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PROJECTING THE
IMPACT OF
DEMOGRAPHIC
CHANGE ON THE
DEMAND FOR AND
DELIVERY OF
HEALTH CARE IN
IRELAND

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1. THE COMPLEX TASK OF PROJECTING THE DEMAND FOR AND DELIVERY OF HEALTH CARE

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1.1 Introduction

This is the final report in a series of three commissioned by the Health Research Board (HRB) to investigate the impact of demographic change on the demand for and delivery of health care in Ireland to 2021 and the implications that this has for the future planning of the health services in Ireland. The project has four specific objectives:

- To examine recent experience of population change in Ireland and assess its effects on demand for health services, focusing in particular on the period 2001-2006. This analysis is set in the context of international research on the influence of population change on demand for health services and draws conclusions on the main drivers of overall and sectoral demand for health services in developed societies. The results of this work are contained in Layte *et al.* (2009).
- The second objective was to develop and set out population projections for Ireland for the period 2006-2021, disaggregated by age-group, sex and county, with additional disaggregations by migrant/ethnic status, family status and household size. This work is contained in Morgenroth (2009) and is summarised in this chapter.
- Applying the analysis developed in Report No. 1 to the projections set out in Report No. 2, in order to examine likely population-driven trends both in overall and regional-level demand for health services in Ireland up to 2021, and in the sectoral distribution of demand within the health system, that is, in regard to hospital inpatient, hospital outpatient, GP services, pharmaceuticals, and long-term health and social care services.

- To set the population effects on health service demand in the context of other drivers of demand and draw overall implications for trends in health service demand up to 2021.

The third objective above, i.e. the application of the demographic projections to the analysis of recent trends in health care utilisation is the main task of the present report. It is important to underline the fact that demographic projection is an exercise in managing uncertainty and this uncertainty is amplified when demographic projections are used to project another dimension such as demand for and utilisation of health care. The projections generated in this project (Report 2: *Demographic Projections for the Period Until 2021* by Morgenroth, 2009) are derived by utilising a cohort component model of the population using assumptions based on past trends in population change in Ireland, and with knowledge of how such trends can interact with other social and economic processes. A good example of this is the interaction of economic growth with trends in migration to Ireland. Recent years have seen an enormous growth in migration to Ireland, particularly from Eastern Europe following the accession of several states to the EU in 2004. This trend reflects both the buoyant Irish economy, and economic circumstances in the country of origin. For example, sound projection of migration trends relies upon an understanding of how Irish economic trends drive inward migration and the extent to which this is counter balanced by economic trends in other countries. This requires a complex macroeconomic model and consequently this project relies on other work carried out at the ESRI for the *Medium-Term Economic Review* (Fitz Gerald *et al.*, 2005; 2008) and the *Quarterly Economic Commentary* (Barrett *et al.*, 2008).¹

The migration example is also useful for pointing out another characteristic of the art of projection: that it is probabilistic in the sense that circumstances can change and the central forecast can become redundant. The speed at which circumstances can change means that there should be regular updates to any projection to account for developments. The projection in this report is no different. Furthermore, while having been calculated for each year in the forecast horizon, our projections should be viewed more as trend over the longer term rather than an indicator of the actual population in any particular year. In other words, they are constructed to minimise the average deviation from the actual but not necessarily any particular deviation. This is important in the context of the current recession which is likely to have an impact on migration and possibly fertility. While migration might currently be significantly different from the assumed level in the model, the probability that it is significantly different over the whole forecasting period is likely to be low.

In this chapter we briefly review the many possible drivers of health care utilisation that have been put forward in Section 2 before outlining the demographic projections from the project (Morgenroth, 2009) in Section 3. In Section 4 we then discuss our methodological approach to combining demographic projections with the analyses of health care utilisation carried out in Layte *et al.*, 2009. In Section 5 of this report we discuss recent

¹ As Report 2: *Demographic Projections for the Period Until 2021* (Morgenroth, 2009) was completed early in 2008, with the projections being finalised late in 2007 before the most recent *Medium-Term Review* was published, it draws on data from the 2005 *Medium-Term Review*.

evidence on trends in population health in Ireland before setting out our own methodology for projecting epidemiological change out to our projection horizon in 2021.

1.2 The Complex Drivers of Health Care Utilisation

The patterns of health care utilisation and pharmaceutical use that we observe in health statistics represent the outcome of the complex interplay of different factors that interact over time. The primary objective of this project is the measurement of the impact of demographic change over the recent past and the projection of this effect into the future, but many other factors are as, or even more important than the changing composition and size of the population. Figure 1.1 below gives some flavour of the complexity of factors that can be said to contribute to overall utilisation.

Figure 1.1: The Complex Drivers of Health Care Utilisation

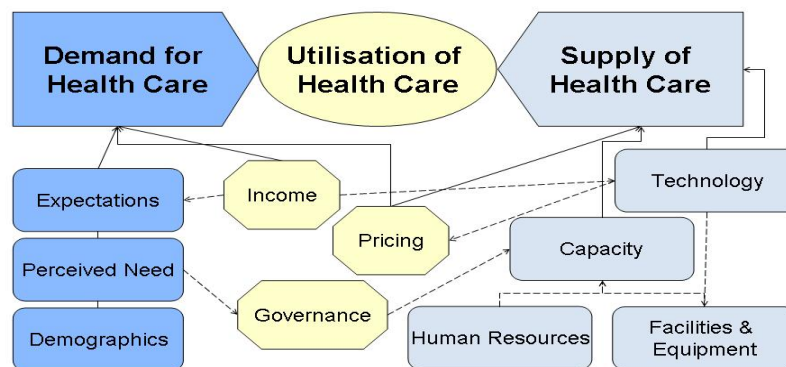


Figure 1.1 is roughly divided into factors influencing the ‘demand’ for health care on the left (e.g. health status and perceived need, demographic factors and expectations) and those influencing the ‘supply’ of health care on the right (capacity, facilities, resources and governance). The first report from this project (Layte *et al.*, 2009) showed clearly that health status and the ‘need’ for health care are important determinants of usage across all areas of health care as shown directly by different measures of health and proxies such as age (use of health care increases strongly with age). Worsening health and the experience of disease clearly increase the probability that someone will seek care, but the relationship is not simple as the decision is mediated by the person’s expectations about the availability and effectiveness of care. Such expectations change over time. Physical symptoms that may have been perceived as a natural part of the ageing process in previous generations are now regarded as treatable and this increases the probability that the person will seek care. Changing expectations increase the demand for health care and thus health care utilisation.

TRENDS IN POPULATION HEALTH STATUS

The changing age profile of the Irish population to 2021 is clearly a central issue of this project, but in assessing the impact of age, we also need to assess the impact of changing health status over time. There is some evidence from studies of older people in Ireland (McGee *et al.*, 2005), the

UK (Cutler, 2001) and the US (Manton, Corder and Stallard, 1997) that levels of disability are falling, reflecting real increases in health status. The recent survey of Health and Social Services for Older People (McGee et al 2005) showed that disability had fallen significantly between 2000 and 2004 among the Irish population aged 65 years or more and evidence on trends in disability between 2002 and 2006 also indicates a downward trend. However, analysis from the Institute of Public Health in Ireland (IPH, 2008) and the National Cancer Registry (NCR, 2006) also shows that other trends such as rates of diabetes and cancer do not appear as positive and this may mean that epidemiological trends are not so positive. We return to the issue of trends in population health and their relationship to health care utilisation in the last section of this chapter.

THE SUPPLY OF HEALTH CARE

The supply of health care is also a very important determinant of utilisation. All health care systems are supply constrained to some degree and in Ireland this is a very significant factor influencing utilisation. This can be seen in the significant waiting lists for many procedures, but can also be seen in the patterns of use in general practice (GP) see (Layte *et al.*, 2009). This showed that GP utilisation is strongly influenced by the pricing structure of GPs in Ireland. Around a third of the population have free access to their GP by virtue of their medical card whilst the remainder of the population pay the GP fee out of pocket. Analyses show that this leads to higher levels of GP utilisation among medical card holders, even controlling for differences in health status and an increase among non-holders as income increases. The fact that current levels of utilisation are constrained is very important for our analyses of future trends as this report will be attempting to quantify the levels of health care required to 2021 given a certain set of demographic changes. The project needs a 'baseline' from which to project future use but in absence of a measure of the 'appropriate' level of utilisation for a given population, most projects of this type fall back on current levels of utilisation as the baseline. This project attempts to get round this problem by examining international levels of care provision and using these as an indicator of the appropriate level of provision. This approach does not entirely circumvent the problem since other countries are also likely to be supply constrained to a certain extent, but it does present a better alternative to the traditional approach.

THE MIX OF PUBLIC AND PRIVATE MEDICINE IN IRELAND

Irish health care services are a complex mixture of public and private provision and financing. This is particularly true in the hospital sector where public hospitals and publicly employed consultant doctors cater for both public and private patients. The intermingling of public and private medicine in Irish hospitals has been driven by the steady increase in the numbers of Irish people with medical insurance which has grown from 4 per cent in 1960 to over 50 per cent by 2003 (Health Insurance Authority, 2003). The overwhelming majority of private medical practice in Ireland is carried out in public hospitals by consultants who have public service contracts which means that data on these activities are contained within the Hospital In-Patient Enquiry System and are thus available for analysis as part of our projection. Private care within private hospitals are not included in our analyses but these activities constitute a small fraction of total discharges within the Irish hospital system.

THE RECIPROCAL RELATIONSHIP BETWEEN SUPPLY AND DEMAND

Although many of the main drivers are represented in Figure 1.1 it cannot represent the complexity of the interaction between the different factors that occur in reality, particularly in terms of the impact of constraints on the supply of health care on patterns of demand. For example, if the availability of many hospital procedures increased it is likely that the demand for these procedures would also increase as the present level of demand is determined to a certain extent by the expectations of patients and doctors about what is available within the system in a practical time frame. It is also true that new technologies and developments can also stimulate demand by making new treatments possible or improving the balance of costs and benefits. Although initially on the right hand side of Figure 1.1, these developments are likely to also stimulate the left hand side increasing overall utilisation.

1.3 Demographic Projections for Ireland to 2021

Report No. 1 from this project (Layte *et al.*, 2009) laid out a detailed analysis of the role of demographic factors in determining health care utilisation and detailed some recent demographic trends in Ireland. Central to this project is the composition of the population in terms of age but the report argued that ageing may not be the primary driver of demand for health care in Ireland. Ireland's population is actually 'ageing' more slowly than many other countries with the proportion aged 65 years or over now the same as it was in the 1960s at around 11 per cent. By 2021 this proportion will have risen to 15.4 per cent (see Morgenroth, 2009), a threshold breached by the UK in 1985 and Germany in 1992. Analyses of trends in health expenditure also suggest that population ageing only accounts for one-tenth of the increase in expenditure experienced across OECD countries between 1970 and 2002. In this respect income growth, changes in medical technology and medical inflation may be more important drivers of expenditure and these operate independently of the age composition of the population.

Layte *et al.* (2009) also showed that other population composition effects may also be important. The rise in the marriage rate among Irish people in the 1970s and 1990s means that the proportion never married is steadily falling and this trend is expected to continue over the coming years. Marital status is a determinant of health with married people generally found to be healthier than non-married, but spouses and children are also an important source of informal care for older and dependent people. Projecting this development to 2021, Morgenroth (2009) suggests that the proportion of those aged 65 years or more living alone in 2021 will remain at the same levels as in 2006: 26 per cent.

Layte *et al.* (2009) suggest that the growing size of the Irish population is particularly important in determining the future demand for health care. Although Ireland suffered long-term population decline for the century following 1851, increased again from the 1960s on and grew particularly strongly between 1996 and 2006 at 1.7 per cent per annum. Between 2002 and 2006 this rate of increase was 2 per cent per year. Population change is the outcome of three processes: fertility, mortality and net migration and each has important implications for the provision of health services. We

look at each of these processes in turn before laying out their impact on demographic change in Ireland to 2021.²

FERTILITY AND BIRTHS

Ireland maintained a high fertility rate until approximately 1980, after which fertility declined markedly (in 1965 it peaked at 4.03). Fertility has been below replacement (2.1) since 1991. There was a further significant decline in fertility in the early 1990s, which was followed by an increase until 2003, but more recently it has been declining again. Considering the period from 1960 to the present, there is a clear long-term downward trend in fertility. Thus, the substantial decline, which was followed by an increase that was not sustained is likely to have been a short-term deviation from that trend. This is likely to be explained by a trend to an increased age at first childbirth, which is reflected in an increase in the average age at childbirth, which rose from 28.5 in 1991 to 30.8 in 2004.³ Indeed, an analysis of age specific fertility rates reveals that the decline in fertility in the early 1990s was primarily driven by a decline in fertility among woman aged 20-29 years for which age specific fertility rates have continued to decline to the present. On the other hand, age specific fertility rates for woman aged 30 to 34 years and particularly those aged 35-39 years have increased. This may be explained by changing economic and sociological factors. The economic factors relate to the marked increase in labour market participation by women, which is in part driven by the increasing educational attainment among females.

There have been a number of interesting developments at the county level. First, crude birth rates have increased over time, but there appears to be some divergence across counties. Second, there appears to be a pattern of lower rates in Western and Northern counties and high rates in the chief commuting counties particularly around Dublin. However, once one calculates the total period fertility rates (TPFR), which indicates the total number of children a woman will have over her lifetime based on age specific fertility rates this pattern changes. While commuting counties have high rates of fertility, counties that contain a large city tend to have lower fertility and a mixed picture emerges for the remainder of the counties. For example, while Monaghan has a low crude birth rate and a low TPFR, Leitrim has a low crude rate but a relatively high TPFR. These patterns are likely to be related to the age structure within each county.

Given the above trends at the national and county level it is possible to derive a number of plausible assumptions. Since it appears that the deviations of the county TPFRs are roughly constant, it appears reasonable to assume that the deviation of the county TPFRs from the national average will remain constant at their 2006 levels. For the projection model the TPFRs were transposed into age specific fertility rates which were then applied to each cohort of women. Because the variation in age specific fertility rates across counties appears to be relatively stable these are

² More detail on fertility, mortality and migration trends plus analysis and projections can be found in the second report from this project entitled: Report 2: *Demographic Projections for the Period to 2021*.

³ Accurate comparisons of the age at first birth are not possible as data for 1991 is only available for first births within marriage (83 per cent of all births) and for mothers aged above 29 years only for age groups rather than single year of age.

assumed to change at an equal rate for each age group, which preserves this pattern. Given these assumptions one requires just an assumption for the national TPF_R in order to derive county level fertility rates. Regarding the national trend two plausible scenarios can be identified from recent trends. First, if one considers only the more recent period then a constant TPF_R would seem plausible (this corresponds to the values for 2006 being carried through until 2021). This is our first scenario, which we term F1, following the terminology used by the CSO. Second, if one considers the slightly longer-term trends then one would expect TPF_R to follow a long-term decline. The second scenario, F2, assumes that TPF_R will decline to 1.65 by 2016 after which it will remain constant.

Under the F1 assumption (which maintains the 2006 age specific fertility rates) the number of births will fall, but not until after 2014 reflecting the decline in the most fertile female age cohorts. With the F2 assumption of declining fertility this decline happens at a much faster rate even though in both scenarios the peak is reached in the same year thus after an initial rise, births fall from 64,237 in 2006 to 62,101 in 2016 to 58,400 in 2021. At the county level interesting differences emerge with Dublin experiencing the largest decline while a few counties such as Roscommon and Leitrim would experience an increase in the number of births, reflecting a different age structure and internal migration pattern. Given recent trends and on the balance of evidence we feel that the F2 scenario is more likely to occur and so we adopt this as our central projection for fertility. In doing so we follow the same path as the CSO who also project fertility to fall (CSO, 2004).

MORTALITY AND DEATHS

The absolute number of deaths occurring within the state has been declining since the early 1990s, with Ireland experiencing a particularly sharp fall in deaths after 1999. Given that there has been population growth during this period, this implies a substantial drop in the crude rate of deaths, which did indeed decline from 9 per 1,000 in 1991 to 6.6 per 1,000 in 2005. There has been a concomitant improvement in life expectancy over the last decade and a half. For males, the life expectancy at birth has increased from 72.3 years in 1990 to 75.1 years in 2002, with further improvements expected over the last four years. Age specific mortality rates have changed dramatically. For example, mortality rates for 55 and 60 year olds has halved since 1986, while that for 80 year olds has improved by a third.

Assumptions about age specific mortality rates are needed for a population projection model. The CSO publish Life Tables, which contain such rates, based on mortality in a three year period around a Census. Comparison of the four most recent Life Tables published by the CSO which cover the periods 1985-1987, 1990-1992, 1995-1997 and 2001-2003 (see Morgenroth, 2009) show quite substantial improvements in age specific mortality rates at all ages but particularly among older age groups. This mirrors similar trends in other developed countries and in this respect it should be noted that life expectancy in Ireland has converged rapidly to the EU-15 average over recent years. The simplest way to project mortality probabilities is to assume that improvements will occur at the historic rate which gives rise to a linear projection. This is the method chosen in the

past by the CSO.⁴ The advantage of this method is that it is simple to implement. The disadvantage is that the results are dependent on the time period that is chosen on which to base the rate of improvement on, and furthermore if there are any non-linearities these cannot be accommodated. Thus, if one suspects that there are cohort effects or that the rate of improvement will gradually decrease due to some limitation, then this linear projection is likely to overestimate the improvements in the long-run. Internationally, research has pointed at a cohort effect where a particular cohort benefits from accelerated improvements in age specific mortality rates that are not achieved by subsequent cohorts. In particular this appears to affect the cohort born between 1923 and 1943 (the 'Inter War Cohort'). Recent research by Armstrong *et al.* (2007) suggests that the cohort effect for Irish males is weak. Nevertheless, the simple trend extrapolation may not be as accurate as alternative methods.

An alternative method to the simple extrapolation is to assume that over the long term the rate of improvement will return to its long-run average which given historic data may be somewhere between 1 and 2 per cent per year. In the interim period the rate of improvement is that pertaining to the recent past. This allows for a non-linearity in the rate of improvement without becoming overly technical. This method has recently been applied to Ireland by Shane Whelan of UCD (see Whelan, 2008). More specifically the long-run rate of improvement is assumed to be 1.5 per cent after 2031 while the rate of improvement between 2005 and 2031 was calculated as a linear extrapolation between the rate of improvement in 2005 and that of 2031 (1.5 per cent).^{5,6} Of course, these tables apply to the national population and clearly local differences in mortality may apply. However, it is beyond the scope of this study to construct Life Tables for each county. Indeed, data limitations would make such analysis exceedingly difficult. Consequently, we apply these national tables at the county level.

MIGRATION

One of the most remarkable features of demographic change over the last 15 years has been the change in the pattern of migration. While there was some positive net immigration in the 1970s this was mostly of returning Irish nationals. In contrast, recent inward migration has been by immigrants with no previous connection too Ireland. Figures (see Morgenroth, 2009) show that immigration trebled from just over 40,000 in 1996 to almost 122,000 in 2006. While almost half of the immigrants in 1996 were born in Ireland and were thus return migrants, this proportion had declined to a fifth by 2006. In 1996, the UK accounted for more than half of all migrants while in 2006 non-EU-15 European countries accounted for 45 per cent of immigrants, and indeed of those a large

⁴ In the last published population projections the CSO projected mortality improvements according to historic improvements over the period 1986 to 2002, with the exception of males aged 20-29 years for whom the improvements over the 1996 to 2002 were applied.

⁵ It has been accepted by the CSO that these projections are superior to their traditional trend extrapolation method and hence the CSO will use these in their next set of population projections.

⁶ Some sensitivity analysis using alternative assumptions shows that over the relatively short forecast horizon to 2021 a range of plausible assumptions yields very similar results, since the size of the cohorts that will be aged over 75 years by the forecast horizon is relatively small.

majority originated in Poland. Another notable fact is that the number of immigrants from African countries has declined significantly since 2002.

Given the finding that the pattern of internal migration has been stable since the substantial changes in the 1990s, it was assumed that these patterns would pertain over the forecast horizon. The slump in the housing market and the recession could impact on this pattern, by altering the relative price of housing, housing affordability and job opportunities across the country. At this point it is not clear what this impact will be. While it may result in a return towards the traditional pattern of internal migration, many of the recent internal migrants will not be in a position to migrate due to negative equity. The age structure of internal migration is also assumed to remain stable over the projection horizon. In general migrants, internal and international are predominantly in the 20 to 34 years age group. Also notable is that international migrants are less likely to migrate with children than internal migrants, which is reflected in the smaller proportion of migrants in the 1-14 years age group. This may either reflect the fact that international migrants are more likely to be single, they have fewer children or that they leave their family in their home country. Overall, few migrants are aged over 65 years. The latter is important since this implies that the number of older persons is essentially independent of migration. On the other hand, while international migrants are less likely to migrate with children given the size of the flows and the age structure (largely younger adults) international migration does have a significant impact on the number of births.⁷

Projections for international migration in this project are based on the ESRI *HERMES* model which takes explicit account of the relationship between economic growth in Ireland, labour demand and international migration. The most recent projections for that model available at the time the population projections were constructed were made as part of the 2005 ESRI *Medium-Term Review (MTR)* (see Fitz Gerald *et al.* (2005). The *MTR* proposed two economic scenarios, a high growth scenario and a low growth scenario. The expectation at the point of publication of the *MTR* was that Ireland would continue on the high growth scenario but make a transition to the low growth scenario at some point due to a deterioration of external circumstances (see Morgenroth, 2009). The two growth scenarios have very different implications for net migration in that a continued high growth scenario would lead to increasing net-immigration while the low growth scenario would have the opposite effect. During 2007 it became clear that the Irish economy was now facing the low-growth scenario, or more likely a recession scenario. The changing underlying economic structure of the Irish economy along with the changing external environment will reduce immigration. Given this, it seems most appropriate to calculate our population projections on the basis of the low-growth scenario.⁸

⁷ By 2021 the difference between the zero net international migration projections and the positive international migration projection regarding births is 7,500 or 15 per cent.

⁸ Given that the *Quarterly Economic Commentary* has since predicted net emigration, a sensitivity analysis was carried out. Allowing for a smooth return to net-immigration as projected by the *MTR*, would reduce the projected population by around 300,000 as compared to the core scenario, but leave the number of persons aged 80 years and over unchanged. However, no firm evidence of significant emigration has yet been published.

PROJECTED OVERALL POPULATION CHANGE

The sections above have outlined the findings from the population projection report for the three drivers of overall population change: fertility, mortality and migration. Two main scenarios were set out for fertility: one assuming unchanged fertility going forward (F1) and one which assumes a declining fertility rate (F2). Similarly, for migration we set out two alternative assumptions: a zero international migration scenario (M0) and a declining migration forecast (M2). As discussed above the M2 scenario was significantly more plausible at the time of preparing the projections than a more bullish high immigration scenario (M1). We also considered the declining fertility assumptions (F2) more convincing and so adopt this combination of forecasts in our core projection (the M2F2 projection). In this section we briefly set out the pattern of overall population change that is expected using M2F2.

Under the M2F2 projection migration remains positive throughout the period to 2021, but reducing over time. With the assumption of falling, but moderating mortality rates and slowly falling fertility to 2016 and then constancy, these developments lead to an increase in overall population of almost 900,000 from 4.24 million in 2006 to 5.1 million in 2021. The level of growth is strongest in the earlier years of the projection as this is when levels of fertility and migration are highest. Thus between 2006 and 2011 population growth averages 2.3 per cent per year, with the level moderating to 1.7 per cent per year 2011-2016 and 1.4 per cent 2016-2021. If migration were to fall to zero in the early stages of the projection horizon overall population growth would moderate to almost half a million (4.71 million) but other population trends would continue.

POPULATION TRENDS AT COUNTY LEVEL

We see increases in population in all of the 26 counties between 2006 and 2021 although rates differ substantially. Continuing the trend of recent years the growth of Dublin will slow to 2016 and then reverse leading to a small decrease in population between 2016 and 2021. This reflects the assumption of an unchanged internal migration pattern from that pertaining to the period from the late 1990s to 2006, which saw substantial internal outmigration from Dublin, particularly to the surrounding counties. Given the assumption of declining international immigration, which went disproportionately to Dublin, the loss of population through internal migration is compensated for at a decreasing rate. Consequently, Dublin is the only county projected to experience a year-on-year decline in population during the period to 2021 although there will be overall growth between 2006 and 2021.⁹ On the other hand, Meath is projected to experience the largest increase in population over the period with an increase of 61 per cent between 2006 and 2021 followed by Laois, Cavan and Wexford with growth rates of 48 per cent, 44 per cent and 39 per cent respectively. At the other end of the spectrum Dublin has the lowest rate of growth between 2006 and 2021 at 8 per cent preceded by Kerry and Sligo at 13 per cent.

⁹ It is important to note that projections are not plans. They are based on past trends and policies. If the circumstances change or appropriate policies to shift the internal migration pattern back to the traditional pattern were enacted then a very different outcome would be expected.

In terms of the age structure of the population, Table 1.1 shows that population distribution is projected to change significantly in the period to 2021 with the proportion in the younger age groups set to decline whereas the proportion over age 50 years will increase. The number of under 5s in the Irish population is set to fall both absolutely (by 32,000) and relatively (by 1.2 per cent). The proportion aged between 15 and 49 years will fall even more strongly over the period from 53 per cent of the population to 48 per cent. On the other hand, the proportion of those aged 65 years or more will increase from 11 per cent to 15.4 per cent with the proportion in the oldest age group, those aged 85+ years increasing from 1.1 per cent to 2.1 per cent. Although a small increase in overall population terms this increase represents almost a doubling of the number aged 85+ years from 63,000 to 105,900, an increase of 42,900. One striking feature of the projection is that the number of older people in the population would rise significantly even without the projected improvement in mortality rates. Another important feature of note is that the number of older Irish people is almost entirely independent of the migration assumption since there is essentially no international migration among the older groups. Consequently, even high immigration leaves the totals of those aged over 65 years, almost unchanged over the projection horizon. Of course, if this horizon were extended then international migration would impact on the number of older people.

Table 1.1: Current and Projected Distribution of Population Across Age Groups 2006-2021

Age Group	2006	2011	2016	2021
	%	%	%	%
0-4 years	7.1	7.2	6.6	5.9
5-14 years	13.3	13.1	13.3	13.0
15-49 years	53.1	51.7	49.8	48.0
50-64 years	15.4	16.1	16.8	17.8
65-74 years	6.2	6.7	7.7	8.5
75-84 years	3.7	3.8	4.1	4.8
85+ years	1.1	1.4	1.7	2.1
Total	100.0	100.0	100.0	100.0

POPULATION TRENDS BY HEALTH SERVICES EXECUTIVE AREA

Analyses by county show very similar trends in the distribution of age groups across the projection horizon, across all counties with younger age groups declining as a proportion of the population and older age groups increase. The decline in the proportion of younger age groups is particularly marked in the southern and western counties of Ireland, whereas the decline in the 15 to 49 year age group will be more strongly felt in Dublin and the surrounding counties. If we translate these developments into Health Service Executive (HSE) Regions, this leads to the patterns that can be seen in Table 1.2.¹⁰ This shows fairly uniform developments across the HSE regions in terms of the decrease in the proportion accounted for by younger age groups and increase in proportion associated with older groups. As stated above, the fall in the proportion in younger age groups is

¹⁰ This is not a trivial exercise as the two HSE regions for Dublin cannot be directly mapped onto the existing county. The population of Dublin city was divided at the river Liffey and the populations attributed accordingly.

higher in the Western and Southern HSE regions whereas the proportionate increase in those aged 65+ years is fairly uniform at around 4.4 per cent across regions. The increase in the proportion of those aged 85+ years, is fairly uniform across HSE regions at just under 1 per cent between 2006 and 2021.

Table 1.2: Distribution of the Population by Age Group by HSE Region 2006-2021

	Dublin North-East			
	2006 %	2011 %	2016 %	2021 %
0-4	7.2	7.3	6.6	5.7
5-14	12.9	13.1	13.0	13.2
15-49	55.1	53.4	51.1	48.9
50-64	14.6	15.3	16.2	17.7
65-74	5.7	6.2	7.2	8.1
75-84	3.4	3.5	3.8	4.5
85+	1.0	1.2	1.5	1.9
Total	100.0	100.0	100.0	100.0
	Dublin Mid-Leister			
0-4	7.3	7.5	6.8	5.9
5-14	13.0	13.1	13.6	13.5
15-49	55.2	53.1	50.6	48.4
50-64	14.7	15.5	16.5	17.8
65-74	5.6	6.1	7.2	8.2
75-84	3.3	3.4	3.8	4.5
85+	1.0	1.2	1.5	1.8
Total	100.0	100.0	100.0	100.0
	Southern			
0-4	7.0	7.0	6.4	5.9
5-14	13.6	13.2	13.1	12.7
15-49	51.4	50.4	48.8	47.3
50-64	16.1	16.7	17.3	17.9
65-74	6.7	7.2	8.2	8.8
75-84	4.0	4.1	4.5	5.2
85+	1.2	1.5	1.8	2.2
Total	100.0	100.0	100.0	100.0
	Western			
0-4	7.0	6.9	6.3	5.9
5-14	13.6	13.2	12.9	12.5
15-49	50.7	50.0	48.8	47.3
50-64	16.3	16.9	17.2	17.7
65-74	6.7	7.2	8.3	9.1
75-84	4.2	4.2	4.5	5.2
85+	1.4	1.6	1.9	2.3
Total	100.0	100.0	100.0	100.0

THE INTERACTION OF DEMOGRAPHIC CHANGE AND HOUSEHOLD COMPOSITION

A very important determinant of the demand for health care and long-term care in particular is the nature of housing structure. Morgenroth (2009) shows that the number of households in Ireland has increased strongly over time from 1.03 million in 1991 to almost 1.5 million in 2006. Over the same period the average size of households shrank from 3.34 to 2.81 people. Our projections suggest that the average size of households will continue to fall to around 2.45 by 2021. However, overall household size is actually of less significance for health service provision than the proportion of older persons that live alone. The proportion of older persons living in

non-private households has remained constant at 10 per cent since 1991 with the proportion among men stable and the proportion among women falling marginally. With an increasing proportion of men surviving into older age it may be that the proportion of women living alone in older age will actually decrease over our projection horizon as more couples remain intact. The increase in the marriage rate in Ireland over time means that couples are also more likely to be together in older age rather than living separately. This has important consequences for the requirement for both residential and community long-term care. If more couples remain together in older age they are more likely to be able to support one another as physical and mental capacities decline leading to a smaller requirement for care.

1.4 Projecting Health Care Utilisation to 2021

The central aim of this report is to apply the demographic projections discussed above to the patterns of health care utilisation and growth trends set out in the first report from this project (Layte *et al.*, 2009a). As there, the projection will be carried out across five areas of health care: primary care, hospital outpatient services, inpatient discharges and day patients/procedures, pharmaceuticals and long-term care. This requires four steps. First, current patterns of health care utilisation for each service area are derived from national statistics and disaggregated by age group and sex where the latter proves to be an important determinant of utilisation. In the second step, trends in utilisation are identified using data for at least the last five years. In the third step, the projection is carried out by combining our projections for demographic change disaggregated by age and sex groups with current patterns of utilisation by service area with the growth trend for the recent period. In the fourth and final step the utilisation projection is inflated to take account of other processes such as epidemiological factors (trends in morbidity) and health demand (as a consequence of income trends and technological change). This approach is used in all chapters except that on hospital inpatient care. Here recent work by PA Consulting for the HSE which was published in the report entitled the *Acute Hospital Bed Capacity Review: A Preferred Health System for Ireland to 2020* (PA Consulting Group 2007a) has already carried out a projection of hospital inpatient discharges and bed days that is almost identical to the work to be carried out in this report. Rather than replicate this work we choose instead to adopt the PA analyses of acute hospital discharges and use this chapter to explore the demand and supply side factors within acute public hospitals which influence the level of day case activity and inpatient length of stay. Increasing the level of day case activity and reducing inpatient length of stay are essential if the HSE's strategy of moving toward an 'integrated health system' (PA Consulting Group, 2007a) in Ireland is to succeed (we refer to this as the 'preferred health system' or PHS). We examine evidence from the Hospital In-Patient Enquiry system on the extent of change which could be achieved.

DELINEATING SPECIFIC PERIOD EFFECTS

In assessing the trends in each health area it is necessary to separate specific period effects from longer-term trends in utilisation. A good example of this is in the area of pharmaceutical prescribing (see Chapter 5) where changes in treatment practice between 2000 and 2006 led to steep positive trends. The rate of growth in this period was 250 per cent higher than in the preceding decade and we would expect that this growth trend would not continue, although the absolute level of activity would of course remain

higher.¹¹ In this instance we use longer-term trends as the basis for the projection. Another important period effect is the growth in personal and household income which occurred in the previous decade. This significantly increased the demand for health services in part because rising incomes led to rising expectations about the possible benefits of health care, but also because the proportion of the population with health insurance rose steeply over the period. Health insurance increases access to health services for elective procedures by bypassing public queues and this increases the likelihood of seeking care. Separating these trends from overall growth trends is more difficult and depends largely upon the availability of data on service use, medical insurance and income levels. Where data were available analysis of trends was undertaken.

The recent downturn in the economy may also present difficulties for the projections in this report. We have already discussed previous research in the Irish context that suggests that controlling for a large number of other characteristics, individuals with a medical card are significantly more likely to visit their GP. The recent increase in the rate of unemployment will also increase the number eligible for a medical card and this could lead to an increased demand for primary care services and GPs in particular. This trend may also be exacerbated by an increase in the need for care among the unemployed as research both in Ireland and internationally shows that the experience of unemployment has a negative impact on health. However, a worsening employment situation can also decrease the requirement for residential and community care as people (overwhelmingly women) who withdraw from the labour market are more likely to be able to provide care for sick and disabled others.

INTEGRATING CHANGING HEALTH POLICY AND ACCESS

In some chapters we will also be examining the implications that changes in health policy or the availability of supply have for the delivery of health care. As explained earlier, analyses of trends in current utilisation are limited because it is not possible to ascertain whether current utilisation is constrained to a greater or lesser extent by the supply of available medical services. To get round this some chapters apply different projections based on the assumption that the supply of services or access to those services changes. A good example of the latter would be if GP services were made available to the entire population on the same basis as for those with a medical card. Research suggests that this would increase levels of utilisation significantly. Projections including such changes in supply will follow the central projection of the impact of demographic change.

¹¹ A similar trend could be observed in day and inpatient care in hospitals where rates of discharges increased more steeply in the late 1990s.

1.5 Projecting Epidemiological Change

Earlier on in this chapter we discussed the impact that an individual's health status has on their probability of seeking out and using health care and the fact that some evidence has suggested that levels of disability in the population are falling. The importance of epidemiological factors means that it is necessary to make some assumptions about their development when projecting health needs to 2021. Unfortunately, such a task is not simple as different indicators can yield different trends and relationships between health and use of health care are by no means simple. For example, it is essential to make a distinction between diseases and disabilities. As Crimmins (2007) has argued, whereas the prevalence of a large number of diseases is increasing, the prevalence of disability may be decreasing. These paradoxical trends are possible because the increased detection of some diseases over recent decades has not necessarily led to an increase in disability as improvements in health care, lifestyle, medical technology and the built environment have meant that many diseases are less severe and impact less on function. The task of projecting the impact of disease and disablement on health care utilisation is made more complex by the fact that different diseases have different effects on use of GPs, hospitalisation, long-term care etc. For example, The World Health Organisation has estimated that up to 80 per cent of GP consultations and 60 per cent of hospital bed days related to chronic diseases (Singh, 2008) such as diabetes, cardiovascular disease and chronic obstructive Pulmonary Disease. However, these diseases and other chronic conditions do not tend to be the primary cause of transition into long-term residential care. Analysis of the National Disability Survey carried out for this report (see Chapter 6 for more detail) show that those individuals aged over 65 years who report 'severe disabilities' (in effect this means that they cannot do everyday activities "at all" or experience a lot of difficulty in doing so) in the categories of speech, remembering and concentrating, intellectual and learning, or emotional, psychological and mental health have the highest probability of being resident in communal care (nursing homes and long-term care hospitals).

The difference in the impact of chronic and acute illness compared to disability on different areas of health care means that we chose to adopt a two-pronged approach. For the chapters on primary care, outpatient services, inpatient services and pharmaceuticals we constructed an epidemiological measure of trends in acute and chronic illness. For the chapter on long-term care on the other hand we carried out detailed analyses of data sources on trends in disability.

EPIDEMIOLOGICAL PROJECTIONS FOR TRENDS IN CHRONIC AND ACUTE ILLNESS

We were aided in the task of creating epidemiological projections for the period to 2021 for chronic and acute illness by the fact that the recent report on acute bed capacity (PA Consulting Group, 2007b, pp. 80-82) had already brought together a database of projections for particular diseases that could act as a template for our own analyses. The PA report combines projections on four disease areas:

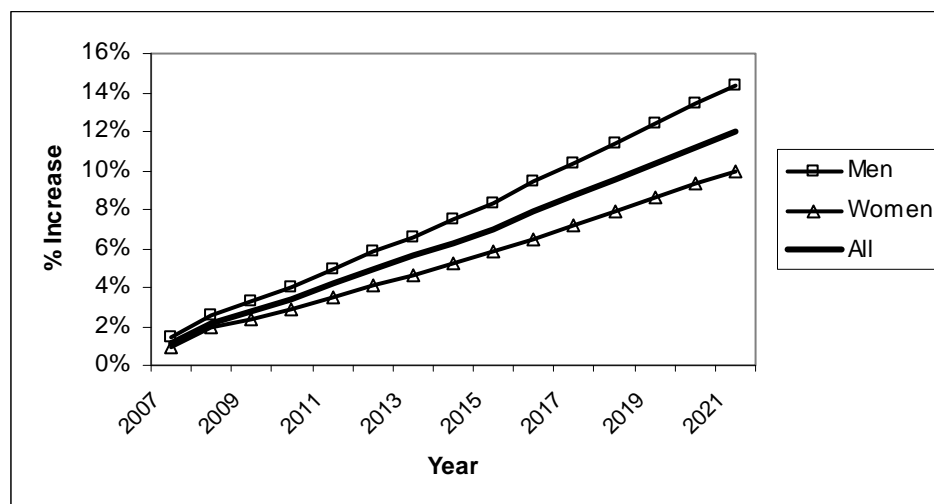
- Diabetes (from the Irish Population Health Observatory and the Institute of Public Health in Ireland).
- Cancer (from the National Cancer Registry of Ireland).

- Cardiovascular disease (hypertension, ischemic heart disease & stroke – from the Irish Population Health Observatory and the Institute of Public Health in Ireland).

In the PA report these different projections are combined by translating the incidents or cases of the disease into a volume of admissions for the appropriate disease groups. The volume of admissions is then combined over the period from 2005 to 2021 to give a yearly inflator for epidemiological change that can be applied to any health care sector. Unfortunately, the PA projections were not disaggregated by age group thus a single inflator is applied across age groups. This is clearly not ideal since disease prevalence may be changing at very different rates across age groups but the simplification is unavoidable. It is also very difficult to know whether this set of indicators gives a reliable measure of the impact of epidemiological change on the different areas of health care.

Figure 1.1 shows the results of the analyses of epidemiological change. The overall pattern is one of increasing disease prevalence across the period with the overall rate increasing by 12 per cent between 2007 and 2021. The increase in prevalence is larger for men than women with the former expected to experience an increase of 14 per cent compared to 10 per cent among women. Decomposition of the increase shows that a large proportion of the change, around 80 per cent comes from projected increases in cancer prevalence and particularly prostate, liver, kidney and breast cancers. As most cancers occur in those over the age of 65 years, lack of disaggregation by age group could underestimate the extent of increase.

Figure 1.2: Projected Increase in Morbidity 2007-2021



Source: Own analyses of PA Consulting Group (2007b).

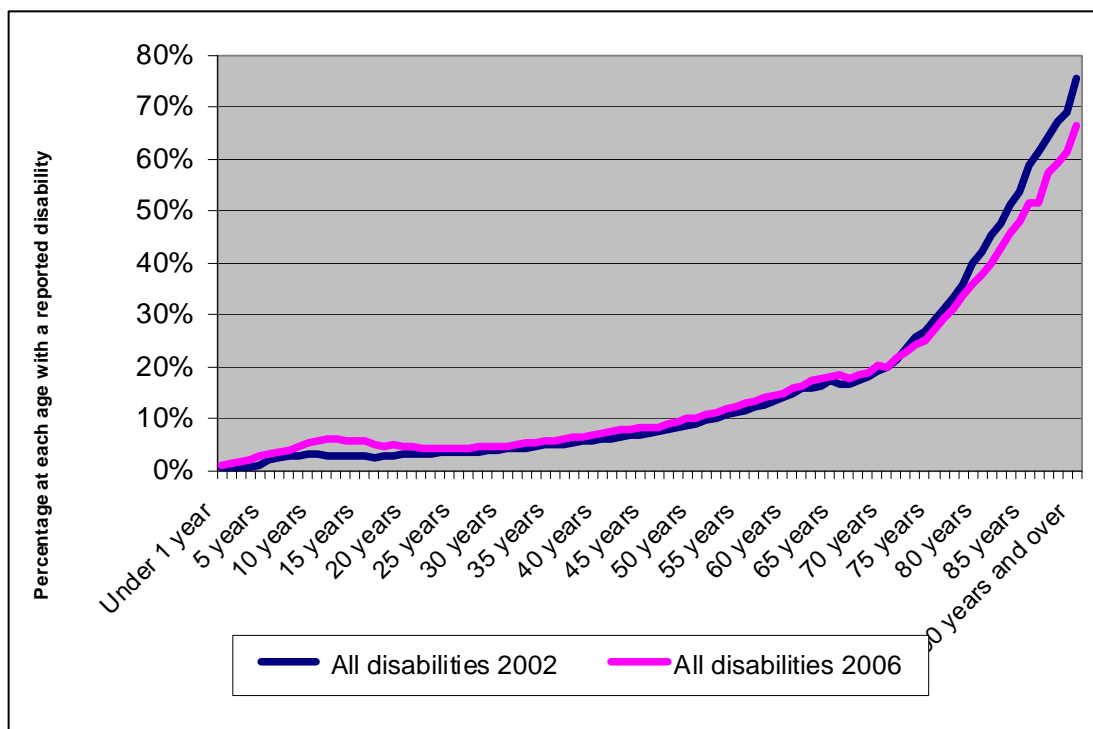
EPIDEMIOLOGICAL PROJECTIONS FOR TRENDS IN DISABILITY

Severe disability is generally considered a reasonable proxy for the need for long-term care, thus defining and measuring disability is important in assessing LTC demand (Schulz, 2004). A central question for planning health and social services is whether increased life expectancy will be

matched by increased years lived in good health. In the international literature, theorists have suggested three possible outcomes: first, that morbidity and disability rates remain the same at specific ages so extended lifespan is associated with extended morbidity; second, poor health and disability appear at later ages but the extension of lifespan has an upper limit leading to a compression of morbidity; third, both average lifespan and age of onset of poor health or disability continue to extend, leading to deferral of disability.

Although the balance of opinion currently supports this third view, cross-country evidence is mixed (Fogel and Costa, 1997; Manton and Gu, 2001; Cutler, 2001; OECD, 2007). Even if disability is deferred, the critical question for LTC demand is whether this deferral is of equal, greater or lesser duration than extended life expectancy, accordingly keeping constant, decreasing or increasing LTC demand relative to the population of older people. The first comprehensive, longitudinal evidence on national disability trends has been supplied by the Census of Population of 2002 and 2006 and supports an optimistic view of the evolution of disability in Ireland. The 2006 National Disability Survey provides data on the incidence of severe disability by age.

Figure 1.3: Percentage of Population with a Disability by Year of Age, 2002 and 2006



Source: *Census of Population Disability Volumes, 2002 and 2006.*

Although *Census 2006* records disability in the overall population at 9.3 per cent compared to 8.3 per cent in *Census 2002* and increased overall disability prevalence in every year of age up to 71 years, it shows reduced prevalence in every year above 71 years. An expansion in 2006 of specified long-lasting disabling conditions is suggested as sufficient explanation for the increase in disability recorded in the population overall.

Such changes in the Census questions do not explain the reduced prevalence of disability at higher ages in 2006. For conditions where the

Census questions remain unchanged, such as impairments of sight and hearing, while there is a marginal drop in disability prevalence overall and in most younger ages, this becomes more marked as age increases. In the case of conditions that substantially limit basic physical activities, there is also an overall decline in disability. Other measures of disability that show similar declines in age-specific prevalence, which broadly increase with greater age, are difficulty in: learning, remembering or concentrating; dressing, bathing or getting around inside the home; or going outside the home alone to shop or visit a doctor's office.

These reduced disability rates at older ages between 2002 and 2006 are important trends in projecting future LTC demand. This improvement is not unexpected given improved life expectancy (Morgenroth, 2009) and could be attributable to many factors: growth in income per capita; improved educational attainment; and improved access to and greater investment in health and social care. In this report the evidence from the two Censuses is employed to construct a range of disability rate forecasts for 2007-2021 which in common with other studies of future LTC demand (Wanless, 2002; Department of Social and Family Affairs, 2002), employs a range of assumptions about the evolution of disability (see Chapter 6).

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