
Pricing the Critical Illness Risk: The Continuous Challenge.

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1	Introduction	3
2	Background Information on the Dread Disease Survey 2003.....	3
3	Survey Results	4
3.1	Declinature Rate	4
3.2	Claims Experience by Sum Assured.....	5
3.3	Cause of Claim	5
3.4	Selection Effect – Population Cancer Rates against Insured Lives Cancer Rates	7
3.5	Incidence Rates	9
3.5.1	A Comparison with Earlier Data	9
3.5.2	Trends Within the Surveyed 5-Year Period.....	10
3.5.3	Selection Effect by Policy Duration	11
3.5.4	Experience by Company	12
4	Changes Effecting Future Experience	13
4.1	Standard Dread Disease Definitions	13
4.2	New Clinical Definition for Heart Attack	13
4.3	Increased Health Awareness - Cancer Screening	13
5	Conclusion and Outlook for India	14

1 Introduction

Under a Critical Illness policy, a lump sum benefit is paid out on the first occurrence and definite diagnosis of a limited number of specified severe diseases or after undergoing specific treatments (surgeries). Typical conditions covered under such policies are cancer, heart attack, stroke, by-pass surgery, kidney failure and major organ transplants.

The Life Insurance Corporation of India introduced Critical Illness products to the Indian market well before the opening of the insurance market to other insurers in 2000. In the meantime direct insurers began establishing this product as a standard rider, although, so far the sales success is lower than in some Southeast Asian countries. This, however, is likely to change once the market develops further and both agents and consumers fully embrace the great potential of this insurance plan. In addition, direct writers approach this product with reasonable care to build up some experience in the new market with this risk.

The lack of suitable local data – both for the population in general and for the insured lives in particular – highlights the need for the industry to begin early with the systematic collection and analysis of experience data. The following chapters shares with the reader results from data collected from three Southeast Asian countries (Malaysia, Singapore and Hong Kong). Rapid changes in experience and the environment require a continuous approach to such investigations. Indian life insurers can learn from the foreign experience but cannot use the results unadjusted, as alone the different disease pattern amongst the Indian population will result in considerably different experience in comparison to a population of mostly Chinese or Malay insured lives. However, for the time being other markets provide valuable information on challenges actuaries are faced when pricing and reserving for Critical Illness plans in India or elsewhere.

This paper is largely based on the Dread Disease Survey 2003 published by Gen Re LifeHealth. Without the contribution and co-operation of the participating life insurers and Gen Re this paper would not have been possible.

For a general introduction on the pricing of a Critical Illness product as well as a possible approach towards generating a pricing basis for India please refer to the paper called “Pricing and Design of a Critical Illness Product: Foreign Experience and Indian Perspective”, presented by Andres Webersinke at the 3rd Global Conference of Actuaries (February 2001).

2 Background Information on the Dread Disease Survey 2003

The survey is based on data submitted by 31 companies from Hong Kong (15), Malaysia (9) and Singapore (7). The total share of new business written by these companies is estimated to be at least over 70% in all three territories. Due to the quality and/or amount of data provided, some insurers' data had to be excluded from certain investigations such as incidence rate calculation.

The survey analyses claims data for the 5-year period to 2000. In total, the number of lives investigated was 4 million at the end of the period of investigation, whereby 45% were covered in Malaysia, one third in Singapore and the remaining 22% in Hong Kong.

Most participating companies launched their first Critical Illness product in the late 80s or early 90s. Consequently, the age-profile of the insured lives is relatively young with a high share of early policy durations. Accordingly, experience data will be limited to certain age-bands; furthermore, ultimate experience may be different from data shown in this paper.

The importance of the Critical Illness product in the countries investigated is probably best demonstrated by stating the total sum at risk for new business sold in a year. The life insurers who participated in the survey sold between 1996 and 2000 policies with a total sum assured of more than US\$ 12 to US\$ 14 billion per year. Every year between 600,000 and 700,000 new Dread Disease policies were sold – a relative high penetration for a total population of 33 million in the three territories.

The survey is based on information on over 16,500 claims (including death claims for acceleration-type Critical Illness plans) of which over 12,000 were admitted Critical Illness claims. Of these just over 70% were filed in the third or subsequent policy year forming the basis for the incidence rate calculations.

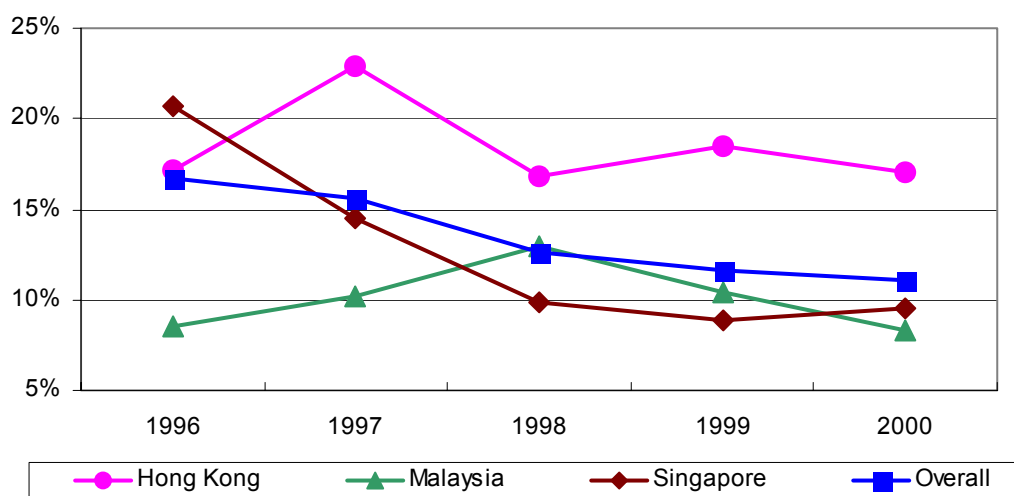
3 Survey Results

3.1 Declinature Rate

Overall about 13% of all filed claims were declined. The lowest observed rate was 10% – in Malaysia. Hong Kong companies experienced with 18% the highest declinature rate. The difference between males and females are negligible. In comparison to the previous Dread Disease survey (covering the period 1993 to 1997) the declinature rate reduced substantially in both Malaysia and Singapore but increased in Hong Kong.

The following graph shows that within the surveyed 5-year period up to 2000 a decreasing trend in declinature rates was observed. Among the three territories, Singapore shows the steepest decreasing curve from 21% in 1996 to 10% in 2000.

Declinature rate by year and territory:



In most cases (over 25%) the reason for declinature is the fact that the definition had not been met. In many cases (just under 25%) the applicant did not disclose all medical information completely or correctly. The latter highlights that underwriters and claims managers have substantial impact on the profitability of this product.

Why exactly the declinature rate reduced substantially in Singapore and Malaysia is unclear. Some companies may not have provided data on all declined claims and thus the rate is underestimated. On the other hand increasing consumer awareness and agent training ensures that the product is better understood potentially leading to fewer unwarranted claims being made. However, the pressure on companies to be service-focussed – often misunderstood as deciding on claims fast and in favour of the insured rather than correctly – may lead to a more lenient decision-making process.

3.2 Claims Experience by Sum Assured

Undoubtedly, living assurance products have a higher risk of anti-selective behaviour than plans covering the mortality risk only. Automatic medical requirement tables and underwriters' assessments take the increased anti-selection risk into account. It appears to be successful at least in that the average sum claimed for is lower than the average sum assured of the in-force portfolio – in all three territories. In both Hong Kong and Singapore the difference is 10 to 12% whereas in Malaysia the difference is smaller and only 2.5%.

3.3 Cause of Claim

The previous survey showed that cancer was the leading cause of claim for both males and females in all three territories. This was perhaps not surprising as the portfolio was then still very young both in terms of age and policy duration. Furthermore, the prevalence of cardiovascular conditions is relatively low amongst young Chinese.

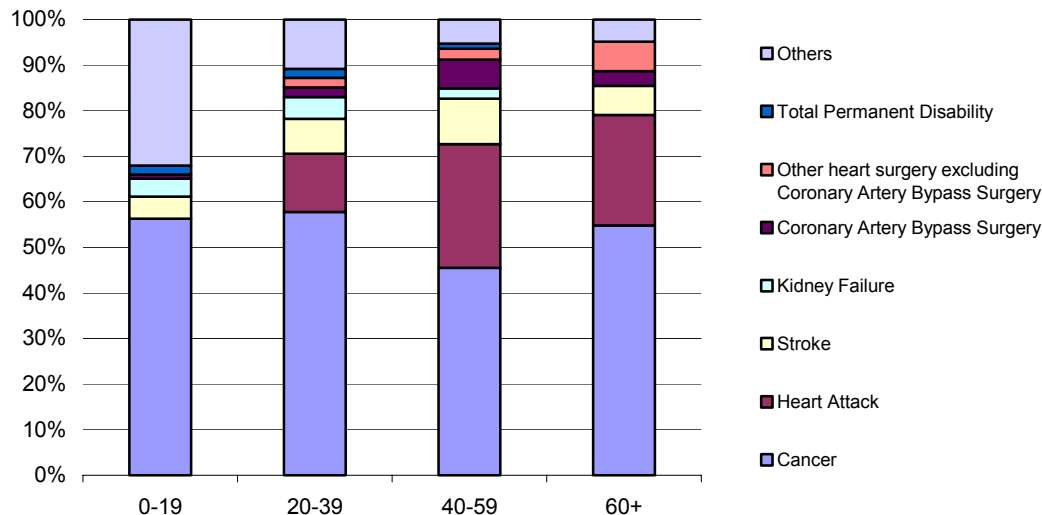
For the period 1996 to 2000 the picture did not change much, however, it clearly "matured". Cancer is still the leading cause by far, however, the share of claims paid following the occurrence of a heart attack or stroke increased.

The share of cancer claims is about 50% amongst males. Heart attack, stroke, by-pass surgery and other serious heart surgeries combined count for more than one third of all claims. The difference by policy duration is negligible, however, the group of "other causes" (combining the covered events not belonging to the 5 to 7 main major Dread Diseases) count for well over 12% of all claims made by men in the first policy year, reducing to less than 8% for subsequent years.

For females the situation is different in so far as cancer is with over 80% by far the leading cause of claim for all durations. Stroke counts for just under 5% of claims.

Obviously, the distribution of causes of claim depends on the attained age. The graph below shows the claims breakdown for males by age group.

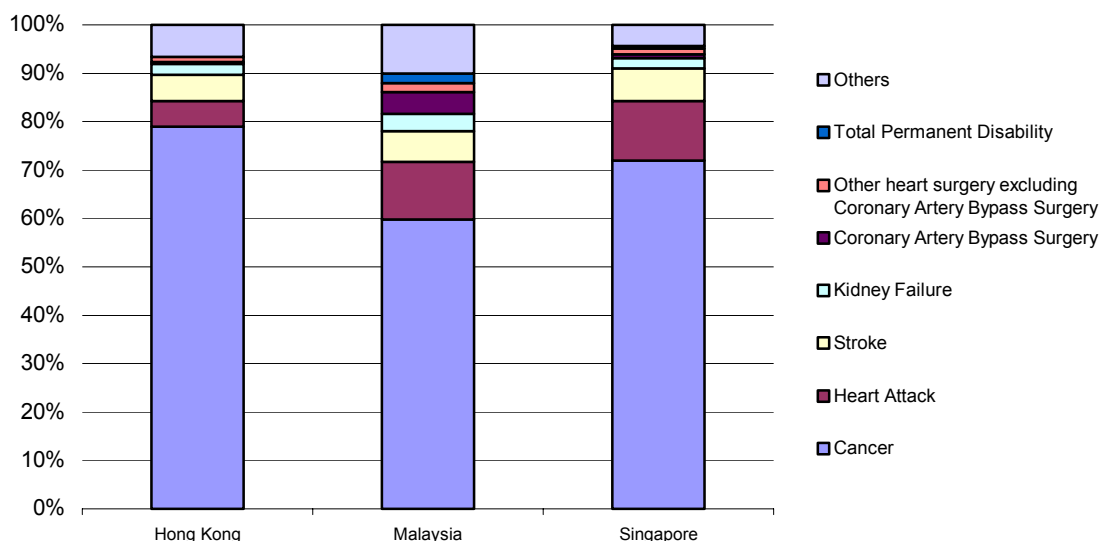
Cause of Claim (Dread Disease) by age group (males):



The 5 to 7 major diseases count for at least 90% of all claims amongst adults. This highlights that a typical Critical Illness plan with 10 or fewer covered diseases and events covers nearly as much as a plan with 20 or more diseases. Whereas the first Critical Illness plans sold in India covered the major diseases and surgeries, plans launched more recently cover already more disease. Thus the newer plans may appear more appealing, however, they are also more difficult to underwrite. To avoid unhealthy competition, many life insurance associations (such as in Malaysia and Singapore) agreed to restrict the number of covered events and surgeries to a maximum (36 and 30 in Malaysia and Singapore respectively).

Differences in the cause of claim pattern are also noticeable by country. The graph below shows that the cancer rate is lower amongst the Malaysian insured lives. Besides lifestyle differences, a possible reason for a lower cancer rate (especially amongst females) is a lower public screening level to detect early cancers in Malaysia in comparison to the cities Singapore and Hong Kong.

Cause of Claim (Dread Disease) by territory (males and females combined):



3.4 Selection Effect – Population Cancer Rates against Insured Lives Cancer Rates

In the absence of insured lives data, actuaries may use population data and adjust for positive (underwriting, etc.) and negative (anti-selection, etc.) effects.

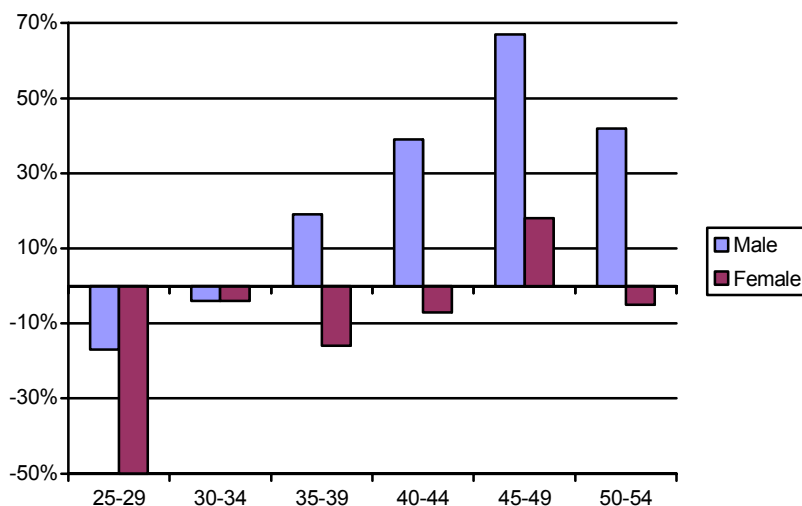
For both Hong Kong and Singapore good cancer statistics are available. Nevertheless, a comparison with insured lives data must be interpreted with care for the following reasons (and others):

- Population statistics cover cancers not necessarily covered under an insurance plan;
- Population statistics may include more than one primary cancer site, whereas an insured lives statistic will count only one qualifying cancer;
- If the insured life dies shortly after the diagnosis, the insurance company may record the claim as a death claim rather than a Critical Illness claim (for acceleration-type plans).

The survey shows very different patterns for Singapore and Hong Kong. In Singapore the overall positive selection is much higher than in Hong Kong. In general the selection effect is stronger amongst males than females indicating a possibly higher anti-selection risk of early female cancers than of other cancers. The cancer risk is more difficult to underwrite as cardiovascular risks. Unlike cancer, cardiovascular risks manifest themselves early and risk factors such as hypertension, diabetes mellitus, overweight and smoking are early warning signs assessed by underwriters at application stage.

The following graph shows the level of selection by age bands for Singapore. Population data excludes skin cancers whereas insured lives data is based on data for policy duration 2 and above.

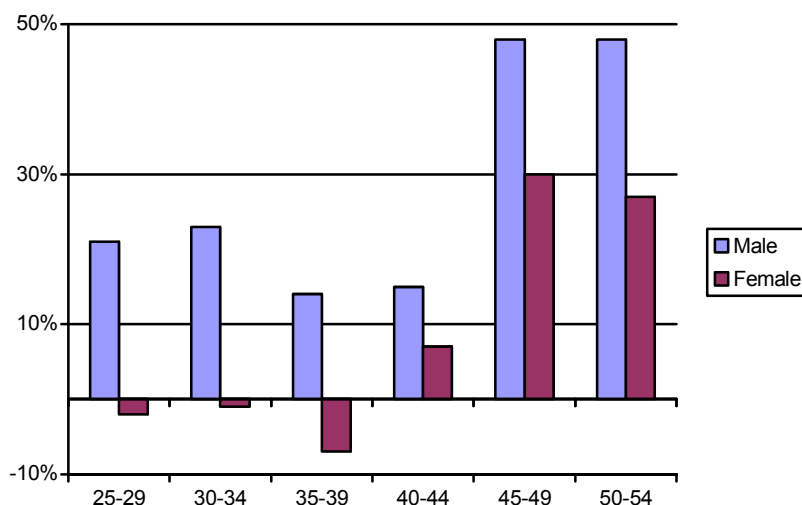
Selection of insured lives vs. population cancer rates by age group (Singapore):



For example, for the age group 25-29, male insured lives experienced a 17% higher incidence rate than the general Singapore male population. Females insured lives experienced a 50% higher incidence rate than the general Singapore female population.

The following graph shows the situation for Hong Kong.

Selection of insured lives vs. population cancer rates by age group (Hong Kong):



In Hong Kong the positive selection effect is higher for males. However, for females in Hong Kong the overall selection effect is negative – similar to Singapore.

As not all participating companies provided information on cause of claims, the information given above may be subject to change once more data is available (especially at the lower and higher age groups and males in general).

However, the graphs show that the risk of anti-selection is real but also that population data may offer only a rough idea of the experience amongst insured lives.

3.5 Incidence Rates

3.5.1 A Comparison with Earlier Data

The 2003 survey calculated incidence rates for different risks:

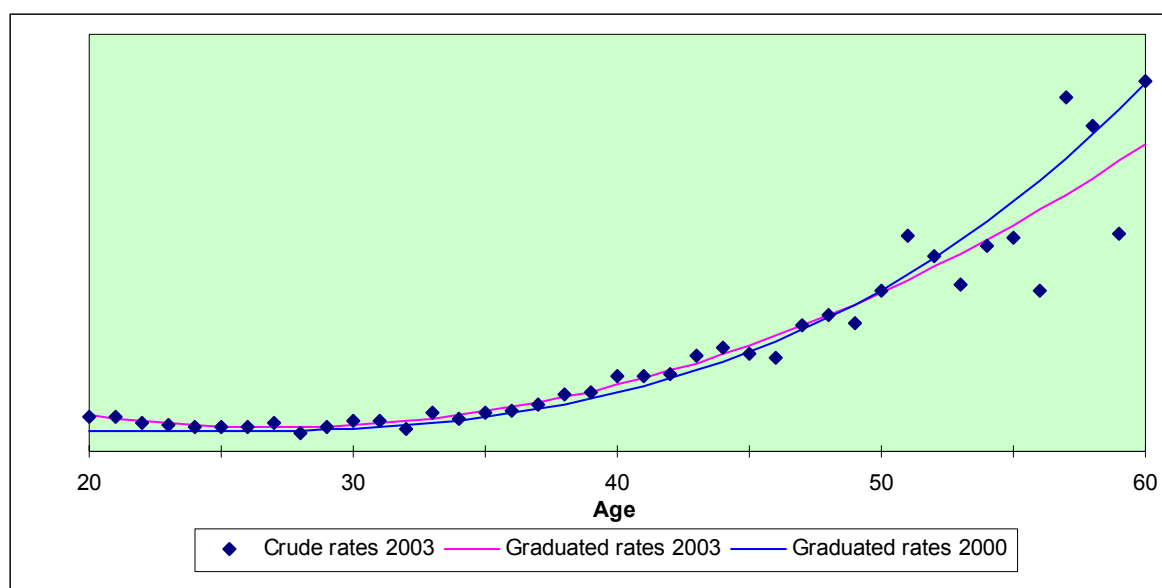
- Acceleration-type claims including death claims;
- Acceleration-type claims only;
- Additional Critical Illness claims (typically subject to a survival period).

This paper will focus on the first type of risk (i.e. death claims together with Critical Illness claims paid as an acceleration of the death benefit) as the data given for this type is most comprehensive and any wrong declaration of whether the actual claim is a death case or perhaps after all a heart attack is irrelevant.

As the actual derived incidence rates are proprietary to the participating company, this paper can only show the shape and relative comparisons.

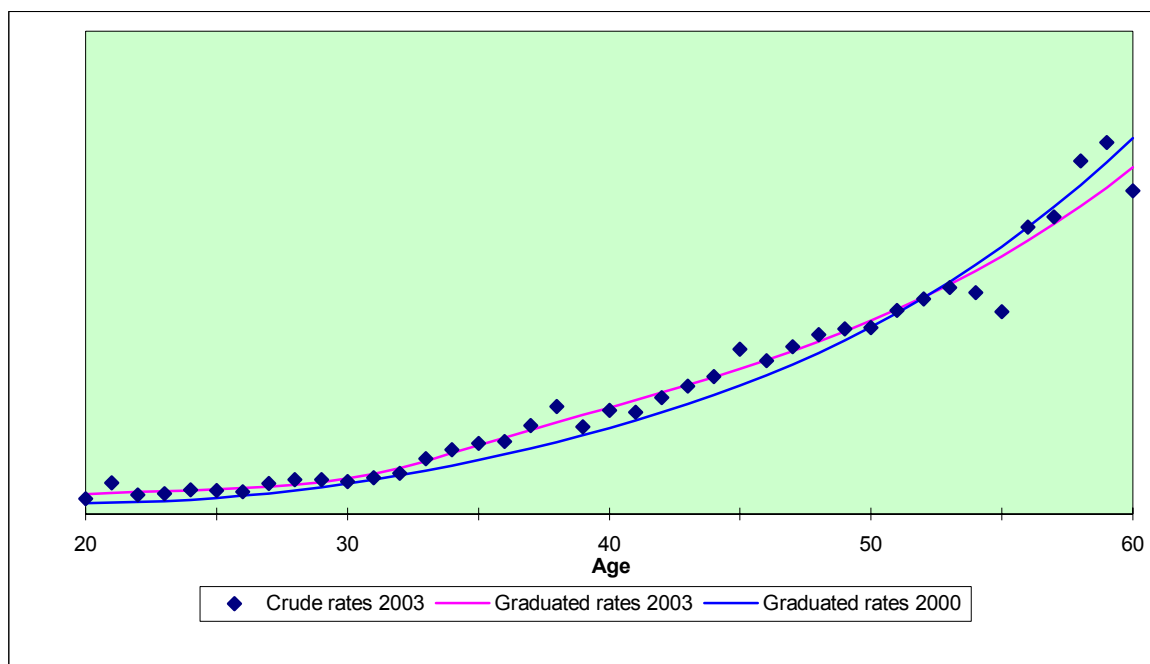
For males the graduated incidence rates are generally higher than those derived in the earlier survey. Only at the higher ages is a reduction noticeable, however, based on relatively few claims.

Death plus Acceleration Dread Disease experience: 2000 survey vs. 2003 survey (males):



Applying the 2000 incidences rates (based on data from 1993 – 1997) on the exposure for 1996 – 2000 resulted in an expected number of claims which is 8.6% lower than the actual figure. In other words: in the three years between the 2000 and the 2003 survey, claims experience deteriorated by close to 10% for males. For females the trend is far more worrying with a deterioration of close to 18%.

Death plus Acceleration Dread Disease experience: 2000 survey vs. 2003 survey (females):



The 2003 rates for females experienced substantially higher incidences in the 35 – 45 age group.

Since the portfolio of females in terms of number of policies and also by sum assured is considerable in all three countries the worsening trend cannot be ignored. Furthermore, it can be expected that the development will carry on with continued and extended screening of adults for early signs of cancer and cardiovascular diseases.

Furthermore, the rapid changes also stress that the cost of guaranteeing risk rates for living assurance benefits such as Critical Illness is not to be underestimated and difficult to determine in the first place.

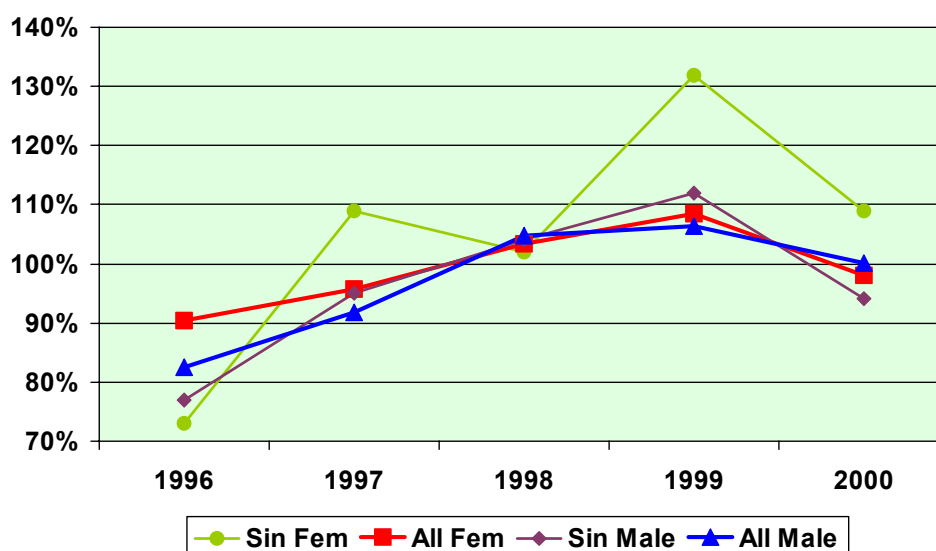
3.5.2 Trends Within the Surveyed 5-Year Period

The trend from the earlier survey to the 2003 survey is substantially as shown above, however, the trend within the 5 years observed is also considerable and requires further analysis.

If analysed by calendar year, the trend from 1996 to 2000 is worsening for both males and females. The trend is increasing for all years except for the year 2000. Furthermore, the trend for males is overall stronger than for females but this cannot be said for each territory individually.

In Singapore the development is most dramatic especially for females, where the experience in comparison to the experience over all territories and all 5 years was 73% in 1996 but 132% in 1999. Experience by year was for both genders within a narrower band in Hong Kong. Unlike Singapore and Malaysia, Hong Kong experienced an increase in the rate of declined claims. This may have led to a lower increase in paid claims experience.

Death plus Acceleration Dread Disease experience trend (A/E) by calendar year and gender for Singapore and all territories:



3.5.3 Selection Effect by Policy Duration

Insured lives mortality experience is lighter at earlier policy durations than ultimate mortality. The underwriting process ensures that particular risks with a substantially increased mortality risk are not accepted. For living assurance benefits the risk of anti-selection could be higher and accordingly reduce the positive selection effect of the underwriting process. As an additional protection mechanism, some insurers introduced an initial waiting period. Any disease, which is diagnosed, or for which signs and symptoms emerge during this period, is excluded from coverage.

The following table shows the actual experience for the first two policy durations in comparison to durations 2+. For the first policy year, the exposure was adjusted to take into

account the waiting period applicable for a particular policy in force. Consequently, for a policy with a 3-months initial waiting period, the exposure was calculated as 9 months only. The survey results show that the initial selection is negative for males and with 10 to 20% somewhat positive for females. The overall negative effect is influenced by the experience from Malaysia, where the actual claims experience in policy year 0 is 135% of the overall experience in policy duration 2+.

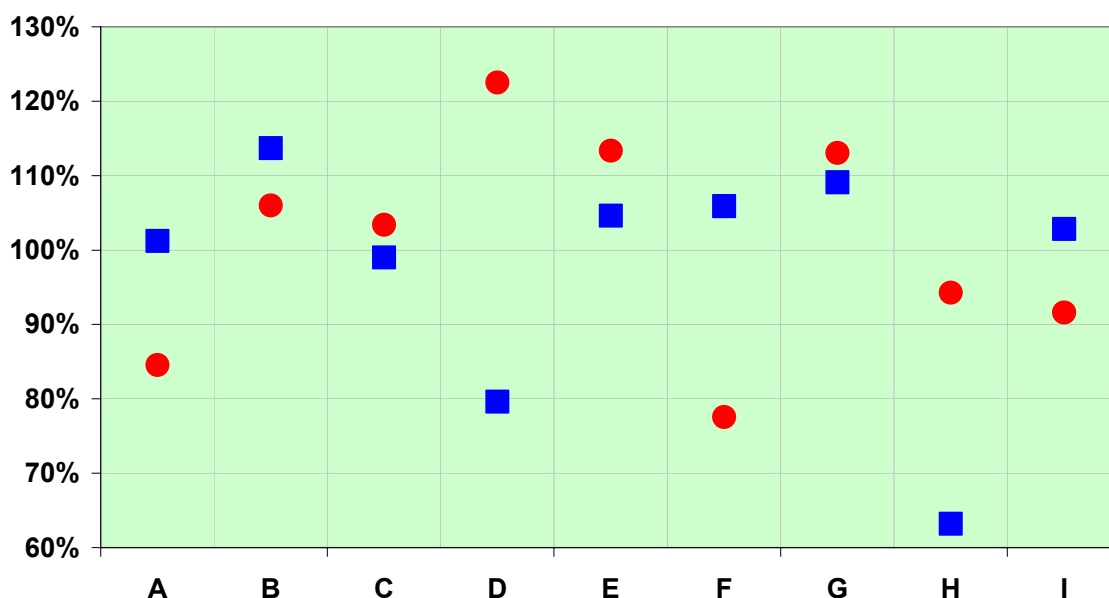
Initial Selection Effect (acceleration Critical Illness, ages 20 – 60):

	Duration 0	Duration 1	Duration 2+
Males	110%	99%	100%
Females	90%	81%	100%

3.5.4 Experience by Company

Experience by company is very diverse. Good male lives experience in a portfolio does not necessarily imply good experience amongst females and vice versa. For some companies, however, the exposure was too low to be statistically significant. Furthermore, due to the considerable differences by territory a comparison by company would show at least similar discrepancies. The following graph shows the relative experience of 9 companies with each company having at least 100 expected claims according to the incidence rates derived for acceleration-type plans. The red dots represent female experience.

Death plus Acceleration Dread Disease experience (A/E) by company and gender (dots = females):



4 Changes Effecting Future Experience

The survey covers the period 1996 – 2000. In the years up to 2004, a number of changes occurred which will influence the future experience of either new business written or both new and existing business.

4.1 Standard Dread Disease Definitions

The Life Insurance Associations in both Malaysia and Singapore developed a set of standard Dread Disease definitions. These new definitions were introduced in 2002 and 2003 respectively. New Critical Illness plans sold have to use the new standard definitions. These definitions are generally better than definitions applicable under older generations of Critical Illness plans: the wording is clearer to minimise ambiguity. It would be in the interest of all parties concerned to update the wording on a regular basis. Due to the long-term nature of life insurance products, such changes (updates) should also be made available to policies already in-force and not only for new policies. The right to change the wording of the covered diseases and events would be a meaningful development for such living assurance benefits. The right to revise the policy wording could be subject to the regulator's approval to ensure the policyholder's interest.

4.2 New Clinical Definition for Heart Attack

The clinical world changes fast and, as an example, cardiologists use different tests to confirm a heart attack today than in 2000 or earlier. The new Critical Illness definition for Heart Attack in Singapore takes this into account. However, the fact that a more sensitive test is used to confirm a heart attack will result in more heart attack claims. Furthermore, claims managers will have problems assessing the claim where the definition of a heart attack is still that of an older generation.

This could be avoided by having the right to change the policy wording as indicated above.

4.3 Increased Health Awareness - Cancer Screening

In many developed and developing countries where cardiovascular diseases and cancer are the major causes of death and disability, the awareness of risk factors associated with these diseases has increased. In addition, the detection rate has increased significantly. For the Critical Illness risk this is both good and bad. It is bad as many diseases are detected which would not have been detected (or survived) otherwise but – in the long run – good as diseases are detected at an early stage helping to prevent it from becoming serious enough to claim under a Critical Illness plan. The actuaries, however, need to revise their pricing assumptions regularly as statistics and experience from the past may no longer be valid in the future. Over the past 10 years, for example, the risk rates for females changed substantially as certain cancer risks develop more often and are detected at earlier ages than in the past.

5 Conclusion and Outlook for India

The Dread Disease survey 2003 of Gen Re is a valuable source for understanding the risk of a living assurance product. It also highlights the complexity of the Critical Illness pricing in itself and demonstrates the rapid changes in experience over the years. Future experience will not remain static or move within narrow bands. In addition, due to the immensely different disease pattern in India to that experienced in Chinese populations, the survey results cannot be simply copied and used for the purpose of pricing Critical Illness plans in India. For example, the following table highlights the different experience by ethnicity in Singapore for acute myocardial infarction (AMI).

Age-standardised AMI incidence rates by gender and ethnicity (1988 – 1997)¹:

	Ages 20 – 64		Ages 65 and above	
	Male	Female	Male	Female
Chinese	115.3	28.3	632.5	393.0
Malay	234.2	65.0	1009.2	569.1
Indians	331.9	102.6	1062.5	986.0

At the younger ages (20 – 64 years) the incidence rate of a heart attack amongst Indians in Singapore is about 2.9 times the rate for Chinese males; for females the factor is 3.6. At higher ages (65+) the factors reduce to 1.7 for males and 2.5 for females. Ethnic differences are reverse for cancer.

Cancer incidence rates in Singapore, 1993 – 1997, males only²

Age Group	Indians (1)	Chinese (2)	(3) = (1) / (2)
30 – 34	16.0	33.8	47%
35 - 39	19.7	57.7	34%
40 - 44	87.5	118.0	74%
45 - 49	123.9	280.3	44%
50 - 54	234.6	317.8	74%
55 - 59	161.4	584.9	28%
60 - 64	227.1	1027.4	22%

¹ Kam R, et al. Gender Differences in Outcome After an Acute Myocardial Infarction in Singapore. Singapore Med J 2002 Vol 43(5): 243-8

² Chia K S, et al. Cancer Incidence in Singapore. Singapore Cancer Registry Report No. 5. 2000

Cancer incidence rates in Singapore, 1993 – 1997, females only²

Age Group	Indians (1)	Chinese (2)	(3) = (1) / (2)
30 - 34	35.2	59.3	59%
35 - 39	74.1	110.2	67%
40 - 44	116.1	204.9	57%
45 - 49	312.0	445.4	70%
50 - 54	210.2	435.2	48%
55 - 59	311.9	554.0	56%
60 - 64	366.0	611.0	60%

The actuarial profession in India is well advised in beginning early with the collection of data from Critical Illness policies sold in India to get a better understanding of the actual differences and to react accordingly. The Life Insurance Board's standing committee on Research and MMIB may want to use the Dread Disease survey 2003 as the basis for similar investigations in India.