

Critical Illness Primer

Part Two: An Overview of Foreign Critical Illness Claims Experience

by Johan L. Lotter

Critical Illness Insurance policies have been sold for over a decade in many countries. To date, there has been one published South African Experience Study, performed under the auspices of the Actuarial Society of South Africa and two major other efforts, one by a Working Party of the Society of Actuaries in Ireland and one by a British Study Group associated with the Institute of Actuaries in London.

The South African Study. (Actuarial Society Of South Africa,

Continuous Statistical Investigations Committee. Dread Disease Investigation 1991-1994)

The South African study was published in 1997 and was based on exposure during the years 1991-1994.

Although it is based on immature experience, the South African study appears to support the view that CI experience in that country has been substantially better than had been allowed for in product pricing.

Some key information relating to initial selection, obtained from the study, is furnished in Table A below:

Table A							
South African Critical Illness Investigation - 1997							
Policies with Critical Illness Riders. Rates are per 1,000 per annum							
Males Age Group	Duration 0			Duration 1+			Duration 0 as % of Duration 1+
	Claims	Exposure	Observed Rate	Claims	Exposure	Observed Rate	
20-24	6	49,367	0.122	15	55,676	0.269	45.1%
25-29	13	56,397	0.231	37	108,560	0.341	67.6%
30-34	16	45,222	0.354	76	117,433	0.647	54.7%
35-39	29	30,510	0.951	122	96,027	1.270	74.8%
40-44	39	18,466	2.112	168	67,498	2.489	84.9%
45-49	25	9,272	2.696	143	39,716	3.601	74.9%
50-54	14	3,493	4.008	115	18,267	6.296	63.7%
55+	6	682	8.798	56	6,188	9.050	97.2%
All	148	213,409	0.694	732	509,365	1.437	48.3%

The final column in Table A furnishes evidence that initial underwriting selection in South African portfolios was very efficient.

Society of Actuaries in Ireland Working Party. (“Reserving for Critical Illness Guarantees” by the Society of Actuaries in Ireland Working Party, 1994).

This important study was produced by the Irish Working Party. Their objective was to compile a valuation table for Critical Illness business written in Ireland. Tables B(M) (males) and B(F) (females) below furnish an extract from the resulting Irish Valuation Table (IC 94) and a comparison with the Dash and Grimshaw UK population Critical Illness incidence rates first published in 1990.

The columns headed “Calibration Ratio” express the IC94 Table as a percentage of the Dash & Grimshaw table. The Calibration Ratio furnishes the result that might have been obtained if one had applied a straightforward calibration to the Dash & Grimshaw population incidence rates using the Rate Calibration Formula. In reality, the Irish Working Party derived its IC94 table by calibrating an adapted version of the Dash & Grimshaw 1990 Population Incidence Rates.

Table B(F):
Critical Illness Incidence Rates Per 1,000 P.A.

Females	IC94 Table	D & G	Calibration
Age	1994 Total	1990	Ratio
20	0.347	0.210	165.2%
25	0.545	0.470	116.0%
30	0.819	0.840	97.5%
35	1.245	1.250	99.6%
40	1.895	2.040	92.9%
45	2.820	3.640	77.5%
50	3.991	5.940	67.2%
55	5.465	9.010	60.7%
60	7.726	12.760	60.5%
65	11.184	17.480	64.0%
70	15.527	25.460	61.0%
75	20.485	37.360	54.8%
80	26.666	44.810	59.5%

Table B(M):
Critical Illness Incidence Rates Per 1,000 P.A.

Males	IC94 Table	D & G	Calibration
Age	1994 Total	1990	Ratio
20	0.251	0.290	86.6%
25	0.317	0.430	73.7%
30	0.494	0.690	71.6%
35	0.899	1.260	71.3%
40	1.663	2.730	60.9%
45	2.889	5.620	51.4%
50	4.553	9.480	48.0%
55	6.715	14.160	47.4%
60	9.896	21.200	46.7%
65	14.602	30.540	47.8%
70	20.804	42.050	49.5%
75	28.377	56.730	50.0%
80	37.341	69.770	53.5%

Table B(M) furnishes ultimate rates for use in valuation of critical illness insurance liabilities pertaining to standard aggregate risks (smokers and non-smokers combined) in the UK. It also shows Dash & Grimshaw’s best estimates of 1990 UK population critical illness incidence rates for an epoch not very far removed from the Irish Table (IC94). Of particular interest is the sharp “notional” calibration from the population rate to the IC94 rate. At age 30, the male calibration factor is 71.6%. This means that calibration from population to insured lives (ultimate) yielded a discount of 28.4%. The discount becomes even larger at higher ages. At age 60, it is 53.3%. This is all the more remarkable, since the Dash & Grimshaw rates cover only heart attack, stroke, and cancer, while IC94 includes a number of other Critical Illness conditions.

A similar phenomenon is visible in the Female Table B(F), except at the very young ages, where it would appear that calibration from population to insured lives produces loadings, not discounts. At age 20, this loading amounts to an addition of 65.2%. This is possibly explained on the basis of the Dash & Grimshaw 1990 population cancer rates, which were based on official cancer numbers that were incorrectly compiled by the

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authorities. It is of interest to note that almost the entire Critical Illness risk for young females emanates from cancer; heart attacks and strokes among young women are very rare indeed.

Additionally, it might be argued that cancer risks are less susceptible to elimination by underwriting and are in their nature somewhat more like accident risks in the sense that cancer incidences are seldom presaged by morbid conditions of any kind. Thus, heavy calibration from population to insured lives for young females is not to be expected.

The UK 2000 Critical Review. (“A Critical Review. Report of the Critical Illness Healthcare Study Group”)

This important study was published by an official Study Group associated with the Institute of Actuaries and the Staple Inn Actuarial Society in London.

The Study Group’s original purpose was to produce tables on the basis of an insured lives experience. The study group found that available data was too sparse to enable fulfillment of this objective. Thus, the Study Group’s objective was modified to one of producing a Critical Illness Base Table (CIBT93) on the basis of population experience in the U.K.

The Study Group expressed the hope that the table would be found useful by practitioners who could calibrate the rates to apply to particular business portfolios within their distribution scope.

The CIBT93 tables are much more extensive than those produced by Dash & Grimshaw in 1990. The CIBT93 working party produced population Critical Illness incidence tables not only for cancer, heart attack and stroke, but also produced age and sex-specific rates for other Critical Illness conditions including organ transplant, kidney failure, multiple sclerosis, coronary bypass surgery, aorta graft surgery, and total and permanent disability.

In Table C(M) and Table C(F) below, we furnish a comparison of the CIBT93 Tables with those of Dash & Grimshaw. Since the Dash & Grimshaw rates were in respect of cancer, heart attack, and stroke only, we have extracted only these three conditions from the CIBT93 tables.

Table C(M):

Comparison of Dash & Grimshaw Population Critical Illness Incidence Rates and CIBT93 Table. (Annual rates per 1,000 males)

Age	Dash & Grimshaw (1990)				Critical Review 2000			
	1990 Cancer	1990 Heart	1990 Stroke	1990 Total	CIBT93 Cancer	CIBT93 Heart	CIBT93 Stroke	CIBT93 Total
20	0.190	-	0.100	0.290	0.216	0.008	0.078	0.302
25	0.240	0.030	0.160	0.430	0.308	0.027	0.113	0.448
30	0.340	0.180	0.170	0.690	0.414	0.092	0.152	0.658
35	0.460	0.580	0.220	1.260	0.566	0.322	0.251	1.139
40	0.760	1.640	0.330	2.730	0.888	0.880	0.449	2.217
45	1.340	3.740	0.540	5.620	1.498	1.604	0.597	3.699
50	2.460	6.030	0.990	9.480	2.767	2.529	1.078	6.374
55	4.550	7.820	1.790	14.160	4.784	3.875	1.647	10.306
60	7.910	9.990	3.300	21.200	8.133	5.265	2.693	16.091
65	12.150	12.610	5.780	30.540	13.568	6.605	3.544	23.717
70	17.880	13.980	10.190	42.050	20.157	7.929	4.781	32.867
75	23.870	15.180	17.680	56.730	27.086	9.706	7.473	44.265
80	29.360	15.370	25.040	69.770	34.301	11.101	9.992	55.394

Table C(F):
Comparison of Dash & Grimshaw Population Critical Illness Incidence Rates and CIBT93 Table. (Annual rates per 1,000 females)

Age	Dash & Grimshaw (1990)				Critical Review 2000			
	1990 Cancer	1990 Heart	1990 Stroke	1990 Total	CIBT93 Cancer	CIBT93 Heart	CIBT93 Stroke	CIBT93 Total
20	0.150	-	0.060	0.210	0.210	0.002	0.097	0.309
25	0.300	0.010	0.160	0.470	0.352	0.005	0.141	0.498
30	0.600	0.060	0.180	0.840	0.651	0.021	0.187	0.859
35	0.990	0.160	0.100	1.250	1.154	0.063	0.265	1.482
40	1.580	0.370	0.090	2.040	1.873	0.125	0.431	2.429
45	2.470	0.820	0.350	3.640	2.982	0.259	0.531	3.772
50	3.550	1.610	0.780	5.940	4.525	0.475	0.801	5.801
55	5.000	2.650	1.360	9.010	6.188	0.934	1.090	8.212
60	6.570	3.760	2.430	12.760	8.285	1.692	1.666	11.643
65	8.220	4.970	4.290	17.480	10.259	2.623	2.262	15.144
70	10.220	7.230	8.010	25.460	12.401	3.731	3.148	19.280
75	12.090	9.570	15.700	37.360	14.785	5.311	5.191	25.287
80	14.140	10.610	20.060	44.810	17.133	6.804	7.866	31.803

The CIBT93 rates are generally lower than the Dash & Grimshaw rates, except for women under age 40. Problems with official cancer reporting provided to Dash & Grimshaw were alluded to earlier and may be the reason for this deviation.

Overall, it seems as if the Dash & Grimshaw Critical Illness incidence rates for men and older women may have been somewhat conservative.

The Working party that produced the CIBT93 table also found that insured experience seemed to justify a high population to insured lives calibration discount and also indicated that initial selection was a powerful force in ameliorating early Critical Illness claims experience. Table D below summarizes their findings in respect of male aggregate policies with Critical Illness Rider.

Table D

UK Critical Illness Investigation 1991 - 1997
Policies With Dread Disease Riders Critical Illness Claims Only
Ratio of Actual Experience to CIBT93

Aggregate Males Age Group	Duration 0 %	Duration 1 %	Duration 2+ %	All Durations %	Duration 0 as % of Duration 2+ %
Up to 30	32%	67%	63%	53%	51%
31-40	37%	48%	59%	51%	63%
41-50	27%	40%	53%	45%	51%
51-60	28%	48%	54%	48%	52%
over 60	39%	48%	54%	51%	72%
All	31%	46%	55%	48%	56%

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The first four columns of percentages show average calibration effects for the British experience against their new population table, CIBT93. The last column shows the clear beneficial effect of initial selection, even in a portfolio where really "ultimate" risks are "practically absent."

The Critical Illness Healthcare Study Group concluded that the beneficial effects of initial selection were markedly demonstrated by the experience data, that earlier concerns about anti-selection seemed to have been exaggerated, that combined general experience had followed an improving trend against the calibrating table until 1996 with a possible slight worsening in 1997.

The Study Group noted that the ultimate experience was still in development because so much of the exposure was still immature. This lack of maturity may account for the finding that smoker/non-smoker differentials were smaller than generally found in life insurance investigations. Finally, the Study Group commented on the considerable variation in experience between insurance companies, which could be somewhat correlated with

differences in underwriting that are typical of differences in distribution channels.

Conclusions.

The technical and market evolution of Critical Illness Insurance in foreign markets is continuing apace, with all-around positive developments in actual experience as compared to expected experience. The theoretical models first published by Dash & Grimshaw have held up in the market place.

In the United States, product development lags behind the rest of the developed world, hamstrung by structural factors described elsewhere in this Primer.

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Actuarial Partners Inc. reviewed it. Part One of this Primer was published in Health Section News of December 2000. Part One of this Primer can be downloaded from the Web site of Lotter Actuarial Partners Inc. at www.lotteract.com

References.

- 1) "Dread Disease Cover — An Actuarial Perspective" by Alison Dash and David Grimshaw (1990)
- 2) "Reserving for Critical Illness Guarantees" by the Society of Actuaries in Ireland Working Party, 1994.
- 3) Actuarial Society Of South Africa, Continuous Statistical Investigations Committee. Dread Disease Investigation 1991-1994.
- 4) "A Critical Review. Report of the Critical Illness Healthcare Study Group" (Dinani et. al.) presented to the Staple Inn Actuarial Society in March, 2000.

Erratum to the December 2000 Health Section News

Please note the following correction to the article "What No One Ever Told Me About the Rate Filing Process" by Karl G. Volkmar, which appeared in the December 2000 edition of the *Health Section News*. An error occurred during the production process of the newsletter. The Health Section Council extends our apologies to our readers and to Karl Volkmar for any inconvenience this error has caused.

The section "Simplicity Versus Complexity" should read:

Simplicity Versus Complexity

As an actuary without much practical experience, my inclination was to believe that: a) the more time I put into developing and creating a rate increase filing; b) the more thorough and complete the actuarial memo and the underlying actuarial work; and, c) the more I research and try to anticipate state-specific filing requirements, the faster the filing and approval process should be. My initial response, in retrospect, is that this is generally not true. The following outlines a couple of reasons: a) In some cases, the more information you provide (even if it's not material to the filing), the more questions are generated; and, b) The regulations for a given state can change or be applied differently year-to-year, company-to-company, etc., depending on who reviews the filing, their interpretations of the regulations, etc.

In my experience, the easier a filing is to walk through and explain, the easier the approval process will be. Obviously, we need to be thorough; however, it is usually in the company's best interest to be thorough without being unnecessarily complicated or providing unnecessary detail.