

Report on the Survey of Older Age Mortality and Other Assumptions

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*Product Development Section
Society of Actuaries*

PREPARED BY

*Tim Rozar, FSA, CERA, MAAA
Catie Muccigrosso, FALU
Susan Willeat, FSA, MAAA*



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Project Overview

Mortality at older ages has been an increasingly important issue for new products and profitability of current products. The Product Development Section Council of the Society of Actuaries (SOA) engaged RGA Reinsurance Co. (RGA) to undertake a research project into the mortality and other actuarial assumptions for products sold at older ages.

The project included coverage of the following topics:

- Product designs and sales trends by age
- Underwriting requirements at older ages
- Mortality assumptions at older ages including selection factors, mortality level, preferred discounts and mortality improvement
- Lapse assumptions
- Comparisons between fully underwritten life insurance and long-term care insurance

Note: The survey request also included questions covering simplified issue life insurance products sold at the older ages including final expense and preneed. Due to the limited number of responses received and the inconsistencies in some of the submissions, analysis of simplified issue products was not included in this report.

A list of the 20 companies that submitted responses to the survey can be found in [Appendix A](#) (p. 48).

Disclosures

This report is intended for use by actuaries, underwriters and other professionals familiar with the product design, underwriting and marketing techniques used by U.S. life insurance companies at the older ages. The actuary responsible for preparing this report is Tim Rozar, FSA, MAAA, CERA, a qualified actuary. The results and analyses presented are derived from the responses to a survey questionnaire. While good faith effort has been made to analyze the reasonableness of each response, the final report is ultimately reliant on the accuracy of the underlying survey responses.

The results provided herein come from a variety of life insurance companies with unique product structures, target markets, underwriting philosophies and distribution methods. As such, these results should not be deemed directly applicable to any particular company or representative of the life insurance industry as a whole.

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Executive Summary

The following high-level conclusions may be drawn from the survey responses.

Fully Underwritten Life Insurance Products

- Among responding companies, universal life secondary guarantee (ULSG) is the most popular product sold to those above age 65 by face amount and policy count (*p. 7*).
- Policy sizes for fully underwritten life are generally higher at older ages (*p. 8*).
- Business over age 65 became an increasing portion of total sales through issue years 2005–07, although that trend seems to have reversed somewhat over the past five years (*p. 9*).
- A slight trend toward increasing maximum issue age was observed between 2005 and 2011 (*p. 10*).
- Per-life retention limits and total case capacity generally decrease as age increases. A trend toward increased retention limits and capacity was observed between 2005 and 2011 at all ages, including the older ages (*p. 11*).
- The availability of several common riders decreases by increasing issue age (*p. 12*).
- Of the companies responding, stranger-owned life insurance (STOLI) sales have dropped significantly since 2005. Many companies have put safeguards in place to identify STOLI cases (*p. 13*).

Fully Underwritten Life Insurance Underwriting

- Companies commonly incorporate cognitive function assessment into the underwriting process (*p. 15*). The delayed word recall (DWR) test, typically with 10 words, is among the most commonly administered cognitive tests (*p. 15*).
- While not as commonly used in life underwriting, respondents ranked the Enhanced Mental Skills Test (EMST), Mini-Mental Status Exam (MMSE) and Minnesota Cognitive Acuity Screen (MCAS) high on predictive value (*p. 19*). The 10-word delayed word recall also scored high in predictive value and was scored highest for protective value.
- Functional tests are also commonly performed as part of the underwriting process (*p. 17*). The get-up-and-go test, typically timed, is the most commonly administered functional test (*p. 17*).
- Preferred criteria requirements often differ at older ages relative to younger ages (*p. 20*). Some requirements such as blood pressure, maximum cholesterol, family history and maximum weight tend to be liberalized at older ages. Other requirements such as pulse pressure, minimum cholesterol and minimum weight are typically more conservative when they vary at the older ages.

Fully Underwritten Life Insurance Actuarial Assumptions

- The majority of respondents consider their internal experience studies as the primary source for setting assumptions at older ages (*p. 23*) and typically develop their own internal mortality table (*p. 24*). Assumptions are commonly revised to reflect internal and industry experience study results as well as changes to underwriting requirements (*p. 25*).
- The number of years of selection built into mortality assumptions often decreases at older ages (*p. 27*). However, a wide variation is observed in the specific selection factors used (*p. 28*).
- A wide variation is also observed in the pattern of mortality by issue age for a given duration (*p. 32*). In general, the increase in mortality rates by issue age is flatter at the earlier durations.

- Most companies have the same number of risk classes available at older ages, although some limit the availability of the best-preferred classes above age 80 (p. 35).
- In general, the difference between the average mortality assumption for the best-preferred class and the residual standard class decreases at older ages and later durations (p. 35).
- Companies commonly assume future mortality improvement but tend to reduce the amount of improvement assumed at older ages and later durations (p.37).
- Lapse rates are generally assumed to be lower for older issue ages for a given product and duration (p. 40).

Long-Term Care

- Cognitive and physical function testing is commonly used for underwriting long-term care (LTC) insurance (p. 41). The EMST is the most commonly used cognitive test among the responding LTC companies.
- The average select period decreases at higher issue ages. The average select period used for LTC mortality assumptions is shorter than for fully underwritten life insurance (p. 43). On average, a smaller select-period discount was used for LTC mortality assumptions than for fully underwritten life insurance.

Fully Underwritten Life Insurance: Background

Eighteen companies provided some information on fully underwritten life insurance, defined as products subject to a full medical application and additional evidence as required based on age and amount (attending physician statement, medical exam, blood profile, etc.). Not every company that responded to this section of the survey answered every question; therefore, total counts will vary between the sections.

Sales by Issue Age and Product Type

Companies were asked to provide sales numbers for calendar year 2011 by product and issue age.

Face Amount

The total face amount issued by all of the responding companies was summed by issue age and product type. The following charts display the product type distribution by issue age, as well as the issue age distribution by product type based on face amount sold.

Table 1.

	Product Distribution by Issue Age					Issue Age Distribution by Product			
	<65	65–79	80+	Total		<65	65–79	80+	Total
VUL/Variable Life	3.9%	4.5%	21.3%	4.0%		93.9%	4.9%	1.1%	100%
Accumulation UL	5.2%	23.0%	27.9%	6.0%		82.4%	16.6%	1.0%	100%
ULSG	6.5%	48.3%	47.4%	8.4%		73.8%	25.0%	1.2%	100%
Whole Life	9.2%	2.6%	2.1%	8.9%		98.7%	1.3%	0.1%	100%
Term or Term UL	74.3%	20.4%	0.1%	71.8%		98.8%	1.2%	0.0%	100%
Other	0.9%	1.1%	1.3%	0.9%		94.4%	5.3%	0.3%	100%
Total	100%	100%	100%	100%		95.4%	4.3%	0.2%	100%

Among responding companies, term or term universal life (UL) was the most popular product for applicants under age 65 with 74 percent of the total sales by volume. Universal life with secondary guarantees (ULSG) was the most popular for those over age 65 with approximately 48 percent of sales. About 95 percent of all products were sold to those under age 65; however, ULSG had a significantly different age distribution than other products with 26 percent of sales by volume above age 65.

Policy Count

The number of policies issued by all of the responding companies was summed by issue age and product type. The following charts display the product type distribution by issue age, as well as the issue age distribution by product type based on the number of policies sold.

Table 2.

	Product Distribution by Issue Age					Issue Age Distribution by Product			
	<65	65–79	80+	Total		<65	65–79	80+	Total
VUL/Variable Life	1.7%	2.0%	5.8%	1.7%		95.2%	4.3%	0.5%	100%
Accumulation UL	10.2%	19.6%	36.8%	10.6%		92.6%	6.9%	0.5%	100%
ULSG	4.2%	36.4%	43.6%	5.4%		74.0%	24.9%	1.1%	100%
Whole Life	23.8%	15.5%	11.4%	23.5%		97.5%	2.4%	0.1%	100%
Term or Term UL	59.1%	24.7%	0.5%	57.7%		98.4%	1.6%	0.0%	100%
Other	1.0%	1.8%	1.8%	1.1%		93.4%	6.4%	0.2%	100%
Total	100%	100%	100%	100%		96.1%	3.7%	0.1%	100%

Similar trends are evident by count as by amount. Term or term UL was the most popular product for applicants under age 65 with 59 percent of the total sales by count. ULSG was the most popular for those over age 65 with 36 percent of sales between ages 65 to 79 and 44 percent of sales ages 80 and over. More than 25 percent of ULSG sales by policy count were above age 65.

Average Size

The total face amount volumes and policy counts were also used to calculate the average face amount by issue age and product type.

Table 3.

	Average Policy Size			
	<65	65–79	80+	Total
VUL/Variable Life	\$ 695,901	\$ 803,370	\$ 1,780,113	\$ 705,477
Accumulation UL	154,043	418,679	370,315	173,279
ULSG	468,522	471,734	531,074	469,993
Whole Life	117,071	59,873	88,979	115,651
Term or Term UL	380,314	293,652	--	378,930
Other	266,165	217,637	342,090	263,236
Total	302,452	355,565	488,459	304,676

Accumulation UL showed significantly higher average sizes above age 65 compared to below age 65. Similarly, variable universal life (VUL) or variable life also showed an increase in average size at older ages. Overall, the average policy size for those over 65 is larger than those under 65. This is especially true for accumulation UL as well as variable products. Whole life and term showed decreases in face amount at older ages, although the number of term policies above age 80 is too small to make any conclusions.

Product Sales Trends

Companies were asked to provide information about the in-force amounts as of Dec. 31, 2011, by original issue year, issue age and product type. Although not a perfect surrogate for volumes issued due to differences in cumulative decrement rates by product, issue year and issue age, this is intended to provide an indication of the trends in product popularity by issue age.

In Force by Product Type and Issue Year—All Ages

The total face amount in force as of Dec. 31, 2011, was summed across all companies by issue year and product type. The following chart shows the product distribution by issue year based on in-force volume for all issue ages.

Table 4.

	Product Distribution by Issue Year—All Issue Ages								
	<1980	1980 –89	1990 –99	2000 –04	2005 –07	2008	2009	2010	2011
VUL/Variable Life	0.2%	9.9%	15.5%	10.3%	7.1%	7.5%	3.9%	4.3%	4.5%
Accumulation UL	0.0%	34.8%	19.5%	9.0%	6.5%	4.9%	4.5%	5.9%	8.6%
ULSG	0.0%	0.0%	1.0%	5.0%	12.8%	12.7%	13.7%	13.0%	9.2%
Whole Life	95.4%	46.8%	23.0%	6.2%	6.5%	7.2%	7.3%	9.1%	9.9%
Term or Term UL	4.4%	8.4%	41.0%	69.6%	67.1%	67.4%	70.2%	67.0%	66.9%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.4%	0.7%	0.8%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

For all ages, the rising popularity of term and term UL can be observed starting in the 1990s and continuing to grow through 2009. ULSG as a product category beginning in the early 2000s has gained in popularity as well while traditional whole life, VUL and accumulation UL have all declined.

In Force by Product Type and Issue Year—Older Ages

The following chart shows the product distribution by issue year by in-force volume for ages 65 and older.

Table 5.

	Product Distribution by Issue Year—Issue Ages 65+								
	<1980	1980 –89	1990 –99	2000 –04	2005 –07	2008	2009	2010	2011
VUL/Variable Life	0.0%	4.0%	13.0%	11.3%	3.4%	3.9%	2.9%	4.3%	6.4%
Accumulation UL	0.0%	26.1%	39.3%	42.2%	27.8%	15.1%	9.5%	11.7%	26.7%
ULSG	0.0%	0.0%	6.7%	38.4%	63.6%	69.6%	70.7%	63.2%	44.7%
Whole Life	100.0%	69.8%	39.2%	2.6%	1.2%	1.8%	2.3%	2.9%	2.9%
Term or Term UL	0.0%	0.2%	1.7%	5.5%	4.0%	9.5%	14.5%	17.4%	18.8%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.5%	0.5%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Focusing specifically on the older ages, it is clear that ULSG is a much larger component of total volume in force compared to the younger ages. For the companies contributing to the study, whole life and accumulation UL had experienced a long-term downward trend that has reversed in the past two years.

Older-Age Business as a Percentage of Total

Taking the ratio of the in-force amounts above age 65 to the total in force provides a view of the growth trend of older-age business in the past 10 years compared to the years prior.

Table 6.

	Age 65+ In Force as Percentage of Total In Force (by Issue Year within Product Type)								
	<1980	1980 –89	1990 –99	2000 –04	2005 –07	2008	2009	2010	2011
VUL/Variable Life	0.0%	0.3%	2.8%	4.7%	3.9%	3.6%	4.4%	5.5%	7.0%
Accumulation UL	0.0%	0.7%	6.8%	20.1%	34.9%	21.2%	12.3%	11.1%	15.4%
ULSG	0.0%	0.4%	23.8%	32.9%	40.3%	38.1%	30.1%	27.0%	24.1%
Whole Life	1.9%	1.3%	5.7%	1.8%	1.6%	1.7%	1.8%	1.8%	1.4%
Term or Term UL	0.0%	0.0%	0.1%	0.3%	0.5%	1.0%	1.2%	1.4%	1.4%
Other	0.0%	0.0%	0.0%	2.3%	1.6%	1.3%	3.2%	3.8%	3.1%
Total	1.8%	0.9%	3.4%	4.3%	8.1%	6.9%	5.9%	5.5%	5.0%

A peak in older-age business appears to have passed during the period from 2005–07, which may or may not be related to a growth in stranger-owned or investor-owned sales. Lower long-term cumulative decrement rates on ULSG may also influence this chart since in-force amounts are displayed instead of sales volumes.

Maximum Issue Ages

Companies were asked to provide the maximum issue age at which various products could be issued as of three points in time: Dec. 31, 2005, Dec. 31, 2008, and Dec. 31, 2011.

Table 7.

	Average of Max Issue Age			Mode (Most Common) Max Issue Age		
	YE 2005	YE 2008	YE 2011	YE 2005	YE 2008	YE 2011
VUL/Variable Life	85.2	84.2	84.2	85.0	85.0	85.0
Accumulation UL	83.9	84.5	85.8	85.0	80.0	85.0
ULSG	85.1	84.4	84.2	85.0	85.0	85.0
Whole Life	82.8	83.8	84.2	80.0	85.0	85.0
Term or Term UL	74.9	75.0	76.0	75.0	75.0	75.0

Term generally has the lowest maximum issue ages while the permanent products all have similar maximum issue ages.

Looking at each individual company, trends in the changes to maximum issue age can be identified. The following chart shows the pattern of changes made to maximum issue age from 2005–11.

Table 8.

	Changes Made to Max Issue Age from 2005–11		
	No Change	Increase	Decrease
VUL/Variable Life	91%	0%	9%
Accumulation UL	62%	31%	8%
ULSG	77%	8%	15%
Whole Life	77%	23%	0%
Term or Term UL	87%	7%	7%

Among participating companies, 31 percent of the companies increased their maximum issue age for accumulation UL and 23 percent increased the maximum issue age for whole life. In general, there has been a slight trend toward increasing maximum issue ages, although most companies have not changed their maximum issue age over the period. Two companies included in the “No Change” column had the same maximum issue age in 2005 and 2011 but different maximum issue ages in 2008 (one higher and one lower).

Per-Life Retention and Capacity

Companies were asked to provide the maximum per-life retention limits and total case capacity (including reinsurance) by issue age. The companies represented in the survey span a wide range of sizes and risk appetites, as evidenced by the wide spread of internal retention limits and capacity as of Dec. 31, 2011. (Note for the right panel in the following displays, the percentage of age 45 retention was calculated for each company first and percentiles were then taken of these percentages.)

Table 9.

Per-Life Internal Retention Limit (2011)				Retention as Percentage of Age 45 Retention		
Issue Age	20th percentile	Median	80th percentile	20th percentile	Median	80th percentile
45	480,000	2,000,000	20,000,000	100.0%	100.0%	100.0%
60	480,000	2,000,000	20,000,000	100.0%	100.0%	100.0%
65	480,000	2,000,000	20,000,000	100.0%	100.0%	100.0%
70	400,000	2,000,000	20,000,000	77.1%	100.0%	100.0%
75	400,000	2,000,000	19,000,000	54.3%	100.0%	100.0%
80	150,000	1,000,000	10,000,000	28.0%	50.0%	100.0%
85	60,000	500,000	9,000,000	21.0%	25.0%	90.0%
90	0	0	900,000	0.0%	0.0%	23.8%

Total Case Capacity Including Reinsurance (2011)				Capacity as Percentage of Age 45 Capacity		
Issue Age	20th percentile	Median	80th percentile	20th percentile	Median	80th percentile
45	8,400,000	40,000,000	65,000,000	100.0%	100.0%	100.0%
60	8,400,000	40,000,000	65,000,000	100.0%	100.0%	100.0%
65	8,400,000	40,000,000	65,000,000	100.0%	100.0%	100.0%
70	8,400,000	40,000,000	65,000,000	77.1%	100.0%	100.0%
75	5,600,000	40,000,000	64,000,000	51.3%	100.0%	100.0%
80	3,100,000	15,000,000	49,840,000	25.0%	56.3%	83.8%
85	1,020,000	10,000,000	24,500,000	6.0%	25.0%	70.7%
90	0	0	4,500,000	0.0%	0.0%	12.3%

Total case capacity and retention limits show a similar pattern by age. Despite the wide range between companies, a general trend of lower retention limits at higher issue ages can be observed. At the 20th percentile level, the retention limit starts decreasing at age 70 while at the median level, it starts decreasing at age 80. For total case capacity, results show a similar pattern by age.

Companies were asked to provide their retention and capacity at three points in time in order to identify trends. The following chart compares the retention and capacity for each company at Dec. 31, 2011, compared to Dec. 31, 2005.

Table 10.

Internal Retention in 2011 vs. 2005				Capacity in 2011 vs. 2005		
Issue Age	Lower	Same	Higher	Lower	Same	Higher
45	0.0%	37.5%	62.5%	12.5%	25.0%	62.5%
60	0.0%	37.5%	62.5%	12.5%	25.0%	62.5%
65	0.0%	37.5%	62.5%	12.5%	25.0%	62.5%
70	0.0%	31.3%	68.8%	6.3%	31.3%	62.5%
75	0.0%	31.3%	68.8%	12.5%	31.3%	56.3%
80	6.3%	31.3%	62.5%	25.0%	25.0%	50.0%
85	0.0%	43.8%	56.3%	18.8%	43.8%	37.5%
90	12.5%	56.3%	31.3%	18.8%	68.8%	12.5%

The general trend has been increased retention and capacity at all ages. None of the respondents had lowered their internal retention limit at any age between 2005 and 2011 (apart from reductions in

maximum age issued). While a few respondents did report lower capacity at some ages in 2011, the majority of companies increased total case capacity during this period.

Riders

Companies were asked to provide the ages at which various riders were available. The following chart shows the results for the most popular riders.

Table 11.

	Number of Companies with Riders Available By Issue Age						
	45	60	65	75	80	85	90
Waiver of premium/deductions	13	5	1	1	1	1	0
Accidental death benefit	12	12	6	2	1	1	0
Accelerated death benefit—terminal illness	10	10	10	10	10	7	3
Chronic illness rider	5	5	5	5	3	1	0
Long-term care rider	3	3	3	2	2	1	0

The availability of riders generally decreases with issue age. For waiver riders, only one company indicated availability above age 65. Accidental death rider availability also declined dramatically at age 65.

Older-Age Product or Marketing Strategies

Companies were given an option to provide a free-form response to the question “Please describe any marketing, distribution or product approaches specifically targeted at the market.” Four companies provided the following responses:

- “Send marketing letters to older-age prospects and highlight products that are designed to meet their needs.”
- “In general, our life products are most competitive for our top three risk classes for all ages. This includes older ages for our UL products.”
- “We sell an SPWL [simplified premium whole life] simplified issue product that is aimed at the older market.”
- “The older-age market is our target market, so we do not do anything special to call them out. Our marketing material reflects images and topics that resonate with this market, our products are priced accordingly and our distribution reflects an affluent professional market. Our underwriting guidelines are competitive for all ages and amounts, with us being a top carrier of choice for the older-age market.”

STOLI/IOLI

Several questions were asked about stranger-owned (STOLI) or investor-owned life insurance (IOLI). This refers to life insurance sales where a third-party investor finances the insurance premiums and receives or sells the rights to the policy death benefits.

Companies were asked to estimate the volume of business by issue age that could be attributed to STOLI/IOLI in issue years prior to 2002, and 2002, 2005, 2008 and 2011. Most companies declined to respond or indicated that 0 percent of their sales were due to STOLI/IOLI. Of the companies that did respond,

- One respondent indicated that STOLI sales for 2008 issue year were less than 1 percent of total sales under age 65, 10 percent of sales for ages 66–70 and approximately 50 percent of sales for ages 71–80. For 2011, no STOLI sales were identified under age 76 and one STOLI policy was written at ages 76 and above. Data for prior years was not available.
- One respondent estimated that STOLI sales were 0 percent of 2005 sales under age 70, 20 percent of sales for ages 70–79, 30 percent of sales for ages 80–84 and 40 percent of sales for ages 85+. STOLI sales for years 2002 and prior were estimated at 0 percent and STOLI sales in 2008 and 2011 were estimated to be 1 percent at ages 65–85.
- One respondent indicated that “while exact numbers are unknown, STOLI/IOLI sales are estimated to be in the \$400 million range. These are concentrated in the 75- to 85-year-old issue age range and most of the sales occurred in 2004–05.”
- One respondent estimated that STOLI represented between 1–2 percent of sales under age 70 for all years and 0 percent at ages 75 and above.
- One respondent estimated that STOLI sales were less than 5 percent of total sales at all ages for all years.

Companies were also asked to provide information on safeguards in place to monitor or limit STOLI/IOLI sales. The following chart shows the number of companies with each type of safeguard.

Table 12.

STOLI/IOLI Safeguards	
No safeguards in place	2
Agent training programs	3
Application question(s)	10
Underwriting guidelines, monitoring procedures or "red flags"	13
Select investors placed on approved list	0
Post-issue investigation and policy rescission	9
Reinsurance approval	2
Other (describe below)	6

Other responses included:

- “Our product is purchased for estate planning, separate account growth and tax benefits. Our clients have no need or desire to sell their policy—that defeats the purpose of utilizing the product as part of their overall personal investment strategy.”
- “Published position to distribution sources, database to track suspicious distribution sources, trust reviews for lacking insurable interest, etc.”
- “Fraud prevention initiative.”
- “Monitor all post-issue owner changes for potential STOLI/IOLI.”

- “Additional forms required based on age, amount and product; if red flags noted or premium financed—conduct special STOLI phone interview with client; all premium financed cases reviewed by attorney and committee.”
- “Product design changes to prevent STOLI/IOLI; home office sales practice review.”

Companies were also asked to provide any additional comments regarding trends and market reactions to STOLI/IOLI. Two responses were received:

- “Most financing is done post issue so we see very little admitted up-front financing.”
- “STOLI continues to morph. Recently it appears to be centered on cash accumulation and trying to take advantage of general account portfolio returns.”

Fully Underwritten Life Insurance: Older-Age Underwriting

Underwriting at the older ages often involves the assessment of different risk factors than those present at younger ages. Specifically, the identification of cognitive impairment and/or reduction in physical function are key considerations. Companies were asked a number of questions about their underwriting practices focused on older ages as well as their views on the efficacy of various tests. Responses were received from 18 companies for this section of the survey. Descriptions of the specific tests can be found in [Appendix B](#).

Cognitive Tests

Companies were asked at what ages and face amounts they performed cognitive testing. For the sake of the displays below, the results submitted have been adjusted to extend beyond the maximum issue age of each specific company. For example, if a company indicated performing a specific test at ages 80 and 85 for all face amounts, the results below will also assume that they would have performed that test at age 90.

Delayed Word Recall (DWR)

DWR is one of the most commonly used cognitive tests. Eleven respondents indicated using this test for at least some ages.

Table 13.

	DWR—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	0	0	0	4	7	7	7	7
100,001	0	0	0	5	8	9	9	9
250,001	0	0	0	5	8	9	9	9
500,001	0	0	0	6	9	10	10	10
1,000,001	0	0	0	7	10	11	11	11
2,500,001	0	0	0	7	10	11	11	11
10,000,001	0	0	0	7	10	11	11	11

Companies were also asked how many questions were asked on their DWR. Eight of the respondents indicated using 10-word DWR, one used five-word DWR and one used three-word DWR. One of the respondents indicated using either three or 10 words based on age and riders applied for.

Customer Interviews

Customer interviews, while not solely an older-age test, are also commonly used to help assess cognitive function. These interviews are typically performed by third-party vendors. Eleven respondents indicated using this test for at least some ages.

Table 14.

	Customer Interview—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	3	3	3	5	7	7	7	7
100,001	2	2	2	5	7	8	8	8
250,001	2	2	2	5	7	8	8	8
500,001	2	2	2	6	8	9	9	9
1,000,001	2	2	2	6	8	10	10	10
2,500,001	2	2	2	6	8	10	10	10
10,000,001	4	4	4	8	10	11	11	11

Clock-Drawing Test

Four companies administered the clock-drawing test for at least some ages.

Table 15.

	Clock Drawing—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	0	0	0	1	2	2	2	2
100,001	0	0	0	1	2	3	3	3
250,001	0	0	0	1	2	3	3	3
500,001	0	0	0	1	2	3	3	3
1,000,001	0	0	0	2	3	4	4	4
2,500,001	0	0	0	2	3	4	4	4
10,000,001	0	0	0	2	3	4	4	4

Minnesota Cognitive Acuity Screen (MCAS)

One company indicated using this test at ages 80 and above for all face amounts.

Another company indicated using this test “on a case-by-case discretionary basis only.”

Serial 3's or 7's

One company indicated that this test was performed exclusively for a life product with a long-term care feature. No other companies indicated using this test.

Mini-Mental Status Exam

One company indicated using this test at ages 70 and above for all face amounts.

Other Cognitive Tests

- One company indicated administering the intersecting pentagons test at ages 75 and above for all face amounts. One additional company indicated administering the intersecting pentagons test for a life product with a long-term care feature.
- One company indicated using an orientation-memory-concentration test (OMCT) at ages 75 and above for all face amounts.
- One company indicated using a shortened form of the Short Portable Mental Skills Questionnaire (SPMSQ) at ages 75 and above for all face amounts.
- One company indicated using a “test for orientation (month, year, day of week, day of month)” at ages 75 and above for all face amounts.

Additional Cognitive Testing Comments

- “Interview includes: education level completed, daily activities, hobbies, volunteer work, driving activity, travel, tobacco usage, falls and number of people in household/pets.”
- “All of our cognitive tests begin at age 71 and are required for all face amounts as part of our ‘mature age supplement.’ ... The ‘customer interview’ is a telephone interview required for ages up to 70 at \$10,000,001, for 71–79 required at \$5 million and up and age 80+ at \$1 million and up.”
- “SPMSQ [administered] by PHI only if four to six words answered on 10-word recall. Ten-word recall given at age 80 and up all amounts; given at 70 and up only if certain rider applied for.”
- “Our senior supplement completed by the examiner contains the DWR test, the get-up-and-go test and interview questions regarding [activities of daily living] (ADLs), falls, etc., but no additional testing for these.”

Physical Function Tests

Companies were asked at what ages and face amounts they performed physical function testing. For the sake of consistency in the displays below, the results submitted have been adjusted to extend beyond the maximum issue age of each specific company. For example, if a company indicated performing a specific test at ages 80 and 85 for all face amounts, the results below will also assume that they would have performed that test at age 90.

Get-Up-and-Go Test

Twelve companies indicated administering the get-up-and-go test for at least some ages and amounts.

Table 16.

	Get Up and Go—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	0	0	0	4	8	8	8	8
100,001	0	0	0	5	9	10	10	10
250,001	0	0	0	5	9	10	10	10
500,001	0	0	0	6	10	11	11	11
1,000,001	0	0	0	7	11	12	12	12
2,500,001	0	0	0	7	11	12	12	12
10,000,001	0	0	0	7	11	12	12	12

This test can be administered on either a timed or untimed basis. Ten respondents indicated that they administered a timed get-up-and-go test while two administered an untimed test.

History of Falls

Nine companies include fall history in their risk assessment.

Table 17.

	History of Falls—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	1	1	1	5	7	7	7	7
100,001	1	1	1	5	7	8	8	8
250,001	1	1	1	5	7	8	8	8
500,001	1	1	1	5	7	8	8	8
1,000,001	1	1	1	6	8	9	9	9
2,500,001	1	1	1	6	8	9	9	9
10,000,001	1	1	1	6	8	9	9	9

Activities of Daily Living

Many companies incorporate activities of daily living (ADL) and/or instrumental activities of daily living (IADL) into older-age underwriting programs. Six respondents filled out the age/amount grid for both ADL and IADL. Five respondents filled out the age/amount grid for ADL only and one respondent filled out the age/amount grid for IADL only.

Table 18.

	ADL—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	1	1	2	6	9	9	9	9
100,001	1	1	2	6	9	10	10	10
250,001	1	1	2	6	9	10	10	10
500,001	1	1	2	7	10	11	11	11
1,000,001	1	1	2	7	10	11	11	11
2,500,001	1	1	2	7	10	11	11	11
10,000,001	1	1	2	7	10	11	11	11

Table 19.

	IADL—Number Using for Given Age and Amount							
	55	60	65	70	75	80	85	90
\$50,001	1	1	1	3	5	5	5	5
100,001	1	1	1	4	6	7	7	7
250,001	1	1	1	4	6	7	7	7
500,001	1	1	1	4	6	7	7	7
1,000,001	1	1	1	4	6	7	7	7
2,500,001	1	1	1	4	6	7	7	7
10,000,001	1	1	1	4	6	7	7	7

Chair Rise/Stand

One company indicated administering the chair rise/stand test at ages 70 and above for face amounts above \$500,000.

Peak Flow Testing

One company indicated administering peak respiratory flow testing at ages 70 and above for face amounts above \$500,000.

Older-Age Laboratory Tests

One company indicated that they incorporate the carcinoembryonic antigen (CEA), a cancer marker, and NT-ProBNP, a marker for congestive heart failure, from the blood test at ages 70 and above for face amounts above \$1 million. Note that information about older-age laboratory tests was not specifically requested on the survey.

Additional Physical Function Testing Comments

- “Tests above are required as part of our mature age supplement for ages 71 and older. ... It also includes observations from the examiner regarding any mobility aids being used, personal grooming and living environment.”
- “Additional requirements may be ordered at underwriter discretion.”

Perceived Value of Older-Age Tests

Respondents were asked to provide their perception of the predictive value and protective value of various older-age tests for a 70-year-old male \$500,000 policy, regardless of whether or not their companies currently used those tests. They were asked to rate the value as either “none,” “low,” medium,” “high” or “very high.”

Responses below have been mapped to a numerical rating as follows:

None = 0, Low = 1, Medium = 4, High = 7, Very High = 10.

For the purposes of this survey,

- Predictive value was defined as “the power of a test at uncovering an impairment, regardless of its cost or ease of implementing in underwriting.”
- Protective value was defined as “the value of a test relative to its cost and ability to implement in underwriting.”

Table 20.

Cognitive Tests/Questions	Perceived Predictive Value							Perceived Protective Value						
	0	1	4	7	10	Avg	Unk	0	1	4	7	10	Avg	Unk
Enhanced Mental Skills Test (EMST)	0	1	1	3	1	6.0	6	0	1	4	1	0	4.0	6
10-word delayed word recall	0	1	3	6	1	5.9	2	0	1	2	9	0	6.0	1
Minnesota Cognitive Acuity Screen (MCAS)	0	1	3	6	1	5.9	2	0	2	4	5	0	4.8	2
Mini-Mental Status Exam (MMSE)	0	1	3	4	1	5.7	3	0	2	4	3	0	4.3	3
Customer interview	0	1	4	5	0	5.2	3	0	1	3	6	1	5.9	2
Clock-drawing test	0	3	2	4	1	4.9	2	0	5	1	3	1	4.0	2
Short Portable Mental Skills (SPMSQ)	0	2	2	3	0	4.4	5	0	2	2	3	0	4.4	5
Serial 3's or 7's	0	3	5	1	0	3.3	3	0	4	3	2	0	3.3	3
Address recall	1	4	2	3	0	3.3	3	1	4	0	5	0	3.9	3
Intersecting pentagons	0	4	4	1	0	3.0	3	0	3	4	2	0	3.7	3
Immediate word recall	0	5	3	1	0	2.7	3	0	5	2	2	0	3.0	3
Three-word delayed word recall	0	7	3	1	0	2.4	1	0	5	4	2	0	3.2	1

Physical Function Tests/Questions	Perceived Predictive Value							Perceived Protective Value						
	0	1	4	7	10	Avg	Unk	0	1	4	7	10	Avg	Unk
Activities of daily living (ADLs)	0	0	1	8	4	7.7	0	0	0	2	9	2	7.0	0
History of falls	0	1	0	10	2	7.0	0	0	0	1	10	2	7.2	0
Instrumental activities of daily living (IADLs)	0	0	4	5	3	6.8	1	0	0	6	6	1	5.8	0
Timed get-up-and-go test	0	0	5	5	2	6.3	1	0	0	8	5	0	5.2	0
Chair rise/stand	0	1	4	5	0	5.2	2	0	0	7	3	0	4.9	2
Peak flow testing	0	1	5	4	0	4.9	2	1	4	3	2	0	3.0	2
Standing balance	0	2	5	2	1	4.6	2	0	2	6	2	0	4.0	2
Gait	0	2	6	2	0	4.0	2	0	1	5	4	0	4.9	2
Untimed get-up-and-go test	0	3	1	3	0	4.0	5	0	3	1	3	0	4.0	5
Grip strength	0	3	4	2	0	3.7	3	0	3	4	3	0	4.0	2

Other Older-Age Tests/Questions	Perceived Predictive Value							Perceived Protective Value						
	0	1	4	7	10	Avg	Unk	0	1	4	7	10	Avg	Unk
Prescription drug history	0	0	3	6	2	6.7	2	0	1	2	6	3	6.8	1
NT-ProBNP lab test	0	1	3	5	2	6.2	1	0	1	4	3	3	6.2	1
Pet ownership	0	1	4	3	0	4.8	4	0	0	6	2	0	4.8	4
Socialization assessment	0	1	5	2	0	4.4	5	0	2	5	2	0	4.0	4

Comparing the perceived predictive and protective values of cognitive tests, respondents generally reported that the formal comprehensive cognitive testing programs such as the EMST, MMSE and MCAS had high predictive value but lower protective value, perhaps due to the costs or perceived complexities in implementing into the underwriting process. The more straightforward 10-word delayed recall was viewed to have high predictive and protective value. Respondents did not place high predictive value on

the simpler immediate word recall and three-word DWR, possibly due to concerns over low sensitivity and specificity.

For the physical function tests, ADLs, IADLs and history of falls were viewed as having high predictive value and protective value. The timed get-up-and go test was also viewed as being highly predictive, but had slightly lower protective value, perhaps due to perceptions about its difficulty in administration. The untimed get-up-and go test was viewed as having much lower predictive value than the timed version. Peak respiratory flow was viewed as having low protective value compared to its predictive value.

For other tests with potential value at the older ages, prescription drug histories were ranked high on both predictive and protective value. Blood tests, pet ownership and socialization assessments were generally rated as having medium predictive and protective value for assessing the unique risk factors at older ages.

Preferred Criteria

Companies were asked to describe the differences between preferred criteria requirements at older ages compared to those at age 45. Responses were requested for both males and females, although the results were not different by gender for any of the respondents. Responses were also requested for both the best-preferred risk class and the next best class, although the responses were identical in almost every case for the two risk classes. The following sections provide a comparison of the requirements for several common preferred criteria evidence for a male best-preferred nonsmoker.

Blood Pressure and Pulse Pressure

Table 21.

	Blood Pressure Preferred Criteria					Pulse Pressure Preferred Criteria				
	60	65	70	75	80	60	65	70	75	80
Same as age 45	8	5	4	3	3	3	2	2	2	2
More liberal than age 45	8	11	12	13	13	0	1	1	1	1
More conservative than age 45	0	0	0	0	0	0	0	0	2	2
Not considered at this age	0	0	0	0	0	13	12	12	11	11

A majority of companies indicated that preferred requirements for blood pressure are more liberal at older ages than at age 45. More than 80 percent of companies had more liberal blood pressure requirements at ages 75 and above compared to age 45.

Pulse pressure is not a common element of preferred criteria for any age, but two companies did indicate having more conservative pulse pressure requirements for ages 75 and above.

Cholesterol

Table 22.

	Max Cholesterol Preferred Criteria					Min Cholesterol Preferred Criteria				
	60	65	70	75	80	60	65	70	75	80
Same as age 45	13	11	11	10	10	6	5	5	4	4
More liberal than age 45	3	5	5	6	6	0	1	1	1	1
More conservative than age 45	0	0	0	0	0	2	2	3	6	6
Not considered at this age	0	0	0	0	0	8	8	7	5	5

A majority of companies do not change their maximum cholesterol requirements for older ages, although those that do tend to liberalize. At ages 75 and above, six companies indicated using a more liberal maximum cholesterol requirement.

At older ages, low total cholesterol is an increased concern for underwriters. By age 75, six companies indicated applying a more conservative standard for minimum cholesterol compared to age 45.

Table 23.

	Cholesterol Ratio Preferred Criteria				
	60	65	70	75	80
Same as age 45	12	11	10	9	9
More liberal than age 45	3	4	5	4	4
More conservative than age 45	0	0	0	0	0
Not considered at this age	1	1	1	2	2

As with maximum cholesterol, companies that use a different cholesterol ratio standard at older ages tend to liberalize at older ages.

Family History

Table 24.

	Family History Preferred Criteria				
	60	65	70	75	80
Same as age 45	15	12	7	4	4
More liberal than age 45	1	4	7	7	7
More conservative than age 45	0	0	0	0	0
Not considered at this age	0	0	2	5	5

The premature death or disease of an applicant's close relative prior to age 65 was reported as a less relevant indicator of mortality risk for an applicant who has already reached an advanced age. Accordingly, respondents generally indicated that family history was either not considered or the requirements were liberalized at older ages. Twelve companies either had more liberal requirements or completely removed the requirement for family history at ages 75 and above.

Build

Table 25.

	Max Weight Preferred Criteria					Min Weight Preferred Criteria				
	60	65	70	75	80	60	65	70	75	80
Same as age 45	16	13	11	8	8	12	10	9	7	7
More liberal than age 45	0	3	5	8	8	0	1	1	1	1
More conservative than age 45	0	0	0	0	0	1	2	3	6	6
Not considered at this age	0	0	0	0	0	3	3	3	2	2

Responding companies often liberalize their maximum weight requirements at older ages. Eight responding companies used more liberal standards for maximum weight at ages 75 and above.

Conversely, at older ages, low weight is a concern. Accordingly, six companies applied a more conservative standard for minimum weight at ages 75 and above.

Table 26.

	Weight Change Preferred Criteria				
	60	65	70	75	80
Same as age 45	11	10	9	8	7
More liberal than age 45	0	1	1	1	1
More conservative than age 45	0	0	0	1	2
Not considered at this age	4	4	5	5	5

Dramatic unexplained weight change can be a concern at any age. For this criteria, two companies used a more conservative standard at age 80 and above.

Driving History

Table 27.

	Driving Record Preferred Criteria				
	60	65	70	75	80
Same as age 45	16	15	14	12	12
More liberal than age 45	0	1	1	1	1
More conservative than age 45	0	0	1	3	3
Not considered at this age	0	0	0	0	0

A history of reckless or alcohol-related driving infractions is a concern for underwriting applicants at any age. At the older ages, most companies utilize the same standard as age 45. Three companies indicated using a more conservative standard at ages 75 and above.

Additional Preferred Criteria Comments

- “We utilize a point system to assign risk class—fewer points are required to obtain certain rate classification at ages 61–70, 71–80, 81+.”
- “Best (super) preferred class N/A over age 80.”
- “[Criteria] same for all age groups; preferred not available over age 75.”
- “Cholesterol ratio: Over age 70, minimum HDL level rather than ratio is considered.”

Fully Underwritten Life Insurance: Mortality and Lapse Assumptions

Companies were asked a series of questions about the mortality and lapse assumptions used for older ages compared with those used for younger ages. Questions were designed to better understand the underlying level, slope and trend of mortality assumptions by issue age.

Source for Older-Age Assumptions

Companies were asked to identify the one “primary” source for different types of assumptions along with any additional “secondary” sources utilized.

Table 28.

	Primary Source for Actuarial Assumptions						
	Select Period Base Mortality	Ultimate Period Base Mortality	Preferred Discounts	Discount for Older Age u/w Tests	Mortality Improv't	Lapse Rates	Rider Incidence/Utilization
Internal experience studies	12	10	10	3	6	16	10
Industry studies/research	0	1	1	0	1	0	0
External consultants	1	1	1	0	2	0	0
Reinsurers	3	4	4	2	3	0	0
U.S. population statistics	0	0	0	0	0	0	0
Actuarial judgment	1	1	0	0	1	1	1
Underwriting/medical judgment	0	0	1	0	0	0	0

Internal experience studies serve as the primary source for setting assumptions for the majority of respondents.

Table 29.

	Secondary Sources for Actuarial Assumptions						
	Select Period Base Mortality	Ultimate Period Base Mortality	Preferred Discounts	Discount for Older Age u/w Tests	Mortality Improv't	Lapse Rates	Rider Incidence/Utilization
Internal experience studies	1	2	3	1	1	0	0
Industry studies/research	9	8	7	1	7	7	2
External consultants	3	3	3	2	0	3	1
Reinsurers	5	4	5	2	3	5	3
U.S. population statistics	1	2	0	0	3	0	1
Actuarial judgment	11	11	12	2	7	12	8
Underwriting/medical judgment	1	0	3	3	0	0	2

A variety of secondary sources are utilized for setting actuarial assumptions. Actuarial judgment and industry studies were most commonly referenced.

Companies were also asked to provide examples of the industry studies that they refer to in setting assumptions. The following responses were received:

- “SOA 04–05 ILEC, 2008 Valuation Basic Tables (VBT) RR, Tillinghast Older Age Mortality Study (TOAMS)”

- “Industry experience studies/research include: SOA 75–80, [2001] VBT and [2008] VBT mortality tables and well as the accompanying reports. We also keep up with studies by consultants and reinsurers as well as industry newsletters, etc.”
- “Base mortality: Used SOA intercompany and TOAMS2 studies; other adjustment is accidental death mortality floor: Used SOA research papers.”
- “Towers paper on global mortality improvement.”

Base Mortality Table

Companies were asked to provide the primary underlying mortality table used for developing pricing assumptions for the most popular permanent product at older ages. Several options were provided.

Table 30.

	Base Mortality	
	Select Period	Ultimate Period
2008 Valuation Basic Table (VBT)	2	3
2001 Valuation Basic Table (VBT)	2	2
SOA 1975–80 Basic Table, "Tillinghast Extension"	0	0
SOA 1975–80 Basic Table, "Milliman Extension"	0	0
SOA 1975–80 Basic Table, "Manulife Extension"	1	1
SOA 1975–80 Basic Table, other extension (describe)	1	1
SOA 1990–95 Basic Table	1	1
SOA 1985–90 Basic Table	0	0
Bragg Mortality Table	0	0
Other Industry table (describe below)	0	0
Internally developed table	11	10

By far the most common response was internally developed table. Many respondents provided additional clarification in a free text comment box.

- “The mortality table was primarily based on our internal experience data and was compared to the SOA 75-80 (Manulife Extension), [2001] VBT and [2008] VBT. The resulting table is not a flat percentage of any of these but does have a reasonable relationship to these industry tables. The table blends to the 08VBT curve at the oldest attained ages where we lack credible experience.”
- “Extension developed by [a reinsurer] with a 25-year select period through attained age 96 and ultimate rates to 110.”
- “We developed select factors by working with a consultant to apply to the RR100 tables. Regular RR tables are too steep.”
- “Internal table is loosely based on the 2001 VBT. We start from this table and make numerous adjustments based on company experience, industry experience, population data for older ages, consultant information at older ages.”
- “Base mortality combination of 1975–80 ANB and 1990–95.”
- “Other adjustments to mortality include adjustments due to Motor Vehicle Report (MVR) review and Pharmaceutical Benefits Manager (PBM) check.”

Assumption Revisions

Companies were asked several questions about the frequency and drivers of assumption revisions at the older ages.

Frequency of Review

Companies were asked how frequently assumptions at attained age 70 and above were reviewed or revised. Several companies selected more than one of the options provided.

Table 31.

	Frequency of Older-Age Assumption Review						
	Select Period Base Mortality	Ultimate Period Base Mortality	Preferred Discounts	Discount for Older Age u/w Tests	Mortality Improv't	Lapse Rates	Rider Incidence/ Utilization
More frequently than annually	1	1	0	0	0	1	0
Annually	6	6	6	1	3	6	0
Every 1–2 years	3	3	3	1	2	1	2
Every 2–3 years	5	4	4	2	3	4	5
When new products are developed	4	4	5	2	4	7	9
With new industry tables or research	1	1	1	0	2	1	0
Not applicable	0	0	0	3	1	1	0

The responses were varied, although companies commonly review their assumptions every year. Additional free text comments were also received.

- “We monitor mortality and lapse experience monthly. We complete a deep-dive mortality study every two years and a deep-dive lapse study every year.”
- “Mortality review scheduled on an approximate five-year interval.”
- “Assumptions for attained ages 70 and above are not reviewed separately from the overall mortality assumption. It is only updated as the result of an overall mortality assumption update.”

Time Since Last Revision

Companies were asked how long their current assumptions had been in place for policies at attained age 70 and above. For the sake of calculating an average, each response was mapped to a central number of months as indicated in parenthesis for each option below.

Table 32.

	Time Since Last Revision of Older-Age Assumption						
	Select Period Base Mortality	Ultimate Period Base Mortality	Preferred Discounts	Discount for Older Age u/w Tests	Mortality Improv't	Lapse Rates	Rider Incidence/ Utilization
Within the past 3 months (1.5)	0	0	1	0	0	1	1
Within the past 6 months (4.5)	1	1	1	0	0	1	0
Within the past 12 months (9)	4	4	5	3	2	6	1
Within the past 2 years (18)	3	3	3	0	2	2	2
Within the past 3 years (30)	5	5	4	3	3	3	4
3–5 years ago (48)	3	2	2	2	3	1	1
More than 5 years ago (72)	1	2	1	0	0	1	2
Average months since revision	27.1	28.5	23.1	26.6	28.8	20.4	32.6

Assumptions for preferred mortality discounts and lapse rates at older ages have generally been revised the most recently while ultimate mortality, mortality improvement and assumptions for policy riders have remained unchanged the longest.

Primary Factors Leading to Revisions

Companies were asked to identify the primary factors that have led to revisions in assumptions at the older ages over the past five years. Several options were provided and respondents were asked to select all that apply.

Table 33.

	Primary Factors Leading to Older-Age Assumption Revisions						
	Select Period Base Mortality	Ultimate Period Base Mortality	Preferred discounts	Discount for older age u/w tests	Mortality Improv't	Lapse Rates	Rider incidence/ utilization
Reflect industry studies/research	8	8	6	4	4	5	3
Reflect internal experience results	13	13	12	4	6	13	8
Market competitiveness	2	2	2	2	2	3	0
Reflect changes in reinsurance pricing	3	3	2	2	1	1	0
Reflect changes to u/w requirements	7	6	7	6	4	3	3
Change in general pricing philosophy	1	1	2	1	2	1	1
Other (describe)	1	1	1	0	1	0	1

The most common driver of changes to assumptions was to reflect the results from internal experience studies. Changes to underwriting requirements at the older ages were also a significant driver of assumption changes.

Other comments received included:

- “Rider assumptions were revised due to modeling differences.”
- “More recent population data.”
- “Consultants on captive reinsurer project recommended new assumption.”
- “Change in underlying mortality table (to 2008 VBT) led to changes in older-age assumptions.”

Select Factors

Respondents were asked about the slope and duration of underwriting selection assumed in their older-age mortality assumptions.

Years of Selection

Companies were asked to provide the number of years of selection assumed for their most popular underwritten permanent plan.

Table 34.

Issue Age	Years of Selection				
	Min	20th percentile	Median	80th percentile	Max
45	15.0	25.0	25.0	39.2	75.0
65	15.0	25.0	25.0	29.0	55.0
70	15.0	20.4	25.0	25.0	50.0
75	15.0	16.0	25.0	25.0	45.0
80	10.0	15.0	21.8	25.0	40.0
85	5.0	11.0	21.5	25.0	35.0
90	5.0	13.4	20.0	25.0	30.0

Ten of the companies indicated that the select period for issue age 80 was shorter than the select period for issue age 45, while seven companies used the same select period for all ages through 85.

Select Factors

Companies were asked to fill in a grid by issue age and duration that showed the ratio of the mortality rate assumed for that issue age and duration compared to the duration 26 mortality rate for the same attained age. A template was provided to calculate these ratios directly from the mortality rates in a consistent manner across companies.

For the sake of comparison, the following grid, which was provided as an example in the survey template, would be generated from 2008 VBT Male Nonsmoker, Age-Nearest Birthday (ANB):

Table 35.

Duration	2008 VBT MNS Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	45	60	65	70	75	80	85
1	18%	25%	24%	24%	25%	25%	25%
2	28%	35%	34%	34%	34%	34%	43%
3	36%	42%	41%	41%	42%	42%	71%
6	49%	55%	56%	58%	59%	67%	100%
11	68%	69%	71%	74%	80%	100%	100%
16	81%	78%	81%	86%	100%	100%	100%
21	83%	88%	90%	100%	100%	100%	100%
26	100%	100%	100%	100%	100%	100%	100%

Best-Preferred Nonsmoker \$500,000 Face Amount, Male

The following chart shows the average of each respondent's "select factor" calculations for each issue age and duration for a male best-preferred nonsmoker at \$500,000 face amount.

Table 36.

Duration	Average of Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	30%	25%	21%	23%	24%	24%	25%
2	40%	34%	32%	32%	31%	33%	36%
3	48%	42%	40%	39%	38%	39%	46%
6	59%	52%	53%	50%	48%	54%	67%
11	70%	66%	62%	66%	67%	79%	79%
16	81%	81%	82%	84%	89%	93%	93%
21	84%	91%	88%	94%	95%	97%	93%
26	100%	100%	100%	100%	100%	100%	100%

This shows that, similar to the 2008 VBT, the select factors tend to be similar in duration 1 but the selection grades off faster at the older issue ages. Selection grades off even faster at the very old issue ages.

The following chart divides these ratios by the corresponding ratios calculated from the base 2008 VBT table.

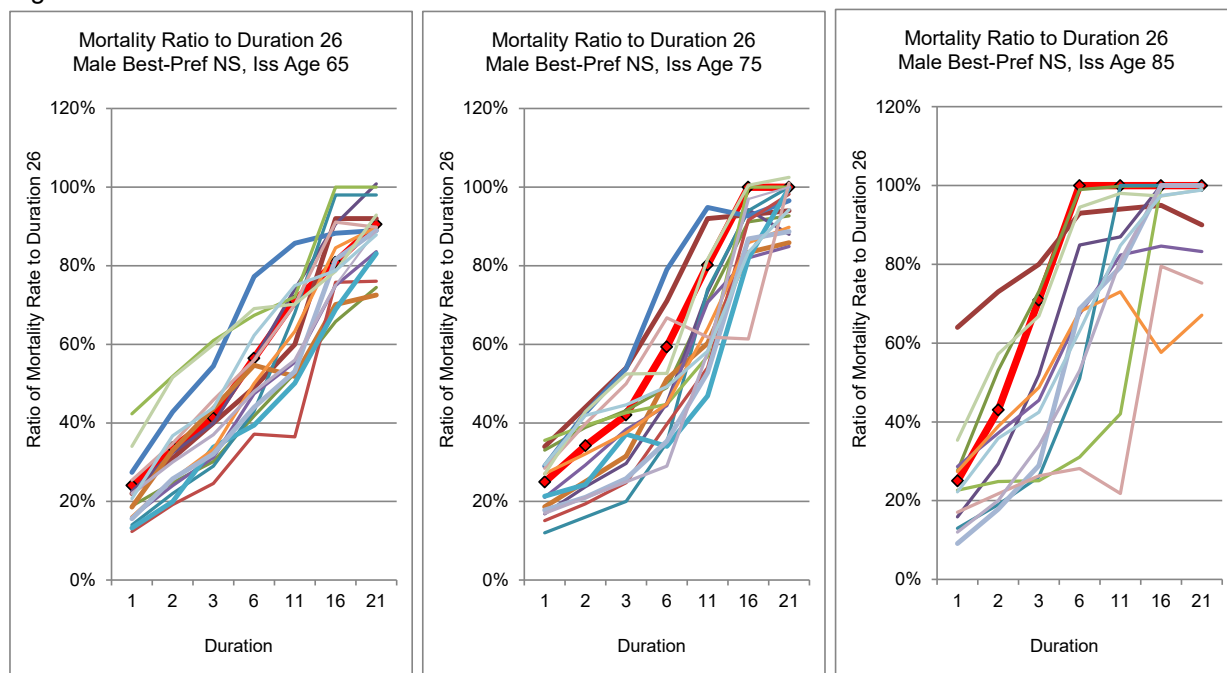
Table 37.

Duration	Best Pref NS Ratio to Implied Select Factors from 2008 VBT						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	168%	100%	89%	95%	96%	96%	98%
2	144%	98%	94%	95%	92%	95%	83%
3	135%	100%	97%	94%	91%	93%	65%
6	121%	95%	93%	86%	81%	82%	67%
11	103%	97%	87%	89%	83%	79%	79%
16	100%	103%	102%	98%	89%	93%	93%
21	102%	103%	97%	94%	95%	97%	93%
26	100%	100%	100%	100%	100%	100%	100%

Comparing these average ratios to the ratios from 2008 VBT, the issue age 45 ratios from respondents have a flatter pattern while the older ages are similar to 2008 VBT. For ages 75 and above, respondents on average applied more selection than 2008 VBT during the middle durations (6–11).

It is also important to note that the responses were quite varied across the companies surveyed, especially at the oldest ages. To illustrate this, the following graphs show all responses for issue ages 65, 75 and 85 for male best-preferred nonsmokers. The thick red line with diamond markers shows the ratios from 2008 VBT for comparison purposes.

Figure 1.



Residual Standard Nonsmoker \$500,000 Face Amount, Male

Table 38.

Duration	Average of Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	36%	28%	25%	26%	27%	26%	27%
2	47%	39%	36%	36%	35%	35%	40%
3	56%	47%	46%	44%	43%	43%	52%
6	68%	59%	60%	56%	53%	59%	72%
11	77%	72%	70%	71%	73%	84%	83%
16	87%	87%	88%	90%	94%	94%	92%
21	88%	94%	93%	97%	97%	97%	93%
26	100%	100%	100%	100%	100%	100%	100%

Table 39.

Duration	Residual Standard NS Ratio to Implied Select Factors from 2008 VBT						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	197%	115%	103%	107%	109%	104%	110%
2	167%	111%	108%	107%	103%	102%	94%
3	156%	113%	111%	105%	102%	102%	74%
6	139%	107%	106%	97%	90%	89%	72%
11	113%	105%	98%	96%	91%	84%	83%
16	107%	111%	109%	105%	94%	94%	92%
21	107%	107%	103%	97%	97%	97%	93%
26	100%	100%	100%	100%	100%	100%	100%

For the residual standard class, the average of respondents' select factors follow a similar pattern: Select factors in duration 1 are similar across age, while selection wears off more quickly at the oldest ages. At issue age 45, the select slope from the average of respondents is much flatter than the base 2008 VBT table. At older ages, the slope is also flatter than 2008 VBT, likely due to the grading together of preferred and nonpreferred assumptions at later durations.

The following chart compares the average select factors for the male best-preferred nonsmoker class to the average factors for the male residual standard nonsmoker class.

Table 40.

Duration	Average of Best Pref NS Ratio/Average of Residual Standard NS Ratio						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	85%	87%	86%	89%	88%	93%	89%
2	86%	88%	87%	89%	89%	93%	89%
3	86%	89%	87%	90%	89%	91%	87%
6	87%	89%	88%	89%	90%	92%	93%
11	91%	92%	89%	93%	91%	94%	94%
16	94%	93%	93%	94%	95%	99%	101%
21	95%	97%	95%	98%	98%	100%	100%
26	100%	100%	100%	100%	100%	100%	100%

This demonstrates that the slope of mortality assumptions by duration is assumed to be steeper for the best-preferred class compared to the residual standard class.

Best-Preferred Nonsmoker \$500,000 Face Amount, Female

Table 41.

Duration	Average of Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	33%	19%	18%	20%	22%	23%	26%
2	43%	31%	29%	28%	28%	30%	36%
3	52%	40%	36%	34%	34%	36%	44%
6	65%	50%	47%	43%	47%	50%	62%
11	72%	64%	61%	66%	67%	76%	73%
16	82%	81%	83%	84%	88%	91%	92%
21	86%	90%	88%	94%	92%	97%	91%
26	100%	100%	100%	100%	100%	100%	100%

Residual Standard Nonsmoker \$500,000 Face Amount, Female

Table 42.

Duration	Average of Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	34%	22%	21%	22%	25%	26%	30%
2	45%	35%	33%	31%	32%	34%	42%
3	55%	44%	41%	37%	39%	41%	52%
6	68%	56%	52%	49%	53%	56%	68%
11	78%	70%	70%	74%	75%	82%	77%
16	87%	88%	90%	90%	93%	92%	92%
21	91%	94%	92%	96%	94%	97%	92%
26	100%	100%	100%	100%	100%	100%	100%

The following chart compares the average select factors for the female best-preferred nonsmoker class to the average factors for the female residual standard nonsmoker class.

Table 43.

Duration	Average of Best Pref NS Ratio/Average of Residual NS Ratio						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	96%	88%	86%	88%	88%	89%	88%
2	96%	89%	87%	89%	88%	88%	86%
3	95%	90%	88%	90%	89%	87%	85%
6	96%	90%	90%	88%	88%	90%	91%
11	93%	92%	88%	90%	89%	93%	95%
16	94%	92%	92%	93%	94%	100%	101%
21	94%	96%	95%	97%	98%	99%	99%
26	100%	100%	100%	100%	100%	100%	100%

Similar to males, the slope of mortality assumption by duration is assumed to be steeper for the best-preferred class compared to the residual standard class.

Mortality Level

Respondents were asked to provide their mortality assumptions by age and duration as a multiple of the corresponding issue age 45 mortality assumption for the same duration.

For the sake of comparison, the following grid, which was provided as an example in the survey template, would be generated from 2008 VBT Male Nonsmoker, ANB.

Table 44.

2008 VBT MNS Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration								
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	4.1	3.9	3.8	3.9	4.3	4.6	5.4	5.2
65	6.5	6.2	6.2	6.7	7.8	8.2	9.3	9.5
70	11.1	10.6	10.8	12.0	14.0	14.5	18.6	16.2
75	20.2	18.9	19.1	21.2	24.6	30.5	32.3	23.5
80	35.3	32.5	32.8	36.2	56.7	53.1	46.9	30.9
85	59.6	70.2	95.9	108.7	100.2	77.1	61.6	34.3
90	94.9	163.9	238.7	199.5	145.5	101.4	68.2	34.5

Best-Preferred Nonsmoker \$500,000 Face Amount, Male

The following chart shows the average ratio for the 17 companies that responded for the best-preferred nonsmoker class for a male at a \$500,000 face amount.

Table 45.

Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration								
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	3.4	3.6	3.8	4.0	4.4	5.0	5.4	5.6
65	5.1	5.7	6.1	6.5	7.2	8.4	9.3	9.7
70	9.0	9.7	10.2	11.0	13.0	16.3	17.8	17.0
75	16.5	16.5	17.1	18.0	23.5	30.3	31.9	26.8
80	26.7	27.4	28.9	32.5	49.5	54.2	50.7	40.2
85	48.0	58.2	69.4	82.3	94.7	86.5	76.0	52.2

The chart above shows that the average assumed mortality at older issue ages for a given duration is generally lower than 2008 VBT by issue age at the earlier durations and higher than 2008 VBT at later durations. This view, however, obscures a wide variation in the responses. The following two charts show the same display for the minimum and maximum ratios at each issue age and duration, respectively.

Table 46.

	Min Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration							
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	2.6	2.7	2.8	3.1	3.5	3.2	3.8	3.7
65	3.4	4.2	4.5	4.9	5.4	5.3	6.3	5.8
70	5.1	7.1	7.2	7.7	8.5	8.0	9.5	8.4
75	10.7	10.1	10.1	11.4	12.9	13.0	13.6	11.3
80	16.4	15.4	15.2	15.6	16.5	24.0	18.2	14.5
85	19.9	17.8	17.3	18.6	28.1	32.2	23.5	19.5

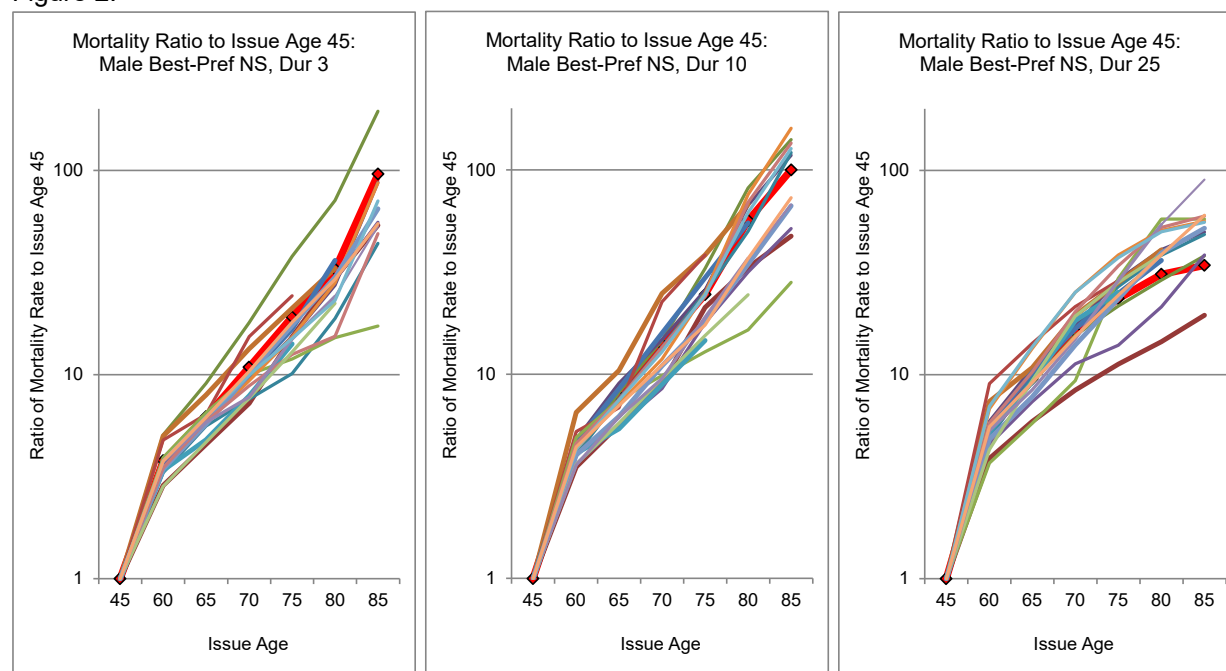
Table 47.

	Max Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration							
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	4.9	5.2	5.1	5.1	6.5	8.4	8.9	9.0
65	7.0	8.6	9.1	8.3	10.4	13.1	14.1	14.2
70	16.4	18.2	18.0	17.3	24.8	36.2	29.6	25.3
75	35.1	38.9	38.0	31.0	38.3	59.3	55.2	38.5
80	53.9	66.6	71.2	70.5	81.4	87.1	81.6	57.8
85	90.8	162.0	194.5	183.0	159.7	143.2	109.2	90.0

As an example for duration 10, the issue age 80 mortality rate was, on average, 49.5 times the issue age 45 mortality rate. This average, however, falls within a wide band from a minimum ratio of 16.5 times to a maximum ratio of 81.4 times.

To further demonstrate the wide variation between responding companies, the following graphs show the full set of responses for durations 3, 10 and 25 respectively on a log scale. The corresponding ratios from 2008 VBT are shown in the thick red line with diamond markers for comparison.

Figure 2.



Responses were also provided for male residual-standard nonsmoker and for female best-preferred and residual-standard nonsmokers. These responses provided similar results as for male best-preferred nonsmokers. On average, the increase in mortality by age is flatter at the earlier durations, but there was considerable variation in responses.

Residual Standard Nonsmoker \$500,000 Face Amount, Male

Table 48.

	Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration							
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	3.4	3.5	3.7	3.9	4.2	4.5	4.8	4.9
65	5.0	5.5	5.9	6.3	6.8	7.5	8.1	8.1
70	8.4	9.0	9.4	10.1	11.4	13.4	14.1	13.1
75	15.1	14.9	15.3	16.1	19.7	23.4	23.3	20.3
80	23.8	24.1	25.2	28.4	38.8	39.3	36.0	30.4
85	42.8	48.9	55.9	63.8	66.7	58.7	53.0	40.1

Best-Preferred Nonsmoker \$500,000 Face Amount, Female

Table 49.

	Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration							
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	2.7	3.4	3.5	3.4	3.6	4.3	5.1	5.5
65	4.2	5.2	5.2	5.2	5.9	7.6	9.1	9.8
70	7.4	8.0	8.0	8.2	11.2	14.4	17.7	17.7
75	13.5	13.4	13.6	14.6	21.1	28.1	32.3	30.2
80	22.7	23.3	24.1	26.7	44.2	52.4	57.4	50.9
85	51.0	56.0	63.1	72.3	83.3	95.3	94.0	69.5

Residual Standard Nonsmoker \$500,000 Face Amount, Female

Table 50.

	Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration							
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	2.7	3.4	3.4	3.4	3.5	4.0	4.6	4.8
65	4.1	5.1	5.0	5.0	5.6	6.9	8.0	8.2
70	7.1	7.7	7.5	7.6	9.8	12.1	14.3	13.8
75	12.9	12.6	12.7	13.4	17.7	22.3	23.8	23.1
80	21.6	22.3	22.6	24.1	34.9	38.2	40.5	38.3
85	45.0	50.3	54.2	57.3	58.3	65.3	65.4	54.4

Preferred Discounts

Number of Underwriting Classes

Companies were asked to provide the number of risk classes available by issue age for their most popular fully underwritten permanent life product.

Table 51.

Issue Age	Number of Risk Classes					
	Nonsmoker				Smoker	
	1	2	3	4	1	2
45	0	1	9	7	1	16
60	0	1	9	7	1	16
65	0	1	9	7	1	16
70	0	1	9	7	1	16
75	0	1	9	7	1	16
80	0	1	10	5	2	14
85	1	3	6	4	3	11

Respondents generally held the same number of risk classes through age 75. The number of risk classes drops for some companies at age 80.

Best-Preferred to Residual Standard Ratios

Companies were asked to provide the ratio of the mortality assumption used for their best-preferred nonsmoker class to the assumption used for their standard residual nonsmoker class for a variety of issue ages and durations.

Male Nonsmoker

The following chart shows the average of the responses for the best-preferred to residual ratio for male nonsmokers by age and policy duration.

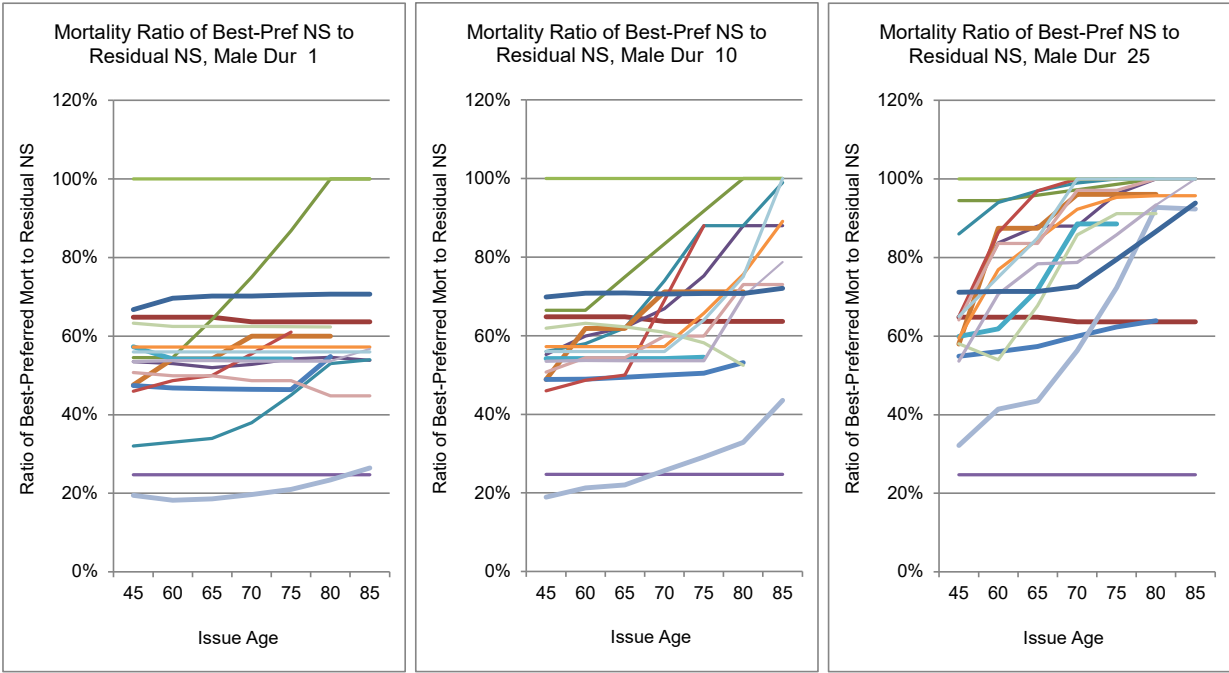
Table 52.

Issue Age	Average Ratio of Best Pref NS to Residual Standard NS						
	Dur 1	2	5	10	15	20	25
45	53%	53%	54%	55%	56%	59%	63%
60	53%	53%	54%	57%	61%	65%	72%
65	54%	54%	55%	58%	63%	68%	76%
70	55%	56%	58%	61%	67%	74%	82%
75	57%	57%	60%	65%	71%	80%	85%
80	59%	59%	62%	69%	77%	83%	87%
85	59%	61%	68%	78%	82%	86%	89%

In general, the difference between the average mortality assumption for the best-preferred and residual classes decreases at older ages and later durations. However, there is variation among the responses. Of the 17 companies responding, 13 had a lower duration 10 preferred discount at age 75 than at age 45, while two assumed a higher discount for issue age 75 and three (2) assumed the same preferred discount at ages 45 and 75.

The following graphs show all responses for durations 1, 10 and 25 respectively.

Figure 3.



These graphs illustrate a wide variation in practice for the surveyed companies. At later durations, most respondents grade the assumptions for their best-preferred and residual nonsmoker classes together at older issue ages, although the level and speed of the grading varies widely.

Female Nonsmoker

The following chart shows the average best-preferred to residual standard ratio for female nonsmokers by age and policy duration.

Table 53.

Issue Age	Average Ratio of Best Pref NS to Residual Standard NS						
	Dur 1	2	5	10	15	20	25
45	54%	55%	55%	56%	57%	59%	64%
60	54%	55%	55%	57%	60%	64%	72%
65	55%	56%	56%	58%	62%	68%	76%
70	57%	57%	59%	62%	67%	73%	82%
75	58%	59%	61%	66%	71%	80%	85%
80	60%	61%	63%	70%	78%	84%	88%
85	61%	63%	69%	78%	83%	86%	90%

The pattern of preferred discounts by age and duration was generally the same for males and females for all respondents, with some differences in the level of the discount applied.

Mortality Improvement

Companies were asked to provide assumptions used for projecting future mortality improvement at older ages. Ten respondents provided details of their improvement assumptions. A calculation template was provided to facilitate consistent calculations across companies.

Primary Factors by Which Improvement Assumptions Vary

Companies were asked which factors their mortality improvement assumptions varied by. They were also asked to briefly describe the nature of the variability.

Table 54.

	Assumption Varies By
Issue age	2
Attained age	4
Year of birth (cohort)	0
Gender	6
Duration	7
Underwriting class	0
Smoker/non smoker	3
Policy size	0
Product type	0
Distribution channel	0

Comments were provided as follows.

Issue Age

- “One percent per year for 15 years for issue ages 0–35 and 10 years for issue ages 40–69; 1 percent per year grading from 15 to 10 years for issue ages 36–40; ½ percent per year for 10 years for issue ages 71+.”
- “Since mortality decreases by AA, it is lower for older issue ages.”

Attained Age

- “Mortality improvement generally decreases as attained age increases.”
- “Grades down from 1.5 percent per annum (.5 percent for smokers) to 0 from attained age 75 to 95.”
- “We take it to zero at attained age 105 and use a 25 bp haircut below attained age 85.”
- “Improvement stops by attained age 90.”

Gender

- “Female improvement roughly half of male.”
- “Female mortality improvement is generally slightly higher than male.”
- “0.5 percent for male, 0 percent for female.”
- “Female improvement roughly 2/3 of male.”
- “M/F as in the paper” (reference to [“Global Mortality Improvement Experience and Projection Techniques”](#) on SOA website).
- “Female improvement half of male improvement.”

Duration

- “Varies by duration since it varies by attained age.”
- “Zero percent for durations 11+.”

- “Slightly more improvement first 10 years than second 10. No improvement after 20th duration.”
- “Level for 10 years and then decreases thereafter.”
- “Mortality improvement applied for 15 year.”
- “Level factor for a specific number of years; zero thereafter.”

Smoker/Nonsmoker

- “Improvement for smokers roughly half of nonsmokers.”
- “Use zero for smokers.”
- “No improvement assumed for tobacco users.”

Improvement Assumptions

Male Nonsmoker

The following chart shows the average cumulative improvement factor applied to mortality rates in future year (n) by issue age for male nonsmokers. (No respondents varied assumptions by risk class.)

Table 55.

Issue Age	Average Cumulative Mortality Improvement Factor Through Year n								
	1	2	3	5	10	15	20	25	30
45	100%	98.9%	98.0%	96.1%	91.5%	88.0%	86.4%	85.2%	84.5%
60	100%	98.7%	97.7%	95.7%	91.2%	88.2%	87.4%	88.0%	89.4%
65	100%	98.7%	97.7%	95.8%	91.2%	88.8%	88.6%	89.5%	92.0%
70	100%	98.7%	97.7%	95.8%	91.7%	89.9%	90.5%	92.9%	94.5%
75	100%	98.8%	97.9%	96.2%	92.7%	91.5%	92.8%	94.4%	95.1%
80	100%	98.8%	98.1%	96.7%	93.9%	93.6%	94.6%	95.6%	95.8%
85	100%	99.1%	98.4%	97.2%	96.2%	95.7%	95.8%	95.9%	95.3%

The following chart converts these factors into annualized improvement rates over the period from duration 1 through future year (n).

Table 56.

Issue Age	Annualized Mortality Improvement Rate from Years 1 Through n								
		2	3	5	10	15	20	25	30
45		1.1%	1.0%	1.0%	1.0%	0.9%	0.8%	0.7%	0.6%
60		1.3%	1.1%	1.1%	1.0%	0.9%	0.7%	0.5%	0.4%
65		1.3%	1.1%	1.1%	1.0%	0.8%	0.6%	0.5%	0.3%
70		1.3%	1.1%	1.1%	1.0%	0.8%	0.5%	0.3%	0.2%
75		1.2%	1.0%	1.0%	0.8%	0.6%	0.4%	0.2%	0.2%
80		1.2%	0.9%	0.8%	0.7%	0.5%	0.3%	0.2%	0.1%
85		0.9%	0.8%	0.7%	0.4%	0.3%	0.2%	0.2%	0.2%

Mortality improvement assumptions are generally lower at older ages and later future durations.

Female Nonsmoker

Table 57.

Issue Age	Average Cumulative Mortality Improvement Factor Through Year n								
	1	2	3	5	10	15	20	25	30
45	100%	99.2%	98.5%	97.2%	93.7%	90.5%	88.6%	87.3%	86.6%
60	100%	99.1%	98.3%	96.8%	93.3%	90.2%	89.5%	90.0%	91.4%
65	100%	99.1%	98.3%	96.9%	93.3%	90.8%	90.7%	91.5%	93.6%
70	100%	99.1%	98.3%	96.9%	93.8%	91.9%	92.4%	94.3%	95.5%
75	100%	99.1%	98.4%	97.2%	94.6%	93.3%	94.3%	95.5%	96.1%
80	100%	99.2%	98.6%	97.6%	95.6%	95.2%	95.7%	96.7%	96.8%
85	100%	99.4%	98.8%	97.9%	97.2%	96.6%	96.8%	96.7%	96.3%

Table 58.

Issue Age	Annualized Mortality Improvement Rate from Years 1 Through n								
		2	3	5	10	15	20	25	30
45		0.8%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.5%
60		0.9%	0.8%	0.8%	0.8%	0.7%	0.6%	0.4%	0.3%
65		0.9%	0.8%	0.8%	0.8%	0.7%	0.5%	0.4%	0.2%
70		0.9%	0.8%	0.8%	0.7%	0.6%	0.4%	0.2%	0.2%
75		0.9%	0.8%	0.7%	0.6%	0.5%	0.3%	0.2%	0.1%
80		0.8%	0.7%	0.6%	0.5%	0.4%	0.2%	0.1%	0.1%
85		0.6%	0.6%	0.5%	0.3%	0.2%	0.2%	0.1%	0.1%

Female results follow a similar pattern, with slightly lower improvement rates than males.

Lapse Rates

Companies were asked to provide lapse-rate assumptions for a variety of products by issue age and duration. Eleven companies provided assumptions for accumulation UL, 14 provided assumptions for ULSG and 10 provided assumptions for whole life.

The following chart shows the average lapse rates by issue age, duration and product.

Table 59.

Duration	Average Lapse Rate											
	Accumulation UL				ULSG				Whole Life			
	45	65	75	85	45	65	75	85	45	65	75	85
1	8.0%	6.2%	5.8%	4.6%	4.8%	3.4%	2.7%	2.3%	11.4%	9.1%	9.0%	6.1%
2	7.1%	5.8%	5.7%	5.0%	4.8%	3.4%	2.9%	2.6%	9.4%	7.6%	7.6%	5.4%
3	5.8%	4.4%	4.4%	3.7%	4.1%	2.8%	2.3%	2.0%	6.2%	4.7%	4.5%	3.8%
10	4.0%	3.5%	3.5%	3.3%	3.1%	2.4%	2.1%	2.0%	4.2%	3.7%	3.6%	3.8%
20	3.6%	3.3%	3.5%	3.3%	2.6%	2.2%	1.9%	1.5%	3.6%	3.3%	3.3%	3.5%

For each company, the lapse rates for ages 65, 75 and 85 were divided by the corresponding lapse rate for age 45 in the same product and duration. The following chart shows the average of those ratios by product.

Table 60.

Duration	Average Ratio of Lapse Rate/Issue Age 45 Lapse Rate by Duration								
	Accumulation UL			ULSG			Whole Life		
	65	75	85	65	75	85	65	75	85
1	84.5%	77.2%	68.7%	81.2%	69.0%	64.8%	83.0%	86.3%	85.7%
2	85.4%	83.8%	74.7%	79.5%	67.7%	62.5%	82.4%	82.6%	79.4%
3	81.5%	79.9%	69.5%	77.0%	63.5%	56.4%	78.8%	76.7%	72.1%
10	87.8%	87.4%	76.9%	82.5%	71.9%	62.5%	86.4%	85.9%	85.6%
20	90.0%	87.0%	85.2%	90.1%	76.2%	69.5%	91.9%	92.6%	89.5%

From these results, it is clear that average assumed lapse rates at ages 65, 75 and 85 were lower than the corresponding issue age 45 lapse rates for each duration and product. On average, the assumed lapse rates were usually between 60 percent and 90 percent of the issue age 45 assumption.

Additionally, average lapse rate assumptions generally decreased by issue age for a given duration and product. This was especially true for the early durations.

Finally, lapse rates at older ages generally decreased by duration at a slower rate than the issue age 45 lapse rates. The assumptions generally show convergence to a similar ultimate lapse rate for all issue ages at later durations.

Long-Term Care Insurance

Five companies provided information on long-term care insurance.

Sales by Issue Age

Companies were asked to provide their 2011 annual premium by issue age. The following chart shows the total issue age distribution.

Table 61.

Issue Age Distribution	
Issue Age	Portion of 2011 Sales
<60	52.8%
61–65	27.0%
66–70	14.2%
71–75	4.5%
76–80	1.3%
80–84	0.1%
85+	0.0%
Total	100%

Older-Age Underwriting Tests

Companies were asked which older-age underwriting tests were used for long-term care insurance.

Cognitive Tests

The following chart shows the number of companies using various cognitive tests for underwriting long-term care insurance and fully underwritten life insurance. For the life insurance column, only the five common companies (CC) from both the LTC and fully underwritten life insurance sections of the survey are included.

Table 62.

Cognitive Tests—Number Using		
Test	Used for LTC	Used For Life Ins (CC)
Enhanced Mental Skills Test (EMST)	4	0
Customer interview	3	3
Minnesota Cognitive Acuity Screen (MCAS)	3	2
10-word delayed word recall	2	3
Intersecting pentagons	1	1
Clock-drawing test	1	0
Address recall	0	2
Short Portable Mental Skills Questionnaire (SPMSQ)	0	0
Serial 3's or 7's	0	1
Immediate word recall	0	0
Three-word delayed word recall	0	0
Mini-Mental Status Exam (MMSE)	0	0

The EMST is the most commonly used test for LTC. No companies indicated using it for fully underwritten life insurance, although it was ranked the highest in perceived predictive value by respondents in that section of the survey.

Physical Function Tests

The following chart shows the number of companies using various physical function tests for underwriting long-term care insurance and fully underwritten life insurance. For the life insurance column, only the five CCs from both the LTC and fully underwritten life insurance sections of the survey are included.

Table 63.

Physical Function Tests—Number Using		
Test	Used for LTC	Used For Life Ins (CC)
Gait	4	2
Chair rise/stand	4	0
Instrumental ADLs (IADLs)	4	3
Activities of daily living (ADLs)	4	4
History of falls	3	4
Standing balance	1	1
Peak flow testing	1	0
Untimed get-up-and-go test	1	1
Grip strength	0	0
Timed get-up-and-go test	0	3

Tests for gait disturbances and the chair rise/stand tests were the most commonly used for LTC. None of common companies and only one company overall indicated using the chair rise/stand test for life insurance underwriting. The timed get-up-and-go test was used by three of the common companies and nine survey respondents overall for life insurance underwriting but was not used by any of the survey respondents for LTC.

Other Factors

The following chart shows the number of companies using various physical function tests for underwriting long-term care insurance and fully underwritten life insurance. For the life insurance column, only the five CCs from both the LTC and fully underwritten life insurance sections of the survey are included.

Table 64.

Other Factors—Number Using		
Test	Used for LTC	Used For Life Ins (CC)
Prescription drug history	2	4
Socialization assessment	2	3
Pet ownership	0	0

Additional Older-Age Underwriting Comments

- “Our older-age ‘assessment’ interviews are always done in the home and are mandatory starting at age 70 years and always include an MCAS. Socialization assessment would be completed with questions regarding activities, exercise and volunteer efforts that are part of this interview.”
- “For 72+, we do all of the above [physical function assessments]; for 65–71, we do EMST; no physical function or other testing; for 18–64, no cognitive screen or physical function testing.”
- “LTC exam that includes, ADL, IADL, medical history, physical measurements (blood pressure, weight) and cognitive.”
- “For peak flow testing, it was assumed this was a cardiovascular stress test, which would be reviewed with the customer's medical records.”

Base Mortality Table

Companies were asked to provide the primary underlying mortality table used for developing LTC assumptions, both for active and disabled lives.

- Three respondents indicated using the 1994 Group Annuity Mortality Table (GAM-94) as the base table for both active and disabled lives.
- One respondent indicated using the Annuity 2000 as the base table for both active and disabled lives.
- One respondent indicated using the “mortality rates as reported in the SOA 1984–2004 Intercompany LTC Experience Reports.”

Select Factors

Years of Selection

Companies were asked to provide the number of years of selection built into their assumptions by gender for both active and disabled lives.

Each of the five companies used select mortality for their active lives assumption, but none varied the length of selection by gender.

Four of the five companies used the same select period for active lives and disabled lives, while one of the companies used no selection for disabled lives.

Three of the five companies used select periods that decreased by increasing issue age. The other two companies did not vary the select period by issue age.

The following chart shows the average select period by issue age for LTC active lives and fully underwritten life insurance. For the life insurance column, only the five CCs from both the LTC and fully underwritten life insurance sections of the survey are included.

Table 65.

	Average Select Period	
	Used for LTC Active Lives	Used for Life Ins (CC)
45	17.6	33.0
65	16.6	30.0
70	16.2	28.0
75	14.2	25.0
80	13.0	21.3
85	12.8	19.3

The average select period for the common companies is longer for fully underwritten life insurance than for long-term care.

Select Factors

Companies were asked to fill in a grid by issue age and duration that showed the ratio of the mortality rate assumed for that issue age and duration compared to the duration 26 mortality rate for the same attained age. A template was provided to calculate these ratios directly from the mortality rates in a consistent manner across companies.

Three of the five companies provided identical or nearly identical select factors for both genders at each age and duration.

The following chart shows the average of each company's select factor calculations for LTC products for male nonsmokers.

Table 66.

Duration	LTC: Average of Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	32%	32%	38%	38%	35%	29%	29%
2	41%	39%	48%	48%	42%	35%	35%
3	47%	48%	52%	52%	51%	41%	41%
6	59%	61%	62%	63%	67%	56%	56%
11	78%	78%	78%	80%	86%	82%	83%
16	88%	88%	88%	90%	98%	96%	90%
21	97%	97%	97%	99%	105%	99%	99%

For the sake of comparison, the following chart shows the average male nonsmoker select factor used for fully underwritten life insurance mortality from the five CCs.

Table 67.

Duration	Life CC: Average of Ratio of (Mort Rate)/(Dur 26 Mort Rate for Same Attained Age)						
	Issue Age 45	Issue Age 60	Issue Age 65	Issue Age 70	Issue Age 75	Issue Age 80	Issue Age 85
1	24%	24%	22%	23%	24%	21%	22%
2	35%	33%	33%	32%	32%	29%	37%
3	42%	39%	40%	37%	37%	35%	48%
6	55%	52%	53%	47%	43%	52%	72%
11	68%	63%	64%	64%	69%	84%	93%
16	75%	76%	79%	84%	93%	98%	99%
21	82%	85%	88%	94%	98%	100%	100%

On average, a smaller select period discount is applied for long-term care mortality assumptions than for fully underwritten life insurance for the five common companies. For LTC, average select factors are similar by issue age for a given duration with a slight decrease at the oldest ages for durations 3 and 6 and a slight increase at the oldest ages for durations 11 and later.

Mortality Level

Four companies provided their mortality rate assumptions by age and duration. One company provided select factors and the base table reference, from which the authors calculated the mortality rates for this analysis.

For the sake of illustration, the following chart shows the ratio of the mortality for each issue age to the mortality rate for issue age 45 in the same duration for males from the GAM-94 Static table.

Table 68.

GAM-94 Static: Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration								
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	5.1	5.2	5.3	5.6	5.5	4.8	4.3	4.1
65	9.2	9.4	9.5	9.3	8.6	7.9	6.9	6.4
70	15.0	15.1	15.0	14.6	14.0	12.6	10.8	9.9
75	23.6	23.7	23.8	24.0	22.5	19.7	16.7	13.9
80	39.3	39.8	39.8	38.5	35.0	30.4	23.3	17.8
85	61.6	61.4	60.9	60.0	54.2	42.5	30.0	21.8

The following chart shows the average ratio of the mortality assumption for responding LTC companies for each issue age to the mortality rate for issue age 45 in the same duration for males and females.

Table 69.

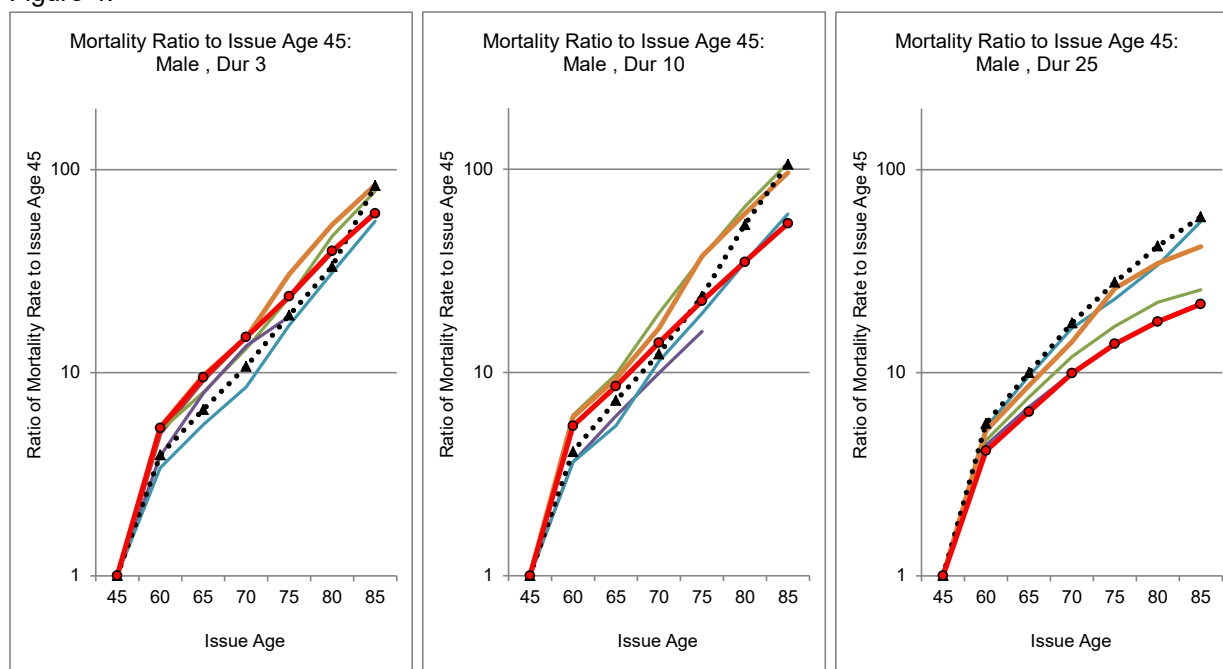
LTC Male: Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration								
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	4.5	4.3	4.6	4.8	5.0	4.5	4.7	4.7
65	8.3	8.0	8.1	8.1	7.8	8.1	7.9	7.8
70	13.8	13.1	13.0	13.0	14.3	14.0	13.2	12.5
75	22.1	20.7	22.8	24.4	26.4	25.4	22.7	18.8
80	32.7	32.0	34.3	35.9	39.2	35.5	27.4	21.7
85	54.5	51.3	55.8	59.5	63.6	50.1	37.1	29.0

LTC Female: Average Ratio of Mortality Rate/Issue Age 45 Mortality Rate by Duration								
Issue Age	1	2	3	5	10	15	20	25
45	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
60	4.7	5.1	5.3	5.9	5.6	5.0	4.8	5.2
65	8.4	9.2	9.3	9.7	9.4	8.7	8.4	9.4
70	13.5	14.4	14.7	16.8	17.0	15.8	15.6	16.2
75	21.8	25.3	27.1	30.7	33.5	32.6	29.6	25.9
80	31.9	36.0	38.8	45.3	52.2	47.0	36.2	31.4
85	58.5	63.9	69.3	82.7	89.6	69.8	52.9	44.7

The increase in the average assumed mortality rate by issue ages for a given duration is similar to the GAM-94 for the earlier durations, but it increases more dramatically at advanced attained ages in the later durations.

The following graphs show all responses for males in durations 3, 10 and 25, respectively. The red line with red circle markers displays the ratios from the GAM-94 static table. The dotted black line shows the corresponding ratios from the fully underwritten life responses for the five common companies.

Figure 4.



Mortality Improvement

Use of Improvement

Companies were asked whether they assumed future mortality improvement in the pricing or projection of their LTC business. The following chart shows the responses.

Table 70.

Mortality Improvement Used	
Yes, explicitly modeled separately from morbidity improvement	3
Yes, but not modeled due to offsetting morbidity improvement	0
No	2

One respondent also indicated that they do not apply mortality improvement to their disabled lives model.

Improvement Assumptions

Due to the limited number of responses and inconsistencies in one survey response, a summary of the specific mortality improvement assumptions for LTC will not be provided. In general terms, two respondents graded the mortality improvement off at advanced attained ages while the other respondent used factors that did not vary by issue age.

Special Thanks

The authors would again like to extend our heartfelt thanks to all participating companies for making this project a success. The survey request was 36 pages with thousands of individual data elements to enter and calculate. Without your support, such research projects would not be possible.

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Appendix A: Survey Participants

American Amicable

Allstate

AXA

Cincinnati Life

Columbus Life

Forethought Life

Genworth

Government Personnel Mutual

John Hancock

Kansas City Life

Lafayette Life

Lincoln National

Mass Mutual

Midland National/NACOLAH

New York Life

Penn Mutual

Philadelphia Financial

Protective

State Farm

Western and Southern Life

Appendix B: Older-Age Underwriting Descriptions

Cognitive Tests/Questions

Mini-Mental Status Exam (MMSE): Clinical tool used for assessment of mental status. Standardized testing assesses various levels of cognitive function including orientation (person, place and time), registration (repeat three objects), memory (recall three words at three minutes), attention (three-stage command), calculation (serial 7's), language (naming repetition, reading and writing) and visuospatial (geometric figure).

Minnesota Cognitive Acuity Screen (MCAS): Cognitive screening test originally developed for the long-term care (LTC) market. Standardized testing covers several cognitive domains including orientation (person, place and time), memory (recall of 10 words after five minutes), language (follow multistep command), calculation (eight simple math problems), judgment (pills, bills, lock, smoke) and verbal fluency (name fruit and vegetables).

Delayed word recall (DWR): Memory test using delayed word recall designed specifically to be sensitive to distinguishing between normal cognitive functioning individuals and those with Alzheimer's disease. DWR can be tested using three, five or 10 words.

Clock-drawing test: Screening tool for dementia where a clock with a specified time is requested to be drawn from memory. Successful completion of this test requires spatial perception, construction and other cognitive abilities.

Serial 3's or 7's: Test of concentration, attention and memory that involves counting backwards from a predetermined number by 7's or 3's.

Customer interview: Interview performed by an outside vendor that asks a series of cognitive, physical, socialization and other older age-related questions in order to better assess overall health at the older ages.

Intersecting pentagons: A test of spatial perception, construction and other cognitive abilities where a drawing of intersecting pentagons is shown and a duplicate is asked to be drawn.

Short Portable Mental Skills Questionnaire (SPMSQ): Brief assessment of orientation, long-term memory and serial subtractions (by 3's). Testing asks "What day of the week is it?", "What year is it?", "What month is it?", "Where are you right now?", "Who is the president?", "Who was the past president?", "What is your date of birth?", "How old are you?", "What is your mother's maiden name?" and "Can you count from 21 to 0 by 3's?" (21-18-15-12-9-6-3-0).

Enhanced Mental Skills Test (EMST): Tests all domains relevant to capture the cognitive impairment spectrum. It mimics human memory processing by focusing on the encoding and retrieval of information. Testing includes three learning trials of 10 words each, metamemory/judgment and insight, abstract reasoning, delayed free recall, delayed cue recognition and delayed cued recall.

Address recall: Recall test of applicant's current address.

Physical Function Tests

Activities of daily living (ADLs): Daily self-care activities within an individual's place of residence, in outdoor environments or both. ADLs consist of self-care tasks including personal hygiene and grooming, dressing and undressing, self-feeding, functional transfers (getting into and out of bed or wheelchair, getting onto or off toilet, etc.), bowel and bladder management and ambulation (walking without use of an assistive device, such as a walker, cane or crutches, or using a wheelchair).

Independent activities of daily living (IADLs): Activities that are not necessary for fundamental functioning, but let an individual live independently in a community including housework, taking medications as prescribed, managing money, shopping for groceries or clothing, use of telephone or other form of communication, using technology (as applicable) and transportation within the community.

Get-up-and-go test: Mobility test involving standing up from a chair, walking 3 meters (in a line), turning, walking back to the chair and sitting down. This test can be timed or untimed. Mobility can be assessed for postural stability, steppage, stride length and balance.

Chair raise/stand: Functional test measuring strength in legs and balance. This test times how long it takes to stand up and sit down five or 10 times from a chair with arms folded across the chest. A variation of this test includes counting the number of times one can stand up and sit down from a chair during a set timed interval.

Peak flow testing: An alternative test of physical function that measures the maximum speed of respiratory expiration. The inference is that the higher peak flow, the higher the functional ability.

Grip strength: Test used to assess muscle strength, functional limitations and disability indicating possible decline in functional ability by measuring hand grip strength for a period of several seconds.