

Academy Longevity Risk Task Force: *Longevity Reinsurance Illustrations for Development of RBC C-2 factors*

July 28, 2026

Presentation to the NAIC Longevity Risk (E/A) Subgroup

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About the Academy

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Background

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- The Academy's Longevity Reinsurance Task Force (LRTF) is providing illustrations of the longevity reinsurance product under various scenarios
- Key features of Longevity Reinsurance:
 - » **Floating Leg:** Stream of benefits paid by the assuming company that is tied to the *actual survival experience of the covered annuitants*
 - » **Fixed Leg:** *Predetermined premiums and fees established at inception* paid to the assuming company, which *generally do not vary* with actual mortality experience
- Longevity risk is by far the primary risk of the product. Other risks (e.g. investment, market, counterparty, etc.) are secondary

Illustrations

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“Representative” sample deal, with a mix of 1) younger and older population and 2) male/female gender

Calculate net cash flows (NCF = fixed leg – floating leg) and PV of NCF on both best estimate and prudent estimate (e.g. 85th percentile / VM-22)

Three shock scenarios (for illustrative purposes only)

- A. Mortality Improvement Shock**
- B. Base Mortality Misestimation Shock**
- C. Pandemic Event**

PV of NCF are calculated pre-shock and post-shock

VM-22 reserve floor of 2% of next 12 months’ benefits is also illustrated to demonstrate where embedded conservatism exists

Key Takeaways

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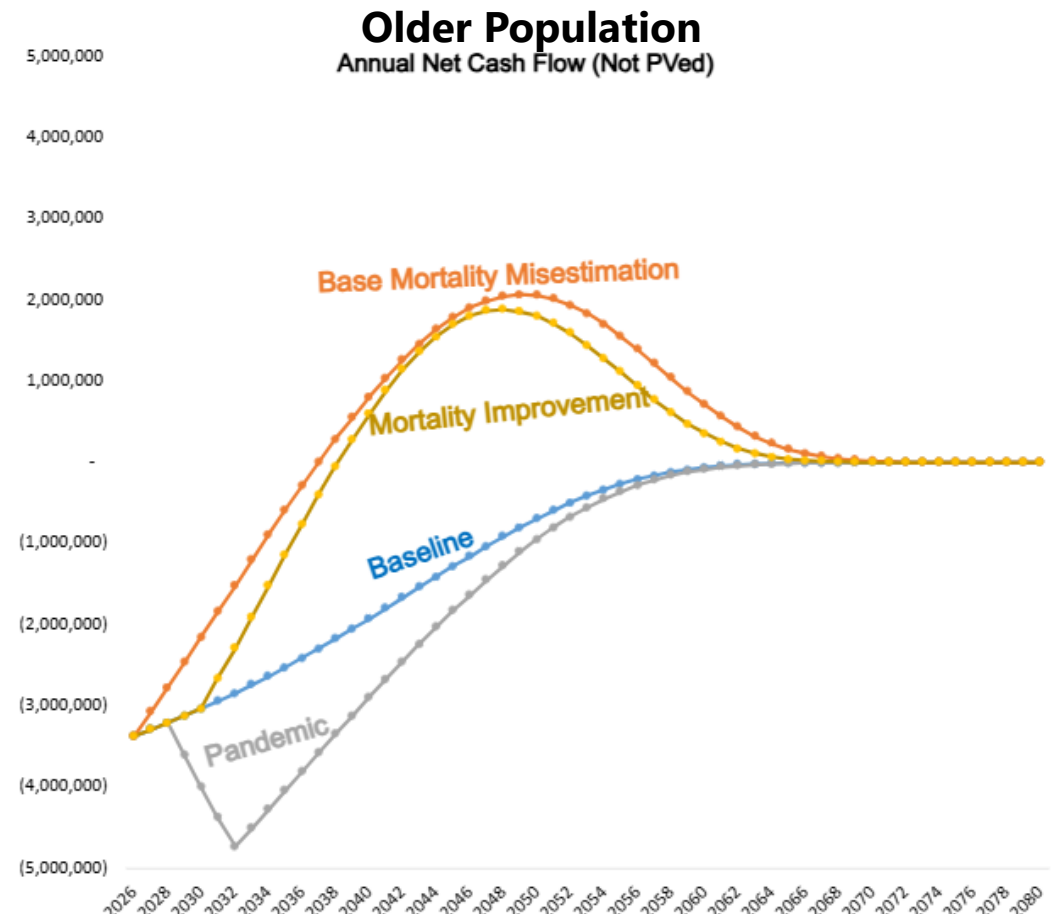
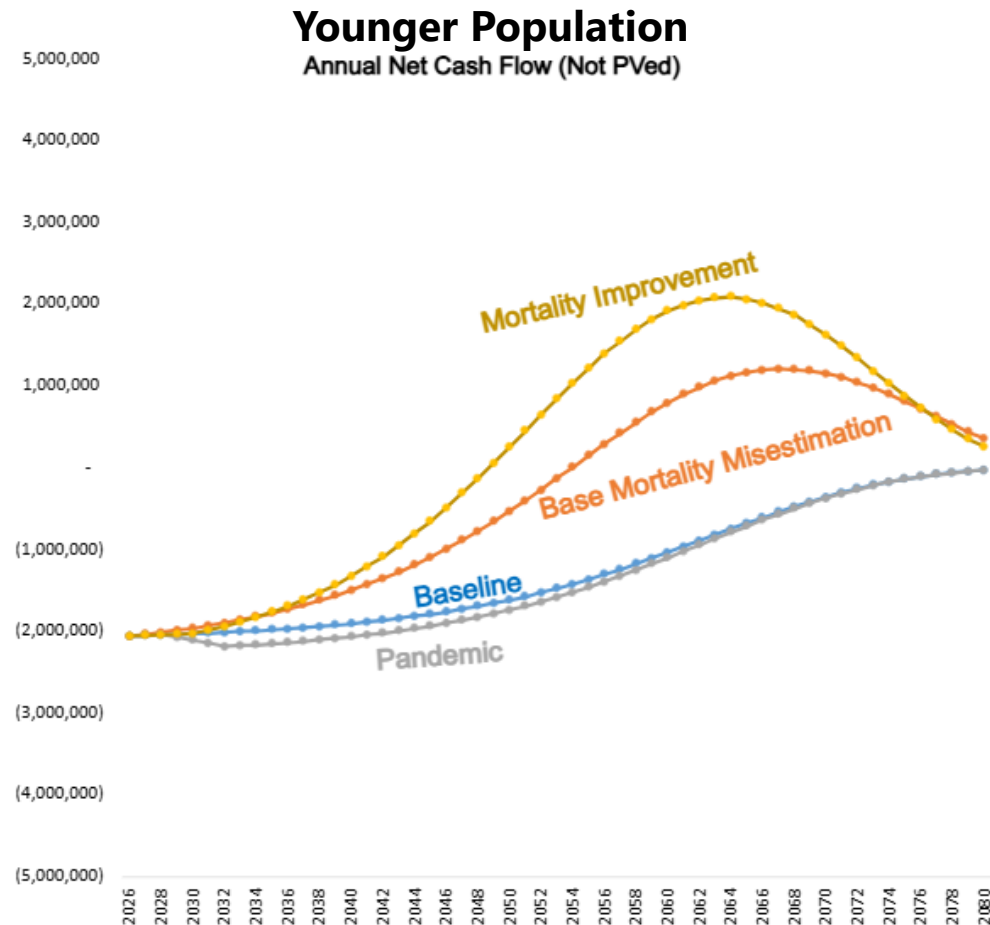
- **Younger and older populations are impacted differently by shocks**
 - » Mortality Improvement more impactful for younger population
 - » Base Mortality Misestimation more impactful for older population
 - » Two independent shocks (vs. one combined shock) better capture risks of younger and older population subsets
- **Insurance companies with material business pre-COVID could have zero C-2** as floating leg payments would be less than assumed at initial pricing.
- Pre-shock, VM-22 floor is meaningfully above prudent estimate reserve as well as beginning years post-shock
- Once shocks are properly calibrated, the post-shock net cash flows may be a reasonable estimate for pre-shock Total Asset Requirement (TAR)
- Illustrations here show patterns of shocks but not meant to discuss size of shocks, **which are exaggerated beyond [current Academy LRTF proposal](#). More analysis to be done by Academy LRTF to recommend size of shocks.**

Projected Net Cash Flows by Scenario

Baseline: Cash inflows (premium + risk fees) are larger than outflows (benefits).

In the mortality improvement and base mortality misestimation shocks,

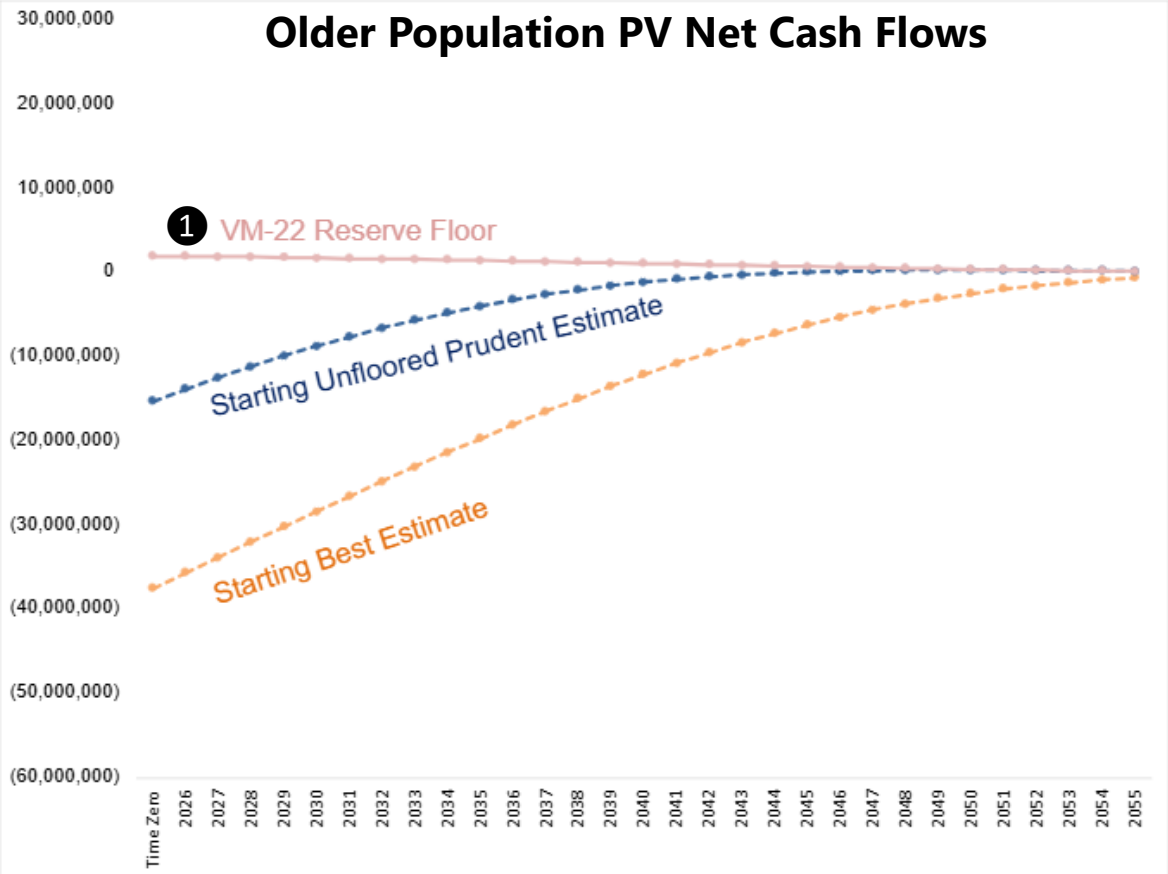
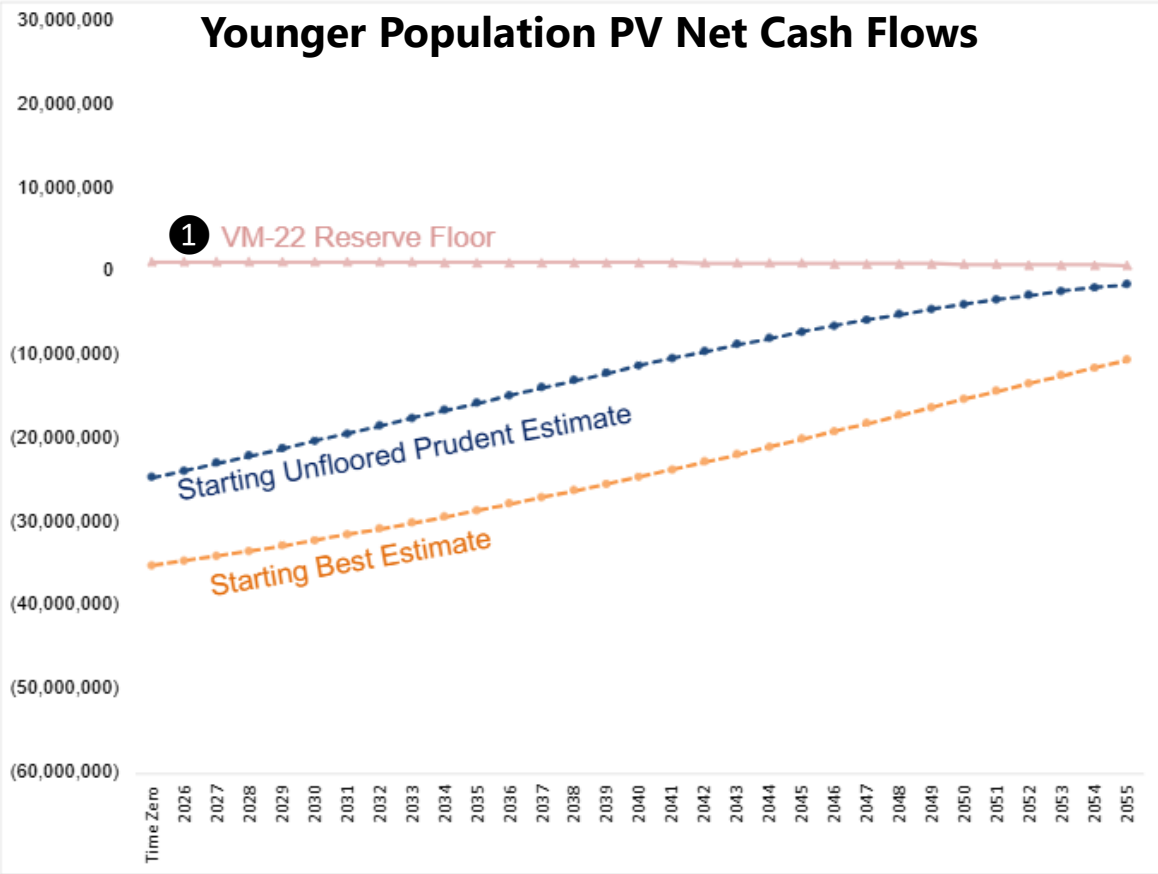
- The first ~10-20 years of the block of business are positive net cash flow.
- Shocks bleed into cash flows in the outer years, which is where we will see impacts to PVs.



Mortality Improvement Trend (140% AA after year 5)

Pre-Shock

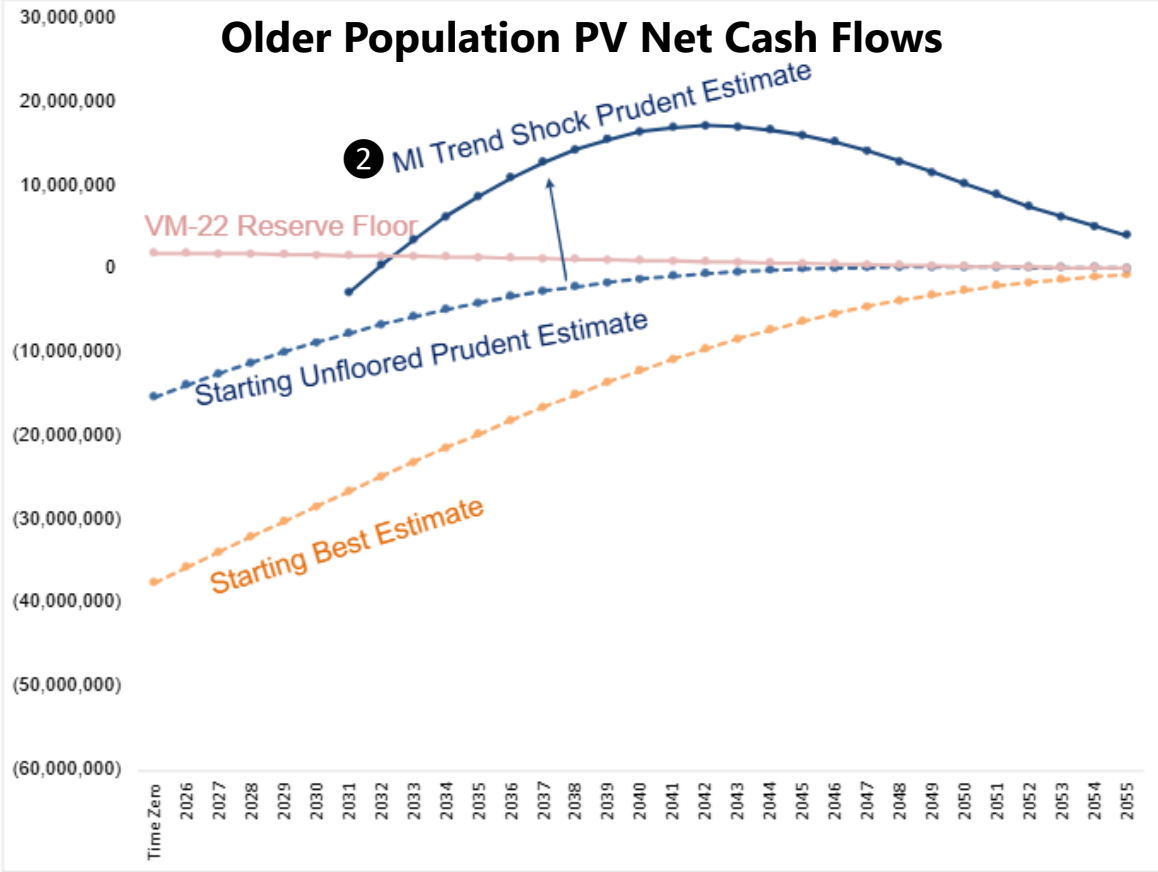
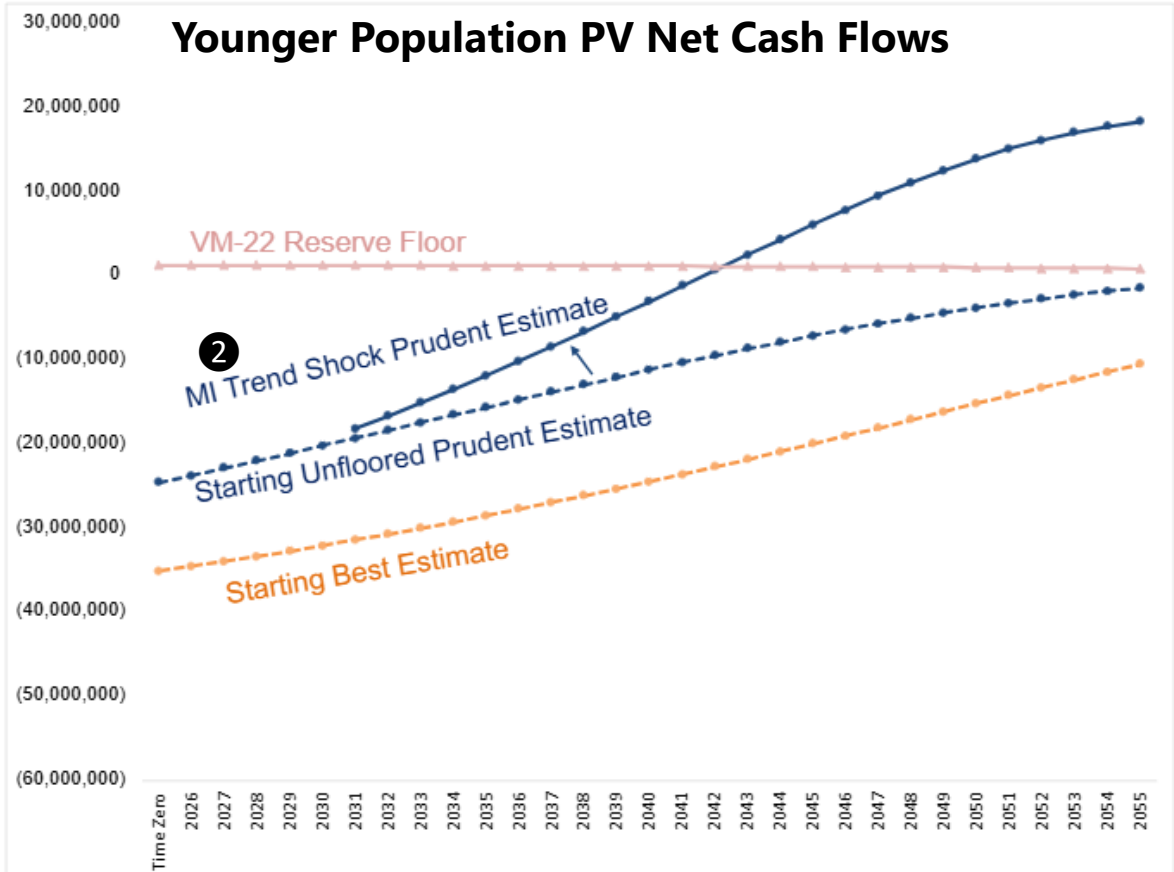
1 Below represents the block of business prior to any shock. Company is effectively held at VM-22 Reserve Floor as PV inflows exceed PV Prudent Estimate Outflows.



Mortality Improvement Trend (140% AA after year 5)

Shock impact to population only

② Reserves increase as the population is living longer than initially expected. However, assumptions have not yet been updated.



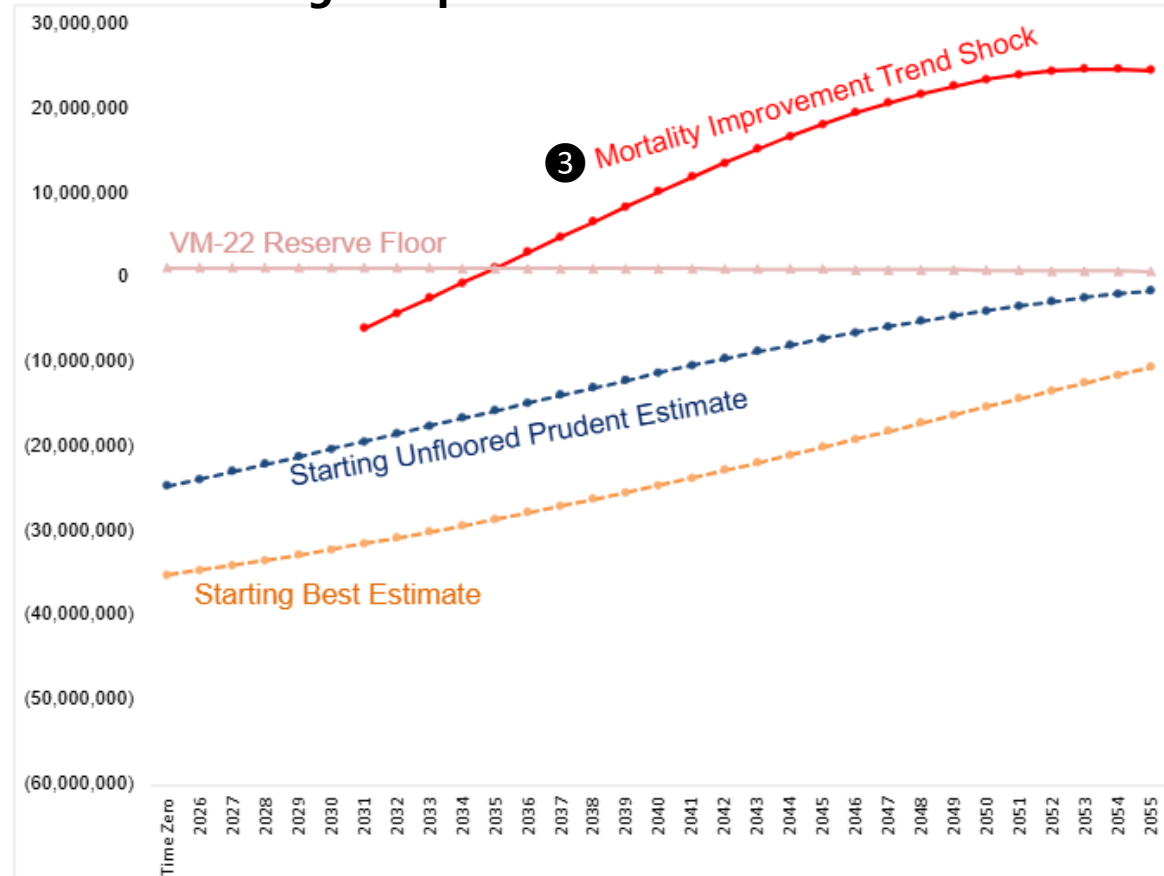
VM-22 Reserve Floor would change post-shock. However, it is not illustrated due to immaterial difference from pre-shock VM-22 Reserve Floor

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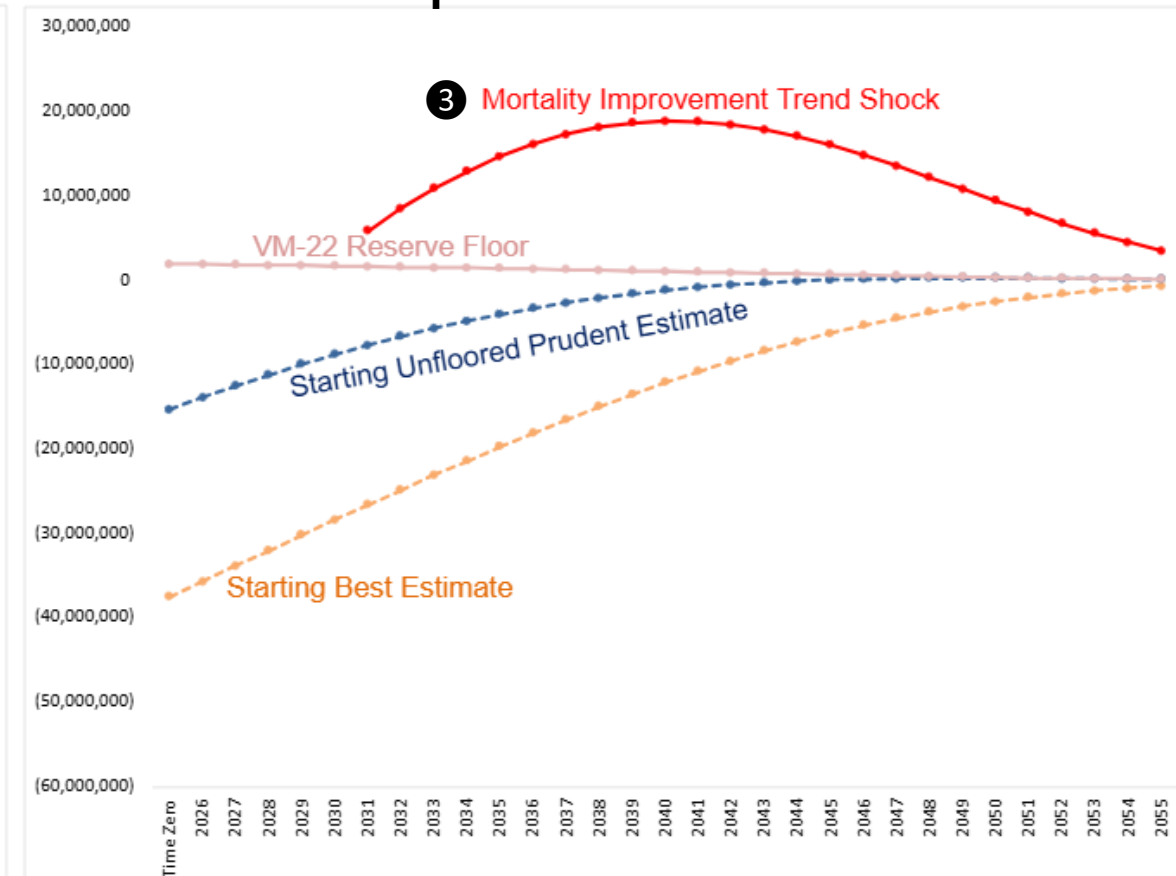
Shock impact to both population and assumptions

③ Company has acknowledged its original mortality improvement assumptions need to be revised, thus increasing its post-shock projection. Impact is much more prominent on younger population although VM-22 floor is broken sooner with older population.

Younger Population PV Net Cash Flows



Older Population PV Net Cash Flows



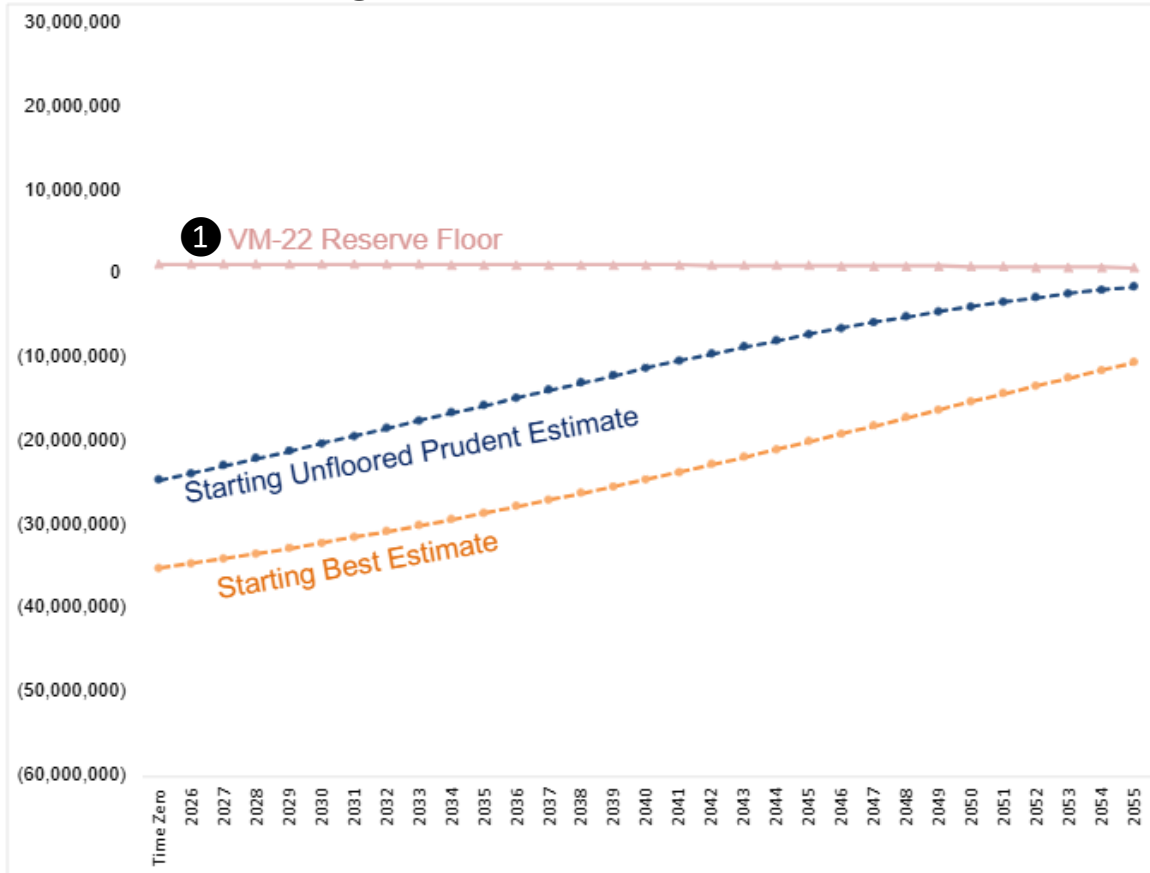
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Base Mortality Misestimation Shock (90% of '94 GAR all yrs)

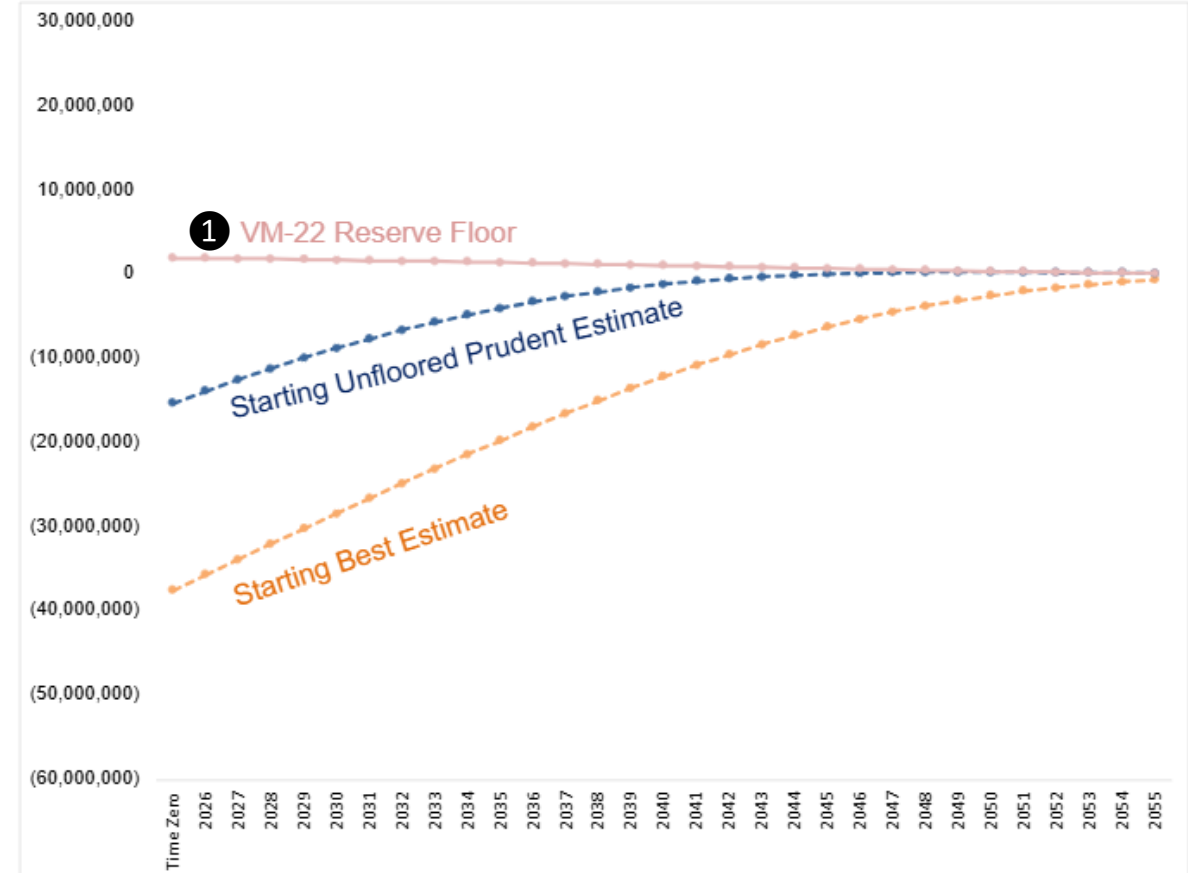
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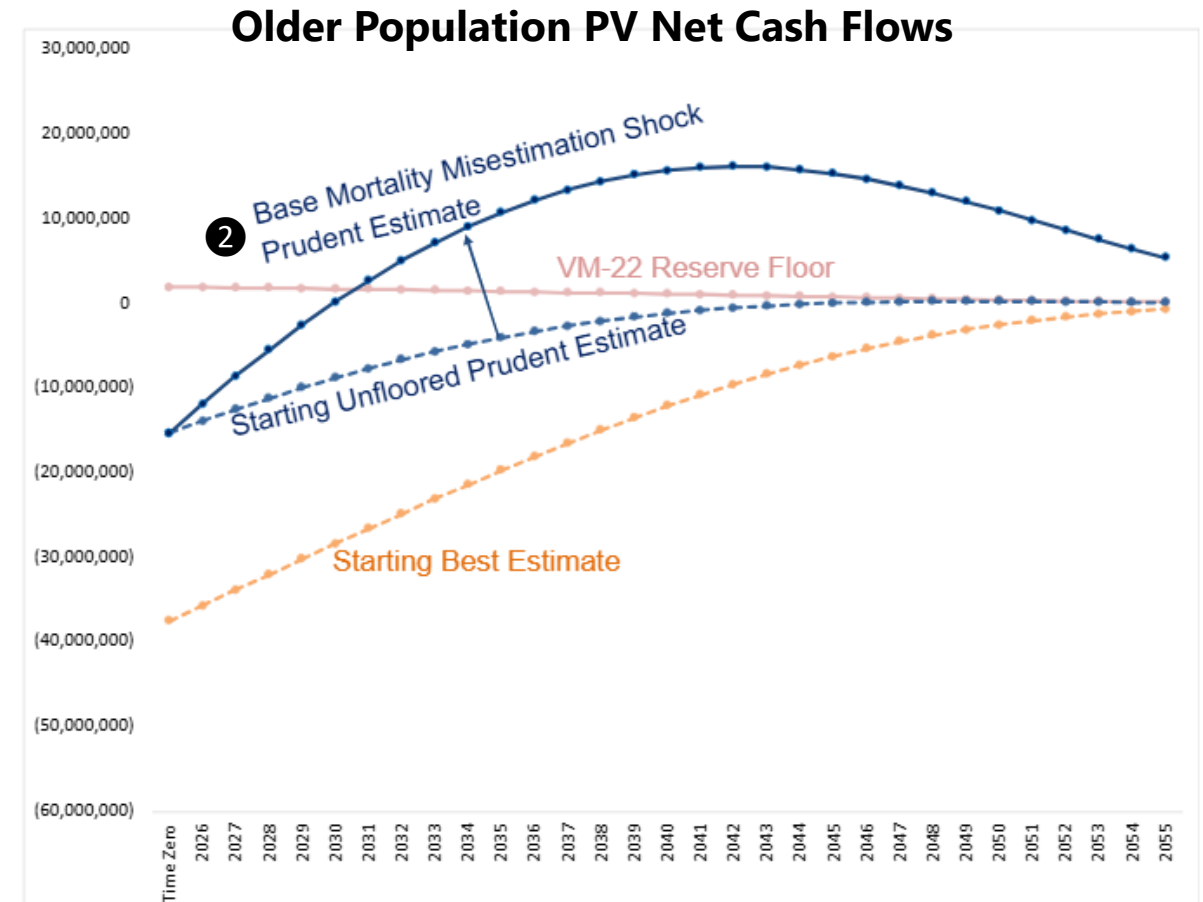
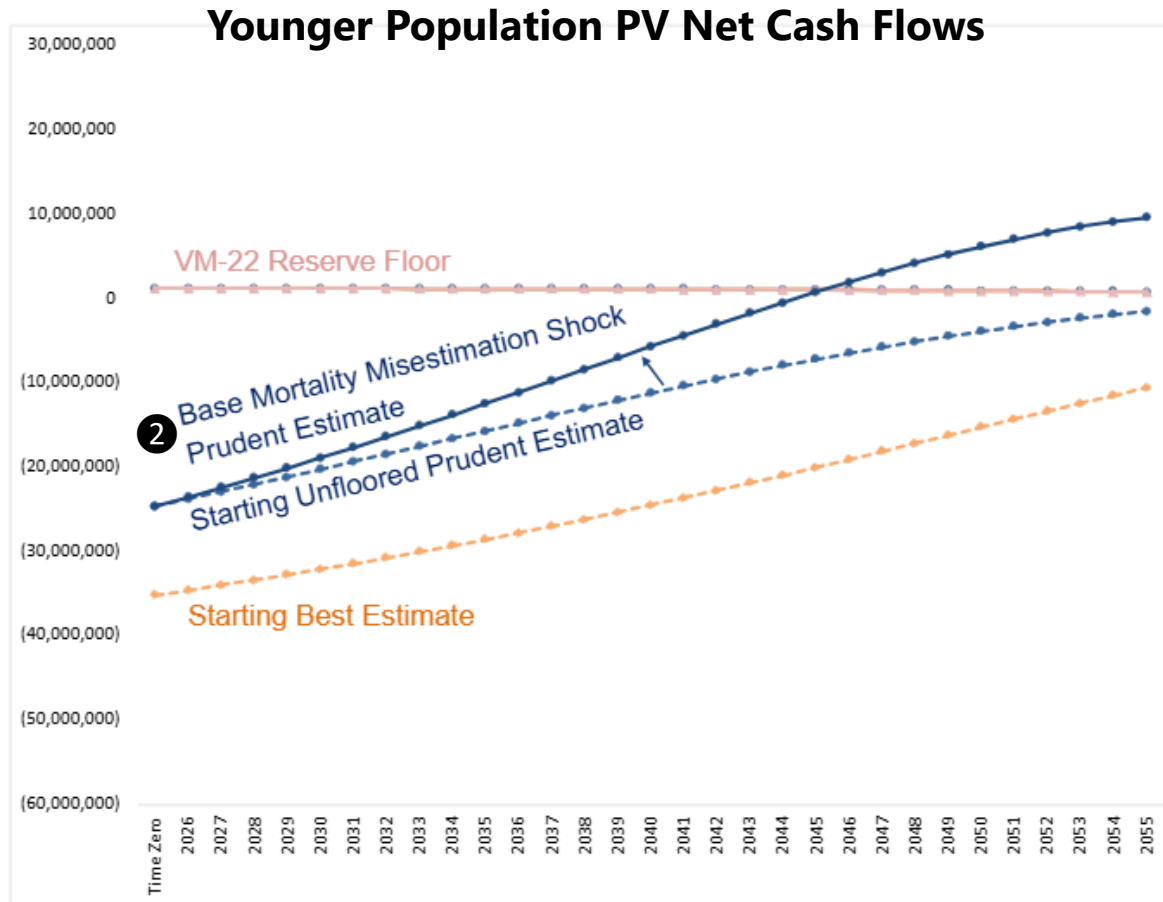
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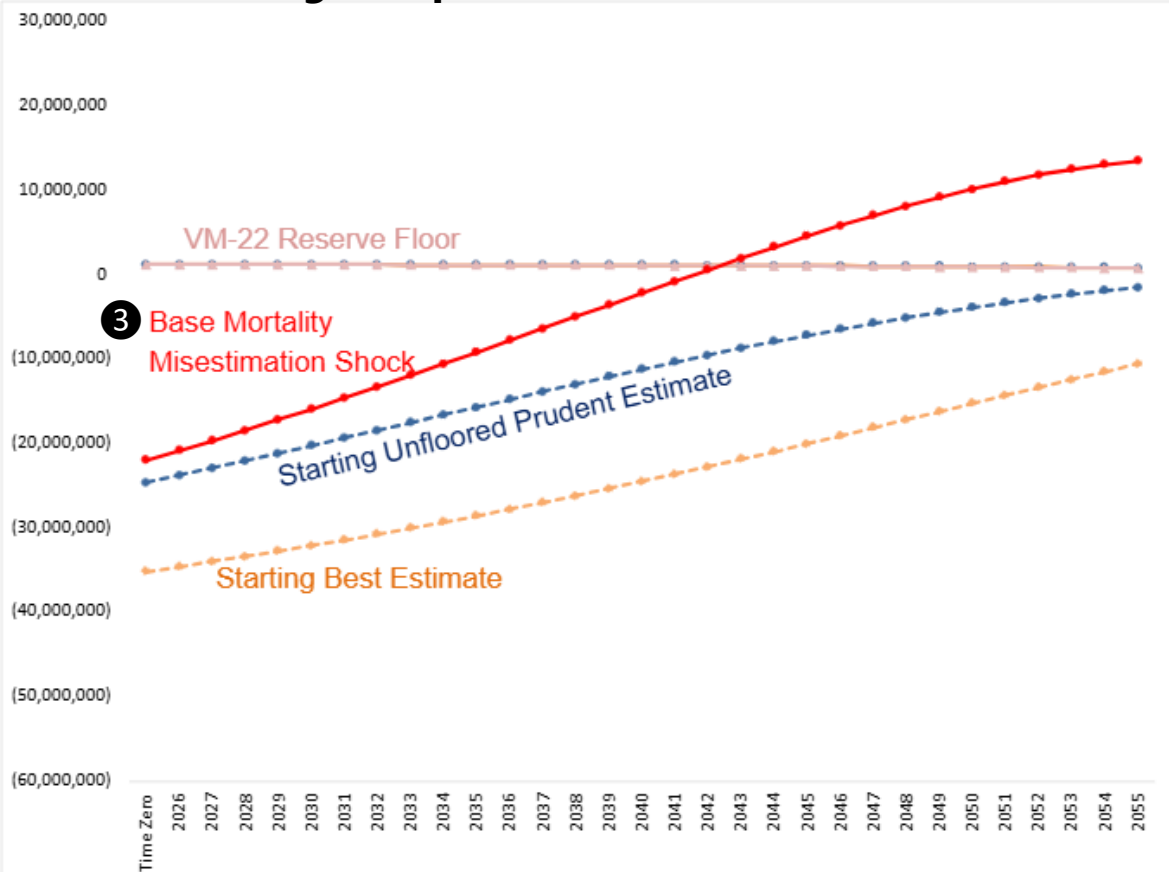
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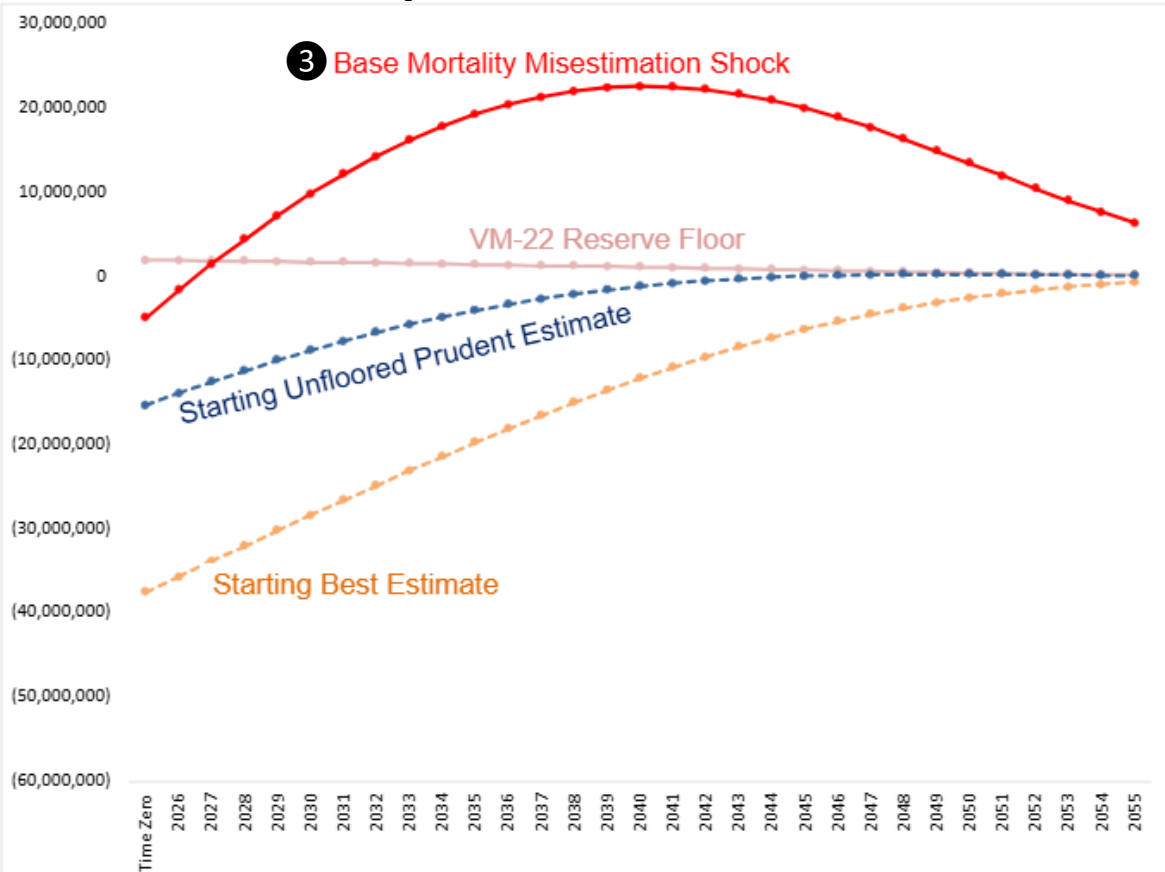
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Younger Population PV Net Cash Flows



Older Population PV Net Cash Flows



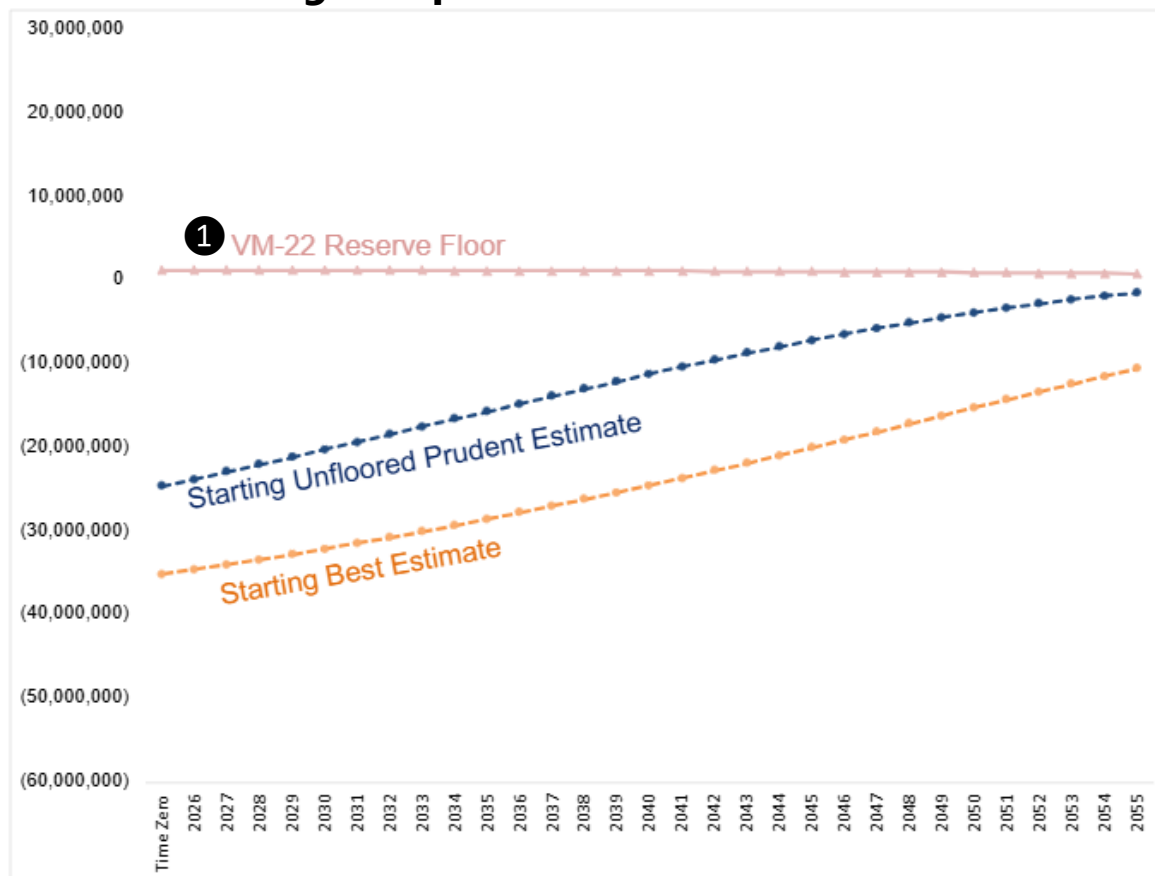
VM-22 Reserve Floor would change post-shock. However, it is not illustrated due to immaterial difference from pre-shock VM-22 Reserve Floor

Pandemic Shock (120% of '94 GAR years 2-5)

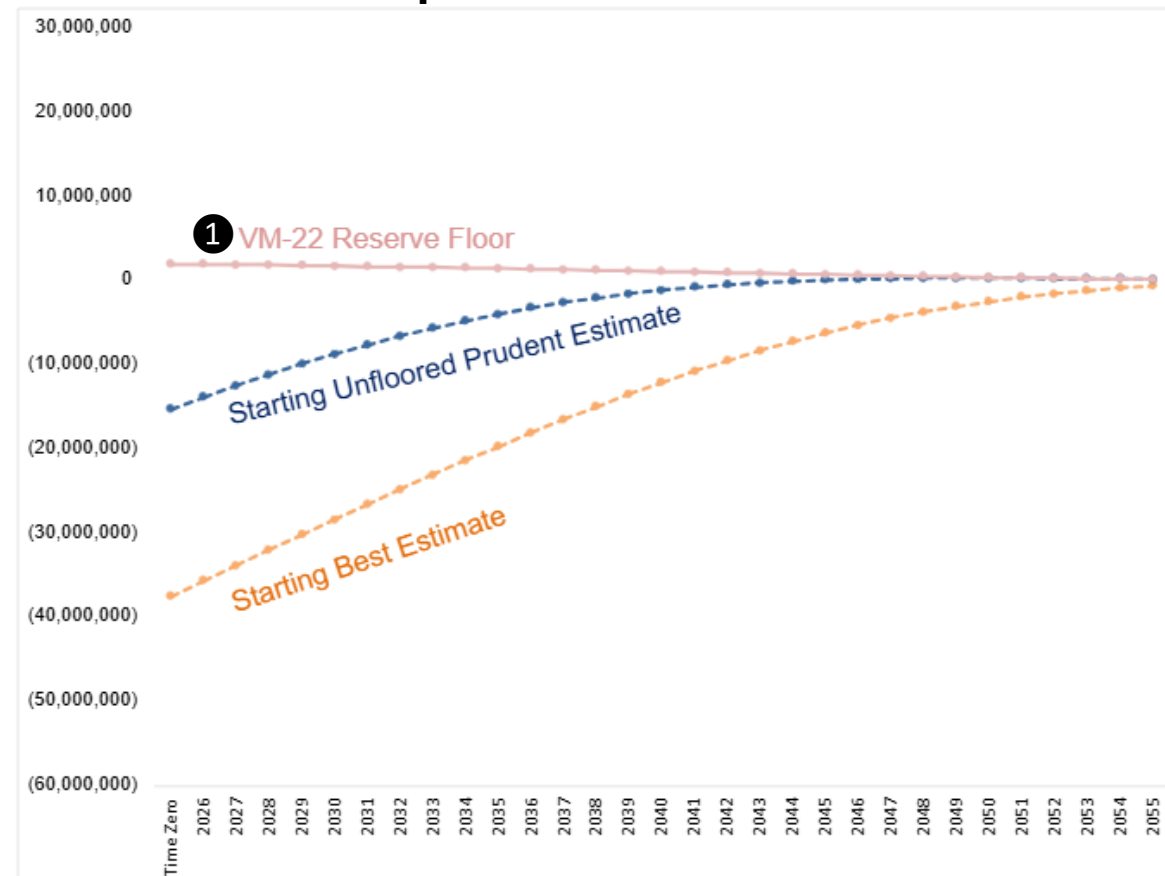
Pre-Shock

① Below represents the block of business prior to any shock. Company is effectively held at VM-22 Reserve Floor as PV inflows exceed PV Prudent Estimate Outflows.

Younger Population PV Net Cash Flows



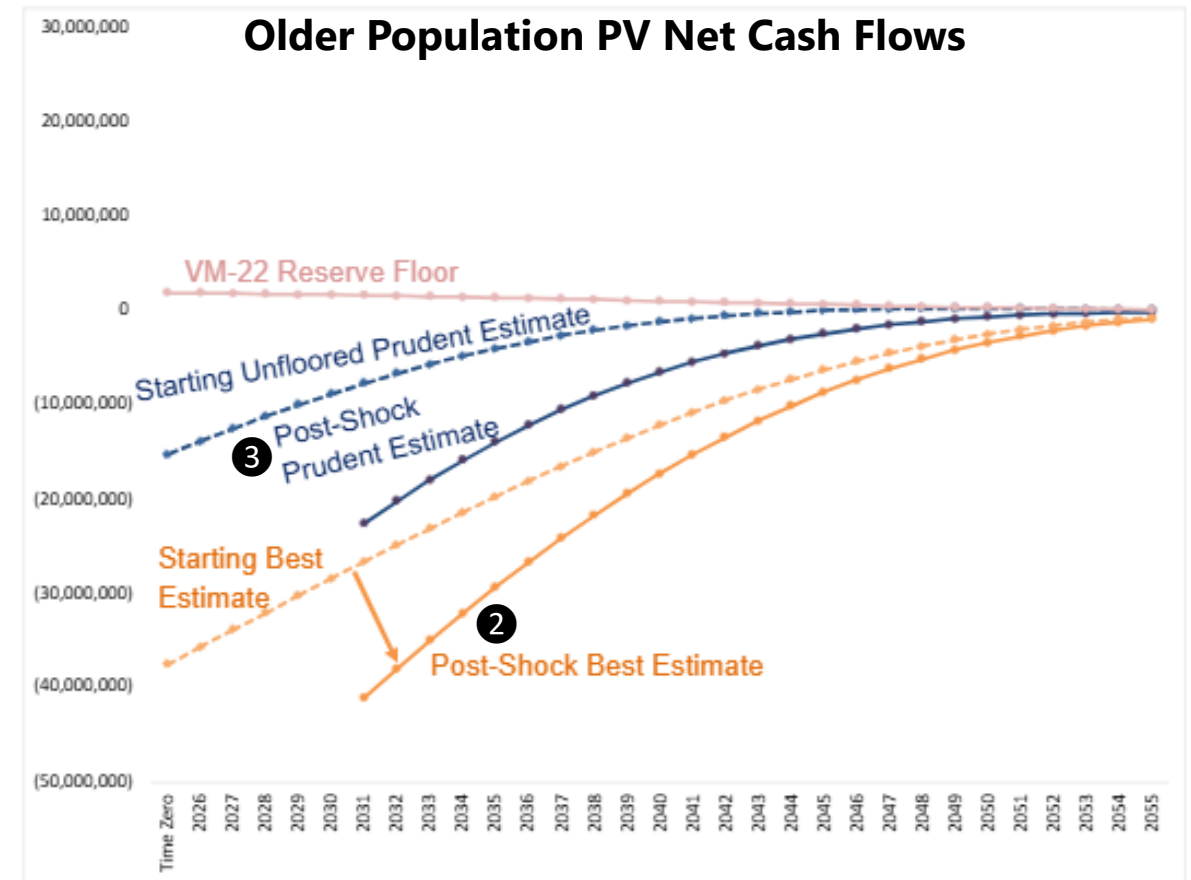
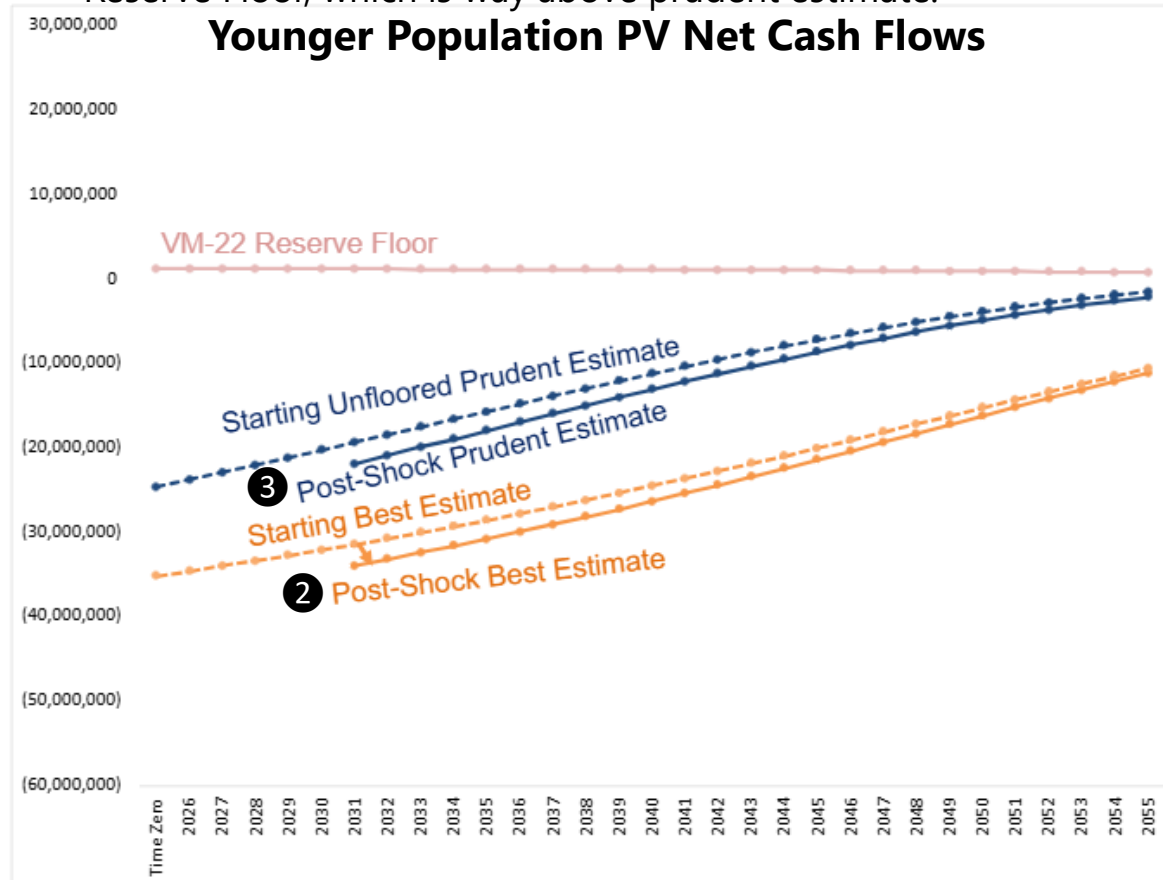
Older Population PV Net Cash Flows



Pandemic Shock (120% of '94 GAR years 2-5)

Post-Shock

After the pandemic, the company determines that pre-pandemic assumptions remain the best view of the future. Thus, ② post-shock best estimate and ③ prudent best estimate are revised solely on post-pandemic inforce block population. Company still holds reserves at VM-22 Reserve Floor, which is way above prudent estimate.



VM-22 Reserve Floor would change post-shock. However, it is not illustrated due to immaterial difference from pre-shock VM-22 Reserve Floor

Next Steps

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- **Mortality Improvement Shock (most important)**
 - » Structure of shock
 - » Size of shock
- **Base Mortality Misestimation (Mortality Level) Shock**
- **Calibration of shocks for non- U.S. originated liabilities**
- **Creating one scenario vs. current proposal of three scenarios**

Appendix

Limitations

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- **Shocks in illustrations are exaggerative relative to the shocks that underly RBC C-2 Longevity factors for life contingent annuities and in the latest Academy LRTF proposal for longevity reinsurance. Intent of the presentation is to illustrate mechanics and not focus on assumptions/shock size.**
- No available industry data and information
 - » *Mortality Assumption:* Each company uses its own assumptions based on its inforce characteristics to set the 85th percentile (VM-22/PBR business or AAT/pre-PBR business). There are no prescribed mortality tables, thus illustrations here use industry assumptions
 - » *Demographics:* We made up a representative deal to consider young vs older demographics, without any use of field study
 - » *Fees earned by the reinsurer:* We illustrate the fee at 3.5% of reinsurance premiums. However, there is no publicly available information on what fee levels are. However, fees do not impact the floating leg
 - » *Expenses:* Did not illustrate expenses as we do not expect to materially vary between pre- and post-shock
- Using VM-22 PBR construct (as opposed to illustrating pre-PBR liabilities)

Assumptions

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Assumptions may vary significantly from actual transactions as 1) LRT transactions are not publicly disclosed and 2) VM-22 requires companies to determine their prudent estimate based on their in-force rather than use prescribed mortality assumptions.

Deal Parameters

- Floating leg: At-Issue Best Estimate Expected Claims = 100% of GAR 94 and 100% of Scale AA mortality improvements
- Fixed leg = Reinsurance Premiums + Fees
 - Reinsurance Premiums = At-Issue Best Estimate Expected Claims
 - 3.50% fee applied to Reinsurance Premiums
- 4.50% annual discount rate

Assumptions Continued

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Prudent Estimate Reserve Assumptions

- 95% of GAR 94 (all years)
- 107.5% of Scale AA (all years)
- Reflects population projected to be alive at each outer loop node
- Reserves are shown prior to application of any floors
- No foreknowledge of outer loop shocks
- Assumptions are locked in from issue (i.e., no learning / adaptation on shock path)

Perfect Foresight Total Asset Requirement (TAR) Assumptions ("Post-Shock")

- Amount required to be held today to defease future liability cashflows net of future premiums and fees
- Reflects population projected to be alive at each outer loop node
- TAR reflects perfect foreknowledge of the future outer loop shock path from issue
- Does not consider asset-side risks, counterparty default risk, general business risks, etc.

Shocks in illustrations are likely exaggerative relative to the shocks that underly [current RBC C-2 Longevity factors for Life Contingent Annuities](#) and in the [latest Academy LRTF proposal for Longevity Reinsurance](#).

Shocks in Illustrations

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Shock	Base Mortality	Mortality Improvement	Comments
Baseline	Best Estimate: 100% of 1994 GAR Prudent Estimate: 95% of 1994 GAR	Best Estimate: 100% of Scale AA Prudent Estimate: 107.5% of Scale AA	Used 1994 GAR / Scale AA for simplicity of expressing shocks
A. Pandemic	120% of 1994 GAR (years 2-5 only) 100% of 1994 GAR (all other years)	100% of Scale AA (all years)	+20% increase loosely inspired by U.S. overall mortality experience during 2020 / 2021
B. Mortality Improvement	100% of 1994 GAR	140% of Scale AA beginning 5 years after issue	- Highly impactful mortality improvement shock - Absolute impact varies significantly by age/sex - Roughly +1.1 years of additional life expectancy for 65/Male or +0.4 years for 75/Female $140/107.5 = 130\%$ - Current RBC C-2 shocks: 116% < age 85, 140% > age 85 in all years
C. Base Mortality Misestimation	90% of 1994 GAR (all years)	100% of Scale AA (all years)	- Misestimation level chosen so that it materially exceeds prudent estimate pad of 5% 10% misestimation of base would be quite large for a large block with credible historical experience - Shock here = 94.7% ($90\%/95\%$), which is close to 94.2% shock that underlies first \$250M PV liabilities of current RBC C-2 life contingent annuities factor - However, most companies would be at most credible tier (> \$1B liabilities) where 99.3% shock underlies current RBC C-2 life contingent annuities factor

Sample Population

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Sample population reflects a mix of younger/older ages, male/female, and various benefit size.

Younger Age Population				
Issue Age	Sex	Annual Benefit	Initial Weight	COLA %
46	M	9,600	15%	0%
47	F	7,800	14%	0%
50	M	11,400	12%	0%
51	F	8,400	11%	0%
54	M	13,200	10%	0%
55	F	9,000	10%	0%
58	M	14,400	8%	0%
59	F	10,200	8%	0%
62	M	15,600	6%	0%
63	F	11,400	7%	0%
51% Male /				
Average	53.0 49% Female	10,678		0%
Life count = 5,500				
Initial Annual Benefit = \$58.7mm				
Initial PV Liability = \$1.00B				
Initial PV Risk Fees = \$35.2mm				
Initial Benefit Cashflow Duration = 13.1 Years				

Older Age Population				
Issue Age	Sex	Annual Benefit	Weight (Life Count)	COLA %
66	M	28,500	12%	0%
67	F	19,200	14%	0%
71	M	24,000	10%	0%
72	F	16,800	15%	0%
76	M	21,600	8%	0%
77	F	14,400	13%	0%
81	M	1,800	6%	0%
82	F	12,600	11%	0%
86	M	15,600	3%	0%
88	F	10,800	8%	0%
39% Male /				
Average	74.6 61% Female	17,940		0%
Life count = 5,500				
Initial Annual Benefit = \$96.0mm				
Initial PV Liability = \$1.07B				
Initial PV Risk Fees = \$37.5mm				
Initial Benefit Cashflow Duration = 8.4 Years				

References

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- American Academy of Actuaries, [Longevity Risk Task Force \(LRTF\) Update](#), 2019.
- American Academy of Actuaries, [Request for Prior Academy Proposal with and without Interim Step Flooring](#), Comment Letter, Feb. 18, 2025.

Questions?

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