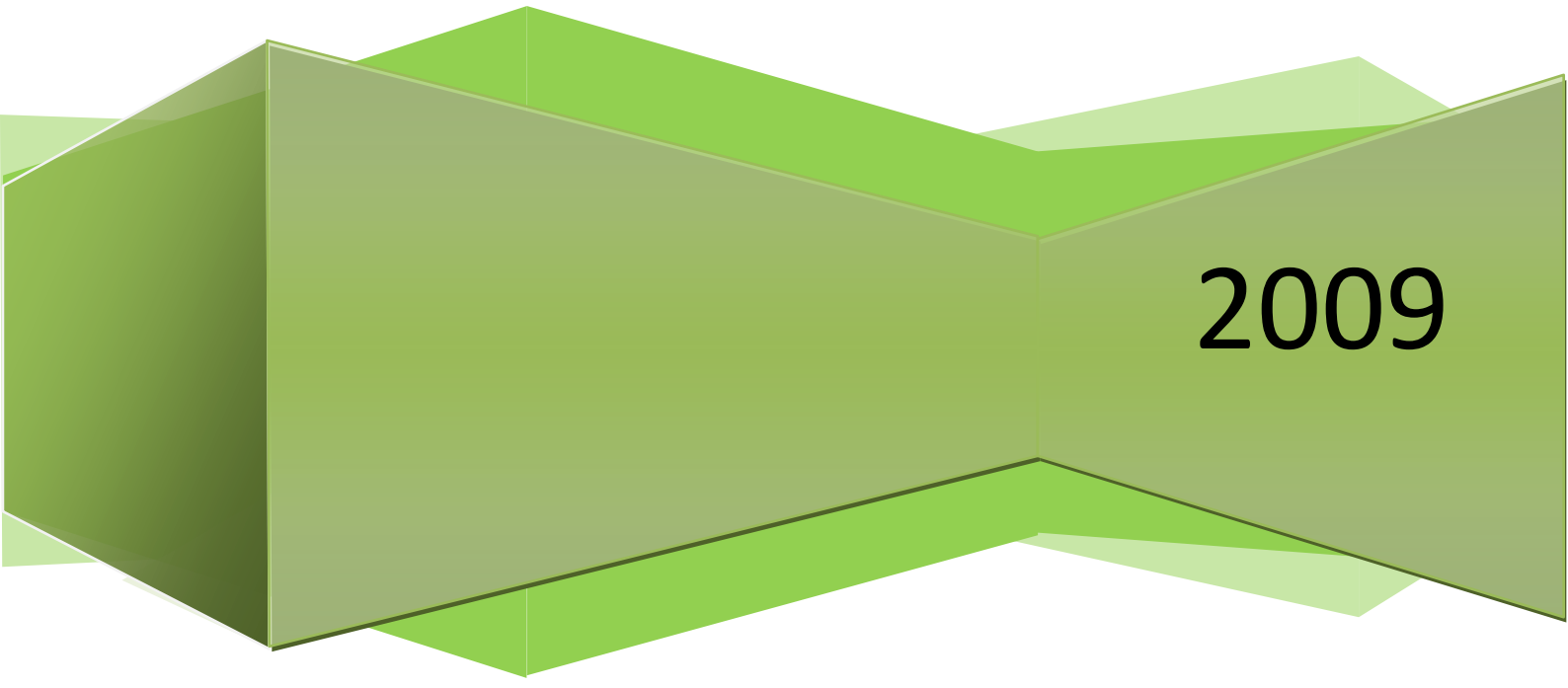
Defined Contribution and Age Related Risk Benefits:

The Equitable Myth

Neil Parkin and Vivek Moodley



Defined Contribution and Age Related Risk Benefits: The Equitable Myth

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ABSTRACT

This paper considers group assurance arrangements where benefits are based on age and the resultant issues that arise from these structures. Such arrangements, which ostensibly attempt to dilute age cross-subsidy, introduce a number of complexities. This paper explains the various issues stakeholders face - in particular the inherent cross-subsidies that exist within group risk schemes.

This includes the purpose of such schemes and the processes involved: starting importantly with the individual member who receives the benefit, to trustees, consultants and pricing actuaries.

Included in this is an explanation of the decision-making processes used for these schemes and how they impact on the final benefits to members. This paper further describes how age-related schemes can be structured, priced and considers the complexities when comparing between insurers.

Pricing methodologies and benefit design variations may result in members of two different group assurance arrangements having significantly different benefits, even though they share similar risk profiles and risk contributions. This then raises the question: are age-related structures as equitable as they first appear, or has the complexity simply shrouded their true nature?

KEY WORDS

Group Assurance; Defined Contribution (DC); age-related benefits; cross-subsidy; fairness; equity; risk benefits; mortality curves; HIV/AIDS.

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"The worst form of inequality is to try to make unequal things equal." Aristotle

1 Introduction

The concept of Defined Contribution (or "DC") arrangements is well entrenched in the group assurance market, and along with it are age dependant risk benefits. While such structures make intuitive sense at first consideration, they can be highly complex with questionable outcomes for individual members. This paper explores the concepts underpinning these arrangements, and further considers how equitable they truly are.

1.1 Scope

While insurance in the form of age-related benefits can include capital disability, the primary focus of this paper is on the provision of death cover. Many of the principles can, however, be equally applied to disability. Further, a basic knowledge of group assurance has been assumed.

Credibility theory and free cover limits have not been discussed here, as we believe these topics (although related) are beyond the scope of this paper.

1.2 Defined Contribution

The terminology 'defined contribution' can be literally understood - quite simply that the contribution or premium is fixed at a specified level. In a group assurance or risk context, this means that the cost of providing risk cover is pre-determined and does not vary from year to year. The balancing item is thus the amount of cover that is provided, which goes up or down according to changes in the underlying mortality and morbidity of the lives insured.

In the past, Defined Benefit (DB) retirement funds commonly provided death benefits defined as a percentage of a member's earnings, or a fixed multiple of salary (e.g. three times annual salary). When Defined Contribution retirement funds first emerged, the risk benefits continued to be structured in this way, in part due to the historical context but largely due to the simplicity that such a structure permits.

However as the risk profile of members began to change (most notably due to the progression of AIDS), employers and funds were faced with the prospect of sharply rising risk costs. The response was to limit their cost through fixed contributions towards risk benefits. "Defined Contribution (DC) Risk" thus became the industry term to describe risk arrangements where the costs are fixed (e.g. 2% of the members' salary) with benefits varying each year.

Hybrids of DB and DC Risk exist where the total allocation towards risk costs is allowed to fluctuate up to a cap. In these cases a fund may increase the risk contribution rate (up to the defined cap) if the trustees feel that a higher contribution is required to provide members with appropriate levels of cover (see Figure 4 on page 5 as an example of this).

1.3 Age Related Benefits

The initial introduction of Defined Contribution Risk seems simple, and merely an inverse of a Defined Benefit arrangement. For example, if life cover of 4 times annual salary costs 2% of salary

bill, a DC Risk arrangement with a contribution rate of 1% should provide 2 times annual salary. However, where the responsibility of providing cover shifted from the employer to a fund, members and trustees began to increasingly question cross-subsidies within the fund.

Such a scenario led to the popularisation of age related benefits – where the amount of cover is determined by the age of the member. The advantage here is that a fund could offer higher multiples at younger ages (where the perceived need is greater) and lower multiples for older members rather than a flat multiple for everyone (which may seem less generous or inadequate). Further, the move to Defined Contribution funds removed cross-subsidy on the retirement front, making glaring cross-subsidy on the risk side less palatable to some members.

An example of such an arrangement is given in the table below:

Table 1: Age Related Benefits

Age	Cover as a multiple of salary
18 - 39	6.0
40 - 44	4.0
45 - 49	3.5
50 - 54	3.0
55 - 59	2.5
60+	2.0

As underlying risk costs fluctuate from year to year, the benefits, rather than the premiums, fluctuate. The graph below illustrates how benefits could change, compared to a defined benefit arrangement.

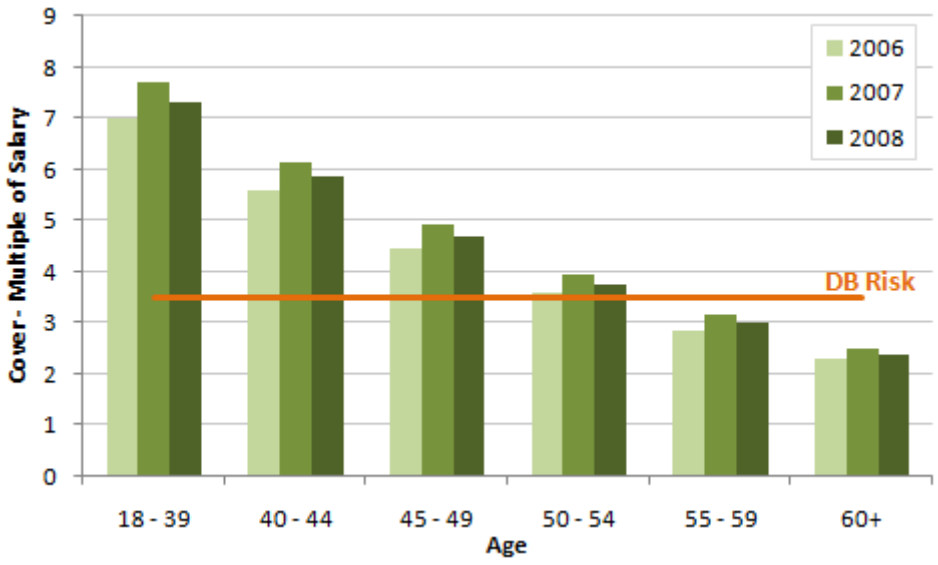


Figure 1: DC Risk vs. DB Risk

This method of structuring a Defined Contribution risk arrangement is so common that the term “DC Risk” is now synonymous with age related benefits. In many instances it will thus be found that “DC Risk” implies an age structure too. Although the focus of this paper generally assumes the context of a DC arrangement, many of the issues regarding age related risk benefits apply in a defined benefit world too.

2 Defined Contribution Risk: What is the Need?

One of the most critical questions that employers or trustees need to address is the reason for providing group cover in the form of a DC Risk structure.

The primary aim of trustees is to meet the needs of the members they represent. However, identifying the needs of members is often a highly complex process due to the heterogeneity of those needs. For example, contrast the need of a member with a spouse and young children with that of a younger member with no dependants.

As the purpose of most insurance is financial or income indemnification, it could be argued that a lump sum benefit in lieu of an annuity should decrease with age (since younger members need more income). This feature is consistent with age-related risk schemes.

Besides the needs of members, other reasons offered for promoting DC risk include:

- Cost savings: aiming to limit costs
- Reducing cross-subsidies between the young and old

2.1 Providing Benefits in line with need

Some may argue that the older a person, the greater their retirement savings. Age related risk cover would thus ensure that their total death benefit (defined as the sum of retirement savings and the insured benefit) remains roughly constant over time.

The graph below illustrates a fund which aims to provide a total death benefit of five times annual earnings.

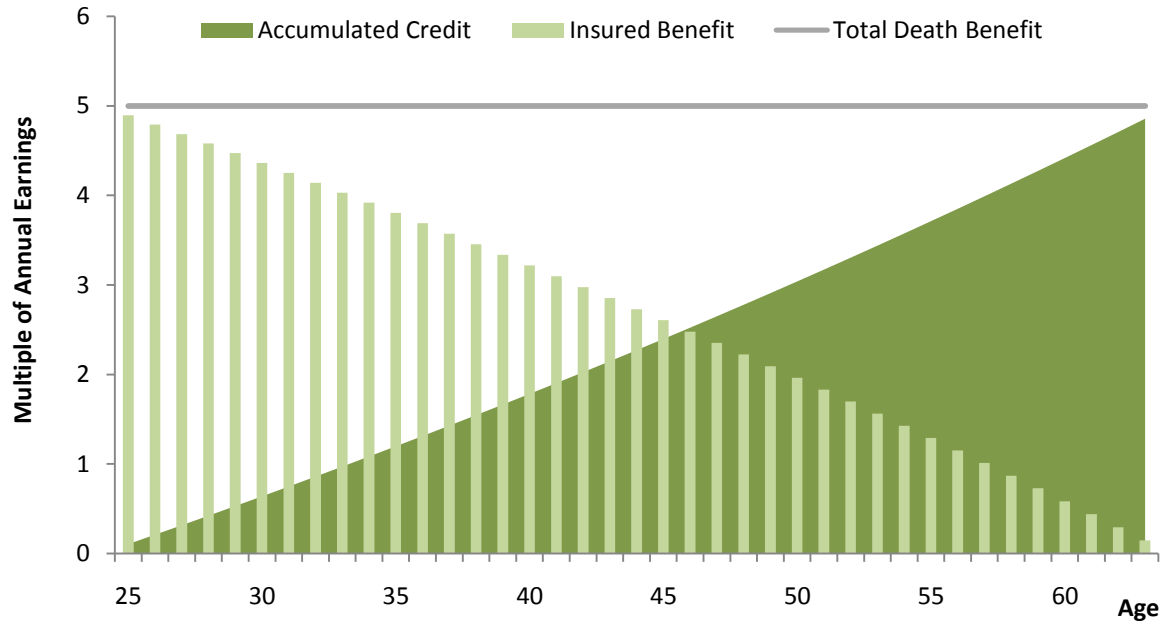


Figure 2: Retirement Savings and Insured Death Benefits

The required insured death cover for selected ages is given in the table below:

Table 2: Required Insurance Cover

Age	Required Cover
25	5.0
35	3.8
40	3.2
45	2.6
50	2.0
60	0.6

By contrast, a flat multiple across all ages would imply an increasing death benefit with age, which is illustrated in the figure below.

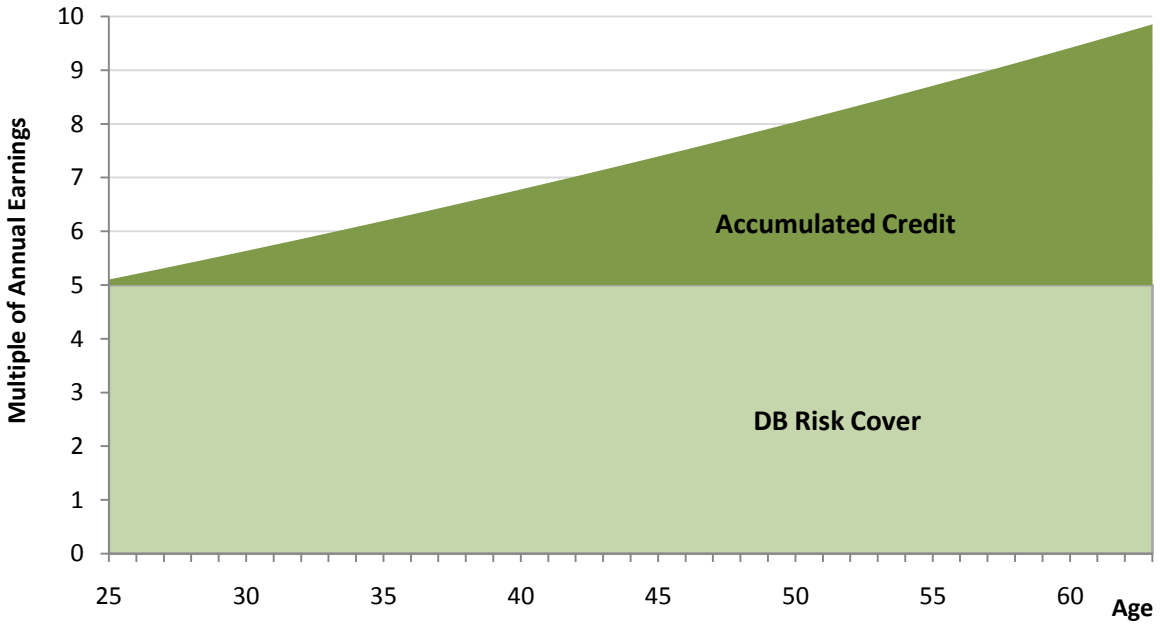


Figure 3: Retirement Savings and DB Risk

Despite the apparent neat fit with need compared to DB risk, there are disadvantages with an age-related approach:

- **Benefits are very sensitive to assumptions chosen.** Using alternative assumptions for investment return or contribution towards retirement provides very different required life cover multiples. It may even suggest negative multiples for some ages, indicating that the overall 'fund target' in respect of death benefits is questionable.

- **Is it equitable?** Initially it may seem fair that a fund aims to provide a flat death benefit including retirement savings. However, is it really equitable that a person's insured benefit is reduced in line with their assumed retirement funding? In some cases members may actually receive nil benefits. This may be addressed by introducing a minimum level of cover (e.g. one times annual salary).

- **Does it make sense?** One can question the concept of having a targeted death benefit equivalent to a person's retirement savings at normal retirement age. Although the illustration appears neat, the link between a death benefit required at an age such as 30 and the retirement savings required at age 65 is not clear. In fact, one would expect a 30 year old member with dependants to require a higher death benefit than the value of the fund credit at retirement. Although a fund may quite legitimately argue that it goes beyond its duty to provide such a benefit, it is worth noting that the intention to 'provide cover in line with need' is falling short of reality.

- **What about preservation of retirement savings?** Do members preserve their retirement savings when they move between employers? While impending legislation may introduce a form of compulsory preservation, the current environment shows very little evidence that this happens on a voluntary basis. Further, even if members preserve their retirement savings, the level will depend on past contribution rates and investment returns.

- **Considering retirement savings in the fund:** some funds explicitly reduce a defined level of insured cover by any current retirement savings for a particular member. Similar comments (as noted above) can be made regarding this structure, which effectively creates a pseudo-age related benefit scale. Another disadvantage of this type of approach is that it ignores any retirement savings in preservation funds. From a risk benefit perspective, this creates a disincentive to transfer retirement savings into funds with such arrangements.

- **Providing multiples in line with need may become very complex:** not all members will have the same needs, even at the same age. Especially important is the number of dependants and their ages.

Members could challenge a benefit design based on need rather than risk profile. Besides the reasons given above, it may mean a significant level of cross-subsidy based on subjective criteria.

2.2 Cost Savings: aiming to limit costs

Escalating risk costs over time has been one of the most significant reasons for the shift from DB Risk to DC Risk. Driven largely by HIV/ AIDS, risk costs have begun to eat away at retirement provision, and in some cases have even exceeded the employer's total contribution towards both risk and retirement.

The graph below provides an example of how the risk costs for an employer could change over time for both a DC Risk arrangement (implemented once the cost reached 3% of salary bill) and a DB Risk structure.

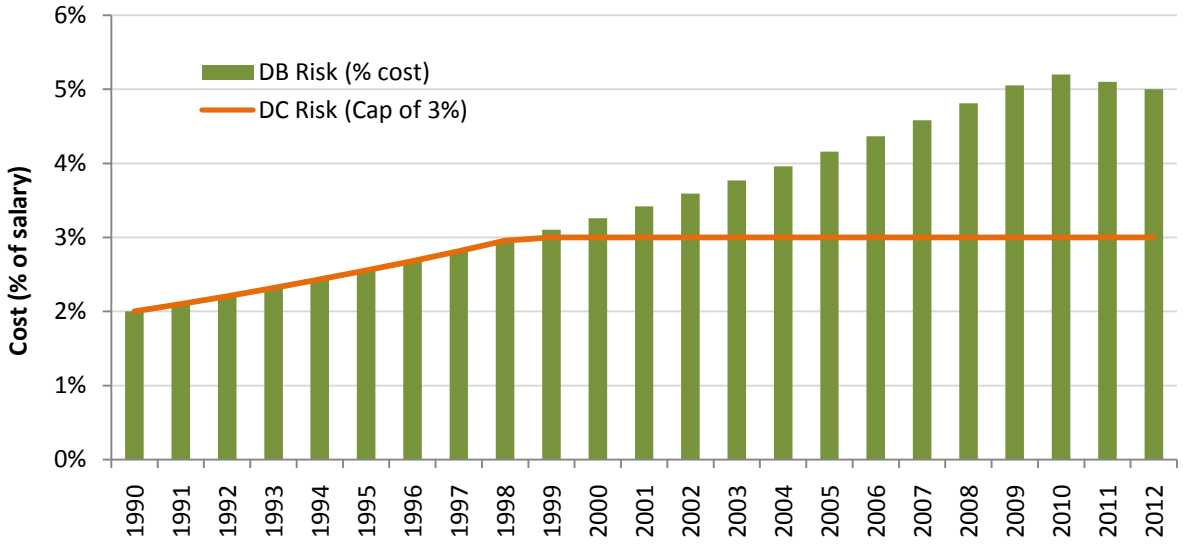


Figure 4: Risk Costs over Time

As alluded to in the figure above, some risk arrangements have already seen a stabilisation, and even a decrease, in risk costs as employers and other stakeholders work proactively to address the impact of HIV/AIDS.

This raises some important challenges to the fundamental purpose of DC Risk arrangements, and the following questions need to be considered:

- If group risk costs are beginning to reduce (or stabilise), **should employers and trustees reconsider their total allocation towards risk costs?**
- Further, if the primary motivation for moving to a DC Risk arrangement is to limit costs, then **should schemes that have not made the transition reconsider their planned restructure?**

It's important to bear in mind that not all employers will necessarily experience increasing costs over time. Such an outcome will depend on an employer's exposure to the impact of HIV/AIDS, as well as any other influence on the mortality and morbidity of the workforce. However, where costs are not increasing (e.g. low HIV exposure) the above questions are still valid in the context of motivating a DC Risk structure.

2.3 Removing cross-subsidies between younger and older members

Cross-subsidies by age can be defended since most young members will age and then be subsidised by the next generation. This is problematic, however, where cross-subsidies are suddenly introduced or removed.

While a scheme may try to reduce age cross-subsidy, they may still be faced with other larger cross-subsidies:

1. Gender
2. Income and Occupation
3. Region
4. Health status, including HIV/AIDS

2.3.1 Gender

Females generally exhibit lighter mortality than males. The difference in mortality can be as large as 30% to 40% of male mortality for a given age. However, lower income schemes may see this pattern reverse for some age bands (particularly 30 to 40) due to HIV/AIDS.

2.3.2 Income and Occupation

Members with higher income usually exhibit lighter mortality than those with lower income. The difference in mortality can be as high as 10 times for a given age and gender. For example, consider the risk profile of an executive versus a blue-collar worker in a manufacturing company. If there is a concentration of higher earners within an age band, it may cause a spike in benefits for that band. As these members age, this spike would shift -leading to further complexities. There is also an occupational effect that is often linked to income.

Higher income members are often more aware of their benefits as well as cross-subsidies than lower income earners. Some schemes address these cross-subsidies by introducing categories or separate schemes know as ‘executive schemes’.

Some might argue that the cross-subsidy between income groups is another form of distribution and provides a social good.

2.3.3 Region

Some regions such as KwaZulu-Natal (KZN) have a high prevalence of HIV/AIDS. A scheme with members in different regions may thus have implicit cross-subsidy e.g. members in the Western Cape may have a low prevalence of HIV and thus subsidise members in other provinces.

Very wide age bands may lead to significant cross-subsidies within those age-bands. For example, a 39 year old may have a much higher expected mortality than a 19 year old.

A change in the mix of gender or earnings distribution within age bands could cause large movements in multiples offered. *The smaller the scheme (or the number of members within an age band), the higher the expected volatility in experience.*

In practice most DC Risk arrangements ignore these cross-subsidies and concentrate solely on reducing the age cross-subsidy.

However, in trying to reduce age cross-subsidy, funds and employers may inadvertently amplify other cross-subsidies. Consider the example that older age groups tend to be dominated by males. This means that females in that group could receive a much lower benefit than if there were more females. Thus, while the scheme may accept gender cross-subsidy in aggregate (e.g. where the overall female proportion in 50%), the proportion vary significantly between age bands.

The outcome is that schemes artificially smooth multiples, resulting in questionable equity.

2.4 How much cross-subsidy is reasonable?

The answer to this question will depend on who you ask – the person being subsidised or the one providing the subsidy. Cross-subsidy may be particularly sensitive within the retirement fund framework, given that they can have a direct impact on a person's long term savings.

Consider an example where two members of a retirement fund are aged 25 and 55. Both contribute 2% of their salary towards risk costs and in return receive life cover of 7 and 2 times annual salary respectively. Is this reasonable?

On the face of it this probably does seem reasonable given that increasing mortality with age is a well accepted concept. But where does the line of reasonability lie? How do we defend these benefits or even calculate them? If trustees had to defend these structures, what rationale and evidence would they give?

In the extreme, what if a fund offered benefits of 9 and 0.25 times annual salary for these two members respectively? Does it still seem reasonable?

Cross-subsidy is a widely accepted and even encouraged practice, especially in the group risk environment. A flat multiple of salary could be seen as the extreme version of cross-subsidy, where everyone gets the same benefit despite the differences in the underlying cost.

The question then arises – is an incorrect age related scale of benefits better or worse than a flat defined benefit structure?

3 How to Structure Your Scheme

3.1 Initial Considerations

There are a number of considerations that need to be considered when creating or maintaining a DC Risk arrangement:

3.1.1 What is the current benefit structure? How much should we budget?

If a scheme previously provided defined risk benefits, the DC Risk structure would need to take account of both the total cost of the arrangement as well as the benefits that members received. Employers may not be keen to increase their costs towards group risk, while employees may not want to see a reduction in cover.

3.1.2 How to tackle the loss of cover

Older members and members that move from one age band to another may lose cover. Schemes can be structured to allow members to purchase additional cover on a voluntary basis so as to maintain their previous level of cover. These top-up arrangements would be paid by the individual member in addition to their normal risk contribution.

Top-up arrangements can be structured using ongoing conversion options to fill the cover lost due to the progression through age bands. These conversion options effectively enable a member to replace any cover lost under the group arrangement with the same cover under a retail policy.

Regardless of their form, top-up arrangements are vulnerable to a number of challenges:

- Administrative complexity
- Higher premium rates
- Underwriting: some members may be declined for additional cover
- Take-up rates: insurers may impose a minimum take-up rate to ensure the viability of the voluntary scheme.

3.1.3 How many age bands do you offer?

Schemes can offer a single age band where all members simply receive the same multiple of salary (so essentially a DC Risk structure *without* age related benefits). However it is more common for schemes to offer six or seven age bands. For example:

Table 3: Number of Age Bands

Band	Age	Cover
1	18 – 39	5.0
2	40 – 44	4.5
3	45 – 49	4.0
4	50 – 54	3.0
5	55 – 59	2.0
6	60+	1.0

The number of age bands should take into account the size of the scheme and the number of members expected to be in each age band. Too many age bands can add extra complexity, making it hard to administer and communicate to members. Also, it may mean more complicated financial planning is required for members as their benefits change over time.

Another point to consider is that the volatility of a scheme's claims experience is expected to increase with the number of age bands (since the variance of the claim amounts increases). This may eventually lead to changes in the benefit multiples themselves.

3.2 Using Mortality Curves

Once the initial considerations above have been finalised, the following will have been established:

- a defined contribution rate to risk costs , and
- the age band structure (see *Section 2.1* which discussed benefits in line with need).

The next step is then to determine the actual benefit that applies for each age band. Age related benefits can be implemented on a number of methodologies, including:

- Using the scheme's own mortality curve
- Referring to published mortality tables
- Using the insurer's mortality basis

Each method essentially aims to determine the underlying mortality curve by age, and then 'allocate' benefits according to this.

3.2.1 The scheme's own mortality curve

For very large schemes, a mortality investigation can be used to determine the mortality curve by age for that specific scheme. Using mortality rates and graduation between age bands where insufficient exposure exists, the scheme can structure how much cover each band should receive as a multiple of earnings (for a given contribution rate to risk benefits).

This method should only be applied where there is sufficient experience in respect of both claim numbers and exposure for each age band. Where this is true, it is the ideal method as it is based on evidence of that scheme's actual mortality experience. When large schemes attempt to insure their benefits, details of such an investigation (or the underlying data) should be provided to insurers in addition to the standard industry format information. This will enable the insurers to quote using a more appropriate curve according to the scheme's risk profile.

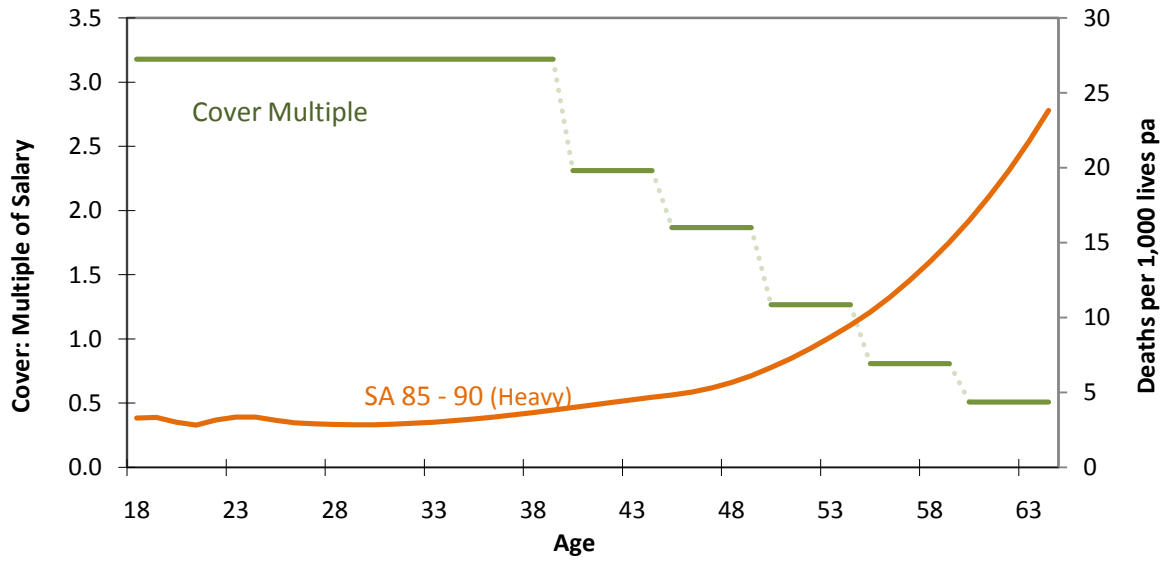
3.2.2 Using published mortality tables

Where schemes are too small to allow for the use of their own mortality curve, published tables can provide an alternative method.

Figure 5 below illustrates the *SA 85 – 90 Heavy* mortality curve (as an example), along with the cover multiple that can be granted for a scheme. This is based on the following assumptions:

- The total risk contribution is 1% of salary bill,
- The mortality for an age band is the linear average of the mortality rates for each age within the age band, and
- There is no allowance for expenses or profit margins.

Figure 5: Using Published Mortality Tables



The SA 85 – 90 curve rises sharply after age 50, and as a result the latter ages receive cover of around half their annual salary. In contrast, a 39 year old would get more than three times their annual salary.

Where mortality does not rise significantly initially, schemes usually group ages 18 to 39 together. However, where schemes exhibit large differences in mortality within this group it would be necessary to consider dividing it appropriately. Schemes with significant HIV/AIDs exposure are a good example of this.

This illustrates the importance of selecting an appropriate published mortality table and hence a disadvantage of this method – the use of an inappropriate curve will result in misallocation of cover. This can be both inequitable for members, and potentially loss-making for the insurer.

3.2.3 Using the insurer's mortality basis

Schemes will often only provide the defined risk contribution rate to insurers, who then provide a set of multiples based on their own mortality curve.

The disadvantage with this approach is that multiples may shift when the scheme changes insurers, or when an insurer reviews its own mortality basis. This can thus result in volatile benefits from year to year, which in turn will require additional communication and member education. Apart from the costs involved, members may still not fully understand what cover they actually have.

To avoid this problem, some schemes opt to retain the shape of the existing curve and insurers quote on this basis. Benefits are then simply increased or decreased proportionately across all age bands to arrive at the total defined risk contribution. This, however, also has disadvantages:

- The curve may have been derived from an insurer's basis at the scheme's inception, which could be very different to the true underlying mortality.
- The risk profile of the scheme may have changed over time and the curve will need to be reviewed from time to time. This needs to be balanced against communication costs and simplicity.

Section 5.1 provides further discussion on these issues. The important point to bear in mind is that by understanding what curve the insurer has used, a scheme or consultant can better assess how appropriate it is. An insurer may, for example, have different curves for different occupational sectors, or just one simple curve that varies by age only.

3.3 Providing benefits in line with each individual age

The previous discussion was based on the premise that ages would be grouped in some form (see paragraph 3.1.3, *How many age bands do you offer?*). If one takes this concept to the extreme, each age could be considered as an 'age band' and benefits provided on this basis. This supports the strategy of reducing cross-subsidies within age bands, which could be significant. The actual curve may still be derived using the methods outlined in Section 3.2.

To illustrate this, we return to the example in Section 3.2.2 (Page 14). Using SA 85 – 90, consider the multiples that can be offered for members using their individual ages ("Individual") compared to the multiple based on the age band in which they fall ("Grouped").

Figure 6: Age Bands v. Individual Cover

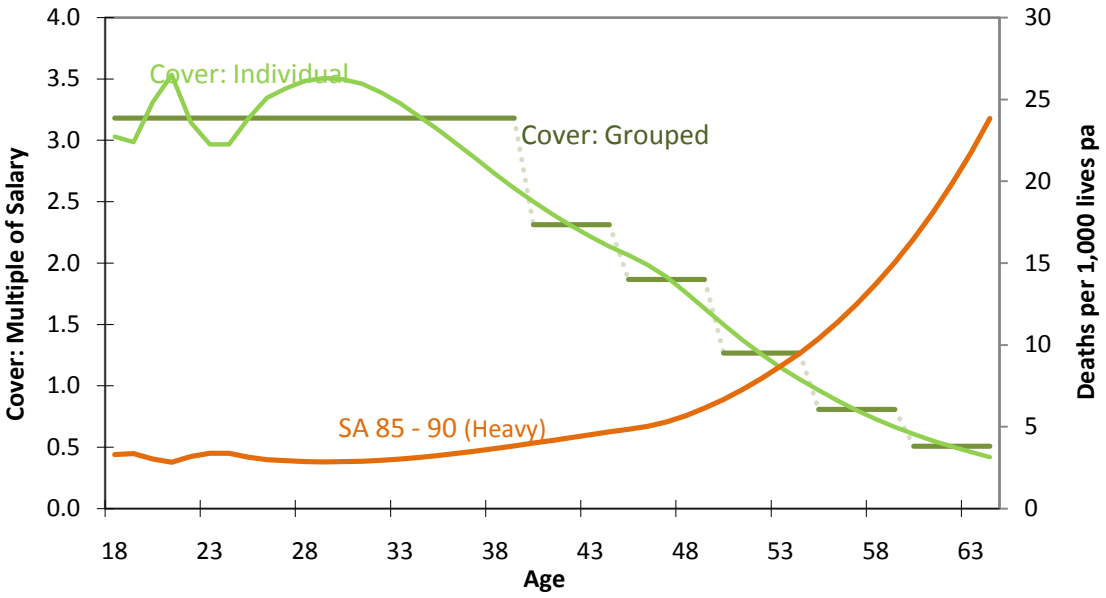


Figure 6 above illustrates how grouping members can have a significant impact on the cover provided. For example, a 55 year old may have 20% more cover if he is not grouped. This is driven by

the slope of the curve, and the number of age bands. Clearly, the latter age bands will be more susceptible to this averaging effect given the steep gradient of the mortality curve for these ages.

It can still be argued, however, that such deviations are still preferable to a broad cross-subsidy where a flat benefit is offered across all ages.

The approach of offering benefits per individual age has some limitations, which are discussed briefly below.

3.3.1 Change in profile by age

Insurers use various factors to calculate an expected cost of providing risk cover. This may include the following:

- Age
- Gender
- Salary
- Industry and Occupation
- Region

The insurer may group members according to each of these factors and calculate a weighted average risk rate for each age. Since the number of people at each year of age is small, the risk profile of that group is vulnerable to significant changes i.e. people joining or leaving. For example, the entrance or exit of a single person with a high salary, or different gender, could shift the profile considerably.

In general, the smaller the number of members within an age band, the greater the expected volatility in benefit multiples from year to year. This in turn implies that such an approach is only feasible in respect of very large schemes.

A scheme that sets multiples using published tables set according to age only may help dilute this problem.

3.3.2 Complexity

It is more difficult and complex to administer a scheme with such a vast number of multiples. Members may also struggle to keep up with changes in their cover, and a small change in cover is likely to be perceived as spurious.

Further, where a voluntary 'top-up' arrangement is in place (to replace cover lost with age), such an approach will create a significant level of administration and hence costs. Members are also likely to forget to exercise the option to purchase the voluntary cover.

3.3.3 Financial Planning

The increased volatility in cover may also make it more difficult to make financial plans. Apart from top-up arrangements noted in 3.3.2 above, members may need to consider individual arrangements, depending on the number and ages of dependents.

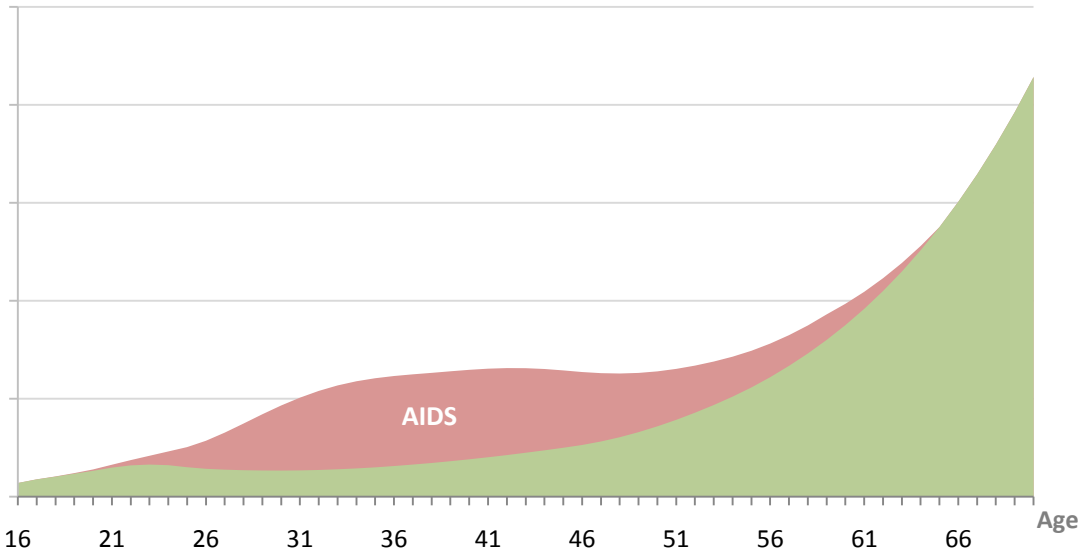
4 Other Issues

4.1 How does HIV/AIDS affect a scheme's benefit structure?

HIV/AIDS has been a major cause of escalating risk costs over the last decade, and a major reason for the move to DC Risk arrangements. The impact of AIDS is most visible in the younger to middle age groups (30 to 45, depending on the gender and income mix), and typically creates a 'hump' in mortality.

Figure 7 below demonstrates an example of this graphically, based on assumptions regarding income, gender and region.

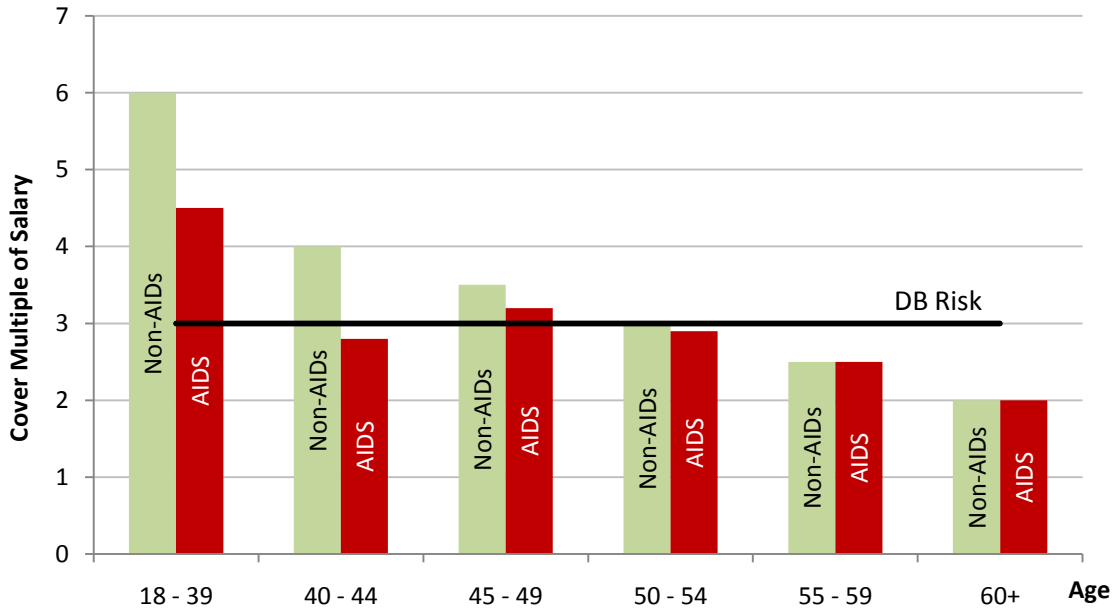
Figure 7: Relative Mortality by Age, including the impact of AIDS



The impact of AIDS on age related benefits is best illustrated with an example. We consider the following three schemes:

- **Minimal AIDS Scheme:** Older members receive relatively less cover since mortality is assumed to increase exclusively with age.
- **High AIDS Scheme:** This scheme takes account of AIDS, which tends to affect members in the 40 to 44 age category. Mortality thus increases up to age 44, and then dips before increasing once again in line with age.
- **Defined Benefit Risk**: This scheme provides traditional life cover of three times annual salary for all members.

Figure 8: DC Risk and AIDS



While it might be easy to communicate multiples that decrease with age to members, a structure that rises and falls may again cause confusion and distrust.

Further, providing benefits that are in line with a scheme's expected mortality will help reduce cross-subsidies between age bands, but may not address the issue of need: older members will get more cover than younger members for certain ages. And precisely where AIDs has increased the risk cost is where the need for risk cover is the greatest.

This result highlights a flaw in the needs argument (see section 2.1, page7) in favour of a DC Risk structure – providing decreasing cover in line with increasing age works, but only if the following assumption is borne out: **greater cover can only be allocated to lives that cost less to insure**.

Although the needs argument conveniently dovetails with a typical mortality curve (i.e. mortality increases strictly in line with age), **the truth is that cover is actually being spread according to the underlying risk cost, and not need.**

4.2 Lump Sum Disability Benefits ('Capital Disability')

Disability insurance is typically seen as indemnification for lost earnings up to retirement age. As a result this ties up neatly to an age related scale where benefits reduce as one approaches retirement. The need for a form of disability benefit that is related to age makes sense given the purpose of the benefit, and the desire to prevent over-insurance.

Further, even defined benefit arrangements typically include a 'reduction basis' where the benefit tapers off during the last few years before normal retirement age. Some schemes with age related benefits still apply a reduction basis, given the desire to prevent over-insurance.

Whether such a reduction basis should apply to an age-related disability structure is largely a moot point. The critical factor is to set up an appropriate benefit structure – whether a reduction basis is simply built into the set of multiples or applied later, the result is the same.

The real issue is to decide how to determine the multiples for each age band. A pure cost based approach may lead to multiples that are not aligned to 'need'. The Life Office Association (before becoming ASISA) issued guidance on converting capital values into an equivalent monthly benefit (LOA Code of Conduct – Chapter 3, Code of Good Practice for Disability Insurance). This guidance can be used to determine the implied maximum benefits per age, as shown in the graph below.

Figure 9: Capital Disability – Balancing Cost and Need

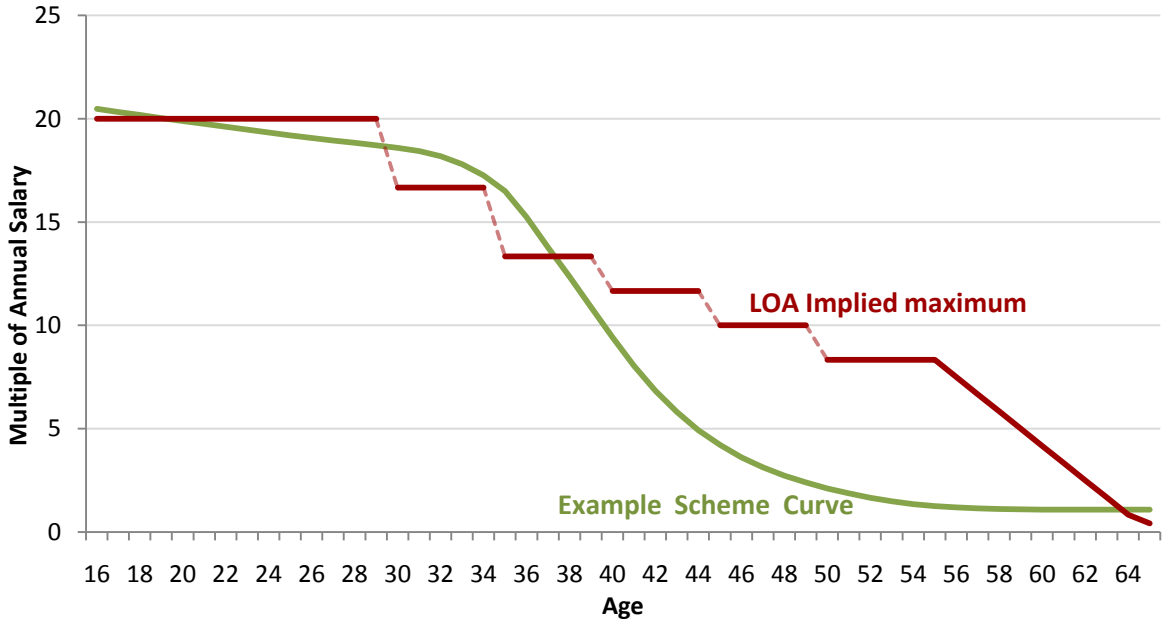


Figure 9 also gives an example scheme curve, which illustrates the shape of a potential set of multiples by each age. Such a curve, based on the morbidity experience of the scheme (or the insurer's book), provides a cost-based method for determining the multiples for each age band. The LOA's implied curve, on the other hand, provides an upper limit in terms of 'need' (i.e. 100% income replacement).

Clearly, any benefit structure would need to take both these constraints into account, balancing the need and cost curve for a given contribution. Where there is a significant limitation on the benefit due to 'expected need' rather than cost, members may be concerned about the cross-subsidy.

Ultimately though, the capital disability benefit structure is likely to be linked to any underlying group life assurance cover. In many instances the benefit is the same for both life and disability, with the latter restricted to the insurer's cover limits. In these cases, a reduction basis could be a useful means to prevent over insurance.

5 The Annual Review of Premium Rates and Benefits

The previous sections have highlighted the various complexities that are inherent in DC Risk schemes. A number of these issues make the annual review of DC Risk premiums and benefits complex and time-consuming.

As described in section 3.2, there are a number of approaches that can be followed when reviewing the DC Risk arrangements each year. This section considers in more detail the implications when re-broking and comparing structures between insurers.

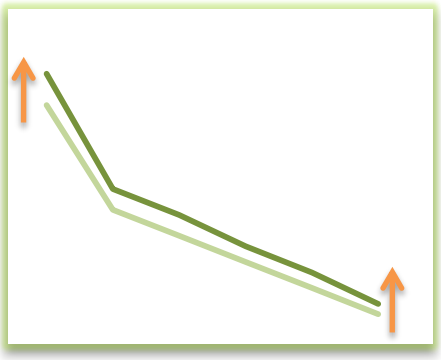
5.1 Maintaining the current curve

Where a scheme elects to maintain the shape of the current curve, the current multiples will be presented to the market and quotes will be performed on this basis. The scheme may then ask the insurer to scale the benefits uniformly to arrive at the total defined contribution rate.

For example, consider a scheme that currently pays 2% of salary bill for the benefit structure in Table 4 below. On review, an alternative insurer provides a quote of 1.82%. Instead of reducing the risk cost, the scheme may increase benefits by 10% across all ages.

Table 4: Maintaining the current curve

Age	Cover as a multiple of salary	
	Current	New
18 – 39	6.0	6.6
40 – 44	4.0	4.4
45 – 49	3.5	3.9
50 – 54	3.0	3.3
55 – 59	2.5	2.8
60+	2.0	2.2



The advantage of this approach is its simplicity, and the change in benefits is easy to explain to members. Such a method is useful for reviews between thorough mortality investigations, or where a scheme changes insurers frequently.

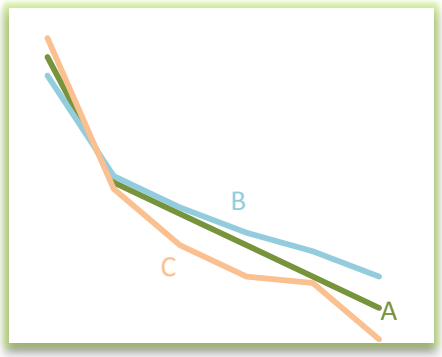
5.2 Using the insurer's curve

An alternative approach would be to ask each insurer to quote multiples that can be purchased for each age band given the scheme's defined contribution rate.

Continuing the example above, we can consider the case where three insurers have been requested to provide benefit multiples for each age band based on the fixed cost of 2%:

Table 5: Insurers' Curves

Age	Cover as a multiple of salary		
	Insurer A	Insurer B	Insurer C
18 – 39	6.0	5.7	6.3
40 – 44	4.0	4.1	3.9
45 – 49	3.5	3.6	3.0
50 – 54	3.0	3.2	2.5
55 – 59	2.5	2.9	2.4
60+	2.0	2.5	1.5



This approach can yield very different results, depending on the shape of each insurer's mortality curve by age. There are various challenges with this approach:

- Benefits are more likely to vary from one year to the next as insurers use different mortality bases
- Twists in benefits may be difficult to explain to members
- It may be difficult to compare benefits between insurers i.e. how do you select which set of multiples is best for the given cost?

5.3 Comparing insurers: more than meets the eye

The following graph illustrates the benefits that each insurer provides:

Figure 10: Comparing Insurers

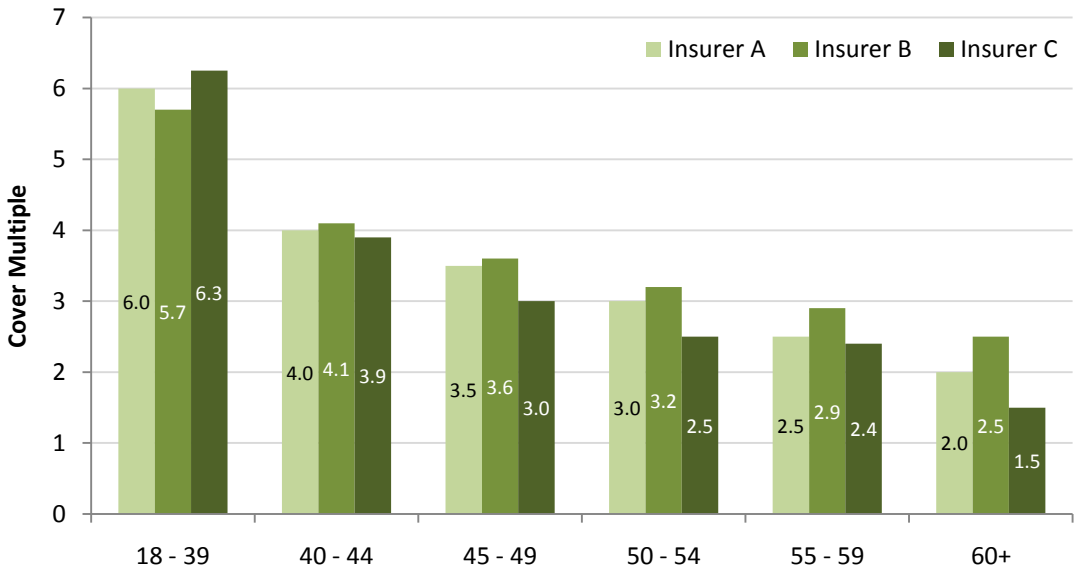


Figure 10 above may suggest that **Insurer B provides the best** multiples, and **Insurer 3 the worst**. However, to make a more informed decision, consultants and trustees would need to look at the membership composition and total cover per age band:

Table 6: Distribution of Membership and Cover

Age	Cover as a multiple of salary			% of Members	% of Cover
	Insurer A	Insurer B	Insurer C		
18 – 39	6.0	5.7	6.3	50%	60%
40 – 44	4.0	4.1	3.9	15%	15%
45 – 49	3.5	3.6	3.0	9%	10%
50 – 54	3.0	3.2	2.5	7%	5%
55 – 59	2.5	2.9	2.4	9%	5%
60+	2.0	2.5	1.5	10%	5%

From this table it is clear that Insurer B has the best cover multiples for all age bands except the first, which has the majority of members and cover.

Some consultants may argue that the best way to compare insurers (and mitigate the above problem), is to compare the total cover offered to the scheme. Such an approach is effective in negating the impact of offering high cover to categories with low membership.

However, consider the following example, where we compare just two insurers:

Table 7: Equal Total Cover

Age	Total Cover		% of Members
	Insurer A	Insurer B	
18 – 39	R 600,000	R400,000	50%
40+	R 400,000	R600,000	50%
Total	**R1,000,000**	**R1,000,000**	**100%**

In this example, both insurers offer the same total cover. Which insurer is offering better benefits? Assuming that the older age band has a higher average mortality rate, it would be cheaper to offer the 18 to 39 age band more cover than the 40+ age band.

Whichever approach schemes decide to follow when either initially setting up or maintaining their existing DC Risk arrangement, careful attention must be paid to the level of current benefits, simplicity and the cost of communication (in the event that benefits change).

Trustees and consultants are advised to question insurers on their methodologies as this directly affects an individual's cover. The outcome of all this is that comparisons between insurers can be difficult and that the annual review may require a lot more time and attention than convention DB Risk structures.

5.4 The role of intermediaries

While traditional DB Risk schemes present various legal, tax and actuarial issues, DC Risk schemes come with even greater responsibility for trustees and intermediaries (or 'consultants').

The need for **qualified and experienced consultants with suitable expertise** is even greater when considering DC Risk schemes, owing to the inherent complexity involved:

- Structuring of initial and ongoing benefits e.g. setting up a Risk Policy Statement, which clearly defines the objectives of the scheme
- Ongoing legal consideration e.g. equity of members
- Addressing the needs of members in an environment where the profile of members can change rapidly
- Communication of benefits and options to members
- Choosing the best insurer on an ongoing basis

Such additional complexity and time requirements compared to DB Risk schemes may support a more generous fee model for intermediaries than the current commission scales, which are based purely on a percentage of gross premiums.

Conversely, the current reward structure may dissuade some consultants from selling DC structures or to spend adequate time and expertise on reviewing the appropriateness of a scheme's benefit structure.

For very large schemes it can be argued that intermediaries are already generously remunerated and don't require further compensation. Fee-based remuneration may help address these issues for small to medium schemes where this is not the case.

6 How to Price DC Risk Schemes

The following section explains some of the pricing methodologies that insurers use. Understanding their pricing processes may help decision-makers better understand how insurers arrive at their premiums and benefits, and whether the resultant curve is appropriate for their scheme. By ensuring that insurers have appropriate expertise and clearly defined pricing processes will assist funds in providing more stable benefits to their members.

An insurer's chosen pricing methodology may be affected by a number of factors, including:

- **The time scale for quoting**
  Large, complex schemes require more time. Where this is not available, insurers may be forced to use the most efficient, rather than accurate, method to meet the deadline.

- **The quality of data**
  Missing data, especially key information, may stall the process or necessitate assumptions, which can lead to contingency margins. As an example, some schemes provide individual claims data, while others do not. In general however, data quality has been improving over time.

The overall approach to pricing a DC Risk scheme follows a similar process to that of a traditional DB Risk scheme. Smaller schemes would require the use of the insurer's technical rates basis (or 'book rates') while for larger schemes the premium rates would incorporate the actual claims experience for that scheme.

Note that the following sections are concerned with deriving a risk rate – in practice expenses and profit margins would be included as separate loadings.

6.1 Book Rates

Where a book rate is required, the insurer would offer cover multiples based on a weighted average premium rate for each age band. The premium for each member is calculated using the probability of claiming multiplied by their cover, a method which is similar to the calculation for DB Risk premiums.

Equation 1: Calculating Book Rates

$$\text{Cover Multiple for Age Band } x = \frac{C \times \sum_i Salary_i}{\sum_i q_i \times Salary_i}$$

Where:

C is the defined contribution rate, as a percent of salary

q_i is the probability of *member i* in Age Band x claiming, based on factors such as age, gender and income

$Salary_i$ is the annual salary in respect of *member i* in Age Band x

6.2 Experience Rating: recapping the DB Risk methodology

As scheme size increases, so too does the insurer's ability to utilise that scheme's actual claims experience to determine the premium. Insurers generally apply a version of credibility theory to determine to what extent the book rate (as calculated in 6.1) needs to be blended with the experience rate.

Before discussing the pricing of DC Risk schemes, it is worth recapping how DB Risk schemes are often priced using claims experience.

As a simple example, consider a scheme with 2 000 members, a benefit structure of 2 times annual salary and full credibility. The average salary in 2009 is R50 000 per annum.

Table 8: Experience Rating - Example Data

Year	Premium Rate	Premiums Due	Claims (incl. IBNR)	Number of Claims	Loss ratio	Members
2006	3.20%	R 1,900,000	R 1,800,000	25	95%	1,500
2007	3.52%	R 2,500,000	R 2,700,000	35	108%	1,650
2008	3.35%	R 2,800,000	R 2,500,000	30	89%	1,800
Total	**3.36%**	**R 7,200,000**	**R 7,000,000**	**90**	**97%**	**4,950**

Premium Method

The premium-weighted rate charged for the period is 3.36%. If one assumes that no trends exist (i.e. there is no improvement or deterioration in the experience), the insurer would calculate the premium rate as follows:

$$3.36\% \times 97\% = 3.27\%$$

[premium-weighted rate × loss ratio for period = experience rate]

Numbers Method

This method involves considering the expected number of claims and the expected average claim amount separately.

The calculation in respect of the number of claims expected in 2009 must take into account any changes in membership. Using claims expressed per thousand lives insured (or *per mille*) assists with this. In this example, the rates per mille are as follows:

Year	Claims per Mille*
2006	16.7‰
2007	21.2‰
2008	16.7‰
Average	**18.2‰**

**Calculated as number of claims divided by membership and multiplied by a thousand*

Given that no trend is evident, we could use the average rate of 18.2 deaths per 1,000 lives insured. Using this, we would **expect 36.4 claims** in 2009 (18.2/1000 × 2000 members).

The average salary in 2009 is R50,000 and the average cover is thus R100,000. The average claim will however, not necessarily be equal to the average cover - for example, lower income earners may be more likely to claim. In practice the average claim might easily vary between 70% to 100% of the average cover, although the actual variance could be quite high for smaller schemes.

In this example the average claim is 90% of the average cover. Assuming this continues for 2009, the **average expected claim would be 90% × R100,000 = R90,000**.

Based on these calculations, we would thus expect total claims equal to R3,276,000 (36.4 × R90,000), which equates to a premium rate of 3.28%.

6.3 Experience Rating: DC Risk Schemes

This section extends the discussion in 6.2 to incorporate the additional considerations when setting an experience rate for a DC Risk scheme. Underpinning this example is the assumption that the risk profile of the scheme has not changed over time, and as such a comparison can be made between periods. In practice, the *Actual versus Expected* approach should be used for every period in each method described below.

6.3.1 Information and Data

The approach to calculate the experience rate for a DC Risk scheme is somewhat dependant on the information that is available.

Where an insurer has been insuring a scheme for a number of years, they are likely to have the following information:

- ✓ Current exposure split by age, gender and salary
- ✓ The benefit structure or multiples per age band for each of the past years
- ✓ Total premiums for each period
- ✓ Total claim numbers and amounts for each period
- ✓ Exposure for each of the past years, split by age, gender and salary
- ✓ A list of claims, with details of the member's age, gender and salary
- ✓ Premiums for each individual age for past years using exposure data
- ✓ Claims for each individual age for past years using claims data

We now consider the information that is available to other insurers using the **standard industry format**:

- ✓ Current exposure split by age, gender and salary
- ✓ The benefit structure or multiples per age band for each of the past years
- ✓ Total premiums for each period
- ✓ Total claim numbers and amounts for each period
- × Exposure for each of the past years, split by age, gender and salary
- × A list of claims, with details of the member's age, gender and salary
- × Premiums for each individual age for past years using exposure data
- × Claims for each individual age for past years using claims data

With this in mind, the following sections discuss the various methodologies that can be applied to price a DC Risk scheme. We then consider the implications of the availability of the above information for these methods.

6.3.2 Example Scheme for DC Risk Rating

Sections 6.3.3 to 6.3.6 are based on this example scheme with a constant membership of 5,000 lives:

Table 9: Example Scheme Claims Experience

Year	Premium Rate	Premiums Due	Claims (incl. IBNR)	Number of Claims	Loss ratio	Total Cover
2006	2.00%	R 2,000,000	R 1,800,000	25	90%	R 300,000,000
2007	2.00%	R 2,350,000	R 2,500,000	27	106%	R 310,000,000
2008	2.00%	R 2,450,000	R 2,300,000	23	94%	R 345,000,000
Total	**2.00%**	**R 6,800,000**	**R 6,600,000**	**75**	**97%**	-

Table 10: Example Scheme Cover Multiples

Age Band	Cover Multiple		
	2006	2007	2008
18 – 39	6.0	5.7	6.3
40 – 44	4.0	4.1	3.9
45 – 49	3.5	3.6	3.0
50 – 54	3.0	3.2	2.5
55 –59	2.5	2.9	2.4
60+	2.0	2.5	1.5

Table 11: Example Scheme Member Distribution

Age Band	Members	% of Members
18 – 39	1,650	33%
40 – 44	2,500	50%
45 – 49	300	6%
50 – 54	250	5%
55 –59	200	4%
60+	100	2%
Total	**5,000**	**100%**

Table 12: Example Scheme Claims per Mille [not part of the standard industry format]

Age Band	Claims per 1,000 Members			
	2006	2007	2008	Average
18 – 39	4	5	4	4.3
40 – 44	8	9	5	7.3
45 – 49	5	4	6	5.0
50 – 54	1	2	1	1.3
55 –59	4	5	4	4.3
60+	3	2	3	2.7
Total	**25**	**27**	**23**	**25.0**

6.3.3 Method 1 – Using Cover

The Cover Method provides a combination of a scheme's claims experience with an insurer's book rates. The book rates are used to determine a mortality curve, and hence the relative cost of providing a given set of multiples by age. The actual experience is then used to adjust this book rate so that the mortality curve is uniformly shifted to the correct level.

The first step is to calculate the book rates for this scheme. For the sake of this example, assume that this yields a book rate of R6.50 per R1,000 cover p.a. for the required benefit structure.

The next step is to calculate the experience rate. To do this, the Cover Method determines the rate that should have been charged per R1,000 cover by calculating:

$$Experience\ Rate = {}^{Total\ Claims}/_{Total\ Cover}$$

The results for each year are as follows (based on Table 9):

Year	Rate per R1,000 Cover p.a.
2006	6.00
2007	8.06
2008	6.97
Average	**6.91**

Assuming full credibility, we would then charge the scheme R6.91 per R1,000 cover per annum (with no allowance for any trends).

The final step is then to proportionately adjust the cover for each age band. In this case the experience rate is higher than the book rates, and the multiples need to be decreased by 6% for each age band (6.5 / 6.91).

Advantages:

- ✓ Simple and easy to understand
- ✓ Quick calculations
- ✓ For very large schemes, with reasonable exposure in each age band, it should produce fairly stable results
- ✓ For schemes that have had little variation in the cover for each band, it should also provide stable results

Disadvantages:

- × If the distribution of cover across age bands varies substantially from year to year, it will distort the results. For example, a scheme may receive more total cover in one year, but only because the lives with lower mortality were granted more cover.
- × The method may produce highly volatile results. Total claims for a given period can be split into an average claim amount as well as the number of claims. While the number of claims may be fairly stable, the average claim can be considerably more volatile depending on the exposure for each age band.
- × The actual scheme's mortality curve is ignored.

6.3.4 Method 2 – Using the expected number of claims

As with the Cover Method described above, this method also uses the book rates to determine the shape of the mortality curve, with an adjustment based on the actual experience of the scheme.

The first step is to calculate the book rates for this scheme.
Using the required contribution rate (2% in this example) and the book rates, we can calculate the multiples implied for each age band.

The next component is to use the book rates to calculate the expected number of claims. To do this, we simply sum the probability of claiming for each member (q_x). For this example, assume that the number of expected claims is 20.

The next step is to calculate the experience rate. For this method the 'experience rate' we consider is the expected number of claims derived from the experience itself. Looking at Table 9, we can see that the average number of claims is 25. *Note that in practice the membership will change from year to year, so the rate per thousand lives will need to be used, rather than a straight average (see Section 6.2, page 27 for more details).*

The final step is then to proportionately adjust the cover for each age band. As experience indicates that claims are 25% higher (25/20) than suggested by the book rates, the multiple implied by the book rates for each band will be reduced as follows:

$$\text{Adjusted Multiple for Age Band } x = \text{ Book Rate Multiple } \times \frac{20}{25}$$

Advantages:

- ✓ The insurer's mortality curve is driven by a large amount of exposure
- ✓ Ideal for schemes where the number of claims is stable

Disadvantages:

- × Does not allow for the actual experience of claim sizes (due to differing multiples), even when this may be stable (e.g. for large schemes)
- × The shape of the insurer's mortality curve may be very different to that of the scheme, thereby increasing cross-subsidy.

6.3.5 Method 3 – Very large schemes

For very large schemes the experience can be analysed by each age band for each past period. We can then consider the Premium Method or the Numbers Method (as described in Section 6.2 on page 27) to calculate the set of multiples the scheme should be offered for the defined contribution rate.

Advantages:

- ✓ Takes all experience into account, including the claim size and number of claims for each age band
- ✓ Reduces cross-subsidies between age bands
- ✓ Uses the scheme's own mortality profile and curve

Disadvantages:

- × Not easy or quick to implement

- ✗ Data is not available via the standard industry format, as a full list of individual claims is needed.

6.3.6 Method 4 – Adjusting the claims history using current multiples

Where a scheme's benefit structure has changed it is important to consider the impact on the claims experience. Table 10 above gives an example of this. One method of dealing with such changes is to restate the claims experience as if the required benefit structure had always been in place.

The approach to achieve this would be as follows:

- Restate each individual claim using the current benefit multiples
- Similarly, the revised cover for each member in each past period can be calculated
- This new cover amount can be used to recalculate the premium due, and consequently the premium rate. This is done by changing the premium in the same proportion as the change in the total cover.
- A new claims summary can be produced, reflecting an adjusted premium rate, premiums due, total cover and claims for each period. This means that all periods are based on a common set of benefits and can be compared.

Table 13: Re-stating Claims Experience

Year	Premium Rate	Premiums Due	Claims (incl. IBNR)	Number of Claims	Loss ratio	Total Cover
2006	2.17%	R 2,166,167	R 2,100,000	25	97%	R 325,000,000
2007	2.03%	R 2,387,903	R 2,400,000	27	101%	R 315,000,000
2008	2.00%	R 2,450,000	R 2,300,000	23	94%	R 345,000,000
Total	**2.06%**	**R 7,004,570**	**R 6,900,000**	**75**	**97%**	-

The average cost for all three years (using the current benefit structure) is 2.06%. This implies that the current multiples need to be cut by 3% (2.06% / 2.00%).

Advantages:

- ✓ Ideal for schemes with a stable incidence of claiming
- ✓ The insurer's mortality curve is based on a large amount of data

Disadvantages:

- ✗ Not easy or quick to implement
- ✗ Data is not available via the standard industry format, as a full list of individual claims is needed.

Variations of this method include:

- Restate the claims and use this to calculate the average claim for each of the past periods
- Divide this by the average cover for that period to determine the expected claim size as a proportion of the average cover
- Use the Numbers Method (see section 6.2, page 27) to calculate the expected number of claims

7 Conclusion

Defined Contribution Risk arrangements combined with age related benefits present a number of complexities that may not be immediately obvious to all the stakeholders. Further, consultants may have to allocate more time for schemes that have such a structure, which in turn may lend itself towards a more dynamic fee model compared to the current percent of premiums approach.

From the initial benefit design to the actual implementation, a thorough understanding of the impact of the various methodologies on members' benefits is required. The additional complexity introduced by age related benefits means that additional communication will be needed on an ongoing basis.

It is important for trustees and employers to carefully consider their benefit design, both initially an on an ongoing basis, to ensure that it continually meets the stated objectives.

Age related benefits are often marketed on the basis of meeting needs and equity. This paper has highlighted potential gaps in the 'needs argument' and there are significant issues regarding equity, a term which itself might be highly subjective (and emotive). Under DC Risk arrangements, equity is achieved through the cost - everyone pays the same, but cover is granted according to the person's risk profile. A DB Risk structure, on the other hand, achieves equity in the benefits - everyone gets the same cover, but some people pay more than they should, while others pay less.

What exactly 'equity' means is likely to be subjective to everyone but the member who is providing the cross-subsidy. The important factor here is that one needs to be aware that such inequities do exist, and as Aristotle so succinctly phrased it, *the worst form of inequality is to try to make unequal things equal*.

8 References

a. Current Issues in South African Group Life Assurance: *P Lewis, J Cooper-Williams and L Rossouw*
b. SA85-90 mortality tables: *The Actuarial Society of South Africa*
c. Defined Contribution Risk Arrangements: *Richard Treagus*
d. LOA Code of Conduct – Chapter 3, Code of Good Practice for Disability Insurance: *Life Office Association*

9 Grazie (per) Mille

Thank you to our wives and children for tolerating being laptop widows and orphans. Thank you to all those who played devil's advocate, including Nico Van Der Colff, Eric Welz and our *bush actuary* Dean Boshoff.

Age Related Risk Benefits
Action Points

A summary of considerations for employers, trustees and consultants when dealing with a defined contribution scheme with age related benefits.

- **Objective**: Why are we offering members an age related benefit structure?
  - What benefits are important – death versus disability?
  - How much can we afford to contribute to risk? What about retirement?
  - How do we feel about cross-subsidy? Age, gender, income, region?

- **Risk Policy Statement**: create this when setting up a new scheme, highlighting the objectives and needs of the scheme.
  - This should be reviewed every 3 years.
  - It should clearly define the intention of the scheme and define (in detail) its interpretation of issues such as equity.
  - It should contain separate and explicit sections dealing with each of the potential complexities and how the final benefit structure is to be selected (e.g. allocation of contributions; number of age bands; mortality curve; smoothing)

- **Consult members**: perform surveys initially, and use ongoing communication thereafter.

- **Communication**: this needs to be clear, simple and regular.
  - Are sufficient resources allocated to this?
  - Do members understand their benefits?
  - Especially important when benefits change
  - Is there a voluntary top-up arrangement?

- **Annual Review**: reconsider the amount of time allocated for the annual review. Use this time to closely compare what insurers are offering. Insurers may need to adjust their curves where deemed inappropriate.

- **Data:** ask the insurer about their data processes.
  - Can the insurer provide regular, detailed and accurate data?
  - At each review (or annually) check the quality of the data provide, including the format
  - Question missing or distorted data
  - For large schemes, use the insurer's data to conduct scheme mortality investigations. This will help understand the profile of the members.

- **Benefit curve**: ensure that this meets the needs of the scheme. Consider the changing profile of the scheme, and whether the benefit multiples are still appropriate.

- **Advice**: DC Risk schemes are complex and as such require the ongoing services of expert consultants who can guide decision-makers.

Reference: Defined Contribution and Age Related Risk Benefits by V. Moodley and N. Parkin