

By Allen M. Klein

Introduction

Underwriting in the United States (US) life insurance marketplace has evolved tremendously over the last several decades. This paper will take a brief look at that history, from the older underwriting techniques still in use today to the introduction of smoker/nonsmoker distinctions in about 1980 to the evolution of preferred underwriting in the late 1980s and finally to a movement toward simplified issue underwriting and a new approach to older age underwriting today.

The paper will describe each of the types of life insurance underwriting used in the US along with each of the tools used. The paper will also provide a look to what might be next on the horizon for life insurance underwriting in the US and will conclude with several methodologies to measure the impact each underwriting type/tool/test has on mortality experience.

Underwriting Types

The underwriting types can be split into two categories, those that have been around a very long time, and are still used today, and those that have come on the scene more recently. More recently here means within the last 30 years or so. The first, more traditional types of underwriting include:

- Fully underwritten
- Medical / Paramedical
- Nonmedical
- Simplified Issue
- Guaranteed Issue
- Guaranteed-to-Issue

The more recent types of underwriting that will be discussed include:

- Smoker/Nonsmoker
- Preferred underwriting
- Older age underwriting
- Simplified Issue (new)
- Financial underwriting
- Policy Ownership
- Remote underwriting
- Outsourced underwriting
- Straight-through processing

Each of these types will be explained below.

Fully underwritten

This consists of a full application. A full application has what is called Part 1 and Part 2. Part 1 contains general non-medical information such as:

- Name
- Address
- Phone number
- Gender
- Birth date
- Social security number
- Drivers license number for Motor Vehicle Report (MVR) check
- Citizenship
- Occupation
- Financial information, including at least income
- A question on smoking
- Plan information, including riders
- Other coverage, including whether it is going to be replaced
- Whether the applicant has ever been denied coverage
- Owner
- Beneficiary

Part 2 contains a series of medical questions (e.g., have you ever been told that you had, or have you consulted or been treated by a physician or licensed medical practitioner for any disease of the lungs or respiratory system, including asthma, bronchitis, emphysema, tuberculosis or shortness of breath?).

Fully underwritten may or may not also include an exam from a doctor or paramedical professional. If so, blood and urine specimens are generally also obtained for analysis.

Medical / Paramedical

A medical or paramedical exam generally consists of the following elements:

- Height and weight measurements
- Blood pressure readings
- Pulse rate
- Blood draw
- Urine specimen
- A series of medical questions

The medical exam may also include an examination of things such as the eyes, nose, throat and listening to the heart and lungs. Readings outside of the normal may be further explored and/or an extra rating may be applied.

Nonmedical

Nonmedical underwriting is another type of fully underwritten. For nonmedical underwriting, the full application is completed, including all of the traditional medical questions, however, no medical or paramedical exam is given. This also means that no blood is drawn or urine specimen taken.

Simplified Issue

Simplified issue underwriting has the following characteristics:

- Less than a full set of medical questions on Part 2 of the application
- No medical / paramedical, blood or urine

Other tests may be used, as will be explained later in this paper.

Guaranteed Issue

Characteristics of guaranteed issue life underwriting include:

- No or a few medical questions
- No medical / paramedical, blood or urine
- Cannot be turned down for coverage, with a few exceptions. Generally the only circumstances where one can be turned down are:
 - The proposed insured doesn't meet specific age requirements for the plan, or
 - The proposed insured currently is living in a nursing home or LTC facility
- Small face amounts
- Return of premium for death in first two years

Guaranteed-to-Issue

Guaranteed-to-issue is sometimes referred to as guaranteed acceptance. This type of underwriting is similar to guaranteed issue, however, the person cannot be turned down for coverage. Instead, rating of the individual is allowed. Guaranteed-to-issue also has relatively small benefits, sometimes return of premium with interest.

Smoker/Nonsmoker

The smoker / nonsmoker distinction began in the US in about 1980. This was a precursor to preferred underwriting. Being a smoker is defined in different ways by companies. These include:

- No cigarettes; occasional pipe, cigar, and chewing tobacco are acceptable
- No nicotine in last year, 2 years, 3 years, etc.
- Never smoked

Some companies will allow former smokers who have quit smoking to reapply for a nonsmoker rate, after a designated period of abstinence.

Preferred Underwriting

As just mentioned, the smoker / nonsmoker distinction was the beginning of preferred underwriting in the US. In addition to not smoking, some companies gave a preferred discount to those who exercised regularly.

In the late 1980s, with the AIDS scare, companies began to have blood drawn to test for HIV. The laboratories convinced life insurance companies that since they were already drawing blood, additional valuable information could be obtained from the same blood draw at a small incremental cost. Thus, preferred underwriting as we know it today, was born in the US.

The key elements of preferred underwriting are used by most companies. These have generally remained the same since preferred underwriting began. The key elements of preferred risk underwriting include:

- Alcohol and drug abuse
- Blood pressure
- Build
- Cholesterol
- Family history
- Motor Vehicle Record (MVR)
- Personal medical history
- Tobacco use
- Other – Aviation, avocations, citizenship, foreign travel, hazardous activities, residence

While the elements themselves haven't changed, what has changed over the years are the number of classes and the cutoff levels of each for the specific criteria. The number of risk classes has increased. With this increase, the cutoff levels have moved both up and down, depending on the company, product and risk class.

Another more recent change is that some companies have moved from a knockout approach to a debit/credit approach. A knockout approach is where an applicant does not qualify for a particular risk class if they do not meet one or more of the cutoff levels for the criteria. A debit/credit approach is one where a point system is used for good and bad results. At the end, the points are summed and the point total determines which risk class into which the applicant is placed. There are also hybrid systems which include a combination of knockout and debit/credit.

Another development is that some companies allow exceptions to the published guidelines. These exceptions are sometimes published and sometimes kept internally to be applied to the criteria. The types of exceptions allowed vary considerably and are beyond the scope of this paper.

A joint Task Force of the Society of Actuaries and American Academy of Actuaries charged a group (called the Underwriting Criteria Team) to determine a method to score the various preferred risk classes. This was done for valuation purposes, but may be of interest to the reader. A report entitled "Report of the Society of Actuaries Underwriting Criteria Team" was republished in 2009 and can be found on the Society of Actuaries (SOA) website (soa.org). A new Underwriting Criteria Team is currently revamping the original work. Results from this team should be published in late 2011 or sometime in 2012.

Older Age Underwriting

While a number of companies have recognized the need for underwriting differently at the older ages for many years, this is a new type of underwriting for many companies. Some companies recognized this need in the late 1990s, but most of the recent adopters did so throughout the 2000s. Today, it is estimated that a little over half of the US life insurance companies have a special (meaning different from that used for the younger ages) older age underwriting program.

As people reach older ages (old age is defined differently company to company), a number of things change. These include:

- Routine readings on blood pressure, cholesterol, etc. may increase
- Weight may increase
- More medications may be taken
- Physical and mental abilities may diminish
- Living arrangements may change

Based on this, underwriting for the elderly should also change. Older age underwriting programs in the US may include one or more of the following:

- Cognitive testing
- Functional testing
- Changes to the traditional levels of underwriting acceptance
- Supplemental questionnaire

At a minimum a cognitive test may indicate whether the applicant has some degree of dementia. Some tests also do a good job of recognizing the precursor to dementia, Mild Cognitive Impairment (MCI). There is extra mortality associated with MCI, but certainly not to the extent of one who has dementia.

The goal of a functional test is to determine where the applicant lies on a scale that has full functionality at one end and frailty at the other end. Depending on the degree of frailty, there can be a large increase in expected mortality from these individuals.

The changes to traditional underwriting were touched on above. That is higher blood pressure, cholesterol and weight, for example, may not be a bad thing. On the other hand, very low levels of cholesterol, for example, may be an indication of a potentially serious problem in the individual.

Supplemental questionnaires vary considerably company to company among those that use one. Some of the items that may be asked about include:

- Living arrangements
- Ability to perform Activities of Daily Living (ADLs), Instrumental ADLs and Advanced ADLs
- Social activities
- Physical activities
- Mental activities
- Travel

The purpose of asking about living arrangements is to determine where the applicant lives (e.g., home, apartment, assisted living facility, nursing home). It is also to determine whether they live with someone or alone (in which case, where help might come from if they need it). Yet another item to consider here is whether the home is safe (i.e., are there items strewn across the floor which may cause the applicant to trip and hurt themselves?). Falls, even ones that seem relatively small, can sometimes turn deadly for the elderly.

ADLs include bathing, dressing, eating, toileting, transferring and continence. Instrumental ADLs include housework, managing money, meal preparation, shopping, taking medications, taking transportation, telephone use. Advanced ADLs include things such as caring for others and driving. As a person ages, advanced ADLs go first, then Instrumental ADLs and finally ADLs.

Social, physical and mental activities are all necessary to maintain one's health in the older ages. Social activities can include going out with friends, religious activities, and Bingo nights. Physical activities may consist of a regular walk or gardening; a heavy physical workout at the gym is not necessary for the elderly to stay fit. Mental activities can include things like the crossword puzzle and Sudoku's.

Travel is sometimes asked about because those not physically fit to travel sometimes stop doing so.

Simplified Issue (new)

Beginning in the mid to late 2000s, there has begun a renewed interest in simplified issue (SI) underwriting/coverage in the US. The reason for this interest is the desire for better, faster and cheaper underwriting. SI can certainly be faster and cheaper than full underwriting, but it can never be as thorough. Many companies, however, have and continue to look for ways to get as much out of the underwriting they do, while keeping it simple. While SI, by definition, is less than a full set of medical questions, many companies are stretching this and asking some very good medical and non-medical questions to gain as much knowledge from the applicant as possible.

In addition, some of these companies are collecting as much other information as possible upon which to base the underwriting decision. There is generally enough information collected on these SI plans to allow preferred risk classifications, although the number of risk classes is typically less than that on a fully underwritten plan. In collecting this additional information, the main consideration is the speed in which the information can be obtained. This eliminates blood, urine and the APS, all of which take a number of days to receive. Some of the additional items that companies collect (tools they use for SI underwriting) include:

- MIB (Medical Information Bureau)
- MVR
- Pharmaceutical database
- Oral fluid
- Tele-underwriting

Each of these will be explained in more detail later in this paper. One additional item that is very new is fraud protection and this can take several forms.

What is collected varies company to company as do the underwriting questions and the preferred risk class structure. SI is continuing to evolve.

Financial underwriting

This has been done for years, primarily when a business was involved. However, with the larger incomes today, more emphasis has been placed on financial underwriting. Financial underwriting is primarily done to make sure that the income and net worth are consistent with the amount of insurance in force and applied for. For business owners, the anticipated growth of the business is also an important consideration.

Policy Ownership

Over the last decade or so, stranger owned life insurance has become popular. This is business written without the fundamental principal of insurable interest. While not preventable without regulation, companies try to look for and stop this type of business from being written in the first place. Mortality and lapse results can vary greatly on this business from traditional business.

Remote Underwriting

This is where the underwriter works from home. With technology, cases and results can easily and quickly be transferred back and forth, no matter how far away the underwriter lives from the home office.

Outsourced Underwriting

This is becoming more popular, primarily to accommodate times of peak work flow. This allows companies to get the work done during these times without having to add to staff. It also keeps companies from needing to reduce staff during non-peak times. Other companies prefer not to have their own underwriting staffs and fully utilize a company that provides underwriting services.

Straight-through Processing

This type of underwriting takes advantage of the technology available today. Rules are pre-programmed into the software. If the proposed insured meets the pre-determined guidelines, they are not only approved for coverage, but the policy is issued right there. Depending on the rules, 30%-70% of policies are typically issued this way. An advantage of this approach is that it allows the underwriter to spend more time on more difficult cases.

Underwriting Tools

The following is a list of underwriting tools that could be used in the life underwriting process:

- Application
- Blood test
- Urine specimen
- Oral fluid
- MIB (Medical Information Bureau)
- APS (Attending Physician Statement)
- MVR (Motor Vehicle Record)
- Tele-underwriting
- Pharmaceutical database
- Inspection report
- EKG, Treadmill
- Chest x-ray

Each of these tools will now be explained.

Application

The information that is usually collected on an application includes non-medical and medical information. Many of the specific items are discussed above. In addition, approval for collecting other information about the applicant (e.g., MIB, APS, Rx) is generally also requested.

Blood test

The life insurance blood test screens for a number of items using a variety of tests. The items typically screened for and their corresponding tests include:

- Diabetes screen
 - Glucose – Measures blood sugar levels and is an indicator of diabetes
 - AGP (Fructosamine Glycated Albumin) – Tests blood sugar levels over a longer period than glucose and is an indicator of diabetes
- Kidney screen
 - BUN (Blood Urea Nitrogen) – Test for kidney disease and dehydration
 - Creatinine – Test for kidney disorder and dehydration
- Lipid screen
 - Cholesterol – Risk factor in heart disease
 - HDL (High Density Lipoprotein) and LDL (Low Density Lipoprotein) – Components of cholesterol that are risk factors in heart disease
 - Triglycerides – Risk factor in heart disease
- Liver screen
 - Alkaline Phosphatase – Test for liver and bone disease
 - Bilirubin – Test for liver and blood disease
 - AST and SGOT (Aspartate Aminotransferase) – Test for liver and muscle disorders
 - ALT and SGPT (Alanine Aminotransferase) – Test for liver disease
 - GGT (Gamma Glutamyltransferase) – Tests for liver disorder, alcohol, drugs
 - Total protein includes Albumin and Globulin
 - Albumin – Test for advanced liver disease and malnutrition
 - Globulin – Test for immune disorders, infections and allergic reactions
- HIV screen
- PSA (Prostate Specific Antigen) for men ages 50+

The blood test provides the most current medical information on an applicant, except for possibly an APS.

Urine specimen

A urine specimen can provide information on:

- Cotinine (metabolite for smoking)
- Cocaine and other drugs
- Medicines

Oral fluid

An oral fluid sample can provide information on:

- HIV
- Cotinine
- Cocaine
- Hepatitis (used in Canada, not currently approved for use in US)

The oral fluid test is less invasive than a blood test. It can also be collected by agent so a paramedical or medical examiner is not needed.

MIB (Medical Information Bureau)

The MIB was founded in 1902 to help protect insurance companies from fraud. Member companies submit a request for information on an applicant. MIB provides information on whether the applicant was found to have an impairment by another member company when they applied for insurance with this other company. MIB will also indicate what the impairment was.

No rating can be attributed to the applicant based solely on the MIB finding, without further research to confirm the impairment. When underwriting has been completed, the company sends their decision back to MIB using special MIB codes for MIB to add to their database. MIB retains information for 7 years after which it may no longer be passed along to companies.

In recent years, MIB has added additional services for member companies. One is called the Insurance Activity Index (IAI). The IAI provides companies with information on how whether the applicant has applied for other coverage and when they applied. It does not provide information on the outcome of that other application. This information can be used to identify possible other coverage or possible denial of coverage not admitted by the applicant.

APS (Attending Physician Statement)

When the extent of a disease or impairment is not known, an underwriter often requests an APS to get a clearer picture of the situation. The advantage of an APS is that it generally provides the underwriter with the additional information needed to make a rating decision on the applicant. The disadvantage of ordering an APS is that it generally takes at least 7-10 days to receive.

MVR (Motor Vehicle Record)

MVRs vary state by state, but they all generally provide information on the driving record of the individual. Included in the MVR is a history of:

- Moving violations
- DUI (Driving Under the Influence) and DWI (Driving While Intoxicated) citations
- Reckless driving incidences

As there are many motor vehicle deaths and many accidental deaths are alcohol related, this information is important for the underwriting process.

Tele-underwriting

There are a number of different types of tele-underwriting, which will be explained below. This is where someone calls the applicant to either confirm information provided on the application or to the medical / paramedical examiner. The call may also be used to find out more information from the applicant. It is always done by phone. The caller can be from the insurance company or from an outside vendor who completes these types of calls. The caller is usually knowledgeable about medical conditions and knows how to deal with customers.

When additional questions are asked of the applicant, there is usually a script and pre-programmed questions that pop up on the caller's screen, depending on how the previous question was answered. These are drill-down questions and are designed to determine the extent of the impairment.

More honest answers are gained from the tele-underwriting interview than other sources because the applicant is usually more comfortable discussing medical issues with someone who sounds like a medical professional. Also, they don't have to admit a potentially embarrassing condition to someone directly (face-to-face), such as with an agent, as the tele-underwriting interview is conducted over the telephone.

Pharmaceutical database

Information is collected by the vendors from Pharmacy Benefit Managers. While the prescription history is not perfect, as people sometimes purchase prescriptions outside of the covered network, the data is very good.

The process is that a company will send a request on a particular individual to the vendor, providing the name, social security number and date of birth. The vendor attempts to match the individual in their database and then returns one of three responses:

- The prescription history if there is one,
- That the proposed insured is in the database, but no prescriptions found, or
- That the person was not found

The first two responses are considered “hits” and the company is charged for this service. They are not charged in third instance where there wasn’t a hit.

The prescription history that is provided includes:

- The drug prescribed
- The date it was prescribed
- The dosage prescribed
- How long the prescription covers
- The doctor who made the prescription
- The relative importance or seriousness of the drug in a red, yellow, green format, with red drugs being the most serious and green drugs being ones that are generally not a concern, like cold medication. Note that green drugs usually become more of a concern when there are a lot of them.

Companies can use the red, yellow, green coding of the vendor or can customize the rankings base on their own research and criteria. Besides, the red, yellow, green information, companies can use this information to find nondisclosure of medications, doctors that may not have been disclosed , and whether they are taking their medications as prescribed. It may also disclose that the person has an impairment not previously mentioned on the application or to the examiner. This information is determined by knowledge of what each drug is used for. Note that a company must be careful about drawing conclusions here as many drugs are used for multiple conditions.

The reason “individual” and “person” was used here instead of “applicant” is because some companies utilize this information at the time of claim rather than at time of application. However, most companies that utilize the pharmacy database do check on applicants.

Inspection report

This is typically where a third party vendor calls to check application information. In the past, this involved a private investigator asking family and friends about the individual applicant regarding personal habits (such as smoking), finances and any criminal behavior. The latter is rarely done today.

EKG, Treadmill

An EKG or ECG is an electrocardiogram or a resting test of the heart. The treadmill test is a stress test to determine whether there are any irregular heart patterns. These are typically performed on older applicants and those applying for large amounts of coverage. There is some concern that an applicant could drop dead from the stress test. A few companies have replaced these tests by blood tests, such as NT-pro BNP, which provides an indicator of cardiac events, however, the EKG and treadmill test are still relatively common.

Chest x-ray

This is less common today, but is still used for very large amounts of coverage by some companies. The chest x-ray makes images of the heart, lungs, airways, blood vessels, and bones of the spine and chest. It can find issues related to shortness of breath, chest pain, chronic cough and fever.

Possible New Approaches to Life Underwriting in the US

Before discussing possible new approaches to life underwriting in the US, it would be good to discuss what might be driving the changes. There are several potential drivers. These include:

- Need for speed – Many companies have the desire to issue policies more quickly. This has created the new interest in SI and this strong interest will likely continue into the foreseeable future.
- Age based underwriting – This concept has been around for awhile, but very few companies have done much about it to date, other than those who have implemented special older age underwriting programs. The concept here is that there are unique characteristics between the young, middle age and older age applicants. For example, the young are more prone to auto accidents than cardiovascular disease.
- Holistic approach – The current knockout approach to preferred underwriting does not provide an accurate classification of all risks. While the debit/credit approach is better in this regard, it still doesn't go far enough to accurately assess each individual risk.
- New work realities – Remote underwriting is a reality at many companies and is growing in popularity. This growth is likely to continue.
- Regulatory – It is unknown what changes may occur, necessitating change. The changes are likely to be consumer driven, especially with the new types of underwriting being considered.
- Is there a better way? – This is probably the biggest driver of change. Everyone wants to gain a competitive advantage.

The new approaches to underwriting are split into the following categories and will be explained in the order listed below.

- Laboratories
- Other vendors
- New medical markers
- Predictive modeling
- Other considerations

Laboratories

The three major laboratories in the US have been collecting data on individual applicants for many years. While some of the earlier data had been purged, there is still much data available. Note that while the instrumentation that measures the results of the tests has changed some since the early days, it has been consistent during the period where the labs have data. Each of the labs has taken advantage of this data, analyzed it and created a scoring system based on the analysis. The labs are just beginning to market this scoring technique to the industry.

The data used for the scoring was based on applicant rather than insured lives because the labs don't know which business actually gets placed. Deaths are determined from the Social Security Death Master file. While not perfect, this source is generally fairly reliable.

The premise behind this work is that there is a better way to assess each individual applicant, that current methods give too much weight to certain combinations of variables and not enough weight to others. Certain

variables have been shown to have strong statistical correlations and others don't and this is not considered with traditional approaches.

This scoring is very new, but has been tested and preliminary findings are very positive. We would expect this scoring to become popular in the near future.

Other vendors

There are other vendors that have also looked at similar issues, clinical literature and developed models that appear to better predict mortality outcomes than the traditional methodologies.

There are also vendors that have automated the underwriting process, utilizing some of this research.

While some companies are already using some of these resources, we anticipate there will be additional growth in these areas as well.

New medical markers

The SOA recently completed a study on potential new medical markers that could be used in the underwriting process. These markers were provided by the laboratories and then independent research was completed to determine the cost and benefit of each of these markers. The research paper can be found on the SOA website.

The 11 markers studied were:

- Apolipoprotein A and B – Lipid test that can be used instead of cholesterol
- CBC (Complete Blood Count) – Specifically within the CBC, Red Cell Distribution width was studied. Wider variation in widths implies higher mortality.
- Cystatin C – Renal (kidney) function
- Hemoglobin – Anemia and other physiological diseases
- Hemoglobin A1c – Metabolism of glucose
- Microalbumin – Early renal disease related to Diabetes
- NT-proBNP (N-terminal fragment of Brain Natriuretic Peptide)– Congestive heart failure
- Oxidized LDL – Early detection of plaque and MI (myocardial infarction) risk
- Phospholipase A2 – Used to predict cardiac event or stroke
- TNF (Tumor Necrosis Factor) alpha - Cancer
- Troponin I and T – Determines if damage to heart

Potential markers from other research include:

- Telomere length to determine life expectancy
- Alzheimer's disease predictors:
 - Protein in the spinal fluid¹
 - Measure of increase in DHEA (dehydroepiandrosterone) when blood is oxidized²
 - Oxidation of blood is a chemical process
 - No increase in DHEA in Alzheimer's patients

Predictive modeling

The term "predictive modeling" means different things to different people. For the purposes of this report, it is to be considered what is known as "life-style based analytics" or the use of consumer information in the underwriting process. Predictive modeling has been used more in health insurance, however, several companies have begun to use it for life insurance and more are expected to use it in the future. Many in the industry oppose use of this.

A very large amount of consumer data (thousands of pieces of information on each individual) can be obtained at a very low cost. Every time a card is swiped or a survey is filled out data is received and stored, generally without the knowledge of the individual it is happening to. The data available has been studied and analyzed by several companies. Some consistent patterns have emerged and conclusions drawn. For example, from the data below, someone could potentially and rightfully conclude that the first person would be healthier and live longer than the second:

1. Just bought new running shoes and subscribes to several healthy living magazines
2. Commutes 75 minutes each way to/from work and just bought a new television and a new reclining chair

Currently, insurance companies using this data only reward the better risks and don't penalize the poor risks. The "reward" might be that more thorough underwriting is not required because the proposed insured received a favorable score based on all of their consumer data.

The use of this data is expected to continue and to evolve, unless there is consumer backlash and/or unfavorable regulatory rulings. Using this data may be considered highly intrusive and could trigger privacy issues.

Other considerations

There are a number of other things that may be considered in the underwriting process in the future. Some of these are listed below along with one or more recent articles on the topic. Most, but not all, of the articles are based on the US.

- Environment
 - Pollutants linked to diabetes³
 - Age of onset of puberty predicts adult osteoporosis⁴

¹ <http://www.bbc.co.uk/news/health-13875984?print=true>, June 23, 2011

² Julie Robert, McGill University Health Centre, http://www.eurekalert.org/pub_releases/2011-05/muhc-btf050411.php, May 4, 2011

³ By Geneva Pittman, Diabetes Care, <http://www.reuters.com/assests/print?aid=USRE75S7OM20110629>, online June 23, 2011

⁴ By Vicente Gilsanz, MD, PhD, Journal of Pediatrics, http://www.eurekalert.org/pub_releases2011-01/chla-rda012811.php, January 28, 2011

- Geographical location
 - Wide difference in life expectancy by region in US⁵
- Poverty, low levels of education and other social factors⁶
 - US study showed following extra deaths in 2000
 - 245,000 due to lower education
 - 162,000 due to low social support
 - 133,000 due to individual-level poverty
- Obesity
 - Overweight more harmful to liver than alcohol in middle-aged men⁷
 - Obesity is a killer in its own right, irrespective of other risk factors⁸
 - Dementia link to middle-age obesity⁹
- Diet
 - Diets for elderly after hospitalization decreased mortality rates¹⁰
 - Eating purple fruit could fend off Alzheimer's Disease and Multiple Sclerosis¹¹
- Exercise

The pollutants, chemicals and hormones found in the environment are growing. These same toxins are found in increasing volume in individuals. It might make sense to screen for this in the underwriting process.

Geographical location can produce different mortality rates for a variety of reasons. If we are seeing these differences, should the underwriting process consider this? Should it also consider income levels and net worth, education levels and social support, each of which has been shown to exhibit differences in mortality experience.

What about diet and exercise? If a healthy diet and regular exercise are two things that keep people healthy and lack of them causes potential health issues, why shouldn't these items be considered in the underwriting process? Why not reward someone for eating well since they should be expected to live longer? Exercise was the first preferred criterion, but was dropped because it was difficult to prove. With the technology available today, the frequency of health club visits is now generally available. This could be used in a positive way in the underwriting process.

⁵ By David Brown, Washington June 15, 2011

⁶ Stephanie Berger, Columbia University's Mailman School of Public Health, http://www.eurekalert.org/pub_releases/2011-06/cums-hmu061611.php, June 16, 2011

⁷ Jerzy Kaczynski, University of Gothenburg, http://www.eurekalert.org/pub_releases/2011-06/uog-omh060711.php, June 7, 2011

⁸ LifeExtension, March 1, 2011

⁹ By Mark Metherell, <http://www.theage.com.au/national/dementia-link-to-middleage-obesity-20110304-1bi6f.html>, March 5, 2011

¹⁰ Andrew Lavin, Ben-Gurion University of the Negev, http://www.eurekalert.org/pub_releases/2010-12/aabu-pdf_1120210.php, December 2, 2010

¹¹ By Richard Alleyne, Telegraph Media Group Limited, December 8, 2010

Measuring the Impact on Mortality Experience

There are a number of methods to measure the mortality of a given underwriting type, tool, test or marker. These methods will be split between those for evaluating new tools and those for evaluating existing tools. For new underwriting tools, two methods will be described:

- Testing and validation
- Protective Value Study

For established underwriting tools, one method will be described:

- Actual-to-Expected Study

These will be discussed in order.

Testing and Validation

This is one process for determining whether to move forward with a new underwriting test or tool. Note that it is often difficult to segment the mortality impact of a particular tool or test relative to the impact from other sources. However, the process is described below.

Mortality data is collected from clinical data, your own studies, or another source. Testing of the new tool should be done to make sure mortality results are consistent with the values received from the tool. For example, if higher scores are indicative of higher mortality and some of the high scores have the lowest mortality results, there is either a problem with the tool or an explanation for this anomaly is needed. The anomaly could be explained by a lack of data in that portion of the study. This would not necessarily mean that the test was not a good one, if the rest of the data proved reliable.

One should also look for evidence of a J- or U-shaped curve. This happens when both high and low values result in increased mortality.

Validation is an important part of this process. In order to validate the data, it is generally split into two segments, with the second (smaller) set of data saved for the validation. Tests are performed on the first set of data and results are attained. The same tests are run on the second set of data and results are hopefully confirmed. Results won't be exact, however, if they are reasonably close they can be considered validated.

Protective Value Study

This is also known as a cost / benefit analysis. Here the cost and benefit are estimated and compared. Does the cost justify the benefit? Determining both the cost and benefit can sometimes be difficult due to the elements involved in each. The following describes the elements and some of the related issues.

Elements of the cost include:

- Cost of the test itself
- Time spent by underwriter and other personnel on evaluating applicant for this underwriting, including any upfront training
- Cost for ordering an APS or another test to verify information from this test
- Time spent analyzing APS or other test
- Time spent explaining to applicant why they were declined due to this new test

Depending on the complexity of the test, a more or less seasoned underwriter may be required. Although not specifically stated above, the medical director's time may also be needed.

The benefit may be even more difficult to quantify. Elements of the benefit (savings) include:

- Mortality savings due to this test / technique – This is typically measured by both the prevalence (how often the disease or impairment will be found) and impact of the findings (the total savings that will be achieved)
- Mortality savings due to needing to order an APS or other test and discovering something else, completely different, that wasn't caught before
- If the new test replaces an existing test, cost of the eliminated test

The mortality savings often vary by age and gender. In terms of evaluating the mortality savings, the biggest challenge may be to determine how much savings was due to the introduction of this new test, that wouldn't be caught through other underwriting. For example, how much savings would the pharmaceutical database provide if the applicant already mentioned the drug or if it was found in an already ordered APS – possibly very little or none!

The sentinel effect may reduce the impact of the savings. That is, if someone knows you are testing for something specific and they have it, it is likely they will go to another insurance carrier. This reduces the prevalence of the disease or impairment being tested for and should be factored into the savings.

After the cost and benefit are determined, they are compared and it can be determined at what ages and face amounts the new test would be cost-justified.

Note that protective value studies can be and are done both to determine whether to use a particular test and after the test is already being used to make sure it is providing the value originally anticipated.

Actual-to-Expected (A/E) Study

A/E studies are generally performed after a test has been used for a period of time. It provides a simple analysis of the mortality experience on the test or marker.

“Actual” is the actual mortality experience and “Expected” is the expected mortality, usually either the pricing assumption or an assumption based on a standard industry table. The actual results are divided by the expected results to create a ratio, the A/E ratio. If actual results were identical to expected results, the ratio would be 100%. Ratios below 100% are better than expected and ratios above 100% are worse than expected.

A/E ratios can be studied by any of the following:

- Study year
- Issue year
- Age
- Duration
- Gender
- Risk class / smoking status
- Policy Size
- Product
- Distribution channel / agent
- Target market
- Underwriter
- Other

The A/E ratio is not a perfect comparison as other factors beyond underwriting come into play, but it is a relatively easy approach to determine the effectiveness of the underwriting that has already been done.

A cause of death study can also be useful in determining the effectiveness of an underwriting tool that is supposed to identify those with a specific impairment or disease.

For more information, contact:

Al Klein, FSA, MAAA
Milliman
Two Conway Park
150 Field Drive, Suite 180
Lake Forest, IL 60045 USA
(312) 499-5731
al.klein@milliman.com