Survival Characteristics of Three Senior Populations, with a Focus on Life Settlements

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EXECUTIVE SUMMARY

Senior populations, while increasingly relevant to society and exhibiting more variability in the range of relative impairment levels, have not received the granular scrutiny afforded younger groups. This paper examines three populations underwritten by an independent life-expectancy provider. The first population is a group of insureds who contemplated settling their life insurance policies in the life-settlement market but did not complete a transaction; either no offer was forthcoming or the offer was deemed undesirable. The second is a group that actually settled their policies. The third is a group of college-educated seniors; some have insurance policies and belong in the first two groups as well. This third population underwent the same underwriting process as the first two as part of a project unrelated to settling a policy. These three populations exhibit varying characteristics with respect to survival from initial underwriting consistent with the theory that there is a third level of selection in the life-settlement transaction. The third level is in addition to the underwriting and wealth effects evident when a life insurance policy is issued and the impact of impairments/conditions evident in underwriting insureds contemplating settling their policies.

The paper then focuses on the two life-settlement populations exclusively, examining the different survival experience observed by gender among them. At this point, the nature of the third level of selection begins to emerge as the effect of insureds and investors selecting against each other. However, it is only when different eras of the life-settlement market are examined that this selection effect can be better defined. The paper concludes that the life-settlement transaction provides opportunities for both investors and insureds to exercise selection during the process and, throughout the short history of the life-settlement industry, each has tried to do so, with varying degrees of success.

TABLE OF CONTENTS

1. INTRODUCTION
    - A. ACKNOWLEDGEMENTS
    - B. SENIOR MORTALITY
    - C. LIFE-SETTLEMENT MARKET
2. METHODOLOGY
    - A. DATA SOURCES
    - B. STATISTICAL METHODS
3. DISCUSSION OF RESULTS
    - A. PREVALENCE OF CONDITIONS
    - B. SURVIVAL CURVES OF SENIOR POPULATIONS
    - C. DIFFERENCES IN SURVIVAL CURVES AMONG LIFE-SETTLEMENT POPULATIONS
    - D. SURVIVAL EXPERIENCE OF DIFFERENT ERAS OF LIFE SETTLEMENTS
4. CONCLUSIONS
5. FIGURES/TABLES
6. REFERENCES

INTRODUCTION

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SENIOR MORTALITY

Information about senior mortality is increasingly important and relevant in modern U.S. society. Seniors represent a larger proportion of the population as the baby boom generation matures and are living longer as well, which accentuates this trend. The impact of this phenomenon is significant. Social insurance systems such as Medicare and Social Security are directly impacted, and the demand for medical services increases with an older population. Finally, there is a need for life insurance and longevity-related insurance products among seniors.

However, these developments present challenges to insurance and financial services organizations. The senior population is not homogenous; indeed, due to rapidly increasing mortality and the onset of many potentially lethal impairments at older ages, mortality varies much more than in younger populations. Traditional sources of mortality information, such as population studies or life insurance experience, do not provide the needed insight into senior longevity patterns. Population studies do not provide granular information about the subpopulations that comprise the senior population. In the case of life insurance, relevant senior mortality data are scarce because historically, many, if not most, seniors are rejected in the underwriting process for health reasons and never enter the pool of insured lives. As well, seniors have not been targeted for the sale of life insurance products until relatively recently. While life insurance data is accumulating for the senior population, it has not been fully developed. The insurance industry's most recent Valuation Basic Tables (VBT) in 2001 and 2008 grade mortality rates to population mortality rates at the upper ages. This was well-suited to the objectives of the tables' authors, to produce a conservative (higher) estimate of mortality to enhance financial solvency, but it may not reflect reality.

Therefore, senior mortality cannot be fully explained by referencing population or life insurance data. Just as is the case with younger individuals, mortality tables should reflect the relevant characteristics of the group. An unimpaired senior who wants to sell his or her policy to an investor may not exhibit the same mortality as a senior of like age, gender and smoking status chosen randomly from the general population or the population of life insurance insureds. However, those entities with access to senior mortality data in the life-settlements markets, the life-expectancy (L.E.) providers and/or life-settlement investors, have not been inclined to share or contribute data to intercompany studies, so there is no publicly available mortality table for life settlements.

The need to understand the nuances of senior mortality for the life-settlement market and the issue raised at the 2011 Society of Actuaries' Living to 100 and Beyond Symposium regarding a third level of selection (Stallard 2011) motivated the authors to undertake this research. Utilizing commercially available data from 21st Services LLC, a leading life-expectancy provider in the life-settlement market, this paper will explore mortality (or survival) rates for three senior populations, with reference to the general population.

Just as senior mortality data are scarce, it is also true there is little information regarding the impact of various conditions on the longevity of this population. The trends observed regarding senior mortality, which may have been attributed principally to age and gender, could also be attributed in part to other factors such as medical conditions. By stratifying these populations by relative risk levels, the paper will also study the impact of various levels of impairments on the mortality risk at upper ages.

This data provides the opportunity to study three populations and compare them to the general population. The relationship of these populations is depicted in figure 1. Within the general population of seniors, there is a college-educated portion. Those seniors who purchase insurance are underwritten by the insurance company, which selects those who are relatively healthy and rejects the impaired. Insured seniors may later contemplate a life-settlement transaction but the most highly impaired select themselves out of this population, seemingly preferring that their beneficiaries receive the full face amount of their policy upon their passing as compared to them receiving only a portion of the face amount immediately.[1](U.S. Government Accountability Office 2010) As indicated above, there has been some discussion about a possible third level of selection that occurs among those who have contemplated settling. Theoretically, this involves two types of selection. First, the investor attempts to select those lives that are more highly impaired and shuns the healthier. Meanwhile the insureds will select out (and not settle) unless they believe they will live beyond the L.E. assumption implicit in the offer they receive for their policies.

LIFE-SETTLEMENT MARKET

The evolution of the life-settlement market from its inception until 2009 has been discussed previously (Granieri 2010). This paper will provide a brief synopsis and then update that information. In the late 1990s, the viatical-settlement market evolved into what is now known as the life-settlement market. Viatical settlements were born out of the needs of HIV-infected people who incurred significant medical expenses while seeking treatment. If these individuals owned life insurance policies, they sought to sell them to accelerate the death benefit to pay for medical care. With the advent of protease inhibitors in the mid-to-late 1990s, the HIV-infected population saw large increases in life expectancies, which destroyed the market for HIV policies.

From there, the focus of the secondary life insurance market shifted to impaired seniors. Insureds who no longer needed their insurance policies were offered values far in excess of statutory cash values and were willing sellers. Life-expectancy providers arose to provide independent underwriting opinions. These underwriters utilized the life insurance industry-accepted debit/credit underwriting models but with adjustments that reflected a clinical understanding of senior impairments.

The life-settlement market grew from its inception in 1997 to an average of $12 billion (face amount of policies sold) in 2007 and 2008 (Conning 2013). With this increase in transactional flow came statistically powerful data and experience data for longer durations. It became evident that mortality experience had changed after 2004, in part due to the influx of policies created through premium finance programs. These programs allowed seniors to enter into financing arrangements so that they paid no premiums for insurance for an initial term. This led to relatively healthy seniors being sold insurance policies that could be packaged for sale in the secondary market after the expiration of the contestable period.

Also in 2008, the Society of Actuaries (SOA) released the 2008 VBT, which showed significant mortality improvement relative to the 2001 VBT. L.E. providers produced new mortality tables based on both the newly credible life-settlement data and also modifications to the 2008 VBT. This led to the downward revaluation of many life-settlement portfolios and it also affected market values for life insurance policies on the secondary market. Life-expectancy extensions varied by age and gender, with younger, healthier male lives exhibiting the largest extensions. Premium-financed policies no longer were viable candidates for settlement transactions. Just as the viatical market was shaken by extensions in life expectancies, these extensions threatened to disrupt the life-settlement industry.

Coupled with the credit crunch in late 2008, these events created a perfect storm to severely cripple the secondary market for life insurance. The face amount of policies sold fell 36 percent to $7.6 billion in 2009 (Conning 2013). Investors became focused on the L.E. estimates, which underpinned the valuations of life insurance policies. By 2010, the volume of settled policies fell to $3.8 billion and further to $1.2 billion in 2011. In late 2011, AVS Underwriting, a leading life-expectancy provider, announced extensions based on, among other things, increased availability of statins and their success in mitigating the effects of heart disease. In early 2013, another provider, 21st Services, revealed extensions based on its analysis of a cohort of presumed settled lives versus those lives they underwrote but who ultimately did not close a transaction. Note these definitions do not exactly match those being utilized in this paper.

Looking back, life-settlement market history (as opposed to that of the precursor viatical-settlement industry dominated by HIV-related settlements) falls into three eras. The first, from the inception of the industry until the influx of premium-financed policies in 2005, can be described as the emerging life-settlement era. The years 2005–08 can be taken to comprise the premium-finance era, and post-2008 years can be described as the modern or post–premium-finance era.

The relative youth of the life-settlement market and the proprietary nature of specialized underwriting utilized therein contribute to the absence of a publicly available mortality table based on industry experience. L.E. providers migrated from disparate sources of their mortality assumptions in the emerging era to the 2001 VBT in the premium-finance era, while the modern era has been marked with some providers utilizing modifications to the 2008 VBT and others using their own proprietary data to develop mortality assumptions. In the current life-settlement market, the use of various life-expectancy providers' mortality assumptions to analyze the implied returns of actual life-settlement transactions results in very high relative internal rates of

return of 15–28 percent. It appears that investors expect significant fluctuations from the independent L.E. estimates, either from errors in the estimates themselves or random statistical fluctuations.

METHODOLOGY

DATA SOURCES

The database for life-expectancy provider 21st Services LLC serves as the basis for both life-settlement populations and the population of college-educated seniors. Lives underwritten since the company began using an automated underwriting system in 2005 are included, subject to modifications listed below. As well, the company re-underwrote a significant portion of those lives it had underwritten in the previous four years; they are also included. The database consists of more than 83,000 unique lives, complete with an average of five years of medical records for each life. These medical records are used as the basis for underwriting, which consists of reviewing the medical records and identifying the conditions that exist therein and meet the company's requirements with respect to severity of the conditions. Each life was underwritten an average of 2.35 times and the database has been updated to include the date(s) of underwriting, mortality multiplier (the relative level of risk, where a standard life has a multiplier of 1.0) and survival curve under the company's current methodology for calculating life expectancies. This data is also catalogued using the ninth revision of the International Classification of Diseases (ICD-9 codes) where possible. The company scrutinizes upward of 200 possible data items encompassing age, gender, smoking status, impairments, activity level and degree of impairment. The result is over 300 possible explanatory variables and mortality multipliers that range from 0.5 to more than 20,000.

The U.S. Social Security Death Master File (DMF) database has been searched to determine if any of these people have died and, if so, the date of death has been appended to the 21st database. Unfortunately, an important segment of the DMF database was removed in November 2011. Since then, the company has supplemented its DMF search with other sources of mortality information to ensure as complete a database as possible under the circumstances.

The life-settlement database was constructed as follows: An underwriting event begins with the review of five years of medical records on average. These records are screened, identified by type and organized chronologically. Underwriters then apply a proprietary manual to the information in the medical records and an automated system generates a vector of mortality multipliers, which can vary by age, gender and year since underwriting. These multipliers are applied to a mortality table adjusted for future assumed mortality improvement and other relevant factors, such as assumed antiselection. Demographic information (age, gender, smoking status, a unique identifier) was extracted for each underwriting event, along with various impairments and conditions identified by underwriters in the underwriting process. It is important to note that the manual considers what would be an appropriate level of impairment for age when identifying conditions. For example, every 90-year-old is assumed to have a certain amount of heart disease, but not every 65-year-old. Life-settlement populations consist of principally impaired lives but there are also those who might qualify as preferred class due to the absence of impairments (considering the age of the insured), a vigorous lifestyle (again taking age into consideration), good exercise tolerance and/or a favorable family history of longevity.

Another important consideration is that the automated underwriting system applies the current underwriting debits and credits—those that would be applied to new business today—to every underwriting. An insured underwritten in 2005 at age 50 will receive the same mortality multiplier as a like 50-year-old insured who presents him or herself for underwriting today. Thus every insured is underwritten consistently as it relates to the application of debits/credits and the calculation of the L.E.

Further information regarding the specific population for each underwriting, such as age, gender, height, weight, smoking status, state of domicile, date of death and mortality multiplier, was also captured. This paper focuses on three populations that comprise the overwhelming majority of the database. The "reported settled" and "contemplated settling" populations were both underwritten for potential life-settlement transactions. Certain clients positively identified the lives they had submitted that were known by them to have settled a policy. The others were tagged as "unknown" since there was no positive identification. It is reasonable to conclude that an insured who allows him or herself to be underwritten in connection with a potential life-settlement transaction is contemplating settling. These unknowns comprise the contemplated-settling population. Given that every client did not participate in the exercise to identify settled policies, it is likely that some small portion of these lives did settle a policy. An important part of this paper is the comparison of the survival of these two populations. Follow up for these populations can exceed 10 years.

It is important to note that L.E. providers do not typically know the face amounts of the insureds they underwrite. We are comfortable that these individuals generally occupy a higher socio-economic classification because we know the average life-settlement policy is nearly $350,000 (Januario and Naik 2013) and the typical settlement is often two to four times that size.

Another important population is a group of about 4,000 college-educated seniors, associated with a university alumni association. This "college-educated seniors" population is disproportionately from the Midwestern United States, although there were strict limits that capped the percentage of the population that could be sourced from residents of any one state. This group was identified in 2008 as part of a project sponsored by a large investment bank intent on creating synthetic longevity instruments. Although a small portion (~1.2 percent) of this population have been underwritten in connection with a potential or actual life-settlement transaction, this fraction is very similar to the percentage of people who have been underwritten in connection with life settlements among the insured population. As higher education is often linked to higher incomes, it is reasonable to assume this group to be of a higher socio-economic status than that of the general population. Because this project began in 2008, there are at most five years of follow up for the college-educated senior population.

STATISTICAL METHODS

The 64-bit version of the R Project for Statistical Computing, version 2.15.1, was used to perform the analyses. A sample data set was analyzed using both SAS and R to ensure consistent results. Kaplan-Meier techniques (the survfit function in the survival library) were utilized to develop survival curves. We chose this approach because it works well with populations such as these where the majority of the members do not die by the end of the study period.

To generate survival curves for a given population, we first created time-dependent strings for each unique life that began at the first underwriting, noting the relevant conditions/impairments at that time. These variables would apply until the end of the substring, which occurs at the next underwriting event, the date of death or the end of the study. The time since the first underwriting was noted along with the relevant conditions identified in the second underwriting. This process is repeated until an insured is found to have died before January 2013 or was alive in January 2013.

We then generated survival curves using Kaplan-Meier for the populations. We analyzed the populations to test homogeneity with respect to composition by gender, age, multiplier and average L.E., which suggested further stratification into subpopulations. We broke the population by relative impairment level based on the initial mortality multiplier. Insureds with initial mortality multipliers less than or equal to 1 were deemed preferred; between 1 and 2, standard; between 2 and 4, mildly impaired; and above 4, severely impaired. It was necessary to exclude those with multipliers above 30 because they tended to skew the summary statistics. We also broke the populations by gender and by the time period in which they were initially underwritten based on the historical eras described above (2001–04, 2005–08 and 2009–12). From these results, we could study the relationships between different cohorts to determine the differences, if any, in survival among them over time.

Table 1 presents the age/gender/smoking status breakdown of the life-settlement database. For the populations, the data is grouped around ages 60–90.

DISCUSSION OF RESULTS

PREVALENCE OF CONDITIONS

Table 2 presents the most common conditions in the life-settlements database for all conditions where the prevalence is over 10 percent.

SURVIVAL CURVES FOR SENIOR POPULATIONS

Figure 2 illustrates survival curves for the three senior populations. Two curves are presented for the life-settlement populations—insureds who contemplated settling their policy but ultimately did not and those who actually settled their policy. Additionally, the survival curve of the college-educated senior population is provided. There is less follow-up available for the college-educated seniors since data on them was collected beginning in 2008, so the comparison ends after six years.

In a previous paper, it was demonstrated that the Medicare population, which was virtually synonymous with population mortality, exhibited a survival curve that began at 100 and resembled a straight line with slope −0.05 for the first 10 durations (Granieri 2010). The survival curves provide clear evidence of better survival among the college-educated seniors than the Medicare population. Both the contemplated-settling and the settled populations' survival curves lie above that of the college educated, suggesting better survival rates. The life-settlement populations include insureds with large face amounts of insurance, again a possible proxy for

higher socio-economic status. Most interestingly, the settled life population's survival is only slightly better than that of those who contemplated settling but did not, at least at the population level, and the relationship actually reverses itself after year 4. At this high level of aggregation, it appears that while there are significant differences in survival rates of the college-educated population as compared to the general population, there is no meaningful difference among the survival of the settled and contemplating-settling populations. It is necessary to further break down the life-settlement populations to determine if this observation applies to its subpopulations as well.

DIFFERENCES IN SURVIVAL CURVES AMONG LIFE-SETTLEMENT POPULATIONS

We now turn our attention to the two populations that together comprise all underwritings related to life-settlement transactions exclusively: reported settled and contemplated settling. Figure 3 presents the survival curves of these two populations combined, broken by overall level of impairment at the time of underwriting. As expected, the survival curves vary by level of impairment with preferred lives exhibiting the best survival rates, then standard lives, mildly impaired lives and, finally, the severely impaired. Broadly speaking, we conclude that the underwriting process reasonably stratifies the population by overall level of impairment.

Comparisons of survival curves among the reported-settled and contemplated-settling populations will provide observations to analyze the existence and nature of a potential third level of selection in the life-settlement underwritten population. The issue is whether the investor or the insured ultimately dominates the life-settlement transaction. By noting the point in time where each population passes the same cumulative survival percentages, the selection effect can be identified. For example, if the reported-settled population crossed 80 percent cumulative survival at the same point on the time line as the contemplated-settling population, it would suggest that investors and insureds have balanced each other and no selection effect was present. If, on the other hand, the reported-settled population passed 80 percent cumulative survival at a different point than the contemplated-settling population, that would support the existence of a third level of selection. Figure 4 provides a more complete view of mortality for the two life-settlement populations, extending into durations where data are nonexistent in the college-educated population.

Focusing on the entire period for which we have data for both life-settlement populations, the selection effect can be studied further. In the life-settlement environment, selection against the insured would result in the survival curve moving down and to the left and selection against the investor results in a survival curve that moves up and to the right. Over the 11-year follow-up period, the survival curve of the reported-settled population barely lies above the contemplated-settling population and the relationship reverses itself in year 4. As we proceed further down the curves, it appears that the contemplating-settling population remains above that of the reported-settled population beyond year 8.

Figures 5 and 6 provide further breakdowns by gender, where the same pattern is evident, except that the break occurs after year 5 for females. We then reviewed the median age, initial mortality multiplier (MPI) and L.E. of these groups (see table 3). We noted that in every case for the subpopulations in figures 5 and 6, the investors chose policies with higher median ages and MPIs and lower L.E.s, which is consistent with them trying to exercise this third level of selection. Given this result, one would expect the survival curve of the reported-settled population to lie

below and to the left of that of the contemplated-settling population. The fact that it does not suggests there is a countervailing force influencing the survival of this group, which may be the selection effect of insureds against the investors.

Survival Experience of Different Eras of Life Settlements

The three eras of life settlements are defined by the existence of premium-financed policies. We developed survival curves to study the mortality experience of each era. Figures 7 and 8 illustrate comparative survival curves for each gender and during the different eras. The meaningful portion of these curves is limited to five years because of the limited follow-up of the modern era.

Given homogeneous groups, one might expect these curves to resemble one another, with each successive era lying above and to the right of the preceding one as survival rates typically improve by a small percentage year by year. Industry participants, on the other hand, would expect the premium-finance era (2005–08) subpopulation to exhibit the highest survival rates, suggesting that the influx of healthier, premium-financed lives were not anticipated by investors and underwriters, who assigned higher mortality multipliers to them than were warranted.

In fact, the premium-finance era policies exhibit the best survival rates for both genders and the other two eras exhibit similar and lower survival rates for males. For females, the emerging era (2001–04) survival rates are better than those from the modern era (2009–12).

To fully test for the insured selection effect, we would need to match our populations for gender, age and impairments in each era. Although that undertaking is beyond the scope of this paper, it is possible to examine the survival experience of subpopulations by gender, population and level of impairment in each era.

We then broke down the life-settlement data above that was split by gender and era into their respective reported-settled and contemplated-settling populations. The results are shown for males in figures 9–11 and females in figures 12–14. Summary statistics are shown in table 3. The selection effect of investors opting for younger, more impaired lives with lower L.E.s is continued. At this level of detail, it is also easy to see different patterns in the survival curves by era. The emerging era (figures 9 and 12) is marked with significantly better survival rates in the reported-settled population versus that of the contemplated-settling, suggesting that the insureds have clearly selected against the investors. Note that this occurs even though the former group is older, more impaired and has shorter life expectancies. In the premium-finance era (figures 10 and 13), there is balance for the most part, although the selection effect of the investor seems to last longer than that of the insured, as evidenced by the slight divergence in later durations. This may be happening as a result of the removal from the Social Security DMF in November 2011. Investors are likely tracking deaths more closely for insureds in their portfolios because of the time value of claims dollars lost, while there is no financial incentives to track the lives of the contemplated-settling population. In the modern era (figures 11 and 14), few conclusions can be made, although the death-tracking issue affects a larger portion of the survival curves.

We also tested this relationship by further breaking down the populations by level of impairment but found no inconsistent or new relationships. At that point, it seemed reasonable to conclude there is evidence of a third level of selection in life-settlement transactions, which consists of two opposing forces, the investor and the insureds.

CONCLUSIONS

1. Mortality among life-settlement, college-educated seniors and general populations is quite different from the onset, due to many factors, primarily the wealth effect, the effects of selection, time since underwriting and impairments.
2. The wealth effect is evident in survival rates among the college-educated seniors versus the general population.
3. There is both wealth effect and the effect of selection between the college-educated population and life-settlement populations, both those contemplating settling their policies and those who actually settle.
4. There is a further selection effect within the life-settlement population among those who actually settle their policy versus those who contemplate settling but do not actually do so. This selection effect arises from two sources that conflict in their effects: investors select older lives with higher levels of impairments/shorter L.E.s to enhance the value of their investment while insureds use the proprietary knowledge of their own health to select against the investor.
5. This third level of selection is not evident from aggregated data because, throughout history, the efforts of investors and insureds to act in their own best interests tend to balance out.
6. Different eras of life settlements exhibit different survival patterns due at least in part to this interplay and balancing of the selection effects.
7. The removal of mortality information from the Social Security Death Master File may invalidate conclusions based on deaths occurring beyond November 2011 as it is likely the mortality of the insureds whose policies are owned by investors do not suffer the reporting lag introduced to the insureds whose policies have not been settled.
8. Further study using age, gender and impairment matched data sets for each era may prove essential in determining the exact nature of this third level of selection in the life-settlement market.

FIGURES

1. Pictorial representation of three populations in the life-settlement database
2. Survival curves for three populations
3. Survival curves for four impairment levels in life-settlement populations
4. Survival curves for the two life-settlement populations
5. Survival curves for the two life-settlement populations—male
6. Survival curves for the two life-settlement populations—female
7. Survival curves for the three eras of life-settlement populations—male
8. Survival curves for the three eras of life-settlement populations—female
9. Survival curves for males underwritten in 2001–04 in each of the two life-settlement populations
10. Survival curves for males underwritten in 2005–08 in each of the two life-settlement populations
11. Survival curves for males underwritten in 2009–12 in each of the two life-settlement populations
12. Survival curves for females underwritten in 2001–04 in each of the two life-settlement populations
13. Survival curves for females underwritten in 2005–08 in each of the two life-settlement populations
14. Survival curves for females underwritten in 2009–12 in each of the two life-settlement populations

TABLES

1. Age/gender/smoking status breakdowns of the database
2. Prevalence of conditions in the database with 10 percent or higher prevalence
3. Selected statistics of life-settlement subpopulations

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