Steven Baxter, FIA, is partner & longevity consultant at Hymans Robertson LLP. He can be reached at steven.baxter@hymans.co.uk.

Conor O'Reilly, FFA, is a longevity consultant at Hymans Robertson LLP.

Grieving Widows:
Exploring excess mortality following bereavement

By Steven Baxter, Conor O'Reilly and Andrew Muddle

> **OUR ANALYSIS**
> Our analysis is based upon data collected by Club Vita in respect of annuitants within occupational pension schemes. Club Vita currently tracks around 1 in 10 of the UK retired population, reflecting the members of over 150 different occupational pension schemes. The full research report and more information on Club Vita can be found at http://www.hymans.co.uk/knowledge-centre/surveys-reports/longevity-awareness/longevity-awareness-grieving-widows.aspx.

The 'grieving widows effect', or the 'broken heart syndrome' as it is often referred to, is the phenomenon whereby the chances of dying are elevated immediate following the loss of a partner.

In many ways the existence of such an effect is no surprise. Companionship can convey a positive benefit on health and well-being through mutual care; and in later life a watchful eye to summon medical care quickly when needed. For example Friedman & Martin (2011) discusses the positive health benefits that companionship can bring.

Companionship also has a positive effect on an individual's desire to stave off a visit from the Grim Reaper. A striking example is a story we heard from Professor Tom Kirkwood. When interviewed, a couple participating in the University of Newcastle's 85+ study both independently responded that the driver keeping them alive is that they did not want to leave the other alone after their death.

In contrast the stress of losing a loved one removes this purpose for living. From a medical perspective this can manifest in a variety of ways including stress cardiomyopathy—a sudden weakening of the heart muscles induced by stress which can lead to acute heart failure—and through more gradual deterioration of function.

To date insurance companies and pension schemes assessing the financial costs of annuities have paid little attention to this effect. Yet in times of low interest rates annuity valuations are acutely sensitive to the longer dated cashflows, including those potentially payable via survivor benefits (i.e., the attaching annuity payable for life to a spouse who outlives the original annuity policy holder).

In this paper we show how allowing for this effect can help reduce annuity prices by circa 50 basis points. This benefit should be of interest to insurers both in terms of the opportunity to gain a competitive edge in pricing, but also in the potential release of capital reserves.

In analysing the 'grieving widows' effect we contrast mortality rates experienced amongst widows with women who are the 'first life' annuitant ('pensioner') and so more likely (but not guaranteed) to be married. To avoid distortions from retirees with mortality elevated by serious ill health we have restricted our attention to pensioners who retired in 'normal health' i.e., those who were not eligible for an enhanced benefit from their pension scheme owing to a known health condition at retirement.

QUANTIFYING THE GRIEVING WIDOWS EFFECT

Chart 1 (on page 9) compares the ratio of deaths observed in the Club Vita data for different age bands with the number of deaths which would have been expected had they been in line with a commonly used actuarial mortality table (known as an 'A/E ratio'). The table used is PNFL00 as published by the CMI

Andrew Muddle, FIA, is a consulting actuary at Hymans Robertson LLP.

on behalf of the UK Actuarial Profession and relates to pensioners who retired from occupational pension schemes where the benefits have been insured with a life office—specifically female pensioners who retired at or after their normal retirement age for that scheme.

The chart includes three lines representing widows, normal health (NH) pensioners and the combined data from both these groups. The dotted lines reflect the 95% confidence interval for the A/E ratio, calculated using approximate formulae.

We see that:

• There is a sharply higher death rate amongst young widows than female pensioners.

• There is convergence of relative mortality from age 70 upwards, suggesting that the mortality of widows is similar to that of female pensioners at older ages, but that the loss of a partner can lead to an increased chance of death at younger ages.
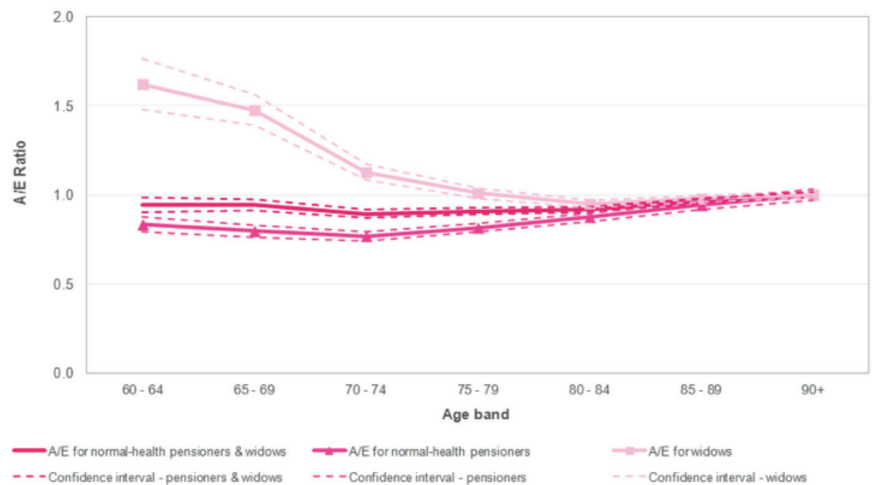
This suggests a strong grieving widows effect, i.e., the mortality of widows being noticeably elevated as compared to female pensioners, and is consistent with other studies e.g., Spreeuw & Wang (2008). Hart et al (2007) suggests that this excess mortality manifests across most of the major causes including cardiovascular disease, coronary heart disease, stroke, cancer, and accidents (including violence); a conclusion which has been supported in a US study by Elwert & Christakis (2008).

AGE, DURATION AND SELECTION
Whilst our analysis indicates a clear pattern with age, it is natural to ask whether this is the full story. For example:

CHART 1
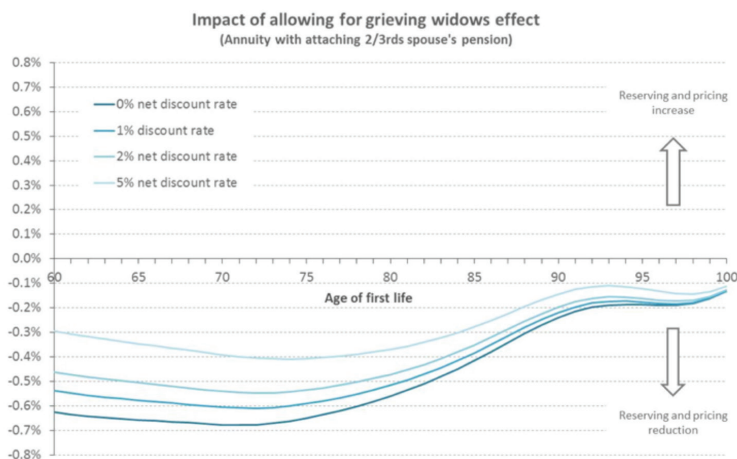**Comparison of A/E Ratios for Normal Health Pensioner Women and Widows**
(2006-2010 data. Expected numbers based on PNFL00 series)

1. The youngest widows will tend to have been recently widowed. At older ages the widows will be a mix of long-term widowed and the recently bereaved. As such the average duration since bereavement will increase with age and so the features seen above may be a duration rather than an age effect.

2. The younger widows will tend to have been married to a man who died at a relatively young age. This is likely to mean the first-life husbands were from the lower socio-economic groups who have higher mortality. In turn we would expect the widows to be from a similar background. As such the age pattern seen above could really be a selection effect whereby the younger widows have above average mortality owing to a bias towards less healthy socio-demographics.

CHART 2.
Impact of Allowing for Grieving Widows Effect
(Annuity with attaching 2/3rds spouse's pension)

Impact of allowing for grieving widows effect
(Annuity with attaching 2/3rds spouse's pension)

We explore these possible issues further in the full report, where we identify a modest duration effect during the first year of bereavement, which interacts with the age effect illustrated above.

FINANCIAL MATERIALITY

Having illustrated the existence of the grieving widows effect, a natural next step is to consider the potential financial significance of allowing for this in reserving and pricing of annuities.

To do this we have calculated the value of an annuity with an attaching spouse's pension under two different approaches. In each case the annuity is assumed to be payable at outset to a man. The approaches differ though in the mortality assumption used for the contingent spouse. Firstly, we have assumed that the mortality of the spouse is in line with the 'average' female (normal health) pensioner within Club Vita's

dataset. Secondly, we have assumed that the mortality of the spouse is in line with the 'average' female pensioner within Club Vita's dataset until she is bereaved, after which mortality is in line with the mortality of an 'average' widow within the Club Vita data.

Further, we have assumed that 90% of men are married at ages up to 65. For older annuitants we have assumed a lower proportion married are currently married consistent with an allowance for the wife having already pre-deceased the member. (No allowance has been made for the possibility of remarriage throughout our calculations.)

Chart 2 (left) illustrates the results of our calculations for a range of different net discount rates, and using an attaching spouse's annuity of 2/3rds of the pension in payment. In each case the line represents the change in value of the annuity once the grieving effect is allowed for.

We can see that:

- For all ages allowing for the grieving widows effect reduces the price of an annuity, by up to 70b.p. at inception where there is a low net discount and a substantial (2/3rds) attaching widows pension.

- There is a clear shape with age – the grieving effect makes a material difference for annuitants aged under 75 (who will be the vast majority of the liabilities in a typical portfolio).

Over the age of 75 the rapidly declining chance of still being married at the outset of the annuity results in a sharp decline in the price/reserving reduction from the grieving widows effect.

Thus, allowing for the grieving widows effect can be financially material, especially for index-linked annuities in the current financial times of close to zero, or indeed negative, net discount rates in the UK.

CONFOUNDING WITH SOCIO-ECONOMICS?

The astute reader might be concerned that by using female pensioner mortality for the spouse prior to the death of the original annuitant man we risk confounding a grieving effect with a socio-economic effect. This would happen for example if the socio-economic status of the typical female pensioner is different to that of the typical widow in the Club Vita data. The socio-demographic profiles of female pensioners and widows for different age bands gives us considerable comfort that this is unlikely to be the case. Further, we have replicated our analysis of the financial impact using the mortality experienced for specific socio-demographic groups.

In each case we found that allowing for the grieving widows effect is financially material, albeit the precise quantum of the effect differs a little between the different lifestyle groupings.

WHAT ABOUT WIDOWERS?

In this paper we have focused on widows. This is deliberate as Club Vita has far richer data on widows than widowers. This is a consequence of both the lower mortality of women leading to a greater proportion of women outliving their husbands (and so greater data volumes for widows;) and of UK pensions legislation where the requirement to provide a widowers pension was introduced after the requirement to provide a widows pension.

However, preliminary analysis of the Club Vita data suggests similar conclusions to those presented above will apply to widowers. This would be consistent with Friedman & Martin (2011) who suggest that not only is a similar grieving effect seen amongst widowers, but that it is much more pronounced than for widows.

CONCLUSIONS

Thus we can conclude:

- There is a clear 'grieving widows' effect whereby mortality of widows is higher than that of female (normal health) pensioners.

- In our full report we see how this effect has both:

  - An age component, with mortality some 50% higher at younger ages, declining to close to parity at 90+; and

  - A duration effect where widows mortality rates are some 10-15% higher during the first year following bereavement compared to later durations.

- The effect has the potential to reduce annuity prices. Using a second life mortality assumption for the widows benefit during payment which captures the grieving effect (rather than a generic female pensioner assumption) has the potential to reduce typical annuity prices by circa 50 basis points.

- For UK life companies with circa £200bn exposure to annuities (net of reinsurance) we estimate that allowing for this effect could release reserves of up to £200m. □

REFERENCES

Elwert, F. & Christakis, N.A. (2008) The effect of widowhood on mortality by the causes of death of both spouses American Journal of Public Health 98(11) 2092-8

Friedman, H.S. & Martin, L.R. (2011) The Longevity Project Hay House

Hart, C.L. Hole, D.J., Lawlor, D.A., Smith, G.D., & Lever, T.F. (2007) Effect of conjugal bereavement on mortality of the bereaved spouse in participants in the Renfrew/Paisley Study Journal of Epidemiology and Community Health 61(5) 455-60

Spreeuw, J. & Wang, X. (2008) Modelling the short-term dependence between two remaining lifetimes Retrieved from http://www.actuaries. org.uk/research-and-resources/documents/modelling-short-term-dependence-between-two-remaining-lifetimes