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RECENT TRENDS IN MORTALITY AND MORBIDITY IN IRELAND

CHANGING MORBIDITY PATTERNS IN IRELAND 1996-2006

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***Abstract*:** The aim of this study is to examine changing patterns of morbidity (and healthcare utilisation) in Ireland and consider the impact of these changing patterns on the need for health services using health insurance data. This analysis is set in the context of a corresponding significant reduction in mortality rates over the period. Using inpatient hospital data from a large health insurer, which covers nearly 40% of the population, the changing pattern of morbidity is analysed by age, gender, and geographic area of residence for the years 1996-2006. Morbidity is measured using the *International Classification of Diseases* standard - Version 9 (ICD). The analysis shows that despite an improvement in mortality, not only has the rate of hospitalisations not correspondingly reduced but also the morbidity rates of the population have not reduced. The results confirm that the population is receiving more medical treatment than before even though mortality has improved. This may be as a result of better access to health services, a worse incidence of ill-health within population, better detection of illness or a combination of all of the above. Either way the changing utilisation pattern suggests that in establishing a policy for resource allocation for health services many factors need to be considered, many of which are not measurable and confirms that increasing life expectancy may come at a significant economic cost in terms of the increased resources that may be needed in the health system.

Keywords: Mortality, Morbidity, Resource allocation, Health insurance
JEL Classifications: J11, J14

1. INTRODUCTION

1.1 Background

In Ireland, since the year 1980 standardised mortality rates have reduced significantly. It is estimated that the Standardised Mortality Rate in 2005 was approximately 60% of what it was in 1980 [1]. This improvement in mortality is consistent with international experience but also exceeds that of

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comparable countries [2]. The causes of the improvements are uncertain but, perhaps result from advances in medical technology, better access to medical services - including the earlier identification of the need for health services (diagnostic services) - and improvements associated with healthier lifestyles being adopted.

Of course, what is also relevant for Ireland is the impact of recent prosperity on mortality and health and well-being. The impact of this is difficult, if not impossible, to measure but it is most likely to have reduced mortality rates. The evidence from the years 1996 to 2005 is that the rate of improvement in mortality increased more than for the previous ten years [2]. This is perhaps an indication of the correlation between improved mortality and economic growth as during the same period the economy grew significantly.

The improvement in mortality rates differs significantly by cause of death and these differences have been identified in previous studies [1]. Furthermore, the linkages between the mortality and morbidity are clearly very direct and some studies have commented on the importance of considering both changing mortality and morbidity patterns [3]. However, compared to mortality, relatively little analysis has been undertaken of how morbidity has changed both aggregately and by individual disease category. This paper explores the changing pattern of morbidity, using data from a significant proportion of the population. The population group represent the majority of persons who have private health insurance. The limitations of using data from this group of the population are explored in Section 2.1.

It considers the implications of these changing patterns for health policy in Ireland. It comes in the context of considerable debate around the need for additional resources to meet the demands for health care of the population.

Of secondary analysis in this study, but nonetheless of tremendous importance, are the different types of hospital settings where treatment is delivered. Some preliminary observations are made that record the change in mix of hospital settings that are used to provide treatments for each morbidity episode. This allows us to consider the change in resources required to treat morbidity within the population.

1.2 Context for Discussion

In considering the causes of the utilisation of hospital services it is useful to understand the main categories of diseases treated within the Irish population and their relative importance compared to causes of death. Table 1 shows that a significant proportion of morbidity is caused by either digestive, cancer or circulatory conditions (13.5%, 11.1% and 10.8% respectively). Aside from digestive diseases, which are not a significant cause of mortality, the other two rank as the two most significant causes of mortality.

Table 1: Causes of Death in Ireland, 2006 (CSO)

Category of Disease	Proportion
Cancers and neoplasms	11.1%
Certain conditions originating in the perinatal period	0.6%
Conditions relating to pregnancy, childbirth and the puerperium	6.1%
Congenital malformations and chromosomal abnormalities	1.0%
Diseases of circulatory system	10.8%
Diseases of digestive system	13.5%
Diseases of the blood(-forming organs)/ immunol.disorders	0.8%
Diseases of the genitourinary system	8.8%
Diseases of the musculoskeletal system/connective tissue	10.5%
Diseases of the nervous system and the sense organs	7.2%
Diseases of the respiratory system	2.1%
Diseases of the skin and subcutaneous tissue	6.7%
Endocrine/ nutritional and metabolic diseases	2.3%
Infectious and parasitic diseases	2.7%
Injury and poisoning	5.4%
Mental and behavioural disorders	1.6%
Symptoms/ signs/ abnormal findings/ ill-defined causes	8.8%

2. METHODS AND DATA

2.1 Data and Period of Analysis

For this study, morbidity and hospital admission data was taken from the records of a large health insurance entity for the years 1996 to 2006. While data for 2007 was available, given that not all of hospital inpatient episodes had been reported to and settled by the insurer as of the date of analysis, it was not considered appropriate to use this data.

Thus, we are using the experience of the voluntarily insured population, of this insurer, as a basis for drawing conclusions for the entire population. In considering whether this is reasonable it should be noted that the insurer covers a very significant proportion of the population. Table 2 shows the proportion of the entire population covered by this insurer for each year of analysis.

Table 2: Size of Exposed Population (millions)

Year	Sample Population	Overall Population	% of Population
2006	1.53	4.23	36.2%
2005	1.52	4.13	36.8%
2004	1.52	4.04	37.6%
2003	1.51	3.98	37.9%
2002	1.50	3.92	38.3%
2001	1.47	3.85	38.2%
2000	1.44	3.79	38.0%
1999	1.41	3.74	37.7%
1998	1.37	3.70	37.0%
1997	1.33	3.66	36.3%
1996	1.33	3.63	36.6%

Source: VHI Healthcare, CSO

The question as to whether the morbidity experience of the members of the population who have private health insurance is appropriate needs to be considered. We know that the socio-economic profile of those who take out private health insurance is somewhat better than those of the general population and is more heavily weighted to the higher socio-economic classes. Insofar as the socio-economic status affects the underlying health of the population this variation in the profile will therefore be reflected in the underlying morbidity experience of the sample.

There are other reasons why the experience of privately insured persons may not be reflective of the underlying experience of the entire population. First, the insurer from which the experience comes has a disproportionate share (even on an age-gender standardised basis) of claims for the insured population. [4] Second, members of the population with private insurance have potentially better access to health services that those without insurance. Indeed, various studies [5,6,7] have recorded the fact that one of the principal reasons for purchasing private health insurance is to provide better access to health services. In addition as already stated, given its voluntary nature and the fact that those below a given income threshold are to entitled to universal coverage through the medical card system, the take-up of private health insurance is disproportionately weighted toward those in higher socio-economic groups.

2.2 International Classification of Disease

All of the data was classified using the International Classification of Diseases (ICD) coding system. This is a system of coding published by the World Health Organisation that categorises diseases according to a prescribed coding system. The system allows easy comparison of mortality and morbidity statistics between countries and between time periods. The system is revised periodically and ICD version 10 is the most recent published version. The data used for the purposes of this study is the ICD-9 CM version which is easily comparable with that used until recently by the CSO. The CM refers to the Clinical Modification system. This allows an easy categorisation of the clinical status of a patient and it is used frequently for morbidity analysis.

The ICD-9 coding system has approximately 1,000 different codes (and many sub-categories below this) and this makes meaningful analysis very complicated to undertake. To summarise the data, individual disease categories are summarised into approximately 47 categories which correspond the classifications used the by the CSO for analysis of mortality. This full list is provided in Annex 1.[1]

2.3 Data sources

Data was available for all hospital related treatment received by members of the insurer from 1996 to 2006. This meant upwards of approximately 4.5 million hospital admissions were included in the analysis. These included both inpatient and day patient hospital stays. For some admissions multiple diagnoses were allocated to a patient and this meant that some patients had two or more ICD-9 codes attached to their hospital admissions. Thus, not only was the principal diagnosis included in the analysis but also any supplementary diagnosis which arose during the course of a patient's treatment for this primary diagnosis.

The analysis of the data from the public hospital system (the Hospital Inpatient Enquiry System - HIPE) has historically analysed only the primary diagnosis. Many other international studies also ignore secondary diagnosis. The logic for this is, in part, to ease analysis and concentrate on the more serious categories of illnesses. However, it was felt that to provide a more detailed outline of the underlying health of the population it was preferable to include the secondary diagnoses.

The nature of the ICD-9 system is such that if treatment, for certain diagnosis, was required in a subsequent hospital visit (for example, investigations, radiotherapy and chemotherapy) this would be likely to get coded as a supplementary contact with the health service. Therefore, by excluding these codes only the underlying disease gets counted in the results. Such an approach was adopted for this dataset.

The dataset included treatments received not only in public hospital institutions but also in private hospitals where a significant proportion of privately insured persons get treatment. Clearly this raises theoretical issues, at least, about the influence of access to hospital services on morbidity rates. It could be argued that, while underlying morbidity rates are higher than otherwise because of better access, morbidity rates reflect actual morbidity.

2.4 Use of Hospitalisation data as measure of Morbidity

The study ignores morbidities outside of the hospital system and this could be considered a limitation of the study. However, hospital services represent a significant proportion of all treatment funded within the Irish health system. This can be seen as follows:

1. In 2006, €5.4 billion was spent on the costs of running public hospitals by the State out of a total non-capital health budget of €12 billion [9]. This ignores the cost of private hospital health services and out of pocket hospital expenditures.

[1] A full overview of the ICD system is provided in a number of publications. A reference is given for a particularly good publication [8]

2. Household budget survey estimates suggest that hospital and associated care represents over 50% [11] of the typical amount of income spent on health care.[2]
3. Private insurance largely pays for the costs of hospital services and total premiums within the market for 2006 were in excess of €1.2 billion. [10].

Given this, it can be argued that while morbidity episodes for which treatment is received in a hospital setting is not a complete representation of all morbidity episodes analysing such episodes provides a good profile of where a significant proportion of health resources are used.

2.5 Assumptions/Adjustments to data used

A number of adjustments and assumptions were made to allow the analysis to be made. In this regard the following should be noted:

1. Age was calculated as at the start date of the review for each year. The data was classified using the age bands used by the Central Statistics Office (CSO). It is felt that given the changing pattern of health service utilisation by age these age bands are quite broad but to allow a comparison with mortality experience as recorded by the CSO these age bands were retained for the current study;
2. Treatment received in public hospital beds where no consultant charge was raised did not have an ICD code and was consequently ignored from the analysis. This arises in a very small proportion of cases and most often for cases where over-night observation was required for the patient anyway and it therefore has limited impact upon the results;
3. It was not considered that each hospitalisation represented one episode of illness in all cases. In many cases, it is clear that multiple hospitalisations are for different episodes of illnesses. For others, the treatment is coded as follow-up treatment for a previously identified disease, e.g. Radiotherapy. However, as already stated for these cases the follow-up treatment does not get coded with an ICD9 diagnosis code.

To calculate an incidence rate, base morbidity numbers and average membership were combined for each period of analysis to calculate the average morbidity rate per person. In calculating the average membership an actuarial exposed to risk method was used using data from multiple periods of the year.

The data was generated using the Oracle computer database and was subsequently analysed using the Statistical Analysis System (SAS). Incidence rates were calculated as the estimated number of episodes for that class of disease divided by the estimated exposed to risk membership.

2.6 Influence of Demographic and Others Factors on Morbidity

In analysing the experience it was necessary to consider the demographic and other factors that could have a significant impact upon morbidity. The factors used were objectively determined as being worth investigating. The principal criteria was that significant homogeneity in morbidity was explained by the factor in question and that sufficient data was available in each risk cell (categorised by that risk factor) to allow sufficiently detailed analysis to be considered.

[2] This is based upon approximately €16 being spent on hospital care (including net private health insurance contributions) out of a total health expenditure of €31.85 per week on healthcare. Healthcare expnditure includes many ancillary health products which are non-therapeutic.

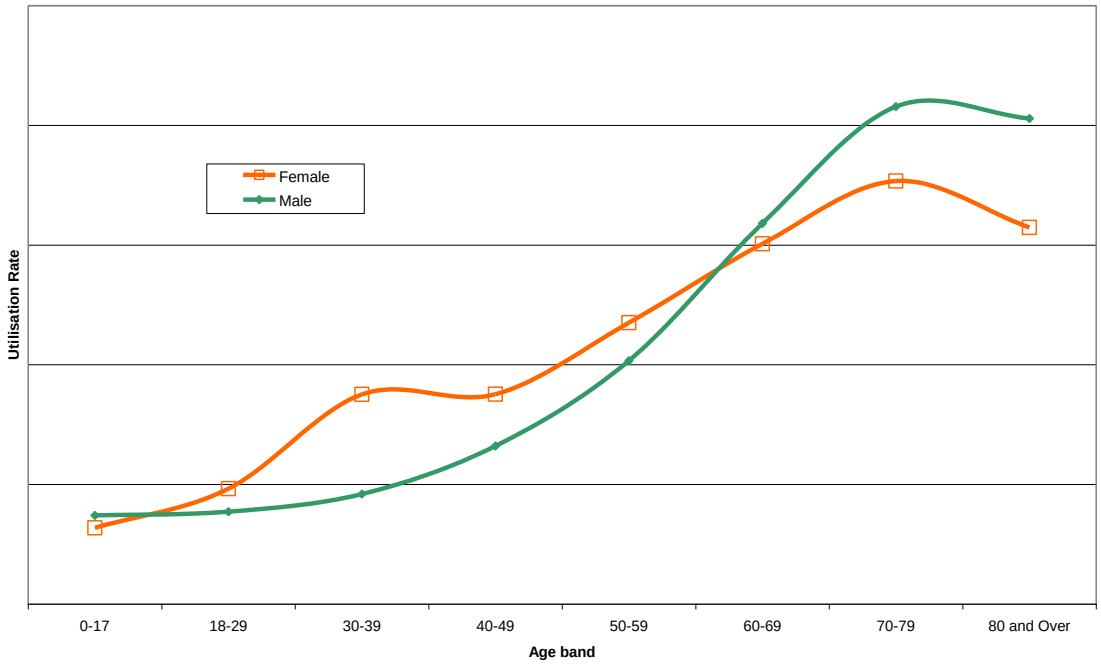
It is important to note that these criterion are clearly are linked together. For example, certain diseases are more likely to be present not only in males compared to females but also at different levels for different age groups.Some of the demographic and non-demographic factors that were considered for the analysis are briefly discussed below.

2.6.1 Demographic factors
Age

Many studies have identified age as a predictor of ill-health and mortality. [12,13] Age appears to be a good predictor of health service utilisation aggregate level. Thus, we can say that older persons use significantly more health care than younger persons. However, attempts to use only age as a measure of the underlying health status of individual person have shown it to explain only a small part of the variation in risk [14]. Notwithstanding this, age is the primary factor affecting the demand and use of health services at an aggregate level and is used here.

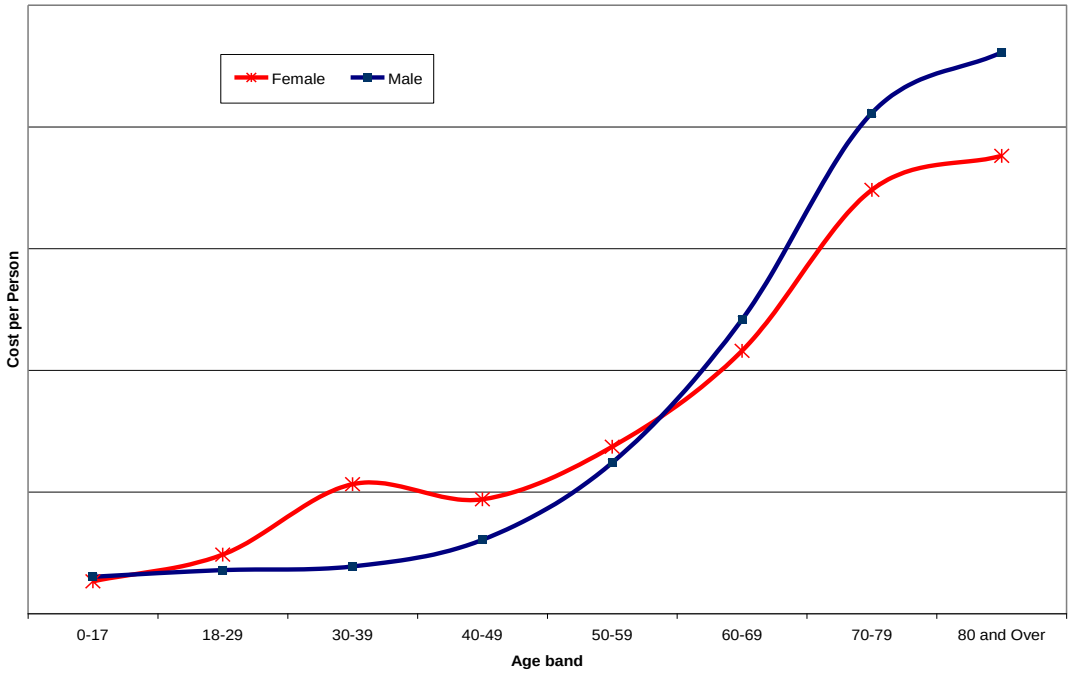
It is also important to understand that not only is age a significant determinant of use it is also a significant determinant of the intensity of use. Chart 1 presents a curve of the utilisation of hospital services by age while Chart 2 presents the cost data for same utilisation. Though it is not easy to see given the differing scales of the charts, the two charts when compared demonstrate that the impact of morbidity at older ages is more costly[3] and therefore, preventing and postponing the onset of illness to older ages can be a significant contributor to containing costs within the health system.

Chart 1: Utilisation of Hospital Services by Age and Gender



[3] The best way to see this is to consider the relative positions of the different curves for a 20-year old and a 80-year old.

Chart 2: Average Cost per Person by Age and Gender



Gender

As shown in Charts 1 and 2 morbidity varies significantly between males and females. For example, the incidence of certain cancers is known to be significantly different for males and females. Men tend to get sicker earlier in life and then die while female life expectancy is longer but even though they live longer their consumption of health services over the lifetime (excluding maternity) costs less.

Influence of geographical area

Given the relative size of the country it is unclear how geography (area of residence for the purposes of this analysis) affects the underlying morbidity rates of the population. The influence can be hypothesised to occur in a number of ways:

1. One's area of residence can mean that one has different levels of access to certain services. This may affect the underlying rate of morbidity within the population in that treatment is not available readily, if not at all, and therefore a person's health suffers. It may also impact insofar as a person may choose not to travel to get treatment in the first instance.
2. It can impact more directly on the underlying morbidity of the population as exposure to certain environmental factors may encourage the onset of a particular disease (e.g. cancer and power lines).

The dataset that was used for this study was coded by individual electoral district for the later years of analysis (2004-2006). This is the lowest level of geographic coding in Ireland. However, given that there are over 3,400 such geographic zones the level of detail was not sufficient to allow analysis by this factor. Instead, data was first grouped at county level and used for analysis.

However, as the size of the individual risk groups became very small given that there were 47 different ICD-9 diseases groupings the data was subsequently grouped into the following geographical areas:

Table 3: Geographical Areas of Analysis

Area	Counties
Dublin	Dublin City and Country
Cork	Cork City and County
Munster	Clare, Kerry, Limerick, Tipperary, Waterford
Leinster / Ulster	Carlow, Kilkenny, Laois, Longford, Kildare, Meath, Offaly, Westmeath, Wexford, Wicklow Louth, Monaghan, Cavan
Connaught / Ulster	Leitrim, Galway, Mayo, Roscommon, Sligo, Donegal

2.6.2 Non Demographic factors

Socio-economic status / Income levels

The empirical evidence relating income to health service utilisation is unclear. On one hand, the theory is that as income levels increase an individual has more disposable income to purchase health care and therefore overall consumption rises. However, it can also be argued that those with a higher income level have a better health status and therefore their underlying morbidity rates may be lower for a mosy health services. It has been shown [15] that controlling for socio-economic status removes much of the variation health status and health utilisation typically attributable to age.

For this dataset, insufficient data was available to allow a review of utilisation by income/socio-economic categories. However, the data was coded for each of the different products provided by the insurer. This could be considered to be a proxy variable for socio-economic status. The results show that age-gender standardised morbidity is higher for the higher products. It could be argued that this is based upon anti-selection by the insured membership given that the benefits for higher products are so much better. This is not explored further in this analysis.

Health and Lifestyle factors

An individual's morbidity levels are also linked to the underlying lifestyle of the individual. No data was allowable to let this factor be considered. However, it is worth noting that over the period of the analysis there has been a considerable change in attitudes to health and well-being in the population.

For example, smoking rates have, over the medium term, reduced[4] although it is less clear if exercise levels have increased and alcohol consumption rates appears to have increased. [16,17,18].

2.7 The Cohort effect

In considering the impact of demographic factors on morbidity and mortality it is important to consider the impact of what is termed the 'cohort effect'. This is the phenomenon that people born in particular generations may have experienced different patterns of changes in morbidity than generations either side of this period [19]. The impact of this cohort effect should be considered when projecting future morbidity rate changes in the underlying population. Such differences may arise for many reasons including for example, improved medical technology (e.g. inoculations at birth) and better diet and lifestyle (including reduced smoking rates). Given the short period of analysis (1996 to 2006) it is difficult to isolate such an impact for this dataset but nonetheless its impact needs to be considered more generally by policy-makers in projecting future morbidity patterns.

2.8 Analysis undertaken

Based upon the data available an analysis of morbidity was undertaken by year, age band and gender for each of the 47 disease categories listed in Annex 1. Age-gender standardised rates were calculated for each disease category and morbidity rates were calculated for each age band and gender cohort. The standardisation weights applied were based upon the 2006 age-gender profile of the insurer.[5]

In some age band-gender disease categories cells there was an insufficient number of episodes to allow credible results to be calculated. To allow for this data was grouped into two-year periods to calculate effectively two-year moving average morbidity rates. For further ease of analysis the following periods are reported (1996/1997, 2000/2001 and 2005/2006).

Given the significant number of outputs from the analysis the following items have been reported:

1. Standardised morbidity rates (and changes therein) for each reported period;
2. The relative size of standardised morbidity rates for each geographic region for the period 2005/2006;
3. Changes in standardised morbidity rates for each disease category between the reported periods; and
4. Changes in morbidity rates by age band and gender cohort between the periods (all causes).

In addition, underlying changes in morbidity rates are reported for key diseases that account for many of the morbidity episodes. Finally, some additional data is reported on the changes in the mix of clinical settings (i.e. inpatient hospital setting versus day patient hospital setting) where the services are provided over the period of analysis.

[4] The Office of Tobacco Control publishes regular statistics on tobacco consumption. It should be noted that while the medium to long term trend has reduced there has been an upward trend in tobacco consumption reported since April 2005.

[5] The age profile of the insured population is younger than that of the overall population but it is not material to the results of the analysis.

3. RESULTS

3.1 Standardised morbidity rates

Table 4 shows the morbidity rates for different periods of time reported. They show a deterioration in the overall morbidity rate over the period. This is not explained by changes in the underlying profile of the analysed population by age and gender given the standardisation process that was adopted.

Table 4: Standardised Morbidity Rates 1996-2006

Year	Standardised Morbidity Rate	Relativity factor
1996/1997	22.9%	100%
2000/2001	25.5%	111%
2005/2006	29.5%	129%

3.2 Morbidity by Category of Disease

The summary of the change in morbidity rates over the period for each category on disease is presented in Table 5. The age-gender profile has again been standardised. The table is ordered such that the disease category where most episodes of illness occur is listed first and so forth. The results show that for the majority of categories morbidity rates have increased over the period.

Table 5: Change in Standardised Morbidity Rates by Category of Disease1996-2006

Description	1996/97	2000/01	2005/06
Diseases of digestive system	100%	103%	109%
Cancers and neoplasms	100%	117%	138%
Certain conditions originating in the perinatal period	100%	109%	96%
Conditions relating to pregnancy, childbirth and the puerperium	100%	90%	79%
Congenital malformations and chromosomal abnormalities	100%	98%	98%
Diseases of circulatory system	100%	109%	112%
Diseases of the blood(-forming organs)/immunology disorders	100%	114%	145%
Diseases of the genitourinary system	100%	105%	101%
Diseases of the musculoskeletal system/connective tissue	100%	142%	232%
Diseases of the nervous system and the sense organs	100%	115%	140%
Diseases of the respiratory system	100%	89%	84%
Diseases of the skin and subcutaneous tissue	100%	111%	146%
Endocrine/ nutritional and metabolic diseases	100%	144%	241%
Infectious and parasitic Diseases	100%	140%	190%
Injury and poisoning	100%	103%	108%
Mental and behavioural disorders	100%	82%	78%
Symptoms/ signs/ abnormal findings/ ill-defined causes	100%	134%	159%

* The more detailed breakdown of changes in morbidity rates by disease are included in Annex 2

3.3 Morbidity by Age band and Gender

When the change in morbidity patterns for each age and gender are separately considered it is clear that rates have deteriorated for all age-genders groups and in a consistent manner for males and females. The deterioration is most pronounced for older age groups.

Table 6: Change in Morbidity Rates by Age and Gender: 1996-2006

Age Band	Gender	1996/1997	2000/2001	2005/2006
0-14	Male	100%	105%	103%
15-24	Male	100%	105%	119%
25-44	Male	100%	111%	133%
45-64	Male	100%	115%	145%
65 and over	Male	100%	120%	142%
0-14	Female	100%	106%	107%
15-24	Female	100%	104%	113%
25-44	Female	100%	101%	107%
45-64	Female	100%	114%	137%
65 and over	Female	100%	118%	141%

3.4 Standardised morbidity rates by region

The relative morbidity rates for different geographical regions are presented in Table 7 allowing for age-gender standardisation. The figures show that there is a consistent pattern of lower morbidity in Dublin and Leinster compared to Cork and Munster. It is unclear why this pattern arises.

It should be noted that the distribution of private hospitals varies significantly between regions and this may impact the results in a number of ways. First it could be argued that a lower supply of hospitals restricts demand for services (as access is restricted). Conversely, it could be argued that the ability of individual hospitals to influence demand is stronger where they operate as the monopoly supplier of services. Furthermore, individual medical consultants who operate within private hospitals may influence demand given their availability.

It is therefore clear that regional variations in morbidity rates need careful analysis before reaching definitive conclusions.

Table 7:
Relative Mortality Rates Compared to National Average (2005/2006)

Year	Region
Dublin City and County	99%
Cork City and County	119%
Leinster/Ulster excluding Dublin but including Monaghan, Cavan	101%
Munster excluding Cork	121%
Connaught/Ulster (including Donegal)	108%

3.5 Effect of Changing Patterns on Resource Intensity

A preliminary analysis was made of the impact of the changing morbidity rates on resource requirements. To do this an analysis was made of the setting in which treatment was delivered for each of the disease categories between the start and end of the period. An average length of stay was attached to each category of disease which reflected the average length of hospital stay for that treatment at the start and end of the periods. Following standardisation of the number of cases the results show that despite mortality rates increasing by 29% over the period the overall standardised lengths of stay declined by between 25-35%.[6] Thus, the net impact of changing morbidity combined with the change in resource intensity required to treat each episode was to change the cost base by between -4% and +6%.

In other words, if morbidity rates increase it is not necessarily so that increased resources are required in the health system. This is because of changes in clinical practice and so forth which mean that other factors are always at hand which affect the costs of delivery of health care.

4. DISCUSSION

4.1 Summary of Results

In most countries over the last century it has been suggested that there have been dramatic improvements in health. The metric that has been traditionally used to measure improvements has been based around mortality rates and life expectancies. However, this ignores the possibility of morbidity rates increasing resulting from deferred death. In our analysis, we have explicitly considered changes in morbidity rates. The results show that morbidity for the population considered has, instead of improving, deteriorated over the period from 1996 to 2006. While morbidity rates for certain conditions have reduced the prevailing message is that for most categories of diseases, morbidity rates have increased. This is particularly true for the conditions which are the cause of most hospitalisations.

From a methodological perspective the variations by cause are important to note. More weight is clearly given to conditions which occur more often in calculating the overall morbidity rate and therefore given that some of these conditions have appreciably worse morbidity than before it is not surprising the overall pattern increased. For example, the rate of cancer morbidity has significantly increased though much of this can be argued to result from better detection.

The experienced overall increased rates of morbidity are mirrored within each age band and for both males and females. Interestingly the increases in morbidity are largely identical for both males and females in each age band. The changes are more significant for older age groups which could be consistent with death being postponed which then leads to a higher proportion of the population becoming sick.

[6] The reason for the range is because some ICD categories of diseases occurred where other morbidity episodes occurred also and therefore it is not possible to get an exact number.

Furthermore, there is evidence that morbidity rates vary significantly by region for the analysed population. This presents a challenge for policy-makers, not just to understand but also to manage and organise the health services in such a way that will ensure that underlying rates will converge.

4.2 Explanations for Increased Morbidity

As identified by other authors analysis of morbidity is not clear and straightforward [20]. Linked to this, the causes for the significant increases in morbidity rates in our results are unclear. Many theories have been put forward in the literature to explain changes in morbidity in the context of rising life expectancy [21,22,23].

Our results suggest that, whatever about changes in life expectancy, morbidity in the last eleven years has increased in Ireland. Possible explanations for this can be summarised are follows:

- Improved mortality is postponing death and thereby increasing the proportion of the population who are in a non-healthy state;
- Individuals now have better access to health services than they did in the past leading to increased diagnosis of medical conditions; and
- People are now more concerned about their health and therefore choose to utilise more healthcare than previously. This correspondingly increases the underlying morbidity rates.

There is circumstantial evidence to support each of these theories though it is not possible to determine the impact of each. It is most probable that the influence of each of these theories explains the upward changes in our results. However, given that the base data for this analysis is from a health insurer where access has not been historically a problem the likelihood of the second explanation being important may be weakened.

As identified above much of this discussion revolves around the impact that longer life expectancy may have on morbidity patterns. Some of the literature has assumed that longer life expectancy will mean that the additional years of life will be in good health. This is by no means certain and some authors have argued that the opposite can be empirically observed to have happened in the recent past. [24].

4.3 Implications of Results for Resource Allocation

The changing levels of morbidity rates, together with an overall ageing of the population, poses particular issues for health planners in terms of allocating resources. The results suggest that it is not sufficient to assume past patterns of morbidity will apply in the future when the population ages. As well as planning for increased life expectancy health planners must allow for increased morbidity rates at a given age and gender if our reported patterns of morbidity rate increases continue. Furthermore, allowance must be made for the changing requirements in the types of treatments. This results confirm that this could have significant resourcing issues for the health services in terms of not just financial resources but also the mix of associated skills (e.g. Consultants / Nurses by specialty) and physical resources (e.g. diagnostic equipment) required in the health services.

5. CONCLUSIONS

It is clear that there is considerable uncertainty around future patterns of morbidity in Ireland. This arises from the uncertainty surrounding future mortality rates and the consequent impact on morbidity, the uncertainty surrounding the impact of external factors on the need and extent of use of health care (e.g. medical technology, change in lifestyle) together with underlying uncertainty attached to the morbidity rates themselves. Medical technology together with an increased appetite on behalf of the population for more health care will in itself bring about increased costs for the health system.

These pressures will lead to considerable pressure on health care costs and dictate that Ireland needs to plan appropriately for such a changing environment. This calls for further analysis of the impact of changing morbidity on the health system including better analysis of past patterns of morbidity. As part of this, further analysis of disability and chronic disease patterns together with an analysis of the impact of an increased life expectancy of healthy years of life should be undertaken.

Heretofore much of the discussion surrounding the impact of ageing on the health system has focused on mortality. This study has attempted to analyse morbidity.

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ANNEX 1:

CATEGORISATION OF DISEASES UNDER THE INTERNATIONAL CLASSIFICATION OF DISEASES SYSTEM

Group Category	Category	ICD-9 Codes
Cancers and neoplasms	Other neoplasms	210-239
Cancers and neoplasms	Other malignant neoplasms	Rem(140-208)
Cancers and neoplasms	Malignant neoplasm of stomach	151
Cancers and neoplasms	Malignant neoplasm of rectum and anus	154
Cancers and neoplasms	Malignant neoplasm of prostrate	185
Cancers and neoplasms	Malignant neoplasm of pancreas	157
Cancers and neoplasms	Malignant neoplasm of ovary	183
Cancers and neoplasms	Malignant neoplasm of other parts of uterus	179, 182
Cancers and neoplasms	Malignant neoplasm of oesophagus	150
Cancers and neoplasms	Malignant neoplasm of lymph./haematopoietic tissue	200-208
Cancers and neoplasms	Malignant neoplasm of liver and the intrahepatic bile ducts	155
Cancers and neoplasms	Malignant neoplasm of lip/ oral cavity/ pharynx	140-149
Cancers and neoplasms	Malignant neoplasm of larynx and trachea/bronchus/lung	161-162
Cancers and neoplasms	Malignant neoplasm of colon	153
Cancers and neoplasms	Malignant neoplasm of cervix uteri	180
Cancers and neoplasms	Malignant neoplasm of breast	174-175
Cancers and neoplasms	Malignant neoplasm of bladder	188
Cancers and neoplasms	Malignant neoplasm kidney	189
Cancers and neoplasms	Malignant melanoma of skin	172
Certain conditions originating in the perinatal period	Certain conditions originating in the perinatal period	760-779
Conditions relating to pregnancy, childbirth and the puerperium	Complications of pregnancy, childbirth and the puerperium	630-679
Congenital malformations and chromosomal abnormalities	Congenital malformations and chromosomal abnormalities	740-759
Diseases of circulatory system	Other diseases of circulatory system	Rem(390-459)
Diseases of circulatory system	Other cardiovascular diseases (except rheumatic heart and valvular diseases)	420-423, 425-429
Diseases of circulatory system	Ischaemic heart diseases	410-414
Diseases of circulatory system	Cerebrovascular diseases	430-438
Diseases of digestive system	Ulcer of stomach/ duodenum and jejunum	531-534
Diseases of digestive system	Other diseases of digestive system	Rem(520-579)
Diseases of digestive system	Chronic liver disease	571
Diseases of the blood(-forming	Diseases of the blood(-forming organs)/	279-289

Group Category	Category	ICD-9 Codes
organs)/ immunol.disorders	immunol.disorders	
Diseases of the genitourinary system	Diseases of the genitourinary system	580-629
Diseases of the musculoskeletal system/connective tissue	Diseases of the musculoskeletal system/connective tissue	710-739
Diseases of the nervous system and the sense organs	Diseases of the nervous system and the sense organs	320-389
Diseases of the respiratory system	Pneumonia	480-486
Diseases of the respiratory system	Other diseases of respiratory system	Rem(460-519)
Diseases of the respiratory system	Influenza	487
Diseases of the respiratory system	Chronic lower respiratory diseases	490-494, 496
Diseases of the skin and subcutaneous tissue	Diseases of the skin and subcutaneous tissue	680-709
Endocrine/ nutritional and metabolic diseases	Endocrine/ nutritional and metabolic diseases	240-278
Infectious and parasitic Diseases	Viral hepatitis	70
Infectious and parasitic Diseases	Tuberculosis	010-018, 137
Infectious and parasitic Diseases	Other infectious and parasitic diseases	Rem(001-139)
Infectious and parasitic Diseases	Meningococcal infection	36
Infectious and parasitic Diseases	AIDS (HIV-disease)	042-044
Injury and poisoning	Injury and poisoning	800-999
Mental and behavioural disorders	Mental and behavioural disorders	290-319
Symptoms/ signs/ abnormal findings/ ill-defined causes	Symptoms/ signs/ abnormal findings/ ill-defined causes	780-799

ANNEX 2:

CHANGE IN STANDARDISED MORBIDITY RATES BY DISEASE

Description	1996/1997	2000/2001	2005/2006
AIDS (HIV-disease)	100%	147%	139%
Cerebrovascular diseases	100%	98%	98%
Certain conditions originating in the perinatal period	100%	105%	112%
Chronic liver disease	100%	98%	111%
Chronic lower respiratory diseases	100%	110%	117%
Complications of Pregnancy, Childbirth and the Puerperium	100%	99%	84%
Congenital malformations and chromosomal abnormalities	100%	110%	109%
Diseases of the blood(-forming organs)/ immunol.disorders	100%	127%	180%
Diseases of the genitourinary system	100%	105%	102%
Diseases of the musculoskeletal system/connective tissue	100%	132%	126%
Diseases of the nervous system and the sense organs	100%	152%	179%
Diseases of the skin and subcutaneous tissue	100%	144%	208%
Endocrine/ nutritional and metabolic diseases	100%	146%	169%
Influenza	100%	127%	129%
Injury and Poisoning	100%	204%	221%
Ischaemic heart diseases	100%	120%	107%
Malignant melanoma of skin	100%	70%	56%
Malignant neoplasm kidney	100%	114%	145%
Malignant neoplasm of bladder	100%	105%	101%
Malignant neoplasm of breast	100%	142%	232%
Malignant neoplasm of cervix uteri	100%	115%	140%
Malignant neoplasm of colon	100%	91%	82%
Malignant neoplasm of larynx and trachea/bronchus/lung	100%	92%	32%
Malignant neoplasm of liver and the intrahepatic bile ducts	100%	86%	90%
Malignant neoplasm of lymph./haematopoietic tissue	100%	111%	146%
Malignant neoplasm of oesophagus	100%	144%	241%
Malignant neoplasm of other parts of uterus	100%	11%	67%
Malignant neoplasm of ovary	100%	104%	45%
Malignant neoplasm of pancreas	100%	143%	196%
Malignant neoplasm of prostrate	100%	75%	77%
Malignant neoplasm of rectum and anus	100%	74%	31%

Description	1996/1997	2000/2001	2005/2006
Malignant neoplasm of stomach	100%	103%	108%
Meningococcal infection	100%	155%	151%
Mental and behavioural disorders	100%	125%	115%
Other cardiovascular diseases (except rheumatic heart and valvular diseases)	100%	98%	102%
Other diseases of circulatory system	100%	120%	147%
Other diseases of digestive system	100%	109%	96%
Other diseases of respiratory system	100%	102%	113%
Other infectious and parasitic diseases	100%	97%	139%
Other Malignant neoplasms	100%	82%	78%
Other neoplasms	100%	134%	159%
Pneumonia	100%	111%	114%
Symtoms/ signs/ abnormal findings/ ill-defined causes	100%	131%	125%
Tuberculosis	100%	104%	121%
Ulcer of stomach/ duodenum and jejunum	100%	90%	79%
Viral hepatitis	100%	116%	130%