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Underwriting: Enhanced Annuities

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Introduction

Life insurance companies must meet the needs of an ageing population, and lifetime annuities are one of the key products to meet this need. As underwriters we will be asked for opinions in respect to both group pricing (so-called 'bulk annuity deals') and at times, individuals who are seeking an enhanced annuity because they are sub-standard risks. Impaired annuity products are very popular in the U.K. because of the tax treatment of all annuities. To a lesser extent they are also popular in the U.S., and will become even more in vogue as governments recognise the need for retirees to fund their own retirement. An individual who has a medical impairment, logically, has a reduced life expectancy and therefore an increased annuity payment.

It follows that not all medical conditions will give rise to entitlement to an advanced annuity. However, whenever the prognosis for a condition is poor, e.g. with certain types of cancer (of the oesophagus or pancreas for instance, and the treating oncologist estimates limited life expectancy), or there are severe sequelae causing inability to perform two or more of the activities of daily living, e.g. following stroke, cardiac event, severe airways disease or liver ascites and cirrhosis, it is likely that consideration would be given to an enhanced annuity.

This paper attempts to provide some guidance on how to assess the longevity of high-age impaired lives.

Pricing

It is important for the underwriter to understand the mortality assumptions contained in our life insurance products and even more important in the assessment of longevity products. The general population may be the basis of pricing some annuities, but annuitants tend to be from upper socio-economic classes and not the general population. There may be some experience from bulk annuity deals or better still, an in-force block of annuity policies, but regardless, a degree of conservatism, in respect of interest assumptions and mortality, is ideal.

Predicting death is different than predicting longevity

Underwriters are adept at assessing mortality and have at their disposal sophisticated guidelines both from reinsurance manuals and various statistical data on the Internet. Ninety percent of sub-standard cases are moderately sub-standard and can be assessed relatively easily. Highly sub-standard cases can be declined, while for enhanced annuities, the opposite applies. That is, the more significant the impairment, the larger the annuity so we will be confronted by much larger numbers of highly sub-standard individuals that we have never assessed—because we have declined these risks. Lastly, the sub-standard annuitant has a completely different attitude than the life insurance applicant—he or she wants to convince the underwriter that they are very, very unwell. Non-disclosure is not seen in this cohort, but over-disclosure may be. However, there may be anti-selection, as once the individual has convinced the underwriter to allow a larger annuity payment, it is then in the interests of the insured to receive payments for as long as possible. The standard life underwriting approach of adjusting for extra mortality by simply increasing the risk premium by a factor such as +100 per cent is simply not applicable, so we must develop different methods for assessing how long we think the individual will live.

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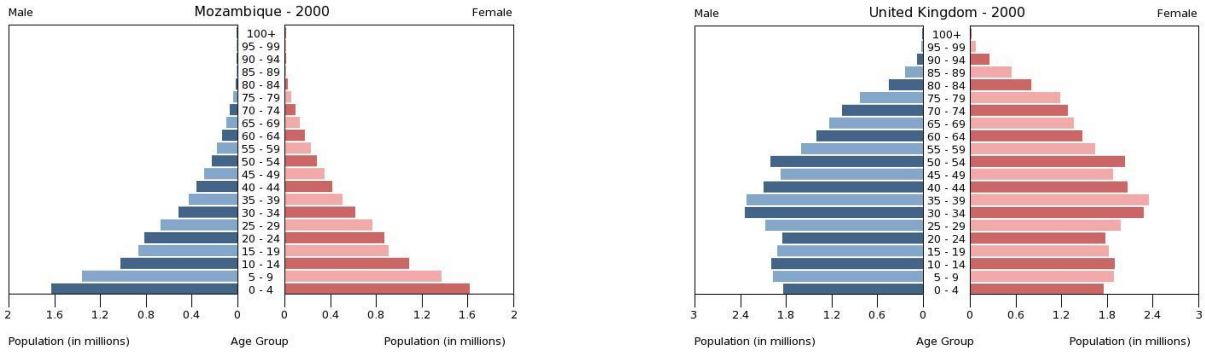
Understanding longevity

It is important to understand the general topic of longevity in order to apply certain principals to the assessment of individuals seeking enhanced annuity payments.

Firstly, mortality has been improving rapidly over the last few decades, and almost all predictions of the future rate of improvement have been incorrect. There is considerable debate as to the rate of improvement, and of course, large discrepancies in this rate geographically as illustrated by the two population pyramids Figure 1.

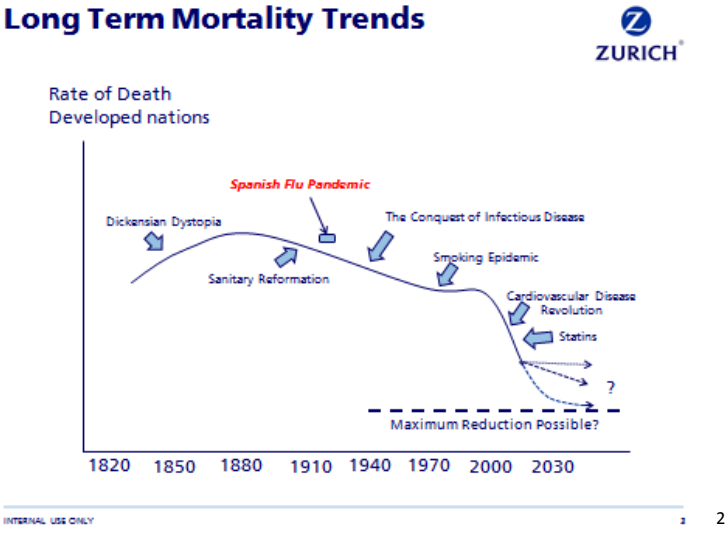
Figure 1: Longevity in an emerging nation vs a developed nation



The shape of the illustration on the left (Mozambique) is typical for emerging nations, while the right illustration (U.K.) is typical of developed nations[1].

Within populations there are certain cohorts that live longer (or have shorter lifespans), with the most obvious being the working population versus the unemployed. It is much more difficult to explain why in the U.K., generations born on either side of the pre-World War II period (1925–1945), exhibit more rapid improvement in longevity as compared to the generations born on either side of that generation. In the long-term, the rate of death in populations has increased or reduced as shown in Figure 2.

Figure 2: Mortality trends in the U.K.



[1] For worldwide data see www.census.gov/population/international

[2] See www.gapminder.org/world

Some of the factors that will influence the mortality rate in a given cohort:

Lifestyle changes—globally the rate of tobacco use is reducing, while in modern Western-type communities, the rate of obesity is increasing. This begs the question, "Is sugar the new tobacco?" Increased awareness of the benefits of a healthy lifestyle seems to be one of the factors in recent increased longevity in many countries but the western diets adopted by some Asian communities may slow longevity improvement.

Pandemic or other catastrophe—the 1918 Spanish flu killed an estimated 30–50 million people[3]. Since then our ability to contain viral events has greatly improved, but another highly contagious and lethal virus could have a major impact on the global mortality rate.

Medical breakthroughs—the "cure for cancer" may be the next major medical breakthrough, but we are already seeing major improvements in circulatory disease mortality from statins and aspirin use. Surgical procedures (such as stent insertion) are providing not only a better lifestyle, but also improved longevity.

Increased wealth—as wealth increases so does the access to medical care. In the most basic example, certain populations gain better understanding of cleanliness and, as a result, improved sanitation systems and longevity follows.

Increased lifespan versus improving longevity

The population pyramids illustrate that there are very few people living beyond the age of 100, but there is considerable debate as to whether humans will show an increased lifespan—so that we will start seeing larger numbers of people living beyond the age of 110 or 120. James Vaupel is a leading advocate for the plasticity of longevity, and believes that the ceiling of life expectancy will continue to rise as it has linearly for hundreds of years[4]. The counter argument, presented by S. Jay Olshansky, argues that the gains in recent decades from improved public health care have done as much as they can, and any further increases in lifespan must come from the prevention of diseases that come with ageing[5]. An increased lifespan has major implications for our industry and especially for annuity products. Whether you favour Vaupel's or Olshansky's argument, the chances that the human lifespan will increase seem rather good.

Information on changes in population mortality and improving longevity can be readily obtained on the Internet and from various publications. Suffice to say, changes in future longevity for various populations are difficult to predict. Predicting longevity in a particular annuitant may be somewhat less difficult as we will be presented with a great deal of medical information that should allow at least a well-informed decision.

High Age, Individual Risks

Most applicants for enhanced lifetime annuities will probably be over age 70, and the assessment of extra mortality for these applicants can be difficult. Almost all life insurance applicants will have some degree of impairment, but does that make an individual "sub-standard" or less likely to live to the age predicted within the pricing? Most life insurers have restricted the entry for life insurance to age 65 or 70, so as underwriters we see very few cases and we do not have well-developed guidelines. Underwriting manuals are written to account for the bulk of applicants – approximately between the ages of 40 to 60, so the reinsurance manuals don't provide much assistance. Dr. Brackenridge's book, *Medical Selection of Risks*, has over 1000 pages of fantastic information on virtually all medical underwriting, but contains only 15 pages dedicated to "Older Age Underwriting."[6] According to Brackenridge,"…the underlying expected death rate of an older population already accounts for much of the high incidence of death…" and… "Traditional underwriting practices, however, do not generally take this into account…" (p.116). Potential

[3] See www.flu.gov/pandemic/history/1918/

[4] See Vaupel, 'Demographic analysis of aging and longevity', *The American Economic Review* May 1988

[5] See Olshansky, S.J., Carnes, B.A. and Cassel, C. (1990) 'In search of Methuselah, estimating the upper limits to human Longevity', *Science* 250(4981): 634-640.

[6] Brackenridge, R.D.C., Croxson, R.S. and Mackenzie, B.R. (eds) (2006) *Brackenridge's Medical Selection of Risks*, 5th edn, Basingstoke. U.K.: Palgrave Macmillan.

customers over age 70 are more than likely to have significant coronary artery disease, impaired renal function and reduced lung function, and much of the "extra mortality" may already be built into the "Standard Rate."

It is also worth noting that population-based rates will differ from insured population versus annuity death rates. Annuitants should be comparatively wealthy individuals and therefore exhibit greater longevity as compared to the other two categories.

So how should underwriters select those that are at extra risk?

Based on U.S. experience, there are at least two significant conditions, currently not assessed in most countries, that play a major part in the prediction of longevity at high ages:

(1) Cognitive Impairment—difficult to assess accurately, but many tools are available and fully explained in Brackenridge (the clock-drawing test, Mini-Cog test, etc.)

(2) Frailty—higher levels of physical activity seem to indicate increased longevity

Depressive Illness is a very strong predictor of higher mortality in high-age groups.[7] Oftentimes, the only evidence of a significant depression is determined by the number and dosage of various medications.

Comorbidity plays an important role in survival rates of the elderly. The cause of death may be cancer or myocardial infarction (MI), but diabetes and chronic obstructive airway disease (COPD) are often found to be co-morbid conditions. We should be wary of the elderly taking a cocktail of six or seven different medications, even if some appear to be rather innocuous (such as sleeping pills).

In addition to our normal underwriting approach for younger lives, we should also consider obtaining information in respect to exercise, activity, travel and even hobbies. In one study,[8] the speed of gait (walking) was found to be a key longevity indicator, while in another, elderly people who had influenza vaccinations were found to have increased longevity. Gait speed may be an indicator of lower limb power (i.e. not fragile), and having had a flu vaccination may indicate advanced thinking (the ability to consider whether to have the vaccination seems to be important).

Additionally, the typical blood panel obtained for younger applicants may not be all that useful for older applicants, as all will have some degree of organ dysfunction such as renal and liver impairment. In the elderly, haemoglobin levels outside the normal range may be an indicator of nutritional deficiency and chronic disease.

It is commonly known that women live longer than men; at high ages this is particularly relevant, as a 2–3 year difference in average age at death may represent a 15 per cent increase in life expectancy for older aged women.

What is the standard mortality at higher ages and how does extra mortality effect life expectancy? The following table (courtesy of Swiss Re[9]) is extracted from VBT 2008 U.S. mortality tables.

Table 1: Life expectancy—female non-smokers

Life Expectancy		Reduction in Life Expectancy by Extra Mortality		
Age	Std Rates	+100%	+200%	+300%
65	24	4	7	8
70	20	4	6	8
75	17	4	6	7
80	13	3	5	6
85	9	2	4	4

7 See www.webmd.com/depression/guide/depression-elderly

8 Harmon, K. (2011) 'Walking speed predicts life expectancy of older adults', *Scientific American*, January.

9 See Somerville, K and Marks, J., 'Actuarial underpinning of older age mortality', slide 10, presentation at the AAIM 121st Annual Meeting, 13–18 October 2012, San Diego, CA, Academy of Insurance Medicine.

Brackenridge provides a short sample of male data (p. 85) below. Note the marked difference from 2008 female select (non-smoker) to 1992 male ultimate, illustrating the need to understand the underlying rate basis before assessing sub-standardness, especially in high-age individuals.

Table 2: Life expectancy—male non-smokers

Life Expectancy		Reduction in Life Expectancy by Extra Mortality		
Age	Std Rates	+100%	+200%	+300%
70	14	5	7	8
80	8	3	5	5

Underwriting at higher ages by necessity should use the concept of reduced life expectancy rather than the usual sub-standard methodology. An example is the use of flat extra premiums as a USD 10 per mille load on an 80-year-old may be financially the same as a 50 per cent load.

This concept of reduced life expectancy can be translated into the assessment of enhanced annuity business.

Underwriting of sub-standard annuities

Portfolio anti-selection can be caused by poor product design or underwriting error, or by individuals who have better information as compared to our technical experts. As previously mentioned, enhanced annuities provide great opportunity for the latter, so our design, pricing and underwriting must be sound and somewhat conservatively based. In pricing, conservatism could mean taking both increased life span and improved longevity into account.

However, in our underwriting, there is difficulty in converting extra mortality or reduced life expectancy into an increased annuity payment. By estimating extra mortality and translating this to reduced life expectancy, we can provide an approximate 'age of annuity calculation.'

In order to determine the appropriate methodology for calculating the annuity, we use the following concepts based on Brackenridge's tables (Table 5.6 is found on p. 85; Table 5.8 is found on p. 88/90):

A = Sub-standard life expectancy

B = Equivalent age, using additional years to age

C = Anticipated life expectancy for standard lives.

The best way to illustrate the methodology is to use the following examples:

Applicant A is a male aged 70 and has USD 100,000 to invest in a lifetime annuity. He has moderate cardiovascular disease and type 2 diabetes; we deem these conditions to be included in the standard annuity rate (USD 639 per month from an online calculator). This individual has slow gait, and there is other evidence of frailty from past medical records. We therefore assess him as having an extra mortality of +200 per cent—a sub-standard life expectancy of seven years (A), so an equivalent age (B) of 80, the anticipated life expectancy for standard male lives (C). The monthly annuity payment then becomes USD 917.

Applicant B is a female aged 66 and is investing the same amount of money. She has rheumatoid arthritis causing significant immobility and takes medication for hypertension and raised lipids. The immobility represents significant extra mortality at +150 per cent or a reduced life expectancy of some 11 years (age 79), so the annuity increases from the standard of USD 535 to USD 819 per month.

Applicant C is a male aged 73 and also has USD 100,000 to invest. He has cardiovascular disease, COPD and mild renal impairment considered acceptable within the standard annuity rate. He also has osteoarthritis with severe mobility limitation and significant cognitive impairment based on external testing. In this case the extra mortality is

deemed to be +500 per cent, so the life expectancy is estimated as three to five years. The standard monthly annuity is USD 707, but we could offer an age equivalent of around 90—resulting in an annuity of USD 1477 per month.

Summary

The concept of longevity and recent improvements, together with the likelihood of an increased human lifespan, makes enhanced annuity pricing difficult. Therefore, pricing must be inherently conservatively based. Standard annuity prices have cardiovascular disease, cancer and many other ageing impairments already built into the annuity rate, so we must introduce cognitive impairment and frailty into the assessment.

Underwriting of enhanced annuities requires a different approach. This type of underwriting needs to focus on the period of reduced life expectancy and consequently, the additional years-that must be added to the actual age.