Mortality Improvement Model, MIM-2021-v3

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SOA Research INSTITUTE

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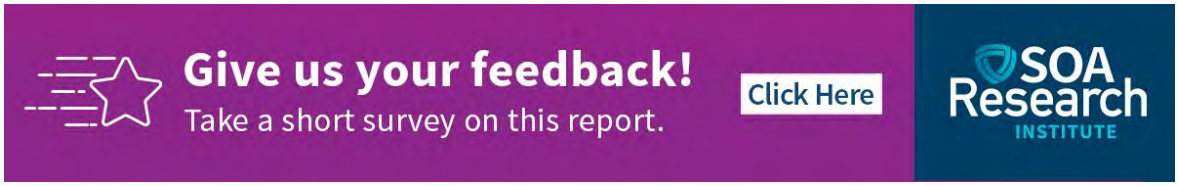
AUTHOR MIM Advisory Group

SPONSOR Mortality and Longevity Strategic Research Program Steering Committee



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Executive Summary

As an aid to practitioners who project mortality improvement (MI), the Society of Actuaries (SOA) Research Institute released MIM-2021 with its two simultaneously released Excel-based tools in April 2021. When it was released, the MIM Advisory Group (Advisory Group) anticipated updating MIM-2021 and associated tools at least annually. The first update, MIM-2021-v2 Application Tool, was released in October 2021.

The MIM-2021-v2 Report[1] listed items under consideration for future updates and enhancements to the MIM-2021 tools, and the MIM Advisory Group (Advisory Group) provided a status update in a May 2022 report.[2] Since then, several items have been addressed and integrated into MIM-2021, resulting in MIM-2021-v3. The MIM-2021-v3 Data Analysis Tool remains the same as MIM-2021-v2, but the MIM-2021 Application Tool has been updated.

Changes from MIM-2021-v2 are summarized below:

- A more straightforward user interface and a high-level process schematic, both designed to facilitate the entry of model parameters. Section 1 contains discussion of this change.
- Addition of a preselected parameter set designed as a possible starting point for individual life insurance and individual annuity practitioners. This parameter set and its development are explained in Section 2.
- Expansion of the feature introduced in October 2021 that allows the user to adjust mortality for COVID-19 and other reasons. Section 3 provides considerations for addressing mortality shocks and waves including COVID-19 in the current MIM-2021 Application Tool.

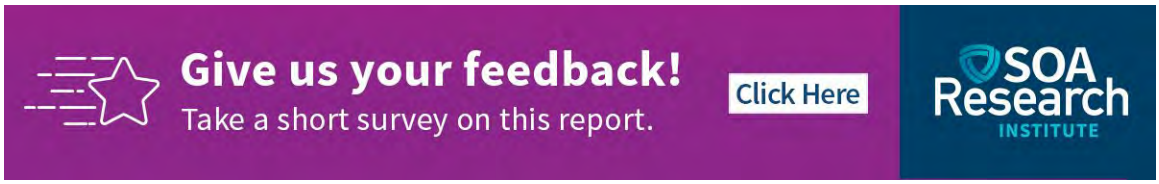
The historical Social Security Administration (SSA) and National Center for Health Statistics (NCHS) based population mortality tables underpinning MIM-2021-v3 are the same as those used in the previous model, with data through 2019. The Advisory Group decided not to include any 2020 mortality data in the model at this time for the following reasons:

1. The 2020 NCHS subpopulation datasets based on socioeconomic mortality deciles and quintiles are still being developed. Once received, the Advisory Group intends to evaluate the data in light of COVID-19.
2. The Retirement Plans Experience Committee (RPEC) has analyzed the 2020 SSA mortality data. RPEC does not believe it would be appropriate to incorporate, without adjustment, the substantially higher rates of mortality experience from 2020 into the graduation and projection models used to forecast future mortality. Therefore, RPEC elected to not release a new MI scale

[1] SOA Research Institute (2021), Developing a Consistent Framework for Mortality Improvement: MIM-2021-v2, https://www.soa.org/4a9d42/globalassets/assets/files/resources/research-report/2021/2021-mim-consistent-framework-v2.pdf.
[2] SOA Research Institute (2022), Developing a Consistent Framework for Mortality Improvement: MIM-2021 Status Report, Spring 2022, https://www.soa.org/49baa7/globalassets/assets/files/resources/research-report/2021/2021-mim-app-tool-user-report.pdf.

for 2022.[3] Consistent with the prior version, running the MIM-2021-v3 Application Tool using the SSA mortality tables and other RPEC parameters can be used to replicate the MP-2021 and O2-2021 MI scales.

Section 4 highlights some of the differences between the two historical mortality tables used in MIM-2021. Section 5 describes certain anticipated future MIM-2021 updates and enhancements.



[3] SOA Research Institute (2022), RPEC 2022 Monthly Improvement Update, https://www.soa.org/resources/research-reports/2022/rpec-mortality-improvement/.

Section 1: MIM-2021-v3 Enhanced User Functionality

The MIM (Mortality Improvement Model) -2021 Application Tool enables users to develop their own sets of mortality improvement (or in some cases deterioration) rates under the MIM-2021 framework.[4] The Advisory Group recognized the complexity presented to practitioners when using the MIM-2021 Application Tool and developed a simpler pathway that helps users understand the key parameters to be entered to achieve results. Compared to the prior versions of the Application Tool, MIM-2021-v3 has a more straightforward user interface and a high-level process schematic, both designed to facilitate the entry of model parameters.

A clearer distinction has also been made between "required" parameters (i.e., those necessary for the spreadsheet to produce results) and "optional" parameters that can be selected to produce alternative projected mortality.[5]

As was the case in the prior versions of the Application Tool, users will need to populate all required parameter cells before the spreadsheet will produce results. This is accomplished either by choosing one of the three preselected parameter sets or by entering each required parameter individually. The required parameters include the following:

- The desired set of historical mortality rates upon which to base the projection and the appropriate order of two-dimensional graduation;
- The overall shape of and key years associated with long-term (and, if desired, intermediate-term) mortality improvement (MI) rates;
- The degree of blending between the Application Tool's horizontal projection along individual ages and its diagonal projection along individual year-of-birth cohorts;
- The historical period used to determine the MI rates and associated slopes immediately preceding the first year of the projection; and
- The magnitude of long-term (and, if desired, intermediate term) MI rates.

Two types of optional parameters are used:

- Adjustment factors that can be used to reflect the anticipated near-term effects of mortality rate shocks, such as the impact of COVID-19, and
- The ability to select a mortality table other than the historical one used to develop the underlying MI rates from which output will be based.

With the MIM-2021-v3 Application Tool user interface, setting and reviewing the required and optional parameters can be accomplished in six steps.[6] Once completed, the last step in the process is to select the desired output and run the model. A schematic diagram illustrating the user interface process is available in the tool and is also shown in Figure 1. A user guide is also available providing more in-depth information and helpful examples about each step of the process.

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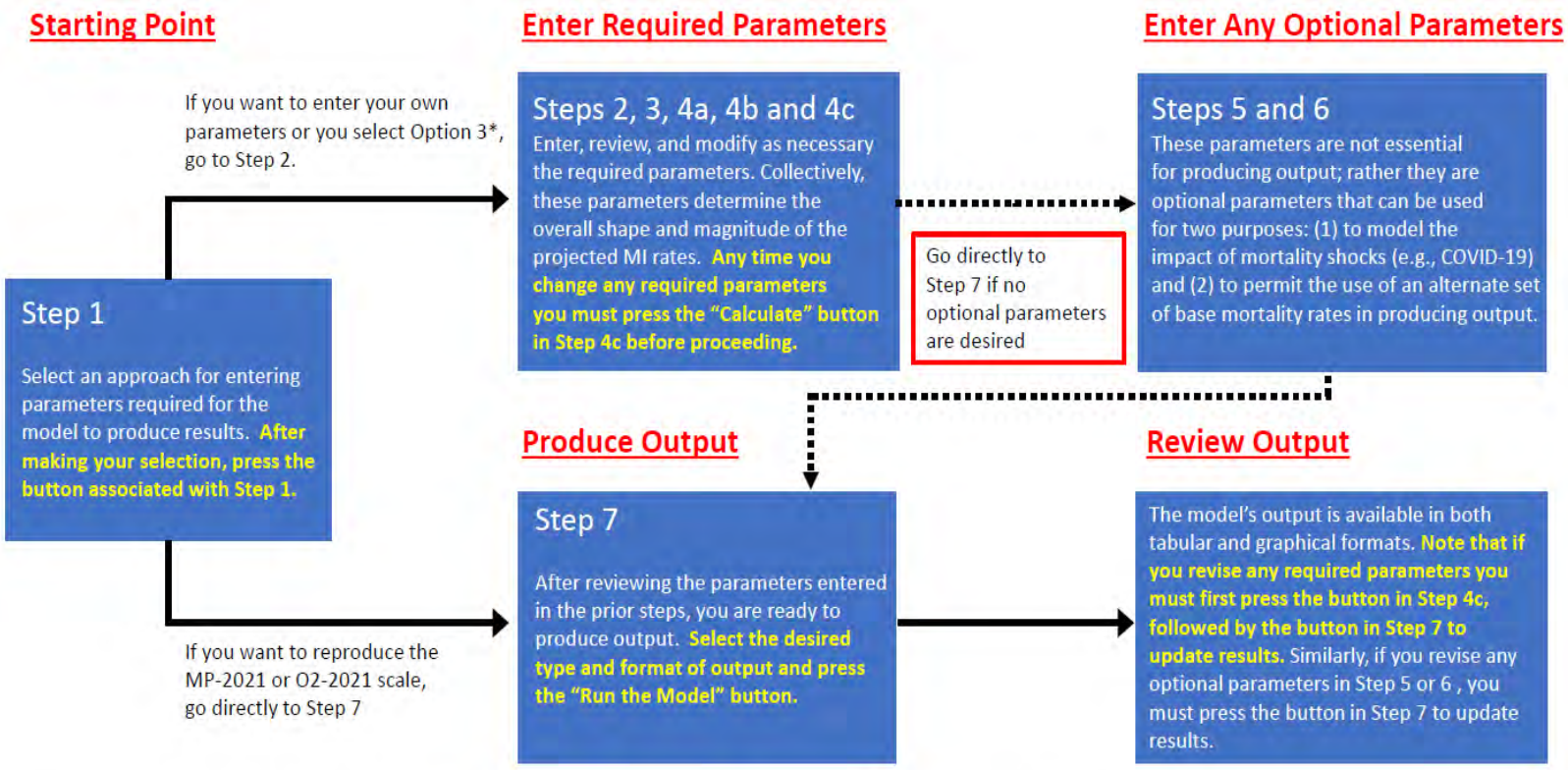
[4] "MIM-2021" stands for the Mortality Improvement Model initially released in April 2021. The framework includes two Excel-based tools with user guides. The Application Tool constructs sets of mortality improvement rates under this framework for specific applications. The Data Analysis Tool helps practitioners analyze the historical datasets included in the Application Tool.

[5] Users can enter *required* parameters in one of two ways: (1) by selecting one of the preselected parameter sets or (2) by entering each parameter individually. Independent of which method is selected for entry of the required parameters, any optional parameters need to be entered individually.

[6] Users who wish to replicate MP-2021 or O2-2021 can do so in essentially one step and then move directly to the last step to select the output and run the model.

Figure 1
MIM-2021-V3 PROCESS SCHEMATIC



* Selection of Option 3 in Step 1 populates the model's required parameters with a new preselected assumption set designed primarily as a starting point for individual life and individual/group annuity applications. Users who select Option 3 should review all of the preselected parameters in Steps 2 though 4c and modify as necessary.

Section 2: Individual Life and Annuity Preselected Parameter Sets

To assist life insurance and annuity practitioners, the Advisory Group is releasing a preselected set of parameters to provide a reasonable starting point for the development and exploration of MI projection scales for individual life insurance and individual/group annuity products. The previous releases of the MIM-2021 Application Tool allowed the practitioner to replicate the MI scales of the Retirement Plans Experience Committee (RPEC) with the click of a single button.[7] The Advisory Group decided to provide practitioners in the individual life insurance and annuity sectors with an option to select a starting set of required parameters that are populated directly into the spreadsheet with the click of a single button.

Initially, the Advisory Group developed a set of MI assumptions varying by age, gender and product (life and annuity) by professional judgment and knowledge of the industry. These assumptions were reviewed for reasonability against actual aggregate MI assumptions from companies participating in a recent Society of Actuaries (SOA) company survey on MI assumptions.[8] The assumptions were fine-tuned based on this review and to make the differences between the assumptions (e.g., male vs. female, life vs. annuity) more consistent.

A small group of actuaries "beta tested" the assumptions in a version of the MIM-2021-v3 Application Tool incorporating the "one button" approach. Reflecting their feedback and our goal of providing a simple reasonable starting point for practitioners, the Advisory Group decided to collapse the multiple sets of assumptions into one assumption set varying only by gender and age. The final preselected parameter set[9] was compared for reasonableness to

- The RPEC-selected assumptions,
- The development of MI assumptions from other SOA and industry mortality improvement committees, and
- Recent SOA surveys of insurance company MI practices derived from both direct writers and reinsurers.

The Advisory Group believes that the preselected parameter set represents an appropriate "starting point" to consider in producing mortality improvement scales for individual life insurance and individual/group annuity applications.[10] It is the responsibility of the practitioner to determine which mortality improvement assumptions are appropriate to use for their specific situation, purpose and circumstances.

Whereas RPEC uses the Social Security Administration (SSA) historical dataset for its MI projections, the preselected parameter set for individual life insurance and individual/group annuity MI projections is based on 50% each of the National Center for Health Statistics (NCHS) deciles 6 and 7 historical datasets. The Advisory Group selected these deciles to reflect a slightly above average U.S. population socioeconomic level of affluence for the preselected parameter MI projection. The choice of these historical datasets is an appropriate starting point for further review and modification. The Advisory Group encourages practitioners, when utilizing the preselected parameter set for MI projections, to utilize the heat map and graph features for visualizing projection results to review and fine-tune the

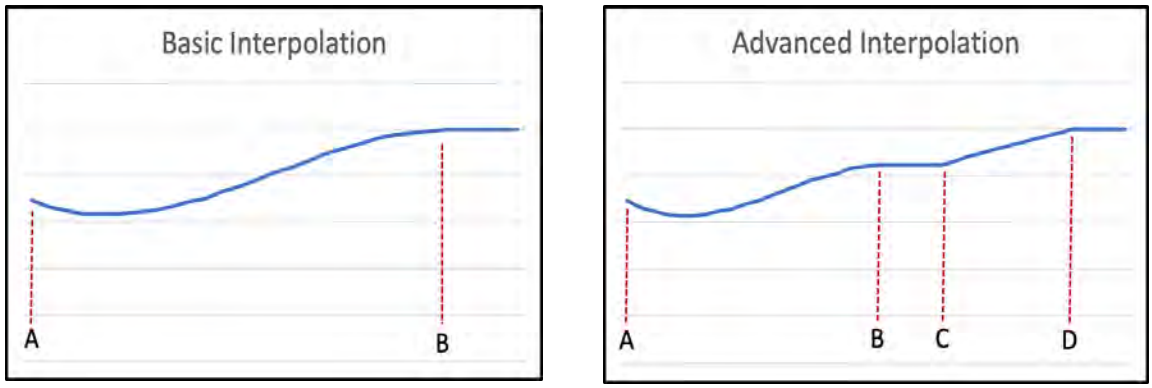
[7] Based on MIM-2021's original methodology and structure, the objective for MIM-2021-v2 Application Tool was to reproduce Scale MP-2021 and its order-2 counterpart, O2-2021 using RPEC's committee-selected assumptions.
[8] Society of Actuaries (2022), 2022 Mortality Improvement Survey Report (forthcoming).
[9] The effects of selection—whether for life insurance or annuities—wear off over the "select" period of mortality. The preselected parameter set assumptions provided at this point are for the "ultimate" period mortality rates. The Advisory Group will continue to consider how the MIM-2021-v3 Application Tool can be applied to project MI rates for select and ultimate mortality tables.
[10] Note that these assumptions do not consider long-lasting increases in mortality from the current pandemic or a future one, any potential significant medical advances occurring in the future, nor any situations causing lasting increases in mortality such as climate change or other occurrences causing lasting decreases in mortality.

assumption parameters to reflect different target markets, individual company experience, underwriting strategies, products, risk classes and any other factors unique to their company or personal future expectations.

The structure of the MIM-2021-v3 Application Tool is based on the user selecting (1) the dataset of historical MI rates, (2) the long-term MI rate structure and (3) the interpolation options to fill in the intervening MI rates between historical MI and long-term MI rates. The user has two interpolation options:

- Basic Interpolation (Figure 2; left side)—a family of cubic polynomials between points A and B.
- Advanced Interpolation (Figure 2; right side)—a family of cubic polynomials between points A and B, followed by an optional period of flat MI rates between points B and C, then linear convergence to the appropriate long-term MI rate between points C and D.

Figure 2
TWO INTERPOLATION OPTIONS



The Advisory Group anticipated that individual life insurance and individual/group annuity practitioners might prefer to have the additional flexibility offered by the Advanced Interpolation structure. Users must always select the historical MI rates at point A, and so the preselected parameters for Option 3 relate to assumed intermediate- and long-term mortality improvement parameters at points B and D. The Advisory Group selected the same set of age-specific MI rates at both years as an appropriate starting point for further review and modification; see Table 1. Linear interpolation was used to calculate MI rates between age 35 and age 55, age 75 and age 85, age 85 and age 95, and age 95 and age 115.

Table 1
PRESELECTED MI ASSUMPTIONS RELATED TO POINTS B AND D FOR THE INDIVIDUAL LIFE INSURANCE AND INDIVIDUAL/GROUP ANNUITY OPTION

Male and Female	
Attained Age	MI Rate
17–35*	0.8
55	1.0
75	1.0
85	0.8
95	0.3
115	0.0

*The MIM-2021-v3 Application Tool's lowest age is 17.

The Advisory Group recognizes that the Advanced Interpolation structure is not required when the assumed sets of intermediate- and long-term MI rates are the same; the same results can be handled using the Basic Interpolation

structure. The Advisory Group, however, thought it would be helpful to present the preselected parameters for the individual life insurance and individual/group annuity option using the Advanced Interpolation framework, anticipating that practitioners would find it helpful when reviewing and modifying parameters for such applications.

Other than the historical mortality database and the intermediate- and long-term MI assumptions, the preselected parameters for the individual life insurance and individual/group annuity option are the same as those selected by RPEC for use in the MP-2021 scale:

- Whittaker-Henderson smoothing of historical mortality data: Order 3.
- Number of years into the future when MI rates are assumed to remain constant: Horizontal = 10; Diagonal = 20.
- Blending of horizontal and diagonal projects: 50%/50%.
- Starting years for MI values and slopes at point A: 2016–2017.
- Restriction on the absolute value of the MI slopes at point A: 0.0%.

Users who are interested in the rationale for these assumptions are directed to previous RPEC reports, particularly the MP-2016[11] and MP-2018[12] reports.

[11] Society of Actuaries (2016), Mortality Improvement Scale MP-2016, https://www.soa.org/4937da/globalassets/assets/files/research/exp-study/mortality-improvement-scale-mp-2016.pdf.
[12] Society of Actuaries (2018), Mortality Improvement Scale MP-2018, https://www.soa.org/49964f/globalassets/assets/files/resources/experience-studies/2018/mortality-improvement-scale-mp-2018.pdf.

Section 3: Mortality Shocks and Waves and COVID-19

Using the following definitions, the U.S.—in fact, almost any population or its segments—has experienced significant spikes and waves in mortality over the years:

- A *spike* is a sudden change in mortality of limited duration, including pandemics such as COVID-19 and armed conflicts.
- A *wave* is a longer-lasting period of mortality different from a benchmark mortality table, such as an unusual period of drug overdoses or a long-lasting epidemic such as HIV/AIDS.

In some cases, it may be difficult to discern whether an increase in mortality, even when the driver of that increase is known, will be a spike, wave or a permanent discontinuity. In some cases, identification and knowledge regarding the driver(s) will strongly suggest its future trajectory. In the meantime, a sudden increase may occur in uncertainty associated with the future trajectory of mortality, at least until an effective vaccine, treatment or other mitigation technique is rolled out. Further, an infectious disease or human behavior can become endemic, that is, continue to affect a population after a large part of its spike or wave pattern is over. In contrast, its effect might decrease rapidly, for example, as Ebola or Zika virus epidemics have proved to be manageable. Other examples are the adverse mortality impacts of smoking tobacco cigarettes or obesity that can result in either a wave, if smoking or obesity prevalence is significantly reduced, or become a permanent discontinuity.

Unless they become endemic, these mortality fluctuations may not affect long-term mortality trends. Rather, they may dissipate totally or have a relatively small residual effect compared to their nadir. Their reflection in a mortality projection depends on several factors, some of which the actuary may need to consider regarding their applicability to a particular situation, such as in pricing (premiums or contributions), reserving/financial reporting, risk management or capital assessment.

As a difference may be found between the mortality of the overall population and (1) a life or health insurance portfolio and (2) a pension program, a difference may also exist between rates of mortality improvement between them, as well as the duration and severity of a mortality spike or wave between these populations. For example, an insured population, because of the make-up of and underwriting decisions involving the market segment involved, may experience a lower level of mortality associated with COVID-19 or drug overdoses. As a result, the individual actuary will ordinarily assess and estimate these differences and their effects on applicable mortality experience. These differences can be reflected in inputs to an application of the MIM-2021 model. Factors that may be appropriate to consider include the following:

- Analysis of the nature of the spike or wave, particularly its drivers and the effectiveness of mitigation techniques applied to control its adverse effects on mortality;
- When the spike or wave began, its severity, its trajectory and when it has completed its course;
- Its effect by sociodemographic characteristic, e.g., age, gender, employment, disability or income status;
- Where in the spike or wave period the evaluator sits, e.g., in its initial rise or decline stage;
- If in the midst of a spike or wave, the prognosis and uncertainty regarding its future course, especially regarding its duration, severity and expected effects on the population being evaluated;
- Whether it has a period and/or cohort effect;
- How it (or its mitigation) affects other causes or drivers of mortality;

- Reliability and accuracy of the supporting data considered or used, given the difficulties in attributing deaths to particular causes and the nature of the spike or wave; and

- Its residual effects—in particular, whether it will establish a "new normal."

Currently, at least two of these fluctuations may be relevant to many actuaries who are projecting mortality:

- *COVID-19*: This pandemic materially affected population mortality during 2020 through at least 2022. It has affected almost all ages, with a larger impact at the older ages, but a decreasing average age at death was also seen during 2021, with a subsequent upward trend in 2022. It is important to note that the number of reported COVID-19 deaths may not be completely accurate or complete because of the difficulty in attributing causes of death in some cases. As a result, a more reliable measure may be "excess deaths" over an expected benchmark. It is important to identify what that benchmark is; for example, it also has had an effect on other causes of death, such as influenza, drug overdoses and untreated other medical conditions. The extent of its effect on future mortality rates due to "long COVID," delayed care and any consequential effects on other causes of death is not yet clear, although some endemic effects may continue.

- *Drug overdoses*: Although drug overdoses have resulted in deaths for more than a century, deaths due to opioids and certain synthetic drugs, such as fentanyl, have adversely affected mortality for only the last two decades and increased again during the COVID-19 pandemic. Drug overdoses are a significant part of the so-called deaths of despair (due to alcohol abuse, drug overdose or suicide) that have mostly affected those in their 20s through 50s. These deaths have contributed to recent deterioration in all-cause mortality. The future course of this cause of death is currently uncertain, although it is likely to continue for some time yet.

Typically, the mortality from a spike or wave is included in historical all-cause mortality experience. If appropriate, an adjustment could be made to this mortality experience from which a projection is based to explicitly remove the historical effect of a significant spike or wave, with a separate improvement factor applied to the allocated cause-specific mortality.

This may be especially important if the population being assessed is different from the source of the historical experience used or if the period to which the projection is to apply is not expected to have the same type of exposure to the drivers or the results of the spike or wave. The actuary may wish to reduce (or increase, if the spike or wave is favorable) or eliminate or reduce its effect in the historical and/or future projection period(s), depending on the circumstances and application.

The method applied for this adjustment will depend on the specific application and available data. In any case, an estimate of the future trajectory of the spike or wave may be needed. If the mortality of the spike or wave has been eliminated from the historical mortality experience, any expected remaining portion of the spike or wave would be added on to the "normal" expected future mortality.

The uncertainty associated with possible future spikes or waves and the future trajectory of a current one would be in addition to the uncertainty associated with the other elements of the mortality estimates, such as future trends. It may be beneficial to keep the projection of applicable spikes or waves separate for future auditability and/or future adjustments as more becomes known.

Although for insurance purposes it is generally believed that capital should reflect significant adverse fluctuations of mortality, the extent to which a current spike or wave should be reflected in current liabilities (reserves) may need to be considered. In general, the expected effect of a past or current spike should be reflected in an insurer's reserves (liabilities), whereas capital should reflect the effect of significant future spikes or waves—or at least those that have

not yet been observed to be significant at the valuation date. An alternative approach would be to ignore the period of a spike in the analysis, because it may not be representative of the underlying mortality, or the available data may not be sufficiently reliable.

Although mortality experience included with MIM-2021 does not reflect the historical or potential future effects of COVID-19, a component has been built into the MIM-2021-v3 Application Tool based on methodology developed by RPEC. Individual practitioners can incorporate a COVID-19 adjustment into the mortality projection scales by entering specific mortality loads separately for males and females for each year 2020 through 2027, an increase of three years over the prior MIM-2021 Application Tool, and separately for 2028 and beyond if a long-term COVID-19 adjustment is desired. An amount entered into this section will be reflected in the resulting projection scale as a percentage load on mortality only for the year listed. A blank or zero load for a subsequent year will cause the model to compute the implied MI rate that would reset mortality rates for that year to what the model would have otherwise forecast absent any adjustment for COVID-19.

For example, suppose a user inputs a 15% load for an age for 2020 and 2021 and a zero load in all subsequent years. This assumption means that mortality rates are 15% higher than what they would have been in 2020 and 2021 absent COVID-19, but that mortality rates in all years after 2021 are unaffected and will revert to what they would have been if no load had been input. Therefore, 2020 MI rates become very negative in response to the 15% mortality load. However, because there is no such load for 2022, the 2022 improvement rate becomes large and positive to revert projected 2022 mortality rates to what they would be had no loads been input at all. There are no changes to improvement rates for 2023 and beyond. The MIM-2021-v3 Application Tool User Guide has also been updated and includes additional examples.

To help practitioners model their selected assumptions for pandemic wear-off utilizing this MIM-2021-v3 feature and to give practitioners information on mortality trends during the pandemic, RPEC's 2022 Mortality Improvement Update[13] includes statistics on excess mortality during 2020, 2021 and the first half of 2022. Also included is an analysis of the sensitivity of annuity values to several possible sample inputs for mortality loads. As explained in the report, RPEC did not believe it was appropriate to incorporate the 2020 mortality data in an updated improvement scale. However, RPEC did develop detailed estimates of the 2020 excess mortality by age and gender for informational purposes, as compared to projections consistent with Scale MP-2021. These estimates are provided in a separate Excel file posted on the SOA website along with the report.

More information on reflecting the effects of a mortality shock such as COVID-19 in MIM-2021-v3 can be found in the Application Tool User Guide.[14]

[13] SOA Research Institute (2022), RPEC 2022 Monthly Improvement Update, https://www.soa.org/resources/research-reports/2022/rpec-mortality-improvement/.

[14] SOA Research Institute (2022), MIM-2021-V3 Application Tool User Guide, https://www.soa.org/resources/research-reports/2022/mortality-improvement-model/.

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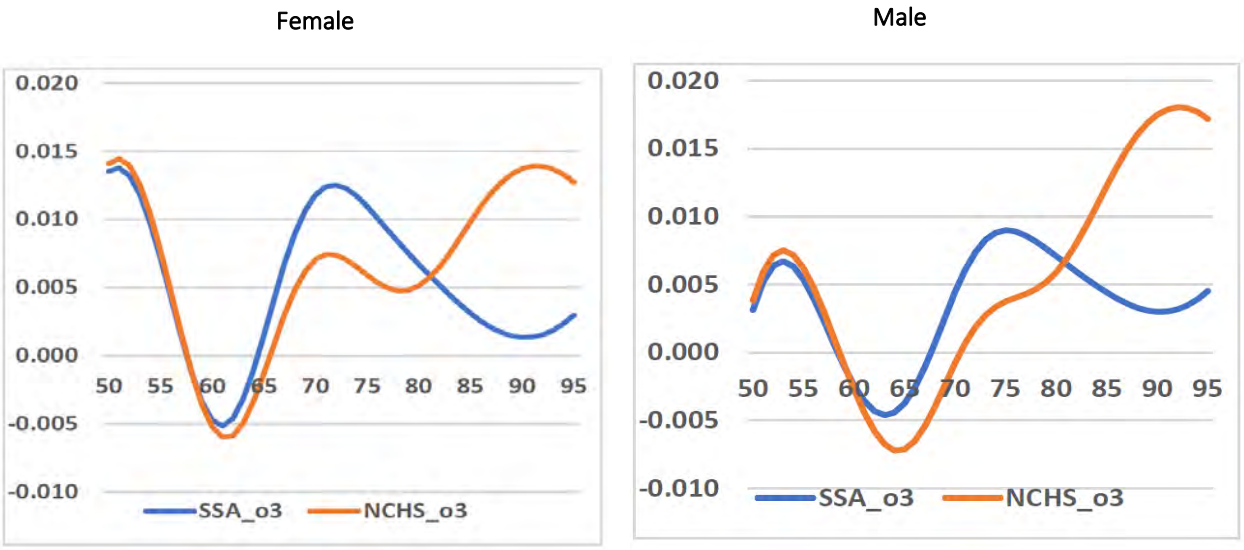
Section 4: MIM-2021-v3 Historical Mortality SSA and NCHS

As noted in Section 4.1 of the MIM-2021-v2 Report,[15] the first step in applying the MIM-2021-v3 methodology is to select a historical mortality dataset to be used. Loaded into the MIM-2021-v3 Application Tool are U.S. population mortality data from SSA and socioeconomic quintile and decile data based on data from NCHS. The Advisory Group recognizes that the SSA data and the NCHS data for ages 65 and older, although both based on U.S. population data, were derived from different sources. As a result, the two datasets will not produce the same national-level rates of MI for these ages. In reviewing the NCHS results, the Advisory Group observes when all deciles are combined to form a national population, the data show slightly faster rates of mortality improvements across the period 1982 to 2019 than did the SSA data.

Practitioners should be aware of the differences in the underlying SSA and NCHS datasets. The MIM-2021-v3 Data Analysis Tool can provide insight into these differences as shown in Figure 3.

Figure 3

NATIONAL-LEVEL ANNUALIZED MORTALITY IMPROVEMENT DATA: SSA VERSUS NCHS 2015–2019



Source: The MIM-2021-v3 Data Analysis Tool was used to generate Figure 3. "_o3" in the legends indicates Whittaker-Henderson Order 3 graduation was used to smooth the data. More information can be found in the MIM-2021-v3 Data Analysis Tool User Guide.[16]

Section 3 of the RPEC Scale MP-2021 Report[17] outlines RPEC's rationale for utilizing the historical SSA data rather than the NCHS data for constructing MI scales. After subsequent consideration of the data available, RPEC concluded that the rationale for using the historical data furnished by SSA for mortality improvement projections from the Scale MP-2021 Report still applies. The population estimates available from the Census Bureau for

[15] SOA Research Institute (2021), Developing a Consistent Framework for Mortality Improvement: MIM-2021-v2, pp. 14–18, https://www.soa.org/4a9d42/globalassets/assets/files/resources/research-report/2021/2021-mim-consistent-framework-v2.pdf.

[16] SOA Research Institute (2022), MIM-2021-v3 Data Analysis Tool User Guide, https://www.soa.org/resources/research-reports/2022/mortality-improvement-model/.

[17] SOA Research Institute (2021), Mortality Improvement Scale MP-2021, pp. 8–15, https://www.soa.org/4a9de4/globalassets/assets/files/resources/experience-studies/2021/2021-mp-scale-report.pdf.

calendar years through 2019 are based on extrapolations from the 2010 census and do not yet reflect the 2020 census.

This is an important issue. The Advisory Group along with a separate SOA research project are working to provide more analysis of it.

Section 5: Future Updates and Enhancements

This section outlines anticipated future updates and enhancements to the MIM-2021 Application Tool. Users of MIM-2021 are encouraged to provide their feedback and ideas to research@soa.org.

1. **Guidance on the relationship between the base mortality table and MI assumptions and their impact**. Base mortality tables can be customized to the population represented by the pension plan or the group annuity in-force block of business to be assessed or valued. However, determining the appropriate mortality improvement assumption applicable to the population being assessed is more subjective. The key parameters from which MIM assumption sets are developed include (1) the short-term rates of improvement, (2) the assumed long-term rates of improvement and (3) the period in which to attain the long-term rates. The Advisory Group is also currently analyzing the sensitivities of these key MIM parameters on life expectancies and the corresponding impact on various insurance/annuity products.

2. **Added functionality to adjust SSA and NCHS datasets if pension plan or insured/annuity cohort data suggest better (or worse) historical mortality.** This issue requires additional analysis and research. It will remain an issue for future consideration.

3. **More insight/research on differences between SSA and NCHS datasets and when to use one over the other.** As indicated in Section 4, the Advisory Group continues to research and analyze the differences between the datasets to provide additional guidance for MIM-2021 users.

4. **Analysis to determine whether some loosening of the two-year step-back at the jumping-off point is appropriate.** This issue requires additional analysis and research. It will remain an issue for future consideration.

5. **Study of how to create projection MI scales for select and ultimate mortality periods and different risk classifications (e.g., smoker and nonsmoker, preferred and standard).** This issue requires additional analysis and research. It will remain an issue for future consideration.

6. **More insight and research on required credibility size for user-supplied historical insured or pensioner data for mortality improvement projections.** This issue requires additional analysis and research. It will remain an issue for future consideration.

Section 6: Acknowledgments

The Society of Actuaries would like to thank the MIM Advisory Group for their support, guidance, direction and feedback throughout the project.

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Harnessing its peer-reviewed research, leading-edge technologies, new data tools and innovative practices, the Institute seeks to understand the underlying causes of risk and the possible outcomes. The Institute develops objective research spanning a variety of topics with its strategic research programs: aging and retirement; actuarial innovation and technology; mortality and longevity; diversity, equity and inclusion; health care cost trends; and catastrophe and climate risk. The Institute has a large volume of topical research available, including an expanding collection of international and market-specific research, experience studies, models and timely research.

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