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First-Principles LTC—Survivorship

by Bob Darnell

This is the second article regarding the use of first-principles actuarial science to evaluate long-term care insurance (LTCi) policies for the purpose of pricing, valuation and/or projection analyses for active lives and disabled lives. The first article, "First Principles LTC—Restoration of Benefits," appeared in the May 2012 issue of *Long-Term Care News*.

This article investigates the survivorship benefit, its effects and some of the more common options applied to this benefit. The survivorship benefit is commonly sold to couples. When one of the couple dies, the policy for the surviving spouse becomes paid-up, subject to policy limitations. This article refers to some of these limitations as options. They are options selected by the underwriting insurance company that place restrictions on the applicability of the benefit. This article refers to the three most common options as x, y and z. These options are:

x) The survivor must pay premiums for a minimum number of years (even if one spouse has died)

y) Both members of the couple must live at least a certain number of years

z) Both members of the couple must be insured a certain number of years without incurring any claims.

These options are placed to limit the cost of the benefit, and, in some cases, to help limit anti-selection.

This article uses **abbreviations**: ALF (assisted-living facility), ALR (active life reserve, or contract reserve), BP (benefit period), EP (elimination period), HC (home care), IP (inflation protection), LTCi (long-term care insurance), MDB (maximum daily benefit), MLB (maximum lifetime benefit), NH (nursing home), ROB (restoration of benefits) and WP (waiver of premium). The term "care settings" refers to the three principal settings for those receiving long-term care benefits: NH, ALF and HC.

The survivorship benefit is issued to couples. One level of complexity is driven by the status of each insured. For each spouse, they begin as married and both are insured. However, over time, they will all become single insureds as their spouse may either die or lapse. After their spouse has died or lapsed, the status for the remaining spouse may be considered permanent. This article will refer to the three spouse statuses:

1) Married, and their spouse is currently insured
2) Married, and their spouse was issued but has since died
3) Married, and their spouse was issued but has since lapsed.

To determine premiums and initial policy reserves, transitioning from status 1 to either status 2 or status 3 must be considered. Status 1 can be expected to have the lowest mortality and morbidity. If one spouse dies or lapses, the remaining spouse is now a single insured and the mortality and morbidity can be expected to increase. Status 2 will have the next-to-lowest mortality and morbidity. Status 3 can be expected to have the highest mortality and morbidity. For status 1, lapses are commonly around 0.5 percent. For status 2, the lapse rate for the survivor may decrease to a very low rate if the policy limitations for survivorship have been met, and will decrease to zero if the policy becomes paid-up. However, if the policy will not become paid-up, the lapse rates can be expected to increase. The lapse rates for status 3 can be expected to be the highest of the three. Some companies may have enough experience data for each of statuses 1, 2 and 3; other companies may need to combine statuses 2 and 3.

To evaluate the effect and cost of the survivorship benefit, as well as the related reserves (which will not be examined in this article), we will need six sets of mortality rates, lapse rates, claim-incidence (incidence) rates and claim-termination (termination) rates—one set for each gender and status.

In the remainder of this article, we will look at the effect of the three options for males and for females. Initially, we will look at couples of the same age, and then we will consider couples of different issue ages.

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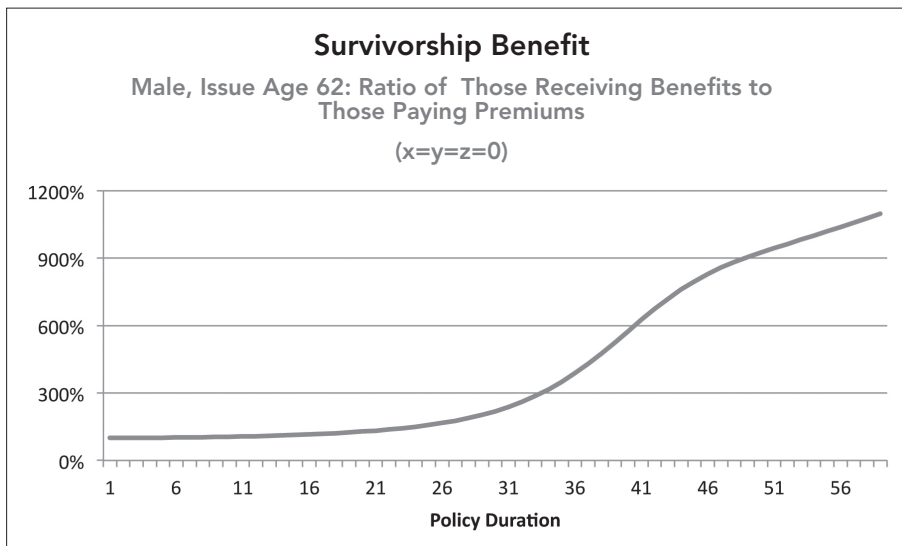
SURVIVORSHIP—NO OPTIONS

As with most insurance plans, the basic objective is to derive expected income and benefit streams. For most health insurance policies, we need assumptions for mortality, lapse and morbidity rates. The survivorship feature is more complicated as each member of the couple has differing expectations depending on whether they are married or single. As

we consider each member of a couple, we consider one at a time as the primary insured. The primary insured begins as status 1, and proceeds to a single status through probabilities of their spouse dying or lapsing.

When deriving the payment and benefit streams, the probability of moving from status 1 to either status 2 or status 3 must be determined based on mortality and lapse assumptions and, if option z is in effect, the incidence rates. Using the assumptions for the three statuses, we can derive the probabilities of survival (in actuarial terminology, tpx) for those paying premium and those receiving benefits.
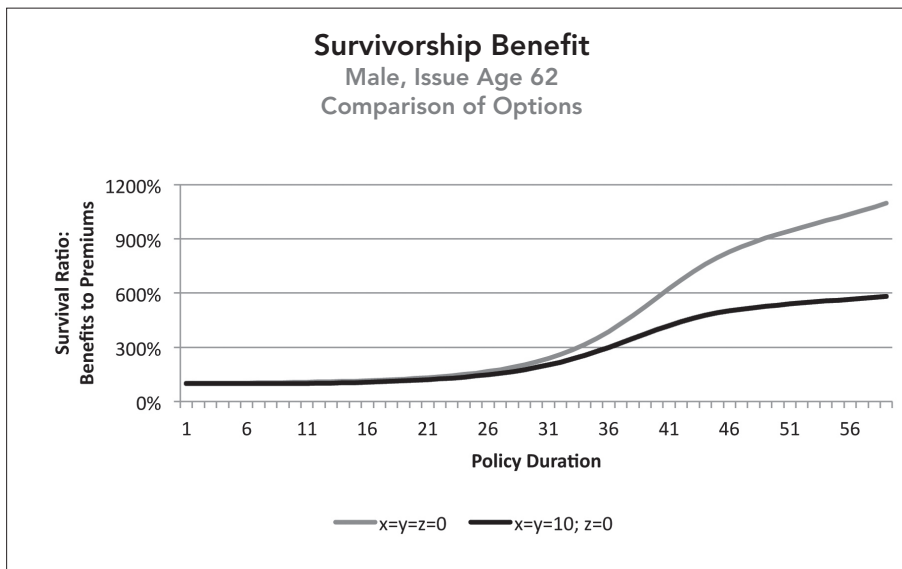
For LTCi policies without the survivorship benefit, the probability of survival for premium payments and benefit payments is the same, and the ratio at all durations is 1. Consider a policy with the survivorship benefit, male primary insured, issue age 62, and x=y=z=0. The spouse is female and issue age 62, as well. The ratio of the survival probabilities for the premium payment compared to the benefit is found in Figure 1. Since x=y=z=0, the curve has the same slope for all benefit periods.

SURVIVORSHIP—WITH OPTIONS

This curve gets sharply steeper around duration 26. The x, y and z options help to level the curve. If we set x=10 (i.e., the surviving spouse must pay premium a minimum of 10 years), the curve is level for the first 10 years (i.e., the ratio between the benefits and premium is 100 percent). After year 10, the curves are identical.

Next we choose to set y=10. Figure 2 compares two curves for the ratio of survivors receiving benefits to those paying premiums: x=y=z=0 (for the higher curve) and x=10; y=z=0 (for the lower curve).

Clearly, the curve has leveled. We can take another step by setting z=10. Figure 3 on page 27 compares two sets of options: x=y=10; z=0 and x=y=z=10.

Although the curves are different, adding z=10 helped levelize the curve only minimally.

Figure 1. Ratio of Persons Receiving Benefits to Persons Paying Premium

Survivorship Benefit

Male, Issue Age 62: Ratio of Those Receiving Benefits to Those Paying Premiums

(x=y=z=0)

Figure 2. Comparison of x=y=z=0 to x=y=10; z=0.

Survivorship Benefit

Male, Issue Age 62
Comparison of Options

x=y=z=0   x=y=10; z=0

To look at the effect of the x, y and z options on annual premium rates, we will use a base policy that is comprehensive with a single 4-year BP, 0-day EP, no WP, 5 percent compound IP, no ROP, and without survivorship. For each issue age, the base policy at each age has a premium rate of 100 percent. The percentage shown for each option combination illustrates the premium for the policy and options as a percentage of the base policy. Percentages are used, rather than premium rates, to focus on the relative differences between the options. Actual premium rates are dependent upon assumptions used and assumptions are commonly different for each company and each block of business.

Figure 4 illustrates a male primary insured with a female spouse. Figure 5 illustrates a female primary insured with a male spouse. For all, the spouse has the same issue age as the primary insured. In all cases the additional premium for the survivorship benefit is charged for the lifetime of the policy.

For the options x=y=z=0, the premium due to the survivorship option increases consistently with age, as the spouse (with the same issue age) dies more quickly with increasing age. Simply changing the x option to force a minimum of 10 years of premium payment forces a substantial lowering of the survivorship premium at the upper ages. As expected from Figure 3, forcing z to 10 years has little effect.

SURVIVORSHIP—A YOUNGER SPOUSE

To illustrate the effect of a younger spouse, we will look at a limited population of those who have a spouse who is 10 years younger than the primary insured. As above, the illustrations will reference a base policy at the same issue age that does not have the survivorship benefit. Since a given policy at a given issue age will have a rate of 100 percent, the policy with survivorship and various option combinations will illustrate its premium rate when compared to the base policy.

Comparing Figures 6 and 7 to Figures 4 and 5 shows that it can make quite a difference when the primary insured has a younger spouse.

Of course, if one spouse is younger, the other spouse is older.
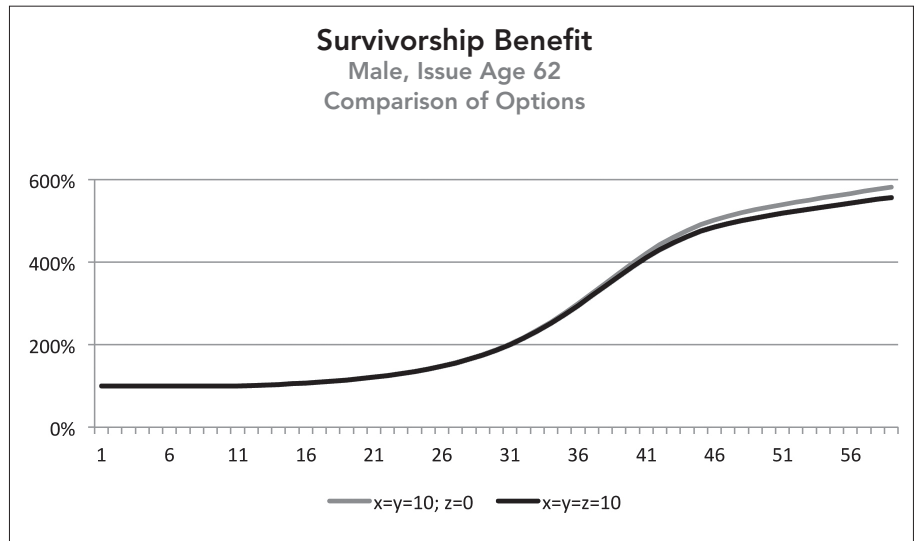
Figure 3. Comparison of x=y=10; z=0 to x=y=z=10.

Survivorship Benefit
Male, Issue Age 62
Comparison of Options

Figure 4. Male Primary Insured (female spouse has same issue age)

Issue	Comparison of Premiums to Policy Without Survivorship			
Age	x=y=z=0	x=10; y=z=0	x=y=10; z=0	x=y=z=10
42	107%	106%	106%	106%
52	111	110	108	108
62	118	113	109	109
72	127	113	106	103
82	138	108	102	100

Figure 5. Female Primary Insured (male spouse has same issue age)

Issue	Comparison of Premiums to Policy Without Survivorship			
Age	x=y=z=0	x=10; y=z=0	x=y=10; z=0	x=y=z=10
42	117%	117%	115%	115%
52	127	124	120	120
62	139	130	119	119
72	155	126	111	108
82	170	114	102	100

Figure 6. Male Primary Insured (female spouse has issue age 10 years younger)

Issue	Comparison of Premiums to Policy Without Survivorship			
Age	x=y=z=0	x=10; y=z=0	x=y=10; z=0	x=y=z=10
42	102%	102%	102%	102%
52	104	103	103	103
62	106	105	104	104
72	109	106	103	102
82	112	104	101	100

Figure 7. Female Primary Insured (male spouse has issue age 10 years younger)

Issue	Comparison of Premiums to Policy Without Survivorship			
Age	x=y=z=0	x=10; y=z=0	x=y=10; z=0	x=y=z=10
42	107%	106%	106%	106%
52	110	109	108	108
62	115	113	110	110
72	121	113	107	105
82	124	108	102	100

Figure 8. Male Primary Insured (female spouse has issue age 10 years older)

Issue	Comparison of Premiums to Policy Without Survivorship			
Age	x=y=z=0	x=10; y=z=0	x=y=10; z=0	x=y=z=10
42	118%	117%	115%	115%
52	129	125	118	118
62	144	129	117	116
72	176	123	107	103
82	222	111	101	100

Figure 9. Female Primary Insured (male spouse has issue age 10 years older)

Issue	Comparison of Premiums to Policy Without Survivorship			
Age	x=y=z=0	x=10; y=z=0	x=y=10; z=0	x=y=z=10
42	139%	137%	132%	132%
52	160	150	135	135
62	186	153	127	126
72	241	132	108	103
82	310	114	101	100

SURVIVORSHIP—AN OLDER SPOUSE

Complementary to Figures 6 and 7, Figures 8 and 9 assume the spouse is 10 years older than the primary insured. In keeping with the above examples, we will compare premium rates by using a base policy at the same issue age without the survivorship benefit. The base policy has a relative rate of 100 percent, and the policy with survivorship and various option combinations will illustrate its premium rate when compared to the base policy.

At first glance, it might make some sense that the younger and older spouses would counterbalance each other. When Figures 6 and 7 are averaged with Figures 8 and 9, we can see that the average of the two usually does not equal the respective percentage number in Figures 4 and 5. The premium rate for an older spouse increases faster than the premium rate decreases for the younger spouse.

CONCLUSION

The survivorship benefit can be complicated. Possible transitions involve a large number of assumptions. The effect of the survivorship benefit may be quite different based on the issue age of the primary insured as well as the issue age of their spouse. Policy reserves can be expected to show similar behavior.

Due to the effect illustrated in Figures 1 through 3, it is not a matter of calculating a percentage load and applying a factor. Because the relationship between those paying premiums and those receiving benefits changes, a level load will not be effective, or appropriate, in producing the proper reserve. For valuation and projection purposes, the further you move down the duration line (in Figures 1 through 3), the more pronounced this effect becomes. As insureds transition from status 1 to either status 2 or 3, reserves and projections should account for the change in expectations.

Nevertheless, the survivorship benefit can be important and very beneficial to consumers who choose to purchase it. It can provide rate relief at a time when the surviving member of a couple most needs it—at a time in their life when some good news is very much appreciated. ∎