

# Mortality Table Development Update 2014 VBT/CSO & Preneed/GI/SI

Society of Actuaries & American Academy of Actuaries Joint  
Project Oversight Group

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# Underlying 2014 VBT - Considerations

- Significant increase in exposures from 2001 or 2008 VBT:
  - 7 exposure years (2002-2009)
  - \$30.7 exposure amount; \$2.55 million claims
  - Preferred experience
  - Non-tobacco versus Non-smoker
  - Older issue ages
  - Female risks
- Underlying experience shows significant variation by issue age, face amount, smoking status
- Underlying experience shows significant improvement



# Improvement in underlying mortality

Study Period	Male	Female	Aggregate	Exposure (Trillion)	# Death Claims
2002-2004	101.1%	100.5%	100.9%	\$ 7.4	699,890
2002-2007	96.2%	97.0%	96.4%	21.1	1,800,912
2002-2009 - Preliminary	94.2%	94.7%	94.3%	30.7	2,549,490
2002-2007 Common Companies	94.6	95.4	94.8	12.4	1,393,521
2002-2009 – Preliminary Common Companies	92.3%	94.3%	92.8%	19.2	1,940,403
2002 – 2009 Preliminary 100k+	88.3%	89.2%	88.5%	26.9	162,095
2002 – 2009 Preliminary 250k+	84.1%	85.4%	84.4%	20.6	46,570

Source: Society of Actuaries, Individual Life Experience Reports 2003 through 2009 Preliminary



# Insured lives mortality varies by many factors

In addition to gender, life insurance mortality experience varies by many factors including face amount, smoking status, and issue age

**A/E\* Ratio – by Face Amount**

Smoking Status	A/E Ratio by Amount
non-smoker	92.3%
Smoker	97.5%
Unknown Status	99.8%
Aggregate	94.3%

**A/E\* Ratio – NS versus SM**

Face Amount Band (\$)	A/E Ratio by Amount
50,000 – 99,999	105.6%
250,000 – 499,999	88.6%
1,000,000 – 2,499,999	81.9%
5,000,000 – 9,999,999	74.1%
Aggregate	92.7%

**A/E\* Ratio – By Issue Age**

Issue Age	A/E Ratio by Amount
40 – 49	100.1%
60 – 69	95.1%
80-89**	61.6%

\* Expected basis = 2008 VBT Primary Tables, ANB

\*\* 80-90 for common companies drops to 55%

Source: Society of Actuaries, Individual Life Experience Reports 2003 through 2009 Preliminary



# Table structure

- Likely to have 3 sets of tables
  - Experience table
  - VBT
  - CSO
- VBT will have aggregate and preferred structure tables
- Focused first on aggregate VBT tables; preferred tables and CSO will follow
- VBT and CSO prospective tables – consider expected experience for issues 2014 and later informed from underlying historical experience versus purely a historical or retrospective table



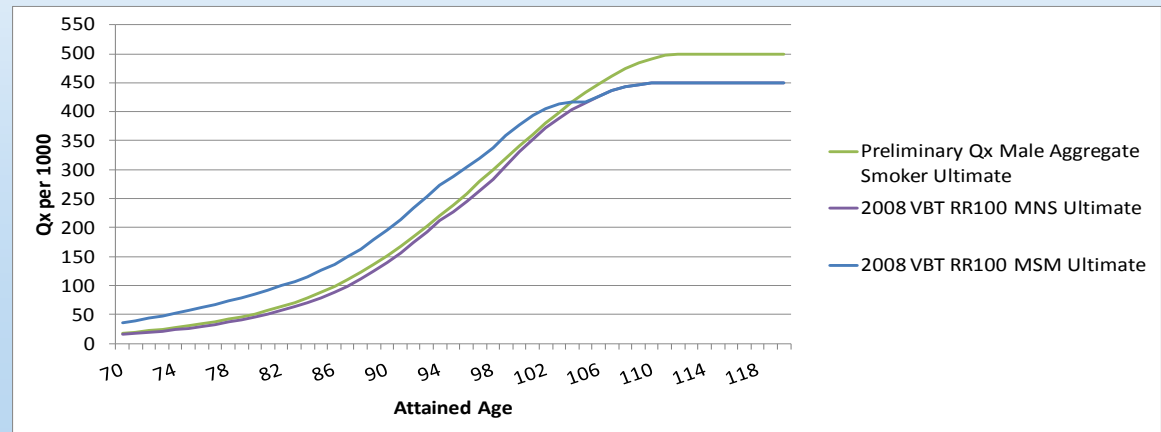
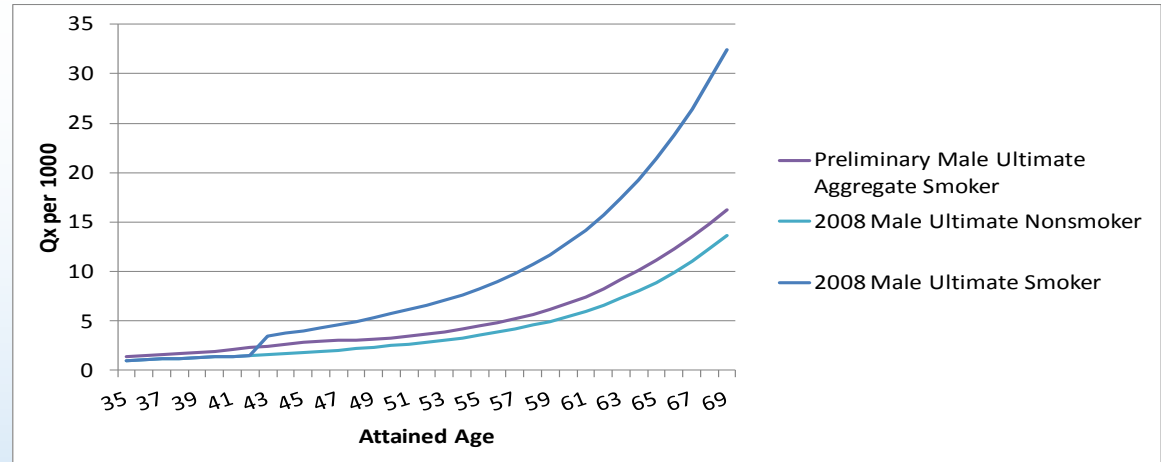
# Table structure

- Similar structure as 2008 VBT, with Primary and RR Tables
  - RR Tables expected to be same in number but perhaps have different relativity amongst the classes
  - Need for limited underwriting table still under examination
    - Relies partially on results from GI/SI study
- To date, have not excluded any data for aggregate and ultimate experience but still examining impact on older age slope
  - Considering excluding certain policies (smaller face amounts) based on issue year and issue age
- Select factor variation by gender and issue age
- Omega rate per 1,000 (0.5000 at attained age 112) but no omega age
  - CSO will have omega age of 121



# Preliminary Ultimate Mortality Rates

- Preliminary Ultimate mortality rates (aggregate) versus 2008 VBT (NS/SM distinct) are lower than 2008 VBT
- Ultimate mortality will be further split into NS/SM distinct rates



Source: 2014 Valuation Basic Table Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Select Period

- Varies by issue age
- Considered both observable as well as prospective select period
- Underlying select period independent of preferred wear-off
- Observable select period
  - Based on underlying data of both common companies as well as all companies
  - Data analyzed based on count rather than amount to remove influence of variations/fluctuations by size of claim
  - Attempted to normalize the socio-economic impact over time
  - Focused on gender/smoking status level, quinquennial age groupings
  - Used GAM (Generalized Additive Model) to test fit of actual mortality to mortality predicted by the GAM model by duration as ratios to ultimate mortality, averaged across all attained ages





# Select Period, cont'd

- Prospective select period
  - Looked to “events” or changes in underwriting which have impacted the select period in the underlying 2002-2009 data
  - E.g., Movement from smoker to non-smoker rates (1980s), movement from non-smoker/smoker to non-tobacco/tobacco distinction (1990s), liberal underwriting period with increased level of underwriting exceptions (2000-2005), development of mature age underwriting requirements such as cognitive function (2005-present)
  - Most “events” thought to shorten select period from that in observed data; a couple such as NT versus NS and older age cognitive function testing may elongate
- Modified the observed select period for changes in smoker prevalence



# Select Period, cont'd

## Proposed Select Period Based on Observable Data

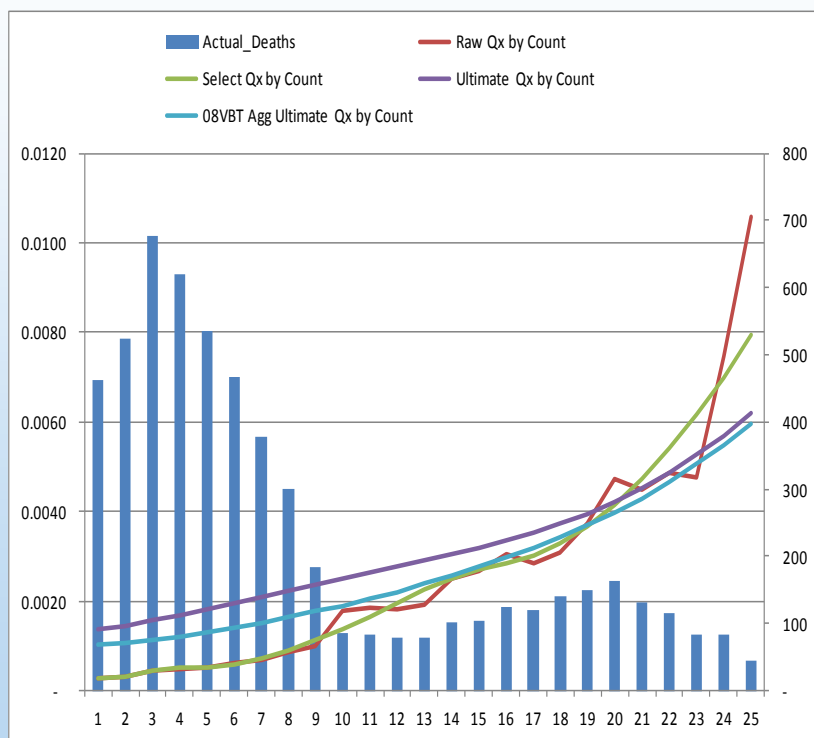
Issue Age	Male	Female	Issue Age	Male	Female
0-17	0	0	76	14	13
18-53	25	20	77	13	12
54-55	24	20	78	13	11
56-57	23	20	79	12	11
58-59	22	20	80-81	11	10
60-61	21	20	82	10	9
62	20	20	83	9	8
63	20	19	84	8	8
64	19	18	85	8	7
65	19	17	86	7	6
66	18	16	87	6	6
67-69	18	15	88-89	5	5
70-72	17	15	90	4	4
73-74	16	14	91	3	3
75	15	13	92-95	2	2

Source: 2014 Valuation Basic Table Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group

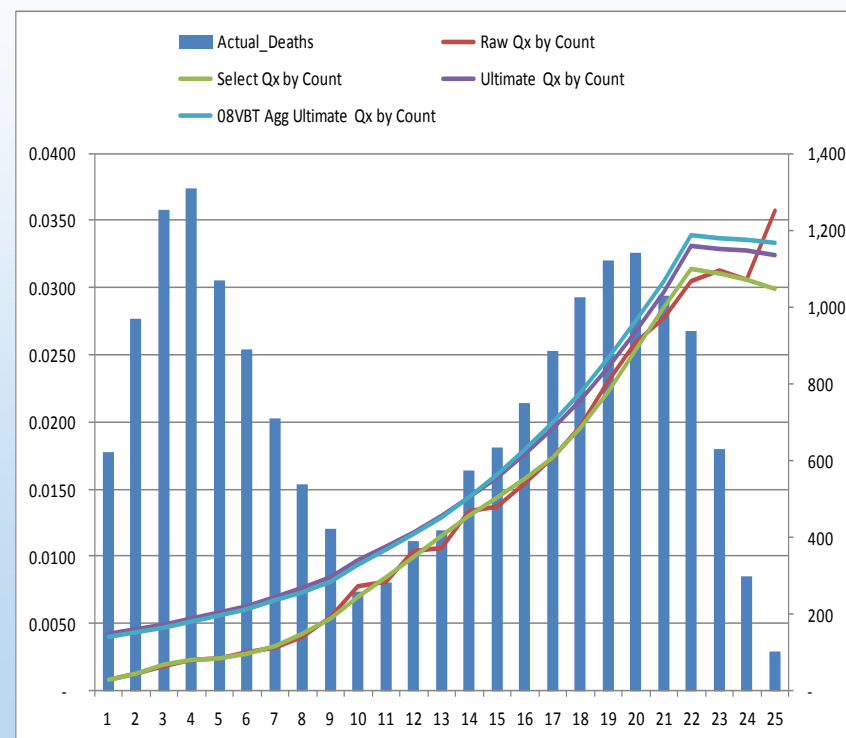


# Select Period, cont'd

## Preliminary MNS Select Period Issue Ages 30-39



## Preliminary MNS Select Period Issue Ages 50-59

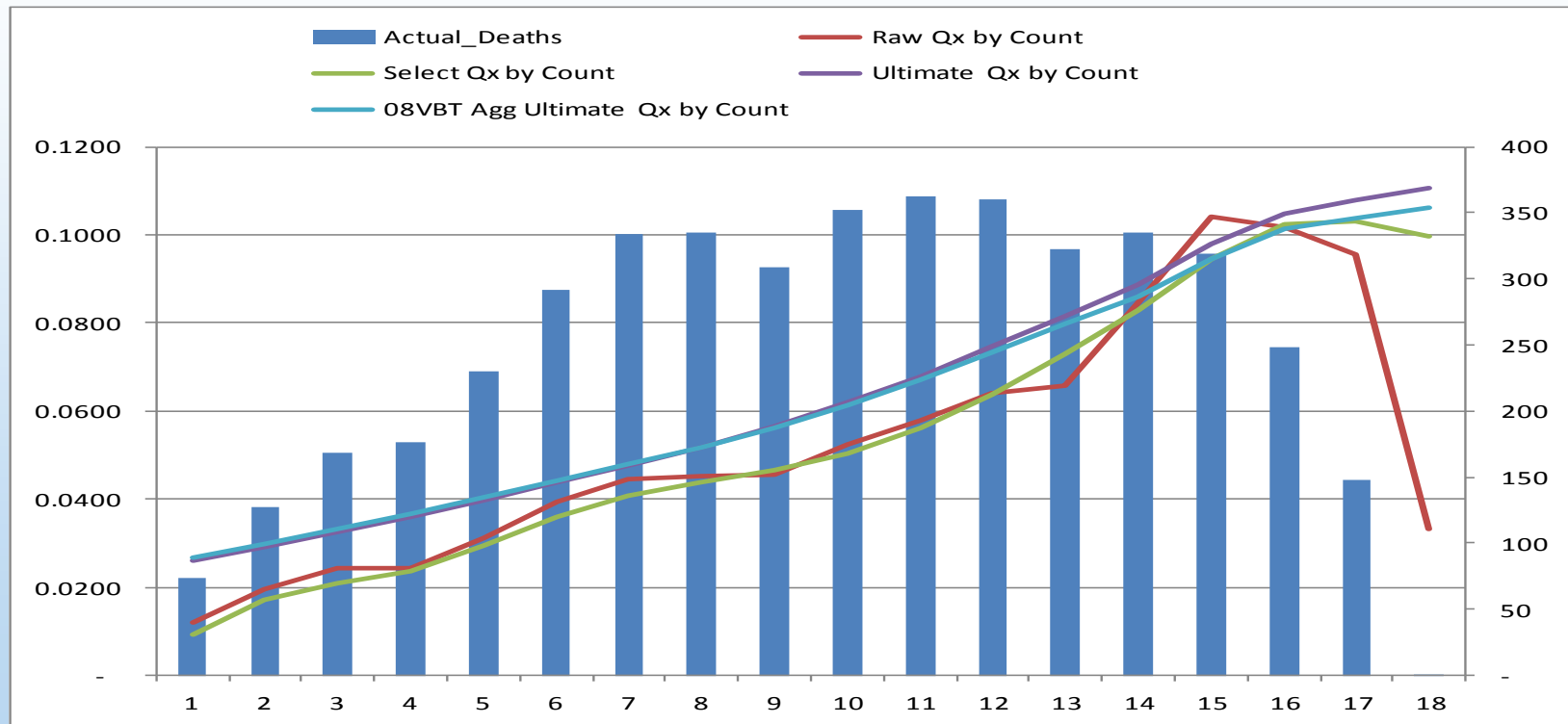


Source: 2014 Valuation Basic Table Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Select Period, cont'd

## Preliminary Mortality Rates, MNS Select Period Issue Ages 70-79



Source: 2014 Valuation Basic Table Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



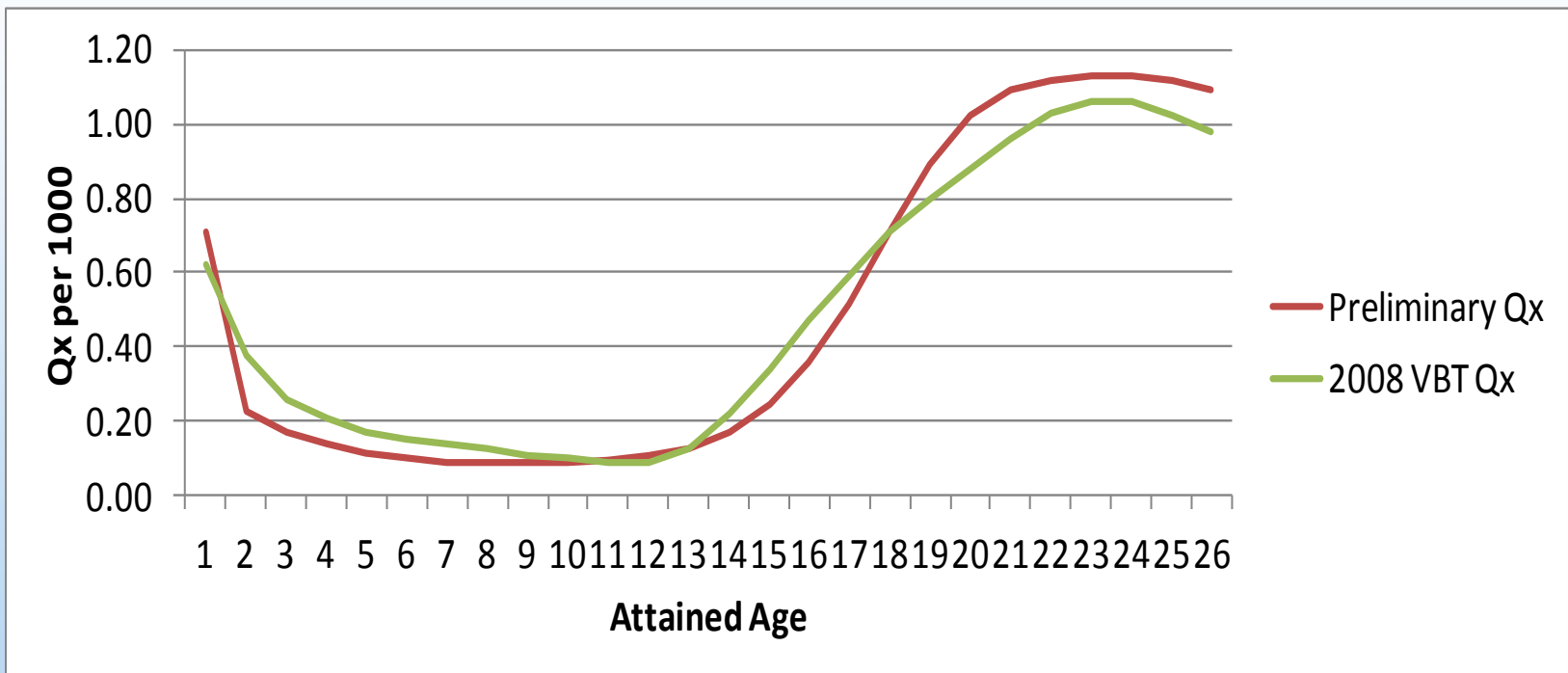
# Juveniles

- Examined mortality relative to population mortality and insured mortality (2008 VBT)
  - No clear relationship to population mortality
- Consider ages 0-17 as juveniles
- No smoker/non-smoker distinction
- No observable select period
  - Proposed table juvenile rates attained age only
  - Some grading/graduation may be needed to smoothly grade at attained age 26 into adult attained ages, possibly causing some element of select mortality rates for smoothness purposes at higher juvenile issue ages and select durations



# Juveniles, cont'd

## Juvenile Preliminary Mortality Rates per 1000, Male Risks



Source: 2014 Valuation Basic Table Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Adjustment to remove effects of post level term mortality

- Examined underlying experience for term plans only
- Calculated actual to expected (A/E) ratios based on face amount by issue age group and duration in total and for 10, 15 and 20 year term plans
- The ratios were calculated for male and female separately and for both genders combined and were not split by smoker status (that is, the ratios were calculated for all smoker statuses combined)
- Recalculated the A/E ratios estimating impact of removing the post level term experience
- Determined the ratio of the A/E excluding post-level term to the total A/E. This provided the proposed adjustment to decrease the total rates to account for the impact of post-level term experience.
- Factors vary by issue age/duration
  - Average 2.9% at duration 13 versus 1.3% at duration 18



# Preferred wear-off

- Still closely examining
- Looking at prevalence of preferred risk in underlying exposures and relationship of mortality for preferred/residual structures to aggregate class
- Will have one weighted aggregate NS class; however, considering development of preferred structure classes (RR Tables) to have different base or slope than aggregate classes
  - Deviation from what was done for 2008 VBT
  - Except at the oldest ages where grade to population

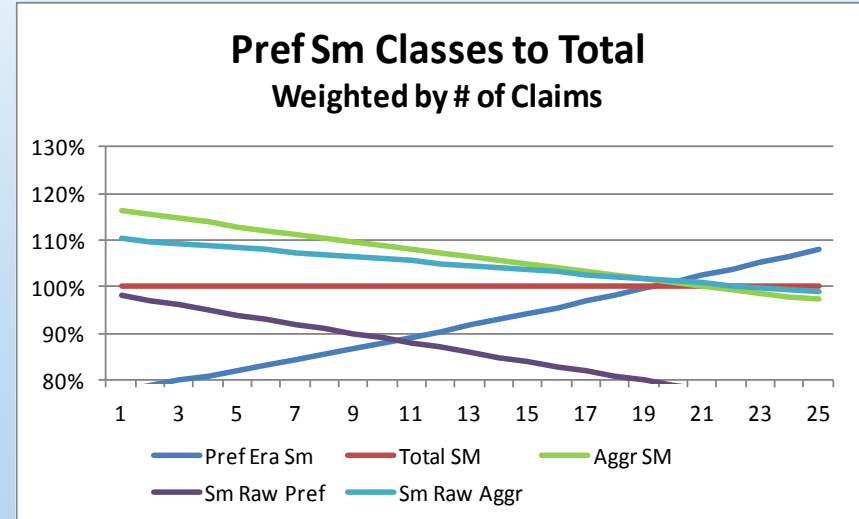
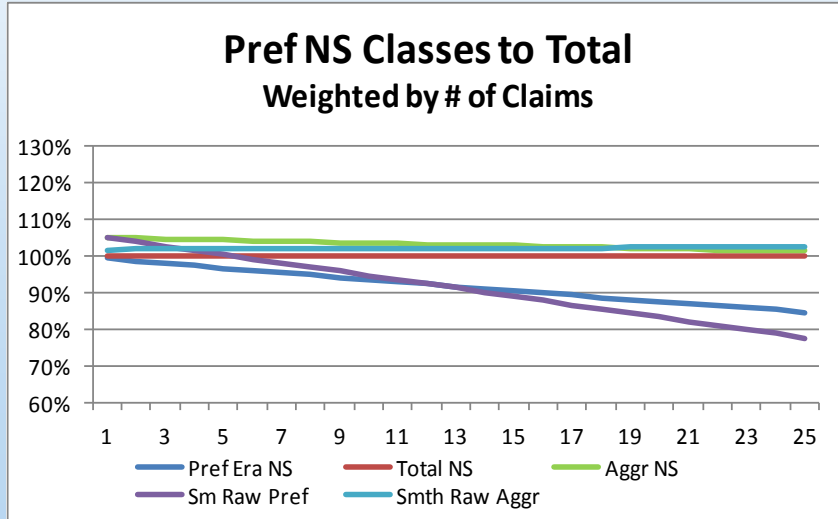




# Preferred wear-off, cont'd

- Concerned with % of aggregate NS data – continuing to investigate adjustments
  - % aggregate NS significantly higher than expected and seen in other recent mortality studies
  - Experience varies significantly between aggregate smoker and non-smoker/smoker distinct

## Example – Issue age 45



Source: 2014 Valuation Basic Table Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# 2014 VBT Next Steps and Timing

- Aggregate NS/SM Tables
- Select & Ultimate NS/SM Tables
- This summer
  - Hope to have first look at preferred structure tables
  - Begin work on CSO
  - Backcast testing of new tables to underlying experience



# 2014 CSO

- 2014 VBT will be underlying table for CSO tables to be used for Net Premium Reserve under PBR, non-forfeiture and tax
- Prescribed table with no adjustment for own company experience
- Table not yet developed; will build from 2014 VBT
- Margin determination and structure still under discussion but will be embedded within table
- Likely to focus on smoothness over fit
- Table updates expected every 10 or more years



# Margins – 2014 CSO

- Focus on net premium valuation
- Look to cover  $x\%$  of contributing companies, likely in form of Margin for Company Variation risk
- Covers deviations from a selected industry mortality due to differences in underwriting practices and the demographics of the underlying insured lives
- Fixed amount that varies by attained age
- For 2008 VBT, this would have ranged from 21% at younger ages to 9% at older ages
- Embedded within table



# Comparison of life valuation mortality table structures

Criteria/Table Structure	2001 CSO	2014 CSO	2014 VBT
<b>Uses</b>	<ul style="list-style-type: none"> <li>•Net Premium Reserves</li> <li>•Tax Reserves</li> <li>•Non-forfeiture</li> </ul>	<ul style="list-style-type: none"> <li>•Net Premium Reserves</li> <li>•Tax Reserves</li> <li>•Non-forfeiture</li> </ul>	<ul style="list-style-type: none"> <li>•VM20 Deterministic</li> <li>•VM20 Stochastic Reserves</li> </ul>
<b>Underlying mortality table and experience</b>	2001 VBT (1990-1995 data)	2014 VBT (2002-2009 data)	Individual Life Experience Committee (ILEC) and US population data
<b>Number of tables</b>	<ul style="list-style-type: none"> <li>•Gender distinct/Composite</li> <li>•Smoker distinct/Composite</li> <li>•3 NT/NS</li> <li>•2 TB/SM</li> </ul>	Expect to be similar to 2001 CSO	Expect to be similar to 2008 VBT
<b>Risk class tables aggregate back to composite</b>	Yes	Yes (proposed)	No Preferred/Residual/Aggregate
<b>Prescribed table</b>	Yes	Yes	No, subject to VM-20 requirements
<b>Considers mortality improvement</b>	No	No	Yes, to valuation date – prescribed and own company
<b>Smoothness versus fit</b>	Smoothness	Smoothness	Fit
<b>Omega age</b>	121	121	None



# Preneed/GI/SI

- All three studies in various stages of analysis
- Project is behind schedule but trying to get back on track
- Compared mortality experience to 4 tables
  - SOA 75/80 Ultimate
  - SOA 2001 VBT Ultimate
  - SOA 2007 VBT Ultimate
  - ✓ SOA 2008 VBT LU Ultimate

	SI	Preneed	GI
Companies submitting data	33	13	15
Count Exposed*	18,840,681	7,976,643	4,774,450
Death Count	272,967	639,084	212,487
Units Exposed*	492,247,920	35,096,568	34,607,741
Death Amount In Units	2,305,043	2,992,148	1,370,634
Expected Deaths By Units*	2,275,344	1,887,021	795,216
A/E Ratio by Unit*	101.3%	158.6%	172.4%
Average Size Exposed	26,127	4,400	7,249
Average Size - Deaths	8,444	4,682	6,450
Exposure by units at attained ages 80+	<1%	40%	8%

Source: GI/SI/Preneed Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group

\* Expected basis is 2008 VBT LU Ultimate



# Simplified Issue

- Initial review nearly complete
- Mortality shows fairly good fit with the 2008 VBT LU Table
- Data shows a short but observable select period



# Simplified Issue, cont'd

- Seeing some large differences between business issued as uni-smoke versus SM/NS distinct – still investigating
- For aggregate smoking status:
  - Significant volume of data submitted at < 25 units (1 unit=\$1,000)
  - Early duration A/E approximately 25% > than experience for units of 25+
  - Significant variation in experience by gender





# Simplified Issue, cont'd

- Much of difference between other and NS/SM distinct due to lower face amounts/number of units
- Differences such that may not be possible to develop a consistent set of NS/SM/Composite mortality rates to accurately reproduce the mortality rates in each group

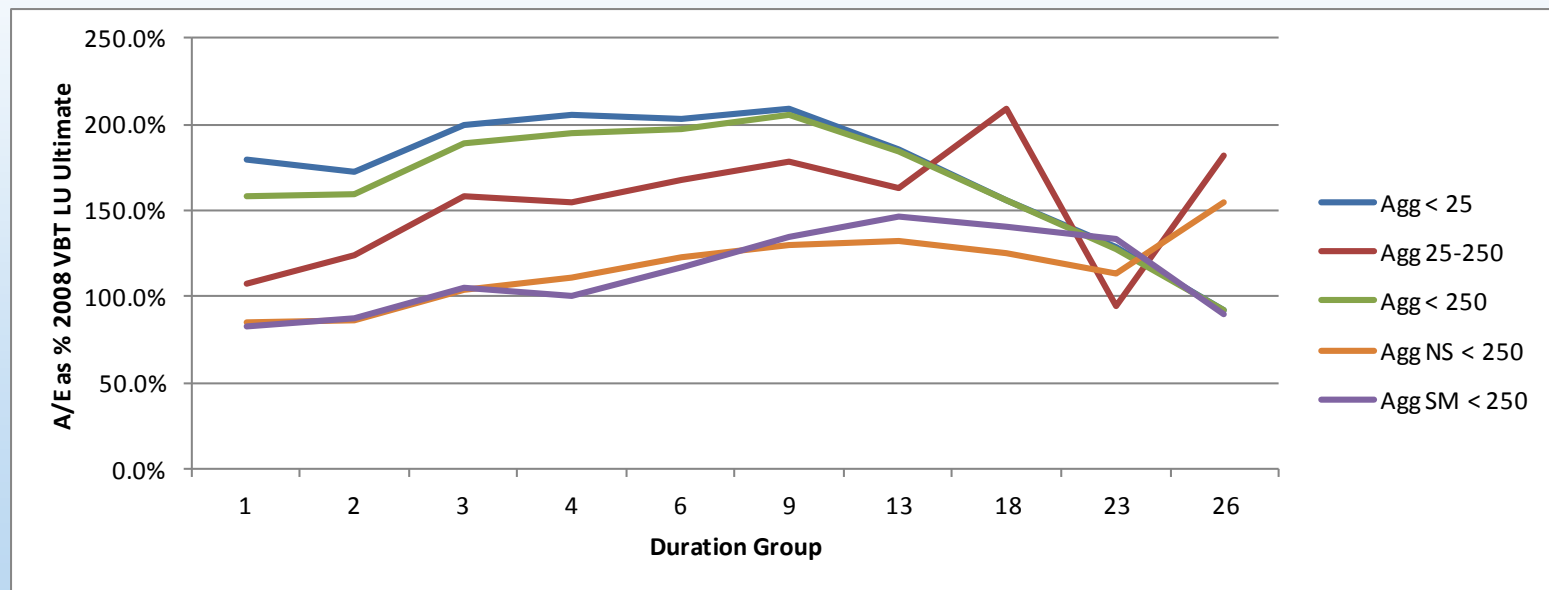
Source: GI/SI/Preneed Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group

SI 2005-09 Preliminary Actual to Expected Mortality Ratios							
Prepared By - MIB Solutions' Actuarial and Statistical Group							
SI data by gender and smoking status							
Table 3-1: Expected mortality based on 2008 Ltd Und VBT - by unit							
Attained Age Band	Female Group			Male Group			Grand Total
	No tobacco/nonsmoker	Tobacco/smoker	others	No tobacco/nonsmoker	Tobacco/smoker	others	
0	0%	565%	399%	91%	343%	0%	186%
1-4	429%	112%	125%	240%	36%	180%	164%
5-9	122%	134%	108%	235%	50%	133%	118%
10-17	188%	186%	161%	186%	115%	202%	166%
18-24	110%	157%	210%	100%	106%	183%	111%
25-29	95%	178%	382%	79%	109%	241%	98%
30-34	98%	146%	295%	85%	81%	220%	94%
35-39	88%	190%	435%	78%	127%	236%	98%
40-44	76%	75%	232%	83%	101%	294%	90%
45-49	62%	55%	131%	75%	74%	205%	76%
50-54	60%	62%	91%	92%	98%	163%	89%
55-59	72%	77%	95%	96%	108%	161%	102%
60-64	87%	83%	101%	99%	117%	147%	111%
65-69	93%	90%	94%	114%	122%	125%	109%
70-74	89%	79%	96%	103%	111%	117%	104%
75-79	88%	68%	99%	101%	104%	121%	105%
80-84	87%	67%	105%	100%	83%	120%	107%
85-89	114%	97%	118%	90%	115%	115%	116%
90-94	114%	84%	120%	115%	30%	100%	113%
95+	0%		99%	0%		66%	88%
Total	77%	77%	101%	92%	102%	131%	101%



# Simplified Issue, cont'd

- Significant variation in experience by size of policy and between aggregate versus NS/SM distinct

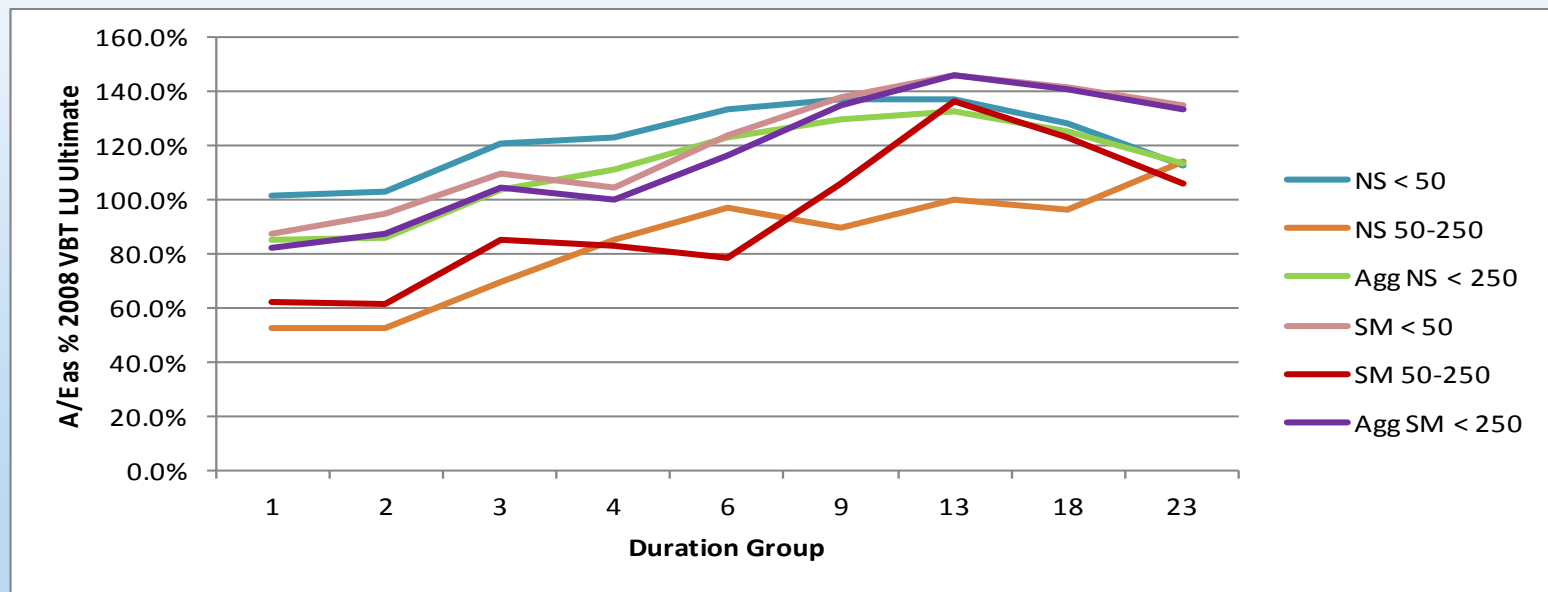


Source: GI/SI/Prened Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Simplified Issue, cont'd

- Variation in experience by size of policy prominent for NS/SM distinct business as well but relationship to 2008 VBT LU and slope are consistent between NS and SM
- Observable 2-year select period



Source: GI/SI/Preneed Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Simplified Issue, cont'd

- Seeing some variation by distribution channel but not much

SI 2005-09 Preliminary Actual to Expected Mortality Ratios				
Table 5-1: SI experience by Distribution Channel				
Values	1 = Affiliated Agents	2 = Independent Agents/Brokers	others	Grand Total
Units_ Exposed	\$29,157,519	\$373,086,207	\$90,004,194	\$492,247,920
A/E Ratio by Unit Ult2008VBTLU	122.9%	101.7%	92.0%	101.3%
Exposure as percent of total	6%	76%	18%	100%

Source: GI/SI/Preneed Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



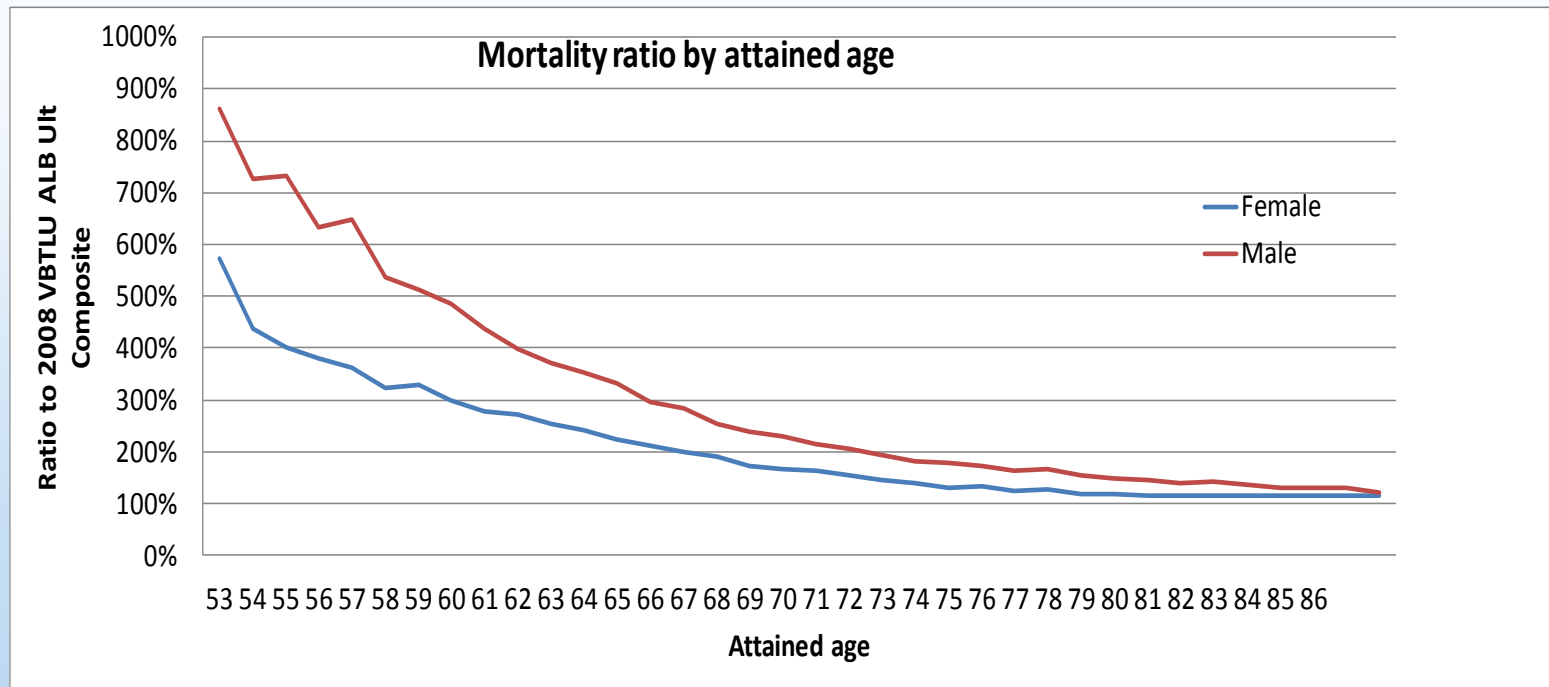
# Guaranteed Issue

- Mortality does not show as nice a fit with the 2008 VBT LU Table as SI
- Excluding data submitted as smoker distinct as experience considerably different from the rest and skewed toward later durations
  - Removes approximate 4 million claims – study still includes over 31 million claims
- Data shows sharply decreasing mortality ratios by attained age



# Guaranteed Issue, cont'd

- Mortality ratios vary significantly by attained age

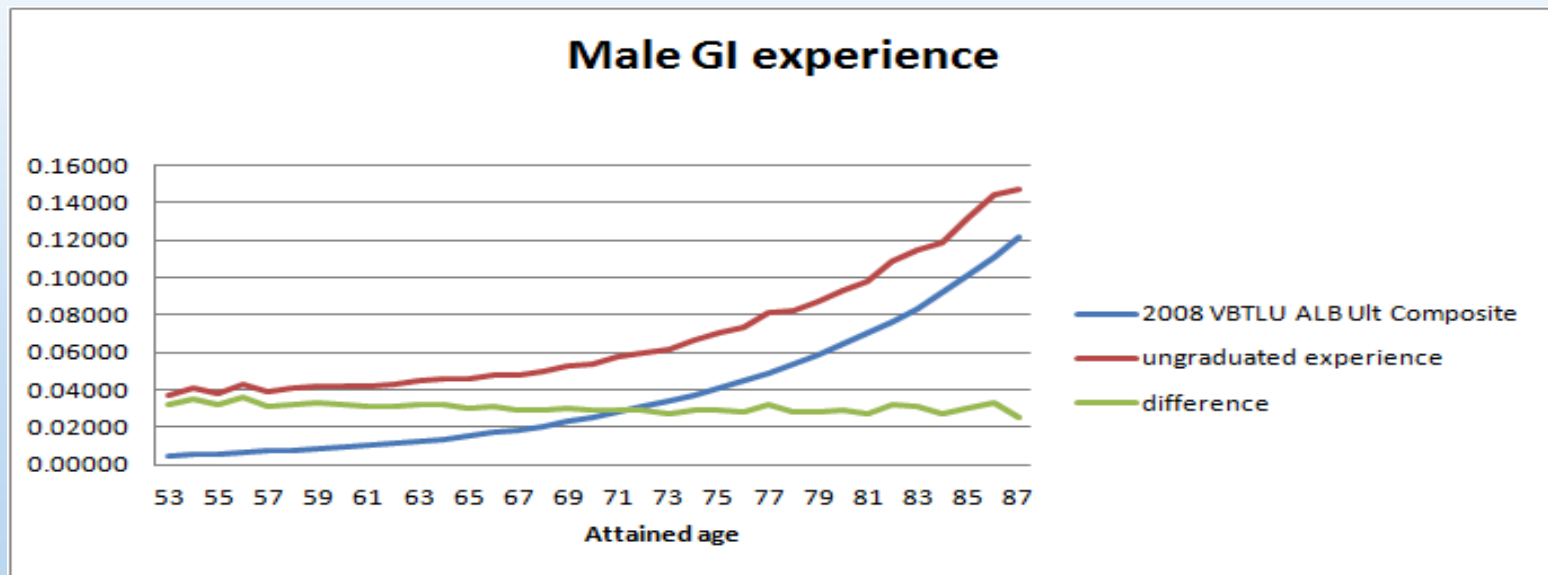


Source: GI/SI/Prened Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Guaranteed Issue, cont'd

- Overall experience mortality is fairly smooth over the attained age range shown
  - The excess over 2008 VBTLU declines with increasing attained age - extending mortality to younger ages may be problematic

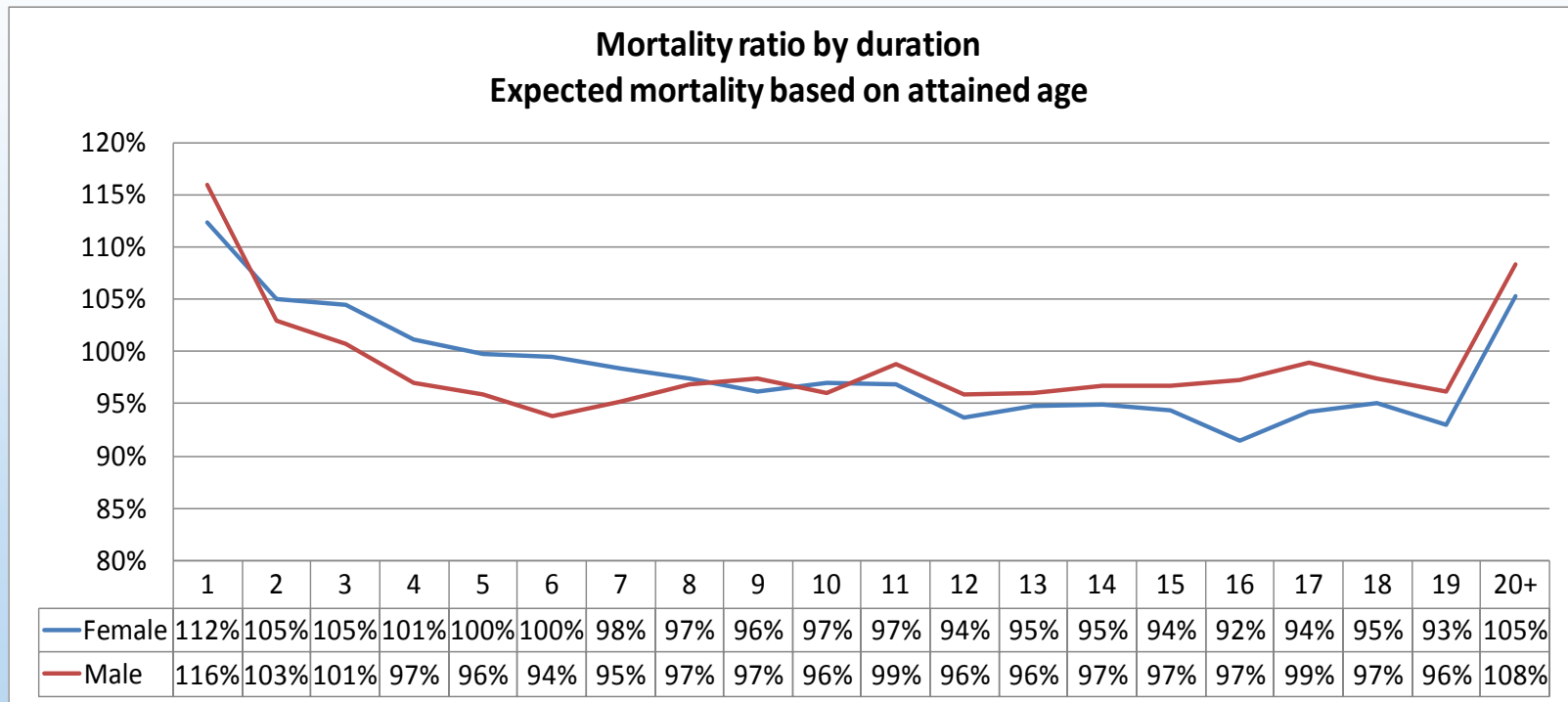


Source: GI/SI/Preneed Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group



# Guaranteed Issue, cont'd

- Observable level of anti-selection in early durations
  - Fairly flat after duration 4 for males and duration 8 for females



Source: GI/SI/Preneed Team of the Society of Actuaries & American Academy of Actuaries Joint Project Oversight Group





# Guaranteed Issue, cont'd

- Mortality ratios higher at younger ages from those in previous study

<b>GISI Calendar Year Summary - GI and No-PreNeed</b>									
<u>Mortality ratio based on US Life 79-81 (White) male &amp; female</u>									
<u>Durations 1-10 only</u>									
<u>Issue age group</u>									
	<u>45-49</u>	<u>50-54</u>	<u>55-59</u>	<u>60-64</u>	<u>65-69</u>	<u>70-74</u>	<u>75-79</u>	<u>80&amp;above</u>	<u>Grand Total</u>
Female	360.0%	255.7%	205.0%	149.4%	116.3%	98.2%	88.3%	87.1%	129.1%
Male	303.2%	232.3%	172.4%	125.1%	103.5%	96.6%	89.8%	90.2%	120.9%
Total	328.3%	243.1%	186.9%	136.0%	109.3%	97.4%	89.0%	88.3%	124.9%
<u>Direct Marketed Life study* from anniversaries in 1990-1992</u>									
<u>Durations 1-10 only</u>									
<u>Issue age group</u>									
	<u>45-49</u>	<u>50-54</u>	<u>55-59</u>	<u>60-64</u>	<u>65-69</u>	<u>70-74</u>	<u>75-79</u>	<u>80&amp;above</u>	<u>Grand Total</u>
Male	276.0%	241.1%	221.7%	173.7%	138.4%	116.1%	91.4%		150.4%
Female	255.1%	245.5%	192.4%	162.9%	134.9%	118.3%	92.1%		143.5%
Combined	267.8%	242.8%	205.7%	169.1%	137.0%	117.1%	91.8%		147.4%

\* REPORT OF THE DIRECT RESPONSE PERSISTENCY AND MORTALITY TASK FORCE TRANSACTIONS OF SOCIETY OF ACTUARIES 1993-94 REPORTS MORTALITY AND PERSISTENCY EXPERIENCE OF DIRECT MARKETED LIFE AND SUPPLEMENTAL HEALTH CONTRACTS BETWEEN 1990 AND 1992 Page 148, Table 4

Source: <http://www.soa.org/library/research/transactions-reports-of-mortality-moribidity-and-experience/1990-99/1993/january/tsr935.aspx>



# Preneed

- Study is a bit further behind
- More to present at next meeting



# Questions for LATF

## ■ VBT/CSO

1. Thoughts on having different aggregate table for preferred structure tables versus aggregate NS/SM
2. Considerations on select period
3. Considerations for percentage of contributing companies the CSO mortality should cover (future conference call)

## ■ GI/SI/Preneed

1. Thoughts on different tables by amount
2. Considerations for aggregate versus NS/SM (SI only)

