

# VM-20 Simplified Approach for Mortality Assumption Determination of $X$ and Proposed Margin

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# VM-20 - Mortality

- Determination of  $X$  for sufficient data period
- Examples of determination of anticipated experience assumptions
- Margin factor
- Sample prudent estimate mortality rate comparisons



# Sufficient Data Period

- Determining credibility of experience data over sufficient data period
  - No method specified other than must follow common actuarial practice as published in actuarial literature
  - Much flexibility in how to determine
- May be determined at mortality segment level or more aggregate level
- Used to determine grading schedule for blending into industry mortality



# X is used to determine grading period from company experience into applicable industry table

- Grade company experience rates into applicable industry table using following proposed schedule:

(1)	(2)	(3)	(4)
Credibility of company data over sufficient data period	Maximum # of years for data to be considered sufficient	Maximum # of years in which to begin grading after sufficient data no longer exists	Maximum # of years in which the assumption must grade to 100% of an applicable industry table (from the duration where sufficient data no longer exists)
0-19%	10	2	10
20-39%	20	4	15
40-59%	30	6	18
60-79%	40	8	20
80-100%	50	10	25

- Must grade into 100% of the applicable industry table mortality by the later of attained age [95] or 15 years after policy underwriting



# Industry Experience

- Looked at SOA ILEC's mortality experience data for 2002-2009 exposure period as well as experience for common companies in 2004-2009 study
- Compared results for all contributors to those of just the common companies
  - Not all companies in 2002-2009 study contributed data in all years
- Value varies by gender and smoker status



# Companies Meeting Criteria for X Male NS

## ■ All Companies (2002 – 2009)

	Total # companies						Total # companies					
	53						53					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	7	9	7	2	1	0%	15%	19%	14%	4%	2%
90	0	8	9	7	2	1	0%	17%	19%	14%	4%	2%
80	0	9	11	8	3	2	0%	20%	23%	16%	6%	4%
70	1	9	11	8	6	3	3%	20%	23%	16%	11%	6%
60	2	9	12	10	8	4	6%	20%	25%	20%	15%	8%
50	3	11	14	12	10	7	10%	24%	29%	24%	19%	13%
40	4	13	15	14	16	12	13%	28%	31%	27%	30%	23%
30	6	15	22	19	16	15	19%	33%	46%	37%	30%	29%
20	7	18	29	25	23	20	23%	39%	60%	49%	43%	38%
10	10	27	36	32	31	29	32%	59%	75%	63%	58%	56%
# co's with data	31	46	48	51	53	52						

## ■ Common Companies (2004 – 2009)

	Total # companies						Total # companies					
	27						27					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	6	6	3	1	1	0%	26%	25%	12%	4%	4%
90	0	7	6	3	2	1	0%	30%	25%	12%	7%	4%
80	0	7	7	4	2	1	0%	30%	29%	16%	7%	4%
70	0	7	7	4	2	1	0%	30%	29%	16%	7%	4%
60	1	8	7	5	3	1	5%	35%	29%	20%	11%	4%
50	1	8	9	6	5	2	5%	35%	38%	24%	19%	8%
40	2	10	9	7	6	6	9%	43%	38%	28%	22%	23%
30	3	12	12	9	7	7	14%	52%	50%	36%	26%	27%
20	5	14	16	11	12	10	23%	61%	67%	44%	44%	38%
10	6	19	20	16	17	16	27%	83%	83%	64%	63%	62%
# co's with data	22	23	24	25	27	26						

Highlighted fields represent cells where at least 30% of the contributors meet the criteria X



# Companies Meeting Criteria for X Female NS

## ■ All Companies (2002–2009)

	Total # companies						53					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	1	2	5	4	2	1	3%	4%	10%	8%	4%	2%
90	1	3	5	4	3	1	3%	7%	10%	8%	6%	2%
80	1	4	5	4	3	1	3%	9%	10%	8%	6%	2%
70	1	5	5	5	3	1	3%	11%	10%	10%	6%	2%
60	1	6	5	5	3	1	3%	13%	10%	10%	6%	2%
50	1	6	7	6	4	1	3%	13%	14%	12%	8%	2%
40	1	6	9	8	6	3	3%	13%	18%	16%	11%	6%
30	1	8	12	10	8	5	3%	17%	24%	20%	15%	10%
20	3	12	16	16	16	12	10%	26%	33%	31%	30%	23%
10	6	18	27	24	26	22	19%	39%	55%	47%	49%	42%
# co's with data	31	46	49	51	53	52						

## ■ Common Companies (2004 – 2009)

	Total # companies						27					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	3	4	4	1	1	0%	13%	16%	16%	4%	4%
90	0	4	4	4	1	1	0%	17%	16%	16%	4%	4%
80	1	4	4	4	2	1	5%	17%	16%	16%	7%	4%
70	1	5	4	4	3	1	5%	22%	16%	16%	11%	4%
60	1	5	4	4	3	1	5%	22%	16%	16%	11%	4%
50	1	5	5	4	3	1	5%	22%	20%	16%	11%	4%
40	1	6	6	4	4	2	5%	26%	24%	16%	15%	8%
30	1	8	7	5	4	2	5%	35%	28%	20%	15%	8%
20	2	9	10	8	7	6	9%	39%	40%	32%	26%	23%
10	2	15	16	11	14	10	9%	65%	64%	44%	52%	38%
# co's with data	22	23	25	25	27	26						

Highlighted fields represent cells where at least 30% of the contributors meet the criteria X



# Companies Meeting Criteria for X Male SM

## ■ All Companies (2002 – 2009)

	Total # companies						53					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	2	3	1	0	0	0%	4%	6%	2%	0%	0%
90	0	2	3	2	0	0	0%	4%	6%	4%	0%	0%
80	0	3	3	2	0	0	0%	7%	6%	4%	0%	0%
70	0	3	3	3	0	0	0%	7%	6%	6%	0%	0%
60	0	3	4	4	0	1	0%	7%	9%	8%	0%	2%
50	0	4	4	4	1	1	0%	9%	9%	8%	2%	2%
40	1	5	6	4	2	1	3%	11%	13%	8%	4%	2%
30	2	6	6	5	4	1	7%	13%	13%	10%	8%	2%
20	3	10	13	8	6	2	10%	22%	28%	16%	11%	4%
10	6	15	18	15	15	12	20%	33%	38%	29%	28%	23%
# co's with data	30	45	47	51	53	52						

## ■ Common Companies (2004 – 2009)

	Total # companies						27					
	Experience Duration						% Companies					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
90	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
80	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
70	0	2	2	2	0	0	0%	9%	8%	8%	0%	0%
60	0	2	2	2	0	0	0%	9%	8%	8%	0%	0%
50	0	2	2	2	0	0	0%	9%	8%	8%	0%	0%
40	0	3	4	2	0	0	0%	13%	17%	8%	0%	0%
30	1	7	4	3	2	1	5%	30%	17%	12%	7%	4%
20	2	9	7	4	3	1	10%	39%	29%	16%	11%	4%
10	3	10	10	7	8	6	15%	43%	42%	28%	30%	23%
# co's with data	20	23	24	25	27	26						

Highlighted fields represent cells where at least 30% of the contributors meet the criteria X





# Companies Meeting Criteria for X Female SM

## ■ All Companies (2002 – 2009)

	Total # companies						53					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	2	2	1	0	0	0%	4%	4%	2%	0%	0%
90	0	2	2	1	0	0	0%	4%	4%	2%	0%	0%
80	0	2	2	1	0	0	0%	4%	4%	2%	0%	0%
70	0	2	3	2	0	0	0%	4%	6%	4%	0%	0%
60	0	2	3	2	0	0	0%	4%	6%	4%	0%	0%
50	1	2	3	4	1	0	3%	4%	6%	8%	2%	0%
40	1	3	4	4	1	0	3%	7%	9%	8%	2%	0%
30	1	4	4	4	2	2	3%	9%	9%	8%	4%	4%
20	1	5	4	4	6	2	3%	11%	9%	8%	11%	4%
10	3	11	12	9	7	6	10%	24%	26%	18%	13%	12%
# co's with data	29	45	47	51	53	52						

## ■ Common Companies (2004 – 2009)

	Total # companies						27					
	# Companies Meeting Criteria X Per Year						% Companies Meeting Criteria X Per Year					
	Duration Grouping						Duration Grouping					
X =	26-30	21-25	16-20	11-15	6-10	4-5	26-30	21-25	16-20	11-15	6-10	4-5
100	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
90	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
80	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
70	0	2	2	1	0	0	0%	9%	8%	4%	0%	0%
60	0	2	2	2	0	0	0%	9%	8%	8%	0%	0%
50	0	2	2	2	0	0	0%	9%	8%	8%	0%	0%
40	1	2	2	2	1	0	5%	9%	8%	8%	4%	0%
30	1	2	3	3	1	1	5%	9%	13%	12%	4%	4%
20	1	4	3	3	4	2	5%	17%	13%	12%	15%	8%
10	1	8	7	5	4	3	5%	35%	29%	20%	15%	12%
# co's with data	20	23	24	25	27	26						

Highlighted fields represent cells where at least 30% of the contributors meet the criteria X



# X Where Average # Claims per Year is Met by 30% of Contributing Companies

■ All Companies (2002 – 2009)

<b>Risk</b>	<b>Duration Grouping</b>				
<b>Class</b>	<b>4-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>
MNS	28	41	34	42	38
FNS	19	20	21	20	17
MSM	7	9	9	17	17
FSM	3	4	6	8	8

■ Common Companies (2004 – 2009)

<b>Risk</b>	<b>Duration Grouping</b>				
<b>Class</b>	<b>4-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>	<b>21-25</b>
MNS	29	29	32	54	95
FNS	17	13	20	26	35
MSM	8	10	7	17	30
FSM	2	5	6	8	14



# At March 2012 NAIC Meeting, LATF asked the Academy to provide a recommendation for the value X

## ■ Recommend X be 20

	% Contributors Meeting Criteria (X) for Certain Durations					
	All Companies (%)			Common Companies (%)		
X=30	21-25	16-20	11-15	21-25	16-20	11-15
MNS	33	46	37	52	50	36
FNS	17	24	20	35	28	20
MSM	13	13	10	30	17	12
FSM	9	9	8	9	13	12
X=20	21-25	16-20	11-15	21-25	16-20	11-15
MNS	39	60	49	61	67	44
FNS	26	33	31	39	40	32
MSM	22	28	16	39	29	16
FSM	11	9	8	17	13	12



# Anticipated Experience Assumptions

- Grade company experience rates into applicable industry table using following schedule:

(1)	(2)	(3)	(4)
Credibility of company data over sufficient data period	Maximum # of years for data to be considered sufficient	Maximum # of years in which to begin grading after sufficient data no longer exists	Maximum # of years in which the assumption must grade to 100% of an applicable industry table (from the duration where sufficient data no longer exists)
0-19%	10	2	10
20-39%	20	4	15
40-59%	30	6	18
60-79%	40	8	20
80-100%	50	10	25

- Must grade into 100% of the applicable industry table mortality by the later of attained age [95] or 15 years after policy underwriting



# Mortality Example 1

- 10 Mortality segments, 6 NS, 4 SM
  - M/F Super Preferred NS, Preferred NS, Residual NS, Preferred SM, Standard SM
- Company experience mortality viewed as NS/SM, M/F Preferred and better, Standard NS, SM with conservation of total deaths used to split out into sub-classes
- Assume experience study has 5 years of exposure
- Assume  $X = 20$  claims per exposure year



# Mortality Example 1

Overall mortality experience, all genders, Nonsmoker risks with credibility determined using Limited Fluctuation at 95% with 3% margin of error

Company ABC Mortality Study														
Experience period: January 1, 2005 to December 31, 2009 Combined														
Traditional Life by Duration														
Gender: All														
Tobacco Status: Nonsmoker														
Underwriting Classes: All, excluding substandard														
Expected Basis: 2008 VBT RR80 ANB														
Duration (All Ages Combined)	Exposure		Actual Claims		Expected Claims		Actual to Expected Ratio		Mortality Rate per 1000	Confidence Interval		Count needed to be fully credible	Percent Credibility	
	Count	Amount	Count	Amount	Count	Amount	Count	Amount		Min	Max			
1	780,000	224,064,000	210	96,852	241	69,170	0.872	1.400	0.31	0.27	0.35	15,852,088	22%	
2	721,500	162,840,000	270	65,040	286	64,606	0.943	1.007	0.40	0.35	0.44	11,404,098	25%	
3	910,000	222,000,000	288	75,348	287	70,001	1.004	1.076	0.32	0.28	0.35	13,484,965	26%	
4	650,000	126,000,000	240	51,600	265	51,333	0.906	1.005	0.41	0.36	0.46	11,558,236	24%	
5	455,000	114,000,000	211	46,860	221	55,344	0.953	0.847	0.49	0.42	0.55	9,219,814	22%	
6	357,500	54,000,000	198	28,140	174	26,344	1.135	1.068	0.49	0.42	0.56	7,704,780	22%	
7	253,500	36,000,000	126	21,330	125	17,698	1.011	1.205	0.49	0.41	0.58	8,585,570	17%	
8	114,400	18,000,000	84	21,780	77	12,153	1.088	1.792	0.68	0.52	0.83	5,811,081	14%	
9	37,700	9,600,000	12	3,600	28	7,199	0.424	0.500	0.75	0.47	1.03	13,407,896	5%	
10	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	4,279,600	966,504,000	1,639	410,550	1,698	383,412	0.965	1.071	0.40	0.38	0.42	11,145,940	62%	

Overall credibility for Nonsmoker Risks = 62%



# Mortality Example 1

## Mortality experience, Male Preferred and Better Nonsmoker risks

Company ABC Mortality Study								
Experience period: January 1, 2005 to December 31, 2009 Combined								
Traditional Life by Duration								
Gender: Male								
Tobacco Status: Nontobacco								
Underwriting Classes: Preferred and Super Preferred								
Expected Basis: 2008 VBT RR80 ANB								
Duration (All Ages Combined)	Exposure		Actual Claims		Expected Claims		Actual to Expected Ratio	
	Count	Amount	Count	Amount	Count	Amount	Count	Amount
1	400,529	111,219,768	82	21,215	87	24,034	0.946	0.883
2	431,808	78,142,845	104	22,140	120	21,702	0.867	1.020
3	418,887	112,634,297	103	25,092	92	24,861	1.114	1.009
4	361,296	67,740,750	107	16,957	103	19,319	1.035	0.878
5	252,048	53,451,750	92	16,335	86	18,164	1.078	0.899
6	168,320	22,512,600	47	8,395	62	8,237	0.760	1.019
7	140,376	19,849,500	69	10,020	62	8,782	1.105	1.141
8	63,528	9,627,750	20	10,506	34	5,200	0.591	2.020
9	21,072	5,544,000	8	2,160	21	5,405	0.380	0.400
10	-	-	-	-	-	-	-	-
Total	2,257,864	480,723,260	631	132,821	666	135,704	94.8%	97.9%

- If  $X = 20$ , # claims for sufficient data period must be  $\geq 100$
- Sufficient data period = last duration at which # claims is 100 or higher = duration 4



# Mortality Example 1

- Using table in Section 9C.4.b.iv

(1) Credibility of company data over sufficient data period	(2) Maximum # of years for data to be considered sufficient	(3) Maximum # of years in which to begin grading after sufficient data no longer exists	(4) Maximum # of years in which the assumption must grade to 100% of an applicable industry table (from the duration where sufficient data no longer exists)
0-19%	10	2	10
20-39%	20	4	15
40-59%	30	6	18
60-79%	40	8	20
80-100%	50	10	25



- Using table and sufficient data period of 4 years (i.e., sufficient data no longer exists at duration 5), must begin grading from own experience to industry experience in duration 12 (4 + 8) and be at 100% industry experience in duration 24 (4 + 20)





# Mortality Example 1

Setting anticipated experience assumption, Male Preferred and Male Super Preferred Nonsmoker risks



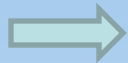
	Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
(1)	% own exp	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	92%	85%	77%	69%	62%	54%	46%	38%	31%	23%	15%	8%	0%	0%	
(2)	% industry table	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	15%	23%	31%	38%	46%	54%	62%	69%	77%	85%	92%	100%	100%	
Experience Mortality Assumption																											
	% 2008 VBT RR80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
	Assumption as % 08VBT	90%	92%	98%	94%	94%	94%	94%	94%	94%	94%	95%	95%	95%	95%	95%	95%	95%	95%	95%	98%	98%	98%	98%	98%	98%	
Using Conservation of total deaths																											
Super Preferred NS (35%)																											
	% 2008 VBT RR80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
(3)	% own exp	82%	84%	90%	86%	86%	86%	86%	86%	86%	86%	87%	87%	87%	87%	87%	87%	87%	87%	87%	90%	90%	90%	90%	90%	90%	
(4)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Preferred NS (65%)																											
	% 2008 VBT RR80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
(5)	% own exp	94%	96%	102%	98%	98%	98%	98%	98%	98%	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%	102%	102%	102%	102%	102%	102%	
(6)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Anticipated Experience Assumption																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
	Male, SPNS	82%	84%	90%	86%	86%	86%	86%	86%	86%	86%	87%	88%	89%	90%	91%	92%	93%	94%	95%	97%	98%	98%	99%	100%	100%	
	=[ (1) * (3) ] + [ (2) * (4) ] Male, PNS	94%	96%	102%	98%	98%	98%	98%	98%	98%	98%	99%	99%	99%	99%	100%	100%	100%	100%	100%	101%	101%	100%	100%	100%	100%	
	=[ (1) * (5) ] + [ (2) * (6) ] Weighted	90%	92%	98%	94%	94%	94%	94%	94%	94%	94%	95%	95%	96%	96%	97%	97%	97%	98%	98%	99%	100%	100%	100%	100%	100%	
	Check $\geq$ Aggregate	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	



# Mortality Example 2

- Same as in example 1 but:
  - With  $X=20$ , there are no durations in which the average claims per year exceed  $X$ , therefore, the sufficient data period is zero
  - Credibility of overall data is 30%
  - Companies base mortality assumptions same as in example 1
- Using table in Section 9C.4.b.iv

(1)	(2)	(3)	(4)
Credibility of company data over sufficient data period	Maximum # of years for data to be considered sufficient	Maximum # of years in which to begin grading after sufficient data no longer exists	Maximum # of years in which the assumption must grade to 100% of an applicable industry table (from the duration where sufficient data no longer exists)
0-19%	10	2	10
20-39%	20	4	15
40-59%	30	6	18
60-79%	40	8	20
80-100%	50	10	25



- Using table and sufficient data period of 0 years, must begin grading from own experience to industry experience in duration 4 ( $0 + 4$ ) and be at 100% industry experience in duration 15 ( $0 + 15$ )



# Mortality Example 2

Setting anticipated experience assumption, Male Preferred and Male Super Preferred Nonsmoker risks



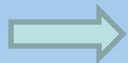
	Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
(1)	% own exp	100%	100%	100%	92%	83%	75%	67%	58%	50%	42%	33%	25%	17%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
(2)	% industry table	0%	0%	0%	8%	17%	25%	33%	42%	50%	58%	67%	75%	83%	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Experience Mortality Assumption																											
	% 2008 VBT RR80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
	Assumption as % 08VBT	90%	92%	98%	94%	94%	94%	94%	94%	94%	94%	95%	95%	95%	95%	95%	95%	95%	95%	95%	98%	98%	98%	98%	98%	98%	98%
Using Conservation of total deaths																											
Super Preferred NS (35%)																											
	% 2008 VBT RR80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
(3)	% own exp	82%	84%	90%	86%	86%	86%	86%	86%	86%	86%	87%	87%	87%	87%	87%	87%	87%	87%	87%	90%	90%	90%	90%	90%	90%	90%
(4)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Preferred NS (65%)																											
	% 2008 VBT RR80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+	
(5)	% own exp	94%	96%	102%	98%	98%	98%	98%	98%	98%	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%	102%	102%	102%	102%	102%	102%	102%
(6)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Anticipated Experience Assumption																											
	Male, SPNS	82%	84%	90%	87%	88%	89%	91%	92%	93%	94%	96%	97%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Male, PNS	94%	96%	102%	98%	99%	98%	99%	99%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Weighted	90%	92%	98%	95%	95%	95%	96%	97%	97%	98%	98%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Check $\geq$ Aggregate	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass



# Mortality Example 3

- With  $X=20$ , there are no durations in which the average claims per year exceed  $X$ , therefore, the sufficient data period is zero
  - Credibility of overall data is 5%
  - Companies base mortality assumptions are as follows:
    - 90% Super Preferred NS; 10% Residual NS
    - Aggregate NS mortality assumption = 50% RR70 table; SPNS is 45% RR70
- Using table in Section 9C.4.b.iv

(1)	(2)	(3)	(4)
Credibility of company data over sufficient data period	Maximum # of years for data to be considered sufficient	Maximum # of years in which to begin grading after sufficient data no longer exists	Maximum # of years in which the assumption must grade to 100% of an applicable industry table (from the duration where sufficient data no longer exists)
0-19%	10	2	10
20-39%	20	4	15
40-59%	30	6	18
60-79%	40	8	20
80-100%	50	10	25



- Using table and sufficient data period of 0 years and 5% credibility, must begin grading from own experience to industry experience in duration 2 (0 + 2) and be at 100% industry experience in duration 10 (0 + 10)



# Mortality Example 3

Setting anticipated experience assumption, Male Preferred and Male Super Preferred Nonsmoker risks



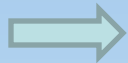
	Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
(1)	% own exp	100%	89%	78%	67%	56%	44%	33%	22%	11%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
(2)	% industry table	0%	11%	22%	33%	44%	56%	67%	78%	89%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Experience Mortality Assumption																										
	% 2008 VBT RR70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
	Assumption as % 08VBT	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Using Conservation of total deaths																										
Super Preferred NS (90%)																										
	% 2008 VBT RR70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
(3)	% own exp	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
(4)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Other NS (10%)																										
	% 2008 VBT RR70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25+
(5)	% own exp	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
(6)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Anticipated Experience Assumption																										
	Male, SPNS	45%	51%	57%	63%	69%	76%	82%	88%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Male, PNS	95%	96%	96%	97%	97%	98%	98%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Weighted	78%	80%	83%	85%	88%	90%	93%	95%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Check $\geq$ Aggregate	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass



# Mortality Example 4

- With  $X=20$ , company's claim experience meets sufficient data period for 68 years
  - Credibility of overall data is 90%
  - Companies base mortality assumptions are as follows:
    - 70% Super Preferred NS; 30% Preferred NS
- Using table in Section 9C.4.b.iv

(1)	(2)	(3)	(4)
Credibility of company data over sufficient data period	Maximum # of years for data to be considered sufficient	Maximum # of years in which to begin grading after sufficient data no longer exists	Maximum # of years in which the assumption must grade to 100% of an applicable industry table (from the duration where sufficient data no longer exists)
0-19%	10	2	10
20-39%	20	4	15
40-59%	30	6	18
60-79%	40	8	20
80-100%	50	10	25



- Using table with sufficient data for 68 years and 90% credibility, must begin grading from own experience to industry experience in duration 60 ( $50 + 10$ ) and be at 100% industry experience in duration 75 ( $50 + 25$ )
  - Sufficient data period is 50 rather than 68 due to cap in step (2)



# Mortality Example 4

Setting anticipated experience assumption, Male Preferred and Male Residual Nonsmoker risks

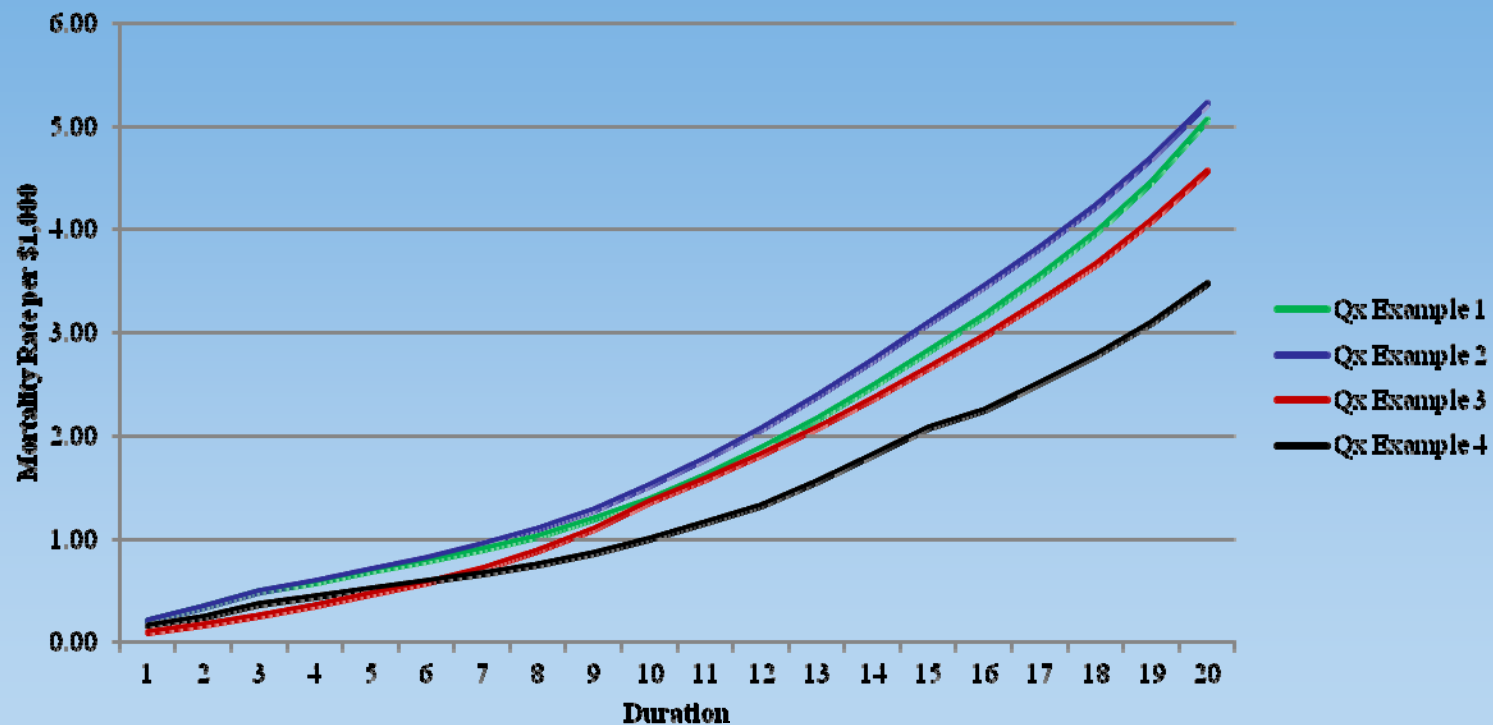


	Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-25	26-35	36-45	46-55	55-59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75+	
(1)	% own exp	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	94%	88%	81%	75%	69%	63%	56%	50%	44%	38%	31%	25%	19%	13%	6%	0%	
(2)	% industry table	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	13%	19%	25%	31%	38%	44%	50%	56%	63%	69%	75%	81%	88%	94%	100%	
Experience Mortality Assumption																																						
	% 2008 VBT RR70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-25	26-35	36-45	46-55	55-59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75+	
	Assumption as % 08VBT	85%	80%	87%	84%	84%	83%	82%	81%	80%	80%	80%	79%	81%	83%	84%	82%	85%	83%	87%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Using Conservation of total deaths																																						
Preferred NS (40%)																																						
	% 2008 VBT RR70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-25	26-35	36-45	46-55	55-59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75+	
(3)	% own exp	79%	74%	81%	78%	78%	77%	76%	75%	74%	74%	74%	73%	75%	77%	78%	76%	79%	77%	82%	86%	87%	88%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%
(4)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Residual NS (60%)																																						
	% 2008 VBT RR70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16-25	26-35	36-45	46-55	55-59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75+	
(5)	% own exp	89%	84%	91%	88%	88%	87%	86%	85%	84%	84%	84%	83%	85%	87%	88%	86%	89%	87%	90%	93%	92%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%
(6)	% industry table	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Anticipated Experience Assumption																																						
	Male, SPNS	79%	74%	81%	78%	78%	77%	76%	75%	74%	74%	74%	73%	75%	77%	78%	76%	79%	77%	82%	86%	88%	90%	91%	92%	92%	93%	94%	95%	95%	96%	97%	97%	98%	99%	99%	100%	
	Male, PNS	89%	84%	91%	88%	88%	87%	86%	85%	84%	84%	84%	83%	85%	87%	88%	86%	89%	87%	90%	93%	93%	92%	92%	93%	94%	94%	95%	95%	96%	97%	97%	98%	98%	99%	99%	100%	
	Weighted	86%	81%	88%	85%	85%	84%	83%	82%	81%	81%	81%	80%	82%	84%	85%	83%	86%	84%	87%	90%	91%	91%	92%	93%	93%	94%	94%	95%	96%	96%	97%	98%	98%	99%	99%	100%	
	Check ≥ Aggregate	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	



# Comparison of Resulting Anticipated Mortality from Examples

## Mortality Comparison for Male, SPNS, Issue Age 45





# Determining the Margin

- A single margin in the form of a %
- Margin % varies by issue age
- Margin % still to be determined
- Margin should be increased to reflect situations involving greater uncertainty



# Determining the Margin – Current Factors

Percentage margin table for company variation risk

Issue Age	Load		Issue Age	Load
<45	21%		58-59	14%
46-47	20%		60-61	13%
48-49	19%		62-63	12%
50-51	18%		64-68	11%
52-53	17%		69-76	10%
54-55	16%		77+	9%
56-57	15%			



# Margin Consideration For Gross Premium Reserve

- Margin considerations for gross premium reserve are different than for net premium reserve
  - Under Net Premium method, a flat % margin increases both the benefits and the net premiums
  - However, under Gross Premium method, only the benefits are increased as the Gross Premium is not affected
- A margin more consistent with the approach used in Canada is preferable
- Unlike current Net Premium reserve method, the mortality assumptions must be re-evaluated each year so should not need to be as high
- Current margin took this into account in determining the % loads; however, was meant to be used in combination with another margin for companies that used their own experience
  - Current table is too conservative for companies that use their own experience



# Margin Consideration For Gross Premium Reserve, cont'd

- The margins are specific to the underlying VBT table and experience of the contributors relative to the mean (i.e., the variation around the mean)
- Margins/loads will need to be re-evaluated once 2014 VBT is complete
- In interim, suggest just modifying the current table to be based on attained age rather than issue age



# Determining the Margin - Proposed

## Percentage margin table for company variation risk

Attained Age	Load		Attained Age	Load
<45	21%		58-59	14%
46-47	20%		60-61	13%
48-49	19%		62-63	12%
50-51	18%		64-68	11%
52-53	17%		69-76	10%
54-55	16%		77+	9%
56-57	15%			



# Comparison of Resulting Prudent Estimate Mortality from Example 4

## Mortality Comparison for Male, SPNS, Issue Age 45

