy. As a result, I recently sent out a message to the states via electronic mail asking for a description of their review procedures. While the number of responses was fairly limited, they were fairly consistent in terms of the approaches that were used. It was basically to the effect that, "We're still in the infancy stage in terms of coming up with models or procedures by which we would review the adequacy of rates and re-serves." The other responses were similar. We received one response from a state that said we do not have any domestic insurers that write LTC insurance.

In the future we are going to try, as the long-term-care regulation is adopted and as we enhance our communications with the various states, to formalize these procedures to the extent we can. To the extent that I can, I will provide some guidance in terms of reviewing the policies and the reserving requirements.

One of the specific activities that we are doing at the NAIC is trying to build a database and trying to create some standardization. We now have the long-term-care experience reporting forms that were used on a trial basis last year. This year, for the first time, they will be a formal part of the reporting requirements. Last year, we tried to get a feel as to how effective these forms were for soliciting information from the companies in terms of what their actual experience had been. We had very few responses, and most of the responses we had simply said we don't write long-term care. A minimal number of responses actually included data. There's going to be a shakedown period, obviously, in terms of people getting comfortable with the information that is actually being requested on the forms. It's going to take several years to build up experience through these forms. It's very important that we start to accumulate this information. As the information does build up, we may have a better chance of having some statistics we can point to in terms of standardizing and developing minimum levels of the reserves.

The issue of the appropriateness of the one-year preliminary term method for the long-term-care products has come up. A company wrote to the NAIC Life and Health Actuarial Task Force and asked that the task force investigate the appropriateness of that method at this time, given the tax concerns that exist. I don't remember whether an official vote was taken, but I'm sure that the task force will be revisiting that issue in terms of seeing what, if any, degree of flexibility can be given. I can't speak for the task force, but if I had to guess, I think it would be reluctant to pull back even on a temporary basis from the one-year preliminary term method. At least the sense I have of the task force is that they feel that given the steepness of the morbidity curve, and given all the uncertainties that exist with this product, they feel much more comfortable with a higher level of conservatism in the reserve approach.

MR. MUNSON: The Society's task force has not done much of anything with this one-year, two-year term issue. We certainly haven't concluded anything, though I think from comments at our last meeting we probably are leaning towards one year. The issue Mark alluded to is that a company can only deduct for tax purposes reserves that are on a two-year full preliminary term basis. It would be nice if those tax reserves were consistent with statutory; it has been suggested, and perhaps it would. Though I can't speak formally for our task force, our goal is to do what we think is right from a statutory valuation basis, even if it must be sometimes inconsistent with some other bases, including tax. So we're going to focus on that issue.

We've heard a little about the industry practice, which is tough to summarize, even with a survey that's had a lot of work put into it. We've heard about the regulatory needs and the status of regulation which is, I think, a little fuzzy in terms of what the different states are doing or need or want; but we know that the regulators are strongly pushing us (rightly, in our opinion) to come up with some valuation help. Now we're going to hear a little bit from Jim on the theoretical and practical issues we're wrestling with as a task force.

MR. JAMES M. ROBINSON: By way of introduction, I am an academic. I used to be an actuary. I went back to the academic life in 1984 and have been teaching actuarial science at the University of Washington since then. My perspective on things has gradually changed, and you'll probably note that in my presentation. If it's not exactly what you're looking for, I apologize in advance. Hopefully, some of the information will be enlightening. I tend to take a longer-term perspective on some of these issues and see long-term-care insurance as one product in an evolution of products over time. That is the approach that I'm taking in looking at the theoretical issues involved in valuing this type of product.

I should comment that most of what I'm going to say is in a National Science Foundation proposal that has recently been approved, and I'll be working on some of these issues this summer. If you're interested in pursuing some of the ideas that I have, I may have a paper somewhere down the road, six months or a year from now, that will pursue some of the questions that I'm raising today. With that out of the way, let's begin.

The title of my presentation is "The Challenges -- Theoretical and Practical." I think from a theoretical point of view everything's simple, because you can generally assume away any problems you have. The practical side becomes much more of a sticking point, and I don't want to spend most of my time developing the theoretical model, but talking about some of the practical issues that are raised in applying the model. The paper that I'm working on basically houses long-term-care insurance as one of several possible multistatus insurance or annuity products. Think of an individual insured or annuitant who is going through several stages or statuses as they move through life.

In Table 1, with this contract, we have a significant example of a situation in which you can bounce back and forth from one status to another, rather than simply leaving a status and never returning. We're getting into products now where you can go from the "never used" status, which you'd never return to again if you left it, to "nursing home" status to "community care," back to "discharge" status; then you might die (that's an absorbing state, generally). The idea is that there are at least a few statuses that you can move in and out of, at least in theory. The probabilities associated with those are another matter.

TABLE 1
LTC Insurance as Multi-Status Insurance

Statuses:	Never Used LTC Discharged Nursing Home Community Care Dead Lapsed	Married Unmarried

Another dimension to this might be related information about the insureds or the annuitants, whatever you want to call them. They might be married or unmarried. Certainly, their sex would have an implication on the probability of moving from one status to another. To abstract this and generalize it, I've simply made a notation.

Let's call M_t, the status of the policy at policy duration t, and let's just say that there's a finite number of statuses, just to simplify things. So it could be status one, two, or three up through m. I've listed six statuses here. If you want to break up at least the first four into married and unmarried, you've got 10 statuses, but it serves as an example.

The status of an individual at any point in time in the development of the policy can be summarized by a vector of the past statuses, what I'll just call the history of the policy through time t.

$$\text{Status History: } H_t = (M_0, M_1, \ldots, M_t)$$

So you can simply say the person at time zero is in status M_0, he then moved to status M_1, etc. The policy moves along up through time t to the current status, M_t. The policies that we're working with, in this case long-term-care insurance, can have cash flows in and out of the policy that depend possibly on much of the information that's developed up through time t. We might, on the other hand, at the extreme, be working with an example in which the cash flows are fixed over time and only vary with the individual's current status (Table 2).

TABLE 2
Policy Cash Flows

$C_t(H_t)$ versus $C_t(M_t)$ versus $C(M_t)$	
$-P$	Never Used
$-P$	Discharged
$C = 1$	Nursing Home
0.5	Community Care
0	Dead
0	Lapsed

Just to give you an example, for the simplest case on the right-hand side you could say that the cash flow at a particular point in time might be minus the premium rate. If you're in the never used category or in the discharge category, it might be a $1 outflow per time period while you're in the nursing home, maybe half that amount if you're in community care or home care, and zero if you're dead or lapsed. That would be a very simple structure. Most policies, of course, are more complicated than that and depend upon, in some way, how you got to the current status. There may be lifetime limits, possibly lifetime deductibles. It certainly might depend upon how long you've been in the current status without regard to how many times you've previously been in that status. So there might be any number of intermediate and stopping points between this extremely simple case that I've shown here and the case where the cash flow at any particular time depends upon the complete history of what's happened up through that point in time. So that defines the cash flows in and out.

We also need to have some idea of the probabilities associated with being in various statuses at various points in time. I suppose one way of summarizing that is to look

at transition probabilities. What's the probability that you moved to status j given your current status history up through time t? In the extreme, you might want the complete history to determine the current transition probability. Or you may throw away information other than what your current status is. Or, again, an intermediate point might be that the probability of being in status j at the next duration might also depend on how long you've been in the current status. Maybe you don't need to know what your previous status history was other than where you are now and how long you've been there.

Transition Probabilities: $Pr(M_{t+1} = j | H_t)$ versus $Pr(M_{t+1} = j | M_t)$

The intent of Table 3 is not to get you bogged down in formulas, but to, hopefully, clarify some of the information that's used in constructing reserves. When we start to talk about reserves for long-term care, we can go back to basic principles and, hopefully, the reserves that are held are something like the expected discounted value of future cash flows on this policy. Notationally you can write that down with this kind of a formula, in which the outer sum is a sum over all the possible status histories that an individual might go through. You have the probability of going through status history, h_t, and then for that particular scenario, the inner sum simply discounts the cash flows that the policy generates under that particular hypothesized status development. So actually the formula looks a little messy, but from a basic point of view it's very straightforward. We can recursively recalculate the probability of being in a particular status history progression. The probability of being in a particular progression can be built up from the start of the policy up through time t by multiplying conditional probabilities of moving from one status to the next.

I'd be a little remiss as an academic teaching out of the new *Actuarial Mathematics* text if I didn't talk about variances. If you want to calculate variances and you have the formula for expected values, of course, the variance is just a slight modification -- just square the discounted cash flows. Take the average of the discounted cash flows and subtract the first moment squared. If you're looking for some way of measuring the uncertainty involved in your reserves, maybe you want to go ahead and do this. I think you'll find on the next table that a lot of this is very nice in theory but is very difficult to accomplish. We can write down recursion formulas very easily in theory -- the reserve at time t in terms of the reserve at the next duration working backwards. There doesn't seem to be any reason, at least in theory, why we can't do that.

We can do the same thing with variances. If you've studied out of the new *Actuarial Mathematics* text, you might have encountered the Hattendorf Theorem. There's an extension of the Hattendorf Theorem that uses Martingale theory. It allows you to construct a recursion formula for the variance of the reserve at time t. Now all of this is fine and good.

You know, in theory, you can write books about this and look at special cases, but how can we rearrange the summations in order to minimize the number of calculations involved? Right now, the practical issues right now simply make it impossible to apply some of these formulas, at least in a very efficient way.

TABLE 3
Reserves as Expected Discounted Cash Flows

$$E = \sum_{h_T \epsilon S_T} Pr(H_T=h_T)\sum_{t=0}^{T} v_t C_t(h_T)$$

$$Pr(H_T=h_T) = p_0(m_0)\prod_{t=1}^{T} p(m_t;h_{t-1})$$

$$Var = \sum_{h_T \epsilon S_T} Pr(H_T=h_T)\left[\sum_{t=0}^{T} v_t C_t(h_T)\right]^2 - E^2$$

$$E_T(h_t) = C_t(h_t) + \frac{v_{t+1}}{v_t}\sum_{m_{t+1}=1}^{m} p(m_{t+1};h_t)E_{t+1}(h_t,m_{t+1})$$

$$Var_t(h_t) = \text{"Hattendorf Extension"}$$

Before I go on to the next table and get into the practical issues, I want to discuss the dependence of any reserve on some set of information that you have about the individual contract or the group of contracts that you're valuing at time t. The reserve, as I've labeled it, is a conditional expected value at time t based on what you know about the policy at time t. Rather than using all of the information that's available, companies seem to be using what they can practically implement based on the amount of information that's available with respect to transition probabilities in terms of the expediency of the calculation. But I think it's always good to think of reserves in the setting of conditional expected values based on information that's available. How much information you use is a question of balance.

Okay, these theoretical formulas would be the most appropriate reserves if we had all the time in the world and perfect information to do these calculations.

Now what are the practical problems with these calculations in Table 4? Well, probably the one that's been talked about most during the sessions that I've attended is the lack of experience data that can be used in calibrating the transition probabilities or generating the scenarios that you're likely to encounter. That, of course, is one of the key purposes of the task force -- trying to settle on a reasonable standard for reserve calculation purposes. From my point of view, even if we get past that point we're still going to have problems doing things in a theoretically correct fashion with this contract. If you look at the calculation of the reserve at any point in time and simply look at the number of calculations involved in going through all the possible status histories over 30 years, on a monthly basis, we're talking about a sizeable number of loops in your computer program.

If you have m statuses and 360 months that you want to look at, and let's say it takes one second to go through each scenario and discount the cash flows associated with that scenario, you've got 10^{282} loops. If it takes a second per loop, it will take you approximately 10^{274} years to do that calculation. It's inconceivable, unless

computing power goes through the roof and something happens to the speed of light in the near future to enable us to do some of these calculations exactly. If you're talking about a life insurance policy where you're either dead, lapsed, or active, you really have two absorbing states and an active state and you can do these calculations in a matter of seconds. But when you start moving up into a few statuses that you can bounce back and forth into and from, really the theoretical calculations, the natural extensions, or the type of calculations you have in life insurance and simpler health insurance contracts, go through the roof.

TABLE 4
Practical Considerations

Number of Calculations Required for E	
$m =$	6, $T = 360$, 1 second per loop 10^{282} loops, 10^{274} years
$m =$	6, $T = 30$, 1 second per loop 10^{24} loops, 10^{17} years
$m =$	6, 2 absorbing states, $T = 30$, 1 sec 10^{19} loops, 10^{12} years
$m =$	6, $T = 360$, Markov, 1 sec 13,000 loops, 4 hours

So you say, well, I can't live with that. Maybe I can back off and do the analysis on a yearly basis, just use average cash flows for the entire year rather than do a monthly resolution of this calculation. You find that you really have to back off quite a bit to even get this to look halfway reasonable. If you go down to 30 years instead of 360 months with six statuses and one second per loop, it's still going to take you 10 to the 17th years to get this calculation done.

You start to say, well, what else can I do? Well, we can recognize that two of the statuses, at least in this example, are absorbing states. If you enter those there's no chance of ever coming out. You throw that into the analysis and it still takes you 10 to the 12th years to do the calculations. This assumes that the probability of going from one status to the next depends upon the complete history of what's happened up to that point in time. I mean you can't throw anyway any of the details of what's happened to that individual and get the correct probability of going to the next status. Likewise, it assumes that the cash flow at any particular point in time in the contract depends exactly on how you got to the current status. If you can simplify those assumptions and if you can do it in the extreme (what I call sort of a Markovian assumption), you assume that your probability of going from one status to the next only depends on where you are; and if your cash flow at the current point in time only depends upon what status you're currently in and how long you've been there or how you've gotten there, then you can do this in a reasonable period of time, about four hours more or less. It's certainly doable.

So one of the primary purposes of my analysis is to look at mid-range here. How far can we go with the analysis and still be able to do the calculations in a reasonable period of time before we have to resort to other methods or approximations? Well, what's an alternative? If we don't want to make this very simplistic assumption that

how we move from one status to another and what the cash flow is at a particular time only depends upon where we are currently, how can we get a handle on things? Well, one approach, and one that I've had some experience with, is simulation techniques (Table 5).

TABLE 5
How Many Simulations are Sufficient?

Conservative Approach:

To make standard deviation of sample mean $< k$,

$$n > (U - L)^2/12k^2$$

$$U - L = 1,000,000 \quad k = 100$$
$$n > 8,000,000 \text{ cases}$$
$$U - L = 1,000,000 \quad k = 1,000$$
$$n > 80,000 \text{ cases}$$

Bootstrapping: Simulate several thousand cases and continue sampling until sample variance is less the nk^2.

I did this for the State of Wisconsin under a subcontract to the Robert Wood Johnson Foundation and my model's been used a bit by the NAIC Task Force in studying nonforfeiture and inflation benefits. I have some experience with simulation techniques. You run into the same problem in a different form if you really start looking at the accuracy of your simulation results. How many simulations do you have to run in order to get a good estimate of what the reserve or what the premium should be on this contract? What you're doing is simulating on each run the discounted cash flows in the future, so that's X. You're going to generate several iterations of X. You're interested in the average value of X. How many of these things do you need to simulate? Well, if X lives on the range from L up to U, lower limit up to some upper limit, and U minus L is about a million (I think maybe 500,000, 200,000 or even 300,000 might be more appropriate). If you didn't have any idea what the distribution of that random variable was and you simply said, "Well, let's assume it's uniformly distributed across that range," then in order to get the standard deviation on your sample mean from your simulation down to a reasonable level, say less than K, you need a considerable number of simulations. And you can get a general idea here of what's involved. The greater the precision (that is, the smaller the value of K), the larger n is going to be and you can plug in your own numbers.

That's a fairly conservative approach. Of course, the actual distribution presumably has heaped towards the expected value. It's not spread out as much as uniform. What might you do in order to determine the appropriate number of cases to simulate? Well, you might do something like bootstrapping. Go ahead and simulate a couple of thousand cases. Take a look at what the sample variance is and then hope that your process is relatively stable and that it's in the right ball park as far as the true variance of the discounted cash flows. Continue to sample until your estimate from your sample of the variance of an individual, X, if you will, is less than n divided by K^2.

Okay, what else may you do other than resorting to simulation? I think many people have looked at simulation and found that it is very time consuming. You tend to generate a lot of paper. Well, you can start to collapse statuses. Realizing that you actually may have six or seven statuses to start with, you start to group them together and say, at least for reserve purposes, that I'm not going to make a distinction between the "never used" category and the "discharge" category. You'll hold the same reserve on those groups. Maybe you group the claim statuses together, "nursing home" and "community care," and average the benefits that are payable to construct an averaged continuance table. Maybe you split them out and do two completely separate analyses, one for "nursing home" and one for "community care" and add the results at the end, ignoring the interaction between the two.

There are many approximations that you might use, as long as you're aware of the potential pitfalls. You could use Markovian transition structures and basically ignore some of the information that's available at valuation. That might help you improve your estimates of these expected values that are the basis for reserves. You can assume simplifications in your policy cash flows, that is ignore things like lifetime limits at the beginning of the analysis and try and make an ad hoc adjustment at the end. There are many degrees of freedom, I suppose, for that type of adjustment.

Finally, in line with some of these approximations, if you ignore something and you use an ad hoc adjustment at the end of the analysis as experience develops, you might tweak some of those adjustments back there so as to try and hit some targets as you see how well your reserves are developing.

I could go on and on about this, but I don't want to spend too much of the remaining time. I know Steve has lots of interesting things to say, so if anybody has one or two questions I can try and address them. Otherwise, look for my paper in the next six to twelve months and I'll have a few more details there.

MR. ROBERT K.W. YEE: Do you have an insight into how to estimate these transition probabilities from nursing home to home community care and from community care to nursing home care?

MR. ROBINSON: Everything I've talked about today is more or less applied probability. It assumes that you know the probabilities and it asks how you use them. The other end is basically statistical inference. Another person at the University of Wisconsin, Greg Arling, has done some work with Wisconsin nursing home and community care data and has actually come up with estimates of the transition probabilities of going from one form of institution to another. So I've been relying on those. I've seen some of the details associated with how he came up with those values, but haven't been directly involved in that side or that part of the calculation. If you're interested in those results, I can give you Greg's address and I'm sure he'll be glad to send you a one-inch report on how he has come up with the numbers.

MR. MUNSON: Jim's gone through some interesting and somewhat befuddling theory for this. I kid him about that, though I was the one who really asked him to join our task force when it was being formed, and we're delighted that he's a part of it. I think all of us who have worked on long-term-care pricing and reserving can see a lot of what we struggle with in his theory. And you might say he has just

explained some of the difficult theory and possibilities that we have to struggle with as we do this valuation. Steve will show you some of the approaches that we're identifying to put into practice. Given that complex maze of possibilities, theoretically, we as a task force think we have a somewhat daunting challenge for making it work-able to all of us.

MR. STEPHEN R. ATKINS: I'd like to give an update on the work of the Society's Task Force on Valuation Methods for Long-Term-Care Insurance.

I'm going to start by reviewing the charge that this task force has been given. This came from Daphne Bartlett in late 1991, and I will quickly read it. It's "to develop recommendations for the valuation of long-term-care insurance products incorporating, as appropriate, an interim method, the valuation actuary concept, and methodologies suitable for the type of product being valued and its underwriting characteristics."

I think some of the examples that both Bill and Mark gave really amplify the impor-tance of the work of this task force when you have the same product being offered at prices that vary by a factor of four. You have the same product with reserves that vary by a factor of two. That really emphasizes the need for a benchmark that companies can use as a valuation standard and, hopefully, the task force's work will lead to that.

I want to review the membership of the task force. There are 13 members. We have a good cross section represented. We have people from both large and small companies, consulting actuaries, insurance company actuaries, a fraternal organization, direct writers, reinsurers, as well as a representative from the academic and the regulatory side. I think we have a pretty good group of people to try to address this challenge. In addition to this group, the Society's LTC experience committee is really a feeder group to this task force in terms of providing experience information that we're going to try to use to help set the morbidity standards. So it's a pretty large group of actuaries that are actively involved in long-term care that are helping to form these standards. I would invite you to take note of the names of the people on the task force. We very much want your input as we go forward with this project over the next year or two. Please feel free to contact any member of the task force and give us your input as we go along.

We have several stakeholders that are interested in the work that this task force is doing. The sponsor of the task force is the Society of Actuaries. The end product will be presented to the Board of Governors through the Vice President of Research. The emphasis of the Society's approach is going to be on the solvency aspect. Another primary customer is the NAIC. The states are crying out for guidance in terms of setting long-term-care reserving standards. There also are two committees within the NAIC that have an intense interest in our work. That's the Life and Health Actuarial Task Force headed by John Montgomery and the LTC Insurance Task Force headed by Earl Pomeroy. There are a number of other audiences that we will keep informed of our work as we move ahead, including the American Academy of Actuaries, Canadian Institute of Actuaries, and the HIAA.

I want to talk briefly about the general approach that the task force is going to take and some of our operating principles and priorities. First is our motto: "A decent job

soon rather than a perfect job never." It's a project that has the potential of collaps-
ing under its own weight if we try to do everything that we might like to do to cover
all the possible long-term-care products that are out there and might be developed in
the next couple of years. On the other hand, there are some of the stakeholders that
are very interested in having an answer soon. I think the NAIC really wanted this
done last year or the year before. Before they have too much more long-term-care
insurance on the books, they really want to have a benchmark that the states and
insurance company actuaries can use in setting reserves.

MR. MUNSON: Steve, before you go on, could I just add a comment? That is,
indeed, our motto. I think Mark said this at our first meeting. It kind of grew out of
our conversation. I put it in the minutes. It's become our motto, and it's one I
struggle with a little bit. For your information, Mike Mateja, Vice President of
Research for the Society, responded in writing, and said, "Exactly. That should be
your motto." So I think we have the unofficial blessing within the hierarchy of the
Society that they read it right. We're not going to run off and do it irresponsibly, but
nobody within the profession, and I appreciate that, is saying, "Wait, wait, wait, do it
theoretically and perfectly; anticipate everything." So I think that's very important for
all of us to know.

MR. ATKINS: Next I wanted to review the top priorities of the task force. In the
theme of trying to do a decent job soon, we needed to cut up the project into smaller
pieces.

- We want to try to do nursing home coverage first, because there is more data
  available on it. It's the bulk of the business that has been written so far. It's
  the bulk of the reserve even on a comprehensive policy at the time of issue.
  Even if we could get just that piece done that would be a big step forward
  and more than what's available now.

- Our emphasis is going to be on statutory reserves as opposed to GAAP or tax.
  We also hope to get to those before the project's over.

- We are going to work on home care coverage also. It's probably not com-
  pletely fair to call it a secondary priority. It's really something we definitely
  want to get done. It's just going to be more difficult because of the com-
  plexity of the home care products that are offered and the small amount of
  experience that is available on those products right now.

- We're also going to emphasize the stand-alone product first rather than the
  riders, but we would hope to get to the riders at some point also.

Now as far as the general approach that we hope to take -- and this was discussed
at our second meeting -- we want to have one table for the nursing home valuation
standard, which we'll call the institutional table, and then we'll have another pair of
tables for the home care standard, which we'll view as one noninstitutional table.
Within the home care table, we would hope to have two end points on a continuum.
At one end, you have what we call the care delivered table, where in order to be on
claim, someone would need both a frailty measure, probably activities of daily living,
and they would have to receive paid services. At the other end of the home care

spectrum would be just a pure disability home care approach, where only the frailty measure is needed to collect the benefits. We don't have that done yet, but that is the general approach that we hope that the project will take.

Now within those two tables, we'd see there would be a need for multiple adjust-ment factors to reflect various items. Just as an example, we feel there would be a need to have a load for stand-alone products where either nursing home or home care is offered separately and a discount for an integrated product where they're both offered. And that's because of the substitution effect that we would expect to have when those products are offered on a stand-alone basis. And there are various other product features that we would attempt to reflect through the use of adjustment factors to the standard tables. We had talked about having one, two, or three. We quickly realized that wasn't practical because we want to be able to reflect different interest rates, different elimination periods, and different benefit caps. So our desire is to have the end product be on a diskette, so that you can vary any of those items rather easily. Jack Luff from the Society staff has agreed to help us do that.

I wanted to talk briefly about some of the challenges that we feel will make the task that I've just set forth especially difficult. The first one is the lack of experience on the home care side. There's still a very great diversity in the products offered on the home care side. One of the challenges for this group is how do we come up with a static valuation standard that will be good for more than two months before the next version of home care comes out. The two very important elements are the effect of lapse assumptions and the underwriting practices on the reserve standards, because of the resulting slopes of the long-term-care morbidity curve. We want to try to find a way to fairly reflect that in the standard. There's currently great diversity in both the assumptions the companies are making in lapses as well as the actual experience that they're having with lapses.

There's a blurring distinction between institutional and noninstitutional care. It has become possible to get care in many different ways as people lose their functional capacity.

One that we're really struggling with is the morbidity experience at the long durations. We suspect that the antiselection experience is going to become very significant as you start with a population that has people lapse out of it at the rate of 5% or 10% a year. After 20 years, you may have a population whose characteristics are very different from the general population data on which the pricing assumptions were made. I think most companies' pricing models are still very much skewed towards the general population data and have not made an explicit assumption as to the deterioration and the population that might take place if there's very heavy lapse experience over time.

This is by no means an exhaustive list. These are just a few of the things that I think are going to be particularly challenging as we move ahead.

The task force has met a couple times and we're going to meet again this afternoon to continue to wrestle with some of these challenges. I wanted to talk about some of the work that's under way. We are preparing a first draft of the institutional table and the noninstitutional table. We made assignments at our last meeting and we

really felt the need to have something to react to. We don't pretend that these tables are going to be anywhere near the final form that this work will take, but we want to have something that we can start to kick around. We're continuing to review available data sources for both the institutional table and, as I've said, it's really on the noninstitutional side that we're going to have our work cut out for us to find an appropriate basis.

We want to assure links and consistency with all the ASB standards. I guess that really goes without saying, but we have explicitly worked at trying to make sure that we are consistent with those. We want to make sure that the lapse, the underwriting, and the antiselection assumptions are all appropriate, both individually and in aggregate, and that they all tie together in a logical way. And we are working on selecting the appropriate mortality table. This assumption is not as critical as either the lapse or the morbidity; nonetheless, we do need to choose the one that we will use as the basis for our standard.

MR. MUNSON: Let's open the session up to questions. I also would like to introduce Jack Luff, who is our staff person and is very helpful. Jack is not only a Fellow of the Society and of the Canadian Institute, but was a valuation actuary in Canada. He and I talk frequently. He not only attends our meetings but is a very helpful staff person between the sessions.

MR. DAVID M. CAMPBELL: My question is for Mr. Atkins and any other members of the task force that want to give input. I have a concern with the idea of going to one table for all products, given the differences of benefit triggers and things like that. I know you said that you're planning on looking at adjustments for different product features. Is the procedure going to be if you have two out of these five triggers you multiply by this percentage and if you have three out of six that's another percentage, or will it be up to the judgment of the actuaries for each company who will use guidelines similar to what would be an actuarial standard type of thing?

MR. ATKINS: We would hope to have some balance between leaving the actuary some room for his or her judgment and having specific examples. We would hope that the adjustments would be specific enough that it would say if you have three out of six or two out of six ADLs, you should adjust accordingly. But at the same time we know that we can't possibly reflect every possible product design that is out there. The work of the task force will be exposed to the membership. So everyone will have an opportunity to submit formal reactions to the proposals that we make.

MR. MUNSON: Could I just add that we struggled with how many tables would we need to have? I don't even know if we would try to get one that's pretty close to everybody's. We struggled with that a lot at our last meeting and said maybe we can give some ranges and some examples that might be helpful to the valuation actuary as to where and how to apply them, but that's a very key challenge.

MR. FRANK E. KNORR: I'm from Duncanson and Holt and a member of the task force. Before I ask my question I'd like to comment on that last question. We also tried to identify or are thinking about identifying which ADLs we're referring to in our proposals. Which ADLs are the ones we want to look at varies quite a bit from company to company. I'm directing my question to Mark Peavy. Could you give us

an update on which states are seriously looking at the new NAIC model where one-year preliminary term is required, and how many states have adopted the health model?

MR. PEAVY: Frank, I can't give you the specifics. I can tell you it's relatively few for both. I know in particular, on the long-term-care model, that's been one element of frustration. As part of the summary of the NAIC model regulations, we put together a list of states that have adopted either the model or something very similar to it and I'd be happy to send you a copy of that list.

MR. GREGORY A. GURLIK: I'm wondering if the work of the task force is going to incorporate anything on policy upgrades as companies move insureds from one policy form to the next?

MR. MUNSON: We talked about that briefly. I don't honestly know whether we're going to be able to. Do you want to add anything Steve, Mark, or Jim? What happens to the reserve or what should happen to the reserve with conceivable upgrades or internal replacements or changes? I don't think we really did more than put that on the list. It's hard to predict what we'll do. It's a decent job soon instead of a complete or a perfect job never. I think we should try. We should at least comment, and maybe that's worth adding. We talked about adding lots of words to our report. We don't intend to come out with just some tables of basic factors or some tables of adjustment factors and put our task force name on the front of it. We think a lot of things need to be commented upon and interpreted a bit. We're trying to do this within the framework of the "Valuation Actuary." I think that's more than just numbers. There was a lot of initial tension over that very point when this task force was formed. What are we told to do? Come up with some tables or come up with some approaches or methods? I think we're trying to do a little of both.

FROM THE FLOOR: How can you do reserve standards if you don't know yet what the nonforfeiture values are to be?

MR. MUNSON: And people working in nonforfeitures don't know what the reserves are, so we have a lot of fun both ways. We observe that they certainly are related and the question is, shouldn't the reserves at least cover the nonforfeiture benefits? Could that help define what nonforfeiture benefits ought to be or should be or could be defined as? We haven't done anything with it, but we've identified the need. Did you have anything specific that you'd like to say?

FROM THE FLOOR: No, not really except that I would assume that the nonforfeiture benefits are going to be minimum nonforfeiture benefits and that a company would be allowed to hold something in excess of that or would have something in excess of that if they wanted. Perhaps the reserve ought to be related to the life insurance context, where you're not supposed to have a reserve smaller than the actual cash value or present value of those nonforfeiture benefits.

MR. MUNSON: Right. That is an issue we need to address. There's time for one more question.

MS. MARY ANN BROWN: I'd just like to commend all of you for your work and we all have sympathy for the challenge ahead of you. I want to give a vote for making it as dynamic and flexible as possible. I've seen companies with anywhere from 5-25% lapses and mortality. I guess there are two factors at which to look. If the incidence could start being credible, we still have a big question mark on the length of stay, because it's going to take a long time to gain credible experience. However making it adjust for each company's experience is a challenge. Mark, I wanted to ask you a quick question. We found that there are quite a few states that have decided to accept the NAIC model even though they have not formally adopted that. On your list do you include the ones that are sort of informally going by it even though they haven't adopted it?

MR. PEAVY: No, the list I was referring to is with states that had formally adopted it, or something similar.

MR. MUNSON: Bill, would you like to make a comment on that?

MR. WELLER: I think that you'll find more states are formally adopting the minimum reserve model because it helps with their certification of the state. However, I think that you may find that they adopt an old one and then they always use the current one. So even though they adopted it previously, if a change comes along and it goes to one year, they expect you to use one year.

As another developing part of the certification models, the NAIC is looking at risk-based capital. The current formula for risk-based capital for the insurance or C-2 risk of LTC insurance does not reflect the underlying risks very well. The factor, assuming that you're on a level premium basis and you're not anticipating rate increases, would come in at 8% of premium. I don't think anybody believes that's a reasonable risk-based capital for long-term care. We don't think a high portion of premium makes sense, because that just induces companies to use a lower premium. We don't think reserves are necessarily the appropriate approach, because, again, if it's a percentage of reserves, those companies that are holding higher reserves end up with higher surplus requirements. We'd like to hear ideas for what a reasonable risk-based capital requirement would be for long-term care. We'd like it to be something that the companies are willing to provide in the statement, too.

MR. MUNSON: Bill is not speaking for the task force but for HIAA or himself. That's a good point and we don't know what we on the Task Force are going to do about it. Naturally, when somebody thinks about risk-based capital, a reasonable question is what kind of risks are you covering in your statutory reserves; you can't divorce the two. So we're not trying to duck it. We haven't even put it on our list until today and that's where we're at.

I do sincerely ask you for any input you want to give. We do have a daunting challenge. Everybody when asked to be on this task force said, "Yes," but in the next breath said, "But I'm not sure if we've got a chance to do this." We want to do a responsible job. Most all of you have some experience or questions or suggestions and you'd do us a lot of good, and you can help your profession, as well as consumers and regulators, if you'd take a moment to write some things down. Don't assume we know it or we've put it on our list.