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Singapore Mortality Experience 2004 – 2008

Mortality Work Group – Final Report

Singapore, 3 November 2011

Agenda

- **New Graduated Tables**
- **Recommendations**
- **Data Issues**
- **Results**
- **Graduation Process**
- **TPD Adjustment**
- **Comparison with other Markets**



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New Graduated Tables

- **S0408**
- **S0408 – IL**
- **S0408DTPD**
- **S0408DTPD – IL**

Note: This covers lives insured with Singaporean Life Insurance Companies on their Singapore Register.



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Recommendations

- Continue the Study, perhaps capturing more data
- Individual company data available for investigation
- Impartial 3rd party carries out the investigation



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Data Issues

- 100% Accelerated CI data to be excluded
- TPD adjustment
- Juvenile Lives
- Age 52 Issue



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DEATH COVER EXCLUDING 100% CI acceleration Exposure in Years and Number of Claims

		Non Medical		Medical		Total	
		<u>Exposure</u>	<u>Claims</u>	<u>Exposure</u>	<u>Claims</u>	<u>Exposure</u>	<u>Claims</u>
Females							
Non Investment Linked							
	WL&E	6,446,906	3,772	502,846	764	6,949,752	4,536
	Term	350,917	135	80,668	34	431,584	169
		6,797,823	3,907	583,513	798	7,381,336	4,705
Investment Linked							
	WL&E	2,350,652	1,173	45,809	39	2,396,460	1,212
	Term	322	-	23	-	345	-
		2,350,974	1,173	45,831	39	2,396,805	1,212
Males							
Non Investment Linked							
	WL&E	5,770,221	5,087	624,189	1,311	6,394,410	6,398
	Term	448,605	311	153,785	108	602,389	419
		6,218,826	5,398	777,974	1,419	6,996,799	6,817
Investment Linked							
	WL&E	2,681,880	2,664	71,474	73	2,753,353	2,737
	Term	267	-	31	-	298	-
		2,682,146	2,664	71,505	73	2,753,651	2,737
TOTAL		18,049,768	13,142	1,478,822	2,329	19,528,590	15,471



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TPD COVER Exposure in Years and Number of Claims

		Non Medical		Medical		Total	
		<u>Exposure</u>	<u>Claims</u>	<u>Exposure</u>	<u>Claims</u>	<u>Exposure</u>	<u>Claims</u>
Females							
Non Investment Linked							
	WL&E	8,364,391	636	706,027	265	9,070,418	901
	Term	347,014	20	82,055	13	429,069	33
		8,711,405	656	788,082	278	9,499,487	934
Investment Linked							
	WL&E	1,255,473	72	38,906	1	1,294,379	73
	Term	-	-	-	-	-	-
		1,255,473	72	38,906	1	1,294,379	73
Males							
Non Investment Linked							
	WL&E	7,301,699	942	793,676	369	8,095,375	1,311
	Term	447,016	48	155,010	35	602,026	83
		7,748,715	990	948,686	404	8,697,401	1,394
Investment Linked							
	WL&E	1,359,826	143	50,496	3	1,410,322	146
	Term	-	-	-	-	-	-
		1,359,826	143	50,496	3	1,410,322	146
TOTAL		19,075,419	1,861	1,826,169	686	20,901,588	2,547



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TOTAL CRITICAL ILLNESS Exposure in Years and Number of Claims

		Non Medical		Medical		Total	
		<u>Exposure</u>	<u>Claims</u>	<u>Exposure</u>	<u>Claims</u>	<u>Exposure</u>	<u>Claims</u>
Females							
Non Investment Linked							
	WL&E	2,982,757	4,231	301,846	913	3,284,603	5,144
	Term	59,136	40	10,426	16	69,562	56
		3,041,893	4,271	312,272	929	3,354,165	5,200
Investment Linked							
	WL&E	519,611	135	31,951	19	551,561	154
	Term	-	-	-	-	-	-
		519,611	135	31,951	19	551,561	154
Males							
Non Investment Linked							
	WL&E	2,391,762	2,563	270,758	746	2,662,519	3,309
	Term	78,085	41	20,458	35	98,543	76
		2,469,847	2,604	291,216	781	2,761,062	3,385
Investment Linked							
	WL&E	472,192	102	38,002	18	510,194	120
	Term	-	-	-	-	-	-
		472,192	102	38,002	18	510,194	120
TOTAL		6,503,542	7,112	673,440	1,747	7,176,981	8,859



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Table 2.2 – Selection Analysis, NL WL&E comparison with S9702 (age 15 - 99)

Actual vs Expected Mortality as a Percentage of A/E at 5+, Med and Non-med, NL WL&E								
		Dur 0	Dur 1	Dur 2	Dur 3	Dur 4	Dur 5+	Dur 2+
Males	2004 - 08	56%	79%	96%	92%	88%	100%	98%
	1997 - 02	67%	88%	102%	91%	94%	100%	99%
Females	2004 - 08	34%	66%	71%	75%	68%	100%	91%
	1997 - 02	37%	73%	77%	83%	89%	100%	95%



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Mortality impact of Medical Cases – Age Standardised Crude rate ‰							
	Age	<u>NL WL&E</u>		<u>NL Term</u>		<u>IL WL&E</u>	
		Non Med	Med	Non Med	Med	Non Med	Med
Males	0 – 14	0.101	0.278	0.038	0.000	0.165	0.803
	15 – 64	0.941	1.069	1.011	0.596	1.192	0.920
	65 – 99	12.382	12.891	26.281	18.831	11.158	8.921
	Overall	0.967	1.103	1.158	0.712	1.185	0.985
Females	0 – 14	0.123	0.361	0.041	0.000	0.071	0.000
	15 – 64	0.608	0.764	0.648	0.432	0.681	0.882
	65 – 99	5.462	7.520	2.324	4.046	4.785	3.152
	Overall	0.623	0.810	0.612	0.436	0.675	0.828



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**Table 2.7 – Mortality Results per 1,000 with TPD Adjustments vs S9702
– Adults (15-64)**

Age Last	Male Crude Rates ‰			Female Crude Rates ‰		
	NL WL&E	ILWL&E	q _x -S9702	NL WL&E	ILWL&E	q _x -S9702
15 – 19	0.251	0.068	0.286	0.152	0.234	0.171
20 – 24	0.341	0.553	0.508	0.234	0.227	0.190
25 – 29	0.334	0.406	0.433	0.166	0.160	0.227
30 – 34	0.312	0.371	0.424	0.184	0.205	0.322
35 – 39	0.469	0.553	0.644	0.277	0.262	0.456
40 – 44	0.675	0.931	1.017	0.551	0.675	0.690
45 – 49	1.062	1.515	1.542	0.759	0.923	1.105
50 – 54	2.130	2.549	2.591	1.295	1.266	1.783
55 – 59	2.928	3.390	4.582	2.010	2.073	2.806
60 – 64	4.756	3.479	8.084	2.819	2.398	4.264

Age Last	Male Rates as % of S9702		Female Rates as % of S9702	
	NL WL&E	ILWL&E	NL WL&E	ILWL&E
15 – 19	87.8%	23.8%	88.9%	136.8%
20 – 24	67.1%	108.9%	123.2%	119.5%
25 – 29	77.1%	93.8%	73.1%	70.5%
30 – 34	73.6%	87.5%	57.1%	63.7%
35 – 39	72.8%	85.9%	60.7%	57.5%
40 – 44	66.4%	91.5%	79.9%	97.8%
45 – 49	68.9%	98.2%	68.7%	83.5%
50 – 54	82.2%	98.4%	72.6%	71.0%
55 – 59	63.9%	74.0%	71.6%	73.9%
60 – 64	58.8%	43.0%	66.1%	56.2%



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Table 2.8 – Mortality Results Death+TPD per 1,000 vs S9702 – Adults (15-64)

Age Last	Male Crude Rates ‰			Female Crude Rates ‰		
	NL WL&E	IL WL&E	q_x -S9702	NL WL&E	IL WL&E	q_x -S9702
15 – 19	0.312	0.068	0.286	0.188	0.234	0.171
20 – 24	0.385	0.553	0.508	0.285	0.271	0.190
25 – 29	0.390	0.430	0.433	0.193	0.169	0.227
30 – 34	0.349	0.414	0.424	0.206	0.223	0.322
35 – 39	0.531	0.604	0.644	0.340	0.308	0.456
40 – 44	0.767	0.990	1.017	0.612	0.748	0.690
45 – 49	1.239	1.751	1.542	0.861	1.076	1.105
50 – 54	2.453	3.024	2.591	1.443	1.444	1.783
55 – 59	3.334	3.695	4.582	2.183	2.246	2.806
60 – 64	5.075	3.664	8.084	2.987	2.391	4.264

Age Last	Male Rates as % of S9702		Female Rates as % of S9702	
	NL WL&E	IL WL&E	NL WL&E	IL WL&E
15 – 19	109.1%	23.8%	109.9%	136.8%
20 – 24	75.8%	108.9%	150.0%	142.6%
25 – 29	90.1%	99.3%	85.0%	74.4%
30 – 34	82.3%	97.6%	64.0%	69.3%
35 – 39	82.5%	93.8%	74.6%	67.5%
40 – 44	75.4%	97.3%	88.7%	108.4%
45 – 49	80.4%	113.6%	77.9%	97.4%
50 – 54	94.7%	116.7%	80.9%	81.0%
55 – 59	72.8%	80.6%	77.8%	80.0%
60 – 64	62.8%	45.3%	70.1%	56.1%



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**Table 2.10 – Mortality Results with TPD Adjustments vs Population 2006
– Juveniles (0-14)**

Age Last	Male Crude Rates ‰		Female Crude Rates ‰	
	NL WL&E	q _x pop 2006	NL WL&E	q _x pop 2006
0 – 4	0.128	0.100	0.184	0.100
5 – 9	0.098	0.100	0.124	0.100
10 – 14	0.120	0.200	0.127	0.100

Age Last	Male Rates as % of q _x pop 2006	Female Rates as % of q _x pop 2006
	NL WL&E	NL WL&E
0 – 4	128.0%	184.0%
5 – 9	98.0%	124.0%
10 – 14	60.0%	127.0%



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	Male NL Term comparison with NL WL&E, both with TPD adjustment			Female NL Term comparison with NL WL&E, both with TPD adjustment		
Age Last	NL Term Crude Rate‰	NL WL&E Crude Rate‰	NL Term/NL WL&E	NL Term Crude Rate‰	NL WL&E Crude Rate‰	NL Term/NL WL&E
10 – 14	0.072	0.120	59.8%	0.072	0.127	56.5%
15 – 19	0.334	0.251	133.1%	0.077	0.152	50.4%
20 – 24	0.247	0.341	72.3%	0.195	0.234	83.4%
25 – 29	0.342	0.334	102.5%	0.117	0.166	70.6%
30 – 34	0.382	0.312	122.5%	0.184	0.184	100.2%
35 – 39	0.409	0.469	87.1%	0.169	0.277	60.9%
40 – 44	0.736	0.675	109.0%	0.314	0.551	56.9%
45 – 49	1.153	1.062	108.6%	0.918	0.759	120.9%
50 – 54	1.494	2.130	70.1%	1.532	1.295	118.3%
55 – 59	2.190	2.928	74.8%	1.782	2.010	88.7%
60 – 64	3.620	4.756	76.1%	2.631	2.819	93.3%



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Mortality Improvement

Annual Improvement S9702 to S0408

	Insured Lives	Population
Male	5.30%	2.90%
Female	4.80%	3.20%



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Table 3.1 – TPD Results – NL WL&E (duration 2+)

Age Last	Male NL WL&E			Female NL WL&E		
	Exposure	TPD	Crude rate ‰	Exposure	TPD	Crude rate ‰
0 – 4	114,962	2	0.017	105,281	2	0.019
5 – 9	374,262	14	0.037	341,887	13	0.038
10 – 14	477,971	23	0.048	433,780	15	0.035
15 – 19	427,643	29	0.068	366,948	15	0.041
20 – 24	368,009	18	0.049	308,396	17	0.055
25 – 29	525,350	32	0.061	578,868	18	0.031
30 – 34	731,032	30	0.041	928,599	23	0.025
35 – 39	894,343	61	0.068	1,110,178	78	0.070
40 – 44	1,039,738	110	0.106	1,169,441	87	0.074
45 – 49	986,505	213	0.216	1,080,724	146	0.135
50 – 54	769,191	335	0.436	836,131	189	0.226
55 – 59	418,424	272	0.650	485,464	162	0.334
60 – 64	130,434	86	0.659	174,892	73	0.417
65 – 69	50,947	19	0.373	73,959	21	0.284
70 – 99	19,202	34	1.771	20,557	9	0.438
TOTAL	7,328,013	1,278		8,015,105	868	



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Table 3.2 – Ratio between TPD and Mortality(with TPD adjustment) Results

Age Last	Male NL WL&E			Female NL WL&E		
	Death Crude Rate‰	TPD Crude Rate‰	TPD/Death	Death Crude Rate‰	TPD Crude Rate‰	TPD/Death
0 – 4	0.128	0.017	13.3%	0.184	0.019	10.3%
5 – 9	0.098	0.037	37.9%	0.124	0.038	30.6%
10 – 14	0.120	0.048	40.1%	0.127	0.035	27.5%
15 – 19	0.251	0.068	27.1%	0.152	0.041	27.0%
20 – 24	0.341	0.049	14.4%	0.234	0.055	23.5%
25 – 29	0.334	0.061	18.2%	0.166	0.031	18.7%
30 – 34	0.312	0.041	13.2%	0.184	0.025	13.6%
35 – 39	0.469	0.068	14.5%	0.277	0.070	25.3%
40 – 44	0.675	0.106	15.7%	0.551	0.074	13.4%
45 – 49	1.062	0.216	20.3%	0.759	0.135	17.8%
50 – 54	2.130	0.436	20.5%	1.295	0.226	17.4%
55 – 59	2.928	0.650	22.2%	2.010	0.334	16.6%
60 – 64	4.756	0.659	13.9%	2.819	0.417	14.8%
65 – 69	9.294	0.373	4.0%	4.134	0.284	6.9%
70 – 99	22.564	1.771	7.8%	14.014	0.438	3.1%



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Table 4.1 – Total CI Results – NL WL&E (duration 2+)

Age Last	Male Total CI			Female Total CI		
	Exposure	CI incidence	Crude rate ‰	Exposure	CI incidence	Crude rate ‰
0 – 4	52,020	21	0.404	48,436	8	0.165
5 – 9	133,699	34	0.254	123,732	39	0.315
10 – 14	131,091	52	0.397	119,986	41	0.342
15 – 19	106,723	61	0.572	96,308	38	0.395
20 – 24	120,063	50	0.416	116,232	43	0.370
25 – 29	216,936	53	0.244	274,701	77	0.280
30 – 34	315,269	90	0.285	430,925	216	0.501
35 – 39	342,516	197	0.575	451,429	444	0.984
40 – 44	340,544	441	1.295	419,188	705	1.682
45 – 49	274,283	597	2.177	356,155	1114	3.128
50 – 54	181,169	694	3.831	256,407	1015	3.959
55 – 59	92,360	571	6.182	146,761	763	5.199
60 – 64	29,448	249	8.456	50,850	335	6.588
65 – 69	8,740	124	14.188	16,854	156	9.256
70 – 99	432.5	12	27.746	2,057	23	11.181
TOTAL	2,345,290	3,246		2,910,017	5,017	



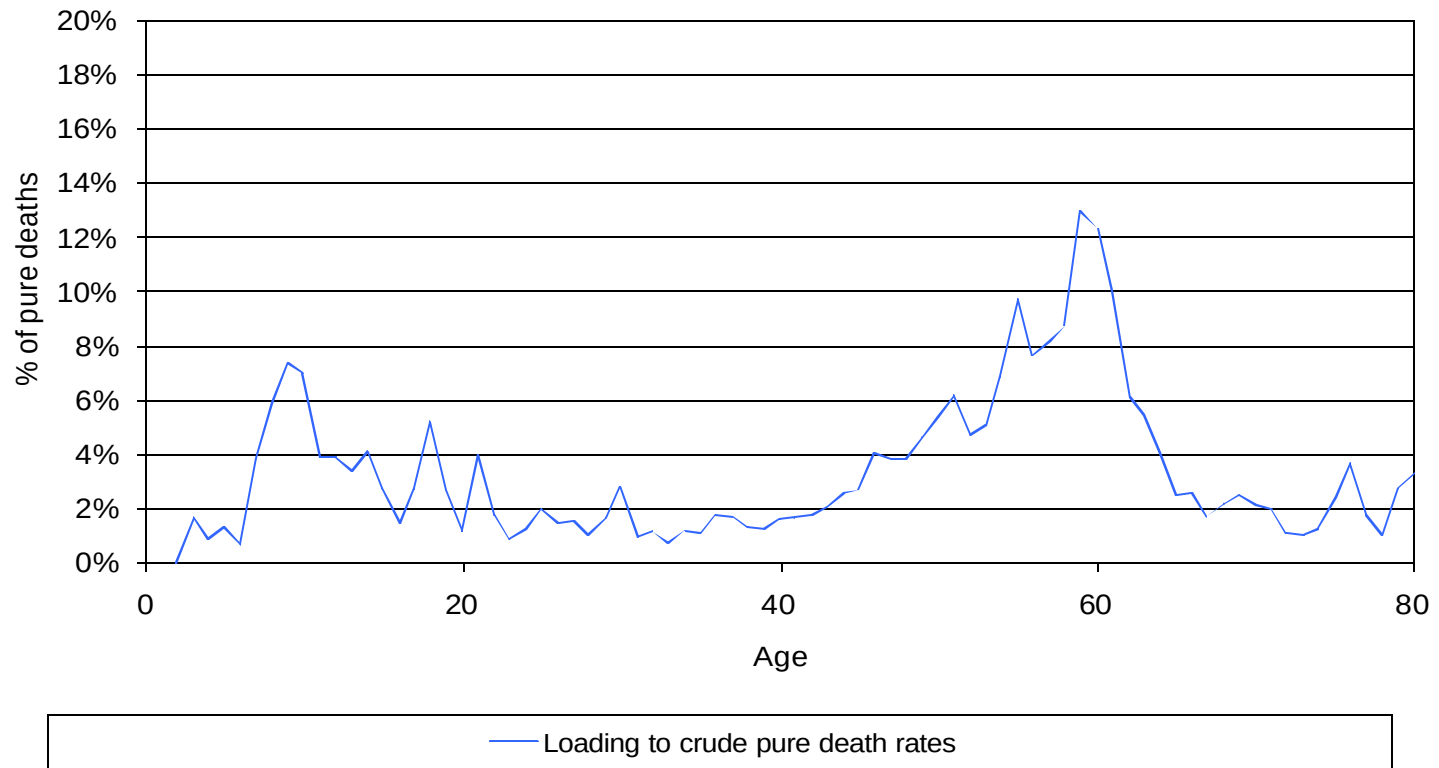
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Graduation Method



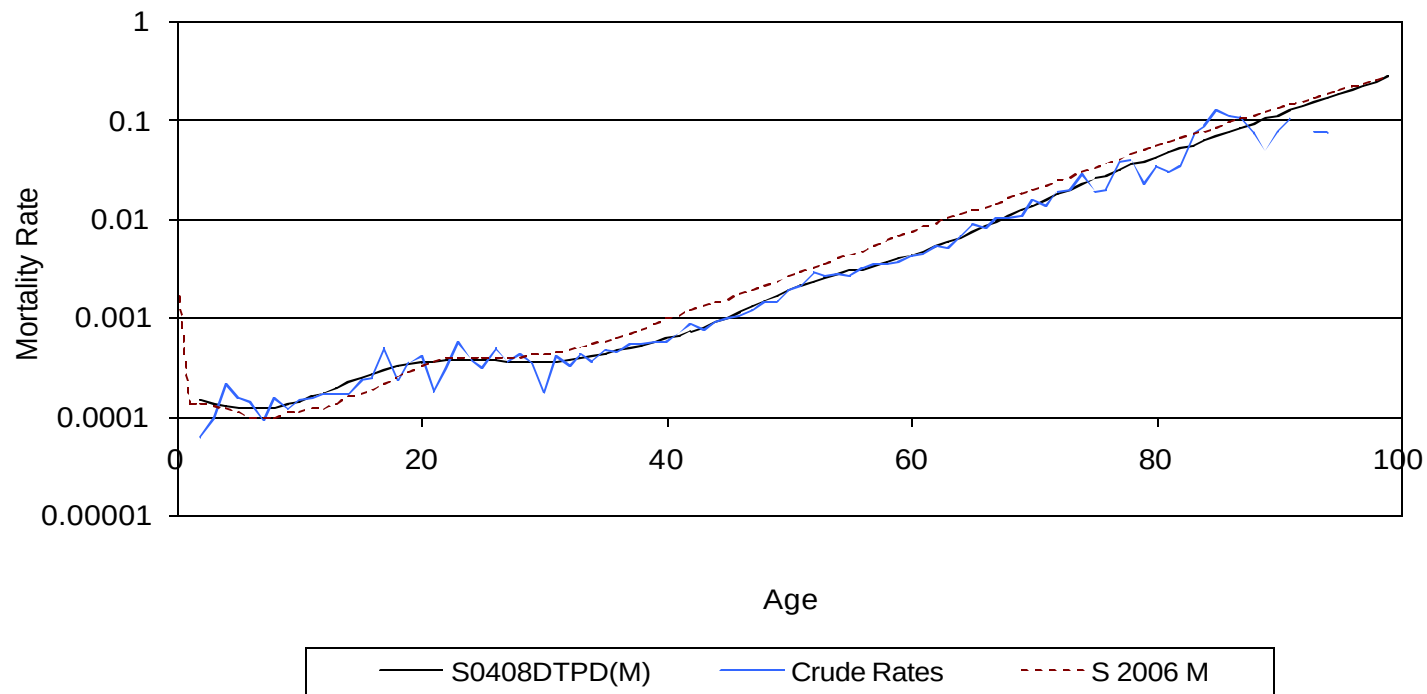
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Allowance for TPD



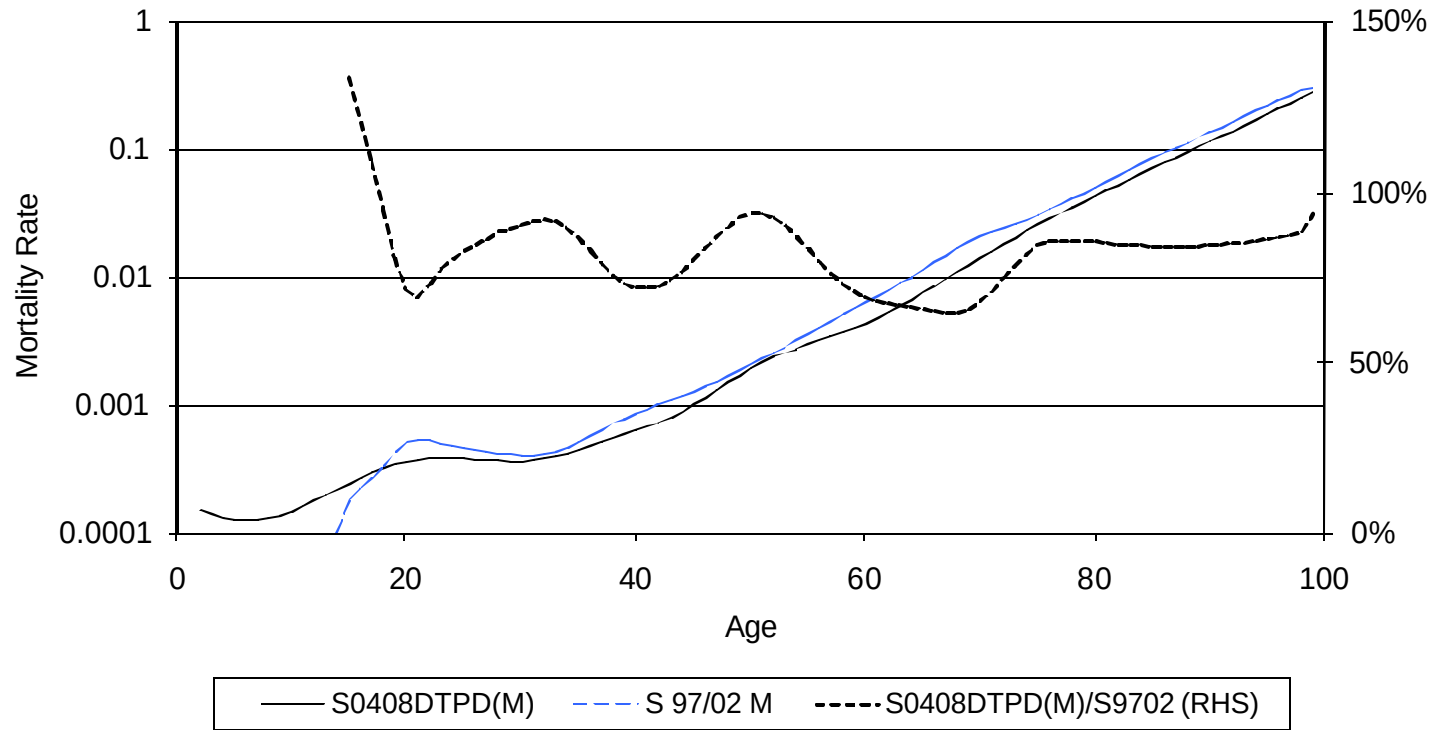
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Comparison with Crude and Popn.



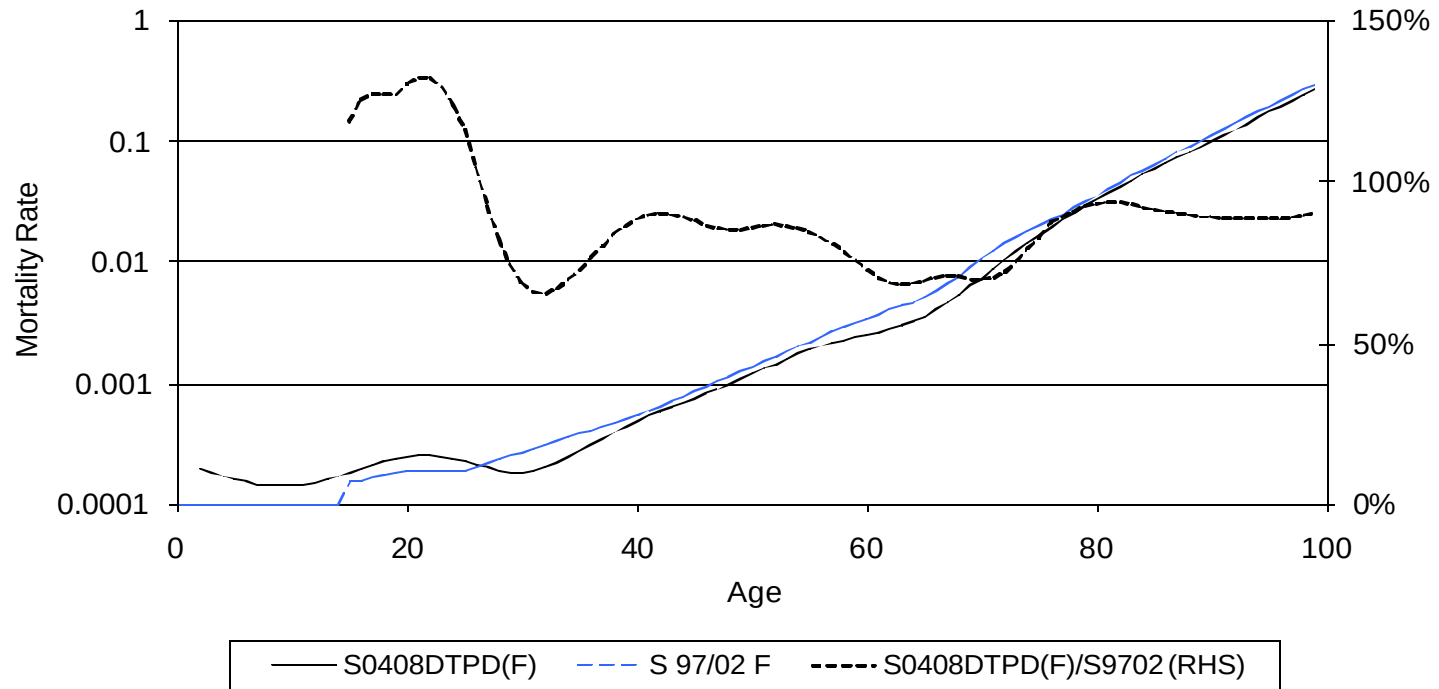
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Comparison with S9702M



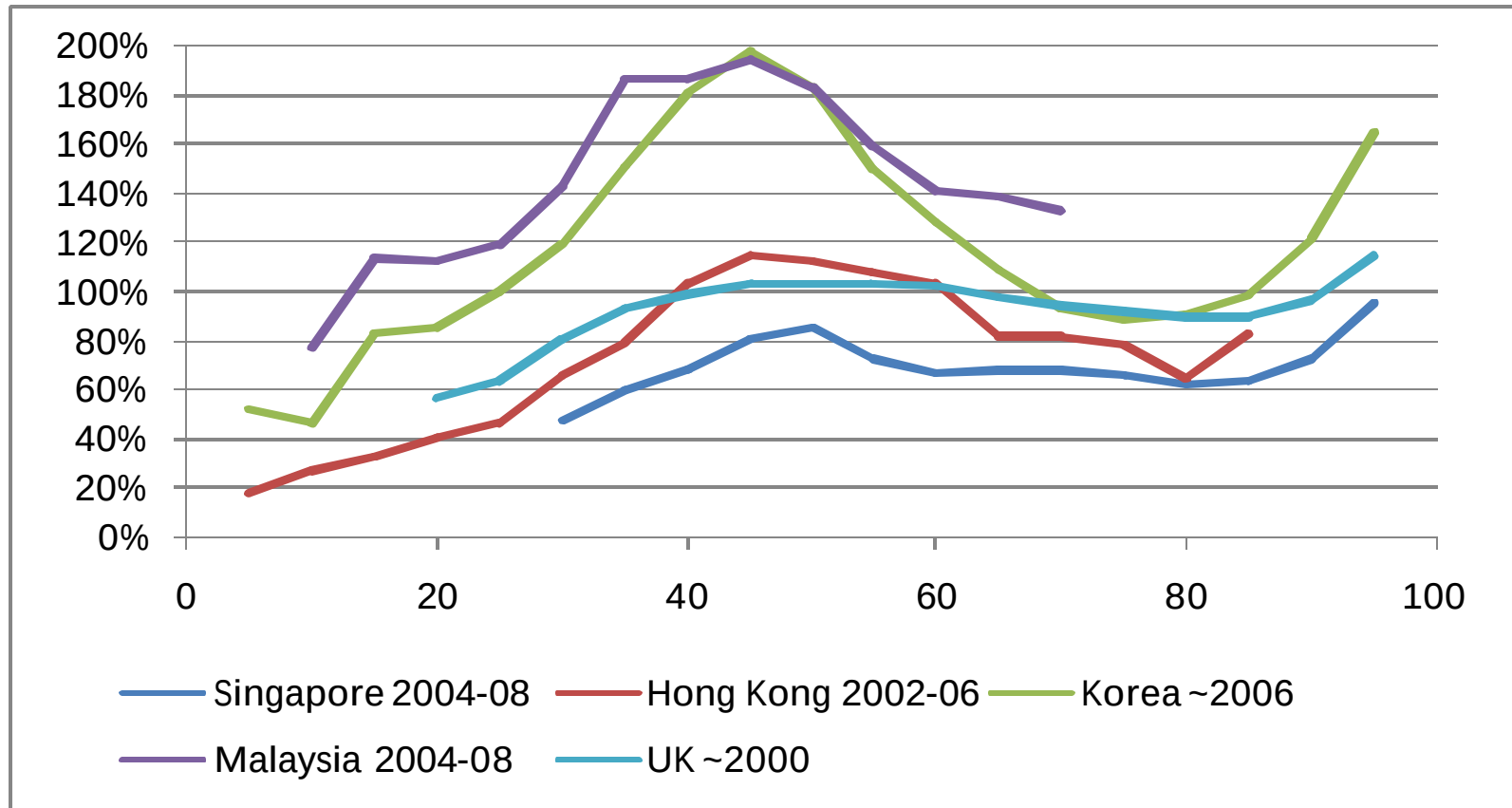
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Comparison with S9702F



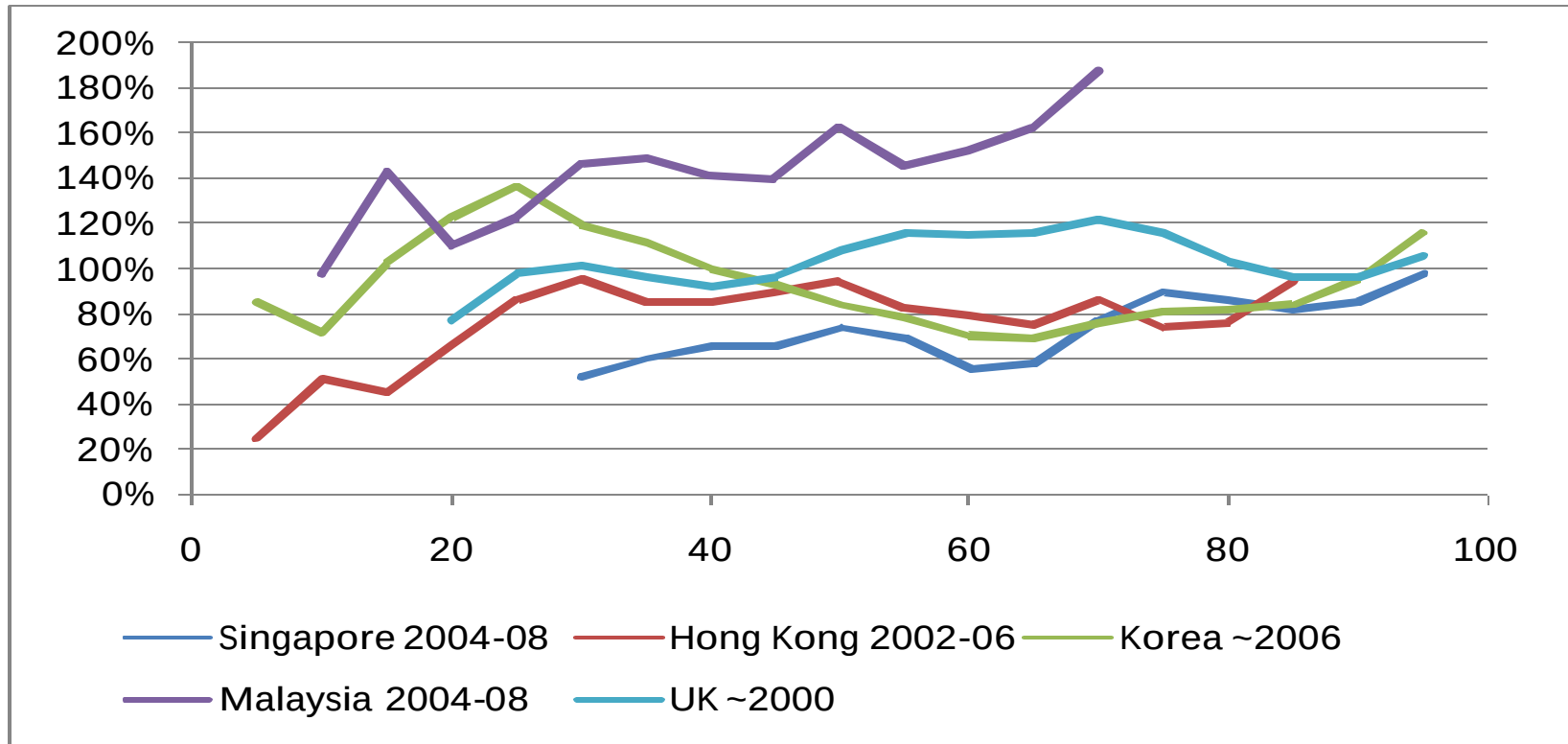
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Regional Comparison - Males



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Regional Comparison - Females



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QUESTIONS



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