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UNDERWRITING AND MORTALITY

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This panel will present new information and approaches that address the impact of underwriting on mortality.

MR. DAVID B. ATKINSON: The U.S. life insurance industry is undergoing a profound shift in the way business is underwritten. This will also have a profound effect on our mortality results. I think you'll agree that today's changes are no less dramatic than the shift we had 15 years ago from aggregate rates to smoker/nonsmoker rates. The goals of this panel are to expose you to some of the current and future changes in underwriting, to give you some ideas on how to manage these changes to better achieve your own company's results, and to give you some tools to estimate the impact of these changes on mortality. So without further adieu, let me introduce our first speaker, Dr. Warren Kleinsasser. He is a senior vice president and medical director of Osborn Labs and is a graduate of the University of Minnesota.

Dr. Kleinsasser joined Osborn Labs in February 1988 after serving at Minnesota Mutual Life for over 21 years as vice president and chief medical director. Dr. Kleinsasser has achieved the designations of Fellow of the Life Management Institute (FLMI), Chartered Life Underwriter (CLU), and Fellow of the Academy of Life Underwriting (FALU) with distinction. He's a past president and past member of the executive council of the American Academy of Insurance Medicine. He is past chairperson of the board of directors for MIB Incorporated.

DR. WARREN KLEINSASSER: I will discuss some of the developing issues in insurance medicine as they relate to laboratory data and laboratory interpretations. I'm going to give just an overview of each of the areas involved. We'll probably barely scratch the surface of some of the subjects that we talk about. Some of them are one-hour, two-hour, or all-day discussions in and of themselves. Like clinical medicine, insurance medicine is changing.

We're going to talk about changes and new developments. What's new in the area of lipids? As we all know, total cholesterol is a significant risk factor for coronary artery

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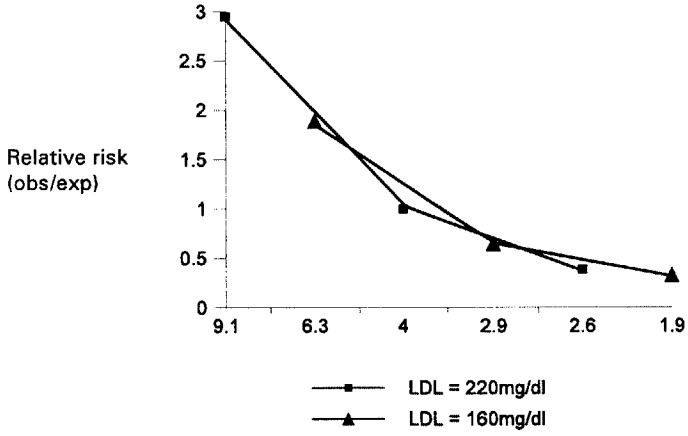
disease, but new data are demonstrating how small the differences in cholesterol levels are between really significant changes and healthy lifestyles. The Johns Hopkins Precursor Study published in 1994 showed that there was a very strong association between just total cholesterol early in adult life in men and cardiovascular disease by age 50. The mean age at measurement was only 22 years. They were all males because the study was done on medical students in 1960—a basically all-male population. They were followed for 30 years and the results were adjusted for age, body mass index, physical activity, smoking status, diabetes, and hypertension. There was only a 36% milligram difference in baseline cholesterol between the 25th and 75th percentile. But after 30 years, that difference was associated with a two-thirds increase in cardiovascular disease—coronary heart disease was doubled; cardiovascular mortality was doubled; and the risk of death before age 50 was two-thirds higher. This was related to measuring only total cholesterol.

In addition, if you consider high-density lipoprotein (HDL) cholesterol (the so-called good cholesterol) as you get low HDL cholesterol and high total cholesterol, there is a greatly increased risk of coronary events. The interesting thing is that this begins to occur in the normal range of HDL cholesterol with only modestly elevated total cholesterol. All one needs is a modestly low HDL and a total cholesterol of 240 and one is at significantly increased risk (Chart 1). The National Cholesterol Education Program Adult Treatment Panel has recently strongly recommended that HDL by itself be recommended as a major risk factor for cardiovascular disease. We'll hear more about this in a moment as we talk about triglycerides.

CHART 1
LIPIDS
LDL/HDL RATIO



As far as low-density lipoprotein (LDL) cholesterol is concerned, some companies are measuring this and using it in risk factor assessment, but most clinical literature will tell you the LDL does not provide much more prognostic information than the measurement of HDL or the total cholesterol/HDL ratio.

There's an important concept that just emerged in the last year or two. It used to be said you can ignore triglycerides as a cardiovascular risk factor because their effect is taken

into account when you consider hypertension, smoking, and other factors. However, the recent data shows that if you compare people with high HDLs, medium HDLs, or low HDLs, relative to the triglyceride concentrations, the group with the combination of low HDL and high triglycerides is extremely important in terms of the number of coronary events. The group experiences roughly six times as many coronary events as would a standard population. This is true in both men and women.

It's thought that as either triglycerides go up or HDL goes down, the nature of the LDL cholesterol, which is the "bad" cholesterol, changes and becomes even more atherogenic. It becomes more dense, free radicals are formed and other changes occur that are not good. If you find the combination of low HDL and high triglycerides, you have a problem case on your hands. This occurs in roughly 4% of the population, and yet it accounts for over one-quarter of the atherosclerotic events in the Procam study. The cardiovascular risk is about six times standard for this group. In the Framingham study, this syndrome produced twice as many cases of coronary artery disease as the next highest disease producing lipid abnormality, thus supporting the Procam findings.

Now a brief word about apolipoproteins. You'll find large lipid structures in the blood called chylomicrons which are full of triglyceride. You also have lipid globules called VLD or low-density LDL (low) lipoproteins, IMDL (intermediate), and HDL (high) or the "good" cholesterol. On each of these, you'll find little protein particles called a-polipoproteins. Apolipoproteins serve the functions of making fats soluble in water or in blood. They also tell the fat particles where to go in the body (to which tissues), and they activate enzymes that metabolize those fats; so they have very important functions. Apolipoprotein A-1 is very closely related to HDL. The nice thing about measuring apolipoproteins is that they don't vary as much with diet or the nonfasting state as do HDL and total cholesterol, and so consequently, they give more stable information. But studies done on apolipoprotein A-1 do show that it is not necessarily superior to HDL. Apo-B, on the other hand, had high predictive value in four out of five studies. It is associated with LDL cholesterol, and it is a marker for coronary artery disease in most studies. Apo-B has also been measured in children and its values in children correlate highly with the amount of coronary disease in the parents.

Why is this important when we already have cholesterol and HDL cholesterol measured? In some cases one can't get HDL data, such as in the use of dry blood spot testing and, in those cases, one can do apolipoprotein testing. Also, in cases where one finds borderline values for total cholesterol and HDL, one may wish to get apolipoprotein testing to clarify the picture.

You may have heard of a substance called lipoprotein(a) or Lp(a) which some people have thought may be the next significant marker because it has been demonstrated to be elevated in people with coronary disease, especially in recent coronary events. It is closely related to genetic inheritance and usually does not change much within the same person. I don't think that Lp(a) will become very significant, however, because there are huge differences in the substance among various ethnic populations. We don't know which type of population we're testing in insurance medicine because that information is not available, and therefore, we cannot define reference ranges that are going to be appropriate for everyone. In addition, Lp(a) is an acute phase reactant, meaning that it will become elevated in febrile conditions or with recent injury. Therefore, I doubt Lp(a) is going to be a very significant risk for insurance underwriters to consider.

Switching now to genetic testing, one can hardly pick up a journal or a paper anymore without seeing something about genetics either from the scientific literature or from the popular press. First, we must define what we mean. When talking about genetic testing, are we talking about actual gene changes? Are we talking about gene products that are the proteins produced in response to the messages of the genes? Or are we talking about the cascade of events, two or three levels removed from the actual gene product? As an example, cholesterol in itself could be called a genetic test in the sense that it is, in large part, genetically determined even though it is affected by diet. So we must be careful how we define genetic testing, and that isn't always done.

There are a number of different types of genetic abnormalities. One may have too many chromosomes as in Down's and Klinefelter's Syndromes. One may have translocations where part of one chromosome changes place with part of another such as the "Philadelphia chromosome" in one type of leukemia. One may have unusual amplifications of one part of a chromosome—the body creates too much of it—and this is what happens in some of the muscular dystrophies. In cystic fibrosis, you can actually find a point mutation in the gene itself where the proteins of the building blocks in a single gene are in error.

Another matter to consider is the distinction of whether the genetic defect is inherited or acquired during one's lifetime. Many of the things that we do affect our genes such as getting too much sunlight, eating the wrong types of foods, and so forth.

One must also consider that technologies are changing rapidly. Not long ago we were very fortunate if we could tell if there was a chromosomal difference. Today in research settings, one can take a specimen of blood and measure 40, 80, or more different gene characteristics and have the answers within a matter of two hours by the use of microchip technology. That will improve markedly in the near future. It is still not cost effective or very advantageous for insurance screening purposes, because one must know exactly what one is looking for which implies the use of specific primers for PCR or other similar technology, but it's coming.

In molecular diagnostics, which is gene testing, one actually tests for specific ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) which has the definite advantage of specificity (very few false positives) and sensitivity (very few false negatives). Currently, one may have rapid turnaround time, but one can't test very many specimens at once. Another big problem, of course, is the lack of standardization and the fact that it takes very specialized facilities and equipment.

The only genetic test for diagnostic purposes, which is now Food and Drug Administration (FDA) approved, is one for chlamydia, an infectious disease. However, molecular genetic testing is being used in various types of cancers. You've all read about the BRCA-1 gene which was recently described in breast cancer and found to be more common in Ashkenazi Jews. People with the BRCA-1 gene are much more prone to get breast cancer, but it still accounts for only about 5% of all breast cancers.

Finally, one may also check for gene errors in the unborn. Sometime decisions are made to terminate pregnancies based on such genetic testing results.

In colon cancer, several genes must be affected before one gets the cancer. The series of genetic problems that occur is now well defined. We start with a normal colon without

any polyps. If one has the familial polyposis colon gene, one can get multiple polyps occurring within the colon. And if one then has another gene which becomes affected, those polyps then become tumorous. If one then has a couple of more abnormal genes such as the P-53 or the K-Ras gene, one gets actual cancers in the colon. With current technology, it's now possible to check stool samples for the P-53 gene (and this has been done in cases of familial colon cancer) and researchers have found that the P-53 gene is abnormal in a very large percentage of them. This has not been done in screening general populations, but this type of thing is probably coming.

The P-53 gene is something you'll hear a great deal about. It is a tumor suppressor gene. In other words, these genes keep you from developing tumors, but when P-53 becomes abnormal or mutated, it doesn't function properly and, consequently, if one has a mutated P-53 gene, one is more apt to get cancer. In addition to colon cancer, P-53 abnormalities have been checked in lung secretions and found to be related to lung cancers in a number of cases. There is an interesting story about Hubert Humphrey. First, he experienced urinary bleeding in 1967. The work-up was apparently not significant, but researchers stored some of his urine specimens. By 1976 his physicians had diagnosed cancer of the bladder and by 1978 he was dead. In 1994, researchers retrieved the urine specimens from 1967 and found that, lo and behold, the P-53 mutant gene was present. Had that been known in 1967, his doctors may have been able to do something earlier and use more aggressive treatment to prevent his premature death.

A point I want to stress is that molecular diagnostics is a form of genetic testing even though we're in many cases testing either an organism's (not a person's) actual genes, or we may be testing genetic changes that have occurred during one's lifetime. We must be very careful in discussions of molecular or genetic testing given all the emotional rhetoric that is widespread regarding insurers being able to use this information sometime in the future; we must carefully define and know what we are talking about. I think the industry has to make a stronger stand about being able to constructively use this testing or the information derived from it.

What about tumor markers? I previously mentioned BRCA-1. There are many kinds of different tumor markers. In the past, a tumor marker was defined as any substance produced by a tumor or by the body in response to it. Nowadays, we're talking more about genetic definitions of tumor markers such as BRCA-1, DR-70, and so on. Tumor product markers, however, include what is probably the most used marker today and that's prostate specific antigen (PSA). I'll say a few words about that.

Prostate cancer is the most common nonskin cancer in men and the second leading cause of male cancer death. PSA, while helpful in cancer screening, is not a cancer-specific test. Twenty-five percent of men with benign prostatic hypertrophy have elevated PSA. It also may be elevated in acute urinary retention and in urinary infections, but primarily in prostate cancer. Digital rectal exam has virtually no effect on PSA, so it can be tested at the time of physical examination. An interesting statistic is that during the mid-to-late 1970s and early 1980s, 42.5% of men operated on for cancer of the prostate could not be cured. It was too far advanced, and only 6% had PSA tests. By 1990 the "not-for-cure" rate had dropped to 32% and 70% had PSA tests; keep that in mind.

The Physicians' Health Study published just this year covered 22,000 men age 40–84. The study was begun in 1982 and excluded persons with histories of cardiovascular

disease, cancer, and so on. Their main study goal was to find out if aspirin prevented cardiovascular disease. But they also studied these people for other problems. They determined who had prostate cancer during the ten-year follow-up and found 366 who had diagnosed prostate cancer and who had stored blood samples drawn at entry so they could go back and do PSAs on the original sample. They found out that 183 were "aggressive cancers." They found out that 75% of the people that died with the diagnosis of prostate cancer, died due to prostate cancer. Sensitivity of the test was greatest in younger males. It picked up 71% of those cancers that occurred in the first five years of the study. It picked up 78% of the aggressive cases, so it was very important.

In an editorial which accompanied the study report in *The Journal of the American Medical Association,* the conclusion was that it appears that large aggressive screening trials are capturing the virulent forms of prostate cancer. Relatively few (less than 15%) of incurable cancers are discovered among men serially screened. Recall that the figures previously were 42.5% and 32.5%. Now we're down to 15% who cannot be treated for cure initially. On the other hand, they said that less than 15% were the so-called indolent form (mild cancers that you don't worry about). The PSA seems to be doing the job that it's meant to do and is doing it pretty well. In fact, these numbers are better than the predictive values that one sees with mammography for breast cancer in women. The editorial's conclusion was that the modern data strongly favor an aggressive approach to significant localized prostate cancer for men with life expectancies greater than ten years. This would seem to include not only treatment, but screening. To me this is a watershed study and is probably going to influence that kind of testing.

I quickly want to mention alternates to blood testing for HIV. With blood testing, there's not much new information. But saliva testing, of course, was recently approved by the FDA for screening and only for HIV testing. There is no approved confirmatory test. That has recently changed due to an end run done by Epitope, which owns the licensed test. With some limitations, and with the approval of an institutional review board, confirmatory testing for saliva is available as a study tool, so that for insurance testing, you have screening ELISAs and Western Blots just as you do for blood. The performance of these tests is not quite as accurate as that done on blood, and, because of that, abnormal or reactive screening results will still require blood follow-up regardless of confirmatory test results.

Collection can be done by nonhealth professionals, meaning agents who are properly trained, but there must be physician involvement in this. The physician must oversee the fact that the collection kits are distributed only to trained collectors. Training means reading some brochures, looking at a videotape, and taking a test. The agent also has to oversee the reporting of positives, assure confidentiality, and the availability of some pretest counseling pamphlets, similar to what we use now for blood.

The reported performance of the test is important. There will be false positives, since specificity was only 99.6%. If that holds in an insurance population, there are eight or nine false positives that occur relative to blood for every positive blood case. That could create some problems.

Just this week I heard a rumor that cocaine for insurance testing purposes was not going to be held up by the FDA. Whether there will be a rush to saliva testing, I don't know. There are some state regulations that have to be considered—in some states it is

prohibited. I think that issue and the false positive issue are some things about which companies are going to have to be very careful.

I should mention that Calypte, another company, has applied for a screening and confirmatory test on urine. This has been before the FDA for several years. The latest I'm hearing on that is that they anticipate approval soon, which may provide yet another alternative.

Incidentally, the buzz is that there will soon be home testing for HIV. Actually, people will be able to buy kits in drug stores, take them home, collect a dried blood spot from a finger stick, and mail them into a central laboratory for testing. Many feel that system will be approved in 1995, which would certainly affect antiselection. You might want to consider the effect that would have on your company's testing program.

I want to mention tests available for heavy alcohol use. I'm not going to get into any of them except I'll briefly mention carbohydrate deficient transferrin. Labs can do testing of alcohol in blood or urine, but you have to be careful in mailed or shipped specimens because bacterial contamination may cause you to get false positives. That's why alcohol testing on blood or urine has not been done very much in an insurance setting.

I want to point out that alcohol consumption in the U.S. is declining over the last decade and yet the presence of abnormal liver enzymes has gone from 10% to 17% over the last six years. Gamma-glutamyl transpeptidase (GGT) abnormalities have gone from about 3.2% in 1988 to almost 7% in 1993, or higher in some labs.

Something has happened in the population. I think what has happened is that all types of medication usage has gone up, but especially acetaminophen (Tylenol) and nonsteroidal anti-inflammatory usage has gone up while aspirin usage has gone down. These drugs are known to affect liver enzymes and there are other drugs also that are more frequently in use now. I think that's what's happening to liver enzymes.

The Centers for Disease Control (CDC) statistics show that if you delete AIDS, which is now the leading cause of death in males age 25–44, and if you delete heart disease, the remaining eight of the top leading causes of death in young males are caused in large part by, or heavily related to, or certainly influenced by the chronic heavy use of alcohol. Therefore, we need a more reliable marker than the liver enzyme. According to the National Institute of Alcohol and Alcohol Abuse, carbohydrate deficient transferrin (CDT) is the surest test so far for spotting heavy drinkers. CDT becomes abnormal with five or six drinks per day on the average for at least two weeks and returns to normal in two to four weeks after cessation of heavy drinking. One must be cautious as to how the CDT test is done. It is not highly standardized and different labs do it differently with differing results. Our lab uses a screening test and a confirmatory test. We use an ELIZA/Western Blot combination quite similar to HIV testing and with that you can get good sensitivity and very good specificity. The CDT in our hands has a positive predictive value of roughly 93% in a 6% heavy alcohol user population, and a negative predictive value of 98% as a pure screen.

MR. ATKINSON: Our next speaker is Steven J. MacDonald, vice president of new business, First Penn-Pacific Life Insurance Company. Steve's a graduate of Boston College with a B.S. in Biology. Steve joined First Penn in February of this year after serving at Kemper Life for over six years as chief underwriter. Steve has achieved the

designations of FLMI and FALU. He has served six years with the Academy of Life Underwriting and is a past member of the Executive Council for the Home Office Life Underwriter's Association.

MR. STEVEN J. MACDONALD: This is my old stomping grounds and I'm really honored to be on a panel with people like Warren, Jessie, and David. My goal for this presentation is to provide you with some insight into the practical considerations that went into setting up the preferred underwriting guidelines at our company. In February of this year, my colleagues and I were presented with an opportunity to establish a separate division in First Penn-Pacific in order to manufacture and distribute low-cost mortality-based products through the independent brokerage/general agent (BGA) market. It's an environment where price and compensation are of paramount importance and where the competition is very heated. Our competition in the marketplace includes some of the most successful low-cost insurance providers in the country.

Our initial product introduction consists of just a straight term insurance product with a 5-, 10-, 15-, and 20-year level premium. We have the typical four underwriting classifications of preferred nontobacco, standard nontobacco, preferred tobacco, and standard tobacco. Our marketing sales objective was to capture as much of the preferred marketplace as possible using the BGA distribution system. Of course, while creating a cheap term product is not technically difficult, getting an acceptable return on equity can be somewhat daunting.

Our objectives in this regard included the following. We wanted to achieve mortality results consistent with product pricing. We had to keep expense levels low and for purposes of this discussion, we'll focus on the evidence costs per paid policy. We wanted to keep an independent, aggressive BGA field force satisfied with our underwriting philosophy. While this last objective might seem in opposition to the first (getting an acceptable mortality return), our long-term success really rests with reconciling those sometimes opposing goals. Therefore, we had to adopt an underwriting strategy that would be acceptable to the field, but also provide acceptable mortality results and, also, keep our evidence cost levels under control.

Before proceeding further I'd like to just talk about the BGA distribution system and marketplace. The BGA that we contract with essentially recruit individual, independent writing agents that funnel business through their organization for submission to various insurance companies. The BGA offers value-added services to these writing agents. Some of these services include: providing the writing agent with advice on which products and companies might best serve their client's needs; managing underwriting evidence gathering for the insurance companies; and acting as intermediary between the writing agent and the home office. Thus, all routine contact takes place between the insurance company's New Business Department and the BGA.

The typical BGA may contract with five, ten, or fifteen different insurance companies, and therefore, is able to offer a wide variety of products and underwriting approaches to assist writing agents in securing the best policy possible for clients. Very often in the preferred versus standard marketplace, this opportunity translates into which company or companies, based on published preferred underwriting criteria, would be best for an individual client. In this capacity, the BGA acts as a selector. Therefore, if the writing agent comes to the BGA with an individual who may have some kind of impairment or some unusual

condition, the BGA, armed with the preferred underwriting criteria of various companies, will select the company that would be willing to issue a policy to the client on the most favorable basis possible. This is a legitimate selection process.

However, it can have an adverse impact on an insurance company especially if a company's guidelines do not cover a certain impairment that might have mortality significance. For instance, if only one company out of the seven that a BGA uses allows private pilots to be preferred, every single application on a private pilot will be sent to that company. So, initial estimates as to the percentage of private pilots in a company's insured population will increase if that company is the only company doing business with a BGA that allows private pilots to have preferred. That's one of the considerations we had to take into account when we were looking at our preferred underwriting guidelines.

Our goal basically was to make sure that our preferred underwriting guidelines didn't have any obvious loopholes where we weren't addressing something that had mortality significance even though initially we might not think that the condition was frequent enough for it to be a concern. When you're the only company that doesn't address an item of mortality significance in this distribution system, all of a sudden you'll see increased numbers of that type of risk coming to your company and that could have a negative effect or impact on mortality.

Another important factor in this particular distribution system is the "not-paid" rate (percentage of submitted applications that do not result in a paid policy). For the purposes of this discussion, we assumed that our evidence costs were going to be approximately $108 per application received, based on utilization rates for the various types of requirements: exams, lab analyses, attending physician statements, inspection reports, and so forth. Also, we estimated that our overall "not-paid" rate for this distribution system will be 20%. While this "not-paid" rate may seem high, it is in line with results to be expected by this type of distribution system.

One of the most detrimental things that can happen to a company is to have the "not-paid" rate exceed pricing expectations. The impact of the underwriting decision, "standard, not-preferred," on the "not-paid" rate is tremendous and our "not-paid" estimate of 40% would be low. I really think that it's about 50% or 60%. In this particular marketplace, a BGA has seven or eight companies that offer preferred products. What happens is the minute that a "standard, not-preferred" decision is made, the business will flow to a company that would accept it on a preferred basis. Obviously, the result of having many "standard, not-preferred" decisions will be to have increased evidence costs per paid policy and, of course, strained relationships with an independent field force, which could be very detrimental to future growth.

From the standpoint of what impact the "standard, not-preferred" decision would have, I made certain assumptions which I think are reasonable. For the most part, close to 100% of the applications that we receive are applied for on a preferred basis. We don't see very many applications for standard insurance rates; it's almost all preferred. Sometimes we even see applicants who are 5'4," 300 pounds applying for preferred. But, for the most part, the BGA selection process will prevent this from happening. The BGA is going to look at a given company's guidelines and is going to determine that, based on the application information, or on the information received from the writing agent, First Penn-Pacific should be able to qualify this person for preferred. Of course, some of the information that

the BGA doesn't have will be the results of the blood profile, electrocardiogram (EKG), attending physician's statement (APS), and so forth. While all the cases that come to us essentially are applied for on a preferred basis, not all will ultimately qualify for preferred.

We assume a 40% "not paid" rate for the "standard, not-preferred" decision. We also assume that 10% of the cases issuing preferred will be not taken, and we assumed that 5% of the applications will be declined. The impact on evidence costs per paid policy will be to increase costs to $154 per paid policy (assuming $108 per application) and if only 50% of those preferred cases qualify. At a 90% qualification rate, evidence costs are reduced to $131. While a swing of over $20 in evidence costs per paid policy is impressive, the impact on field relations in having only 50% qualified rate is enormous, especially in the independent marketplace. The likelihood of a company with a 50% qualification rate being terribly successful in that marketplace is questionable especially with respect to getting additional cases coming in from a disappointed field force.

Our goal, then, when establishing the preferred criteria was not only to improve mortality, but also to get a qualification rate that might result in a respectable preferred qualification rate. Based on the guidelines that we have without any further adjustments by the BGA, we feel that about 70% of the cases will qualify for preferred. If the BGA uses the selection process properly, which they do by knowing our guidelines and not sending us business that could not possibly qualify for preferred, perhaps we can push that qualification rate up to 80%, maybe 85%. If the BGAs do a good job in their selection process, the qualification rate will be improved and that's crucial to our success.

A consideration in our quest to improve mortality so that results match the product pricing was to not rely solely on the tightening of the preferred guidelines in order to achieve mortality improvement. We felt that if we relied solely on the preferred guidelines to improve mortality, we'd have to wind up with a 50% qualification rate and all the attendant problems that would come with that approach. Obviously, based on our experience we weren't working in a vacuum—we had been in this marketplace for quite some time. We knew we had to tighten some of our preferred guidelines, but we wanted to focus in other areas to improve mortality even further.

One major decision that we made to improve our overall mortality was really not an underwriting decision at all. Instead it was a product decision. We eliminated the one-year increasing premium plan from our initial product introduction. The obviously higher lapse rates of that product, especially in this particular distribution system, and the impact of selective lapsation made it prudent for us to leave that particular product out of our introduction. Arguably, it may have been the most significant thing that we did from the standpoint of improving mortality. We also made sure that our underwriting staff was experienced. We provided them with a great deal of training in understanding our distribution system and, also, what our profit objectives were.

From the standpoint of laboratory testing, we also have adopted a reflex testing approach which enables us to better determine the significance of various abnormalities. Most of the tests have already been addressed by Dr. Kleinsasser. I'm going to talk mostly about the CDT, but I'd also like to talk about the hepatitis B and C screen that I think is becoming more and more important in improving mortality on a case-by-case basis. The hemoglobin AIC helps us determine a diabetic's degree of control or pick up a diabetes

and glucose intolerance. It would be reflexed if glucose was elevated or glycosuria was present.

The CDT is reflexed in the presence of a liver enzyme elevation. The PSA is done on males over the age of 50. The hepatitis B and C screen is done with certain elevations in liver enzymes. In the past, underwriters have accepted mild-to-moderate elevations in some of the liver enzymes as long as alcohol abuse was ruled out. However, there is a portion of that population walking around with chronic hepatitis. And, while we were accepting these individuals with liver enzyme elevations as applied for, we were actually pulling into our mix of insureds some very questionable risks. By reflexing the hepatitis B and C screen when certain liver enzyme elevations are present, we have removed from our insured population some potentially adverse risks.

Microalbuminuria is a urine test and can be reflexed on individuals who have a history of diabetes or have elevated glycohemoglobin. And what it does is provide some insight into those individuals with diabetes who are more likely to develop early kidney disease which is obviously a tremendous risk factor.

One case that I wanted to talk about provides an example of reflexing the CDT and alcohol abuse. A male, age 65, came in for a $120,000 policy. He admitted to a history of angina on his examination and some of the routine lab tests were elevated—AST, ALT, GGT, and HDL. The elevations in the GGT and the AST were suggestive of excessive alcohol use. Even the elevation of the HDL cholesterol is suggestive of excessive alcohol use, but it's not inconsistent with it. We reflexed the CDT due to the elevated liver enzymes. The CDT was abnormal, and as it turned out, we declined the case immediately based on the admitted medical history of angina and the laboratory findings. I did not get involved with this case until about two months ago when I received a letter from an attorney who just happened to be the insured requesting a layman's explanation as to why we had done what we'd done. It came in typical legalistic terms and it cited different state statutes as to how and by when we had to respond. Before obtaining the actual underwriting file, I thought that I would have a pretty arduous letter to write. However, when I obtained the file I found that, after our declination, we actually received an APS sent by the BGA who ordered it early in the application process but sent it to us after our declination. The medical records contained numerous entries with respect to alcoholism, alcohol abuse, esophageal varices, and memory loss, along with several references to "please seek counseling." It turned out that I had a very easy letter to write because I included a copy of his medical records with the letter. About 30 days have gone by and he has not yet responded to the letter, and usually you get quick responses in situations like this.

One of the most important things that we had to do when setting up underwriting guidelines was to make sure that the results were monitored. Some of the areas that we are monitoring very closely are evidence costs, that is, the actual evidence costs and utilization rates to make sure that our actual costs are consistent with the pricing assumptions. Through our new business system we are monitoring "not paid" rates measured by BGA and by underwriter. We are measuring "not issued as applied for" rates by BGA and underwriter. We are doing random underwriting audits. As time goes by (hopefully, we can put that off for a long time), we will be conducting death claim audits and we will have, obviously, mortality experience studies. In addition, to make sure that our preferred guidelines don't become antiquated, we continue to do competitive analyses to make sure that we are competitive and that we are not leaving any significant loopholes.

Here's an example of a simplified competitive analysis. I've included nontobacco though technically it's not a preferred underwriting factor, but I think it's demonstrative of where the industry is right now. We chose our nine toughest competitors from a price standpoint and these nine companies deal in the BGA distribution system. One company has a five-year nontobacco waiting period. Four companies have three years, two companies have two years, and two other companies have one year. This is a very recent comparison. But a question I would ask is this: Is a 58-year old male with a 30-pack-per-year history who stopped smoking for only 13 months truly a nontobacco risk? Where will the BGA, using the selection process, send an individual who just stopped smoking 13 months ago? This applicant will be sent to the two companies that have the one-year nontobacco rule. Logically, the selection process will have a negative impact on those two companies. We feel that having a 12-month nontobacco requirement would create a loophole in the underwriting guidelines.

Table 1 is just an example of some of the information you can obtain from the insurance laboratories so that when setting up criteria in your preferred guidelines you will know what impact it will have on your qualification rates. For instance, if you set up a cholesterol level of 240 as your preferred cut-off level, you are basically removing 17% of your population from consideration for preferred. A similar approach can be taken with the HDL cholesterol ratio.

TABLE 1
LIPID DISTRIBUTION

Cholesterol		Cholesterol/HDL Ratio	
≤ 200	50%	≤ 4	34%
≤ 220	69	≤ 5	56
≤ 240	83	≤ 7.5	89
≤ 300	98	≤ 10.0	97

In summary, what we've accomplished has been a joint effort between the actuarial and the underwriting department. In order to establish an effective monitoring process, we will need to work together. We'll have to speak in a common language and we'll have to be very careful to check results as time goes by. We have established mortality objectives and expense assumptions which will need to be met. We've gone beyond the preferred guidelines in seeking mortality improvement. We will use the BGA selection process to our advantage. We do not want the BGA to send us business that we can't issue as applied for. We are willing to let that business go to another company because we know that a tremendous amount of those cases will never get placed. Of course, if someone is willing to accept a nonpreferred policy, we would be happy to process that business. We now have in place the ongoing checks and balances and the studies are ready. Finally, we have a new business system capable of monitoring the various not-paid rates and the not-issued-as-applied-for rates and we will keep aware of changes that occur in the marketplace with regard to preferred underwriting.

MR. ATKINSON: Our final speaker is Jess Mast, assistant vice president and director of research and analysis for Lincoln National Reinsurance Companies. Jess directs all research activities for underwriting, product, and pricing with heavy involvement on the coordination of pricing and underwriting. Jess has been involved with Lincoln National for more than 30 years. He's a contributing editor of *On the Risk*, and coeditor of the

Society of Actuaries *Life Insurance Specialty Guide on Underwriting Individual Products.* Jess serves on the Joint American Council of Life Insurance (JACLI) and the Health Insurance Association of America (HIAA) Ad Hoc Group on AIDS Data. He's on the SOA Task Force on Preferred Risk Underwriting and is a member of the Joint Committee on Mortality and Morbidity Liaison. He also chairs the Home Office Life Underwriters Association (HOLUA)/Institute of Home Office Underwriters (IHOU) Underwriting Experience Studies Committee. Jess holds a bachelor's degree in mathematics from Washington State University and also took some actuarial exams along the way.

MR. JESS L. MAST: On a subject of great interest to me for over 25 years, we will cover some ideas falling under the umbrella of analytic processes for evaluating and understanding mortality.

The following quote suggests the need for processes to be used in analyzing and understanding mortality: "To be ignorant of many things is expected, to know you are ignorant of many things is the beginning of wisdom, to know a category of things of which you are ignorant is the beginning of learning, to know the details of that category is to no longer be ignorant" (Phenella in *The Unwritten Comedy*). We will discuss some processes that help reduce the ignorance factor in understanding mortality.

In organizing topics to include under the subject of analytic processes, my comments will focus on some potential benefits from the process of evaluating and understanding mortality, some analytic processes for evaluating and understanding mortality, the application of risk management concepts, and uses of survival analyses.

Two potential benefits from evaluating and understanding mortality include the opportunity to identify ranges needed to improve the contributions of underwriting, pricing and marketing to financial goals, and the opportunity to be able to benchmark against intercompany experience.

To identify changes that can improve the contribution of underwriting and pricing to financial goals, involve the underwriter and/or risk manager in the process of trying to understand mortality experience. Sometimes it's easier to establish a hypothesis about overall results, and then proceed with analyses at more detailed levels. Also, determine whether studies are done to compare experience vis-à-vis expectations such as those used in pricing.

Some specific steps to take include identifying problematic areas, such as too many policies issued as preferred or too many violent deaths. Next, review application files and claims in problem cells. For example, were preferreds adequately screened and properly classified? Also, examine selection-related expenses vis-à-vis expectations. Has spending been too high or too low? In which areas? Another step involves tracking "wastage" rates by final action. Wastage involves any application that doesn't culminate in a placed policy as well as policies lapsing too early to cover acquisition expenses!

To understand sources of wastage, consider examining wastage rates by underwriter and producer. Consider reviewing policy placement rates by risk classification. Which kinds of business are being placed? Too few or too many preferreds? Too few or too many smokers? Also, consider tracking persistency by risk classification and producer.

If your company offers financial incentives to the field based on factors that reflect the quality of business written, then you may already be studying the impact of quality of business incentives on lapse rates and paid-to-submitted rates.

The following comments on benchmarking recognize the need for certain kinds of reality checks to periodically indicate a company's relative position in the marketplace. First, as practical, benchmark against intercompany experience from the SOA standard ordinary study. The key to success here is being able to review mortality results in cells comparable to SOA study cells, striving for apple-to-apple comparisons, for example, smoker versus nonsmoker, tobacco versus nontobacco, or preferred versus nonpreferred, when available in SOA study; nonmedical versus paramedical versus medical evidence of insurability; issued "standard" and male versus female, using sex-distinct, expected mortality rates.

The benchmark may focus primarily on issue years since 1988 as data from the SOA become available on more contemporaneous bases and reflect the current underwriting process!

The benchmark process will definitely become more effective and improve as seriatim record data can be used to compile and analyze intercompany experience and to develop age-by-age experience tables rather than quinqennial age-group tables.

Age-by-age tables are needed for at least three reasons: first, to price older age more effectively; second, to improve comparisons between nonmedical and examined business mortality; and, third, to make comparisons between insured lives and population mortality.

The benchmark process also includes a comparison of intracompany versus industry uses of underwriting requirements. The underwriting organizations periodically survey companies' uses of such requirements and summarizes the results for members of the IHOU and the HOLUA.

Benchmarking also compares intracompany with industry uses of risk classifications, for example, various approaches to determining no-tobacco and preferred classifications. The underwriting organizations periodically survey classifications, too, including categories of definitions used.

If a company is not using a nontobacco or preferred class, then the mix of new business written may not include a prevalence of nontobacco users or preferred risks as high as the company would have written otherwise.

The analytic processes for evaluating and understanding mortality may fall within the scope of performing due diligence, recognizing the strengths and limitations of both intra- and intercompany studies, which parameters are available for analyses, the need to control for the effect of pricing parameters on experience, and the importance of the comparability of intracompany experience with intercompany studies.

Let's focus on some strengths and limitations of studies. What is standard experience? The SOA study requires the policy to have been rated standard at issue and must continue to be rated as standard to be included in the standard ordinary mortality.

Are preferred, nonpreferred standard, and generic standard segregated from one another? Unless preferred business is segregated from nonpreferred and generic standard business, variations in the mix of preferred and nonpreferred business among companies contributing to the Society's standard ordinary study present interpretive challenges similar to those encountered by not taking the smoking factor into consideration when comparing experience among companies.

Are smokers or tobacco users distinguished from noncigarette or nontobacco users? If data are not available according to these distinctions, the inferential usefulness of comparisons drawn between intercompany and intracompany experience is weakened.

Over a period of time, a company's mix of products, market, and underwriting all could change dramatically. Consequently, the comparability and usefulness of experience on years of issue prior to the adoption of dramatic changes in a company's products, market and/or its underwriting may bear little semblance to experience emerging on the years of issue following such changes. For example, if a company switched from unismoker rates and/or switched from relatively little lab testing to extensive lab testing, it would not be surprising then that the results on business written prior to the change in focus are apt to be appreciably different than on business written subsequently.

It's imperative to recognize that a company's experience may change dramatically even if no changes are adopted in its products, market, or underwriting. Why? The influence of the open market tends to drive the better risks in the direction of the availability of competitive rates.

Also, some of the less favorable risks will be attracted to companies that do not screen routinely for the use of tobacco or for evidence of infection by the AIDS virus. Whether or not a company makes dramatic changes in its products, markets, or underwriting, the mortality that emerges will reflect those factors.

The impact becomes more understandable when put into context with what other companies in the industry, particularly a company's competitors, have done along those lines to possibly influence the mix of business the company sees in the way of completed applications and in the nature of business actually won in a competitive environment.

What is the comparability of products, market and underwriting that bases mortality experience by different periods of issue and, particularly, the current period versus periods actually studied? The more reflective the study is of contemporaneous business written, the more the results may be viewed on more prospective bases.

To focus on study cells that lend themselves to analysis that may be useful prospectively, distinguish policy size at issue. Combining policies by size into relatively homogeneous groups helps control for differences in underwriting requirements that vary by amount of insurance applied for and tend to adjust for differences in concentrations of business by socioeconomic class. You must distinguish whether applications are screened for HIV infection.

The stronger the underwriting process employed, the more likely the process will be successful in minimizing the risk of antiselection or opportunistic self-selection. Also, distinguish whether other lab tests are used routinely in the screening and classification of

risk by age for particular years of issue. The sentinel effect of lab testing will drive many applicants away from situations requiring such testing.

It's desirable, if not mandatory, for the following parameters to be available for analyses: (1) Factors used to price mortality should be included as a minimum. (2) Characteristics used to select and classify risk should be studied since they influenced the decision to accept the risk and which classification to assign. (3) Risk classification for a policy at issue versus during the policy years studied should be used. Please note that the SOA Standard Ordinary Study includes only policies issued on a "standard" basis; hence, the study does not include policies issued on a special-class basis that subsequently are reclassified as "standard." This point is very important for companies able to study only the latest risk classification assigned to policies. Information about prior classifications may reveal higher relative mortality risks than can be inferred only from the latest classification.

Consider desirability of policy level detail versus summary records. Policy level or seriatim record detail permits investigations of many more parameters than is practical by using only summary records.

In determining mortality ratios by policy amounts instead of policy counts it is useful to evaluate the credibility of mortality ratios by understanding their variability. For example, Harry Panjer's paper, "The Aggregate Claims Distribution and Stop-Loss Reinsurance" (which appeared in *Transactions*, Vol. XXXII, 1980, pp. 523–45), clearly indicates that mortality ratios based on amounts can vary much more dramatically than ratios based on numbers of claims.

Controlling for basic pricing parameters may be accomplished by using the 1975–80 sex-distinct select-and-ultimate basic tables for expecteds, and/or by use of pricing expected qs for the business studied, which is highly desirable, too.

To compare results with intercompany experience, study similar cells and breakdowns that were used in SOA studies and include the same bases for expected mortality rates. Also, compare the criteria used to include policies in an intracompany study with the qualification criteria used for contributions to the SOA Standard Ordinary Study.

The following items include some qualification criteria required by the SOA for companies to decide whether to contribute any data on a policy to the Standard Ordinary Study. (1) Risk must be classified as "standard" or "preferred" at issue. Only regular underwriting rules were applied and used to approve risk as "standard" or "preferred." (2) Only regular marketed policies are included. Moreover, nonmedical, paramedical, and medical underwriting bases should be distinguishable to include policy in the main part of the study. (3) There must be consistency between the amounts of policies used in exposure and amounts used in corresponding claims. (4) Insured must be resident of the U.S. only. Likewise, studies conducted by the CIA focus only on residents of Canada.

The following items include some exclusion criteria required by the SOA for companies to decide whether to contribute any data on a policy to the standard ordinary study: guaranteed issue or simplified issue underwritten cases; amounts on term or paid-up additions and policies on nonforfeiture option; reinsurance assumed and conversions from term;

nonresident of the U.S.; and not regularly marketed business such as payroll deduction, pension, and direct mail.

In my view, the application of risk management concepts to the topic of underwriting and mortality involves three basic steps, each of which presents its own set of challenges and opportunities. First, determine which experience monitoring processes are needed to monitor the interplay between underwriting and mortality along with the related objectives to be achieved. Second, develop experience study capabilities needed to provide data on key aspects of the interplay between underwriting and mortality. Third, evaluate emerging experience by exploiting the newly developed study capabilities on a periodic basis.

In determining which experience monitoring processes to employ, it may be helpful to address the extent to which the following needs are critical:

- understanding both the mortality experience that emerges and the effectiveness of related underwriting processes.
- addressing the needs of "risk managers" to identify as quickly as practical when experience is emerging differently than anticipated, and then be able to distinguish some of the contributing factors.
- Defining corresponding study system capabilities needed, including which management reports and other periodic studies are to be developed.
- Identifying corresponding sources of data and data elements available to tap as well as those that still need to be tapped and developed.

Regarding the development of experience study capabilities, it's important to involve the potential users of data from studies in developing study capabilities. Also, it's fundamental to include the ability to measure experience against expectations. Intuitively, since it's better to learn about problems earlier rather than later, at least one of the study capabilities could provide an early warning system such as claim trend analysis. A related article on that subject appeared in the fall 1989 issue of the *Reinsurance Reporter*, published by Lincoln National Reinsurance Companies. Studies need to include the ability to make comparisons with intercompany experience. Study capabilities may be designed in such a way as to facilitate the understanding of key factors for success and related risks.

After the new and improved version of your company's experience study capabilities has been developed, you may be evaluating emerging experience according to the following characteristics: key products and markets, claims during the contestable period, regular versus guaranteed issue or simplified issue underwriting approaches, and producer category or geographic region. Also, you may be studying policy size categories that help delineate among those eligible for the preferred risk classification, those routinely screened for HIV infection, and those routinely examined by a physician or paramedical technician. Break down issue ages into young, middle, greying, and elderly groups; also study key causes of death, which I'll discuss further in a moment.

It's both helpful and interesting to follow the incidence of key causes of death similar to the breakdowns reviewed in intercompany mortality studies compiled by the Society. Distributions of death by cause can be expected to vary by such factors as age, duration, sex, and smoking habits. It's important to know what these distributions look like to draw comparisons between intra- and intercompany data. Some examples follow.

Violence and other external causes, can all be lumped together. The results may indicate the need for, or demonstrate the value of, routine use of certain underwriting requirements such as cocaine screening, liver enzyme testing, and motor vehicle reports. Also, financial underwriting, when effective, reduces the risk of violent death. If financial underwriting is ineffective, then the violent death risk is likely to be increased, in large part, from antiselection. Financial underwriting also plays a key role in managing the risk of suicide.

Heart and circulatory causes have been declining steadily since the latter 1960s due to the impact of Medicare, the continuing shift away from cigarette smoking as well as improvements in treatments for heart disease, hypertension, kidney disease, and cerebrovascular diseases. You may be aware that soon after the introduction of Medicare in the latter 1960s, mortality among the elderly began to improve steadily and dramatically. Attempts to reform healthcare and Medicare in this country may influence mortality among the elderly.

Since cancer and heart disease are competing causes of death, reductions in mortality from heart disease tend to increase the relative importance of cancer as a cause of death. Many of you may be aware that the underwriting process is rather ineffective in identifying applicants at increased risk of developing cancer.

Since many companies may not have priced their products to overtly recognize the anticipated influence of HIV infection on mortality, it's important to monitor the impact of AIDS-related claims, particularly on business that wasn't screened for evidence of HIV infection.

Given the strong interdependence between underwriting and mortality assumed in the pricing of products, certain risk classification factors need to be evaluated periodically; for example, preferred versus standard versus other classes. Are the results what you expected? Is the effect of writing business in an open market biasing the mix of applications coming in the door, and/or is the market affecting the mix of business actually placed? Does the percentage of applications approved on the "preferred" basis appear close to expectations? Has the placed business been reviewed for fit with expectations from viewpoints of risk classification?

The experience on nonmedically underwritten business, in relation to paramedically and/or medically examined cases, requires monitoring to evaluate whether the force of underwriting employed is consistent with financial objectives. Mortality on paramedically underwritten business issued at ages 60 years and above also requires careful monitoring since the experience in intercompany studies has consistently been worse than on physician-examined business at the higher ages. Perhaps the sentinel effect of examination by a physician drives less favorable risks to the less intimidating prospect of a paramedical exam. It could be interesting to compare the mortality on untested nonmedical business with examined and tested business.

Periodic studies of nonsmokers versus an aggregate of smokers and nonsmokers versus those undistinguishable by smoking habits are likely to reflect the migration of nonsmokers from aggregate priced products to nonsmoker, no-tobacco-use, and preferred priced products.

It is important and potentially quite helpful to study experience by both amounts and amounts of claims. In general, mortality experience by dollar years of exposure is relatively more favorable than experience by policy years of exposure. There are, however, three notable exceptions. First, successful antiselection or speculation by the proposed insured or applicant is apt to produce less favorable experience by amount than by number, particularly in the early policy years. A second example is when financial underwriting is not employed effectively. The third exception is when the underwriting process is required to disregard information of relevance to the process of selection and classification of risk.

Keep in mind the interdependence of underwriting with mortality based on which underwriting requirements were employed routinely, the underwriting manual and philosophy employed (including how information from tests was used), the risk classifications employed, policy placement rates and persistency, and so on. Also keep in mind the interdependence of underwriting with financial objectives based on costs of mortality to be achieved and costs of underwriting expenses to be achieved. But, which of these is the chicken and which is the egg, mortality or underwriting?

Survival analysis involves the processes of comparing population studies with insured lives' studies to form basic relationships that are inferentially useful. These relationships include the 1975–80 basic tables versus population experience, the new 1985–90 basic tables versus population, and the 1985–90 basic tables and the 1975–80 tables. Analysis also requires delineating classes of risk such as "standard" versus "substandard" from one another, and using clinical and epidemiologic studies to supplement data from impairment mortality studies on insured lives, particularly to obtain data on uninsurable lives.

Two major references for data based on survival analyses include the two volume *Medical Risks: Trends in Mortality by Age and Time Elapsed* (E.A. Lew, J. Gajewski, eds. Westport, CT: Praeger Publishers, 1990) and *Medical Risks: 1991 Compendium of Mortality and Morbidity* (R.B. Singer, M.W. Kitaand, J.R. Avery, eds. Westport, CT: Praeger Publishers, 1994). These references derive and summarize survival data from both clinical and epidemiologic studies in ways that are user friendly to actuaries, underwriters and medical directors, facilitating the application of findings to insurance settings.

A course of study for survival analysis is available. It's called the Mortality Methodology and Analysis Seminar and is sponsored by the American Academy of Insurance Medicine (AAIM) and the Board of Life Insurance Medicine (BLIM). This seminar provides a how-to guide to use in analyzing clinical and epidemiologic studies. This is more practical than the theoretic approaches many actuaries have been exposed to in texts on the mathematics of survival analysis.

Summing up, in order to analyze mortality results, one must understand the thought processes, methodologies and tools used to write the business being analyzed. Also, data from intra- and intercompany studies can be supplemented by population data, which broadens the bases for analyses in resetting mortality assumptions and modifying underwriting processes.

I hope these comments will be helpful in expanding the framework used to recognize and understand changes in mortality experience.