

# Valuation Manual (VM)-22 (A) Subgroup Meeting

## VM-22 SPA Assumptions—Mortality Proposed Mortality Adjustment Factors for Individual Annuities

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# VM-22—SPA Assumptions—Mortality Adjustment Factors for Individual Annuity Product Lines

- The mortality adjustment factors have been developed for use as Standard Projection Amount (SPA) assumptions for the anticipated 2024 VM-22 Field Test
- Proposed factors have been developed for all Individual Annuity product lines:
  - Fixed Deferred Annuities (accumulation products), including Fixed Indexed Annuities (FIAs)
  - Individual Payout Annuities
  - Structured Settlement Annuities
- The base mortality adjustment factors were developed based on industry experience studies conducted by the SOA
- A basis for historical mortality improvement has been developed
- The mortality adjustment factors have been brought up to 12/31/2022 based on historical mortality improvement

# Development of Basis for Historical Mortality Improvement (HMI)

- Our objective is to set a baseline mortality as of 12/31/2022, to serve as the new “jumping-off” point
- Historical Mortality Improvement is needed to bring mortality up from the mid-point of the respective industry studies, such as 2013 for the fixed deferred annuities, 2016 for individual payout annuities, and 2011 for structured settlements
- We split the historical era into **two periods**, first the pre-pandemic era through 2019, and then 2020–2022
- Historical Mortality Improvement through 2019
  - We used data from the SOA’s report on Mortality by Socioeconomic Category, authored by Magali Barbieri, to generate improvement rates by quinquennial age groups
  - U.S. counties were assigned to one of 10 deciles, based on various socioeconomic criteria
  - The 10<sup>th</sup> decile (highest socioeconomic category) aligned with the experience from all individual annuity product lines, except for Structured Settlements, which aligned with the 1<sup>st</sup> decile (lowest)
  - Mortality data for this study was sourced from the National Center for Health Statistics (NCHS), which had a fairly good alignment with Social Security data except at older ages (above age 80)

# Development of Basis for Historical Mortality Improvement, continued

- Historical Mortality Improvement for 2020 through 2022
  - Actual experience was severely impacted by the pandemic
  - Even if specific COVID-related deaths could be identified with precision and factored out, other aspects of the pandemic environment affected overall mortality drivers
  - **Decision was made to assume 0% improvement for 2020 through 2022**
    - Mortality rates at the end of 2022 had not yet improved to 2019 levels post-pandemic, but were getting close, especially at the older ages relevant for most annuity product lines

# Mortality Adjustment Factor Development

- The Base Adjustment Factors, representative of the central point of the respective industry study, are brought up to 12/31/2022 using the historical mortality improvement basis just covered
- The Mortality Adjustment Factors were developed for the quinquennial age groups by averaging the raw factors for the five consecutive ages, and then rounding and smoothing the results
- We propose using linear interpolation for generating the factors for the individual ages
- The Mortality Adjustment Factors are intended to be applied the same way the factors in the current VM-21 are applied, i.e. as a multiplicative factor to a basis using the 2012 IAM Basic table and Mortality Improvement Scale G2 (for Fixed Deferred Annuities and Individual Payout Annuities) and the 1983 IAM Table 'A' and Scale G2 for Structured Settlements
- The following slides show the proposed Mortality Adjustment Factors for quinquennial ages for:
  - Fixed Deferred Annuities, differentiating between those with and without Guaranteed Living Benefits (GLBs)\*
  - Individual Payout Annuities
  - Structured Settlements

\* Developed based on Variable Annuity relationships between with and without GLBs, due to lack of credible experience on Fixed Deferred Annuities with GLBs from the 2011-2015 experience study

# Mortality Adjustment Factors for VM-22 Fixed Deferred Annuities

## Fixed Deferred Annuity Mortality Adjustment Factors

| Age | FDA non-GLB |      | FDA GLB |      |
|-----|-------------|------|---------|------|
|     | Female      | Male | Female  | Male |
| 52  | 150%        | 120% | 125%    | 105% |
| 57  | 150%        | 110% | 125%    | 88%  |
| 62  | 120%        | 95%  | 95%     | 78%  |
| 67  | 108%        | 105% | 90%     | 88%  |
| 72  | 118%        | 108% | 103%    | 93%  |
| 77  | 125%        | 108% | 110%    | 98%  |
| 82  | 118%        | 108% | 110%    | 103% |
| 87  | 110%        | 110% | 110%    | 110% |
| 92  | 108%        | 110% | 108%    | 110% |
| 97  | 107%        | 110% | 107%    | 110% |
| 102 | 103%        | 105% | 103%    | 105% |
| 105 | 100%        | 100% | 100%    | 100% |

Note that Appendix slides 15 & 16 shows the breakout between the Base and HMI Factors

# Mortality Adjustment Factors for VM-22 Individual Payout Annuities

## IPA - Female

| Age | Base Adj Factors | HMI Impact | Factors thru 2022 |
|-----|------------------|------------|-------------------|
| 52  | 125.0%           | 101.7%     | 125%              |
| 57  | 125.0%           | 99.8%      | 125%              |
| 62  | 100.0%           | 101.2%     | 103%              |
| 67  | 90.0%            | 100.4%     | 93%               |
| 72  | 95.0%            | 106.4%     | 100%              |
| 77  | 102.0%           | 104.6%     | 108%              |
| 82  | 102.0%           | 106.2%     | 108%              |
| 87  | 102.0%           | 104.1%     | 108%              |
| 92  | 112.0%           | 102.6%     | 113%              |
| 97  | 112.0%           | 101.5%     | 113%              |
| 102 | 104.5%           | 100.5%     | 105%              |
| 105 | 100.0%           | 100.0%     | 100%              |

## IPA - Male

| Age | Base Adj Factors | HMI Impact | Factors thru 2022 |
|-----|------------------|------------|-------------------|
| 52  | 100.0%           | 102.5%     | 100%              |
| 57  | 100.0%           | 102.5%     | 100%              |
| 62  | 90.0%            | 104.1%     | 95%               |
| 67  | 90.0%            | 107.2%     | 97%               |
| 72  | 100.0%           | 106.7%     | 105%              |
| 77  | 108.0%           | 105.7%     | 115%              |
| 82  | 113.0%           | 107.1%     | 120%              |
| 87  | 113.0%           | 104.9%     | 120%              |
| 92  | 113.0%           | 103.2%     | 115%              |
| 97  | 113.0%           | 101.6%     | 115%              |
| 102 | 104.9%           | 100.5%     | 105%              |
| 105 | 100.0%           | 100.0%     | 100%              |



# Structured Settlement Annuities

- Structured Settlement Annuities (SSAs) comprise a niche annuity market, with a very distinct demographic when compared to typical annuities used to fund retirement programs, and much different mortality.
- SSA annuitants often have significant health impairments, and underwriting may be performed. Impaired annuitants are eligible to receive an age “rate up,” reflecting a diminished life expectancy; contracts covering annuitants receiving such a rate-up are often referred to as “Substandard” business.
- Statutory reserving for Structured Settlements uses the 1983 IAM Table ‘A’; valuation for substandard business uses the “Constant Extra Death (CED)” methodology, as provided for in Actuarial Guideline IX-A. This serves to frontload expected mortality, as adding a constant number of deaths is more impactful on younger ages when mortality is otherwise lower.

# Development of Base Mortality Adjustment Factors for SSAs

- Base mortality adjustment factors were developed based on an SOA experience study covering the 2005-2017 period. This longer period was helpful in increasing the credibility of the data, but the sparseness of the data remains an issue.
- Standard and Substandard business were studied separately, and distinct mortality adjustment factors were developed for each. For factor development, experience was compared to the 1983 Individual Annuity Mortality (IAM) Table A, including the CED methodology for substandard business
- A careful analysis of the experience pointed to duration from issue being a very important consideration, and thus it was taken into account with the factor development
- For Substandard business, the degree of rate-up was also identified as significant, so the adjustment factors were differentiated between two groups—1-20 year, and 21+ year rate-ups.

# Mortality Adjustment Factors for Structured Settlement Annuities

- The base factors are brought up to 12/31/2022 using the HMI methodology described above.
- The Mortality Adjustment Factors are intended to be applied in a similar way to the way the factors in the current VM-21 are applied, i.e. as a multiplicative factor to a basis using the **1983 IAM Table 'A', with projected mortality improvement using Scale G2 from 2011 (the mid-point of the experience study)**. For substandard lives, the multiplicative factor would apply following the application of the Constant Extra Death methodology described in Actuarial Guideline IX-A.
- Based on the duration and rate-up impacts for SSAs, we propose the following 11 distinct cohorts:
  - **Structured Settlement Annuities – Standard Lives (factors on Slides 12 & 13)**
    - Durations 1-5
    - Durations 6-10
    - Durations 11+
  - **Structured Settlement Annuities – Substandard Lives, Rate-Ups < 21 Years (factors on Slides 17 & 18)**
    - Durations 1-10
    - Durations 11-20
    - Durations 21-30
    - Durations 31+
  - **Structured Settlement Annuities – Substandard Lives, Rate-Ups > 20 Years (factors on Slides 19 & 20)**
    - Durations 1-10
    - Durations 11-20
    - Durations 21-30
    - Durations 31+

# Mortality Adjustment Factors for VM-22—SSA Standard Lives

| SSA Standard 1-5 - Female |                  |            |                   | SSA Standard 1-5 - Male |            |                   | SSA Standard 6-10 - Female |                  |            |                   | SSA Standard 6-10 - Male |            |                   |
|---------------------------|------------------|------------|-------------------|-------------------------|------------|-------------------|----------------------------|------------------|------------|-------------------|--------------------------|------------|-------------------|
| Age                       | Base Adj Factors | HMI Impact | Factors thru 2022 | Base Adj Factors        | HMI Impact | Factors thru 2022 | Age                        | Base Adj Factors | HMI Impact | Factors thru 2022 | Base Adj Factors         | HMI Impact | Factors thru 2022 |
| 2                         | 290.0%           | 101.3%     | 300.0%            | 290.0%                  | 103.7%     | 300.0%            | 2                          | 290.0%           | 101.3%     | 300.0%            | 290.0%                   | 103.7%     | 300.0%            |
| 7                         | 290.0%           | 116.9%     | 330.0%            | 290.0%                  | 115.1%     | 330.0%            | 7                          | 290.0%           | 116.9%     | 335.0%            | 290.0%                   | 115.1%     | 330.0%            |
| 12                        | 290.0%           | 123.6%     | 355.0%            | 290.0%                  | 114.0%     | 330.0%            | 12                         | 290.0%           | 123.6%     | 355.0%            | 290.0%                   | 114.0%     | 330.0%            |
| 17                        | 290.0%           | 122.1%     | 355.0%            | 290.0%                  | 116.9%     | 335.0%            | 17                         | 290.0%           | 122.1%     | 355.0%            | 290.0%                   | 116.9%     | 335.0%            |
| 22                        | 290.0%           | 120.9%     | 350.0%            | 290.0%                  | 115.3%     | 335.0%            | 22                         | 290.0%           | 120.9%     | 350.0%            | 290.0%                   | 115.3%     | 335.0%            |
| 27                        | 290.0%           | 117.9%     | 350.0%            | 290.0%                  | 119.3%     | 350.0%            | 27                         | 290.0%           | 117.9%     | 350.0%            | 290.0%                   | 119.3%     | 350.0%            |
| 32                        | 290.0%           | 131.4%     | 375.0%            | 290.0%                  | 137.7%     | 390.0%            | 32                         | 290.0%           | 131.4%     | 375.0%            | 290.0%                   | 137.7%     | 390.0%            |
| 37                        | 290.0%           | 131.9%     | 375.0%            | 290.0%                  | 137.9%     | 400.0%            | 37                         | 290.0%           | 131.9%     | 375.0%            | 290.0%                   | 137.9%     | 400.0%            |
| 42                        | 252.2%           | 116.9%     | 295.0%            | 252.2%                  | 136.0%     | 335.0%            | 42                         | 252.2%           | 116.9%     | 295.0%            | 252.2%                   | 136.0%     | 335.0%            |
| 47                        | 195.0%           | 107.0%     | 210.0%            | 195.0%                  | 108.4%     | 220.0%            | 47                         | 195.0%           | 107.0%     | 215.0%            | 195.0%                   | 108.4%     | 220.0%            |
| 52                        | 168.8%           | 112.0%     | 190.0%            | 168.8%                  | 109.1%     | 185.0%            | 52                         | 168.8%           | 112.0%     | 190.0%            | 168.8%                   | 109.1%     | 185.0%            |
| 57                        | 145.0%           | 130.3%     | 185.0%            | 145.0%                  | 127.8%     | 185.0%            | 57                         | 145.6%           | 130.3%     | 185.0%            | 145.6%                   | 127.8%     | 185.0%            |
| 62                        | 120.4%           | 130.3%     | 155.0%            | 120.4%                  | 135.1%     | 160.0%            | 62                         | 132.2%           | 130.3%     | 170.0%            | 132.2%                   | 135.1%     | 175.0%            |
| 67                        | 103.6%           | 118.4%     | 125.0%            | 103.6%                  | 125.7%     | 130.0%            | 67                         | 126.2%           | 118.4%     | 150.0%            | 126.2%                   | 125.7%     | 160.0%            |
| 72                        | 100.0%           | 114.8%     | 115.0%            | 100.0%                  | 118.6%     | 120.0%            | 72                         | 125.0%           | 114.8%     | 145.0%            | 125.0%                   | 118.6%     | 150.0%            |
| 77                        | 100.0%           | 110.7%     | 110.0%            | 100.0%                  | 114.8%     | 110.0%            | 77                         | 124.6%           | 110.7%     | 135.0%            | 124.6%                   | 114.8%     | 140.0%            |
| 82                        | 100.4%           | 105.9%     | 110.0%            | 100.4%                  | 106.3%     | 110.0%            | 82                         | 117.2%           | 105.9%     | 125.0%            | 117.2%                   | 106.3%     | 125.0%            |
| 87                        | 107.6%           | 103.9%     | 110.0%            | 107.6%                  | 104.3%     | 110.0%            | 87                         | 111.2%           | 103.9%     | 115.0%            | 111.2%                   | 104.3%     | 115.0%            |
| 92                        | 109.8%           | 102.4%     | 110.0%            | 109.8%                  | 102.9%     | 110.0%            | 92                         | 109.8%           | 102.4%     | 110.0%            | 109.8%                   | 102.9%     | 110.0%            |
| 97                        | 105.9%           | 101.5%     | 105.0%            | 105.9%                  | 101.4%     | 105.0%            | 97                         | 105.9%           | 101.5%     | 105.0%            | 105.9%                   | 101.4%     | 105.0%            |
| 102                       | 100.3%           | 100.5%     | 100.0%            | 100.3%                  | 100.5%     | 100.0%            | 102                        | 100.3%           | 100.5%     | 100.0%            | 100.3%                   | 100.5%     | 100.0%            |
| 105                       | 100.0%           | 100.0%     | 100.0%            | 100.0%                  | 100.0%     | 100.0%            | 105                        | 100.0%           | 100.0%     | 100.0%            | 100.0%                   | 100.0%     | 100.0%            |

# Mortality Adjustment Factors for VM-22—SSA Standard Lives

SSA Standard 11+ - Female

SSA Standard 11+ - Male

| Age | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 |
|-----|---------------------|---------------|----------------------|---------------------|---------------|----------------------|
| 2   | 355.0%              | 101.3%        | 365.0%               | 355.0%              | 103.7%        | 375.0%               |
| 7   | 355.0%              | 116.9%        | 410.0%               | 355.0%              | 115.1%        | 405.0%               |
| 12  | 355.0%              | 123.6%        | 435.0%               | 355.0%              | 114.0%        | 405.0%               |
| 17  | 355.0%              | 122.1%        | 435.0%               | 355.0%              | 116.9%        | 415.0%               |
| 22  | 355.0%              | 120.9%        | 430.0%               | 355.0%              | 115.3%        | 410.0%               |
| 27  | 355.0%              | 117.9%        | 425.0%               | 355.0%              | 119.3%        | 430.0%               |
| 32  | 355.0%              | 131.4%        | 460.0%               | 355.0%              | 137.7%        | 480.0%               |
| 37  | 355.0%              | 131.9%        | 460.0%               | 355.0%              | 137.9%        | 490.0%               |
| 42  | 326.0%              | 116.9%        | 380.0%               | 326.0%              | 136.0%        | 430.0%               |
| 47  | 270.4%              | 107.0%        | 295.0%               | 270.4%              | 108.4%        | 300.0%               |
| 52  | 228.4%              | 112.0%        | 260.0%               | 228.4%              | 109.1%        | 255.0%               |
| 57  | 196.4%              | 130.3%        | 250.0%               | 196.4%              | 127.8%        | 250.0%               |
| 62  | 174.2%              | 130.3%        | 225.0%               | 174.2%              | 135.1%        | 230.0%               |
| 67  | 157.8%              | 118.4%        | 190.0%               | 157.8%              | 125.7%        | 200.0%               |
| 72  | 139.4%              | 114.8%        | 160.0%               | 139.4%              | 118.6%        | 165.0%               |
| 77  | 127.0%              | 110.7%        | 140.0%               | 127.0%              | 114.8%        | 145.0%               |
| 82  | 117.2%              | 105.9%        | 125.0%               | 117.2%              | 106.3%        | 125.0%               |
| 87  | 111.2%              | 103.9%        | 115.0%               | 111.2%              | 104.3%        | 115.0%               |
| 92  | 109.8%              | 102.4%        | 110.0%               | 109.8%              | 102.9%        | 110.0%               |
| 97  | 105.9%              | 101.5%        | 105.0%               | 105.9%              | 101.4%        | 105.0%               |
| 102 | 100.3%              | 100.5%        | 100.0%               | 100.3%              | 100.5%        | 100.0%               |
| 105 | 100.0%              | 100.0%        | 100.0%               | 100.0%              | 100.0%        | 100.0%               |

# APPENDIX

# Mortality Adjustment Factors for VM-22 Fixed Deferred Annuities

## FDA non-GLB - Female

| <u>Age</u> | <u>Base Adj<br/>Factors</u> | <u>HMI<br/>Impact</u> | <u>Factors<br/>thru 2022</u> |
|------------|-----------------------------|-----------------------|------------------------------|
| 52         | 150.0%                      | 97.7%                 | 150%                         |
| 57         | 150.0%                      | 105.3%                | 150%                         |
| 62         | 105.0%                      | 108.6%                | 120%                         |
| 67         | 100.0%                      | 104.9%                | 108%                         |
| 72         | 115.0%                      | 103.4%                | 118%                         |
| 77         | 120.0%                      | 105.0%                | 125%                         |
| 82         | 110.0%                      | 106.9%                | 118%                         |
| 87         | 105.0%                      | 104.6%                | 110%                         |
| 92         | 105.0%                      | 102.8%                | 108%                         |
| 97         | 105.0%                      | 101.7%                | 107%                         |
| 102        | 102.0%                      | 100.6%                | 103%                         |
| 105        | 100.0%                      | 100.0%                | 100%                         |

## FDA non-GLB - Male

| <u>Age</u> | <u>Base Adj<br/>Factors</u> | <u>HMI<br/>Impact</u> | <u>Factors<br/>thru 2022</u> |
|------------|-----------------------------|-----------------------|------------------------------|
| 52         | 115.0%                      | 104.3%                | 120%                         |
| 57         | 100.0%                      | 107.5%                | 110%                         |
| 62         | 85.0%                       | 108.3%                | 95%                          |
| 67         | 95.0%                       | 111.8%                | 105%                         |
| 72         | 100.0%                      | 109.4%                | 108%                         |
| 77         | 100.0%                      | 107.5%                | 108%                         |
| 82         | 100.0%                      | 107.4%                | 108%                         |
| 87         | 105.0%                      | 105.1%                | 110%                         |
| 92         | 105.0%                      | 103.4%                | 110%                         |
| 97         | 110.0%                      | 101.7%                | 110%                         |
| 102        | 104.0%                      | 100.6%                | 105%                         |
| 105        | 100.0%                      | 100.0%                | 100%                         |

# Mortality Adjustment Factors for VM-22 Fixed Deferred Annuities

## FDA GLB - Female

## FDA GLB - Male

| Age | Base Adj       | HMI           | Factors          | Base Adj       | HMI           | Factors          |
|-----|----------------|---------------|------------------|----------------|---------------|------------------|
|     | <u>Factors</u> | <u>Impact</u> | <u>thru 2022</u> | <u>Factors</u> | <u>Impact</u> | <u>thru 2022</u> |
| 52  | 130.0%         | 97.7%         | 125%             | 100.0%         | 104.3%        | 105%             |
| 57  | 120.0%         | 105.3%        | 125%             | 80.0%          | 107.5%        | 88%              |
| 62  | 85.0%          | 108.6%        | 95%              | 70.0%          | 108.3%        | 78%              |
| 67  | 85.0%          | 104.9%        | 90%              | 80.0%          | 111.8%        | 88%              |
| 72  | 100.0%         | 103.4%        | 103%             | 85.0%          | 109.4%        | 93%              |
| 77  | 105.0%         | 105.0%        | 110%             | 90.0%          | 107.5%        | 98%              |
| 82  | 105.0%         | 106.9%        | 110%             | 95.0%          | 107.4%        | 103%             |
| 87  | 105.0%         | 104.6%        | 110%             | 105.0%         | 105.1%        | 110%             |
| 92  | 105.0%         | 102.8%        | 108%             | 105.0%         | 103.4%        | 110%             |
| 97  | 105.0%         | 101.7%        | 107%             | 110.0%         | 101.7%        | 110%             |
| 102 | 102.0%         | 100.6%        | 103%             | 104.0%         | 100.6%        | 105%             |
| 105 | 100.0%         | 100.0%        | 100%             | 100.0%         | 100.0%        | 100%             |



# Mortality Adjustment Factors for VM-22 SSA Substandard Lives

| SSA Substandard 1-10 - Female<br>Rate-Ups of <21 Years |                     |               |                      | SSA Substandard 1-10 - Male<br>Rate-Ups of <21 Years |               |                      | SSA Substandard 11-20 - Female<br>Rate-Ups of <21 Years |                     |               |                      | SSA Substandard 11-20 - Male<br>Rate-Ups of <21 Years |               |                      |
|--|---------------------|---------------|----------------------|--|---------------|----------------------|---|---------------------|---------------|----------------------|---|---------------|----------------------|
| Age  | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors                                  | HMI<br>Impact | Factors<br>thru 2022 | Age   | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors                                   | HMI<br>Impact | Factors<br>thru 2022 |
| 2  | 55.0%               | 101.3%        | 55.0%                | 55.0%  | 103.7%        | 55.0%                | 2   | 55.0%               | 101.3%        | 55.0%                | 55.0%   | 103.7%        | 55.0%                |
| 7  | 55.0%               | 116.9%        | 65.0%                | 55.0%  | 115.1%        | 65.0%                | 7   | 55.0%               | 116.9%        | 65.0%                | 55.0%   | 115.1%        | 65.0%                |
| 12   | 55.0%               | 123.6%        | 65.0%                | 55.0%  | 114.0%        | 65.0%                | 12  | 55.0%               | 123.6%        | 65.0%                | 55.0%   | 114.0%        | 65.0%                |
| 17   | 55.0%               | 122.1%        | 65.0%                | 55.0%  | 116.9%        | 65.0%                | 17  | 55.0%               | 122.1%        | 65.0%                | 55.0%   | 116.9%        | 65.0%                |
| 22   | 55.0%               | 120.9%        | 65.0%                | 55.0%  | 115.3%        | 65.0%                | 22  | 55.0%               | 120.9%        | 65.0%                | 55.0%   | 115.3%        | 65.0%                |
| 27   | 55.0%               | 117.9%        | 65.0%                | 55.0%  | 119.3%        | 65.0%                | 27  | 55.0%               | 117.9%        | 65.0%                | 55.0%   | 119.3%        | 65.0%                |
| 32   | 55.0%               | 131.4%        | 70.0%                | 55.0%  | 137.7%        | 75.0%                | 32  | 55.0%               | 131.4%        | 70.0%                | 55.0%   | 137.7%        | 75.0%                |
| 37   | 55.6%               | 131.9%        | 75.0%                | 55.6%  | 137.9%        | 75.0%                | 37  | 57.0%               | 131.9%        | 75.0%                | 57.0%   | 137.9%        | 80.0%                |
| 42   | 66.4%               | 116.9%        | 75.0%                | 66.4%  | 136.0%        | 85.0%                | 42  | 93.0%               | 116.9%        | 105.0%               | 93.0%   | 136.0%        | 120.0%               |
| 47   | 70.0%               | 107.0%        | 75.0%                | 70.0%  | 108.4%        | 80.0%                | 47  | 105.0%              | 107.0%        | 115.0%               | 105.0%  | 108.4%        | 115.0%               |
| 52   | 70.0%               | 112.0%        | 80.0%                | 70.0%  | 109.1%        | 80.0%                | 52  | 105.0%              | 112.0%        | 120.0%               | 105.0%  | 109.1%        | 115.0%               |
| 57   | 70.0%               | 130.3%        | 90.0%                | 70.0%  | 127.8%        | 90.0%                | 57  | 105.0%              | 130.3%        | 135.0%               | 105.0%  | 127.8%        | 135.0%               |
| 62   | 70.0%               | 130.3%        | 90.0%                | 70.0%  | 135.1%        | 95.0%                | 62  | 105.0%              | 130.3%        | 135.0%               | 105.0%  | 135.1%        | 140.0%               |
| 67   | 70.0%               | 118.4%        | 85.0%                | 70.0%  | 125.7%        | 90.0%                | 67  | 105.0%              | 118.4%        | 125.0%               | 105.0%  | 125.7%        | 130.0%               |
| 72   | 70.0%               | 114.8%        | 80.0%                | 70.0%  | 118.6%        | 85.0%                | 72  | 105.0%              | 114.8%        | 120.0%               | 105.0%  | 118.6%        | 125.0%               |
| 77   | 71.4%               | 110.7%        | 80.0%                | 71.4%  | 114.8%        | 85.0%                | 77  | 105.0%              | 110.7%        | 115.0%               | 105.0%  | 114.8%        | 120.0%               |
| 82   | 96.6%               | 105.9%        | 100.0%               | 96.6%  | 106.3%        | 100.0%               | 82  | 105.0%              | 105.9%        | 110.0%               | 105.0%  | 106.3%        | 110.0%               |
| 87   | 105.0%              | 103.9%        | 110.0%               | 105.0%   | 104.3%        | 110.0%               | 87  | 105.0%              | 103.9%        | 110.0%               | 105.0%  | 104.3%        | 110.0%               |
| 92   | 105.0%              | 102.4%        | 110.0%               | 105.0%   | 102.9%        | 110.0%               | 92  | 105.0%              | 102.4%        | 110.0%               | 105.0%  | 102.9%        | 110.0%               |
| 97   | 105.0%              | 101.5%        | 105.0%               | 105.0%   | 101.4%        | 105.0%               | 97  | 105.0%              | 101.5%        | 105.0%               | 105.0%  | 101.4%        | 105.0%               |
| 102  | 105.0%              | 100.5%        | 105.0%               | 105.0%   | 100.5%        | 105.0%               | 102   | 105.0%              | 100.5%        | 105.0%               | 105.0%  | 100.5%        | 105.0%               |
| 105  | 105.0%              | 100.0%        | 100.0%               | 105.0%   | 100.0%        | 100.0%               | 105   | 105.0%              | 100.0%        | 100.0%               | 105.0%  | 100.0%        | 100.0%               |

# Mortality Adjustment Factors for VM-22 SSA Substandard Lives

SSA Substandard 21-30 - Female  
Rate-Ups of <21 Years

SSA Substandard 21-30 - Male  
Rate-Ups of <21 Years

SSA Substandard 31+ - Female  
Rate-Ups of <21 Years

SSA Substandard 31+ - Male  
Rate-Ups of <21 Years

| Age | Base Adj | HMI    | Factors   | Base Adj | HMI    | Factors   | Age | Base Adj | HMI    | Factors   | Base Adj | HMI    | Factors   |
|-----|----------|--------|-----------|----------|--------|-----------|-----|----------|--------|-----------|----------|--------|-----------|
|     | Factors  | Impact | thru 2022 | Factors  | Impact | thru 2022 |     | Factors  | Impact | thru 2022 | Factors  | Impact | thru 2022 |
| 2   | 55.0%    | 101.3% | 55.0%     | 55.0%    | 103.7% | 55.0%     | 2   | 55.0%    | 101.3% | 55.0%     | 55.0%    | 103.7% | 55.0%     |
| 7   | 55.0%    | 116.9% | 65.0%     | 55.0%    | 115.1% | 65.0%     | 7   | 55.0%    | 116.9% | 65.0%     | 55.0%    | 115.1% | 65.0%     |
| 12  | 55.0%    | 123.6% | 65.0%     | 55.0%    | 114.0% | 65.0%     | 12  | 55.0%    | 123.6% | 65.0%     | 55.0%    | 114.0% | 65.0%     |
| 17  | 55.0%    | 122.1% | 65.0%     | 55.0%    | 116.9% | 65.0%     | 17  | 55.0%    | 122.1% | 65.0%     | 55.0%    | 116.9% | 65.0%     |
| 22  | 55.0%    | 120.9% | 65.0%     | 55.0%    | 115.3% | 65.0%     | 22  | 55.0%    | 120.9% | 65.0%     | 55.0%    | 115.3% | 65.0%     |
| 27  | 55.0%    | 117.9% | 65.0%     | 55.0%    | 119.3% | 65.0%     | 27  | 55.0%    | 117.9% | 65.0%     | 55.0%    | 119.3% | 65.0%     |
| 32  | 55.0%    | 131.4% | 70.0%     | 55.0%    | 137.7% | 75.0%     | 32  | 55.0%    | 131.4% | 70.0%     | 55.0%    | 137.7% | 75.0%     |
| 37  | 58.2%    | 131.9% | 80.0%     | 58.2%    | 137.9% | 85.0%     | 37  | 58.8%    | 131.9% | 80.0%     | 58.8%    | 137.9% | 85.0%     |
| 42  | 115.8%   | 116.9% | 130.0%    | 115.8%   | 136.0% | 150.0%    | 42  | 127.2%   | 116.9% | 145.0%    | 127.2%   | 136.0% | 165.0%    |
| 47  | 135.0%   | 107.0% | 150.0%    | 135.0%   | 108.4% | 150.0%    | 47  | 150.0%   | 107.0% | 165.0%    | 150.0%   | 108.4% | 165.0%    |
| 52  | 135.0%   | 112.0% | 150.0%    | 135.0%   | 109.1% | 150.0%    | 52  | 150.0%   | 112.0% | 170.0%    | 150.0%   | 109.1% | 165.0%    |
| 57  | 135.0%   | 130.3% | 175.0%    | 135.0%   | 127.8% | 170.0%    | 57  | 150.0%   | 130.3% | 190.0%    | 150.0%   | 127.8% | 190.0%    |
| 62  | 135.0%   | 130.3% | 175.0%    | 135.0%   | 135.1% | 180.0%    | 62  | 150.0%   | 130.3% | 195.0%    | 150.0%   | 135.1% | 200.0%    |
| 67  | 135.0%   | 118.4% | 160.0%    | 135.0%   | 125.7% | 170.0%    | 67  | 150.0%   | 118.4% | 180.0%    | 150.0%   | 125.7% | 190.0%    |
| 72  | 135.0%   | 114.8% | 155.0%    | 135.0%   | 118.6% | 160.0%    | 72  | 150.0%   | 114.8% | 170.0%    | 150.0%   | 118.6% | 180.0%    |
| 77  | 133.8%   | 110.7% | 145.0%    | 133.8%   | 114.8% | 150.0%    | 77  | 148.2%   | 110.7% | 160.0%    | 148.2%   | 114.8% | 165.0%    |
| 82  | 112.2%   | 105.9% | 120.0%    | 112.2%   | 106.3% | 120.0%    | 82  | 115.8%   | 105.9% | 125.0%    | 115.8%   | 106.3% | 125.0%    |
| 87  | 105.0%   | 103.9% | 110.0%    | 105.0%   | 104.3% | 110.0%    | 87  | 105.0%   | 103.9% | 110.0%    | 105.0%   | 104.3% | 110.0%    |
| 92  | 105.0%   | 102.4% | 110.0%    | 105.0%   | 102.9% | 110.0%    | 92  | 105.0%   | 102.4% | 110.0%    | 105.0%   | 102.9% | 110.0%    |
| 97  | 105.0%   | 101.5% | 105.0%    | 105.0%   | 101.4% | 105.0%    | 97  | 105.0%   | 101.5% | 105.0%    | 105.0%   | 101.4% | 105.0%    |
| 102 | 105.0%   | 100.5% | 105.0%    | 105.0%   | 100.5% | 105.0%    | 102 | 105.0%   | 100.5% | 105.0%    | 105.0%   | 100.5% | 105.0%    |
| 105 | 105.0%   | 100.0% | 100.0%    | 105.0%   | 100.0% | 100.0%    | 105 | 105.0%   | 100.0% | 100.0%    | 105.0%   | 100.0% | 100.0%    |

# Mortality Adjustment Factors for VM-22 SSA Substandard Lives

| SSA Substandard 1-10 - Female<br>Rate-Ups of 21+ Years |                     |               |                      | SSA Substandard 1-10 - Male<br>Rate-Ups of 21+ Years |               |                      | SSA Substandard 11-20 - Female<br>Rate-Ups of 21+ Years |                     |               |                      | SSA Substandard 11-20 - Male<br>Rate-Ups of 21+ Years |               |                      |
|--|---------------------|---------------|----------------------|--|---------------|----------------------|---|---------------------|---------------|----------------------|---|---------------|----------------------|
| Age  | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors                                  | HMI<br>Impact | Factors<br>thru 2022 | Age   | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors                                   | HMI<br>Impact | Factors<br>thru 2022 |
| 2  | 55.0%               | 101.3%        | 55.0%                | 55.0%  | 103.7%        | 55.0%                | 2   | 55.0%               | 101.3%        | 55.0%                | 55.0%   | 103.7%        | 55.0%                |
| 7  | 55.0%               | 116.9%        | 65.0%                | 55.0%  | 115.1%        | 65.0%                | 7   | 55.0%               | 116.9%        | 65.0%                | 55.0%   | 115.1%        | 65.0%                |
| 12   | 55.0%               | 123.6%        | 65.0%                | 55.0%  | 114.0%        | 65.0%                | 12  | 55.0%               | 123.6%        | 65.0%                | 55.0%   | 114.0%        | 65.0%                |
| 17   | 55.0%               | 122.1%        | 65.0%                | 55.0%  | 116.9%        | 65.0%                | 17  | 55.0%               | 122.1%        | 65.0%                | 55.0%   | 116.9%        | 65.0%                |
| 22   | 55.0%               | 120.9%        | 65.0%                | 55.0%  | 115.3%        | 65.0%                | 22  | 55.0%               | 120.9%        | 65.0%                | 55.0%   | 115.3%        | 65.0%                |
| 27   | 55.0%               | 117.9%        | 65.0%                | 55.0%  | 119.3%        | 65.0%                | 27  | 55.0%               | 117.9%        | 65.0%                | 55.0%   | 119.3%        | 65.0%                |
| 32   | 55.0%               | 131.4%        | 70.0%                | 55.0%  | 137.7%        | 75.0%                | 32  | 55.0%               | 131.4%        | 70.0%                | 55.0%   | 137.7%        | 75.0%                |
| 37   | 56.0%               | 131.9%        | 75.0%                | 56.0%  | 137.9%        | 80.0%                | 37  | 56.4%               | 131.9%        | 75.0%                | 56.4%   | 137.9%        | 80.0%                |
| 42   | 74.0%               | 116.9%        | 85.0%                | 74.0%  | 136.0%        | 95.0%                | 42  | 81.6%               | 116.9%        | 95.0%                | 81.6%   | 136.0%        | 105.0%               |
| 47   | 80.0%               | 107.0%        | 85.0%                | 80.0%  | 108.4%        | 90.0%                | 47  | 90.0%               | 107.0%        | 100.0%               | 90.0%   | 108.4%        | 100.0%               |
| 52   | 80.0%               | 112.0%        | 90.0%                | 80.0%  | 109.1%        | 90.0%                | 52  | 90.0%               | 112.0%        | 100.0%               | 90.0%   | 109.1%        | 100.0%               |
| 57   | 80.0%               | 130.3%        | 100.0%               | 80.0%  | 127.8%        | 100.0%               | 57  | 90.0%               | 130.3%        | 115.0%               | 90.0%   | 127.8%        | 115.0%               |
| 62   | 80.0%               | 130.3%        | 105.0%               | 80.0%  | 135.1%        | 105.0%               | 62  | 90.0%               | 130.3%        | 115.0%               | 90.0%   | 135.1%        | 120.0%               |
| 67   | 80.0%               | 118.4%        | 95.0%                | 80.0%  | 125.7%        | 100.0%               | 67  | 90.0%               | 118.4%        | 110.0%               | 90.0%   | 125.7%        | 110.0%               |
| 72   | 80.0%               | 114.8%        | 90.0%                | 80.0%  | 118.6%        | 95.0%                | 72  | 90.0%               | 114.8%        | 105.0%               | 90.0%   | 118.6%        | 105.0%               |
| 77   | 80.4%               | 110.7%        | 90.0%                | 80.4%  | 114.8%        | 90.0%                | 77  | 90.0%               | 110.7%        | 100.0%               | 90.0%   | 114.8%        | 100.0%               |
| 82   | 87.6%               | 105.9%        | 90.0%                | 87.6%  | 106.3%        | 90.0%                | 82  | 90.0%               | 105.9%        | 95.0%                | 90.0%   | 106.3%        | 95.0%                |
| 87   | 90.0%               | 103.9%        | 95.0%                | 90.0%  | 104.3%        | 95.0%                | 87  | 90.0%               | 103.9%        | 95.0%                | 90.0%   | 104.3%        | 95.0%                |
| 92   | 90.0%               | 102.4%        | 90.0%                | 90.0%  | 102.9%        | 90.0%                | 92  | 90.0%               | 102.4%        | 90.0%                | 90.0%   | 102.9%        | 90.0%                |
| 97   | 90.0%               | 101.5%        | 90.0%                | 90.0%  | 101.4%        | 90.0%                | 97  | 90.0%               | 101.5%        | 90.0%                | 90.0%   | 101.4%        | 90.0%                |
| 102  | 90.0%               | 100.5%        | 90.0%                | 90.0%  | 100.5%        | 90.0%                | 102   | 90.0%               | 100.5%        | 90.0%                | 90.0%   | 100.5%        | 90.0%                |
| 105  | 90.0%               | 100.0%        | 100.0%               | 90.0%  | 100.0%        | 100.0%               | 105   | 90.0%               | 100.0%        | 100.0%               | 90.0%   | 100.0%        | 100.0%               |

# Mortality Adjustment Factors for VM-22 SSA Substandard Lives

| SSA Substandard 21-30 - Female<br>Rate-Ups of 21+ Years |                     |               |                      | SSA Substandard 21-30 - Male<br>Rate-Ups of 21+ Years |               |                      | SSA Substandard 31+ - Female<br>Rate-Ups of 21+ Years |                     |               |                      | SSA Substandard 31+ - Male<br>Rate-Ups of 21+ Years |               |                      |
|---|---------------------|---------------|----------------------|---|---------------|----------------------|---|---------------------|---------------|----------------------|---|---------------|----------------------|
| Age   | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors                                   | HMI<br>Impact | Factors<br>thru 2022 | Age   | Base Adj<br>Factors | HMI<br>Impact | Factors<br>thru 2022 | Base Adj<br>Factors                                 | HMI<br>Impact | Factors<br>thru 2022 |
| 2   | 70.0%               | 101.3%        | 70.0%                | 70.0%   | 103.7%        | 75.0%                | 2   | 70.0%               | 101.3%        | 70.0%                | 70.0%   | 103.7%        | 70.0%                |
| 7   | 70.0%               | 116.9%        | 80.0%                | 70.0%   | 115.1%        | 80.0%                | 7   | 70.0%               | 116.9%        | 80.0%                | 70.0%   | 115.1%        | 80.0%                |
| 12  | 70.0%               | 123.6%        | 85.0%                | 70.0%   | 114.0%        | 80.0%                | 12  | 70.0%               | 123.6%        | 85.0%                | 70.0%   | 114.0%        | 80.0%                |
| 17  | 70.0%               | 122.1%        | 85.0%                | 70.0%   | 116.9%        | 80.0%                | 17  | 70.0%               | 122.1%        | 85.0%                | 70.0%   | 116.9%        | 80.0%                |
| 22  | 70.0%               | 120.9%        | 85.0%                | 70.0%   | 115.3%        | 80.0%                | 22  | 70.0%               | 120.9%        | 85.0%                | 70.0%   | 115.3%        | 80.0%                |
| 27  | 70.0%               | 117.9%        | 85.0%                | 70.0%   | 119.3%        | 85.0%                | 27  | 70.0%               | 117.9%        | 85.0%                | 70.0%   | 119.3%        | 85.0%                |
| 32  | 70.0%               | 131.4%        | 90.0%                | 70.0%   | 137.7%        | 95.0%                | 32  | 70.0%               | 131.4%        | 90.0%                | 70.0%   | 137.7%        | 95.0%                |
| 37  | 71.4%               | 131.9%        | 95.0%                | 71.4%   | 137.9%        | 100.0%               | 37  | 72.6%               | 131.9%        | 100.0%               | 72.6%   | 137.9%        | 105.0%               |
| 42  | 96.6%               | 116.9%        | 110.0%               | 96.6%   | 136.0%        | 125.0%               | 42  | 119.4%              | 116.9%        | 135.0%               | 119.4%  | 136.0%        | 155.0%               |
| 47  | 105.0%              | 107.0%        | 115.0%               | 105.0%  | 108.4%        | 115.0%               | 47  | 135.0%              | 107.0%        | 145.0%               | 135.0%  | 108.4%        | 150.0%               |
| 52  | 105.0%              | 112.0%        | 120.0%               | 105.0%  | 109.1%        | 115.0%               | 52  | 135.0%              | 112.0%        | 150.0%               | 135.0%  | 109.1%        | 150.0%               |
| 57  | 105.0%              | 130.3%        | 135.0%               | 105.0%  | 127.8%        | 135.0%               | 57  | 135.0%              | 130.3%        | 175.0%               | 135.0%  | 127.8%        | 170.0%               |
| 62  | 105.0%              | 130.3%        | 135.0%               | 105.0%  | 135.1%        | 140.0%               | 62  | 135.0%              | 130.3%        | 175.0%               | 135.0%  | 135.1%        | 180.0%               |
| 67  | 105.0%              | 118.4%        | 125.0%               | 105.0%  | 125.7%        | 130.0%               | 67  | 135.0%              | 118.4%        | 160.0%               | 135.0%  | 125.7%        | 170.0%               |
| 72  | 105.0%              | 114.8%        | 120.0%               | 105.0%  | 118.6%        | 125.0%               | 72  | 135.0%              | 114.8%        | 155.0%               | 135.0%  | 118.6%        | 160.0%               |
| 77  | 104.4%              | 110.7%        | 115.0%               | 104.4%  | 114.8%        | 120.0%               | 77  | 133.2%              | 110.7%        | 145.0%               | 133.2%  | 114.8%        | 150.0%               |
| 82  | 93.6%               | 105.9%        | 100.0%               | 93.6%   | 106.3%        | 100.0%               | 82  | 100.8%              | 105.9%        | 110.0%               | 100.8%  | 106.3%        | 110.0%               |
| 87  | 90.0%               | 103.9%        | 95.0%                | 90.0%   | 104.3%        | 95.0%                | 87  | 90.0%               | 103.9%        | 95.0%                | 90.0%   | 104.3%        | 95.0%                |
| 92  | 90.0%               | 102.4%        | 90.0%                | 90.0%   | 102.9%        | 90.0%                | 92  | 90.0%               | 102.4%        | 90.0%                | 90.0%   | 102.9%        | 90.0%                |
| 97  | 90.0%               | 101.5%        | 90.0%                | 90.0%   | 101.4%        | 90.0%                | 97  | 90.0%               | 101.5%        | 90.0%                | 90.0%   | 101.4%        | 90.0%                |
| 102   | 90.0%               | 100.5%        | 90.0%                | 90.0%   | 100.5%        | 90.0%                | 102   | 90.0%               | 100.5%        | 90.0%                | 90.0%   | 100.5%        | 90.0%                |
| 105   | 90.0%               | 100.0%        | 100.0%               | 90.0%   | 100.0%        | 100.0%               | 105   | 90.0%               | 100.0%        | 100.0%               | 90.0%   | 100.0%        | 100.0%               |