SOA Research Institute

Aging and Retirement

Variable Uninsured Life (Value) Annuities: Theory, Practice and Country Cases
Appendix 2: Value Concept Illustrations

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Appendix 2: Value Concept Illustrations

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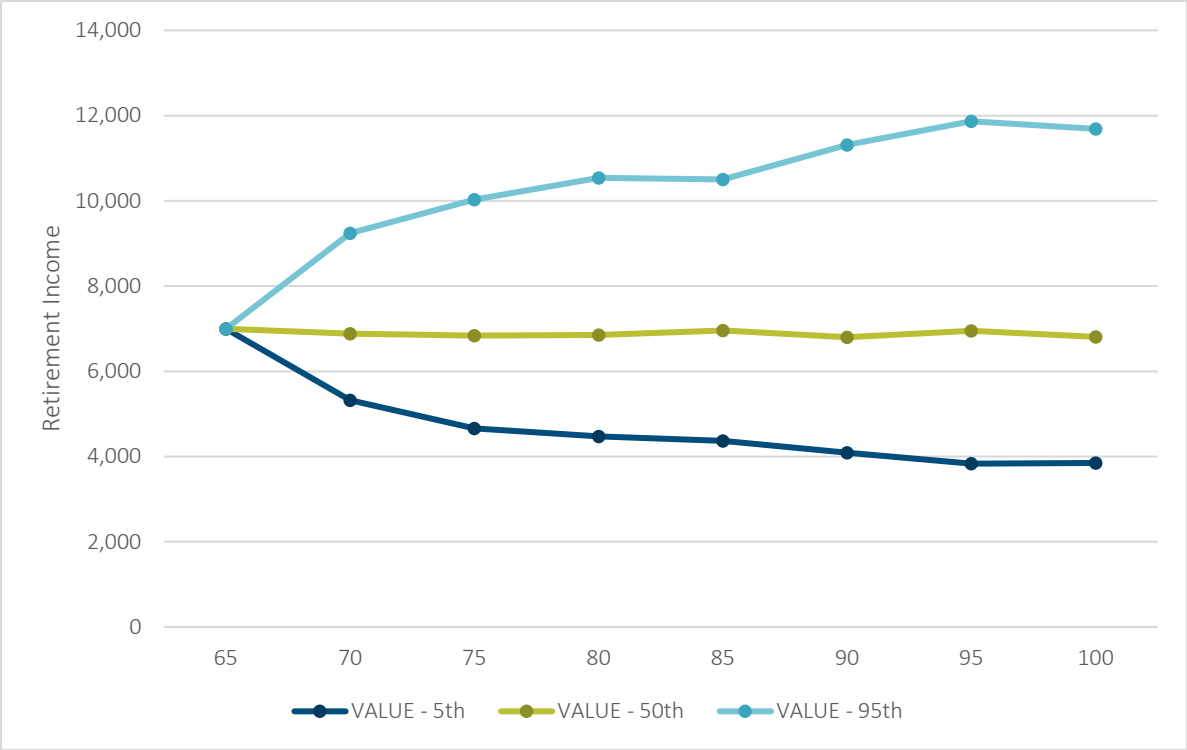
Variable Uninsured Lifetime Annuities (Value)

The Longevity Pool

A Value (an acronym for Variable Uninsured Life Annuities) pool pays income to and shares all risk among a group of retirees called a pool. Retirees transfer their retirement savings into the pool and receive income for their lifetime in return. The concept is similar to an insured annuity, but no insurance company is needed since all the risk is borne by the members of the pool. The level of income will vary with investment returns and mortality experience. However, changes in income are limited by spreading unexpected investment or mortality results over the future lifetime of all the pool members. Figure A2.1 shows a sample range of outcomes for an illustrative pool of retirees who start with an expected lifetime income of about 6,500. Five percent of future income levels are expected to be above the 95th percentile. Similarly, 5% of future outcomes would be expected to have income lower than the 5th percentile line at any point in time.

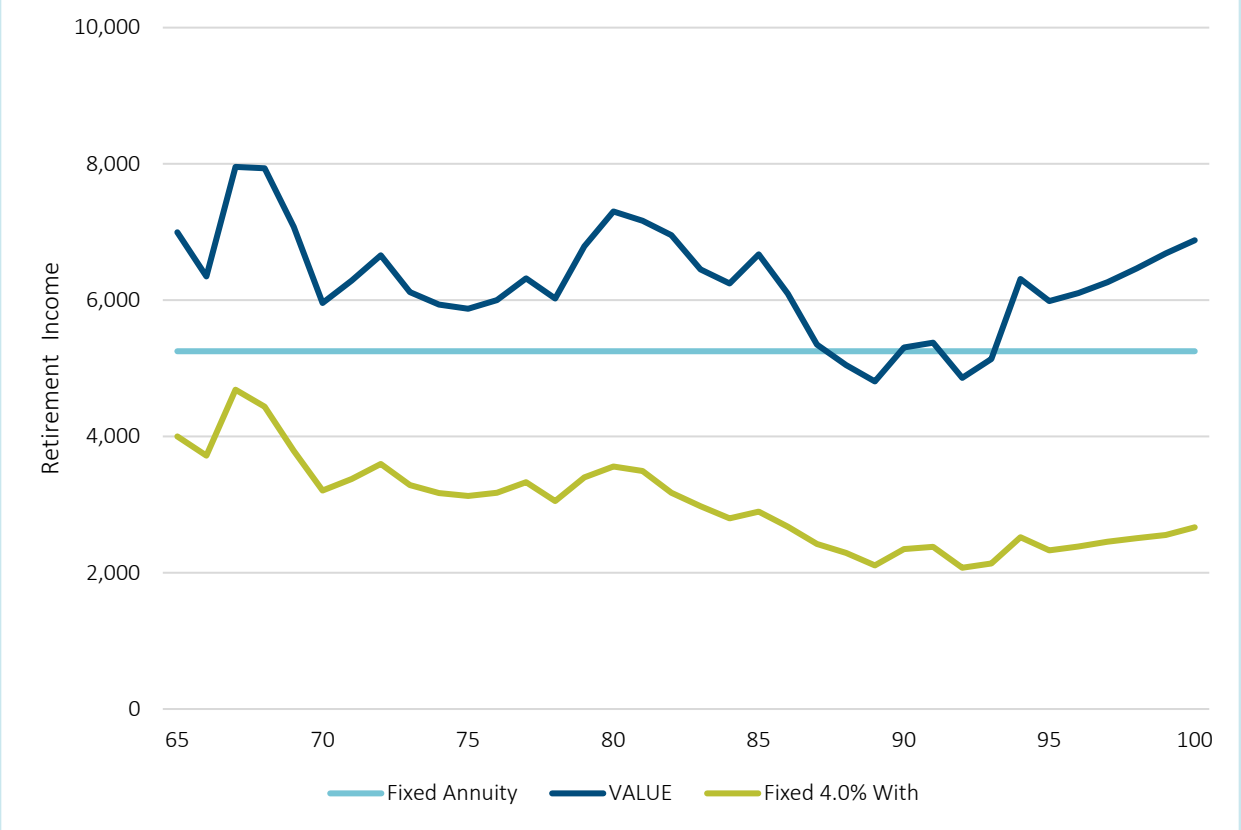
FIGURE A2.1: DISTRIBUTION OF VALUE INCOME AMOUNTS



Value Versus Systematic Withdrawals and Fixed Annuities

Lifetime income solutions like Value and other annuities provide more income during retirement than systematic withdrawals. Systematic withdrawals leave money behind that can be passed on to heirs, while annuities keep that money in the retirement pool and pay it to retirees who are still living. Sharing risk among the pool members increases income during the lifetime of all the members. A Value approach is expected to provide more income than a fixed annuity because the costs are lower and the investments have higher returns. Figure A2.2 is only for a single potential future scenario and is intended to show a conceptual difference between Value and systematic withdrawals. It does not represent average expectations. The fixed withdrawals of 4% each year allow for any balance of savings left at death to be passed on to heirs but does not deliver the same level of income to retirees.

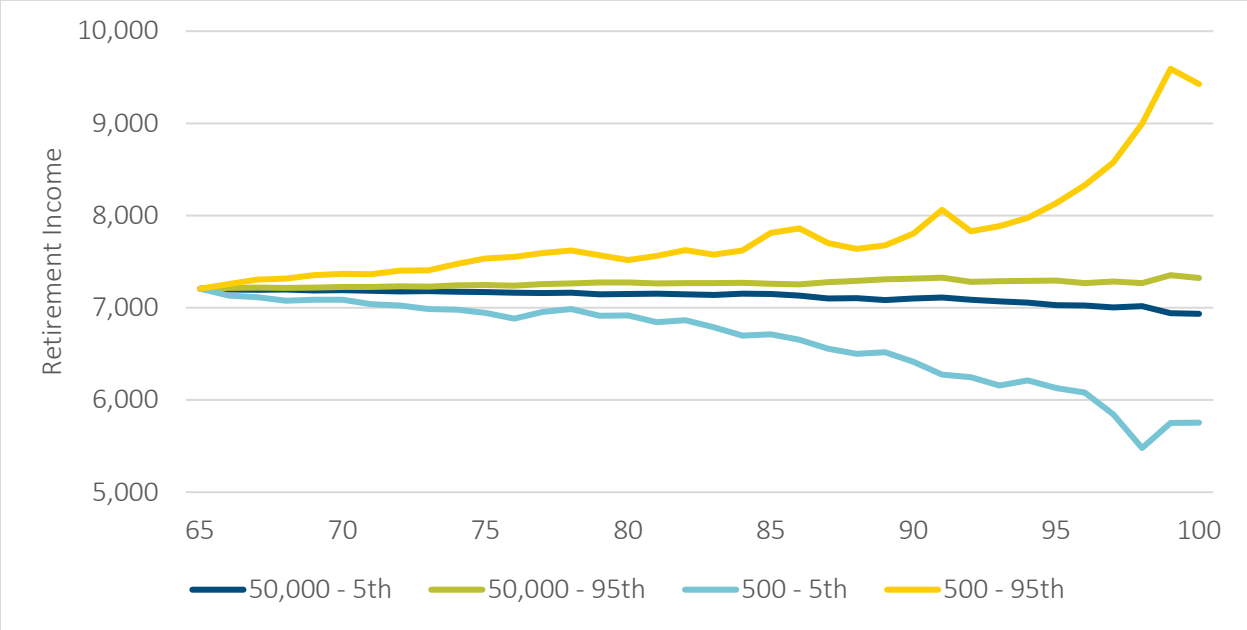
FIGURE A2.2: VALUE VERSUS SYSTEMATIC WITHDRAWALS AND FIXED ANNUITIES



Value Avoids Extreme Income Levels

Value annuity income amounts vary with the mortality experience of the pool members, but the volatility is not extreme as in the case with a classic tontine. Benefits can tend toward extreme levels if only a small, single cohort (one group starting at a single age) is followed to death. This is similar to a classic tontine. As shown in Figure A2.3 the longest survivors from a group that started with 500 pool members could experience very high or very low benefit amounts. However, with larger groups, even a single cohort will experience manageable variation in the income delivered at later ages. The size of a Value pool is key to its success, but in real-world pools, the variability of each single cohort will end up being shared with all the other cohorts, so pools can start small and grow over time.

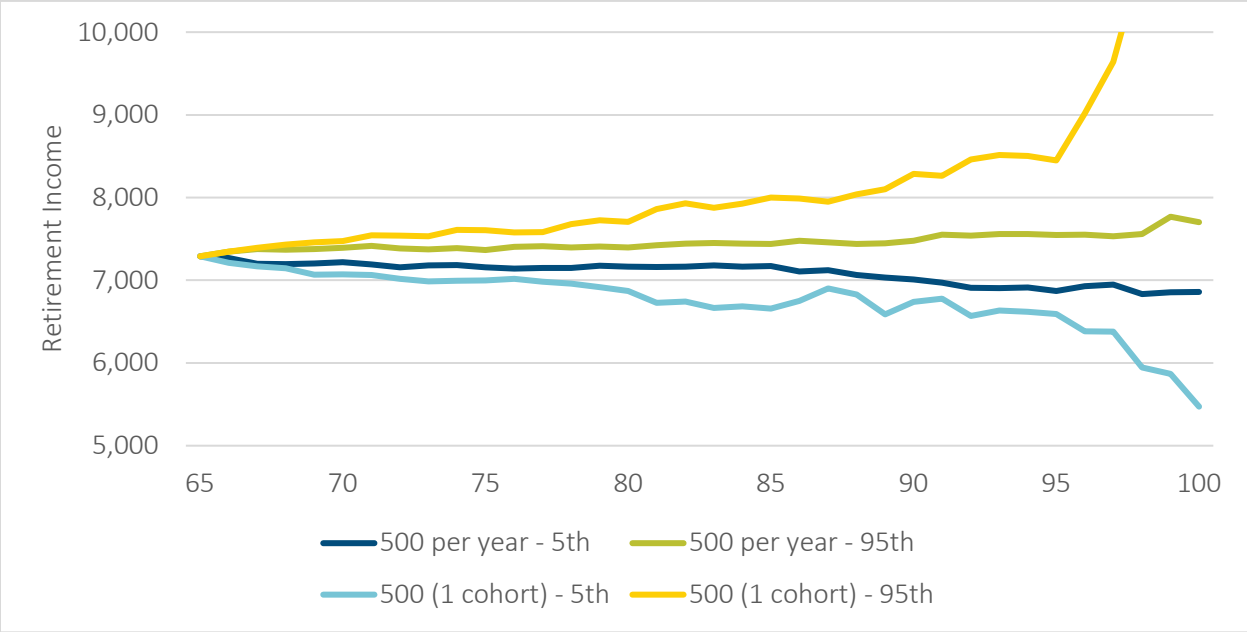
FIGURE A2.3: DISPERSION OF OUTCOMES FOR VALUE LONGEVITY POOL: DIFFERENT COHORT SIZES, SINGLE COHORT



Value Spreads Risk Among All Pool Members

In a real pool, new cohorts are added every year. Since this increases the size of the pool and allows the experience of each cohort to be smoothed out over all the cohorts of new retirees, the variability in income levels is reduced, even for the longest survivors. Figure A2.4 shows the outcome for a pool with a constant number of new members each year. The pooling of longevity risk is a key principle underlying lifetime income solutions for the payout phase and creates a manageable level of potential variation in income delivered by the Value concept.

FIGURE A2.4: DISPERSION OF OUTCOMES FOR VALUE LONGEVITY POOL: MANY COHORTS VERSUS SINGLE COHORT



Conclusion

In summary, the Value approach provides the following advantages:

- Income is delivered for the entire lifetime of all members.
- Income is variable and uncertain, but changes in the income are limited by allocating the investment returns and mortality experience over the future lifetime of all pool members.
- Income is higher than with systematic withdrawals because remaining balances at death are shared with the pool, similar to an insured annuity.
- Income is higher than with insured annuities because the pool bears all risk and does not provide profit to the insurance company for taking on risk.
- Income does not grow to extremes as it would in a classic tontine except in the case of very small pools.

Note on Mortality Volatility and Uncertainty

There are several potential sources of changes in future benefit levels due to actual mortality experience. The potential impacts of these sources of variability and uncertainty are illustrated in the Dispersion of Outcomes charts. The sources of variability include the following.

1. The table of mortality rates is not an accurate reflection of future mortality experience because:
    a. Experience data are not available, not robust or not enough to be credible
    b. The table is not reflective of anticipated mortality for the specific group to which it is being applied (e.g., a white-collar table is applied to a blue-collar population)
    c. Mortality rates change (e.g., a new disease permanently increases future mortality)
2. Random variation in mortality that decreases as the size of the group increases. This can be modeled with the binomial distribution, with a standard error for deaths at any age equal to SQRT($qx \times (1 - qx) \times Lx$).
3. Random variation in population mortality due to temporary factors—for example, an unknown illness increases mortality for one year. If such a factor increases mortality in one year, then mortality rates may be lower in the next year.

Notes and Assumptions for Charts

- Chart 1—250 Scenarios
- Chart 2—1 Scenario
- Chart 3—250 Scenarios
- Chart 4—250 Scenarios for one cohort and 20 scenarios for multicohort results

TABLE A2.1 ASSUMPTIONS

Retirement Age	65	
Lump-sum value	100,000	Retirement savings account balance at retirement age
Group size	500 or 50,000	Impacts the volatility of the Value option where longevity risk is shared by the group
Population mortality volatility	2.50%	Represents short-term factors such as pandemics or natural disasters
Geometric portfolio real return	3.00%	Arithmetic real return of 3.32% adjusted for volatility
Portfolio real return volatility	8.00%	Standard deviation of real returns for a diversified portfolio
Fixed annuity discount rate	1.00%	Assumed to be fixed income (real return)
Sales, administration (admin) and profit charge		
Fixed annuity	12%	Sales 3%, admin 1%, risk and profit 8% of annuity premium
Value pool annuity	3%	Education and administration

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