



Institute  
and Faculty  
of Actuaries

# Longevity Bulletin

From the Institute and Faculty of Actuaries



## The gender edition

Issue 5

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# 1. Introduction by the President, Institute and Faculty of Actuaries, David Hare

I have great pleasure in introducing the fifth issue of the Longevity Bulletin. I'd like to thank Ross Matthews, Consultant at Punter Southall, for his thought provoking and informative article on gender and longevity.

The 'gender gap' in longevity is a global phenomenon that has real implications for actuaries and firms involved in pensions, life insurance and Public Policy.

Ross has approached the topic with rigour, addressing lifestyle and the genetic reasons for changes in the 'gender gap' around the world, as well as illustrating the trends, policy and business landscape that actuaries must navigate.

We hope that this issue will be read with interest by all those with a technical, professional or personal interest in the topic of healthy life expectancy.

Best wishes,



**David Hare**

President, Institute and Faculty of Actuaries



## 2. Editorial: Mind the gap

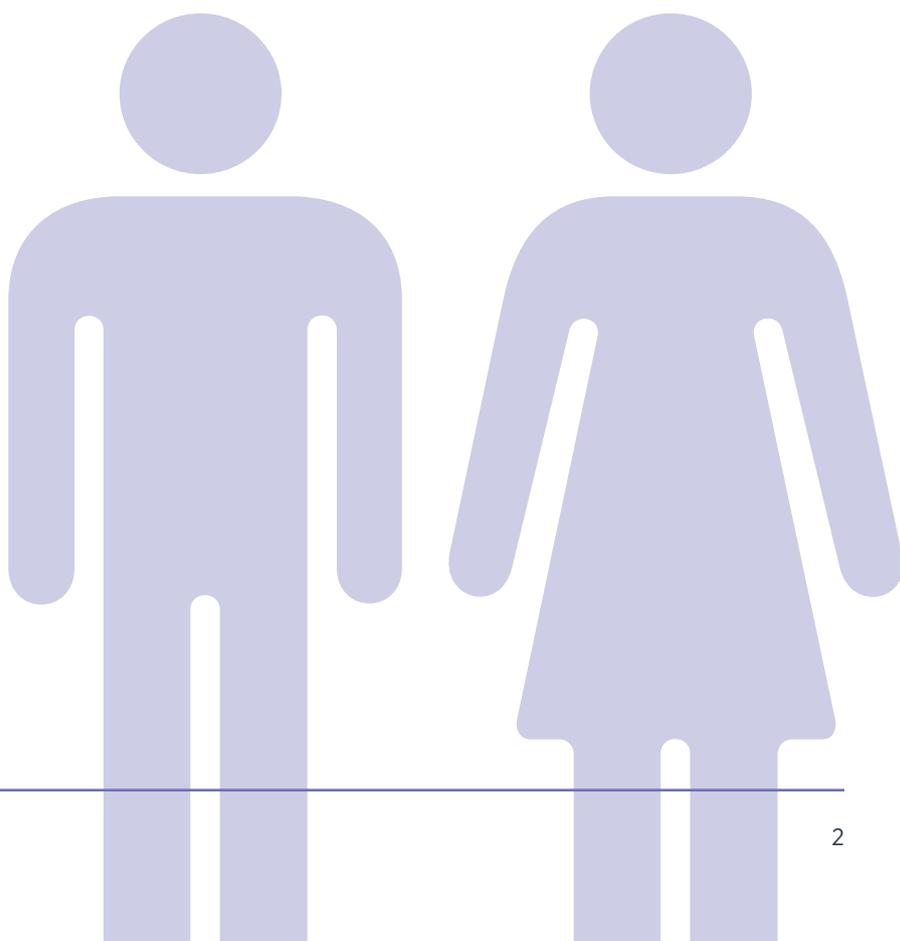
All around the world, with just a few exceptions, women live longer than men; yet the differences in life expectancy varies considerably country by country. Why this should be the case is a matter of much research and debate. The investigations into how the gender gap evolved over time and the scope for future reductions are fascinating, but there are still many questions that need to be answered.

In March 2011 the European Court of Justice ruled that insurance companies can no longer use gender as a variable for calculating and quoting prices to individuals and in so doing highlighted the gender gap to a broader audience than ever before.

The Focus article in this issue of the Longevity Bulletin explores the reasons why women live longer than men. It considers the global impact of the differences in life expectancy between the sexes and some of the changes that have been seen in recent history. It is an insightful and compelling article that covers grounds for consideration that include factors as diverse as cigarettes & alcohol, telomeres, testosterone, nuns, monks and even castration – which can add an average of 19 years to your life expectancy as a man, but I'm not sure I can see it catching on as a health trend. Finally the wider implications of the gender gap in life expectancy for pensions and insurance are considered.

The Longevity Bulletin is designed to be a 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 truly intriguing and globally relevant subject.

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# 3. Focus on: Exploring the role and impact of gender on longevity

Life expectancy continues to increase in most countries around the world - this should be celebrated. However, there are large variations in life expectancy within populations resulting from a wide range of factors. One of the key factors is gender.

This Focus article:

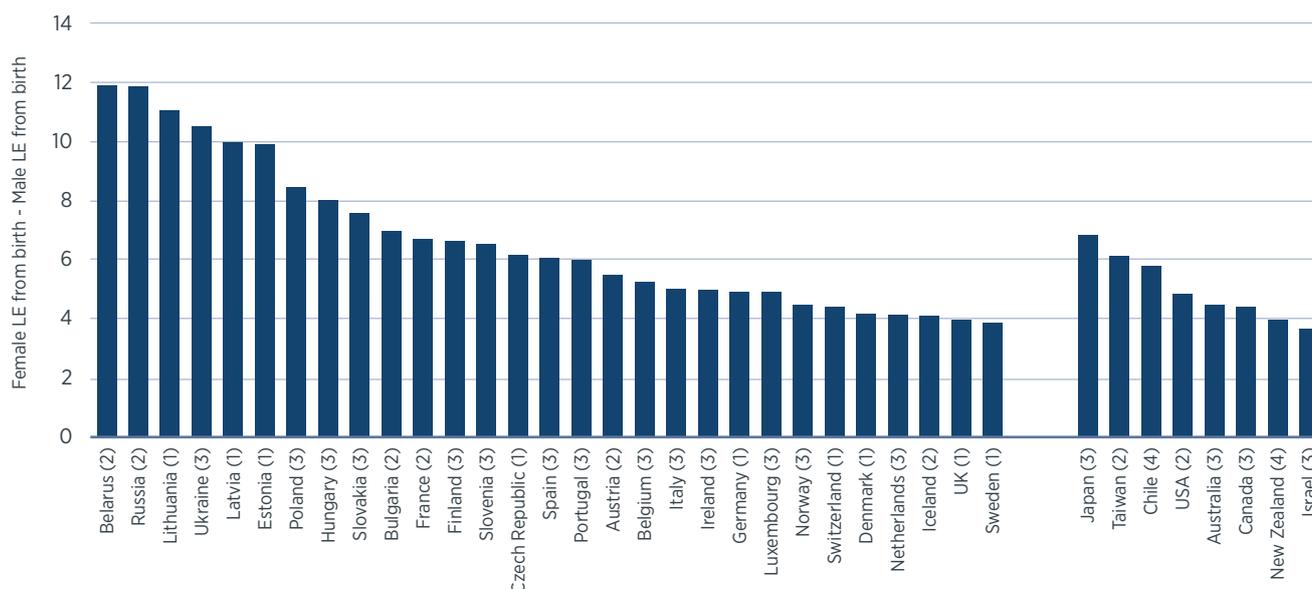
- explores differences in life expectancy between men and women around the world
- explores the reasons why a gender gap in longevity exists
- considers some of the wider implications.

## Life expectancy by gender around the world

Throughout recorded human history women have mostly outlived men. Today female life expectancy is greater than

male life expectancy in nearly all countries around the world (World Health Organisation, 2013). However, the gender gap in life expectancy and the extent to which this gap has been changing over time varies considerably. Chart 1 shows the difference in period<sup>1</sup> life expectancy from birth in 29 European countries together with a selected group of 8 other countries from around the world. This highlights the vast range in the difference in life expectancy between men and women. Within Europe the gender gap is larger amongst the Eastern European countries compared to the more affluent Western European and Scandinavian countries. For example, while women

**Chart 1 - Difference in female and male period life expectancy from birth. Selected countries from Europe and rest of the World (Height of bars = female life expectancy - male life expectancy)**



(1) Data for 2011, (2) Data for 2010, (3) Data for 2009, (4) Data for 2008. Source: Human Mortality Database ([www.mortality.org](http://www.mortality.org))

<sup>1</sup>An explanation of period life expectancy and how this differs from cohort life expectancy is given in the Institute and Faculty of Actuaries Longevity Bulletin: Issue 2, which can be accessed through the following link: [www.actuaries.org.uk/research-and-resources/documents/longevity-bulletin-issue-02](http://www.actuaries.org.uk/research-and-resources/documents/longevity-bulletin-issue-02)

living in the UK and Sweden can expect to outlive their male counterparts by 4 years, the gap is much greater in Russia at 12 years. In Japan where women have the highest life expectancy in the world (period life expectancy from birth of 86 years) the gender gap is relatively large compared to other wealthy nations, with the male lifespan being almost 7 years shorter.

### How has the gender gap changed over time?

In most countries, the gender gap in life expectancy has been reducing, especially so for many developed countries in particular over the last decade. However, there are still some contrasting patterns.

Chart 2 shows the difference in period life expectancy from birth between males and females in the UK, USA and Japan. In the UK and the USA, the gender gap increased after World War II, peaking in the 1970s before steadily tailing off ever since. The reasons for this vary, but it could be largely attributed to changes in smoking prevalence between men and women (which is explored later). However, this contrasts to the pattern observed in Japan where the gender gap has continued to increase over the last 40 years and has only begun to stabilise in the last decade.

### Why does the gender gap exist? Lifestyle choices

There are many reasons why women live longer than men and the factors that contribute to the longevity gender gap vary considerably around the world. However, these can be broadly

categorised into two main areas. Firstly, those factors that can be attributed to different lifestyle choices between men and women. Secondly, those factors surrounding the different genetic and biological make-up of each gender.

There are many lifestyle choices that may have an impact on an individual's health to some degree, but there are four main lifestyle factors which are generally recognised as having the biggest impact on longevity (Lu et al, 2012). These are smoking, alcohol consumption, obesity and a lack of exercise.

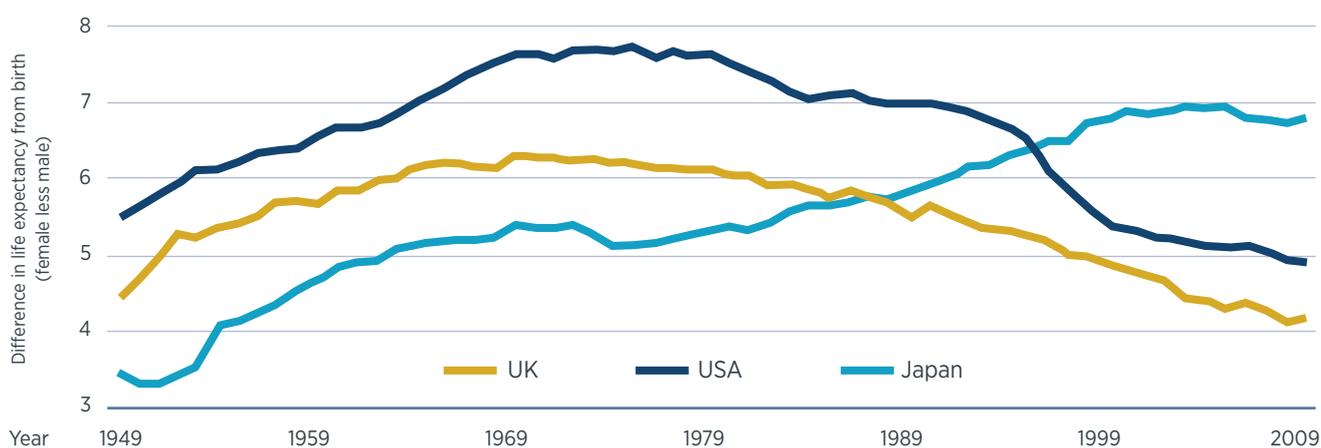
#### Cigarettes and Alcohol

The health risks associated with smoking are widely recognised today and smoking-related deaths, for instance those resulting from cardio-vascular disease and lung cancer, still account for a significant proportion of deaths. A reduction in smoking rates can therefore have a significant impact on longevity.

Research using data obtained from 30 European countries revealed that differing smoking habits between men and women is one of the greatest causes of the gender gap in life expectancy. In particular, it was estimated that smoking-related deaths accounted for around 40%-60% of the gender gap (McCartney et al, 2011).

This is perhaps best illustrated by looking at smoking habits in the UK. Men have historically been more likely to smoke than women and of those who do smoke, men are likely to smoke more cigarettes. Smoking rates for both sexes were at their peak shortly after World War II, with smoking rates in 1948

Chart 2 - Gender gap in life expectancy: UK, USA and Japan (1949 to 2009)

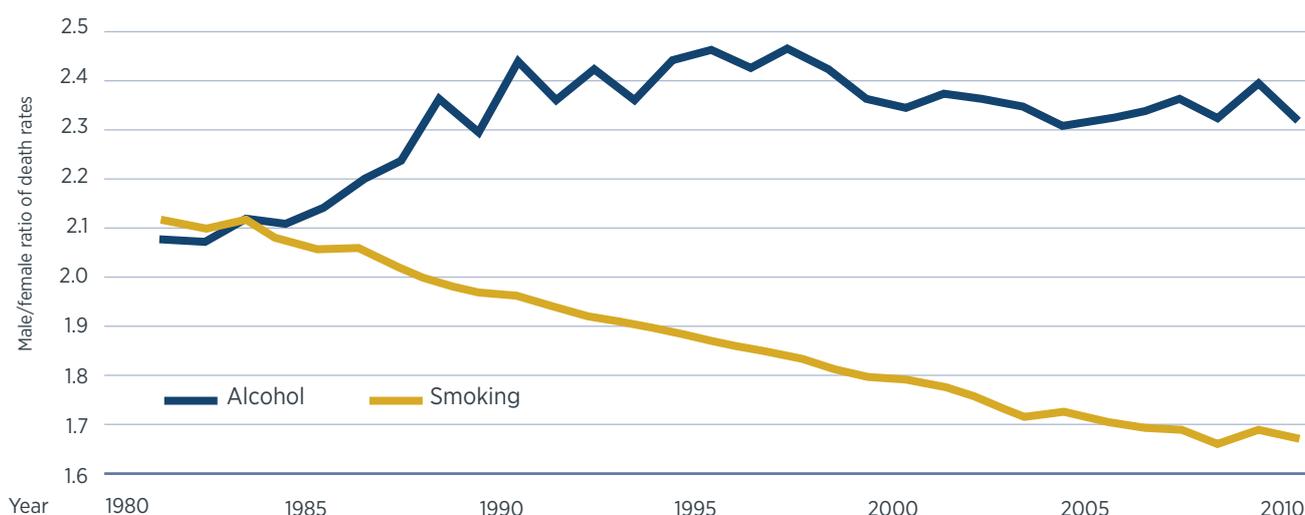


Source: Human Mortality Database ([www.mortality.org](http://www.mortality.org))

### Record Breakers

The oldest recorded person that ever lived was a French woman called Jeanne Calment, who lived to 122 years and 164 days before her death in 1997. She lived over 6 years longer than the oldest man, Jiroemon Kimura from Japan who lived to 116 years and 54 days before his death in June 2013. He is the only man in the top 10 of the 100 oldest people who have ever lived (he is the 9th oldest) and in all, women make up 92 out of the top 100. At the time of writing, the oldest known living person on the list is a Japanese lady, due to reach 116 in March 2014.

**Chart 3 - Male to female ratio of death rates: alcohol and smoking related cases, United Kingdom**



Source: World Health Organisation, Regional office for Europe; European Health for All Databases. Data accessed on 19 November 2013 (<http://data.euro.who.int/hfad/b/>) © World Health Organisation 2013

amongst adult men at 82%, double that for women (Action on Smoking and Health, 2013). Smoking rates then began to fall, more steeply for men, such that in 1974 smoking prevalence was at 51% for adult men and 41% for adult women and of those who smoked, men would smoke on average 18 cigarettes per day compared to 13 for women (Office for National Statistics, 2013). Since then, smoking rates in the UK have more than halved and the difference in smoking rates between men and women has converged such that the overall prevalence of smoking in the population today is around 20% for both men and women. Furthermore, the average number of cigarettes smoked by men and women has also converged such that they are today broadly the same. This has resulted in a steady decrease in the male to female ratio of age-standardised death rates related to smoking, as illustrated in Chart 3. It should be noted that it can take time before the effects of a fall in smoking rates begins to filter through into actual longevity improvements in the population.

A somewhat different culture appears to exist in Japan, with a much larger gap in smoking prevalence between men and women. Smoking rates amongst Japanese men were around 80% in 1970 but although they have gradually decreased since then to 34% in 2012, they still remain at one of the highest levels in the developed world. By contrast, smoking rates amongst Japanese women have always been very low and broadly stable since 1949 and in 2012 were at only 11% (Funatogawa et al, 2012). Whereas in the UK smoking rates are now broadly equal between men and women, in Japan men are still three times more likely to smoke than women.

This evolution in the level of smoking prevalence could go some way to explain how the gap in life expectancy between men and women in the UK peaked in the 1970s, before tailing off ever since, while the gap in Japan continued to increase, only recently beginning to stabilise (as shown earlier in Chart 2).

One of the other key risk factors on longevity is excessive alcohol consumption. Evidence suggests that alcohol consumption in men has outweighed the level of alcohol consumption in women. The same study of 30 European countries also concluded that, although smoking appeared to be the largest single contributor to the gender gap in longevity, alcohol consumption also contributed a further 20% of the gap in life expectancy between men and women (McCartney et al).

In the UK, while we have seen a narrowing in the gender gap caused by smoking related deaths, the opposite has occurred for deaths related to alcohol. Between 1981 and 2010, age-standardised death rates for smoking related causes fell faster for men (63%) compared to women (53%), but the pattern was reversed for alcohol related death rates over the same period where death rates fell by 33% for women, but only 26% for men (World Health Organisation, 2013).

This is illustrated in Chart 3, which compares the male to female ratio of age-standardised death rates by smoking and alcohol related cases in the UK. While the male to female ratio of death rates from smoking has steadily reduced since 1981, the same ratio for deaths from alcohol increased in the 1980s, overtaking the male to female ratio for smoking related death rates in 1984. In 2010, the male to female ratio of death rates was around 40% higher for alcohol related deaths compared to deaths caused by smoking.

In Russia, alcohol consumption can explain the huge gap in life expectancy between men and women (12 years as shown in Chart 1). In particular, men and women have significantly different preferences for alcohol beverages. Russian men have a strong preference for hard spirits, namely vodka, and they drink it in much larger amounts than women. Women are more likely to refrain from drinking altogether or drink milder types of

alcoholic beverages such as wine and beer. It is not just alcohol consumption, but the distinct beverage types consumed by men and women which are behind the apparent linear relationship between drinking and all-cause mortality rates in Russian men, Nicholson et al, (2005) and Minagawa (2011).

## Obesity

Obesity, coupled with a lack of exercise, is a growing health problem. It is a risk factor that contributes to many conditions such as hypertension, cardiovascular disease and diabetes. Although obesity rates have been increasing in many countries in recent years, unlike smoking and alcohol, obesity rates between men and women have been broadly similar in most EU countries, including the UK (Organisation for Economic Co-operation and Development, 2010). However, even though obesity rates appear to be similar for both genders, it is difficult to ascertain if obesity has had a meaningful impact on the gender gap in life expectancy as the effect of obesity in developing chronic conditions can vary by gender. For example, the chances of developing Type 2 diabetes resulting from obesity is, when compared to not being obese, greater for women than for men (Guh et al, 2009).

## Socio-Economic Groups

In England, the difference in life expectancy between the top and bottom socio-economic groups overshadows the overall difference in life expectancy by gender. Period life expectancy from birth amongst the most affluent fifth of the population was 8 years higher for men and 5.6 years higher for women compared to the most deprived fifth of the population (ONS, period 2006 to 2009). However, the gender gap in life expectancy was greater amongst the most deprived fifth where women outlived men by 5.6 years compared with only 3.1 years amongst the most affluent fifth. Much of these differences can again be attributed to differing lifestyle choices between the socio-economic groups. For example, those with no qualifications are five times more likely to engage in all four main risk factors (smoking, alcohol consumption, poor diet, and lack of exercise) than those with higher education (Lu et al., 2012).

## Why does the gender gap exist? Genetics and Biology

The different lifestyle choices between men and women account for a significant proportion of the gender gap in life expectancy. However, there are of course some very important genetic and biological reasons why the average lifespan of women surpasses that of men.

### The 'X' Factor

Some of the differences between male and female longevity can be attributed to the genetic processes which determine our sex and in particular, our chromosomes. Each human cell has 23 pairs of chromosomes; 22 pairs are known as autosomes (not gender specific) and the remaining pair are the sex-chromosomes, either 'X' or 'Y' and determine our gender.

In mammals, females have two copies of the X chromosome, while males have one X and one Y chromosome. The X chromosome contains thousands of genes, many of which are not actually specific to females. On the other hand, the Y chromosome is smaller, and contains only a handful of important genes for male development and fertility.

One of the key benefits in having two X chromosomes is that a mutated gene on the X chromosome inherited from one parent will usually not affect cells in which there are two X chromosomes. Examples of this are certain rare X-linked diseases such as haemophilia, most commonly found in males.

Females live longer than males in nearly all known species. An exception to this is birds, where males typically outlive females. One of the reasons for this is believed to be the fact that, unlike other species, the make-up of their sex chromosomes is reversed (Tower & Arbeitman, 2009) i.e. males are homogametic (have a matched pair of chromosomes) while females are heterogametic (have an un-matched pair of chromosomes), which illustrates the benefits that having two X chromosomes can have on longevity.

### Telomeres

Telomeres sit at the ends of chromosomes and are often compared to the plastic caps on the ends of shoelaces that protect the laces from fraying. However, telomeres degrade over time and when they do, can lead to a cell malfunctioning or dying. This is all part of the ageing process, but the process can be accelerated. In humans, telomeres differ by sex, with men having not only shorter telomeres, but also a higher rate of degradation than women. Both shorter telomeres and an increased degradation rate have been linked to reduced lifespan.

Furthermore, a recent Finnish study found that the stress of unemployment caused men to genetically age faster. Researchers found that men who had experienced being unemployed for 500 days or more exhibited a significant shortening of their telomeres (Ala-Mursula et al, 2013).

### Testosterone vs. Oestrogen

Testosterone is a steroid hormone found in mammals and many other species. In humans, males have significantly more testosterone than women and it can have a substantial impact on male longevity. For instance, testosterone suppresses the immune system meaning that there is a greater risk of men developing certain conditions such as cardiovascular disease. Testosterone can also lead to higher levels of stress and increased aggression, making men more likely to take risks which can lead to higher levels of accidental deaths than for women.

Oestrogen is the primary sex hormone for females. While testosterone can have a negative impact on the male longevity, the positive effects that oestrogen has on the longevity of women are wide-ranging. Oestrogen can lower the risk of women developing cardiovascular disease and developing Type 2 diabetes (Faulds et al, 2012) as well as having a positive effect

## Castration

Studies surrounding the effects of castration are useful as they reveal the effects of males losing the ability to produce testosterone and therefore removing the negative impacts that testosterone can have on longevity. Studies have revealed that among domesticated cats, neutered males lived much longer than unneutered males (State of Pet Health Report, 2013). Furthermore, a recent study analysing a hundred years of eunuch records in Korea found that castration had a huge effect on the lifespans of Korean men, with castrated men living up to 19 years longer than uncastrated men from the same social class (Min et al, 2012).

on muscle repair (Horstman et al, 2012). Women are also more likely to have a more active immune system than men, meaning that they are more likely to be able to stave off infection.

### Infant mortality

Life expectancy at all ages appears to be greater for women than for men with evidence suggesting that differences can start to occur as early on as infancy. Studies have shown that infant mortality rates in 15 developed countries were on average 24% higher for males than females (Drevenstedt et al, 2008). Likely reasons for this stem from boys being more likely to cause difficult labour due to their large body and head size and that they are more likely to be born prematurely. Boys are also more likely to suffer from respiratory problems, while conversely girls have a stronger immune system.

### What capacity is there for the gender gap to converge in the future?

In the absence of a dramatic change in human evolution, it would appear that for genetic and biological reasons, women are likely to outlive men to some extent. There is certainly scope for the gender gap in longevity to reduce further in the future as the different lifestyle choices between men and women evolve over time. We have already seen a fall in the gender gap in the UK largely due to smoking rates between men and women converging and the gap may reduce further as the benefits from the fall in smoking rates continue to filter through into longevity improvements. However, the number of alcohol related deaths still remains much higher for men, so if drinking habits of men reduce, or conversely if women become heavier drinkers, then this could lead to further reductions in the gender gap in longevity.

Perhaps an interesting insight into the capacity for the longevity gender gap to converge surrounds the life expectancy of nuns and monks. A study of Catholic communities in Bavaria found that, under the special environmental conditions of nuns and monks, biological factors appeared to confer a maximum survival advantage for women of no more than one year in remaining life expectancy at young adult ages (Luy, 2003).

### What are the implications of the gender gap in longevity?

A few of the current topical key areas in the UK surrounding the possible implications of women living longer than men are discussed here.

### Insurance contracts

In March 2011, the European Court of Justice passed judgement on the Test-Achats case, which surrounded the equal treatment of men and women in insurance contracts (European Court of Justice, 2011). One of the key impacts of this judgement is that, from 21 December 2012, insurance companies are no longer permitted to quote different life assurance or annuity prices based on gender. Prior to this date they were allowed to differentiate by gender. For example, all other things being equal, male annuities rates (i.e. the rate at which a pot of money is converted into annuity income) were typically lower than those for females as men are not expected to live as long. Therefore, since December 2012, annuity rates for males are likely to have declined, while female annuity rates are likely to have improved. So for a male member of a defined contribution pension plan reaching retirement, it can be argued they will now receive less value for money from their pension pot compared to women when taking account their respective longevity due to their gender. However, it should be noted that with the expansion of the impaired annuity market, many other factors are now often taken into account by insurers when providing annuity rates (such as smoking, alcohol consumption and certain medical conditions), the impact of which may far outweigh any differences due to gender.

### Defined benefit pension schemes

When assessing the funding levels of defined benefit pension schemes, assumptions need to be made about the longevity of pension scheme members as this affects the period over which pension payments are expected to be paid out of a scheme. This is usually split into two parts: firstly there is the assumption for current levels of life expectancy, typically referred to as 'base mortality'; secondly the assumption of how mortality rates and hence life expectancy will change in the future, typically referred to as 'future improvements'. The base mortality assumption is set using different mortality tables for men and women to reflect the fact that women currently live longer than men. Most pension schemes will also now use a different assumption by gender for the future improvement assumption to reflect the fact that, in recent years, men have experienced greater levels of longevity improvement than women and in the long term, the gender gap in longevity is expected to reduce further.

Such mortality assumptions are also required by pension schemes to set actuarial factors, which are used to determine

a member's benefits if they wish to exercise certain options under their pension scheme, such as exchanging part of their pension for a cash lump sum on retirement or taking a cash equivalent transfer value of their benefits to an alternative pension arrangement. These are often set using sex-specific mortality assumptions. At present the 2011 European Court of Justice ruling has not been extended to apply to defined benefit pension schemes, so mortality assumptions in these areas are still permitted to differentiate by gender.

### State Pension Age

The State Pension Age (SPA) in the UK is currently being amended between men and women and as such the SPA will be 65 for both genders by 2018. The SPA is then legislated to increase in increments such that it will reach age 68 by 2046. The 2013 Pension Bill was laid before parliament in May 2013 and proposed a number of changes to state pension provision in the UK. One of the key changes was to link future increases in the SPA to changes in longevity, in particular by maintaining a given proportion of adult life spent in receipt of a state pension. In his 2013 Autumn Statement, the Chancellor of the Exchequer announced that "people should expect to spend up to a third of their adult life in retirement" and the Department of Work and Pensions (DWP) is currently working on the assumption that the given proportion is 33.3%. Given the SPA is set to remain the same for men and women, but men and women are expected to have different life expectancies from SPA, the DWP and the Government Actuary's Department will use a weighted average cohort life expectancy by gender to assess when the SPA may need to increase in future to maintain the 33.3% proportion. Based on Office for Nation Statistics life expectancy figures, the DWP currently expects that the increase in SPA to age 68 might happen in the mid 2030s, a decade earlier than that currently legislated for (DWP, 2013)

### Conclusion

Women continue to outlive men in nearly all countries, although the size of the longevity gender gap and how it is evolving over time varies considerably throughout the world. The main reasons for the gender gap appear to stem largely from the different lifestyle choices of men and women. The extent to which the gender gap may reduce further in the future may largely depend on how countries address the various health issues associated with the key risk factors affecting longevity, in particular the higher smoking rates and alcohol consumption seen in men. However, a difference in life expectancy between women and men is always likely to remain as it would appear that women may just be hard-wired to live longer.

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Data extracted on 19 November 2013

# 4. Longevity exhibition at the Royal Society

From January to June 2014 the IFoA is hosting a joint exhibition with the Royal Society called “To the measured life: longevity past and present” at the Royal Society’s London building in Carlton Terrace, Pall Mall.

How long we are expected to live and how healthy our lives are likely to be is information used by Governments and businesses to inform social policies and offer products and services. As valuable as this information is, it has been collected for only a comparatively short period of time.

Measuring life expectancies can represent a valuable indicator of the prosperity and health of a society. It also helps to inform people’s pensions, life insurance and health and care requirements. Actuarial science has been at the forefront of measuring lives since the profession was first constituted in England in 1848.

Whilst actuaries have measured lives, medical science has helped to lengthen them. Many of the fellows of the Royal Society have introduced changes to health and care that have helped extend our lives considerably. Vaccinations, antiseptics, midwifery, pharmaceuticals - all have had a significant impact in the last 200 years and have meant that we now enjoy longer lives in the UK than any age before us.

The exhibition casts a spotlight on longevity, looking at what and who has contributed historically to the extended lives we lead, the impact living longer has and a consideration of the future. If you are in London during this period we hope you find the time to visit the Royal Society and this exhibition.

# 5. News

## News from the Institute and Faculty of Actuaries

### **Mortality and Longevity Conference 2014**

**15 – 17 September 2014**

This conference will provide a multi-disciplinary forum for the exchange of information on the latest research, and an opportunity to exchange knowledge, all with the aim of better understanding and managing this complex yet critical subject.

The themes for this event are:

1. Medical advances and the impact of genetic profiling on medicine and longevity
2. The international perspective: what can we learn from elsewhere?
3. New sources of information: “big data”, risk factors
4. Practical mortality and morbidity: pricing/reserving for the long-term, underwriting, critical illness, long-term care and underwritten annuities.

For more information about the conference, please contact Event Coordinator, Petrina Parnell:  
[petrina.parnell@actuaries.org.uk](mailto:petrina.parnell@actuaries.org.uk)

### **Cass Business School and Hymans Robertson win bid for Longevity Basis Risk Quantification research project**

Cass Business School, part of City University London, and Hymans Robertson were the successful recipients of the call for a Longevity Basis Risk Quantification research project for the Longevity Basis Risk Working Group (LBRWG).

The project is funded by the IFoA FTSE Bursary and the Life and Longevity Markets Association.

An important problem facing insurance companies and pension schemes is the measurement of the basis risk arising from the use of population-based mortality indices for managing the longevity risk inherent in specific blocks of pension benefits or annuitant liabilities.

Cass and Hymans Robertson will develop a readily-applicable methodology to quantify this basis risk, and will present progress and results over 2014 and early 2015.

Please contact [john.anderson@actuaries.org.uk](mailto:john.anderson@actuaries.org.uk) for more information.

### **‘Life Beyond Measure: A Brief History of Longevity’ - The Institute and Faculty of Actuaries and the Royal Society hold exhibition on Longevity.**

**January – June 2014, The Royal Society  
6-9 Carlton House Terrace, London SW1Y 5AG**

This exhibition casts a spotlight on longevity: who and what has contributed historically to the extended lives we lead, the impact of living longer and a consideration of the future.

The exhibition is an opportunity to view a selection of material from IFoA's archive, as well as items from the Royal Society and other organisations.

The IFoA will also be holding a series of events at the Royal Society during the course of the exhibition.

Please contact [john.anderson@actuaries.org.uk](mailto:john.anderson@actuaries.org.uk) for more information.

### **IFoA Proud Sponsors of Longevity 9 Conference**

The Institute and Faculty of Actuaries were proud to be Platinum Sponsors of the 9th International Longevity Risk and Capital Markets Solutions Conference hosted by the China Institute for Actuarial Science, Central University of Finance & Economics in China (CUFE) in Beijing between 6th and the 7th Sept 2013.

IFoA President David Hare gave a speech at the conference on “The challenges for actuaries in dealing with longevity predictions”, describing how actuaries are developing models used to project future life expectancy. He also highlighted the vital role that judgement and communication play in dealing with the intrinsic uncertainty that existed in these projections.

# 6. Reports

Longevity and mortality reports published during 2013  
(courtesy of Brian Ridsdale)

## Social inequalities and mortality in Europe

Gallo V., et al. (2012)

**Social inequalities and mortality in Europe – Results from a large multi-national cohort.**

PLoS ONE 7(7): e39013. doi:10.1371/journal.pone.0039013  
[www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0039013](http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0039013)

Mackenbach, J.P., et al. (2013).

**The unequal health of Europeans: success and failures of policies.**

The Lancet. 381 (9872). p. 1125-1134.  
[www.thelancet.com/journals/lancet/article/PIIS0140-6736\(12\)62082-0/fulltext?\\_eventId=login](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)62082-0/fulltext?_eventId=login)

## Mortality improvement

Society of Actuaries. (2013).

**Literature review and assessment of mortality improvement rates in the U.S. population: past experience and future long-term trends.**

Society of Actuaries, Illinois.  
[www.soa.org/Research/Experience-Study/Pension/research-2013-lit-review.aspx](http://www.soa.org/Research/Experience-Study/Pension/research-2013-lit-review.aspx)

Willems, P. (2013).

**UK longevity in an international context.**

The Actuarial Post. [online].  
[www.actuarialpost.co.uk/article/uk-longevity-in-an-international-context-5073.htm](http://www.actuarialpost.co.uk/article/uk-longevity-in-an-international-context-5073.htm)

## Will mortality improvements go on forever?

Department of Health & Department of Environment & Rural Affairs. (2013).

**UK 5 year antimicrobial resistance strategy 2013 to 2018.**

Department of Health, London.  
[www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018](http://www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018)

Ritchie, G. (2013).

**Herding experts.**

Longevity. [online].  
[www.longevity.co.uk/site/informationmatrix/herdingexperts.html](http://www.longevity.co.uk/site/informationmatrix/herdingexperts.html)

World Economic Forum. (2013).

**The dangers of hubris on human health.**

Global Risks Report. [online].  
<http://reports.weforum.org/global-risks-2013/risk-case-1/the-dangers-of-hubris-on-human-health/>

## Does retirement affect mortality?

Bloemen, H., et al. (2013)

**The causal effect of retirement on mortality: evidence from targeted incentives to retire early (August 12, 2013).**

Netspar Discussion Paper No. 08/2013-024.  
[http://hq.ssrn.com/Journals/RedirectClick.cfm?url=http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2312379&partid=424335&did=184205&eid=198448195](http://hq.ssrn.com/Journals/RedirectClick.cfm?url=http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2312379&partid=424335&did=184205&eid=198448195)

Hernaesa, E., et al. (2013).

**Does retirement age impact mortality?**

Journal of Health Economics. 32 (3). p. 586-598.  
[www.sciencedirect.com/science/article/pii/S0167629613000313](http://www.sciencedirect.com/science/article/pii/S0167629613000313)

Sahlgren, G. H. (2013).

**Work longer, live healthier: the relationship between economic activity, health and government policy.**

Institute of Economic Affairs, Discussion paper, No 46.  
[www.iea.org.uk/sites/default/files/publications/files/Work%20Longer,%20Live\\_Healthier.pdf](http://www.iea.org.uk/sites/default/files/publications/files/Work%20Longer,%20Live_Healthier.pdf)



Institute  
and Faculty  
of Actuaries

2014

# Mortality and Longevity Conference

2014

15-17 September 2014, Birmingham, UK

The Mortality and Longevity Conference 2014 will focus on improving our ability to forecast future mortality by drawing on the knowledge, insights and techniques of a wide range of specialities including; medics, demographers, epidemiologists and underwriters.

2014

This two night residential conference has a reputation for lively discussions and debates, with lots of opportunities for networking with a diverse range of attendees.

The conference aims to expand delegates' horizons by giving a better view of the scope of current mortality research in a wide variety of relevant disciplines, and by providing a forum to discuss the implications for actuarial practice.

2014

#### Who should attend?

The Mortality and Longevity Conference 2014 will be of interest to all actuaries concerned with pricing or reserving for mortality and longevity, underwriters, demographers, epidemiologists, policy-makers, gerontologists, other medical researchers, and all those with an interest in better understanding and projecting mortality and longevity.

2014

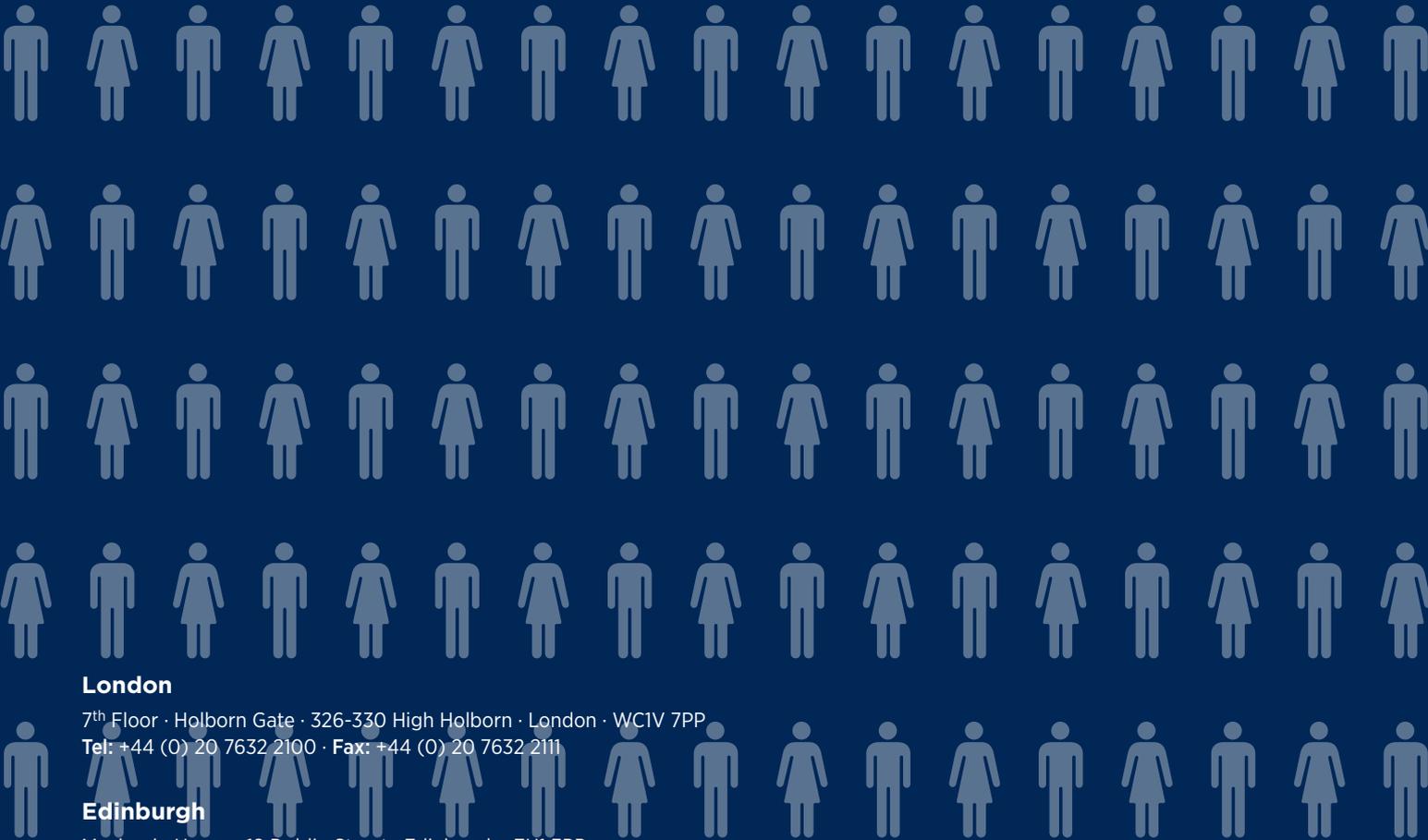
For more information please visit the Institute and Faculty of Actuaries website:

[www.actuaries.org.uk/events](http://www.actuaries.org.uk/events)

2014



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