

# Scheme-specific mortality assumptions

Two estimates are better than one...

Trustees and employers often need to form a view of their scheme members' current life expectancy. This newsletter describes a new model for deriving a better-informed, robust, best estimate of current mortality rates that combines results obtained using two different approaches.

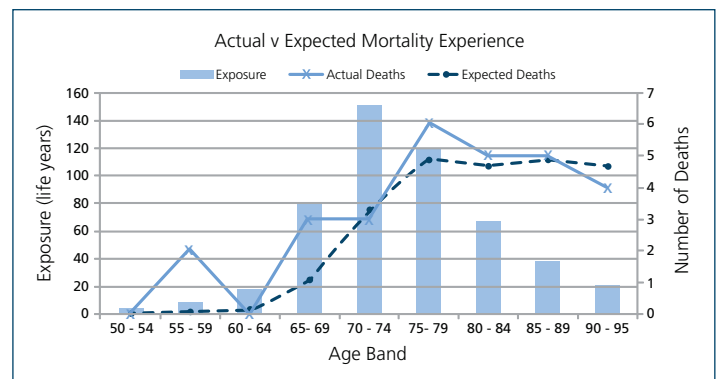
The mortality experience of different groups of people can vary considerably based on the specific characteristics of the groups being considered. Using unadjusted standard mortality tables based on grouped data can therefore lead to an unrealistic assessment of life expectancies of scheme members who might not fit the average. This can have a significant impact on the assessed value of scheme liabilities and an even bigger effect on the value of any surplus or deficit.

We have produced a model that combines two approaches to estimating current mortality rates that apply to a particular scheme, thereby leading to a more credible estimate.

## 1) Past experience

The first method is to analyse the past experience of the pension scheme. As part of this analysis it is necessary to consider a number of issues, for example:

- How statistically reliable is our past experience? This will depend on the size of the scheme (in particular the number of members who have died) and on the distribution of liabilities between members (for example, if a large proportion of the scheme's liabilities are concentrated in a small number of people with large pensions the results would be expected to be less reliable).
- How similar were previous pensioners' characteristics to those of the current pensioners and to the active and deferred members? This will depend on whether, for example, there have been any significant changes to the type of employment of scheme members over time.



The results of this analysis are then expressed as an adjustment to make to a standard table.

## 2) Profile of scheme membership

The second method used in our model is an analysis of the scheme membership itself. Mortality has been shown to vary by such factors as wealth, socio-economic group, smoking status, lifestyle and family history. Bearing in mind the need to be practical it is important to focus on information that is readily available for scheme members.

Our model bases its second estimate of a scheme's current mortality position on its mix of members by socio-economic group, which is generally straightforward to assess for a scheme's membership. Several statistically credible studies have shown that socio-economic group is a useful indicator of likely mortality rate.

We have combined data on current life expectancies of different socio-economic groups obtained from the Office for National Statistics with further government data on the spread of earnings for different occupations. This has provided us with additional information on how mortality levels vary between and within different socio-economic groups. We have then used the results to produce estimates of life expectancy weighted by income for each socio-economic group.

Taking all of this information together, we form an assessment that is expressed as an adjustment to make to a standard table.

Life Expectancy in years at age 65 in 2004 for men			
Registrar General Socio-Economic Group		Example Occupations	Life Expectancy weighted by income*
I	Professional	Doctors, accountants, engineers	19.4
II	Managerial and Technical / Intermediate	Marketing and sales managers, technical/ teachers, journalists	19.0
IIIN	Skilled non-manual	Clerks, cashiers, retail staff	18.3
IIIM	Skilled manual	Carpenters, goods van drivers, joiners	16.8
IV	Partly skilled	Warehousemen, security guards, machine tool operators	16.5
V	Unskilled	Labourers, cleaners	15.3

\*These life expectancies make no allowance for future improvements.

## Combined estimate

Common practice to estimate scheme-specific mortality rates is to rely on past experience alone for larger schemes and to use another measure, perhaps socio-economic group, for smaller schemes. In our view combining two estimates is more reliable than using either of these methods in isolation.

We do this ourselves in everyday life. If we are trying to estimate something we often form our own view and ask someone else to do the same for reassurance. The combination of the two estimates may well be closer to the actual answer than one estimate alone. For example, if you are unsure how long it will take to drive somewhere in the rush hour you may form your own view but also ask a friend for an estimate.

Statistically this is described as credibility theory. If there are two different ways of estimating the same thing then a better estimate can be obtained by combining the two estimates and weighting them according to the confidence the user has in each one. In the real life example, if you think your friend is

rather better at estimating driving times than you, you may give their estimate of journey time more weight and therefore end up with a combined estimate that is closer to their estimate than yours.

Our BW Mortality model combines an estimate of mortality calculated using past experience with an estimate of mortality derived using an assessment of the mix of members by socio-economic group.

Alongside these two estimates we need a view of the reliability of each one and this will vary from scheme to scheme. The key determinants of the reliability and hence the weighting applied to each estimate will be the size of the past experience data and the level of confidence in the assumed socio-economic mix. The resulting estimates of mortality are then expressed as an adjustment to a standard table that is applicable for the scheme membership being considered.



If the resulting adjustment is significant then it could be appropriate to reconsider the standard table used and if possible select a different standard table that requires a smaller adjustment. Evidence shows that the mortality differentials between different groups of people reduce at higher ages. For example, at the age of 95 it does not matter so much which socio-economic group you are in - the important thing is that you are 95. As a result, applying a large percentage adjustment at all ages is likely to give unrealistic assumptions at higher ages. Finding an alternative standard table that more closely matches the required mortality should provide a better estimate overall.

For larger schemes with more data and resources we can improve the estimate by delving more deeply into past experience and by using additional information about the scheme membership.

As well as producing an estimate of current mortality, the model illustrates the range of uncertainty in the estimate. This will help users to understand the likelihood of alternative scenarios being borne out in practice. In particular, this information may help trustees to determine a suitable margin for prudence when deciding on mortality assumptions for Scheme Funding purposes.

Combined estimate =

$$\begin{aligned} & \text{weighting} \quad \times \quad \text{Past Experience estimate} \\ & + (1\text{-weighting}) \quad \times \quad \text{Socio-Economic Group estimate} \end{aligned}$$

It is important to remember that even if the estimate of the underlying current mortality rates was spot on, the future experience would in practice be different because of future random variations (which are especially prominent for small schemes). In addition we expect the underlying mortality rates to improve over time.

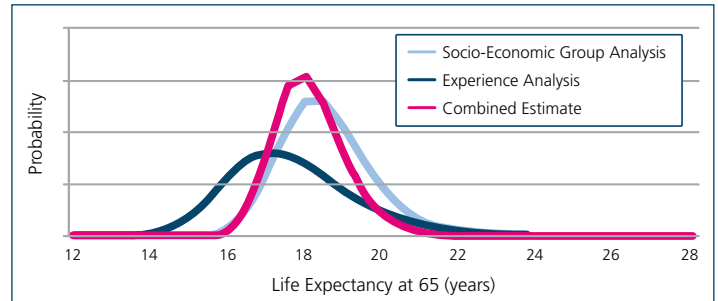
## CASE STUDY – XYZ Pension Scheme

The trustees provided scheme data for the last six years, covering 265 pensioners. Based on their occupations, 80% of the scheme members were judged to be in socio-economic group IIIIN, with the remaining 20% split between higher and lower groups.

We performed separate calculations for men and women. For men, based on the numbers of deaths of pensioners and the pensions they were receiving, the past experience implied a mortality rate of 119% of a particular standard mortality table. Given the volume of data available, a reasonable range for this estimate was assessed as 69% to 169%.

Working from the assessment of socio-economic group, we derived mortality level estimates of 103% of the same standard mortality table. This time a reasonable range for the estimate was 73% to 133%. We placed more weight on this estimate when combining the two estimates because its reasonable range was smaller.

Taking the two results together in a combined estimate of a mortality level led to an adjustment of 107%, with a narrower reasonable range of 81% to 133%. This implies a typical life expectancy for a 65 year old of 17.9 years (reasonable range 16.3 to 20.0) before allowing for any future improvements in mortality.



The chart illustrates the two estimates (in blue), showing them as distributions around their central best estimates (the peaks of the curves). The estimates differ, but their ranges overlap. The red line shows the distribution of the combined best estimate. Note that its peak is the weighted average of the peaks of the first two estimates and therefore sits between them. Its distribution is narrower than for either of the initial estimates, showing that we can have more confidence in the combined estimate.

The analysis has shown that the selected standard table is a reasonable starting point for this scheme and that the mortality assumption can be refined by combining the available information about the scheme's membership and past experience.

## Further Information

### Would you like to know more?

If you would like to discuss these issues further please contact your usual Barnett Waddingham consultant. Alternatively, email Susanna Morran on [Susanna.Morran@Barnett-Waddingham.co.uk](mailto:Susanna.Morran@Barnett-Waddingham.co.uk)

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Chalfont Court  
Hill Avenue  
Amersham  
HP6 5BB  
Tel: 01494 788100  
Fax: 01494 788800

Rigby Hall  
Rigby Lane  
Bromsgrove  
B60 2EW  
Tel: 01527 559111  
Fax: 01527 559222

St James's House  
St James's Square  
Cheltenham  
GL50 3PR  
Tel: 01242 538500  
Fax: 01242 538501

163 West George Street  
Glasgow  
G2 2JJ  
Tel: 0141 243 4400  
Fax: 0141 243 4432

West Riding House  
67 Albion Street  
Leeds  
LS1 5AA  
Tel: 0113 394 3700  
Fax: 0113 394 3760

Port of Liverpool Building  
Pier Head  
Liverpool  
L3 1BW  
Tel: 0151 235 6600  
Fax: 0151 235 6640

Cheapside House  
138 Cheapside  
London  
EC2V 6BW  
Tel: 020 7776 2200  
Fax: 020 7776 3800

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