The Elderly Population in 2014

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Summary

This paper shows that although the UK population is surviving longer it is not in fact living longer after the age of 65, of the total population over 65 in 2014, only half will reach age 74 in 2025 and 27% reach age 85 in 2034, by that time forward projections only increase this to 76 by 2045.

We need to adapt to a new era of population change, in which over 90% of live births survive to age 65 and even 70 but the normal mortality attrition of old age still dominates from thereon, the increased numbers reaching 70 also raise levels thereafter by survival probability independent of any further natural changes occurring. Mortality rates and survival are a good indicator of the Nation's health, which has increased rapidly over the past 70 years.

The results of a study on the latest ONS 2014 population review are presented which show that there is a health wave of reduced mortality / survival longevity passing through the age / time distribution which has reached age 77 and will exhaust within the next 20 years by age 97. This conflicts with the present ONS review assumptions that reduced mortality will continue indefinitely and indicates a new steady state of constant mortality rate in which fertility, mortality and nett migration dominate.

It also indicates that forward projections of the elderly population over 80 may be exaggerated with the major factor being the increased numbers reaching age 65 which will combine with the present increased nett migration in 35 years to give age dependency problems which can only be solved by adequate pension savings (self-provision) over the working age to provide income and care in old age.

The decline of the 65+ population at any given time is also faster than that indicated by Life tables and life expectancy projections, which eases the problem of provision in State and group schemes, making changes to retirement age completely unjustified and unnecessary except by choice, with 20% of the 65+ population being deprived by mortality of any retirement at all by the age of 70.

Introduction

This study considers the elderly population of the UK on the basis of the mortality rate qx, changes that have occurred over the past 30 years and from projections forward from 2014 to 2034 and beyond to 2114.

The disturbance wave shown affects mortality and hence survival and population but is separate from health, fertility / baby boom and current nett annual migration factors which may build up into similar waves; regression waves due to living styles, war, plague or similar annihilation events can also occur.

This wave of healthy living is followed by a new steady state of higher survival from birth of low mortality and the major demographic population changes now referred to as the problem of ageing in which live birth rate and nett migration, with its sharp age distribution profile, dominate by 2034. When exactly is dependent on how far this wave progresses into the mortality attrition barrier that exists beyond 85 due to exponentially rising mortality rates.

The paper is based on previous work and the ONS 2014 population review, which however considers mortality rates reducing steadily at 1.2% for the next 100 years without considering the implications or reality of this assumption or a return to steady state conditions.

The UK had been going through a period of increase in survival due to advances in medical and social care which combined with the absence of war has resulted in the population growing and accumulating with time and age and now reaching the elderly population where it can progress no further.

A previous paper (Radstats 201, 2014,Marshall et al) showed that the major part of the rise in the 65+ population was due to increased flow from younger ages, resulting from population survival levels from birth to age 65 reaching unprecedented levels of 90%. Further studies (unpublished) on the 2012 results showed that the progression of these advances beyond 65 or 70 was uncertain, although large reductions in mortality rates were still occurring through the age spectrum, which is updated here.

This shows that the population is now entering the more steady state of constant mortality rate qx where fertility, mortality and nett migration dominate, with the population distribution by age at a new level although it will take a further 20 to 25 years for the increased flow and reducing mortality rate to progress through the system to age 100. This contradicts the current assumptions that qx reductions continue indefinitely from existing low levels without any adequate support evidence.

This review gives the latest Life tables and estimated population figures for the UK together with the latest forward population projections to 2039 and 2114 in the standard ONS variants, and these results will be considered later. The most significant aspect is the slowdown in the annual mortality rate reduction which was 2.0% in 2012, then 1.5% and now at 1.2%,

together with the dominance of nett migration, which now accounts for two thirds of the population rise to 2114.

The previous studies were therefore extended to include these latest results, approaching the problem from the aspect of mortality rate reductions and survival progression in forward projections to 2034 extending to 2114, with comparison to the more extensive ONS projections.

Furthermore the total 65+ population at any one time is declining at a greater rate than the lx component of Life tables and hence life expectancy suggest; as this is the economic basis of elderly provision which when combined with the now higher population flow suggest the logical solution to the problem is one of self-sufficiency through pension provision

More important is the comparison ratio of mortality rates (charts 1 &2) taken from Life table values of qx; the ten year ratio of 2014 to 2114 show erratic change around 1.0 below age 40 due to the low values now occurring. Then an almost steady drop occurs to 0.7 rising to 0.9 -1.0 above age 90, where the rapid rise in mortality rate occurs, this wave minimum moves with age and time.

If it is accepted that these factors are limited in time and progression then the present problems of ageing appear to be exaggerated, with the total change in natural population over 65 stabilising at a new constant higher level and balance.

The resulting demographic changes still need innovative measures to adapt to the economic and social challenges that arise, but their projection forward in time can become more certain and controlled

The Study used standard cohort component projections in which the annual population change by single year of age is calculated on the basis of existing less mortality plus migration; mortality rate can be varied at any point in the age – time projection and population distributions superimposed giving great flexibility.

The approach was on the basis of mortality rate variation over the whole population with particular attention to the over 65's and considered the historical and current positions. The latest ONS data was used and is acknowledged and comparison made with ONS projections where relevant; nett migration was treated separately and ONS live birth projections were taken. It was carried out in the main areas:-

- Analysis of mortality rate changes over the past 30 years
- Forward projections to 2034 and 2114 of the UK population by single year of age
- Comparison of 65+ population decline, life expectancy and survival

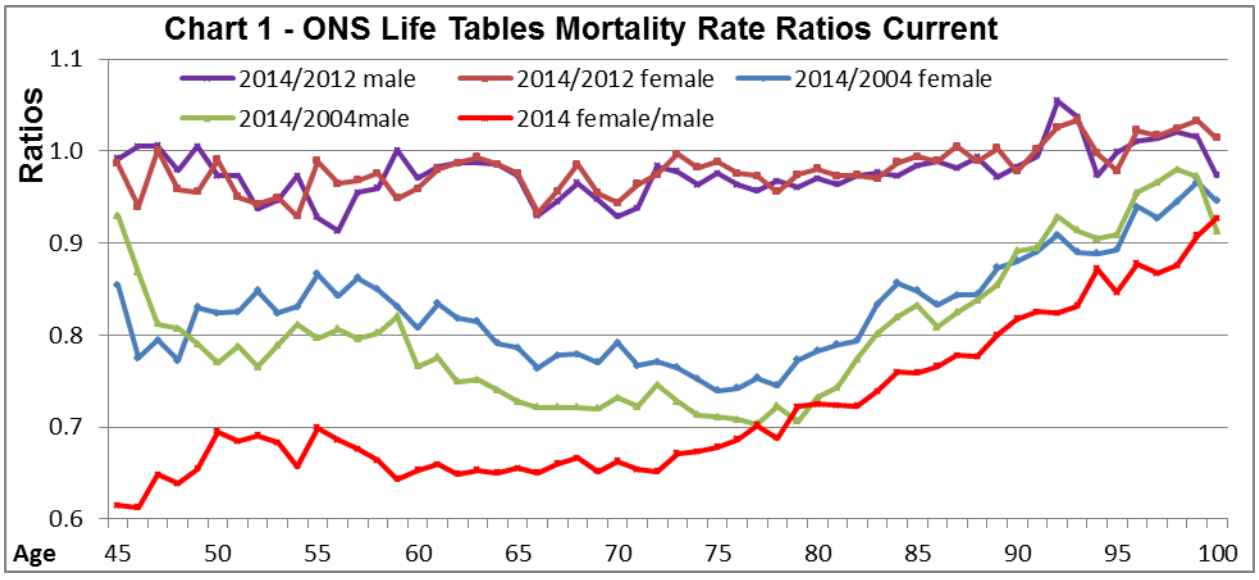
Analysis of mortality rate changes

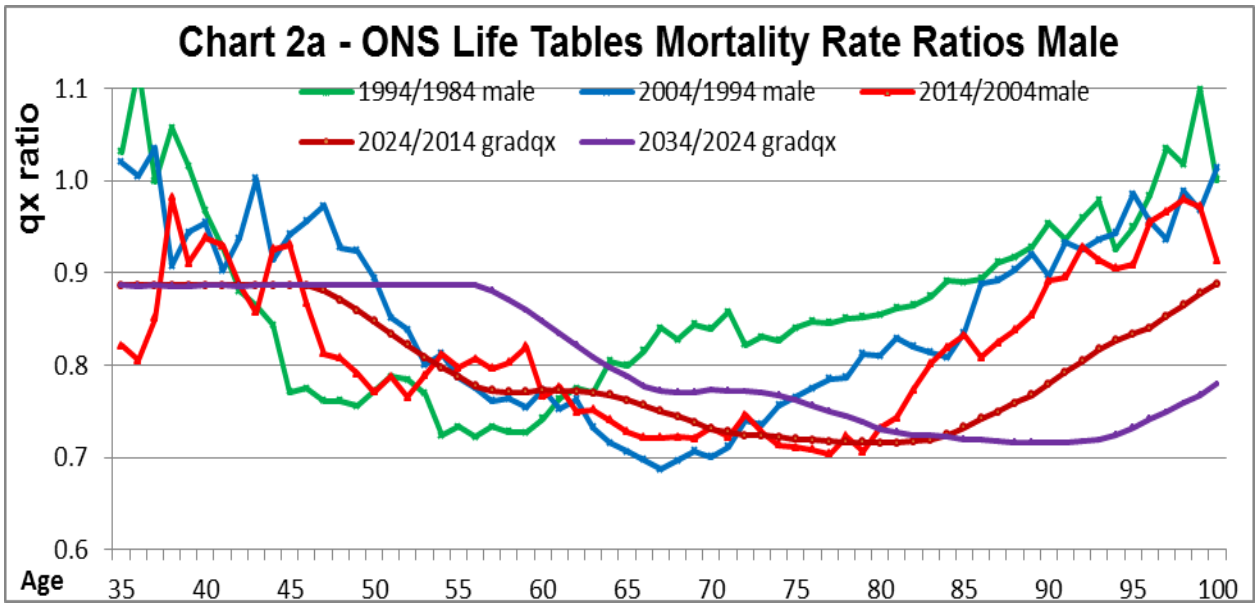
Charts 1 and 2 show mortality rate qx ratios over 2 and 10 years and the significant point that arises is the reduction wave that occurs with age, which moves in time with the population. In the ten year ratios the minimum occurs at 57 for 1994/1984 (green); 67 for 2004/1994 (blue) and 77 for 2014/2004 (red).

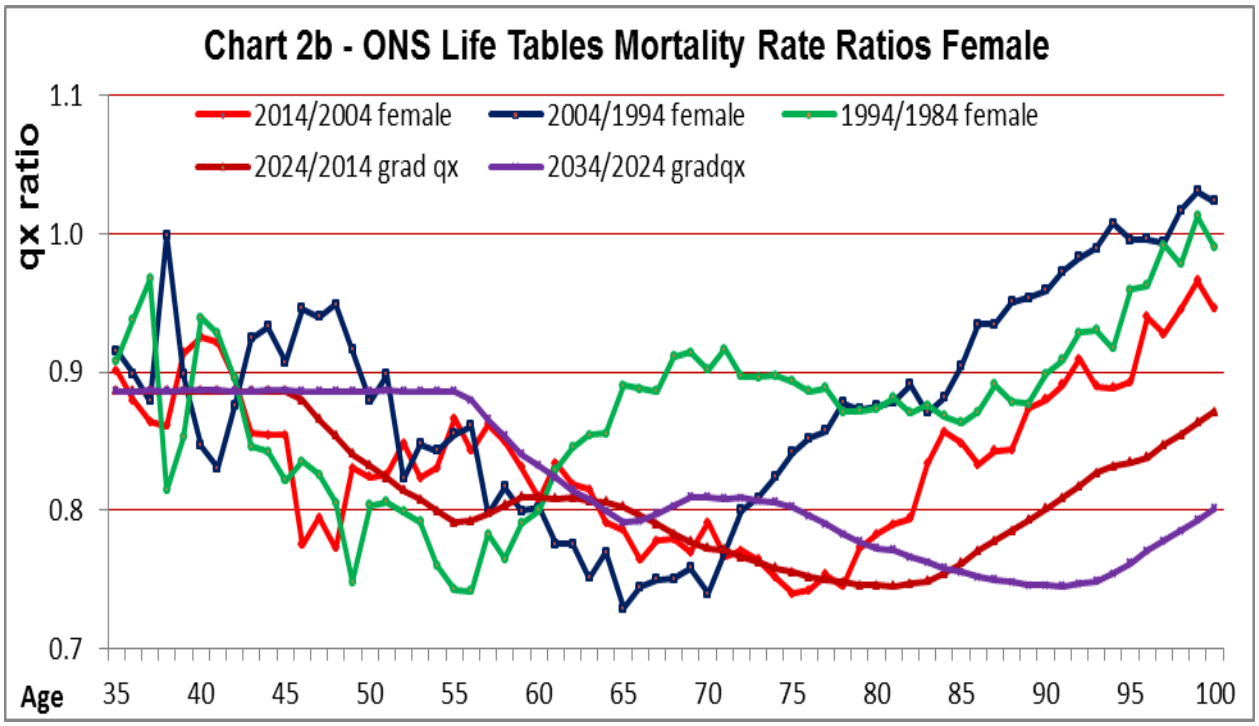
This is the penetration rate of reduced qx into the elderly population, which leaves behind a new steady state of low virtually constant mortality rate where ratios fluctuate wildly; the ratio period shows the accumulated effect of the reducing and decreasing rates now occurring with the retarding effect of rapidly increasing qx with age.

The main question that arises is how long this progression will continue for and how far the present mortality attrition barrier at higher ages will impact on this process; if the progression continues at the present rate then it will reach age 97 in 20 years. However due to the low population numbers and high qx levels, its impact will diminish and the process even die out altogether after 80 or 85.

The grad qx projections were an attempt to explore this using the latest 2014/2004 ratio superimposed on the limited -1.2% qx reduction model with an annual age-time shift over the 20 years to 2034 (chart 2). There is a definite slowing down of the wave with reduced penetration with the suggestion that qx reduction may remain unaffected as age 100 is approached which needs further investigation. All the qx ratio curves show a rise towards constant qx after the minimum as the high qx barrier is reached.







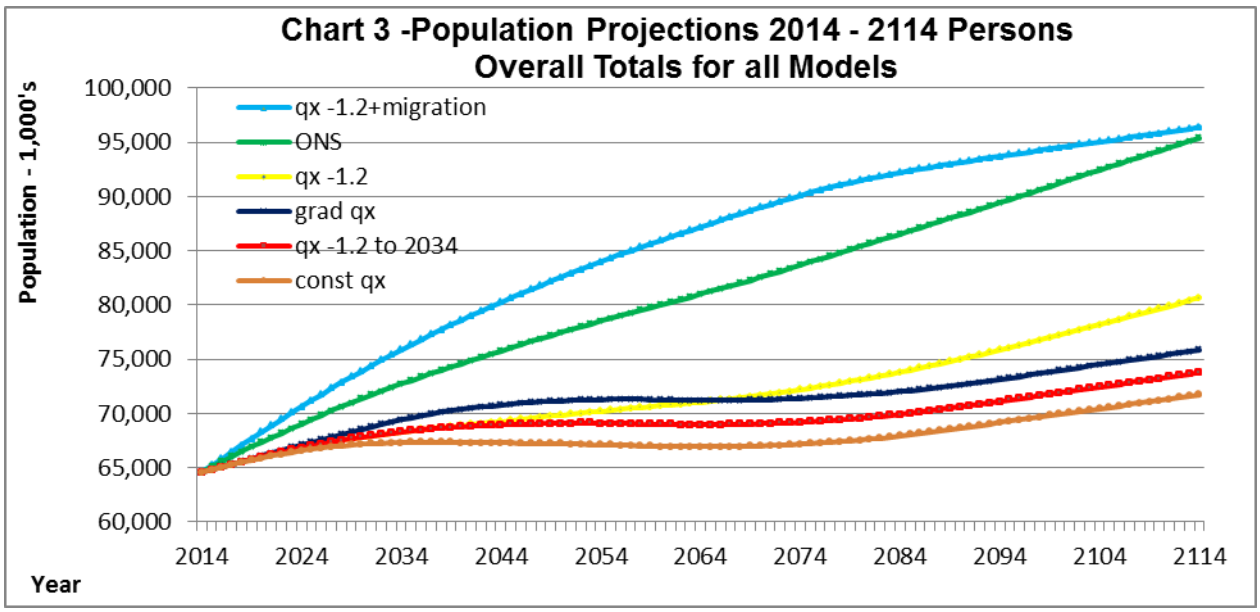
Population Projections

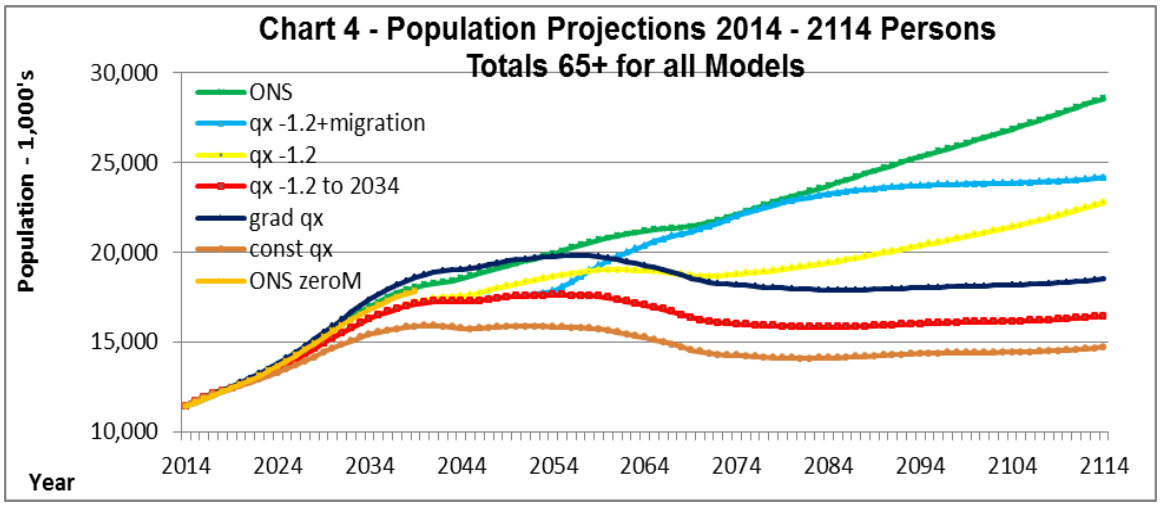
These are shown in charts 3, 4 and 5 for the total UK, 65+ and 85+ populations for the different models which are:-

- Reduction of 1.2% per year in Mortality rate qx
- Similar but limited in time to 2034 and constant thereafter
- As 2 but plus migration taken as peak addition between ages 18-to 32
- Constant qx
- Grad qx, as 2 based on wave progression with 2014 / 2004 mortality ratio superimposed with annual age-time shift

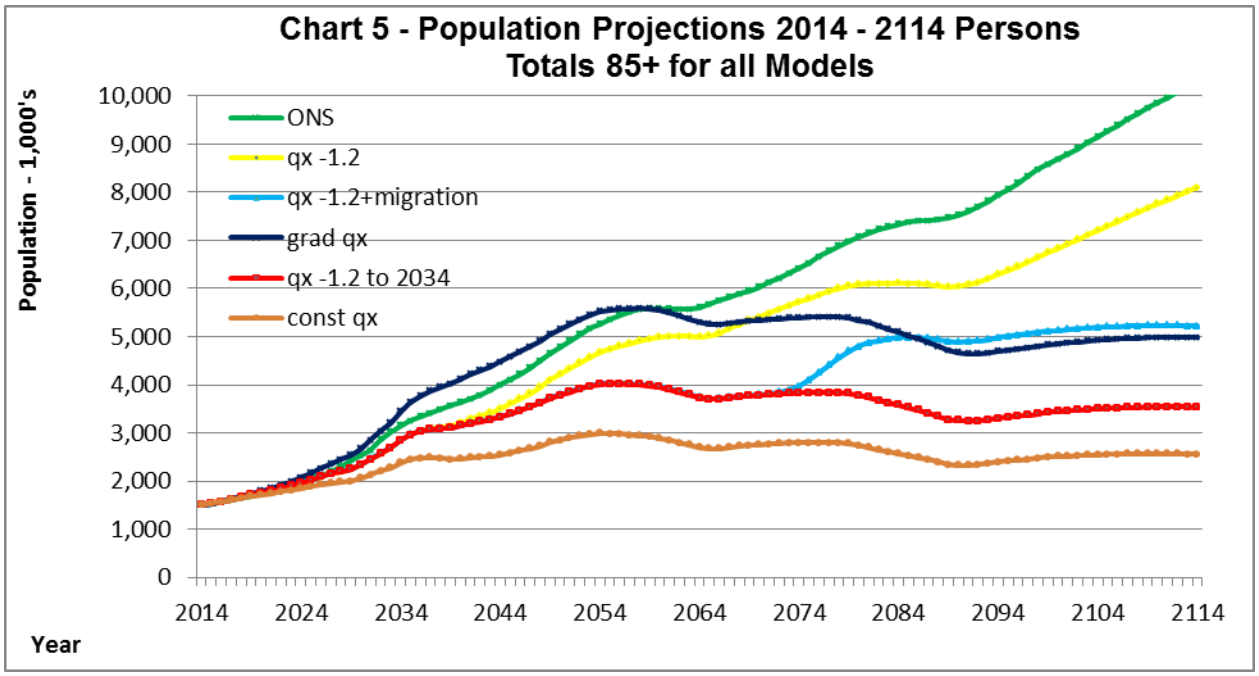
- ONS projections

The charts are almost self-explanatory; the major effect on total population is due to migration levels, which dominate the projected increase, the differences with ONS are due to the higher current migration levels being taken. However the natural increases, without migration, clearly show the effect of sustained qx reduction, particularly on the higher age 65+ and 85+ charts, where population levels out after the increased survival flow is completed.





The current qx reduction of -1.2% limited to 2034 is believed to be the probable population behaviour and shows the immediate surge to 2034 but stabilising at some 150% for 65+ and 200% for 85+, which although substantial can be managed more readily than current predicted values. If qx reduction penetration slows down, then the limited or constant qx models become active. The grad qx model follows a similar pattern but at a higher population level of some 2 million and requires further investigation.



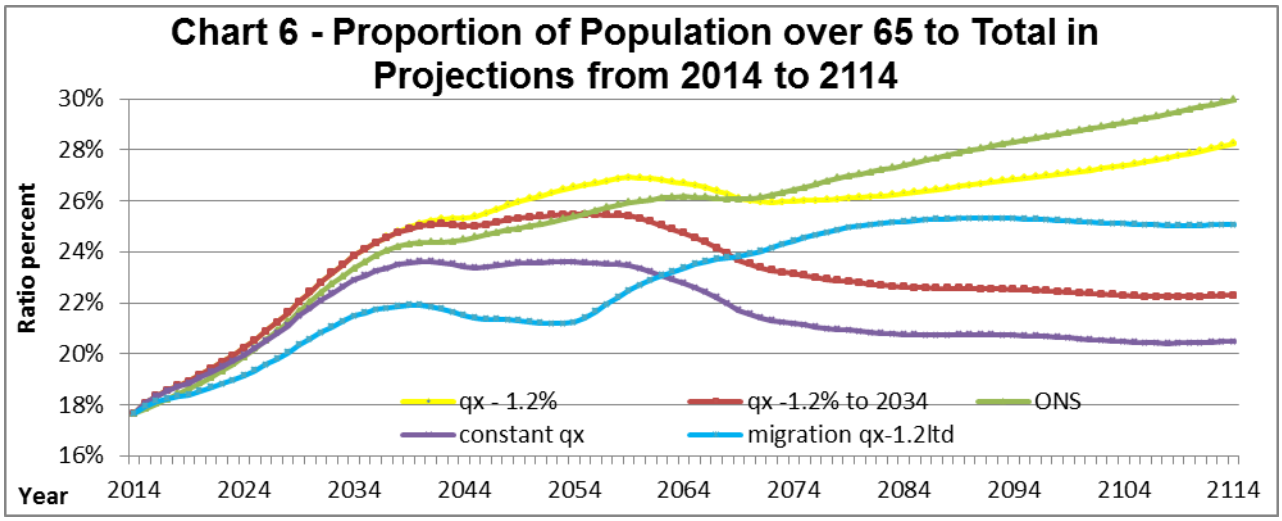
The delayed effect of migration is also clearly illustrated, which was treated as additive to the standard cohort method, currently migration is mainly in a low age band between 18 and 32, peaking sharply at 25; a constant input at present level of 200,000 was therefore added each year in this age distribution profile. It then worked its way through the overall age distribution reaching 65 by 2052, although beneficial at working ages this causes major population increase of 20 million by 2114 with associated extra ageing problems.

Table1 shows a comparison of the expected Life table values in the forward projections to 2114 of mortality rate qx and population survival lx per 100,000 at age 95 at the continued qx reduction of 1.2% per year to illustrate these points. Is it realistic to expect health advances to reach this position by 2114, with 55% of live births reaching age 95?; medical progress is still many years away and embryo manipulation would take a further 95 years to bear fruition.

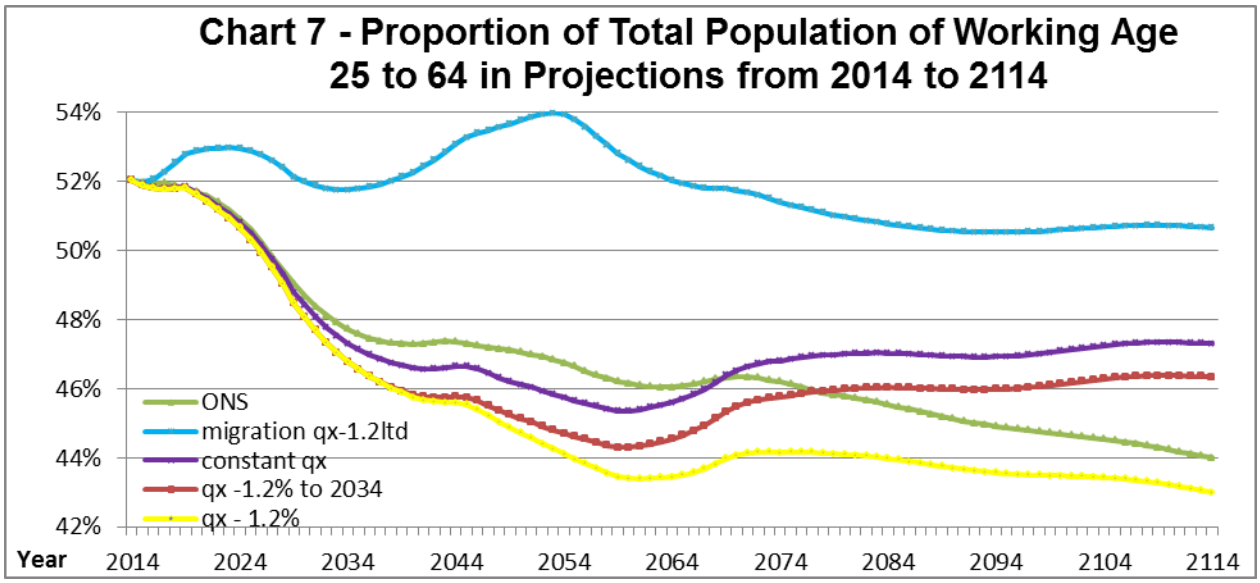
Table 1 – Comparison of NLT qx and lx values at age 95 in forward projections at -1.2% qx reduction

Year	2014	2024	2034	2054	2074	2094	2114
qx male	0.2591	0.2260	0.2035	0.1598	0.1255	0.0986	0.0775
qx female	0.2192	0.1942	0.1721	0.1352	0.1062	0.0834	0.0655
lx male	6,521	9,084	12,125	19,456	27,976	37,033	46,028
lx female	12,,443	15,981	19,889	28,490	37,587	46,582	55,032

A factor of importance is the proportion of the total population over 65 and of those supporting them of working age from 25 to 64 and this ratio is given in Charts 6 and 7. The elderly population ratio rises rapidly for the restricted and constant mortality rates from 18% to 25% by 2040 then levels out until 2060 and dropping back slowly to 22% with constant qx some 1.5% lower throughout, confirming the lower impact of elderly mortality rate change shown in the orevious paper. Migration effect start to come in by 2054, rising steadily until a new equilibrium is reached, when they level out. Continuous mortality rate reduction show the initial rapid rise initially and then a steady continuing rise thereafter reaching a peak of 28% and 30% for ONS with migration.



The working age ratio show a completely different picture, dropping rapidly initially from 52% to 44% then steadying out and starting to rise for the constant and limited qx, levelling out at 46%, with constant 1% higher. Continuing qx reduction and ONS carry on falling to below 44%.



These long term changes reduce dependency ratio of elderly on those in work from 3 to 2:1, however nett migration taken with qx change limited, conteracts this trend increasing initially then levling out at 50%.

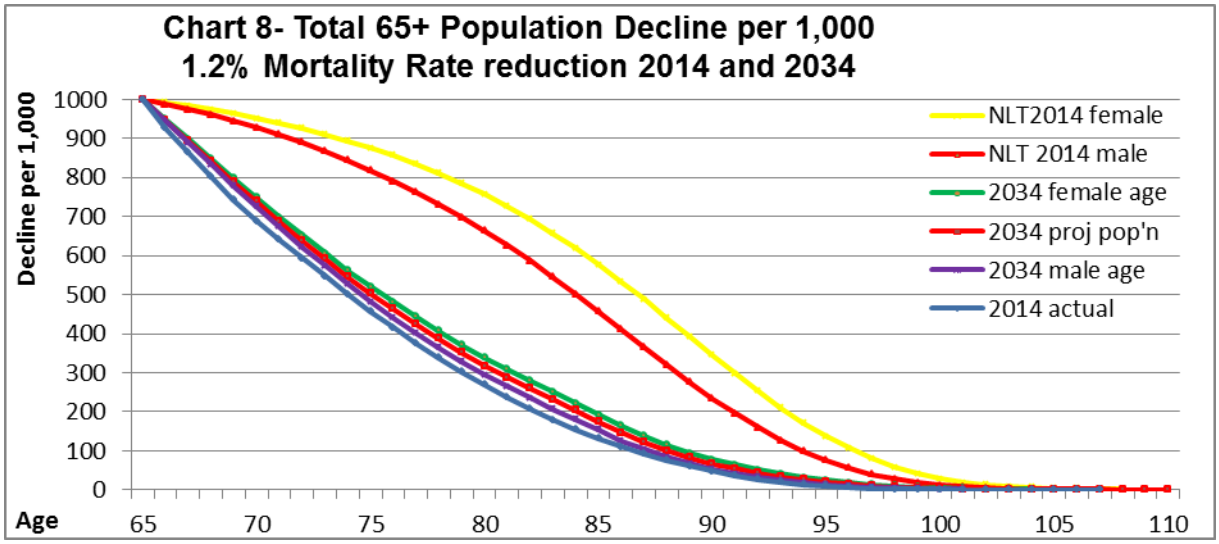
Population Decline and Life Expectancy

Life expectancy is derived from Life tables and based on the population decline per 100,000 lx at the current mortality rates qx existing at each age and is therefore the predicted decline or survival at that defined age, and is only true at birth and for the individual at that age. In constant mortality rate conditions when derived from age 65, it is therefore the decline or average lifespan that will occur in 65 to 100 years.

+The values derived from projected population use the same techniques, expressed per 1,000, but are based on the actual population numbers for each age at start (2014) and track the decline of the total population at that start age (65+) for the projected mortality rates. This is an isolated system decline, similar to that used in leak detection, and these values are unaffected by subsequent changes in birth rates or migration. They are influenced by the historical values of mortality rates experienced up to that time, which in the current dynamic state have seen large changes, the accumulated lifetime effects of ageing, based on the average mortality from 65 to 110. This is the decline of the group and the basis of economic decisions on pension provision.

The population age distribution profile therefore occurs at a much faster decline (twice) than that predicted theoretically for 100,000 persons and this is reflected in the distribution template which is the basis for the forward projections based on expected mortality rates. This makes them a much sounder basis for decisions on elderly provision and retirement age than predicted life expectancy ones.

Chart 8 shows the decline per 1,000 of the 65+ population in various forms. The historical decline by age for 2014 (blue) shows the current steep decline of the total 65+ population which reaches the half-life average value in 2075 at age 74 of 9 years and compares with the slower Life Table predicted values for male (red), half-life of 20 years and female (yellow) of 23. The projected values of age decline for 2034 give a similar sharp decline with moderate change and average life from 65 increasing to 11 years at age 76.



The life expectancy from birth is currently 79 years for male and 82 for female whilst average life on the lx decline basis for persons is 84, rising to 85 by 2034 so there is a large discrepancy in predicted to actual.

The impact of reducing mortalityrates are more than offset by the rapidly rising rates that occur after 65, in addition the resulting decline in population numbers and shorter timescales available lessen the effect of any changes in mortality rates, as illustrated in the comparison of projections with constant qx.

The effect of life expectancy is therefore overated when considering economic costs where group criteria apply with shared mortality risk, as occur in State, Company, annuities and general group pension schemes. They only apply to individual private schemes.

Conclusions

It does not seem logical or realistic that mortality rates will continue reducing indefinitely and resulting in major increased survival beyond 85 in the present generation, the reduction wave penetration suggests 10 to 20 years, dependent on the resistance of the mortality attrition barrier.

There is little evidence to suggest that the population over 75 is getting healthier, after 73 some form of disability starts to appear, mortality was the highest ever last winter and medical progress is more remedial and preventive than rejuvenation. Although there are early advances in stem cell and gene manipulation therapy, even if applied universally and immediately they would not affect the elderly for a generation.

The increased numbers reaching age 65 will result in substantial rises in older population from survival probability, as shown in forward projections, but the time limited qx change projections represent what is believed to be the likely position during this century. Nett migration and associated birth

rates will be the dominant factor, but will take 30 to 70 years before they react on elderly population numbers.

The resultant steady state situation should make forward planning more positive and the demographic changes are the major challenge with increases in the dependency ratio of the elderly on those in work, the elderly population needs to be taken out of the economic equation, which can be done by individual self-provision pension savings. The population has 40 years of productive working life from 25 to 65, present saving levels from both NI and private are sufficient to meet both income and care needs if managed in an efficient, effective, and positive manner. Retirement age would then be determined by the adequate saved fund position and personal choice and not official predicted values of life expectancy.

This situation will be universal in developed Countries, studies on Australia and New Zealand (unpublished), where suitable statistics were available, show similar results

The use of ONS reports and data is acknowledged.

Also is the help and inspiration of Professor James Nazroo and Dr Alan Marshall, co-authors of the previous paper, Marshall, A., Read, J. and Nazroo, J. 'An analysis of the demographic contributions to population ageing in England and Wales', Radical Statistics, 110 (2014).