The National Population Projections Expert Advisory Group: results from a questionnaire about future trends in fertility, mortality and migration

Chris Shaw
Office for National Statistics

This article discusses the results of a questionnaire completed by the National Population Projections Expert Advisory Group in spring 2007. As well as asking for the experts' opinions on the most likely future levels of key fertility, mortality and migration indicators, views were collected about a wide range of factors that may have an influence on key demographic variables over the next 25 years.

Introduction

The National Population Projections (NPP) Expert Advisory Group was originally set up in 2005. Although there had always been strong informal contacts between the Government Actuary's Department (GAD) (who then had responsibility for the production of the official UK national population projections[1]) and the leading academic experts in the field, the aim of setting up the panel was to have a formal way of feeding expert views into the assumption setting process. So, at the beginning of 2005, GAD invited the British Society for Population Studies (BSPS) to nominate experts who could advise on the most appropriate headline assumptions to be adopted for the key projection variables of the total fertility rate (TFR), life expectancy at birth and annual net migration.

The NPP Expert Advisory Group has since provided advice for both the 2004-based[2] and 2006-based[3] national projections and is now established as an integral part of the assumption setting process. The membership of the panel on both occasions has been:

- Professor David Coleman (University of Oxford)
- **John Hollis (Greater London Authority)**
- **Professor Mike Murphy (London School of Economics)**
- Professor Phil Rees (University of Leeds)
- Professor John Salt (University College London)
- Professor Robert Wright (University of Strathclyde)

The role of the panel is strictly advisory. The assumptions underlying the projections are based on an analysis of recent demographic trends. The views of the panel are taken into account in preparing proposals for headline assumptions which are then the subject of widespread consultation with the users of UK national projections. However, responsibility for the final decision on assumptions lies with the

| Figure 1 | NPP Expert Panel advice for 2006-based projections: most likely levels and 67 per cent confidence intervals for key demographic indicators in 2030 |
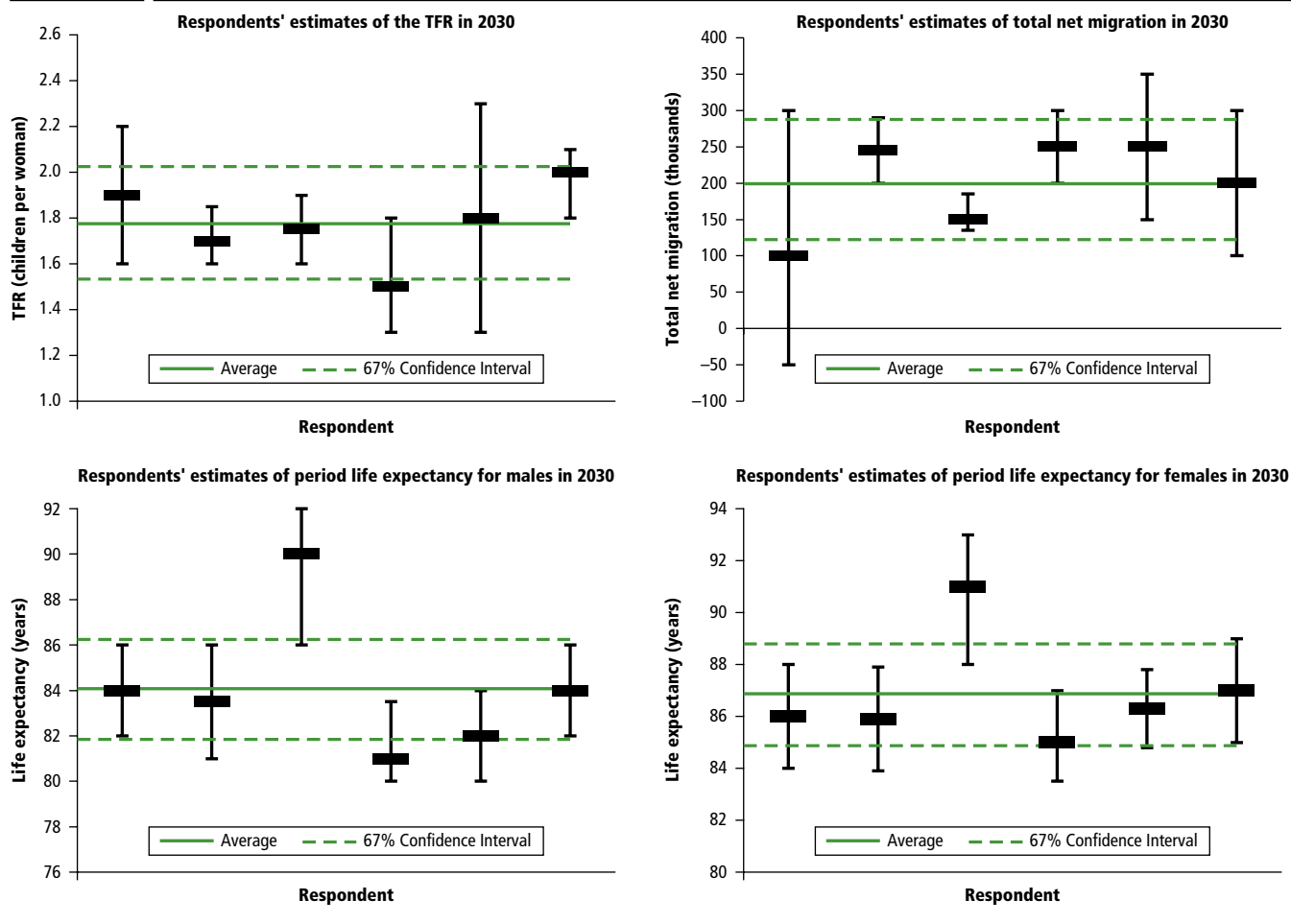
Office for National Statistics (ONS) in consultation with the devolved **administrations.**

The impact that the panel has had on NPP assumptions is a little hard to judge as, of course, we do not know what the assumptions would have been had the panel not been introduced. However, as shown below, the **headline assumptions from the latest (2006-based) national projections are closely in line with the average views from the expert panel.** Certainly, the unanimous view of the panel in 2005 that constant rates of mortality improvement should be assumed in the long-term[4] was an influential factor in the decision to abandon the assumption of a gradual long-term decline in improvement which had been adopted in earlier projections.

The expert panel views have also lent some support to the assumptions currently used for variant projections and provided a basis for developing probabilistic (stochastic) forecasts for the UK. These points are discussed further below. However, this article concentrates mainly on the results **of a detailed questionnaire completed by the panel in 2007 which provides a greater understanding of the factors that the experts believe to be important in determining how future demographic indicators will develop.**

Experts' views on future demographic levels

Experts' responses

In both 2005 and 2007, the expert panel was asked to give their estimates of the 'most likely level' of the TFR, male and female (period) life

expectancy at birth and annual net migration to the UK for the years 2010 and 2030. In 2007, the latest actual data available at the time related to 2005, so the experts' views effectively related to five and 25 years ahead. The 2007 responses for the year 2030, including the experts' estimates of 67 per cent confidence intervals, are shown in **Figure 1. The responses for the year 2010 and the responses provided by the experts in 2005 are available elsewhere**[2,3].

There is clearly a range of views among the experts, not only about the **most likely future levels of the various indicators but also regarding how much certainty they have about their estimates. The central estimates of** the TFR at 2030 ranged from 1.5 to 2.0, while central estimates of annual net migration to the UK ranged from +100,000 to +250,000. The width of the estimated two-thirds confidence intervals for the TFR varied from 0.25 to 1.0 child per woman, while those for annual net migration in 25 years time varied from 50,000 to 350,000. The expert with the largest estimated confidence interval for net migration was the only one whose **two-thirds interval included the possibility of there being a net migration** outflow at 2030. The estimates of uncertainty were more consistent for period life expectancy, although one expert was strikingly more **optimistic about mortality prospects than the rest.**

It is also worth noting that, individually, the experts did not always provide symmetrical confidence intervals around their best estimates. For example, one expert gave an estimated TFR of 2.0 with an associated two-thirds confidence interval of 1.8 to 2.1. However, for each indicator, **the averages of the estimated upper and lower bounds were roughly symmetrical around the average of their central estimates. This provides** some support for the normal practice in the official national projections

Table 1	Best estimates of key UK demographic indicators at 2030	
	ONS 2006-based principal assumption	NPP expert panel average
Total fertility rate	1.84	1.78
Male period life expectancy at birth (years)	82.6	82.9
Female period life expectancy at birth (years)	86.1	86.0
Annual net migration	+190,000	+199,000

Note: The expert panel averages for life expectancy exclude the responses from the extremely optimistic outlier of the group shown in Figure 1.

where the high and low variant assumptions for each component have tended to be broadly symmetrical around the principal assumption.

Comparison with principal assumptions from national projections

The experts' views were one of the factors taken into account in preparing the assumptions for the 2006-based national projections. The headline assumptions for the 2006-based projections are compared with the average of the NPP expert panel's responses in **Table 1**. Although the comparison is very close, there are qualifications to be made.

The expert panel averages for life expectancy exclude the responses from the extremely optimistic outlier of the group shown in Figure 1 (the experts were asked to assess their level of expertise in each component and the relevant expert gave himself a 'low' assessment for mortality). If his responses were included, this would raise the panel average by one year and the panel would then appear to be somewhat more optimistic than the national projection assumption.

Also for migration, the expert views were collected prior to the **announcement in 2007[5]** of improvements to the way in which ONS measures migration. These resulted in revisions to international migration estimates for recent years. Without these revisions the net migration assumption in the 2006-based projections would have been 20,000 lower. So, in reality, Table 1 underestimates the difference between the expert panel and the current national projection assumption.

Uncertainty at 2030

The experts' estimates of 67 per cent confidence intervals can also be compared with the intervals covered by the high and low variant assumptions in the national population projections. This serves two purposes. First it gives an indication of the probability range covered by the official variants, and second it provides a check on whether the official high and low variants are covering a similar range of uncertainty for each of the three components. The uncertainty ranges are compared in **Table 2**.

The cohort component method used in the UK (and almost universally) to produce population projections does not enable statements of

Table 2	Estimates of uncertainty in key demographic indicators at 2030	
	ONS 2006-based assumptions	NPP expert panel
	(High variant – Low variant)	(Average width of 67% confidence intervals)
Total fertility rate	0.40	0.50
Male period life expectancy at birth (years)	3.7	4.1
Female period life expectancy at birth (years)	2.4	3.7
Annual net migration	120,000	165,000

probability to be attached to them, or for confidence intervals to be ascribed to variants. Indeed, projection variants are not intended to simulate confidence intervals. For one thing, uncertainty clearly increases the further ahead we look. However, for fertility and migration, the **variant assumptions (as well as the principal projection) conventionally assume that the TFR and the level of annual net migration will remain** constant at a particular level in the long-term. Therefore, the difference between the high and low assumptions remains fixed after a certain **point and is likely to cover a progressively smaller range of uncertainty** through time. Rather, the official variants should be seen as providing a **sensitivity analysis for plausible changes in the underlying assumptions.**

Nevertheless, Table 2 suggests that, in the view of the expert panel, the range covered by the official ONS high and low variant assumptions (at the year 2030) is a little narrower than a 67 per cent confidence interval. However, as noted above, there were wide ranging views about **uncertainty amongst the panel members themselves.**

The relationship between the experts' confidence intervals and the NPP **variant range is broadly consistent across all components which gives** some support for believing that the official projection variants for each component cover broadly similar ranges of uncertainty. However, the **width of the variant range for female life expectancy at birth looks a little narrow in comparison to the other components.**

Stochastic forecasting

Internationally, growing attention is now being given to stochastic **projection methods which aim to give users information about the** expected accuracy of projections. Typically, stochastic forecasts use probability distributions for indicators of fertility, mortality and migration **which are derived from some combination of three approaches: (a) analysis of past projection errors; (b) expert opinion; and (c) time-series** analysis. ONS are now considering the use of such methods for the UK **national projections using the views on uncertainty collected from the expert panel.**

2007 Expert panel questionnaire

While the quantitative information discussed above provides vital input to the assumption setting process for projections, it does not tell us why **the experts hold the views that they do.**

To develop this insight, ONS asked the expert panel in 2007 to complete **a detailed questionnaire. The questionnaire was devised by Professor Wolfgang Lutz and colleagues from the International Institute for Applied Systems Analysis (IIASA) in Vienna as part of the MicMac project[6] which aims to combine macro and micro approaches to projection making. The questionnaire is still being developed and so this** UK application was effectively a pilot study.

The aim of the questionnaire is to assess the validity and importance of alternative arguments concerning future trends in fertility, mortality **and migration. It is structured around a set of major 'forces' shaping** future trends in fertility, mortality and migration. Within each force, the **experts were asked for their views about a number of 'arguments' which** could influence future trends. They were asked whether they thought the argument was correct or incorrect (that is, its validity) and, if the argument did prove to be correct, how much impact it would have on the key demographic variable (that is, its importance). A full list of the forces **and arguments is given in the Appendix.**

With the agreement of Professor Lutz, some amendments were made to the questionnaire to make it more applicable for use in the UK. For example, some additional forces and arguments which seemed relevant in the UK context were added and some others which did not were dropped.

However, changes were kept to a minimum so that the UK exercise could be meaningfully compared to any future applications in other countries.

ONS produced an Excel-based computer version of the questionnaire for this exercise which has also been supplied to, and used by, IIASA. This is available on request from ONS[7] or IIASA.

Fertility

The questionnaire considered six major forces shaping the course of future trends in fertility. These are shown in Table 3. The experts were asked to assess the relative importance of each of these factors in determining fertility trends over the next 25 years by giving them a proportional weighting out of 100. The panel average, and the minimum and maximum weightings given by the six individual panellists, are **shown in the table.**
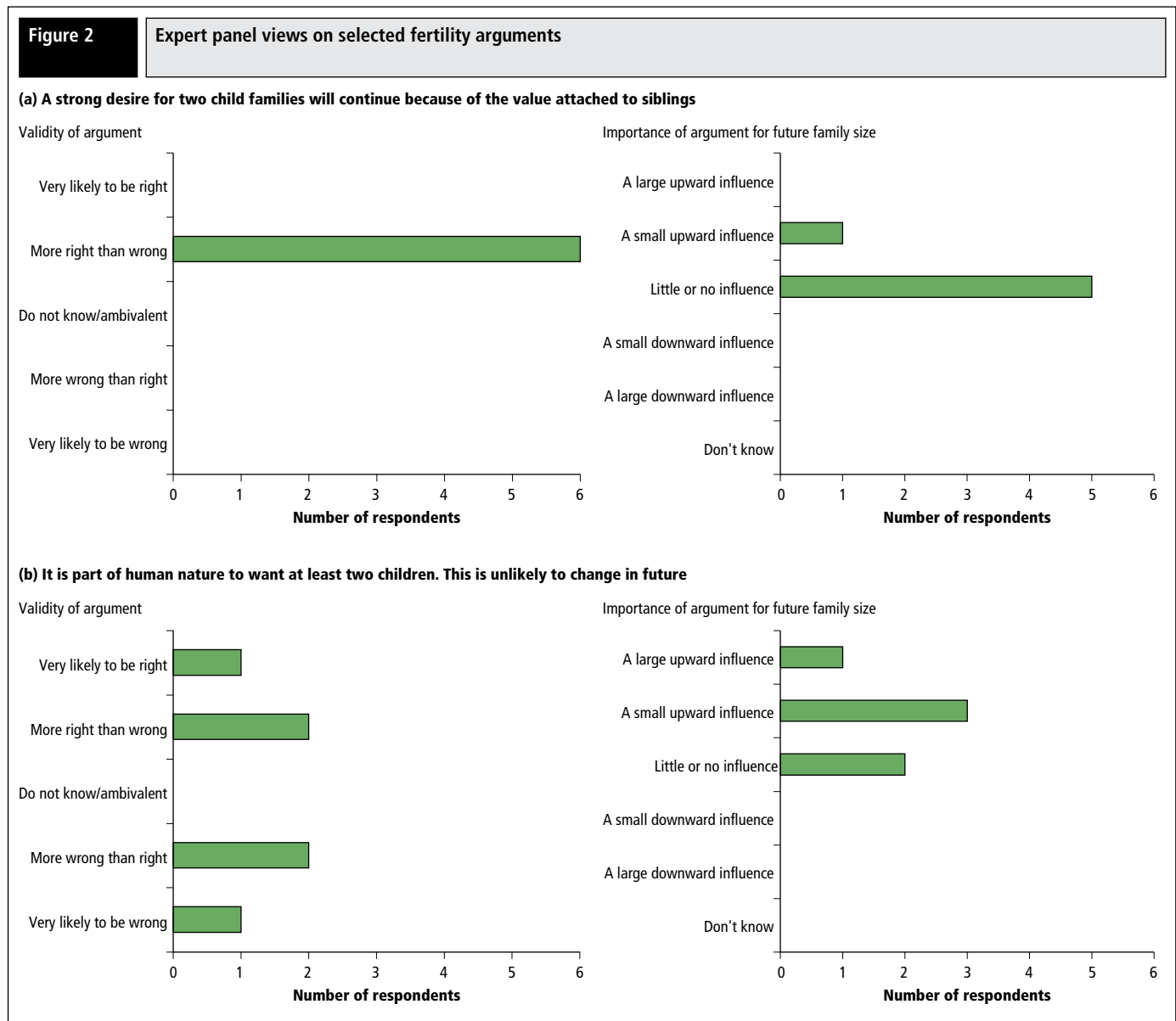
Although there were a range of views among the experts, overall, **'individuals' views on ideal family size' was seen as the most important force and 'bio-medical conditions' the least important.**

The experts' views on two of the arguments within the 'ideal family size' force are shown in Figure 2. Figure 2(a) shows that while there was

Table 3	Expert panel ranking of major forces shaping future fertility		
Force*	% weighting given to each force		
	Panel average	Min	Max
Ideal family size	23	5	60
Education & work	17	10	30
Macro level conditions	18	5	30
Stability of partnerships	18	10	25
Bio-medical conditions	9	5	15
Population composition	15	10	20
	100		

* These are abbreviated descriptions of each force. See Appendix for full description.

unanimous agreement amongst the experts that 'a strong desire for two child families will continue because of the value attached to siblings', they did not think this would have much upward or downward influence on family size. Of course, the experts did not always agree about the **validity of arguments as shown by the responses to the related argument in Figure 2(b).**

Figure 2	Expert panel views on selected fertility arguments

(a) A strong desire for two child families will continue because of the value attached to siblings

(b) It is part of human nature to want at least two children. This is unlikely to change in future

Key influences on fertility

The arguments which were considered to be valid by the majority of the panel and which were also thought to have the potential to impact on future levels of fertility are listed below.

Factors that could have an u   ar   impact on fertility:

- Increasing social acceptability of having children at older ages
- Government being likely to improve financial support for children through child subsidies and tax benefits
- Increases in union dissolution and re-formation leading to additional children in new partnerships
- Medically assisted conceptions solving more fecundity problems in future

Factors that could have a   o   n   ar   impact on fertility:

- Family formation being postponed due to increased time spent in education
- Fewer grandmothers available to help with childcare (due to increased female labour force participation and increasing retirement age)
- Women delaying trying to conceive to older ages where there is a higher risk of not getting pregnant
- Decreasing proportion of unplanned births due to improvements in contraception
- Convergence in fertility rates for women from ethnic minorities resident in the UK with fertility rates for white British women

Mortality

As with fertility, the questionnaire considered six major forces shaping the course of future trends in mortality. The relative weighting given to these forces by the expert panel is shown in Table 4. Although there was again a range of views, 'bio-medical technology' and 'behavioural changes' were identified as the most important of these individual forces.

In the case of mortality, the responses of the UK panel can be compared with those from a group of 18 world experts convened for the MicMac project[6] to discuss assumptions for future mortality trends in Europe. This group of experts (which did not include any member of the NPP expert panel) completed the mortality part of the questionnaire, but in the context of the European Union as a whole[8]. As shown by Table 5, the ranking of forces by the two expert groups was very similar.

Figure 3 shows the responses to two of the arguments given to the NPP expert panel, one from each of the two forces which they ranked highest. The panel unanimously agreed that 'increased understanding of bio-medical ageing processes will allow us to develop effective anti-

Table 4	Expert panel ranking of major forces shaping future mortality

Force*	% weighting given to each force		
	Panel average	Min	Max
Bio-medical technology	28	15	50
Health care systems	17	10	30
Behavioural changes	28	10	53
New/resurgent diseases	9	5	15
Environmental changes	8	5	15
Population composition	9	0	20
	100		

*   These are abbreviated descriptions of each force. See Appendix for full description.

Table 5	NPP & IIASA expert panels' ranking of major forces shaping future mortality

Force*	% weighting given to each force	
	NPP panel (considering UK)	IIASA panel (considering EU)
Bio-medical technology	28	25
Health care systems	17	24
Behavioural changes	28	25
New/resurgent diseases	9	7
Environmental changes	8	8
Population composition	9	11
	100	100

*   These are abbreviated descriptions of each force. See Appendix for full description.

ageing strategies' and that this would have an upward influence on life expectancy. Indeed half the panel thought this would have a large impact. This was an unusually strong result. The experts were rarely unanimous and generally tended to think impacts would be small rather than large. Among the 'behavioural changes' arguments, the one the experts agreed with most strongly was that smoking prevalence would continue to decline. However, they were unanimous in thinking that this would only have a small upward influence on life expectancy.

It is interesting to note that the 'environmental changes' force and its component arguments were ranked amongst the least influential factors in the entire questionnaire. Table 5 shows that the force was ranked as low by both the NPP and IIASA panels and none of the seven arguments included within this force were considered likely to have a significant impact on life expectancy by the NPP panel. In particular, five out of six experts thought the arguments about increased frequency of natural disasters, global warming and less extreme winter cold spells (see L5.1, L5.2 and L5.4 in the Appendix) would have little or no influence on life expectancy, even if the arguments proved to be correct.

Key influences on mortality

The arguments which were considered to be valid by the majority of the panel and which were also thought to have the potential to impact on future levels of life expectancy are listed below. The clear balance in favour of arguments which would have an upward impact on life expectancy reflected the panellists' generally optimistic views about future mortality. Five out of six thought life expectancy would increase at least as fast over the next 25 years as it has over the last.

Factors that could have an u   ar   impact on life expectancy:

- 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 dissemination of information about health
- A continued decrease in smoking prevalence
- Increasing mental stimulation and social activities at older ages
- Effective and easily affordable new technologies

Factors that could   iminis   or reverse increases in life expectancy:

- 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

Figure 3	Expert Panel views on selected mortality arguments

(a) Increased understanding of bio-medical ageing processes will allow us to develop effective anti-ageing strategies
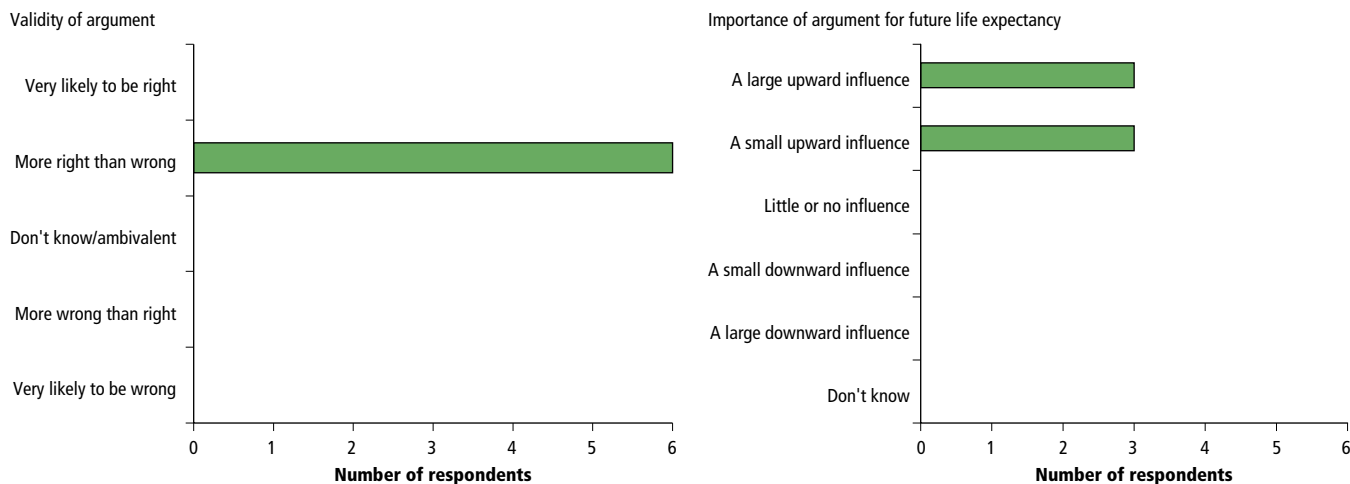
(b) Smoking prevalence will continue to decline
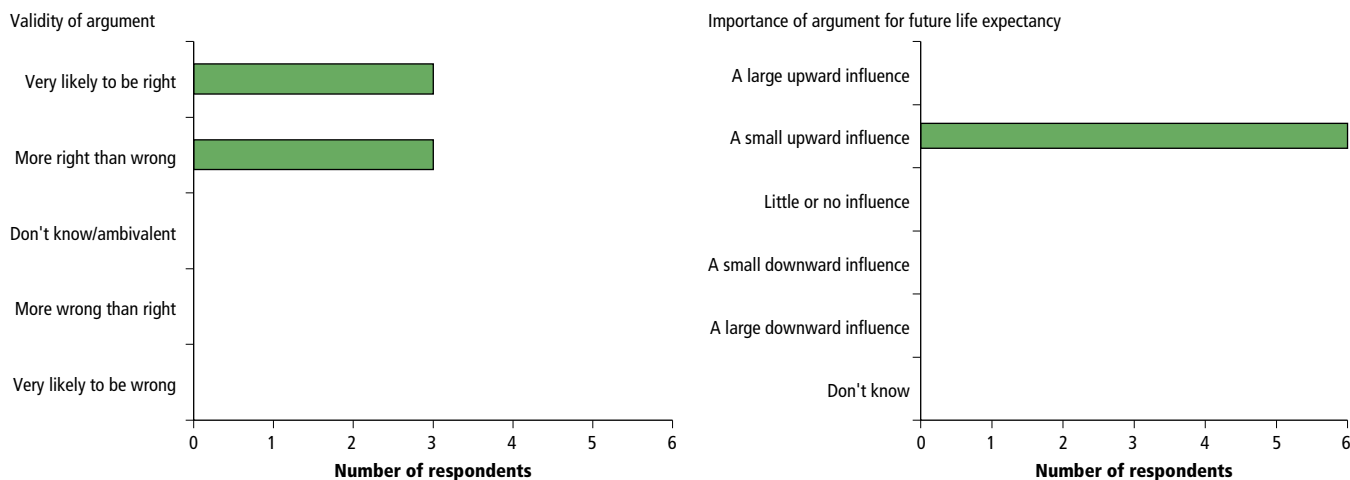
It should be noted that the questionnaire did not include a question on the impact of obesity on life expectancy.

Migration

The questionnaire considered five major forces shaping the course of future trends in migration. The relative weighting given to these forces by the expert panel is shown in **Table 6**. The 'attractiveness of the UK' was ranked as the most important of these forces.

Table 6	Expert panel ranking of major forces shaping future migration

Force*	% weighting given to each force		
	Panel average	Min	Max
Motives for migration (work, family formation, study)	18	10	25
Changes in country of origin	20	10	30
Attractiveness of UK	30	10	50
Costs of migration	8	5	15
Barriers against migration	23	10	50
	100		

* These are abbreviated descriptions of each force. See Appendix for full description.

Figure 4 a shows the responses to the argument that 'there will be an increase in the total number of people wishing to migrate to and from the UK for work related reasons'. There was general agreement with this argument (although one expert strongly differed) and this was another of the factors that was thought to have the greatest potential for a large impact if the argument were to prove to be correct. Although the argument referred to people moving 'to and from' the UK, the experts were united in thinking this would be an upward influence on net migration[9]. The overall view was that there would also be increases in migration to and from the UK for family formation/reunification reasons, for education and study, and at the time of retirement, although it was thought these would have smaller impacts on net migration numbers than work-related moves.
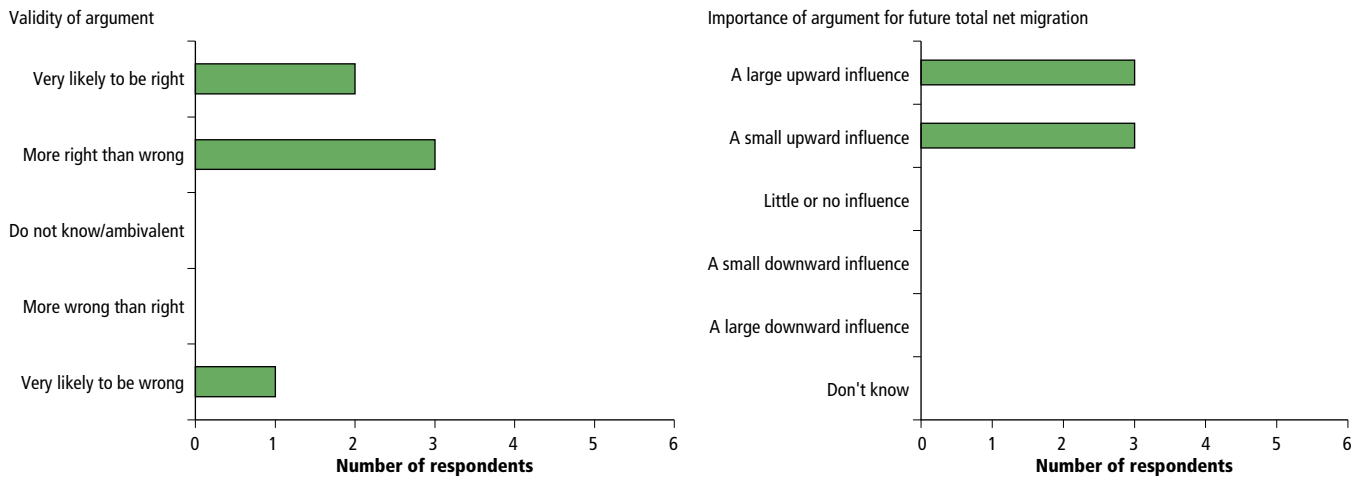
Figure 4 b shows the experts' views on one of the key issues in the current migration debate that 'population ageing in the UK will result in a shortage of young labour, which will increase the demand for immigrants'. This is clearly a closely related argument to Figure 4(a) and the responses were, not surprisingly, similar. There was general agreement, although again one expert (the same as in Fig 4(a)) disagreed.

Key influences on migration

The arguments which were considered to be valid by the majority of the panel and which were also thought to have the potential to impact on future levels of net migration are listed below.

Figure 4	Expert panel views on selected migration arguments

(a) There will be an increase in the total number of people wishing to migrate to and from the United Kingdom for work related reasons

(b) Population ageing in the UK will result in a shortage of young labour which will increase the demand for immigrants
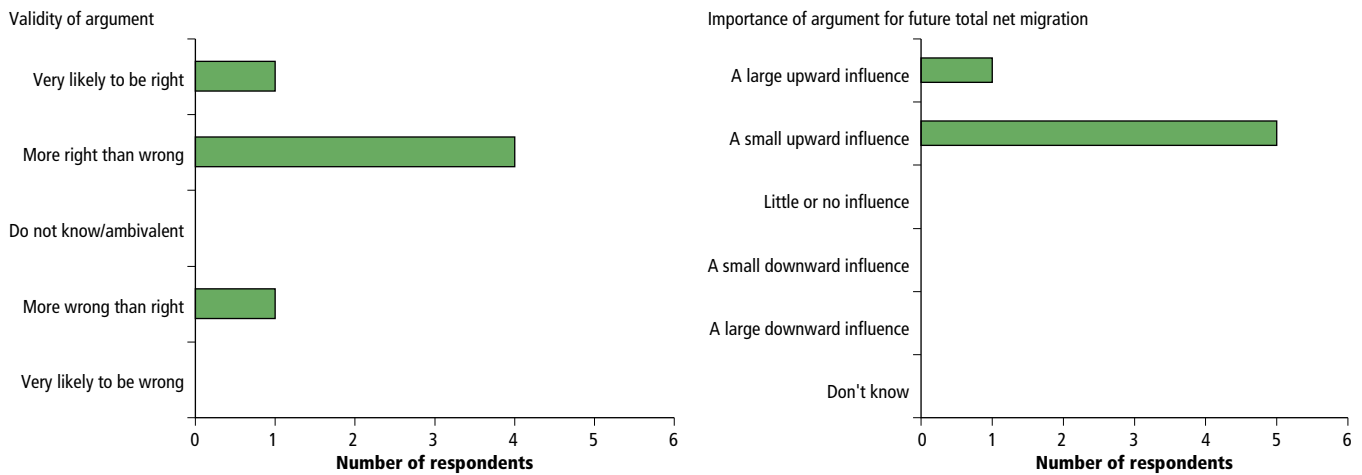
Factors that could have an u   ar   impact on net migration to the UK:

- Likelihood of increasing migration to and from the UK for work-related, family reunification/formation and educational reasons
- **High population growth in developing countries**
- **Development in the poorest countries**
- Population ageing in the UK
- The relative attractiveness of the UK as a country of destination **(for economic and other reasons)**
- With increasing globalisation, the increasing ease of movement **from one country to another**

Factors that could have a o n   ar   impact on net migration to the UK:

- Increases in retirement emigration from the UK
- The likelihood of new EU countries and developing countries 'catching-up' in terms of economic growth
- **Problems with integration leading to more restrictive immigration policies**

Other questionnaire results

Some other selected results from the questionnaire are shown in Figure 5. In total, the experts were asked for their views on over 90 **different arguments (see Appendix)** that might be thought likely to

influence future demographic levels. Of all these arguments, there **was only one that the Expert Panel unanimously rejected as invalid. This relates to the notion of 'professional parenthood' and is shown in** Figure 5(a). Although this may be an unfamiliar idea in the UK, it may **have more currency in some of the low fertility countries of Europe** (such as Austria, perhaps, where this questionnaire was devised).

The fertility, mortality and migration sections above concluded with a **list of arguments with which a majority of the panel (though rarely all)** agreed. There were, however, some interesting cases of disagreement. For example, as shown in Figure 2(b), the panel were divided about the **argument 'It is part of human nature to want at least two children. This is unlikely to change in future'.**

Examples of disagreements over mortality and migration arguments are shown in Figures 5(b) and 5(c). Figure 5(b) is an example of one of a number of compound arguments that were included in the questionnaire. While in accordance with the definition favoured by Monty Python, that **an argument is 'a connected series of statements intended to establish a proposition'[10]**, we cannot say with such arguments precisely why they were rejected. In this case, logically, the argument could have been **rejected for one or more of four reasons: (a) because the expert did not** think there would be climate change, (b) because they did not think climate change would lead to a decline in food production, (c) because **they did not think a decline in food production would lead to mass**

**Figure 5** | **Expert Panel views on other selected arguments**

(a) There is likely to be a move in the direction of 'professional parenthood' where some couples will specialise in raising larger families and receive compensation equivalent to that of other professional services, while other women become entirely work-oriented
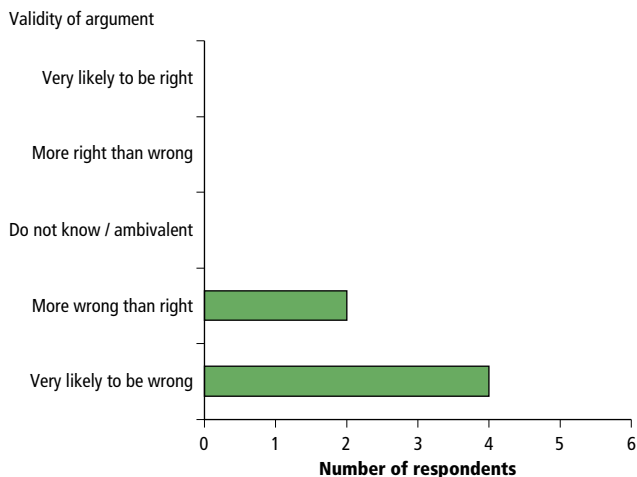
(b) Global climate change will lead to a decline in food production in certain parts of the world and, as a result, uncontrolled mass migration and conflicts will increase mortality in this country
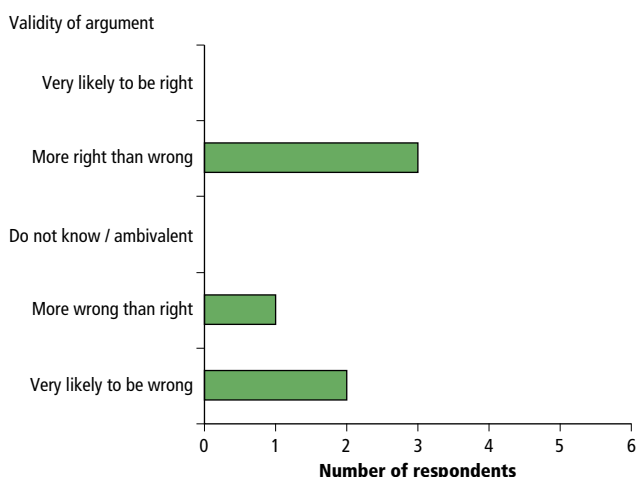
(c) The economic consequences for the poorest countries of substantial out-migration will put moral pressure on developed countries to limit immigration
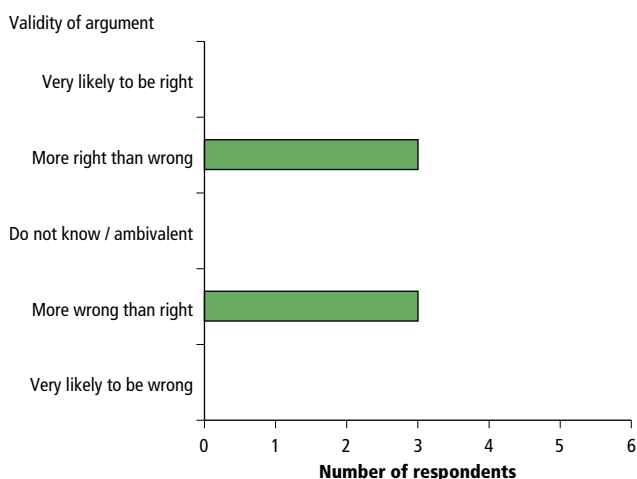
migration and resulting conflict or d) because they did not think this mass migration and conflict would lead to increased mortality in the UK. Meanwhile, Figure 5(c) shows the Expert Panel were evenly divided in their views on the more straightforward 'moral' argument about migration from poor countries to rich countries.

A full list of the arguments included in the questionnaire is given in the Appendix, along with an overall summary of the expert panel's responses. Full details of the responses to other questions are available from ONS on request[7].

Discussion

The 2007 expert panel questionnaire has yielded a rich source of information. As suggested by one member of the expert panel at a 2008 BSPS meeting which discussed the results of the questionnaire[11], the factors identified as being likely key influences on future fertility, mortality and migration may suggest areas of future research for the ONS Centre for Demography perhaps in collaboration with academic partners.

The questionnaire may also be a useful resource in itself in helping to answer particular enquiries. For example, the response to a parliamentary question in March 2008 by the Liberal Democrat MP Dr Vincent Cable[12] about the impact on longevity of a change in summer or winter mean temperature was partly informed by the expert panel's responses to the following two arguments included in the questionnaire:

> 'More intensive heat waves during summer will lead to higher mortality among the elderly', and 'Less extreme cold spells during winter will lead to lower mortality among the elderly'

Overall the panel agreed that both arguments were likely to be valid, especially the former. However, in both cases, the overall view was that this would have little impact on life expectancy levels.

ONS are considering whether similar exercises of this kind would be useful in future. The questionnaire was long and complex and we would not want to repeat it with the panel every two years. In any case, views are unlikely to change dramatically over a short period. However, it might be useful to do a similar exercise for one of the three components every two years so that all would be covered over a six year cycle.

It was also noted above that the quantitative results from the questionnaire are being used by ONS to develop a set of experimental stochastic forecasts for the UK. The NPP panel of six is smaller than would ideally be wanted for this purpose. The panel members also have a rather similar demographic profile. While ONS are clearly fortunate to have such a wealth of experience in the advisory panel (all six members have over 25 years experience with population projections), it is arguable that there could be similarities of outlook because of common influences on their thinking. It would be interesting to know if younger demographers, for example, hold similar views about the factors likely to influence future trends. For these reasons, and although the separate IIASA expert mortality group mentioned above gave similar responses to the UK panel, it would be interesting to try a (shorter) questionnaire on a wider and larger UK group.

It should also be emphasised that the questionnaire is still under development and the 2007 UK exercise was effectively a pilot study. As mentioned above, ONS kept changes to the original IIASA questionnaire to a minimum. Consequently, some questions were included that may not be very relevant in the UK context. Conversely, we were reluctant to introduce questions that seemed highly UK-specific. So, despite the number of arguments covered, the questionnaire clearly does not provide a comprehensive list of all factors with the potential to influence future demographic trends. The lack of a question on the impact of obesity on

life expectancy is one obvious omission. However, the questionnaire **has provided valuable insight into why the academic experts believe key demographic variables will move in particular directions.**

Acknowledgements

ONS wishes to thank Professor Wolfgang Lutz and the International **Institute for Applied Systems Analysis for allowing the expert** questionnaire to be trialled in the UK, and the members of the NPP **expert panel for their time and thoroughness in completing it. Thanks are** also due to Catherine Brand, formerly of ONS, for her innovative work in **producing the Excel-based computer version of the questionnaire.**

Notes and references

1   This responsibility transferred to ONS in January 2006.
2   www.gad.gov.uk/Demography_Data/Population/2004/methodology/ **expert.asp**
3   www.gad.gov.uk/Demography_Data/Population/2006/methodology/ **expert1.asp**

4   **National population projections: 2004-based. Government Actuary's** Department/Office for National Statistics. ONS Series PP2, No 25 (page 83).
5   www.statistics.gov.uk/statbase/Product.asp?vlnk=14834
6   www.nidi.knaw.nl/en/micmac/
7   **Contact natpopproj@ons.gsi.gov.uk**
8   MicMac Questionnaire on Mortality. Lutz W & Prommer I. IIASA **(2007).**
9   **The impacts of the arguments are expressed in terms of the effect on** net migration, so an upward impact would make net inward migration **higher (or net outward migration lower) and a downward impact would make net inward migration lower (or net outward migration higher).**
10   'The Argument Clinic'. Monty Python's Flying Circus (1972). http://montypython.50webs.com/scripts/Series_3/27.htm
11   **Comment from Professor Phil Rees. See** www.lse.ac.uk/collections/ BSPS/dayMeetings/Population-Projections.htm
12   Hansard, 4 March 2008, Col. 2321W. **www.publications.parliament.** uk/pa/cm200708/cmhansrd/cm080304/text/80304w0017. htm#0803056000019.

Appendix
The full list of forces and arguments included in the questionnaire is given below. Each argument has been given a score for both validity and importance. Two questions were asked for each of the arguments (with the wording of the fertility questions given as an example):

(a) Importance
Assuming that the argument was to prove correct, what would be its impact over the next 25 years, compared with family size today?

−   a large upward influence on family size (2)
−   a small upward influence on family size (1)
−   little or no influence on family size (0)
−   a small downward influence on family size (–1)
−   a large downward influence on family size (–2)
−   **don't know (0)**

(b) Validity
Ignoring the possible impact of this argument on fertility, do you think the argument is?

−   **very likely to be right (2)**
−   **more right than wrong (1)**
−   **don't know (0)**
−   more wrong than right (–1)
−   very likely to be wrong (–2)

The score given to individual responses is indicated in brackets. As there were six experts on the panel, there is therefore a possible overall score ranging from a maximum of 12 to a minimum of –12. So:

•   for 'importance' a positive overall score indicates that the panel thought that the argument, if it proved to be correct, would have an upward influence on family size and a negative score indicates they thought it would have a 'downward influence' and
•   **for 'validity' a positive overall score indicates that the panel agreed with the argument and a negative score indicates they disagreed with it**

Major Forces Influencing Cohort Fertility

FERTILITY			
Force F1	**Trend in ideal family size and the strength of individual desires for children**	*NPP panel rating*	
Arguments		*Validity*	*Importance*
F1.1	It is part of human nature to want at least two children. This is unlikely to change in the future.	0	5
F1.2	Family size ideals will decline as young people experience fewer children around them and hence have fewer children as part of their expectations of what constitutes a desirable life.	0	−5
F1.3	In the future, it will become increasingly socially acceptable to have children at older ages.	9	2
F1.4	There is likely to be a revival of the value attached to children and family life and it will become more fashionable to have larger families.	−5	4
F1.5	A strong desire for two child families will continue because of the value attached to siblings.	6	1
F1.6	The only floor (minimum level) on ideal family size is that most people will still want to experience parenthood and so will have at least one child.	−1	−1

Force F2	Trend in the patterns of education and work, including the proportion of time to be dedicated to the professional side of life	NPP panel rating	
Arguments		Validity	Importance
F2.1	Education and work will consume increasing proportions of our time and become more important as the main sources of our personal identities.	0	−5
F2.2	New technologies and increases in productivity will reduce the time spent on work and increase leisure and family time.	−3	1
F2.3	The knowledge society will result in young adults spending more time in education leading to a postponement of family formation processes.	3	−2
F2.4	School reforms and reductions in youth unemployment in the future will lead to men and women become economically independent at younger ages.	−3	0
F2.5	Increasing female labour force participation and an increase in women's age at retirement will reduce the potential number of grandmothers available to help with childcare of grandchildren.	6	−3
F2.6	New policies will allow young parents to reduce significantly their workload for several years with close to full compensation of income.	−4	5
F2.7	There is likely to be a move in the direction of 'professional parenthood' where some couples will specialize in raising larger families and receive compensation equivalent to that of other professional services, while other women become entirely work-oriented.	−10	0
Force F3	Changing macro-level conditions (government policies, childcare facilities, housing, etc.) that influence the cost of children in a broader sense	NPP panel rating	
Arguments		Validity	Importance
F3.1	The government is likely to improve the financial support for children by raising child subsidies and tax benefits.	7	4
F3.2	The government will make sure that all parents have access to comprehensive and free childcare starting when the child is very young.	−3	5
F3.3	Couples with young children and all pregnant women will have access to heavily subsidized or free housing supported by the government.	−8	3
F3.4	The government will pay a substantial birth premium which parents will have to spend mostly for the benefit of the child (childcare, education, housing).	−3	4
Force F4	Changing nature and stability of partnerships	NPP panel rating	
Arguments		Validity	Importance
F4.1	Relationships that last at least 20 years (the time needed to raise children) will be the exception in the future.	0	−5
F4.2	In the future men and women will share much more equally the burden of childcare and housework.	5	1
F4.3	There is a trend towards more self-fulfilment for men which does not include getting more involved in daily childcare.	−7	−3
F4.4	Men may be willing to share childcare responsibilities for the first child, but once they have experienced it, they will not want to do so for another child.	−4	−3
F4.5	Because of divorce (separation) and remarriage (new union), there will be a growing desire for additional children in a new partnership.	2	3
F4.6	More women will want to have children but to live without a partner.	−2	−1
Force F5	Changing bio-medical conditions (sperm quality and counts, female fecundity, new methods for assisted conception)	NPP panel rating	
Arguments		Validity	Importance
F5.1	There will be increasing problems with male fertility due to declining sperm quality as a consequence of environmental pollution and stress.	1	−1
F5.2	Women will delay trying to become pregnant until later in life and to ages where fecundity is lower which will lead to longer waiting times for conception and greater risks of not getting pregnant.	7	−5
F5.3	In the future, medically assisted conception will solve a greater proportion of fecundity problems and more couples will be able to have all the children they actually want.	6	2
F5.4	The proportion of unplanned births will decrease due to improvements in contraceptives (increased effectiveness, reduced side effects and lower cost).	5	−2
Force F6	Changes in population composition and differential trends in population subgroups	NPP panel rating	
Arguments		Validity	Importance
F6.1	For ethnic minority women already resident in the UK and their descendants, fertility rates will converge to those for indigenous women.	5	−4
F6.2	The majority of new immigrants will come from countries where fertility rates are higher than in the UK.	1	4
F6.3	In the future, women who emigrate from the UK are likely to have lower fertility than the UK average.	2	1

Major Forces Influencing Life Expectancy

MORTALITY			
Force L1	Changes in bio-medical technology	NPP panel rating	
Arguments		Validity	Importance
L1.1	Increased understanding of bio-medical ageing processes will allow us to develop effective anti-ageing strategies.	6	9
L1.2	Breakthroughs in the understanding of carcinogenic processes will lead to substantial reductions in mortality from cancers.	7	7
L1.3	Innovative medication will make hitherto life threatening diseases containable.	5	5
L1.4	Improvements in surgery including transplants and implants will enhance longevity.	6	3
L1.5	Unintended adverse consequences of new bio-medical technologies will outweigh their benefits.	−3	−2

Force L2	Effectiveness of health care systems	NPP panel rating	
Arguments		Validity	Importance
L2.1	The cost of new treatments will be prohibitive to large segments of the population.	−2	0
L2.2	There will be some very effective and easily affordable new technologies.	6	6
L2.3	Because of the growing elderly population there will be limited access and increased waiting times for treatment.	2	−2
L2.4	Society will be able and willing to afford expensive new treatments.	2	5
L2.5	Progress in preventive medicine (screening, genetic testing) will lead to lower death rates.	8	7
L2.6	Better and faster medical and health information dissemination will increase longevity.	7	5
Force L3	Behavioural changes related to health	NPP panel rating	
Arguments		Validity	Importance
L3.1	Smoking prevalence will continue to decline.	9	6
L3.2	Substance abuse (alcohol and drugs) will lead to more premature mortality and accidents.	1	−2
L3.3	Increased awareness of the importance of physical activity will lead people to exercise more.	2	6
L3.4	Increased awareness of the importance of nutrition will lead people to adopt healthier diets.	3	6
L3.5	Increased stress levels will impact negatively on health.	1	−5
L3.6	Increasing mental and social activities at old age will lead to greater longevity.	6	4
Force L4	Possible new infectious diseases and resurgence of old diseases	NPP panel rating	
Arguments		Validity	Importance
L4.1	There will be a growth in infectious diseases leading to increases in overall mortality.	−2	−4
L4.2	Increasing drug resistance to known infectious diseases will lead to higher mortality.	6	−4
L4.3	Increased capability of early detection and control will help to contain the spread and impact of new infectious diseases.	5	1
L4.4	A major flu epidemic (avian or other) is likely to occur over the next 25 years.	0	−2
Force L5	Environmental change, disasters and wars	NPP panel rating	
Arguments		Validity	Importance
L5.1	Increased frequency and intensity of natural disasters (such as flooding and strong storms) will lead to increasing mortality in the UK.	0	−1
L5.2	Global warming will lead to the spread of malaria in Europe and result in higher mortality.	−2	1
L5.3	More intensive heat waves during summer will lead to higher mortality among the elderly.	6	−1
L5.4	Less extreme cold spells during winter will lead to lower mortality among the elderly.	3	1
L5.5	Global climate change will lead to a decline in food production in certain parts of the world and, as a result, uncontrolled mass migration and conflicts will increase mortality in this country.	−2	−3
L5.6	Because of the European Union, we will not experience wars in our country in the future.	5	2
L5.7	A 'clash of civilizations' will lead to major conflicts that result in lower life expectancy.	−4	−3
Force L6	Changes in population composition and differential trends in population subgroups	NPP panel rating	
Arguments		Validity	Importance
L6.1	The UK 'golden cohorts' born between 1925 and 1945 have experienced relatively high rates of mortality improvement throughout their lifetimes. The rate of improvement in overall population life expectancy will slow down as these cohorts reach advanced ages.	−2	0
L6.2	For ethnic minority groups already resident in the UK and their descendants, mortality rates will converge to those for the indigenous population.	2	3
L6.3	The majority of new immigrants will come from countries where mortality rates are higher than in the UK.	7	−2
L6.4	In the future, people who emigrate from the UK are likely to have lower mortality rates than the UK average.	2	−1

Major Forces Influencing Migration

MIGRATION			
Force M1	Trends in the main motives for international migration	NPP panel rating	
Arguments		Validity	Importance
M1.1	There will be an increase in the total number of people wishing to migrate to and from the United Kingdom for work related reasons.	5	9
M1.2	There will be an increase in the total number of people wishing to migrate to and from the United Kingdom for family reunification reasons.	6	5
M1.3	There will be an increase in the total number of people wishing to migrate to and from the United Kingdom for education or study reasons.	5	4
M1.4	There will be an increase in the total number of people wishing to migrate to the United Kingdom for the purpose of claiming asylum.	0	8
M1.5	There will be an increase in the total number of people wishing to migrate to and from the United Kingdom at the time of retirement.	2	−4

Force M2	Trend in migration pressure resulting from changes in the countries of origin	NPP panel rating	
Arguments		*Validity*	*Importance*
M2.1	High population growth and a large 'youth bulge' in developing countries together with high unemployment will increase the pressure for out-migration.	7	6
M2.2	Global climate change will lead to a decline in food production in certain parts of the world causing a wave of 'environmental refugees'.	0	4
M2.3	Many developing countries will catch up in terms of economic growth and hence weaken the incentives for out-migration.	4	−4
M2.4	Economies of new EU countries will catch up with those of the EU15 reducing inflows to, and/or increasing outflows from, the UK.	6	−6
M2.5	Success in development in the poorest countries will lead to an increase in international migration, since people are more likely to migrate from semi-developed countries than from the least developed countries.	4	5
Force M3	Trend in the attractiveness of the United Kingdom as a country of destination	NPP panel rating	
Arguments		*Validity*	*Importance*
M3.1	Population ageing in the UK will result in a shortage of young labour which will increase the demand for immigrants.	5	7
M3.2	The recent strength of the UK economy relative to other industrialized countries will not persist and an increasing number of people will leave this country over the coming 25 years.	−2	0
M3.3	Wages in the UK will continue to be a lot higher than in the new EU countries and outside the EU and hence we will continue to attract immigrants.	4	7
M3.4	Existing networks with immigrant populations already resident in the UK will make it more attractive to come to this country.	7	7
M3.5	English will become more dominant as an international language, increasing the attractiveness of the UK for immigrants.	4	4
M3.6	There will be serious problems with integration of immigrants in the UK and Europe generally and hence a widespread fear of cultural conflict will lead to very restrictive immigration policies.	5	−7
M3.7	Out-migration of unemployed foreigners will be actively encouraged.	−2	−3
Force M4	Costs of migration (in the broader sense)	NPP panel rating	
Arguments		*Validity*	*Importance*
M4.1	Increasing globalization and cheaper international airfares will make it easier to move from one continent to another.	4	2
M4.2	As migration pathways become more established, the readiness of future migrants to follow along these pathways will be greater.	4	3
M4.3	Internet and satellite TV will make it easier for migrants to stay in touch with their family, friends and culture.	7	1
M4.4	Countries of origin will fight brain drain by trying to reclaim the cost of education for people who leave the country.	−3	−2
M4.5	The economic consequences for the poorest countries of substantial out-migration will put moral pressure on developed countries to limit immigration.	0	−2
Force M5	Effectiveness of barriers against uncontrolled migration flows	NPP panel rating	
Arguments		*Validity*	*Importance*
M5.1	There will always be international migration, no matter whether countries try to control it or not.	8	0
M5.2	Any successful attempts by EU countries to limit legal migration will have the side effect of increasing illegal migration.	3	−2
M5.3	Any successful attempts by EU countries to reduce illegal migration will have the side effect of increasing legal migration	−4	−2
M5.4	In the future, asylum seekers will not be allowed to enter EU territory but rather will be kept in camps until each case is clarified.	−3	−6