SOA Research INSTITUTE

Aging and Retirement

Variable Uninsured Life (Value) Annuities:
Theory, Practice and Country Cases
Appendix 5: Illustrations for Malaysia

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Variable Uninsured (Value) Life Annuities

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Appendix 5: Illustrations for Malaysia

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SOCIETY OF ACTUARIES

Appendix 5: Dispersion of Outcome illustrations for Malaysia

Basic Assumptions (unless adjusted for scenario shown)

- **New cohort** of age 65-year-old retirees is added to pool each year
- **Account balance** at retirement = 500,000 ringgit
- **Interest rate** for actuarial factors = 3.0%
- **Mortality base table** based on the United Nations 2020–25 five-year central rates of mortality with linear interpolation
- **Mortality improvement** is 1.25% per year
- **Mortality uncertainty**
  - Mortality volatility is based on random variation from the binomial distribution with a standard error of SQRT($p \times q \times N$) where N is the number of participants at each age in a particular year.
  - In addition, population mortality is assumed to have a standard error of 2.5% per year. In other words, in about two out of three years, actual population mortality would be between 97.5% and 102.5% of mortality predicted by the mortality table with the variation due to things like bad flu seasons or natural disasters. The impact of the mortality assumption being inaccurate is shown in Example 4.
- **Investment returns** (real) are 3.0%, except for the examples with diversified portfolios.
- **Investment returns for the diversified portfolios** are based on economic conditions in the country as of June 2021. The parameters are not determined precisely since the information is only illustrative. The following information describes the stochastic investment return assumptions:
  - **Aggressive portfolio**
    - 60% growth-oriented assets/40% fixed income
    - Arithmetic mean of real investment return of 3.50% with volatility of 10.0%, producing a 3.0% geometric average.
  - **Conservative portfolio**
    - 30% growth-oriented assets/70% fixed income
    - Investment returns (real) for the alternative, more conservative, portfolio have an arithmetic mean or 2.125% with volatility of 5.0%. Some mean reversion in returns is assumed when asset prices get very high or very low.
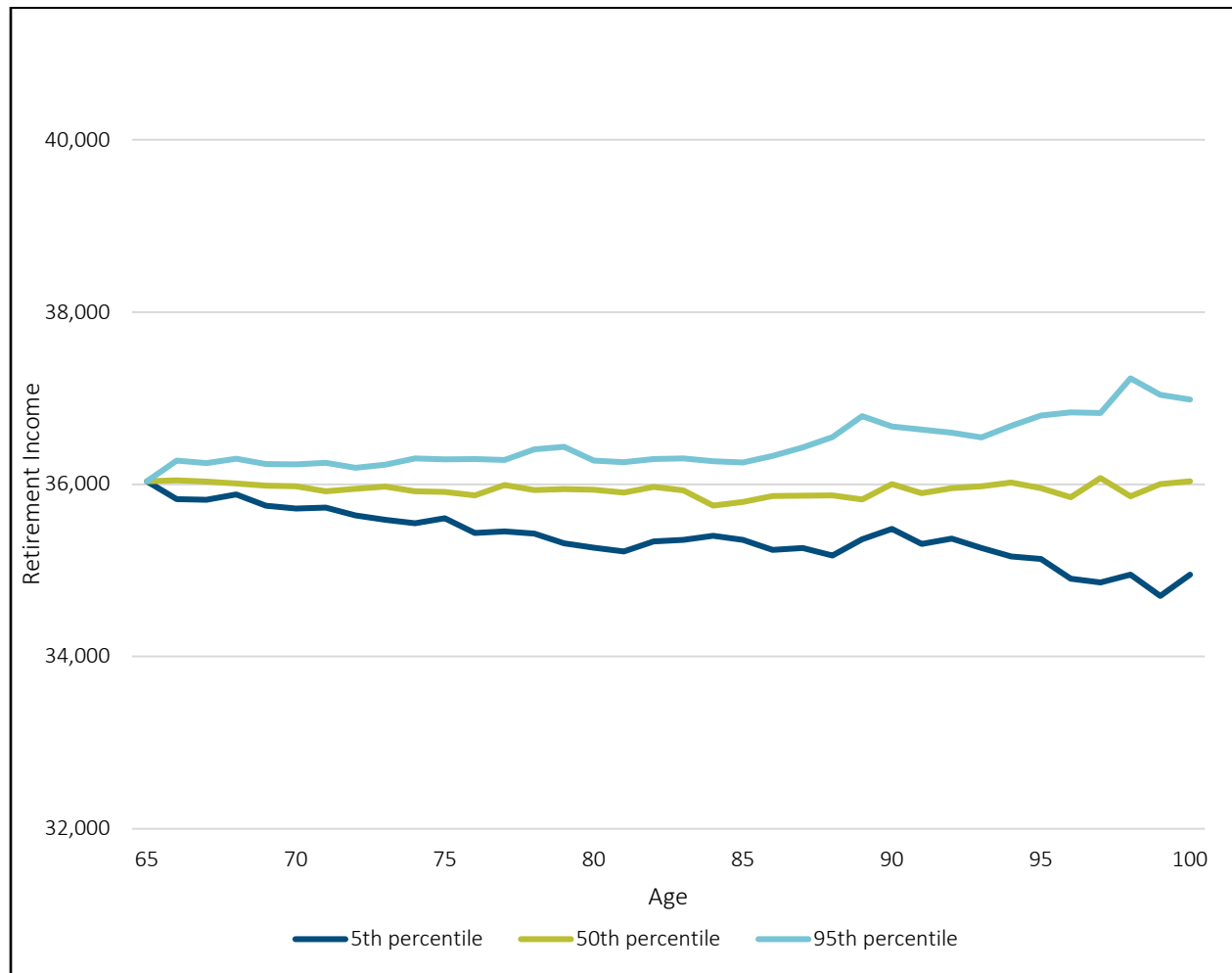
Example 1

MALAYSIA: COHORT NO. 1—NO MORTALITY IMPROVEMENT
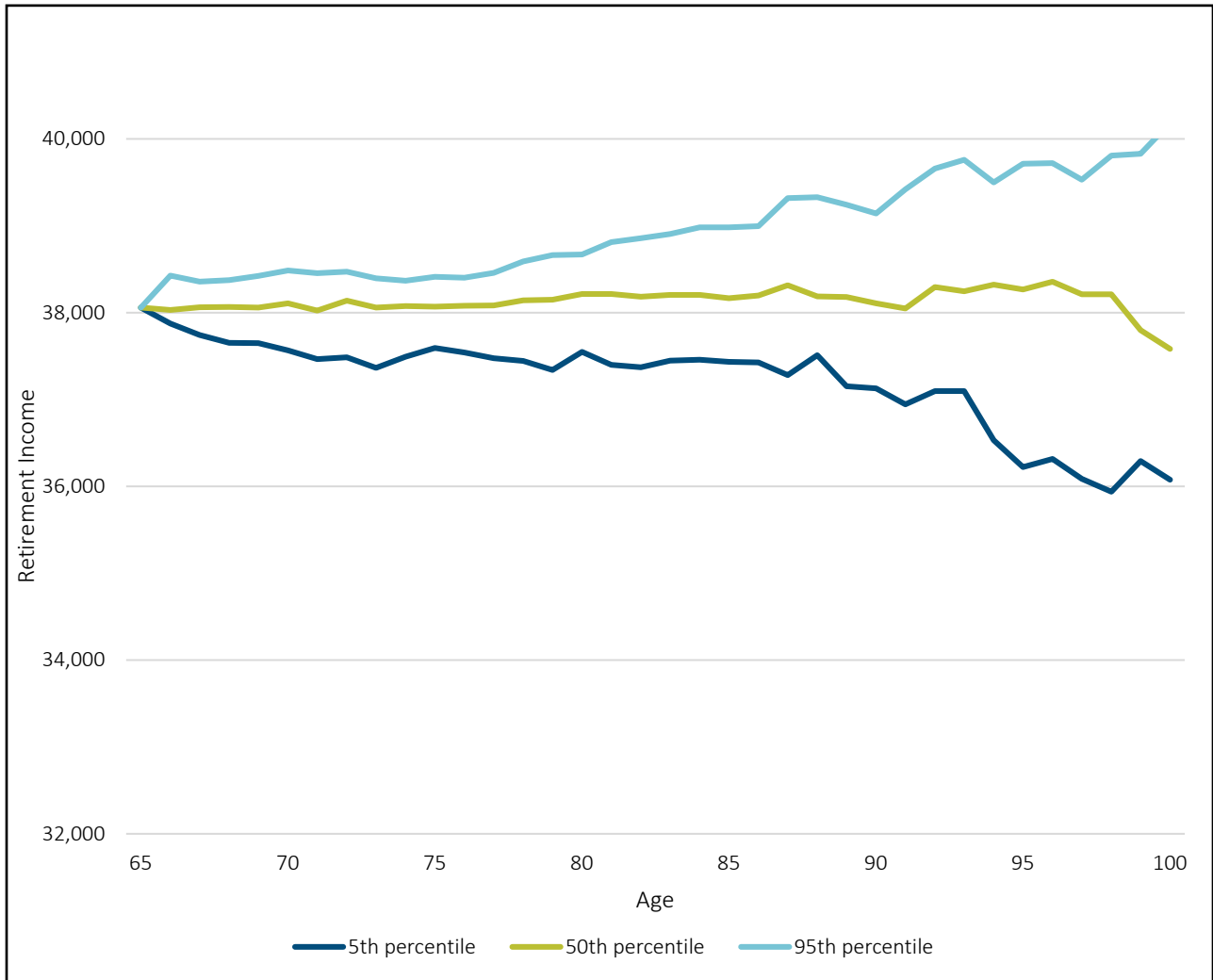
Example 2

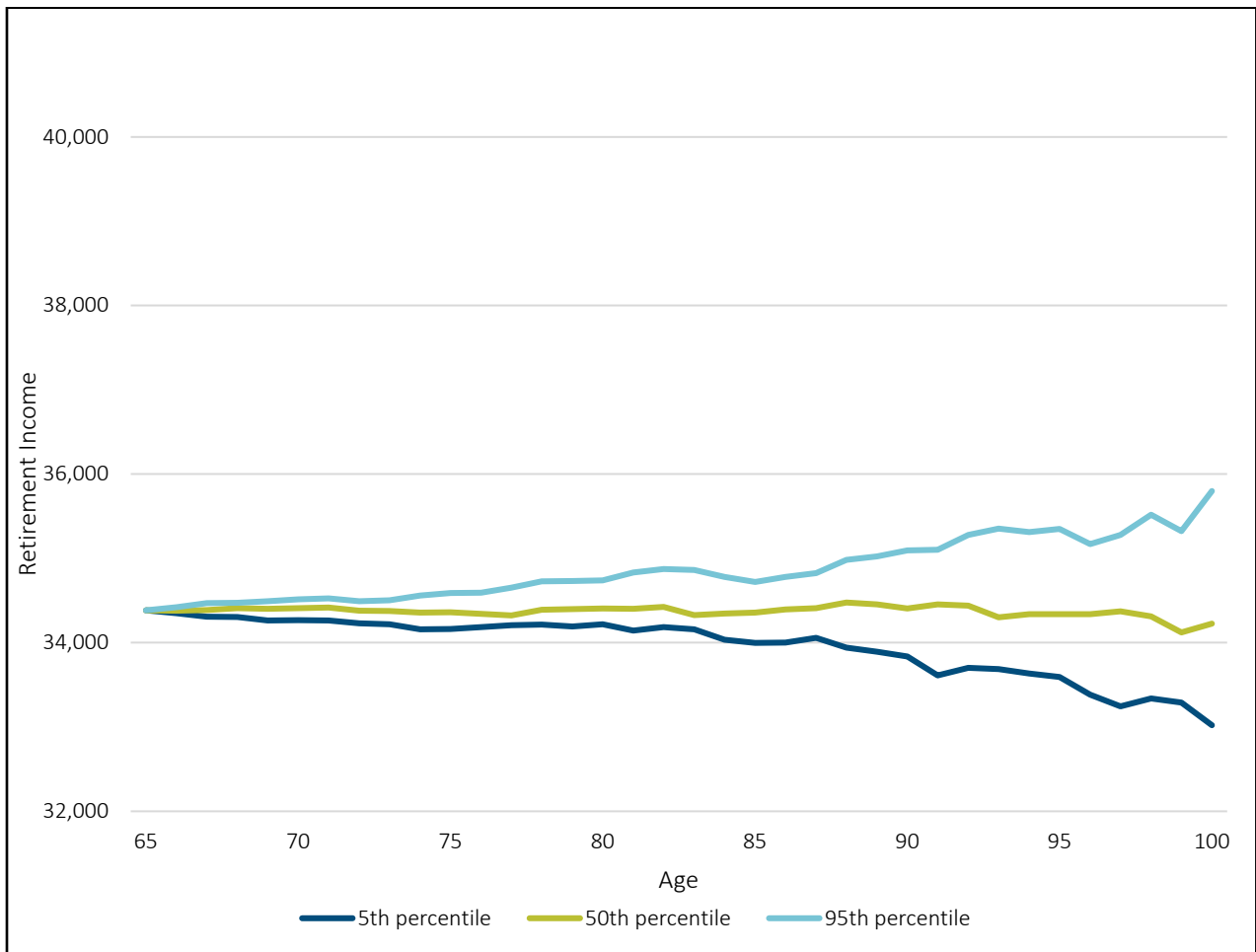MALAYSIA: COHORT NO. 1—ASSUMED MORTALITY IMPROVEMENT = 1.25% PER YEAR

Benefit amounts are lower due to assumed longer life expectancy.

Example 3

MALAYSIA: COHORT NO. 10—ASSUMED MORTALITY IMPROVEMENT = 1.25% PER YEAR

Lower benefit amounts for later cohorts that have longer life expectancy as longevity improves.

Example 4

MALAYSIA: COHORT NO. 1—MORTALITY ASSUMPTION 20% TOO LOW IN YEAR 1, CORRECTING 2% PER YEAR UNTIL YEAR 10
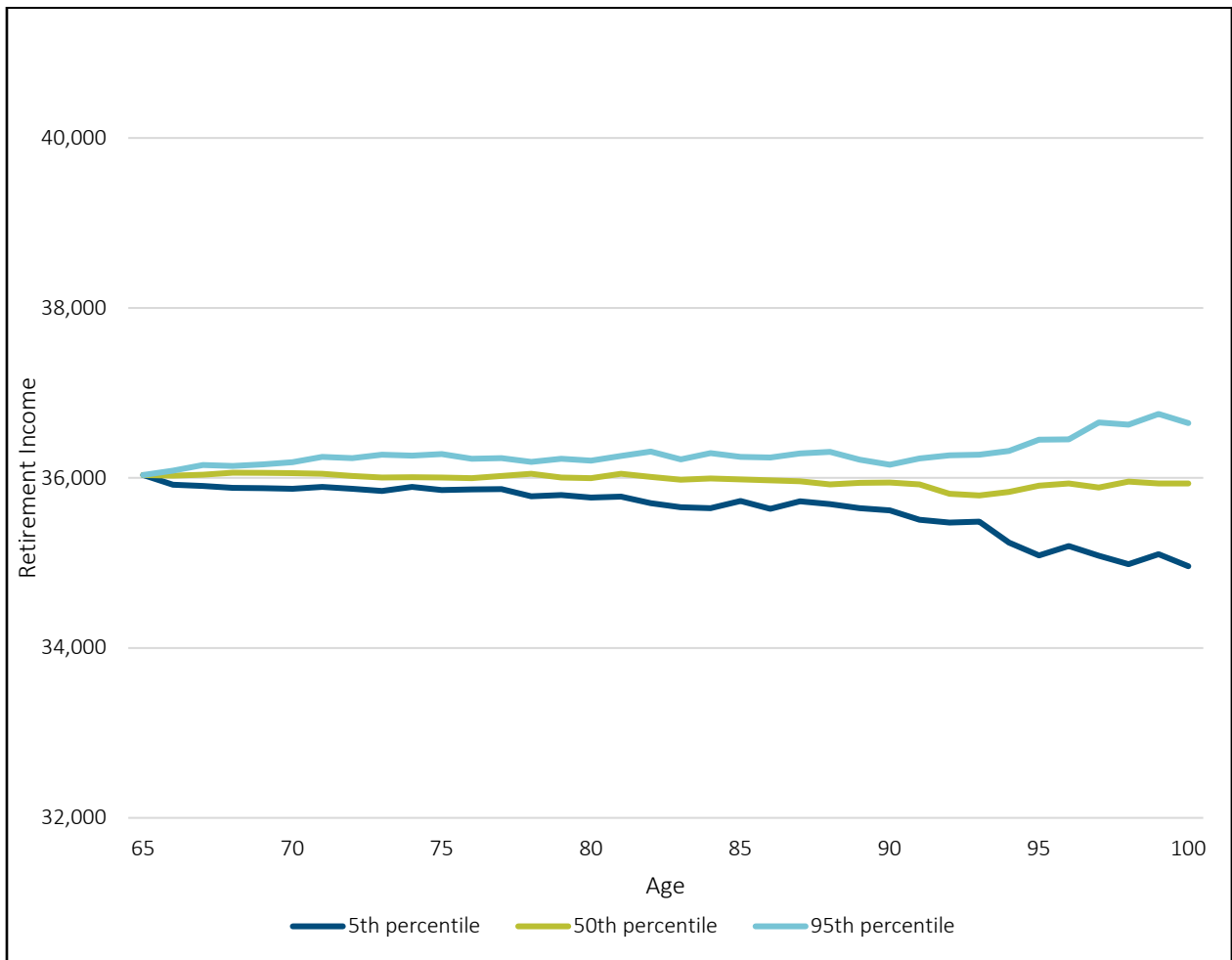
Benefit amounts increase in the early years when mortality risk has been estimated too low and actual mortality is higher, producing bigger mortality gains.
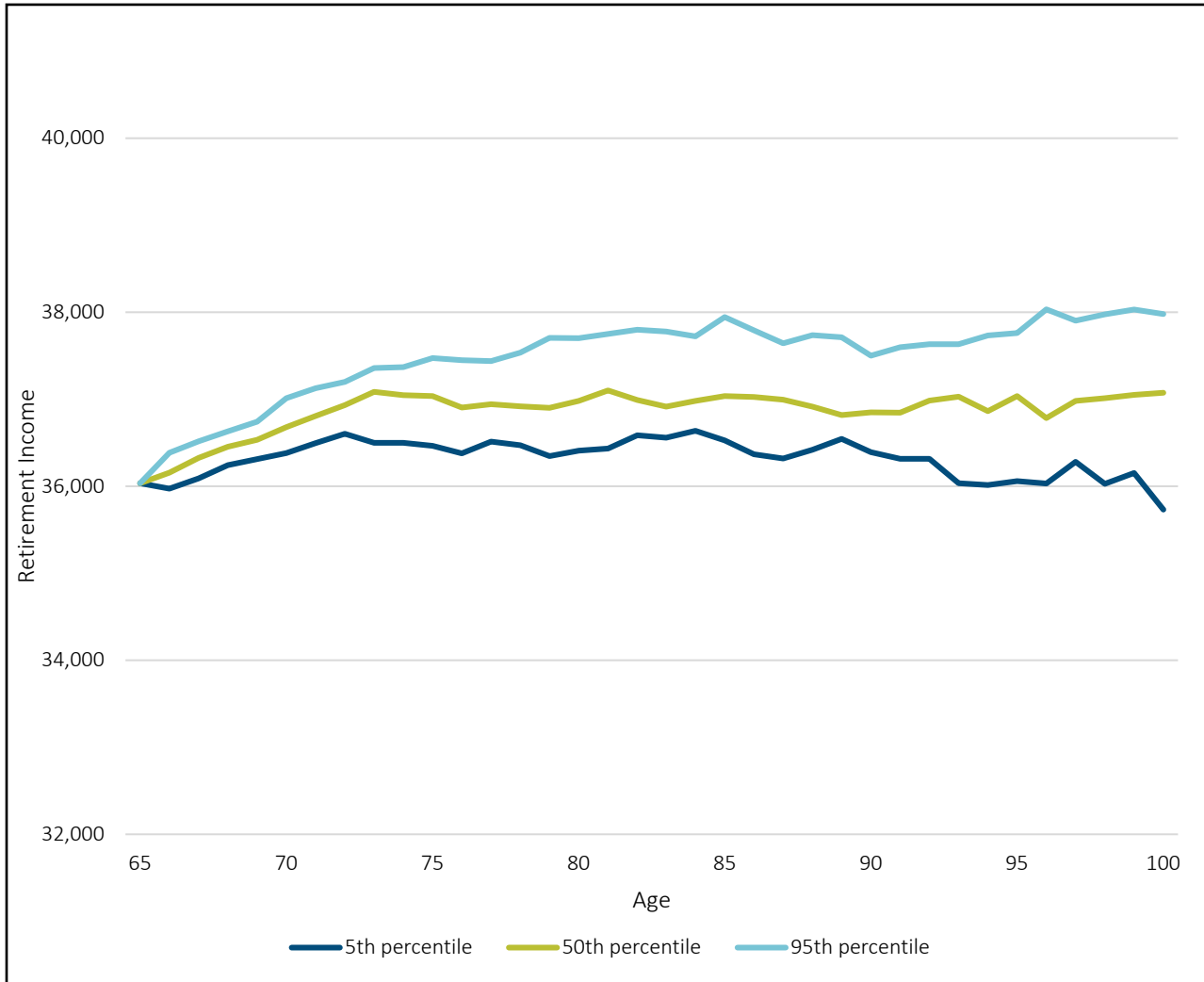
Example 5

MALAYSIA: COHORT NO. 1—5,000 NEW MEMBERS EACH YEAR

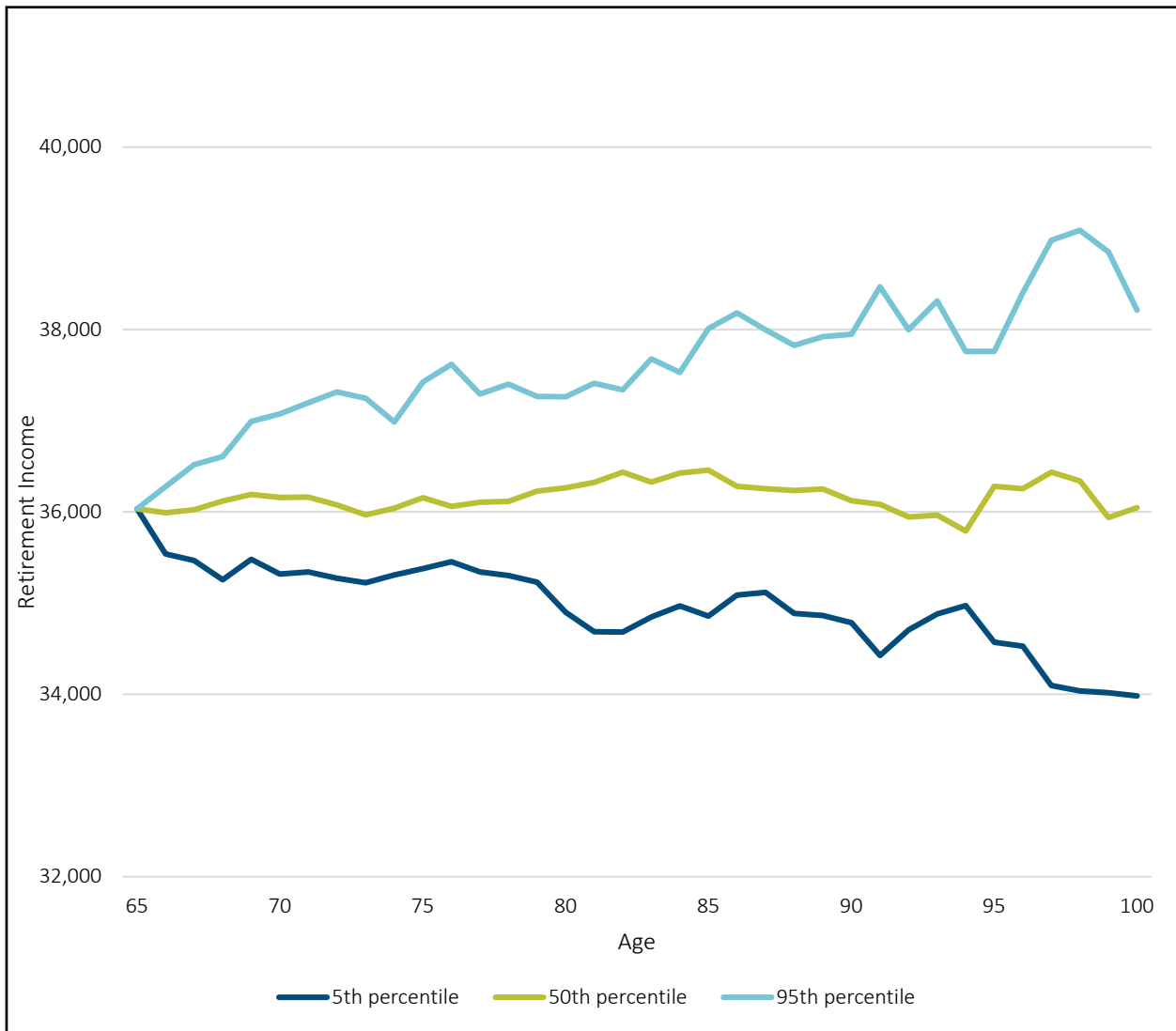Benefit amounts are less variable since risk is spread among more participants.

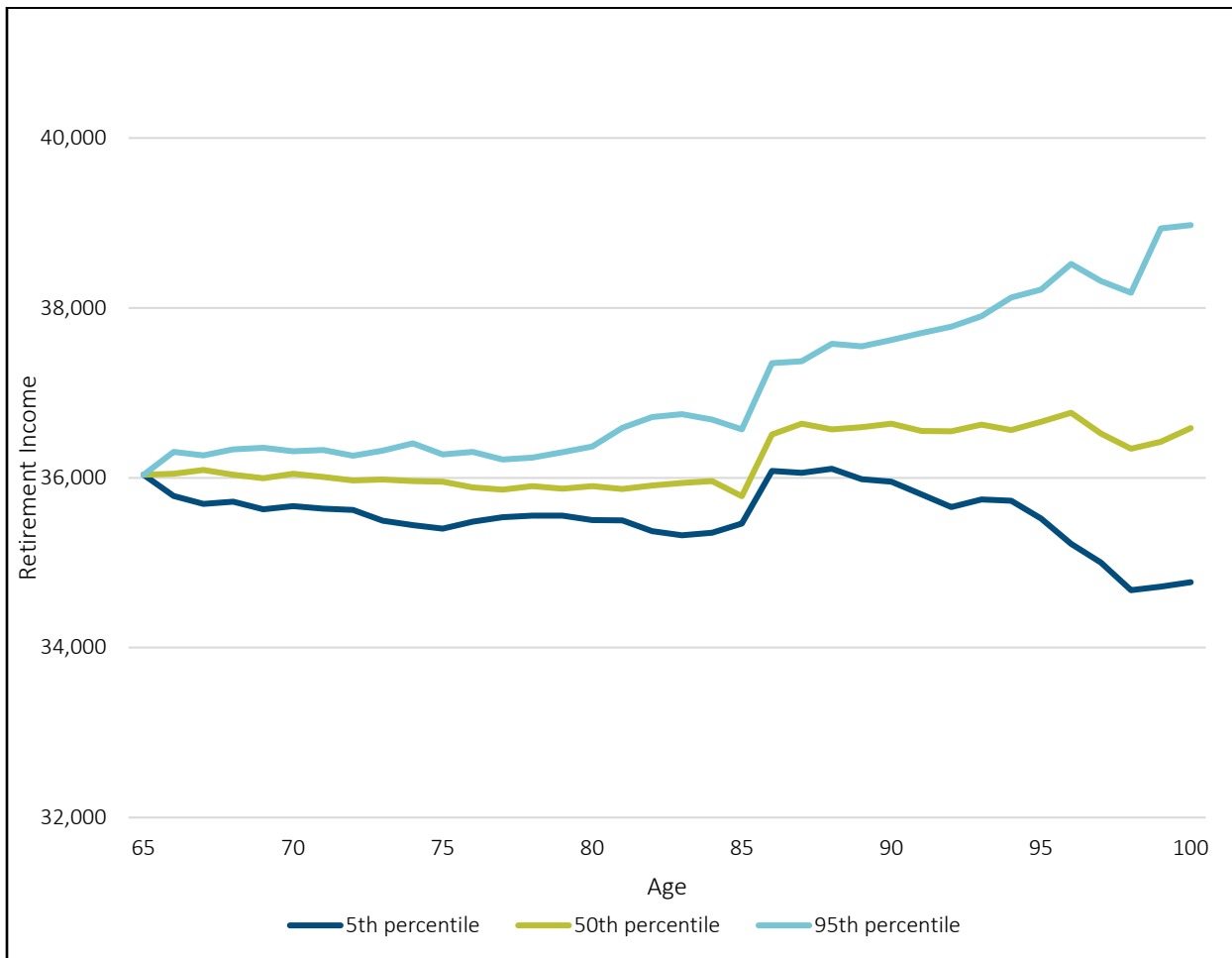Example 6

MALAYSIA: COHORT NO. 1—200 NEW MEMBERS EACH YEAR

Benefit amounts are more variable since risk is spread among fewer participants.

Example 7

MALAYSIA: COHORT NO. 1—COVID-TYPE EVENT: MORTALITY 25% HIGHER IN YEAR 20 OF POOL

Large mortality gains in the high mortality year.

Example 8

MALAYSIA: COHORT NO. 10—COVID TYPE EVENT: MORTALITY 25% HIGHER IN YEAR 20 OF POOL, YEAR 10 FOR COHORT

Mortality gains in same year are much smaller for cohort 10 since this group is younger and gets a smaller allocation of the mortality gains.
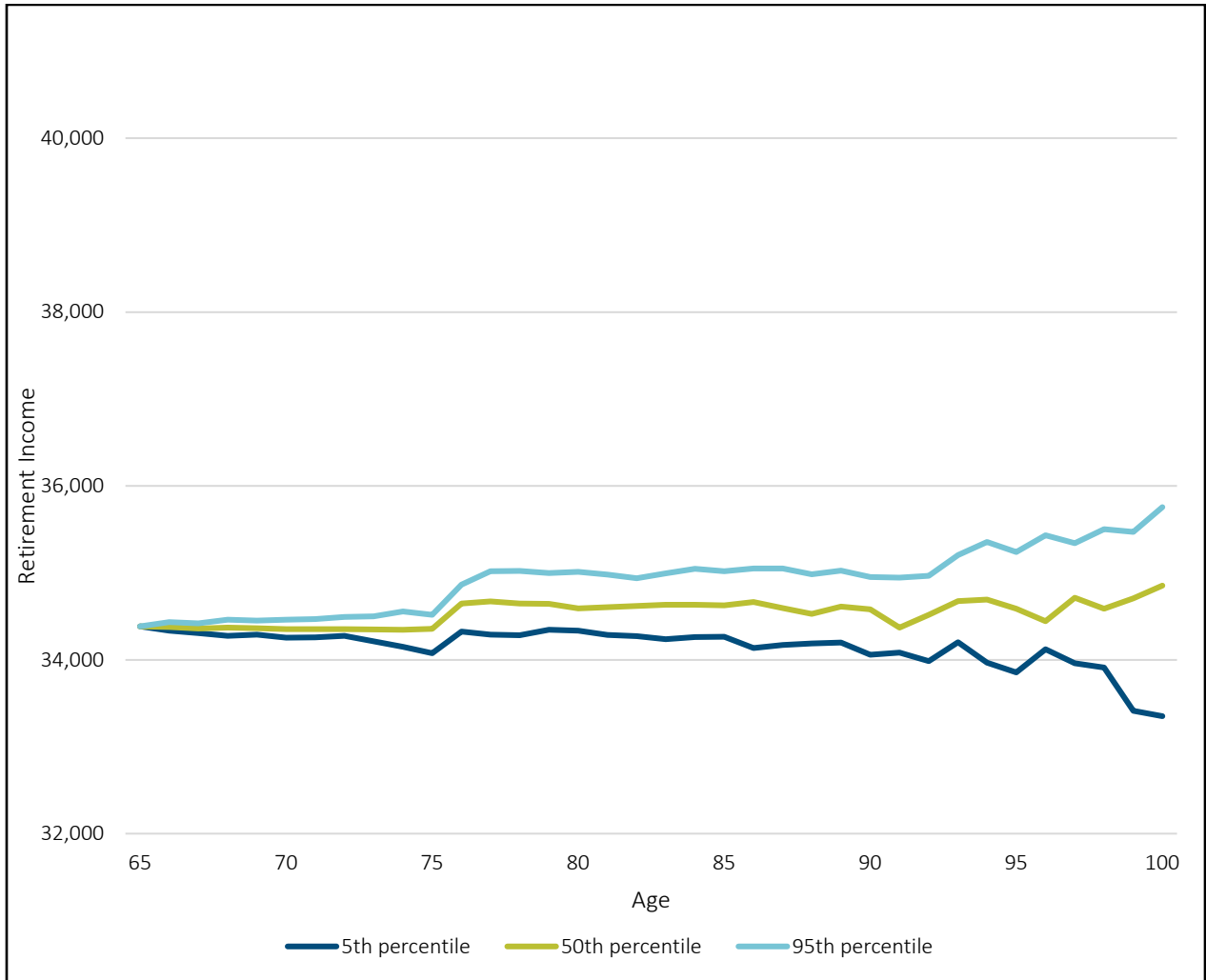
Example 9

MALAYSIA: COHORT NO. 1—DIVERSIFIED PORTFOLIO WITH 10.0% VOLATILITY

Variability due to investment returns is much greater than variability due to mortality risk. *Note that the scale of the chart* is different from that of the earlier charts.
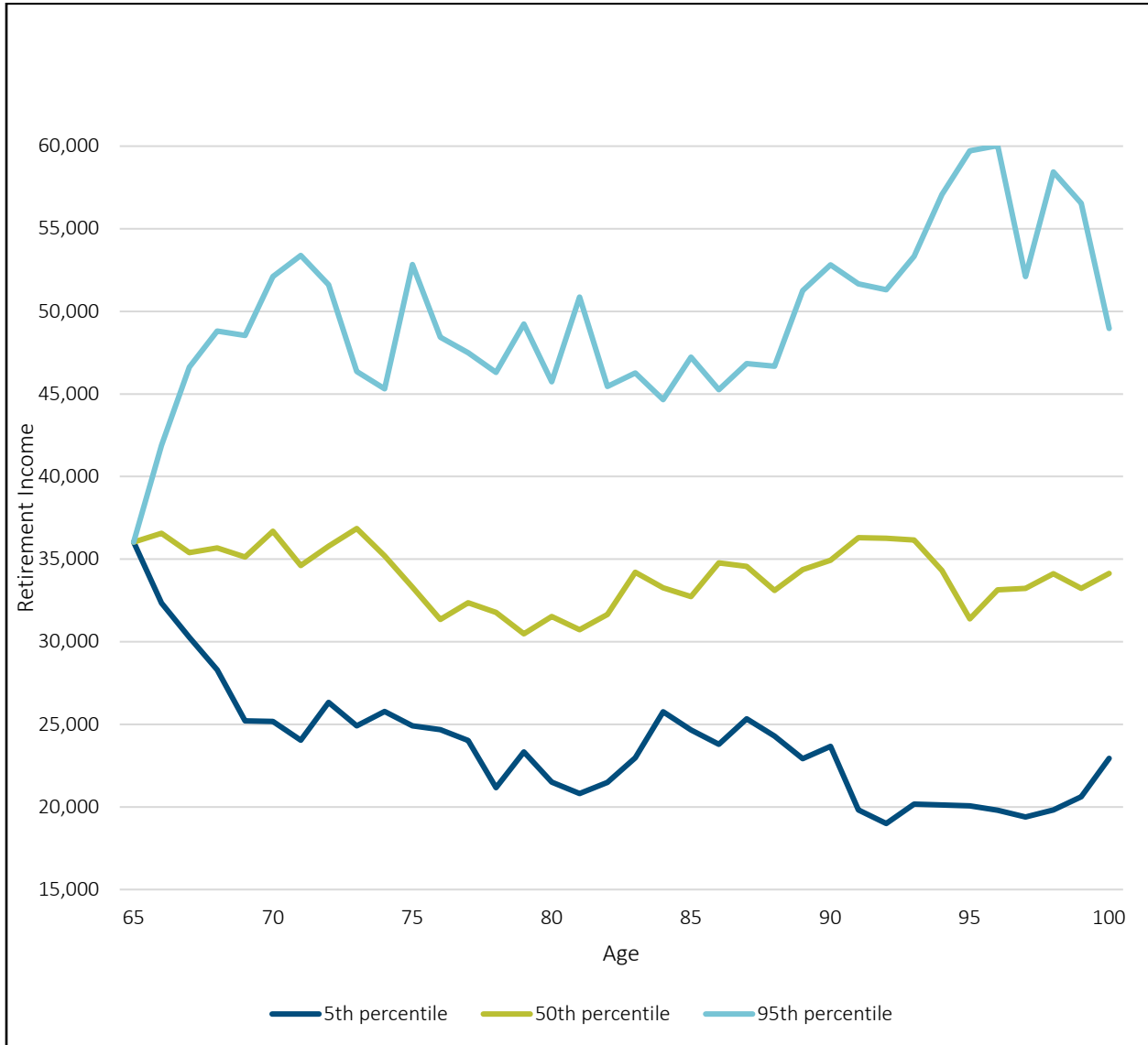
Example 10

MALAYSIA: COHORT NO. 1—DIVERSIFIED PORTFOLIO WITH 5.0% VOLATILITY

Lower volatility of investment returns has a significant impact on the dispersion of outcomes for the pool. *Note that the scale* of the chart is different from that of the earlier charts.
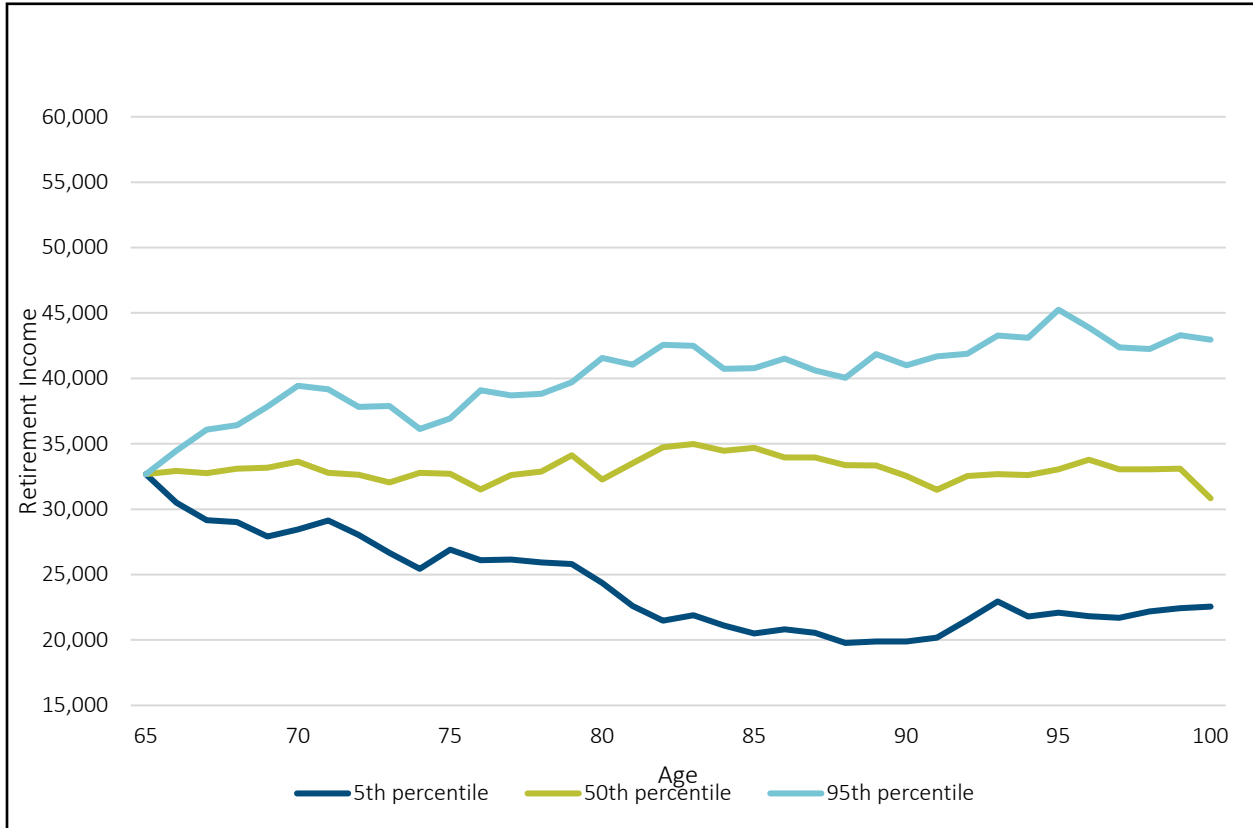
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