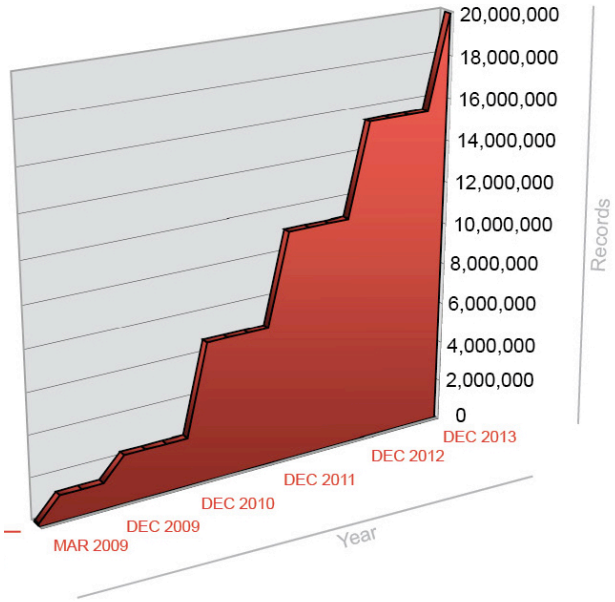
21st Services' Mortality Study



Issues and Answers

21st Services' Chief Actuary Vincent Granieri and Dr. Robert Foley of our research partner CDRG spoke at the LISA Fall Conference about our **mortality study of 20 million Medicare records.** The lively interest in the presentation prompted us to continue the discussion Vince and Rob started, here and on our website, www.21stServices.com.

21st Services

Introduction

21st Services' Chief Actuary Vincent Granieri, FSA, MAAA, EA, MBA, and Robert Foley, MD, of Chronic Disease Research Group (CDRG) made a presentation at the LISA Fall Conference on 21st Services' multi-year, 20-million-life mortality study. CDRG began the research project, under 21st Services' sponsorship, in the fall of 2008.

21st Services is committed to providing our clients with the most accurate life expectancy estimates possible, given the data available to us. In our 10-year history, we have continually sought to expand the data by

1. Studying our emerging experience in the life settlement/financial planning markets.
2. Utilizing the most pertinent life insurance industry data, but only after rigorously researching it and evaluating its relevance to our markets.

Recognizing limitations of the life settlement and life insurance industries as sources for senior mortality data, we have sought new sources. In September 2008, we announced our sponsorship of a study that will vastly expand our data, both in quantity and in quality. The study, being conducted by Chronic Disease Research Group (CDRG), is based on a large sample of senior lives derived from the U.S. Medicare system.

The detailed data and analysis will be used not only to refine our tables and underwriting system but they will be made available to our clients though our Data Subscription Service.

Life insurance industry mortality tables are not the answer

The need for old-age mortality data is critical. The life insurance carriers have not been collecting this data for these reasons:

1. Until the past few years, critically few life insurance policies were issued to older age applicants.
2. Until recently, many older-age applicants were considered substandard risks.
3. Many substandard risks were declined and not underwritten to completion.

The life settlement industry is collecting pertinent mortality data on the exact demographic it underwrites for, but unfortunately, the industry has such a small data pool that mortality results are extremely volatile. The full shape of the mortality curve is not yet fully known.

Problem: Insufficient statistically relevant data is available on the group of people we underwrite. Growing that pool using life settlement data only will take many years.

Solution: 21st Services is sponsoring the country's first exhaustive study of senior mortality data. It will ultimately track the medical diagnoses and mortality history of more than 20 million elderly United States lives.

The study uses a 5% sample of the Medicare population (ages 65 and up) every year from 1992 to the present. In this group, every single medical diagnosis is documented by ICD-9 code, an internationally recognized system to classify medical diagnoses.

No person-specific information (such as names or social security numbers) is a part of this study, and no one's private information can be accessed. There are no possibilities for breach.

Why this solution works for 21st Services

From the introduction of our senior model in 1998, 21st Services has done all we could to systematically eliminate the subjectivity that clouds results evaluation. We have built our underwriting program to be objective, using a strict rules-based underwriting platform. Each of the diagnoses in our underwriting system is assigned by ICD-9 code, dovetailing perfectly with the methodology of the CDRG study. In fact, an extra step in this study is to funnel the Medicare data through our proprietary underwriting model along with all associated deaths. This will provide an invaluable supplement to the mortality experience on which our current underwriting manual is based.

In addition, the CDRG statisticians have determined that the Cox multi-hazard model is best suited to analyze this data. The Cox model develops "hazard ratios." Hazard ratios show the effect of a medical condition on mortality. The hazard ratios are, in essence, mortality multipliers, and they have a direct relationship with those in 21st's underwriting system.

Exhaustive analysis

Dr. Robert Foley, who is the project lead for the study at CDRG, has commented that "when this study is completed and published in the public domain, it will facilitate very long-term survival estimates that account for hundreds of possible pre-existing conditions."

In total, more than 400 medical impairments are being evaluated. The list is then winnowed to approximately 300 variables that have the most statistical relevance. These can be looked at as single entries or – which is extremely important to 21st Services – in combinations (comorbidities). Dr. Foley commented that this study has produced the biggest spread sheet CDRG has ever constructed for one analysis.

What the study will show

By the time the study has been completed, 21st Services will have, by far, the largest data pool on factors that affect mortality. With the huge sample size, the confidence interval is incredibly tight – with very little dispersion around the midpoint of the particular hazard ratio associated with each diagnosis or comorbid scenario.

Not only will we have mortality data, as we track these lives over time, 21st Services will be able to ascertain the exact level of mortality improvement with each of the medical diagnoses. Today we apply a factor for mortality improvement broadly, across the base mortality tables. In future, we will be able to pinpoint improvements, ICD-9 code by ICD-9 code.

Based on the results of this study, 21st Services will be able to calibrate the particular debit associated with each of the medical conditions it tracks in its underwriting process. We will be able to confirm the validity of our underwriting system with a far larger set of statistically credible data.

Over time, 21st Services will be able to construct the mortality curve of the U.S. senior population beyond its median value. This will be of great value to the financial institutions investing in the life settlement marketplace.

Limitations

Like all scientific studies, this one has limitations. In fact, the studies underlying the 2008 VBT have limitations, which the SOA has acknowledged and documented. We are aware of the limitations of our mortality study, and in this section, we list them and discuss the methods we will use to extract meaningful and relevant conclusions in spite of them.

But we want to be clear: The limitations are minor. For the purposes of senior life expectancy analysis, this is the most comprehensive study of its kind, anywhere.

Limitation: The Medicare data is not an exact fit for the life settlement population. This is because the life settlement population was healthy enough at some period of time to warrant the issuance of a life insurance policy, but there was no health requirement for acceptance into Medicare.

Solution: A proxy for the life settlement population can be created by laying wealth parameters over the data by zip code segmentation. (This does not result in "red-lining" because life expectancy estimates, sales decisions and pricing of products are not differentiated by zip codes.) We can also split off a group of people with no medical diagnoses (i.e., in presumably good health), and look at their death rates over the course of the study. The experience of this cohort may be of interest in the premium finance market, because they may mirror the kinds of senior customers to whom insurance companies would issue life policies.

With all this data in our possession, we will be able to analyze many partial data sets and create many subgroups. Our clients, too, will be able to tap into our data, defining their own variables, and use this vast store of senior health information to answer a variety of business questions.

Limitation: ICD-9 codes don't always track the severity of the condition.

Solutions:

1. We may be able to further study ICD-9 codes out to the fourth or fifth digit – the number after the code's decimal point. These codes, in many cases, take severity into account.
2. The confidence intervals around each impairment will become so tight over time that having the severity information at the onset may become a moot point.

Limitation: ICD-9 codes don't take into account stage of cancer.

Solution: The quantity of cancer data we will have will be vastly superior to what is currently being collected. The overall hazard ratios associated with each cancer can then be integrated into the

most recent five-year survival rates for each type of cancer and each stage of disease (typically 1-4). The biggest benefit to investigating cancer through this study is the fact that 21st will be able to gauge mortality trends for each type of cancer underwritten.

Limitation: The smoking status (current or historical) is not captured in ICD-9 codes.

Solutions: There are relatively few current smokers as a percentage of the overall senior population, so investigating smoker mortality is of limited importance in the life settlement market. However, there are ways we can and will gain insight into the mortality effects of smoking on seniors:

1. Our study sample is so large that current smoking statistics for the entire senior population, superimposed over the study data, will give us an acceptable picture of the smoking habits of the study group.
2. We could look at medical impairments associated with a smoking history (e.g., pulmonary disease, lung cancer and vascular disease) and assign subjects exhibiting these impairments to our smoker pool.
3. The relationship of smoker to nonsmoker mortality is well-documented and serves as a backdrop from which to properly interpret the data.

Limitation: Information about laboratory values is not included in the data.

Solution: Even though current laboratory values will not be present, the diagnoses associated with abnormal lab work will be present, such as anemia, platelet disorders, diabetes, renal insufficiency and hyperlipidemia.

Limitation: ICD-9 codes don't include information about family medical history – specifically premature death from cardiovascular disease or, conversely, a family history of longevity.

Solution: We can superimpose over the study our own extensive data regarding family history.

Limitation: Activity levels and functional status are not readily apparent from ICD-9 codes.

Solutions:

1. We can superimpose our own data regarding activity levels and functional status over the existing study.
2. We can cull out and further investigate some diagnoses that suggest limited functional status (e.g., recent fractured hip, head injuries, gait and balance issues).

What the study means for our industry and our customers

We have been asked whether this study will lead to a significant shift in life expectancy results from 21st Services in the future.

In September 2008, we completed a major evaluation of our mortality experience in conjunction with the recently released Society of Actuaries' VBT 2008 mortality tables. We used an appropriately modified version of the VBT as the basis for our current proprietary mortality tables, and almost 75% of the change in our evaluations was due to the changes in the VBT table.

Having responded to this shift, we do not expect the results of the senior mortality study to lead to a further adjustment in overall life expectancies. We may determine that some impairments or groups of impairments should be assigned higher debits, and perhaps others, lower debits. But we do not expect changes like this to lead to dramatic adjustments to our LEs across the board.

Our goal is to build and maintain a database that enables us to monitor mortality change continually – and to make sure our LEs are incrementally adjusted in sync with that change, so that they are always as reliable as we can possibly make them.

When this study is completed, 21st Services will have the largest database anywhere of mortality information on old age. The number of individuals we will have analyzed will be well in excess of the number of insureds used by the SOA in developing mortality tables like the VBT. We will be able to evaluate the data in terms of the impact of a solitary condition or a group of comorbid conditions. We will be able to evaluate the effect of medical advances in terms of mortality improvements. All this is consistent with 21st Services' commitment to continuously advancing the state of the art in life expectancy evaluations.

As an added benefit, we are making the results of studies based on this mortality data available to clients through our Data Subscription Service. The service includes custom studies of population segments and/or clusters of conditions of the subscribers' choosing. Subscribers will also be provided with our mortality table and A-to-E studies.

For more information

Contact

- Paul Kirkman, 21st Services' Chief Underwriting Officer, PKirkman@21stServices.com
- Vince Granieri, 21st Services' Chief Actuary, VGranieri@21stServices.com

Or go to www.21stServices.com.