The Actuarial Profession
making financial sense of the future

Longevity Bulletin

From the Institute and Faculty of Actuaries

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Contents:

1. Editorial:
Seeing the wood for the trees

longevity *n.*

Pronunciation: **/lɒnˈdʒɛvɪti/**

Long life; long duration of existence (Oxford English Dictionary)

Reports on the latest research of what makes us unhealthy, or what could make us live longer, are common from magazines, newspapers and websites. Often, the messages get shortened so that it sounds like one risk factor dominates. The reality is that the way in which many relevant risk factors work together is still not yet fully understood, and there is an element of chance affecting the longevity prospects of each of us.

"The relative contribution of lifetime environment, genetic factors and chance, whether these contributions change with age, and the underlying social and biological pathways are still to be clarified."

Kuh et al (2009)

The increasing prevalence of obesity is a mortality risk of current concern. Yet recent research (discussed in section 3) from the United States suggests that obesity will not cause a decline in life expectancy. The future is uncertain. However, as the *Focus* article in section 2 of this *Longevity Bulletin* highlights, the overarching context is consistent improvement in longevity worldwide. Life expectancy has only ever declined in a few countries subject to specific and significant negative mortality risk. While we need to examine the trees of individual risk factors, there is much to be said for pausing to look at the woods of the consistent achievement in longevity progress.

Longevity Bulletin aims to provide a regular guide to the prospects for long lives. It presents and explains actuarial perspectives on population longevity and looks outside the profession for statistics, research and the latest thinking on related subjects. It is not intended as a comprehensive guide to everything new in longevity research but rather as a helpful companion for those interested in a most intriguing subject.

We hope the *Bulletin* is read by actuaries, users of actuarial services and anyone with a technical, professional or personal interest in longevity.

To receive future issues of *Longevity Bulletin*, email: **longevitybulletin@actuaries.org.uk**.

2. Focus on:
Is life expectancy the lifespan we should expect?

A number of recent publications have used life expectancy data. If life expectancy is given as 82 years then should people from that population expect their average lifespan, or age at death, to be 82? A lot depends on the precise definition of the life expectancy indicator.

This *Focus* article explains life expectancy and outlines how it should be interpreted.

- Period life expectancy is useful as a summary of relative mortality levels between populations, but will underestimate realistic expected lifespans.
- If the question is "What lifespan should I expect?" the technically correct answer will be given by cohort life expectancy for a specific cohort.
- Life expectancy is becoming an increasingly limited indicator. The most common age at death - the mode – may become more useful.

Using period and cohort life expectancy

To understand life expectancy, we first need to understand the building block of any analysis of longevity: a mortality rate for a given population is the probability of dying at a certain age and in a given time period, usually a year. So, for simplicity ignoring some technical aspects of definition, $q_{3,\ 1981}$ is the probability that in 1981 a three year old would die before his or her fourth birthday. From the building block of mortality rates, actuaries and demographers calculate a number of indicators, including life expectancy. These calculations can be made either using mortality rates from a period or those relevant to a cohort of people.

Period life expectancy is: "the average number of additional years a person can be expected to live for if he or she experiences the age-specific mortality rates of the given area [or population] and time period for the rest of his or her life".[1]

For example, period life expectancy for 1981 would be calculated using the mortality rates for each age from birth until the highest age to which people are assumed to live[2], the mortality rate at each age being as it was in 1981.

In contrast, cohort life expectancy follows the lifecourse of a cohort of people defined by age in a given year. Cohort life expectancy for the 1981 birth cohort would be calculated using the mortality rates for a newborn in 1981, a one-year-old in 1982, a two-year-old in 1983, a three-year-old in 1984 and so on.

Period life expectancies can be calculated using actual mortality rates from past years or using projected estimates for future years. The calculation of cohort life expectancy uses actual mortality rates until the current age of the cohort, but then requires estimates of future mortality at later ages. The difference in concept between period and cohort indicators is illustrated in Table 1.

[1]| *See Interim Life Tables, United Kingdom, 1980-82 to 2008-10 on the Office for National Statistics (ONS) website http://www.statistics.gov.uk.*

[2]| *In practice, the end age is over age 100, but in the UK interim life tables the highest published mortality rate is for age 100.*

Table 1:
Mortality rates used in calculation of indicators on a period or cohort basis: example.

	Calendar year								
Age	1981	1982	1983	1984	…	2079	2080	2081	…
0	$q_{0, 1981}$	$q_{0, 1982}$	$q_{0, 1983}$	$q_{0, 1984}$	…	$q_{0, 2079}$	$q_{0, 2080}$	$q_{0, 2081}$	…
1	$q_{1, 1981}$	$q_{1, 1982}$	$q_{1, 1983}$	$q_{1, 1984}$	…	$q_{1, 2079}$	$q_{1, 2080}$	$q_{1, 2081}$	…
2	$q_{2, 1981}$	$q_{2, 1982}$	$q_{2, 1983}$	$q_{2, 1984}$	…	$q_{2, 2079}$	$q_{2, 2080}$	$q_{2, 2081}$	…
3	$q_{3, 1981}$	$q_{3, 1982}$	$q_{3, 1983}$	$q_{3, 1984}$	…	$q_{3, 2079}$	$q_{3, 2080}$	$q_{3, 2081}$	…
…	…	…	…	…	…	…	…	…	…
98	$q_{98, 1981}$	$q_{98, 1982}$	$q_{98, 1983}$	$q_{98, 1984}$	…	$q_{98, 2079}$	$q_{98, 2080}$	$q_{98, 2081}$	…
99	$q_{99, 1981}$	$q_{99, 1982}$	$q_{99, 1983}$	$q_{99, 1984}$	…	$q_{99, 2079}$	$q_{99, 2080}$	$q_{99, 2081}$	…
100	$q_{100, 1981}$	$q_{100, 1982}$	$q_{100, 1983}$	$q_{100, 1984}$	…	$q_{100, 2079}$	$q_{100, 2080}$	$q_{100, 2081}$	…
…	…	…	…	…	…	…	…	…	…

Period 1981

Cohort born 1981

Period life expectancy is clearly a hypothetical construct, as we know that mortality rates change from year to year. In nearly all developed countries mortality rates are declining over time, that is, mortality is improving and lifespans are increasing. As *Longevity Bulletin 01* showed, the trend of mortality improvement is expected to continue, although there is debate about the pace of change. But whatever view is taken about the pace of future change, it is certain that mortality rates will change. Therefore, the conditions underlying a period life expectancy – *if he or she experiences the age-specific mortality rates of the … period for the rest of his or her life* – will never be met. A period life expectancy should not be used as an indicator of a lifespan that any individual should expect, or the average to be expected from any population.

The correct use of period life expectancy is to summarise the level of mortality in a population in one period. It is used widely to compare mortality between populations or between time periods. Cohort life expectancies are useful as an estimate of what lifespan a person of the defined cohort might expect, although the estimate will only be as good as the assumptions made about future mortality.

Table 2 gives some life expectancy indicators for the United Kingdom (UK) population on both cohort and period bases. The table illustrates some facts about period and cohort life expectancy indicators that hold true for most developed countries, and were also evident in the data in *Longevity Bulletin 01*:

- **Male life expectancy is lower than female** and projected to continue to be so.
- **Life expectancy is improving over time** and projected to continue to do so.
- **The life expectancy of a cohort is higher than the life expectancy from the period of the cohort's birth year**, because mortality rates have fallen in the past and are generally assumed to continue to reduce in future. For example, the period life expectancy of 1981 will give too low an estimate of the potential average lifespan of the cohort born in 1981 as it will not reflect the reduction in mortality rates over the cohort's lifetime, whereas both the actual reduction from 1981 until now[3] and the assumed future reduction thereafter are reflected in cohort life expectancy. The period life expectancy of 2035 reflects assumed mortality improvement from now until 2035 only, but the cohort indicator assumes mortality improvements continue throughout the life of the cohort. This means that the period life expectancy at birth figure of 82 years (rounded) is not a good estimate for how long UK women can be expected to live on average. A better estimate for the cohort of UK women born in 1981 is 88.6 years.
- **Life expectancy and total expected lifespan improve as we age.** Cohort life expectancy at birth for women born 1981 is 88.6 years but by the time that cohort has reached age 65, estimated lifespan is 92.3 years (65 plus 27.3). In retirement planning, survival to the age when a pension starts is assumed, so it is appropriate to use this higher lifespan estimate.
- **There is less cohort life expectancy data available than period life expectancy.** This is because assumptions further out into the future are required.

Interpreting life expectancy data

Three recent articles put period life expectancy data to good use to highlight mortality trends over time and between populations.

I. Epidemiology and public health perspective

David Leon (2011) plots period life expectancy at birth from 1970 for European countries to highlight the striking features of the broad picture: similar rates of almost straight-line improvement across Western European countries throughout; the same rate of improvement in Central and Eastern Europe and the Baltic States since the 1990s following years of stagnation or decline; but Russia still lagging. Leon uses period life expectancy at birth as a summary of the mortality and therefore the health of each country at different points of time. The question asked is ***Is health improving, mortality declining, are things moving in a positive direction?***

Table 2:

Life expectancy indicators, period and cohort examples, UK

		Period 1981	Cohort born 1981	Period 2008	Cohort born 2008	Period 2035	Cohort born 2035
At birth	Male	70.9	84.2	77.6	88.6	83.4	92.0
	Female	76.9	88.6	81.7	92.2	87.1	95.2
At age 65	Male	13.0	24.8	17.5	n/a	22.3	n/a
	Female	16.9	27.3	20.1	n/a	24.7	n/a

Source: *ONS Period and cohort expectation of life tables (2008-based) for United Kingdom, principal projection only. Based on historic mortality rates for 1981-2008 and thereafter assumed mortality rates consistent with 2008-based principal projection.*

[3] | *"Now" meaning the date up to which actual data is used in the calculation of cohort life expectancy.*

The conclusion is one of general improvement, with any decline in life expectancy limited to periods of severe social difficulty in Russia and Baltic States. The interpretation of these results made by Leon rests on the role of social, political and economic drivers, including how gender differences in smoking and alcohol-related mortality may account for over half of the gender gap in life expectancy; and how the geographic distribution of the decline in mortality from cardiovascular disease can be partially explained by adoption of treatments. The analysis raises questions of why the life expectancies at birth of Western European countries have increased in parallel and not converged; how inequalities of mortality are distributed within countries; and what will be the result of future trends in the underlying drivers of life expectancy.

II. Theoretical demography perspective

Chris Wilson (2011) uses period life expectancy at birth since 1950 for every country in the United Nations to show the history of mortality in five world regions. The question asked is: ***Is the world converging to a single demographic regime?***

Life expectancy at birth in the two largest regions "Other Developed" and "Other Developing" has converged over time as the latter started from a lower level but has improved faster. The gap in life expectancy from "Other Developed" to that of East, Middle and West Africa has remained roughly constant. Life expectancy in the two smallest regions "USSR and post-Soviet" and Southern Africa declined since the late 1980s and early 1990s respectively, for different reasons: the Soviet transition evident in Leon's data and the African HIV/AIDS epidemic. The interpretation by Wilson of these results looks at the theory of global mortality convergence: it appears a *"general (though not universal) process"*.

III. Statistical time series data

The Office for National Statistics (ONS) has used period life expectancy at birth as an indicator of the health status of different geographic areas of the UK since the 1840s, and now also publishes life expectancy at age 65. These period indicators have recently been reported for the constituent countries of the UK, regions, countries and local areas (ONS 2011a) and for areas defined by health organisation (ONS 2011b).

"Life expectancy provides users with a summary indicator of an area's mortality experience (and by implication, overall level of health) which can be used to inform policy, planning and research in both public and private sectors in areas such as health, population, pensions and insurance."

(ONS 2011b p. 1)

Similarly, another data series produced by ONS, period life expectancy at birth and at age 65 by socio-economic classification in England and Wales (ONS 2011c) allows the comparison of mortality levels between groups defined by that classification. So, for example, period life expectancy at birth for 2002-6 was estimated at 80.4 years for male "higher managerial and professional" workers and 74.6 years for "routine" workers.

In none of the epidemiological, theoretical demographic or statistical sources described here was the period life expectancy at birth indicator used to make any suggestion of expected lifespans. However, the period life expectancy indicator is often incorrectly used as such. To take one example, the BBC used the ONS data on period life expectancy at birth by region to suggest how long people could expect to live:

"…men in Blackpool are expected to live 73.7 years and women in Manchester to an average of 79.1."[4]

Period life expectancy compares summary mortality across groups. On average people in the "higher managerial and professional" group would be expected to live longer than people in the "routine" workers group; and the same would be true comparing people living in Kensington and Chelsea to those living in Blackpool. But it would not be true to say that expected lifetimes are as given by the period life expectancy indicators. Realistic lifespans would depend on the age of the person within the group, and the rate of future mortality improvement expected, which could be different for each group. Cohort life expectancy indicators are not produced by statistical agencies in the UK (or in other countries) by region or socio-economic group. So it is not possible to say from public data what the expected lifespan of a man in Blackpool or a member of a particular socio-economic group would be.

[4] | *http://www.bbc.co.uk/news/uk-england-11675101. Data consistent with ONS (2011b, Tables 2 and 3).*

Examples of good use of cohort life expectancy data can be found in two recent publications.

IV. Lifespan projections

Cohort life expectancy was used as an indicator of expected lifetime remaining in a recent publication from the UK's Department for Work and Pensions. This tabled projected cohort life expectancies for each cohort reaching age 65, which is the current state pension age, from 1951 to 2058 (DWP 2011a). The published set of life expectancies was calculated using the principal projection basis from ONS population projections for the UK, consistent with the cohort indicators in Table 2. As *Longevity Bulletin 01* explained, other projection scenarios based on alternative assumptions for how mortality will improve in future are available.

This publication gave a time series of cohort life expectancies at age 65 which showed the general trend of increasing longevity because of past and projected future mortality improvement. For example, for UK males aged 65 in 1951, cohort life expectancy at age 65 was 12.2 years, in 2011 it is projected to be 21.4 years and in 2058 it is projected to be 26.0 years. The Department has published other analyses using the same cohort-based data to investigate the chances of becoming a centenarian in the UK. For example, fewer than ten per cent of those aged over 65 in 2011 are projected to live to 100 but over a quarter of those aged 16 and under could (DWP 2011b, c).

V. Best-practice population lifespans

A recent article by Shkolnikov et al (2011) updated the seminal paper by Oeppen and Vaupel (2002) which documented the linear rise in the best national **period** life expectancy in the world since the mid-19th century and estimated best-practice female **cohort** life expectancy. The article looks at global longevity trends using a realistic rather than synthetic lifespan indicator.

The best-practice cohort life expectancy trend is also linear, and it is no surprise to find the trend line is even steeper than that for period life expectancy, because the rate of mortality improvement is fully reflected in the cohort indicator. The rate of increase in best-practice female cohort life expectancy across birth years 1870 to 1920 was found to be 0.43 years annually, compared to that for period life expectancy between 1870 and 2008 of 0.28 years. If such mortality improvement continued, best-practice average lifespan is estimated to reach about 93 years for females born in the 1970s, which would be about 14 years higher than the period indicator.

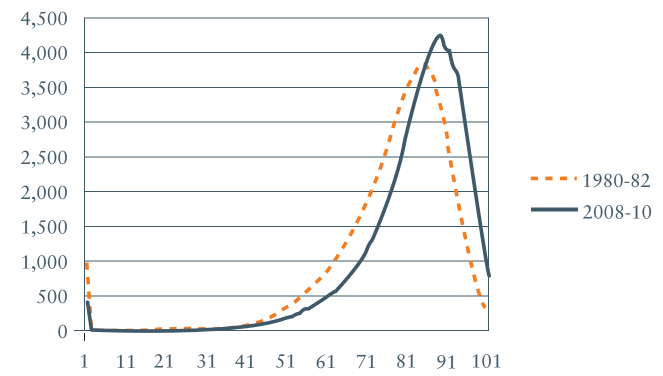
These examples show the need to use cohort life expectancy to understand better both individual prospects for lifespan and global lifespan trends. For individuals planning retirement and for governments considering longevity-related policy, the danger in using period rather than cohort life expectancy is that the true rate of improvement in mortality is hidden and potential future lifespans underestimated.

Considering other indicators

Put simply, life expectancy at any age is the average remaining lifespan for the population the mortality data represents. Life expectancy at birth is the average total lifespan, or equivalently average age at death, for the defined population. Recent studies of demographic theory have started to ask whether the **average** age at death is the best measure for understanding longevity. The reason for this is the changing shape of the distribution of age at death.

This distribution for any population is usually shown in two ways: the curve of deaths and the survival curve. Charts 1 and 2 define and show these curves for females in the UK. Period life tables are used rather than cohort as we are looking at how the mortality of a population has changed over a time period; in this case, the last nearly thirty years. Both charts are calculated from the same mortality rates so simply show the same information in different ways.

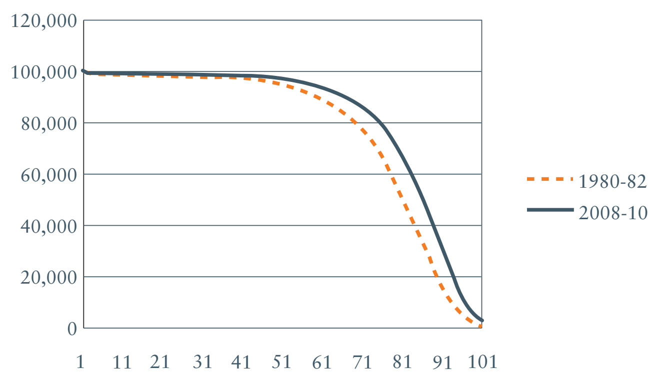
Chart 1



Curve of deaths for females in the UK from two period life tables: numbers dying at each age from 100,000 births experiencing mortality rates of period at each age.

Source: *ONS Interim Life Tables, United Kingdom*

Chart 2



Survival curve for females in the UK from two period life tables: numbers still alive at each age from 100,000 births experiencing mortality rates of period at each age.

Source: *ONS Interim Life Tables, United Kingdom*

The pattern of the curves and how they have changed over time is replicated in most developed countries. The first peak in the curve of deaths at age zero which represents newborn deaths has reduced significantly over past decades. In modern times, the peak at adult ages has become the dominant single modal age at death, that is, the most common age at death. The mode has shifted to the right as more people survive to older ages. However, maximum lifespan has increased more slowly, causing what has been called compression of mortality. As a result the survival curve pushes further out to the right before it starts falling. This is called the rectangularisation of the survival curve.

An average of a curve works best when the curve is symmetric, which is not the case for the curve of deaths in developed countries. Because of this, it has been suggested that life expectancy at birth becomes less useful as an indicator of population mortality trends as period life expectancy approaches 80 years and the changes in mortality occur at older ages (Olshansky et al. 1990). To supplement the use of life expectancy, other indicators can help us understand longevity trends, including the modal and median ages at death (Benjamin 1982; Canudas-Romo 2010; Cheung and Robine 2007)[5]. The value in considering these three indicators together comes from the fact that in populations where mortality rates are steadily reducing, each indicator changes differently according to whether mortality rates reduce above or below the indicator, as Table 3 shows.

[5] | The median age at death is that given in the middle of an ordered list of ages at death from the defined population. The mode or modal age at death is the most common.

Table 3:

Does age at death indicator change when mortality rates reduce?

Indicator	Mortality rates reduce at ages below the indicator	Mortality rates reduce at ages above the indicator
Average (life expectancy)	Yes	Yes
Median	Yes	No
Mode	No	Yes

Source: *Adapted from Canudas-Romo (2010).*

The three indicators are shown for females in the UK in Table 4, for the same time periods as the earlier figures.

Table 4:

Indicators of central tendency for age at death, in years, UK females

	1980-82	2008-10
Average	77	82
Median	80	85
Mode	84	88

Source: *Adapted from Canudas-Romo (2010).*

As in other developed countries, the UK has had recent mortality improvements at the oldest ages, period life expectancy at birth exceeds 80 years, and modal age at death is extending to near 90 years. The mode changes when mortality rates change at the oldest ages, which is the age range of interest in ageing populations. The mode is higher than period life expectancy, and more like the life expectancy from cohort indicators.

Therefore, to answer the question **"What lifespan should I expect?"** modal age at death provides a simple approximation. However, cohort life expectancy is the technically correct form of indicator to use in response. Most importantly, whenever "life expectancy" is quoted, the reader should check on precisely what is meant and whether the indicator given can estimate a realistic lifespan. As the discussion above illustrated, an answer of around 82 years coming from a period life expectancy indicator may hide the more realistic estimate of 89 years and a more appropriate estimate for retirement planning of 92 years.

3. Longevity research news

This section highlights some recently published research. Each item is selected for its relevance to longevity knowledge and interest to Bulletin readers. Check the links and the Sources section at the end of this *Bulletin* to follow up on a reference.

The latest edition of World Population Prospects, the "2010 Revision" was published in May 2011. This biennial publication of the Population Division of the United Nations' Department of Economic and Social Affairs is a standard source for historic and projected future demographic indicators for each country and major region of the world. Mortality is assumed to improve steadily so that the worldwide average period life expectancy at birth reaches just over 80 years in 2100, from nearly 70 years today. It was only around 48 years in 1950. The highest life expectancy in 2100 is projected to be for Japanese females, at over 95 years. African countries are expected to reach at least 75 years. The data can be found at **http://esa.un.org/unpd/wpp/index.htm**.

Major studies on the prevalence of obesity and its effects have been published. *The Lancet* described "an epidemic of risk factors for cardiovascular disease" based on the data available from 199 countries studied by the Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group. Average Body Mass Index (BMI) and the prevalence of diabetes have increased globally between 1980 and 2008. However, global average systolic blood pressure and blood cholesterol slightly decreased, falling in high-income countries while increasing in many low- and middle income countries (Danaei et al. 2011a; Danaei et al. 2011b; Farzadfar et al. 2011; Finucane et al. 2011; The Lancet 2011).

It is not yet clear what effect the rising trend of obesity will have on the global trend of improving longevity. Further evidence of the "J-shaped" relation between BMI and mortality from cardiovascular disease, cancer and all causes in high-income countries was also published recently (Huxley and Jacobs Jr 2011). However, most of the cardiovascular risk associated with high BMI is mediated by high blood pressure, diabetes and high cholesterol. These risk factors are amenable to lifestyle change, as smoking has been, and the risk lessened by treatment, although the likelihood of treatment may be higher in high-income countries than in low- to middle-income regions.

New mortality forecasting for the United States suggests that the trend to greater prevalence of obesity will not stop or reverse the continued increase in life expectancy, at least until 2030. This is because the general trend towards lower mortality from other causes, and especially from giving up smoking, exerts a more powerful effect on mortality than the risk from obesity. The forecast life expectancies for the 2030 US population by the detailed methods of King & Soneji (2011) are in line with those shown in *Longevity Bulletin 01* (sourced from the US Social Security Administration) for females and even higher for males.

Finally, on the theme of variations in mortality, in an article which asks "Is there a 'Scottish effect' for mortality?", Popham and Boyle (2011) investigate competing explanations for why mortality is higher in Scotland than in England and Wales (E&W). They use longitudinal study data for 35-74 year olds from 1991 to find that **those born in Scotland have higher mortality than people born in E&W and living there, whether or not the Scottish-born live in Scotland or E&W.** Adjusting for socio-economic differences between households in Scotland and E&W, defined by car access and housing tenure, does not explain the difference. There does appear to be a 'Scottish effect', not fully explained, but it is suggested that the cause may lie in early life histories.

4. News from the Institute and Faculty of Actuaries

Emerging Trends in Mortality and Longevity Symposium 2011

13-14 September, Warwick Conferences, the University of Warwick, Coventry

September 2011 saw the second conference hosted by the Institute and Faculty of Actuaries focusing on the development of new thinking in mortality and longevity by encouraging actuaries to work collaboratively with other disciplines to better understand past, present and future trends. Following on from the Joining Forces conference in October 2009 **www.actuaries.org.uk/baj-15-supplt**, the Emerging Trends symposium extended its group of partners to include the IAA and the Society of Social Medicine. The symposium was extremely well attended. Plenary sessions and workshops were held across three themes (i) socio-demographics, (ii) individualised risk and (iii) the international dimension.

The socio-demographics plenary session was presented by Michael Murphy, London School of Economics, who focussed on contrasting and correlating recent mortality trends in Eastern and Western Europe. His paper looked at macro and micro drivers of mortality and highlighted the need to better understand the impact of cultural and social institutions.

The importance of social attitudes also emerged in the international theme, in particular in the different cultural attitudes to ageing relating to the ongoing health and independence in the old-old and the desire to be a productive member of society. In his plenary session, Jean-Marie Robine, INSERM, French National Institute of Health and Medical Research, contrasted the trends in mortality of the 100+ age group in Japan and Denmark suggesting cultural attitudes would seem to be playing a role in the differences exhibited. The benefits that high quality international comparative research can bring in investigating trends and drivers, and the need for more work in this area, were highlighted by international workstream leader Carol Jagger in her closing summary. As well as international comparisons showing where there is common ground (as also covered in *Longevity Bulletin 01*), international diversity may bring insights into drivers.

The individualised risk theme focused on genetics and genomic studies of ageing in the plenary session by Eline Slagboom, Leiden University. This synthesis of the latest research also highlighted areas where more study was needed especially with the need for larger studies. This theme also saw a greater contribution and new insights from the underwriting community.

In all themes, the need emerged for concerted action to ensure surveys include enough information to enable differentiation of risk factors in the 85+ age group. The UK Actuarial Profession's Mortality Research Steering Committee will be reviewing the messages that emerged from the symposium in the next few months and developing the next stage of its thought leadership project to encourage interdisciplinary work in this area. A selection of papers from the conference will be published as a supplement to *British Actuarial Journal*.

Improving health: it's more complicated than you think!

The Institute and Faculty of Actuaries' Autumn Lecture by Sir Harry Burns, Chief Medical Officer for Scotland.

Sir Harry Burns has been Chief Medical Officer for Scotland since 2005 and is an expert in the field of public health. His lecture examined the reasons behind Scotland having the lowest life expectancy in western Europe and suggested that rather than conventional risk factors such as smoking and obesity, socioeconomic mechanisms seemed to be the main drivers of premature mortality in the unhealthiest regions of Scotland.

The lecture offered a synthesis of evidence from a range of disciplines including psychology, evolutionary biology and molecular genetics to explain the biological consequences of social adversity. It also offered a view on a new approach to health improvement in the light of such evidence.

CMI report

The Continuous Mortality Investigation (CMI) carries out research into the mortality and morbidity experience of insurance portfolios and pension schemes in the UK market. The CMI has recently updated its library of UK mortality projections to include 32 additional projections. The CMI's latest mortality working papers cover statistics on the mortality experience of self-administered pension schemes, and the 2011 version of the CMI mortality projections model (which incorporates ONS data for 2010). All publications and the CMI mortality projections model are available on the CMI website: **http://www.actuaries.org.uk/research-and-resources/pages/continuous-mortality-investigation.**

British Actuarial Journal

British Actuarial Journal is now published through Cambridge University Press at **http://journals.cambridge.org/BAJ**. Volume 16 part 1 was recently published and includes an article on what longevity predictors to allow for when valuing pension scheme liabilities.

Annals of Actuarial Science

The latest issue of *Annals of Actuarial Science*, now also published through Cambridge University Press, includes an editorial on the usefulness of stochastic mortality modelling. Volume 5, Issue 02 is available at **http://journals.cambridge.org/AAS**.

For your diary

The Actuarial Profession and ILC-UK Joint Debate: Older Workers, Health and Employment, 22 November 2011

Demographic change means that many organisations now employ greater numbers of older workers, many of whom will carry on working for longer than employees in recent decades. By many measures, today's older workers are healthier than in the past, however, older people are more likely to experience ill health. Many of the health problems that older workers suffer can be prevented or managed, but doing so requires a comprehensive approach that involves many actors, including the NHS, health professionals, employers and older workers themselves. The debate will consider how issues relating to the employment of older workers can be successfully managed. For more details see Current Events on the Institute and Faculty website **www.actuaries.org.uk/events**.

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United Kingdom

Maclaurin House
18 Dublin Street
Edinburgh · EH1 3PP
T +44 (0)131 240 1300
F +44 (0)131 240 1313

Staple Inn Hall
High Holborn
London · WC1V 7QJ
T +44 (0)20 7632 2100
F +44 (0)20 7632 2111

Napier House
4 Worcester Street
Oxford · OX1 2AW
T +44 (0)1865 268 200
F +44 (0)1865 268 211

Overseas

Hong Kong
2202 Tower Two
Lippo Centre
89 Queensway · Hong Kong
T +852 2147 9418
F +852 2147 2497

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longevitybulletin@actuaries.org.uk

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