

# Academy C-2 Mortality Work Group Recommendation

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# Agenda

- Review Life RBC C-2 mortality overall approach and current risk-based capital (RBC) factors
- Present recommendation on updated C-2 factors
  - ▣ Structural changes to factor categories
  - ▣ Updated factors under the recommended structure
- Appendix:
  - ▣ Methodology, assumption, and risk distribution comparisons
  - ▣ Validation, peer review, limitations



# Life RBC C-2 Mortality Overall Approach (1 of 2)

- Mortality risk is defined as adverse variance in life insurance deaths (i.e., insureds dying sooner than expected) over the remaining lifetime of a block of business while appropriately reflecting the pricing flexibility to adjust current mortality rates for emerging experience
- C-2 requirement covers mortality risk up to the 95<sup>th</sup> percentile covering adverse experience in excess of the amount covered in statutory reserves
- C-2 requirement includes mortality risks related to:
  - Volatility Risk—natural statistical deviations in experienced mortality
  - Level Risk—error in experience mortality assumption
  - Trend Risk—adverse mortality trend
  - Catastrophe Risks
    - Large temporary mortality increase from a severe event such as a pandemic or terrorism
    - Sustained mortality increase from an unknown risk



# Life RBC C-2 Mortality Overall Approach (2 of 2)

- Evaluate mortality risks using stochastic simulation of projected statutory losses
- Discount after-tax cash flows (at 2.765% after-tax discount rate [3.5% pre-tax])
- Express capital requirement using a factor-based approach applied to Net Amount at Risk (NAR) and convert to pre-tax



# C-2 Life Mortality Risk-Based Capital

Per \$1000 of NAR	Current Pre-Tax RBC Factors	
	Individual & Industrial Life	Group & Credit Life
First \$500M	2.23	1.75
Next \$4.5B	1.46	1.16
Next \$20B	1.17	0.87
>\$25B	0.87	0.78

- The C-2 component of RBC represents 17-18% of total life industry risk-based capital



# What Changed and Didn't Change from the Original Work\*

## What Changed

- Expanded categories to three product categories for individual life and two categories for remaining rate terms for group life
- Addition of a catastrophe terrorism component
- Addition of a catastrophe unknown sustained risk component, replaces severe adverse HIV scenarios in original work
- Lower experience mortality rates
- Lower discount rates (2.765% after-tax versus 6% in original work)
- Inforce assumptions reflecting current U.S. life insurers (demographic, product, lapses, etc.) and group specific assumptions
- Mortality risk assumptions calibrated to latest research and studies
- New model developed in Excel VBA; stochastic capabilities are much greater today than the early 1990's

## What Didn't Change

- Statistical safety level – 95<sup>th</sup> percentile over 5 years for individual life products with inforce pricing flexibility
- Capital is determined for losses in excess of reserve mortality – 5% margin in statutory reserve mortality is consistent with one standard deviation



# Pre-Tax C-2 Factor Recommendation versus Current RBC

Risk Component	Large Inforce Size >\$25B NAR	Small Inforce Size ≤\$500M NAR	Key Updates
HIV Scenarios	↓ 45%	↓ 25%	- Removal of discrete HIV scenarios
Level	↓ 25%	↑ 5%	- Lower experience mortality rates, reducing risk with large credible blocks
Trend	↑ 20%	↑ 10%	- Greater range of mortality trends and differences by age/sex cohort - Risk increases with longer exposure periods
Catastrophe	↑ 10%	↑ 5%	- Similar pandemic severity - Addition of 9/11-type terrorism event (+1%) - Addition of unknown sustained risk event (+4-9%)
Capital Quantification Method	↑ 10%	↑ 5%	- Update to greatest present value of accumulated deficiencies (GPVAD) - Loss quantified as death benefits minus reserves released
Volatility	↑ 0%	↓ 5%	- Similar results as the original model
Length of Risk Exposure Period	↑ varies	↑ varies	- Factors increase based on the length of the current mortality rate risk exposure period - This is a critical variable for differentiating mortality risk



# Lower Experience Mortality Rates

- The new model uses a distribution of rating classes using 2017 CSO tables
- 2017 Commissioners Standard Ordinary (CSO) mortality rates are significantly lower (50%-90%) than “88% of the 1975-80 Basic Table” used previously due to decades of mortality improvement in the U.S.
- An example at a typical age highlights the significant decrease

Comparison of Experience Mortality Rates, Example	
Rates Per 1,000	
Age 45, Male	
Table	Duration 1
88% of 1975-80 Basic Table	1.08
2017 CSO Unloaded Composite	0.48
<i>% Difference</i>	<b>-56%</b>

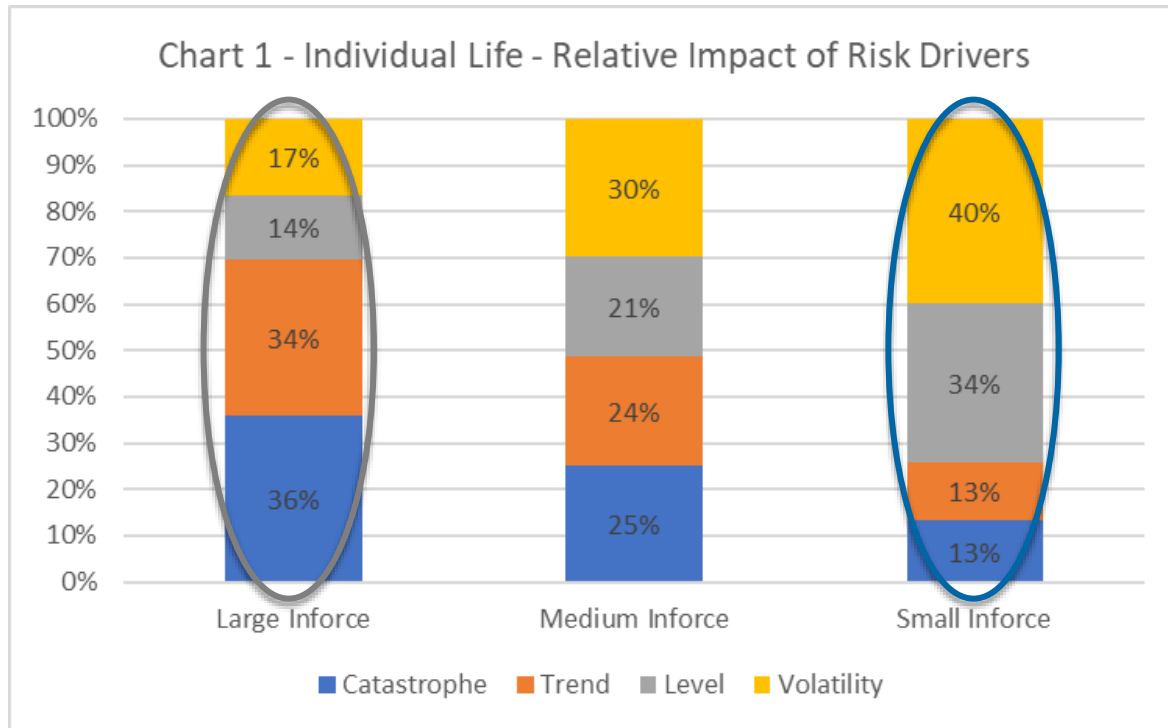
- Similar % decreases also occur at different gender, ages and underwriting classes
- Experience mortality manifests through the level risk component





# C-2 Factor Attribution by Mortality Risk

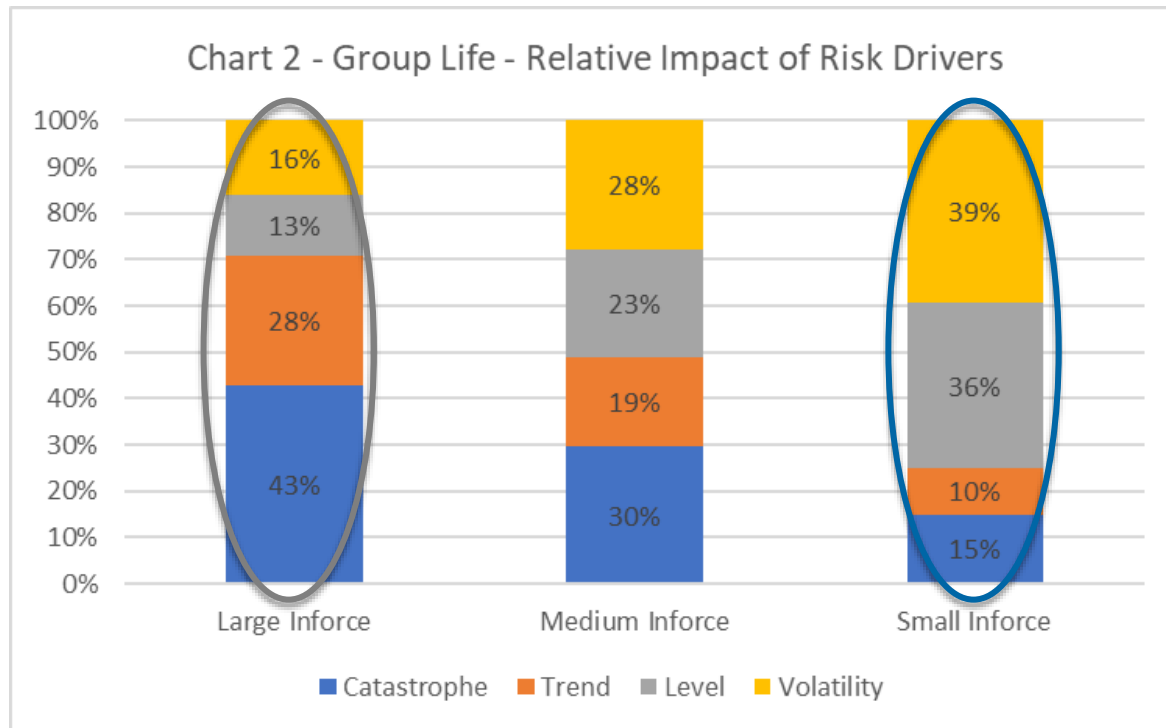
## Individual Life - 5-Year Projection Period Example



- Risks for large inforce blocks are spread proportionately between volatility/level, trend, and catastrophe
- Smaller inforce blocks are subject to higher volatility and level risks, which results in higher factors versus larger blocks



# C-2 Factor Attribution by Mortality Risk Group Life - 5-Year Projection Period Example



- ❑ Risks for large inforce blocks are spread proportionately between volatility/level, trend, and catastrophe
- ❑ Smaller inforce blocks are subject to higher volatility and level risks, which results in higher factors versus larger blocks



# Expanded Categories to Three Products for Individual Life and Two Categories for Remaining Rate Terms for Group Life

## Original 1990s Work

- 1993 factors used a 5-year risk exposure period for all individual life business and a 3-year risk exposure period for group life because it assumed that management actions would occur to reset current mortality rates to reflect emerging experience



# Expanded Categories to Three Products for Individual Life and Two Categories for Remaining Rate Terms for Group Life

## Current Work

- For individual life, management action to reset current mortality rates may be limited or non-existent for products that offer longer term mortality rate guarantees (e.g., Universal Life with Secondary Guarantees (ULSG), Level Term)
- For group life, there are varying lengths of premium rate terms in the marketplace
- Factors aligned with the remaining risk exposure period of current mortality rates on an inforce block is appropriate. This risk differentiation can be accomplished by varying factors by product for individual life and by remaining premium term for group life.
- **The recommendation is to expand factors into additional categories to reflect the current mortality rate risk exposure period over the remaining lifetime of an inforce block of business**
  - **For individual life insurance, the recommendation is to differentiate into three product categories with definitions consistent with the annual statement – analysis of operations by line of business – individual life insurance and VM-20**
  - **For group life insurance, the recommendation is to differentiate into two categories by remaining length of the rate term based on company records by group contract**



# Two New Catastrophe Components

- A terrorism component was developed based on industry experience from the September 11, 2001 terrorist attacks
  - Component assumes a 5% annual probability of an extra 0.05 deaths per 1,000.
- As shared at the [September 11, 2020 LRBCWG meeting](#), a new catastrophe component was developed for a sustained mortality increase from an unknown risk, which serves as a replacement for the adverse HIV scenarios in the original work
  - Component is intended to cover unknown risks that could materialize in the insured population
  - The component assumes a 2.5% annual probability of a 5% sustained severe mortality increase
    - In follow up to a question at the 9/11/20 meeting, sensitivity testing was performed at a 5% annual probability, which has a very modest impact (within rounding to the nearest 0.05)
  - If the event occurs, it is sustained for the remainder of the projection period up to a maximum period of 10 years
  - Without this component the recommended factors would be about 0.1 lower
- **The recommendation is to include these two new catastrophe components.**



# Recommended Updated C-2 Factors

Pre-Tax Life RBC C-2 Factors					
Per \$1000 of NAR	Individual & Industrial Life			Group & Credit Life	
	Universal Life with Secondary Guarantees	Term Life	All Other Life	Remaining Rate Terms Over 3 Years	Remaining Rate Terms 3 Years and Under
First \$500M (Small)	3.90	2.70	1.90	1.80	1.30
Next \$24.5B (Medium)	1.65	1.10	0.75	0.70	0.45
>\$25B (Large)	1.10	0.75	0.50	0.45	0.30

Individual Life: New categorization would be determined based on the categories specified in the annual statement analysis of operations by line of business and consistent with VM-20

- ULSG: factors are the highest due to the longest current mortality rate guarantees and are based on a 20-year risk exposure period for a mature inforce block
- Term Life: factors are based on a typical 10-year risk exposure period for a mature inforce block. The industry is concentrated in 10, 20 and 30-year level term.
- All Other Life: factors are based on a 5-year risk exposure period and assume inforce pricing may be adjusted following adverse mortality experience due to the presence of non-guaranteed elements. Examples are universal life products without secondary guarantees and participating whole life products.

Group Life: New categorization would be determined based on company records for the remaining premium rate terms by group contract

- One category is for remaining premium rate terms greater than 3 years and is represented by a 5-year exposure period
- The other category is remaining premium rate terms 3 years and under and is represented by a 3-year exposure period



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# Recommendation on Updated C-2 Factors

Per \$1000 of NAR	Pre-Tax Life RBC C-2 Factors						
	Individual & Industrial Life				Group & Credit Life		
	Universal Life with Secondary Guarantee	Term Life	All Other Life	% of Individual Life Insurers*	Remaining Rate Terms Over 3 Years	Remaining Rate Terms 3 Years and Under	% of Group Life Insurers*
First \$500M (Small)	3.90	2.70	1.90	43%	1.80	1.30	54%
Next \$24.5B (Medium)	1.65	1.10	0.75	36%	0.70	0.45	33%
>\$25B (Large)	1.10	0.75	0.50	21%	0.45	0.30	12%

- ❑ Size bands were reviewed, and **the recommendation is to combine the current middle two categories (\$500M-\$5B and \$5B-\$25B) into one category (\$500M-\$25B)**
- ❑ The recommendation is to continue categorizing industrial life with individual life and credit life with group life
- ❑ The recommendation is to continue with the 50% credit given for group premium stabilization reserves

\* As of 2019 annual statement reporting



# Recommendation vs Current RBC Individual & Industrial Life Impacts

Per \$1000 of NAR	Pre-Tax Life RBC C-2 Factors						
	Individual & Industrial Life				Change vs Current RBC		
	Current RBC	ULSG	Term	All Other	ULSG	Term	All Other
First \$500M	2.23	3.90	2.70	1.90	+75%	+21%	-15%
Next \$4.5B	1.46	1.65	1.10	0.75	+13%	-25%	-49%
Next \$20B	1.17				+41%	-6%	-36%
>\$25B	0.87	1.10	0.75	0.50	+26%	-14%	-43%

- Overall individual life industry impact would be a modest decrease with industry exposure by NAR concentrated in Term business amongst large insurers
- Factors increase for ULSG
- Factors decrease for products with inforce pricing flexibility (i.e., All Other category)
- Small ULSG and Term carriers would experience an increase on retained business; however, reinsurance is typically used to transfer/mitigate the mortality risk





# Recommendation vs Current RBC Group & Credit Life Impacts

Per \$1000 of NAR	Pre-Tax Life RBC C-2 Factors				
	Group & Credit Life			Change vs Current RBC	
	Current RBC	Remaining Rate Terms Over 3 Years	Remaining Rate Terms 3 Years and Under	Remaining Rate Terms Over 3 Years	Remaining Rate Terms 3 Years and Under
First \$500M	1.75	1.80	1.30	+3%	-26%
Next \$4.5B	1.16	0.70	0.45	-40%	-61%
Next \$20B	0.87			-20%	-48%
>\$25B	0.76	0.45	0.30	-41%	-61%

- Overall group industry impact would be a significant decrease in C-2 capital
- Factors decrease for all but one category: small size for longer rate terms which stays about the same
- Group life factors decreased due to the decades-long decline in experience mortality rates, and the exposure periods remain shorter term as compared to individual life
- C-2 is reduced by up to 50% of premium stabilization reserves



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# C-2 Factors as an Overall Mortality Increase and Observations Versus Other Capital Regimes

Inforce Block Size	Overall Mortality Increase	
	Individual & Industrial Life – 5-year	Group & Credit Life – 5-year
Small	+22%	+31%
Medium	+10%	+14%
Large	+8%	+10%

- Table translates factors to an overall mortality percentage increase for a 5-year risk exposure period
- Percentage increases are similar for other risk exposure periods with cumulative magnitudes being greater for longer periods
  - For example, a 10% increase for 10 years is more severe than a 10% increase for 5 years
- Factors were reviewed against other capital regimes, including Canada, International Capital Standards (ICS), Solvency II and rating agency
  - Mortality risk drivers are consistent
  - Confirmed magnitudes are reasonable for the 95<sup>th</sup> percentile



# Sensitivity Testing:

## Other Attributes that Increase Mortality Risk

- The model was extensively sensitivity tested, and the following attributes increase mortality risk for companies concentrated in these areas
- The C-2 Mortality Work Group doesn't recommend differentiating RBC factors by these attributes; however, they may be useful to regulators when reviewing potentially weakly capitalized companies
- **Older Attained Ages:** capital needs per unit of net amount at risk increase for attained ages 65 and older due to increasing mortality rates
- **Substandard/Classified Underwriting Classes:** capital needs are higher due to higher mortality rates on unhealthier/riskier lives



# Summary of Recommendations

- The Academy C-2 Life Mortality Work Group recommends the factors shown on [Slide 14](#) which reflect
  1. Expanding factors into additional categories to reflect the current mortality rate risk exposure period over the remaining lifetime of an inforce block of business
    - For individual life insurance, the recommendation is to differentiate into three product categories with definitions consistent with the annual statement – analysis of operations by line of business – individual life insurance and VM-20
    - For group life insurance, the recommendation is to differentiate into two categories by the remaining length of the premium term based on company records by group contract
  2. Including the two new catastrophe components for 1) terrorism (expressed as a 5% annual probability of an extra 0.05 deaths per 1,000) and 2) the risk of a sustained mortality increase from an unknown event (expressed as a 2.5% annual probability of a 5% sustained mortality increase)
  3. Combining the current middle two size categories into one category
  4. Continue categorizing industrial life with individual life and credit life with group life
  5. Continue with the 50% credit given for group life premium stabilization reserves
- The work group opines that additional review of the adopted correlation factor with longevity C-2 is not necessary as the Life C-2 modeling was completed consistently with longevity



# Proposed Timeline

- A proposed timeline for a year-end 2022 implementation
  - By end of Q4 2021: expose recommended final factors
  - By end of Q1 2022: structural changes are adopted
  - By end of Q2 2022: updated factors are adopted
  - Year-end 2022: factors are implemented for year-end 2022 annual statements



# Questions?

## Additional Questions, contact:

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# Appendix: Method and Assumption Comparison

Item	Original Work	Recommendation
General Method	Monte Carlo Model – Present Value (PV) of Death Benefits	Monte Carlo Model – PV of Statutory Losses <ul style="list-style-type: none"> <li>Loss defined as death benefits minus reserves released</li> </ul>
Capital Quantification	PV[95 <sup>th</sup> ] – 105%*PV[Expected] <ul style="list-style-type: none"> <li>5% margin/load assumed in reserve mortality</li> </ul>	GPVAD[95 <sup>th</sup> ] <ul style="list-style-type: none"> <li>Greatest present value of accumulated deficiencies (GPVAD)</li> <li>5% margin/load assumed in reserve mortality</li> </ul>
Length of Exposure Period	5 years (3 years for Group) <ul style="list-style-type: none"> <li>Assumed exposure past 5 years could be offset through management actions (raise premium, adjust non-guaranteed elements, etc.)</li> </ul>	5, 10, and 20 years for Individual Life 3 and 5 years for Group Life
Discount rate	6% after-tax	2.765% after-tax (3.5% pre-tax)
Experience Mortality	88% of 1975-1980 Male Basic Table <ul style="list-style-type: none"> <li>15Y Select &amp; Ultimate Structure</li> <li>Male/Female not explicitly modelled</li> <li>Underwriting adjustments applied based on generation</li> </ul>	2017 Unloaded Commissioners’ Standard Ordinary Table (CSO) for Individual Life <ul style="list-style-type: none"> <li>25Y Select &amp; Ultimate structure</li> <li>Gender distinct – Male/Female</li> <li>5 underwriting classes (3 non-smoker/2 smoker)</li> </ul> SOA 2016 Group Life Experience Study for Group Life <ul style="list-style-type: none"> <li>Gender distinct – Male/Female</li> </ul>
Mortality Improvement	Unknown source <ul style="list-style-type: none"> <li>1.00%</li> </ul>	2017 Improvement Scale for VM-20 <ul style="list-style-type: none"> <li>Varies by gender and age</li> </ul>



# Appendix: Risk Distribution Approach Comparison

Risk	Original Work	Recommendation
Volatility	Binomial(Policies, q)	Binomial(Policies, q)
Level	Implicit from Discrete Scenarios: <ul style="list-style-type: none"> <li>7 <i>Competitive Pressures</i> scenarios – risk of overoptimistic pricing assumptions</li> <li>15 AIDS scenarios – early 90's estimates of the impact of AIDS on insured mortality (could fit in level, trend, or catastrophe)</li> </ul>	$LR \sim N(0, \sigma_{Lev}); \sigma_{Lev} = \sqrt{\sigma_{Cred}^2 + \sigma_{MVol}^2}$ <ul style="list-style-type: none"> <li>Two independent components:               <ul style="list-style-type: none"> <li>Credibility/statistical sampling volatility (<math>\sigma_{Cred}</math>)</li> <li>True mortality volatility (<math>\sigma_{MVol}</math>)</li> </ul> </li> <li>Continuous normal distribution</li> </ul>
Trend	Discrete Distribution <ul style="list-style-type: none"> <li>7 scenarios adjust mortality improvement assumption</li> </ul>	$[MI_1, MI_2, \dots, MI_{C6}] \sim N(\mu, \Sigma)$ <ul style="list-style-type: none"> <li>6 gender/age group improvement variables (<math>MI_n</math>)</li> <li>Correlated normally distributed random variables</li> </ul>
Catastrophe	Discrete Distribution <ul style="list-style-type: none"> <li>Pandemic</li> </ul>	3 Discrete Distributions <ul style="list-style-type: none"> <li>Pandemic – calibrated from multiple sources</li> <li>Terrorism – 5% probability of additional 0.05 / 1K</li> <li>Unknown Risk – 2.5% probability of a sustained 5% increase</li> </ul>





# Appendix: Model Validation, Peer Review, Limitations

- **Validation:** Model assumptions were developed by the work group through reviewing current mortality research and studies applicable to the U.S. life insurance industry. The assumptions were discussed, reviewed and agreed upon through the work group's bi-weekly calls. Model results and sensitivities were also reviewed extensively by the work group. The work group also provided several updates to the NAIC Life Risk-Based Capital Working Group throughout the project and feedback was obtained from regulators.
- **Peer Review:** The model was independently peer reviewed by a member of the work group. The peer review confirmed that the calculations performed by the model were reasonable for the intended purpose and were being applied as intended.
- **Limitations:** The model is intended to stochastically project through Monte Carlo simulation the run-off of inforce life insurance blocks typical of U.S. life insurers in order to develop capital factors for use in the NAIC RBC formula for C-2 life insurance mortality risk. Other uses outside of this intended purpose may not be appropriate. Product features in the model were developed at a very basic level and consider differences in base statutory reserves, lapses, post level term mortality experience, face amounts and attained ages. The model is not designed to replicate detailed product and inforce block characteristics unique to individual companies. In particular, ULSG products were not directly modeled. The work group concluded based on the modeling that the capital factors are insensitive to product differences for a given risk exposure period. The recommendation to differentiate based on product is an indirect way to get at the length of mortality rate guarantee, utilizes the current reporting structure of the annual statements, and is aligned with principles based reserving differentiation.



# Appendix:

## Prior Work Group Presentations to Life RBC

- [September 2020](#)
- [December 2019](#)
- [June 2019](#)
- [April 2019](#)
- [August 2018](#)
- [August 2017](#)

