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The evolution of medical underwriting in life insurance

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THE EVOLUTION OF MEDICAL UNDERWRITING IN LIFE INSURANCE

by

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Abstract

The concept of insurance as a way of spreading the risk of financial loss over many individuals has existed for thousands of years. Historians believe that insurance first developed in Babylonia around 3000 BCE. Merchants and traders who transported goods by ship used to pool their money to protect against losses of cargo to thieves and pirates. Since those early beginnings and throughout the centuries, informal agreements between individuals have evolved into more formalized legal contracts, and risk pooling has become more institutionalized with the formation of insurance companies. In addition, the types of insurance coverage available have expanded dramatically to include home, automobile, disability, health, and life insurance, to name but a few. Life insurance really took off in the 1800s during the Industrial Revolution in Europe and North America.

Since life insurance provides protection against the adverse financial impact of the death of an individual, the expected mortality rate is the main determinant used to price the premium. Life insurance companies utilize various underwriting criteria to stratify their policyholders into mortality risk classes based on age, sex, smoking status and level of health. Medical underwriting in life insurance has been used for well over 100 years to determine which lives may be expected to have substandard mortality, but the use of medical criteria has really shifted within the last 15-20 years, especially with the introduction of preferred underwriting products. The evolution of life insurance underwriting and risk classification will likely continue into the future as new medical technologies such as genetic testing become more developed and sophisticated.

I will begin this paper by first providing some definitions and introducing some general concepts of insurance, then providing some of the history of insurance and the history of life insurance specifically. Next I will introduce mortality, underwriting and risk classes, and how risk classes and medical underwriting have evolved over time. Finally, I will discuss the future of life insurance underwriting including the issue of genetic testing.

Definitions and Concepts of Insurance

Insurance is a contract in which an individual or entity pays a premium in exchange for financial protection or reimbursement against losses from an adverse event. This definition contains several important points. The first is that an insurance policy is a legal contract between two parties, usually the insured and the insurer. Second, it provides protection against financial loss due to an adverse event that could not have been foreseen with certainty. It is this underlying uncertainty or risk which forms the basis for insurance.

There are a few more general concepts about insurance which should be explained. The idea of risk sharing implies that the burden of financial loss is smaller when it is spread over many individuals. For example, the premiums paid by an individual for the insurance protection are relatively small and more affordable when compared to the total loss which would be incurred if the adverse event occurred suddenly and the individual needed to pay for the entire loss. Many individuals therefore pool their risk together and collectively share in the risk of each other's losses. The creation of insurance companies has formalized and institutionalized this pooling of risk between individuals, and removed the need for individuals to go out and find other people with whom to share their risk. Finally, the law of large numbers states that there is a diversification effect of pooling many similar risks together, such that the larger the number of homogeneous exposures considered, the more closely the losses reported will equal the underlying probability of loss. In simple terms, it's easier to predict the aggregate total losses from a large group of insurance policies than individually.

Inherent in the concept of insurance is the idea of homogeneous populations. That is, the level of risk that each individual brings to the pool should be roughly commensurate with the average risk of the pool. This introduces the ideas of underwriting and risk classification, which will be discussed later in the paper. There are two main reasons why it is desirable to have homogeneous populations. The first is simply a matter of fairness, that everybody in the pool sharing in the risk should have a similar level of risk as everyone else. For example, it wouldn't really be fair to have a 20 year-old female paying the same premium as a 60 year-old male for the same amount of life insurance. Second, having similar risks grouped together also reduces the statistical variability of losses and thereby lowers the overall level of risk within the pool.

History of Insurance

The notion of risk sharing has existed for thousands of years, with the first examples believed to have originated in Babylonia around 3000 BCE. Merchants and traders would pool their money together to protect against losses of cargo to thieves and pirates.

This type of "marine insurance" was informally arranged between individuals and predated any legal definitions or rules about insurance. However, in the mid-1700s BCE, one of history's first written codes of law, the famous Code of Hammurabi, was created and inscribed onto a stone tablet. In addition to having laws relating to crime and punishment, it also contained civil laws, one of which related to this ancient form of risk sharing. Traders had to repay the merchants who financed their trading voyages unless the goods were stolen in transit, in which case the debts would be cancelled (Encarta, 2007).

The earliest forms of life insurance originated in ancient Greece and Rome around the 4th century BCE. Citizens formed benevolent societies where members paid dues that went towards paying for the burial expenses of members who died. During the Middle Ages, artisans of a similar craft, such as stonecutters or glassmakers, came together and formed guilds. Many of these guilds provided benefit payments to the surviving family, in the event of a member's death (Encarta, 2007).

Modern insurance, or what is thought of today in terms of written contracts with insurance companies, is a fairly recent phenomenon of the last 400 years. Over this period of time, insurance became more formalized, and branched out into many different areas of coverage. The first known life insurance policy was written in London in the late 1500s. Fire insurance became more common, especially after the Great Fire of London in 1666. Marine insurance was being transacted in the late 1600s, where traders and merchants met at Lloyd's Coffee House (which later became known as Lloyd's of London), to discuss insurance deals protecting against damage to goods transported by ship. Modern life insurance really took off in the 1800s during the Industrial Revolution in Europe and North America, with the formation of many of the life insurance companies that are still in existence today (Encarta, 2007).

Therefore, it is apparent that many different types of insurance have evolved over time. Today, there are countless varieties of insurance coverages, such as life insurance, health insurance, disability insurance, automobile insurance, home insurance, malpractice insurance and many others. The rest of this paper will focus on life insurance.

Mortality, Underwriting and Risk Classes

A discussion about life insurance is impossible without next addressing the concepts of mortality, underwriting and risk classes.

Mortality is an incidence rate of death. Actuaries tabulate mortality rates q_x, which represents the probability that a person alive at age x will die within the next year, that is,

before age x+1. Mortality rates depend on many factors; age and sex are obvious ones, but there are also many other factors like health, habits (such as smoking) and lifestyle.

Underwriting is the process of classifying and rating risks for insurance. In life insurance, individuals having similar mortality risk profiles should be grouped together into homogeneous risk classes for the purposes of determining premiums and estimating death benefit costs. Underwriting is therefore the process that involves determining which category or class to assign the insured lives to.

A risk class is a group of lives expected to have a similar mortality profile, based on some objective criteria, such as age, sex, etc. The theory is that each life insured within a risk class should contribute an expected level of mortality roughly commensurate with the average mortality for that class. To reiterate, the two main reasons for stratifying individuals into separate risk classes are fairness and lower statistical variability.

Evolution of Risk Classes in Life Insurance

Prior to the 1940s, insurers only had one risk class, differentiated by age. In the 1940s, life insurers began introducing sex-distinct risk classes, recognizing the mortality differences between males and females. This doubled the number of risk classes from 1 to 2 (male and female). A graph of mortality rates (q_x) by age (x) would show a roughly exponential curve with very low rates at younger ages and a steeply increasing curve at older ages. Males generally have higher mortality rates than females at almost every age.

In the 1970s, life insurers further divided the sex-distinct risk classes into smoker-distinct classes, recognizing the accumulated evidence which showed that smokers experienced higher mortality rates than non-smokers. This change again doubled the number of risk classes from 2 to 4 (male non-smoker, male smoker, female non-smoker, and female smoker). This was a more equitable risk classification method, because the non-smokers were no longer subsidizing the smokers who had worse mortality.

During the 1980s, competition among life insurers intensified. With increasingly computerized quotation systems and a relatively simple 4-risk class system, insurance brokers were able to shop around for the lowest premiums. Customers typically weren't concerned with which insurance company they bought their policies from, and insurance became a very commodity-like product driven by price.

As a consequence, during the 1990s, some life insurers began designing more innovative products by further stratifying their risk classes. They split their standard non-smoker class into a preferred non-smoker class and a residual non-smoker class. Using various underwriting criteria, such as blood pressure and cholesterol, the insurance companies

selected out the "healthier" non-smokers, and gave them a preferred rate because they were likely to have lower mortality. The remainder of the non-smokers who did not qualify as preferred risks were given the residual class with a higher premium rate. This type of split was analogous to the non-smoker/smoker split which had occurred 20 years earlier.

The underwriting criteria which were used to determine whether someone qualified for preferred rates included tobacco use, blood pressure, total cholesterol, total/HDL cholesterol ratio, height/weight charts, family medical history, personal medical history, as well as some non-medical criteria like driving record, occupation, avocation and foreign travel.

The introduction of preferred underwriting using medical criteria prompted insurers to increase the number of preferred classes. They accomplished this by using narrower intervals of the medical criteria, such as blood pressure and cholesterol, which resulted in further risk stratification. Most companies have settled somewhere in the range of 10-12 risk classes: 3-4 non-smoker classes plus 2 smoker classes for both males and females. However, some companies have as many as 20 risk classes! The problem with having too many classes is that there might not be enough data within each class to have credible experience.

Medical Underwriting in Life Insurance

Although medical underwriting had just begun to be used for identifying preferred risks, medical underwriting itself was not new and had been used in insurance for over 100 years to identify individuals with worse than average mortality (substandard risks). Individuals not qualifying as standard risks were given a substandard mortality rating that increased their premium rates. For example, if a person had a medical condition that the underwriter felt carried a 50% greater mortality risk, then the premium charged would be 150% of the standard rate.

It was the introduction of preferred products, however, that signalled a fundamental shift in the use of medical underwriting information. Whereas previously, medical criteria were only used in underwriting to classify substandard risks with worse than average mortality, preferred products opened the door for that medical underwriting information to be used in classifying preferred risks with better than average mortality.

Various medical underwriting criteria are included in an insurance policy. First, there are questions related to personal medical history and family medical history on the insurance application form. Then additional underwriting tests are ordered, depending on the age and amount of insurance being applied for. For young people applying for low face

amounts of insurance, not much medical information would likely be requested, and a paramedical practitioner such as a nurse may just record some basic vitals. However, an older person applying for a large amount of insurance would likely require more medical underwriting, including the Attending Physician's Statement, fluid tests such as saliva, urinalysis and blood chemistry profile to check for tobacco, drugs, HIV, diabetes, kidney and liver disease, and electrocardiograms to check for heart disease.

Future of Life Insurance Underwriting

After so much innovation in life insurance underwriting over the past 15-20 years, one may wonder whether there are any more changes on the horizon. The next big frontier, of course, is the possibility of insurers using genetic testing in their underwriting. It is important to note that insurers already gather genetic information by asking questions about family medical history on the insurance application. The real question is whether life insurers would use the results from the newer genetic technology available, such as DNA tests, to see if individuals were genetically susceptible to diseases that may increase their mortality or, conversely, to determine if they had some genetic advantage that would lower their mortality.

There are two ways that genetic testing may be used in life insurance underwriting. First, insurers could use genetic testing as a new underwriting tool to be added to their existing set of standard medical underwriting tests, such as urine, blood, electrocardiogram, etc. The second way is that if someone has already had genetic testing done, then those results should available to the insurer as part of its overall underwriting assessment. I don't see the former method being adopted by the insurers anytime in the near future, but the latter issue has already been addressed by the insurance industry.

There are a number of problems with using genetic testing in life insurance underwriting. First of all, there are many diseases that have a known genetic component, but they are complex, multifactorial genes that represent probabilities, not certainties. Gene penetrance is rarely 100%, and genotype does not always equal phenotype (disease expression). Disease expression is often a combination of genes and environment. Lastly, disease does not necessarily equal death or even higher levels of mortality for that matter. As far as life insurance is concerned, it is only the person's mortality risk that is relevant to the insurance company, not their morbidity.

There have been concerns about the use of genetic testing in life insurance underwriting. The Canadian Institute of Actuaries has issued a statement to the public addressing these issues. Some quotes from the statement are provided.

> One concern is that insurers will use the information to deny insurance or charge exorbitant premiums. Insurers worry that people who learn they are at a higher risk will purchase insurance without telling them about their risk, and costs will rise.... Much of the information that could be provided by genetic tests is already available through conventional questions about medical and family history, and at this juncture in the development of genetic knowledge, there are few genetic tests that have real predictive value for insurance purposes…. Should insurers propose genetic test results in underwriting in the future, actuarial analysis must be used to ensure that decisions about risk classification can be based on facts. We must prove that the results of genetic tests have sound predictive properties before using them for underwriting purposes. (Canadian Institute of Actuaries, 2000)

The Canadian Life and Health Insurance Association, which represents the life insurance industry in Canada, has also issued a statement with respect to the industry's position on genetic testing, summarized as follows.

> Current industry policy is that insurers would not require an applicant for insurance to undergo genetic testing. However, if genetic testing has been done and the information is available to the applicant for insurance and/or the applicant's physician, the insurer would request access to that information just as it would for other aspects of the applicant's health history. (Canadian Life and Health Insurance Association, 2003)

An article was published in the Canadian Medical Association Journal entitled "Physicians, genetics and life insurance," written by members of the Canadian Genetics and Life Insurance Task Force. The article highlighted some of the issues around the use of genetic information in life insurance. One quote from the article suitably captured the public's sentiment with respect to this issue. "Although genetic information may in reality not be different from any other type of actuarial medical information, the public perceives genetic information as different. This fact cannot be discounted or dismissed." (Knoppers and Joly, 2004)

The task force made two recommendations with respect to the use of genetic information in life insurance underwriting. First, no genetic test results (excluding family history) should be used in the underwriting process for a limited period of time (5-year moratorium). Second, an independent body of consumers, government, clinicians, industry and researchers should be created for ongoing review of criteria concerning the reliability of genetic information for underwriting purposes. (Knoppers *et al.*, 2004).

Clearly the debate about the use of genetic testing in life insurance underwriting is not over. It will continue to evolve into the future, just as our knowledge and understanding of the role of genetics in disease, morbidity and mortality will continue to progress.

Conclusion

Although the concepts of risk sharing and insurance have been around for several thousands of years, the history of modern life insurance is only a few hundred years old. Only recently have underwriting methods become much more sophisticated, especially with regard to medical information. Correspondingly, the risk classes used by insurers have become progressively more stratified with the introduction of sex-distinct, smoker-distinct and preferred classifications. With the genetic era upon us, there will likely be even more ways for insurance companies to underwrite and assess mortality risk for life insurance.

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