




	THE SOCIETY OF ACTUARIES IN IRELAND
	Irish Critical Illness Experience
	1995-2000
	<p>Critical Illness Working Party</p> <p>Neil Guinan (Chair)</p> <p>Gareth Colgan</p> <p>Jeff Davies</p> <p>Alan Grant</p> <p>Tony Jeffery</p> <p>Steve Payne</p> <p>David Roberts</p>


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	Terms of Reference
	<p>► Compare the critical illness experience of insurance offices selling within the Republic of Ireland with relevant published tables and analyse the data for trends.</p> <p>► Determine whether the production of an Irish insured lives critical illness table is appropriate and if so, produce one.</p> <p>► Survey current reserving bases for critical illness of Irish insurers and make recommendations.</p>


	THE SOCIETY OF ACTUARIES IN IRELAND
	Contents
	<ol style="list-style-type: none"> 1. Executive Summary 2. How the group operated 3. Collection and analysis of the data for the CMIB investigation 4. IBNR and IBNS 5. All office results and commentary 6. Office by office analysis 7. Comparison of UK and Irish results 8. Qualification to results 9. Valuation survey results and recommendations on reserving 10. What next


	THE SOCIETY OF ACTUARIES IN IRELAND
	How the group operated
	<ul style="list-style-type: none"> ▶ Role of CMIB <ul style="list-style-type: none"> » Data cleaning processes » Calculation of claim rates subdivided by a range of factors » Comparison with standard tables (Both CIBT93 and IC94) ▶ Data Liaison Officer <ul style="list-style-type: none"> » Data follow up work » Contact point for individual office queries » Data checking » Office by office analysis ▶ Support of Offices


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	▶ Data Contributors	▶ Other Offices
	<ul style="list-style-type: none">» Acorn Life» Canada Life» Eagle Star» Friends First» Hibernian Life» Irish Life» Irish Progressive» Lifetime» New Ireland» Standard Life	<ul style="list-style-type: none">» Ark Life» Royal Liver» Scottish Provident ▶ Reinsurers <ul style="list-style-type: none">» GE Frankona Re» General & Cologne Re» Munich Re» Revios Re (Gerling)» RGA» Swiss Re

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	Validation of data
	<ul style="list-style-type: none"> ▶ Illegal coding ▶ Suspect field values which are considered unlikely to be valid ▶ Warning field values which may be invalid and should be checked

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	CMIB Investigation
	<ul style="list-style-type: none"> ‣ Exposure ‣ Date of Claim <ul style="list-style-type: none"> » Diagnosis, Notification, Admittance, Settlement ‣ Problems with Date of Diagnosis <ul style="list-style-type: none"> » Not submitted » Would require claims to reallocated to previous years » Not consistent between offices » Not easy to define for some causes e.g. TPD

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	CMIB Methodology
	<ul style="list-style-type: none"> ‣ Use the claims records submitted in respect of a particular year ‣ Calculate the age and duration of claim based on the diagnosis date, if supplied. ‣ If not supplied, the diagnosis date is estimated using the following algorithm: <ul style="list-style-type: none"> » Use date of settlement, if available, less 155 days. » Otherwise, use date of notification, if available, less 80 days. » Otherwise, use date of admission less 155 days. » The estimated date is set to the policy commencement date if it would otherwise precede it.

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	Problems with CMIB Methodology
	<ul style="list-style-type: none"> ‣ Claims diagnosed before the period are included ‣ Claims settled after the period are excluded ‣ Estimation of diagnosis date is crude




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Adjustments Required

Remove claims diagnosed prior to the investigation period

Estimate for IBNS



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IBNR & IBNS Delays

Table A4.1 - Analysis of notification delay by claim type

	Number	Mean	Standard Deviation	Median	Inter Quartile Range
Critical Illness	1,290	90	144	44	69
Death	165	52	78	24	49

Table 4.1 - Analysis of settlement delay by claim type

	Number	Mean	Standard Deviation	Median	Inter Quartile Range
Critical Illness	1,325	164	163	113	109
Death	207	158	147	109	141




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Settlement Delay by Cause

Table 4.2 - Analysis of settlement delay by claim type group

	Number	Mean	Standard Deviation	Median	Inter Quartile Range
Cancer	722	149	138	107	98
Heart Disease	271	161	180	101	95
Coronary Artery Bypass Graft	74	168	221	93	124
Multiple Sclerosis	62	206	156	162	154
Stroke	78	143	106	115	102
Other	118	249	218	163	197
Total	1,325	164	163	113	109

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	IBNS by Office			
	» Office	Mean	Median	Std Dev
	» 1	141	109	112
	» 2	151	98	159
	» 3	157	139	108
	» 4	163	105	202
	» 5	172	134	116
	» 6	183	116	203
	» 7	188	163	97
	» 8	194	147	116
	» 9	196	135	199

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IBNS Development Triangle

Table 4.8 – IBNS cumulative development triangle (numbers)


Sum of Count	Calendar Year						
Diagnosis Year	1	2	3	4	5	6	Grand Total
1995	38	76	82	85	86	87	87
1996	89	147	155	159	159		159
1997	138	252	262	266			266
1998	207	325	344				344
1999	232	409					409
2000	267						267
Grand Total	971	1,476	1,519	1,530	1,531	1,532	1,532

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IBNS Year on Year Ratios

Table 4.9 – IBNS development ratios (numbers)

Diagnosis Year	Calendar Year					
	1	2	3	4	5	6
1995		2.0000	1.0789	1.0366	1.0118	1.0116
1996		1.6517	1.0544	1.0258	1.0000	
1997		1.8261	1.0397	1.0153		
1998		1.5700	1.0585			
1999		1.7629				
2000						
Weighted Result		1.7173	1.0538	1.0220	1.0118	1.0116




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Aggregate Development Ratios

IBNS

Calendar Year	IBNS	% Settled
End Year 1 to ultimate	1.8930	53%
End Year 2 to ultimate	1.1023	91%
End Year 3 to ultimate	1.0461	96%
End Year 4 to ultimate	1.0235	98%
End Year 5 to ultimate	1.0116	99%
End Year 6 to ultimate	1.0000	100%




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Estimated Total Claims

Table 4.17 – Estimated total claims (numbers)

Year of Diagnosis	No of claims settled by 31.12.2000	No. of claims after prior period exclusions	Aggregate Development Ratio	Estimated total experience
1992	1	0	0.0000	0.00
1993	1	0	0.0000	0.00
1994	19	0	0.0000	0.00
1995	148	122	1.0000	122.00
1996	210	196	1.0116	198.28
1997	307	307	1.0235	314.22
1998	376	376	1.0461	393.33
1999	437	437	1.1023	481.71
2000	273	273	1.8930	516.80
TOTAL	1,772	1,711		2,026.35




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Adjustment Factors Example

Calculation of the adjustment factors for female Stand Alone claims

Year	A No of claims settled	B No of claims diagnosed	C No. of claims diagnosed after prior period exclusions	D Aggregate Development Ratio	E Expected total experience C x D	F Implied Adjustment Factor E / A
1995	3	15	11	1.0000	11.00	3.67
1996	23	33	28	1.0116	28.33	1.23
1997	47	50	50	1.0235	51.18	1.09
1998	63	64	64	1.0461	66.95	1.06
1999	82	100	100	1.1023	110.23	1.34
2000	94	50	50	1.8930	94.65	1.01
TOTAL	312	312	303		362.33	1.16


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Background to Results

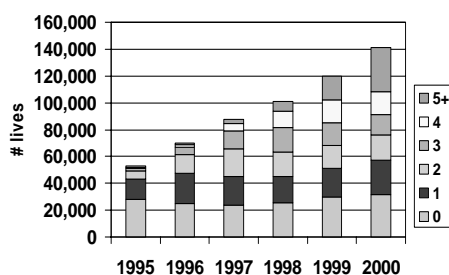
- ▶ Nearly 1.1m exposure years
- ▶ 1,772 claims
- ▶ 54% of exposure and 55% of claims are Accelerated
- ▶ Male lives account for 54% of Accelerated exposure, 57% for Stand Alone
- ▶ Smokers account for 27% of exposure
- ▶ 44% Direct Sales, 35% IFA, 28% Bancassurer, 3% Other




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Background to Results

▶ Exposure by calendar year and duration (Accelerated):

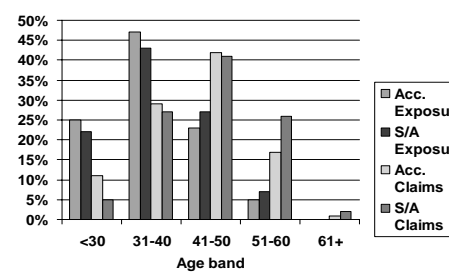




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Background to Results

▶ Distribution of claims and exposure by age:

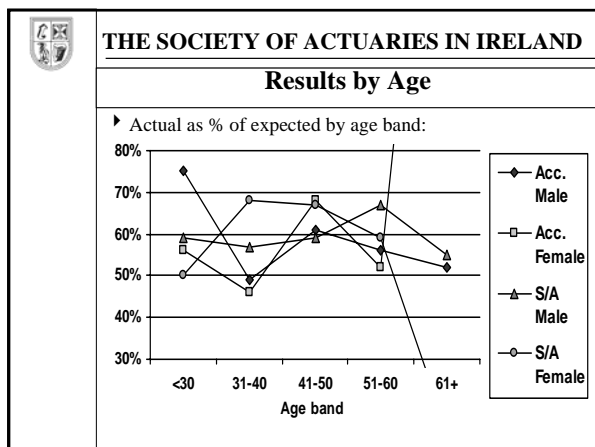



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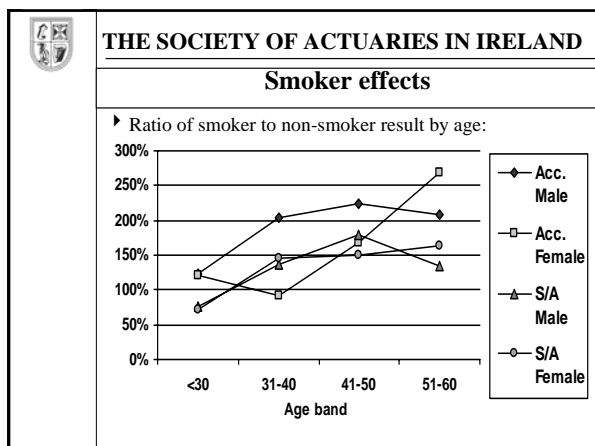
“The answer...”

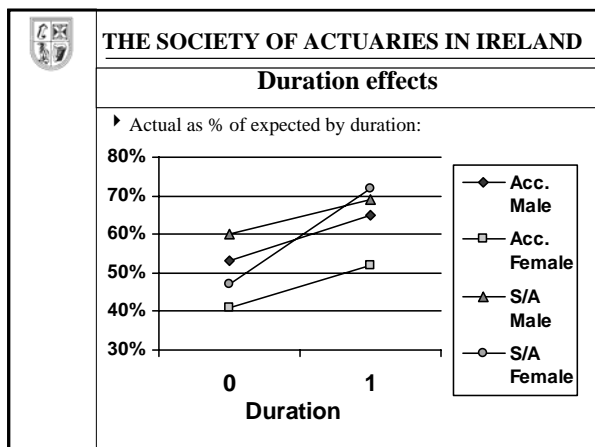
▶ Actual claims (Lives) as % of expected, based on CIBT93:

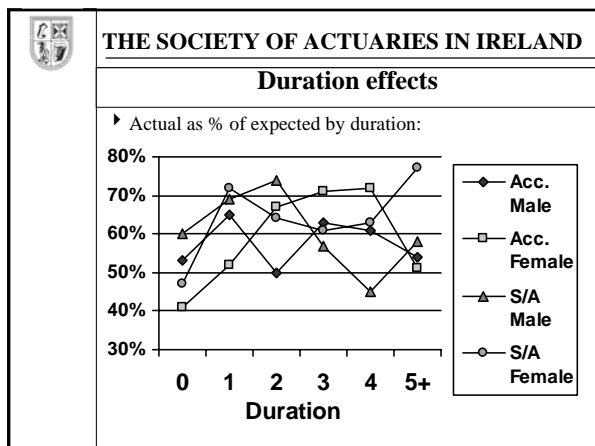
	Non-Smoker	Smoker	All
Acc. Male	46%	91%	57%
Acc. Female	52%	72%	57%
S/A Male	55%	80%	60%
S/A Female	57%	83%	64%

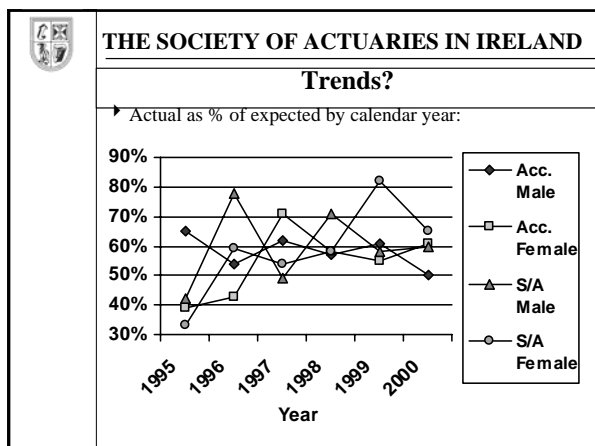


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	Smoker effects		
	▶ Ratio of smoker to non-smoker result:		
		Male	Female
	Acc. All Claims	197%	139%
	Acc. CI Claims only	180%	139%
	Stand Alone	145%	146%









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Distribution channel

► Actual as % of expected:

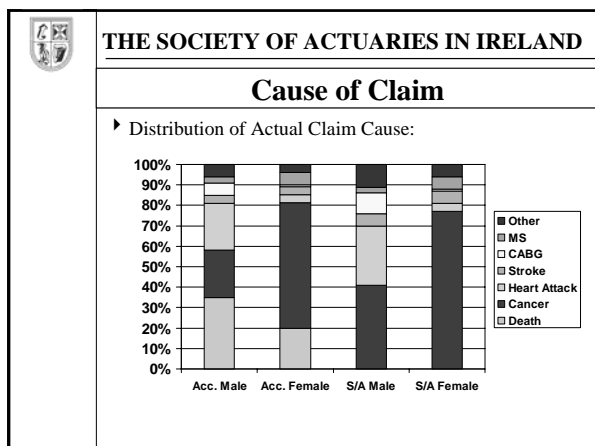
	Banc.	Direct	IFA	All
Acc. Male	51%	67%	51%	57%
Acc. Female	46%	64%	55%	57%
S/A Male	57%	70%	50%	60%
S/A Female	97%	57%	68%	64%

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Amounts Experience

► Amounts Results as % of Lives Result:

	Non-smoker	Smoker	All
Acc. Male	94%	98%	93%
Acc. Female	95%	113%	98%
S/A Male	91%	85%	89%
S/A Female	100%	88%	94%



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Cause of Claim


► A v E for individual causes


- » High (relative to overall result):
 - CABG (male)
 - MS (male, especially age <40)
 - Death (female, and male age < 30)
- » Low:
 - Stroke
 - Kidney failure
 - Major Organ Transplant
- » Very low:
 - TPD


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Cause of Claim


- Ratio of smoker to non-smoker results for major illnesses typically at least 180%
- Much higher in many cases, e.g. 250% for heart attack
- Cancer is the exception: overall about 115%
- Lung cancer experience much heavier for smokers, but not a major part of the overall cost


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	Comparison with IC94																					
	<p>▸ Actual claims (Lives) as % of expected, based on IC94:</p> <table> <tr> <th></th><th>Non-Smoker</th><th>Smoker</th><th>All</th></tr> <tr> <td>Acc. Male</td><td>80%</td><td>157%</td><td>98%</td></tr> <tr> <td>Acc. Female</td><td>76%</td><td>106%</td><td>83%</td></tr> <tr> <td>S/A Male</td><td>92%</td><td>133%</td><td>101%</td></tr> <tr> <td>S/A Female</td><td>88%</td><td>124%</td><td>96%</td></tr> </table>				Non-Smoker	Smoker	All	Acc. Male	80%	157%	98%	Acc. Female	76%	106%	83%	S/A Male	92%	133%	101%	S/A Female	88%	124%
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	Individual Offices - Exposure		
	<p>▸ Features that are consistent across most offices</p> <ul style="list-style-type: none"> » Male / female split » Smoker / non-smoker split » Average sum assured for males about 16% higher than for females » Average sum assured for non-smokers about 20% higher than for non-smokers <p>▸ Features that vary from office to office</p> <ul style="list-style-type: none"> » Distribution channel » Average sum assured (from £35k to £69k with average £42k) » Benefit type (from Accelerated only to mostly Stand Alone) 		

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	Individual Offices - Results		
	<p>▸ Results at office level highly variable due to amount of data</p> <p>▸ E.g. 60 for a typical office</p> <p>▸ No office with experience out of line</p> <p>▸ Results by cause consistent across offices</p>		

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	Comparison with UK data - Exposure
	<ul style="list-style-type: none"> ▸ UK results for years 1998 and 1999 from CMIB ▸ UK has much more Accelerated exposure (8 times higher for 1999) ▸ Stand Alone exposure is similar ▸ Similar male / female split ▸ Similar age profile ▸ Similar duration pattern ▸ UK has lower smoker proportion (about 20% of lives) ▸ Bancassurers more important in UK

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	Comparison with UK data - Results
	<ul style="list-style-type: none"> ▸ Compared results based on settlement year ▸ Growth rates are different, so comparison distorted ▸ Overall results suggest Irish experience heavier ▸ Accelerated non-smoker result for Ireland 15%-30% higher for both male and female ▸ More variable for smokers and for stand alone ▸ Looking at duration 0 in isolation, less clear that Irish experience is heavier

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	Qualifications to Results
	<ul style="list-style-type: none"> ▸ Limited data ▸ IBNS ▸ Definition of date of claim ▸ Rated lives ▸ Children's claims ▸ Critical illness definitions ▸ Type of business sold



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Valuation Survey Results

Table 9.1 – Basic critical illness valuation methodology

	2000	2003 Guaranteed	2003 Reviewable
Net Premium Valuation	3	2	-
Discounted Cash Flow	7	5	7
Both, depending on product type	2	-	1
Total	12	7	8

Table 9.2 – Sources of base morbidity rates

	2000	2003 Guaranteed	2003 Reviewable
IC94	8	5	2
Reinsurance Rates	2	2	6
Both IC94 and reinsurers' rates, depending on product	1	-	-
Rates charged to policyholders	1	-	-
Total	12	7	8



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Valuation Survey Results

Table 9.3 – Morbidity table valuation loadings

	IC94			Reinsurers' or Policyholder Rates		
	2000	2003 Guaranteed	2003 Reviewable	2000	2003 Guaranteed	2003 Reviewable
No loading	0	-	-	3	2	3
+10% to +20%	1	-	-	1	-	1
+30% to +35%	4	3	2	0	-	2
+50%	4	2	-	0	-	-
Total	9	5	2	4	2	6

Table 9.4 – Allowances for critical illness claims deterioration

	2000	2003 Guaranteed	2003 Reviewable
None	3	2	6
1.0% p.a.	1	1	1
1.5% p.a.	3	1	1
2.0% p.a.	4	2	-
3.0% p.a.	1	1	-
Total	12	7	8




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Reserving Suggestions

Table 9.5 – Suggested valuation critical illness table assumptions before variation margins

		Males		Females	
		Non-smoker	Smoker	Non-smoker	Smoker
CIBT 93	Accelerated	50%	95%	55%	75%
	Stand Alone	55%	80%	60%	85%
ICA 94	Accelerated	80%	160%	80%	110%
	Stand Alone	95%	135%	90%	125%

- Margin for variation (Factor X) – 25% to 35%
- Deterioration (Factor Y) – 1% to 3% p.a.
- Use of reinsurers' rates
- IBNR

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	Aggregate Development Ratios		
	IBNS		
	Calendar Year	IBNS	% Settled
	End Year 1 to ultimate	1.8930	53%
	End Year 2 to ultimate	1.1023	91%
	End Year 3 to ultimate	1.0461	96%
	End Year 4 to ultimate	1.0235	98%
	End Year 5 to ultimate	1.0116	99%
	End Year 6 to ultimate	1.0000	100%
	IBNR		
	Calendar Year	IBNR	% Notified
	End Year 1 to ultimate	1.3722	73%
	End Year 2 to ultimate	1.0688	94%
	End Year 3 to ultimate	1.0338	97%
	End Year 4 to ultimate	1.0235	98%
	End Year 5 to ultimate	1.0116	99%
	End Year 6 to ultimate	1.0000	100%

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	What Next?		
	<ul style="list-style-type: none"> ▶ Annual exercise <ul style="list-style-type: none"> » Level of data increasing » 2001 & 2002 data ▶ Trends analysis ▶ Insured lives table? 		
