Life Actuarial (A) Task Force

VM-21 SPA Assumptions—Mortality
Proposed Update to Mortality Adjustment Factors

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VM-21: SPA Assumptions—Mortality Adjustment Factor update

- The Mortality Adjustment Factors (MAFs) presented here are being proposed as an update to the current Standard Projection Amount (SPA) assumptions in VM-21.
- The Base Mortality Adjustment Factors have been developed based on an industry study covering variable annuities (VAs) during the 2011-2015 experience period.
- A basis for historical mortality improvement (HMI) has been developed, and was used to bring the factors up to 12/31/2022.
- Compared to the current MAFs in VM-21, the current proposal has the following structural changes:
  - Distinct factors are being proposed for female and male lives, driven by the HMI differences.
  - Factors were developed for a wider range of ages, i.e., starting at age 50 versus 65 in the current VM-21.
  - The non-Guaranteed Living Benefit (non-GLB) factors are split between the Basic and Enhanced Death Benefits; the current VM-21 only has a GLB/non-GLB split.

VM-21: SPA Assumptions—Mortality Adjustment Factor update, continued

- Enhanced Death Benefits are defined as those that include a Roll-up; everything else was categorized with Basic Death Benefits. Therefore, Enhanced DBs include Roll-ups and Roll-up/Ratchet combinations, while Basic DBs consist of contracts with no DBs, minimal DBs such as waiver of surrender charges, Return of Premium DBs, and Ratchets without Roll-ups.
- The updated factors proposed here are intended to be applied using the same formula as the current Standard Projection Amount (SPA) assumptions in VM-21, i.e., tied to an expected basis using the 2012 Individual Annuity Mortality (IAM) Basic Table and the G2 Mortality Improvement Scale.
- The base mortality adjustment factors are comparable to the current VM-21 MAFs, except for the bifurcation of the death benefit categories. This can be seen in slides 6 and 7. Note that in the industry experience study, the Basic Death Benefit has more exposure than the Enhanced Death Benefit, so on a blended basis the non-GLB results were quite similar to the current VM-21 SPA mortality assumptions.
- HMI has generally been below that predicted by the G2 improvement scale, and that is the primary reason the updated factors are higher than the current VM-21 factors.

Base Adjustment Factors for VAs

VA Base Mortality Adjustment Factors*

	VA non-GLB Enhanced DB	VA non-GLB Basic DB	VA GLB
Age	Female and Male	Female and Male	Female and Male
52	150%	105%	95%
57	150%	105%	90%
62	150%	95%	80%
67	145%	95%	83%
72	145%	105%	95%
77	140%	108%	98%
82	125%	108%	105%
87	112%	108%	108%
92	112%	110%	110%
97	110%	110%	110%
102	104%	104%	104%
105	100%	100%	100%

*These Base Mortality Adjustment Factors were developed based on an industry study covering the 2011-2015 experience period.

Base Adjustment Factor Comparison—non-GLB

Age	VA non-GLB Enhanced DB Female and Male*	Current VM-21 non-GLB MAFs Female and Male	Difference Female and Male
52	150%	100%	50%
57	150%	100%	50%
62	150%	100%	50%
67	145%	104%	41%
72	145%	114%	31%
77	140%	118%	22%
82	125%	113%	12%
87	112%	110%	2%
92	112%	110%	2%
97	110%	108%	2%
102	104%	103%	1%
105	100%	100%	0%

Age	VA non-GLB Basic DB Female and Male*	Current VM-21 non-GLB MAFs Female and Male	Difference Female and Male
52	105%	100%	5%
57	105%	100%	5%
62	95%	100%	-5%
67	95%	104%	-9%
72	105%	114%	-9%
77	108%	118%	-10%
82	108%	113%	-5%
87	108%	110%	-2%
92	110%	110%	0%
97	110%	108%	2%
102	104%	103%	1%
105	100%	100%	0%

*These Base Mortality Adjustment Factors were developed based on an industry study covering the 2011-2015 experience period.

Base Adjustment Factor Comparison—GLB

	VA GLB	Current VM-21 GLB MAFs	Difference
Age	Female and Male*	Female and Male	Female and Male
52	95.0%	80.0%	15.0%
57	90.0%	80.0%	10.0%
62	80.0%	80.0%	0.0%
67	83.0%	83.0%	0.0%
72	95.0%	90.5%	4.5%
77	98.0%	98.0%	0.0%
82	105.0%	105.5%	-0.5%
87	108.0%	110.0%	-2.0%
92	110.0%	110.0%	0.0%
97	110.0%	108.0%	2.0%
102	104.0%	103.0%	1.0%
105	100.0%	100.0%	0.0%

*These Base Mortality Adjustment Factors were developed based on an industry study covering the 2011-2015 experience period.

Development of Basis for Historical Mortality Improvement

- 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 2013 mid-point of the industry study.
- 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 10th decile (highest socioeconomic category) aligned with the VA mortality experience.
  - Mortality data for this study was sourced from the National Center for Health Statistics (NCHS), which had a 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-19 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 the VAs.

Annual Rates of Historical Mortality Improvement applied for VAs covering 2013-2019

Female

Age	G2 Scale (1)	Current HMI 2013-2019 (2)	Difference (2) - (1) (3)
52	1.10%	1.97%	0.87%
57	1.20%	0.95%	-0.25%
62	1.30%	0.62%	-0.68%
67	1.30%	1.16%	-0.14%
72	1.30%	1.38%	0.08%
77	1.30%	1.15%	-0.15%
82	1.20%	0.71%	-0.49%
87	0.80%	0.48%	-0.32%
92	0.50%	0.30%	-0.20%
97	0.30%	0.18%	-0.12%
102	0.10%	0.06%	-0.04%
105	0.00%	0.00%	0.00%

Male

Age	G2 Scale (1)	Current HMI 2013-2019 (2)	Difference (2) - (1) (3)
52	1.10%	0.96%	-0.14%
57	1.40%	0.92%	-0.48%
62	1.50%	0.95%	-0.55%
67	1.50%	0.47%	-1.03%
72	1.50%	0.79%	-0.71%
77	1.50%	1.07%	-0.43%
82	1.30%	0.79%	-0.51%
87	0.90%	0.55%	-0.35%
92	0.60%	0.36%	-0.24%
97	0.30%	0.18%	-0.12%
102	0.10%	0.06%	-0.04%
105	0.00%	0.00%	0.00%

Mortality Adjustment Factor Development

- The Base Adjustment Factors, representative of the central point of the industry study (mid-2013), are brought up to 12/31/2022 using the HMI 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 G2 Improvement Scale would remain the mortality improvement basis for future mortality improvement (FMI).
- Slide 12 below shows a summary of the proposed revision of Mortality Adjustment Factors by the central age in the quinquennial groupings for the Enhanced Death Benefit, Basic Death Benefit, and GLB bases.
- Slides 13-15 show the development combining the base factors with the HMI impacts, along with a comparison to the current VM-21 factors.

Mortality Adjustment Factors for VM-21

Variable Annuity Mortality Adjustment Factors

	VA non-GLB Enhanced DB		VA non-GLB Basic DB		VA GLB	
Age	Female	Male	Female	Male	Female	Male
52	150%	160%	105%	110%	95%	100%
57	160%	160%	110%	110%	95%	95%
62	160%	160%	105%	105%	88%	88%
67	155%	160%	100%	105%	88%	93%
72	150%	160%	108%	115%	98%	103%
77	145%	150%	113%	115%	105%	105%
82	135%	135%	115%	115%	113%	113%
87	120%	120%	113%	113%	113%	113%
92	115%	115%	113%	113%	113%	113%
97	110%	110%	110%	110%	110%	110%
102	105%	105%	105%	105%	105%	105%
105	100%	100%	100%	100%	100%	100%

Mortality Adjustment Factors for VM-21

VA non-GLB
Enhanced DB—Female

Age	Base Adj Factors	HMI Impact	Factors thru 2022	Current VM-21	Diff from VM-21
52	150.0%	97.7%	150%	100.0%	50.0%
57	150.0%	105.3%	160%	100.0%	60.0%
62	150.0%	108.6%	160%	100.0%	60.0%
67	145.0%	104.9%	155%	104.0%	51.0%
72	145.0%	103.4%	150%	114.0%	36.0%
77	140.0%	105.0%	145%	118.0%	27.0%
82	125.0%	106.9%	135%	113.0%	22.0%
87	112.0%	104.6%	120%	110.0%	10.0%
92	112.0%	102.8%	115%	110.0%	5.0%
97	110.0%	101.7%	110%	108.0%	2.0%
102	104.0%	100.6%	105%	103.0%	2.0%
105	100.0%	100.0%	100%	100.0%	0.0%

VA non-GLB
Enhanced DB—Male

Age	Base Adj Factors	HMI Impact	Factors thru 2022	Current VM-21	Diff from VM-21
52	150.0%	104.3%	160%	100.0%	60.0%
57	150.0%	107.5%	160%	100.0%	60.0%
62	150.0%	108.3%	160%	100.0%	60.0%
67	145.0%	111.8%	160%	104.0%	56.0%
72	145.0%	109.4%	160%	114.0%	46.0%
77	140.0%	107.5%	150%	118.0%	32.0%
82	125.0%	107.4%	135%	113.0%	22.0%
87	112.0%	105.1%	120%	110.0%	10.0%
92	112.0%	103.4%	115%	110.0%	5.0%
97	110.0%	101.7%	110%	108.0%	2.0%
102	104.0%	100.6%	105%	103.0%	2.0%
105	100.0%	100.0%	100%	100.0%	0.0%

Mortality Adjustment Factors for VM-21

VA non-GLB
Basic DB—Female

Age	Base Adj Factors	HMI Impact	Factors thru 2022	Current VM-21	Diff from VM-21
52	105.0%	97.7%	105%	100.0%	5.0%
57	105.0%	105.3%	110%	100.0%	10.0%
62	95.0%	108.6%	105%	100.0%	5.0%
67	95.0%	104.9%	100%	104.0%	-4.0%
72	105.0%	103.4%	108%	114.0%	-6.0%
77	108.0%	105.0%	113%	118.0%	-5.0%
82	108.0%	106.9%	115%	113.0%	2.0%
87	108.0%	104.6%	113%	110.0%	3.0%
92	110.0%	102.8%	113%	110.0%	3.0%
97	110.0%	101.7%	110%	108.0%	2.0%
102	104.0%	100.6%	105%	103.0%	2.0%
105	100.0%	100.0%	100%	100.0%	0.0%

VA non-GLB
Basic DB—Male

Age	Base Adj Factors	HMI Impact	Factors thru 2022	Current VM-21	Diff from VM-21
52	105.0%	104.3%	110%	100.0%	10.0%
57	105.0%	107.5%	110%	100.0%	10.0%
62	95.0%	108.3%	105%	100.0%	5.0%
67	95.0%	111.8%	105%	104.0%	1.0%
72	105.0%	109.4%	115%	114.0%	1.0%
77	108.0%	107.5%	115%	118.0%	-3.0%
82	108.0%	107.4%	115%	113.0%	2.0%
87	108.0%	105.1%	113%	110.0%	3.0%
92	110.0%	103.4%	113%	110.0%	3.0%
97	110.0%	101.7%	110%	108.0%	2.0%
102	104.0%	100.6%	105%	103.0%	2.0%
105	100.0%	100.0%	100%	100.0%	0.0%

Mortality Adjustment Factors for VM-21

VA GLB—Female

Age	Base Adj Factors	HMI Impact	Factors thru 2022	Current VM-21	Diff from VM-21
52	95.0%	97.7%	95%	80.0%	15.0%
57	90.0%	105.3%	95%	80.0%	15.0%
62	80.0%	108.6%	88%	80.0%	8.0%
67	83.0%	104.9%	88%	83.0%	5.0%
72	95.0%	103.4%	98%	90.5%	7.5%
77	98.0%	105.0%	105%	98.0%	7.0%
82	105.0%	106.9%	113%	105.5%	7.5%
87	108.0%	104.6%	113%	110.0%	3.0%
92	110.0%	102.8%	113%	110.0%	3.0%
97	110.0%	101.7%	110%	108.0%	2.0%
102	104.0%	100.6%	105%	103.0%	2.0%
105	100.0%	100.0%	100%	100.0%	0.0%

VA GLB—Male

Age	Base Adj Factors	HMI Impact	Factors thru 2022	Current VM-21	Diff from VM-21
52	95.0%	104.3%	100%	80.0%	20.0%
57	90.0%	107.5%	95%	80.0%	15.0%
62	80.0%	108.3%	88%	80.0%	8.0%
67	83.0%	111.8%	93%	83.0%	10.0%
72	95.0%	109.4%	103%	90.5%	12.5%
77	98.0%	107.5%	105%	98.0%	7.0%
82	105.0%	107.4%	113%	105.5%	7.5%
87	108.0%	105.1%	113%	110.0%	3.0%
92	110.0%	103.4%	113%	110.0%	3.0%
97	110.0%	101.7%	110%	108.0%	2.0%
102	104.0%	100.6%	105%	103.0%	2.0%
105	100.0%	100.0%	100%	100.0%	0.0%