



Singapore
Actuarial
Society

Singapore Mortality Experience 2004 – 2008 Mortality Work Group

Singapore, AA Symposium 4 November 2010

Agenda

- **Data received**
- **Preliminary Results – Mortality**
- **Population Experience**
- **Critical Illness Graduated Table**
- **TPD Graduated Table**
- **Use of the Results**



The Investigation

- **After a few false starts final data received from all companies.**
- **Issue was Death with 100% Critical Illness acceleration.**
- **Are able to produce tables for**
 - **Mortality (Both WoL/End and Term)**
 - **Critical Illness**
 - **TPD**



Data – Years 2003 - 2008

- **We received exposure and claims data split:**
 - **Age**
 - **Duration 0,1,2,3,4 and 5+**
 - **Gender**
 - **Investment Linked /Non Investment Linked**
 - **WoL and Endowment/Term**
 - **Benefit Type (Mortality, CI 100% acceleration, CI not 100% acceleration, TPD)**
 - **Medical / Non Medical**



Data – Exposure

DEATH COVER Average annual exposure					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	1,773,844	148,212	1,922,056
		Term	81,356	17,941	99,297
			1,855,200	166,153	2,021,353
	Investment Linked				
		WOL	553,526	12,181	565,707
		Term	64	5	69
			553,590	12,186	565,776
Males					
	Non IL		Non Medical	Medical	Total
		WOL	1,534,884	165,897	1,700,781
		Term	104,804	34,352	139,156
			1,639,688	200,249	1,839,937
	Investment Linked				
		WOL	609,696	17,984	627,680
		Term	53	6	59
			609,749	17,990	627,739
TOTAL			4,658,227	396,578	5,054,805



Data – Exposure

CRITICAL ILLNESS WITH 100% acceleration Average Annual Exposure					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	484,643	47,643	532,286
		Term	11,373	1,087	12,460
			496,016	48,730	544,746
	Investment Linked				
		WOL	83,396	3,019	86,415
		Term	-	-	-
			83,396	3,019	86,415
Males					
	Non IL		Non Medical	Medical	Total
		WOL	380,340	41,059	421,399
		Term	15,083	3,595	18,678
			395,423	44,654	440,077
	Investment Linked				
		WOL	73,320	3,689	77,009
		Term	-	-	-
			73,320	3,689	77,009
TOTAL			1,048,155	100,092	1,148,247



Data – Exposure

DEATH COVER EXCLUDING 100% CI Business Average Annual Exposure					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	1,289,201	100,569	1,389,770
		Term	69,983	16,854	86,837
			1,359,184	117,423	1,476,607
	Investment Linked				
		WOL	470,130	9,162	479,292
		Term	64	5	69
			470,194	9,167	479,361
Males					
	Non IL		Non Medical	Medical	Total
		WOL	1,154,544	124,838	1,279,382
		Term	89,721	30,757	120,478
			1,244,265	155,595	1,399,860
	Investment Linked				
		WOL	536,376	14,295	550,671
		Term	53	6	59
			536,429	14,301	550,730
TOTAL			3,610,072	296,486	3,906,558



Preliminary Results

- We followed the previous decision to combine the Medical and Non Medical experience.
- We also looked at the selection effect on mortality and initially agreed on a 2 year effect:
 - **Actual/Expected(S9702)**
 - Year 0 : 59% Male, 27% Female
 - Year 1 : 71% Male, 52% Female
 - Year 2 : 72% Male, 54% Female
 - Year 3 : 74% Male, 59% Female
 - Year 4 : 73% Male, 73% Female
 - Year 5+ 73% Male, 76% Female



Preliminary Results

So the comparison with S9702 is with:

- **Whole Life and Endowment**
- **Investment Linked and Non Investment Linked**
- **Duration 2 years and more**
- **Does not look at Juveniles**
- **Medical and Non Medical combined**
- **Excludes policies with 100% Accelerating Critical Illness**



Preliminary Results

- Comparing actual to expected (S9702) we get:

			2004	2005	2006	2007	2008	Overall
Male	Expected		1,906	2,070	2,236	2,360	2,465	11,037
	Actual		1,390	1,704	1,617	1,608	1,704	8,023
			72.9%	82.3%	72.3%	68.1%	69.1%	72.7%
			2004	2005	2006	2007	2008	Overall
Female	Expected		1,214	1,360	1,498	1,586	1,662	7,320
	Actual		860	948	1,057	1,109	1,093	5,067
			70.9%	69.7%	70.6%	69.9%	65.8%	69.2%



Preliminary Results

- Looking at IL Whole Life/Endowment and Term separately:

			IL WoL/End	Non IL Tern
Male	Expected		2,275	609
	Actual		1,991	388
			87.5%	63.7%
Female	Expected		1,295	246
	Actual		945	152
			72.9%	61.8%



Population Mortality Improvement

	1984-88 to 1989-93		1989-93 to 1997-02		1997-02 to 2003-08		1989-93 to 2003-08	
Age Last	Male	Female	Male	Female	Male	Female	Male	Female
15 - 19	-7.31%	-5.92%	-4.03%	-0.57%	-3.29%	-6.05%	-3.72%	-2.88%
20 - 24	-6.44%	-3.75%	-1.24%	-4.81%	-2.14%	2.11%	-1.62%	-2.00%
25 - 29	-12.05%	-6.89%	0.32%	-3.88%	-2.39%	-2.99%	-0.81%	-3.51%
30 - 34	-6.51%	-6.41%	-2.38%	-2.54%	-2.85%	-4.88%	-2.57%	-3.51%
35 - 39	-8.28%	-5.25%	-1.39%	-2.97%	-2.75%	-4.28%	-1.95%	-3.51%
40 - 44	-6.12%	-2.30%	-2.34%	-4.74%	-1.86%	-1.18%	-2.15%	-3.28%
45 - 49	-5.06%	-5.02%	-3.74%	-3.00%	-1.42%	-3.03%	-2.79%	-3.01%
50 - 54	-5.09%	-4.65%	-4.23%	-3.74%	-1.99%	-2.71%	-3.31%	-3.31%
55 - 59	-4.88%	-3.22%	-4.01%	-4.15%	-3.18%	-3.05%	-3.67%	-3.69%
60 - 64	-2.87%	-4.17%	-3.62%	-3.25%	-3.84%	-4.18%	-3.71%	-3.64%
65 - 69	-3.23%	-3.38%	-2.46%	-2.62%	-3.37%	-4.89%	-2.84%	-3.57%
Weighted Average	-6.97%	-4.93%	-2.50%	-3.35%	-2.51%	-3.14%	-2.59%	-3.25%



Critical Illness Exposure

CRITICAL ILLNESS WITH 100% acceleration					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	484,643	47,643	532,286
		Term	11,373	1,087	12,460
			496,016	48,730	544,746
	Investment Linked				
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TOTAL			1,048,155	100,092	1,148,247



Critical Illness Exposure

CRITICAL ILLNESS WITHOUT 100% acceleration					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	112,089	12,726	124,815
		Term	455	278	733
			112,544	13,004	125,548
	Investment Linked				
		WOL	20,526	3,371	23,897
		Term	-	-	-
			20,526	3,371	23,897
Males					
	Non IL		Non Medical	Medical	Total
		WOL	98,013	13,092	111,105
		Term	534	496	1,030
			98,547	13,588	112,135
	Investment Linked				
		WOL	21,118	3,911	25,029
		Term	-	-	-
			21,118	3,911	25,029
TOTAL			252,735	33,874	286,609



Critical Illness Exposure

TOTAL CRITICAL ILLNESS					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	596,732	60,369	657,101
		Term	11,828	1,365	13,193
			608,560	61,734	670,294
	Investment Linked				
		WOL	103,922	6,390	110,312
		Term	-	-	-
			103,922	6,390	110,312
Males					
	Non IL		Non Medical	Medical	Total
		WOL	478,353	54,151	532,504
		Term	15,617	4,091	19,708
			493,970	58,242	552,212
	Investment Linked				
		WOL	94,438	7,600	102,038
		Term	-	-	-
			94,438	7,600	102,038
TOTAL			1,300,890	133,966	1,434,856



Critical Illness Results (Acc plus Add)

Sample Graduated Critical Illness Rates per 1000					
Age Last		Males	% S9702	Females	% S9702
	5		0.295	NA	0.265
15		0.451	244%	0.335	216%
25		0.269	58%	0.301	151%
35		0.389	76%	0.662	169%
45		1.674	131%	2.341	259%
55		4.871	135%	4.371	187%
65		11.995	104%	8.097	147%
75		33.201	109%	16.492	77%



TPD Exposure

TPD					
Females					
	Non IL		Non Medical	Medical	Total
		WOL	1,672,878	141,205	1,814,083
		Term	69,403	16,411	85,814
			1,742,281	157,616	1,899,897
	Investment Linked				
		WOL	251,095	7,781	258,876
		Term	-	-	-
			251,095	7,781	258,876
Males					
	Non IL		Non Medical	Medical	Total
		WOL	1,460,340	158,735	1,619,075
		Term	89,403	31,002	120,405
			1,549,743	189,737	1,739,480
	Investment Linked				
		WOL	271,965	10,099	282,064
		Term	-	-	-
			271,965	10,099	282,064
TOTAL			3,815,084	365,233	4,180,317



TPD Results

- Sample result from a graduated table.

Sample Graduated TPD Rates per 1000				
Age Last				
	Males	% S9702	Females	% S9702
15	0.049	27%	0.028	18%
25	0.050	11%	0.032	16%
35	0.059	12%	0.050	13%
45	0.164	13%	0.109	12%
55	0.561	16%	0.293	13%



Next Steps

Results need careful checking.

Need to decide an approach to TPD impact.

Should consider whether a separate Critical Illness table is valid.



Thank you

To the Working Group

To the MAS

To the Contributors

