



SOCIETY OF ACTUARIES

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Three More Years! Three More Years!¹

A follow-up to the article *Comfort Food for an Actuary: Cognitive Testing in Underwriting the Elderly*, published in the May 2006 edition of *Product Matters!*

by Eric D. Golus, Laura Vecchione and Thomas Ashley

Having just come off a hotly contested presidential primary season and with the presidential election just around the corner, many conversations have considered who will be taking up residence at 1600 Pennsylvania Avenue next year. We admit that the title of this article is a bit misleading since the appropriate saying is four more years, not three more years and that it is more appropriate when an incumbent president is seeking re-election, which is not the case in the upcoming election. However, we are excited to report updated results based upon three more years of data in our Delayed Word Recall (DWR) Test mortality study. The mortality study was originally presented in the May 2006 edition of *Product Matters!* in the article titled, *Comfort Food for an Actuary: Cognitive Testing in Underwriting the Elderly*. The article can be found at <http://www.soa.org/library/newsletters/product-development-news/2006/may/pdn0605.pdf>. Since many of the concepts still apply, some of the text in this article is taken directly from the prior article.

The current article will:

- refresh the reader as to the background of the DWR Test mortality study, the mortality study population and mortality study methodology,
- present the results of the updated mortality study,
- introduce a Cost-Savings Analysis, and

- discuss the results of a recent survey of life insurance companies concerning their underwriting of the elderly.

Background

It has been shown that in community dwelling elderly populations, cognitive dysfunction is a predictor of mortality.² We decided to study the use of a cognitive test, the DWR Test, as a potential underwriting tool in an insured population because a DWR Test is simple to administer, objectively scored and easily validated. We will show that as the population ages and more life insurance is being applied for at the older ages, performing a cognitive test such as a DWR Test on elderly applicants can help life insurance companies become comfortable with writing large amounts of elderly business.

A DWR Test uses a predefined and validated list of 10 words. The examiner presents each word to the subject visually on a flash card. The subject reads the word aloud and then uses it in a sentence, after which the process is repeated. Following the process, the subject is administered other tests during a five-minute period. When this five-minute period is over, the subject is asked to recall as many of the 10 words from the first test as possible. The subject does not have a time limit on the recall period and the resulting test score is the number of words the subject recalls.³

¹ This article is based on an article that was published in the *Journal of Insurance Medicine* that similarly updated an earlier article on the Delayed Word Recall Test mortality study. *J Insur Med* 2007;39:264-269.

² Fried, L.P., et al. Risk Factors for 5-year Mortality in Older Adults: The Cardiovascular Health Study. *JAMA* 1998;278(8):585-592.

³ Knopman, D.S., et al. Development and standardization of a new telephonic cognitive screening test: the Minnesota cognitive acuity screen (MCAS). *Neuropsychiatry, Neuropsychology, and Behavioral Neurology*: 2000;13(4):286-296.

Mortality Study Population and Methodology

We performed a mortality study on a population of applicants ages 70 and older underwritten for an employer-sponsored long-term care insurance (LTCI) program where a DWR Test was utilized. Companies that sell LTCI routinely test applicants ages 70 and older using a variety of cognitive tests for evidence of cognitive dysfunction. We recognize that we used a population underwritten for LTCI, not life insurance. However, we thought this was the best surrogate population available since this population represented a group of (mostly) retired workers who share many of the characteristics we would expect in a population applying for life insurance.

After being underwritten, each applicant was accepted for LTCI (12,928 applicants), declined for cognitive impairment (1,703 applicants) or declined for medical reasons (7,477 applicants). The mortality study included all those who were accepted for LTCI or declined for cognitive impairment since both of these groups include applicants who we judged to be acceptable for life insurance.

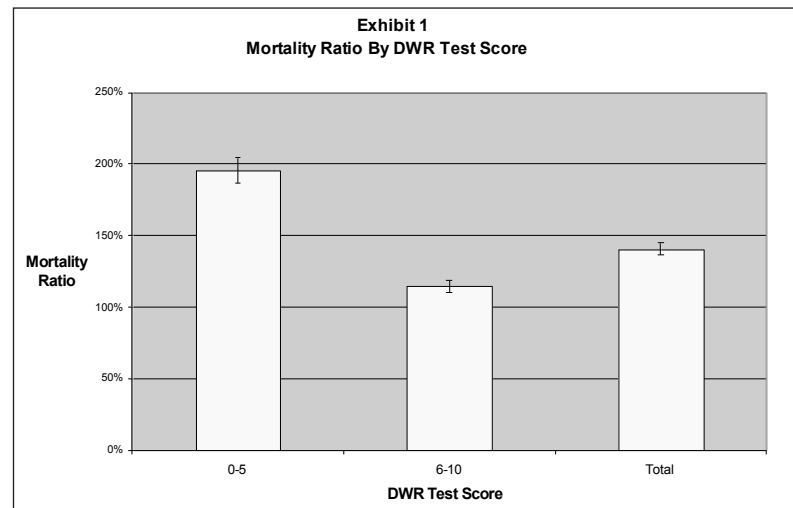
For the updated study (2006 Study), the exposure period for each applicant started at the date of underwriting and continued until May 2006 or death. This is an additional three-plus years of observation over the original study (2003 Study) which ended the exposure period in March 2003.

For the 2006 Study, applicants underwritten from March 1995 to May 2006 were included. This is an additional three-plus years over the 2003 Study which ended with applicants underwritten before March 2003.

Mortality Study Results

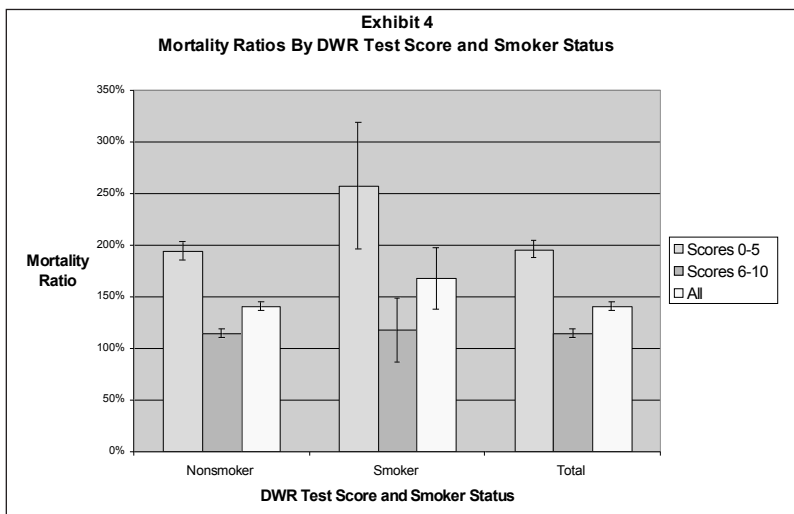
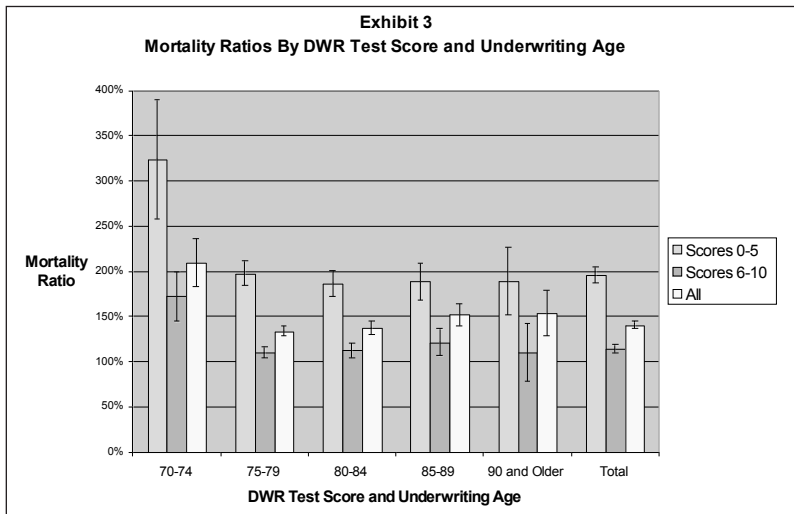
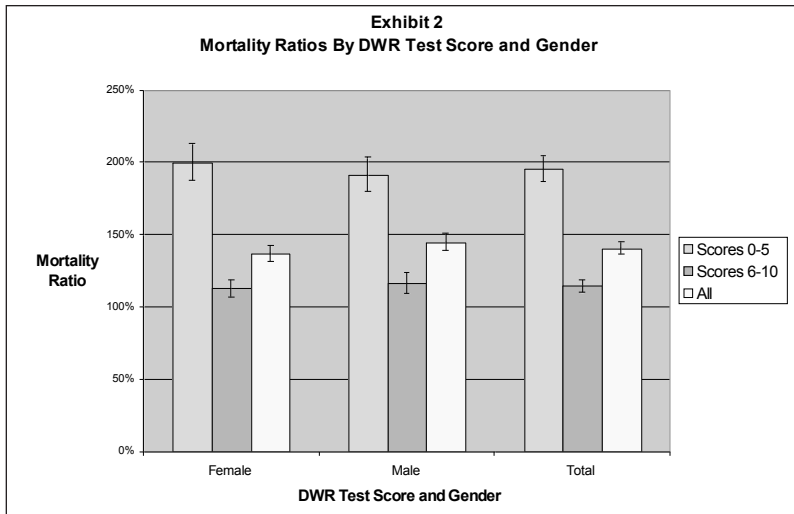
For the 2006 Study, the overall mortality ratio was 141 percent where expected mortality was based upon the 2001 VBT Select and Ultimate Smoker Distinct, Sex Distinct Tables. For those in the group recalling zero to five words (poorer scoring

group) on the DWR Test, the mortality ratio was 196 percent while those in the group recalling six to 10 words (better scoring group), the mortality ratio was 114 percent. The results show that the mortality ratio for the poorer scoring group was significantly higher than the mortality ratio for the better scoring group. Thus, **DWR Testing can be used to differentiate the mortality risk associated with elderly applicants.** Exhibit 1 shows these mortality ratios and 95 percent confidence intervals of the mortality ratios. The whiskers on the mortality ratio boxes in the exhibit represent the confidence intervals.



The results are further divided by gender, underwriting age and smoking status in Exhibits 2 to 4, respectively. The results show that when the data was dissected by the groupings for these variables, the mortality ratios for the poorer scoring groups were significantly higher than the mortality ratios for the better scoring groups. (For example, for males and females separately, the poorer scoring group had significantly higher mortality ratios than the better scoring groups.) Thus, **DWR Testing can be used to differentiate the mortality risk associated with elderly applicants for all the breakdowns of the variables examined.**

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To quantify the difference between the mortality of the poorer scoring group and the better scoring group, we calculated the

ratio of the mortality ratios for these groups. Overall, this ratio was 171 percent (= 196 percent/114 percent), meaning that the poorer scoring group had 71 percent higher mortality than the better scoring group. Exhibits 5 to 7 display the ratios of the mortality ratios of the poorer scoring groups to the better scoring groups for the various groupings of gender, underwriting age and smoking status, respectively.

Exhibit 5
Ratio of Mortality Ratios of Poorer Scoring Group to Better Scoring Group By Gender

Gender	
Female	178%
Male	164%
Total	171%

Exhibit 6
Ratio of Mortality Ratios of Poorer Scoring Group to Better Scoring Group By Underwriting Age

Underwriting Age	
70-74	188%
75-79	180%
80-84	166%
85-89	155%
90 and Older	171%
Total	171%

Exhibit 7
Ratio of Mortality Ratios of Poorer Scoring Group to Better Scoring Group By Smoking Status

Smoking Status	
Nonsmoker	170%
Smoker	219%
Total	171%

In the original article, the mortality ratios overall, for the poorer scoring group and for the better scoring group were 71 percent, 136 percent and 35 percent, respectively. These results are noticeably different than the results in Exhibit 1. This difference is due to an error in the data we were provided for the 2003 Study. The error involved the exclusion of data points which were not representative of the 2003 Study as a whole. The 2006 Study included all the data points.

Two conclusions can be drawn from the 2006 Study when compared to the corrected

2003 Study. First, the ratio of the mortality ratios was not materially different (171 percent vs. 174 percent). Second, **the additional three years of exposure in the 2006 Study shows that the power of DWR Testing persisted to the end of the exposure period in policy year 12 but diminished with duration.** This can be viewed in Exhibit 8.

Policy Years	Corrected 2003 Study	2006 Study
1 to 4	201%	198%
5 to 8	149%	165%
9 to 12	0%	150%
Total	174%	171%

We also note that the three additional years of underwriting in the 2006 Study had roughly the same ratio of mortality ratios of the poorer scoring group to the better scoring group as the other years of underwriting (233 percent vs. 203 percent).

Cost-Savings Analysis

As another avenue to highlight the power of DWR Testing, we performed a Cost-Savings Analysis. The Analysis focused on the Savings part of the equation. It examined the present value of death benefits paid to the mortality study population who died during the mortality study. It assumed that the death benefit paid was \$500,000 per person and the discount rate was 5 percent. It then split the present value of death benefits into groups based upon DWR Test score and underwriting age. Exhibit 9 shows this information. The exhibit also provides the percent reduction in the present value of death benefits paid had the poorer scoring group been declined for insurance due to their low DWR Test scores. **The percent reduction increased with age showing that the mortality savings associated with DWR Testing increased with age.**

DWR Test Score	Underwriting Age					
	Total	70-74	75-79	80-84	85-89	90+
0 to 5 (poorer scoring group)	783	36	324	251	131	41
6 to 10 (better scoring group)	927	58	469	285	97	18
All	1,710	94	793	536	229	59
Percent Reduction by Declining the Poorer Scoring Group	46%	39%	41%	47%	57%	70%

In our Analysis, out of \$1,710 million of total death benefits paid, \$783 million was saved due to declining the poorer scoring group. When the savings is compared to the number of people underwritten, we find that the maximum testing cost per person underwritten is \$35,000. In other words, DWR Testing was an effective means of reducing mortality costs as long as the cost associated with performing a DWR Test is less than \$35,000. Obviously, the cost is less. Note that the number of people underwritten that we refer to here (22,108) is larger than the mortality study population (14,631) since it includes applicants who would have been underwritten and had DWR Test performed on them but would not have made it into the mortality study population since they were declined for medical reasons.

Our Analysis assumes that a DWR Test is the only way to pick up cognitive dysfunction and the extra mortality associated with it in the elderly insured population. While this is not 100 percent true, there is evidence that other underwriting tools do a much poorer job of identifying cognitive dysfunction. Attending physician statements, for example, are ineffective since physicians typically misjudge cognitive function and neglect to record cognitive status in the record. In one study of office-based care, the record accurately reported only about 20 percent of cases of mild dementia and 80 percent of severe dementia. Overall, the record neglected detection of over 60 percent of dementia cases.⁴ The reader is welcome to use a discount factor he or she

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⁴ Valcour VG, et al. Arch Intern Med 2000;160:2964-8



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thinks is appropriate to recognize that other underwriting tools may pick up cognitive dysfunction. Even a very large discount preserves substantial savings from use of a DWR Test.

Elderly Underwriting Survey

The Society of Actuaries recently published the results of a survey that was taken in August/September 2006 that asked life insurance companies about their elderly underwriting practices. Since that time, we have noticed changes in the way in which life insurance companies were assessing elderly risks. To get a better feel for the changing climate, Gen Re LifeHealth sponsored a similar survey where we surveyed 41 companies in January 2008. The following is a discussion of the results of the survey. It is similar to the discussion presented in our survey report.

Nearly half of the companies participating reported they use cognitive function tests on elderly applicants as a standard practice, or are planning to implement in 2008. Of those companies that are currently using cognitive function tests, six out of the 11 companies use either the DWR Test or the Clock Drawing Test (CDT), which measures the ability of a subject to draw a clock face. While six out of these 11 companies reported using one test, five companies use multiple tests, most frequently teaming the DWR Test and the CDT. These two tests also appear to be most popular with the eight companies that are planning to add cognitive function tests in 2008.

When asked why they use cognitive testing, companies most often cited that they are unable to obtain relevant information through existing requirements. Following this response, companies then cited that the problems are too common to ignore and that they are able to offer more competitive premiums to those that pass the test.

As indicated earlier, just over half of the participating companies reported neither

using cognitive function testing with elderly applicants nor planning to add it in 2008. Twelve out of these 21 companies cited as their reason, that the information can be obtained from other requirements. This judgment contradicts that of companies that use cognitive function tests, and could be the primary explanation for differences in underwriting strategy.

Conclusion

The results of our mortality studies and Cost-Savings Analysis make the power of DWR Testing apparent. The mortality studies have been cited as, “important first steps in an attempt to quantify the mortality impact of cognitive screening.”⁵ Life insurance companies have begun to recognize that different or additional tools are needed to underwrite elderly risks versus non-elderly risks. Recent information has shown that life insurance companies are beginning to introduce these tools into the marketplace. We encourage life insurance companies to endorse the new protocol sooner rather than later. Waiting to see how all of this unfolds runs the risk of being selected against by applicants who would be unacceptable to companies that have started DWR Testing.

One practical consideration that needs to be addressed before DWR Testing becomes a more universal underwriting tool for the elderly is the administration of the DWR Tests by parameds. We challenge the life insurance industry to make paramed training a priority.

People often try to predict the outcome of the presidential election using unconventional means. We would like to throw our hat into the ring with something we hope will become more conventional, at least in the life insurance world. We would like to use the DWR Test scores of the presidential nominees to determine the winner of the election. If only politics were so simple. ■

⁵ Margolis, B. Cognitive Testing in the Elderly—A Predictor of Mortality? J Insur Med 2007; 39:237-238.