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WHY MICRO HEALTH INSURANCE UNITS CANNOT FOREGO REINSURANCE

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ABSTRACT

Micro health insurance units (MIUs) reduce negative financial consequences of healthcare costs for people who cannot access to formal and affordable health insurance. In order to survive, MIUs need capital to cover their outlier costs (whose probability of occurring is low but not zero). The first purpose of this study is to estimate the capital that MIUs require to secure their financial viability as stand-alone risk carriers. The second objective is to consider the cost/benefit of reinsurance as an alternative solution.

INTRODUCTION

IN SEVERAL LOW- & middle-income countries, the government has been unable to provide health insurance to many population segments, most notably to those who live and work in rural areas or in the informal economy. The World Bank suggested that *"In many poor regions of the world, and particularly for many poor people, informal institutions such as community networks are the only ones that are relevant, because access to formal ones is relatively scarce …"* ([1]). Community safety-nets are relevant because they are established by people themselves. We call "micro health insurance units" the community schemes that focus on protection against the financial consequences of healthcare costs. This article seeks to establish the capital levels that these grassroots schemes require. We also examine alternative ways that might be cheaper or safer than maintaining contingency reserves, notably reinsurance. Special reference is made to Social Reinsurance.

BACKGROUND ON MICRO HEALTH INSURANCE UNITS

The concept of micro health insurance units (MIUs) is relatively new. The attraction to deal with MIUs finds its origin in the thought that, just as

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micro finance opened access to capital for poor people, micro health insurance might provide the platform to make health insurance work for the poor.

What are MIUs? MIUs are grassroots organizations whose purpose is to provide financial protection in case of illness ([2]). They are "micro" in two ways: their claim-load is small, and they are small groups in the hierarchy of social organization (where whole countries are "macro" and regional groupings are "meso"). Four main models of MIUs can be identified:

Mutual MIUs: Cooperatives schemes, which are launched by members who may be associated in other ways as well, e.g. through a trade organization, a micro finance institution, village committee etc. (also known as Mutual Health Insurance or "mutuelles" in Francophone Africa). They perform quite a few operations of insurance agents: establish a benefit package, determine a premium, require members to pre-pay and collect the premium, and process claims.

Provider MIUs: Schemes launched by a provider of care, which are intended as much to generate larger volume for the provider as to offer affordable care to the clients. Hence, such schemes often restrict clients' choice the provider's facility or to the providers' health professionals. On occasion, the provider – and risk carrier – absorbs deficits, and thus indirectly subsidizes the MIU.

NGO-driven MIUs: Schemes established and operated by an external agent, e.g. a health NGO, a church, a development project etc. These often enjoy financial support from the NGO.

Principal-agent model: Schemes where the fundamental relationship is principal-agent, which are linked to a public or a private insurer. The modus operandi of these schemes is to delegate some functions of the agent to the community or another intermediary, e.g. recruiting the insureds, collecting contributions and providing financial help to do so, pre-screening claims, collecting benefits from the insurer and distributing them among the insureds etc. The facilitator does not however underwrite risk, but serve as a "super policy-holder", thus extending to the members of the MIU the benefits of a collective / group contract.

MIUs are established when top-down systems are inexistent or dysfunctional. Many MIUs function in isolated areas, and operate as quasi-monopolies: they face no competition from other insurers, and no "cream skimming" exists, but opportunities to diversify risks are also limited. This isolation amplifies the "micro" characteristic of MIUs.

One might wonder whether, being "micro", MIUs can at all be considered as risk underwriters. Unlike savings (when individuals keep ownership of their assets) or loans (when individuals receive funds which they repay later) or spot transactions (when individuals exchange money for tangible products/services), insurance reverses the business cycle in that clients pre-pay the premium to the insurer when neither insured nor insurer know if or when there will be a financial return. As the relationship needs to be maintained long-term, clients must trust insurers to keep sufficient capital in order to pay claims in the future. Like every insurer, MIUs need capital to

cover their outlier costs (whose probability of occurring is low but not zero), thereby securing their survival and solvency. But how much capital do they need? The question has so far not been treated in the literature. So, the first purpose of this study is to estimate the capital that MIUs would require to secure their financial viability as stand-alone risk carriers.

Only very large insurers (national systems or insurers that cover large numbers of insureds) can reach sufficient internal diversification. Smaller insurers must diversify their risk – both with others (in a larger pool of risks) and over a longer period of time (time diversification between good and bad periods) – by ceding part of their portfolio to reinsurance.

The very small client-base of MIUs aggravates their vulnerability ([3]). This reason and other difficulties (Fairbanks) explain why no reinsurer accepts the risks of MIUs today. In the face of doubts whether MIUs could at all reach sustainability, Bonnevay et al ([4]) examined the theoretical basis for the long-term viability of MIUs, and of reinsurers covering them, and concluded that reinsurance of MIUs can work. The present article goes beyond the theoretical study by using a live dataset rather than theoretical hypotheses to obtain three new pieces of information: (i) an estimate of capital needs; (ii) quantitative values of the impact of group size on capital, relative to overall cost of the claim load; and (iii) a comparison of the cost of retaining contingency reserves with the cost of a reinsurance premium, to shows that reinsurance is more affordable. This information will hopefully allay the concerns of MIUs that a reinsurance premium may be prohibitively expensive.

The ultimate purpose is to present to MIUs the evidence that they can afford reinsurance and to confirm to policy makers that they should facilitate access of these embryonic health insurers to the standard mechanism used in the insurance industry to pool risks and apply the law of large numbers.

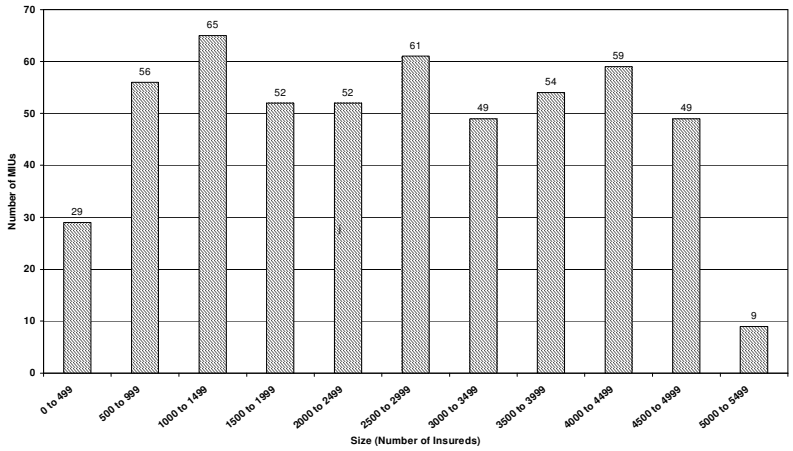
THE STUDY

Database: The database of an actual insurer in Ireland was used, containing 1.39 million insureds; we used data for the year 2001, for which practically all claims were settled ("the original dataset"). We consider this dataset to be robust because of its large size and the stable nature of the claims profile experienced by this insurer.

Data yield: Virtual MIUs: We split the original dataset into smaller groups resembling the sizes of typical MIUs. The number of the small groups was determined randomly, by using the Excel random number generator, applying a decision rule that each group had to count no less than 200 and no more than 5,500 insureds, which seem to represent the likely range of sizes of MIUs. We obtained 535 '*virtual MIUs*'. The size of membership of each group was also determined randomly in Excel, and was kept unchanged throughout

the experiment. The distribution of these 535 virtual MIUs by size of insured is provided in Figure 1.

Figure I: Distribution of Schemes by Size



The modeling exercise (Iterations): We ran 278 iterations of the database; each round consisted of assigning individuals randomly from the original dataset to one of the virtual MIUs. For each individual that was assigned, we copied the total claims cost from the original dataset to the relevant virtual MIU for the entire year. As stated earlier, the number of virtual MIUs remained unchanged throughout the 278 iterations; and the number of individuals in each virtual MIU remained constant as well. In this way, we obtained a random and different composition of the persons in each virtual MIU at each iteration, reflecting a distinctive membership structure by age, gender, health status and all other risk factors affecting the level of health care utilization. Consequently, by having run 278 iterations of the original dataset to obtain 535 virtual MIUs in each run, the total data yield in this experiment has been 148,730 virtual MIUs; the breakdown of this number of virtual MIUs by membership size is given in Table 1. The modeling exercise required writing upward of 5 billion records[4].

Table 1: Data Yield

Size of MIU	MIUs	Iterations	Number of MIUsin all iterations
200-1000	85	278	23,630
1000-2000	117	278	32,526
2000-3000	113	278	31,414
3000-4000	103	278	28,634
4000-5500	117	278	32,526
All	**535**	**278**	**148,730**

4. The algorithm required 14 shuffling of the data for each iteration, times 278 iterations times 1,393,000 individuals in the original dataset = 5,421,556,000 rows of data. In a perfect world we would have wished to run more iterations than 278 (perhaps as much as 10,000), but the large size of the original dataset made this impractical. Incidentally, bootstrapping estimates have been made using similarly sized number of iterations.

Assumptions: We assume that each virtual MIU needs surplus capital to cover its accumulated losses, just as the original dataset must have the capital to cover the aggregate loss experience in the given year.

Income: We assume that all virtual MIUs derive their income only from premiums. We further assume that the premiums are calculated in relation to the long-term average cost of claims, rather than relative to individual risk (risk rating) or to annual experience rating for each year separately (community rating). The proxy for the long-term average cost is the average community rated premium for the original dataset (rather than an MIU-specific community or another rate)[5]. We call this benchmark the "*market average per-capita cost*". This benchmark premium may be lower than the MIU-specific community rate.

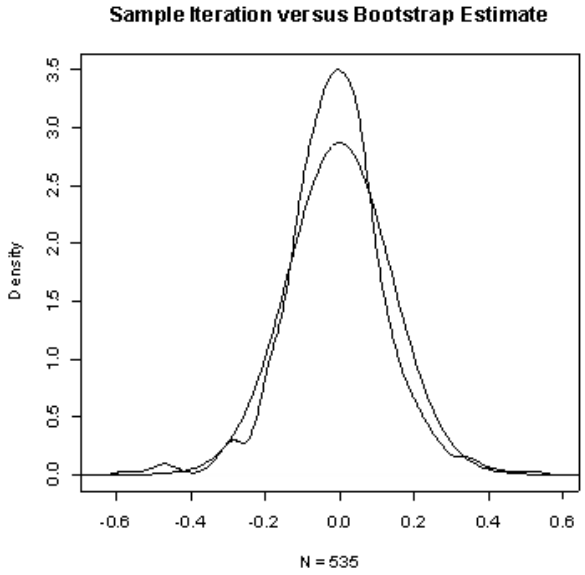
Expenditure / cost experience of virtual MIUs: We calculated the actual costs each virtual MIU must bear (in each of the 278 iterations) by copying from the original dataset the total cost of healthcare used by each member of each virtual MIU in each iteration. We then compared the results to the benchmark market average per capita cost.

Method of calculating capital requirements: We consider as an indicative measure of capital needs the shortfall in capital of a virtual MIU compared to the benchmark market average per-capita cost. We noted all instances when the costs of each virtual MIU were higher than the benchmark, and repeated this exercise for all virtual MIUs in all iterations. As expected, the distribution of these differences changed somewhat across iterations; the graphic description of the distribution obtained in 2 of the 278 iterations is shown in Figure 2[6]. As Figure 2 suggests, about 90% of claims occur within ± 25% of the mean cost; however, the distribution is not quite normal, because the tails are skewed (meaning that the extreme situations occur more often than predicted by a perfectly normal distribution). We are interested here in the right side of the tail; the longer the tail, the greater the eventuality that outlier claims (i.e. claims exceeding the market average per-capita cost) could occur, and therefore virtual MIUs need more capital. Using the overall distribution of the deviations of costs from the benchmark[7], and applying an adjusted form of the statistical boot-strap method[8], we calculate the amount

5. The pool-wide community rate acts as equalizer of some of the risk across the MIUs, and in reality a mechanism must be established for this equalization, which will reallocate amounts between MIUs and cover the possible difference between the sum of MIU-specific community rates and the pool-wide community rate.
6. A similar distribution was obtained to varying degrees for the other iterations.
7. The difference between the mean claims cost of the single MIU and the market average per-capita cost, divided by the market average per capita cost.
8. The method pioneered by Eflon ([5]) uses repeated samples as a basis for calculating the underlying statistical distribution of the random variable. Combined with this, the Law of Large Numbers postulates that when observations are independently and identically distributed, the sample statistics converge to the underlying population value as the number of iterations n becomes 'large' ([6]) This method is described in more detail by Chernick ([7]) and Green ([8]).

that needs to be added to the premiums to secure the solvency of each virtual MIU at a given level of confidence ("loading" for capital accumulation).

Figure II: Variability in Risk Profile



Independence: Since each virtual MIU is defined by the number and characteristics of its "members" (which change from one run to another), we assume that the virtual MIUs are independent from each other, and no interaction or correlation between them is considered during the simulation procedure. As we are using real data of a health insurer, we need not postulate any assumptions about the independence of cost-generating events or about possible correlations between different causes of morbidity. Possible correlations, if any, are already reflected in the claims data we are using. For the same reason we can also forego any assumption on the statistical distribution functions of the costs.

Confidence levels: we look at confidence levels of 99.9%, 99.5%, 99.0% and 95.0%.

FINDINGS

The level of capital was calculated by comparing the difference in costs per insured in a single large pool of 1.39 million insureds versus the same cost for the 1.39 million persons who are distributed randomly over 535 virtual MIUs (numbering each between 200 and 5,500 insureds). Capital requirements are expressed as a percentage of the overall average cost per

member. We estimated the capital requirements at different confidence levels[9] and for different sizes of virtual MIUs.

CAPITAL REQUIREMENTS FOR LARGE VIRTUAL MIUS

In this exercise, the overall size of the population of the original dataset was steady, at about 1.39 million insured, and the number of virtual MIUs was steady at 535 (each counting no less than 200 and no more than 5,500 insureds, with an average size of 2,604 individuals). Since we wish to examine both the capital required by these virtual MIUs and the impact of different group sizes on capital requirements, we also created larger virtual MIUs: 53 virtual MIUs (each counting no less than 2,000 and no more than 55,000 insureds, i.e. ten times larger than the 535 virtual MIUs; the average size of each was 26,283 individuals), and 10 virtual MIUs (each counting no less than 10,600 and no more than 291,500 insureds, with average size of 139,300 persons). The results are presented in grey highlight in Table 2 below.

Table 2: Capital Requirements for Different Group Sizes and Different Confidence Levels

Number of virtual MIUs to which the sample was divided	535	53	10
Average number of insureds per virtual MIU	2,604	26,283	139,300
Mean variation from overall average cost	0.02%	0.00%	0.00%
Standard deviation from average cost	13.9%	9.4%	1.5%
Capital requirements at 99.9% confidence level	42.9%	29.0%	4.7%
Capital requirements at 99.5% confidence level	35.8%	24.0%	3.9%
Capital requirements at 99.0% confidence level	32.3%	22.0%	3.5%
Capital requirements at 95.0% confidence level	22.8%	15.0%	2.5%

Table 2 provides the figures substantiating the claim that the higher the confidence level, the higher the capital requirement. For example, a virtual MIU (with about 2,604 insureds) operating in isolation must load 42.9 percent

9. The Confidence level is the probability value (1 – á) associated with a confidence interval. It is often expressed as a percentage. Confidence intervals are usually calculated at 95 percent, but one can produce 90%, 99%, 99.9% (or whatever) confidence levels for the unknown parameter. For example, if á =0.05=5%, then the confidence level is 95% = (1-0.05) = 0.95=95%. The interval gives an estimated range of values for an unknown parameter, calculated from a given set of sample data. If independent samples are taken repeatedly from the same population, and a confidence interval calculated for each sample, then a certain percentage of the intervals (confidence level) will include the unknown population parameter.

to its total annual cost in order to have sufficient funds to pay all its costs at 99.9% of the cases, but only 35.8 percent of annual costs at confidence level of 99.5%, and only 22.8% at confidence level of 95.0%.

This result is not surprising; a higher confidence level means less tolerance that virtual MIUs would go bankrupt. However, the very sharp drop in capital requirements as confidence levels are reduced is an unexpected insight. In this example, when confidence levels are brought down from 99.9% to 95.0%, capital requirements drop by almost 50%. This finding could have important policy implications.

Table 2 also illustrates that for an identical confidence level, the capital required drops when the number of insureds in virtual MIUs increases. For example, virtual MIUs with an average size of 2,604 members will need capital reserves equal to 32.3 percent of annual cost at confidence level of 99%, whereas virtual MIUs with 139,300 insureds will need only 3.5 percent of its annual costs for the same confidence level. This result shows the huge impact of size on reducing the standard deviation (from overall average cost of the pool of 1.39 million insureds), reducing the mean variation of the annual costs of virtual MIUs which determines capital requirements, as well as the impact on better diversification of risk. This insight could have policy repercussions.

CAPITAL REQUIREMENTS FOR SMALLER VIRTUAL MIUS (TYPICAL FOR THE INITIAL PERIOD OF ACTIVITY)

In real life, we anticipate that when MIUs start operating, they are likely to have fewer insureds (and, incidentally, fewer MIUs are likely to exist so the pool will also be smaller). We therefore estimate the capital required under the scenario that both the size of membership and the number of MIUs will increase gradually.

For this illustration, we filtered from the original dataset the virtual MIUs that were randomly assigned small group sizes: in the first year we looked at the data of the 85 virtual MIUs with up to 1,000 insureds; in year two we looked at the data of the 202 virtual MIUs with up to 2,000 insureds; in year three we looked at the data of the 315 virtual MIUs with up to 3,000 insureds; in year four we looked at the data of the 418 virtual MIUs with up to 4,000 insureds; And in year five we look at all the 535 MIUs, each with up to 5,500 insureds. The calculated estimates, at the same confidence levels that were used before, are given in Table 3. The grey cells in Table 3 are copied from Table 2, for ease of comparison of the smaller virtual MIUs to the 535 virtual MIUs.

Table 3: Capital Requirements for Smaller MIUs with Fewer Insureds

Year	1	2	3	4	5
Number of virtual MIUs in the pool	85	202	315	418	535
Number of insureds per virtual MIU	≤ 1,000	2,000	3,000	4,000	5,500
Average number of insureds per virtual MIU	621	1,103	1,609	2,073	2,604
Mean variation from overall average cost	0.14%	0.06%	0.03%	0.03%	0.02%
Standard deviation from average cost	24.00%	19.10%	16.60%	15.10%	13.90%
Capital requirements at 99.9% confidence level	74.30%	59.00%	51.30%	46.70%	42.90%
Capital requirements at 99.5% confidence level	62.00%	49.20%	42.80%	38.90%	35.80%
Capital requirements at 99.0% confidence level	56.00%	44.40%	38.60%	35.20%	32.30%
Capital requirements at 95.0% confidence level	39.60%	31.40%	27.30%	24.90%	22.80%

≤

As can be seen in Table 3, capital requirements are considerably higher for virtual MIUs with fewer insureds, and decline when membership in the virtual MIUs increases. And, as already seen before, capital requirements drop also when the confidence level is lowered: At confidence level of 99.9%, capital requirements decline from 74.3% to 42.9% above average costs when group size increases from under 1,000 to 5,500. But when the confidence level is relaxed to 95%, for the same group sizes the capital loading declines from 39.6% to 22.8%.

CONSEQUENCES OF RETAINING INSUFFICIENT CAPITAL

MIUs that retain low- or no capital reserves run the risk of insolvency. We assessed this risk, and present the data in Tables 4 and 5. Table 4 contains the expected solvency of the 535 virtual MIUs in the original dataset; Table 5 presents the expected insolvency rates for smaller virtual MIUs. Both Tables are calculated at a constant confidence level of 95%.

Table 4: Expected Insolvency Rates at Various Levels of Capital Shortage (MIU size and numbers constant, at Confidence level 95% in all cases)

Margin of retained capital (above average market cost)	Expected proportion of all schemes becoming insolvent
22.80%	5%
20%	8%
10%	24%
5%	36%
1%	47%
0%	50%

The grey-highlighted cells in Table 4 are identical to those shown in Table 2, and are repeated here for ease of reference. This table shows that if the average capital retained by the simulated 535 virtual MIUs is lower than the required 22.8%, the expected number of insolvencies grows quite dramatically.

The expected probability of insolvencies would be higher when smaller virtual MIUs fail to keep adequate capital levels. These calculations are presented in Table 5.

Table 5: Expected Insolvency Rates at Various Levels of Capital Shortage (Different MIU sizes and numbers, at confidence level 95% in all cases)

MIUs in simulation	Average MIU Size	Retained Capital Insureds	Expected proportion of all schemes becoming insolvent				
			0%	1%	5%	10%	20%
85	621	1,000	50.00%	48.50%	42.00%	34.00%	21.40%
202	1,103	2,000	50.00%	48.00%	39.80%	30.10%	14.80%
315	1,609	3,000	50.00%	47.50%	38.20%	27.40%	11.50%
418	2,073	4,000	50.00%	47.30%	37.00%	25.50%	9.30%
535	2,604	5,500	50.00%	46.90%	36.00%	23.70%	7.50%

In Table 5, each row refers to virtual MIUs that include all groups up to the noted maximum number of members. Table 5 provides the demonstration that as average group size increases, the risk of insolvency due to insufficient capital falls. For example, when capital retention is 20%, the larger groups (average group size 2,604) have 7.5% risk of insolvency, whereas smaller virtual MIUs (with average membership of 621) incur 21.4% risk of insolvency. When capital inadequacy becomes more pronounced, the gap between larger and smaller groups diminishes, and when the virtual MIUs keep no capital at all, all run an identical risk of insolvency of 50%. At this risk level, each MIU has the same likelihood to remain solvent or become insolvent.

It should be noted that the risk of insolvency increases over time as well: even if an MIU with insufficient capital survives the first year, its aggregated probability to survive two years is lower, three years even lower etc.

It is recalled that we have looked only at underwriting risks, i.e. the capital is required to cover outlier cost of benefits above the expected average

per insured. There may be additional components of operational risk, e.g. a "recovery gap" (which occurs when contribution income is lower than the expected average benefit expenditure).

DISCUSSION

MICRO HEALTH INSURANCE UNITS NEED CAPITAL

Micro health insurance units (MIUs), essentially like other insurers, have two "raw materials": capital and information. They need both components in order to assume the risk that their customers, the insureds, will incur financial loss. In return for assuming this risk, insurers collect premiums from the insureds. Under normal circumstances, insurers expect their premium income to pay for the losses in full. However, when insured losses exceed premium income, the insurers have to pay for losses out of their own capital. This is why insurers need reserves or surplus capital as a buffer against the risk of insolvency. And this is also why premiums must be high enough to pay for underwriting expenses (plus administration) plus setting up the necessary reserves to pay future losses.

The exact level of costs payable by the insurer is usually known only retrospectively. However, premiums are set prospectively, and must rely on estimates of the underwritten risk. The higher the uncertainty about how the covered risk will behave statistically, the more difficult it is to calculate premiums that will perform the two functions mentioned above (pay underwritten costs and contribute to reserves). In these circumstances, insurers must have access to more capital to cover a higher likelihood that costs exceed premium income. The same applies to operational risks: the better the level of predictability of the exposure of the insurer, the more accurate the estimated surplus capital.

The theoretical explanation for capital needs is that outlier costs can occur due to statistical fluctuations in the number of claims, or in the cost of care, or both ("underwriting risk"), but also due to other reasons[10]; and these fluctuations intensify due to small group-size. In this study, we assess the level of uncertainty in the liability by looking at the standard deviation of the observed benefit cost of 148,730 virtual MIUs (535 MIUS for 278 iterations) from a benchmark used to calculate the premium levels.

The results of the calculations provide concrete proof that the capital loading onto premiums of the virtual MIUs is quite considerable, and ranges from a low of 22.8% (at confidence level of 95% and average group size 2,604 insureds) to a high of 74.3% (at confidence level of 99.9% and average group size of 621 insureds) (See Tables 3 and 5).

10. We refer here to "operational risks, but shall not deal with these here, other than to point out that there is no uniform and generally accepted definition of Operational risk. Incidentally, there is much debate on how this risk can be quantified and on whether it should be counted in the risk-based capital requirement of the insurer.

It should be noted that the method used in this exercise to calculate capital is more lenient than that applied to insurance companies under regulatory standards.

The salient point here is that when capital reserves are lower than required (even under our unconventional calculation), the risk of insolvency increases rapidly, and reaches 50% when the virtual MIUs do not retain any capital at all. Absence of capital reserves can explain why some MIUs did not survive very long.

IMPACT OF GROUP SIZE ON CAPITAL REQUIREMENT

An earlier analysis of the impact of group size (based on theoretical assumptions of risk distributions of two virtual MIUs, one of 100 and the other of 1,000 members) ([9]), ([10]) concluded that a major part of the overall uncertainty of MIUs is linked to their small group size. This is due to two statistical characteristics: first, for an identical risk, small groups have a wider distribution, and thus a higher risk of outlier claims. Secondly, when the probability drops, small groups benefit less from that drop, because of the larger variance. In addition, small MIUs have a lesser possibility to diversify risks, and in some cases the demographic profile of the insured may in fact represent risk clustering, which aggravates their capacity to underwrite risk.

The present study shows, surprisingly, that the impact of group size is considerable even when the group numbers more than 25,000 (in this example maximum size was 26,283 insureds). As stated in Table 2, a tenfold increase from 2,604 to 26,283 insureds resulted in the lowering of the standard deviation by only 32% (from 13.9% to 9.4%). This could be due to the fact that although the variance in incidence of cost-generating events drops steeply as the number of insureds increases, the variance due to unit cost of benefits is much less sensitive to changes in group size. This finding is striking and important, because upper limit of membership we investigated (groups numbering up to 135,000 insureds) covers practically all known MIUs. This finding leads to the conclusion that the impact of size on capital requirements continues to be strong even for MIUs numbering tens of thousands of members. And, considering that this insight is derived from actual data (rather than from theoretical analysis based on simulations) it is all the more credible[11].

The second important insight gained from this study is that an increase in the number of insureds produces a more powerful effect than a reduction of the confidence level. For example, an increase in the number of insured from 2,604 to 139,300 reduces the standard deviation, and hence the capital requirement, by almost ten-fold (Table 2). By comparison, reducing the

11. The earlier theoretical work relied on an assumption that events were independent, or at least that the dependence did not have a financial consequence. The present investigation does not require this hypothesis, as the cost data already reflects all chain reactions between cost-generating events.

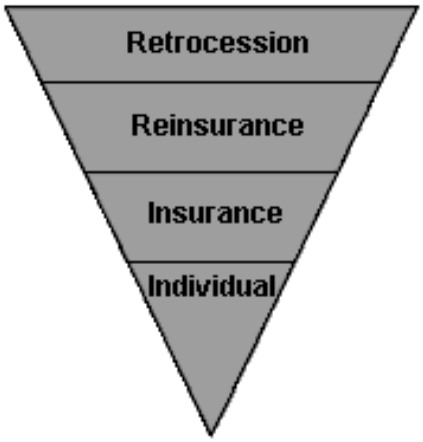
confidence level from 99.9% to 95.0% entails a reduction in capital requirements of only 53%. Conversely, when the maximum size of the virtual MIU drops from 5,500 to 1,000, capital requirements rise to extremely high levels (e.g. from 42.9% to 74.3% at confidence level of 99.9%, or from 22.8% to 39.6% at confidence level of 95.0% (Table 3).

Bearing in mind that the smaller group size is the rule rather than an exception for MIUs, the consequence is that they need to raise premiums very significantly to remain viable. Yet, many of the MIUs operate among low-income persons and in the informal economy where the trade-off between a higher premium and more membership is quite steep. The public policy implication is that using public funds to subsidize the capital loading of MIUs, at least for an initial period, can provide an effectively targeted way to reach two objectives: generating more resources from premium payments of members, and extending health insurance coverage to more people.

ALTERNATIVES TO MAINTAINING CAPITAL

It has been shown in this study that the required levels of capital can be sizeable. MIUs have great difficulty in accumulating and managing reserves. Therefore, it is necessary to consider the alternatives to holding capital which can ensure comparable levels of sustainability of MIUs. Two main options seem possible: ceding risks to reinsurance, or government support (which can be in the form of subsidies or deficit-financing guarantees). As elaborated below, the two options are not mutually exclusive.

Reinsurance: The original purpose of reinsurance has been to enable primary insurers to limit their exposure to the (more affordable) average cost of the underwritten risk, while transferring to another risk-carrier the costs linked to unexpected changes in the portfolio or business environment.



This relationship between primary insurer (a.k.a. “direct” or “original” insurer) and reinsurer is sometimes described as “insuring an insurance

company or a similar entity"[12]. This relationship is based on two fundamental processes: (i) Diversifying the risk across a large risk pool. (Re)insurance is based on the application of the "Law of Large Numbers", which postulates that the greater the number of exposures, the smaller the difference between actual results and probable results which can be expected from an infinite number of exposures. This explains why the volatility in claims costs[13] drops as the size of the pool (and the number of claims) increases. Moving up along the insurance "production chain" (which looks like an inverted pyramid) translates to a higher absolute claim-load and a smaller difference between actual and expected results. (ii) Accessing the reinsurers' capital-base and knowledge/expertise: The attraction for primary insurers to do business with reinsurers is the latter's larger supply of capital and information. Because reinsurers are exposed to lower outlier risk, they are required to meet lower/different levels of solvency compared to primary insurers. Therefore, they can underwrite more risk for every dollar of capital/surplus[14]. Secondly, reinsurers have a unique inside view of the insurance industry, particularly in markets where they interact with a large number of primary insurers. Therefore, they can share with clients an understanding of how best to address underwriting challenges and management concerns about expanding (or reducing) their existing product lines. This expertise is particularly valuable for primary insurers who are particularly exposed to the risk of error in estimating the underwritten average risk or the cost of claims of a new product ("Innovation error").

The main services provided by reinsurers to reduce capital requirements of insurers are:

"Capacity"= extending the primary insurer's ability to underwrite a single loss exposure (large line capacity) or many contracts in one line of business (premium capacity) beyond its own financial limits, based on the capital strength of the reinsurer;

"Surplus relief" (a.k.a. "Financing")= allowing the primary insurer to reduce the amount of surplus it must set aside for unearned premium;

Catastrophe protection= covering the primary insurer from exposure to fundamental risks that can endanger its survival;

Stable loss experience = enabling primary insurers to keep loss ratios within defined tolerance levels, and ensure steady profits.Reinsurers also provide a range of services that deal with legal, actuarial, IT and analytical capacities, which the insurer needs but only from time to time:

Underwriting expertise= sharing with the ceding insurer the statistical knowledge required to succeed in a specific line of business, and helping the insurer enter into new and specialized business lines or enlarging a benefit package;

Compliance assistance = helping the insurer comply with regulations linked to insurance of certain risks;

12. Examples of entities similar to reinsurance include Special Risk Pools, Natural Disaster Funds, Captives etc.

13. Claims cost is the amount paid to an insured as a result of incurring financial loss due to an insured event (such as damage to a car, house, or the individual's health).

14. Capital/Surplus = Admissible Assets – Liabilities

"Portfolio insurance" = (a.k.a. Withdrawal from a business) the entire class, line, territory or book of business is ceded;

Access to international capital markets = drawing investors who are willing to invest in the reinsurance company which has more financial and technical strength but would not wish to invest in emerging markets in low-income countries.

How Prevalent is Reinsurance? The insurance market is largely concentrated in very few rich countries; in fact, in 2002 85 per cent of global premium volume was concluded in only 10 countries[15] of which five countries captured almost 75 percent of global insurance premiums[16] ([11]). A similar situation prevails in health reinsurance (see **Box 1**).The list of countries contributing to global insurance penetration includes only one lower-middle income country[17] but not a single low-income country. Some developing countries, e.g. Bermuda, have made an effort to develop local insurance capacity. But even in this case, local insurance companies retain only 3 to 5 percent of written premiums, and are thus highly dependent on (foreign) reinsurance, which provides considerable surplus relief and underwriting assistance. With such high rate of cession, it is hard to imagine how emerging economies could manage their primary insurance markets without access to large international reinsurers.

Considering that the vast majority of insurance in low-income countries is ceded to reinsurance, it seems self-explanatory that MIUs stand to gain a lot from adapting their business practices to the same standard. But is this a realistic proposition at the conditions prevailing today? Just as most poor people cannot buy insurance, MIUs cannot buy reinsurance. As stated by Feeley et al. ([12]), "*Commercial reinsurers see no profit in a market that is characterized by low premiums, badly identified risks, and widely variable management capacity of the primary insurers, the microinsurers. That is why reinsurance companies have never designed a product for this market. But suppose microinsurers could obtain reinsurance through an organization with a social commitment? Such a program—Social Re—would provide coverage for microinsurers' unanticipated losses in return for a reinsurance premium paid from the microinsurers' contribution income*".

Consequently, someone needs to provide the reinsurance facility that would accept risks of MIUs. Following a few examples in other domains (Mexico set up crop reinsurance for small farmers through Agroasemex[18];

15. USA, Japan, UK, Germany, France, Italy, S. Korea, Canada, Spain and Netherlands.

16. USA, Japan, UK, Germany, France

17. The notable exception is South Africa, a middle-income country, which has the highest rate of premiums as % of GDP in the world ([11])

18. Agroasemex S.A. is a state-owned crop reinsurance company serving the Fondos de Aseguramiento (Mexican non-profit mutual insurance civil associations of small-scale farmers) that acts both as a development agency (which played a very important role in nurturing and developing the Fondos when the private sector was not keen to invest in helping farmers establish Fondos) and as a reinsurer (which provides protection against catastrophic loses, capacity to cover more risks than the farmers could do with their own means, underwriting assistance developing additional insurance coverage, as well as assistance in accounting, audit & review of financial statements and field inspections to locations that announce losses). The prevailing reinsurance method used is non-proportional Excess of loss (XL) reinsurance. ([13]), ([14]), ([15]).

and Turkey established reinsurance for catastrophic damages of earthquakes[19]) one could argue that governments, together with development agencies, are able to establish and operate *Social Re* for health risks covered by MIUs.

The Commission on Macroeconomics and Health proposed a more direct way to provide funding to MIUs, when it recommended *"to offer local communities an incentive scheme, in which each $1 that the community raises for pre-paid health coverage would be augmented, at some rate of co-financing, by the national government (backed by donor assistance)"* ([18]). Government subsidies of health insurance premiums are not new. For example, Germany subsidizes some 60% of the total cost its health insurance, and the Netherlands government subsidizes about 25% of total ([19]). In the USA, the government subsidizes the Medicare and Medicaid programs, which together represent about 45% of total health spending. In all three countries cited as example, the government does not operate a national health insurance scheme. Yet, the government intervenes in regulating the system and in subsidizing those parts that would not exist without subsidies. This formula can well work in low-income countries as well.

GOVERNMENT SUBSIDIES OF REINSURANCE PREMIUMS

At least four reasons justify using government subsidies to reduce MIUs' reinsurance premiums: (i) as discussed earlier in this paper, the cost of the risk diminishes when the group is larger. The more MIUs join the reinsurance pool, the larger the overall group size, and the lower the community-rated reinsurance premium payable. All MIUs that participate in the reinsurance pool will capture sizeable savings compared to scheme-specific community rated premium. However, no MIU would accept to absorb the cost of covering the risk of other MIUs. Therefore, the pooling arrangement can work if the difference between the pool-wide community rate and the MIU-specific risk rate is subsidized. The subsidy amount will in fact ensure that more risky and smaller MIUs will de facto enjoy a higher subsidy, and this targeting is very efficient because it does not require any additional administrative adjustment to base the subsidy on the inherent characteristics of reinsured health risk; (ii) One way of reducing the reinsurance premium and the contribution of the MIU is to reduce to zero the loading for capital requirements plus interest. This can be done if the necessary capital is supplied from another source, either as an upfront cash payment or by way of concessionary drawing rights in case of need. This subsidy can be limited in time to the first few years of operation of the MIU and the social reinsurer; (iii) MIUs have no experience with reinsurance, and the higher the reinsurance premium, the more likely their reluctance to pay it. Yet MIUs are most

19. The Turkish Catastrophe Insurance Pool (TCIP) was established by the government in 2001 with help from the World Bank, after the Marmara region was devastated by an earthquake in 1999.([16]), ([17]).

vulnerable financially precisely in the first few years, when they need reinsurance most, both for surplus relief and for technical assistance. A subsidy can reduce their status-quo bias; (iv) One of the arguments against supporting small MIUs is their inadequate administrative capacity. MIUs need capacity building and technical assistance, which they cannot pay for but which can be cheaper and more effective when provided by the reinsurance. This support is customary in the reinsurance industry, because it is not only cost-effective but enhances adherence to the industry rules on reporting and audit. The classical sharing of responsibilities entrusts front-office activities with the MIU (to capture their relative advantage in low-cost collection of contributions and social pressure to reduce free-riding), and back-office functions with the reinsurer in a pool-wide service center (to process claims, analyze costs for actuarial, costing and product development purposes, negotiate with providers of healthcare, etc).

In summary, regardless of whether the push for health insurance comes from the top down or from the bottom up, governments can promote the development of the health insurance industry by subsidizing part of the cost of insurance (e.g. Ghana ([20])), or part of the reinsurance premium (e.g. Mexico ([15])), or by setting up a reinsurance facility (e.g. Turkey ([17])) or by a combination of these options, like guaranteeing drawing rights in case of catastrophic exposure. Reinsurance is probably the least costly and most efficient form of support to MIUs, and therefore it should be the preferred choice.

WHAT TRADE-OFF BETWEEN REINSURANCE AND ACCUMULATING CAPITAL?

Reinsurance is an alternative to holding contingency reserves (capital), and its cost is easily measured by the premium payable. All other things being equal, if the two alternatives are equal, they should be interchangeable. However, considering that capital markets are imperfect, and that there is less than perfect information about the underlying risk of each insurer, the monetary cost of both options is unlikely to be equal.[20] In addition, the reinsurance premium is calculated differently according to whether the reinsurance contract is proportional or non-proportional (please see **Annex I**); for proportional reinsurance contacts, the premium will vary with the 'ceding commission' the insurer receives from the reinsurer; the larger the commission received, the cheaper the net reinsurance premium. For non-proportional reinsurance contracts, pricing is based on the reinsurer's estimate of expected underlying losses, plus loading for administration costs and profit (**Annex II**). One of the key questions is how the cost of reinsurance compares with that of retaining reserves.

20. In fact given the operational risk associated with MIUs the cost of acquisition of external capital may be prohibitive.

An option to assess the reinsurance premium is to base the estimated cost of reinsurance on the theoretical elaboration of the cost of premium under the *Social Re* model, which claims that the minimum reinsurance premium is equal to half the standard deviation of the average cost of stand-alone MIUs ([21]). Taking the values of the standard deviation given in Table 3, one can see that the premium would be lower than the loading for capital in all cases reviewed. However, one needs to recall also that at that premium level, the reinsurer can survive after five years only if 20 MIUs or more are reinsured.

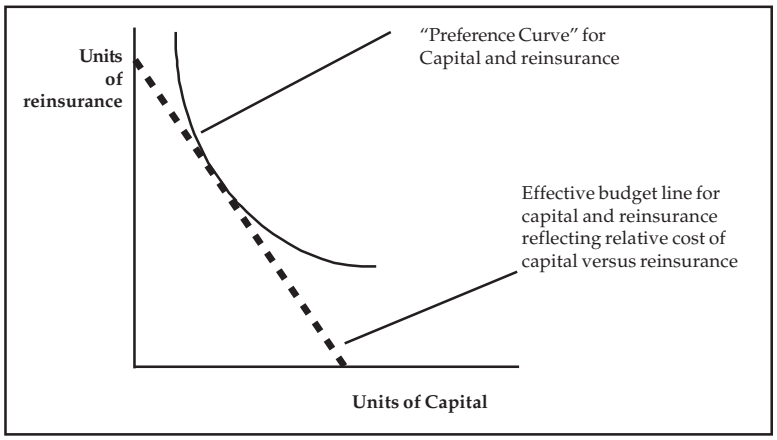
The numbers, shown in Table 6, are merely indicative, and in reality one would need to base the premium on the value of the standard deviation applying to each MIU specifically. But the distance between capital loading and reinsurance premium is so large, that a small margin of error (due to the possible difference between average value of the SD and the specific value) does not alter the conclusion. The main insight is that the cost of reinsurance is much lower than the minimum capital needed to assure the solvency of MIUs for all group sizes. As a reminder, table 2 shows data that capital loading will be only 2.5 % when the size of the insured population reaches 139,000 clients, at 95% confidence level. Needless to say, this extremely large size is irrelevant as a comparison for MIUs, and the only lesson one can draw from this information is that subsidizing the reinsurance premium can be done by comparison to a notional group of insureds that would have been in the pool if universal coverage would have been implemented in the country in question.

Table 6: Comparison between Reinsurance Premiums and Capital Loading

Size of MIUs	Standard deviation from average cost	Estimated reinsurance Premium under the Social Re Model	Capital Loading (at 95% confidence)
≤ 5,500	13.90%	6.95%	23.00%
4,000	15.10%	7.55%	24.90%
3,000	16.60%	8.30%	27.30%
2,000	19.10%	9.55%	31.40%
1,000	24.00%	12.00%	39.60%

As indicated previously, reinsurance is really a substitute for accumulating capital, and it is therefore possible to show how the trade-off between the amount of reinsurance or capital can be optimized; the trade will be based on the relative cost of capital and of reinsurance, as well as on the preference each MIU may have. The graphical presentation of this trade-off is shown in Figure III.

Figure III: The notional expression of a trade-off between reinsurance and capital



LIMITATIONS OF THE MODEL

The model considers only the risk emanating from an adverse profile of members but disregards other types of underwriting risks, such as operational risks due to deficient administration.

The calculations of the variance in benefit costs and the resultant requirements for capital loading were based on an average of benefit cost registered in respect of the original dataset. Clearly, any stand alone MIU needs to base its calculations on a long term average of claim experience. In reality risks vary between geographic areas due to different epidemiology, distance between residence and point-of-service or available services. Therefore, theoretically, capital requirements should be calculated separately for each location, if information is available.

This model is based on a specific benefit package that applied to all insureds included in the original dataset. The results would differ if the benefit package was modified. On the other hand, the quality of the data and the benefit package used may perhaps give a more realistic position than can be obtained from the data available from most operating MIUs. Moreover, MIUs with limited resources usually offer a more restricted benefit package than the original dataset analyzed here, which would result in a smaller case load, and hence probably larger variance in costs. Therefore, we conclude that this model underestimates the vulnerability of MIUs due to their small membership.

CONCLUSION

The objective of increasing access to healthcare even as costs rise requires that the total expenditure should be distributed on as many people as possible,

for as long as possible, and as equitably as possible. When risks are pooled and funds are amassed, the critical mass of resources needed to operate access to healthcare of large populations is more likely. The experience of all rich countries that implement universal coverage proves that insurance is the only alternative to full public provision of services.

The reality in most low-income countries is health infrastructure is at best heavily overburdened, and at worst very weak or even non-existent. Several countries have rolled back public provision that they used to offer in the past. In addition, most poor persons must cover travel costs, (formal and informal) user fees and endure loss of income due to illness, care-seeking and care-giving. Therefore, external funding of health facilities is unlikely to produce a trickle-down effect in favor of the poor and the rural populations.

Yet, very little effort is directed to building top-down insurance systems, even though they are relatively more effective for the poor than for the rich, and even though insurance can be operated everywhere. Where national health insurance systems are absent, and where private insurers do not sell affordable health insurance to poor and rural populations - as is the case in most low-income countries - MIUs offer a real alternative.

It has been shown that MIUs require capital in order to remain solvent. The amount of capital is linked to their membership size and to the confidence level for their sustainability. It has been shown that the amount of capital can be very considerable, and if it is not amassed, that the risk of insolvency is very high.

Many MIUs were obliged to go it alone and have fallen. These failures are however not the failings of MIUs or of insurance, but of governments and development agencies that followed a "Darwinian strategy" of supporting only the survivors, and only with inconsistent and insufficient measures. The lesson that can be drawn from the failure of stand-alone MIUs is that these organizations must be offered different, holistic and continued access to a financial infrastructure. Any half-measures to help MIUs with less than what they need are comparable to offering half the clinically required dose of medications. The result is bound to be failure, despite the cost of half the dose.

It has also been shown that the cheapest and simplest method for capital relief is reinsurance. The advantage of reinsurance is that it provides a natural bundle of financial and technical services that together provide the standard "financial infrastructure". Reinsurance has become the standard tool serving the insurance industry worldwide, for all heads of damage. Examples of reinsurance of small self-help groups of farmers in Mexico, or of catastrophic risks in Turkey, exemplify the versatility of reinsurance.

MIUs represent an opportunity for governments to extend health insurance among population-segments that are at present excluded, provided that the grassroots schemes can themselves remain solvent. Bennett's recent paper on conceptualizing the role of MIUs in such a framework is a useful contribution in this regard ([22]). The alternative strategy, of assisting MIUs at the technical level without opening an option for these schemes to pool their

risks and resources with similar insurers ([23]) is bound to fail, because it omits to remedy a critical source on insolvency.

The inescapable conclusion from this study, as well as from previous comprehensive theoretical work described in the Social Reinsurance book ([24]) is that if MIUs should develop an insurance system, they need capital to deal with their risk exposure. Failing their capacity to accumulate and hold large amounts of capital, and failing external deficit financing, MIUs must seek capital-relief and pool risks through reinsurance. This need starts at the moment of launch of operations, well before the risk of insolvency occurs. In this, MIUs need to follow the standard that prevails for insurance world-wide, the ultimate purpose of which is to protect the customers.

Stated differently, the link between MIUs and the reinsurance is imperative whenever MIUs can neither retain capital nor enjoy deficit financing from an external source, and when MIUs. In addition, unlike capital, reinsurance has the added advantage of providing the technical platform for indispensable insurance skill-mix, in addition to providing the financial safety net. Reinsurers can organize technical assistance to MIUs more effectively and efficiently, because they must retain the underwriting capacity in any case. Providing assistance to MIUs on a project basis, which begins and ends without the inherent rewards for success on which reinsurance functions, is bound to be less effective. And, the role of Social Reinsurance is to enable MIUs to access these services for as long as neither the private nor the public-sector are willing to provide them, because MIUs seeking to remain sustainable cannot forego reinsurance.

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MARKET DEVELOPMENTS IN HEALTH REINSURANCE

The health reinsurance marketplace has changed noticeably over the last decade. For one, new reinsurers have entered the market (e.g. MUTRÉ, a French joint-stock company established in October 1998 to offer cover to mutual insurance companies, notably members of one of the reinsurance company's stockholders, La Mutualité Française, an umbrella organization of 3,000 mutuals providing cover for more than 30 million people in France, mainly voluntary supplementary health insurance). At the same time, a few large reinsurance companies have either ceased to do business (e.g. John Alden Life Insurance Company, a large USA provider of stop-loss reinsurance, went out of business in 1996 after suffering major losses), or stopped offering health reinsurance (e.g. Swiss Reinsurance Company folded its health reinsurance business in 2000/2001).

There been a perceptible increase in demand for health reinsurance, mainly because the health insurance marketplace has changed in many countries due to the changes in social insurance, the entry of HMO-type providers, provident associations, and medical aid societies/schemes. Private health insurance is growing in some developing countries, mainly due to the failure of public health systems.

Insurance companies are turning to reinsurers for technical assistance in designing, underwriting and managing health insurance products. Ceding insurers need reinsurance solutions that can offset the adverse effect of changes in legislation (e.g., restrictions on preexisting exclusions) and/or facilitate the change from government-run healthcare to private systems. Insurers are also looking for administrative support in claims handling and technical understanding of the medical expense businesses.

Proportional reinsurance contracts dominate the market, coupled with underwriting guidelines designed by reinsurers. Proportional reinsurance is often in the form quota-share, which is particularly suitable for start-up

entities seeking to limit their claims exposure, and for insurers who introduce new products or write policies that cover volatile exposures. Non proportional reinsurance contract are seen very rarely, except in the United States, and to some extent in Germany. The most common form of non proportional contract offered in markets other than the U.S. is Specific Stop Loss (SSL). Aggregate stop loss reinsurance is more likely to cover business with which the insurer is familiar and for which it wants to stabilize results.

The needs for reinsurance of emerging micro health insurers have also received attention lately, through a World Bank / ILO project called "Social Re", which started in Feb 2000, and provided the hub for work to consider this option. The "Social Re" conceptual framework was published recently in English (October 2002) and in French (October 2003). MIUs is many countries in Africa and Asia have expressed interest to establish a relationship with "Social Re", but the main obstacle is adequate funding of the reinsurance for operation in this challenging market. The International Cooperative and Mutual Insurance Federation (ICMIF) has decided in 2003 to become associated with "Social Re", by agreeing to take an equity position when this project is incorporated.

ANNEX I:

REINSURANCE TYPES AND METHODS, ADVANTAGES AND DISADVANTAGES

Risk transfer via reinsurance is achieved by choosing the appropriate reinsurance structure. There are primarily two methods of reinsurance to choose from:

PROPORTIONAL REINSURANCE

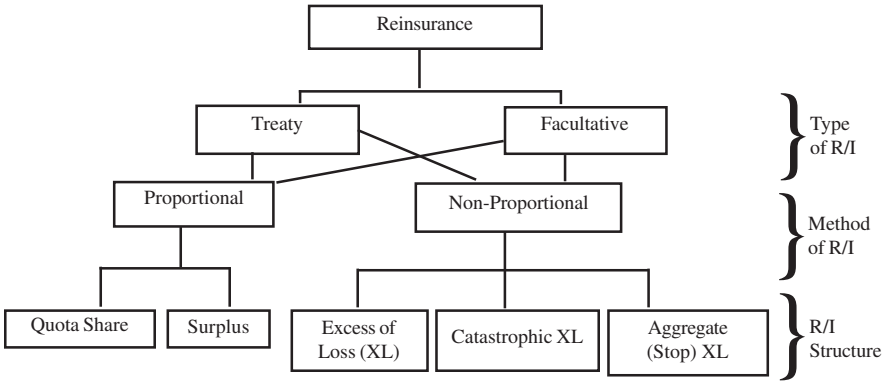
Determining the claim amount: as the name suggests, the reinsurer accepts a share of the risk, and pays that same proportion of claims.

Determining the premium: the reinsurer collects a share of every dollar of premium the primary insurer charges. The reinsurer's share in the premium is commensurate with its share of risk. Hence pricing of the reinsurance is similar to that of the primary/direct insurance. Non-Proportional reinsurance, also known as Excess of Loss reinsurance

Determining the claim amount: the contracts are based on the size of the loss and not the reinsurer's share in the risk. The name 'Excess of loss' describes the essential feature of the contract, that before a claim can be made against the reinsurance the loss has to exceed a certain deductible.

Determining the premium: the premium is calculated based on the claims/loss experience (not based on loss ratio) of the insurance company, and hence has no bearing to what the insurer charged the insured for providing the coverage.

Annex I Figure 1: The Type, Method And Structure Of Reinsurance



Annex I Table 1: Advantages and Disadvantages of Reinsurance Methods

Method	Advantages	Disadvantages
Proportional reinsurance	Special assistance from reinsurers on unusual risks, such as health insurance underwriting capital relief	Large amount of premium income are ceded away
		Increasing premium volatility, particularly in situations where the primary insurer is dependent on reinsurer for underwriting certain classes of business (e.g. catastrophe reinsurance),
	Provides capacity, thus allowing the insurance company/entity to underwrite more risk than what its policyholder surplus or risk appetite might otherwise allow.	The insurance company or entity is bound by treaty terms and the insurer cannot alter the retention or its underwriting practice.
Non proportional reinsurance	Provides greater underwriting capacity by reinsuring losses above a specified retention level Helps in stabilizing or smoothing the results, particularly following catastrophe events	High volatility in reinsurance premium Difficulty in finding cover for products with very limited data or experience

ANNEX II:

CALCULATING THE COST OF REINSURANCE THAT MIUS NEED

Reinsurance premium is an amount paid by the reinsuring (or "ceding") company to the reinsurer in return for sharing insurance policy liability.

The calculation of the reinsurance premium in (non-proportional) excess-of-loss reinsurance is based on the agreed indemnity payable by the reinsurer to the primary insurer for losses above a predefined level ("the retained loss"). Thus, the critical parameter determining the level of the reinsurance premium is claims experience on the reinsured portfolio.

In proportional (or pro rata, or quota share) reinsurance, the reinsurer shares a defined share of the primary insurer's liability, losses and premium income. However, the cost of acquiring the portfolio ("acquisition costs"[21]) must be deducted from gross premium income that is shared; the practice in the industry is for the reinsurer to repay the primary insurer the recognized share of acquisition costs (compensation called "ceding commission" or "reinsurance commission") after cashing in from the primary insurer the gross premium received on the reinsured risk. It follows that the higher the ceding commission, the lower the net amount paid by the primary insurer for proportional reinsurance. This is why the ceding commission frequently determines the reinsurer's profit or loss. Consequently, reinsurers take a keen interest that this commission, and the underlying acquisition costs, should be as low as possible.

It was explained in the article that the reinsurer can provide different support services to the primary insurer, and different services come at a different premium price.

DETERMINING THE INSURANCE PREMIUM (BASED ON CLAIMS PER BENEFIT, DIAGNOSIS AND TREATMENTS)

The health insurance premium is a function of the probability of risk and its unit cost (which is also influenced by the frequency[22] and severity[23] of the

21. Acquisition costs may include commissions paid to agents or brokers, marketing expenses, underwriting costs, medical and inspection fees, field supervision costs, taxes and overhead. Acquisition costs usually range between 20 and 25 percent of written premiums.

22. Frequency and severity are influenced by the applicable benefit package, the composition of the group[1] and the applicable claims management and provider payment system. On the composition of the group, insurers and reinsurers prefer a "homogenous" group. However, the volatility of new groups is largely unknown, and thus the industry practice is to follow two rules of thumb in pricing new groups: (i) group size: is it equal to or larger than 10 percent of the existing portfolio? and (ii) will the increase in loss potential be no more than 0.1 percent of overall losses at the company level?. If these two conditions are met, the new group is considered to be homogenous, and the standard pricing applies. As for claims management, reinsurers prefer claims management by a professional Third Party Administrator over in-house administration. And regarding provider remuneration, some form of capitation is considered more stable than fee-for-service billing.

23. An example of measuring severity is the length of stay in hospitalization cases; the overall severity would be obtained by dividing the number of hospitalization days by the number (or percent) of insureds hospitalized during the year

case), estimated by the Burning Cost (BC); and the necessary loadings (Safety Margin, Acquisition Cost, and Profit Margin).

Net Risk (Reinsurance) Premium = BC + Safety Margin (Reinsurer's own capital) + Acquisition Cost + Profit Margin

Determining the burning cost, and the safety margin, are two important aspects towards arriving at a premium. Acquisition cost is established by way of negotiation with the primary insurer, and the reinsurers' concern is not to compensate inefficiency of the insurer. On the reinsurer's side, profit margins are agreed upon by the reinsurer's treasury and line departments, hence there is very little scope for maneuvering.

Like capital requirements, the safety margin is a function of the confidence level. A lower confidence level, e.g. of 95 percent survival probability, requires less capital than a confidence level of 99.9 percent. A higher confidence level or safety margin will inevitably lead higher - and at times unaffordable - premiums. The table below provides an illustration of the impact confidence level on safety margin to be charged over and above the basic burning cost.

Product Description: Hospital cash allowance, with a waiting period of 3-days, and a daily cash benefit of 250 monetary units (MU), and a maximum benefit period of 45 days. Burning Cost (based on ERP and Claims Experience): 14.25 MU

	Safety Margin Premium (MU)	New Risk Premium (MU)	Safety Margin in % to Burning Cost
Premium requirements at	4.42	18.67	32.67%
99.9% confidence level			
Premium requirements at	4.16	18.41	29.10%
99.5% confidence level			
Premium requirements at	3.87	18.12	27.17%
99.0% confidence level			
Premium requirements at	2.48	16.73	17.38%
95.0% confidence level			
Premium requirements at	1.78	16.03	12.52%
90.0% confidence level			

The Burning Cost premium of 14.25 MU provides a confidence level of 55.8 percent ONLY, meaning the premium will guarantee the survival probability of the firm at 56 percent.

The above premiums were arrived at following 500 simulations of different claims pattern. The exposed at risk population was about 85,000, given that the product is a hospitalization with minimum benefits a better premium could be obtained with a much higher ERP, say in excess of 500,000.

The above table illustrates the usefulness of the safety margin. MIUs that have a small base of insureds and more concentrated risks will have to calculate premiums based on a very high confidence level (at least 99 percent), whereas a reinsurer could price the product at 90 to 95 percent confidence level.

In the real world, the situation is complicated by the practice of insurers and reinsurers to add a safety margin that result in much higher premiums

for the insured than necessary. The motivation for doing so are different: the reinsurer adds a safety margin based on the depth of statistical information available and experience of working with different clients, whereas the insurer adds the safety margin as a way to generate additional cash flows or margins. This scenario is particularly applicable in developing markets.

Once the net risk (reinsurance) premium has been determined a profit commission with the insurer is determined, which is typically on a sliding scale and is on a 3-5 years lock-in period. The lock-in period ensures that the there is no gaming in the process by the insurer. The profit commission is designed in fashion to reward the insurer for good underwriting and claims management.

DETERMINING THE CAPITAL REQUIREMENT OF AN INSURER

Once the premium of an insurer has been determined, based on the benefit package, it is necessary to determine the level of capital that the entity requires. The level of capital is usually stated as a percentage of the insurer's total liabilities. However, this amount can change under the following conditions:

Does the insurer enjoy a premium subsidy? If so, how much? (This may be particularly relevant in the case of health insurance coverage extended to persons who cannot pay, and might other wise be "charity patients"

Level of risk retention: risk that is ceded to reinsurance will entitle the primary insurer to capital relief, provided that reinsurance is proportional and that it is contracted with an authorized reinsurer. Such capital relief is not acceptable under non-proportional reinsurance, or if contracted with unauthorized reinsurers.

The cost of capital investments (human resources, I.T., and physical infrastructure). Initial working capital (incl. for training, promotion, and marketing) management/administration cost.

All such costs need to be covered before the product is launched or while the product is initially sold within the market.

APPLICATION TO MICRO HEALTH INSURANCE

Experience has shown that reinsurers are prepared to offer a level of comfort to the primary insurer during the formative/development stage of new products, by accepting to reinsure (under quota share or other proportional method) up to 80 or 90 percent of the portfolio, if they are involved in designing the product. As the primary insurer gains experience, the proportional reinsurance decreases to 40 – 50 percent, in a gradual process that lasts a few years (usually between 3 and 5 years).

Micro health insurance units operate in immature markets and with insufficient capital, expertise or accounting practices. In addition, they deal with health insurance, in which the process of underwriting and claims management is complicated. One of the complicating factors is that three agents compete

with each other to maximize returns: the insured, the healthcare provider and the insurer. Secondly, the volume of claims handled is large compared to most other classes of insurance (with the frequency of claims[24] as high as 10 percent for inpatient care and 600 percent for outpatient care). And, because of the social nature of healthcare, pricing of health insurance products is constrained by the need to ensure that the premium is affordable (a concern that is often prioritized over sustainability of the insurance). MIUs usually recognize their limited understanding of the risk potential, and their difficulty in setting the premium correctly. Therefore, MIUs would be keen to enter into a relationship with a reinsurer that includes technical expertise in product design, costing, management and administration, as well as surplus relief. The major concern of MIUs is whether they can afford to pay the reinsurance premium. From their side, reinsurers would also wish to ensure – as best they can – that the relationship with MIUs is based on utmost good faith, all the more so as the underwriting risks are considerable and more difficult to estimate due to dearth of reliable information.

24. Frequency of claims is measured relative to the number of insured members. For instance, it is not rare to expect an average of 5 to 10 outpatient consultations with a physician per member per year.