ANALYSIS OF LONG-TERM CARE INSURANCE EXPERIENCE FOR INSUREDS BY DIAGNOSIS AT ISSUE

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I. INTRODUCTION

Although long-term care insurance (LTCI) is still a relatively new product in the insurance marketplace, the consumer base has already undergone several transformations. In part, this is due to the 2002 introduction of the federal long-term care insurance program, which triggered considerable interest among those who had never before considered long-term care options. Traditionally purchased by those in their late 60s, LTCI is now not uncommon for individuals who are in their 40s or 50s. Another recent change is decreased exclusion of various mental or nervous disorders among some carriers. Based on data from the following study, it may be possible to expand coverage to groups previously considered or treated as uninsurable.

Underwriters have excluded many individuals diagnosed with such disorders as hypertension or arthritis from LTCI, based on the assumption that the claim rates of individuals with such conditions would be much higher than the norm. These assumptions can now be replaced by relying on hard data. An increased predictability regarding claim, lapse, and mortality rates of multiple disorders may allow insurers to expand the categories they consider eligible for coverage.

The importance of relying on precise statistics taken from actual claims experience is illustrated by the emergence of data that some might regard as counterintuitive. For example, it might be assumed that osteoarthritis, a degenerative disease of the bones, would lead to increased claims. However, our data indicate that identifiable subsets of individuals with osteoarthritis (that we have categorized as low and medium risks) have *lower* than normal claim rates. Additionally, these two subsets make up 92% of the life-years exposed from all individuals with osteoarthritis in our dataset. By simply separating out the 8% of those diagnosed with osteoarthritis who have unstable conditions or mobility limitations (the high-risk category), it may be possible to offer LTCI at normal underwriting classifications to the vast majority of those suffering from the most common type of arthritis.

The example of osteoarthritis also demonstrates the importance of making more precise distinctions within specific disorder categories. The breakdowns used in our study are easily replicated because they are based on information often available to

underwriters, and therefore they can be used by companies when determining eligibility for LTCI.

Another example is presented by prostate cancer, which is the most common type of cancer among American men. In creating risk categories for prostate cancer, years since diagnosis at time of underwriting and the presence of a mobility limitation were the only individual characteristic used to sort people into risk categories. What resulted were three risk groups with very disparate claim rates: the low-risk category had a claims rate 27% *lower* than the norm, the medium-risk category had a claims rate 14% higher than the norm, and the high-risk category had a claims rate 50% higher than the norm.

Thus, it appears that by making finer distinctions within disorders that, when looked at as a whole, appear ineligible for LTCI, it may well become feasible to create subcategories of insurable individuals. For example, while overall, those diagnosed with rheumatoid arthritis have a claim rate 46% higher than the norm; more than 50% can be categorized as low risk, which has a claim rate 20% lower than the norm. Although acceptable claims ratios vary by insurer, this report indicates subcategorizations may be found that could be insurable at every possible cut-off level.

Many of those diagnosed with the disorders covered in our report are well aware of the need for long-term care insurance. Individuals who have hypertension or breast cancer have likely already thought about the possibility of losing their financial and daily independence, resulting in a consumer already conscious of the importance of LTCI. Statistics indicating that many of these people are eligible for LTCI potentially creates a new consumer market. For those categories with claims rates that are greater than what is normally determined to be an acceptable level, some may be willing to pay higher premiums.

This study identifies large categories of conditions that carriers previously might have avoided because of a lack of data. This report is only one piece of publicly available information on understanding the risks for LTCI. Hopefully, there will be further investigation of these risks. Our hope is that underwriters and carriers will choose to conduct further studies exploring additional classes of people who are eligible for LTCI.

This study uses a dataset of long-term care (LTC) claims and underwriting data to investigate the relationship between a diagnosis at issue and nursing home utilization and, to a lesser extent, mortality and lapse. Such experience studies have been infrequent in the LTC industry, in which individual insurers have accumulated proprietary datasets for internal use but rarely share this information with outside parties. Further, insurers are only able to learn information about the individuals that they *do* choose to cover. There is generally no opportunity to monitor future LTC utilization of the individuals whose applications are rejected. Insurers have attempted to conduct surveys of rejected applicants and have found them to be particularly unwilling survey subjects. The database upon which this study is based includes many insureds that likely would have been denied coverage through other insurers, making it an ideal source for this study.

We have chosen to study the following conditions for this study: mental conditions, hypertension, cerebrovascular disease, congestive heart failure (CHF), coronary artery disease (CAD), diabetes, arthritis, osteoporosis, breast cancer, and prostate cancer. These are especially important groups of diagnoses for LTC underwriters, because conventional wisdom based on experience in disability and health insurance is that such individuals are more likely to require LTC services. However, we are not aware of any studies that measure the effect of the presence of these conditions on the likelihood of a policyholder going into claim status.

Using the claims and underwriting data from a large LTC insurance program, we have constructed claims, mortality, and lapse rates that vary by attained age, sex, and duration from issue. The observed rates were smoothed to provide benchmark rates for the general insured population. We then selected several diagnoses with sufficiently large samples to permit effective analysis and compared the mortality, claims, and lapse experience of these subgroups to the aggregate of the insured population. The results of this study—and the model that was developed to produce this study—could be an important tool to LTC actuaries and underwriters as they continue to learn more about the interplay between conditions at underwriting and future LTC utilization. This is especially timely as the current trend in LTC insurance has been toward more exclusive rather than inclusive underwriting standards (Murnane, 2004).

II. LITERATURE REVIEW

This section is divided into several subsections. Each subsection describes the literature relevant to a specific condition. The purpose of this literature review is to provide a general orientation to the research in this area as well as to provide benchmarks to which the data in this study can be compared.

A. Mental Conditions

The body of literature relevant to mental conditions is best considered in two pieces. First, there is an extensive literature concerning the relationship between various mental conditions and mortality. Studies by Alstrom (1942) and Odegard (1952) laid the groundwork for this research. Second, although there is some literature concerning the relationship between mental diagnoses and the need for LTC services, it is more recent and sparse. This issue has only been of significant practical importance to actuaries, underwriters, and insurers since the rise of LTC insurance over the past 20 years.

1. Mental Conditions and Mortality

Many studies exploring the connection between diagnoses of mental conditions and mortality focus on depression. In general, the studies find that depression leads to mortality rates that are somewhat higher than the general population. Vythilingam et al. (2003) showed that hospitalized patients with psychotic depression had about 41% higher mortality and patients with nonpsychotic depression had about 20% higher mortality than nondepressed individuals. Schoevers et al. (2000) used a Dutch survey database to analyze excess mortality among individuals with depression and found that for women the mortality ratio[1] was 1.28. The mortality ratio for men was 2.65. A similar study on the same data was published by Beekman et al. (2002). Despite these findings, other studies have concluded that depression does not have a significant effect on mortality. Koenig et al. (1989) determined that while depressed hospital patients were more likely to die during their hospitalization, there was no increased mortality among these individuals after discharge.

[1] The mortality ratio is defined as the mortality rate among the subgroup of interest divided by the mortality rate in the general population. Thus, a mortality ratio of 2.0 would imply exactly double the general population's mortality rates.

Several researchers have studied the link between a diagnosis of an affective disorder and mortality. Affective disorders are a class of mental disorders characterized by a disturbance in mood. This includes manic disorder, depressive disorder, bipolar disorder, and seasonal affective disorder. Osby et al. (2001) analyzed a sample of more than 15,000 Swedish individuals hospitalized with an affective disorder. Among this population, the suicide rate was nearly 20 times the rate observed in the general population. Death from natural causes was about double for this group. Black, Winokur, and Nasrallah (1987) also studied the relationship between mortality and affective disorders and concluded that any increased mortality only persists for about 2 years following hospitalization.

Several studies also explore the relationship between excessive alcohol use (either a history of such use or current use) and mortality. One common finding among these studies is that the effect of alcohol use on mortality appears to decrease with age. Thus, a 75-year-old alcoholic would have much closer to average mortality than a 40-year-old alcoholic. Liskow et al. (2000) observed mortality ratios of 5.5 for a group of male veterans aged 35 to 44, 2.6 for ages 45 to 54, and 2.25 for ages 55 to 64. One exception to this relationship was published by Jarque-Lopez et al. (2001), although this study was based on a small, geographically isolated group. Neumark, Van Etten, and Anthony (2000) and Dawson (2000) all found mortality ratios for various groups of alcohol users to be between 1.5 and 2.0. Banks et al. (2000) found similar results and confirmed the decreasing effect by age.

2. Mental Conditions and LTC Utilization

The detection of mental conditions that could lead to dementia has long been a primary goal of LTC underwriters. In a survey of eight of the largest LTC insurers, five stated that they had more admissions from non-Alzheimer's dementia than any other diagnosis (Gordon, 2003). Jorm (2001) concluded that individuals with a history of depression pose double the risk of eventual dementia. Mehta, Yaffe, and Covinsky (2002) demonstrated that individuals with cognitive impairment pose a 2.3 times greater risk of ADL failure and individuals with symptoms of depression 1.9 times greater. These

findings represent a tremendous incentive for insurers to identify those individuals before coverage is granted.

Currently, LTC underwriters are wary of manic episodes, psychiatric hospitalizations, suicide attempts, and alcohol or drug use (Knudson, 2003). The results of this study should provide hard data upon which these types of underwriting decisions can be made. Although the scope of this study is limited to incidence rates, there is also evidence that the cost of caring for individuals with mental conditions is somewhat higher than the cost of treating physical conditions alone (Wright, 2003).

A study conducted by Murtaugh, Kemper, and Spillman (1995) underscored the importance of the analysis presented in this paper. This report states, "A lack of data on which to base forecasts of the expected cost of covered services could result in conservative underwriting where individuals are rejected who, on average, pose no greater financial risk than those accepted." Data have been building up gradually since 1995, but in a proprietary fashion. There is little information in the public domain to assist underwriters in determining precisely which conditions could potentially be covered. The Murtaugh et al. study used survey data to simulate the underwriting decision and evaluate the future nursing home utilization of those who were expected to be accepted against those who were expected to be declined. Although mental conditions were not specifically studied, Murtaugh et al. found that cognitive impairment at the time of application for coverage did lead to somewhat larger probabilities of eventual ADL loss.

A later study (Temkin-Greener, Mukamel, and Meiners, 2000) confirmed that expansion of coverage to certain groups that are generally declined would not necessarily result in higher claims payment. Temkin-Greener et al. found that one in seven older persons who apply for LTCI and are rejected could have been offered coverage without posing significantly greater risk to insurers. Again, specific mental conditions were not studied. This study suggested that individuals with cancer, anemia, or multiple diagnoses could be offered coverage at standard rates and individuals with macular degeneration, respiratory illness, fractures, and heart disease could be offered coverage at an impaired rate level. A substandard rate class is one whose applicants are offered coverage, but at somewhat higher rates than the normal, or preferred, risks. These additional inclusions,

Temkin-Greener et al. report, could increase the potential size of the LTCI market by as much as 10%. The intent of this study is to identify certain mental conditions, as well as other conditions, that could potentially be added to this list.

B. Hypertension

The literature related to hypertension that is relevant to this study can be separated into three topics. First, there is a brief discussion of articles that consider the implications of hypertension and coronary heart disease (CHD) on underwriting for life insurance. Second, there is a discussion of the relationship that has been found between hypertension and mortality. Finally, there is a discussion of a few articles that analyze the relationship between hypertension and the use of long-term care services.

1. Hypertension, CHD, and Underwriting for Life Insurance

One of the few articles that discuss underwriting life insurance for people with hypertension is a brief case study by Quinn and Easton (2002). The authors note that hypertension affects 25% of all adults and 60% of those people over age 60. Because untreated hypertension can cause a life span to be shortened by 10 to 20 years, this condition is a serious concern when underwriting life insurance. There are four sources of mortality associated with hypertension: heart attacks, strokes, heart failure, and kidney failure. The overall mortality risk associated with hypertension is magnified when it occurs together with any other coronary risk factors, such as diabetes, smoking, or high cholesterol levels. The authors note that mortality rates are not affected significantly if hypertension is treated and controlled. However, because hypertension often is asymptomatic, many individuals are not aware of their hypertension, and many who are aware miss taking their medication, thereby leading to erratic control of their hypertension. The authors state that it has been estimated that 50% of people being treated for hypertension with medication do not take the medication regularly. The authors believe that a well-controlled and stable blood pressure reading reflects good compliance with treatment for hypertension and can qualify an applicant for the best rating class.

An article by Duckett (2000) also discussed the factors important in the underwriting of hypertension. The author identified stroke, myocardial infarction, left ventricular hypertrophy, CHF, and renal insufficiency as the primary mortality risks associated with hypertension. The author stated that three factors are important when assessing the mortality risk related to hypertension: disease duration, hypertension control, and evidence of end organ damage. Hypertension is a slow, progressive disorder, so the effects of the condition can be reduced by shortening the duration of the condition. Obviously, the effects of hypertension can also be reduced if treatment is used to successfully control the condition. Shorter disease duration and better control of the condition will reduce the damage done to organs such as the heart, kidneys, and blood vessels in the brain.

Underwriting for life insurance focuses on the impact of CHD on mortality, rather than the impact of hypertension itself, which is a risk factor for CHD. Goodwin (1999) provides an overview of issues facing life underwriters as they assess older-age risks, particularly those with CHD. The author notes that heart disease is the number one killer in the United States, causing 30 to 50% of all deaths. About half of these deaths are due to CHD. About 75% of all CHD deaths in the United States occur in people over age 65, and half of all deaths in the elderly are due to CHD. In addition to the increased mortality associated with CHD, congestive heart failure, which is often due in part to CHD, is an increasingly frequent cause of disability and morbidity in the elderly. CHF is the number one reason for hospitalization and for rehospitalization for people over the age of 65. Because people with CHD are living longer but have more severe heart disease than in the past, CHD and CHF are both becoming important concerns for underwriting long-term care products.

About half of older adults with CHD have no symptoms or history of heart disease, making screening tests to look for evidence of CHD important in underwriting older adults. The author identifies two classes of risk factors for CHD—traditional factors (low levels of HDL cholesterol, high total cholesterol, diabetes, hypertension, left ventricular hypertrophy, smoking, and obesity) and factors that are unique to the elderly (low albumin levels, depression, lower extremity disability, and ankle-brachial index less than 0.9). Signs and symptoms of CHD in the elderly are also identified. The author

believes that stress tests, both exercise and nonexercise, have high predictive values in diagnosing CHD in the elderly.

With respect to the value of stress test results, one article (The ING Underwriter, 1998) considered whether stress test debits or credits were appropriate. The article asked if there was evidence to support reclassifying known CHD into clinical risk categories based on the results of a treadmill or thallium scan after coronary artery bypass surgery (CABG) or an angioplasty (PTCA). The article reviewed one study that followed a group of 255 patients for 5 years, all of whom underwent a thallium stress test after a CABG. The study found that some variables examined by the test were good predictors of death and the number of myocardial infarctions during the follow-up period. The study concluded that the thallium scan was very useful in stratifying patients after CABG into low-, intermediate-, and high-risk groups for future cardiac events.

2. Hypertension and Mortality

According to a review by Miller and Weissert (2000), only a handful of studies have examined the link between hypertension and mortality. The authors found that among five studies examining hypertension, only one found a statistically significant positive link between hypertension and mortality. The other four studies examined found nonsignificant links. Miller and Weissert also examined the link between hypertension and three other outcomes: institutionalization, hospitalization, and functional impairment. They found that two of three studies that analyzed the relationship between hypertension and institutionalization observed a statistically significant *negative* relationship, while the third study did not observe a significant relationship. Five studies analyzed the relationship between hypertension and hospitalization, and all five found no significant relationship. Finally, 12 studies analyzed the relationship between hypertension and functional impairment, with 4 finding a statistically significant positive relationship, 1 finding a significant negative relationship, and 7 finding no significant relationship.

3. Hypertension and the Use of Long-term Care Services

Because hypertension is a major risk factor for several major diseases, it may play an important role in the need for and use of long-term care services. The most comprehensive study involving actual claims filed under long-term care policies was reported by the Long Term Care Experience Committee of the Society of Actuaries (the SOA LTC Experience Committee) (2004). The committee analyzed claims incurred on long-term care policies of 21 insurers in force from January 1, 1984, through December 31, 2001. There were 3.9 million insureds, 95,000 claimants, and more than 12 million years of exposure. Eighty percent of the claims were for nursing home care, 15% for home health care, and 5% for both nursing home and home care.

Among all claims that reported a primary diagnosis, hypertension accounted for 1.2% of both the number of claims and of claim payments. While hypertension was fairly insignificant as a primary diagnosis, circulatory diseases and stroke, which both count hypertension as a primary risk factor, were far more prevalent as a primary diagnosis. Circulatory disease accounted for 10.7% of claims and 8.5% of claim payments, while stroke accounted for 12.7% of claims and 15.5% of claim payments. With respect to average claim payments, payments for hypertension, circulatory system, and stroke were 111%, 92%, and 142% of the average claim payment for all diagnoses, respectively.

In a study on the risk factors for nursing home placement among the "oldest old" population, Atherton (2003) found that respondents aged 70 and over who participated in the Study of Assets and Health Dynamics Among the Oldest Old (AHEAD) and had untreated hypertension in 1993 were almost twice as likely to be placed in a nursing home compared to respondents without hypertension.

A study by Hodges and Liming (2001) estimated medical expenditures attributable to hypertension, including expenditures for cardiovascular complications, other conditions for which people with hypertension are at higher risk, and comorbid conditions related to hypertension. They estimated total expenditures of $108.8 billion in 1998 attributed to hypertension, which was 12.6% of total personal health expenditures attributed to diagnoses that year. Approximately 12% of expenditures for hypertension were for nursing home care, and about 4% were for home health care. Per capita expenditures attributed to hypertension in 1998 were $403 and the expenditure per

condition in 1998 was $3,787. The study also reported attributed expenditures for hypertension by age and sex.

C. Stroke

Because stroke is often a debilitating condition leading to a significant loss in functional capacity, it plays an important role in the need for and use of long-term care services. The most comprehensive study involving actual claims filed under long-term care policies was reported by the Long Term Care Experience Committee of the Society of Actuaries (2004). Among all nursing home claims that reported a primary diagnosis, stroke accounted for 13.4% of claims and 15.1% of claim payments, while average payments for stroke claims were 1.34 times the overall average. The average number of days for stroke claims was 1.23 times the overall average. Finally, the average payment per day for stroke claims was 1.09 times the overall average.

Among all home health care claims that reported a primary diagnosis, claims with stroke listed as the primary diagnosis accounted for 11.0% of all claims and 18.2% of all claim payments. The average claim payment for stroke was 1.81 times the average for all claims. The average number of visits for stroke was 1.54 times the overall average. Finally, the average payment per visit for stroke was 1.17 times the overall average.

D. Congestive Heart Failure and Coronary Artery Disease

This section summarizes a few articles that analyze the relationship between congestive heart failure (CHF) and coronary artery disease (CAD) and the use of long-term care services.

1. CHF and CAD and the Use of Long-term Care Services

Because CHF and CAD disease are major risk factors for several major diseases, they may play important roles in the need for and use of long-term care services. The most comprehensive study involving actual claims filed under long-term care policies was reported by the Long Term Care Experience Committee of the Society of Actuaries (2004). Although this study did not identify CHF and CAD as specific conditions for analysis, it did examine claims for circulatory disease in general.

Among all nursing home claims that reported a primary diagnosis, circulatory disease accounted for 11.2% of claims and 8.6% of claim payments, while average payments for circulatory claims were 0.91 times the overall. The average number of days per circulatory claim was 0.99 the overall average. Finally, the average payment per day for circulatory claims was 0.92 times the average.

Among all home health care claims that reported a primary diagnosis, claims with circulatory disease listed as the primary diagnosis accounted for 8.2% of all claims and 7.3% of all claim payments. The average claim payment for circulatory disease was 0.96 times the average for all claims. The average number of visits for circulatory disease was 1.02 times the overall average. Finally, the average payment per visit for circulatory disease was 0.94 times the overall average.

E. Diabetes

Diabetes is also a major risk factor for several major diseases. Thus, it may play an important role in the need for and use of long-term care services. The SOA LTC Experience Committee report found that among all claims that reported a primary diagnosis, diabetes accounted for 1.3% of claims and 1.2% of claim payments, while average payments for diabetes were 107% of the average claim payment for all diagnoses.

F. Arthritis

The SOA LTC Experience Committee report also examined the relationship between arthritis and the use of long-term care services. Among all claims that reported a primary diagnosis, arthritis accounted for 10.1% of claims and 9.4% of claim payments. With respect to average claim payments, payments for arthritis were 109% of the average claim payment for all diagnoses.

III. DESCRIPTION OF DATA SOURCE

The data that provide the basis for this study are the complete underwriting, application, and claims experience for the entire insured population of a large group LTCI program.

The data were provided in several text files, all linkable by matching of policy numbers. The files provided were:

- **Active database:** Contains coverage effective date, application date, demographics (age, sex, marital status), and policy details (maximum daily benefit, elimination period, lifetime maximum, billing frequency, premium, presence of a disability premium waiver) for all individuals in active status as of November 1, 2003.
- **Claim database:** Contains the same data elements as the active database, but for those insureds in current claims status as of November 1, 2003.
- **Benefits database:** For any individual who has ever been approved for claim payment, contains the total covered amount, total enrollee payment, total plan payment, service dates, and reason for claim (e.g., Alzheimer's, dementia, stroke).
- **Mobility database:** From underwriting process, describes time frame and types of any mobility limitations, including quad cane use, wheelchair use, cane use, walker use, oxygen, etc.
- **Paid benefits summary database:** Contains total benefits paid, count of service days, date deductible was met, and description of claim.
- **Terminations database:** Contains date and reason for any plan terminations, including voluntary lapse, exhaustion of benefit maximum, and death.
- **Underwriting database:** Contains description of all conditions identified during the underwriting process. Diagnoses are identified by ICD-9 code and (for each diagnosis) the time period, severity, and stability of the condition are noted. Additionally, the "accept or reject" decision is shown for each individual. This study is only concerned with individuals who were accepted for LTC coverage.

The population size of this database is sufficiently large to make statistically sound conclusions. The underwriting database contains nearly 1 million records covering more than 250,000 lives. Of course, not all of these individuals were accepted for coverage. However, about 190,000 individuals were present in the active database in

November 2003. Claims data are available for about three thousand individuals. Table 1 presents a summary of the demographic breakdown of the individuals in the active database.

Table 1: Summary of Population Demographics

Age Group	Male	Female	**TOTAL**
Under 50	15,143	26,065	41,208
50 to 64	39,705	56,761	96,466
65 to 79	21,344	27,401	48,745
80 and over	1,217	2,114	3,331
TOTAL	77,409	112,341	189,750

IV. DERIVATION OF AGGREGATE RATES

The basic methodology used in this study is to compare the experience of individuals with various conditions at underwriting to the experience of the whole group. Thus, the first task is to construct claim, lapse, and mortality rates for the aggregate experience of all individuals in the group.

A. Calculating Exposures

The first step in the calculation of rates for each of the three decrements in the study (claims, death, and lapse) is to determine the exposure base for each of the three decrements. Batten (1978) presents three methods of calculating exposure, which he defines as "the number of annual units of human life which are subject to death, disability, or some other decrement." These three methods are based on one of the following assumptions: (1) the uniform distribution of deaths or UDD, (2) the Balducci hypothesis, or (3) the constant force of mortality. While mathematically flexible, the UDD and constant force assumptions result in discontinuities (either in the mortality function or the force of mortality function) that do not mirror reality. The Balducci approach, however, results in much a more realistic representation of mortality (or any other decrement).

The selection of the Balducci hypothesis as the basis for the decrement tables requires a careful handling of exposure determination. For each year in which a

decrement occurs, a full year of exposure is credited for that decrement only. All other decrements are credited with the exposure until the first decrement occurs. For example, if a policy is effective as of January 1 and a claim occurs on March 1, the exposure to claim is equal to 1 year, but the exposure to death and lapse is equal to only 2 months.

The necessity for this seemingly counterintuitive step is made clear by a simple example. Consider two lives, both with policies effective January 1. Life A dies on January 2. Life B persists for 1 year to the end of the analysis period, December 31. Using the Balducci exposure method, the total exposure to mortality is equal to 2 years. There was only one decrement, resulting in a mortality rate of 50%. If Life A were only credited with 1 day of exposure, there would only be a total of 1.003 years of exposure, resulting in a mortality rate of nearly 100%. This is clearly at odds with the experience of the two lives. Thus, we have used the Balducci hypothesis assumptions concerning exposure determination in the construction of the population decrement tables.

B. Calculating Decrement Rates

Once the correct exposure base was calculated for each decrement, the calculation of the observed decrement rates was a straightforward process. We tabulated the exposures and the number of decrements for death, claims, and lapse by issue age (in single-year increments), duration (also in single-year increments), and sex. Table 2 presents summary rates for each decrement by attained age. Table 3 presents summary rates for each decrement by duration. Males and females are combined in both tables.

Table 2: Population Decrement Rates by Attained Age

	Claims			Mortality			Lapse		
Age Group	Exposure	Decrements	Rate	Exposure	Decrements	Rate	Exposure	Decrement	Rate
Under 50	104	65	0.06%	104	102	0.10%	105	2,551	2.42%
50 to 64	329	379	0.12%	329	918	0.28%	331	4,277	1.29%
65 to 79	280	1,442	0.52%	280	2,379	0.85%	280	2,246	0.80%
80 and over	31	991	3.18%	31	701	2.26%	31	291	0.94%
TOTAL	744	2,877	0.39%	745	4,100	0.55%	747	9,365	1.25%

Note: exposures are in thousands of person-years

Table 3: Population Decrement Rates by Duration

Policy	Claims			Mortality			Lapse		
Duration	Exposure	Decrements	Rate	Exposure	Decrements	Rate	Exposure	Decrements	Rate
Year 1	126	282	0.22%	126	423	0.33%	128	4,052	3.16%

Year 2	122	346	0.28%	122	515	0.42%	123	2,053	1.67%
Years 3–4	225	873	0.39%	226	1,289	0.57%	226	2,051	0.91%
Year 5+	270	1,376	0.51%	270	1,873	0.69%	270	1,209	0.45%
TOTAL	744	2,877	0.39%	745	4,100	0.55%	747	9,365	1.25%

Note: exposures are in thousands of person-years

C. Graduating Rates

Even with nearly 750,000 life-years of exposure, the observed decrement tables showed a considerable amount of variation from one attained age to the next. To make these tables more useful, we smoothed the rates using a graduation procedure. To do this, we used the two-dimensional Whittaker-Henderson (2DWH) graduation model, as described by McKay and Wilkin (1977). McKay and Wilkin built upon an earlier model by T. N. E. Greville described in a Study Note written for the Society of Actuaries that performed one-dimensional graduation. The 2DWH model permits flexibility by using horizontal and vertical smoothing coefficients to determine the degree to which values are smoothed. A major advantage of the WH graduation is that when the graduated rates are multiplied by the exposures, regardless of the smoothing coefficients that are used, the resulting "graduated" decrements possess two properties: (1) the total graduated decrements equals the total observed decrements, and (2) the average "row" (usually age) of the graduated decrements is equal to the average row of the observed decrements. In a 2DWH graduation, the average "column" (usually duration) of the graduated decrements is equal to the average column of the observed decrements.

A disadvantage of the 2DWH graduation model is that negative rates can arise. With the relatively low annual rates of decrement, negative rates did occur for the claims and mortality tables at the lower issue ages and higher durations, where exposure-years were very few. There were no negative numbers for the lapse tables, so no adjustment was necessary for the graduated lapse tables. To prevent the negative numbers, we forced the rates to remain positive by limiting the age-to-age multiplicative differences between the rates. Thus, for any age the final graduated rate was constrained to be no less than 75% of the rate for the next highest age at the same duration or the next lower duration at the same issue age.

The observed rates for claims, mortality, and lapse are shown in detail in Appendix A, while the corresponding graduated rates are shown in Appendix B. The

smoothing coefficients used for the graduation were 500,000 for vertical (age) smoothing and 1,000 for horizontal (durational) smoothing. These coefficients compare with an average exposure for males of 701 life-years and for females of 1,020. Exposures in the heart of the table for males typically varied between 1,000 and 2,000 life-years of exposure, while for females they varied between 1,500 and 2,600. The tables are labeled with three letters. The first letter is a C, M, or L; representing claim, mortality, or lapse. The second letter is an M or F, representing male or female. Finally, the third letter is an O or G, representing observed or graduated.

The row at the top of each table labeled "Subtotal" (for claims, deaths, or lapses) is to give an indication of how the rates vary by duration. The rate at each duration for attained ages 35 through 88 was multiplied by the total exposure for all durations for the corresponding attained age. The sum of the resulting multiplications is the number shown in the subtotal row. The row is labeled as a subtotal, because, for each duration, there are rates either below age 35 and/or above age 88 that are not used in the calculation. Thus, the rates at each duration were multiplied by the exact same total exposure. By comparing the numbers at different durations, the general level of the aggregate rates at each duration can be compared. For example, the number at durations 1 and 2 for female observed claims is 1,514 and 1,768, respectively. This indicates that the claims rates at duration 1 are 86% (= 1514/1768) of the rates at duration 2.

Figures 1 and 2 demonstrate the difference between the smoothed and graduated mortality rates. The smoothed rates permit a much more intuitive interpretation of the age-to-age and duration-to-duration differences in mortality. In Figure 2, it is clear that beginning around the mid-40s mortality increases by attained age and that about 10 years later the impact of underwriting is manifested by the mortality variations across durations. The differences across durations become very large as attained age increases. The decrease in mortality at the highest ages could either be a function of the relatively low levels of exposures at that age range or an indication of the effectiveness of the underwriting at such extreme ages.

Figure 1
Unsmoothed Mortality Rates - Males

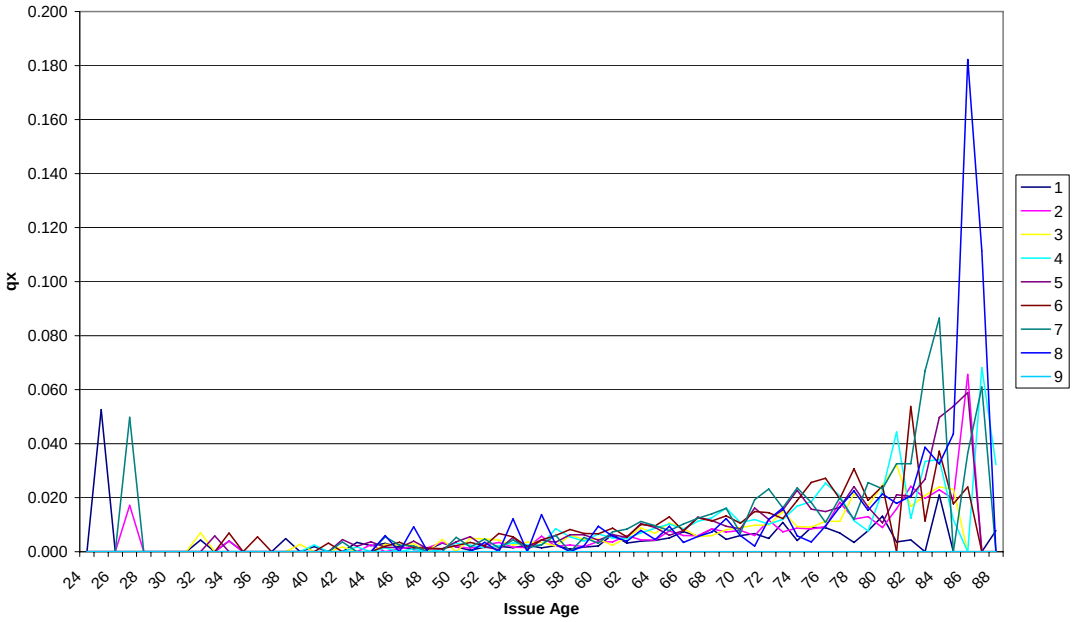
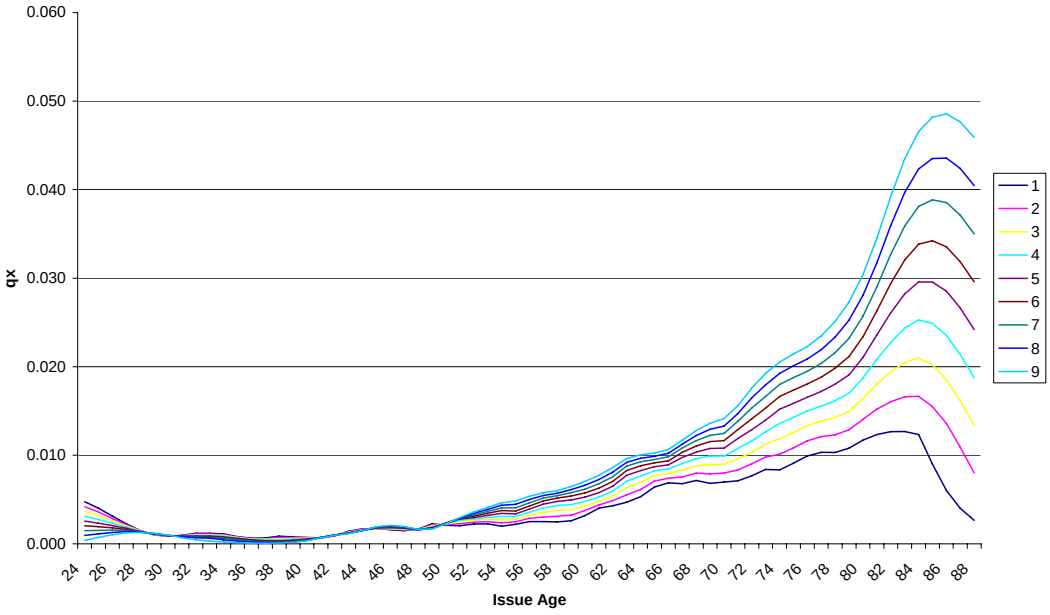


Figure 2
Smoothed Mortality Rates - Males



V. SELECTION OF SUBGROUPS

The purpose of this study is to analyze claims and mortality experience among insureds with certain conditions at time of underwriting and to compare the experience of these

individuals to that of the insured population as a whole. Table 4 shows the set of mental disorders and other conditions that were represented in the experience database. Diagnoses with less than 50 records are not displayed in this list as any analysis on this group would not likely be statistically significant. One exception to this selection rule is the 307 code series, which includes miscellaneous diagnoses such as eating disorders, stuttering, and sleep disorders. Studying these diagnoses as a group without knowing which particular type of diagnosis was present would not likely be a useful exercise. Neurotic depression (ICD-9 code 300.4) was also excluded from the analysis because of the large number of individuals with depressive disorder (311). Because the group with depressive disorder is so much larger, useful conclusions will come from this group.

In addition to mental conditions, a number of other diagnoses are also included in the analysis. These other conditions are breast cancer, prostate cancer, osteoporosis, hypertension, diabetes, arthritis, cerebrovascular disease, congestive heart failure, and coronary artery disease.

Table 4: Selected Conditions Represented in Underwriting Data

ICD-9 Codes	Diagnosis found at Underwriting	Number of Insured Lives
296.0–296.7	Affective psychoses	365
300.0	Anxiety states	3,189
300.3	Obsessive-compulsive disorders	89
302.0–302.9	Sexual deviations and disorders	95
303.0 and 303.9	Alcohol dependence	266
304.0–304.9	Drug dependence	94
308.0–308.4	Acute reaction to stress	263
311	Depressive disorder	8,737
174	Breast cancer	3,106
185	Prostate cancer	1,679
250.0, 250.4, 250.6	Diabetes	7,474
401.0–405.9	Hypertension	41,576
414, 414.0, 414.1	Coronary artery disease	4,994
428, 428.0, 428.1	Congestive heart failure	863
430.0–438.9	Cerebrovascular disease	2,510
711, 713, 714, 715, 716	Arthritis	28,064
733.0–733.9	Osteoporosis	5,182

In addition to the stratification by type of diagnoses, the underwriting data also contain severity (no problem, pending surgery, questionable, hospitalization required, or severe complications), stability (stable, fluctuating, unstable), recency (current, within

last 6 months, within last 12 months, within last 2 years, within last 3 years, within last 5 years, more than 5 years), and mobility restrictions (use of cane, quad-cane, walker, wheelchair, oxygen). We have used these data elements to subdivide each diagnosis into several risk categories.

A. Comparison of Subgroups to Population Rates

For each of the condition families just identified, we present both claims and mortality experience stratified by attained age, duration, and level of risk. The level of risk was determined on a condition-by-condition basis to divide the insureds into three, approximately similar, risk groups. For each level of detail in the tables, we have reported several data elements: the life-years exposed (calculated as described in the previous section), the actual number of decrements in the group, the expected number of decrements in the group, the ratio of actual to expected, the additional decrements per 1,000 life-years of exposure, and the associated p-value. The expected number of decrements for each group was calculated by applying the general population rate table (by issue age, duration, and sex) to the observed exposures for the subgroup. Thus, the expected number of decrements is based on the aggregate experience of the total insured population. Also, we used the observed rates (as opposed to the graduated rates) to calculate the expected number of decrements. Although we believe that the graduated rates are more useful in comparing the experience of this group to other groups, we believe that the observed rates are better for comparing the experience of subgroups to the aggregate group. The p-value indicates the level of significance of any difference between actual and expected. For instance, a p-value greater than 0.95 indicates that the subgroup experienced higher than expected claims with 95% confidence. Likewise, a p-value less than 0.05 would indicate that the subgroup experienced lower than expected claims with 95% confidence.

B. Mental Conditions

This section presents the results of analyses on various mental conditions.

1. Affective Psychoses

Affective psychoses are a family of conditions that include manic disorder, depressive disorder, bipolar disorder (or manic depression), and seasonal affective disorder. Bipolar disorder is the most common type of affective psychosis. Bipolar disorder is marked by frequent swings from a manic state to a depressed state. Symptoms of the manic state include irritability, poor judgment, reckless behavior, and hallucinations. Symptoms during the depressed state include prolonged sadness, lethargy, and thoughts of death or suicide. We used ICD-9 codes 296.0 through 296.7 to identify affective psychosis. Claims experience tabulations for affective psychoses are shown in Tables 5a through 5b. Mortality experience tabulations are in Tables 5c through 5d. Comments on any notable findings are also presented.

Table 5a: Claims Experience by Attained Age: Affective Psychoses

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	62	0	0.0	0%	-0.75	0.415
50 to 64	414	2	0.5	364%	3.51	0.975
65 to 79	504	7	2.7	257%	8.49	0.995
80 and over	55	2	1.5	135%	9.34	0.666
ALL AGES	1,035	11	4.8	229%	5.99	0.998

Although based on only 11 claims, the data show additional risk of LTC utilization for individuals with affective psychoses. While the under 50 and 80 and over age groups do not carry enough exposure to come to any conclusions about these ages, the overall picture is more conclusive: the presence of affective psychoses more than doubles the likelihood of eventual LTC utilization. This level may be acceptable as part of a substandard class.

It is interesting to note the results by duration. With the exposures fairly equally spread through the duration categories, there should be some statistical validity to these results. The results in years 2, 3, and 4 are highly significant and indicate a very elevated risk of LTC utilization. However, for durations 5 and over, the data show no additional risk. This may mean that the additional risk comes from those who have recently been diagnosed.

Table 5b: Claims Experience by Duration: Affective Psychoses

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	198	1	0.5	205%	2.59	0.769
Year 2	190	1	0.5	189%	2.48	0.742
Years 3–4	330	7	1.5	471%	16.69	1.000
Year 5+	317	2	2.3	87%	-0.94	0.422
ALL YEARS	1,035	11	4.8	229%	5.99	0.998

Disaggregating insureds with affective psychoses into risk groups proved to be difficult because almost all insureds were coded similarly. Specifically, 87% were coded with "severe complications," 89% were coded with the stability code "stable," and only 4% had a mobility limitation. The one code that showed a significant number of insured in several codes was recency, but this code revealed no pattern of risk level. The recency code with the greatest actual-to-expected ratio (about 600%) was "within 6 months," although the two surrounding the "within 6 months" ("current" and "within 12 months") both had significantly lower actual-to-expected ratios (0% and 166%, respectively). Almost half of the insured had a recency code of "5+ years," and their experience was nearly the same as that of all insureds with affective psychosis. In summary, there appears to be no good way to disaggregate the insureds with affective psychosis into risk classes with significantly different risk levels based on the types of information available at underwriting.

Table 5c: Mortality Experience by Attained Age: Affective Psychoses

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	62	0	0.1	0%	-0.98	0.403
50 to 64	412	1	1.2	86%	-0.41	0.438
65 to 79	508	9	4.6	197%	8.73	0.981
80 and over	56	2	1.6	129%	8.07	0.643
ALL AGES	1,038	12	7.3	163%	4.48	0.957

The overall mortality ratio of 163% is somewhat less than the Osby et al. (2001) result that individuals with affective psychoses have about double the risk of dying from natural causes. The p-value of 0.957 indicates that there is a high level of certainty that the mortality rate for persons with affective psychosis is greater than the average insured.

Table 5d: Mortality Experience by Duration: Affective Psychoses

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	200	4	0.8	494%	15.99	1.000
Year 2	190	0	1.0	0%	-5.08	0.162
Yeasr 3–4	331	4	2.4	167%	4.87	0.852
Year 5+	318	4	3.2	126%	2.56	0.677
ALL YEARS	1,038	12	7.3	163%	4.48	0.957

It is interesting to note that while the claims risk was less elevated during the period immediately following underwriting and acceptance, the highest level of excess mortality is in the first year of coverage. This may be due to random fluctuation or to the emphasis of avoiding LTC claims through underwriting as opposed to the avoidance of individuals likely to die.

2. Anxiety States

Anxiety states in this context refer to both panic disorder and generalized anxiety disorder. Panic disorder is characterized by acute episodes of intense fear with physical symptoms often resembling a heart attack. It is most common in women and in individuals under the age of 24. Panic disorder is also highly correlated with the presence of other mental conditions such as depression and substance abuse. Generalized anxiety disorder is more of a constant condition marked by extreme worrying and tension. Physical symptoms such as fatigue, headache, and nausea can also result. Claims experience tabulations for individuals with anxiety states are shown in Tables 6a through 6c. Mortality experience tabulations are in Tables 6d through 6f.

Table 6a: Claims Experience by Attained Age: Anxiety States

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	389	0	0.3	0%	-0.67	0.305
50 to 64	2,465	2	3.1	64%	-0.47	0.259
65 to 79	7,331	60	44.7	134%	2.08	0.989
80 and over	913	45	31.4	143%	14.86	0.993
ALL AGES	11,097	107	79.6	134%	2.47	0.999

The size of the population (about 11,000 life-years of exposure) and overall claims ratio (134%) could provide excellent support for the inclusion of individuals with anxiety disorder in a substandard class. Their experience is not a great deal more risky than the general insured population and the result is highly statistically significant.

Table 6b: Claims Experience by Duration: Anxiety States

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	1,956	12	7.5	160%	2.30	0.950
Year 2	1,900	12	10.2	117%	0.93	0.710
Years 3–4	3,502	41	25.4	162%	4.47	0.999
Year 5+	3,739	42	36.5	115%	1.48	0.821
ALL YEARS	11,097	107	79.6	134%	2.47	0.999

The bulk of the insureds with an anxiety diagnosis were coded stable (80%) for stability and with “severe complications” (81%) for severity. Those who had a severity rating of “no problem” or “unknown” had the lowest claims experience, while there was little variation in the experience for the three stability codes. Those with a “current” or “unknown” diagnosis had the highest claims experience. After 6 months’ duration from diagnosis, there was no particular pattern for level of claims experience. We placed all those with a severity code of “no problem” or “unknown” in the low-risk group. The high-risk group included those with a recency code of “current” or “unknown” who were not placed in the low-risk group. The medium-risk group was everyone else. The low-

risk group represented 24% of the insureds with anxiety diagnoses, the medium-risk group represented 32%, and the high-risk group represented 44%.

Table 6c: Claims Experience by Risk Level: Anxiety States

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	467	3	2.6	115%	0.85	0.598
Medium	9,345	80	66.1	121%	1.49	0.957
High	1,286	24	10.9	221%	10.22	1.000
TOTAL	11,097	107	79.6	134%	2.47	0.999

The stratification of anxiety states into risk levels was a somewhat more useful exercise than for affective psychoses. Although most insureds were placed in the medium-risk category, we attempted to isolate insureds with characteristics that indicated a higher or lower risk. Those with a severity code of no specific problem seemed to have a risk level near the average, and their p-value of 0.598 indicates that their experience is not significantly different from the aggregate. Also, those with a current diagnosis do seem to be a significantly greater risk. The resulting medium group (with most of the insureds) does have a greater risk than average; the fact that the risk is only 121% of aggregate indicates that it may be a good category for issue under a substandard class.

Table 6d: Mortality Experience by Attained Age: Anxiety States

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	389	1	0.4	279%	1.65	0.859
50 to 64	2,464	2	7.0	29%	-2.03	0.029
65 to 79	7,340	70	60.1	116%	1.34	0.899
80 and over	898	16	18.2	88%	-2.44	0.302
ALL AGES	11,092	89	85.7	104%	0.30	0.640

Table 6e: Mortality Experience by Duration: Anxiety States

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			

Year 1	1,958	9	8.6	104%	0.19	0.549
Year 2	1,899	11	11.0	100%	0.01	0.502
Years 3–4	3,499	31	28.1	110%	0.82	0.707
Year 5+	3,736	38	37.9	100%	0.01	0.504
ALL YEARS	11,092	89	85.7	104%	0.30	0.640

Table 6f: Mortality Experience by Risk Level: Anxiety States

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	467	2	3.2	115%	-2.63	0.246
Medium	9,341	64	71.2	90%	-0.77	0.197
High	1,284	23	11.3	204%	9.12	0.964
TOTAL	11,092	89	85.7	104%	0.30	0.640

Unlike the claims results, elevated mortality rates were not detected for individuals with anxiety disorder, except for those in the high-risk group. This is to be expected as the physical manifestations of anxiety are relatively mild.

3. Obsessive-Compulsive Disorders

Obsessive-compulsive disorder is a condition that results in persistent unwanted thoughts and resulting ritualistic behavior. Sufferers may have unrealistic expectations with regard to sanitation or cleanliness. Without treatment, these obsessions can become crippling. About 3.3 million Americans have some degree of obsessive-compulsive disorder, which affects men and women equally. Claims experience tabulations for individuals with obsessive-compulsive disorder are shown in Tables 7a and 7b. Mortality experience tabulations are in Tables 7c and 7d.

Table 7a: Claims Experience by Attained Age: Obsessive-Compulsive Disorders

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	21	0	0.0	0%	-0.48	0.460
50 to 64	78	0	0.1	0%	-1.38	0.372
65 to 79	122	1	0.7	147%	2.61	0.651
80 and over	6	1	0.1	742%	148.71	0.991

ALL AGES	227	2	0.9	214%	4.71	0.866

Table 7b: Claims Experience by Duration: Obsessive-Compulsive Disorders

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	45	0	0.1	0%	-2.00	0.382
Year 2	44	0	0.1	0%	-2.61	0.367
Years 3–4	75	1	0.3	321%	9.13	0.892
Year 5+	62	1	0.4	241%	9.47	0.819
ALL YEARS	227	2	0.9	214%	4.71	0.866

The results show that there is an elevated risk of claim, because the actual-to-expected ratio is 214%. However, because there were only two claims based on 227 life-years of exposure, the results are not significant. The p-value is only 0.866. The exposure years are too few to observe a significant pattern by age or duration. These data probably do not represent enough evidence to support rate development for individuals with obsessive-compulsive disorder.

Nearly 90% of the obsessive-compulsive insureds were coded “stable,” and 87% were coded with “severe complications.” Also, both claims had been diagnosed within 2 years. The scarcity of data made it impossible to disaggregate the insured into risk categories in any meaningful way, so such an attempt was not made.

Table 7c: Mortality Experience by Attained Age: Obsessive-Compulsive Disorders

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	21	0	0.0	0%	-1.57	0.428
50 to 64	78	1	0.3	399%	9.57	0.933
65 to 79	123	2	1.0	197%	7.97	0.836
80 and over	5	0	0.1	0%	-21.42	0.365
ALL AGES	228	3	1.4	212%	6.93	0.909

Table 7d: Mortality Experience by Duration: Obsessive-Compulsive Disorders

Duration	Life-Years	Number of Deaths	Actual-to-Expected	Extra Deaths per	p-value

	Exposed	Actual	Expected	Ratio	1,000	
Year 1	45	0	0.2	0%	-3.75	0.340
Year 2	45	1	0.2	456%	17.35	0.953
Years 3–4	77	2	0.5	387%	19.30	0.981
Year 5+	61	0	0.5	0%	-8.37	0.236
ALL YEARS	228	3	1.4	212%	6.93	0.909

The mortality experience of persons diagnosed with obsessive-compulsive disorder is also greater than the aggregate experience, with slightly more credibility than the claims experience. However, the exposure is still too low to make conclusive observations.

4. Sexual Deviations

Sexual deviations, as grouped in the ICD-9 classification, include ego-dystonic homosexuality, zoophilia, pedophilia, transvestism, exhibitionism, trans-sexualism, disorders of psychosexual identity, and psychosexual dysfunction. These conditions clearly run the gamut from isolated behavioral tendencies to lifestyle-dominating dysfunctions. It is not clear whether these conditions are currently part of the LTC underwriting process. Claims experience tabulations for individuals with sexual deviations are shown in Tables 8a and 8b. Mortality experience tabulations are in Tables 8c and 8d.

Table 8a: Claims Experience by Attained Age: Sexual Deviations

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	0	0	0.0	0%	0.00	0.000
50 to 64	65	0	0.1	0%	-1.16	0.392
65 to 79	443	0	1.9	0%	-4.38	0.081
80 and over	57	0	1.3	0%	-23.35	0.122
ALL AGES	565	0	3.3	0%	-5.92	0.033

Table 8b: Claims Experience by Duration: Sexual Deviations

Duration	Life-Years	Number of Claims	Actual-to-Expected	Extra Claims per	p-value

	Exposed	Actual	Expected	Ratio	1,000	
Year 1	85	0	0.3	0%	-3.28	0.298
Year 2	84	0	0.4	0%	-4.29	0.274
Years 3–4	163	0	0.9	0%	-5.26	0.176
Year 5+	232	0	1.8	0%	-7.94	0.086
ALL YEARS	565	0	3.3	0%	-5.92	0.033

Surprisingly, there were no claims from insureds diagnosed with a sexual deviation, based on an exposure of 565 life-years. While the results are not significant at the 95% level for any particular age group or duration, they are significant in total. This supports the conclusion that such individuals do not possess any greater risk than the aggregate, and, in fact, appear to have a lower risk of going onto claim status.

Like the obsessive-compulsive group, the insureds with diagnoses of sexual deviation were too small of a group to disaggregate into risk categories. About 90% of the insured were coded as "stable," and about 90% were coded as having "severe complications."

Table 8c: Mortality Experience by Attained Age: Sexual Deviations

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	0	0	0.0	0%	0.00	0.000
50 to 64	65	0	0.3	0%	-4.76	0.288
65 to 79	447	10	5.2	191%	10.67	0.982
80 and over	57	1	1.5	65%	-9.34	0.331
ALL AGES	570	11	7.1	155%	6.89	0.931

Table 8d: Mortality Experience by Duration: Sexual Deviations

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	86	1	0.7	150%	3.91	0.659
Year 2	84	0	0.8	0%	-9.33	0.187
Years 3–4	164	3	2.0	147%	5.86	0.751
Year 5+	236	7	3.6	195%	14.44	0.965
ALL YEARS	570	11	7.1	155%	6.89	0.931

Although experiencing a lower risk of claim, individuals with sexual deviations have demonstrated significantly greater risk of death than the general insured population. The results, however, are just short of being significant at the 95% confidence level. The increased mortality risk actually strengthens the case that such individuals may be good LTC risks.

5. Alcohol Dependence

Alcohol dependence is somewhat self-explanatory. This includes any individuals who had a diagnosis of alcohol dependence that was discovered through the underwriting process. Claims experience tabulations for individuals with alcohol dependence are shown in Tables 9a and 9b. Mortality experience tabulations are in Tables 9c and 9d.

The results show a 34% greater LTC claims experience for insured that have a dependence on alcohol. However, the p-value of only 0.781 indicates that this group does not show experience that is different from the aggregate experience at a statistically significant level. Just as the total results are not statistically significant, the results for specific age groups or durations also are not statistically significant.

Table 9a: Claims Experience by Attained Age: Alcohol Dependence

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	38	0	0.0	0%	-0.48	0.446
50 to 64	187	0	0.2	0%	-1.25	0.314
65 to 79	726	7	3.7	188%	4.51	0.955
80 and over	58	0	1.3	0%	-21.48	0.129
ALL AGES	1,009	7	5.2	134%	1.75	0.781

Table 9b: Claims Experience by Duration: Alcohol Dependence

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	171	1	0.4	227%	3.28	0.801
Year 2	166	1	0.6	170%	2.50	0.705
Years 3–4	304	3	1.5	199%	4.90	0.888
Year 5+	369	2	2.7	74%	-1.89	0.335
ALL	1,009	7	5.2	134%	1.75	0.781

YEARS						

Because there were only seven claims for this group, it was not feasible to disaggregate the results into meaningful risk categories. For insureds with a history of alcohol dependence, 92% were coded as having "severe complications," and 93% were considered "stable." There was no discernable pattern of risk by recency of diagnosis.

Table 9c: Mortality Experience by Attained Age: Alcohol Dependence

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	38	0	0.0	0%	-1.24	0.414
50 to 64	189	3	0.7	445%	12.33	0.998
65 to 79	728	12	7.2	168%	6.65	0.965
80 and over	59	4	1.4	279%	43.61	0.985
ALL AGES	1,014	19	9.3	204%	9.55	0.999

Table 9d: Mortality Experience by Duration: Alcohol Dependence

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	171	1	1.0	100%	-0.02	0.499
Year 2	166	3	1.1	271%	11.42	0.964
Years 3–4	306	7	2.9	239%	13.31	0.992
Year 5+	371	8	4.3	187%	10.02	0.965
ALL YEARS	1,014	19	9.3	204%	9.55	0.999

Mortality experience among those with a history of alcohol dependence produced a much clearer picture than claims experience. Consistent with several studies, these individuals have about double the mortality rates of the general population. For all age groups and durations with significant exposure, there appears to be an increased risk of death. The significantly increased risk of death coupled with a modest increased risk of claim may indicate that this group could be accepted as a standard risk.

6. Drug Dependence

This is a subset of individuals with a history of drug dependence. Such dependence could have been either illegal drugs or over-the-counter medications. Claims experience tabulations for individuals with a history of drug dependence are shown in Tables 10a and 10b. Mortality experience tabulations are in Tables 10c and 10d.

Table 10a: Claims Experience by Attained Age: Drug Dependence

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	22	0	0.0	0%	-0.27	0.470
50 to 64	89	0	0.1	0%	-1.25	0.369
65 to 79	172	5	0.8	637%	24.47	1.000
80 and over	9	1	0.2	533%	92.02	0.971
ALL AGES	292	6	1.1	550%	16.83	1.000

Table 10b: Claims Experience by Duration: Drug Dependence

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	56	1	0.1	1027%	16.12	0.998
Year 2	53	2	0.1	1345%	34.82	1.000
Years 3–4	94	3	0.3	865%	28.34	1.000
Year 5+	89	0	0.5	0%	-5.60	0.240
ALL YEARS	292	6	1.1	550%	16.83	1.000

While not a large sample, the experience of this group is more than 5 times greater in terms of claims risk than the aggregate experience. The difference in claims experience is great enough that it results in a p-value of 1.000, indicating that the claims experience of this group is greater than the average with near certainty. The individual attained age and duration cells are too small for any conclusions to be drawn about whether the pattern of increased risk varies across ages or durations.

Again, we were not able to split the insureds with a history of drug dependence into meaningful risk classifications. Recency and severity data were missing for more than 80% of these diagnoses. Regardless, it appears clear from Tables 10a and 10b that all of the insureds with a history of drug dependence ought to be considered high risk.

Table 10c: Mortality Experience by Attained Age: Drug Dependence

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	22	0	0.0	0%	-0.83	0.447
50 to 64	92	4	0.3	1254%	40.07	1.000
65 to 79	173	4	1.5	259%	14.24	0.976
80 and over	8	0	0.1	0%	-17.34	0.351
ALL AGES	294	8	2.0	395%	20.31	1.000

Table 10d: Mortality Experience by Duration: Drug Dependence

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	56	0	0.2	0%	-4.38	0.310
Year 2	55	3	0.3	1032%	49.29	1.000
Years 3–4	93	1	0.7	141%	3.10	0.635
Year 5+	90	4	0.8	514%	35.76	1.000
ALL YEARS	294	8	2.0	395%	20.31	1.000

As with the claims risk, there is a significantly greater risk of death for insureds diagnosed with drug dependence. The increased risk appears at all ages and durations with significant exposure.

7. Acute Reaction to Stress

Acute reactions to stress include conditions such as post-traumatic stress disorder, catastrophic stress, and combat fatigue. These conditions can be marked by physical and psychological symptoms stemming from a stressful event or situation. While it is unknown whether current underwriting practice is wary of individuals with such conditions, the data from this sample do shed some light on the claims experience of these individuals. Claims experience tabulations for individuals with acute stress reactions are shown in Tables 11a and 11b. Mortality experience tabulations are in Tables 11c and 11d.

Table 11a: Claims Experience by Attained Age: Acute Reaction to Stress

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	65	0	0.1	0%	-0.82	0.408
50 to 64	391	0	0.5	0%	-1.27	0.241
65 to 79	642	2	3.6	55%	-2.53	0.196
80 and over	64	2	2.3	85%	-5.32	0.410
ALL AGES	1,163	4	6.5	61%	-2.17	0.161

Table 11b: Claims Experience by Duration: Acute Reaction to Stress

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	200	2	0.6	327%	6.93	0.962
Year 2	194	1	0.7	145%	1.61	0.646
Years 3–4	375	0	2.0	0%	-5.22	0.080
Year 5+	394	1	3.3	31%	-5.74	0.104
ALL YEARS	1,163	4	6.5	61%	-2.17	0.161

Overall, these individuals appear to exhibit a lower LTC risk than the general insured population, and there appears to be no reason they cannot be insured as standard. In fact, as a whole, they experienced only 61% of the expected claims levels. While sample sizes are small, it is interesting to note that the worst experience actually occurred during the first year. It is possible that the additional time passed since the traumatic event lessens the symptomatic expressions of the stress reactions. The experience was lower than the aggregate in all age groups.

Because there were only four claims for this group, it was not possible to disaggregate the experience into risk categories. About 78% of the insureds were coded as having “severe complications” (and all 4 claims came from this group), and about 14% were coded as having “questionable” severity. About 81% of insured were coded as having a “stable” condition (and all four claims came from this group), and about 18% had stability coded as fluctuating. There did appear to be a pattern of claims coming

from cases where diagnosis was recent. There were no claims from insureds where the diagnosis was more than 3 years ago.

Table 11c: Mortality Experience by Attained Age: Acute Reaction to Stress

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	65	0	0.1	0%	-0.86	0.406
50 to 64	392	1	1.2	85%	-0.46	0.434
65 to 79	643	3	5.1	59%	-3.26	0.175
80 and over	64	1	1.3	79%	-4.27	0.404
ALL AGES	1,164	5	7.6	66%	-2.24	0.172

Table 11d: Mortality Experience by Duration: Acute Reaction to Stress

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	200	1	0.7	135%	1.29	0.618
Year 2	193	0	0.9	0%	-4.77	0.168
Years 3–4	376	1	2.5	40%	-4.04	0.169
Year 5+	396	3	3.4	88%	-1.08	0.409
ALL YEARS	1,164	5	7.6	66%	-2.24	0.172

The mortality experience of those with acute reaction to stress is similar to their claims experience. Overall, mortality rates were only 66% of the aggregate experience, although not at the 95th percentile confidence interval.

8. Depressive Disorder

Depressive disorder is one of the most important conditions monitored by LTC underwriters. Recent research has focused on the link between depression and eventual dementia, a leading impetus for nursing home admission (Holland, 2004). Claims experience tabulations for individuals with major depressive disorder are shown in Tables 12a through 12c. Mortality experience tabulations are in Tables 12d through 12f.

Table 12a: Claims Experience by Attained Age: Depressive Disorder

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	1,471	2	1.0	208%	0.71	0.855
50 to 64	8,537	17	10.6	160%	0.75	0.975
65 to 79	15,407	157	89.4	176%	4.39	1.000
80 and over	1,903	86	60.5	142%	13.42	1.000
ALL AGES	27,318	262	161.4	162%	3.68	1.000

The overall result that LTC claims are about 62% higher for individuals with a history of depression is backed by a sample large enough to provide credibility. The additional risk appears to generally decrease with age and increase by duration, although those diagnosed more than 5 years before underwriting had experience near the average for all those with depressive disorder. While clearly higher than average risks, the additional risk is moderate. Thus, this group could potentially be placed in a substandard risk class.

Table 12b: Claims Experience by Duration: Depressive Disorder

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	4,986	20	15.9	126%	0.83	0.851
Year 2	4,822	33	19.8	167%	2.74	0.999
Years 3–4	8,529	93	50.5	184%	4.98	1.000
Year 5+	8,981	116	75.3	154%	4.54	1.000
ALL YEARS	27,318	262	161.4	162%	3.68	1.000

The high number of insured with a depressive disorder allowed us to disaggregate the insureds into risk categories. Individuals with a depression diagnosis that was “no problem” or greater than 3 years prior to the date of underwriting were considered low risk. The “fluctuating stability” and “unstable” individuals, as well as those with diagnoses in the previous 12 months were high risk. The low-risk category represented

24% of the insureds with depressive disorder, the medium-risk category 50%, and the high-risk category 26%.

Table 12c: Claims Experience by Risk Level: Depressive Disorder

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	6,151	41	31.5	130%	1.55	0.956
Medium	12,849	108	74.2	145%	2.63	1.000
High	8,318	113	62.5	181%	6.07	1.000
TOTAL	27,318	262	168.3	156%	3.43	1.000

The stratification by risk classification for individuals with depressive disorder demonstrates some potential for selective underwriting within this group. As recency was the primary classification mechanism, this suggests that setting underwriting criteria to select only individuals whose diagnoses of depression had passed a certain time threshold could be a means of controlling risk in this population.

Table 12d: Mortality Experience by Attained Age: Depressive Disorder

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	1,471	3	1.4	218%	1.10	0.917
50 to 64	8,540	22	23.1	95%	-0.13	0.406
65 to 79	15,394	140	124.8	112%	0.99	0.914
80 and over	1,884	39	39.7	98%	-0.37	0.455
ALL AGES	27,288	204	189.0	108%	0.55	0.863

Table 12e: Mortality Experience by Duration: Depressive Disorder

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	4,988	20	19.3	104%	0.14	0.562
Year 2	4,814	25	24.6	101%	0.07	0.529
Years 3–4	8,516	69	61.3	112%	0.90	0.837
Year 5+	8,971	90	83.7	108%	0.70	0.756
ALL YEARS	27,288	204	189.0	108%	0.55	0.863

Table 12f: Mortality Experience by Risk Level: Depressive Disorder

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	6,144	31	40.1	77%	-1.49	0.074
Medium	12,846	97	86.6	112%	0.81	0.870
High	8,298	76	62.6	121%	1.62	0.956
TOTAL	27,288	204	189.3	108%	0.54	0.858

Although the claims experience for persons with a depressive disorder is somewhat greater than that of the aggregate insureds, the mortality risk appears to be close to the same, with no discernable pattern by age or duration.

C. Hypertension

An estimated 50 million people in the United States have high blood pressure, or hypertension. This condition, if left untreated, can cause serious damage to arteries, the heart, and the kidneys and can lead to more serious conditions such as atherosclerosis and stroke. This section presents the results of the analysis focusing on insureds with hypertension. The ICD-9 diagnosis codes used to identify insureds with hypertension for this analysis are listed below, along with the number of cases with each ICD-9 code. Some cases had more than one code. Because nearly all cases were coded with code 402, we analyzed all codes together in one analysis.

- 401—Essential hypertension (1068)
- 402—Hypertension with heart involvement (40,454)
- 403—Hypertension with renal involvement (9)
- 404—Hypertension with cardiorenal disease (18)
- 405—Secondary hypertension (i.e., due to other causes) (27)

Claims experience tabulations for individuals with all forms of hypertension are shown in Tables 13a through 13c. Mortality experience tabulations are in Tables 13d

through 13f. Table 13g shows the results separately for each of the five ICD-9 codes for hypertension.

Table 13a: Claims Experience by Attained Age: Hypertension

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	1,888	0	1.2	0%	-0.62	0.140
50 to 64	31,921	39	42.2	92%	-0.10	0.313
65 to 79	100,367	673	584.4	115%	0.88	1.000
80 and over	15,239	543	499.2	109%	2.87	0.977
ALL AGES	149,415	1255	1127.0	111%	0.86	1.000

While the difference between the aggregate claim risk and that of those with hypertension is small (only 11%), the size of the group is so large that the measured difference is statistically significant. More than one out of five insureds was diagnosed with hypertension. There does not appear to be any strong pattern by age or duration, although some may surmise a slight increase in risk by duration.

Table 13b: Claims Experience by Duration: Hypertension

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	25,746	108	105.9	102%	0.08	0.582
Year 2	24,960	153	137.5	111%	0.62	0.908
Years 3–4	45,337	374	342.1	109%	0.70	0.958
Year 5+	53,371	620	541.5	114%	1.47	1.000
ALL YEARS	149,415	1255	1127.0	111%	0.86	1.000

Table 13c: Claims Experience by Risk Level: Hypertension

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	74,199	536	555.5	96%	-0.26	0.203
Medium	41,340	244	237.5	103%	0.16	0.664
High	36,232	500	353.0	142%	4.06	1.000
TOTAL	149,415	1,255	1,127.0	111%	0.86	1.000

Note: The sum of the risk classes adds to more than the total because some individuals are coded with more than one ICD-9 code, each one of which can appear as a separate case when disaggregating by risk class.

We attempted to divide the insureds by risk class. The stability codes and the severity codes provided little useful information on risk groups. About 85% of insureds were coded as having "severe complications," and about 95% were coded as "stable." In addition, both of these groups had the same experience as the total (about 111% of expected). Among the severity codes, the actual-to-expected ratio varies from 103% for those coded as having "no problem" to 130% for those coded as severity "unknown." Among the stability codes, those coded as having an "unstable" condition experienced an actual-to-expected ratio of 171% (but this was only 0.6% of the cases), and those coded as having a "fluctuating" condition experienced an actual-to-expected ratio of 109%. The concentration of most insureds into one of the stability and severity codes, along with the relatively small range of outcomes, led us to rule out these codes as useful for use in risk classification.

The other two codes available for risk classification are mobility and recency. About 3% of insured with hypertension were coded as having a mobility limitation at the time of underwriting. These individuals experienced a claims rate over double that of the aggregate experience, while the 97% of those with no mobility limitation experience an actual-to-expected ratio of 104% (much colder to average experience than the total group with hypertension). Experience by recency of diagnosis (at the time of underwriting) showed a U-shaped pattern, where claims rates were greatest for a diagnosis that was within the last 6 months, claims rates were lowest for diagnosis between 6 months and 5 years, with claims rates in the middle for those with a diagnosis more than 5 years before underwriting. Also, the 10% of insureds where the time since diagnosis was unknown had the highest actual-to-expected ratio (144%).

We believe that the more useful codes for disaggregating the insureds into risk classes are recency and mobility. We defined the low-risk class as those with no mobility limitation and whose diagnosis was 1 to 5 years ago. The medium-risk class consists of those with no mobility limitation and who were diagnosed more than 5 years ago. The high-risk class consists of those with a mobility limitation and who were diagnosed within the last 6 months (or time of diagnosis is unknown).

It is interesting to note that once those individuals with a mobility limitation or a recent diagnosis are separated from the group with hypertension, the remaining group has experiences very close to the aggregate experience. This suggests that a diagnosis of hypertension alone may not be sufficient to decline coverage.

Table 13d: Mortality Experience by Attained Age: Hypertension

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	1,888	2	2.3	87%	-0.16	0.420
50 to 64	31,957	116	105.2	110%	0.34	0.855
65 to 79	100,594	1108	907.3	122%	1.99	1.000
80 and over	15,167	372	342.5	109%	1.94	0.946
ALL AGES	149,606	1598	1357.3	118%	1.61	1.000

Table 13e: Mortality Experience by Duration: Hypertension

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	25,778	158	131.8	120%	1.01	0.989
Year 2	24,980	205	169.1	121%	1.44	0.997
Years 3–4	45,408	514	430.6	119%	1.84	1.000
Year 5+	53,440	721	625.8	115%	1.78	1.000
ALL YEARS	149,606	1598	1357.3	118%	1.61	1.000

Table 13f: Mortality Experience by Risk Level: Hypertension

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	56,268	634	548.0	116%	1.53	1.000
Medium	46,440	497	423.5	117%	1.58	1.000
High	49,283	496	413.9	120%	1.67	1.000
TOTAL	149,606	1,598	1,357.3	118%	1.61	1.000

The mortality experience by age indicates that insureds with hypertension were approximately 18% more likely to die than were those without hypertension and that the ratio of actual-to-expected deaths generally increased with age. There was little variation in the mortality experience by duration or by risk level.

Table 13g: Claims Experience by ICD-9 Code: Hypertension

ICD-9 Code	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
401	4,416	58	37.7	154%	4.60	1.000
402	148,656	1,247	1,121.4	111%	0.85	1.000
403	40	1	0.4	226%	14.03	0.801
404	77	2	0.7	285%	16.89	0.940
405	112	0	0.5	0%	-4.05	0.250
TOTAL	149,415	1,255	1,127.0	111%	0.86	1.000

D. Cerebrovascular Disease

Cerebrovascular disease is any disease affecting an artery within the brain or supplying blood to the brain. The most common cerebrovascular disease is atherosclerosis, where plaques (fatty deposits) form in blood vessels, leading to a narrowing of the arteries. Other forms of the disease involve a defect or weakness in a blood vessel in the brain, which can cause an aneurysm (ballooning of an artery). Cerebrovascular disease often leads to a thrombosis (blood clot forming in a cerebral artery) or an embolism (fragment of material, e.g., blood clot, piece of tissue, etc., traveling in the blood stream). A thrombosis or an embolism that completely blocks the blood supply to a part of the brain or a ruptured blood vessel resulting in bleeding within the brain causes a stroke. A stroke affects about 4 out of 1,000 people and is the third leading cause of death in most developed countries. The incidence of stroke rises dramatically with age, and about 5% of people over age 65 have had a stroke.

The ICD-9 diagnosis codes used to identify insureds with cerebrovascular disease at the time of underwriting for this analysis are listed here, along with the number of cases with each code.

- 430—Subarachnoid hemorrhage (17)
- 431—Intracerebral hemorrhage (24)
- 432—Other and unspecified intracranial hemorrhage (13)
- 433—Occlusion and stenosis of precerebral arteries (184)
- 434—Occlusion of cerebral arteries (1021)
- 435—Transient cerebral ischemia (1129)

- 436—Acute, but ill-defined, cerebrovascular disease (3)
- 437—Other and ill-defined cerebrovascular disease (119)
- 438—Late effects of cerebrovascular disease (0)

Claims experience tabulations for individuals with cerebrovascular disease are shown in Tables 14a through 14c. Mortality experience tabulations are in Tables 14d through 14f.

Table 14a: Claims Experience by Attained Age: Cerebrovascular Disease

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	43	0	0.0	0%	-0.75	0.429
50 to 64	869	3	1.2	260%	2.12	0.957
65 to 79	6,836	98	46.9	209%	7.47	1.000
80 and over	1,670	72	55.5	130%	9.88	0.988
ALL AGES	9,418	173	103.6	167%	7.37	1.000

These data show a 67% additional risk of LTC utilization for individuals with cerebrovascular disease with enough experience to conclude that an increased risk is virtually certain. The increased risk appears to decrease with age but does not display a clear pattern by duration. The increased level of risk may be acceptable as part of a substandard class.

Table 14b: Claims Experience by Duration: Cerebrovascular Disease

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	1,638	21	10.2	207%	6.61	1.000
Year 2	1,581	17	13.2	129%	2.40	0.853
Years 3–4	2,896	42	32.4	130%	3.32	0.955
Year 5+	3,303	93	47.8	194%	13.68	1.000
ALL YEARS	9,418	173	103.6	167%	7.37	1.000

Table 14c: Claims Experience by Risk Level: Cerebrovascular Disease

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	2,239	29	23.7	123%	2.38	0.865

Medium	4,703	72	51.7	139%	4.32	0.998
High	2,822	80	32.1	250%	16.99	1.000
TOTAL	9,418	173	103.6	167%	7.37	1.000

More than 96% of insureds with cerebrovascular disease were coded as being in a "stable" condition, and 88% were coded as having "severe complication." Another 8% were coded as having an unknown level of severity (and the experience for this group was significantly worse than the average of those with cerebrovascular disease). Thus, the severity codes and the stability codes were not very meaningful for disaggregating the insureds into risk classes. The trend by recency of diagnosis showed a somewhat elevated risk for a recent diagnosis (within the last year, and also for unknown time since diagnosis), with a slight downward trend as the time since diagnosis increased. Thus, we have chosen the recency codes along with mobility codes to create risk classes. The low-risk class includes those with no mobility limitation and with diagnosis more than 5 years before underwriting. The medium-risk class includes those with no mobility limitation and time of diagnosis between 1 and 5 years before underwriting. The high-risk class includes those with a mobility limitation or with a time of diagnosis of less than 1 year before underwriting or the time of diagnosis is unknown.

The results by risk class show that if the high-risk cases can be removed from the insured pool, the remaining cases have experience that is much closer to the aggregate, although the risk even for the low-risk class is still 23% greater than the aggregate. Some companies may be willing to insure this elevated risk, especially if they insure substandard risks.

Table 14d: Mortality Experience by Attained Age: Cerebrovascular Disease

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	43	0	0.0	0%	-1.02	0.417
50 to 64	871	7	3.1	229%	4.53	0.988
65 to 79	6,843	109	69.4	157%	5.78	1.000
80 and over	1,663	56	39.1	143%	10.16	0.997
ALL AGES	9,420	172	111.6	154%	6.41	1.000

The mortality experience indicates that insureds with cerebrovascular disease were approximately 54% more likely to die than were those without cerebrovascular disease, and that the additional risk tends to decrease by age.

Table 14e: Mortality Experience by Duration: Cerebrovascular Disease

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	1,638	16	10.9	146%	3.10	0.938
Year 2	1,578	17	14.5	118%	1.61	0.750
Years 3–4	2,906	57	36.4	157%	7.11	1.000
Year 5+	3,298	82	49.9	164%	9.74	1.000
ALL YEARS	9,420	172	111.6	154%	6.41	1.000

There is no clear pattern by duration of the additional mortality risk for those with cerebrovascular disease, although the pattern could be explained as exhibiting an increased risk by duration after the first policy year.

Table 14f: Mortality Experience by Risk Level: Cerebrovascular Disease

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	2,248	49	26.3	186%	10.09	1.000
Medium	4,708	77	55.4	139%	4.58	0.998
High	2,808	53	33.9	166%	6.81	1.000
TOTAL	9,420	172	111.6	154%	6.41	1.000

The classification of risks by expected LTC claims rates for those with cerebrovascular disease does not yield a corresponding result for the mortality risk. The lowest risk group actually had the highest mortality experience.

E. Congestive Heart Failure

Congestive heart failure (CHF) is a condition in which the heart is unable to adequately pump blood throughout the body and/or unable to prevent blood from backing up into the lungs. In most cases, heart failure is a process that occurs over time, when an underlying condition damages the heart or makes it work too hard, weakening the organ. Some of

the underlying conditions that increase the risk for heart failure include an abnormal heart rhythm, abnormal heart valves, alcoholism and drug abuse, coronary heart disease, diabetes, hypertension, damaged heart muscle, and low red blood cell count (severe anemia). According to the American Heart Association, nearly 5 million people experience heart failure, and 550,000 new cases are diagnosed each year. Heart failure becomes more prevalent with age, and about 5% of those aged 75 years and older have been affected by congestive heart failure. Approximately 10% of patients diagnosed with heart failure die within 1 year, and about 50% die within 5 years of diagnosis.

The ICD-9 diagnosis code used to identify insureds with congestive heart failure for this analysis was 428 (heart failure). Claims experience tabulations for individuals with congestive heart failure are shown in Tables 15a through 15c. Mortality experience tabulations are in Tables 15d through 15f.

Table 15a: Claims Experience by Attained Age: Congestive Heart Failure

Attained Age	Life Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	1	0	0.0	0%	-0.63	0.493
50 to 64	255	1	0.3	296%	2.59	0.873
65 to 79	2,409	37	16.9	219%	8.35	1.000
80 and over	769	46	29.3	157%	21.69	0.999
ALL AGES	3,434	84	46.5	180%	10.91	1.000

Table 15b: Claims Experience by Duration: Congestive Heart Failure

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	646	9	5.7	157%	5.07	0.915
Year 2	592	12	6.7	178%	8.88	0.979
Years 3–4	1,052	26	14.5	179%	10.94	0.999
Year 5+	1,143	37	19.6	189%	15.24	1.000
ALL YEARS	3,434	84	46.5	180%	10.91	1.000

These data show 80% increased risk of a LTC claim for individuals with CHF. The additional risk decreases significantly by age, and shows only a slight increase by

policy duration. The claim risk posed by individuals with CHF may be acceptable as part of a substandard class.

Table 15c: Claims Experience by Risk Level: Congestive Heart Failure

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	513	6	5.5	109%	0.94	0.582
Medium	655	18	8.6	210%	14.37	0.999
High	2,280	61	32.6	187%	12.45	1.000
TOTAL	3,434	84	46.5	180%	10.91	1.000

About 93% of insureds with CHF were coded as having a stable condition, and about the same number were coded has have a severity level of either "severe complications" or severity level unknown. There was no clear pattern of risk by time since diagnosis measured at underwriting. However, there was a slightly elevated risk for those with a recent diagnosis or where the time since diagnosis was unknown, and also when the time was more than 3 years. Consequently, there was a slightly reduced risk when the time since diagnosis was between 2 and 3 years before underwriting. We divided the insureds with CHF into risk categories as follows: Individuals who had no mobility limitations and who were diagnosed between 2 and 3 years before underwriting were placed in the low-risk category. Individuals who had no mobility limitation and were diagnosed more than 3 years ago were placed in the medium-risk category. Finally, those who had a mobility limitation or who were diagnosed with 2 years of underwriting (or where the time since diagnosis was unknown) were placed in the high-risk category.

The low-risk group exhibited claims experience only slightly above the aggregate experience; however, the experience of the medium-risk group was actually greater than that of the high-risk group. This may have been due to chance. The high-risk group included all insureds whose time of diagnosis was less than 2 years. This group included those whose recency of diagnosis was "current" (with an actual-to-expected ratio of 227%), "within 6 months" (with an actual-to-expected ratio of 51%), "within 12 months" (with an actual-to-expected ratio of 225%), and "within 2 years" (with an actual-to-expected ratio of 200%). It appears that the favorable experience of those with a recency

of diagnosis "within 6 months" (51%) pulled the average experience of all of those classified as high risk below that of those classified as medium risk. However, given the high claims rates experienced by those with recency surrounding the "within 6 months" (227% and 200%) category, it makes little sense to classify them as low risk.

Table 15d: Mortality Experience by Attained Age: Congestive Heart Failure

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	1	0	0.0	0%	-0.63	0.493
50 to 64	259	6	1.1	565%	19.07	1.000
65 to 79	2,444	104	25.6	407%	32.10	1.000
80 and over	769	44	18.8	234%	32.77	1.000
ALL AGES	3,472	154	45.4	339%	31.27	1.000

The mortality experience by age indicates that insureds with CHF were almost 3.4 times more likely to die than were those without CHF and that the ratio of actual-to-expected deaths decreased significantly by age. It also appears that the additional risk of mortality does decrease with duration since underwriting. The additional mortality risk of those with CHF is much more pronounced that the additional claims risk, which should reduce the overall risk of insuring persons with CHF for LTC insurance.

Table 15e: Mortality Experience by Duration: Congestive Heart Failure

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	656	22	4.9	452%	26.12	1.000
Year 2	601	23	6.4	360%	27.62	1.000
Years 3–4	1,061	53	14.7	361%	36.14	1.000
Year 5+	1,154	56	19.5	287%	31.63	1.000
ALL YEARS	3,472	154	45.4	339%	31.27	1.000

Table 15f: Mortality Experience by Risk Level: Congestive Heart Failure

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	528	31	6.4	486%	46.63	1.000
Medium	658	25	8.5	295%	25.12	1.000

High	2,299	98	30.8	319%	29.25	1.000
TOTAL	3,472	154	45.4	339%	31.27	1.000

F. Coronary Artery Disease

Coronary artery disease (CAD) occurs when the arteries that supply blood to the heart become hardened and narrowed. The condition occurs due to the accumulation of plaque on the inner walls or lining of the arteries (atherosclerosis). Blood flow to the heart is reduced, which reduces the oxygen supply for the heart muscle. When blood flow and oxygen supply to the heart are reduced or cut off, it can result in angina (chest pain or discomfort) or heart attack. Over time, CAD can weaken the heart muscle and contribute to heart failure or arrhythmias (changes in the normal rhythm of the heartbeats). The leading risk factors for CAD are age, family history, high cholesterol, hypertension, smoking, diabetes, obesity, and physical inactivity. Coronary artery disease is the most common type of heart disease and is the leading cause of death in both men and women in the United States. About 13 million people in the United States have CAD, and more than 500,000 people die from the disease each year.

The ICD-9 diagnosis code used to identify insureds with CAD for this analysis was 414 (other forms of chronic ischemic heart disease). Claims experience tabulations for individuals with CAD are shown in Tables 16a through 16c. Mortality experience tabulations are in Tables 16d through 16f.

Table 16a: Claims Experience by Attained Age: Coronary Artery Disease

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	14	0	0.0	0%	-0.29	0.475
50 to 64	1,732	2	2.2	91%	-0.12	0.445
65 to 79	15,866	136	99.3	137%	2.31	1.000
80 and over	3,367	124	104.6	119%	5.75	0.973
ALL AGES	20,979	262	206.2	127%	2.66	1.000

These data show that LTC claims are 27% higher for individuals with CAD than for the aggregate. This indicates that the group as a whole may be an acceptable level of

risk to some insurers (especially as part of a substandard class) or that a significant subgroup may be identified that would be acceptable as part of the standard class. There is no monotonic pattern of risk by age or by duration, although the risk appears to increase for about 5 years after underwriting and then to decline.

Table 16b: Claims Experience by Duration: Coronary Artery Disease

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	3,589	19	19.2	99%	-0.06	0.481
Year 2	3,443	31	25.2	123%	1.67	0.875
Years 3–4	6,309	87	60.8	143%	4.15	1.000
Year 5+	7,638	125	100.9	124%	3.15	0.992
ALL YEARS	20,979	262	206.2	127%	2.66	1.000

Table 16c: Claims Experience by Risk Level: Coronary Artery Disease

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	2,153	16	19.8	81%	-1.77	0.195
Medium	9,199	102	86.8	117%	1.65	0.949
High	9,671	144	99.7	144%	4.58	1.000
TOTAL	20,979	262	206.2	127%	2.66	1.000

The division into risk categories for CAD followed a pattern similar to other diagnoses. Again the codes of stability and severity were not very useful because more than 95% of insureds were coded as having a "stable" condition, and more than 95% were coded as having "severe complications." The pattern by recency of diagnosis appeared to be that risk increased as time since diagnosis increased. We placed individuals into the low-risk category if they had no mobility limitations and were diagnosed within 6 months of underwriting. Individuals who had no mobility limitations and who were diagnosed between 6 months and 3 years before underwriting were classified as medium risk. Those who had a mobility limitation, or who were diagnosed more than 3 years before underwriting, were classified as high risk.

The results by risk class are very encouraging for the potential to isolate a subgroup of those with CAD that has claims experience no worse than average. Because

CAD is a progressive disease, those who have a recent diagnosis and no mobility limitations had experience less than the aggregate. As time with CAD increases, so does the risk of claim.

Table 16d: Mortality Experience by Attained Age: Coronary Artery Disease

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	14	0	0.0	0%	-2.23	0.430
50 to 64	1,735	8	7.2	110%	0.44	0.611
65 to 79	15,941	267	175.7	152%	5.73	1.000
80 and over	3,361	102	85.2	120%	5.00	0.967
ALL AGES	21,051	377	268.1	141%	5.17	1.000

The mortality experience by age indicates that insureds with coronary artery disease were approximately 40% more likely to die than were those without coronary artery disease, and that the ratio of actual-to-expected deaths was highest for insureds ages 65 to 79. There was no clear pattern of risk level by duration or by claims risk level.

Table 16e: Mortality Experience by Duration: Coronary Artery Disease

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	3,601	41	26.3	156%	4.08	0.998
Year 2	3,448	46	34.2	134%	3.41	0.978
Years 3–4	6,333	119	84.0	142%	5.52	1.000
Year 5+	7,669	171	123.5	138%	6.19	1.000
ALL YEARS	21,051	377	268.1	141%	5.17	1.000

Table 16f: Mortality Experience by Risk Level: Coronary Artery Disease

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	2,166	40	27.1	148%	5.95	0.994
Medium	9,230	151	113.4	133%	4.07	1.000
High	9,699	186	128.1	145%	5.97	1.000
TOTAL	21,051	377	268.1	141%	5.17	1.000

G. Diabetes

Approximately 18 million people in the United States suffer from diabetes, which is caused either when a person's pancreas does not produce enough insulin or when a person's cells do not respond appropriately to the insulin that is produced, thereby leading to high blood sugars. Diabetes can lead to a multitude of problems, including heart disease, hypertension, kidney damage, nerve damage, and many other conditions. The ICD-9 diagnosis codes used to identify insureds with diabetes for this analysis were as follows:

- 250.0—Diabetes mellitus without mention of complication
- 250.4—Diabetes with renal manifestations
- 250.6—Diabetes with neurological manifestations

Claims experience tabulations for individuals with diabetes are shown in Tables 17a through 17c. Mortality experience tabulations are in Tables 17d through 17f.

Table 17a: Claims Experience by Attained Age: Diabetes

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	478	0	0.3	0%	-0.65	0.289
50 to 64	6,516	17	8.3	204%	1.33	0.999
65 to 79	17,271	182	94.2	193%	5.09	1.000
80 and over	1,993	89	56.6	157%	16.27	1.000
ALL AGES	26,258	288	159.4	181%	4.90	1.000

These data show an 81% additional risk of a LTC claim for individuals with diabetes. The additional risk appears to decrease with age, while the pattern by policy duration is somewhat reduced the year after underwriting and uniformly high thereafter. At all age groups and durations, the experience is significantly higher than the aggregate experience. However, the resulting level may be acceptable as part of a substandard class.

Table 17b: Claims Experience by Duration: Diabetes

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	4,621	21	15.3	137%	1.23	0.926

Year 2	4,469	37	19.7	188%	3.87	1.000
Years 3–4	8,055	90	49.3	182%	5.05	1.000
Year 5+	9,113	140	75.0	187%	7.13	1.000
ALL YEARS	26,258	288	159.4	181%	4.90	1.000

Table 17c: Claims Experience by Risk Level: Diabetes

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	14,728	131	85.7	153%	3.07	1.000
Medium	3,717	55	27.5	200%	7.40	1.000
High	7,943	104	46.7	223%	7.21	1.000
TOTAL	26,258	288	159.4	181%	4.90	1.000

The actual-to-expected ratio by "severity" code was as follows: code "questionable" (6% of total) had a ratio of 150%; code "severe complications" (87% of total) had a ratio of 180%; code "unknown" (5% of total) had a ratio of 191%; and code "no problem" (2% of total) had a ratio of 255%. It is interesting to note that those coded "no problem" had the worst experience. A result more in line with expectations was that those coded "questionable" had the best experience. The actual-to-expected ratio by "stability" codes was as follows: code "stable" (92% of total) had a ratio of 180%; code "fluctuating" (7% of the total) had a ratio of 199%.

The pattern of additional risk by recency code was U-shaped, with experience high (about 203%) for those diagnosed within 6 months of underwriting, low for those whose diagnosis was between 6 months and 5 years (about 160%), and then high again for those whose diagnosis was more than 5 years (about 205%).

We divided those with diabetes into risk categories in a manner similar to other diagnoses. Individuals who were diagnosed with diabetes between 6 months and 5 years prior (or where the time since diagnosis was unknown) and who had no mobility limitation were considered low risk. Individuals who were diagnosed with diabetes within 6 months of underwriting and who had no mobility limitation were considered medium risk. The remainder, those who were diagnosed more then 5 years before underwriting or who had a mobility limitation were assigned to the high-risk group.

The experience by risk group does exhibit an increasing pattern as the risk group increases; however, all risk groups show a significant additional risk (ranging from 55% for the low-risk group to 123% for the high-risk group).

Table 17d: Mortality Experience by Attained Age: Diabetes

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	478	0	0.6	0%	-1.19	0.225
50 to 64	6,529	41	22.7	181%	2.81	1.000
65 to 79	17,305	250	165.2	151%	4.90	1.000
80 and over	1,988	77	47.6	162%	14.78	1.000
ALL AGES	26,300	368	236.1	156%	5.01	1.000

The mortality experience of those with diabetes was significantly greater than the aggregate experience, although the additional mortality risk (56%) was not as great as the additional claims risk (81%). There was a slight downward trend in the risk with increasing age, whereas the trend was not clear by policy duration. The high-risk group for claims was also the high-risk group for mortality.

Table 17e: Mortality Experience by Duration: Diabetes

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	4,634	44	24.7	178%	4.17	1.000
Year 2	4,475	44	30.7	143%	2.98	0.992
Years 3–4	8,065	115	75.9	152%	4.85	1.000
Year 5+	9,127	165	104.9	157%	6.58	1.000
ALL YEARS	26,300	368	236.1	156%	5.01	1.000

Table 17f: Mortality Experience by Risk Level: Diabetes

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	14,754	192	128.9	149%	4.28	1.000
Medium	3,717	53	39.5	134%	3.62	0.984
High	7,943	104	46.7	223%	7.21	1.000

TOTAL	26,300	368	236.1	156%	5.01	1.000

H. Arthritis

Arthritis is a term that refers to a group of more than 100 diseases that involve joint inflammation. Inflammation of a joint usually causes pain, swelling, and sometimes difficulty moving. Inflammation that lasts for a long time or recurs can lead to tissue damage. As many as 70 million Americans suffer from arthritis. This section presents the results of the analysis focusing on insureds with arthritis. The following ICD-9 diagnosis codes were used to identify insureds with arthritis for this analysis:

- 711—Arthritis associated with infections
- 713—Arthritis associated with other disorders classified elsewhere
- 714—Rheumatoid arthritis and other inflammatory polyarthropathies
- 715—Osteoarthritis and allied disorders
- 716—Other and unspecified arthritis

1. All Forms of Arthritis

This section summarizes the results of the analysis regarding insureds with all forms of arthritis (ICD-9 codes 711, 713–716). Claims experience tabulations for individuals with all forms of arthritis are shown in Tables 18a through 18c. Mortality experience tabulations are in Tables 18d through 18f.

Table 18a: Claims Experience by Attained Age: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	556	1	0.3	301%	1.20	0.877
50 to 64	14,008	26	19.5	133%	0.46	0.929
65 to 79	71,330	496	451.8	110%	0.62	0.982
80 and over	13,077	458	435.4	105%	1.73	0.864
ALL AGES	98,971	981	907.1	108%	0.75	0.993

Individuals with arthritis experienced a somewhat greater risk of claim (8%). Although this is only slightly greater than the aggregate experience, the size of the group

results in a p-value of 0.993, indicating that those with arthritis do indeed have an elevated risk of claim. The ratio of actual-to-expected claims decreases with age.

Table 18b: Claims Experience by Duration: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	16,654	79	83.9	94%	-0.29	0.296
Year 2	16,129	123	110.0	112%	0.81	0.893
Years 3–4	29,863	295	276.3	107%	0.63	0.871
Year 5+	36,325	484	436.9	111%	1.30	0.988
ALL YEARS	98,971	981	907.1	108%	0.75	0.993

The pattern observed in the durational experience is what would generally be expected. In the first year after acceptance, the insureds demonstrated somewhat lower than expected claims experience, after which the risk increases to a higher, but steady, level.

Table 18c: Claims Experience by Risk Level: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	43,792	339	376.8	90%	-0.58	0.025
Medium	45,218	388	383.9	101%	0.09	0.583
High	15,989	305	204.2	149%	6.31	1.000
TOTAL	98,971	981	907.1	108%	0.75	0.993

The distribution of insureds by severity code was interesting. About 70% were coded as having “severe complications” and another 17% had unknown “severity,” both of which experienced about a 10% increased risk of claim. The codes that experienced the greatest and least risk were “hospitalization required” (168% of expected) and “pending surgery” (63% of expected), respectively. However, each of these codes applied to less than 1% of the insureds. Curiously, those coded with “no problem” experienced claims 27% above expected (3 times the additional risk of those that had “severe complications”).

About 87% and 14% of insureds had stability codes of “stable” and “fluctuating,” respectively, and both experienced a claims rate 8% above expected. The 8% of insureds coded as “unstable” experienced a claim rate 48% above expected.

The pattern of risk by time of diagnosis before underwriting shows the greatest risk is for those with a current diagnosis, a somewhat reduced risk for those diagnosed between 6 months and 3 years, and then a moderate and steady risk for those diagnosed more than 3 years before underwriting.

The division into risk categories for all forms of arthritis followed a pattern similar to other diagnoses. Individuals who were diagnosed with arthritis between 6 months and 3 years before underwriting and had no mobility limitation were considered low risk. Those who were diagnosed more than 3 years before underwriting and had no mobility limitation were assigned to the medium-risk group. Individuals who were diagnosed within the previous 6 months and had a mobility limitation were considered high risk.

The results by risk class were very interesting. The low-risk group actually had claims experience 10% better than the aggregate, and the medium-risk group had experience that was essentially the same as the aggregate. All of the additional risk was concentrated in the high-risk group, which contained all insureds with a mobility limitation as well as those who were recently diagnosed. It appears that as long as individuals with arthritis are not restricted as to mobility, they would pose a normal risk of claim.

Table 18d: Mortality Experience by Attained Age: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	556	0	0.6	0%	-1.06	0.221
50 to 64	14,029	58	43.0	135%	1.07	0.989
65 to 79	71,423	669	622.0	108%	0.66	0.971
80 and over	13,001	290	290.0	100%	0.00	0.500
ALL AGES	99,009	1017	955.6	106%	0.62	0.977

The mortality experience of those with arthritis was slightly worse (by 6%) than the aggregate, and improved (relative to the aggregate) as age increased, so that by age 80, the mortality rate was the same as that of the aggregate. There was no clear pattern of the mortality experience relative to the aggregate by policy year duration.

Table 18e: Mortality Experience by Duration: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	16,668	91	88.0	103%	0.18	0.624
Year 2	16,139	138	116.8	118%	1.31	0.976
Years 3–4	29,868	309	301.6	102%	0.25	0.666
Year 5+	36,333	479	449.1	107%	0.82	0.922
ALL YEARS	99,009	1017	955.6	106%	0.62	0.977

Table 18f: Mortality Experience by Risk Level: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	43,847	438	418.7	105%	0.44	0.828
Medium	45,254	426	414.9	103%	0.25	0.708
High	15,940	204	178.9	114%	1.58	0.971
TOTAL	99,009	1017	955.6	106%	0.62	0.977

All three risk groups experience mortality rates above the aggregate experience, although only the experience of the high-risk group was above the aggregate experience with 95% confidence.

Table 18g: Claims Experience by ICD-9 Code: Arthritis—All Forms (ICD-9 Codes, 711, 713–716)

ICD-9 Code	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
711	15	0	0.4	0%	-27.88	0.257
713	34	0	0.4	0%	-12.21	0.258
714	4,161	42	28.9	146%	3.16	0.993
715	21,585	196	201.1	97%	-0.24	0.359

716	86,822	889	805.4	110%	0.96	0.998
TOTAL	98,971	981	907.1	108%	0.75	0.993

Table 18g shows the experience of those with arthritis by ICD-9 code. Those with code 715 (osteoarthritis) show the best experience, while those with code 714 (rheumatoid arthritis) show the worst experience. The experience of those with codes 714, 715, and 716 will be shown in more detail in the following sections.

2. Osteoarthritis

Osteoarthritis (ICD-9 code 715, sometimes referred to as osteoarthrosis) is the most common type of arthritis. It occurs when the cartilage covering the end of the bones gradually wears away. Without the protection of the cartilage, the bones begin to rub against each other, and the resulting friction leads to pain and swelling. Osteoarthritis can occur in any joint, but most often affects the hands and weight-bearing joints such as the knee, hip, and facet joints (in the spine). Osteoarthritis often occurs as the cartilage breaks down, or degenerates, with age. For this reason, osteoarthritis is sometimes called degenerative joint disease. Claims experience tabulations for individuals with all forms of arthritis are shown in Tables 19a through 19c. Mortality experience tabulations are in Tables 19d through 19f.

Table 19a: Claims Experience by Attained Age: Osteoarthritis (ICD-9 Code 715)

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	76	0	0.1	0%	-0.70	0.409
50 to 64	2,574	2	3.6	56%	-0.61	0.201
65 to 79	16,054	106	103.7	102%	0.15	0.591
80 and over	2,881	88	93.8	94%	-2.02	0.271
ALL AGES	21,585	196	201.1	97%	-0.24	0.359

The overall result that LTC claims are 3% lower for individuals with a history of osteoarthritis is backed by a sample large enough to provide credibility. The ratio of actual-to-expected claims was the lowest for ages 50 to 64 and highest for ages 65 to 79.

Table 19b: Claims Experience by Duration: Osteoarthritis (ICD-9 Code 715)

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	4,000	19	20.5	93%	-0.38	0.370
Year 2	3,860	23	26.6	87%	-0.92	0.244
Years 3–4	6,941	71	65.1	109%	0.85	0.770
Year 5+	6,784	83	89.0	93%	-0.88	0.262
ALL YEARS	21,585	196	201.1	97%	-0.24	0.359

The pattern observed in the durational experience is not monotonic. In the first 2 years after acceptance, the insureds demonstrated somewhat lower than expected claims experience. In years 3 and 4 expected claims experience is a bit higher than expected, and then decreases in the year 5 and beyond.

Table 19c: Claims Experience by Risk Level: Osteoarthritis (ICD-9 Code 715)

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	17,585	140	161.9	86%	-1.25	0.042
Medium	2,366	17	18.9	90%	-0.79	0.334
High	1,634	39	20.3	192%	11.42	1.000
TOTAL	21,585	196	201.	97%	-0.24	0.359

The experience by severity code showed that almost 80% of insureds were coded as having “severe complications” and that almost 15% had a severity level coded as “questionable.” The actual-to-expected ratio for these two groups was 97% and 110%, respectively.

The experience by stability code showed an actual-to-expected ratio of 96% for those coded as “stable” (about 80% of the total) and 103% for those coded as “fluctuating” (about 18% of the total). The less than 2% of insureds coded as having an “unstable” condition had a claims experience 91% greater than the aggregate.

There was a general U-shaped pattern of claims experience by time since diagnosis at time of underwriting. The actual-to-expected ratio was 90% for those with a current diagnosis, dropping to 62% for those diagnosed between 1 and 2 years before underwriting, increasing to 121% for those diagnosed more than 5 years before

underwriting. Those with an unknown time of diagnosis had the worst experience—56% above the aggregate.

The division into risk categories for osteoarthritis was based on stability of condition and mobility. Those with a stable condition and no mobility limitation were considered low risk. Those with a fluctuating condition and no mobility limitation were considered medium risk. Those with an unstable condition or with a mobility limitation were considered high risk.

It is interesting to note that all of the additional claims experience is concentrated in the high-risk group and that the experience of those in the low- and medium-risk groups was better than the aggregate. Because all insured with a mobility limitation were in the high-risk group, it appears that this is a key factor in classifying risk. Insureds with osteoarthritis who do not have a mobility limitation appear to be acceptable risks.

Table 19d: Mortality Experience by Attained Age: Osteoarthritis (ICD-9 Code 715)

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	76	0	0.1	0%	-1.28	0.377
50 to 64	2,577	10	8.0	126%	0.80	0.767
65 to 79	16,077	150	140.6	107%	0.58	0.786
80 and over	2,867	57	63.8	89%	-2.38	0.194
ALL AGES	21,597	217	212.5	102%	0.21	0.621

The mortality experience of those with osteoarthritis is only slightly greater than that of the aggregate. The experience decreases by age from 126% of expected for ages 50 to 64 to 89% of expected for ages 80 and over. The pattern by duration is not as clear, but it does appear to decrease somewhat by policy duration. There is also no clear pattern of the relative mortality experience by risk category

Table 19e: Mortality Experience by Duration: Osteoarthritis (ICD-9 Code 715)

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	4,005	24	21.9	110%	0.54	0.678
Year 2	3,865	32	28.7	112%	0.86	0.734
Years 3–4	6,938	75	72.3	104%	0.39	0.626

Year 5+	6,790	86	89.7	96%	-0.55	0.347
ALL YEARS	21,597	217	212.5	102%	0.21	0.621

Table 19f: Mortality Experience by Risk Level: Osteoarthritis (ICD-9 Code 715)

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	17,612	183	175.3	104%	0.44	0.722
Medium	2,363	17	19.9	86%	-1.21	0.259
High	1,622	17	17.4	98%	-0.24	0.463
TOTAL	21,597	217	212.5	102%	0.21	0.621

There appears to be very little difference in the mortality experience between the three risk groups for insureds with osteoarthritis. While all three groups have a somewhat high ratio of actual-to-expected deaths, the ratios fall in a narrow range.

3. Rheumatoid Arthritis

Rheumatoid arthritis (ICD-9 code 714) is a chronic disease that can affect joints in any part of the body. With rheumatoid arthritis, the immune system mistakenly causes the joint lining to swell. The inflammation then spreads to the surrounding tissues and can eventually damage cartilage and bone. Claims experience tabulations for individuals with rheumatoid arthritis are shown in Tables 20a through 20c. Mortality experience tabulations are in Tables 20d through 20f.

Table 20a: Claims Experience by Attained Age: Rheumatoid Arthritis (ICD-9 Code 714)

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	111	0	0.1	0%	-0.61	0.397
50 to 64	958	2	1.3	156%	0.75	0.736
65 to 79	2,767	27	16.9	160%	3.64	0.993
80 and over	325	13	10.6	123%	7.45	0.775
ALL AGES	4,161	42	28.9	146%	3.16	0.993

The overall result is that LTC claims are 46% higher for individuals with a history of rheumatoid arthritis than the aggregate experience. Because there is only one age

group with enough experience to be credible, it is difficult to determine a pattern by age, although the extra risk of claims appears to decrease with advancing age. While clearly higher than average risks, this group could potentially be placed in a substandard group.

Table 20b: Claims Experience by Duration: Rheumatoid Arthritis (ICD-9 Code 714)

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	721	4	2.9	140%	1.58	0.751
Year 2	694	11	3.8	292%	10.42	1.000
Years 3–4	1,269	13	9.0	144%	3.14	0.909
Year 5+	1,476	14	13.2	106%	0.53	0.585
ALL YEARS	4,161	42	28.9	146%	3.16	0.993

The ratio of actual-to-expected claims appears to peak in policy year 2 before falling in years 3 and 4 and falling to near normal risk in year 5 and beyond.

Table 20c: Claims Experience by Risk Level: Rheumatoid Arthritis (ICD-9 Code 714)

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	2,110	11	13.8	80%	-1.31	0.227
Medium	355	4	2.5	158%	4.14	0.802
High	1,695	27	12.6	215%	8.52	0.963
TOTAL	4,161	42	28.9	146%	3.16	0.993

The pattern of claims rates by severity code showed that 81% of insureds were coded as having “severe complication” with a 42% extra risk and that about 14% of insureds were coded as having a “questionable” condition with a 156% extra risk. There were no claims from the 4% coded as having “no problem.”

The pattern of claims rates by stability code showed that the 82% of insured coded as having a “stable” condition had a 42% extra risk and that the 16% of insured coded as having a “fluctuating” condition had a 67% additional risk.

The pattern of claims rates by time since diagnosis at underwriting showed a high rate when there was a “current” diagnosis, a somewhat lower rate when the diagnosis was

6 months to 5 years before underwriting, and a high rate again when the diagnosis was more than 5 years before underwriting.

The division into risk categories for rheumatoid arthritis followed a pattern similar to other diagnoses. Individuals who were diagnosed with rheumatoid arthritis between 6 months and 5 years prior to the date of underwriting and who had no mobility limitation were considered low risk. Individuals who were diagnosed with rheumatoid arthritis at the time of underwriting (or unknown time) and who had no mobility limitation were considered medium risk. The remainder (i.e., those who were diagnosed with rheumatoid arthritis more than 5 years ago or who had a mobility limitation) was assigned to the high-risk group.

The experience by risk class shows that the low-risk group experienced only 80% of the expected claims. This class had roughly half of the total experience of those with rheumatoid arthritis. This indicates that those with a diagnosis made less than 5 years ago (but not those with a current diagnosis) and who do not have a mobility limitation may be accepted as a standard risk because all of the additional claims are concentrated in those with mobility limitations and those who have had the condition for a long time.

Table 20d: Mortality Experience by Attained Age: Rheumatoid Arthritis (ICD-9 Code 714)

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	111	0	0.1	0%	-0.99	0.370
50 to 64	960	5	2.7	186%	2.41	0.922
65 to 79	2,773	41	21.6	190%	6.99	1.000
80 and over	326	13	7.1	183%	18.06	0.987
ALL AGES	4,170	59	31.5	187%	6.59	1.000

Table 20e: Mortality Experience by Duration: Rheumatoid Arthritis (ICD-9 Code 714)

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	723	5	3.0	168%	2.79	0.879
Year 2	694	11	4.1	269%	9.96	1.000
Years 3–4	1,268	13	10.0	130%	2.40	0.833
Year 5+	1,485	30	14.5	207%	10.45	1.000

ALL YEARS	4,170	59	31.5	187%	6.59	1.000

Table 20f: Mortality Experience by Risk Level: Rheumatoid Arthritis (ICD-9 Code 714)

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	2,113	21	15.9	132%	2.40	0.899
Medium	357	7	2.8	247%	11.66	0.993
High	1,700	31	12.8	243%	10.73	1.000
TOTAL	4,170	59	31.5	187%	6.59	1.000

The mortality of experience of those with rheumatoid arthritis was 87% greater than expected with no clear pattern by age group or policy duration. The mortality experience of the low-risk group, however, was significantly less than the other groups with this disease.

I. Osteoporosis

Osteoporosis is a progressive disease that causes bones to become thin and porous, significantly increasing your risk for vertebrae and hip fractures. Hip fractures often require hospitalization, and vertebral fractures can cause loss of height and severe back pain. Both may lead to permanent disability. In the United States, about 10 million people have osteoporosis and another 18 million have osteopenia, which is the stage of bone loss before osteoporosis. The ICD-9 diagnosis codes used to identify insureds with osteoporosis were 733 and 733.00. We looked for codes 733.01, 733.02, 733.03, and 733.09, but found none in the database. They were presumably coded simply as 733. The description of each of these codes is as follows:

- 733.00—Osteoporosis, unspecified
- 733.01—Senile osteoporosis
- 733.02—Ideopathic osteoporosis
- 733.03—Disuse osteoporosis
- 733.09—Other osteoporosis

Claims experience tabulations for individuals with osteoporosis are shown in Tables 21a through 21c. Mortality experience tabulations are in Tables 21d through 21f.

Table 21a: Claims Experience by Attained Age: Osteoporosis

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	76	0	0.1	0%	-0.66	0.411
50 to 64	2,196	7	3.3	212%	1.68	0.979
65 to 79	11,717	107	83.6	128%	1.99	0.995
80 and over	2,733	122	103.9	117%	6.61	0.965
ALL AGES	16,722	236	190.9	124%	2.69	0.999

Individuals with osteoporosis experienced 24% higher LTC claims than did insureds without osteoporosis. There was a clear pattern of decreasing additional risk as age increased. The pattern by policy year was not clear. It was the highest in the first policy year, lowest in the second year, and then leveled off at the overall rate of about 24% above the expected rate. While clearly higher than average risks, this group could potentially be placed in a substandard group.

Table 21b: Claims Experience by Duration: Osteoporosis

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	3,016	29	19.1	152%	3.30	0.989
Year 2	2,904	25	24.8	101%	0.05	0.512
Years 3–4	5,171	78	61.9	126%	3.11	0.980
Year 5+	5,632	104	85.1	122%	3.35	0.980
ALL YEARS	16,722	236	190.9	124%	2.69	0.999

Table 21c: Claims Experience by Risk Level: Osteoporosis

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	8,476	91	93.8	97%	-0.34	0.384
Medium	1,559	22	17.9	123%	2.63	0.835
High	6,750	123	79.5	155%	6.44	1.000
TOTAL	16,722	236	190.9	124%	2.69	0.999

The pattern of actual-to-expected ratios by severity code showed that the 20% of insureds coded as "unknown" severity experienced claims rates 43% above expected, the 74% of insureds coded as having "severe complications" experienced claims rates 22% above expected, and the 5% of insureds coded "questionable" experienced claims rates 13% below expected.

The pattern of actual-to-expected ration by stability code showed that the 94% of insureds coded as having a stable condition experienced claims rates 25% above expected, the 5% of insureds coded as having a "fluctuating" condition experienced claims rates 30% below expected, and the 1% of insureds coded as having an "unstable" condition experienced a claims rate 147% above expected.

The pattern of experienced by recency of diagnosis before underwriting showed that experience was highest (69% above expected) for those with a current diagnosis or with an unknown time since diagnosis (38% above expected). There was no clear pattern of relative experience by time since diagnosis for those diagnosed any time before underwriting.

The division into risk categories for osteoporosis followed a pattern similar to other diagnoses. Individuals who were diagnosed with osteoporosis between 6 months and 5 years prior to the date of underwriting and had no mobility limitations were considered low risk. Individuals who were diagnosed with osteoporosis more than 5 years ago and had no mobility limitations were considered medium risk. The remainder (i.e., those who were diagnosed within 6 months of underwriting or whose time of diagnosis was unknown or who had a mobility limitation) was assigned to the high-risk group.

The claims experience by risk group follows the expected pattern, with the low-risk group having the lowest actual-to-expected claims ratio and the high-risk group having the highest actual-to-expected claims ratio. This stratification demonstrates the potential for selective underwriting within this group. Those with a diagnosis less than 5 years prior (but more than 6 months prior) to underwriting who show no mobility limitation had experience that was actually slightly less than the aggregate experience. Those with a very recent diagnosis, or where the time of diagnosis is unknown, showed elevated risk levels. It may be that this is a sign of anti-selective behavior. When the

time diagnosis is more than 5 years before underwriting or when there already is a mobility limitation, then the risk level increases substantially. This may be the result of the progressive nature of the disease.

Table 21d: Mortality Experience by Attained Age: Osteoporosis

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	76	0	0.1	0%	-0.67	0.411
50 to 64	2,199	9	5.5	163%	1.57	0.930
65 to 79	11,711	90	84.7	106%	0.46	0.720
80 and over	2,697	45	52.4	86%	-2.74	0.151
ALL AGES	16,683	144	142.6	101%	0.08	0.546

Overall, those with osteoporosis experienced mortality rates that were near expected. However, the mortality rates were high at young ages and decreased with increasing age. There was no clear pattern of the relative mortality by policy duration.

Table 21e: Mortality Experience by Duration: Osteoporosis

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	3,008	12	13.4	90%	-0.45	0.355
Year 2	2,907	23	18.0	128%	1.71	0.880
Years 3–4	5,154	40	46.5	86%	-1.26	0.170
Year 5+	5,614	69	64.8	107%	0.75	0.701
ALL YEARS	16,683	144	142.6	101%	0.08	0.546

Table 21f: Mortality Experience by Risk Level: Osteoporosis

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	8,464	61	72.1	85%	-1.31	0.095
Medium	1,560	15	13.2	114%	1.17	0.694
High	6,750	123	79.5	155%	6.44	1.000
TOTAL	16,683	144	142.6	101%	0.08	0.546

The mortality experience by risk group follows the same pattern as the claims risk, with the low-risk group having the lowest ratio of actual deaths to expected deaths and the highest risk group having the highest.

J. Breast Cancer

Breast cancer is the most common cancer among American women. Over the past 50 years, the number of women diagnosed with the disease has increased each year. Today, approximately 1 in every 8 women will develop breast cancer in her lifetime. Breast cancer is the second-leading cause of cancer death in women after lung cancer—and it is the leading cause of cancer death among women ages 35 to 54. Claims experience tabulations for individuals with breast cancer are shown in Tables 22a through 22c. Mortality experience tabulations are in Tables 22d through 22f.

Table 22a: Claims Experience by Attained Age: Breast Cancer

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	127	0	0.1	0%	-0.74	0.380
50 to 64	2,435	3	3.4	87%	-0.18	0.407
65 to 79	7,963	63	53.7	117%	1.17	0.898
80 and over	1,211	51	45.4	112%	4.66	0.804
ALL AGES	11,736	117	102.6	114%	1.23	0.924

The overall result is that LTC claims are 14% higher than expected for individuals with breast cancer. Based on the size of group, this is not enough difference to say that the experience is different than the aggregate with 95% confidence. There does not appear to be any pattern in the relative claims rate by age. There is also no policy duration where experience is significantly different from expected with 95% confidence.

Table 22b: Claims Experience by Duration: Breast Cancer

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	2,031	6	9.5	63%	-1.74	0.126
Year 2	1,968	18	12.7	142%	2.71	0.933
Years 3–4	3,599	36	32.7	110%	0.92	0.720

Year 5+	4,139	57	47.7	119%	2.25	0.912
ALL YEARS	11,736	117	102.6	114%	1.23	0.924

Table 22c: Claims Experience by Risk Level: Breast Cancer

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
No mobility limitation	11,346	105	97.9	107%	0.63	0.765
With mobility limitation	390	12	4.7	255%	18.69	0.938
TOTAL	11,736	117	102.6	114%	1.23	0.924

It was difficult to determine any pattern by severity code, because 98% of the insureds with breast cancer were coded has having "severe complication." Of some note, however, is that a mere 0.5% of insureds were coded as "hospitalization required," and there were two claims from this group. Similarly, there was no discernable pattern by stability code because 98% of those in this group were coded as having a "stable" condition. Finally, there was no clear pattern of relative claims risk by recency of diagnosis at time of underwriting. Almost one-half of the cases were diagnosis more than 5 years before underwriting, and these cases had experience 17% above expected. The cases with diagnosis less than 5 years had no clear pattern.

Because none of the three codes for "severity," "stability," or "recency" was useful for disaggregating into risk classes, we created only two risk classes: one for those with a mobility limitation and one for those without a mobility limitation. The results show that about one-half of the extra claims come from the insureds with a mobility limitation, who had just over 3% of the exposure.

Table 22d: Mortality Experience by Attained Age: Breast Cancer

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	128	1	0.1	1150%	7.15	0.999
50 to 64	2,439	14	5.8	242%	3.37	1.000
65 to 79	7,971	80	53.0	151%	3.38	1.000

80 and over	1,197	27	21.1	128%	4.89	0.900
ALL AGES	11,734	122	80.1	152%	3.57	1.000

Unlike the claims experience of those with breast cancer (which was only slightly above expected), the mortality experience is higher than expected by 52%. The mortality experience is greater than the aggregate with near 100% certainty. The additional mortality risk shows a strong pattern of decreasing risk as age increases and as policy duration increases.

Table 22e: Mortality Experience by Duration: Breast Cancer

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	2,035	13	7.1	184%	2.91	0.987
Year 2	1,969	17	9.5	179%	3.80	0.993
Years 3–4	3,596	42	26.1	161%	4.42	0.999
Year 5+	4,134	50	37.4	134%	3.05	0.981
ALL YEARS	11,734	122	80.1	152%	3.57	1.000

Table 22f: Mortality Experience by Risk Level: Breast Cancer

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
No mobility limitation	11,348	117	76.9	152%	3.53	1.000
With mobility limitation	386	5	3.1	161%	4.88	0.858
TOTAL	11,734	122	80.1	152%	3.57	1.000

Also unlike the claims risk (which showed a significant increase in risk for those with a mobility limitation), there was no significant difference in the mortality experience based on mobility.

K. Prostate Cancer

Prostate cancer occurs when cells within the prostate grow uncontrollably, creating small tumors. Prostate cancer is the most common form of cancer and the second-leading cause of cancer deaths among men in the United States. Claims experience tabulations

for individuals with prostate cancer are shown in Tables 23a through 23c. Mortality experience tabulations are in Tables 23d through 23f.

Table 23a: Claims Experience by Attained Age: Prostate Cancer

Attained Age	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Under 50	3	0	0.0	0%	0.00	0.000
50 to 64	515	0	0.6	0%	-1.18	0.218
65 to 79	4,762	27	26.9	100%	0.02	0.506
80 and over	1,045	30	26.7	112%	3.13	0.739
ALL AGES	6,324	57	54.3	105%	0.43	0.645

Those with prostate cancer experienced a claims rate that was only 5% greater than expected. This result is too small of a difference to be statistically significant. There appears to be an increasing pattern of risk as age increases. The results by policy duration show an increased risk in the first policy year and in policy years 5 and greater, with reduced risk in policy durations for years 2 through 4.

Table 23b: Claims Experience by Duration: Prostate Cancer

Duration	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Year 1	1,092	10	5.4	184%	4.17	0.975
Year 2	1,053	5	6.7	74%	-1.65	0.251
Year 3-4	1,927	14	15.2	92%	-0.64	0.375
Year 5+	2,251	28	26.8	104%	0.51	0.589
ALL YEARS	6,324	57	54.3	105%	0.43	0.645

As with breast cancer, it was difficult to determine any pattern by severity code. About 95% of the insureds with prostate cancer were coded has having “severe complication.” Of the 1% of insureds that were coded as “hospitalization required,” there were two claims. Similarly, there was no discernable pattern by stability code because 95% of those in this group were coded as having a “stable” condition. Unlike the results for breast cancer, those with prostate cancer showed a significant pattern of increasing risk by time since diagnosis. The 22% of the insureds that were diagnosed more than 5

years before underwriting experienced a claims rate that was 49% greater than expected, while the 56% of insured that were diagnosed within 3 years of underwriting experienced a claims rate that was 22% less than expected. The 3% of insureds with a mobility limitation experienced an actual-to-expected ratio of 357%.

We created three risk classes for those with prostate cancer. The low-risk group was comprised of those with no mobility limitation and who were diagnosed within 3 years of underwriting. The medium-risk group was comprised of those who were diagnosed between 3 and 5 years of underwriting and who had no mobility limitation. Finally, the high-risk group consisted of those who either had a mobility limitation or who were diagnosed more than 5 years before underwriting.

Table 23c: Claims Experience by Risk Level: Prostate Cancer

Risk Level	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Low	3,437	19	26.0	73%	-2.04	0.083
Medium	1,435	14	12.3	114%	1.19	0.688
High	1,452	24	16.0	150%	5.54	0.979
TOTAL	6,324	57	54.3	105%	0.43	0.645

The division into risk categories for prostate cancer resulted in groups with very different experience. The high-risk group had experience that was twice that of the low-risk group (and 50% greater than the aggregate experience). This indicates that those with a recent diagnosis and no mobility limitation are good claims risks.

Table 23d: Mortality Experience by Attained Age: Prostate Cancer

Attained Age	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Under 50	3	0	0.0	0%	-3.31	0.463
50 to 64	518	5	2.5	199%	4.81	0.942
65 to 79	4,780	67	60.0	112%	1.47	0.819
80 and over	1,046	30	31.1	97%	-1.04	0.422
ALL AGES	6,346	102	93.6	109%	1.33	0.809

The mortality experience of those with prostate cancer was only 9% greater than expected. The mortality experience exhibited a clear pattern of decreasing risk with increasing age and a generally decreasing pattern with increasing policy duration.

Table 23e: Mortality Experience by Duration: Prostate Cancer

Duration	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Year 1	1,093	13	9.4	139%	3.32	0.883
Year 2	1,056	14	12.7	110%	1.26	0.646
Years 3–4	1,939	34	29.5	115%	2.32	0.798
Year 5+	2,257	41	42.0	98%	-0.46	0.435
ALL YEARS	6,346	102	93.6	109%	1.33	0.809

Table 23f: Mortality Experience by Risk Level: Prostate Cancer

Risk Level	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Low	3,450	50	48.3	103%	0.48	0.595
Medium	1,438	22	21.5	102%	0.36	0.544
High	1,457	30	23.8	126%	4.29	0.902
TOTAL	6,346	102	93.6	109%	1.33	0.809

The mortality experience by risk group showed that nearly all of the additional mortality risk was in the high-risk group, while the mortality experience of the low- and medium-risk groups was near expected.

VI. SUMMARY

Table 24a summarizes the claims experience for each condition analyzed in this study. The results are shown for all insureds with the particular condition (i.e., including all ages, durations, and risk categories). We have added two rows to show the experience of all insureds that have no ICD-9 code and all insureds that have any ICD-9 code. Surprisingly, there is very little difference between the two compared with the expected. Although nearly equal in life-years of exposure, those with an ICD-9 code had an expected number of claims that was over 4 times that of insureds with no ICD-9. This was because the average age of those with an ICD-9 code was much greater than those

without a code. The conditions have been arranged in order of their actual-to-expected ratios, from highest to lowest. Breaks are shown at percentages of 110, 125, 150, and 200.

Table 24a: Summary of Claims Experience

Condition at Underwriting	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Aggregate (all insureds)	743,879	2,877	2,877	100%	0.00	.500
No ICD-9 code	390,404	503	509.8	99%	-0.02	.381
Any ICD-9 code	353,475	2,374	2,367.2	100%	0.02	.556
Drug dependence	292	6	1.1	550%	16.83	1.000
Affective psychoses	1,035	11	4.8	229%	5.99	0.998
Obsessive-compulsive	227	2	0.9	214%	4.71	0.866
Diabetes	26,258	288	159.4	181%	4.90	1.000
Congestive heart failure	3,434	84	46.5	180%	10.91	1.000
Cerebrovascular disease	9,418	173	103.6	167%	7.37	1.000
Depressive disorder	27,318	262	161.4	162%	3.68	1.000
Rheumatoid arthritis	4,161	42	28.9	146%	3.16	0.993
Anxiety states	11,097	107	79.6	134%	2.47	0.999
Alcohol dependence	1,009	7	5.2	134%	1.75	0.781
Coronary artery disease	20,979	262	206.2	127%	2.66	1.000
Osteoporosis	16,722	236	190.9	124%	2.69	0.999
Breast cancer	11,736	117	102.6	114%	1.23	0.924
Hypertension	149,415	1,255	1,127.0	111%	0.86	1.000
Arthritis—total	98,971	981	907.1	108%	0.75	0.993
Prostate cancer	6,324	57	54.3	105%	0.43	0.645
Osteoarthritis	21,585	196	201.1	97%	-0.24	0.359
Acute reaction to stress	1,163	4	6.5	61%	-2.17	0.161
Sexual deviations	565	0	3.3	0%	-5.92	0.033

When comparing the results of this analysis, it must be remembered that the insureds with the conditions studied do not comprise the total of all applicants with the conditions, but only those that were accepted. Nevertheless, most of the cases were coded as having "severe complications" manifested as a result of condition, and many even had mobility limitations. This suggests that, for the most part, those denied coverage with the conditions were not denied solely on the basis of the condition studied (i.e., other conditions were present that triggered denial).

The results of this study show that there is evidence to support the issuance at standard risks applicants with the following conditions (where the claims risk is no more

than 10% greater than expected): sexual deviations, acute reaction to stress, osteoarthritis, prostate cancer, and arthritis. Conditions suitable for a substandard class with no more than a 25% increased risk include hypertension, breast cancer, and osteoporosis. Conditions with an increased risk between 25% and 50% include coronary artery disease, alcohol dependence, anxiety states, and rheumatoid arthritis. Conditions where the increased risk is between 50% and 100% consist of depressive disorder, cerebrovascular disease, congestive heart failure, and diabetes. Conditions that experienced a claims rate more than twice expected include obsessive-compulsive disorder, affective psychoses, and drug dependence. However, two conditions that showed increased risk did not have a sufficient number of insureds to conclude that their experience was different than the aggregate with 95% confidence. Those two were obsessive-compulsive disorder and alcohol dependence.

Table 24a focused on the claims experience for various conditions for all ages, durations,and risk categories of insureds. In an effort to identify additional opportunities for the development of substandard classes, Table 24b highlights specific risk categories within conditions that displayed an actual-to-expected claims ratio of less than 150%, or a p-value of less than 0.95. We believe these groups may also be suitable for development as substandard classes, or at least demonstrate that a subset of those with conditions that may be considered uninsurable may be insurable.

Table 24b: Risk Categories Suitable for Substandard Classes

Condition at Underwriting	Life-Years Exposed	Number of Claims		Actual-to-Expected Ratio	Extra Claims per 1,000	p-value
		Actual	Expected			
Anxiety states: low risk	467	3	2.6	115%	0.85	0.598
Anxiety states: medium risk	9,345	80	66.1	121%	1.49	0.957
Depressive disorder: low risk	6,151	41	31.5	130%	1.55	0.956
Depressive disorder: medium risk	12,849	108	74.2	145%	2.63	1.000
Hypertension: low risk	74,199	536	555.5	96%	-0.26	0.203
Hypertension: medium risk	41,340	244	237.5	103%	0.16	0.664
Cerebrovascular disease: low risk	2,239	29	23.7	123%	2.38	0.865
Cerebrovascular disease: medium risk	4,703	72	51.7	139%	4.32	0.998
Congestive heart failure: low risk	513	6	5.5	109%	0.94	0.582
Coronary artery disease: low risk	2,153	16	19.8	81%	-1.77	0.195
Coronary artery disease: medium risk	9,199	102	86.8	117%	1.65	0.949
Coronary artery disease: high risk	9,671	144	99.7	144%	4.58	1.000

Arthritis: low risk	43,792	339	376.8	90%	-0.58	0.025
Arthritis: medium risk	45,218	388	383.9	101%	0.09	0.583
Arthritis: high risk	15,989	305	204.2	149%	6.31	1.000
Osteoporosis: low risk	8,476	91	93.8	97%	-0.34	0.384
Osteoporosis: medium risk	1,559	22	17.9	123%	2.63	0.835
Breast cancer: no mobility limitation	11,346	105	97.9	107%	0.63	0.765
Prostate cancer: low risk	3,437	19	26.0	73%	-2.04	0.083
Prostate cancer: medium risk	1,435	14	12.3	114%	1.19	0.688
Prostate cancer: high risk	1,452	24	16.0	150%	5.54	0.979

Table 24c summarizes the mortality experience for each condition analyzed in this study. The results are shown for all insureds with the particular condition, regardless of age, duration, or risk category.

Table 24c: Summary of Mortality Experience

Condition at Underwriting	Life-Years Exposed	Number of Deaths		Actual-to-Expected Ratio	Extra Deaths per 1,000	p-value
		Actual	Expected			
Affective psychoses	1,038	12	7.3	163%	4.48	0.957
Anxiety states	11,092	89	85.7	104%	0.30	0.640
Obsessive-compulsive	228	3	1.4	212%	6.93	0.909
Sexual deviations	570	11	7.1	155%	6.89	0.931
Alcohol dependence	1,014	19	9.3	204%	9.55	0.999
Drug dependence	294	8	2.0	395%	20.31	1.000
Acute reaction to stress	1,164	5	7.6	66%	-2.24	0.172
Depressive disorder	27,288	204	189.0	108%	0.55	0.863
Hypertension	149,606	1,598	1,357.3	118%	1.61	1.000
Cerebrovascular disease	9,420	172	111.6	154%	6.41	1.000
Congestive heart failure	3,472	154	45.4	339%	31.27	1.000
Coronary artery disease	21,051	377	268.1	141%	5.17	1.000
Diabetes	26,300	368	236.1	156%	5.01	1.000
Arthritis—total	99,009	1,017	955.6	106%	0.62	0.977
Osteoarthritis	21,597	217	212.5	102%	0.21	0.621
Rheumatoid arthritis	4,170	59	31.5	187%	6.59	1.000
Osteoporosis	16,683	144	142.6	101%	0.08	0.546
Breast cancer	11,734	122	80.1	152%	3.57	1.000
Prostate cancer	6,346	102	93.6	109%	1.33	0.809

Table 24d summarizes the policy acceptance ratio found for each condition included in the study. This ratio was calculated by dividing the number of policy applications that were accepted by the total number of policy applications for each condition.

Table 24d: Summary of Policy Acceptance Ratios

Condition at Underwriting	Total Number of Applications	Acceptance Ratio
Affective psychoses	1,364	31.4%
Anxiety states	6,249	51.0%
Obsessive-compulsive	195	45.6%
Sexual deviations	125	76.0%
Alcohol dependence	1060	25.1%
Drug dependence	545	17.2%
Acute reaction to stress	410	64.1%
Depressive disorder	24,687	35.4%
Hypertension	101,268	41.1%
Cerebrovascular disease	13,157	19.1%
Congestive heart failure	5,789	14.9%
Coronary artery disease	10,613	47.1%
Diabetes	38,289	19.5%
Arthritis—total	69,219	40.5%
Osteoarthritis	11,389	55.1%
Rheumatoid arthritis	3,324	32.9%
Osteoporosis	15,934	32.5%
Breast cancer	7,858	39.5%
Prostate cancer	5,613	29.9%

As indicated by the table, insureds diagnosed with acute reaction to stress, sexual deviations, essential hypertension, osteoarthritis, and anxiety states had acceptance rates above 50%. The lowest acceptance rates (all below 30%) were for insureds diagnosed with drug dependence, alcohol dependence, cerebrovascular disease, congestive heart failure, diabetes, and prostate cancer.

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APPENDIX A. OBSERVED AGGREGATE CLAIMS, MORTALITY, AND LAPSE RATES

Table CMO. Observed Claim Incidence Rates—Males								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Claims Subtotal	841	836	1080	957	1209	1144	895	403
35	0.00000	0.00095	0.00103	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00578	0.00668	0.00000	0.00000
37	0.00000	0.00000	0.00000	0.00000	0.00000	0.00607	0.00000	0.00000
38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.00301	0.00321	0.00000	0.00000	0.00000	0.00000	0.00000
40	0.00000	0.00268	0.00000	0.00318	0.00000	0.00000	0.00000	0.00000
41	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42	0.00000	0.00208	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
43	0.00175	0.00000	0.00196	0.00000	0.00252	0.00000	0.00000	0.00000
44	0.00164	0.00000	0.00000	0.00000	0.00000	0.00258	0.00000	0.00000
45	0.00000	0.00000	0.00000	0.00000	0.00199	0.00000	0.00000	0.00000
46	0.00129	0.00000	0.00142	0.00000	0.00000	0.00203	0.00000	0.00000
47	0.00000	0.00000	0.00121	0.00400	0.00150	0.00178	0.00000	0.00000
48	0.00000	0.00096	0.00100	0.00107	0.00000	0.00000	0.00000	0.00000
49	0.00000	0.00167	0.00265	0.00194	0.00112	0.00000	0.00000	0.00000
50	0.00078	0.00000	0.00085	0.00000	0.00216	0.00000	0.00414	0.00000
51	0.00075	0.00000	0.00163	0.00180	0.00000	0.00129	0.00000	0.00000
52	0.00073	0.00075	0.00079	0.00087	0.00204	0.00247	0.00180	0.00000
53	0.00132	0.00000	0.00291	0.00000	0.00185	0.00110	0.00163	0.00000
54	0.00190	0.00131	0.00070	0.00230	0.00087	0.00105	0.00000	0.00000
55	0.00245	0.00063	0.00067	0.00220	0.00172	0.00107	0.00160	0.00000
56	0.00060	0.00000	0.00000	0.00071	0.00082	0.00400	0.00000	0.00000
57	0.00058	0.00180	0.00126	0.00139	0.00080	0.00098	0.00000	0.00000
58	0.00058	0.00118	0.00250	0.00205	0.00000	0.00093	0.00000	0.00289
59	0.00163	0.00112	0.00116	0.00124	0.00139	0.00000	0.00233	0.00000
60	0.00109	0.00000	0.00117	0.00126	0.00141	0.00084	0.00480	0.00275
61	0.00103	0.00053	0.00110	0.00059	0.00000	0.00076	0.00210	0.00000
62	0.00106	0.00164	0.00286	0.00123	0.00339	0.00235	0.00430	0.00000
63	0.00151	0.00155	0.00322	0.00171	0.00188	0.00144	0.00000	0.00000
64	0.00100	0.00000	0.00160	0.00337	0.00431	0.00420	0.00186	0.00874
65	0.00000	0.00165	0.00229	0.00301	0.00390	0.00454	0.00000	0.00185
66	0.00058	0.00119	0.00247	0.00195	0.00350	0.00239	0.00322	0.00195
67	0.00185	0.00252	0.00261	0.00413	0.00298	0.00519	0.00120	0.00440
68	0.00000	0.00135	0.00279	0.00294	0.00000	0.00533	0.00935	0.00000
69	0.00067	0.00346	0.00431	0.00227	0.00741	0.00472	0.00858	0.00657
70	0.00000	0.00316	0.00489	0.00257	0.00826	0.00723	0.00542	0.00481
71	0.00410	0.00169	0.00440	0.00560	0.01018	0.00824	0.00925	0.00269
72	0.00389	0.00403	0.00729	0.01093	0.00697	0.01455	0.01606	0.00640
73	0.00735	0.00219	0.00341	0.00240	0.01675	0.01941	0.01807	0.00743
74	0.00351	0.00728	0.01380	0.01462	0.01773	0.01892	0.01636	0.00000
75	0.00142	0.01460	0.01228	0.01132	0.01411	0.01636	0.00827	0.02523
76	0.00893	0.01293	0.00964	0.01256	0.02077	0.02494	0.01952	0.01356
77	0.00824	0.01069	0.01797	0.01698	0.03962	0.01878	0.02942	0.00000
78	0.00795	0.01960	0.03330	0.01012	0.02587	0.03473	0.00598	0.00000
79	0.01875	0.01669	0.00711	0.02656	0.04677	0.03991	0.03449	0.00000
80	0.01275	0.00445	0.02797	0.02526	0.02825	0.06717	0.03918	0.00000
81	0.01782	0.01268	0.01370	0.01511	0.04282	0.02036	0.08403	0.02783
82	0.01528	0.01624	0.00913	0.01948	0.02196	0.05424	0.08266	0.00000
83	0.02118	0.02311	0.02569	0.02960	0.06868	0.04335	0.00000	0.00000
84	0.02308	0.01234	0.02745	0.04667	0.03730	0.04866	0.08463	0.00000
85	0.06443	0.03608	0.01981	0.04320	0.05443	0.03527	0.05351	0.00000
86	0.02554	0.05563	0.06507	0.11504	0.04902	0.05790	0.00000	0.00000
87	0.00000	0.00000	0.13094	0.00000	0.06250	0.00000	0.00000	0.00000
88	0.15534	0.19444	0.00000	0.12496	0.05065	0.11492	0.10742	0.00000

Table CFO. Observed Claim Incidence Rates—Females

Issue Age	Policy Year 1	2	3	4	5	6	7	8+
Claims Subtotal	1514	1768	1843	2102	2268	1906	1494	750
35	0.00057	0.00000	0.00065	0.00000	0.00000	0.00102	0.00142	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
37	0.00000	0.00000	0.00247	0.00271	0.00000	0.00000	0.00000	0.00000
38	0.00000	0.00000	0.00000	0.00249	0.00000	0.00000	0.00476	0.00000
39	0.00000	0.00166	0.00176	0.00000	0.00000	0.00494	0.00000	0.00000
40	0.00000	0.00154	0.00000	0.00185	0.00000	0.00000	0.00000	0.00000
41	0.00000	0.00000	0.00143	0.00155	0.00000	0.00201	0.00000	0.00000
42	0.00000	0.00116	0.00000	0.00000	0.00000	0.00351	0.00000	0.00000
43	0.00000	0.00213	0.00000	0.00000	0.00000	0.00160	0.00000	0.00000
44	0.00000	0.00187	0.00000	0.00000	0.00000	0.00136	0.00000	0.00000
45	0.00000	0.00085	0.00091	0.00100	0.00226	0.00000	0.00185	0.00000
46	0.00214	0.00074	0.00078	0.00170	0.00194	0.00115	0.00314	0.00000
47	0.00063	0.00130	0.00137	0.00000	0.00084	0.00098	0.00000	0.00000
48	0.00000	0.00000	0.00061	0.00133	0.00150	0.00265	0.00121	0.00275
49	0.00096	0.00000	0.00104	0.00057	0.00065	0.00000	0.00109	0.00000
50	0.00048	0.00098	0.00000	0.00112	0.00000	0.00000	0.00118	0.00000
51	0.00000	0.00045	0.00048	0.00157	0.00000	0.00075	0.00110	0.00000
52	0.00131	0.00089	0.00047	0.00000	0.00178	0.00070	0.00101	0.00000
53	0.00000	0.00043	0.00000	0.00051	0.00115	0.00068	0.00000	0.00000
54	0.00120	0.00083	0.00132	0.00143	0.00270	0.00000	0.00100	0.00000
55	0.00236	0.00245	0.00129	0.00093	0.00053	0.00130	0.00000	0.00000
56	0.00076	0.00156	0.00081	0.00133	0.00101	0.00122	0.00169	0.00185
57	0.00039	0.00041	0.00169	0.00323	0.00422	0.00063	0.00000	0.00198
58	0.00082	0.00084	0.00220	0.00095	0.00264	0.00000	0.00261	0.00000
59	0.00190	0.00118	0.00287	0.00088	0.00194	0.00114	0.00156	0.00167
60	0.00279	0.00164	0.00171	0.00182	0.00398	0.00293	0.00082	0.00171
61	0.00000	0.00124	0.00344	0.00184	0.00151	0.00288	0.00077	0.00300
62	0.00083	0.00086	0.00133	0.00283	0.00258	0.00468	0.00161	0.00000
63	0.00335	0.00086	0.00000	0.00331	0.00463	0.00411	0.00386	0.00000
64	0.00248	0.00254	0.00131	0.00322	0.00149	0.00227	0.00593	0.00140
65	0.00180	0.00416	0.00238	0.00301	0.00380	0.00796	0.00493	0.00000
66	0.00250	0.00407	0.00209	0.00218	0.00290	0.00393	0.00345	0.00313
67	0.00160	0.00272	0.00337	0.00354	0.00702	0.00445	0.00397	0.00354
68	0.00273	0.00224	0.00115	0.00479	0.00387	0.00663	0.00589	0.00000
69	0.00215	0.00441	0.00456	0.00597	0.00962	0.00729	0.00676	0.00359
70	0.00289	0.00177	0.00542	0.00882	0.01148	0.00792	0.01045	0.00929
71	0.00481	0.00708	0.00659	0.00922	0.00998	0.00953	0.00882	0.01534
72	0.00414	0.00427	0.00439	0.01378	0.01656	0.00958	0.01301	0.00710
73	0.00800	0.00989	0.01109	0.01885	0.01560	0.01960	0.01597	0.00828
74	0.00436	0.00452	0.01401	0.01870	0.02805	0.02715	0.00702	0.01601
75	0.01110	0.01253	0.01992	0.01545	0.02626	0.01542	0.03290	0.00000
76	0.00260	0.01202	0.01392	0.02523	0.02817	0.02689	0.02926	0.01480
77	0.00575	0.01490	0.01580	0.02872	0.03071	0.04186	0.02800	0.02976
78	0.01043	0.01797	0.02658	0.02286	0.04397	0.04219	0.03091	0.02886
79	0.01007	0.01269	0.01765	0.02874	0.03875	0.04833	0.03952	0.02939
80	0.01779	0.03762	0.03852	0.03308	0.07066	0.04732	0.04574	0.02531
81	0.03088	0.03303	0.02720	0.04322	0.05075	0.04358	0.07002	0.01962
82	0.00901	0.04688	0.03103	0.06351	0.04114	0.07600	0.05197	0.03087
83	0.02074	0.01629	0.06380	0.03305	0.05275	0.06663	0.05604	0.00000
84	0.05852	0.01842	0.08956	0.10262	0.05678	0.09089	0.16327	0.00000
85	0.05774	0.07407	0.06068	0.05558	0.17346	0.06004	0.05948	0.00000
86	0.04094	0.04428	0.09643	0.12865	0.16625	0.04226	0.05839	0.00000
87	0.07060	0.11765	0.11410	0.05911	0.10318	0.08113	0.10405	0.00000
88	0.05173	0.10475	0.06820	0.13325	0.05561	0.12530	0.07637	0.00000

Table MMO. Observed Mortality Rates—Males								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Deaths Subtotal	1764	2131	2356	2583	2440	2602	2240	1561
35	0.0027	0.0019	0.0010	0.0000	0.0014	0.0017	0.0024	0.0000
36	0.0000	0.0000	0.0000	0.0000	0.0000	0.0067	0.0000	0.0000
37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	0.0064	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	0.0000	0.0000	0.0032	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0026	0.0000	0.0000	0.0032	0.0000	0.0000	0.0000	0.0000
41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0037	0.0000	0.0000
42	0.0000	0.0000	0.0022	0.0000	0.0056	0.0000	0.0045	0.0000
43	0.0053	0.0000	0.0000	0.0022	0.0025	0.0000	0.0000	0.0000
44	0.0033	0.0034	0.0000	0.0000	0.0045	0.0000	0.0000	0.0000
45	0.0044	0.0000	0.0032	0.0017	0.0020	0.0023	0.0064	0.0070
46	0.0026	0.0014	0.0028	0.0000	0.0017	0.0040	0.0028	0.0000
47	0.0011	0.0023	0.0036	0.0013	0.0045	0.0018	0.0025	0.0109
48	0.0009	0.0019	0.0000	0.0000	0.0012	0.0014	0.0000	0.0000
49	0.0040	0.0042	0.0053	0.0010	0.0011	0.0013	0.0000	0.0000
50	0.0023	0.0024	0.0000	0.0037	0.0043	0.0026	0.0062	0.0000
51	0.0007	0.0015	0.0057	0.0027	0.0062	0.0039	0.0019	0.0000
52	0.0022	0.0030	0.0055	0.0017	0.0020	0.0025	0.0054	0.0041
53	0.0026	0.0041	0.0051	0.0024	0.0009	0.0077	0.0016	0.0000
54	0.0019	0.0020	0.0028	0.0038	0.0061	0.0063	0.0050	0.0141
55	0.0031	0.0019	0.0040	0.0029	0.0009	0.0021	0.0016	0.0000
56	0.0018	0.0068	0.0039	0.0028	0.0049	0.0050	0.0029	0.0155
57	0.0029	0.0024	0.0025	0.0097	0.0040	0.0068	0.0071	0.0033
58	0.0012	0.0030	0.0069	0.0061	0.0070	0.0092	0.0000	0.0000
59	0.0022	0.0022	0.0052	0.0043	0.0069	0.0075	0.0058	0.0024
60	0.0027	0.0045	0.0053	0.0075	0.0049	0.0076	0.0036	0.0109
61	0.0082	0.0042	0.0028	0.0059	0.0072	0.0098	0.0083	0.0066
62	0.0042	0.0071	0.0063	0.0055	0.0061	0.0062	0.0097	0.0044
63	0.0050	0.0052	0.0102	0.0080	0.0118	0.0115	0.0128	0.0090
64	0.0055	0.0051	0.0079	0.0101	0.0104	0.0112	0.0111	0.0053
65	0.0064	0.0093	0.0125	0.0120	0.0072	0.0151	0.0091	0.0110
66	0.0093	0.0071	0.0098	0.0097	0.0091	0.0088	0.0117	0.0039
67	0.0074	0.0069	0.0065	0.0130	0.0148	0.0146	0.0143	0.0066
68	0.0105	0.0101	0.0070	0.0146	0.0133	0.0133	0.0163	0.0084
69	0.0060	0.0090	0.0100	0.0195	0.0115	0.0160	0.0195	0.0152
70	0.0077	0.0095	0.0105	0.0128	0.0101	0.0124	0.0081	0.0072
71	0.0090	0.0076	0.0123	0.0149	0.0202	0.0187	0.0244	0.0027
72	0.0068	0.0150	0.0125	0.0131	0.0151	0.0184	0.0302	0.0159
73	0.0157	0.0098	0.0192	0.0155	0.0205	0.0164	0.0220	0.0221
74	0.0058	0.0121	0.0126	0.0226	0.0307	0.0257	0.0326	0.0081
75	0.0126	0.0117	0.0123	0.0242	0.0210	0.0344	0.0246	0.0051
76	0.0124	0.0129	0.0154	0.0350	0.0208	0.0387	0.0157	0.0135
77	0.0103	0.0256	0.0158	0.0290	0.0239	0.0280	0.0294	0.0240
78	0.0053	0.0195	0.0332	0.0167	0.0368	0.0474	0.0178	0.0337
79	0.0125	0.0199	0.0247	0.0115	0.0259	0.0301	0.0412	0.0244
80	0.0211	0.0133	0.0372	0.0354	0.0170	0.0408	0.0393	0.0355
81	0.0060	0.0250	0.0472	0.0663	0.0343	0.0000	0.0564	0.0280
82	0.0077	0.0405	0.0273	0.0195	0.0327	0.0930	0.0625	0.0391
83	0.0000	0.0339	0.0381	0.0594	0.0528	0.0215	0.1260	0.0807
84	0.0347	0.0367	0.0407	0.0609	0.0916	0.0723	0.1997	0.0687
85	0.0000	0.0364	0.0388	0.0219	0.1039	0.0347	0.0000	0.1371
86	0.0000	0.1361	0.0000	0.0000	0.1380	0.0587	0.1002	0.4399
87	0.0000	0.0000	0.0000	0.1106	0.0000	0.0000	0.0931	0.1941
88	0.0237	0.0000	0.0000	0.0844	0.0000	0.0000	0.0000	0.0000

Table MFO. Observed Mortality Rates—Females

Issue Age	Policy Year							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8+**
Deaths Subtotal	1181	1498	1818	2026	1912	2124	1721	1048
35	0.0006	0.0006	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0000	0.0025	0.0000	0.0000	0.0000	0.0000	0.0050	0.0000
37	0.0000	0.0000	0.0025	0.0000	0.0000	0.0000	0.0051	0.0000
38	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	0.0016	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0015	0.0000	0.0000	0.0000	0.0024	0.0034	0.0000
41	0.0013	0.0027	0.0014	0.0031	0.0000	0.0020	0.0000	0.0000
42	0.0011	0.0000	0.0024	0.0013	0.0015	0.0018	0.0000	0.0000
43	0.0020	0.0011	0.0000	0.0012	0.0014	0.0000	0.0000	0.0000
44	0.0009	0.0000	0.0010	0.0000	0.0000	0.0014	0.0000	0.0000
45	0.0016	0.0000	0.0018	0.0000	0.0000	0.0000	0.0000	0.0000
46	0.0014	0.0015	0.0000	0.0000	0.0010	0.0023	0.0016	0.0000
47	0.0006	0.0007	0.0007	0.0015	0.0025	0.0000	0.0000	0.0000
48	0.0006	0.0006	0.0006	0.0007	0.0007	0.0009	0.0000	0.0000
49	0.0000	0.0010	0.0010	0.0017	0.0006	0.0015	0.0000	0.0000
50	0.0019	0.0010	0.0005	0.0011	0.0045	0.0015	0.0024	0.0000
51	0.0013	0.0027	0.0010	0.0021	0.0006	0.0030	0.0033	0.0000
52	0.0017	0.0013	0.0019	0.0026	0.0006	0.0014	0.0020	0.0043
53	0.0008	0.0009	0.0014	0.0030	0.0017	0.0034	0.0020	0.0021
54	0.0012	0.0008	0.0026	0.0014	0.0022	0.0032	0.0030	0.0000
55	0.0031	0.0029	0.0017	0.0028	0.0027	0.0019	0.0019	0.0000
56	0.0008	0.0023	0.0024	0.0036	0.0005	0.0043	0.0008	0.0037
57	0.0031	0.0040	0.0017	0.0032	0.0026	0.0031	0.0026	0.0040
58	0.0008	0.0021	0.0035	0.0019	0.0021	0.0031	0.0026	0.0019
59	0.0023	0.0020	0.0045	0.0022	0.0024	0.0028	0.0031	0.0033
60	0.0016	0.0020	0.0034	0.0036	0.0035	0.0093	0.0049	0.0017
61	0.0008	0.0033	0.0030	0.0028	0.0040	0.0046	0.0039	0.0015
62	0.0004	0.0021	0.0053	0.0056	0.0046	0.0076	0.0080	0.0047
63	0.0029	0.0047	0.0054	0.0052	0.0051	0.0041	0.0054	0.0043
64	0.0021	0.0021	0.0031	0.0046	0.0059	0.0079	0.0037	0.0028
65	0.0018	0.0042	0.0071	0.0055	0.0049	0.0061	0.0082	0.0031
66	0.0005	0.0020	0.0031	0.0043	0.0052	0.0065	0.0103	0.0109
67	0.0027	0.0038	0.0056	0.0082	0.0089	0.0067	0.0040	0.0053
68	0.0027	0.0011	0.0057	0.0084	0.0064	0.0103	0.0088	0.0071
69	0.0032	0.0050	0.0102	0.0060	0.0096	0.0066	0.0087	0.0036
70	0.0035	0.0047	0.0060	0.0082	0.0108	0.0134	0.0073	0.0056
71	0.0076	0.0042	0.0088	0.0100	0.0116	0.0133	0.0126	0.0044
72	0.0048	0.0057	0.0066	0.0100	0.0058	0.0086	0.0078	0.0095
73	0.0016	0.0058	0.0077	0.0072	0.0137	0.0127	0.0064	0.0055
74	0.0061	0.0117	0.0075	0.0119	0.0119	0.0143	0.0070	0.0032
75	0.0071	0.0105	0.0100	0.0119	0.0119	0.0154	0.0166	0.0110
76	0.0039	0.0080	0.0070	0.0105	0.0166	0.0154	0.0108	0.0149
77	0.0072	0.0120	0.0095	0.0187	0.0174	0.0048	0.0212	0.0150
78	0.0052	0.0090	0.0134	0.0187	0.0094	0.0366	0.0233	0.0288
79	0.0161	0.0042	0.0089	0.0121	0.0387	0.0280	0.0201	0.0000
80	0.0051	0.0081	0.0150	0.0266	0.0152	0.0192	0.0262	0.0128
81	0.0000	0.0221	0.0118	0.0474	0.0258	0.0249	0.0356	0.0198
82	0.0135	0.0000	0.0209	0.0235	0.0069	0.0256	0.0754	0.0310
83	0.0000	0.0109	0.0177	0.0199	0.0456	0.0292	0.0832	0.0309
84	0.0169	0.0184	0.0206	0.0239	0.0435	0.0191	0.0000	0.0696
85	0.0194	0.0323	0.0245	0.0144	0.0168	0.0000	0.0593	0.0516
86	0.0137	0.0000	0.0167	0.0436	0.0888	0.0423	0.0000	0.0000
87	0.0000	0.0000	0.0478	0.0296	0.0000	0.0000	0.0000	0.0829
88	0.0174	0.0495	0.0118	0.0571	0.1066	0.0769	0.0772	0.0000

Table LMO. Observed Lapse Rates—Males								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Lapses Subtotal	8851	4820	2936	2163	1850	1177	1034	881
35	0.067	0.039	0.038	0.029	0.022	0.025	0.010	0.000
36	0.040	0.047	0.032	0.015	0.006	0.000	0.027	0.019
37	0.063	0.033	0.004	0.031	0.036	0.006	0.017	0.019
38	0.038	0.020	0.022	0.016	0.004	0.005	0.014	0.000
39	0.037	0.035	0.010	0.021	0.004	0.019	0.000	0.000
40	0.033	0.021	0.023	0.028	0.004	0.018	0.019	0.000
41	0.034	0.033	0.025	0.003	0.003	0.007	0.000	0.021
42	0.045	0.031	0.022	0.026	0.022	0.003	0.000	0.009
43	0.060	0.027	0.019	0.011	0.022	0.003	0.012	0.008
44	0.045	0.035	0.013	0.014	0.018	0.003	0.011	0.008
45	0.051	0.014	0.011	0.015	0.014	0.002	0.006	0.000
46	0.046	0.023	0.014	0.009	0.005	0.006	0.000	0.013
47	0.036	0.015	0.017	0.009	0.007	0.009	0.002	0.000
48	0.040	0.029	0.016	0.009	0.008	0.007	0.004	0.000
49	0.023	0.024	0.011	0.012	0.009	0.005	0.009	0.000
50	0.034	0.026	0.014	0.008	0.010	0.004	0.006	0.000
51	0.029	0.020	0.015	0.009	0.007	0.003	0.000	0.000
52	0.034	0.019	0.009	0.008	0.006	0.001	0.004	0.000
53	0.036	0.017	0.012	0.006	0.007	0.003	0.002	0.004
54	0.028	0.017	0.010	0.010	0.006	0.003	0.005	0.011
55	0.029	0.020	0.009	0.004	0.007	0.001	0.000	0.000
56	0.027	0.017	0.010	0.008	0.007	0.004	0.003	0.003
57	0.028	0.020	0.013	0.006	0.005	0.003	0.001	0.003
58	0.026	0.016	0.006	0.004	0.003	0.001	0.005	0.000
59	0.031	0.011	0.008	0.005	0.002	0.002	0.000	0.002
60	0.025	0.016	0.006	0.008	0.006	0.004	0.004	0.000
61	0.030	0.010	0.011	0.008	0.004	0.002	0.004	0.000
62	0.034	0.011	0.013	0.004	0.003	0.002	0.003	0.000
63	0.027	0.008	0.007	0.003	0.001	0.004	0.001	0.002
64	0.031	0.011	0.006	0.004	0.002	0.005	0.003	0.002
65	0.021	0.014	0.008	0.006	0.003	0.002	0.001	0.002
66	0.021	0.014	0.004	0.003	0.006	0.005	0.001	0.004
67	0.024	0.006	0.008	0.002	0.002	0.002	0.000	0.002
68	0.021	0.009	0.004	0.003	0.004	0.001	0.002	0.002
69	0.026	0.011	0.009	0.005	0.007	0.003	0.000	0.004
70	0.024	0.006	0.002	0.008	0.006	0.003	0.001	0.000
71	0.022	0.014	0.011	0.006	0.006	0.002	0.005	0.000
72	0.025	0.012	0.004	0.004	0.003	0.004	0.000	0.010
73	0.028	0.018	0.006	0.010	0.006	0.008	0.004	0.000
74	0.024	0.016	0.006	0.003	0.010	0.009	0.002	0.000
75	0.028	0.010	0.008	0.002	0.004	0.006	0.003	0.005
76	0.016	0.007	0.010	0.012	0.002	0.003	0.000	0.014
77	0.020	0.011	0.005	0.005	0.000	0.009	0.004	0.000
78	0.034	0.031	0.006	0.007	0.007	0.009	0.006	0.000
79	0.031	0.020	0.007	0.000	0.004	0.015	0.007	0.000
80	0.029	0.013	0.000	0.010	0.011	0.007	0.000	0.018
81	0.024	0.025	0.000	0.000	0.000	0.020	0.000	0.000
82	0.038	0.032	0.027	0.000	0.000	0.000	0.000	0.000
83	0.052	0.034	0.038	0.015	0.018	0.000	0.000	0.000
84	0.012	0.012	0.000	0.000	0.000	0.000	0.000	0.000
85	0.048	0.019	0.000	0.022	0.027	0.000	0.000	0.000
86	0.025	0.000	0.033	0.078	0.000	0.000	0.000	0.000
87	0.111	0.000	0.045	0.000	0.000	0.000	0.000	0.000
88	0.069	0.000	0.000	0.000	0.000	0.061	0.000	0.000

Table LFO. Observed Lapse Rates—Females								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Lapses Subtotal	13682	6987	4497	3249	2619	1916	1270	883
35	0.067	0.038	0.025	0.035	0.020	0.020	0.007	0.007
36	0.052	0.025	0.021	0.009	0.013	0.011	0.005	0.000
37	0.041	0.036	0.029	0.027	0.012	0.007	0.010	0.000
38	0.051	0.023	0.033	0.025	0.011	0.003	0.005	0.000
39	0.049	0.046	0.017	0.015	0.009	0.012	0.007	0.000
40	0.037	0.018	0.023	0.015	0.000	0.012	0.003	0.000
41	0.044	0.027	0.027	0.014	0.007	0.006	0.000	0.000
42	0.042	0.021	0.017	0.016	0.014	0.017	0.005	0.010
43	0.048	0.019	0.019	0.013	0.011	0.003	0.000	0.005
44	0.039	0.024	0.011	0.008	0.008	0.001	0.004	0.000
45	0.045	0.032	0.016	0.004	0.006	0.005	0.009	0.000
46	0.036	0.017	0.015	0.013	0.011	0.003	0.002	0.000
47	0.037	0.023	0.010	0.014	0.010	0.006	0.005	0.005
48	0.034	0.015	0.010	0.010	0.010	0.002	0.001	0.000
49	0.040	0.023	0.008	0.007	0.003	0.005	0.003	0.000
50	0.033	0.019	0.012	0.013	0.008	0.004	0.002	0.000
51	0.032	0.018	0.016	0.007	0.007	0.002	0.000	0.005
52	0.028	0.016	0.014	0.011	0.005	0.006	0.005	0.002
53	0.035	0.018	0.010	0.006	0.003	0.001	0.004	0.000
54	0.033	0.022	0.012	0.004	0.002	0.003	0.004	0.002
55	0.031	0.019	0.009	0.007	0.006	0.004	0.002	0.009
56	0.027	0.012	0.012	0.008	0.007	0.003	0.002	0.002
57	0.034	0.014	0.009	0.007	0.008	0.007	0.003	0.002
58	0.032	0.016	0.007	0.009	0.004	0.002	0.002	0.000
59	0.033	0.014	0.007	0.005	0.006	0.003	0.004	0.002
60	0.032	0.015	0.011	0.005	0.002	0.004	0.002	0.003
61	0.029	0.016	0.010	0.006	0.004	0.002	0.002	0.002
62	0.033	0.014	0.007	0.006	0.002	0.003	0.002	0.002
63	0.026	0.015	0.012	0.004	0.007	0.003	0.000	0.001
64	0.025	0.012	0.006	0.005	0.004	0.003	0.000	0.001
65	0.028	0.013	0.007	0.004	0.005	0.004	0.002	0.002
66	0.025	0.006	0.010	0.003	0.005	0.001	0.002	0.003
67	0.020	0.015	0.005	0.001	0.005	0.004	0.005	0.004
68	0.021	0.012	0.006	0.007	0.005	0.004	0.003	0.000
69	0.027	0.014	0.004	0.004	0.003	0.003	0.004	0.002
70	0.023	0.006	0.005	0.004	0.005	0.005	0.002	0.004
71	0.022	0.015	0.006	0.004	0.007	0.005	0.004	0.002
72	0.031	0.016	0.007	0.007	0.007	0.005	0.004	0.005
73	0.027	0.007	0.009	0.003	0.011	0.006	0.006	0.000
74	0.033	0.012	0.007	0.004	0.004	0.003	0.000	0.000
75	0.023	0.010	0.012	0.006	0.005	0.006	0.002	0.000
76	0.034	0.007	0.007	0.009	0.002	0.004	0.000	0.000
77	0.030	0.013	0.009	0.009	0.004	0.012	0.011	0.008
78	0.031	0.009	0.011	0.002	0.007	0.011	0.000	0.007
79	0.030	0.021	0.002	0.010	0.003	0.011	0.005	0.000
80	0.028	0.024	0.003	0.007	0.011	0.010	0.013	0.013
81	0.031	0.007	0.000	0.009	0.016	0.013	0.000	0.000
82	0.035	0.024	0.026	0.006	0.007	0.000	0.013	0.000
83	0.010	0.027	0.006	0.007	0.008	0.010	0.000	0.000
84	0.042	0.018	0.021	0.012	0.000	0.019	0.000	0.000
85	0.019	0.011	0.025	0.014	0.000	0.020	0.000	0.000
86	0.067	0.015	0.017	0.044	0.000	0.000	0.000	0.000
87	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000
88	0.043	0.020	0.012	0.000	0.019	0.000	0.077	0.000

APPENDIX B. GRADUATED AGGREGATE CLAIMS, MORTALITY, AND LAPSE RATES

Table CMG. Graduated Claims Incidence Rates—Males

Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Claims Subtotal	847	956	1059	1099	1098	1004	839	658
35	0.00029	0.00054	0.00062	0.00059	0.00060	0.00054	0.00041	0.00030
36	0.00033	0.00056	0.00064	0.00062	0.00062	0.00053	0.00040	0.00030
37	0.00036	0.00058	0.00066	0.00065	0.00063	0.00053	0.00039	0.00030
38	0.00040	0.00060	0.00068	0.00068	0.00064	0.00052	0.00039	0.00029
39	0.00043	0.00062	0.00070	0.00070	0.00066	0.00051	0.00038	0.00029
40	0.00046	0.00064	0.00072	0.00073	0.00067	0.00050	0.00038	0.00028
41	0.00049	0.00066	0.00074	0.00075	0.00069	0.00051	0.00039	0.00029
42	0.00052	0.00067	0.00076	0.00078	0.00070	0.00053	0.00039	0.00030
43	0.00055	0.00068	0.00079	0.00080	0.00072	0.00054	0.00040	0.00030
44	0.00058	0.00069	0.00081	0.00082	0.00073	0.00055	0.00041	0.00031
45	0.00060	0.00071	0.00083	0.00085	0.00074	0.00056	0.00042	0.00031
46	0.00062	0.00072	0.00085	0.00087	0.00075	0.00056	0.00042	0.00032
47	0.00065	0.00073	0.00087	0.00089	0.00076	0.00057	0.00042	0.00032
48	0.00067	0.00074	0.00088	0.00089	0.00076	0.00057	0.00043	0.00032
49	0.00070	0.00075	0.00089	0.00090	0.00076	0.00057	0.00043	0.00032
50	0.00073	0.00075	0.00089	0.00089	0.00076	0.00057	0.00043	0.00032
51	0.00075	0.00075	0.00089	0.00089	0.00075	0.00056	0.00042	0.00032
52	0.00078	0.00075	0.00088	0.00088	0.00074	0.00056	0.00042	0.00031
53	0.00079	0.00074	0.00086	0.00087	0.00074	0.00055	0.00042	0.00031
54	0.00079	0.00074	0.00085	0.00087	0.00074	0.00056	0.00042	0.00031
55	0.00078	0.00073	0.00084	0.00087	0.00075	0.00060	0.00045	0.00034
56	0.00075	0.00072	0.00084	0.00089	0.00077	0.00065	0.00049	0.00037
57	0.00071	0.00072	0.00086	0.00092	0.00082	0.00073	0.00058	0.00048
58	0.00066	0.00071	0.00090	0.00097	0.00091	0.00085	0.00075	0.00064
59	0.00062	0.00072	0.00096	0.00106	0.00105	0.00103	0.00098	0.00085
60	0.00058	0.00074	0.00105	0.00119	0.00124	0.00126	0.00126	0.00113
61	0.00054	0.00079	0.00117	0.00136	0.00150	0.00157	0.00159	0.00150
62	0.00053	0.00087	0.00134	0.00160	0.00184	0.00197	0.00199	0.00193
63	0.00054	0.00099	0.00155	0.00191	0.00225	0.00245	0.00248	0.00242
64	0.00059	0.00116	0.00182	0.00230	0.00276	0.00304	0.00306	0.00298
65	0.00069	0.00140	0.00217	0.00277	0.00337	0.00374	0.00375	0.00362
66	0.00086	0.00172	0.00260	0.00334	0.00408	0.00456	0.00456	0.00433
67	0.00112	0.00212	0.00314	0.00402	0.00493	0.00550	0.00549	0.00513
68	0.00147	0.00262	0.00378	0.00482	0.00591	0.00657	0.00654	0.00603
69	0.00194	0.00324	0.00455	0.00575	0.00704	0.00777	0.00769	0.00702
70	0.00252	0.00398	0.00544	0.00681	0.00830	0.00910	0.00895	0.00810
71	0.00324	0.00484	0.00647	0.00802	0.00970	0.01056	0.01031	0.00928
72	0.00409	0.00584	0.00763	0.00936	0.01121	0.01211	0.01176	0.01056
73	0.00506	0.00698	0.00892	0.01081	0.01283	0.01375	0.01328	0.01193
74	0.00617	0.00826	0.01033	0.01238	0.01453	0.01547	0.01488	0.01338
75	0.00742	0.00965	0.01186	0.01404	0.01631	0.01723	0.01654	0.01491
76	0.00882	0.01116	0.01349	0.01579	0.01814	0.01904	0.01826	0.01651
77	0.01034	0.01277	0.01520	0.01761	0.02001	0.02089	0.02003	0.01818
78	0.01199	0.01447	0.01700	0.01949	0.02190	0.02275	0.02184	0.01991
79	0.01375	0.01626	0.01886	0.02142	0.02381	0.02462	0.02368	0.02169
80	0.01562	0.01814	0.02079	0.02339	0.02571	0.02649	0.02554	0.02353
81	0.01758	0.02010	0.02277	0.02539	0.02763	0.02835	0.02740	0.02539
82	0.01963	0.02214	0.02480	0.02741	0.02954	0.03021	0.02926	0.02729
83	0.02175	0.02424	0.02688	0.02946	0.03146	0.03205	0.03112	0.02921
84	0.02392	0.02640	0.02899	0.03152	0.03338	0.03389	0.03298	0.03115
85	0.02614	0.02860	0.03113	0.03359	0.03530	0.03574	0.03483	0.03309
86	0.02839	0.03083	0.03328	0.03567	0.03723	0.03758	0.03668	0.03504
87	0.03066	0.03308	0.03544	0.03774	0.03915	0.03942	0.03854	0.03700
88	0.03294	0.03534	0.03760	0.03982	0.04107	0.04126	0.04039	0.03895

Table CFG. Graduated Claims Incidence Rates—Females								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Claims Subtotal	1558	1785	1951	2089	2075	1823	1452	1083
35	0.00024	0.00035	0.00053	0.00057	0.00060	0.00077	0.00087	0.00083
36	0.00025	0.00040	0.00055	0.00059	0.00063	0.00078	0.00083	0.00077
37	0.00027	0.00044	0.00057	0.00062	0.00065	0.00078	0.00080	0.00070
38	0.00029	0.00048	0.00059	0.00064	0.00067	0.00079	0.00077	0.00064
39	0.00031	0.00052	0.00061	0.00066	0.00068	0.00080	0.00073	0.00057
40	0.00034	0.00056	0.00063	0.00067	0.00070	0.00080	0.00070	0.00052
41	0.00036	0.00059	0.00064	0.00068	0.00072	0.00080	0.00066	0.00050
42	0.00039	0.00061	0.00065	0.00069	0.00073	0.00079	0.00063	0.00047
43	0.00043	0.00064	0.00066	0.00070	0.00074	0.00078	0.00059	0.00044
44	0.00046	0.00065	0.00067	0.00071	0.00075	0.00076	0.00057	0.00043
45	0.00050	0.00066	0.00069	0.00073	0.00076	0.00073	0.00055	0.00041
46	0.00054	0.00066	0.00070	0.00074	0.00076	0.00070	0.00053	0.00040
47	0.00057	0.00067	0.00070	0.00075	0.00076	0.00067	0.00050	0.00038
48	0.00060	0.00068	0.00071	0.00077	0.00076	0.00064	0.00048	0.00036
49	0.00064	0.00069	0.00072	0.00078	0.00076	0.00060	0.00045	0.00034
50	0.00067	0.00071	0.00073	0.00080	0.00077	0.00057	0.00043	0.00032
51	0.00071	0.00073	0.00074	0.00081	0.00078	0.00059	0.00044	0.00033
52	0.00076	0.00076	0.00077	0.00084	0.00081	0.00061	0.00046	0.00034
53	0.00080	0.00079	0.00080	0.00086	0.00085	0.00064	0.00048	0.00036
54	0.00084	0.00083	0.00084	0.00090	0.00090	0.00067	0.00051	0.00038
55	0.00088	0.00086	0.00089	0.00094	0.00096	0.00072	0.00054	0.00041
56	0.00092	0.00088	0.00094	0.00099	0.00104	0.00078	0.00059	0.00044
57	0.00095	0.00090	0.00099	0.00105	0.00115	0.00086	0.00064	0.00048
58	0.00099	0.00093	0.00105	0.00113	0.00127	0.00102	0.00077	0.00058
59	0.00103	0.00097	0.00111	0.00123	0.00143	0.00126	0.00095	0.00071
60	0.00108	0.00103	0.00118	0.00138	0.00164	0.00157	0.00118	0.00088
61	0.00113	0.00111	0.00129	0.00159	0.00192	0.00195	0.00157	0.00117
62	0.00119	0.00123	0.00144	0.00187	0.00229	0.00242	0.00205	0.00154
63	0.00128	0.00141	0.00165	0.00224	0.00276	0.00298	0.00264	0.00200
64	0.00139	0.00164	0.00197	0.00272	0.00337	0.00367	0.00335	0.00267
65	0.00155	0.00194	0.00240	0.00335	0.00415	0.00450	0.00419	0.00348
66	0.00175	0.00232	0.00297	0.00414	0.00511	0.00548	0.00518	0.00444
67	0.00203	0.00281	0.00370	0.00513	0.00627	0.00665	0.00633	0.00555
68	0.00240	0.00342	0.00460	0.00632	0.00765	0.00803	0.00768	0.00683
69	0.00289	0.00418	0.00570	0.00774	0.00926	0.00963	0.00921	0.00827
70	0.00350	0.00512	0.00700	0.00938	0.01110	0.01146	0.01095	0.00989
71	0.00427	0.00624	0.00853	0.01124	0.01317	0.01352	0.01289	0.01166
72	0.00519	0.00757	0.01027	0.01332	0.01545	0.01581	0.01502	0.01359
73	0.00630	0.00912	0.01225	0.01560	0.01795	0.01831	0.01735	0.01568
74	0.00758	0.01088	0.01444	0.01807	0.02063	0.02100	0.01985	0.01793
75	0.00906	0.01286	0.01683	0.02073	0.02347	0.02385	0.02252	0.02031
76	0.01075	0.01506	0.01942	0.02357	0.02647	0.02684	0.02531	0.02283
77	0.01265	0.01746	0.02220	0.02658	0.02960	0.02996	0.02822	0.02546
78	0.01476	0.02006	0.02516	0.02973	0.03284	0.03316	0.03123	0.02820
79	0.01706	0.02282	0.02829	0.03303	0.03617	0.03642	0.03431	0.03101
80	0.01954	0.02575	0.03156	0.03644	0.03958	0.03974	0.03745	0.03389
81	0.02216	0.02880	0.03495	0.03996	0.04304	0.04309	0.04063	0.03682
82	0.02491	0.03196	0.03844	0.04357	0.04656	0.04647	0.04383	0.03979
83	0.02776	0.03521	0.04202	0.04723	0.05011	0.04987	0.04705	0.04280
84	0.03069	0.03854	0.04564	0.05094	0.05370	0.05328	0.05029	0.04583
85	0.03367	0.04193	0.04930	0.05468	0.05731	0.05670	0.05352	0.04887
86	0.03668	0.04537	0.05298	0.05844	0.06091	0.06013	0.05676	0.05193
87	0.03970	0.04882	0.05666	0.06222	0.06452	0.06356	0.06000	0.05499
88	0.04273	0.05229	0.06035	0.06600	0.06812	0.06699	0.06323	0.05805

Table MMG. Graduated Mortality Rates—Males								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Deaths Subtotal	1833	2117	2359	2512	2525	2437	2168	1808
35	0.0017	0.0013	0.0010	0.0007	0.0005	0.0004	0.0003	0.0002
36	0.0017	0.0013	0.0010	0.0007	0.0005	0.0004	0.0003	0.0002
37	0.0017	0.0013	0.0010	0.0007	0.0006	0.0005	0.0004	0.0003
38	0.0018	0.0013	0.0010	0.0007	0.0006	0.0006	0.0005	0.0004
39	0.0018	0.0013	0.0010	0.0008	0.0007	0.0007	0.0007	0.0005
40	0.0018	0.0014	0.0010	0.0008	0.0008	0.0008	0.0008	0.0007
41	0.0018	0.0014	0.0011	0.0009	0.0010	0.0010	0.0009	0.0008
42	0.0019	0.0014	0.0012	0.0011	0.0011	0.0011	0.0011	0.0010
43	0.0019	0.0015	0.0013	0.0012	0.0013	0.0012	0.0012	0.0011
44	0.0019	0.0016	0.0015	0.0014	0.0014	0.0014	0.0014	0.0013
45	0.0019	0.0017	0.0016	0.0015	0.0016	0.0016	0.0015	0.0015
46	0.0019	0.0018	0.0018	0.0017	0.0018	0.0017	0.0017	0.0016
47	0.0020	0.0020	0.0020	0.0019	0.0020	0.0019	0.0019	0.0018
48	0.0020	0.0021	0.0022	0.0021	0.0022	0.0021	0.0021	0.0020
49	0.0020	0.0022	0.0024	0.0023	0.0024	0.0024	0.0023	0.0022
50	0.0020	0.0024	0.0026	0.0025	0.0026	0.0026	0.0025	0.0024
51	0.0021	0.0025	0.0028	0.0028	0.0029	0.0029	0.0028	0.0026
52	0.0022	0.0027	0.0030	0.0031	0.0032	0.0033	0.0030	0.0029
53	0.0023	0.0028	0.0033	0.0034	0.0035	0.0036	0.0033	0.0031
54	0.0024	0.0030	0.0035	0.0037	0.0039	0.0040	0.0037	0.0034
55	0.0025	0.0032	0.0038	0.0041	0.0043	0.0044	0.0040	0.0037
56	0.0027	0.0034	0.0041	0.0044	0.0047	0.0048	0.0044	0.0041
57	0.0030	0.0037	0.0044	0.0049	0.0052	0.0053	0.0049	0.0044
58	0.0032	0.0040	0.0047	0.0053	0.0057	0.0059	0.0054	0.0048
59	0.0036	0.0043	0.0051	0.0058	0.0062	0.0065	0.0060	0.0053
60	0.0039	0.0047	0.0056	0.0063	0.0068	0.0071	0.0066	0.0058
61	0.0043	0.0051	0.0061	0.0069	0.0075	0.0078	0.0073	0.0064
62	0.0048	0.0055	0.0066	0.0076	0.0082	0.0085	0.0081	0.0070
63	0.0052	0.0060	0.0072	0.0083	0.0089	0.0094	0.0089	0.0077
64	0.0056	0.0065	0.0078	0.0090	0.0098	0.0102	0.0098	0.0085
65	0.0061	0.0071	0.0084	0.0098	0.0106	0.0112	0.0108	0.0094
66	0.0066	0.0076	0.0091	0.0107	0.0116	0.0122	0.0118	0.0104
67	0.0070	0.0082	0.0098	0.0116	0.0126	0.0133	0.0130	0.0116
68	0.0075	0.0089	0.0106	0.0126	0.0138	0.0145	0.0143	0.0128
69	0.0079	0.0096	0.0115	0.0137	0.0150	0.0158	0.0156	0.0142
70	0.0084	0.0103	0.0124	0.0148	0.0163	0.0172	0.0171	0.0157
71	0.0089	0.0110	0.0134	0.0159	0.0176	0.0187	0.0187	0.0173
72	0.0094	0.0119	0.0145	0.0172	0.0191	0.0203	0.0204	0.0191
73	0.0100	0.0127	0.0156	0.0185	0.0206	0.0219	0.0221	0.0211
74	0.0105	0.0137	0.0168	0.0199	0.0222	0.0237	0.0240	0.0231
75	0.0111	0.0146	0.0180	0.0213	0.0238	0.0255	0.0259	0.0253
76	0.0117	0.0156	0.0193	0.0228	0.0255	0.0274	0.0280	0.0276
77	0.0124	0.0167	0.0207	0.0243	0.0272	0.0293	0.0301	0.0301
78	0.0131	0.0177	0.0221	0.0259	0.0289	0.0312	0.0323	0.0326
79	0.0138	0.0188	0.0234	0.0275	0.0307	0.0332	0.0346	0.0352
80	0.0145	0.0199	0.0248	0.0290	0.0325	0.0352	0.0369	0.0379
81	0.0152	0.0210	0.0262	0.0307	0.0343	0.0372	0.0392	0.0407
82	0.0160	0.0221	0.0276	0.0323	0.0361	0.0393	0.0416	0.0435
83	0.0168	0.0232	0.0289	0.0339	0.0380	0.0413	0.0440	0.0463
84	0.0176	0.0243	0.0303	0.0355	0.0398	0.0434	0.0465	0.0492
85	0.0184	0.0253	0.0316	0.0371	0.0417	0.0454	0.0489	0.0521
86	0.0192	0.0264	0.0330	0.0387	0.0435	0.0475	0.0513	0.0550
87	0.0200	0.0275	0.0343	0.0403	0.0453	0.0495	0.0537	0.0578
88	0.0208	0.0285	0.0356	0.0419	0.0471	0.0516	0.0561	0.0607

Table MFG. Graduated Mortality Rates—Females								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Deaths Subtotal	1195	1557	1836	1975	1991	1930	1660	1309
35	0.0006	0.0005	0.0004	0.0003	0.0002	0.0002	0.0001	0.0001
36	0.0006	0.0006	0.0004	0.0003	0.0002	0.0002	0.0001	0.0001
37	0.0007	0.0006	0.0005	0.0004	0.0003	0.0002	0.0002	0.0001
38	0.0007	0.0006	0.0005	0.0004	0.0003	0.0003	0.0002	0.0002
39	0.0008	0.0007	0.0005	0.0004	0.0004	0.0003	0.0003	0.0002
40	0.0008	0.0007	0.0006	0.0005	0.0004	0.0004	0.0003	0.0002
41	0.0008	0.0007	0.0006	0.0006	0.0005	0.0005	0.0004	0.0003
42	0.0009	0.0007	0.0007	0.0006	0.0006	0.0006	0.0004	0.0003
43	0.0009	0.0008	0.0007	0.0007	0.0007	0.0007	0.0005	0.0004
44	0.0010	0.0008	0.0008	0.0008	0.0008	0.0007	0.0006	0.0004
45	0.0010	0.0009	0.0008	0.0009	0.0009	0.0008	0.0006	0.0005
46	0.0010	0.0009	0.0009	0.0010	0.0010	0.0009	0.0007	0.0006
47	0.0011	0.0010	0.0010	0.0011	0.0011	0.0011	0.0009	0.0006
48	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0010	0.0007
49	0.0012	0.0012	0.0012	0.0013	0.0014	0.0013	0.0011	0.0008
50	0.0012	0.0013	0.0013	0.0014	0.0015	0.0015	0.0013	0.0010
51	0.0013	0.0014	0.0014	0.0016	0.0016	0.0017	0.0015	0.0011
52	0.0014	0.0015	0.0016	0.0018	0.0018	0.0019	0.0016	0.0013
53	0.0014	0.0016	0.0017	0.0019	0.0020	0.0021	0.0018	0.0014
54	0.0015	0.0017	0.0019	0.0021	0.0021	0.0023	0.0020	0.0016
55	0.0015	0.0019	0.0021	0.0023	0.0023	0.0025	0.0023	0.0018
56	0.0015	0.0020	0.0023	0.0025	0.0026	0.0028	0.0025	0.0020
57	0.0016	0.0021	0.0025	0.0027	0.0028	0.0031	0.0028	0.0023
58	0.0016	0.0023	0.0028	0.0030	0.0031	0.0034	0.0031	0.0025
59	0.0016	0.0024	0.0030	0.0032	0.0034	0.0038	0.0035	0.0028
60	0.0016	0.0025	0.0033	0.0035	0.0038	0.0042	0.0038	0.0031
61	0.0017	0.0027	0.0035	0.0039	0.0042	0.0046	0.0042	0.0034
62	0.0017	0.0028	0.0038	0.0042	0.0046	0.0050	0.0046	0.0038
63	0.0018	0.0030	0.0041	0.0046	0.0050	0.0054	0.0051	0.0042
64	0.0020	0.0032	0.0044	0.0050	0.0055	0.0059	0.0055	0.0047
65	0.0022	0.0034	0.0047	0.0055	0.0061	0.0064	0.0061	0.0052
66	0.0024	0.0037	0.0051	0.0060	0.0066	0.0070	0.0066	0.0058
67	0.0026	0.0040	0.0055	0.0065	0.0073	0.0076	0.0073	0.0064
68	0.0029	0.0043	0.0059	0.0071	0.0079	0.0083	0.0079	0.0071
69	0.0032	0.0047	0.0064	0.0077	0.0087	0.0091	0.0087	0.0079
70	0.0036	0.0052	0.0070	0.0084	0.0094	0.0099	0.0095	0.0087
71	0.0040	0.0057	0.0075	0.0091	0.0103	0.0108	0.0104	0.0097
72	0.0044	0.0062	0.0081	0.0099	0.0112	0.0118	0.0114	0.0108
73	0.0048	0.0068	0.0088	0.0107	0.0121	0.0128	0.0125	0.0120
74	0.0052	0.0074	0.0095	0.0116	0.0132	0.0139	0.0138	0.0132
75	0.0057	0.0081	0.0103	0.0126	0.0143	0.0151	0.0151	0.0146
76	0.0062	0.0087	0.0111	0.0136	0.0155	0.0164	0.0165	0.0161
77	0.0067	0.0094	0.0120	0.0147	0.0167	0.0177	0.0179	0.0176
78	0.0072	0.0101	0.0130	0.0159	0.0180	0.0191	0.0195	0.0193
79	0.0077	0.0109	0.0140	0.0171	0.0193	0.0206	0.0210	0.0209
80	0.0083	0.0116	0.0150	0.0183	0.0206	0.0220	0.0227	0.0227
81	0.0088	0.0124	0.0161	0.0195	0.0220	0.0235	0.0243	0.0244
82	0.0094	0.0133	0.0171	0.0208	0.0234	0.0250	0.0260	0.0262
83	0.0100	0.0141	0.0182	0.0220	0.0248	0.0266	0.0276	0.0280
84	0.0106	0.0150	0.0193	0.0233	0.0263	0.0281	0.0293	0.0299
85	0.0112	0.0159	0.0204	0.0246	0.0277	0.0297	0.0310	0.0317
86	0.0118	0.0168	0.0216	0.0259	0.0292	0.0313	0.0326	0.0335
87	0.0124	0.0177	0.0227	0.0272	0.0307	0.0328	0.0343	0.0354
88	0.0131	0.0186	0.0238	0.0285	0.0322	0.0344	0.0360	0.0372

Table LMG. Graduated Lapse Rates—Males								
Issue Age	Policy Year							
	1	2	3	4	5	6	7	8+
Lapses Subtotal	8200	5397	3397	2246	1636	1222	920	647
35	0.053	0.041	0.031	0.024	0.018	0.014	0.010	0.005
36	0.051	0.039	0.030	0.023	0.017	0.013	0.009	0.005
37	0.049	0.038	0.029	0.022	0.017	0.012	0.009	0.005
38	0.048	0.037	0.027	0.021	0.016	0.012	0.008	0.005
39	0.046	0.035	0.026	0.020	0.015	0.011	0.008	0.004
40	0.045	0.034	0.025	0.018	0.014	0.010	0.007	0.004
41	0.043	0.032	0.024	0.017	0.013	0.009	0.007	0.004
42	0.042	0.031	0.022	0.016	0.012	0.009	0.006	0.004
43	0.041	0.030	0.021	0.015	0.011	0.008	0.006	0.004
44	0.039	0.029	0.020	0.014	0.011	0.008	0.005	0.003
45	0.038	0.027	0.019	0.013	0.010	0.007	0.005	0.003
46	0.037	0.026	0.018	0.013	0.009	0.006	0.005	0.003
47	0.036	0.025	0.017	0.012	0.008	0.006	0.004	0.003
48	0.034	0.024	0.016	0.011	0.008	0.006	0.004	0.003
49	0.033	0.023	0.015	0.010	0.007	0.005	0.004	0.002
50	0.032	0.023	0.015	0.010	0.007	0.005	0.003	0.002
51	0.031	0.022	0.014	0.009	0.006	0.004	0.003	0.002
52	0.031	0.021	0.013	0.008	0.006	0.004	0.003	0.002
53	0.030	0.020	0.012	0.008	0.005	0.004	0.003	0.002
54	0.029	0.019	0.012	0.007	0.005	0.003	0.003	0.002
55	0.028	0.019	0.011	0.007	0.005	0.003	0.002	0.002
56	0.028	0.018	0.011	0.006	0.004	0.003	0.002	0.002
57	0.027	0.017	0.010	0.006	0.004	0.003	0.002	0.002
58	0.027	0.017	0.010	0.006	0.004	0.003	0.002	0.002
59	0.026	0.016	0.009	0.005	0.004	0.003	0.002	0.002
60	0.026	0.015	0.009	0.005	0.003	0.002	0.002	0.002
61	0.025	0.015	0.008	0.005	0.003	0.002	0.002	0.002
62	0.025	0.014	0.008	0.005	0.003	0.002	0.002	0.002
63	0.024	0.014	0.008	0.005	0.003	0.002	0.002	0.002
64	0.024	0.014	0.008	0.004	0.003	0.002	0.002	0.002
65	0.023	0.013	0.007	0.004	0.003	0.003	0.002	0.002
66	0.023	0.013	0.007	0.004	0.003	0.003	0.002	0.002
67	0.023	0.013	0.007	0.004	0.003	0.003	0.002	0.002
68	0.022	0.013	0.007	0.005	0.003	0.003	0.002	0.002
69	0.022	0.013	0.007	0.005	0.004	0.003	0.002	0.002
70	0.022	0.013	0.008	0.005	0.004	0.003	0.002	0.002
71	0.022	0.014	0.008	0.005	0.004	0.003	0.002	0.002
72	0.022	0.014	0.008	0.005	0.004	0.003	0.003	0.002
73	0.022	0.014	0.009	0.006	0.004	0.004	0.003	0.002
74	0.022	0.015	0.009	0.006	0.005	0.004	0.003	0.002
75	0.023	0.015	0.010	0.006	0.005	0.004	0.003	0.002
76	0.023	0.016	0.010	0.007	0.005	0.004	0.003	0.002
77	0.023	0.016	0.011	0.007	0.005	0.004	0.003	0.002
78	0.024	0.017	0.011	0.008	0.006	0.004	0.003	0.002
79	0.024	0.018	0.012	0.008	0.006	0.004	0.003	0.002
80	0.025	0.018	0.012	0.009	0.006	0.005	0.003	0.001
81	0.025	0.019	0.013	0.009	0.007	0.005	0.003	0.001
82	0.026	0.019	0.014	0.010	0.007	0.005	0.003	0.001
83	0.026	0.020	0.014	0.010	0.007	0.005	0.003	0.001
84	0.027	0.021	0.015	0.011	0.008	0.005	0.003	0.001
85	0.028	0.021	0.016	0.011	0.008	0.005	0.003	0.001
86	0.028	0.022	0.017	0.012	0.008	0.005	0.003	0.001
87	0.029	0.023	0.017	0.013	0.009	0.006	0.003	0.001
88	0.029	0.023	0.018	0.013	0.009	0.006	0.003	0.000

Table LFG. Graduated Lapse Rates—Females

Issue Age	Policy Year							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8+**
Lapses Subtotal	8587	5387	3253	2143	1601	1206	855	529
35	0.054	0.039	0.029	0.023	0.017	0.012	0.007	0.002
36	0.052	0.038	0.028	0.021	0.016	0.011	0.006	0.002
37	0.050	0.036	0.026	0.020	0.015	0.010	0.006	0.002
38	0.048	0.035	0.025	0.019	0.014	0.010	0.006	0.002
39	0.046	0.033	0.024	0.018	0.013	0.009	0.005	0.002
40	0.044	0.032	0.023	0.016	0.012	0.008	0.005	0.002
41	0.043	0.030	0.021	0.015	0.011	0.008	0.005	0.002
42	0.041	0.029	0.020	0.014	0.010	0.007	0.004	0.002
43	0.040	0.028	0.019	0.013	0.009	0.007	0.004	0.002
44	0.038	0.027	0.018	0.012	0.009	0.006	0.004	0.002
45	0.037	0.026	0.017	0.012	0.008	0.006	0.004	0.002
46	0.036	0.024	0.016	0.011	0.008	0.005	0.003	0.002
47	0.035	0.024	0.015	0.010	0.007	0.005	0.003	0.002
48	0.034	0.023	0.014	0.010	0.007	0.004	0.003	0.002
49	0.033	0.022	0.014	0.009	0.006	0.004	0.003	0.002
50	0.033	0.021	0.013	0.009	0.006	0.004	0.003	0.002
51	0.032	0.020	0.012	0.008	0.006	0.004	0.003	0.002
52	0.031	0.020	0.012	0.008	0.005	0.004	0.003	0.002
53	0.031	0.019	0.012	0.007	0.005	0.003	0.002	0.002
54	0.030	0.019	0.011	0.007	0.005	0.003	0.002	0.002
55	0.030	0.018	0.011	0.007	0.005	0.003	0.002	0.002
56	0.030	0.018	0.010	0.006	0.004	0.003	0.002	0.002
57	0.029	0.017	0.010	0.006	0.004	0.003	0.002	0.002
58	0.029	0.017	0.010	0.006	0.004	0.003	0.002	0.002
59	0.028	0.017	0.009	0.006	0.004	0.003	0.002	0.002
60	0.028	0.016	0.009	0.005	0.004	0.003	0.002	0.002
61	0.027	0.016	0.009	0.005	0.004	0.003	0.002	0.002
62	0.027	0.015	0.008	0.005	0.004	0.003	0.002	0.002
63	0.026	0.015	0.008	0.005	0.004	0.003	0.002	0.002
64	0.025	0.015	0.008	0.005	0.004	0.003	0.002	0.002
65	0.025	0.014	0.008	0.005	0.004	0.003	0.002	0.002
66	0.024	0.014	0.008	0.005	0.004	0.003	0.003	0.002
67	0.024	0.014	0.008	0.005	0.004	0.003	0.003	0.002
68	0.024	0.014	0.007	0.005	0.004	0.003	0.003	0.002
69	0.024	0.014	0.008	0.005	0.004	0.004	0.003	0.002
70	0.024	0.014	0.008	0.005	0.004	0.004	0.003	0.002
71	0.024	0.014	0.008	0.005	0.004	0.004	0.003	0.002
72	0.024	0.014	0.008	0.005	0.005	0.004	0.003	0.002
73	0.024	0.015	0.008	0.006	0.005	0.004	0.003	0.002
74	0.024	0.015	0.009	0.006	0.005	0.004	0.003	0.003
75	0.024	0.015	0.009	0.006	0.005	0.005	0.004	0.003
76	0.025	0.016	0.010	0.007	0.005	0.005	0.004	0.003
77	0.025	0.016	0.010	0.007	0.006	0.005	0.004	0.003
78	0.025	0.017	0.011	0.007	0.006	0.005	0.004	0.003
79	0.026	0.017	0.011	0.008	0.006	0.005	0.004	0.003
80	0.026	0.018	0.012	0.008	0.007	0.005	0.004	0.003
81	0.026	0.019	0.013	0.009	0.007	0.006	0.004	0.003
82	0.027	0.019	0.013	0.009	0.007	0.006	0.004	0.003
83	0.027	0.020	0.014	0.010	0.007	0.006	0.004	0.003
84	0.027	0.020	0.015	0.010	0.008	0.006	0.005	0.003
85	0.028	0.021	0.015	0.011	0.008	0.006	0.005	0.003
86	0.028	0.022	0.016	0.012	0.008	0.006	0.005	0.003
87	0.029	0.022	0.017	0.012	0.009	0.007	0.005	0.003
88	0.029	0.023	0.017	0.013	0.009	0.007	0.005	0.003