CIBT93 and its use for pricing and valuation of Indian morbidity risks

By: Andres Webersinke

1 Introduction

With letter dated 31st December 2004 the Actuarial Society of India (ASI) advised Appointed Actuaries that with respect to incidence rates and morbidity assumptions, the CIBT93 (Critical Illness Basic Table 1993) as outlined in the Staple Inn Actuarial Society paper "A Critical Review" should be used as base rates and any modification or adjustment made to these base rates should be justified for the purposes such as pricing of products and other purposes. The adoption shall be with effect of 1st January 2005. Further, CIBT93 shall constitute 'Published Tables' within the meaning of Regulation 4 of IRDA Regulations 2000.

The latter refers to valuation parameters which are commonly based on the insurer's or industry's experience studies. For most, if not all, morbidity risk products sold in India no such data is currently available and thus the pricing bases used for pricing the products would be seen as suitable valuation parameters. For morbidity risks the published table (mentioned above) shall be used unless the insurer has constructed a separate table based on own experience. If justifiable, less than 100% of the table can be used.

Consequently, the published table CIBT93 has a significant impact on pricing and reserving of morbidity risks in India. In other words, the Appointed Actuary has to be familiar with the CIBT93 to determine the extent the table is indeed suitable or, better, unsuitable for pricing and reserving morbidity risks sold in India.

This paper tries to offer a brief review of the (un)suitability of CIBT93 for pricing typical Critical Illness (CI) plans sold in India as well as a broad concept of adjustments necessary for the pricing and valuation of CI risks.

2 Recommendation of CIBT93 as a published table

In the absence of credible local data for pricing morbidity risks in India, the Morbidity Experience Committee of the ASI recommended in November 2004 the use of the CIBT93 Table as a reference point that can be used as a benchmark by insurers and the regulator. However, the committee stated that the very same table would be inappropriate for pricing and is recommended purely for the purpose of benchmark comparisons.

The committee highlighted its concern that the setting of a benchmark table in itself could be perceived as attaching credibility to that benchmark table which the committee felt is not justified.

A number of reasons are listed why experience in India will differ significantly from CIBT93. To name a few:

- different disease pattern amongst different populations,
- medical advancement since the early nineties (the time period the table relates to) result in changing detection and treatment methods,
- CIBT93 is a population table rather than an insured lives table, and

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- underwriting and claims management abilities and the effect positive and negative selection may have.[1]

3 The use of CIBT93 for pricing Critical Illness insurance in India

Whereas the Morbidity Experience Committee suggests that CIBT93 cannot be a credible pricing basis of a CI risk in India, the fact that it could be justified as a valuation basis may, in the absence of local population or insured lives data, give it a higher degree of reliability than it ought to have. The following shall further support this statement and provide input into how significantly different the pricing of an Indian CI risk can be when compared with CIBT93.

Both pricing and product design of CI products sold in all main CI markets (UK, Ireland, Australia, South Africa and Asia) advanced tremendously over a relative short time-span of 20 years.

Once the original idea of a lump sum payment upon diagnosis of a severe disease was embraced, reinsurers provided assistance in pricing and product design wherever the product was newly introduced. Initial pricing was often based on data from other countries where credible hospitalisation data was available. However, adjustments were made to reflect regional differences. Adjustments were mostly based on 'cause of death' statistics. It should be stressed that this methodology worked fine for most markets as the process was done with a good sense of prudence. However, the same approach and use of 'cause of death' statistics may not be a reasonable approach for pricing the CI risk in India where the population is extremely heterogeneous with many deaths due to communicable, maternal and perinatal deaths as shown in the following table. The general population may not be a good predictor for insured lives.

Table 1: Relative proportion of cause of death based on age-standardised mortality rates[i]

	Communicable[1]	Injuries	Cancer	CVD + DM[2]
India	33%	9%	8%	35%
Singapore	13%	5%	28%	41%
UK	11%	5%	28%	36%

Looking back only 10 years, new business sold was based on considerably different premium rates and policy wording.

In many cases premium rates reduced for some time but, more recently, increased in a number of markets. And where they did not change much on an overall basis, at least the shape changed due to actual experience or trends in the diagnosis of diseases.

Policy wording – mostly guaranteed for the entire duration of a policy – also changed. In particular the claims eligibility criteria (definitions of the covered disease and events) are

[1] Communicable, maternal, perinatal, nutritional deficiencies
[2] Cardiovascular diseases and diabetes mellitus

regularly reviewed to ensure that the definitions are clear, precise, applicable, and, increasingly, "future-proof".

The above indicates that the pricing of a CI risk must be seen as a holistic exercise of all parties involved in the risk management process. Unlike the mortality risk, the morbidity risk is exposed to frequent and on-going changes. Past experience, expected future trends, medical advances in diagnostic techniques, and clarity of policy wording all impact the pricing and reserving of a CI risk. A table such as CIBT93 cannot appropriately reflect the changes over the past decade nor be a representative table for Indian risks.

4 CIBT93 in comparison to actual experience

CIBT93 is based on population of England data – not of UK data. The authors of the paper "A Critical Review"[ii] state, "it is not expected that the experience under UK policies will follow the rates in the Base Table. … [*but that*] the Base Table will nevertheless provide a useful standard against which the insured lives experience can be compared".

4.1 UK experience vs. CIBT93

The paper "A Critical Review" provides a comparison of UK experience (from varying companies) with CIBT93. The experience refers to the years 1991-97.

Accordingly, experience for acceleration CI benefits is around 55% of CIBT93 for males (policy duration 2+) – same by amounts and by count – and around 45% of CIBT93 for females. A positive initial selection effect has been observed.

Table 2: 1991-97 UK aggregate experience by lives in % of CIBT93 – acceleration CI only, males

	Duration 0	Duration 1	Duration 2+	All Durations
Age				
Under 31	32%	67%	63%	53%
31-40	37%	48%	59%	51%
41-50	27%	40%	53%	45%
51-60	28%	48%	54%	48%
Over 60	39%	48%	54%	51%
Total	31%	46%	55%	48%

Table 3: 1991-97 UK aggregate experience by lives in % of CIBT93 – acceleration CI only, females

	Duration 0	Duration 1	Duration 2+	All Durations
Age				
Under 31	24%	41%	63%	43%
31-40	28%	41%	49%	42%
41-50	35%	43%	44%	42%
51-60	21%	43%	39%	37%
Over 60	24%	42%	34%	34%
Total	29%	42%	45%	41%

Experience, however, differs substantially by sales channel. Experience from direct sales force (DSF) is about 15% higher in comparison to the overall experience which is heavily weighted towards DSF.

The Continuous Mortality Investigation (CMI) Bureau reviewed subsequent periods. A considerable share of all claims submitted to the CMI for review did not show 'date of diagnosis' of the covered disease or event but instead 'date of settlement'. The CMI estimates that about 20% of all claims diagnosed in the period 1999-2002 were settled after 2002. The data so adjusted shows that overall experience in the UK worsened from 1991-97 to the period 1999-2002.

Table 4: UK aggregate (draft) experience by lives in % of CIBT93 – acceleration CI and death, all ages, all durations

	1991-97	adj. 1999-2002[iii]
Male	46%	50%
Female	43%	54%

In particular female experience worsened. The increase from 43% to 54% represents a 25% worsening. The comparison should be interpreted with care as the composition of companies contributing to the various periods changed (32 offices took part in the 1991-97 survey but only 16 in the subsequent period). Interesting to note is that despite the reducing share of exposure from direct sales forces, experience worsened. Part of the worsening can be attributed to a slight increase in average duration.

Experience by cause provides interesting information on differences between the general population and insured lives and/or where a positive selection effect due to underwriting can be expected.

Table 5: 1991-97 UK aggregate experience by cause of claim in % of CIBT93

	Cancer	Heart Attack	CABG	Stroke	Kidney Failure
Males	59%	54%	69%	29%	36%
Females	52%	20%	52%	20%	25%

For all core diseases/events covered under a CI plan, cancer experience will be closer to general population experience due to the limited risk factors known to the underwriters when applying for a policy. Hence it is surprising to see that the coronary artery disease experience for males is at a similar level of cancer.

4.2 Irish experience vs. CIBT93

The Critical Illness Working Party of the Society of Actuaries in Ireland published Irish CI experience for the period 1995-2000.[iv]

Table 6: 1995-2000 Irish aggregate adjusted[3] experience by lives in % of CIBT93 – acceleration CI only, males

	All Durations
Age	
Under 31	63%
31-40	47%
41-50	60%
51-60	61%
Over 60	34%
Total	56%

Table 7: 1995-2000 Irish aggregate adjusted experience by lives in % of CIBT93 – acceleration CI only, females

	All Durations
Age	
Under 31	54%
31-40	44%
41-50	66%
51-60	44%
Over 60	182%[4]
Total	54%

[3] Data is adjusted for incurred but not settled claims

Experience in Ireland is heavier although the comparison is made for slightly different periods. As in the UK, experience by distribution channel suggests that experience from direct sales force is heavier.

Experience by amount is lighter but by less than 10%, i.e. the positive effect associated with higher sums assured due to more stringent underwriting and sales to higher socio-economic groups is somewhat low.

Experience by cause is shown in the following table.

Table 8: 1995-2000 Irish aggregate experience by cause of claim in % of CIBT93 – acceleration claims only

	Cancer	Heart Attack	CABG	Stroke	Kidney Failure
Males	51%	64%	100%	20%	9%
Females	62%	50%	55%	19%	0%

In comparison to the UK data the coronary artery disease risk is higher in general but this is particularly noteworthy for females.

4.3 Asian experience vs. CIBT93

Gen Re's regular Critical Illness survey[v] covers claims incurred in Singapore, Malaysia and Hong Kong. The last survey was published in 2003 covering the period 1996-2000. In South-East Asia many CI plans cover more than 30 diseases and events but not Total and Permanent Disability (TPD). CIBT93 includes TPD but otherwise only 7 core events and diseases. A comparison is, nevertheless, appropriate, as the core diseases and events constitute at least 90% of all claims in the age group 20-60. TPD incidence rates incorporated in CIBT93 is comparable with the sum of the experience for all other causes – at least on an overall basis.

[4] fewer than 10 claims

The following tables show the different experience for Malaysia and Singapore in comparison to CIBT93.

Table 9: 1996-2000 Asian aggregate experience (durations 2+) by lives in % of CIBT93[5] – acceleration CI only, males

	Singapore	Malaysia
Age		
20-29	41%	46%
30-39	48%	52%
40-49	43%	49%
50-60	51%	42%
Total	46%	48%

Table 10: 1996-2000 Asian aggregate experience (durations 2+) by lives in % of CIBT93 – acceleration CI only, females

	Singapore	Malaysia
Age		
20-29	36%	34%
30-39	56%	51%
40-49	67%	49%
50-60	60%	35%
Total	60%	45%

Although neighbouring countries, experience in both Malaysia and Singapore are markedly different. Whereas experience for males is overall similar, experience for females in Malaysia is around a quarter lighter than in Singapore. In comparison to Irish and UK experience it is noteworthy that experience is lighter for Asians at younger ages. The experience amongst Singaporean males is particularly light for the age group 40-49. In contrast, experience amongst Singaporean females at the same age group is significantly heavier.

On an overall basis, however, it is worth noting that experience for males in the various territories (Ireland, UK, Singapore and Malaysia) is within narrow bands. Experience ranges between 51% and 56% of CIBT93. For females the range is with 45% to 65% substantially wider. No further firm conclusions should be drawn from this comparison as Irish experience, for example, is based on all durations and, in general, experience is still heavily weighted towards earlier durations. In addition, experience differs more significantly for different age groups. Recent UK findings, too, suggest that the 1991-97 experience is far lighter than current UK experience.

A break-down by cause of claim provides the following comparison:

Table 11: 1996-2000 Asian aggregate experience (durations 2+) by cause in % of CIBT93 Base Table – acceleration CI only

	Cancer	Heart Attack	CABG	Stroke	Kidney Failure
Males - Singapore	51%	42%	6%	25%	74%
Males - Malaysia	48%	40%	95%	25%	117%
Females - Singapore	80%	25%	7%	22%	155%
Females - Malaysia	57%	16%	30%	10%	103%

For males a comparison with UK and Irish experience shows that cancer rates in Singapore and Malaysia are on a comparable level, whereas experience for coronary artery diseases, which make up a high proportion of the overall premium for the exposed age groups, is more favourable in the Asian countries. As expected, kidney failure amongst the surveyed Asian populations is well above the UK or Irish experience – although from a low basis.

Amongst females, Singapore experiences a very high cancer rate. A higher detection rate of female cancers may be responsible for this heavy experience. In Singapore the reach of population screening programmes for cancer of female sites may be more successful than in other countries with rural areas.

5 Disease pattern by ethnic origin

It is well documented that the disease pattern amongst South-Asian, Chinese and Western European populations is considerably different. Prevalence of diabetes as well as insulin resistance is rapidly increasing – in particular amongst the urban population of India.

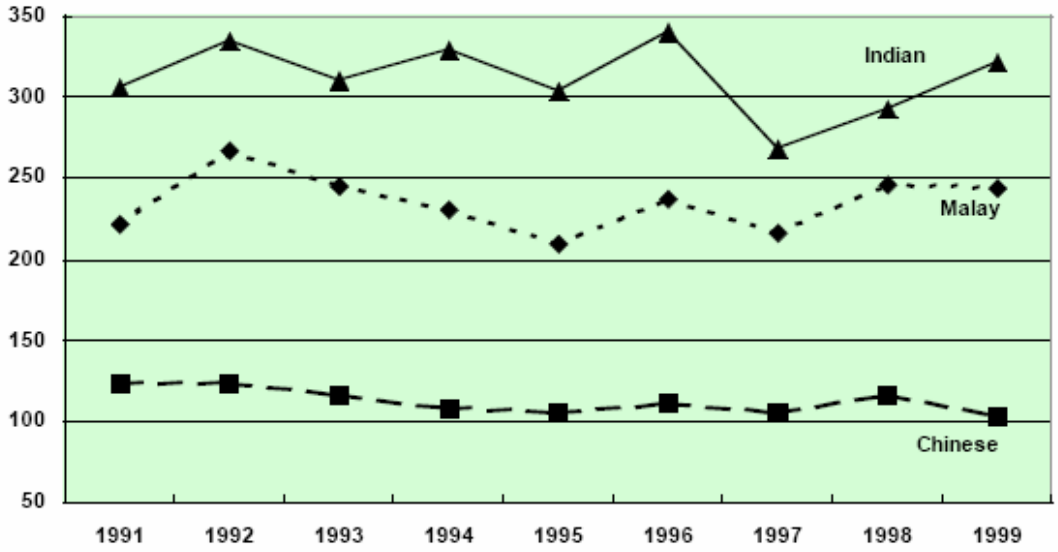
At last year's Global Conference of Actuaries a paper called "Mortality Associated with Diabetes"[vi] was presented stating that amongst 11 Asian cohorts, Indians had the highest prevalence of Type-2 diabetes, which peaked approximately 10 years younger than the other groups studied, and, in contrast to mainly Caucasian countries, the burden of diabetes does not fall in the age group over 65 but the economically active age range of 45-65.

Diabetes is a strong risk factor for various cardiovascular diseases such as heat attack and stroke and may also cause kidney failure, blindness and 'loss of limb'.

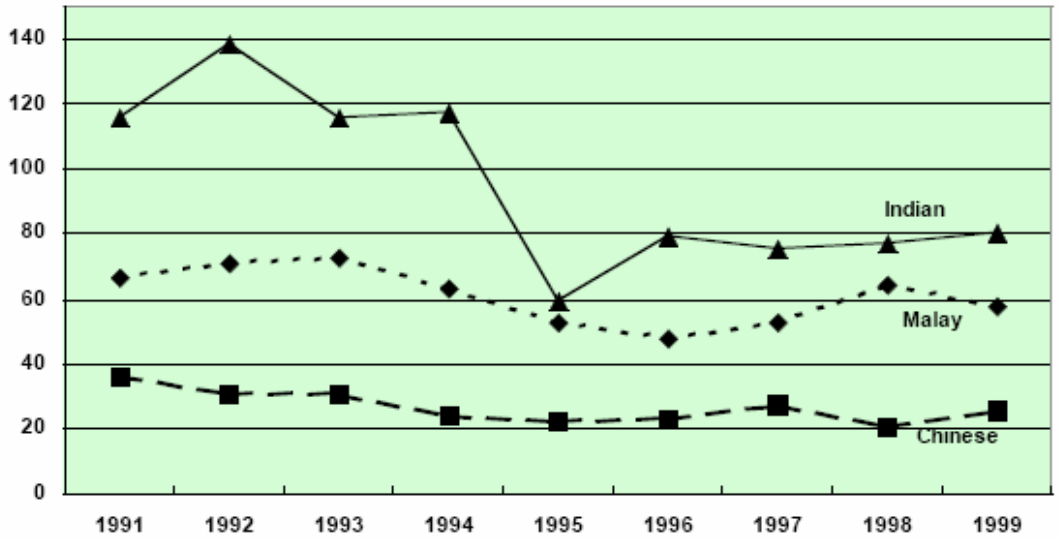
[5] Comparison of actual CI claims experience versus stand-alone incidence rates (Base Table)

The following graphs[vii] visualise the rates of new cases of heart attacks by ethnic groups among Singaporeans aged 20 – 64 years.

Graph 1: Age-standardised myocardial infarction event rate per 100,000 male Singapore residents by ethnic origin (ages 20-64)



Graph 2: Age-standardised myocardial infarction event rate per 100,000 female Singapore residents by ethnic origin (ages 20-64)



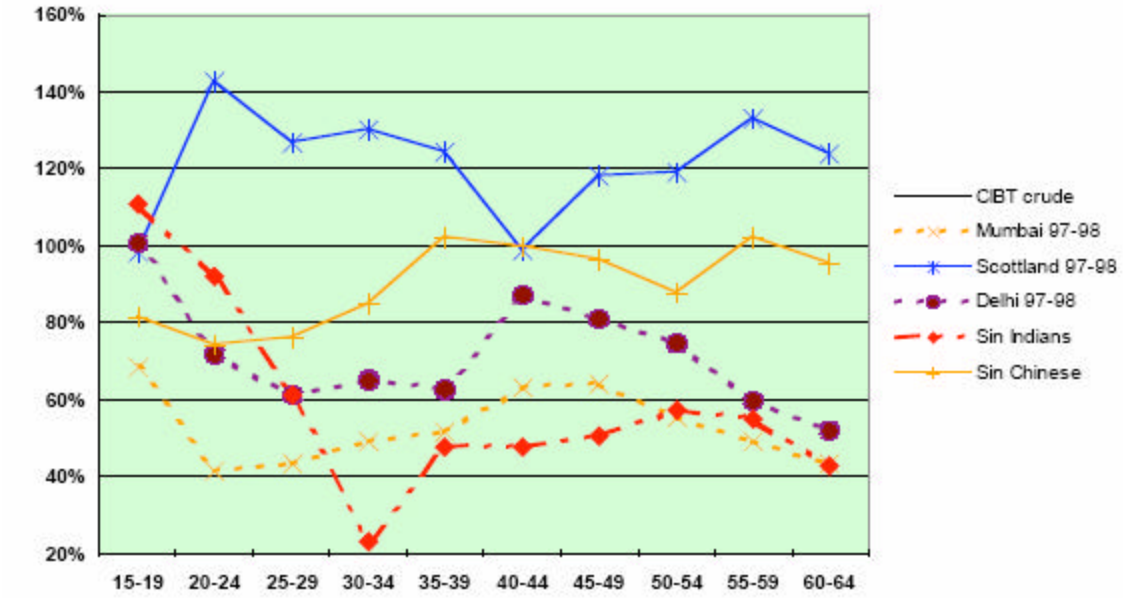
For both males and females the incidence rate of a heart attack amongst Singaporeans of Indian origin is about 3 times as high as that for Chinese. For females the relative risk is even higher. The value of underwriting is thus of particular importance in India as the

assessment of known risk factors at underwriting stage can reduce the insurer's risk substantially.

On the other hand, cancer often does not present itself with risk factors which could be assessed at underwriting stage. Indians, however, have a more favourable cancer risk. Cancer rates in India are lower than those in Western countries, but are rising with increasing migration or rural population to the cities and changes in lifestyles. In India, rates for oral and oesophageal cancers are some of the highest in the world. In contrast, the rates for colorectal and lung cancers are on of the lowest.[viii]

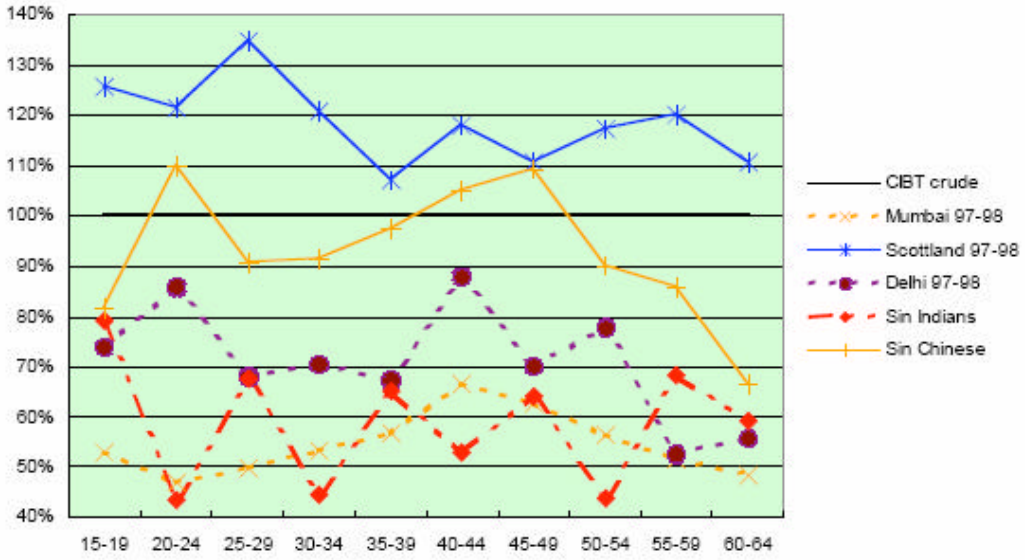
The following graphs shall highlight that even if so diverse populations as Chinese Singaporeans on the one side, and England and Scotland on the other side have comparable cancer risks, that this is not a good predictor for the cancer rate in India.

Graph 3: Population cancer incidence rates[ix] in comparison to crude CIBT93 cancer incidence rates – males



For age groups 30 and above, population rates for England (CIBT93), Scotland and Chinese Singaporeans are closer together than rates for population in Delhi, Mumbai and Singaporeans of Indian origin. The same pattern can be observed for females:

Graph 4: Population cancer incidence rates in comparison to crude CIBT93 cancer incidence rates – females



6 Use of CIBT93 in the UK

6.1 Pricing Basis

Most insurers reinsure Critical Illness insurance plans. Reinsurers are typically involved in designing the main claims eligibility criteria and reinsurance risk rates are often used as a pricing basis for direct offices, too. This seems to be a reasonable starting point as CIBT93 is a population table and ignores latest trends and changes in claims eligibility criteria. Furthermore, some reinsurers spent significant more resources in the research and development of this product that it can be assumed that these reinsurers' rates are a better proxy of a Best Estimate than CIBT93. Having said this, the Appointed Actuary of a direct office should make himself or herself familiar with the impact the reinsurer's pooling may have on the quoted rates as well as whether the reinsurance structure would influenced the pricing. In addition, the reinsurer may not necessarily follow the direct office's policy conditions in all aspects. Even if both parties do not guarantee risk rates, the direct office may want to include a margin as a premium adjustment of the consumer's risk charges may be delayed or applied differently than between the reinsurer and the direct office.

6.2 Valuation Basis

As for pricing, morbidity assumptions are typically based on reinsurers' rates. In the UK, a number of reinsurers used to base their valuation on IC94[6] but many switched to CIBT93. The following table shows the range of valuation bases used by some of the UK registered reinsurers (based on 2004 FSA returns).

Table 12: CI valuation bases of UK reinsurers (year 2004 where available) – acceleration CI

Reinsurer		Adjustment Factors				Annual worsening	
	Base Table	Male – NS	Female – NS	Male –S	Female – S	Male	Female
1.	CIBT93	42%	42%	80%	80%	1%	1¾%
2.	CIBT93	45%	50%	90%	110%	2%	2%
3.	CIBT93	50%	56%	86%	69%	2%	2%
4.	CIBT93	65%	75%	120%	140%	1.6%	1.6%
5.	CIBT93	100% adjusted[7]		160% adjusted[8]		1½%	1½%
6.	IC94	110%	120%	110%	120%	1½%	1½%
7.	IC94	Age-dependent percentages				2%	2%

Important to note is that both CIBT93 and IC94 are substantially adjusted to reflect the best estimate and any padding needed for future deterioration, cost of guarantee, etc. Although many companies use a base table with a flat adjustment, various papers suggest that an age independent adjustment of a population morbidity table is not appropriate due to medical advances. Age-dependent and duration-dependent adjustments seem to reflect trends and the long-term future more appropriately and realistically.

Although only available in 2005, i.e. after the respective offices did the valuation for year-end 2004, the following UK experience for the years 1999-2002 makes an interesting comparison.

Table 12: 1999-2002 UK (draft adjusted) experience by lives in % of CIBT93 – acceleration CI plus death

		Duration 2+
Male	Nonsmoker	49%
	Smoker	82%
Female	Nonsmoker	55%
	Smoker	71%

Assuming reinsurers' experience is similar to that of UK direct offices, some reinsurer's valuation basis would not allow for 'shocks' in the short term. (The above shown experience is already adjusted for certain reserves and yet un-settled claims.)

Valuation actuaries need to carefully consider the need to adjust any own experience for [5] incurred but not reported (IBNR) as well as incurred but not yet settled (IBNS) claims reserve. Not only are claims reported to the direct offices with a considerable delay but also the assessment of the daims takes a longer time than for mortality claims. Some definitions inherently require substantial time after the actual event to appropriately assess the eligibility of a claims notification. For example, one criterion for a successful stroke claim is permanent neurological deficit. Due to the high rehabilitation rate within the first 6 months after a stroke, claims assessor may need several months after an acute event before a claim is finally settled. In addition, CI plans are vulnerable to shocks as well as intense trends which are outside the direct office's area of influence (such as new and better diagnostic technology). This would be particularly important for the valuation of options and guarantees. Most offices offer some form of guarantees for CI plans. Even if rates are not guaranteed, the definitions of covered disease and events are mostly guaranteed and may not be "future-proof".

7 Valuation basis for morbidity insurances written in India

The published CIBT93 as a valuation basis for CI plans written in India is, as the Morbidity Experience Committee pointed out, not appropriate for pricing of CI risks written in India. Yet, it could be considered as a starting point. However, each of the core diseases/events included in CIBT93 needs to be carefully adjusted to reflect the considerable differences between the disease pattern of the Indian and English population. A flat adjustment – either through ageadjustment or application of a percentage – would be most inappropriate. A more detailed analysis is necessary. For as long as neither the direct office in India has sufficient own experience the following tiered approach appears reasonable:

1. Adjustment of CIBT93 for latest UK insured lives experience – to reflect an insured lives portfolio. Care should be taken to ensure that UK experience includes sufficient margin for IBNR and IBNS and that the mix of distribution channel is appropriately reflected.
2. An age and disease-dependent adjustment to reflect the differences between the disease pattern of the British and Indian population.
3. A further adjustment to reflect the effect of underwriting in India versus underwriting in the UK where, for example, medical records are easier to obtain.
4. Allowance of a margin for variability/shocks: 25 – 35% is recommended for Ireland and should thus build a lower benchmark for India where the degree of uncertainty is higher.
5. Allowance for trend deterioration: although some CI claims studies do not clearly identify a worsening trend, it is nevertheless recommended to allow a worsening to reflect the many indications for such a worsening to happen (introduction of troponin as a more sensitive heart attack diagnostic protein, introduction of cancer screening programmes, etc.). UK FSA annual returns of reinsurers suggest an annual worsening of about 1.5%. In India this may be seen as a lower benchmark as the incidence of chronic conditions such as diabetes mellitus is rising.

[6] "Insured Lives" CI table created by the Society of Actuaries in Ireland, 1994
[7] multiplied with TM92/ELT15M to convert population table CIBT93 into "insured lives" table
[8] multiplied with TF92/ELT15F to convert population table CIBT93 into "insured lives" table

The degree of allowances under 4 and 5 should depend on the level of guarantees and options build into the CI policies.

8 Conclusion

CIBT93 is not a "one-size-fits-all" morbidity table. Too great are the differences between the genetic composition, underwriting experience, etc.; too uncertain are the true ultimate CI experience in the UK and the future trend of claims experience, that 100% of CIBT93 without wide-ranging adjustments can be recommended as a valuation basis for CI risks written in India – unless the portfolio size is negligible, which, at this stage, may be the case for most CI risk takers in India. Having said this, considerable data and experience are available to appropriately adjust CIBT93 to reflect the expected experience in India. For pricing, CIBT93 is unlikely to be a starting point. Some reinsurers are able to use their own international experience. Careful adjustment is needed to reflect the differences between international experience and Indian risks.

CIBT93 is, nevertheless, a benchmark – a standard against which the Indian market and direct offices can measure experience over time and against other markets in order to develop an Indian Base Table in the not so distant future.

6

[i] WHO Global InfoBase Online, 2002 data
[ii] "A Critical Review" by the Critical Illness Healthcare Study Group, 14 March 2000
[iii] CMI Critical Illness Update, CMI Critical Illness Committee, 7 December 2005
[iv] "Irish Critical Illness Experience 1995-2000" – a report of the Critical Illness Working Party, 3 November 2003
[v] Dread Disease Survey 2003, Gen Re LifeHealth, Cologne Reinsurance Company
[vi] Mortality Associated with Diabetes, Dr David Muiry, 7th Global Conference of Actuaries, 15-16.02.2005
[vii] Mak K.-H., et al., Ethnic differences in acute Myocardial infarction in Singapore. Eur Heart J 24:151-60
[viii] Sinha R, et al., Cancer Risk and Diet in India. J Postgrad Med 2003:49:222-8
[ix] Bombay Cancer Registry, Delhi Cancer Registry, Scottish Cancer Registry (NHS National Services Scotland), Singapore Cancer Registry Report No. 6

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Andres began his working career with Allianz Life in Germany before joining Cologne Re (trading as Gen Re) as Product Manager for disability products and preferred lives. Before joining Gen Re's Singapore office in 2000, Andres spent 3.5 years in South Africa heading first Gen Re's group life business and then individual life. In Singapore, Andres is Principal Officer and General Manager for the Life & Health division looking after ASEAN countries as well as South Asia. Andres regularly visits India since 2000. This is his 6th Global Conference of Actuaries.