



Choosing Population Projections for Public Policy

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About this Report

This report summarizes a conference entitled *Choosing Population Projections for Public Policy* which took place on October 29th 2008 at the Institute of Actuaries, Staple In Hall, High Holborn, London. The conference was organized jointly by the ILC-UK and the Actuarial Profession.

Acknowledgements

This report and the original conference it draws upon were made possible by the generous financial support of *Swiss Re*.

The organizing committee for the *Choosing Population Projections for Public Policy* conference comprised: Colin Redman, Andrew Bryans, Hanna Bolton, Martin Hewitt (Actuarial Profession) and James Lloyd, Noreen Siba (ILC-UK).

Speakers and session chairs at the original conference comprised:

Lord Richard Best
Niki Cleal, Director, Pensions Policy Institute
Peter Goldblatt, ONS Centre for Demography
Baroness Sally Greengross, ILC-UK
Professor Emily Grundy, London School of Hygiene and Tropical Medicine
Professor Carol Jagger, University of Leicester
Lord Archie Kirkwood
Martin Lunnon, Government Actuary's Department
Christian Mumenthaler, Swiss Re
Chris Shaw, ONS
Richard Willets, Paternoster

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Foreword

The credit crunch of 2008-9 has coincided with some western countries experiencing for the first time a declining elderly support ratio. As governments around the world confront periods of intense and, for some, unprecedented fiscal strain, it has never been more important for them to use the very best possible data and projections on future population growth.

The production and use of population projections for policymaking is hugely important and, ultimately, touches all of us. It is also an exciting and dynamic topic: the different fields of research involved, such as epidemiology and demography as well as actuarial science, are developing their methodologies, improving data sources and pushing forward the boundaries of our knowledge and understanding.

The users and producers of population projections in public policy all have an interest in improving understanding of population trends and ensuring that the best possible use of projections is made in decision-making.

Swiss Re was therefore delighted to support the joint ILC-UK and Actuarial Profession conference *Choosing Population Projections for Public Policy*. The conference for the first time brought together a range of experts on mortality and healthy life expectancy with a broad range of public policy stakeholders to review the future of knowledge in these fields and to explore how projections can best be used in various kinds of policymaking.

As a leading global reinsurer Swiss Re understands the importance of obtaining the best possible data and applying the most rigorous analytical techniques to maximise our knowledge and understanding.

We believe the conference that this report summarises represents an important first step in an ongoing agenda to explore and optimise the use of population projections in policymaking.

Christian Mumenthaler
Head of Life&Health
Swiss Re

Part 1: Introduction

Forecasts of both life expectancy and *healthy* life expectancy (how long an individual lives in good health) shape strategic choices and decisions in many areas of public policy: state and public sector pensions; healthcare; social care; housing, and transport. In the private sector, understanding future life expectancy trends is also essential for companies with pension liabilities and for the private insurance industry.

Multiple areas of academic and professional research have contributed to policymakers' understanding of (healthy) life expectancy. Two academic disciplines in particular have emerged as important sources of projections: *epidemiology* . the study of factors affecting the health and illness of populations; and, *demography* . the statistical study of the characteristics of populations. Actuarial science has also traditionally been a key source of projections on *mortality* and *morbidity*.

For policymakers and other stakeholders, the imperative is clear: to use the best possible projections of (healthy) life expectancy in making decisions. Many billions of pounds rest on the outcomes of such decisions and the accuracy of the projections used. Academic research findings from disciplines such as epidemiology have permeated the policymaking process in relation to defined policy interventions, such as spending on preventative health.

However, there is a clear need to constantly monitor and review the whole production of population projections for use in public policy, particularly in light of advances in different fields of research that are occurring as methodologies are refined and new data is acquired for use in making forecasts. These issues are also clearly of significance where the risks associated with ageing are transferred into the private sector.

However, while the imperative is clear, the path forward is not. Different academic disciplines concerned with mortality have evolved separately, deploy different methodologies and utilise different data. In particular, different definitions and measures of *healthy* life expectancy abound and such differences impact upon the use of projections in policymaking. As a result, the findings of research on mortality and healthy life expectancy cannot easily be integrated, and in fact, disagreements about projections of life expectancy are widespread. Such disagreements have also shaped the institutional arrangements that govern the production of mortality projections for public policy.

One way to resolve these dilemmas that has been proposed is the creation of an independent statutory body, at arms-length from government, which would review the projections produced from different fields of academic inquiry, make sense of scientific disagreements and uncertainties, and advise policymakers on future mortality.

Such a standing commission on mortality is perceived to have other benefits. For example, an independent public body specifically charged with making public pronouncements on mortality could also seek to address the widespread tendency for individuals to underestimate their own life expectancy, and by association, their retirement income needs. Difficult policy decisions dependent on scientific projections of (healthy) life expectancy could also be given more credibility and public acceptability if handled by a statutory body independent from government, such as the fixing of the state pension age. An independent commission could also provide a useful bridging function between the producers and users of mortality projections . both public and private sector alike.

Nevertheless, questions exist as to the functioning of such an independent public body. What exactly would the outputs of such an organisation be? What governance arrangements would be deployed? How would judgements be made as to the relative merits and reliability of different projections? How would scientific disagreements be settled? How can diverse methodologies be comparatively evaluated? The weight of these questions leads some to

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believe that the task of forging consensus on population projections should be left to the academic and professional communities through open, scientific debate.

While many observers believe there is scope to review and improve the production of population projections for public policy and for risk transfer into the private sector, the best approach is therefore far from clear.

To explore these and related questions, the ILC-UK and the Actuarial Profession held a conference in London during October 2008 that brought together academics, policymakers and other stakeholders. The conference was made possible by the generous support of Swiss Re.

This report provides a summary of this conference. It draws upon the presentations by speakers at the conference and contributions from members of the audience.

Part 2: The State of Knowledge on Mortality and Healthy Life Expectancy

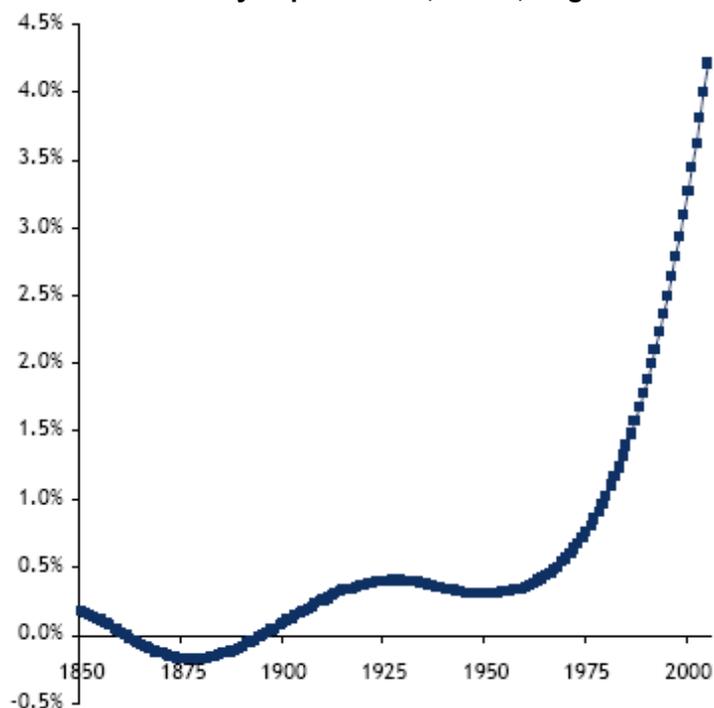
This chapter explores the state of knowledge on mortality and healthy life expectancy, drawing on presentations given by speakers. The chapter explores the questions:

- What does the latest research tell us about the future of life expectancy?
- What are the forces shaping trends in life expectancy?
- Are there significant disagreements or uncertainties about future trends?
- How will the frontier of our knowledge and understanding of life expectancy change in coming decades?

What does the latest research tell us about the future of life expectancy?

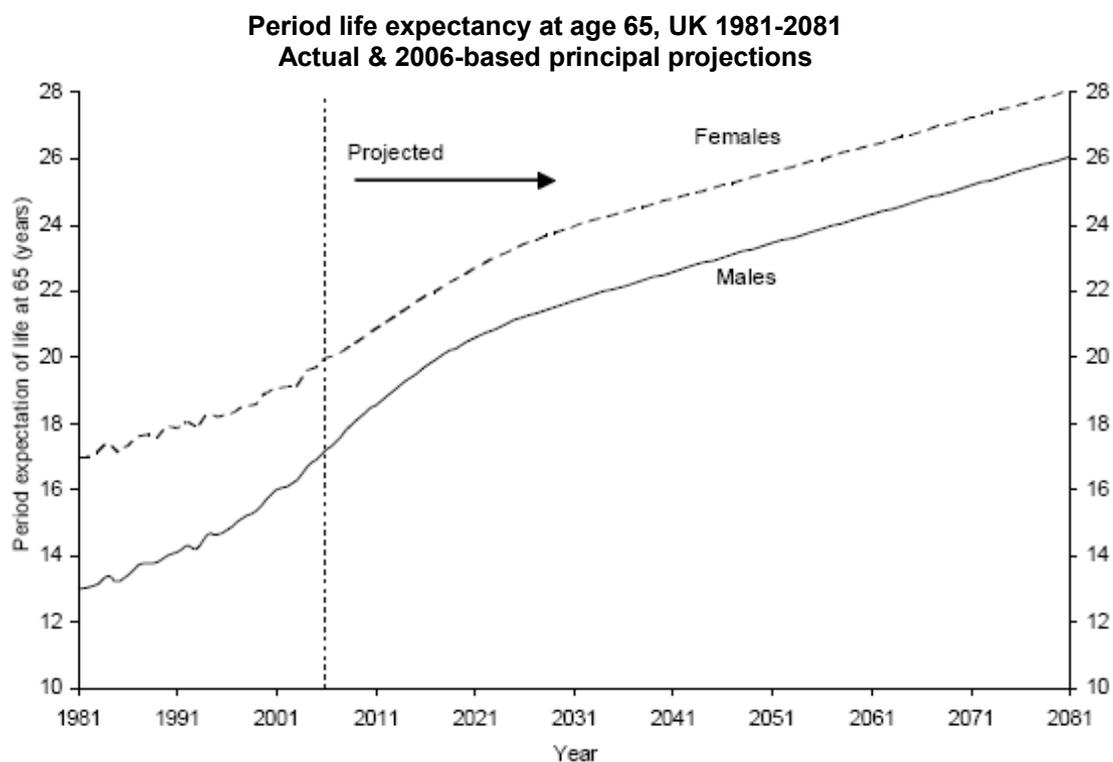
Life expectancy is increasing. In historical terms, this trend is relatively recent, as can be seen from actuarial analysis of historical rates of *improvement* in mortality:

Smoothed annual rate of mortality improvement, males, England & Wales, aged 70-79



(Source: Willets R: 2008)

Looking forward, projections of future changes in life expectancy drawn from demographic analysis indicate a continued increase in life expectancy:



(Source: Shaw C: 2008)

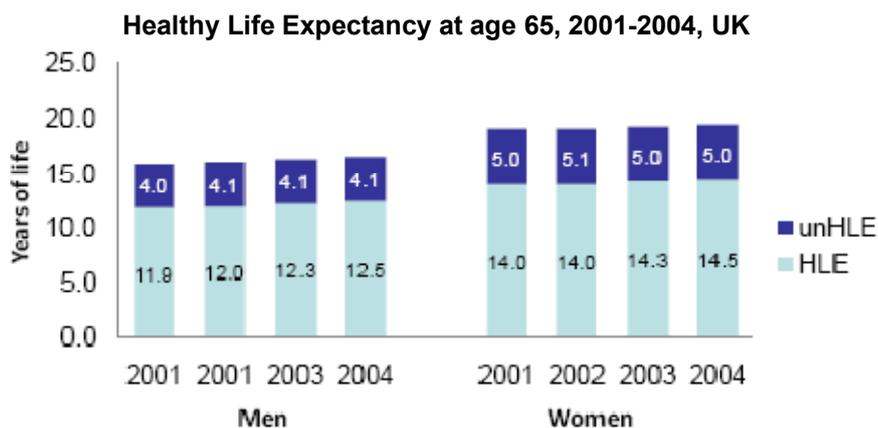
In contrast to life expectancy, multiple definitions of healthy life expectancy exist. Several definitions of healthy life expectancy can be identified, and importantly, different measures of health may exhibit different trends.

The most common definitions of healthy life expectancy include:

- Healthy Life Expectancy (self-rated health) (HLE)
- Disability free Life Expectancy (DFLE), measured according to:
 - Incidence of limiting longstanding illness
 - Capacity to carry out Instrumental Activities of Daily Living (IADL) or Activities of Daily Living (ADL)
- Dementia free Life Expectancy (DFLE DemFLE)

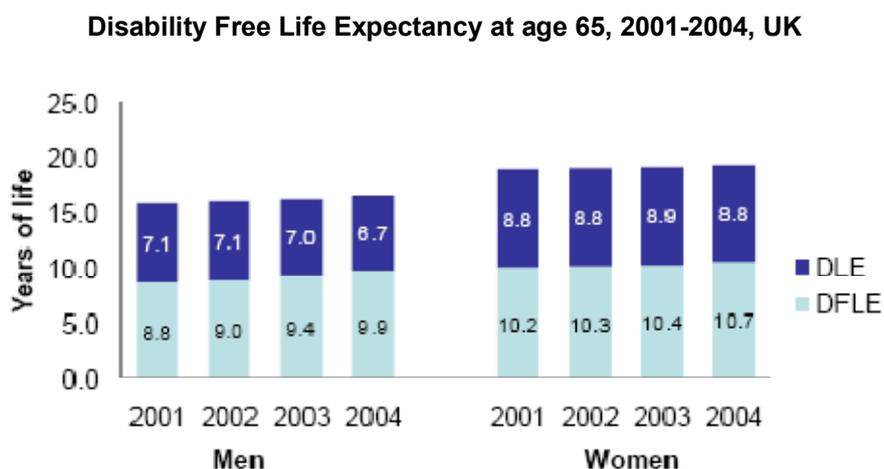
(Source: Jagger C: 2008)

Like life expectancy, projected healthy life expectancy at 65 is increasing for both men and women:



HLE based on good or fairly good self-rated health, Source: ONS
(Source: Jagger C: 2008)

Projected disability free life expectancy is also increasing for men and women. However, although the period of life spent experiencing disability is projected to decrease for men, it remains largely unchanged for women:



Disability free life expectancy based on free from long-term limited illness, Source: ONS
(Source: Jagger C: 2008)

What are the forces shaping trends in life expectancy?

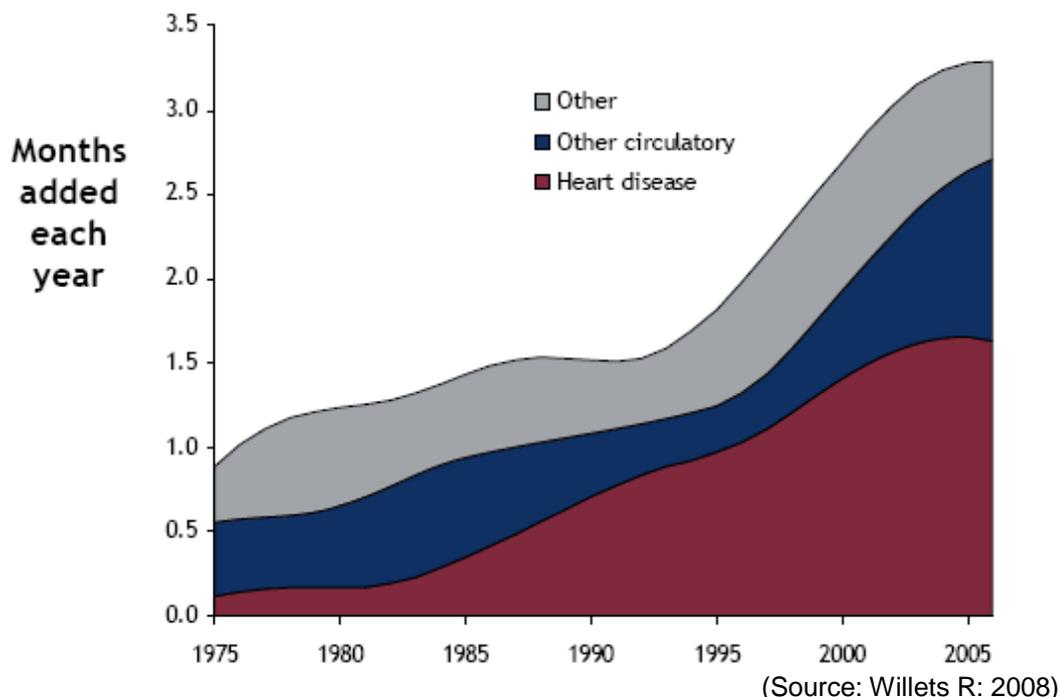
Multiple factors are driving changes in life expectancy and healthy life expectancy. A list of factors that influencing healthy life expectancy would include:

- Diseases
- Socio-demographics
- Education
 - For example, years of disability-free life expectancy varies by years of education.
- Ethnicity
- Lifestyle
- Obesity
 - Research has found that obesity has an impact on disability free life expectancy.
- Smoking
- Exercise

(Source: Jagger C: 2008)

In particular, advances in combating specific diseases have had a significant effect on life expectancy, as the following actuarial analysis shows:

Life expectancy gains split by cause
Gain in life expectancy (at age 65) p.a., males, England & Wales population



Are there significant disagreements or uncertainties about future trends?

Significant differences exist in projections of life expectancy and healthy life expectancy. These exist as a result of differences in scientific disciplines, for example, epidemiology, demography and actuarial science.

Such differences are manifest, for example, in modelling approaches:

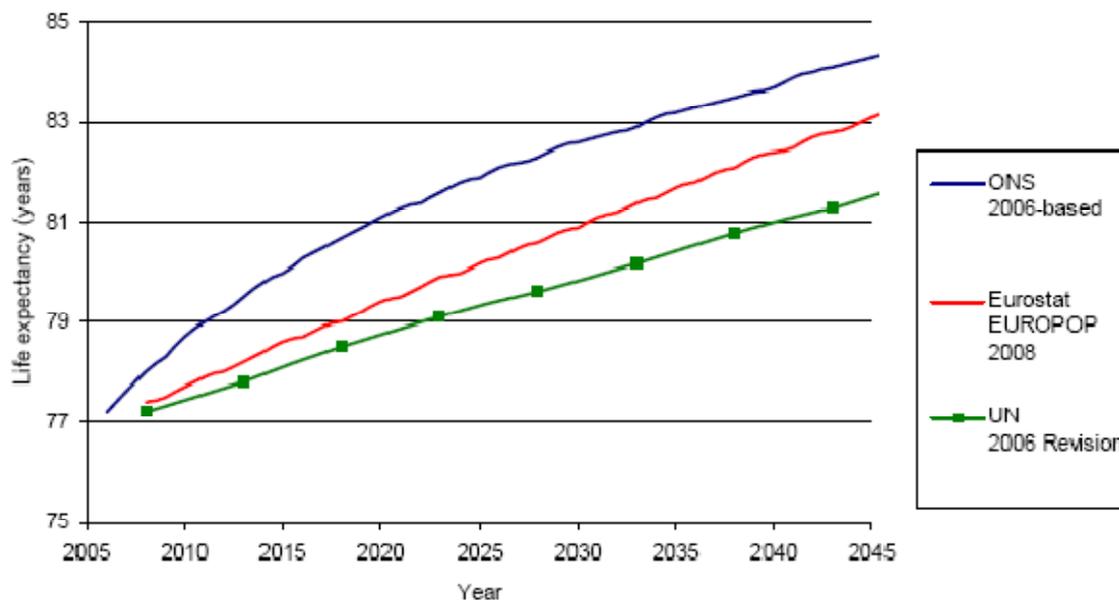
- Use of output from a statistical model fitted to population data
- Use of a model in which current rates of improvement tend towards long-term assumptions
- Use of a scenario-driven approach utilising data on underlying causes or risk factors

As a result of such different approaches, and variations in views on the forces shaping mortality change and the implications for likely future improvements, a best-estimate rate of improvement for males aged 75 in 2030 varies from 1.0% to 3.0% p.a. (Source: Willets R: 2008).

Policymakers can therefore find themselves presented with contradictory projections produced by major institutions, as shown by the following chart:

UK male period life expectancy at birth
Latest ONS, Eurostat & UN assumptions

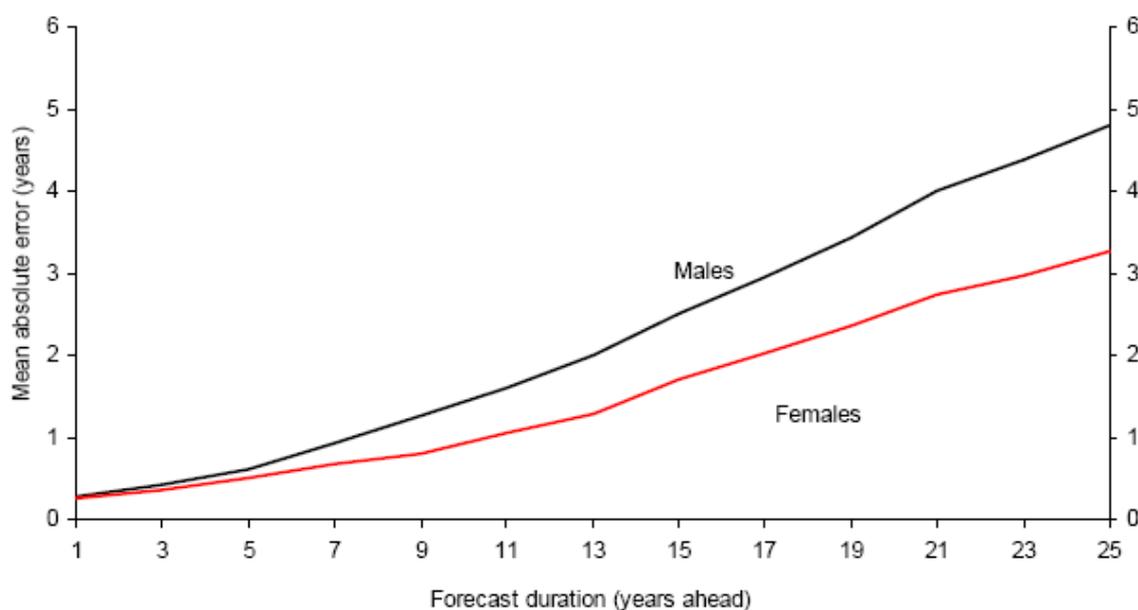
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(Source: Shaw C: 2008)

Indeed, significant disagreements or uncertainties about future trends are a consistent feature of projections, as is error in projections. The inevitable existence of error in projections is shown by the following chart, which shows historical projection error:

Mean absolute error: period life expectancy at birth, 1971-based to 2004-based projections



(Source: Shaw C: 2008)

The inevitability of disagreement over projections and error contained in them suggests a need to estimate future probability distribution. Three approaches for doing this can be identified:

- Analysis of accuracy of past projections
- Expert opinion
- Time series analysis

(Source: Shaw C: 2008)

However, ultimately no right answer is possible, and some subjective judgment will always be involved.

How will the frontier of our knowledge and understanding of life expectancy change in coming decades?

Various factors could be expected to accelerate and decelerate improvements in life expectancy. For example, further acceleration may result from medical advances, further reductions in key risk factors, such as smoking and blood pressure, and an increasing focus on healthy diets. Conversely, deceleration may emerge as the effect of big falls in deaths from circulatory causes recedes, levels of obesity and type II diabetes continue to increase, as well as the potential impact of excess alcohol consumption, increasing drug use and stress (Source: Willets R: 2008).

The ONS has sought to explore the views of experts on life expectancy as to what factors will impact life expectancy in future years. A questionnaire was given to the ONS Expert Advisory Panel in 2007, to identify which factors were considered to be valid by the majority of the panel and considered to have the potential to impact on future levels of life expectancy. This survey found a belief that factors that could have an *upwards* impact on life expectancy include:

- Greater understanding of bio-medical ageing processes leading to the development of effective anti-ageing strategies.
- Breakthroughs in the understanding of carcinogenic processes leading to reduced mortality from cancer.
- Medical advances leading to previously life-threatening diseases becoming containable.
- Progress in preventive medicine.
- Better information about health.
- A continued decrease in smoking prevalence.
- Increasing mental and social activities at old age.
- Effective and easily affordable new technologies.

Factors that could *diminish or reverse* increases in life expectancy include:

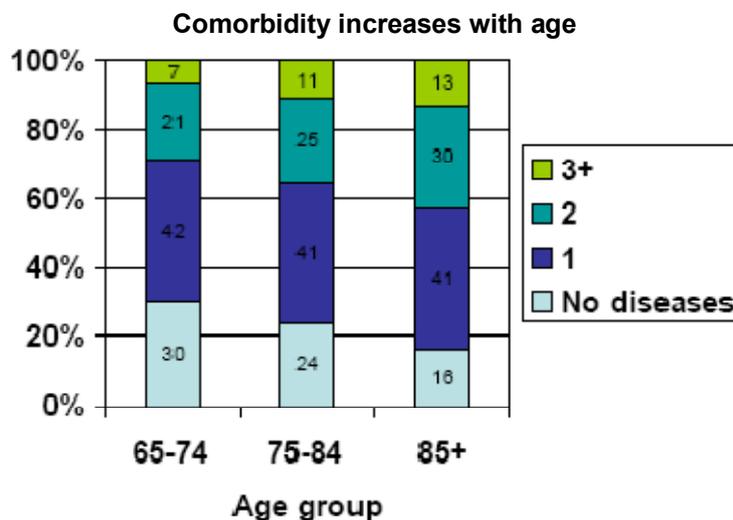
- Increasing drug resistance to known infectious diseases.
- Negative impact on health of increased stress levels.
- Majority of immigration will be from countries with higher mortality than UK.

(Source: Shaw C: 2008)

As these factors suggest, various scenarios regarding the future of life expectancy and healthy life expectancy could be imagined. In particular, various scenarios could be imagined in relation to changes in *healthy* life expectancy:

- Improving population health:
 - Decline in risk factors, particularly smoking and obesity
 - New treatments or technologies emerge to reduce the disabling effects of arthritis, dementia, stroke and CHD and make further gains in survival
- Poorer population health:
 - Obesity trends of 2% increase annually continue increasing prevalence of arthritis, stroke and CHD.
 - Treatments continue to focus on reducing the mortality from diseases rather than reducing the disabling effects.

For the frontier of knowledge and understanding of healthy life expectancy to advance, evidence is particularly required in certain key areas, such as data on ethnic minorities, as well as panel data for trends in transitions to consider the whole disablement process associated with any particular disease. More generally, going forward it will be important to recognise that single disease models will be less useful as the age of death (and co-morbidity) increases, and treatments and risk factors may act on more than one disease.



7 diseases: arthritis, stroke, CHD, CAO, PVD, cognitive impairment, diabetes
(Source: Jagger C: 2008)

Key Points:

- Significant increases in rates of mortality improvement are relatively recent in historical terms.
- Multiple definitions of healthy life expectancy exist.
- Many factors influence healthy life expectancy, e.g. obesity, smoking and lifestyle.
- Differences in projections of mortality and healthy life expectancy exist across different research disciplines and institutions, and are reflected in the projections available for use by policymakers.
- Different future scenarios are possible, including improving and worsening trends in mortality and healthy life expectancy.

Part 3: From Projections to Policy and Decision Making

The previous chapter explored the state of current knowledge on (healthy) life expectancy, the variations in projections that exist across different institutions and disciplines, and highlighted some of the factors that explain both these trends and the existence of different opinions.

For any given area of public policy, decision-makers can seek out the best available evidence to inform decisions. However, ultimately, all policymaking takes place against a backdrop of uncertainty. To cope with such uncertainty, policymakers can ask several questions:

- Is there an evidence base for the decision?
- How reliable is the evidence?
- Does the evidence give an adequate pointer over the period covered by the decision?
- How much controversy/disagreement is there about the available evidence?
- Can a decision be taken without reference to the evidence base?

(Goldblatt P: 2008)

A key interest of the *Choosing Population Projections for Public Policy* conference was how policymakers cope with uncertainties when using population projections, which are required in fields as varied as healthcare, pensions, housing and transport.

For policymakers making decisions involving population projections, multiple sources of uncertainty are present, including healthy life expectancy. These uncertainties include:

- Migration uncertainties
 - Predicting future net migration flows is especially difficult as many factors are impacting on the decisions of potential future migrants.
 - Increased population individual mobility and population turnover mean that past trends may not be a good guide to the future.
 - The extent to which assumptions have varied in the past highlights the uncertainty that exists when attempting to model future trends.
- Natural change uncertainties
 - Fertility - changing attitudes to family size, delayed entry into marriage or cohabitation, and increased female participation in education and the labour market.
 - Life expectancy . disagreement over limits to improvements, effects of lifestyle changes in the developed world, technology change
- Household uncertainties
 - Household numbers - influenced by changes in family formation, and an ageing population.
 - The structure of households and their behaviour - affect the role of Government in the future and the public finances in the long term.

(Goldblatt P: 2008)

How should policymakers using population projections cope with such uncertainty? Various analytical techniques are available to policymakers when making decisions for addressing uncertainties inherent in the use of population projections. These include:

- Quality measures
- Stochastic modeling
- Indicators of the impact of change

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- Comparison of alternative data sources
- Comparing top-down and bottom-up approaches
- Developing indicators of the impact of change
- International comparisons.

(Goldblatt P: 2008)

However, no approach is perfect, and each of these strategies raises secondary questions. For example, the use of international comparisons in dealing with uncertainty around population projections creates questions around:

- Which countries should be used for comparison?
- How applicable is the use of another country?
- Are there political sensitivities around the use of certain countries for comparison?

Ultimately, policymakers must choose how much uncertainty to incorporate into decision-making, and how this uncertainty should be incorporated. For example, policymakers can choose whether to use a best-estimate central projection or take a more prudent approach by generating variants around a central projection.

In many cases, policymakers may wish to adopt a more prudent, more conservative, approach by using a range of possible projections, or the development of possible scenarios against which to evaluate the impact of policy decisions.

However, once again, measures to deal with uncertainty in decision-making using population projections raise further questions. The use of scenarios by policymakers for the purpose of making decisions raises questions around:

- How many scenarios to test?
- What variables/assumptions should be adjusted (sensitivity analysis)?
- What are the different possible values to take in each case?
- Is there correlation between different factors?

(Adapted from Lunnon M: 2008)

These questions show that uncertainty is inescapable when policymakers use population projections. Although different strategies can be used to navigate this uncertainty, choices must be made about how to deploy these approaches, which in turn impact upon the nature of the projections used.

However, while it is useful to analyse the different approaches for incorporating uncertainty inherent in population projections into policy-making, it is important to recognize that in most cases, the use of population projections evolves and changes over time, and is shaped by inherited institutional factors. A good example of the use of population projections in practical policymaking is resource allocation to local authorities in the UK:

- Over £100bn per year are distributed to local areas on a population capitation basis using formulae that include projected population distributions by age.
- These age-cost weightings in these formulae are generally substantial.
- Currently no variant projections are produced, although there is substantial disagreement about the accuracy of the projections.
- A Treasury Sub-Committee inquiry into Counting the Population found that mid-year population estimates are not fit for purpose as they fail to properly account for internal migration: the current methods of estimating internal migration lead to decisions on the allocation of funding to Local Authorities being based on inadequate information.
- In particular, local population figures are highly sensitive to the methods used in calculations: successive routine rebasing of projections and revisions to

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the population estimates and migration and fertility assumptions can have a substantial impact on local projections over a public spending period.

(Adapted from Goldblatt P: 2008)

This example shows that although policymakers may seek to make the best possible use of population projections in decision-making, the institutional and time constraints that shape decision-making also shape the use of population projections by policymakers. Alert to the need to address such issues, policymakers in the UK are working with researchers and experts, such as the ESRC Centre for Population Change.

Key Points:

- Healthy life expectancy is one uncertainty that policymakers must take account of in using population projections, as well as factors such as migration and trends in household composition.
- Various strategies can be deployed to communicate uncertainty to decision-makers using population projections.
- However, using different strategies to cope with uncertainty raises in turn further choices. For example, the use of scenario generation for more prudent decision-making involves choices of what factors to vary to generate scenarios and how much they should be adjusted.
- Thus, despite the various approaches for addressing uncertainty in population projections and communicating uncertainty to policymakers, uncertainty is inescapable.

Part 4: A Standing Commission on Mortality and Healthy Life Expectancy

There has long been interest among academics and policymakers in the idea of an independent statutory commission responsible for the production and dissemination of population projections that would inform the policymaking process at a national and local level.

Delegates at the *Choosing Population Projections for Public Policy* conference explored what the possible remit for a standing commission on mortality could be, and the arguments for and against such a body.

The Role of a Standing Commission on Mortality

An independent statutory body, at arms-length from government, could undertake a number of functions:

- Review and collate projections of life expectancy produced from different fields of academic inquiry.

A standing commission on mortality could act as an information clearing-house for projections of mortality and healthy life expectancy, so that all stakeholders had access to projections in a standardised and accessible format.

- Attempt to make sense of scientific disagreements and uncertainties involved in the projection of life expectancy to improve the quality of projections.

Disagreements exist in projections of mortality and healthy life expectancy. A multi-disciplinary body of experts employed by a standing commission could catalogue and identify differences between projections, attempt to make sense of disagreements, and therefore help all researchers improve their projections.

- Advise national and local policymakers on mortality projections, for example, by ensuring that data was accessible, available and appropriate.

A standing commission could produce its own projections of life expectancy for use by policymakers, including a best-estimate and range of possible prudent scenarios. These projections could vary by geography and time horizon to better facilitate policymaking at different levels of governance.

The Advantages of a Standing Commission on Mortality

- De-politicise difficult policy decisions that elected officials may struggle to make such as the fixing of the State Pension Age.

A number of important policy choices – most notably, the State Pension Age – respond to changes in projections of mortality and healthy life expectancy. Where politicians have to use such projections to make difficult policy choices, such as raising the State Pension Age, public distrust of politicians is likely to create resistance to change. A standing commission could help to de-politicise such difficult policy choices by providing an independent neutral voice in public discourse that would disseminate projections in mortality and healthy life expectancy and help to prepare public opinion. In addition, where politicians are resistant to making appropriate policy choices, because of shorter-term time

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horizons, an independent voice on population projections could provide extra pressure on politicians to make appropriate choices.

- Address the widespread tendency for individuals to underestimate their own life expectancy by making public pronouncements on trends in life expectancy.

It is generally acknowledged that individuals routinely underestimate their life expectancy, and this contributes to a lack of preparedness for retirement, particularly in terms of pension saving. A standing commission for mortality could seek to improve public knowledge of trends in life expectancy, and thereby promote better preparation for retirement.

- Provide a useful bridging function between the producers and users of mortality projections . both public and private sector alike.

A standing commission could improve the interaction between the users and producers of projections for mortality and healthy life expectancy, providing a context in which producers could better understand the needs of users, and users can better understand the limitations of projections and barriers to their development.

Challenges for a Standing Commission on Mortality

- Inevitability of uncertainty in population projections

Uncertainty in projections of mortality and healthy life expectancy is inevitable. However, the necessary element of uncertainty in projections is at odds with the role of a standing commission to provide a single authoritative voice on trends in mortality and healthy life expectancy, and may encourage stakeholders to neglect the uncertainty inherent in projections.

- Achieving public credibility and independence from government

Although an independent statutory commission on mortality could exist at arm's length from Government, such a legal position would not guarantee public perceptions of independence. Clear lines of accountability would need to be established.

- Lack of power in relation to government

Although a standing commission could help to inform public attitudes and policymaking with the best available data on population projections, a commission could nevertheless be ignored by any government that did not wish to make difficult policy choices, and may in fact be attacked by governments who did not wish to acknowledge trends in mortality and healthy life expectancy.

- Capacity and human capital

The fields of research into mortality and healthy life expectancy are specialised, and as such, recruitment of necessary and appropriate skills to a standing commission on mortality could be difficult, and threaten the capacity of such an organisation to meet its remit.

- Overlapping existing functions of other bodies

A standing commission may risk overlapping or duplicating some of the functions of other bodies, in particular the UK Statistics Authority and the Pensions Regulator.

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- Limits to regulating usage of population projections

Although improved population projections released in forms better suited to users could be expected to improve the use of such projections in policymaking, it would be beyond the scope of a standing commission to monitor and regulate the usage of all such projections. In short, a standing commission could not guarantee improved outcomes in policymaking, but rather, could only improve the quality of inputs into the policymaking process.



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