

Individual Life Insurance Mortality Improvement Scale Recommendation – for Use with AG38/VM20

American Academy of Actuaries' Life Work
Group and the Society of Actuaries
Research Institute's Mortality and
Longevity Oversight Advisory Council

Revised October 2023

Revision – October 31, 2023

The 2023 FMI scale values have been revised from what was published on September 26, 2023 to correct for an error found in the interpolation between the 2023 HMI Scale and the long-term mortality improvement rate (MI LTR) at ages 0-20 and at ages 62-119. These are ages where the calculation of the HMI with the full COVID impact did not result in an initial deterioration level at 2023. So at these ages, values should have been graded from the 2024 FMI level (with lower mortality improvement than the 2023 HMI, but not deterioration) to the long-term MI rate (rather than grading from 0 at year 2026 to the long-term rate).

In the accompanying spreadsheet with revised values as of October 31, 2023, the values that have changed compared to September 26, 2023 are highlighted in orange. All values that changed have had increases in loaded FMI rates up to a maximum increase of 0.0042. Both the September 26th and October 31st Excel files with HMI and FMI rates are published on the webpage because companies can opt to use the September 26th rates if they choose since the corrected October 31st rates were published after September 30th.

Purpose

This document describes the 2023 individual life insurance historical mortality improvement (HMI) and future mortality improvement (FMI) recommendations approved by the National Association of Insurance Commissioners (NAIC) Life Actuarial Task Force (LATF) on the September 14, 2023 call.

For US statutory reserves under VM20 or AG38 using the 2008 Valuation Basic Table (2008 VBT) or the 2015 Valuation Basic Table (2015 VBT), the HMI and FMI scales discussed herein are applicable.

For statutory reserves using the 2008 Limited Underwriting tables, the HMI and FMI mortality improvement assumptions are zero.

Background

As part of the work conducted by the American Academy of Actuaries' Life Work Group and the Society of Actuaries Research Institute's Mortality and Longevity Oversight Advisory Council (MLOAC) to develop the 2015 Valuation Basic Table, the Mortality Improvements Life Working Group (MILWG) (a subgroup of MLOAC) was tasked with reviewing recent mortality improvement levels based on available data for the individual life insurance policyholder population.

Since yearend 2014, the MILWG has been tasked with studying and annually recommending updates to the mortality improvement scales for use with AG38 and VM20 (specific to the individual life insurance product lines). Each year, the MILWG presents a recommendation for a set of HMI factors, and starting in 2022, a set of FMI factors to be used in conjunction with the 2015 Valuation Basic table. Both the HMI and FMI scales vary by age and sex. The FMI scale also varies by calendar year.

The HMI & FMI scales presented in this document were accepted for use for the 2023 valuation year in conjunction with AG38 and VM20. See Appendix A of this document for background on the development of the current methodology for producing these scales.

The SOA Research Institute's Mortality and Longevity Steering Committee is simultaneously working on a general framework for developing product-neutral mortality improvement scales, which will subsequently be used as a guide by the MILWG to revisit the current approach for creating these scales each year.

Recommendation

HMI and FMI Scales

The MILWG, as well as other industry groups working on valuation mortality and mortality improvement rates, considered appropriate methods to reflect the impact of a shock mortality event like COVID-19. In order to ensure consistency in thinking about how to reflect the impact of a shock mortality event, an industry group was formed in January 2022 to discuss and develop a set of principles to reflect the impacts of COVID-19 on life insurance and annuity valuation mortality. This group included representatives from the life insurance industry, the American Academy of Actuaries, the Society of Actuaries, and the NAIC. A key principle agreed upon by the group was that the initial shock impact of the COVID-19 event should be reflected in valuation mortality only to the extent it is expected to continue into the future.

In practice, this principle was reflected in the current recommendation by implementing the following revised methodology for HMI and FMI for both 2022 and 2023.

It is recommended that the HMI and FMI rates provided in the accompanying spreadsheet be used for 2023.

For HMI, this will result in a reduction in mortality improvement levels from the 2022 scale for ages 22-43 and an increase for other ages. For FMI, for ages 22-43, for the first two reserve projection years, the rates will project deterioration in mortality to reflect a reasonable estimate of potential ongoing impacts of COVID-19. This will result in an increase in mortality over pre-pandemic levels at these ages. See below for a more detailed description of the methodologies applied to develop the 2023 HMI and FMI scales and an example of how the HMI and FMI scale rates should be applied in practice.

2023 Historical Mortality Improvement (HMI) Scale Methodology

The raw, unsmoothed HMI rates are equal to the average of a historical component and a future-looking component as described below:

- Historical component
The historical component is represented by the 10-year (ending in 2021) average annual historical mortality improvement levels, implied from general population historical mortality data published by the Social Security Administration (SSA). **However, for 2023, in order to reflect the principle of not including the initial shock impact of COVID-19 to develop the HMI or FMI scales, the historical average was calculated as the 10-year average from 2011-2021 but assumed that 2020 and 2021 mortality was at the same level as 2019.** So, no change in the rates of improvement or deterioration for 2020 and 2021 was assumed.
- Future-looking component
The future component is represented by the 20-year average annual mortality improvement levels (for 2023, this covers the period from 2021 to 2041), based on the most recent SSA Trustees report (2023) intermediate assumption.

For AG38/VM20 purposes, the “future/unknown” period is relatively short (for 2023, final historical data only exists through 2021, so that the “unknown” future component is 2 years). However, applying the 20-year period for averaging generally results in smoother patterns by age and calendar year, as well as allowing for greater weight being given to the long-term average.

The average annual rates calculated as above are then smoothed using simple linear interpolation to produce final scales by gender and age (as well as calendar year for FMI).

2023 Future Mortality Improvement (FMI) Scale Methodology

The FMI rates are calculated as follows.

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- The starting point for FMI is the 2023 HMI scale.
 - The FMI rates grade from the 2023 HMI level to a long-term MI assumption that is based on the average of years 10-15 of the SSA 2023 Trustee’s Report intermediate projected mortality assumption. The FMI rates grade to the long-term level over the first 10 years of the projection.
 - The FMI rates then remain level at the long-term rate from 2033-2038 (5 years).
 - The FMI rates then grade to zero at year 20 (2043).
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A reasonable estimate of the deterioration in mortality for years 2024-2026 was determined by calculating an initial 2024 deterioration level that reflects the full impact of COVID in determining the initial FMI starting point. This leads to an initial “alternative” HMI scale that reflects deterioration rather than improvement in mortality at some ages. This initial HMI deterioration then grades to the long-term mortality assumption over 10 years as the standard FMI approach would dictate. The resulting implied deterioration in the first year is reflected in full for the 2024 FMI rates. In 2025, deterioration is expected to be 50% of the 2024 level. In 2026, mortality improvement rates are expected to be zero. Then FMI rates grade from zero to the long-term assumption over the remaining 7-year period to 2033, remain level at the long-term assumption until 2038 and then grade to zero in 2043 and later.

Example Application

The recommended HMI and FMI scales are intended to be applied to update (“improve or deteriorate”) valuation basic table mortality rates to the end of the current valuation year and into the future for the length of the projection period used in the reserve calculation.

The following is an example of how to determine the mortality rate to be used in the reserve projection for calendar year 2028, for male 40, using the 2023 approved HMI and FMI scales.

Step 1: Improve 2015 VBT q₄₀ mortality rate to year-end 2023.		
$q_{40,2023} = q_{40} * (1 - HMI_{40})^{(8.5)} = q_{40} * (1 - (-0.0106))^{(8.5)}$ q ₄₀ is the mortality rate from 2015 VBT. HMI ₄₀ is the mortality improvement rate from the 2023 recommendation. Improvement applied to q ₄₀ from the middle of 2015 to the end of 2023 or 8.5 years.	Attained Age	HMI Males (2023)
	36	-0.0106
	37	-0.0006
	38	-0.0106
	39	-0.0106
	40	-0.0106
	41	-0.0074
	42	-0.0042
	43	-0.0009
Step 2: Improve q_{40,2023} from year-end 2023 to the start of calendar year 2028, using the FMI rates for male, attained age 40, for each calendar year 2024 to 2028:		
So, q _{40,yyyy} is mortality rate used at the start of calendar year yyyy +1 in the projection in the reserve calculation.		
$q_{40,2027} = q_{40,2023}$ * (1 - (-0.0244306)) * (1 - (-0.0122153)) * (1 - 0.0000000) * (1 - 0.0007472)	Calendar Year	FMI Loaded Males Attained Age 40
	2024	-0.0244306
	2025	-0.0122153
	2026	0.0000000
	2027	0.0007472
	2028	0.0014944
	2029	0.0022416
	2030	0.0029888
	2031	0.0037360
	2032	0.0044832

Note: For clarity, for the actual reserve projection for an individual policyholder attained age 40 in 2023, the mortality rates applied to determine the reserve calculation would be as follows: q_{40,2023}, q_{41,2024}, q_{42,2025}, q_{43,2026}, etc.

APPENDIX A:

Considerations in developing mortality improvement factors for application with VM38 and VM20.

- Recent Historical Experience Impact – The desire for a methodology that weights the impact of recent historical rates of improvement with a longer-term assumption (i.e., SSA intermediate mortality projections) in determining projected improvement rates. This approach is (at a very high level) consistent with the current U.K. Continuous Mortality Investigation (“CMI”) projection models, as well as methods commonly used to develop other insured mortality projection scales. These methods project rates based on past experience, but trend toward a long-term assumed average annual improvement level.
- Insured Data – Aggregate insurance company data for the period 2002-2009 from the Society of Actuaries regular studies of individual life insurance mortality was initially examined. It was eventually decided that, given (1) the relatively short period over which historical insured experience is available and (2) the year-over-year volatility of industry specific results (likely in part the result of both industry factors - such as changes in target market, distribution channel or underwriting mix and changes in underlying mortality rates), general population data is a preferable source for determining both an improvement scale for use in VBT table development efforts and as annual AG38/VM20 scale recommendations, at least for the near term.
- General Population Data Source – The MILWG examined several sources of general population data, including data from the U.S. Vital Statistics, the Human Mortality Database (HMD), and the SSA. The SSA data was selected as the source for general population analysis for several reasons, including the fact that it is strongly vetted, that it may have better data regarding age at death for the oldest ages than HMD, and that it includes projections of future estimated mortality.
- Additional Factors Considered (Gender, Attained Age, Smoker Status, Socioeconomic Status, Differences in Cause of Death for Insured vs. General Population) – In addition to data sources discussed above, the subgroup also researched and considered additional factors that could impact mortality improvement experience. The decision was made to regularly review the use of alternative or further adjustments to population mortality to eliminate potential basis risk (differences between the results using general population data in lieu of industry specific data) at the same time any changes for consistent framework recommendations are incorporated.

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Society of Actuaries Research Institute
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org