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## NON-SMOKERS POLICIES

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1. What data are available? How significant are they? (e.g., Surgeon General's Report, experience of life insurance companies).
2. What are the effects of cigarette smoking on health? What are the epidemiological aspects of cigarette smoking?
3. In what ways can people be educated to stop smoking cigarettes or not to start smoking them? How can one assess the accuracy of verbal reports on smoking behavior?
4. What are the possible policy implications of the foregoing for the life and health insurance business?
5. For policies with nonsmoker discounts, what are the pricing implications with respect to the following:
  - a. Nature of the discount - Should it be guaranteed? Should a separate dividend class be established? What follow-up procedures can be used?
  - b. Effect on standard class pricing?
  - c. Deficiency reserves?
  - d. Reinsurance?
  - e. Competitive impact?
6. The application form: What information do you need, and how do you best get it?

MR. DANIEL F. CASE: I would like to introduce our panel starting with Dr. Elena O. Nightingale. The next person we have with us is Dr. Nathan Maccoby. Both Doctors Maccoby and Nightingale are members of a group which was formed a couple of years ago by the American Council of Life Insurance and the Health Insurance Association of America called the Advisory Council on Education for Health. This Council is doing very important work, with the support of the Insurance business in matters of educating the public for better health.

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Our next panelist is Marshall H. Lykins who is Second Vice-President and Actuary at New England Life. There he heads Product Development in the individual area. His company recently introduced a series of preferred risk policies with selection based in large part on smoking habits. And, lastly, we have Michael J. Cowell, who is Vice-President and Chief Actuary of State Mutual, which was the first major life insurance company to introduce premium discounts in life insurance for nonsmokers. Mike is co-author with Brian Hirst of the paper, "Mortality Differences Between Smokers and Nonsmokers". Our recorder is Lee E. Launer, Assistant Actuary at Metropolitan.

We have a very full agenda, and our first speaker will be Dr. Nightingale.

DR. ELENA O. NIGHTINGALE: I was asked to address the first two questions listed in the Program relating to the available data on the impact of cigarette smoking: "What are the epidemiological aspects of cigarette smoking and how do they relate to morbidity and mortality?"

You're probably all aware that every cigarette ad and cigarette package contains the warning label: "The Surgeon General has determined that cigarette smoking is dangerous to your health." This warning label has probably had some impact on smoking behavior. It is derived from the first Surgeon General's report on smoking and health issued in 1964. It analyzed the available data relevant to the questions being discussed here today and concluded that cigarette smoking increases the chance of lung cancer 10-20-fold, depending on the duration and amount of smoking. It also concluded that smoking is the most important cause of chronic bronchitis and increases the chances of dying from this disease. Furthermore, smoking increases the death rate from coronary heart disease in men. Actually, the first report dealt almost entirely with data on men; there was not much data available on women and smoking. The second Surgeon General's report deals with women in some detail. Also, the first report mentioned the effect of cigarette smoking on death and disability from fires. This is something often overlooked but important--considering that surveys indicate about 18-40 percent of the deaths that occur in fires are attributable to cigarette smoking.

Finally the report concluded that death rates for cigarette smokers are 70 percent higher than for nonsmokers and that the death rate increases with the amount smoked and number of years of smoking. The ratio of death rates is highest at ages 40-50 and declines thereafter.

In 1979, on the 15th anniversary of the publication of the first report, the Department of Health, Education and Welfare issued the second Surgeon General's Report on smoking and health. This report is much weightier. The new volume really only adds to the old and backs up the original conclusions. Yet on September 22nd of this year, a spokesman for the Tobacco Institute, Walter Merryman, was quoted in the New York Times, in reference to a Federal Trade Commission Study on the impact of the warning label on cigarette packages, as saying that the Surgeon General's Report, the FTC studies and others, "use health statistics the way drunks use lamp-posts, for support rather than illumination." There still is not a basic answer to why people who smoke fall victim to some diseases in greater numbers than people who don't smoke.

The tobacco industry is still fighting the basic premise of the Surgeon General's report, but not as successfully as in the past. Now they do admit, which they did not do in 1974, that greater numbers of people who

smoke die younger than they would if they didn't smoke. The tobacco industry's main basis for attack is that all the information on cigarette smoking and health is circumstantial and statistical and does not establish causality. Both Surgeon General's Reports go into the issue of causality to some extent, and I'll just take a moment to explain why it is possible to say that cigarette smoking does cause certain diseases. Of course, you cannot do experimental studies on causation of cancer in man - that's quite unethical, and we cannot accomplish that. But if, together with the epidemiological studies, you add clinical observations, pathologic observations, and animal experimental data, the causality question really is not a question any more. Therefore, the Surgeon General again in 1979 concluded that cigarette smoking is dangerous to your health. The epidemiological studies have consistency, they have strong associations, they are specific, they show a dose response and temporal relationship and a coherence of the association between smoking and increased mortality. All these factors point to causality. So to summarize, 15 years later the second Surgeon General's Report on Smoking and Health confirms the conclusions of the original report backed up by thousands of additional studies done throughout the world.

The scientific evidence on the health hazards of cigarette smoking is overwhelming. The new report adds information in several areas that make the evidence even stronger. For one thing, women parallel men in their response with disease if they smoke cigarettes. The new report contains a section on the effects of cigarette smoking on the developing fetus and on the development of the young baby and child. It also includes significant data on smoking and children and discusses the various effects on children who have parents who are smokers. For example, 100,000 children under the age of 13 are "regular smokers" today, and the percent of girls ages 12-14 who smoke increased 8-fold from 1968 to 1978, though now it has leveled off. There are chapters in the new report on education and prevention, but again fires are not treated at all. Cigarette smoking is identified by then-Secretary of HEW Joseph Califano and by many health workers as the largest preventable cause of premature deaths in America. And as such, it should be of interest to the members of your profession.

The Advisory Council on Education for Health to the Clearing House on Corporate Social Responsibility, of which Nathan Maccoby and I are members, came out with two recommendations at its meeting of February 1, 1979. In part, these read:

1) That the Associations should urge the Society of Actuaries to include smoking habits among the personal characteristics which it studies, such as in its impairment studies. 2) The Associations should also urge the Society of Actuaries to include in its meeting programs, discussions of the desirability and soundness of fully reflecting the known hazards of smoking in their life and health insurance prices, such as by establishing separate premium and/or dividend classes or in other ways. I am very pleased to see that this recommendation is in part being implemented by the discussions being held here today and tomorrow.

I'd like to refer to specific sources of further information on the impact of cigarette smoking on health for those of you who are interested. Of course, the new Surgeon General's Report deals extensively with both mortality and morbidity. The chapter on mortality summarizes 8 very large prospective epidemiological studies taking place over the past 30 years,

ranging from a study of British doctors over a period of 20 years to a study in nine states done by the American Cancer Society. The conclusion, as I said before, is that the overall mortality ratio is 170%, varying from 120% to 200% depending on the amount smoked, and is highest at the younger ages. Cigarette smoking in 40-year-old men can reduce life expectancy by as much as 8 years. Women show the same dose response relationship as men from cigarette smoking, and stopping smoking reverses the excess mortality. After 15 years the excess risk seems to have dissipated back to what the risk is for a nonsmoker. This is for persons who are not otherwise ill.

Mortality ratios are particularly high for cigarette smokers for three basic conditions - cancer of the lung, chronic lung disease, and ischemic heart disease. Because heart disease is so common, coronary heart disease is the chief contributor to excess mortality from cigarette smoking, lung cancer is a close second and chronic obstructive lung disease third. It is of particular significance for you, therefore, to follow the changing trends in smoking, particularly of young women in order to determine to what extent, as more women smoke, their disease patterns approach those of men. The chapter on morbidity is not as good as the one on mortality in that the data are not as firm and require further collection and analysis, but while smoking cessation reduced mortality risk, morbidity doesn't seem to be affected as much by stopping smoking. The results of the smoking and health report are summarized by the Center for Disease Control in a brief report, "Morbidity and Mortality Weekly Report" of January 12th 1979, and also they are summarized in a September 1979 article in "The Actuary" by Michael Cowell and Brian Hirst. A paper by Luce and Schweitzer in the New England Journal of Medicine of March of last year estimated that direct health costs attributable to cigarette smoking for the year 1976 were \$8.2 billion, and that if indirect costs were counted in, the price tag went up to \$27.5 billion for one year. Part of this cost is undoubtedly borne by insurers.

Finally, I'd like to touch on a couple of thoughts that may not be directly relevant to actuarial needs but that are of interest for the future. One is the behavioral aspects of smoking. These are not dealt with adequately in the Surgeon General's Report. We don't know why a third of the adult population smokes and what clues smoking behavior may give to other kinds of behaviors that are also related to increased morbidity and mortality. This is true particularly for young people and for young women. For example, adolescents who smoke may in fact take up other risky behaviors more than adolescents who do not smoke, including reckless driving, alcohol intake, drug abuse, etc. The effects of smoking on pregnancy are profound. Young women are becoming pregnant in greater numbers and are smoking more. What is the total effect on the development and outcome of their children?

The Surgeon General and HEW published a draft report for comment just this August on the objectives for the nation for health promotion and disease prevention. An objective for 1990 is to reduce to 25 percent from 33 percent the adults who smoke and to reduce childhood smoking from 12 percent to 6 percent. These may seem like modest objectives but with 320,000 excess deaths per year attributable to cigarette smoking they could translate into thousands of saved lives.

I'd like to leave you with this thought. It is better to single out the non-smoker for a positive incentive than to single out the smoker for an extra penalty. Positive approaches seem on the whole to be more effective than negative or punitive approaches in modifying behavior. Your profession, therefore, has a real contribution to make to the health of the nation by providing incentives for nonsmokers.

MR. MICHAEL COWELL: My remarks this afternoon focus principally on question 1 - "What data are available on nonsmoker mortality and how significant are they?" I will also comment later in the program on item 4, the underwriting and pricing considerations involved in nonsmoker life insurance coverages.

First, some brief background.

Shortly after the publication of the Surgeon General's 1964 Report "Smoking and Health," State Mutual publicly stated its position of recognizing the health risk people took when they smoked and, as a mutual company, we acknowledged a responsibility to our nonsmoking policyholders to reflect their lower mortality in the form of reduced life insurance costs.

In the absence of insurance experience on mortality differentials between smokers and nonsmokers, we used the findings of the Surgeon General's 1964 Report to estimate what savings might be expected in a group of nonsmokers and reflected these estimates in pricing a new policy, the Non-Cigarette Smoker Preferred Protector, a life paid-up at age 95 policy, with a minimum insurance amount of \$10,000.

We commenced selling this policy in April, 1964. In addition to the usual underwriting information, all we required was a statement that the applicant had not smoked cigarettes for at least a year. In 1976, we extended the concept of nonsmoker premium discounts to all individual life non-pension policies.

Over the past 15 years, we have sold 105,000 non-cigarette smoker life policies for a total insurance amount of \$3.4 billion. New sales of non-cigarette smoker business currently account for approximately two-thirds of our new individual life production at the adult ages, approximately the proportion of the adult U.S. population that does not now smoke.

The experience on State Mutual's nonsmoker business presented in our paper<sup>1</sup> is essentially statistical. The clinical aspects of smoking, and the causal relationship between smoking and disease were covered in the Surgeon General's 1964 Report, and are addressed even more extensively in the 1979 Report. While they are beyond the scope of our paper, we anticipate these aspects will probably be raised in the discussion.

Our study compares the experience of two groups of insured lives with standard underwriting characteristics, where an individual is assigned to one or the other group solely on the basis of classification as a smoker or nonsmoker. This distinguishes our practice from that of companies that have defined a preferred risk classification that includes nonsmoking as one of several criteria. We believe this to be the only published mortality experience of lives identified as to their smoking habits at the time they were underwritten for insurance, and expressed in terms of a standard mortality basis.

Our study is confined to permanent plans on which we offered coverage to smokers and, at a premium discount, substantially the same coverage to non-cigarette smokers. While this has the effect of increasing the similarity

<sup>1</sup>"Mortality Differences Between Smokers and NonSmokers" by Michael J. Cowell, FSA and Brian L. Hirst, FSA, Society of Actuaries, 1980.

of the two groups, there is some disparity between them in that the average size of new nonsmoker policies has ranged from 20% to 55% higher than that of comparable regular sales. In 1978, for example, the face amount for all our permanent nonsmoker issues averaged \$32,000, against \$22,000 for corresponding regular sales.

However, analysis of our experience by policy size indicates that these differences are not significant from a mortality standpoint.

We also recognize that while nonsmokers form a relatively homogeneous group with respect to their smoking habits, those insured under our regular policies form a group that is not so homogeneous. Within this latter group, which for convenience we refer to as "smokers" even though we realize that this is not a perfectly accurate description, are people who, since buying insurance from us, have given up smoking. On the basis of data included in the Surgeon General's reports, we estimate that people who have quit smoking may account for as many as 25% of our policyholders who were classified as "smokers" at issue. Further, among those correctly identified as "smokers," there is a wide variation in smoking habits ranging from light inhalation of less than ten low-tar-and-nicotine cigarettes daily to heavy inhalation of forty or more cigarettes daily of the stronger tobacco variety. The Surgeon General's data, as shown in Table 1, indicate that at most age groups there is a wider variation in the effects of smoking on mortality between these two extremes of the smoking spectrum than there is between nonsmokers and all smokers combined. Because we do not ask our smoker policyholders the extent of their cigarette consumption, we have no way of measuring results according to intensity of smoking habits. We assume that State Mutual's smoker policyholders have habits that, in general, are not dissimilar from those of all smokers in the U.S. population, an assumption that does not appear to be unreasonable.

Against this background, and with these qualifications, I will now present State Mutual's mortality experience.

Our study consists of experience between policy anniversaries in 1973 and 1978 under standard, regularly underwritten policies, where both smoker and nonsmoker policies were available at issue. Expected deaths are based on the 1965-70 Basic Tables. Because we commenced issuing nonsmoker policies in 1964, this experience is contained entirely within the 15-year select period of the Basic Tables.

The experience under insurance issued subject to a medical examination is based on an exposure for smokers of 77,000 policy years for \$2.7 billion of insurance and 340 actual death claims for just under \$13 million. Nonsmoker experience includes 127,000 policy years of exposure for \$5.6 billion of insurance and 240 actual death claims for \$11 million. The medical experience by age group at issue for the first fifteen policy years combined is shown in Table 2 separately for smokers and for nonsmokers, and also for the two groups combined.

The medical experience by quinquennial policy year groupings is shown in Table 3.

For smokers the actual to expected ratio by amount of insurance is 132%; by number of policies it is 127%, with a confidence interval of  $\pm 13\%$  at the 95% confidence level. For nonsmokers the ratio is 53% by

amount and 54% by number with a confidence interval of  $\pm 7\%$ . For both groups combined the ratio is 79% by amount and 82% by number with a confidence interval of  $\pm 7\%$ .

Our paper also gives experience under insurance issued without a medical examination. The overall non-medical mortality ratios by amount of insurance are 109% for smokers, 76% for nonsmokers, and 90% for the two groups combined. However, any division of this experience by issue age group or policy year groupings produces cells that contain too few claims to be significant. Our paper also shows mortality by cause of death, separately for smokers and nonsmokers. This is displayed in Table 4.

While the small number of deaths makes any kind of detailed analysis statistically meaningless, results by cause of death are not inconsistent with those reported by the Surgeon General. As might be expected, the largest mortality differentials are in the categories of respiratory cancer and arteriosclerotic and degenerative heart disease.

One interesting aspect of our cause of death analysis is the predominantly higher mortality rates for smokers in those categories not commonly associated with smoker mortality (i.e. Mental Disorders, Accidents, Suicides, Homicides, and All Other Causes). This result could be used in arguing that the use of smoking as an underwriting criterion is, in reality, a substitute or "proxy" for the underwriting of lifestyle. If these "non-associated" causes are omitted, the ratio of smoker to nonsmoker mortality rates would actually increase from 2.5 to 2.8, suggesting that the percentage of extra mortality from smoking would be even greater in populations with "identical" lifestyles.

Next, I would like to comment on the relationships we have observed between our findings and those of the Surgeon General.

Although State Mutual has been issuing nonsmoker policies for just over fifteen years, our experience is still quite limited. While the difference in mortality between smokers and nonsmokers is statistically significant almost to the point of certainty, the limited volume of our experience prevents us from determining precisely the size of the mortality differential between smokers and nonsmokers. To substantiate our findings we attempted to compare State Mutual's experience to that reported by the Surgeon General. On the basis of these comparisons, we conclude that, when adjustments are made to account for the different populations, our experience conforms reasonably well with the Surgeon General's findings.

Table 5 shows mortality ratios by issue age and duration of the most statistically significant blocks of experience from our study.

The results, although based on limited data, suggest smoker to nonsmoker ratios lower at the later durations than at the earlier durations, a trend due, we believe, in part to the increase, by duration, in the number of insureds who were issued smoker policies but who have since quit smoking.

Using an estimate of the number of ex-smokers with State Mutual smoker policies, we adjusted the ratios in Table 5 to compare current smoker to current nonsmoker mortality. We made this adjustment by estimating the division of our nonsmoker population into those who have never smoked and those who are former smokers. The Surgeon General's Report indicates that

the mortality ratio of ex-smokers who quit on their own (as contrasted with those who quit on medical advice) to that of people who never smoked is approximately 1.2. This ratio appears to be fairly constant during the first 15 years after cessation. Utilizing these assumptions, we developed a comparison of mortality ratios between current smokers and current non-smokers. This is referenced in Table 6.

The results do not indicate any clear trend toward narrowing of the mortality differential by duration. They do, however, show a higher ratio of smoker to nonsmoker mortality than does the Surgeon General's Report. This latter result is not all that surprising when we consider that our experience is that of an insured group with mortality rates much lower than those in the general population. The same absolute difference in mortality rates would yield a higher ratio of smoker to nonsmoker mortality in an insured population. To test the reasonableness of State Mutual's mortality ratios against those in the Surgeon General's Report, we compared mortality rates for male smokers and nonsmokers combined to those in the 1969-1971 U.S. Life Tables. We assumed that the differences are attributable to deaths that were not a function of smoking, but rather to other characteristics that would cause people to exhibit higher than standard select mortality. Adding the excess deaths to both our smoker and nonsmoker rates, the resulting smoker to nonsmoker ratio is 1.9 which compares reasonably well to the ratio reported in the Surgeon General's Report for the appropriate age ranges.

DR. NATHAN MACCOBY: I want to discuss question 3: "In what ways can people be educated to stop smoking cigarettes or not to start smoking them and how can one assess the accuracy of verbal reports of smoking figures?"

Smoking has declined significantly since the first Surgeon General's Report of 1964. For men the percentage has reduced from 53% to 38%. In 1978 54 million men and women smoked 650 billion cigarettes, and you've already heard from Dr. Nightingale about the estimated damage. The Surgeon General says smoking is the single most important preventable environmental factor contributing to illness, disability and death in the United States.

The next question is: "How many people did succeed in quitting?" What's encouraging is that, of those people who did succeed in quitting, 95 percent did so on their own without any help from a therapist, hypnotist, psychologist, etc. Four factors seem to be of major importance in their success.

- a) Health concerns seem to be by far the most important single factor in leading people to quit smoking.
- b) A desire to set an example for others; parents in particular realize that they might be setting models for their children.
- c) A desire for self-control. That sounds strange, but as one man put it so dramatically, "Am I the master of my fate or is a little 100 mm cylinder that burns the master of my fate?"
- d) Finally the esthetic reasons, such as breath odor, loss of taste and smell for food.

What can be done about it? Are we stuck with the fact that the people who do smoke are going to stay smokers? Can one do anything to keep adolescents



from beginning to smoke? It ought to be easier not to start than it is to give up an addiction long since acquired. There's a good deal of research on adolescent prevention which I want to cite, and then I want to talk about research on adult cessation and the problems.

A study that we have been doing at Stanford for the last two years gives results on prevention of smoking among adolescents. We have, unfortunately, not been able to assign the school classes at random, in treatment and control, although we currently have experiments underway in which we have been doing so. We're going to have a world-wide study of this and we'll find out how well we can do at it. But our early data are very encouraging.

It's very clear from our data that when children start experimenting with cigarettes they don't think of themselves as being smokers, but before they realize it they become hooked. This is the beginning, and we're trying to get it at the beginning. Our statistics indicate that we have been able to depress the onset of smoking at age 12 by at least one-half. In other words, only 1/2 as many are smoking as would have been had the treatment not taken place.

Let me describe that treatment to you very briefly. It basically consists of our using three-year-old peers whom we train. We have them provide pupils with ways of defending themselves against temptation to start smoking. We find out what the typical situations are that tempt them to start smoking, such as peer group pressures. For example, a girl goes into the bathroom and the other girls are smoking, and they offer her a cigarette, and she's made to feel a little foolish if she doesn't accept it. Or the partying-type situation in which a little boy likes a little girl and she's smoking and wants him to smoke. How would you handle that?

We put up ads, tempting ads. And what happens is that the peer group leader, the trainer, will discuss the ad. I remember watching one of the Virginia Slim ads with a very svelte and cool-looking model holding a cigarette in her hand and the peer group leader saying, "Look at that, doesn't that make you want to smoke? What do you say to yourself when you see that?" One of the peer members would then say, "Who wants to be like that with all the makeup and that type dress, etc? She's paid to do that, and they're just trying to sell cigarettes." This is the sort of thing they say in response to looking at the tempting situation.

What we get are peer group leaders who are big, mature, popular, and just what the other kids want to be like. Of course, the group leaders are nonsmokers. So this is basically the procedure, and we have a manual now that's being used rather widely, not only in California but also in Berlin, Amsterdam, Oslo and Finland. So we're looking forward to seeing data on this over the course of the next couple of years.

Now with respect to adult cessation we feel there are psychological processes involved in learning to quit smoking. First of all you have to be aware of the problem. There are various ways of making people aware of the problem. Calling their attention to the Surgeon General's Report does this beautifully. There are many, many ways in which people are made aware of the problem. In fact, our data and data I've seen on a more national basis indicate that almost everybody who smokes knows it is bad for them. Most of those wish they could quit and indeed have tried to quit and succeeded either for very

temporary periods or not at all. So that isn't why they're not quitting. The awareness job has really been done on the American people.

Second is knowledge of the health hazard. While this is not by any means complete, it is substantial. In other words, people do know the risk when they smoke. They aren't exactly sure as to how and why, but then neither is some of our medical research sure exactly how and why, but nevertheless they are aware of the association. Third is motivation. Some people feel that as long as people are motivated to quit, they'll quit. But that's not entirely true. After all, as I've already indicated, most people who smoke wish they could quit, and as Mark Twain once put it, "Quitting smoking is easy; I've done it thousands of times." There are some problems with motivation. If the motivation is strong enough, many people do quit. Approximately 50 percent of all victims of myocardial infarctions stop smoking. It's interesting that only about 1/2 of them do; the other 1/2 continue to smoke even though their lives have already been threatened very seriously. But still, if you're scared to death, you may quit, but it takes an enormous amount of motivation for many confirmed addicts to stop. Unfortunately, many people feel that the price of quitting is too high; that is, they're only going to be able to think about cigarette smoking.

What's required are skills. Learning to stop smoking is a skill, just like learning to typewrite, play the piano, tennis or golf. One of the important skills to learn is self-managing, and it's only by being a self-manager of one's own behavior that maintenance really can succeed. I want to give you three examples of studies. The first is one of our own, "The Stanford Three Community Study" which the Stanford Heart Disease Prevention Program did in 1972-1975. In that study we had a mass media program in two communities, and one of those communities in addition was supplemented with intensive face-to-face small-group instruction. After a three-year period, 50 percent had quit smoking, as compared to 15 percent of those who had no special treatment. The second example occurred in South Australia, where a very dramatic experiment has been taking place. The Health Department runs classes of about fifteen people, for three evenings and one weekend of intensive instruction. But the big feature of what they're doing is their maintenance schedule. In other words, they carry on once a week, then once a month, and they keep stretching out the intervals between further training. They may also do further training by telephone and not necessarily by coming to group meetings. The dramatic characteristic of that study is to achieve long-term maintenance via follow-up training. I don't believe that has been done as adequately before.

The third study is even more interesting in some ways - and that's being done in Finland. This is a televised program showing people who are trying to quit smoking. Organized groups sat watching television and practiced and developed the skills of nonsmoking. The point is that if it can be done over a mass medium, we may have a method that's generally harnessable for the population.

If we can learn how to do it on television, for example, as is the case in Finland, then we have a method that is generally exportable and can be done on a widespread basis. So this is where the hopes are.

Now let me turn to the problem of the measurement of accuracy of verbal reports. Up until quite recently, the last five years anyway, we really had no way of measuring smoking behavior except through verbal reports. All of the Surgeon's Reports are really based on verbal reports of people as to

whether or not they're smoking. Work of two sorts promises to change that to an extent. One is a clinical test which will measure the extent to which the concentration of carbon monoxide is in the exhaled breath. As it seems to be turning out, the exhaled breath of the adult will run below 7 parts per million in a nonsmoker and in a smoker will be between 30 and 50 parts per million. Unfortunately it only has a half-life of about 12 hours. So there would be a problem if you were to want to use this test on people who, for example, were coming in for an insurance exam. The other method is a clinical test of certain body characteristics such as the blood, the urine or saliva. Again it is possible to get a very clear-cut distinction between smokers, in fact light smokers, medium smokers and heavy smokers, and nonsmokers. This seems to have a little longer half-life, but still a relatively short one. Work is being done on both of these methods to increase the half-life.

In summary, I feel hopeful that research is making progress in the area of helping people to learn not to start smoking, or to stop if they already have.

MR. MARSHALL H. LYKINS: On January 1st of this year my company, New England Life, introduced a new line of individual non-pension life insurance policies. Both permanent and term policies are available with a preferred risk classification, which is essentially a nonsmoker classification. Thus my comments today will reflect the perspective of a company that has just recently begun to recognize smoking habits. However, the comments are my own and not necessarily those of my company.

Except for a few high cash value policies, our new policies are valued at four percent interest using the CRVM method. The premiums per \$1,000 are roughly 20 percent below those of our preceding policy series and the cash values are much lower. The preferred classification is based upon height and weight as well as on smoking habits. The smoking definition is the typical one based on no cigarette smoking within the past year. For issue ages of 20 and over, the preferred discounts are roughly 5 percent for permanent plans and 20 percent for term plans, although these vary by age and plan.

We can offer no mortality experience of our own of course. However, you might be interested in some relative sales statistics from the past several months. These exclude substandard cases and juveniles.

1. For permanent compared with term plans, the preferred percentage for term plans is much greater, perhaps by a dozen percentage points or more, than the preferred percentage for permanent plans. This may be due to our much larger preferred premium discount (as a percentage) for term insurance. Compared with the current proportion of nonsmoker business at State Mutual mentioned by Mike Cowell, our preferred percentage is somewhat greater for term insurance and somewhat less for permanent insurance.
2. By sex, the preferred percentages are very close, the females only a few percentage points greater than the males.
3. By plan, the relationships are as you might expect from the permanent/term figures. The low premium per \$1000 plans (such as Graded Premium Life) generally have higher percentages, while the higher premium per \$1000 plans (such as Life at 65) generally lower percentages.

4. By age, for both permanent and term, the preferred percentages are rather flat, except for younger ages among permanent plans, where the preferred percentages are definitely higher.
5. By amount of insurance for both permanent and term, the larger size policies show higher preferred percentages.

My comments today will touch basically two areas: policy questions and pricing questions. The policy questions relate to motivation - the "why did we do it" and "why now" questions; and the pricing questions relate to pricing alternatives.

Our decision to consider smoking habits was not the result of any sudden, overwhelming, irresistible force. There was no new discovery, no novel solution to the underwriting problems. Rather it was the result of a continual weighing of pros and cons over a period of more than a dozen years. Time and again the preferred question has been raised at New England Life, and the pendulum has now swung. Thus, it's been an evolution rather than a revolution. No one thing can be identified as that which tipped the scale. So, although I cannot offer a breakthrough in thinking that will make the decision possibly easier for your companies, hopefully I can give some idea of the thinking that ultimately may result in your selling nonsmoker policies.

I've grouped these considerations into four basic areas: equity, competition, acceptability and practicality. The first, and unquestionably the most important, is the equity consideration. This includes consideration of: how much of a difference there is in mortality; what is the credibility of the statistics; can general population differences be translated into insurance populations? In answer to these questions, each year has brought further evidence, not only in population studies but in indications from several companies that data they have from their own insurance populations support what the general population data have been showing.

We believe that the mortality differences are real, that they're substantial and that equity requires a separate classification for nonsmokers. For some of us, this is enough. For most of us, however, there are other considerations. Equity alone, and the degree of extra mortality, are not sufficient. (I might mention on the side that, to us at New England Life, equity did require that all plans should have a preferred classification.)

Of the three other types of considerations that I'd like to mention, the most important is competition. This includes both what other companies are doing and how their net costs compare with yours. What other companies are doing, of course, is jumping onto the preferred risk wagon, and at an accelerating rate. Some of our closer competitors have done this recently. Your companies would be foolish to totally ignore this activity. The improvement in net costs for preferred products can be truly impressive and really enticing. That alone has probably led some companies to enter the market, often with just a single policy. But some companies in their haste have not done what is equitable - increase the cost of their "smoker" policies. That aspect of preferred risk pricing has concerned us greatly. However, as we priced our new series, we found that the lower premiums, the lower cash values and the higher investment returns enabled us to offer the smoker a lower cost than we had before, even though we were loading the mortality to reflect the higher mortality for the smoker.

A third area of consideration is what I would call acceptability - acceptability both to the public and to the field force. Acceptability has to do with the acceptance of smoking as an activity and with the acceptance of the risk involved. In the past, a majority of adult males smoked. Smoking was considered almost a measure of adulthood, a healthy, mature thing to do. Although the actuary might have suspected an extra risk, the man in the street did not. He might very well have lied to us about his smoking habits if he felt we were being unfair to him or if he felt he was as healthy a risk as the nonsmoker.

Today much less than a majority of individuals smoke. The "dangerous to your health" logo has been trumpeted everywhere. How many of us have known some smoker who died from lung cancer? We think that today the average man in the street, even the smoker, believes there is a risk associated with smoking. From our brief experience at New England Life, the nonsmoker classification seems to be accepted.

A fourth area of consideration is what I would call practicality. The practicality considerations include those related to the ability of the underwriters to accurately classify individuals and to verify the data. At New England Life we essentially accept the nonsmoking statement on the application. We obtain inspection reports only on larger cases and are not asking for them any more frequently just because of our preferred classification. However, if an underwriter sees a history of respiratory trouble, he might ask for an inspection report; but other than that, we're not doing anything just because of the preferred classification.

We think the question is one, in large part, of equity vs. expense. In the usual cost/benefit analysis done to establish underwriting rules, expenses are offset in part by mortality savings, because uninsurables are eliminated. With smoking habits, however, the question is not one of insurability. The aggregate mortality will be the same. Any additional expense to accurately classify smokers will merely serve to redistribute the mortality, achieving better equity. However, this additional cost must be passed along to the policyholders. Thus the benefits of correcting misclassifications of smokers will be lost if the expense is too great. Therefore, if there are relatively few misclassifications, the extra cost charged to the nonsmoker for identifying them may well be greater than the extra cost associated with including these people as misclassified nonsmokers. The key question, of course, is the number of misclassifications.

Even if the number of misclassifications is not numerous, some individuals will be getting away with an unjustified lower cost. This is similar to the income tax situation which occurs when some people lie to the IRS about their income; even though this may not affect our taxes, because the expense of the IRS to find those people would be greater than the amount saved, nonetheless we feel badly about their getting away with lower taxes. More of an insurance analogy might be provided by other kinds of underwriting information that is difficult to verify, for example, family history.

Now, I would like to discuss some pricing questions.

How the pricing is done, of course, depends upon how the risk classifications are changed. New England Life has taken the approach of splitting the old standard class into two parts; a preferred class and a "new" standard class.

The new standard classification includes smokers and is really the first "substandard" class. For New England Life, this class has expected mortality that is relatively close to that of our first table rating. One question might be, why not combine the new standard class with the first substandard class to form a larger "standard" class? Another question is whether there should be a breakdown of the substandard classes into smoking and nonsmoking components? Another approach might be to take individuals who are presently at Table C, for example, and if they're nonsmokers put them into Table B and if they're smokers put them into Table D (or some such approach). I wonder whether those companies that provide nonsmoker discounts on substandard policies have seen any data on which to base these discounts. Is there any basis for giving the same preferred discounts to substandard risks as to standard risks, as some companies do?

For companies that do not make the smoker/nonsmoker distinction for substandard risks, should the old substandard extra premium be reduced because the new standard policy to which premium the extra premium would now be added already represents mortality in excess of 100 percent?

For companies with participating contracts, should the nonsmoker mortality savings be reflected in lower premiums or higher dividends? New England Life has chosen the premium approach for its simplicity and for the immediate impact of the savings. However, we do consider these policies to be in a separate dividend class and fully expect to give them different dividends if experience warrants.

To arrive at the mortality assumptions for our preferred policies we started with our existing mortality experience. We separated this experience into smoking/nonsmoking components by making assumptions first, as to the percent preferred and second, as to the relative smoker/nonsmoker mortality. Either or both of these can be varied by issue age, sex, and/or duration in making this breakdown of the existing standard mortality. It is important to note, however, that it is not the current percentage preferred or the current relative mortality that you should be using in making this kind of a breakdown, but rather the percentage preferred and relative mortality for the period of your experience. Several adjustments might then be made to these separate sets of mortality rates to reflect such things as the following: the increasing use of lower tar cigarettes since your experience was determined, your company's position with respect to changeovers (after issue) from smoker to nonsmoker status, your conservatism that may in turn reflect the degree of confidence you have in your assumptions, and the degree of misclassifications of risks that will occur; for example, if predominantly low level smokers are misclassified, this would increase both sets of mortality rates. Having established the separate sets of mortality assumptions that would apply to the preferred class and the "new" standard class, we priced the "new" standard class as we normally would price a standard class; and we determined the preferred discount as we normally would determine a female discount.

In closing, I will mention several questions that you will have to consider during your pricing:

1. Will lapse rates be the same for smokers and nonsmokers?
2. How will you treat the smoker who stops smoking after issue - as a reduction in rating? If not, what will be the effect on lapse rates and replacements?

3. What about preferred status on the exercise of purchase options and the conversion of term insurance? Does a preferred term policy convert to a preferred permanent policy?
4. How about pricing at low ages? For a previously issued policy at a young age, is the discount available when a nonsmoker reaches the first age for which discounts are available?
5. How about pricing at the high ages? Are mortality differences graded to zero at some age?
6. What can be done for policies sold before the nonsmoking discounts were available - especially on term insurance? Should old policyholders replace their coverage if they are nonsmokers? Should replacement commission rules be changed?
7. How much deficiency reserves will be needed?

MR. COWELL: Turning to question 4, I will address the policy implications of our experience for the life and health insurance business.

As a broad general statement, we believe we have confirmed mortality differentials between smokers and nonsmokers large enough to validate the separate identification of these two groups for life insurance underwriting. These differentials at many ages exceed the corresponding differentials between male and female mortality. Since mortality differentials by sex are recognized in pricing life insurance, we believe it will become increasingly difficult to justify not making an underwriting distinction by smoking classification.

Should the standard underwriting class include smokers, with nonsmokers considered as preferred risks; or should the standard class include only nonsmokers, with smokers considered substandard? While from a marketing point of view any attempt at the present time to classify smokers as substandard would probably be regarded as impractical, I would suggest that the insurance industry may eventually decide to adopt a substandard classification for smokers.

Another principle in establishing underwriting classifications is that the standard group should be the largest group; those who are either preferred or substandard should be in the minority. The larger of the two groups is now the nonsmoker group. The Surgeon General's Report shows that in 1965, non-cigarette smokers made up 58% of the adult population, but only 49% of the male population. The nonsmoker group has been growing in recent years and by 1978 had increased to 67% overall, with 62½% of the male population now reported as nonsmokers. Comparable figures for adults issued insurance policies by State Mutual at standard rates closely parallel figures for the entire population. Sixty-seven percent of all the individual non-pension business sold by State Mutual in 1978 was issued to nonsmokers. Our non-smoker business as a percentage of new sales has been increasing for the last several years in a pattern that closely approximates the nonsmoking trend in the general population.

Against this background, we conclude that non-cigarette smokers could be considered as the population that defines "standard" risks, while smokers could be considered substandard, with the degree of rating increasing by the

extent of smoking. Nonsmokers who are better than average in other underwriting considerations (e.g. build or blood pressure) could be considered preferred risks.

From this we concluded that a general mortality table could be separated into two component tables, one for smokers and the other for nonsmokers.

Taking the 1965-70 Basic Tables as representative of composite smoker and nonsmoker mortality, we separated, for a male age 32 at issue, the mortality rate at each attained age into its smoker and nonsmoker components. These rates are illustrated in detail in Table 7. In determining these rates, we assumed that during the select period the ratio of smoker to nonsmoker mortality was the same as State Mutual's experience, and that it grades down to 1.0 at attained age 85 following the pattern shown in the Surgeon General's Report. We also assumed that the experience underlying the Basic Tables had the same percentage of smokers (i.e. 60%) as the general population for the same time period.

Taking the nonsmoker rates in this table as "standard", then the smoker rates represent mortality of up to 340 percent of "standard". These rates would apply to "average" (30-cigarette-a-day) smokers. If we assume that the patterns in the Surgeon General's mortality data by number of cigarettes smoked also apply to these rates, then the mortality associated with smoking 20 cigarettes a day is approximately 225% of "standard", and for 40 cigarettes or more a day is in excess of 450% of "standard".

We also calculated the complete expectation of life for a male age 32 on the 1965-70 Basic Table, and on the basis of the separate smoker and nonsmoker mortality rates shown in the previous table. The results are as follows:

1965-70 Select and Ultimate Basic Tables	$\overset{0}{e[32]}$ 42.2 years
"Smoker" Table	39.6
"Nonsmoker" Table	46.9

This shows a difference in expectation of life between smokers and nonsmokers of 7.3 years. Given the modest assumptions used in the construction of our smoker and nonsmoker tables as to nonsmoker mortality improvements at the ultimate ages, this result for insured lives between nonsmokers and "average" cigarette smokers compares not unreasonably with the conclusions in the Surgeon General's Report regarding overall population statistics, namely that the life expectancy of a 30 to 35 year-old male, two-pack-a-day cigarette smoker is 8 to 9 years shorter than that of his nonsmoking counterpart.

As one benchmark of the significance of the 7.3 year difference taken from our data, the complete expectation of life for a female age 32 on the 1965-70 Basic Tables is 47.2 years, or only 5 years greater than that for a male the same age.

Turning to the practical implications of these differences, while the use of a graded substandard scale by degree of smoking appears to be justified



by the data contained in the Surgeon General's Report, we acknowledge two principal areas of difficulty. First is the verification, at a reasonable cost, of the degree of smoking. Among the criteria which should be considered are: number of cigarettes smoked, age at which smoking began, tar and nicotine content, and the extent of inhalation.

A second major difficulty in utilizing price differentials for smoking is the problem of reclassification. The life insurance industry has traditionally considered reclassification of a life rated substandard if the severity of the impairment has been reduced. The Surgeon General's Report gives evidence of the extent of mortality improvement for ex-smokers. Are they entitled to a change of dividend or rating class if they stop smoking after issue? It would be inappropriate to include them with people who were non-smokers at the time of issue, since that group contains both people who have never smoked as well as ex-smokers. Also, the insured may have quit smoking because of poor health. It might be possible to allow a change in classification upon evidence of insurability. We would greatly appreciate discussion on this challenging issue.

Another aspect of this study that could have significance for the insurance industry is the implications of these results for other areas of risk classification and selection. The significant variances between socio-economic and demographic groups with respect to their smoking habits may be causing distortions in mortality patterns among groups the industry has until now considered homogeneous for mortality purposes.

Two characteristics that illustrate this point are insurance amount and sex. In our paper, we give an example of such distortions.

Our paper also discusses the distortion from calculating expected deaths on a basic table where smoker and nonsmoker representation differs from that of the experience being measured.

One result may be that the improvements observed in overall population mortality for the last decade may be attributable in part to the reduced incidence of smoking.

Although our paper does not investigate this phenomenon in depth, we believe the questions raised do merit further study.

In conclusion, we believe our experience demonstrates that cigarette smokers are subject to mortality risks significantly higher than those of nonsmokers. These mortality differences are real, they emerge early, they are not deferred to older ages and they are statistically significant at any reasonable level. In short, we believe they are too large to be ignored for individual insurance underwriting and pricing purposes.

Since nonsmokers are now the larger segment of the life insurance buying public, we further conclude that they should be considered the basis of the standard underwriting classification. Over a broad range of adult male ages, mortality among smokers who are otherwise standard for life insurance runs two to four times that of standard nonsmokers. We believe these differences should not be ignored, especially when characteristics associated with smaller mortality differences are well established as part of the life insurance underwriting and pricing mechanism. The differences shown in our study are so substantial as to suggest that experience tables

developed on a composite basis show mortality rates that are not actually experienced by any significant homogeneous group.

In closing, I acknowledge that our paper only scratches the surface of what we expect will be a vast new area for mortality investigation, particularly so because it involves an underwriting criterion that is completely within the individual's control. We foresee the possibility of these investigations leading to recognition of mortality differences of the type we have described in our paper, and eventually, the publication of separate mortality tables for smokers and nonsmokers.

#### Discussion

MR. EDWARD A. LEW: My comments spring from the information I have been privileged to acquire while serving as consultant on epidemiology to the American Cancer Society. In this capacity I had a hand in the analysis of the findings of the Cancer Prevention Study in which over 1,000,000 men and women enrolled in 1959-60 were traced for twelve years. They all answered questionnaires on cigarette smoking and various factors at time of enrollment; the survivors answered repeat questionnaires on three later occasions. In a recent analysis, cigarette smokers were classified by the amount of tar and nicotine delivered and by the brand they usually smoked at the start of each of the two six-year periods covered by the study.

The principal point I wish to make is that the broad category of nonsmokers is highly deceptive for developing the effects of cigarette smoking on health and for underwriting purposes. This is because it includes two disparate groups: those who have never smoked and those who gave up smoking - frequently on medical advice. The ex-smokers may, for a short period of time after giving up cigarette smoking, exhibit higher mortality than smokers, whereas those who never smoked almost invariably show very low death rates. The level of mortality experienced among nonsmokers who comprise both the never-smoked and the ex-smokers may vary considerably, depending on the proportion of ex-smokers in poor health included.

Among smokers who smoked the same number of cigarettes a day, death rates from all causes, death rates from coronary disease and death rates from lung cancer have been lower among those who smoked "low" tar-nicotine cigarettes than for those who smoked "high" tar-nicotine cigarettes. If you care to research this further you can see the article, "Tar and Nicotine Content of Cigarette Smoke in Relation to Death Rates," by E. Cuyler Hammond et al, Environmental Research 12, 263-274, 1976. Death rates of subjects who smoked "low" tar-nicotine cigarettes were, nevertheless, far higher than the death rates of subjects who never smoked regularly. Cigarettes with reduced tar-nicotine content were introduced in the late 1950's. Those switching to "low" tar-nicotine cigarettes reduced the serious hazards incurred in cigarette smoking, provided they did not increase the number of cigarettes smoked per day. There is reason to believe that as the tar-nicotine content of cigarettes is progressively decreased, cigarette smokers will fare considerably better than in the past. Such expectations are credible because in animal experiments with "low" tar-nicotine cigarettes it has been very difficult to induce lung cancer.

The effects of cigarette smoking on health cannot be measured by the differences in mortality between smokers and the never-smoked, because the latter usually have life styles highly conducive to greater longevity. This

is illustrated by the very low death rates of Mormons, Seventh Day Adventists and like groups. In other words, the differences in mortality between smokers and the never-smoked reflect not only the effects of cigarette smoking, but also the effects of more salutary modes of living.

The Framingham Heart Study has recently demonstrated that measurements of forced vital capacity are highly indicative of the extent of damage done by cigarette smoking to the cardiovascular system. Cigarette smoking apparently produces a distinctly greater decline in forced vital capacity with advancing age than has been observed among nonsmokers. On giving up cigarette smoking, forced vital capacity tends to return more and more to the pattern of nonsmokers. Again, if you wish further information, you can see the article, "Pulmonary Function: - Relation to Aging, Cigarette Habit, and Mortality," by Frantz Ashley et al, Annals of Internal Medicine Vol. 82 No. 6 June 1975. Measurements of vital capacity may make it possible to determine the extent of an individual's smoking habits without asking any questions of him.

MR. JAMES L. LEWIS, JR.: Mutual Security Life has been selling nonsmokers life insurance policies since 1964. Our definition of nonsmoking has been "No tobacco for one year."

We recently completed a limited mortality study, by amount, of 1976-78 experience, based on valuation data of 6 major plans issued between 1961 and 1978. Substandard policies were not removed in this study. Our results for policy years 1-15 are compared to State Mutual's results in the following table. Amounts are shown in \$1,000 units.

		Mutual Security Life	State Mutual Life
Nonsmokers:	Exposed to Risk	\$ 539,581	\$5,570,737
	Actual Deaths	750	11,004
	(Number)	(43)	(240)
	Expected* Deaths	1,348	20,648
	Mortality Ratio	56%	53%
Smokers:	Exposed to Risk	\$ 843,363**	\$2,722,663
	Actual Deaths	1,805**	12,972
	(Number)	(109)**	(340)
	Expected* Deaths	1,824**	9,798
	Mortality Ratio	99%**	132%
Smokers & Nonsmokers:	Exposed to Risk	\$1,382,944	\$8,293,400
	Actual Deaths	2,555	23,976
	(Number)	(152)	(580)
	Expected* Deaths	3,172	30,446
	Mortality Ratio	81%	79%

\*65-70 Basic Table (Milliman & Robertson Male & Female Combined)

\*\*MSL smoker policies include a substantial number of nonsmokers.

## DISCUSSION—CONCURRENT SESSIONS

Apparently our policies were much smaller than State Mutual's as indicated in the following table.

	<u>Mutual Security Life</u>	<u>State Mutual Life</u>
Average Size Death Claim: Nonsmokers	\$17,400	\$45,900
Smokers	16,600	\$38,200
Total	\$16,800	\$41,300

The remarkable similarity of our nonsmokers mortality ratios to State Mutual's mortality ratios may be due in part to chance, but our results suggest that there is a substantial difference between nonsmokers and smokers mortality, even for smaller policies.

MR. CARL H. ROSENBUSH, JR.: Dr. Maccoby's statement that 10,000 people had quit smoking after watching a television series in Finland impressed me very much. It made me think that a comparable series during "prime time" on American television would be a worthwhile project for those life insurance companies with large television advertising budgets. Such a series, along with preliminary spot commercials and follow-up reading material, would have a much greater effect in increasing the public weal and the companies' mortality profits than the sponsorship of football games or escapist adventures.

TABLE 1

Mortality ratios for male cigarette-only smokers, by number of cigarettes smoked per day and age. U.S. veterans 1954 cohort, 16-year followup

Number of cigarettes per day	Age				
	30-34	35-44	45-54	55-64	65-74
Nonsmokers	1.00	1.00	1.00	1.00	1.00
less than 10	1.94	1.44	1.44	1.20	1.15
10-20	1.27	1.79	1.64	1.49	1.30
21-39	1.76	2.23	2.10	1.67	1.42
40+	2.33	2.72	2.13	1.86	1.65
All smokers	1.52	1.95	1.83	1.53	1.32

SOURCE: Smoking and Health, Report of the Surgeon General, 1979, Chapter 2, Table 5, p. 17 (Citations omitted).

TABLE 2

## STATE MUTUAL'S STANDARD MEDICALLY EXAMINED ISSUES OF 1964 - 1977

Permanent Plans - Policies with Face Amounts of Insurance \$10,000 and Higher  
 Male and Female Lives Combined - Issue Ages 20 and Over  
 Experience Between 1973 and 1978 Anniversaries by Age at Issue  
 Policy Years 1-15 Combined  
 Expected Deaths on 1965-70 Select Basic Tables  
 (Amounts Shown in \$1,000 Units)

Ages at Issue	Smokers					Non-Smokers					Smokers and Non-Smoker Combined
	Exposed to Risk	Actual Deaths	Expected Deaths	Mortality Ratio		Exposed to Risk	Actual Deaths	Expected Deaths	Mortality Ratio		Mortality Ratio
20 - 29	\$ 506,421	\$ 831 (25)	\$ 461	180%		\$ 874,081	\$ 195 (6)	\$ 761	26%		81%
30 - 39	1,031,142	4,167 (101)	2,031	205	[156+]	1,985,563	1,091 (29)	3,751	29		91 [74+]
40 - 49	856,980	4,853 (124)	3,994	122		1,900,021	4,162 (102)	8,612	48		72
50 - 59	293,503	2,416 (75)	2,638	92		726,496	4,766 (80)	6,203	77	[45++]	81 [59++]
60 and Over	34,617	705 (15)	674	105		84,576	790 (23)	1,321	60		75
20 and Over	\$2,722,663	\$12,972 (340)	\$9,798	132%	[122+]	\$5,570,737	\$11,004 (240)	\$20,648	53%	[44++]	79% [69+++]

Note - The actual number of deaths is shown in parentheses.

+ Excludes one death for \$1 million.

++ Excludes one death for \$2 million.

+++ Excludes the two deaths noted above.

TABLE 3

STATE MUTUAL'S STANDARD MEDICALLY EXAMINED ISSUES OF 1964 - 1977  
 Permanent Plans - Policies with Face Amounts of Insurance \$10,000 and Higher  
 Male and Female Lives Combined - Issue Ages 20 and Over  
 Experience Between 1973 and 1978 Anniversaries by Policy Year  
 Expected Deaths on 1965-70 Select Basic Tables  
 (Amounts Shown in \$1,000 Units)

Policy Years	Smokers					Non-Smokers					Smokers and Non-Smoker Combined			
	Exposed to Risk	Actual Deaths		Expected Deaths	Mortality Ratio	Exposed to Risk	Actual Deaths		Expected Deaths	Mortality Ratio	Mortality Ratio			
1 - 5	\$1,191,868	\$ 4,060	(97)	\$2,700	150%	\$2,591,728	\$ 5,394	(67)	\$ 6,333	85%	[4++]	105%	[3+]	
6 - 10	1,191,751	6,759	(153)	4,929	137	[17]	2,518,473	4,029	(110)	11,275	36	67	[60]	
11 - 15	339,044	2,153	(90)	2,169	99	460,536	1,581	(63)	3,040	52	72			
1 - 15	\$2,722,663	\$12,972	(340)	\$9,798	132%	[22]	\$5,570,737	\$11,004	(240)	\$20,648	53%	[4+]	79%	[59+]

Note - The actual number of deaths is shown in parentheses.

+ Excludes one death for \$1 million.

++ Excludes one death for \$2 million.

+++ Excludes the two deaths noted above.

NON-SMOKERS POLICIES

TABLE 4

## STATE MUTUAL'S MORTALITY RATES PER THOUSAND OF INSURANCE BY CAUSE OF DEATH

Permanent Plans - Policies with Face Amounts of Insurance \$10,000 and Higher  
 Standard Medical and Nonmedical Issues of 1964 to 1977  
 Male and Female Lives Combined - Issue Ages 20 and Over  
 Experience Between 1973 and 1978 Anniversaries  
 Policy Years 1 - 15 Combined

Cause of Death	Smokers		Non-Smokers		Ratio of Smokers to Non-Smokers
Respiratory Cancer	.344	(37)	.023	(6)	15.0
Pneumonia and Influenza	.147	(6)	.010	(3)	14.7
Other Respiratory Diseases	.118	(10)	.061	(11)	1.9
Arteriosclerotic and Degenerative Heart Disease and Myocardial Insufficiencies	1.298	(129)	.487	(88)	2.7
	[1.020+]	(128)			[2.1+]
Hypertensive Heart Disease and Hypertension	.145	(15)	.018	(3)	8.1
Other Cardiovascular Diseases	.147	(25)	.076	(21)	1.9
Cancer (Excluding Respiratory Cancer)	.695	(72)	.573	(65)	1.2
			[.280+]	(64)	[2.5+]
Mental Disorders and Diseases of the Central Nervous System	.120	(9)	.051	(8)	2.4
Digestive Diseases	.064	(5)	.011	(6)	5.8
Motor Vehicle Accidents	.134	(22)	.052	(13)	2.6
Other Accidents	.271	(23)	.178	(35)	1.5
Suicide	.199	(26)	.022	(9)	9.0
Homicide	.095	(9)	.044	(12)	2.2
All Other Causes	.126	(25)	.153	(25)	0.8
Total All Causes	3.898	(413)	1.758	(305)	2.2
	[3.620+]	(412)	[1.466+]	(304)	[2.5+++]

Note - The actual number of deaths is shown in parentheses.

+ Excludes one death for \$1 million.

++ Excludes one death for \$2 million.

+++ Excludes the two deaths noted above.



TABLE 5

## MORTALITY RATIOS OF STATE MUTUAL'S STANDARD MEDICALLY EXAMINED ISSUES OF 1964 - 1977

Permanent Plans - Policies with Face Amounts of Insurance \$10,000 and Higher  
 Male Lives - Issue Ages 30 - 49  
 Experience Between 1973 and 1978 Anniversaries by Age at Issue and Policy Year  
 Expected Deaths on 1965-70 Male Select Basic Table

Policy Years	Issue Ages 30-39			Issue Ages 40-49			Issue Ages 30-49		
	Smokers	Non- Smokers	Ratio of Smokers to Non-Smokers	Smokers	Non- Smokers	Ratio of Smokers to Non-Smokers	Smokers	Non- Smokers	Ratio of Smokers to Non-Smokers
1 - 5	197% (19)	18% (5)	10.9	144% (32)	82% (23)	1.8	162% (51)	62% (28)	2.6
6 - 10	148+ (47)	36 (17)	4.1	137 (59)	32 (45)	4.3	141+ (106)	33 (62)	4.3
11 - 15	135 (29)	32 (6)	4.2	85 (28)	49 (25)	1.7	101 (57)	43 (31)	2.3
1 - 15	157+ (95)	30 (28)	5.2	126 (119)	48 (93)	2.6	137+ (214)	42 (121)	3.2

Note - The actual number of deaths is shown in parentheses.

+ Excludes claim for \$1,000,000.

TABLE 6

ADJUSTED MORTALITY RATIOS OF STATE MUTUAL'S STANDARD MEDICALLY EXAMINED ISSUES OF 1964 - 1977  
MORTALITY RATIOS ADJUSTED TO REFLECT CURRENT SMOKING STATUS

Permanent Plans - Policies with Face Amounts of Insurance \$10,000 and Higher  
Male Lives - Issue Ages 30 - 49  
Experience Between 1973 and 1978 Anniversaries by Age at Issue and Policy Year  
Expected Deaths on 1965-70 Male Select Basic Table

Policy Years	Issue Ages 30-39			Issue Ages 40-49			Issue Ages 30-49		
	Current Smokers (Est.)	Non- Smokers	Ratio of Smokers to Non-Smokers	Current Smokers (Est.)	Non- Smokers	Ratio of Smokers to Non-Smokers	Current Smokers (Est.)	Non- Smokers	Ratio of Smokers to Non-Smokers
1 - 5	216%	18%	12.0	149%	82%	1.8	172%	62%	2.8
6 - 10	193	36	5.4	179	32	5.6	184	33	5.6
11 - 15	212	32	6.6	106	49	2.2	140	43	3.3
1 - 15	197	30	6.6	149	48	3.1	165	42	3.9

TABLE 7

SEPARATION OF 1965-70 MALE SELECT AND ULTIMATE BASIC TABLES INTO SMOKER AND NON-SMOKER COMPONENTS  
Mortality Rate Per 1,000 - Issue Age 32

Age	Basic Table	Smoker	Non-Smoker	Ratio of Smoker to Non-Smoker	Age	Basic Table	Smoker	Non-Smoker	Ratio of Smoker to Non-Smoker
32	.75	1.05	.31	3.4	66	28.73	37.12	16.14	2.3
33	.87	1.21	.36	3.4	67	31.40	40.57	17.64	2.3
34	.98	1.37	.40	3.4	68	34.21	43.76	19.89	2.2
35	1.10	1.53	.45	3.4	69	36.99	47.31	21.51	2.2
36	1.19	1.65	.50	3.3	70	39.92	50.50	24.05	2.1
37					71	43.46	54.98	26.18	2.1
38	1.33	1.84	.56	3.3	72	47.47	59.34	29.67	2.0
39	1.46	2.02	.61	3.3	73	51.73	64.66	32.33	2.0
40	1.68	2.33	.71	3.3	74	56.43	69.62	36.64	1.9
41	1.92	2.65	.83	3.2	75	61.64	76.05	40.03	1.9
42	2.17	2.99	.94	3.2	76	67.41	81.99	45.55	1.8
43	2.47	3.41	1.06	3.2	77	73.71	89.65	49.80	1.8
44	2.75	3.79	1.19	3.2	78	80.63	96.53	56.78	1.7
45	3.06	4.20	1.35	3.1	79	88.00	103.53	64.71	1.6
46	3.46	4.75	1.53	3.1	80	95.60	110.31	73.54	1.5
47	3.96	5.43	1.75	3.1	81	103.29	116.62	83.30	1.4
48	4.42	6.06	1.96	3.1	82	111.63	122.98	94.60	1.3
49	4.92	6.71	2.24	3.0	83	120.51	129.12	107.60	1.2
50	5.51	7.51	2.50	3.0	84	130.63	135.56	123.24	1.1
51	6.17	8.41	2.80	3.0	85	141.76	141.76	141.76	1.0
52	6.84	9.33	3.11	3.0	86	153.97	153.97	153.97	1.0
53	7.50	10.16	3.50	2.9	87	167.26	167.26	167.26	1.0
54	8.23	11.15	3.85	2.9	88	181.42	181.42	181.42	1.0
55	9.05	12.26	4.23	2.9	89	193.63	193.63	193.63	1.0
56	10.03	13.50	4.82	2.8	90	202.96	202.96	202.96	1.0
57	11.17	15.04	5.37	2.8	91	210.32	210.32	210.32	1.0
58	12.42	16.72	5.97	2.8	92	217.76	217.76	217.76	1.0
59	13.73	18.35	6.80	2.7	93	230.07	230.07	230.07	1.0
60	15.10	20.18	7.48	2.7	94	248.83	248.83	248.83	1.0
61	16.50	21.89	8.42	2.6	95	267.93	267.93	267.93	1.0
62	18.01	23.89	9.19	2.6	96	279.78	279.78	279.78	1.0
63	19.69	25.91	10.36	2.5	97	292.83	292.83	292.83	1.0
64	21.63	23.46	11.38	2.5	98	306.15	306.15	306.15	1.0
65	23.81	31.06	12.94	2.4	99	319.74	319.74	319.74	1.0
66	26.17	34.13	14.22	2.4	100	333.56	333.56	333.56	1.0

