RESEARCH
SERIES
NUMBER 67
October 2017

PROJECTIONS OF DEMAND FOR HEALTHCARE IN IRELAND, 2015-2030

FIRST REPORT FROM THE HIPPOCRATES MODEL

MAEV-ANN WREN, CONOR KEEGAN, BRENDAN WALSH, ADELE BERGIN, JAMES EIGHAN, AOIFE BRICK, SHEELAH CONNOLLY, DOROTHY WATSON, JOANNE BANKS

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

PROJECTIONS OF DEMAND FOR HEALTHCARE IN IRELAND, 2015-2030: FIRST REPORT FROM THE HIPPOCRATES MODEL

Maev-Ann Wren, Conor Keegan, Brendan Walsh, Adele Bergin, James Eighan, Aoife Brick, Sheelah Connolly, Dorothy Watson, Joanne Banks

October 2017

RESEARCH SERIES
NUMBER 67

Report prepared for the Department of Health
by the Economic and Social Research Institute (ESRI)

Available to download from www.esri.ie

ESRI, Whitaker Square, Sir John Rogerson's Quay, Dublin 2

ISBN 978-0-7070-0443-3
DOI https://doi.org/10.26504/rs67

ABOUT THE ESRI

The mission of the Economic and Social Research Institute is to advance evidence-based policymaking that supports economic sustainability and social progress in Ireland. ESRI researchers apply the highest standards of academic excellence to challenges facing policymakers, focusing on 12 areas of critical importance to 21st Century Ireland.

The Institute was founded in 1960 by a group of senior civil servants led by Dr T.K. Whitaker, who identified the need for independent and in-depth research analysis to provide a robust evidence base for policymaking in Ireland.

Since then, the Institute has remained committed to independent research and its work is free of any expressed ideology or political position. The Institute publishes all research reaching the appropriate academic standard, irrespective of its findings or who funds the research.

The quality of its research output is guaranteed by a rigorous peer review process. ESRI researchers are experts in their fields and are committed to producing work that meets the highest academic standards and practices.

The work of the Institute is disseminated widely in books, journal articles and reports. ESRI publications are available to download, free of charge, from its website. Additionally, ESRI staff communicate research findings at regular conferences and seminars.

The ESRI is a company limited by guarantee, answerable to its members and governed by a Council, comprising 14 members who represent a cross-section of ESRI members from academia, civil services, state agencies, businesses and civil society. The Institute receives an annual grant-in-aid from the Department of Public Expenditure and Reform to support the scientific and public interest elements of the Institute's activities; the grant accounted for an average of 30 per cent of the Institute's income over the lifetime of the last Research Strategy. The remaining funding comes from research programmes supported by government departments and agencies, public bodies and competitive research programmes.

Further information is available at www.esri.ie

THE AUTHORS

Maev-Ann Wren is a Senior Research Officer, Conor Keegan is a Post-Doctoral Research fellow, Brendan Walsh is a Research Officer, Adele Bergin is a Senior Research Officer, James Eighan is a Research Assistant, Aoife Brick is a Research Officer, Sheelah Connolly is a Research Officer, Dorothy Watson is an Associate Research Professor and Joanne Banks is a Research Officer at the Economic and Social Research Institute, Dublin.

ACKNOWLEDGEMENTS

Financial support for this research was provided by the Department of Health. The authors would like to thank the members of the Steering Group of the ESRI Research Programme in Healthcare Reform for their support, input and encouragement. The authors would particularly like to thank Teresa Maguire and Robert Murphy of the Department of Health for their assistance to this research project. The authors are also grateful to the many officials of the Department of Health, HSE, CSO and many other providers of data and insights in the public and private sectors, who have assisted this research. Contacts with policymakers, providers and stakeholders have provided important context and understanding to this research. The authors would like to acknowledge the contributions of colleagues at the ESRI. Valuable comments on the text and suggestions for revision were provided by four anonymous reviewers. We would like to thank them for their contributions while acknowledging that the authors bear sole responsibility for the analyses and interpretations presented.

Table of contents

List of Tables

List of Figures

Abbreviations

AHCP	Allied healthcare professionals
ADL	Activities of Daily Living
ADLd	Difficulties with Activities of Daily Living
AMU/AMAU/ MAU	Acute Medical Unit/Acute Medical Assessment Unit/ Medical Assessment Unit
AR	Activity Rate
AV	Activity
CAPI	Computer-assisted personal interview
CGE	Computable general equilibrium models
CHO	Community Healthcare Organisations
CM	Compression of Morbidity
COSMO	COre Structural MOdel for Ireland
CP	Central Population Growth Projection
CSO	Central Statistics Office
CVD	Cardio vascular disease
DALY	Disability-adjusted life year
DALYs	Disability-adjusted life years
DC	Day case
DE	Dynamic Equilibrium
DoH	Department of Health
DPS	Drug Payment Scheme
DRG	Diagnosis-related groups
ED	Emergency Department
EM	Expansion of Morbidity
ESRI	Economic and Social Research Institute
EU	European Union
EU-SILC	European Survey of Income and Living Conditions
GDP	Gross Domestic Product
GMS	General Medical Services
GNI	Gross National Income
GNP	Gross National Product

GP	General practitioner
GUI	*Growing Up in Ireland* survey
HCPs	Home care packages
HIA	Health Insurance Authority
HIE	Health insurance experiment
HIPE	Hospital Inpatient Enquiry
Hippocrates	**H**ealthcare in **I**reland model of effects of **P**opulation **P**rojections, Patterns **O**f **C**a**R**e and **A**geing **T**rends on **E**xpenditure and Demand for **S**ervices
HIQA	Health Information and Quality Authority
HP	High Population Growth Projection
HPO	Healthcare Pricing Office
HSE	Health Service Executive
HSE BIU	Health Service Executive's Business Information Unit
HTD	High Tech Drugs Scheme
IADL	Instrumental Activities of Daily Living
IADLd	Difficulties with Instrumental Activities of Daily Living
IHI	Individual Health Identifier
IP	Inpatient
IPDC	Inpatient and day case
ISAs	Integrated Service Areas
LE	Life expectancy
LHO	Local Health Office
LOS	Length of stay
LSAS	Long-Stay Activity Statistics
LTC	Long-term care
LTI	Long-Term Illness (Scheme)
MHA	Moderate Healthy Ageing
NHI	Nursing Homes Ireland
NHSS	Nursing Home Support Scheme
NTPF	National Treatment Purchase Fund
OECD	Organisation for Economic Co-operation and Development
OOP	Out-of-pocket

OPD	Outpatient Department
OT	Occupational therapist
PCRS	Primary Care Reimbursement Scheme
PCT	Primary Care Teams
PET	Patient Experience Time
PHI	Private health insurance
PHN	Public Health Nurse
PSSRU	Personal Social Services Research Unit
PT	Physiotherapist
QNHS	Quarterly National Household Survey
SAT	Single Assessment Tool
SHA	System of Health Accounts
SLT	Speech and language therapist
SWITCH	Simulating Welfare and Income Tax Changes model
SYOA	Single year of age
T(P)FR	Total (Period) Fertility Rate
TILDA	The Irish Longitudinal Study on Ageing
UD	Unmet Demand
UHI	Universal health insurance
UK	United Kingdom
US(A)	United States (of America)
WTE	Whole-time equivalents
YLD	Years (of life) lost due to disability
YLL	Years of life lost

Glossary of terms

Activities of Daily Living	An index which measures difficulties with personal tasks (e.g. eating, dressing) – used as a proxy for severe disability
Baseline year	The year from which activity is projected
Bed Days	Days in which hospital/nursing home beds are used
Capitation	A payment method where a healthcare provider receives a set amount for each enrolled person per time period, whether or not that person seeks care
Compression of Morbidity	The theory that gains in life expectancy are exceeded by gains in years lived without disability and chronic disease
Co-payment	An out-of-pocket payment for care which is partially financed by the state or another source
COSMO	A model of the Irish macroeconomy developed by the ESRI
Delayed Discharge	A patient who remains in hospital after a senior doctor (consultant or registrar grade) has documented in the medical chart that the patient can be discharged
Diagnosis-Related Group (DRG)	A system to classify hospital cases into a diagnosis-specific group
Disability	This term covers impairments, activity limitations, and participation restrictions where an impairment is a problem in body function or structure, an activity limitation is a difficulty encountered by an individual in executing a task or action, and a participation restriction is a problem experienced by an individual in involvement in life situations
Disability-Adjusted Life Years	The sum of the Years of Life Lost (YLL) due to premature mortality and the years lost due to disability (YLD) for people living with a health condition
Disability-free life years	Years of life lived without disability
Dynamic Equilibrium	The healthy ageing theory that life expectancy increases are equalled by additional years without disability/ill health
Epidemiological Transition	The shift in fatal diseases in developed countries from communicable and infectious diseases in the early 20th Century to chronic diseases by the end of the century.
EU15	The 15 European Union Member States prior to 1 May 2004

EU28	The current European Union Member States, since 1 July 2013
Expansion of Morbidity	The healthy ageing theory that gains in life expectancy are accompanied by additional years with chronic disease and disability
Fee-for-service	A payment method where a separate payment is made to a healthcare provider for each medical service provided to a patient
General Medical Services Scheme	A scheme in which individuals who are eligible for a medical card receive mostly free access to public health services.
GP Visit Card	A card which allows the eligible recipient free GP visits
Health Information and Quality Authority	An independent authority established in 2007 to monitor and promote quality and safety in Irish health and social care services
Health Service Executive	The organisation which administers public health and social care services in Ireland
Healthy life expectancy	The number of years an individual is expected to live in good health.
Hippocrates Model	The model developed by the ESRI to project future healthcare demand and expenditure
Home Care Package	A publicly-provided set of health and domestic services under the Home Care Package Scheme
Home Help	A service which provides domestic and personal care to individuals in their own home
Independent Activities of Daily Living	An index which measures difficulties with household tasks (e.g. cooking, shopping)
Legacy Funded Residents	Residential long-term care residents who are funded though schemes that existed prior to the introduction of the NHSS in 2009.
Limited-Stay Beds	Short term residential care beds which include beds used for rehabilitation or convalescence after an illness/injury; palliative care for patients at a time ‘when the medical expectation is no longer cure’; and respite, for ‘the planned admission of dependent persons for short periods of time in order to assist carers in their task of caring’
Local Health Office	A HSE administrative geographic division (32 in total)

Long-Stay Beds	Residential care beds which include those for extended/continuing care for people who have been assessed as being in need of long-term care; psychiatry of old age, for specialised psychiatric services; and 'young chronic sick' for young people with long-lasting illness which is usually irreversible and may be progressive
Mean	The arithmetic average of a group of numbers
Medical Assessment Unit	A facility whose primary function is the immediate and early specialist management of patients in a dedicated location for the quick assessment, diagnosis, and initiation of appropriate treatment for these patients. Also referred to as an Acute Medical Assessment Unit (AMAU) or an Acute Medical Unit (AMU)
Medical Card	A card which allows the recipient free access to most public health services
Morbidity	The state of being ill or having a disease
Mortality Rate	The number of deaths within a population at a particular period in time, divided by the number of individuals in that population.
National Treatment Purchase Fund	A state body established in 2002 to reduce waiting lists in the public hospital sector
Nursing Home Support (Fair Deal) Scheme	A scheme through which the state funds or subsidises the care of residents in long-term care institutions based on an assessment.
Occupancy Rate	The rate of available beds occupied or in use in a hospital or residential institution.
Out-of-Pocket Payments	Personal payments made by service users at the point of use
Primary Care Reimbursement Service	The state body responsible for making payments to primary healthcare professionals
Primary Care Team	A multidisciplinary group of health and social care professionals, including GPs and allied healthcare professionals, focused on the delivery of primary care
Proximity to Death	The theory that growth in medical care costs is driven not by ageing *per se* but by how close individuals are to death.
SWITCH	A model developed by the ESRI to simulate welfare and income tax changes
Total Fertility Rate	A measure of the number of children that a representative woman will have over her lifetime

Foreword

This report was prepared by researchers at the Economic and Social Research Institute (ESRI) for the ESRI Research Programme in Healthcare Reform, which is funded by the Department of Health. The report is published as an ESRI Research Series Report and is the first output applying the Hippocrates model of healthcare demand and expenditure which has been developed at the ESRI. This report analyses utilisation of a wide range of health and social care services and projects demand for these services for the years from 2015 to 2030.

The ESRI Research Programme in Healthcare Reform was agreed between the Economic and Social Research Institute (ESRI) and the Department of Health in July 2014. The broad objectives of the programme are to apply economic analysis to explore issues in relation to health services, health expenditure and population health, in order to inform the development of health policy and the Government's healthcare reform agenda. The programme is overseen by a Steering Group comprising nominees of the ESRI and the Department of Health, which agrees its annual work programme.[1] The Steering Group agreed in 2015 that this programme would include the development of a projection model of healthcare demand and expenditure and work on developing the model began in that year. The objectives of the development of the Hippocrates model are to supply a tool which will: inform health and social service planning in Ireland; inform financial planning for the healthcare system; inform planning for capacity, services and staffing; identify future demand pressures; and provide a framework in which to analyse the effects of potential system changes and reforms.

The ESRI is responsible for the quality of this research, which has undergone national and international peer review prior to publication. This report was prepared by Dr Maev-Ann Wren, Dr Conor Keegan, Dr Brendan Walsh, Dr Adele Bergin, Mr James Eighan, Dr Aoife Brick, Dr Sheelah Connolly, Dr Dorothy Watson and Dr Joanne Banks and reflects their expertise and views. The views expressed in this report are not necessarily those of other ESRI researchers, the Minister for Health, Department of Health or organisations represented on the Steering Group.

October 2017

[1] See Appendix 8 for Steering Group membership.

EXECUTIVE SUMMARY

INTRODUCTION

This report provides baseline estimates and projections of public and private healthcare demand for Irish health and social care services for the years 2015–2030. This is the first report to be published applying the Hippocrates projection model of Irish healthcare demand and expenditure which has been developed at the ESRI in a programme of research funded by the Department of Health. Development of the model has required a very detailed analysis of the services used in Irish health and social care in 2015. This is the most comprehensive mapping of both public and private activity in the Irish healthcare system to have been published for Ireland.

The development of this model has been an unprecedented undertaking for Ireland. The Hippocrates model has potential for a wide range of applications, extending beyond the projections of demand to 2030 presented in this report. The scope of the model includes, to the degree that the data support: all health and social care services (acute hospital, primary, community and long-term and intermediate care); and public and private services (including private hospitals and privately-purchased GP visits and home help hours).

The objectives of the development of the Hippocrates model are to supply a tool which will: inform health and social service planning in Ireland; inform financial planning for the healthcare system; inform planning for capacity, services and staffing; and identify future demand pressures. An additional objective of the development of the model is to provide a framework in which to analyse the effects of potential system changes and reforms, such as changing the system of financing healthcare; models of care or systems of access and eligibility. Thus, the model can be developed to examine the implications for resourcing community care and hospital care, if Ireland were to change the model of care to meet more care in the community. By incorporating demand in public and private systems, the model can examine policy questions such as the implications for the public hospital system if services were transferred from private hospitals or vice versa.

The aims of this first report are to provide evidence for such health policy questions as how will population growth and ageing affect demand for health and social care services, what is the extent of unmet need for care, and how much would addressing unmet need add to future demand for services. Future ESRI research will analyse the capacity implications of the demand projections in this report. In the next phase of the development of the model, it will be extended to incorporate projections of healthcare expenditure and analyse drivers of expenditure as well as demand.

In this report on healthcare demand, the analysis is based on two key inputs: healthcare use in the 2015 base year and projected population growth. The model starts from an analysis of current use of health and social care services. New ESRI projections for population growth, the first projections to be published since the 2016 Census, inform projected demand. Detailed analysis of national and international evidence on trends in health and disability inform the development of preferred projection scenarios by sector, with modelling of alternative assumptions about healthy ageing, or the relationships of health and disability status to age. There is evidence that such relationships have changed over time and differ across countries so that age alone may not be a reliable predictor of service use and demand. Detailed analysis of evidence on unmet need and demand also informs the modelling of the effect on demand of addressing unmet need and demand for healthcare services.

MAIN FINDINGS

The main finding of this report is that due to projected continued rapid population growth, demand for health and social care is projected to increase across all sectors in the years to 2030. Furthermore, the even greater increases in older age cohorts reflecting extended life expectancy will substantially increase demand for those forms of care which are particularly required by older people.

This report projects that demand for public hospital services could increase by up to 37 per cent in the case of inpatient bed days and up to 30 per cent in the case of inpatient discharges. Private hospitals too are projected on present patterns of utilisation to face up to a 32 per cent increase in demand for inpatient bed days and up to a 25 per cent increase in demand for inpatient admissions. Even greater percentage increases in demand are projected for long-term and intermediate care places at 40 to 54 per cent. Similar magnitudes of demand increase are projected for home care, increasing projected hours by up to 54 per cent. Home care packages are projected to show the greatest increase in demand of 66 per cent reflecting a high level of unmet demand. Demand for GP visits is projected to increase by up to 27 per cent.

These estimates assume no change to models of care yet such changes could change how demand manifests. This report does not forecast what will happen; it provides projections of demand based on clear assumptions about the drivers of population growth in Ireland, trends in healthy ageing and evidence on unmet need and demand. Although the concept of unmet need is complex, in this analysis unmet need is derived from surveys in which individuals identify a need for healthcare which is not met; while unmet demand is analysed from waiting lists for different forms of care.

TABLE E.1 SUMMARY OF FINDINGS FOR MAJOR CATEGORIES OF ACTIVITY, 2015 BASELINE AND 2030 PROJECTIONS, PREFERRED PROJECTION RANGE BY SECTOR

Sector	Measure of activity	Baseline findings Volume of activity in 2015/ end 2015[1] ('000)	Projected demand, 2030	
			Projection range excluding unmet need/demand ('000)	Lower end projection range plus unmet demand/need ('000)
Public hospitals	Inpatient discharges[2,5]	514	640 - 670	660
	Day-patient discharges[2,5]	1,010	1,250 - 1,290	1,310
	Inpatient bed days[2]	3,273	4,330 - 4,470	4,460
	ED attendances	1,138	1,320 - 1,430	-
	OPD attendances	3,299	4,000 - 4,260	4,300
Private hospitals[3]	Inpatient admissions[5]	133	160 - 170	-
	Day-patient admissions[5]	459	570 - 590	-
	Inpatient bed days	613	780 - 810	-
General practice	GP visits	17,551	21,060 - 22,340	21,370
	Practice nurse visits	5,944	7,470 - 7,830	-
Community pharma.	Prescription items (public)	73,059	98,000 - 100,450	-
	Total consultations[4]	5,977	7,100 - 7,480	-
Long-term care	Residents/places	29	41 - 45	42
	LTC bed days	10,582	14,852 - 16,275	15,185
Home care	Home help service	66	94 - 103	97
	Home Care Package recipients	15	22 - 24	25
	Home help hours	14,311	19,720 - 22,000	-
Public health nursing and community therapy	Public PT referrals	189	237 - 250	249
	Public OT referrals	88	119 - 124	124
	PHN visits[6]	1,362	1,710 - 1,840	-
	Public PT visits	760	940 - 990	-
	Public OT visits	347	460 - 480	-
	SLT visits	147	140 - 170	

Source: See Chapters 5 to 11.
Notes: 1. Long-term care residents' places are estimated at end-2015; other measures are for total activity in 2015.
2. These estimates are exclusive of maternity activity in public hospitals which is analysed separately in Chapter 5.
3. Day-patient admissions and inpatient bed days derive from data for private insurance-funded activity in private hospitals and do not capture the very small fraction of activity financed solely out-of-pocket. Inpatient admissions for ages 15+.
4. Total consultations for ages 18+. 2010 activity rates are assumed for 2015.
5. Public hospital data refer to cases as discharges, while private hospital data refer to cases as admissions.
6. Excludes schools vaccination programme.

DETAILED FINDINGS

Table 1 summarises the detailed analysis of health and social care activity in 2015 and the demand projections for 2030. A range of projections are presented reflecting uncertainty about key assumptions regarding population growth, trends in the relationship of healthy ageing to extended life expectancy and the levels of unmet need or demand. These assumptions and the detailed analyses that inform them are described in the main report.

Population growth projections (Chapter 4)

- The Irish population is projected to increase by between 14 per cent (0.64 million) and 23 per cent (1.08 million) from 2015 to 2030;[2]
- Projected population increases are greatest for older ages. The population aged 80 and over is projected to increase by between 89 per cent (0.128 million) and 94 per cent (0.135 million) from 2015 to 2030.

Projections of demand for public hospital services (Chapter 5)

- The demand for inpatient bed days is projected to increase by between 32 to 37 per cent by 2030, from a level of 3.27 million in 2015;
- The demand for inpatient cases is projected to increase by between 24 and 30 per cent by 2030, from a level of 0.51 million in 2015;
- The demand for day-patient cases is projected to increase by between 23 to 29 per cent by 2030, from a level of 1.01 million in 2015;
- The demand for Emergency Department attendances is projected to increase by between 16 to 26 per cent by 2030, from a level of 1.14 million in 2015;
- The demand for Outpatient Department attendances is projected to increase by between 21 to 30 per cent by 2030, from a level of 3.3 million in 2015.

Projections of demand for private hospital services (Chapter 6).

- The demand for private hospital inpatient bed days is projected to increase by between 28 to 32 per cent by 2030, from a level of 0.61 million in 2015;
- The demand for private hospital inpatient cases is projected to increase by between 20 to 25 per cent by 2030, from a level of 0.13 million in 2015;
- The demand for private hospital day-patient cases is projected to increase by between 24 to 28 per cent by 2030, from a level of 0.46 million in 2015.

Projections of demand for GP and practice nurse visits (Chapter 7)

- The demand for GP visits is projected to increase by between 20 to 27 per cent by 2030, from a level of 17.55 million in 2015;

[2] These are our preferred Central and High population growth projections.

- The demand for practice nurse visits is projected to increase by between 26 to 32 per cent by 2030, from a level of 5.94 million in 2015.

Projections of demand for community pharmaceuticals and pharmacy services (Chapter 8)

- The demand for prescription items under public schemes is projected to increase by between 34 to 37 per cent by 2030, from a level of 73.06 million in 2015;
- Demand for pharmacy consultations is projected to increase by between 19 and 25 per cent by 2030, from a level of 5.98 million in 2015.

Projections of demand for long-term and intermediate care (Chapter 9)

- The demand for long-term and intermediate care resident places is projected to increase by between 40 to 54 per cent by 2030, from a level of 29,000 in 2015;
- The demand for long-term and intermediate care bed days is projected to increase by between 40 to 54 per cent by 2030, from a level of 10.6 million in 2015.

Projections of demand for home care (Chapter 10)

- The demand for home care packages is projected to increase by between 44 to 66 per cent by 2030, from a level of 15,300 in 2015;
- The demand for home help hours is projected to increase by between 38 to 54 per cent by 2030, from a level of 14.3 million in 2015.

Projections of demand for public health nursing and community therapy services (Chapter 11)

- The demand for public health nursing visits is projected to increase by between 26 to 35 per cent by 2030, from a level of 1.36 million in 2015;
- The demand for public physiotherapy visits is projected to increase by between 24 to 30 per cent by 2030, from a level of 0.76 million in 2015;
- The demand for public occupational therapy visits is projected to increase by between 33 to 38 per cent by 2030, from a level of 0.35 million in 2015;
- The demand for public speech and language therapy visits is projected to change by between a 2 per cent reduction to a 16 per cent increase by 2030, from a level of 0.15 million in 2015.

New analysis of health and social care service provision in 2015

- Public hospitals delivered approximately 85 per cent of the estimated 4.2 million total inpatient bed days and private hospitals delivered the remaining 15 per cent;
- Public hospitals delivered approximately 69 per cent of the estimated 1.5 million total day-patient discharges and private hospitals delivered the remaining 31 per cent;
- The estimated 10.6 million bed days in long-term and intermediate care settings in 2015 is over twice the estimated 4.2 million inpatient bed days in public and private acute hospitals combined;
- Visits to practice nurses accounted for 25 per cent of 23.5 million general practice visits when visits to GPs and practice nurses are combined;
- Privately-purchased home help hours account for approximately 27 per cent of 14.3 million home help hours in 2015.

POLICY IMPLICATIONS

There are important policy implications from this report's findings of substantial projected demand for health and social care across all sectors in the years to 2030 due to projected increases in and ageing of the population in Ireland. These projected increases in population and demand come after two decades of rapid population growth, a decade of cutbacks in public provision of care and a consequent build-up of unmet need and demand for care. The additional demand projected in this report for the years to 2030 will give rise to demand for additional expenditure, capital investment and expanded staffing and will have major implications for capacity planning, workforce planning and training. Additional investment will be required in most forms of care to meet the needs of a rapidly growing and ageing population. The projected population growth will, however, also increase numbers at work and contribute to national income and the revenue base. Future analysis will examine the capacity implications of this report's demand projections and the potential effects of changes in models of care which substitute care across settings. Policy developments could lessen demand in some sectors but increase it in others, adding shifts in the balance of care to the existing projected demand. It could be the case that requirements to meet projected increases in demand for long-term care services, for instance, might be reduced by a new policy emphasis on and investment in home care.

It is acknowledged that, due to data limitations, this report may understate unmet demand and baseline activity in some service sectors. Areas in which data could be improved are identified and discussed in the main report. It is hoped that future development of the Hippocrates model will benefit from improved data collection.

CHAPTER 1

Introduction

1.1 INTRODUCTION

This report marks the first phase in the development of the Hippocrates[3] projection model of Irish healthcare demand and expenditure. In this report we provide baseline estimates and projections of public and private healthcare demand for a wide range of Irish health and social care services for the years 2015–2030. These projections have been generated in the Hippocrates model, which has been developed at the ESRI in a programme of research funded by the Department of Health.

The Hippocrates model will continue to be developed in stages. The model currently projects demand for services and informs this report. Future ESRI research will analyse the capacity implications of the demand projections in this report. In the next phase of its development, the model will be extended to incorporate projections of healthcare expenditure and facilitate analysis of the drivers of expenditure as well as demand.

Healthcare projection models have been used in a number of countries and a variety of ways. Such models assist policymakers to identify future demand pressures and to inform financial planning as well as planning for services and staffing. The development of this model has been an unprecedented undertaking for Ireland and the approach to its development is ambitious even in an international context. Many models project at more aggregated levels, centred primarily on expenditure, while the Hippocrates model has a much wider range of applications because it projects from a bottom-up perspective by building a service-level picture of demand across the health and social care systems, and incorporating measures of unmet need or demand in projecting demand. Development of the model has required a very detailed analysis of the services used in Irish health and social care in 2015. The comprehensive picture of public and private health and social service utilisation presented in this report has not previously been published for Ireland.

The next section outlines the objectives of the model and this report. Sections 1.3 and 1.4 describe the background to and context of this research. Section 1.5 gives

[3] Hippocrates – Greek physician (born c. 460 – died c. 375 BC) regarded as the father of modern medicine. (www.britannica.com/biography/Hippocrates). Also an acronym of **H**ealthcare in **I**reland model of effects of **P**opulation **P**rojections, Patterns **O**f **C**a**R**e and **A**geing **T**rends on **E**xpenditure and Demand for **S**ervices.

an overview of the modelling approach. Section 1.6 presents a summary of the report's findings about baseline activity in Irish health and social care in 2015. Section 1.7 describes the approach taken to data sourcing and data challenges. Section 1.8 outlines this report's structure.

1.2 OBJECTIVES

The objective of the development of the Hippocrates model is to supply a tool which will: inform health and social service planning in Ireland; inform financial planning for the healthcare system; inform planning for capacity, services and staffing; and identify future demand pressures. The aims of this first report are to provide evidence for such health policy questions as: how will population growth and ageing affect demand for health and social care services; what is the extent of unmet need for care; and how much would addressing unmet need add to future demand for services. In future developments, the model can be extended to develop detailed analyses of capacity and staffing, develop demand projections by region, incorporate projections of healthcare expenditure and project demand and expenditure for service sectors which could not be included in this first report.

An additional objective of the development of the model is to provide a framework in which to analyse the effects of potential system changes and reforms, such as changing the system of financing healthcare. Thus, the model can be developed to examine the implications for resourcing community care and hospital care, if Ireland were to change the model of care to meet more care in the community. The model can assist in analysing the effects on demand for services of changing eligibility for services by measures such as further extending access to free general practitioner (GP) care or developing a new system of eligibility for home care. By incorporating demand in public and private systems, the model can examine such policy questions as the implications for the public hospital system if services were transferred from private hospitals or vice versa.

1.3 BACKGROUND

In July 2014, the Economic and Social Research Institute (ESRI) agreed a programme of research with the Department of Health. The broad objectives of the programme are to apply economic analysis to explore issues in relation to health services, health expenditure and population health, in order to inform the development of health policy and the Government's healthcare reform agenda. The programme's Steering Group agreed that this programme would commence with an analysis of the potential cost implications of a proposed system of Universal Health Insurance (UHI) in Ireland, which was published in 2015 (1). Subsequently, the programme Steering Group agreed that the ESRI should develop a projection model of healthcare demand and expenditure, which would incorporate analysis of unmet need for services in Ireland.

The Hippocrates healthcare projection model is an important addition to the ESRI modelling infrastructure and can be updated regularly. Already at the ESRI, the COSMO and SWITCH models inform macroeconomic, budgetary and wider areas of economic, fiscal and social policy. The demographic projections which inform the demand projections in this report are based on analyses of labour market flows and migration using the COSMO model. The Hippocrates model also has potential to link to the other models. For example, when the healthcare expenditure projections are complete they could be used as a direct input into the medium- and long-term fiscal projections in COSMO and also more generally in studies examining the impacts of ageing on the public finances.

The development of the Hippocrates model is in part intended to address some of the acknowledged deficiencies in the evidence base available to the 2015 study of the costs of UHI. That study concluded that further research was needed to estimate the extent of unmet need in the Irish system which would be addressed in any universal system. It was also an acknowledged limitation of that study that the cost of UHI was estimated separately from other potential cost drivers in Irish healthcare. Development of the projection model will allow future reforms to be costed within an understanding of other such drivers like population growth and ageing.

1.4 CONTEXT

In this report 2015 is the base year for analysis with activity rates from the base year used to project Ireland's healthcare demand from 2015 to 2030. Population projections are informed by the 2016 Census of Population and the ESRI's demographic analyses. However, the authors are cognisant that while the report's focus is on the effects of population growth and ageing on demand for healthcare over the years to 2030, already in 2015 the Irish health and social care systems were under pressure from Ireland's unusually high population growth rate. Ireland's population increased by 31 per cent (1.136 million) in the twenty years 1996 to 2016. Over the same time period, the average population growth in the EU28 was 6 per cent. Although the Irish proportion of older people remains low compared to many other EU countries, there has nonetheless been rapid growth in the absolute numbers of older people within the context of overall population growth. This growth in the numbers of older people could be expected to contribute to pressures on the health and social care system. The extent to which population ageing may drive healthcare demand is a topic which this report explores in detail.

Furthermore, due to the economic and fiscal crisis beginning in 2008, there have been considerable pressures on healthcare budgets. This has resulted in reductions in bed availability in public acute hospitals, reduced public health sector staffing and increased out-of-pocket charges for access to healthcare (1, 2). For these reasons, the approach in this report is to include measures of unmet need or demand in estimating demand for services in our baseline year of 2015, to the degree that available data sources can support this.

The development of this model will aid the understanding of Ireland's apparently relatively high healthcare expenditure by international standards. Revised estimates applying the OECD's System of Health Accounts, which Ireland has recently adopted, place Irish healthcare expenditure in 2014 at 11.9 per cent of GNI[4] (3, 4). However, there are limitations to the international comparability of these Irish estimates due to differences in how countries categorise their social and long-term care spending with Ireland having adopted a particularly inclusive approach (4, 5). In the second phase of the development of the Hippocrates model, this research will analyse how the volume of Irish health services delivered and the costs of delivering these services compare in an international context. Decomposing these two components of expenditure will facilitate a better understanding of the drivers of Irish healthcare expenditure.

While the development of the model aims to address some of the acknowledged limitations in the analysis of the cost of UHI earlier in this research programme, the model can also assist in assessing the effects of implementing the more recent reform proposals from the all-party Oireachtas Committee on the Future of Healthcare (6). Implementation of the *Sláintecare Report*'s proposed changes to the model of care could affect demand in different sectors; and proposed changes to eligibility and out-of-pocket charges could affect overall demand, expenditure and the composition of healthcare expenditure and financing.

1.5 MODEL SCOPE AND MODELLING APPROACH

Since the Hippocrates model has been designed with the objective of addressing the wide variety of questions outlined above, it is very broad in scope. To the degree that the data support, it includes: all health and social care services (acute hospital, primary, community and long-term care); and all public and private services (including private hospitals and privately-purchased GP visits, home help hours and other non-acute care services). The analysis in this report does not include mental health services or the disability programme (which required

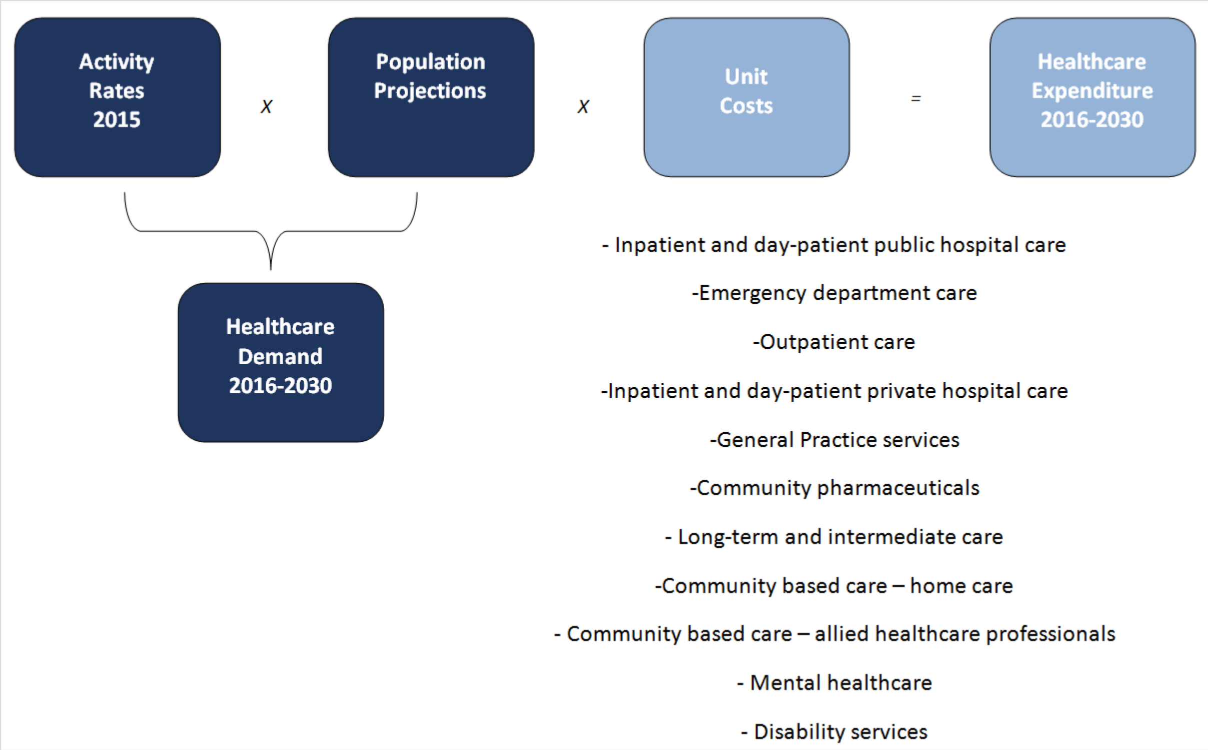
4 GNI (Gross National Income) is equal to Gross National Product (GNP) plus EU subsidies less EU taxes. GNP represents the total of all payments for productive services accruing to the permanent residents of the country. GNI is considered a better reflection of Ireland's national income than GDP (Gross Domestic Product) which includes the profits of multinational companies, which may be repatriated.

further data investigation) but these programme areas can be included in the future development of the model. Further envisaged developments include incorporating the effects of the availability of informal carers in projections of demand for care of older people in community or residential settings. This would in turn entail examining the effects on informal care availability in Ireland of factors such as household composition, family size, convergence in male and female life expectancies and labour market trends.

In the full development of the model (illustrated diagrammatically in Figure 1.1) the projections will be based on three key parameters: activity rates, demographics and unit costs. In this report on healthcare demand, the analysis is based on two of these parameters; activity rates and demographics. The model starts from an analysis of current use of health and social care services by single year of age and sex, or at as disaggregated a level as the data provides. We refer to projections as projections of demand rather than utilisation as we do not make assumptions about how capacity will adjust to meet future demand.

Since any projection exercise must address uncertainty, alternative projection scenarios are developed for each service analysed and sensitivity analyses are undertaken to test the sensitivity of our projections to changes in key assumptions. This report therefore examines a number of alternative scenarios for population growth and projects the effects of the population projections on healthcare demand. In all cases, a comparator scenario is included which assumes that utilisation rates by age and sex will remain at their 2015 levels. We then incorporate in our projections differing assumptions about utilisation rates based on evidence about the development of healthy life expectancy and requirements to meet unmet need. These scenarios have been informed by a detailed review of the national and international literature and evidence (see Chapter 2), with scenarios chosen based on the most appropriate evidence for a specific healthcare service.

FIGURE 1.1 HIPPOCRATES MODEL – DIAGRAMMATIC REPRESENTATION



Source: Authors' representation of model.

In the second phase of the model development we will apply unit cost estimates to project forward service-specific and aggregate expenditures. These expenditure projections will be subject to a range of sensitivity analyses incorporating varying assumptions on demography, morbidity, unmet need, and unit cost trends. It is hoped that this analysis will be published in a further report from the Hippocrates Model in 2018/2019. Furthermore, the model has been constructed to allow for future iterations, using different base years, and incorporating the newest data available.[5]

1.6 A SUMMARY PICTURE OF ACTIVITY IN IRISH HEALTH AND SOCIAL CARE

In order to develop projections, the development of a very detailed picture of the services used in Irish health and social care in 2015 was required. Such a comprehensive picture of public and private health and social service utilisation has not been published before in Ireland. Table 1.1 summarises major measures of activity from the highly detailed baseline analyses by service, which are presented in this report.

5 The model is automated using SPSS software with subsidiary analyses undertaken in STATA and Excel.

TABLE 1.1 ESTIMATED LEVELS OF ACTIVITY IN IRISH HEALTH AND SOCIAL CARE, 2015

Sector	Measure of activity	Baseline findings Volume of activity in 2015/ end 2015[1] ('000)
Public hospitals	Inpatient discharges[2,5]	514
	Day-patient discharges[2,5]	1,010
	Inpatient bed days[2]	3,273
	ED attendances	1,138
	OPD attendances	3,299
Private hospitals[3]	Inpatient admissions[5]	133
	Day-patient admissions[5]	459
	Inpatient bed days	613
General practice	GP visits	17,551
	Practice nurse visits	5,944
Community pharma.	Prescription items (pub.)	73,059
	Total consultations[4]	5,977
Long-term care	Residents/places	29
	LTC bed days	10,582
Home care	Home help service	66
	Home Care Package recipients	15
	Home help hours	14,311
Public health nursing and community therapy	Public Physiotherapy referrals	189
	Public Occupational Therapy referrals	88
	Public health nursing visits[6]	1,362
	Public Physiotherapy visits	760
	Public Occupational Therapy visits	347
	Public Speech and language therapy visits	147

Source: See Chapters 5 to 11.

Notes: 1. Long-term care residents' places are estimated at end-2015; other measures are for total activity in 2015.
2. These estimates are exclusive of maternity activity in public hospitals which is analysed separately in Chapter 5.
3. Day-patient admissions and inpatient bed days derive from data for private insurance-funded activity in private hospitals and do not capture the very small fraction of activity financed solely out-of-pocket. Inpatient admissions for ages 15+.
4. Total consultations for ages 18+. 2010 activity rates are assumed for 2015.
5. Public hospital data refer to cases as discharges, while private hospital data refer to cases as admissions.
6. Excludes schools vaccination programme.

An estimated 3.9 million bed days were used in public and private hospitals combined in 2015,[6] while an estimated 10.6 million bed days were used in long-term and intermediate care facilities. There were over 17 million visits to GPs, nearly 6 million visits to practice nurses, over 1.3 million visits to public health nurses, over 14 million hours of home help care supplied and over 73 million prescribed medications dispensed. In public hospitals, there were over a million day cases, over 500,000 inpatient discharges, 1.1 million Emergency Department attendances and 3.3 million Outpatient Department attendances. In private hospitals there were nearly half a million day-patient admissions and 130,000 inpatient admissions. There were over a million visits to public community

6 Excluding 0.3 million maternity bed days.

physiotherapists, occupational therapists and speech and language therapists combined. The services analysed in this report are estimated to account for approximately 70 per cent of public current healthcare expenditure and over 50 per cent of private current healthcare expenditure.[7]

1.7 DATA SOURCES AND LIMITATIONS

Developing the model necessitated overcoming significant data challenges. To assemble the composite picture of demand in 2015 shown in Table 1.1 required considerable research and, in some cases, negotiation to identify and access the data required. The process of data scoping and access was undertaken by a large team of researchers over an 18-month period and remains ongoing to identify sources to fill data gaps. At the time of writing this report, the projection model team had accessed data from 41 separate sources. The analysis has combined data collected by the Central Statistics Office (CSO), from administrative sources like the Health Service Executive (HSE) including the important and valuable Hospital Inpatient Enquiry (HIPE) Database, and from surveys such as The Irish Longitudinal Study on Ageing (TILDA), *Growing Up in Ireland* (GUI), and Healthy Ireland.

Many of these challenges arise because Ireland does not collect some data that in many other countries are routinely collected. There is, for instance, no Irish publication of Irish healthcare expenditure by age. Thus when the EU in 2015 published a major report projecting the effects of population ageing on healthcare expenditures across 28 EU states, most countries could provide data for expenditure at differing ages. However, only Greece, Ireland and Romania did not provide age-cost profiles. Due to the lack of data, the Irish projections were based on an assumption that Ireland has the EU average age-cost profile (9), which may not be the case. Providing such an age-cost profile for Ireland will be one of the contributions of the Hippocrates model when fully developed.

Further data that are not routinely collected include how much care Ireland delivers either publicly or privately under many headings; e.g. numbers of visits to GPs, occupational therapists or speech and language therapists. Nor is there a published record of how much is paid for care under many headings; e.g. number of home carer visits paid out-of-pocket. This partially reflects the nature of the

7 Services analysed in this report account for approximately 70 per cent of public current healthcare expenditure (including the majority of HSE-funded services but excluding disability and mental health services and some primary and community care professionals' services including dentistry) (7). It is estimated that the services analysed in this report cover over 50 per cent of private current healthcare expenditure. Major categories of private expenditure covered include private hospital care, GP visits, long-term residential care and home help services. Private expenditures on dental care, allied healthcare professionals' services, and on prescribed and over-the-counter medicines and medical goods are not included. Estimating the precise proportion of private healthcare expenditures accounted for by the services analysed in this report would require detailed analysis of out-of-pocket expenditures (8).

Irish healthcare system with much private purchase and delivery of care. However, even in the public healthcare system much activity is not routinely recorded (see especially in this regard Chapter 11 on community therapy services).

To model demand in the Irish healthcare system and to analyse the effects of proposed system reforms, it is necessary to understand both the public and private systems. Understanding demand for hospital care, for instance, requires analysis of both the public and private hospital systems. Requests for data from private health insurers and private hospitals did not achieve adequate access to inform this analysis, although alternative data sources have facilitated developing in this report a broader picture of the contribution of private hospitals to the overall healthcare system than has been published hitherto. A further limitation to this analysis which applies currently to all health research in Ireland, is the inability of researchers to link health datasets, because a unique patient identifier has yet to be introduced in the Irish healthcare system. The research team's approach to data challenges has been to build the model based on the best data available, while continuing to seek better data sources for further iterations of the model.

1.8 STRUCTURE OF THIS REPORT

The remainder of the report is structured as follows:

- Chapter 2 describes the Irish healthcare system; reviews the international literatures on modelling healthcare demand and expenditure, on analysing unmet need and on the evolution of life expectancy, morbidity and disability; and analyses recent Irish evidence on the evolution of morbidity and disability.
- Chapter 3 outlines the data sources and methods used in completing the analysis presented in the report.
- Chapter 4 presents our demographic projections.
- Chapters 5 to 11 present findings for our baseline analysis of utilisation, unmet need analysis and projections by sector as follows:
    - Chapter 5 Demand for acute public hospital services
    - Chapter 6 Demand for private hospital services
    - Chapter 7 Demand for general practice services
    - Chapter 8 Demand for pharmaceuticals and pharmacy services in the community
    - Chapter 9 Demand for long-term and intermediate care

  - Chapter 10 Demand for home care services
  - Chapter 11 Demand for public health nursing and community therapy services

- Finally Chapter 12 concludes by summarising and discussing the findings presented in the report.

REFERENCES

1. Wren M., S. Connolly, N. Cunningham (2015). *An examination of the Potential Costs of Universal Health Insurance in Ireland*. Dublin, Ireland: Economic and Social Research Institute.

2. Thomson S., M. Jowett, P. Mladovsky, T. Evetovits, J. Figueras, A. Nolan et al. (2012). *Health System Responses to Financial Pressures in Ireland: Policy Options in an International Context*. Brussels: World Health Organisation and European Observatory on Health Systems and Policies.

3. Central Statistics Office (2016). *Ireland's System of Health Accounts, Annual Results 2014*. Dublin: Central Statistics Office.

4. Keegan C., S. Connolly and M. Wren (2017). 'Measuring healthcare expenditure: different methods, different results'. *Irish journal of Medical Science*. Epub 2017/06/02.

5. OECD (2015). *Health at a Glance 2015*. Paris: OECD.

6. Houses of the Oireachtas Committee on the Future of Healthcare (2017). *Sláintecare Report*. Dublin: Houses of the Oireachtas.

7. Department of Health (2017). 'HSE non-capital Vote allocation in millions of Euro, 2009 to 2015'. http://health.gov.ie/publications-research/statistics/statistics-by-topic/health-expenditure/2017.

8. Central Statistics Office (2016). *System of Health Accounts CSO*. Available from: www.cso.ie/en/releasesandpublications/er/sha/systemofhealthaccounts2014.

9. European Commission (2015). *The 2015 Ageing Report: Economic and budgetary projections for the 28 EU Member States (2013-2060)*. Brussels: European Commission.

CHAPTER 2

Background

2.1 INTRODUCTION

Developing the Hippocrates projection model of healthcare demand and expenditure for Ireland has been a complex and substantial undertaking. The approach to constructing the model has been informed by a number of different strands of literature, which we review and discuss in this chapter. A wide review of the diverse methodological approaches to modelling healthcare demand and expenditure applied in different countries and contexts is summarised and discussed in this chapter and Appendix 1. Some of the complex issues which arise in defining and measuring unmet need are also explored. In projecting the effects of increased population and changes in the age structure of the population on healthcare demand and expenditure, a critical set of assumptions must be adopted, which concern the relationships of age to health and disability status and consequently to health and social care service demand. There is evidence that such relationships have changed over time and differ across countries so that age alone may not be a reliable predictor of service use and demand. Therefore the literatures on the themes of the evolution of life expectancy, morbidity and disability are reviewed and discussed in this chapter, with a focus on evidence to inform the modelling approach for different sectors of Irish health and social care activity; and to inform the demographic projections in this report.

To establish the background for modelling Irish healthcare demand and expenditure by sector in Chapters 5 to 11 of the report, the next section provides an overview of the Irish healthcare system. Section 2.3 reviews the literature on the drivers of healthcare demand and expenditure. Section 2.4 reviews the literature on healthcare modelling methods (while Appendix 1 reviews some modelling approaches in Ireland and elsewhere). Section 2.5 discusses issues that arise in defining and modelling unmet need for care. Section 2.6 reviews the literature on trends in life expectancy, morbidity and disability. Section 2.7 summarises Irish evidence on life expectancy, morbidity and disability analysed for this report. Section 2.8 concludes.

2.2 IRISH HEALTHCARE SYSTEM – AN OVERVIEW

This section outlines the characteristics of the Irish healthcare system under the headings of organisational structure; systems of financing, delivery and access; and proposals for reform. Irish healthcare structures and functions are similar to those in many developed countries, but there are some important differences, notably in the system of eligibility for public healthcare and the complex mix between public and private financing and provision. In Chapters 5 to 11, we describe in greater detail the characteristics of specific sectors.

2.2.1 Organisational structures

The Department of Health provides strategic leadership for the Irish healthcare system, ensuring that government policies are translated into actions (1). It provides support to the Minister for Health and junior Ministers of State, who are politically accountable for the health service. The Department is responsible for policy and planning, evaluation of resource allocation and the development of the legislative and regulatory framework for the health system (1). The Health Information and Quality Authority (HIQA) was established in 2007 to monitor independently and to promote quality and safety in Irish health and social care services (2, 3). The Health Service Executive (HSE) was established in 2005, and manages the operation of the Irish health service, replacing former local health boards (4). The Department of Health and the HSE in Ireland are responsible for both health and social care services, which in some countries are separately administered and funded. The HSE was reorganised in 2013 when a regional division of responsibilities was replaced by a directorate structure organised along service delivery lines (5).

Hospitals in Ireland may have public, private or voluntary ownership. In 2013 the HSE assigned public and voluntary hospitals to seven hospital groups with group chief executive officers reporting to the HSE National Director of Acute Hospitals (6). The *Programme for Government 2011-2016* proposed that these groups should become independent Hospital Trusts, in a new system of Universal Health Insurance (UHI) (7). Although the proposed UHI reform was abandoned in 2015 and there was a change of Government in 2016, the hospital group structure remains. The 2016 Programme for Government commits to further developing the Hospital Group Structure and proposes that the HSE should eventually be transformed into a Health Commission (8). It envisages that hospital groups would evolve to have greater autonomy in a system separating purchaser and provider functions with payment for activity replacing block grants (activity based funding). Hospitals would have to meet target waiting times for inpatient, outpatient and Emergency Departments, which would be agreed with the Performance Management Unit, a subdivision of the Health Commission (8).

Primary and community care services are administered and some are delivered by a network of 32 Local Health Offices (LHOs), a structure which predates the establishment of the HSE. Re-organisation has changed the regional structures above the LHOs from 17 Integrated Service Areas (ISAs) between 2010 and 2013 to nine Community Healthcare Organisations (CHOs). Whereas ISA managers were responsible for overseeing hospital, primary, and community and continuing care services in their areas, the CHOs no longer have responsibility for hospital services (9). CHOs are tasked with implementing nationally standardised models of care for each care group (i.e., primary care, social care, mental health, health and wellbeing services), but have scope to bring a local community focus to service delivery (10).

2.2.2 System of financing

Total current expenditure on health and social care combined has been estimated at €18.8 billion in 2013 and €19.1 billion in 2014 (10.1 per cent of gross domestic product (GDP) or 11.7 per cent of gross national income (GNI)) (11). This estimate by the Central Statistics Office (CSO) was compiled according to the OECD's System of Health Accounts. This adopts an inclusive approach to social care services, which can affect international comparability since some other countries exclude a higher proportion of social service funding from estimates of health expenditure (12). Capital expenditure has been estimated at €914 million in 2013 and €894 million in 2014, 4.6 and 4.5 per cent of overall Irish healthcare expenditure for those years respectively (11). Current expenditure is financed from a mixture of public and private sources, with government financing (largely from taxation) contributing an estimated 69.3 per cent in 2014 (11). Private financing in the form of out-of-pocket (OOP) spending by users and private health insurance accounted for 15.4 per cent and 12.7 per cent respectively of current healthcare expenditure in 2014 (11). The remaining 2.6 per cent is accounted for by other voluntary schemes, i.e. non-profit institutional financing (e.g. voluntary donations and contributions) and enterprise financing schemes (e.g. employers providing healthcare and/or occupational healthcare to employees).

2.2.3 System of delivery

There are public, voluntary and private (for profit) providers of healthcare in Ireland. Public providers (e.g. public hospitals, public long-stay units etc.) are owned and directly funded by the HSE. Voluntary bodies are usually religious organisations or charities, and receive most of their funding from the state. Service level agreements with the HSE generally govern services to be provided in return for Exchequer funding. Many major acute hospitals are owned by voluntary organisations. Similarly, voluntary organisations provide mental health and addiction services. Private acute care is provided in both public and private hospitals. Private providers also deliver many primary and community health services, e.g. general practitioners (GPs), pharmacists and private providers of home care. Other areas of private delivery include private mental health and addiction services, and private nursing homes.

2.2.4 System of access

Ireland has the only European health system that does not offer universal coverage of primary care (13). Although the system is predominantly tax-financed, purchasing private health insurance offers preferential access to public hospital care despite the relatively low financing contribution made by such insurance, and much of primary care remains financed out-of-pocket (4, 14). There is evidence of financial barriers to access, unmet need for care and relatively high user charges for primary healthcare (15, 16).

All citizens are eligible for treatment in public hospitals. Public hospitals are funded by the state for public patients' care and by private fees and insurance for private patients' care. Care in private hospitals is generally financed by private insurance or out-of-pocket but the state has purchased private hospital care for public patients on waiting lists. GPs deliver care in a private market to the majority of citizens who purchase care out-of-pocket; and GPs are paid by the state by a mixture of capitation and fees for the care of people on lower incomes and in age or other categories, who qualify for free GP care. Ireland's complex system of eligibility for publicly-financed care is summarised in Table 2.1.

TABLE 2.1 ELIGIBILITY FOR HEALTH SERVICES IN THE IRISH HEALTHCARE SYSTEM

Type of Care	Category 1 (Full medical card holders)	GP Visit Card	Category 2 (Do not hold medical cards)
GP	Free	Free	Out-of-pocket fee
Prescription Medicines	Co-payment charge of €2.50 per item. Capped at €25 per person (or family) per month (General Medical Services Scheme), at €20 if aged 70 or over	Drugs Payment Scheme: Free above €144 out-of-pocket payment per month per family/individual. For Specified Long-Term Illness (Long-Term Illnesses/ High Tech Drug Schemes): Free	
Acute public hospital inpatient	Free	€80 per night (annually capped at €800 per person)[1]	
Acute public hospital outpatient (includes Emergency Department)	Free	Free with GP referral. €100 per visit without GP referral[2] Free access to other outpatient services.	
Other	Varied eligibility for community, personal and social care services, dental, ophthalmic, aural care;[3] other benefits		

Source: Citizens Information, 2017.

Notes: 1. Exemptions to inpatient charge: Children up to six weeks of age; Children with a mental handicap or mental illness, phenylketonuria, cystic fibrosis, spina bifida, hydrocephalus, haemophilia and cerebral palsy; Children referred for treatment from child health clinics and school health examinations; People receiving treatment for prescribed infectious diseases; People who are entitled to hospital services because of EU Regulation; Women receiving maternity services.

2. Exemptions to Emergency Department charge: Those admitted as an inpatient from the Emergency Department (still liable for the inpatient charge); Children up to six weeks of age; Children with a mental handicap or mental illness, phenylketonuria, cystic fibrosis, spina bifida, hydrocephalus, haemophilia and cerebral palsy; Children referred for treatment from child health clinics and school health examinations; People receiving treatment for prescribed infectious diseases; People who are entitled to hospital services because of EU Regulation; Women receiving maternity services; People with Hepatitis C who have a Health Amendment Act Card

3. For example, free treatment of children in state schools.

Individuals can qualify for a full medical card (Category 1) or a GP visit card on a means-tested basis[8] under the General Medical Services (GMS) scheme (17, 18). Full medical cards entitle holders and their dependants to largely free primary and public hospital services. Recipients also receive free medical appliances and a maternity cash grant on the birth of a child. However, since 2010, medical card holders have been charged co-payments for prescribed medications. Individuals aged 70 and older were automatically entitled to medical cards between 2001 and 2009. While means testing has been re-introduced for this age cohort they still qualify for cards at a higher income threshold than those aged under 70.

GP visit cards, introduced on a means-tested basis in 2005, confer eligibility for free GP visits to the holder and their dependants.[9] In August 2015 those aged 70 and older and above this threshold have been eligible for a GP visit card. Since July 2015, all children aged under six years have been eligible for GP visit cards. Due to changes in the relationship between the income thresholds for eligibility and the income distribution, there is fluctuation in the percentage of the population covered by medical and GP visit cards. From 2005 to 2015, the percentage of the population covered by cards increased from 29 to 47 per cent (20). Tax relief is available for all medical expenses, including costs of nursing home care, that are not otherwise reimbursed by public funding or by private health insurance (21).

Individuals who are defined as being in Category 2 do not meet the criteria for a full medical card. Generally, such individuals have to pay the full cost of GP care (unless they qualify for a GP visit card) and a charge for attending the Emergency Department (ED) or staying overnight in a hospital. Discretionary medical cards may be issued to those in Category 2 if they have certain health needs which are determined to cause them 'undue hardship'.[10]

Approximately 46 per cent of the population purchased private health insurance in 2015 (22). Private health insurance mainly covers hospital services and is largely purchased to avoid long waits for public care (23). Private insurance can cover treatment both in public and private hospitals. The government supports the market by subsidising the cost of private health insurance through 20 per

8 Individuals living alone aged under 66 who earn less than €9,568 annually or a couple with two children aged under 16 who earned less than €17,810 annually are entitled to a medical card. Income cut-offs are slightly higher for those aged 66-69. The income limit for over 70s medical card is €26,000 for a single person and €46,800 for couples. The income thresholds for GP visit cards for under individuals living alone aged under 66 is €14,352 and €26,725 for a couple with two children aged under 16 (www.citizensinformation.ie)(17, 18).

9 Additionally, those with Health Amendment Act Cards, who contracted Hepatitis C through contaminated blood products, are entitled to GP visits and a variety of other services, free of charge (19).

10 The *Health Act 1970*, as amended, states that a person is eligible for a discretionary medical card if 'considered by the chief executive officer of the appropriate health board to be unable, without undue hardship, to provide that service for himself or his dependants' HSE (2014). *Report of the Expert Panel on Medical Need for Medical Card Eligibility*.

cent tax relief on private health insurance premiums.[11] The system of access and eligibility for long-term and intermediate care is outlined in Chapter 9.

2.2.5 Proposals for reform

The complex mixed public-private system persists despite repeated reform attempts, including the 2011 to 2016 Government's proposal for UHI, which was abandoned in 2015 (20). More recently, an all-party Oireachtas (parliamentary) Committee was established in 2016 with the aim of achieving a single long-term vision for healthcare and the direction of health policy in Ireland. The Committee's *Sláintecare Report*, published in May 2017, recommended the introduction of universal GP and primary care in stages, ending private practice in public hospitals, reducing or removing out-of-pocket fees and substantially increasing public healthcare expenditure and capacity in a tax-funded system (24). The Hippocrates model has been structured to facilitate modelling the effects of such proposed reforms, including modelling the effects of changing the composition of healthcare financing or changing eligibility; and modelling the capacity and expenditure implications of meeting unmet need or demand.

Reviews of literature and evidence

In the next sections, this chapter reviews the best available evidence on a number of important themes that inform the approach to analysis and modelling in this report. These themes include: the drivers of healthcare demand and expenditure; modelling methods to project healthcare demand and expenditure; defining, measuring and projecting unmet need; and trends in mortality and in the relationships of morbidity and disability to life expectancy.

2.3 REVIEW OF LITERATURE ON DRIVERS OF HEALTHCARE DEMAND AND EXPENDITURE

The wide literature on drivers of healthcare expenditure and demand considers such factors as population size, the age structure of the population, health status, national income, technological change and health system characteristics. The number of people in the population will impact on total demand for healthcare services. However, the structure of the population will also drive the demand for healthcare; demand tends to be higher in the first and later years of life and during maternity years for women (25). Although population ageing is often associated with increased healthcare utilisation, there are competing hypotheses about the relationship of health to ageing, which we examine in detail in Section 2.6.

[11] Tax relief at source restricted to €1,000 gross premium for adults and €500 for children and students.

Early studies of the determinants of health expenditure found national income to be a strong predictor of cross-country differences (26-28), while a recent study finds that over two-thirds of cross-country differences in healthcare expenditure are explained by demographic and economic differences (29). The relationship of health expenditure to national income continues to be explored (30, 31). Early studies tended to report high income elasticities of demand, much greater than unity (32). This implied that healthcare could be considered a luxury good. That is, consumption of healthcare increased at a greater rate than income. As longitudinal data became available and econometric specifications improved, estimates of income elasticity were revised downwards, closer to unity (9). However, the European Commission (25) notes that health expenditure per capita generally grows 1 to 2 per cent faster than GDP across OECD countries. As an explanation, it is suggested that aggregate expenditure decisions by government will not have a linear relationship to GDP because budget allocations may be influenced more by political than economic factors. Increases in health expenditure growth in excess of income growth may also be explained by supply-side effects such as Baumol’s cost disease. This theory posits that in labour intensive services such as healthcare, productivity is lower than in other sectors. However, as wages in low-productivity sectors must keep up with wages in high-productivity sectors, prices for health services will tend to rise faster than other prices (32). There is still a lack of empirical agreement on the impact of Baumol’s cost disease on health expenditure growth (32).

Technology is an important supply-side driver of health expenditure and recent estimates suggest that medical technology explains between 27 and 48 per cent of health expenditure growth since 1960 in the United States (33). Other studies, which have used various proxies for technological change, have also shown the impact of technological change on expenditure growth across countries (34-36). The adoption of new technologies may broaden the range of conditions that are treatable and thus increase demand. While medical innovations may lead to falling unit costs (potentially having a negative effect on expenditures), if the demand response to lower prices is large enough, this may also lead to rising expenditures (30). Furthermore, while new technologies impact short-term costs, they also impact downstream costs, positively and negatively, due to extending life (37).

Health system characteristics may have an influence on health expenditures. Some evidence exists to show that the higher the publicly-financed share of health expenditure, the lower is overall per capita health expenditure in OECD countries (28, 38, 39). Gerdtham et al. (28) showed an increase in the fraction of public financing by 10 per cent was associated with 5 per cent lower health expenditure. Greater control of healthcare providers in publicly-financed systems has been advanced as an explanation for these findings (30). Other studies have contradicted these findings (40-42) and suggested that higher public healthcare provision may lead to higher healthcare expenditure through a reduced perception of the price of healthcare on the part of consumers and and/or lower incentives for minimising cost in public systems (40). Evidence from the United States shows that while private health insurance growth may explain some of the increase in healthcare expenditure in the past, relative to other factors, it was a not a key driver and its impact may lessen further in the future (33).

Methods of provider remuneration have also been considered potential determinants of healthcare expenditure. Analysis of a sample of 22 OECD countries over the period 1970 to 1991, showed that countries that reimburse physicians by capitation (an annual amount per patient rather than fees for services delivered) tend to have lower health expenditures (43). Similarly, Christiansen et al. (41) showed a negative association between total healthcare expenditure per capita and both payment of GPs by salary and capitation compared to fee-for-service. Moreover, case-based reimbursement of hospitals was associated with lower expenditure per capita. The impact of primary care gate-keeping (where a GP referral is required to see a hospital specialist) on expenditures has also been analysed. Recent evidence has shown that strong primary care is associated with better population health, though it may also result in higher expenditure, but not with increases in expenditure over time (44). Barros found no evidence of a relationship between primary care gate-keeping and health expenditures (45).

2.4 REVIEW OF LITERATURE ON MODELLING METHODS

The literature identified on projection methodologies characterises three broad modelling approaches; macro level, macro-simulation, and micro-simulation (Table 2.2). Classification is based primarily on the level of data disaggregation inherent in the approach. The focus of these methodologies is mainly on health expenditure projections as an outcome rather than on utilisation or demand (which may be considered as inputs into expenditure projection).

Macro-level models relate to modelling of aggregate expenditures (46). Astolfi et al. (46) discuss two main types of macro-level models. The first relates to time series modelling of aggregate expenditures. Projections can be based on pure extrapolation of a trend or they can be based on projected values of important explanatory variables (46). This approach is most appropriate for short term projections under the assumption of clear and undisturbed trends (30). Trend based analyses of demand projections have also been outlined in the literature (47). The main advantages of this approach are that modelling tends to be straightforward and it is the least demanding of all approaches in terms of data requirements. As a drawback, however, this is not a viable approach for longer term forecasts because the future structural changes to demand drivers cannot be taken into account (30). Since these models extrapolate past trends, they may lead to unrealistic estimates of long-term health expenditures (e.g. very large health expenditure/GDP ratios) (48). A comparative analysis of health expenditure forecasting models, developed by or used to inform, policymakers in OECD member countries and other international institutions found very few examples of this approach being adopted in practice (46).

Computable general equilibrium models (CGE) can also be considered a class of macro-level models (46). CGE specify a number of equations designed to replicate the entire economy. Implications of higher levels of healthcare spending on economic growth along with the long-run determinants of healthcare spending can be assessed through this approach (46, 49). These models are based on economic theory and rely on strong simplifying assumptions about behaviour of economic agents and of equilibrium that may not reflect observed trends (46). Data requirements for CGE models are generally much higher than for other macro-level models. They have had limited applicability to healthcare projection analysis.

Macro-simulation models or cell-based models represent a large and important class of what Astolfi et al. (46) refer to as component-based models. These models project health expenditure by different components, for example financing agent, provider, or diagnosis. In macro-simulation models, individuals are grouped into cells according to a limited number of characteristics (e.g. age and sex). Health expenditure is calculated by multiplying the number of individuals in each cell by the unit (or average) cost. Baseline activity rates can be projected forward using population forecasts. Baseline unit costs can be projected forward using, for example, GDP per capita growth rates (50). Manipulations can then be made to these components for more sophisticated analyses of utilisation and expenditures. For instance, different demographic scenarios can be assessed through alternative population projections for each cell. Changes in health status can be assessed through manipulating activity levels in each cell. Assumptions about supply-side factors (e.g. technology, labour costs and raw materials) can also be analysed through specifying alternative unit costs trajectories (see European Commission (50)). The implementation and maintenance of these models tends to be simple and relatively inexpensive. Cell-based models tend to be less data demanding than micro-simulation models (see below). While basic cell-based models disaggregate estimates into major categories of healthcare expenditure (or utilisation) and age/sex classes, more sophisticated models might encompass further disaggregation by disease categories, decedent/survivor status or end-of-life cost (46) (See Table 2.2 and Appendix 1). Cell-based modelling tends to be the dominant methodological approach to health expenditure projection, accounting for a large proportion of the forecasting models surveyed by OECD (51). Cell-based models are also applied to modelling projected demand for and expenditure on long-term care, in which context they have been extended to include projections of informal care demand (52, 53).

Micro-simulation models focus on individuals as the unit of analysis rather than focusing on aggregated values (30). Although micro-simulation may relate to any predictive modelling approach using micro-units, micro-simulation models are used primarily to simulate individual behavioural responses to policies yet to be implemented (54). Dynamic micro-simulation models project population samples over time which allow for the modelling of various 'life-events' (e.g. exposure to risk-factors) under a variety of policy scenarios (46, 54, 55). The POHEM (Population Health Model) is a dedicated health micro-simulation model developed for modelling life-cycle dynamics within the Canadian population, which has been used to model the cost (and demand) implications of various health interventions (56). Micro-simulation models are useful tools for ex-ante analysis of health policy scenarios including exploring distributional effects (54, 56) but their benefits may be outweighed by the time and large amounts of data their development requires (46, 57). Jillian Oderkirk et al. (51) note that micro-simulation models may face difficulties trying to incorporate components of health expenditure growth such as health system characteristics, administration, or investments in research, into simulations. A drawback of micro-simulation models is that they may appear to be a 'black box' whereas macro-simulation models are more transparent and easier to interpret in policy discussion.

TABLE 2.2 SUMMARY OF MODELLING APPROACHES

Modelling Approach	Data Disaggregation	Description	Advantages	Disadvantages	Examples of country/ institutional application
Time series	Aggregate expenditures (e.g. per capita health expenditures)	Projections can be based on pure extrapolation of a trend or they can be based on projected values of important explanatory variables. Appropriate for short term projections under the assumption of clear and undisturbed trends	Modelling is straightforward. Limited data requirements	Not a viable approach for longer-term projections	OECD countries (58); Australia (59); Canada (60)
Computable General Equilibrium	Aggregate expenditures	Sophisticated, broader modelling of economic agents that allow for analysis of health expenditure trajectories	Allow for analysis of broader consequences (e.g. impact on non-health markets)	Rely on strong simplifying assumptions that may not reflect reality. Substantial data requirements. Limited application to healthcare contexts.	United States (Medicare) (49)
Macro-simulation	'Cell-based' breakdown of key characteristics (e.g. age/sex)	Within each breakdown, individuals are grouped into cells according to a limited number of characteristics (e.g. age and sex). Health expenditures are calculated by multiplying the number of individuals in each cell by the unit (or average) cost	Implementation and maintenance simple and inexpensive. Straightforward to model alternative expenditure scenarios. Moderate data requirements	Limited ability to explore scenarios associated with potential policy changes	United Kingdom (61); New Zealand (62); Australia (63); US (Dept. Veterans' Affairs) (64); Netherlands (65); European Union Member States and Norway (25, 66, 67); Ireland (68, 69)
Micro-simulation	Micro-level units (e.g. patient level data)	These models reproduce characteristics and behaviours of populations that model the impact of various interventions over individuals' lives	Allow for detailed analysis of potential 'what if' scenarios	Substantial amounts of statistical resources and data required	United States (70, 71) Canada (72)

Source: Sources as referenced in table.

Standard regression-based models, incorporating micro-level units, perhaps outside the definition of micro-simulation models outlined above, have also sometimes been used in health expenditure forecasting but appear to be uncommon (73). While useful for identifying and measuring causal relationships, the validity of their results tends to be limited to the range of historical values on which they are estimated so that they are less appropriate for estimating the effects of major demographic, structural or institutional changes that extend beyond the range of past experience. As noted by Przywara (30), health-based predictive models such as those used in the risk-adjustment literature may also be considered a class of micro-simulation models. These involve using various diagnosis-based groupers (DRGs, DCGs) to explain expenditure variation among populations. However, the primary focus of this methodology tends to be on using econometric techniques to identify the best predictors of health expenditure and not health expenditure forecasting per se.

As noted by Astolfi et al. (46), no class of projection modelling approach can be considered superior. The choice of approach requires decisions about time and resources, available data, and the purpose of the projection. Following review of the modelling literature and the data requirements and intended policy applications for the Hippocrates model, the research team concluded that the most appropriate modelling approach to pursue in an Irish context was a form of macro-simulation (cell-based) modelling. This approach offers more flexibility than standard macro-level modelling yet may still be feasible in the face of existing data constraints. From the perspective of stakeholders, cell-based forecasting is also likely to be the most transparent approach to adopt. This is also the most common approach to health expenditure forecasting identified in the literature. Chapter 3 outlines the application of this methodology in the Hippocrates model.

2.5 REVIEW OF LITERATURE ON UNMET NEED

2.5.1 Defining unmet need

This section reviews the literature on unmet need for healthcare services to inform the analysis of unmet need in the projection model. While the term ‘unmet need’ is commonly used, there is no universally accepted definition and the term is used differently by different commentators. For example, some have defined unmet need as a need for care that is not being met (74), while others defined unmet need as individuals being unable to obtain care when they believe it to be medically necessary (75). Additionally, Hennell included a socio-economic dimension to his definition when defining unmet need as the belief that less affluent populations are differentially less likely to present early with illness, or are otherwise systematically more likely to face inhibitions on achieving hospital treatment due to resource constraints (76). A number of studies have defined unmet need as the difference between services judged necessary to deal appropriately with health problems and the services actually received (77, 78). Allin et al. define unmet need as arising when an individual does not receive an available and effective treatment that could have improved their health (79).

While some studies have focused mainly on identifying the factors contributing to unmet need, others have focused on examining the individual and household factors associated with unmet need. There is also a small literature on assessing the implications of unmet need in terms of subsequent health services use and health outcomes. Much of the early work on unmet need was based in the United States and tended to be assessed through a utilisation model for specific conditions using clinical examinations (80). While potentially informative, such an approach fails to capture unmet need among those that remain undiagnosed and does not take into account that using services may not equate to having healthcare needs met. More recently, methods of assessing unmet need have distinguished between clinical and subjective approaches (79). The former relies on a clinical assessment of whether an individual did not receive appropriate care while the latter relies on individuals' subjective assessments that they have not received the care that they need. Allin et al. (79) and Cavalieri (81) suggest subjective measures of unmet need may be considered superior to objective measures in assessing unmet need; they can feasibly be included in national surveys and are consistent with the assumption that the patient is the best judge of his/her health status and healthcare. However subjective measures are also associated with potential shortcomings not least neglect of unperceived (but clinically relevant) unmet health needs (81).

2.5.2 Factors contributing to unmet need

A commonly used classification of the factors contributing to unmet need includes issues relating to access, availability and acceptability (77, 82-84). Accessibility refers to factors associated with cost and proximity (including transport issues) of services. Availability concerns the timely provision of health services (77) and is influenced by factors such as long waits and insufficient supply. Acceptability relates to personal attitudes and circumstances and includes factors such as how family and work might influence individuals' ability to take time to access health services (83). In terms of accessibility, a number of studies have identified cost as an important determinant of unmet need. Examining unmet need in 14 European countries, Koolman found significant variation in the proportion of survey respondents reporting unmet need due to cost, ranging from seven per cent in Spain to 50 per cent in Ireland to 64 per cent in Belgium of those who reported unmet need (85). This may reflect differences in the extent to which care is provided free at the point of use across Europe. In Canada, while fewer than one per cent of respondents reported having had a need for healthcare in the previous year that was not met because of problems related to accessibility, the prevalence of such unmet need was related to household income (86). In relation to availability, evidence from Europe has found signification variation in the proportion reporting waiting lists as the reason for unmet need for healthcare services across countries; ranging from one per cent in Belgium to 24 per cent in Ireland to 38 per cent in Finland of those who reported unmet need (85). In Canada, studies have found that availability issues are the most common reason for unmet healthcare needs (82, 86), with the most common reason for unmet need being waiting time (reported by 23 per cent of those with an unmet need), followed by the services not being available when required (reported by 15 per cent) (82). In terms of acceptability, available studies of unmet need have identified a variety of factors at the individual level which have contributed to unmet need. These include being too busy or not being able to take time off work (77, 82, 87), not knowing where to get help (87) and distance or transport issues (87, 88).

2.5.3 Characteristics associated with unmet need

A number of individual characteristics have been found to be associated with unmet need for healthcare including age, sex, health, medical coverage, and socio-economic status. There is an inconsistent relationship between age and the likelihood of reporting an unmet need for healthcare in the literature, with some studies showing higher unmet need among older age groups (87), others showing higher unmet need among younger age groups (81, 83, 88) and others finding no clear relationship (77). Studies on unmet need have consistently found higher levels of unmet need among females (77, 81-83, 86, 87). Gender differences might be explained by women’s dual role in the workplace and home (77, 81, 86), with these multiple roles generating more competing priorities and leaving women with less time to seek care for themselves. Alternatively, women may be the primary care seekers for dependent children and elderly family members, have more contacts with the healthcare system and thus more opportunities to experience difficulties in accessing care and to report such as unmet needs (81).

In general, higher levels of unmet need have been found among more deprived individuals (81, 86, 89-91). However, the relationship between socio-economic status and unmet need varies depending on the indicator of socio-economic status used. While lower income has been consistently found to be associated with unmet need (81, 82, 85, 86), education has shown a mixed association (81, 84, 86, 89), especially once income is controlled for. The literature has also provided somewhat mixed results about the relationship between economic activity and unmet need. Evidence suggests that unmet need by lower income groups is in part driven by issues of accessibility (including cost and transportation) (81, 82, 84). Some have argued that it is not surprising to find no relationship between income and unmet need due to waiting times in universal healthcare systems because wealthier individuals cannot jump the queue to get necessary care (81). Unmet need may be higher in lower income groups because they have higher incidences of health problems and greater healthcare needs and therefore are more likely to interact with the health system (92). Their lower socio-economic standing will not only contribute to their greater healthcare need but also potentially contribute to their not having these needs met. Poor health status (which is typically used as a proxy for need) has consistently been shown to be related with high unmet need (77, 79, 81), due to the fact that those in poor health are more likely to need healthcare and therefore to experience an unmet need. In this context, a number of studies have found a positive relationship between reporting an unmet need for healthcare services and health service use (77, 79, 82, 83, 89). However, even after controlling for health status, a number of studies have continued to find a positive association between unmet need and health service use (79, 82).

A small body of research on unmet need has considered the relationship between unmet need and subsequent health service use: individuals reporting unmet need in 1999 in the US were more likely to use ED and hospital care in 2000 than those not reporting unmet need (74). A study on the association between perceived unmet healthcare needs and the risk of adverse health outcomes (93) found that overall unmet healthcare needs were not associated with an increased risk of admission to hospital among those with chronic conditions. However, in a stratified analysis, participants who reported issues of limited resource availability had a slightly higher risk of hospital admission. A study from Spain examining unmet healthcare needs and mortality among older people found that after a median of five years, those with unmet healthcare needs had a higher risk of mortality than those without unmet needs (94).

2.5.4 Evidence on unmet need in Ireland

In relation to unmet need in Ireland, a study using 2004 EU-SILC data found that just over 2 per cent of survey respondents from Ireland reported an unmet need for a medical examination or treatment in the previous 12 months; of those reporting an unmet need, the most common reason was cost (50 per cent) and waiting lists (24 per cent) (85). In this context, Ireland has amongst the highest rates of unmet need in the EU due to access. A more recent study by Connolly and Wren, using 2013 EU-SILC data for Ireland, found that almost 4 per cent of participants reported an unmet healthcare need (95). Overall, lower income groups, those with poorer health status, and those without either a medical/GP visit card or private insurance were more likely to report unmet healthcare needs. Cost (59 per cent) and waiting lists (25 per cent) were the most commonly cited reasons for those with an unmet need (95). Others have argued that EU-SILC data may underestimate the true extent of unmet need (96) and evidence from Ireland provides some support for this assertion. One study found that almost 19 per cent of patients in Ireland had a medical problem in the previous year but had not consulted the GP because of cost (15), while gaining a medical card resulted in a 27-43 per cent increase in the number of GP visits per annum (97-99).

2.5.5 Limitations of research on unmet need

There are a number of limitations in the existing research on unmet need. A potential limitation of the use of survey data to identify self-reported unmet need is that some types of unmet need remain undetected. Allin et al., for example, identified five types of unmet need including unperceived unmet need where an individual is unaware of the need and consequently the unmet need (79). Recent research using data from TILDA found examples of undiagnosed medical issues among the older population of Ireland (100, 101), with one study finding that 45 per cent of those with hypertension were unaware of their hypertensive status (101). Thus, it is unlikely that a single indicator or method of measurement will be sufficient to capture all aspects of unmet need (102). A further potential limitation of much of the existing research on unmet need is a failure to consider the implications of unmet healthcare need. While some studies have examined the impact of unmet need on subsequent health services use and health status (74, 93, 94), much of the research has focused on unmet need at a point in time and fails to consider the subsequent effect of the unmet healthcare needs in terms of subsequent use of healthcare services and health status.

While some studies have examined unmet need for specific services, a limitation of much existing research is a failure to consider how the extent, causes and characteristics of those experiencing unmet need may differ across different services and sectors. In the Irish context, it is anticipated that the causes and characteristics of those who experience unmet need may differ for primary and secondary care services. For example, relatively high user fees for GP care (16) could contribute to unmet need due to cost among those without a medical card, while relatively long waiting times for public hospital services (103) may contribute to unmet needs for those without private health insurance. For policymakers to address unmet healthcare needs within the system, more information is required on the specific nature of the unmet needs including the health sector or service to which the unmet need relates.

2.5.6 Unmet need in projection modelling

Although assessments of unmet need play an increasing role in health service planning and evaluation (104, 105), incorporating unmet need and demand estimates in modelling future demand is not generally a feature of macro-simulation projection models. Micro-simulation projection models, however, have included analysis of unmet need. For instance, in a study modelling need for formal and informal care for older people in Australia using a dynamic micro-simulation approach, the number of older Australians likely to need different types of care is compared to the projected supply of care places to estimate unmet need at the national level over the next 40 years (106). Need is modelled on the basis of an individual's disability level and potential family assistance (informal care). A similar approach is taken by Forder and Fernandez using the PSSRU dynamic micro-simulation model to analyse the impact of a tightening fiscal situation on social care for older people (55). In their study, unmet need is defined in terms of the gap between levels of support received and the current average state-supported care packages for people in different circumstances.

In this report, which adopts a macro-simulation rather than a micro-simulation modelling method, the approach is to analyse evidence of existing unmet need and demand in each sector of health and social care activity, where data availability can support this. While need is analysed using self-reported survey data, unmet demand is analysed using administrative waiting list data. (For further information on methods of unmet need and demand analysis see Chapter 3).

2.6 REVIEW OF LITERATURE ON LIFE EXPECTANCY, MORBIDITY AND DISABILITY

This section reviews the literature on population health, in particular focussing on mortality, morbidity, and disability and hypotheses on healthy ageing.

2.6.1 Definitions

Mortality is defined by the World Health Organisation (WHO) as the number of deaths by place, time, or cause and is usually measured by mortality rates (107).[12] Life expectancy is measured as period or cohort life expectancy depending upon the mortality or life tables used. Period life expectancy estimates how long a person will live using mortality rates from life tables at the present time. Life

[12] Crude mortality rates for a specific group (e.g. those aged between 55 and 60) are estimated by dividing the number of individuals who died in that population group in a specific year by the number of individuals in that cohort in that specific year. Age-standardised mortality rates facilitate comparison of changes in mortality over time or groups such as age cohorts or countries. They are computed by estimating a weighted average of age cohort mortality rates, where the weight is the proportion that each respective cohort makes of the total population.

expectancy at age 65 (how long a person aged 65 is expected to live) is a common period life expectancy measure and is often used when examining health and social care in older people. Alternatively, cohort life expectancy provides the probability of a person born in a given year(s) dying at each age over their lifetime, and may be a better measure as it allows for age-specific mortality rate trends to be used.

Life expectancy, how long a person is expected to live on average, and mortality are closely linked. Mortality rates are used to calculate the probabilities of surviving to the following year at a given age, which are in turn used to calculate life expectancy.

Disability is defined as 'an umbrella term, covering impairments, activity limitations, and participation restrictions' where 'an impairment is a problem in body function or structure, an activity limitation is a difficulty encountered by an individual in executing a task or action, and a participation restriction is a problem experienced by an individual in involvement in life situations' (108). Common measures of disability are: the difficulties with Activities of Daily Living (ADL) index, which measures difficulties with personal maintenance tasks (e.g. eating, dressing); and the difficulties with Instrumental Activities of Daily Living (IADL) index, which measures difficulties with household maintenance tasks (e.g. cooking, shopping).[13] These measures can capture disability severity which is important when considering how disability relates to healthy ageing. A limitation of these measures is that changes in the environment (e.g. electric wheelchairs, 'kneeling' buses, ramps/elevators) rather than an intrinsic improvement in disability can impact the indicator (109, 110). Furthermore, these measures do not include disabilities related to vision, hearing, cognition, psychological distress, and frailty (111). Consequently, functional limitation measures, such as the ability to handle and pick up small objects or the ability to walk a short distance, which are unaffected by changes in environmental factors, may be preferred (110). However, disability captured by functional limitation measures is quite broad, and is considered to be of less severity than that captured by the ADL difficulties index (112).

Morbidity is defined as 'the state of being ill or having a disease' (113). While this is the definition used in this report, other definitions of morbidity are also used in the literature. As opposed to disability, morbidity is measured using clinical measures such as the average age of onset of an episode of acute illness (e.g. stroke) (114). While some morbidity measures use clinical definitions such as the

---

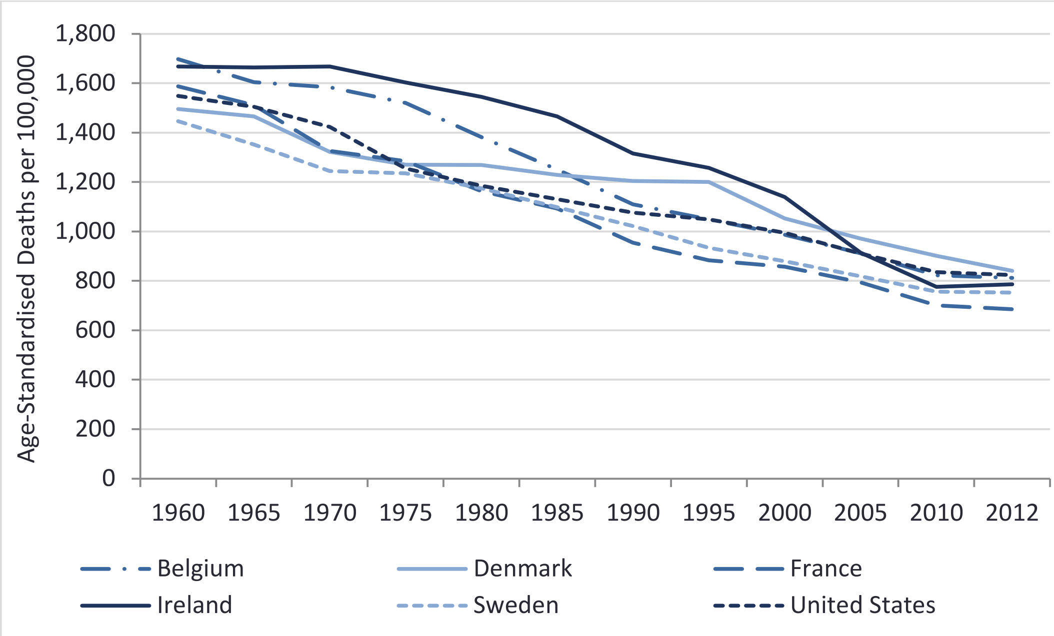
[13] Disability-Adjusted Life Years (DALYs), which are expressed as the sum of the Years of Life Lost (YLL) due to premature mortality, and the years lost due to disability (YLD) for people living with a health condition or its consequences, are also used.

presence, absence or severity of a particular disease, many studies conflate disability and morbidity, defining morbidity as the capacity to perform certain activities of daily living. In this context, disability is often used as a proxy for measuring morbidity (115). In this report, where possible, morbidity and disability are clearly defined as separate concepts.

2.6.2 Trends in mortality

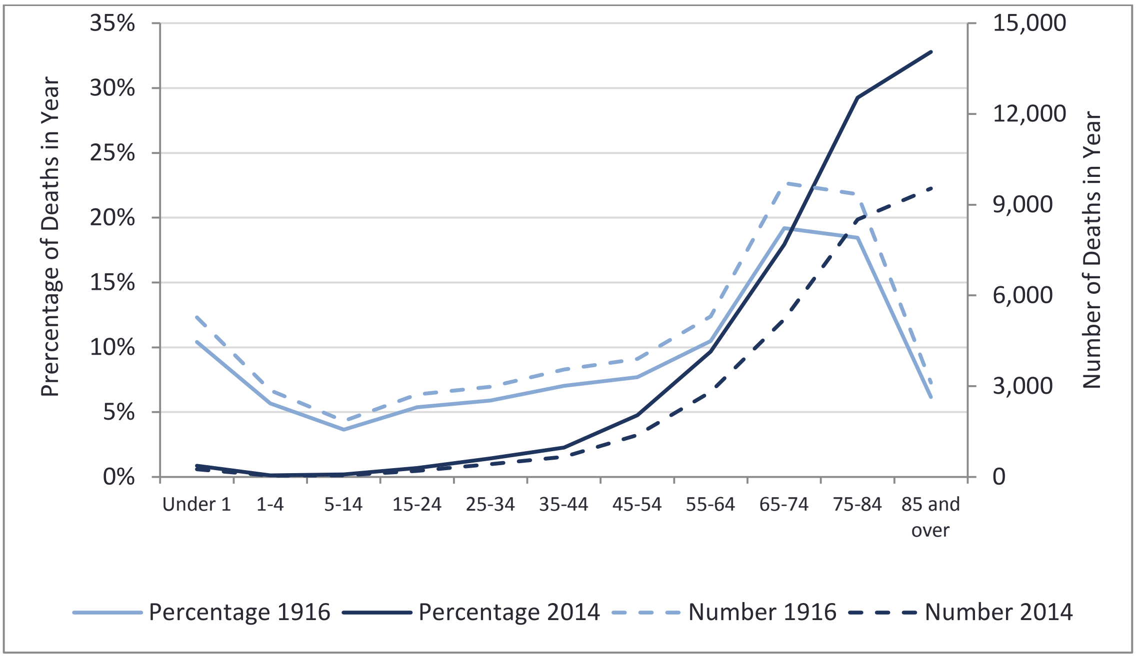
Since 1840, world life expectancy has increased in a linear trend at an average of three months per year (116). Life expectancy at birth, the average number of years a person born today can expect to live, in developed countries has increased by 30 years in the course of the 20th Century (117). Figure 2.1 shows that age-standardised mortality (deaths per 100,000 of the population) for selected OECD countries from 1960 to 2012 have dropped dramatically. Between 1960 and 2012, the age-standardised death rate fell by 53 per cent in Ireland. The majority of the increases in life expectancy in developed countries in the first half of the 20th Century were due to improvements in infant and childhood mortality (118); deaths became more concentrated in older age cohorts; and mortality in older ages remained static (119). The *2015 EU Ageing Report* reflected that future gains in overall life expectancy will be driven by mortality rates at older ages (25). Later chapters in this report show that older people have the highest rate of utilisation for many forms of healthcare, therefore distinguishing overall life expectancy and life expectancy at different ages is crucial when projecting future healthcare demand. This effect of a concentration of deaths in older people was also observed in Ireland, as Figure 2.2 demonstrates. It shows that 62.1 per cent of deaths in 2014 occurred in those aged 75 years and older, as compared to 24.7 per cent in 1916.

FIGURE 2.1 AGE-STANDARDISED DEATHS PER 100,000 POPULATION FOR SELECTED OECD COUNTRIES, 1960-2012



Source: OECD Health Database.

FIGURE 2.2 PERCENTAGE OF TOTAL DEATHS BY AGE GROUP IN IRELAND, 1916 AND 2014



Source: Registrar-General Annual Report for 1916, Vital Statistics CSO.

Although females have a higher life expectancy than males, there has been a convergence in life expectancy between males and females. In the 1990s, females lived on average 6.9 years longer than males in OECD countries (120). By 2015 this difference had dropped to 5.2 years and this convergence in life expectancy is projected to continue (121), which will have implications for projected future demand for healthcare. The difference in male and female life expectancy is largely explained by mortality caused by chronic conditions such as lung cancer and cardiovascular disease (CVD), for which risk factors (e.g., smoking) differ between sexes (122).

Very recent evidence on life expectancy is more ambiguous than long-term evidence. In the United States, a decline in life expectancy by 0.1 years was reported between 2014 and 2015, when compared to 2014, the first fall in life expectancy since 1993 (123). Mortality rates among middle-aged non-Hispanic white Americans have increased in recent years (124, 125). In England and Wales, age-standardised mortality increased by 5.1 per cent for females and 3.1 per cent for males between 2014 and 2015 (126). It is unclear if these results are indicative of worsening life expectancy or result from looking at trends using a small number of time points. In Ireland and internationally life expectancy is lower in lower socio-economic groups (127), partly as a consequence of poorer health status and greater exposure to risk factors (128). Evidence suggests that inequalities in mortality are worsening, with increases reported in socio-economic inequalities in mortality for five European countries, in the US and in Ireland (129-131).

Factors related to lifestyle, such as obesity and smoking, are likely to affect future trends in mortality, morbidity and disability. Age-standardised obesity (BMI greater than or equal to 30) prevalence has increased from an estimated 3.2 to 10.8 per cent for men and 6.4 to 14.9 per cent for women worldwide (132), while in Ireland it has increased from 6.3 to 25.9 per cent for men and 5.1 to 25.2 per cent for women, between 1975 and 2014 (133). Based on current trends, age-standardised obesity prevalence in Ireland is projected to increase to 38.4 and 36.9 per cent of the male and female populations respectively by 2025 (134). Obesity is a major risk factor for a number of chronic diseases such as type 2 diabetes, which in turn cause other chronic illnesses and disability (135, 136). However, there have been improvements in other areas, such as smoking rates which declined in Ireland between 2003 and 2014 from 28.3 to 19.5 per cent. This may reduce cardiovascular, pulmonary and respiratory diseases including COPD and lung cancer (137).

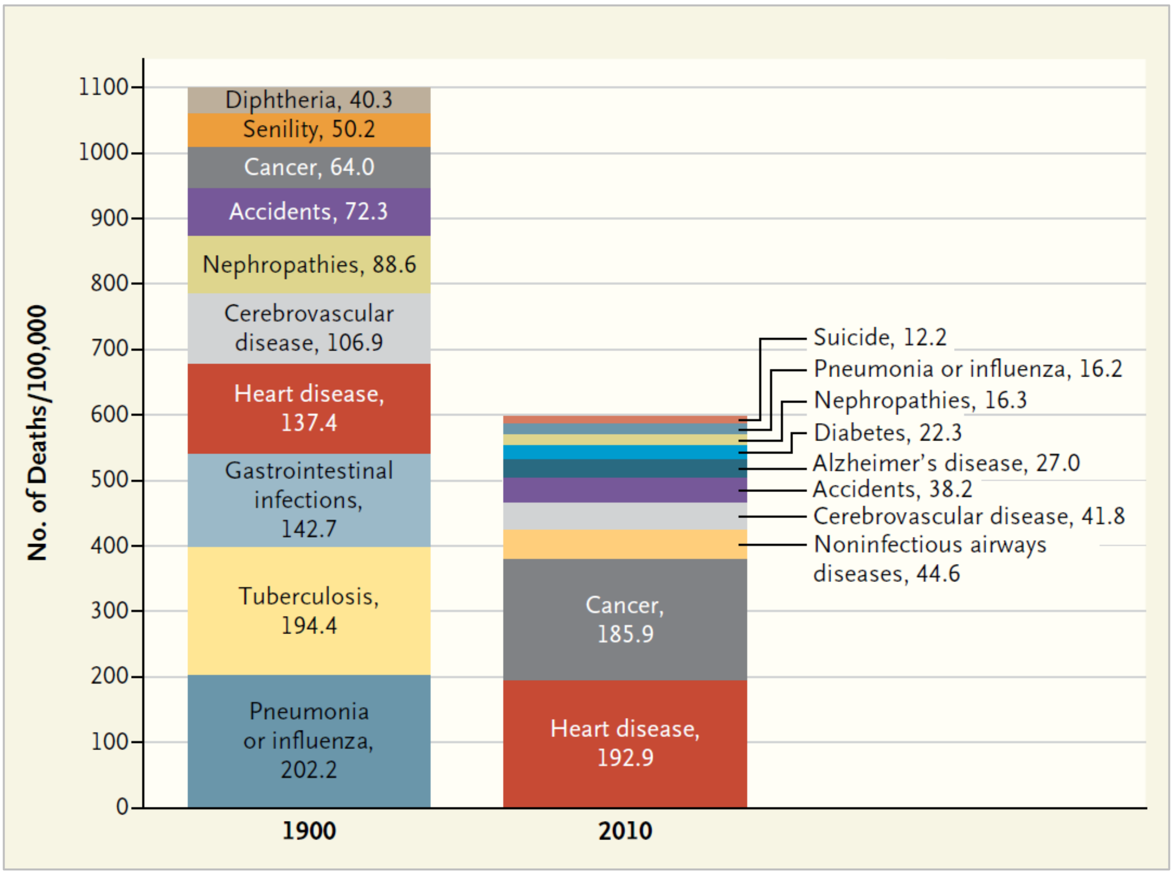
2.6.3 Trends in population health

2.6.3.1 The epidemiological transition

While increases in life expectancy in the 20th Century were a result of reductions in communicable and infectious diseases in developed countries, by the 2000s chronic diseases had become the leading cause of death (118, 138). This process has been called the ‘Epidemiological Transition’ (139). Using evidence from Jones et al. (2012), Figure 2.3 shows that in the United States, over the course of the

20th Century the dominant causes of deaths changed from communicable and infectious diseases to chronic or lifestyle diseases (140). In the United States, cardiovascular diseases and cancers accounted for 58 per cent of deaths in 2005 (141).

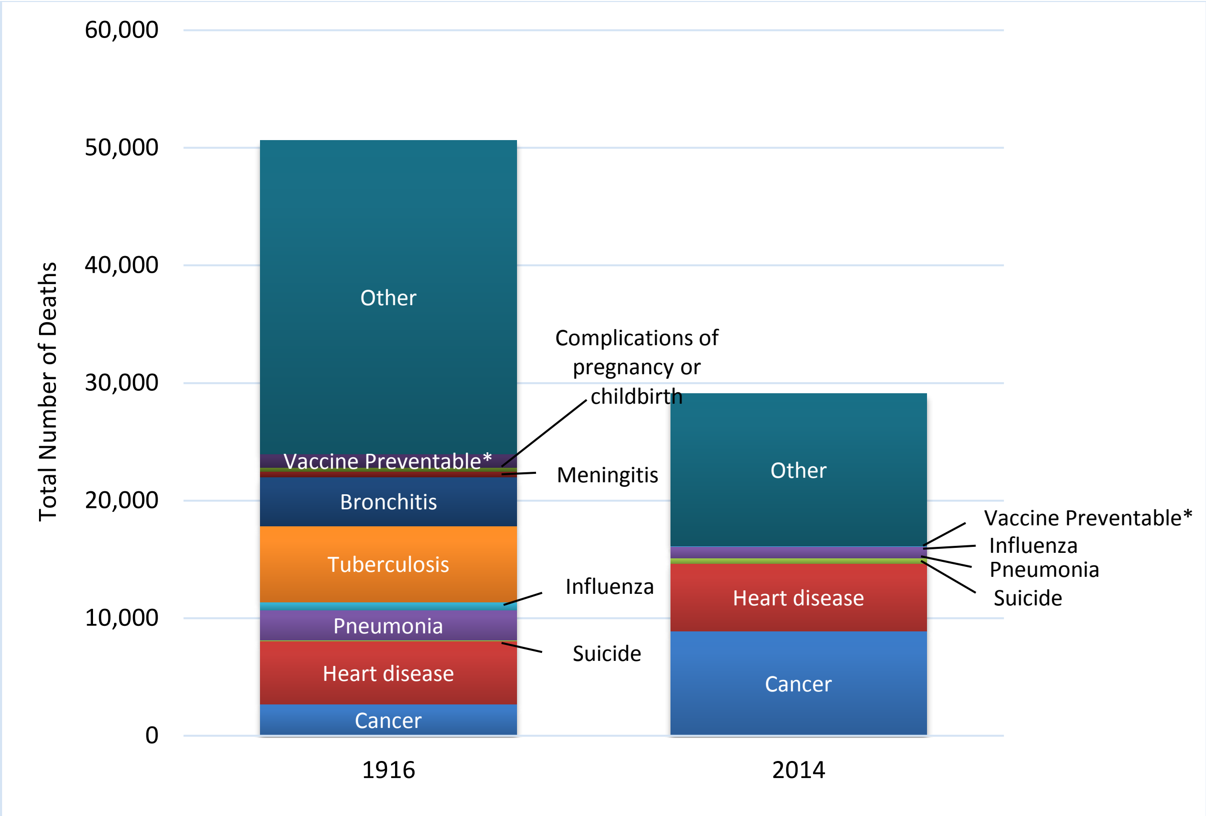
FIGURE 2.3 TOP TEN CAUSES OF DEATH IN THE UNITED STATES: 1900 VS. 2010

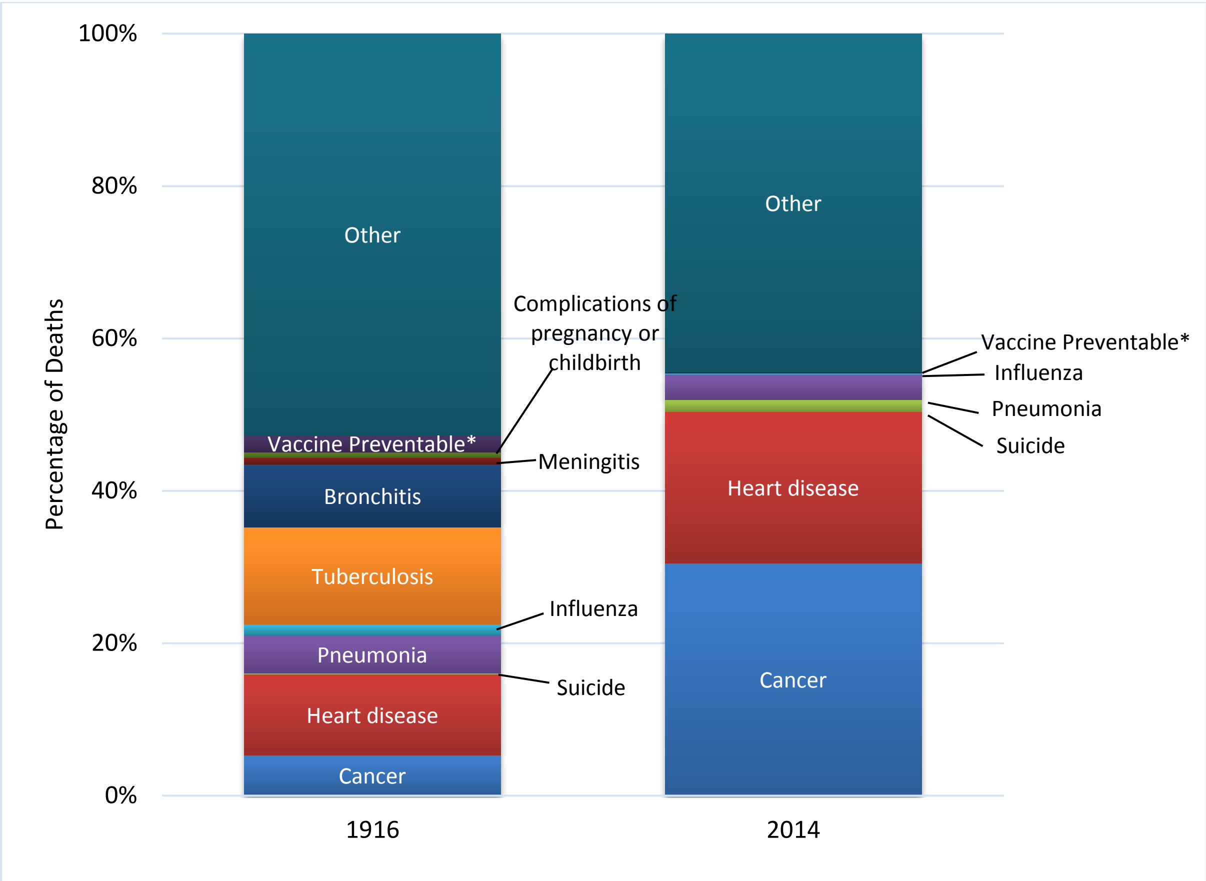


Source: NEJM. Jones et al., 2012 (140). Data are from the Centers for Disease Control and Prevention (CDC).

This Epidemiological Transition was also observed in Ireland. Figure 2.4 illustrates the main causes of death in Ireland in 1916 and 2014. Vaccine preventable diseases accounted for 1,127 deaths in 1916, and zero deaths in 2014. Tuberculosis, bronchitis, and influenza accounted for 11,347 deaths in 1916, and 74 deaths in 2014. While the number of heart disease deaths was similar in both periods, they accounted for a higher proportion of deaths in 2014. Chronic illnesses such as cancer can be seen to account for a much higher proportion of the causes of death in 2014.

FIGURE 2.4 CAUSES OF DEATH IN IRELAND, 1916 AND 2014





Source: Registrar-General Annual Report for 1916, Vital Statistics CSO.
Notes: * Measles, Scarlet fever, Whooping cough, and Diphtheria.

While chronic disease rates have increased in recent years, at the same time life expectancy is also improving. Evidence shows that mortality rate reductions in older age cohorts are at least in part a result of the improvements in outcomes for those with CVD and cancer (142). In Ireland, overall cancer mortality rates have decreased steadily over time, and saw an average annual reduction of 1.5 per cent and 1.1 per cent between 1994 and 2013 for males and females respectively (143). However, this improvement in life expectancy for those with chronic disease results in a greater number of years spent living with the consequences of chronic disease, which has the consequence of increased demand for healthcare. Reducing mortality from chronic conditions is often a result of changes in lifestyle or medical advancements. Evidence from the US shows that for CVD, the role of nutrition and public health in reducing mortality was less important than improvements in individual behaviours (such as smoking and diet) and the role of medical innovations in treatment (144). In Ireland, 48 per cent of the 47 per cent reduction in CVD mortality for those aged 25 to 84 between 1985 and 2000 can be explained by improvements in lifestyle factors, with 43.6 per cent explained by improvements in treatments (145). However, some of this decline was offset by increases in the risk factors of obesity, diabetes and physical inactivity (145).

Longer life expectancy with a chronic illness increases the probability of having multiple morbidities. There is now clear evidence that individuals with multiple chronic conditions will have large impacts on demand for health and long-term care. In the United States, 82 per cent of Medicare beneficiaries (aged 65 years and older) have at least one chronic condition, and 65 per cent have multiple chronic conditions, which are associated with a greater likelihood of hospital admission (146). In Ireland, there is evidence that 66 per cent of patients aged 50 years and older utilising primary care have two or more chronic conditions (147). Some diagnoses in particular result in more than one condition. In an Irish study of patients with type 2 diabetes, 90 per cent of patients with type 2 diabetes had at least one other chronic condition, and 25 per cent had at least four more (148). Conversely there has been evidence of a reduced rate of disability in older people in Ireland (149). More recent evidence is reviewed in Section 7.

In developed countries, the 'Epidemiological Transition' has significant impacts on population health and demand for health and long-term care. A significant literature on 'Healthy Ageing' has developed about the implications of this phenomenon.

2.6.3.2 Healthy Ageing hypotheses

Three alternative hypotheses have been proposed about the relationship between increased life expectancy and health: Expansion of Morbidity, Compression of Morbidity, and Dynamic Equilibrium. Table 2.3 outlines the healthy life expectancy assumptions of these hypotheses and the mechanisms assumed by each (150).

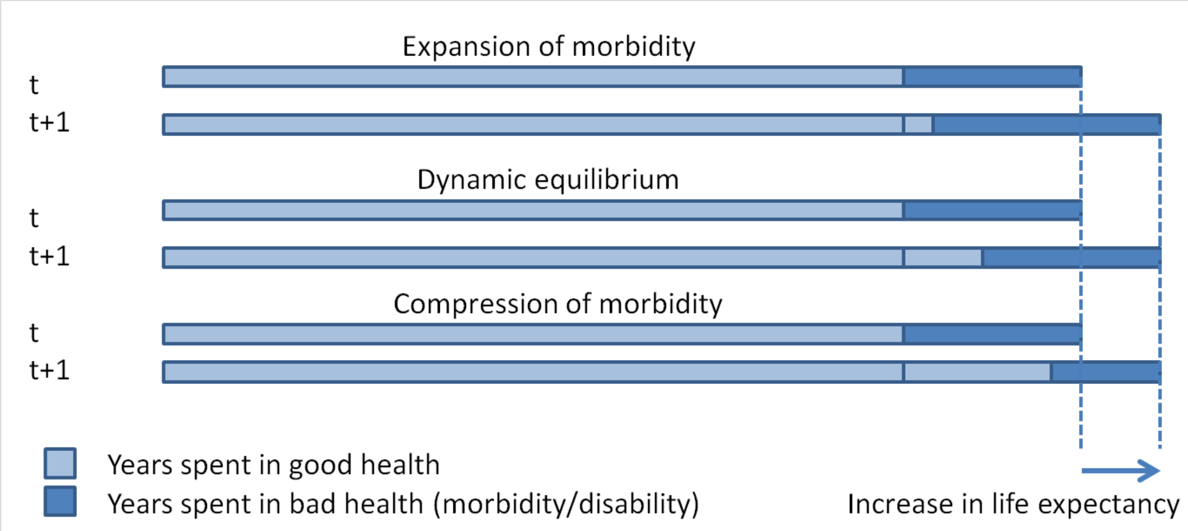
TABLE 2.3 HYPOTHESES ON GAINS IN LONGEVITY AND HEALTH STATUS

Hypothesis	Healthy life expectancy	Mechanisms assumed
Expansion of Morbidity (Gruenberg, 1977)	Gains in longevity accompanied by additional years with chronic disease	Incidence of disease unchanged, medical progress will successfully improve survival probabilities for a number of chronic diseases requiring life-long treatment, hence increasing the prevalence of chronic disease.
Compression of Morbidity (Fries, 1980)	Both disease and disability-free years increasing more than gains in longevity	Healthier lifestyles will decrease and/or postpone the incidence of disease until later ages, while there is a defined upper limit for life extension, hence decreasing the prevalence of both chronic disease and disability.
Dynamic Equilibrium (Manton, 1982)	Gains in longevity accompanied by additional years without disability, not necessarily without chronic disease but disease with less severe progress due to new medical treatments.	Incidence of disease unchanged, medical progress will successfully improve survival probabilities while reducing the severity of the disease, hence increasing the prevalence of chronic disease but decreasing disability.

Source: Lindgren (2016) (150).

The expansion of morbidity hypothesis (151, 152) assumes that as life expectancy increases, the years spent in ill health and disability also increase. This is often characterised as a 'failure of success', whereby new treatments prolong life as opposed to improving quality of life. In contrast, Fries suggested the compression of morbidity hypothesis, where healthier lifestyles result in a decrease in the number of years lived in poor health or with a disability (153). Subject to the key assumption of a natural limit to human lifespans, which the compression of morbidity hypothesis requires, the onset of chronic illness and resultant morbidity will be compressed into an ever decreasing proportion of an individual's life, as they approach death. The dynamic equilibrium hypothesis is that increasing life expectancy is accompanied by a reduction in disability and the severity of the consequences of chronic diseases, due to advances in medical technology (154). Dynamic equilibrium hypothesises that, as life expectancy increases, the absolute number of years lived in good health or mild ill health will have increased by an amount equivalent to the increased life expectancy (30). Figure 2.5 provides a graphical illustration of how each hypothesis assumes the years of improved life expectancy will be lived.

FIGURE 2.5 HYPOTHESES ON GAINS IN LONGEVITY AND HEALTH STATUS



Source: Przywara (2010) (30).

While the concept of dynamic equilibrium is straightforward, in practice it is difficult to test the hypothesis due to the difficulty in differentiating between severe and mild disability, and chronic disease. However, the dynamic equilibrium hypothesis can be related to the 'proximity to death' hypothesis, which posits that closeness to death rather than chronological age is the key determinant of increasing healthcare costs amongst older people. While most studies on healthy ageing and the significance of age in increasing healthcare costs have not explicitly connected dynamic equilibrium and proximity to death, some recent studies have linked these hypotheses (30, 46, 155). For example Klijs et al. found that moderate and severe disability was associated with proximity to death although mild disability showed a rapid expansion with increased life expectancy (155). In its simplest form, the proximity to death hypothesis proposes that improved life expectancy simply shifts the period close to death – when the greatest amount of healthcare is consumed by an individual – to a later age, with neutral cost consequences (156, 157).[14]

2.6.3.3 Evidence on Healthy Ageing hypotheses

Varied results from studies examining the relationship between ageing and health make it difficult to identify a consensus on which theory of healthy ageing is consistent with past trends. According to the *2015 EU Ageing Report*, 'recent empirical evidence has not come to a clear conclusion regarding these hypotheses' making it 'very difficult to predict the levels of morbidity and therefore potential demand for health services, even in the near future' (25), with others expressing similar views (30). Some attempts (117, 150, 158) have been made to collate and synthesise this literature. A review of over 100 recent papers

[14] This is why the Dynamic Equilibrium hypothesis is often referred to as the 'postponement of morbidity hypothesis'.

on healthy ageing found that trends in high income countries have been in accordance with the 'dynamic equilibrium' hypothesis, where the prevalence of chronic disease has expanded but the severity of the consequences of these diseases has reduced (150). However, it remains to be seen if current trends will continue given the increase in obesity and other risk factors among younger age cohorts (150).

The use of different measures and definitions of morbidity is partially responsible for the heterogeneity of results across studies. Studies using disability-related measures often find support for compression of morbidity/disability, while those using chronic disease measures find support for expansion of morbidity (158). While many studies clearly differentiate between disability and morbidity, others conflate them, due to a lack of applicable data, or a belief that they measure similar outcomes. For example, Fries regards disease-specific measures of morbidity as erroneous (111). However, as the evidence discussed below demonstrates, compression of disability rates does not imply compression of chronic disease, since trends in disability levels and the prevalence or onset of chronic disease can be contradictory. Therefore, employing disability-based measures of morbidity can result in inaccurate conclusions about overall healthy ageing. For this reason the next section and this report in general define and discuss disability and morbidity as separate concepts.

2.6.3.4 Healthy Ageing and disability evidence

Disability measures are the most common type of measure applied to test healthy ageing hypotheses. However findings for trends in disability rates differ greatly, depending on the disability measure and whether disability is defined as mild, moderate or severe (158). Many US studies have found that disability rates among older people measured using difficulties with ADL and IADL have declined since the 1990s (159, 160). However, international evidence is more mixed with one 12-country OECD study finding that severe disability (any ADL difficulty) declined in five countries, increased in three and remained constant in two from the 1980s to the early 2000s (112). International evidence on disability trends from the 1980s to the 2000s showed declines in the rates of IADL difficulties in older ages in all, and the rates of ADL difficulties in older ages in most, but not all, high income countries (161). Changes in environmental factors may affect the ability to carry out ADL to a lesser extent than the ability to carry out IADL (161). Analysis of more recent trends found that, across all age cohorts, ADL and IADL difficulty rates stayed constant in most European countries between 2004 and 2006 (158).

Evidence on trends in functional limitations are also ambiguous, with some studies finding increasing functional limitations and decreasing or constant levels of ADL/IADL difficulties in the oldest cohorts (110, 162) and others finding decreasing rates of both functional limitations and ADL/IADL difficulties (163-166). The former results suggest a dynamic equilibrium, where mild disability increases while severe disability decreases; the latter suggest compression of disability, where mild and severe disability are both decreasing. A German study of administrative data found stagnant and increasing trends in severe and moderate disability respectively (167). Others find constant levels of functional limitations with decreasing (168) or constant (169) levels of ADL/IADL difficulties. Vision impairment rates have improved (170-172), largely explained by medical progress in treatments, such as cataract surgery, whereas evidence on aural impairments is ambiguous, with declines, improvements and constant rates being reported (170-172). This highlights the importance of disentangling the effects that environmental factors have on reducing disability rates, from those that are linked directly to the presence of chronic disease.

While some divergence in findings on trends in disability rates may be due to the different disability measures used, different results are also found across studies that use the same disability measure. Two major explanations for divergent trends have been advanced. It may be that countries with high initial rates of disability have more potential for reduction, therefore demonstrating compression of disability, whereas those starting with low rates of disability will have less potential for reduction and compression (173). Alternatively, Robine and Jagger argue that gender and socio-economic groups within countries are at different stages of transition in health status (174). Therefore different disability rate trends may be expected across countries and time periods. Robine and Jagger suggest that mortality from chronic diseases at older ages improves, leading to an increased portion of life spent with disability and morbidity (expansion of morbidity). Then population health improves as people take proactive health measures and the years lived in disability and morbidity decrease (compression of morbidity). Finally, the number of years lived with disability rises again with average age of death and people spend their final years in advanced old age with multiple co-morbidities and frailty (expansion of disability). As these stages of transition can occur at different points across the age/sex distribution and at different times in different countries, evidence supporting each healthy ageing hypothesis may be found depending upon which cohort and country is examined. This theory is further supported by evidence from France (175), where compression of disability and dynamic equilibrium were observed in the 1980s and 1990s respectively, and an expansion of disability for some disability dimensions in the 50-65 age group along with a continued trend of dynamic equilibrium for those aged over 65, were observed in the 2000s.

Increased obesity may result in an increased prevalence of disability in younger cohorts. Associations between increased rates of disability and obesity have been found in working age people (176, 177) and recent US evidence suggests that trends in declining ADL/IADL difficulties stalled in both older people and the general population between 2000 and 2008 (109), though some diseases (diabetes) associated with obesity may have become less disabling (178). Obesity and healthcare demand have been found to be highly associated in Ireland (179). There is not enough evidence yet to dismiss the possibility that morbidity and disability will expand in younger age cohorts in the future, while trends in older cohorts simultaneously conform to the dynamic equilibrium hypothesis. In Section 2.7, we review some new evidence for Ireland which appears consistent with this pattern of divergence in the evolution of disability across age cohorts.

2.6.3.5 Healthy Ageing and morbidity evidence

Fewer studies use age-specific prevalence or onset of disease to measure morbidity. These studies tend to find evidence against compression of morbidity (117, 150). A study of 12 OECD countries found increases in the prevalence of chronic diseases (arthritis, heart problems and diabetes) and risk factors (hypertension and obesity), in people aged 65 years and older (112). Other studies also report increases in self-reported chronic disease (162, 169, 180). Many found an overall decrease in the prevalence of certain chronic conditions (CVD, cancer and COPD) (110, 164), but an increase in diabetes for some groups.

Divergent trends are sometimes found in studies which look at how disability relates to clinical morbidity, in that difficulties with ADL/IADL decrease while the age-specific rates of chronic diseases increase, suggesting that conditions have become less disabling than before, so that a dynamic equilibrium holds overall (110, 117, 164, 181). Some of the increase in the prevalence of chronic disease may be a consequence of improved awareness and detection methods, but this also means that earlier detection of diseases results in more effective disease treatment and management, which has the effect of reducing the severity, or even postponing the disabling consequences of chronic disease (117). Thus, while healthcare utilisation may increase, reflecting treatment for chronic disease, the effect may be to reduce demand for community and residential long-term care due to reduced rates of disability.

It is important to understand whether healthy ageing has had any effect on dementia, a predictor of residential long-term care use (see Chapter 9). Earlier evidence on dementia was ambiguous (117), with Sweden and Japan reporting an increase and Australia reporting a decrease in the rate of dementia among those aged 65 years and older between 1998 and 2003 (112). However, more recent evidence, from high income countries finds that the age-specific risk of dementia has decreased (182-186). Consistently with Robine and Jagger's theory of transitions in health levels, Sweden and Japan are at the frontier of life expectancy and therefore may be at the final stage of health level transition, where morbidity is stagnant or expanding (162). As the countries with the highest life expectancies tend also to be those with the highest healthy life expectancies, compression of morbidity may be less likely in such countries (187).

As with disability, current trends in chronic disease could worsen due to increases in obesity and resultant illnesses (e.g. diabetes). A recent German study of healthcare claims data from 2005 to 2014 found that the proportion of life spent with type 2 diabetes increased with life expectancy (188). However, it could not be ascertained if this was an expansion of morbidity or a dynamic equilibrium, due to a lack of disease severity data. Were the prevalence of chronic disease to increase among younger populations, then morbidity may see an even greater expansion in the future, along with increases in life expectancy.

2.6.3.6 Age and Proximity to death evidence

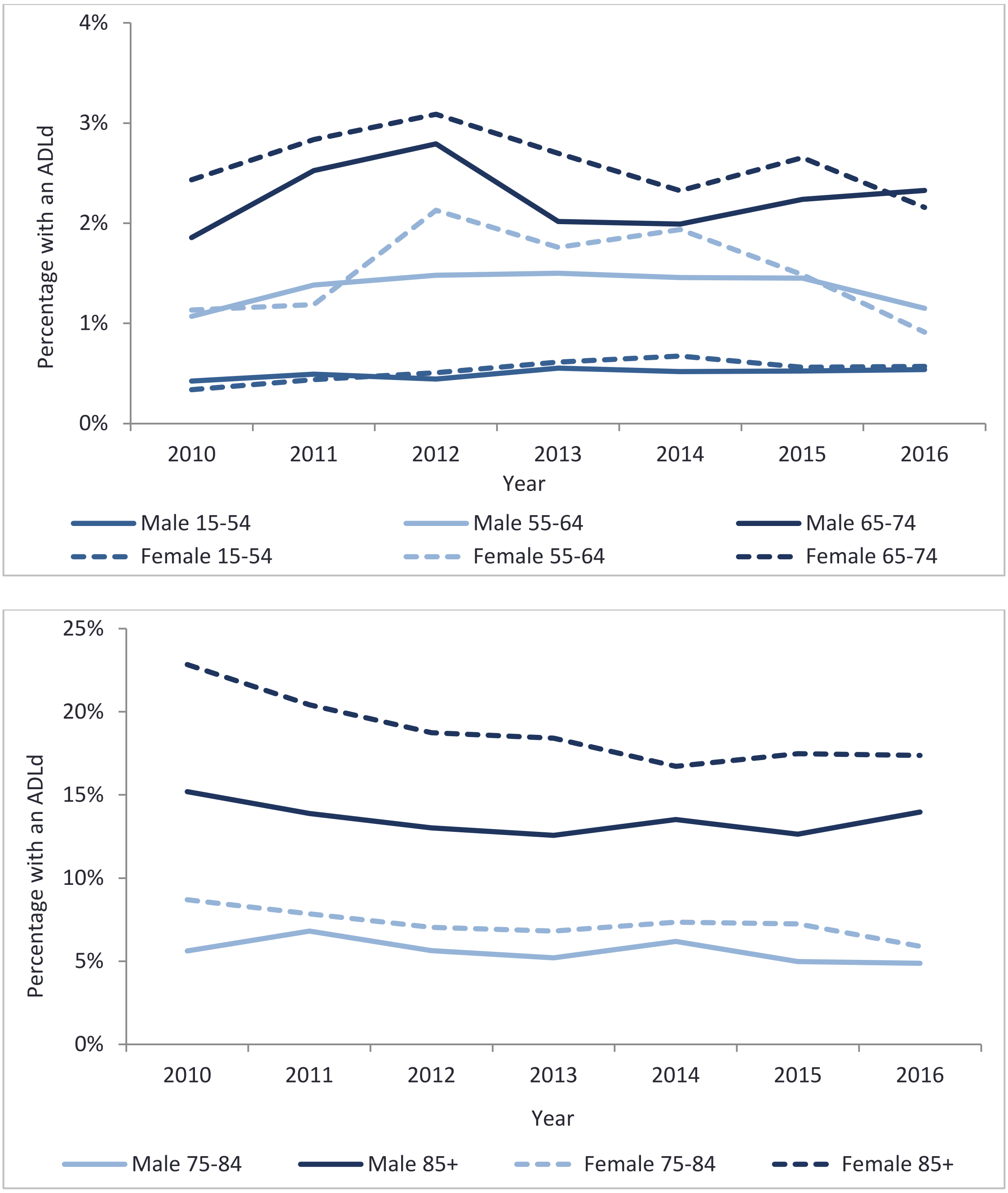
Most studies on proximity to death examine healthcare expenditure rather than healthcare demand. Under the dynamic equilibrium hypothesis, increases in life expectancy are accompanied by equivalent increases in good health or mild ill health, and the years spent with severe ill health remain the same. While the proximity to death hypothesis does not capture all aspects of the dynamic equilibrium hypothesis, it is a reasonable approximation to it. The first empirical test of the proximity to death theory (in Switzerland) found that proximity to death was a better predictor of acute hospital expenditure than increased ageing (189). Studies in other countries have found further evidence supporting this hypothesis (190-193). While ageing may be a significant driver of costs, the size of the effect is much smaller than the effect of proximity to death (194). Evidence on ageing and proximity to death is dependent upon the care being examined. Proximity to death is most closely related to healthcare costs such as hospital care (189-193, 195), including for severe conditions such as cancer (196), while ageing has been found to be a driver of long-term care expenditure (195, 197-199), although proximity to death still plays a role (200). Proximity to death has been found to be a predictor of home care expenditure, but may be a proxy for disability in this case (197). Others have argued that medical technology, rather than proximity to death impacts costs (201, 202). In an Irish context, Moore et al. found proximity to death, but not age, to be a significant driver of pharmaceutical costs (203), while a Danish study found that pharmaceutical costs will increase with age regardless of proximity to death (204).

2.7 IRISH EVIDENCE ON TRENDS IN MORBIDITY AND DISABILITY

The literature reviewed in this chapter has found evidence for Ireland of reducing mortality rates from cancer (143), increasing obesity rates (133), reducing disability rates (149) and a high prevalence of chronic disease and multi-morbidities in people aged 50 and older (147). Detailed analysis of a number of data sources has been undertaken for this report in an endeavour to inform the assumptions on healthy ageing with further Irish evidence on trends in morbidity and disability. Treating hospital utilisation as a proxy for morbidity, trends in hospital use were examined using HIPE data. This analysis sought to follow the methods applied by a study of Spanish hospital records (114) which examined specific chronic diseases over time to test healthy ageing hypotheses. However, it was not possible to follow patients across care episodes due to the lack of an individual health identifier (IHI) in Ireland. While hospital discharge data inform analysis of hospital activity in Chapter 5, trends in discharge-level activity may not be indicative of trends in population health, since they cannot be distinguished from changes in other factors such as length of stay, readmission rates, and reconfiguration of public hospitals. The introduction of an IHI would allow for greater understanding of healthy ageing trends by examining factors such as age at onset or diagnosis of disease, number of co-morbidities, and healthcare use.

To analyse recent evidence of trends in disability, two data sources were examined. The Irish Longitudinal Study on Ageing (TILDA) dataset includes questions on ADL and IADL difficulties and is a potential source to examine disability trends over the years 2009/2011 to 2014/2016. This analysis is not however presented here due to limitations in comparability between waves of the survey arising from changes in survey questions and the exclusion in the first wave of individuals with cognitive impairment or living in nursing homes. The Quarterly National Household Survey (QNHS) is another source of data on disability although it covers only the population in private households (i.e. not those in residential settings) and excludes children. An unchanged question between 2010 and 2016 allowed analysis of trends in prevalence of ADL difficulty over those years (Figure 2.6).

FIGURE 2.6 RATES OF ADL DIFFICULTY BY GENDER, AGE AND YEAR FROM QNHS, 2010-2016



Source: Central Statistics Office, QNHS.

The QNHS data show divergent disability rate trends by age cohort over this period in line with the evidence for some other countries discussed above (175, 176). Disability rates declined for the oldest although younger age cohorts showed an expansion in disability rates. The declining disability rate trends can be seen to be steeper for older women than for men. The male differences in rates between 2010 and 2016 are not statistically significant for the age cohorts as shown. In women, this evidence shows statistically significant increases in ADL difficulty rates in the adult population aged 15 to 54 years and statistically significant and steep decreases in disability rates in the 75 to 84 and the 85 and over age cohorts. While as in other countries this trend of increasing disability in younger women may reflect increasing obesity, further research is required to identify whether there may be confounding factors accounting for this increase in disability rates in the community, such as movement of people with disabilities from residential settings. Caution is also required in interpreting the decline in female disability rates in the oldest age cohorts, which could reflect increased rates of nursing home utilisation having the effect of reducing numbers with disability at these ages in the community. However, the examination of trends in long-term care utilisation in Chapter 9 does not suggest increased rates of nursing home utilisation over this period, so it would appear that the QNHS evidence supports a trend in reducing disability in women at older ages in Ireland. This finding is compatible with earlier evidence of reducing disability from Census 2002 and 2006 (149) (which included residents in nursing homes). Due to changes in the disability question in Census 2011, the 2011 rates are not comparable with earlier years. Publication of more detailed findings from Census 2016 will however facilitate comparison of rates between 2011 and 2016, enabling validation of this QNHS analysis.

2.8 CONCLUSION

This Chapter has reviewed and discussed the background and the evidence, which informs the approach taken to applying the Hippocrates model to project health and social care demand in Ireland. As later chapters will demonstrate, critical factors influencing projected demand for care include projected life expectancy, levels of unmet need or demand in the baseline year of analysis, and the assumed relationships between rates of morbidity and disability and extended life expectancy. The evidence-based approach to developing these assumptions is outlined in Chapter 3. Evidence reviewed in this chapter supports differentiating our assumptions about the effects of ageing on health and social care utilisation by sector. The next chapter describes the data sources used in the model and the methods applied, including how the evidence reviewed in this chapter informs the development of preferred projection scenarios, which differ by sector.

REFERENCES

1. Department of Health (2016). Department of Health Statement of Strategy 2016 – 2019. In: Health Do, editor. Dublin: Department of Health.

2. Health Information and Quality Authority (2007). *Press Release*: 'Health Information and Quality Authority established to drive continuous improvements in Ireland's health and social care services. Health Information and Quality Authority'; [cited 2017 10 February]; Available from: www.hiqa.ie/hiqa-news-updates/health-information-quality-authority-established-drive-continuous-improvements.

3. Health Information and Quality Authority (2017). 'About Us. Health Information and Quality Authority'; [cited 2017 10 February]; Available from: www.hiqa.ie/about-us.

4. Brick, A., A. Nolan, J. O' Reilly and S. Smith (2010). *Resource allocation, financing and sustainability in health care: Evidence for the Expert Group on Resource Allocation and Financing in the Health Sector.* Dublin, Ireland: Economic and Social Research Institute.

5. Houses of the Oireachtas (2013). *Health Service Executive (Governance) Act 2013.* Houses of the Oireachtas.

6. Higgins, J.R. (2013). *The Establishment of Hospital Groups as a transition to Independent Hospital Trusts.* Dublin: Department of Health.

7. Department of the Taoiseach, 2011). *Programme for Government 2011-2016*. Dublin: Department of the Taoiseach.

8. Department of the Taoiseach (2016). *A Programme for a Partnership Government*. Dublin, Ireland: Department of the Taoiseach.

9. ISA Review Project Team (2014). *Community Healthcare Organisations. Report and Recommendations of the Integrated Service Area Review Group*. Dublin: Health Service Executive.

10. Health Service Executive (2015). *Health Service Executive Code of Governance*. Dublin: Health Service Executive.

11. Central Statistics Office (2016). 'System of Health Accounts CSO'; [cited 2016 04/08]; Available from: www.cso.ie/en/releasesandpublications/er/sha/systemofhealthaccounts 2014.

12. Keegan C., S. Connolly and M. Wren (2017). 'Measuring healthcare expenditure: different methods, different results'. *Irish journal of Medical Science*. Epub 2017/06/02.

13. Thomson S., M. Jowett, P. Mladovsky, T. Evetovits, J. Figueras, A. Nolan et al. (2012). *Health System Responses to Financial Pressures in Ireland: Policy Options in an International Context*. Brussels: World Health Organisation and European Observatory on Health Systems and Policies.

14. Wren M., S. Connolly and N. Cunningham (2015). *An examination of the Potential Costs of Universal Health Insurance in Ireland*. Dublin, Ireland: Economic and Social Research Institute.

15. O'Reilly D., T. O'Dowd, K.J. Galway, A.W. Murphy, C. O'Neill, E. Shryane et al. (2007). 'Consultation charges in Ireland deter a large proportion of patients from seeing the GP: results of a cross-sectional survey'. *The European Journal of General Practice.* 2007;13(4):231-6. Epub 2008/03/08.

16. Kringos D., W. Boerma, Y. Bourgueil, T. Cartier, T. Dedeu, T. Hasvold et al. (2013). 'The strength of primary care in Europe: an international comparative study'. *The British Journal of General Practice:* the journal of the Royal College of General Practitioners. 2013;63(616):e742-50. Epub 2013/11/26.

17. Citizens Information Board (2016). 'Medical Cards'. [cited 2017 06/01]; Available from: www.citizensinformation.ie/en/health/medical_cards_and_gp_visit_cards/medical_card.html.

18. Citizens Information (2016). 'GP visit cards'. [cited 2017 10 February]; Available from: www.citizensinformation.ie/en/health/medical_cards_and_gp_visit_cards/gp_visit_cards.html.

19. Citizens Information (2015). 'Hepatitis C and the Health Amendment Act Card'. [cited 2017 12 February]; Available from: www.citizensinformation.ie/en/health/health_services/blood_and_organ_donation/hepatitis_c_and_health_amendment_act_cards.html.

20. Wren, M. and S. Connolly (2016). *Challenges in Achieving Universal Healthcare in Ireland*. Dublin: Economic and Social Research Institute (ESRI). Budget Perspectives 2017/1.

21. Citizens Information (2016). 'Taxation and medical expenses'. [cited 2017 10 February]; Available from: www.citizensinformation.ie/en/money_and_tax/tax/income_tax_credits_and_reliefs/taxation_and_medical_expenses.html.

22. Health Insurance Authority (2016). *Annual Report and Accounts 2015*. Dublin: Health Insurance Authority.

23. MillwardBrown (2016). 'Health Insurance Authority - A Review of Private Health Insurance in Ireland'. www.hia.ie/publication/consumer-surveys: The Health Insurance Authority.

24. Houses of the Oireachtas Committee on the Future of Healthcare (2017). *Sláintecare Report*. Dublin: Houses of the Oireachtas.

25. European Commission (2015). *The 2015 Ageing Report: Economic and budgetary projections for the 28 EU Member States (2013-2060)*. Brussels: European Commission.

26. Newhouse, J.P. (1977). 'Medical-care expenditure: a cross-national survey'. *The Journal of Human Resources.* 1977;12(1):115-25. Epub 1977/01/01.

27. Parkin, D., A. McGuire and B. Yule (1987). 'Aggregate health care expenditures and national income. Is health care a luxury good?' *Journal of Health Economics*. 1987;6(2):109-27. Epub 1987/05/10.

28. Gerdtham, U.G., J. Sogaard, F. Andersson and B. Jonsson (1992). 'An econometric analysis of health care expenditure: a cross-section study of the OECD countries'. *Journal of Health Economics*. 1992;11(1):63-84. Epub 1992/04/08.

29. de la Maisonneuve, C., R. Moreno-Serra, F. Murtin and J. Oliveira Martins (2017). 'The Role of Policy and Institutions on Health Spending'. *Health Economics*. 2017;26(7):834-43.

30. Przywara, B. (2010). *Projecting future health care expenditure at European level: drivers, methodology and main results*. Brussels: European Commission.

31. Martın, J.J., M.P.L.dA. Gonzalez and MDC Garcıa (2011). 'Review of the literature on the determinants of healthcare expenditure'. *Applied Economics*. 2011;43:19-46.

32. Baltagi, B.H., F. Moscone (2010). *Health Care Expenditure and Income in the OECD Reconsidered: Evidence from Panel Data*. Maxwell School of Citizenship and Public Affairs Syracuse University.

33. Smith S., J.P. Newhouse, M.S. Freeland (2009). 'Income, insurance, and technology: why does health spending outpace economic growth?' *Health Affairs* (Millwood). 2009;28(5):1276-84. Epub 2009/09/10.

34. Baker, L.C. and S.K. Wheeler (1998). 'Managed care and technology diffusion: the case of MRI'. *Health Affairs* (Millwood). 1998;17(5):195-207. Epub 1998/10/14.

35. Okunade, A.A. and V.N. Murthy (2002). 'Technology as a 'major driver' of health care costs: a cointegration analysis of the Newhouse conjecture'. *Journal of Health Economics*. 2002;21(1):147-59. Epub 2002/02/21.

36. You, X. and A.A. Okunade (2017). 'Income and Technology as Drivers of Australian Healthcare Expenditures'. *Health Economics*. 2017;26(7):853-62.

37. Cutler, D.M. (2007). 'The lifetime costs and benefits of medical technology'. *Journal of Health Economics*. 2007;26(6):1081-100.

38. Gerdtham, U.G. (1992). 'Pooling international health care expenditure data'. *Health Economics.* 1992;1(4):217-31. Epub 1992/12/01.

39. Gerdtham, U.G., J. Sogaard, B. Jonsson and F. Andersson F. (1992). 'A pooled cross-section analysis of the health care expenditures of the OECD countries'. *Developments in Health Economics and Public Policy.* 1992;1:287-310. Epub 1991/12/10.

40. Leu, R.E. (1986). 'The public-private mix and international health care costs'. In: Culyer, A.J. and B Jonsson (eds). *Public and Private Health Services.* Oxford: Basil Blackwell.

41. Christiansen, T., M. Bech, J. Lauridsen and P. Nielsen (2006). *Demographic changes and aggregate health-expenditure in Europe.* ENEPRI Research Report no322006.

42. Bech, M., T. Christiansen, E. Khoman, J. Lauridsen and M. Weale (2011). 'Ageing and health care expenditure in EU-15'. *The European journal of health economics: HEPAC: health economics in prevention and care.* 2011;12(5):469-78. Epub 2010/06/25.

43. Gerdtham, U.G., B. Jonsson, M. MacFarlan and H. Oxley (1998). 'The determinants of health expenditure in the OECD countries: a pooled data analysis'. *Developments in health economics and public policy.* 1998;6:113-34. Epub 2000/02/08.

44. Kringos, D.S., W. Boerma, J. van der Zee and P. Groenewegen (2013). 'Europe's Strong Primary Care Systems Are Linked To Better Population Health But Also To Higher Health Spending'. *Health Affairs.* 2013;32(4):686-94.

45. Barros, P.P. (1998). 'The black box of health care expenditure growth determinants'. *Health Economics*. 1998;7(6):533-44. Epub 1998/11/11.

46. Astolfi, R., L. Lorenzoni and J. Oderkirk (2012). 'Informing policy makers about future health spending: a comparative analysis of forecasting methods in OECD countries'. *Health Policy.* 2012;107(1):1-10. Epub 2012/06/12.

47. Cote, M.J. and S.L. Tucker (2001). 'Four methodologies to improve healthcare demand forecasting'. *Healthcare financial management: journal of the Healthcare Financial Management Association.* 2001;55(5):54-8. Epub 2001/05/16.

48. MaCurdy, T. and P. Hansen (2013). *Implications of Time Series Models for LongTerm Projections of Health Expenditures*. California: Acumen LLC.

49. Borger, C., T.F. Rutherford and G.Y. Won (2008). 'Projecting long term medical spending growth'. *Journal of Health Economics*. 2008;27(1):69-88. Epub 2007/04/27.

50. European Commission. *The 2015 Ageing Report: Underlying Assumptions and Projection Methodologies.* Brussels: European Commission, 2014.

51. Oderkirk, J., F. Sassi, M. Cecchini and R. Astolfi (2012). *Toward a New Comprehensive International Health and Health Care Policy Decision Support Tool.* Paris: OECD, 2012.

52. Wittenberg, R., L. Pickard, A. Comas-Herrera, B. Davies and R. Darton (1998). *Demand for long-term care: projections of long-term care finance for elderly people*. PSSRU:University of Kent.

53. Comas-Herrera, A., J. Costa-Font, C. Gori, Ad. Maio, C. Patxot, L. Pickard et al. (2003). 'European Study of Long-Term Care Expenditure: Investigating the sensitivity of projections of future long-term care expenditure in Germany, Spain, Italy and the United Kingdom to changes in assumptions about demography, dependency, informal care, formal care and unit costs'. PSSRU Discussion Paper 1840: PSSRU, LSE Health and Social Care, London School of Economics.

54. Zucchelli, E., A.M. Jones and N. Rice (2012). 'The evaluation of health policies through dynamic microsimulation methods'. *Journal of Microsimulation.* 2012;5(1):2-20.

55. Forder, J. and J-L. Fernández (2010). 'The impact of a tightening fiscal situation on social care for older people'. PSSRU Discussion Paper 2723: Personal Social Services Research Unit/Age UK.

56. Spielauer, M. (2007). 'Dynamic microsimulation of health care demand, health care finance and the economic impact of health behaviours: survey and review'. *Journal of Microsimulation*. 2007;1(1):35-53.

57. Ringel, J.S., C. Eibner, F. Girosi, A. Cordova and E.A. McGlynn (2010). 'Modeling health care policy alternatives'. *Health Services Research.* 2010;45(5 Pt 2):1541-58. Epub 2010/11/09.

58. Getzen, T.E. and J.P. Poullier (1992). 'International health spending forecasts: concepts and evaluation'. *Social Science & Medicine*. 1992;34(9):1057-68. Epub 1992/05/01.

59. Productivity Commission (2005). *Impacts of Advances in Medical Technology in Australia.* Melbourne: Productivity Commission.

60. Di Matteo, L. (2010). 'The sustainability of public health expenditures: evidence from the Canadian federation'. *The European Journal of Health Economics*: HEPAC: health economics in prevention and care. 2010;11(6):569-84. Epub 2010/01/13.

61. Wanless D. (2002). *Securing our Future Health: Taking a Long-Term View.* London: HM Treasury Office of Budget Responsibility.

62. Ministry of Health (2004). *Ageing and Health Expenditures: New Zealand 2002-2051*. Wellington: Ministry of Health.

63. Goss, J. (2008). *Projection of Australian health care expenditure by disease, 2003 to 2033*. Canberra: Australian Institute of Health and Welfare.

64. Harris, K.M., J.P. Galasso and C. Eibner (2008). *Review and Evaluation of the VA Enrollee Health Care Projection Model.* California: RAND Corporation.

65. Besseling, P. and V. Shestalova (2011). *Forecasting public health expenditure in the Netherlands.* The Netherlands Bureau of Economic Policy Analysis.

66. European Commission (2012). *The 2012 Ageing Report: Economic and budgetary projections for the 27 EU Member States (2010-2060).* Brussels European Commission.

67. European Commission (2009). *The 2009 Ageing Report: Economic and budgetary projections for the EU-27 Member States (2008-2060).* Brussels European Commission.

68. Layte, R., M. Barry, K. Bennett, A. Brick, E. Morgenroth, C. Normand et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland*. Dublin: ESRI.

69. Health Service Executive (2015). *Planning for Health: Trends and Priorities to inform Health Service Planning 2016.* Dublin: Health Service Executive.

70. Roybal Center for Health Policy Simulation (2016). 'The Future Elderly Model'. University of Southern California [cited 2016 21 April]; Available from: https://roybalhealthpolicy.usc.edu/fem.

71. RAND (2016). *Comprehensive Assessment of Reform Efforts (COMPARE): Compare Micro-Simulation Model.* California: RAND; [cited 2016 26 April]; Available from: www.rand.org/health/projects/compare/how-it-works.html.

72. Hennessy, D.A., W.M. Flanagan, P. Tanuseputro, C. Bennett, M. Tuna, J. Kopec, et al. (2015). 'The Population Health Model (POHEM): an overview of rationale, methods and applications'. *Population Health Metrics*. 2015;13:24. Epub 2015/09/05.

73. Bhattacharya, J., D.M. Cutler, D.P. Goldman, M.D. Hurd, G.F. Joyce, D.N. Lakdawalla et al. (2004). 'Disability forecasts and future Medicare costs'. *Frontiers in Health Policy Research.* National Bureau of Economic Research. 2004;7:75-94. Epub 2004/12/23.

74. Long, S.K., J. King and T.A. Coughlin (2005). 'The implications of unmet need for future health care use: findings for a sample of disabled Medicaid beneficiaries in New York'. *Inquiry: a Journal of Medical Care Organization, Provision and Financing.* 2005;42(4):413-20. Epub 2006/03/30.

75. Reeves, A., M. McKee and D. Stuckler (2015). 'The attack on universal health coverage in Europe: recession, austerity and unmet needs'. *European Journal of Public Health.* 2015;25(3):364-5. Epub 2015/05/23.

76. Hennell T. (2009). 'Resource allocation policies to reduce avoidable health inequalities between Primary Care Trusts in England'. *Eurohealth.* 2009;15(3):22-4.

77. Pappa, E., N. Kontodimopoulos, A. Papadopoulos, Y. Tountas and D. Niakas (2013). 'Investigating unmet health needs in primary health care services in a representative sample of the Greek population'. *International Journal of Environmental Research and Public Health.* 2013;10(5):2017-27. Epub 2013/05/21.

78. Sanmartin, C., C. Houle, S. Tremblay, J.M. Berthelot (2002). 'Changes in unmet health care needs'. *Health Reports.* 2002;13(3):15-21. Epub 2003/05/15.

79. Allin, S., M. Grignon and J. Le Grand (2010). 'Subjective unmet need and utilization of health care services in Canada: what are the equity implications?' *Social Science & Medicine*. 2010;70(3):465-72. Epub 2009/11/17.

80. Carr, W. and S. Wolfe (1976). 'Unmet needs as sociomedical indicators. International journal of health services: planning, administration, evaluation'. 1976;6(3):417-30. Epub 1976/01/01.

81. Cavalieri, M. (2013). 'Geographical variation of unmet medical needs in Italy: a multivariate logistic regression analysis'. *International Journal of Health Geographics*. 2013;12:27. Epub 2013/05/15.

82. Chen, J. and F. Hou (2002).' Unmet needs for health care'. *Health Reports.* 2002;13(2):23-34. Epub 2003/05/15.

83. Nelson, C.H. and J. Park (2006). 'The nature and correlates of unmet health care needs' in Ontario, Canada. *Social Science & Medicine*. 2006;62(9):2291-300. Epub 2006/01/25.

84. Sibley, L.M. and R.H. Glazier (2009). 'Reasons for self-reported unmet healthcare needs in Canada: a population-based provincial comparison'. *Healthcare policy = Politiques de Sante.* 2009;5(1):87-101. Epub 2010/08/03.

85. Koolman, X. (2007). 'Unmet need for health care in Europe'. In: European Commission, editor. *Comparative EU Statistics on income and living conditions: issues and challenges*. Helsinki: Eurostat.

86. Bryant, T., C. Leaver and J. Dunn (2008). 'Unmet healthcare need, gender, and health inequalities in Canada'. *Health Policy*. 2009;91(1):24-32. Epub 2008/12/17.

87. Thammatacharee, N., K. Tisayaticom, R. Suphanchaimat, S. Limwattananon, W. Putthasri, R. Netsaengtip et al. (2012). 'Prevalence and profiles of unmet healthcare need in Thailand'. *BMC Public Health*. 2012; 12:923. Epub 2012/11/01.

88. Washington, D.L., B. Bean-Mayberry, D. Riopelle and E.M. Yano (2011). 'Access to care for women veterans: delayed healthcare and unmet need'. *Journal of General Internal Medicine*. 2011;26 Suppl 2:655-61. Epub 2011/10/19.

89. Westin, M., A. Ahs, K. Brand Persson and R. Westerling (2004). 'A large proportion of Swedish citizens refrain from seeking medical care-lack of confidence in the medical services a plausible explanation?' *Health Policy*. 2004;68(3):333-44. Epub 2004/04/29.

90. Ahs, A.M. and R. Westerling (2006). 'Health care utilization among persons who are unemployed or outside the labour force'. *Health Policy.* 2006;78(2-3):178-93. Epub 2005/12/14.

91. Moscelli, G., L. Siciliani, N. Gutacker and R. Cookson (2017). 'Socioeconomic Inequality of Access to Healthcare: Does Choice Explain the Gradient?' *Journal of Health Economics.* In Press, Accepted Manuscript Epub 23 June 2017.

92. Marmot, M.G., G.D. Smith, S. Stansfeld, C. Patel, F. North, J. Head, et al. (1991). 'Health inequalities among British civil servants: the Whitehall II study'. *Lancet.* 1991;337(8754):1387-93. Epub 1991/06/08.

93. Ronksley, P.E., C. Sanmartin, H. Quan, P. Ravani, M. Tonelli, B. Manns, et al. (2013). 'Association between perceived unmet health care needs and risk of adverse health outcomes among patients with chronic medical conditions.' *Open Medicine*: a peer-reviewed, independent, open-access journal. 2013;7(1):e21-30. Epub 2013/05/21.

94. Alonso, J., F. Orfila, A. Ruigomez, M. Ferrer and J.M. Anto (1997). 'Unmet health care needs and mortality among Spanish elderly'. *American Journal of Public Health*. 1997;87(3):365-70. Epub 1997/03/01.

95. Connolly, S. and M. Wren (2017). 'Unmet healthcare needs in Ireland: Analysis using the EU-SILC survey'. *Health Policy*. Epub 2017/02/25.

96. Allin, S. and C. Masseria (2009). 'Unmet need as an indicator of health care access'. *Eurohealth*. 2009;15(3):7-9.

97. Nolan A. (2008). 'Evaluating the impact of eligibility for free care on the use of general practitioner (GP) services: a difference-in-difference matching approach'. *Social Science & Medicine*. 2008;67(7):1164-72. Epub 2008/07/22.

98. Ma, Y. and A. Nolan (2016). 'Public Healthcare Entitlements and Healthcare Utilisation among the Older Population in Ireland'. *Health Economics*. Epub 2016/10/04.

99. Nolan, A. and R. Layte (2017). 'The impact of transitions in insurance coverage on GP visiting among children in Ireland'. *Social Science and Medicine*. 2017;180:94-100.

100. Leahy, S., A.M. O' Halloran, N. O' Leary, M. Healy, M. McCormack, R.A. Kenny et al. (2015). 'Prevalence and correlates of diagnosed and undiagnosed type 2 diabetes mellitus and pre-diabetes in older adults: Findings from the Irish Longitudinal Study on Ageing (TILDA)'. *Diabetes Research and Clinical Practice*. 2015;110(3):241-9. Epub 2015/11/02.

101. Murphy, C.M., P.M. Kearney, E.B. Shelley, T. Fahey, C. Dooley, R.A. Kenny (2015). 'Hypertension prevalence, awareness, treatment and control in the over 50s in Ireland: evidence from The Irish Longitudinal Study on Ageing'. *J Public Health* (Oxf). 2015. Epub 2015/04/30.

102. Allin, S. and C. Masseria (2009). *Unmet need as an indicator of access to health care in Europe.* Brussels, Belgium: European Commission.

103. Bjornberg, A. (2016). *Euro Health Consumer Index 2015 Report*. Taby, Sweden: Health Consumer Powerhouse.

104. August, E.M., E. Steinmetz, L. Gavin, M.I. Rivera, K. Pazol, S. Moskosky, et al. (2016). 'Projecting the Unmet Need and Costs for Contraception Services After the Affordable Care Act'. *American Journal of Public Health.* 2016;106(2):334-41.

105. Bhatt A. (2015). 'Assessing unmet medical need in India: A regulatory riddle?' *Perspectives in Clinical Research*. 2015;6(1):1-3.

106. Nepal, B., L. Brown, S. Kelly, R. Percival, P. Anderson, R. Hancock et al. (2011). 'Projecting the need for formal and informal aged care in Australia: A dynamic microsimulation approach'. NATSEM Working Paper National Centre for Social and Economic Modelling (NATSEM), University of Canberra; 2011.

107. World Health Organization (2017). *Health Topics: Mortality.* [cited 2017 10 May]; Available from: www.who.int/topics/mortality/en.

108. World Health Organization (2017). 'Health topics: Disabilities'. [cited 2017 10 May]; Available from: www.who.int/topics/disabilities/en.

109. Freedman, V.A., B.C. Spillman, P.M. Andreski, J.C. Cornman, E.M. Crimmins, E. Kramarow, et al. (2013). 'Trends in late-life activity limitations in the United States: an update from five national surveys'. *Demography*. 2013;50(2):661-71. Epub 2012/10/30.

110. Crimmins, E.M., H. Beltrán (2011). 'Mortality and Morbidity Trends: Is There Compression of Morbidity?' *Journal of Gerontology: Social Sciences*. 2011;66B(1):75-86.

111. Fries, J.F., B. Bruce and E. Chakravarty (2011). 'Compression of morbidity 1980-2011: a focused review of paradigms and progress'. *Journal of Aging Research*. 2011;2011:261702. Epub 2011/08/31.

112. Lafortune, G. and G. Balestat (2007). 'Trends in Severe Disability among Elderly People: Assessing the Evidence in 12 OECD Countries and the Future Implications'. OECD Health Working Papers. Paris: OECD; 2007.

113. Martin E. (2015). *Concise Medical Dictionary: Oxford University Press*. Available from: www.oxfordreference.com/view/10.1093/acref/9780199687817.001.0001/acref-9780199687817.

114. Walter, S., H. Beltran-Sanchez, E. Regidor, C. Gomez-Martin, J.L. Del-Barrio, A. Gil-de-Miguel, et al. (2016). 'No evidence of morbidity compression in Spain: a time series study based on national hospitalization records'. *International Journal of Public Health.* 2016;61(7):729-38. Epub 2016/05/29.

115. Cutler, D.M., K. Ghosh and M.B. Landrum (2013). *Evidence for significant compression of morbidity in the elderly US population*. National Bureau of Economic Research, 2013.

116. Oeppen, J. and J.W. Vaupel (2002). 'Demography. Broken limits to life expectancy'. *Science*. 2002;296(5570):1029-31. Epub 2002/05/11.

117. Christensen, K., G. Doblhammer, R. Rau and J.W. Vaupel (2009). 'Ageing populations: the challenges ahead'. *Lancet.* 2009;374(9696):1196-208. Epub 2009/10/06.

118. Vallin, J. and F. Meslé (2009). 'The Segmented Trend Line of Highest Life Expectancies'. *Population and Development Review*. 2009;35(1):159-87.

119. Mathers, C.D., G.A. Stevens, T. Boerma, R.A. White and M.I. Tobias (2015). 'Causes of international increases in older age life expectancy'. *Lancet.* 2015;385(9967):540-8. Epub 2014/12/04.

120. World Health Organization (2015). *World Heath Statistics, 2015*. World Health Organization.

121. Kontis, V., J.E. Bennett, C.D. Mathers, G. Li, K. Foreman and M. Ezzati (2017). 'Future life expectancy in 35 industrialised countries: projections with a Bayesian model ensemble'. *Lancet.* 2017;389(10076):1323-35. Epub 2017/02/27.

122. Beltran-Sanchez, H., C.E. Finch and E.M. Crimmins (2015). 'Twentieth century surge of excess adult male mortality'. *Proceedings of the National Academy of Sciences of the United States of America*. 2015;112(29):8993-8. Epub 2015/07/08.

123. Centers of Disease Control and Prevention (2016). 'Mortality in the United States, 2015'; NCHS Data Brief No. 267. National Center for Health Statistics; [cited 2017 1 June]; Available from: www.cdc.gov/nchs/products/databriefs/db267.htm.

124. Case, A. and A. Deaton (2015). *Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century.* PNAS. 2015;12(49):15078–83.

125. Gelman, A. and J. Auerbach (2016). 'Age-aggregation bias in mortality trends'. *Proceedings of the National Academy of Sciences of the United States of America*. 2016;113(7):E816-7. Epub 2016/02/10.

126. Office for National Statistics (2016). *Deaths registered in England and Wales: 2015*. Office for National Statistics.

127. O'Shea, E. (1997). 'Male mortality differentials by socio-economic group in Ireland'. *Social Science and Medicine*. 1997;45(6):803-9.

128. Wilkinson, R.G. and M. Marmot (2003). *Social determinants of health: the solid facts:* World Health Organization.

129. Mackenbach, J.P., V. Bos, O. Andersen, M. Cardano, G. Costa, S. Harding et al. (2003). 'Widening socioeconomic inequalities in mortality in six Western European countries'. *International Journal of Epidemiology.* 2003;32(5):830-7. Epub 2003/10/16.

130. Olshansky, S.J., T. Antonucci, L. Berkman, R.H. Binstock, A. Boersch-Supan, J.T. Cacioppo et al. (2012). 'Differences in life expectancy due to race and educational differences are widening, and many may not catch up'. *Health Affairs* (Millwood). 2012;31(8):1803-13. Epub 2012/08/08.

131. Layte, R. and J. Banks (2016). 'Socioeconomic differentials in mortality by cause of death in the Republic of Ireland, 1984–2008'. *The European Journal of Public Health*. 2016;26(3):451-8.

132. NCD Risk Factor Collaboration (2016). 'Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants'. *Lancet.* 2016;387(10026):1377-96.

133. NCD Risk Factor Collaboration (2016). *Evolution of BMI over time.* NCD Risk Factor Collaboration.

134. NCD Risk Factor Collaboration (2016). *BMI; Country Profile: Ireland. NCD Risk Factor Collaboration*; [cited 2017 2 June]; Available from: http://ncdrisc.org/downloads/country-pdf/country-profile-Ireland.pdf.

135. Koh-Banerjee, P., Y. Wang, F.B. Hu, D. Spiegelman, W.C. Willett and E.B. Rimm (2004). 'Changes in body weight and body fat distribution as risk factors for clinical diabetes in US men'. *American Journal of Epidemiology*. 2004;159(12):1150-9. Epub 2004/06/12.

136. Carey, V.J., E.E. Walters, G.A. Colditz, C.G. Solomon, W.C. Willett, B.A. Rosner et al. (1997). 'Body fat distribution and risk of non-insulin-dependent diabetes mellitus in women. The Nurses' Health Study'. *American Journal of Epidemiology*. 1997;145(7):614-9. Epub 1997/04/01.

137. Hickey, P. and D. Evans (2014). *Smoking in Ireland 2014: Synopsis of Key Patterns.* National Tobacco Control Office, Health Service Executive.

138. Delaney, L., M. McGovern and J.P. Smith (2011). 'From Angela's ashes to the Celtic tiger: early life conditions and adult health in Ireland'. *Journal of Health Economics*. 2011;30(1):1-10. Epub 2010/11/06.

139. Omran, A.R. (2005). 'The epidemiologic transition: a theory of the epidemiology of population change. 1971'. *The Milbank Quarterly*. 2005;83(4):731-57. Epub 2005/11/11.

140. Jones, D.S., S.H. Podolsky and J.A. Greene (2012). 'The burden of disease and the changing task of medicine'. *The New England Journal of Medicine.* 2012;366(25):2333-8. Epub 2012/06/22.

141. Kung, H., D. Hoyert, J. Xu and S. Murphy (2008). 'Deaths: final data for 2005'. National vital statistics reports: from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. 2008;56(10):1.

142. Wilmoth, J.R. (2000). 'Demography of longevity: past, present, and future trends'. *Experimental gerontology.* 2000;35(9-10):1111-29. Epub 2000/12/13.

143. National Cancer Registry Ireland (2016). *Cancer in Ireland 1994-2014: Annual Report of the National Cancer Registry*. Cork, Ireland.

144. Cutler, D. E. M. (2001). 'Changes in the age distribution of mortality over the 20th Century'. NBER Working Paper No 8556.

145. Bennett, K., Z. Kabir, B. Unal, E. Shelley, J. Critchley, I. Perry et al. (2006). 'Explaining the recent decrease in coronary heart disease mortality rates in Ireland, 1985-2000'. *Journal of Epidemiology and Community Health.* 2006;60(4):322-7. Epub 2006/03/16.

146. Wolff, J.L., B. Starfield and G. Anderson (2002). 'Prevalence, expenditures, and complications of multiple chronic conditions in the elderly'. *Archives of Internal Medicine*. 2002;162(20):2269-76. Epub 2002/11/07.

147. Glynn, L.G., J.M. Valderas, P. Healy, E. Burke, J. Newell, P. Gillespie and A.W. Murphy (2011). 'The prevalence of multimorbidity in primary care and its effect on health care utilization and cost'. *Family Practice*. 2011;28(5):516-23.

148. Teljeur, C., S.M. Smith, G. Paul, A. Kelly and T. O'Dowd (2013). 'Multimorbidity in a cohort of patients with type 2 diabetes'. *The European Journal of General Practice*. 2013;19(1):17-22. Epub 2013/02/26.

149. Wren, M., C. Normand, D. O'Reilly, S.M. Cruise, S. Connolly, C. Murphy (2012). *Towards the Development of a Predictive Model of Long-Term*

Care Demand For Northern Ireland and the Republic of Ireland. Dublin: Centre for Health Policy and Management, Trinity College Dublin, 2012.

150. Lindgren, B. (2016). *The rise in life expectancy, health trends among the elderly, and the demand for health and social care.* Cambridge, US: National Institute of Economic Research.

151. Gruenberg, E.M. (1977). *The failures of success.* Milbank Memorial Fund Q Health Society. 1977;55.

152. Olshansky, S.J., M.A. Rudberg, B.A. Carnes, C.K. Cassel, J.A. Brody (1991). 'Trading Off Longer Life for Worsening Health'. *Journal of Aging and Health*. 1991;3(2):194-216.

153. Fries, J.F. (1980). 'Aging, natural death, and the compression of morbidity'. *New England Journal of Medicine.* 1980;303:1369–70.

154. Manton, K.G. (1982). *Changing concepts of morbidity and mortality in the elderly population.* The Milbank Memorial Fund quarterly Health and society. 1982;60(2):183-244. Epub 1982/01/01.

155. Klijs, B., J.P. Mackenbach and A.E. Kunst (2011). 'Future disability projections could be improved by connecting to the theory of a dynamic equilibrium'. *Journal of Clinical Epidemiology.* 2011;64(4):436-43. Epub 2010/08/31.

156. Fuchs, V.R. (1984). *'Though Much is Taken'-Reflections on Aging, Health, and Medical Care*. National Bureau of Economic Research, Inc.

157. Rechel, B., Y. Doyle, E. Grundy and M. McKee (2009). *Organization WH. How can health systems respond to population ageing.* World Health Organization Regional Office for Europe, Copenhagen.

158. Chatterji, S., J. Byles, D. Cutler, T. Seeman and E. Verdes (2015). 'Health, functioning, and disability in older adults-present status and future implications'. *Lancet*. 2015;385(9967):563-75. Epub 2014/12/04.

159. Freedman, V.A., L.G. Martin and R.F. Schoeni (2002). 'Recent trends in disability and functioning among older adults in the United States: a systematic review'. *Jama*. 2002;288(24):3137-46. Epub 2002/12/27.

160. Crimmins, E.M., M.D. Hayward, A. Hagedorn, Y. Saitoa and N. Brouard (2009). 'Change in disability-free life expectancy for Americans 70-years-old and older'. *Demography*. 2009;46(3):627-46. Epub 2009/09/24.

161. Parker, M.G. and M. Thorslund (2007). 'Health trends in the elderly population: getting better and getting worse'. *The Gerontologist.* 2007;47(2):150-8. Epub 2007/04/19.

162. Parker, M.G., K. Ahacic and M. Thorslund (2005). 'Health changes among Swedish oldest old: prevalence rates from 1992 and 2002 show increasing health problems'. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences.* 2005;60.

163. Murabito, J.M., M.J. Pencina, L. Zhu, M. Kelly-Hayes, P. Shrader and R.B. D'Agostino Sr. (2008). 'Temporal trends in self-reported functional limitations and physical disability among the community-dwelling elderly

population: the Framingham heart study'. *American Journal of Public Health.* 2008;98(7):1256-62. Epub 2008/05/31.

164. Puts, M.T., D.J. Deeg, N. Hoeymans, W.J. Nusselder and F.G. Schellevis (2008). 'Changes in the prevalence of chronic disease and the association with disability in the older Dutch population between 1987 and 2001'. *Age and Ageing. 2*008;37(2):187-93. Epub 2008/02/06.

165. Moe, J.O. and T.P. Hagen (2011). 'Trends and variation in mild disability and functional limitations among older adults in Norway, 1986-2008'. *European Journal of Ageing*. 2011;8(1):49-61. Epub 2011/04/09.

166. Jeune, B. and H. Brønnum-Hansen (2008). 'Trends in health expectancy at age 65 for various health indicators, 1987–2005, Denmark'. *European Journal of Ageing*. 2008;5(4):279.

167. Kreft, D. and G. Doblhammer (2016). 'Expansion or compression of long-term care in Germany between 2001 and 2009? A small-area decomposition study based on administrative health data'. *Population Health Metrics.* 2016;14(1):24.

168. Schoeni, R.F., J. Liang, J. Bennett, H. Sugisawa, T. Fukaya and E. Kobayashi (2006). 'Trends in old-age functioning and disability in Japan, 1993-2002'. *Population Studies* (Camb). 2006;60.

169. Jagger, C., R.J. Matthews, F.E. Matthews, N.A. Spiers, J. Nickson, E.S. Paykel et al. (2007). 'Cohort differences in disease and disability in the young-old: findings from the MRC Cognitive Function and Ageing Study (MRC-CFAS)'. *BMC Public Health.* 2007;7(1):156.

170. Sagardui-Villamor, J., P. Guallar-Castillon, M. Garcia-Ferruelo, J.R. Banegas, F. Rodriguez-Artalejo (2005). 'Trends in disability and disability-free life expectancy among elderly people in Spain: 1986-1999'. *The journals of gerontology Series A, Biological sciences and medical sciences.* 2005;60(8):1028-34. Epub 2005/08/30.

171. Freedman, V.A., R.F. Schoeni, L.G. Martin and J.C. Cornman (2007). 'Chronic conditions and the decline in late-life disability'. *Demography.* 2007;44(3):459-77. Epub 2007/10/05.

172. Parker, M.G., P. Schön, M. Lagergren and M. Thorslund (2008). 'Functional ability in the elderly Swedish population from 1980 to 2005'. *European Journal of Ageing.* 2008;5(4):299-309.

173. Deeg, D.J. (2004). 'Looking forward to a general theory on population aging': population aging: the benefit of global versus local theory. *The Journals of Gerontology Series A, Biological Sciences and Medical Sciences*. 2004;59(6):M600; author reply M16-20. Epub 2004/06/25.

174. Robine, J-M. and C. Jagger (2005). 'The relationship between increasing life expectancy and healthy life expectancy'. *Ageing Horizons*. 2005;3:14-21.

175. Cambois, E., A. Blachier and J-M. Robine (2012). 'Aging and health in France: an unexpected expansion of disability in mid-adulthood over recent years'. *European Journal of Public Health*. 2012;23(4): 575–81.

176. Lakdawalla, D.N., J. Bhattacharya, D.P. Goldman (2004). 'Are the young becoming more disabled?' *Health Affairs* (Millwood). 2004;23(1):168-76. Epub 2004/03/09.

177. Walter, S., A. Kunst, J. Mackenbach, A. Hofman and H. Tiemeier (2009). 'Mortality and disability: the effect of overweight and obesity'. *International Journal of Obesity (2005).* 2009;33(12):1410-8. Epub 2009/09/30.

178. Bardenheier, B.H., J. Lin, X. Zhuo, M.K. Ali, T.J. Thompson, Y.J. Cheng et al. (2016). 'Compression of disability between two birth cohorts of US adults with diabetes, 1992-2012: a prospective longitudinal analysis'. *Lancet Diabetes & Endocrinology.* 2016;4(8):686-94. Epub 2016/06/15.

179. Doherty, E., M. Queally and C. O'Neill (2015). 'An examination of the relationships between service use and alternative measures of obesity among community-dwelling adults in Ireland'. *The European Journal of Health Economics*. 2015;16(9):951-6.

180. Rosen, M. and B. Haglund (2005). 'From healthy survivors to sick survivors — implications for the twenty-first century'. *Scandinavian Journal of Social Medicine*. 2005;33(2):151-5.

181. Freedman, V.A. and L.G. Martin (2000). 'Contribution of chronic conditions to aggregate changes in old-age functioning'. *American Journal of Public Health*. 2000;90(11):1755-60. Epub 2000/11/15.

182. Langa, K.M., E.B. Larson, J.H. Karlawish, D.M. Cutler, M.U. Kabeto, S.Y. Kim, et al. (2008). 'Trends in the prevalence and mortality of cognitive impairment in the United States: is there evidence of a compression of cognitive morbidity?' *Alzheimer's & Dementia: the Journal of the Alzheimer's Association*. 2008;4(2):134-44. Epub 2008/07/18.

183. Qiu, C., E. von Strauss, L. Backman, B. Winblad and L. Fratiglioni (2013). 'Twenty-year changes in dementia occurrence suggest decreasing incidence in central Stockholm, Sweden'. *Neurology*. 2013;80(20):1888-94. Epub 2013/04/19.

184. Schrijvers, E.M., B.F. Verhaaren, P.J. Koudstaal, A. Hofman, M.A. Ikram, M.M. Breteler (2012). 'Is dementia incidence declining?: Trends in dementia incidence since 1990 in the Rotterdam Study'. *Neurology.* 2012;78(19):1456-63. Epub 2012/05/04.

185. Matthews, F.E., A. Arthur, L.E. Barnes, J. Bond, C. Jagger, L. Robinson et al. (2013). 'A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the Cognitive Function and Ageing Study I and II'. *Lancet.* 2013;382(9902):1405-12. Epub 2013/07/23.

186. Doblhammer, G., A. Fink, S. Zylla and F. Willekens (2015). 'Compression or expansion of dementia in Germany? An observational study of short-term trends in incidence and death rates of dementia between 2006/07 and 2009/10 based on German health insurance data'. *Alzheimer's Research & Therapy*. 2015;7(1):66.

187. Robine, J-M., Y. Saito and C. Jagger (2009). 'The relationship between longevity and healthy life expectancy'. *Quality in Ageing and Older Adults.* 2009;10(2):5-14.

188. Muschik, D., J. Tetzlaff, K. Lange, J. Epping, S. Eberhard and S. Geyer (2017). 'Change in life expectancy with type 2 diabetes: a study using claims data from lower Saxony, Germany'. *Population Health Metrics.* 2017;15(1):5. Epub 2017/02/15.

189. Zweifel, P., S. Felder and M. Meiers (1999). 'Ageing of population and health care expenditure: a red herring?' *Health Economics.* 1999;8(6):485-96. Epub 1999/11/02.

190. Yang, Z., E.C. Norton and S.C. Stearns (2003). 'Longevity and health care expenditures: the real reasons older people spend more'. *The Journals of Gerontology Series B, Psychological Sciences and Social Sciences.* 2003;58(1):S2-10. Epub 2002/12/24.

191. Lubitz, J., L. Cai, E. Kramarow and H. Lentzner (2003). 'Health, life expectancy, and health care spending among the elderly'. *The New England Journal of Medicine.* 2003;349(11):1048-55. Epub 2003/09/12.

192. Polder, J.J., J.J. Barendregt and H. van Oers (2006). 'Health care costs in the last year of life-the Dutch experience'. *Social Science & Medicine*. 2006;63(7):1720-31. Epub 2006/06/20.

193. Busse, R., C. Krauth and F. Schwartz (2002). 'Use of acute hospital beds does not increase as the population ages: results from a seven year cohort study in Germany'. *Journal of Epidemiology and Community Health*. 2002;56(4):289-93.

194. Seshamani, M. and A. Gray (2004). 'Ageing and health-care expenditure: the red herring argument revisited'. *Health Economics.* 2004;13(4):303-14. Epub 2004/04/07.

195. Werblow, A., S. Felder and P. Zweifel (2007). 'Population ageing and health care expenditure: a school of 'red herrings'?' *Health Economics.* 2007;16(10):1109-26. Epub 2007/02/22.

196. Wong, A., P.H. van Baal, H.C. Boshuizen and J.J. Polder (2011). 'Exploring the influence of proximity to death on disease-specific hospital expenditures: a carpaccio of red herrings'. *Health Economics.* 2011;20(4):379-400. Epub 2010/03/17.

197. de Meijer, C., M. Koopmanschap, T.B. d'Uva and E. Van Doorslaer (2011). 'Determinants of long-term care spending: Age, time to death or disability?' *Journal of Health Economics.* 2011;30(2):425-38.

198. McGrail, K., B. Green, M.L. Barer, R.G. Evans, C. Hertzman and C. Normand (2000). 'Age, costs of acute and long-term care and proximity to death: evidence for 1987-88 and 1994-95 in British Columbia'. *Age and Ageing.* 2000;29(3):249-53. Epub 2000/06/16.

199. Karlsson, M. and F. Klohn (2011). 'Some notes on how to catch a red herring: Ageing, time-to-death and care costs for older people in Sweden'. Darmstadt Discussion Papers in Economics.

200. Weaver, F., S.C. Stearns, E.C. Norton and W. Spector (2009). 'Proximity to death and participation in the long-term care market'. *Health Economics.* 2009;18(8):867-83. Epub 2008/09/05.

201. Breyer, F. and S. Felder (2006). 'Life expectancy and health care expenditures: a new calculation for Germany using the costs of dying'. *Health Policy*. 2006;75(2):178-86. Epub 2005/05/17.

202. Colombier, C. and W. Weber (2011). 'Projecting health-care expenditure for Switzerland: further evidence against the 'red-herring' hypothesis'. *The International Journal of Health Planning and Management.* 2011;26(3):246-63. Epub 2010/10/13.

203. Moore, P.V., K. Bennett and C. Normand (2017). 'Counting the time lived, the time left or illness? Age, proximity to death, morbidity and prescribing expenditures'. *Social Science & Medicine.* 2017;184:1-14.

204. Kildemoes, H.W., T. Christiansen, D. Gyrd-Hansen, I.S. Kristiansen and M. Andersen (2006). 'The impact of population ageing on future Danish drug expenditure'. *Health Policy*. 2006;75(3):298-311.

CHAPTER 3

Data and methods

3.1 INTRODUCTION

In this chapter, we describe the data sources and the methods applied in this report. The Hippocrates model has been designed to provide projections of demand and expenditure for a broad range of health and social care services. To the degree that the data support, the model includes: all health and social care services (acute hospital, primary, community and long-term care); and all public and private expenditures (including private hospitals, private payments for GP services and for other non-acute care). The first step in building the model is to estimate utilisation of services in the base year for this analysis, which is 2015. To ensure that projections are sensitive to changes in population structure, these estimates are on as disaggregated a basis as possible.

The next section of this chapter describes the data sources which have been employed to build the model across a wide range of activity in Irish health and social care. Section 3.2 lists the data sources used, the level of disaggregation and the base year for which the data were available. Further detail on these data sources appears in Appendix 2. Section 3.3 describes the Hippocrates macro-simulation model and the methodology employed to develop the projections in this report. This section further outlines the sequence of steps in building the model; developing analyses of baseline utilisation in 2015, analysing unmet need and demand, and projecting demand from 2015 to 2030. This section outlines how the evidence reviewed in Chapter 2 supports adopting assumptions about healthy ageing in this report's preferred projections, which differ by sector; and describes the approach to testing the sensitivity of these projections to alternative assumptions about population growth, healthy ageing and unmet need or demand. Sections 3.4 and 3.5 describe in detail the methods applied to estimate baseline utilisation and develop activity rates by age and sex and to estimate unmet need and demand for care in Chapters 5 to 11. Section 3.6 concludes.

3.2 OVERVIEW OF DATA SOURCES AND APPROACH TO DATA ANALYSIS

Where appropriate disaggregated administrative data are available, they are applied in the analyses in this report. However, where disaggregated administrative data are not available, more aggregated data and/or survey data are included. Administrative data are collected by organisations, including government bodies, primarily for administrative purposes. Administrative data are not ordinarily collected to provide information for research; however use of administrative data within research is becoming increasingly prevalent. The benefits of these data are that they are routinely collected, do not depend upon recipient self-reporting, and they are often stringently audited and quality controlled. Furthermore, they often provide information on the full population of service use rather than a sub-sample. Limitations with the data also arise. As the data are not collected for the purpose of research there is often a paucity of granular information at the provider or service user-level, such as disaggregation of healthcare use by age and sex, which has been essential for the analysis in this report.

Survey-based data are the most common form of data used in health research. These data are ordinarily collected through a face-to-face interview or computer assisted personal interview (CAPI). These data depend upon self-reported responses of interviewees. Survey-based data ask interviewees about their current health or use of a service within a particular timeframe. Responses may not always be accurate due to common issues with survey-based data such as failure to understand the question or recall bias. Furthermore, survey-based data respondents are a sample of the full population of service users, and may not be representative of the full population of users. However, the increasing use of representative weighting techniques addresses such issues. The benefits of survey-based data are that they include tailored questions on specific topics, many of which would never be captured sufficiently in administrative data. They ordinarily also ask a range of demographic questions relating to the respondent and their environment. This provides richer sources of information to measure healthcare demand. In this report, where insufficient administrative data exist we rely on survey-based data in lieu of, or in combination with, administrative data. For example, where granular information such as the age distribution of service recipients is lacking within administrative data, survey data are used to impute this. Where representative weights are available, they are used to estimate demand from survey-based data.

For many chapters, granular administrative data disaggregated by age and sex are available. For example, the Hospital Inpatient Enquiry (HIPE) administrative data provide the basis for the acute public hospital analyses. However, since no analogous centralised system exists to capture activity in private hospitals, the ability to make comparisons between public and private hospital care demand is diminished. Furthermore, where administrative data are available, e.g. for home care, which lacks disaggregation by age and sex, survey data are also used to estimate an age and sex distribution. For many health and social care services, in particular privately-delivered services, no appropriate administrative or survey data exist, which has limited the scope of the analysis in this report.

Table 3.1 lists the data sources employed in the baseline utilisation analysis and in the analysis of unmet need and demand. For each principal data source, the table shows: the level of disaggregation (by age and sex); the category of data (administrative or survey); and the base year(s) of the data included in the analysis. Where possible, data have been analysed at the level of single year of age (SYOA) and sex, with the most disaggregated age cohort included if SYOA is not available. As the base year for this report is 2015, where available, data from 2015 are used. Where data from 2015 are not available, the most recent year of data available are used as a substitute. A detailed description of each data source is provided in Appendix 2.

TABLE 3.1 PRINCIPAL DATA SOURCES: NAME WITH PROVIDER IN BRACKETS

Baseline Utilisation	Principal Data Source	Level of Data Disaggregation	Data Type	Data Base Year
Public hospital care	Emergency Department Attendance Data (Health Service Executive (HSE) Planning and Business Information Unit (BIU))	Age Cohorts (0-15, 16-64, 65+)	Administrative	2015
	Patient Experience Time (PET) Data (HSE BIU)	Single Year of Age (SYOA) and Sex	Administrative	2015
	Outpatient Attendance Data (HSE BIU)	Age Cohorts (0-15, 16-64, 65+)	Administrative	2015
	Hospital Inpatient Enquiry (HIPE) Inpatient and Day-case Data (Healthcare Pricing Office)	SYOA and Sex	Administrative	2006-2015
Private hospital care	Healthy Ireland Survey Wave 2 Data (Department of Health)	Age Cohorts (15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75+) and Sex	Survey	2015/2016
	Health Insurance Authority (HIA) Risk Equalisation Returns Data (Health Insurance Authority)	SYOA and Sex	Administrative	2015
General practice services	Healthy Ireland Survey Wave 1 Data (Department of Health)	Age Cohorts (15-19, 20-24, 25-29, …, 85-89, 90+) and Sex	Survey	2014/2015
	Growing Up in Ireland Infant Cohort Wave 1 Data	Age (9 months) and Sex	Survey	2008/2009
	Growing Up in Ireland Infant Cohort Wave 2 Data	Age (3 Years) and Sex	Survey	2011
	Growing Up in Ireland Child Cohort Wave 1 Data	Age (9 Years) and Sex	Survey	2007/2008
	Growing Up in Ireland Child Cohort Wave 2 Data	Age (13 Years) and Sex	Survey	2011/2012
Community Pharmaceuticals and Pharmacy Services	Primary Care Reimbursement Scheme (PCRS) Drug Reimbursement Data (HSE)	Age Cohorts (0-4, 5-11, 12-15, 16-24, 25-34, 35-44, 45-54, 55-64, 65-69, 70-74, 75+) and Sex	Administrative	2010-2014
	Quarterly National Household Survey (QNHS) Health Module (Central Statistics Office (CSO))	Age Cohorts (18-19, 20-24, 25-29, …, 80-84, 85+) and Sex	Survey	2010
Long-term and intermediate care services	Nursing Home Support Scheme (NHSS) Data (HSE Social Care Division)	SYOA and Sex	Administrative	2015
	Publicly-financed residents under legacy schemes (HSE Social Care Division)	SYOA[15] and Sex	Administrative	2015
	Department of Health Long-Stay Activity Statistics (Dept of Health)	Age Cohorts and Sex	Survey	2014

[15] For some schemes, only age cohorts available.

	Nursing Homes Ireland Surveys (Nursing Homes Ireland)	-	Survey	2014
	Health Information and Quality Authority Long-Term Care Bed Data (Health Information and Quality Authority)	-	Administrative	2015
Home care services	Home Help and Home Care Package Data (HSE Social Care Division)	-	Administrative	2015
	The Irish Longitudinal Study on Ageing Wave 3 (The Irish Longitudinal Study on Ageing (TILDA))	Age Cohorts (65-69, 70-74, 75-79, 80-84, 85+) and Sex	Survey	2015/2016
Public health nursing and community therapy services	Public health nursing and community therapy data (HSE BIU)	Age Cohorts (0-4, 5-17, 18-64, 65+)	Administrative	2015
	The Irish Longitudinal Study on Ageing Wave 3 (TILDA)	Age Cohorts (65-69, 70-74, 75-79, 80-84, 85+) and Sex	Survey	2015/2016
Unmet Need/Demand	**Principal Data Source**	**Level of Data Disaggregation**	**Data Type**	**Data Base Year**
Public hospital care	National Treatment Purchase Fund Outpatient Waiting List Data (National Treatment Purchase Fund (NTPF))	SYOA and Sex	Administrative	2015
	NTPF Inpatient and Day-Patient (IPDC) Waiting List Data (NTPF)	SYOA and Sex	Administrative	2015
General practice services	Quarterly National Household Survey (QNHS) Health Module (CSO)	Age Cohorts (18-19, 20-24, …, 80-84, 85+) and Sex	Survey	2010
Long-term and intermediate care services	Nursing Home Support Scheme (NHSS) Data (HSE Social Care Division)	SYOA and Sex	Administrative	2015
	Health Service Executive Delayed Discharge Data (HSE BIU)	SYOA and Sex	Administrative	2015
Home care services	Home Help and Home Care Package Waiting List Data (HSE Social Care Division)	-	Administrative	2016
Public health nursing and community therapy services	Community therapy data (HSE BIU)	Age Cohorts (0-4, 5-17, 18-64, 65+)	Administrative	2015
	The Irish Longitudinal Study on Ageing Wave 3 (TILDA)[16]	Age Cohorts (65-69, 70-74, 75-79, 80-84, 85+) and Sex	Survey	2015/2016

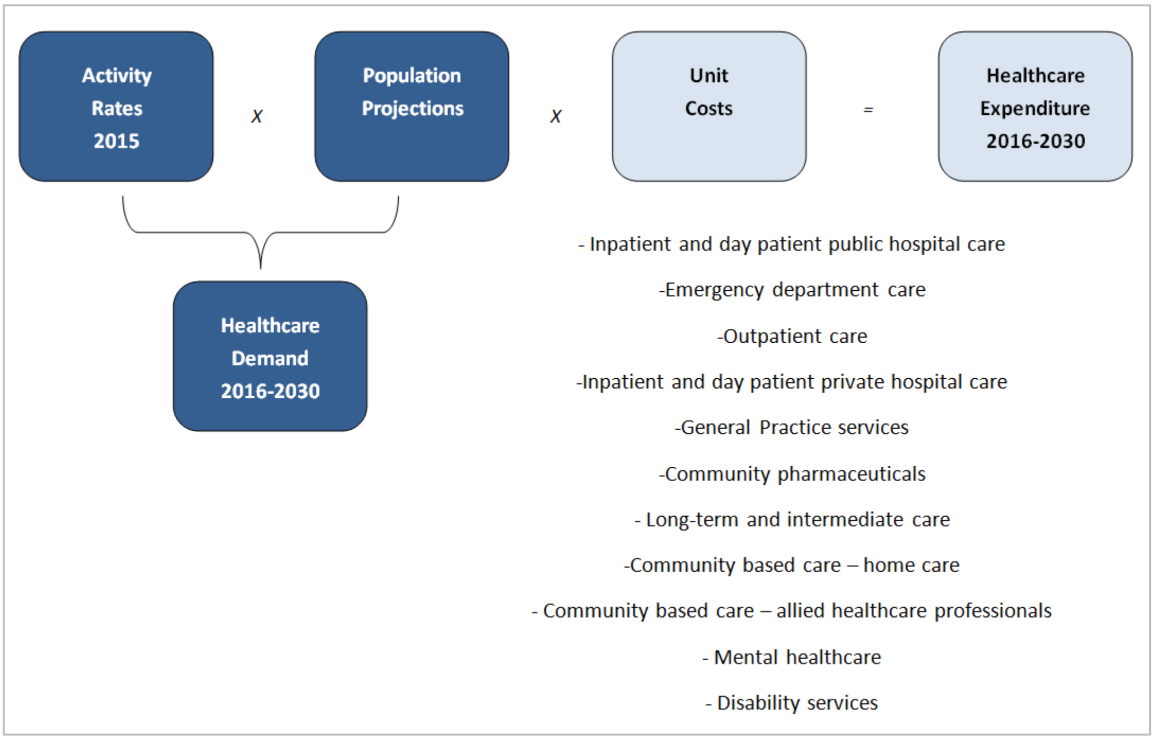
[16] For public health nursing referrals.

3.3 METHODS – APPROACH TO MODELLING

3.3.1 Model construction

As discussed in Chapter 2, following a review of the projection modelling literature, macro-simulation (cell-based) modelling was selected as the most appropriate modelling approach to pursue in an Irish context given the data requirements and intended policy applications of the Hippocrates model. This choice is supported by the wide scope of the model and heterogeneity in data quality across the Irish health system, which is demonstrated in this chapter's review of data sources and estimation methods to derive baseline activity. In the full application of the model (illustrated diagrammatically in Figure 3.1) the projections will be based on three key parameters: demographics, activity rates and unit costs. In this report, the analysis is based on activity rates and demographics. The model starts from an analysis of current use of health and social care services by SYOA and sex, or with the most disaggregated age cohort included if SYOA is not available. The detailed steps to developing baseline utilisation are described in the next Section 3.4.

FIGURE 3.1 DIAGRAMMATIC REPRESENTATION OF THE HIPPOCRATES MODEL



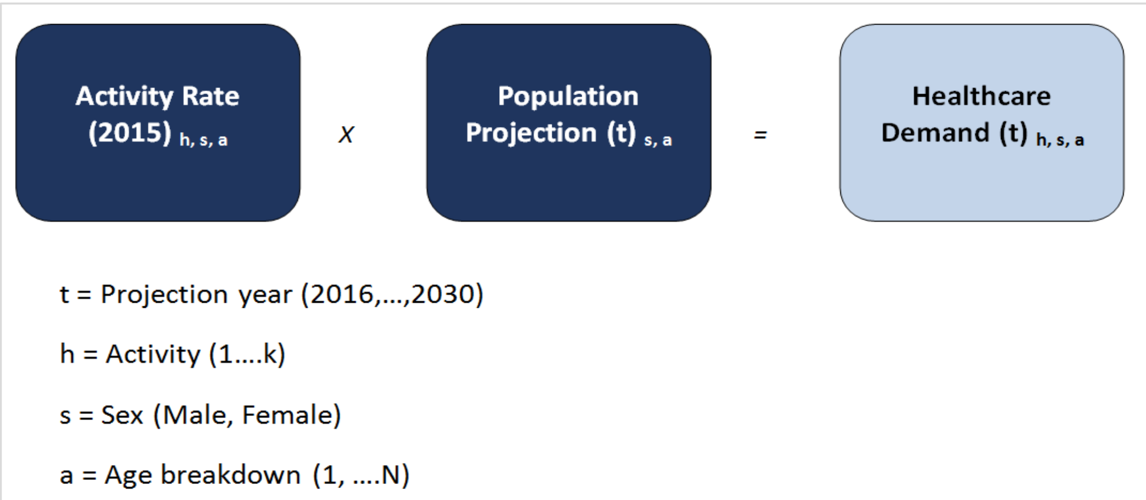
Source: Authors' representation of model.

This report projects that there will continue to be rapid population growth in Ireland, examines a number of alternative scenarios for population growth (described in Chapter 4) and projects the effects of these alternative scenarios on healthcare demand, assuming initially that this demand will reflect the 2015 utilisation rates by age and sex. We then incorporate in our projections differing assumptions about utilisation rates based on evidence about the development of healthy life expectancy and requirements to meet unmet need or demand. The detailed steps to estimate unmet need and demand are described in Section 3.5.

In further development of the model we will apply unit cost estimates to project forward service-specific and aggregate expenditures. These expenditure projections will be subject to a range of sensitivity analyses incorporating varying assumptions on demography, morbidity, unmet need, and unit cost trends. The model is automated using the SPSS statistical package with subsidiary analyses undertaken using STATA and Excel.

The macro-simulation approach to generating demand projections is presented more formally in Figure 3.2. Healthcare demand for projection year *t* for activity *h*, sex *s*, and age cohort *a* is calculated as a product of age- and sex-specific population projections for that year, and age-, sex- and activity-specific rates for 2015 (or the nearest year available). The activity is a measure of healthcare utilisation e.g. a hospital bed day, a home help hour or a visit to a general practice.

FIGURE 3.2 DEMAND PROJECTIONS BASED ON POPULATION GROWTH



Source: Authors' representation of model.

Where administrative data are available (as in the case of public hospital activity), activity rates (AR) for 2015 are calculated by dividing the volume of activity (AV) for each age and sex cohort in 2015 by the population volume (Pop) for each age and sex cohort in 2015. Formally,

$$AR(2015)_{h,s,a} = \frac{AV(2015)_{h,s,a}}{Pop(2015)_{s,a}}$$

Where adequate administrative data are not available and projections are based on the use of survey data (as in the case of general practice visits), activity rates for 2015 are calculated by dividing the (weighted) volume of activity recorded for each age and sex cohort by the corresponding (weighted) number of respondents in each age and sex cohort. In most of the sectors analysed, the measure of utilisation is activity over the entire 2015 base year (e.g. numbers of hospital discharges or home help hours). Baseline activity is estimated by aggregating total flows of activity up to the end of the year. In the analysis of long-term care in Chapter 9, however, due to data constraints, the methodology differs in starting from an estimate of baseline utilisation as the number of residents at end-2015. This is equivalent to a measure of occupied beds and the projection can be viewed as a projection of demand for long-stay and intermediate-stay beds. In the long-stay analysis, this projection is then converted into an estimate of bed day utilisation for the year 2015. We perform a reverse calculation when we convert estimated inpatient bed day utilisation in hospitals into estimated available inpatient hospital beds. For public hospitals we perform this calculation as a validation exercise so that estimated beds available can be compared to published public hospital bed figures for 2015. For private hospitals, we provide an estimate of beds available because little evidence exists on the scale of the private hospital system.

The formula applied to convert bed days to beds available is specified as,

$$Beds\ Available\ (2015)_h = \frac{\frac{\sum_{s=1}^{2}\sum_{a=1}^{N} Bed\ Days(2015)_{h,s,a}}{365}}{OR}$$

Where OR represents the assumed bed occupancy rate. This calculation of bed capacity follows the OECD definition of ‘available’ beds i.e. ‘hospital beds which are regularly maintained and staffed and immediately available for the care of admitted patients’ (1). For public hospitals we assume an occupancy rate of 94 per cent in line with published average occupancy rates for this sector in Ireland (2). For private hospitals, where occupancy rates are likely to be lower, we assume an occupancy rate of 85 per cent.[17]

Activity rates are converted into projected activity volumes (demand) for each age and sex cohort for each projection year by multiplying these rates by the corresponding population projection, by age and sex, for each year. That is,

[17] An occupancy rate of 85 per cent is considered the threshold above which concerns for patient safety may arise (3).

$$AV(t)_{h,s,a} = AR(t)_{h,s,a} * Pop(t)_{s,a}$$

Total projected demand for a particular service for each year can then be estimated by summing across each age and sex breakdown.[18] That is,

$$AV(t)_h = \sum_{s=1}^{2} \sum_{a=1}^{N} AV(t)_{h,s,a}$$

3.3.2 Adjustments to model input parameters and preferred projection scenarios

A range of potential assumptions about future demand can be made based upon varying each of the components included in the model, namely activity rates, population growth, unmet need/demand and healthy ageing. However, in this analysis we develop 'preferred projections' for each area of health or social care. These 'preferred projections' do not refer to desired projections but rather are based upon scenarios which combine population growth, healthy ageing and unmet need/demand assumptions. The assumptions applied in these 'preferred projections' are those best supported by evidence available for each sector of health and social care based on detailed review of the Irish and international literature, on analysis of Irish disability rate trends and, in the case of unmet need and demand assumptions, on analyses of evidence for unmet need and demand in Ireland. The range of preferred projections by sector in this report reflects uncertainty about the evidence.

Projections for demand for all healthcare services in this report begin with the assumption that while activity rates in 2015 will differ by age and sex cohorts, the activity curves these rates generate will remain constant across all projection years. Consequently, all growth in activity is purely a function of the shape of the respective activity curves in 2015 and changes in the size and structure of the population through the projection period. Two alternative population growth trajectories are applied to the projection analysis; referred to respectively as the Central population and High population growth projections (see Chapter 4).

While it is a useful starting point to inform our projections to hold activity rates constant through the projection period and project purely in terms of our

18 It is not possible to sum demand across different areas of activity where measures of activity are not comparable (for example, hospital discharges and GP services). In the next phase of this analysis where unit costs are appended to demand projections and converted to expenditures it will then be possible to sum across different services and provide estimates of future healthcare system expenditure.

population growth projections, such assumptions may be unrealistic and not very informative. In effect, since our population projections assume increased life expectancy, assuming unchanged activity rates and implicitly unchanged health status by age and sex is to adopt a pessimistic assumption that morbidity and disability will increase with increased life expectancy, thus favouring the expansion of morbidity (EM) hypothesis (see Chapter 2).

Since we do not find that the evidence supports this hypothesis in all contexts, we model a number of alternative projection scenarios by making a range of adjustments to activity rates to reflect alternative assumptions about healthy ageing. We further adjust activity rates to reflect unmet need or demand for care. The methods adopted to make these adjustments are described in Sections 3.3.5 and 3.3.6. The next section describes how the evidence reviewed in Chapter 2 is applied to support alternative healthy ageing assumptions in our projection scenarios. Section 3.3.4 discusses the development of our preferred projection range by sector.

3.3.3 Healthy ageing evidence by sector

A key factor in the preferred projections relates to the healthy ageing assumption. In Chapter 2 a detailed review of the healthy ageing hypotheses and the evidence for them is provided to support the healthy ageing assumptions included in the preferred projections. Where possible, evidence from Irish studies or trends in Irish data undertaken for this report are given precedence to inform the preferred projections chosen. Section 2.7 discusses the thorough review of data sources in Ireland undertaken to inform assumptions of healthy ageing. While data such as HIPE and TILDA may not be appropriate to inform healthy ageing trends due to lack of a unique patient identifier (HIPE) and issues with comparability across waves (TILDA), evidence from QNHS is used to inform disability rate trends. The impact of ageing on healthcare demand in each health and social care sector differ, and therefore the healthy ageing assumptions included are based upon those best supported by the evidence available in each sector of the health service where possible. For example, many studies have shown a clear demarcation between the determinants of long-term care and acute care demand respectively (4-6). Table 3.2 presents the evidence for the healthy ageing assumption by sector and Table 3.3 presents the preferred projection scenarios for each health and social care sector.

3.3.3.1 Sectors where evidence supports the Dynamic Equilibrium hypothesis

In the area of acute hospital care in particular, a considerable number of studies have examined the drivers of trends in demand and expenditure. These studies are broadly in agreement that ‘proximity to death’, as opposed to age, is the key driver of acute care demand and expenditure. In this context, increases in life expectancy will be accompanied by equivalent increases in good health or mild ill health, and the years spent with severe ill health remain constant, which is a key assumption of dynamic equilibrium. Many of these studies which test for proximity to death use data from a point in time, but a Dutch study using data over time to examine the link between proximity to death and dynamic equilibrium found evidence to support the theory of a dynamic equilibrium (7). Similarly to previous authors (7,8), we interpret evidence of proximity to death as evidence for the assumption of dynamic equilibrium in our preferred projections for hospital care. Evidence from Switzerland (6, 9), the United States (10, 11), the Netherlands (12) and England (13) finds that proximity to death is the main driver of acute hospital expenditure growth. Those studies that explicitly compare proximity to death and age find that age is not a significant factor, having controlled for closeness to death (14). Studies have also shown that for less severe chronic conditions (which may be more appropriately managed in primary care) age is still a significant predictor of demand and expenditure, but for severe diseases such as cancer, time to death remains the key determinant of expenditure (15).

In the most recent studies of acute services reviewed, there is no evidence for expansion or compression of morbidity found. A recent study from Spain sought explicitly to test for compression of morbidity in acute hospital care using age at onset of condition and hospitalisation rates (16). The authors found no evidence of compression of morbidity but found that age-specific incidence rates of chronic disease remained similar over time for most diseases and increased for some. A similar study, including using PCRS and TILDA data in Ireland, has found that proximity to death, not age, to be the main determinant of community pharmaceutical expenditure (17). Based upon this evidence for public hospital inpatient, day-case, and Emergency Department services, private hospital inpatient and day-case services, and for community pharmaceutical services the healthy ageing assumptions applied in our preferred projections is Dynamic Equilibrium (DE), which assumes that all additional life years are lived in good health or mild ill health.

3.3.3.2 Sector where evidence supports the Expansion of Morbidity hypothesis

General practice is the main service which meets the demands of increased treatment for chronic disease. There is evidence for less optimistic healthy ageing assumptions when chronic disease prevalence is examined. Studies from England (18), Sweden (19, 20) and the United States (21) have shown that there is a growing burden of chronic disease and multi-morbidities in ageing populations. This trend towards chronic disease and its effects in general practice have been seen in Ireland (see Chapter 2). Figure 2.4 (Chapter 2) highlights that over 50 per cent of deaths in Ireland can now be attributed to cardiovascular disease and cancer. Based upon this evidence on chronic disease prevalence and severity, the healthy ageing assumptions applied in our preferred projections for general practice care are Expansion of Morbidity (EM), which assumes that years lived in bad health or severe disability will increase as life expectancy increases, and Moderate Healthy Ageing (MHA), which assumes that a lower proportion of additional life expectancy is lived in ill health. MHA falls between EM and DE and is included in this report to account for the reduction in the severity of chronic disease.

3.3.3.3 Sectors where mixed evidence supports a wide range of assumptions

In the sectors of health and social care such as residential long-term care and home care, where disability rates are a predictor of utilisation, we assume that utilisation is primarily driven by the ADLd rate. This is based on evidence from TILDA and Census 2011 that show recipients of these services having high rates of ADLd. As discussed in Chapter 2, evidence on disability rate trends is much more ambiguous than the evidence on proximity to death and chronic disease prevalence for acute and primary care services respectively. While chronic disease rates are increasing, evidence from the United States (22), Netherlands (23) and an international review (24) finds that the disabling consequences of chronic disease are not as severe as previously thought. Evidence from international reviews (24-26), the United States (27, 28) and Japan (29) finds that age-specific rates of disability, as measured by difficulties with IADL, have reduced over time. However, trends in age-specific rates of disability, as measured by ADLd, vary across studies (30, 31) (see discussion Chapter 2 Section 2.6.3.4).

Evidence of declining disability rates have been found for Ireland and applied to previous projections of long-term and community care demand (32, 33). More recent evidence from the QNHS discussed in Chapter 2 found statistically significant and steep decreases in ADLd rates in community-dwelling older Irish women (aged 75 and over). Dementia is also associated with long-term care utilisation and trends in dementia rates from England (34) and the US (35) suggests that a reduction in age-specific dementia rates may be occurring.

In our analysis, the QNHS evidence of declining disability rates for older Irish women combined with the balance of international evidence supports Compression of Morbidity but we apply a wider range of healthy ageing assumptions to reflect uncertainty in this area. For home care, residential long-term care and for those community therapists (occupational therapists and physiotherapists) for whom care of older people with disabilities represents a high proportion of their workload, the healthy ageing assumptions applied in our preferred projections are the more optimistic Compression of Morbidity and less optimistic Dynamic Equilibrium. (The relationship between our methodology to model CM and the Irish QNHS evidence is further explored in Appendix 3.)

A further service where a wide range of assumptions is applied is public and community health nursing. A range of different healthcare services are provided by public and community health nurses including childhood development screenings, primary care nursing, and home care. Furthermore, evidence from TILDA shows that older individuals who access public health nursing services have high rates of ADLd and IADLd (36), and therefore demand for public health nursing services may be impacted by changes in the disability rate. Consequently, for public health nursing the healthy ageing assumptions applied in our preferred projections are broad and encompass those applying to primary care and care of older people. We therefore apply both MHA and DE in our preferred projections.

3.3.3.4 Sectors in which data do not support applying healthy ageing assumptions

The aggregated age cohort data available to the analysis of outpatient care provide a poor basis for application of healthy ageing assumptions (see Appendix 5) and consequently we apply pure population projections.

Maternity services and speech and language therapy services are used predominantly by younger adults and young children. Therefore, the preferred projections included for these services do not include a healthy ageing scenario.

TABLE 3.2 HEALTHY AGEING EVIDENCE BY SECTOR

Services	Evidence Supporting Preferred Projection scenarios
Public Acute Hospitals: Inpatient and Day-case Public Acute Hospitals: Emergency Department Private Acute Hospitals: Inpatient and Day-case Pharmaceuticals	• There is strong evidence that 'proximity to death' (dynamic equilibrium) is the main driver of expenditure growth in acute hospital inpatient and day-case care in evidence from Switzerland (6, 9), the United States (10, 11), the Netherlands (12) and England (13). • There is no evidence for compression of morbidity in acute hospital care in recent evidence from Spain (16). • There is strong evidence that proximity to death (dynamic equilibrium) is the main driver of pharmaceutical expenditure growth in Ireland (17).
General Practice	• Evidence from England (18), Sweden (19, 20) and the United States (21) shows an expansion in chronic disease, but the severity/disabling consequences of chronic disease has lessened (22, 23), suggesting expansion of morbidity and moderate healthy ageing
Residential Long-Term Care Home Care Community Therapy: Physiotherapists; Occupational Therapists	• Evidence from international reviews (24-26), the United States (27, 28) and Japan (29) finds that age-specific rates of disability, as measured by IADLd, have reduced over time. However, trends in age-specific rates of disability, as measured by ADLd, vary across studies (30, 31) • Trends from QNHS data in Ireland show reductions in disability rates for older age cohorts and reductions in age-specific dementia rates have been seen recently in England (34) and the United States (35) • Uncertainty about trends of disability and healthy ageing support a projection range including both compression of morbidity and dynamic equilibrium for care of older people in long-term and community care settings
Public Health Nursing	• As public health nursing services overlap both primary care and care for older people, trends in chronic disease(18-20) (21-23) suggesting moderate healthy ageing; and trends in disability rates (24-31) suggesting dynamic equilibrium are used to inform the healthy ageing assumptions chosen.
Public Acute Hospitals: Maternity Public Acute Hospitals: Outpatient Care Community Therapy: Speech and Language Therapists	• It is not appropriate to adopt healthy ageing assumptions for maternity services and SLT. • Outpatient data are too highly aggregated to apply healthy ageing assumptions in the modelling.

Source: Sources as referenced in table.

TABLE 3.3 PREFERRED PROJECTION SCENARIO RANGES BY SERVICE SECTOR STATING POPULATION PROJECTIONS, HEALTHY AGEING AND UNMET NEED/DEMAND ASSUMPTIONS APPLIED IN EACH SCENARIO

Service Sector	Assumptions About Healthy Ageing	Population Projections	Assumptions About Unmet Need/Demand	Preferred Projection Scenario Range
Public Acute Hospitals: Inpatient and Day case	Dynamic Equilibrium	Central	None	1. Dynamic Equilibrium
	Dynamic Equilibrium	High	None	2. Dynamic Equilibrium + High Pop
	Dynamic Equilibrium	Central	High Unmet Demand	3. Dynamic Equilibrium + Unmet Demand
Public Acute Hospitals: Emergency Department Private Acute Hospitals: Inpatient and Day-case services Pharmaceuticals	Dynamic Equilibrium	Central	None	1. Dynamic Equilibrium
	Dynamic Equilibrium	High	None	2. Dynamic Equilibrium + High Pop
Public Acute Hospitals: Outpatient Care	None	Central	None	1. Central Pop
	None	High	None	2. High Pop
	None	Central	High Unmet Demand	3. Central Pop + Unmet Demand
General Practice	Expansion of Morbidity	Central	None	1. Expansion of Morbidity
	Moderate Healthy Ageing	Central	None	2. Moderate Healthy Ageing
	Moderate Healthy Ageing	High	None	3. Moderate Healthy Ageing + High Pop
	Moderate Healthy Ageing	Central	Unmet Need	4. Moderate Healthy Ageing + Unmet Need
Residential Long-Term Care Home Care	Dynamic Equilibrium	Central	None	1. Dynamic Equilibrium
	Compression of Morbidity	Central	None	2. Compression of Morbidity
	Compression of Morbidity	High	None	3. Compression of Morbidity + High Pop
	Compression of Morbidity	Central	Unmet Demand	4. Compression of Morbidity + Unmet Demand
Community Therapy: Physiotherapists; Occupational Therapists	Dynamic Equilibrium	Central	None	1. Dynamic Equilibrium
	Compression of Morbidity	Central	None	2. Compression of Morbidity
	Compression of Morbidity	High	None	3. Compression of Morbidity + High Pop
	Compression of Morbidity	Central	Unmet Demand	4. Compression of Morbidity + Unmet Demand
Public Health Nurses	Moderate Healthy Ageing	Central	None	1. Moderate Healthy Ageing
	Dynamic Equilibrium	Central	None	2. Dynamic Equilibrium
	Dynamic Equilibrium	High	None	3. Dynamic Equilibrium + High Pop
	Dynamic Equilibrium	Central	Unmet Demand	4. Dynamic Equilibrium + Unmet Demand
Public Acute Hospitals: Maternity Community Therapy: Speech and Language Therapists	None	Central	None	1. Central Pop
	None	High	None	2. High Pop

Source: Methodology developed by authors.

3.3.4 Development of preferred projection range by sector

Table 3.2 summarises the evidence for the healthy ageing assumptions by sector. Table 3.3 lists the preferred projections for each health and social care service in the report. For all services, a projection based purely on the Central population growth projection, while not a preferred projection (except for a small number of services listed in Table 3.3) is presented as a comparator, since purely population-based projections are frequently published. Healthy ageing assumptions by sector are combined with the Central and High population growth projections to develop a preferred projection range, which reflects uncertainty about population growth. Where available, an unmet need or demand assumption is combined with the healthy ageing assumption and Central population growth projection to develop a further preferred projection incorporating unmet need/demand. If two healthy ageing assumptions are applied, both are combined with the Central population projection to show a range reflecting uncertainty about healthy ageing evidence in this sector. Only the healthy ageing assumption which appears on balance better supported by the evidence is combined with the High population growth projection or the Unmet Need or Demand assumption in two alternative scenarios.

3.3.5 Adjusting activity rates to account for healthy ageing

In the Hippocrates model, we apply these alternative healthy ageing assumptions by treating activity as a proxy for morbidity or disability. Thus in the case of Dynamic Equilibrium which assumes that all future gains in life expectancy will be in good health or mild ill health, we assume that any gain in life expectancy is accompanied by an equivalent reduction in morbidity/disability. Put simply, if the gain in life expectancy is one year, we assume that an 80-year-old in the projection year will have the health status and therefore activity rate of a 79-year-old in the base year. In the case of Expansion of Morbidity there is no shift in activity rates. In the case of Compression of Morbidity, we assume the gain in health status exceeds the gain in life expectancy by 50 per cent, while in the case of Moderate Healthy Ageing, we assume the gain in health status is one half the gain in life expectancy and we adjust activity rates accordingly. Activity rate shifts only take place where activity rates, as a proxy for morbidity or disability, are increasing. Similar to previous research adopting these methods (37) we consider it appropriate not to apply these activity shifts to the entire age distribution as variation in activity rates at younger ages may be less reflective of variation in morbidity. For the majority of services examined we limit activity shifts to those aged 35 and over (or nearest age cohort where only aggregated age data are available). The exception to this is for analysis of long-term and intermediate care and home care where the nature of the services being examined make it more appropriate to apply activity shifts at 65 and over. Formally, based on the approach adopted by the European Commission (38-40), activity rate shifts enter into our model as follows,

$$AR(t)'_{h,s,a} = AR(2015)_{h,s,a-\partial\Delta LE(t,2015)s,a}$$

And

$$\Delta LE(t,2015)_{s,a} = LE(t)_{s,a} - LE(2015)_{s,a}$$

In this formulation, $AR(t)'_{h,s,a}$ represents the adjusted activity rate in year t for service h, sex s and age a and, as described, is based on shifting the baseline activity rate to reflect the activity rate of a younger cohort (where activity rates are increasing through age) in proportion to life expectancy (LE) increases.[19] The parameter ∂ represents the relationship between life expectancy increases and gains in health status. Where ∂ = 0 no shift takes place which models the expansion of morbidity hypothesis whereby gains in life expectancy are not matched by gains in health status. Any value between 0 and 1 represents an expansion of morbidity, where some of the gain in life years is spent in ill health. Reflecting uncertainty about the extent of this effect, we apply an intermediate assumption called Moderate Healthy Ageing (MHA) where ∂ = 0.5, an intermediate point between Expansion of Morbidity and Dynamic Equilibrium. Reflecting an assumption that all gains in life expectancy are spent in good health, our Dynamic Equilibrium (DE) scenario sets ∂ = 1 so that, for example, a one-year increase in life expectancy results in the activity rate being shifted back exactly one year. Any value of ∂ > 1 represents Compression of Morbidity (CM), in which scenario gains in healthy life expectancy exceed gains in life expectancy. Unfortunately, little international guidance exists on the value of ∂ to choose for compression of morbidity. We set ∂ = 1.5 for modelling compression of morbidity in this report. (See Appendix 3 for a discussion of evidence on trends in disability rates in Ireland and their relationship to the CM methodology in this report.) These shift factors are summarised in Table 3.4 and their effect on a hypothetical projected activity curve is demonstrated in Figure 3.3.

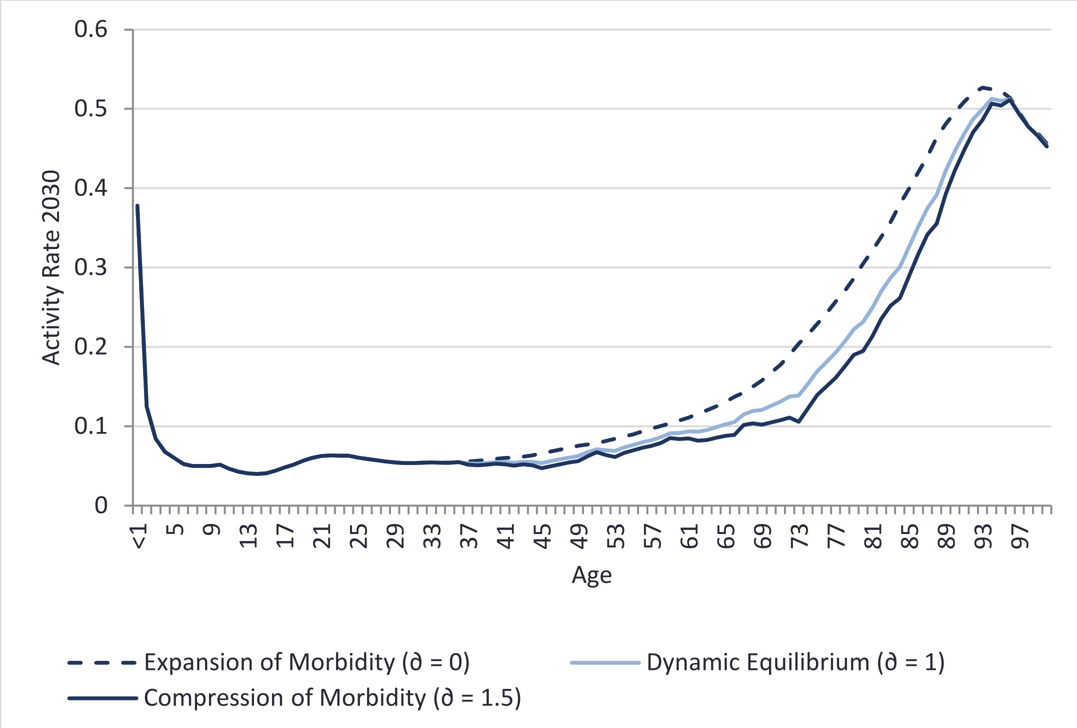
TABLE 3.4 SUMMARY OF HEALTHY AGEING SHIFTS APPLIED

Ageing assumption	Shift
Expansion of morbidity	∂ = 0
Moderate healthy ageing	∂ = 0.5
Dynamic equilibrium	∂ = 1
Compression of morbidity	∂ = 1.5

Source: See accompanying text. Method adapted from European Commission (38-40).

19 Changes in life expectancy are generally not in the form of whole numbers and simple linear interpolation is used to calculate activity shifts in such instances. (For life expectancy projections see Chapter 4.)

FIGURE 3.3 ILLUSTRATIVE EXAMPLE OF IMPACT OF HEALTHY AGEING SHIFTS ON ACTIVITY RATE DISTRIBUTION IN 2030



Source: Authors' illustration of modelling method.
Notes: This is an illustrative example and does not reflect the activity rate of any particular service examined in this report.

3.3.6 Adjusting activity rates to account for unmet demand or need

An important objective of the development of the Hippocrates model was to be able to incorporate unmet need for healthcare services into the projection framework. As described in Chapter 2, however, incorporating measures of unmet need is not generally a feature of macro-simulation modelling (although such measures have been incorporated into micro-simulation modelling). Consequently, we were required to develop and apply a novel conceptual approach to the incorporation of unmet need into our projections. This is a feature of the Hippocrates model that we consider a meaningful conceptual development.

The fundamental approach adopted is to calculate a volume of unmet need or demand for services in the base year and apply this (unmet) activity to our baseline (met) activity volumes to estimate an unmet-need adjusted activity rate on which to project forward volumes of demand over the projection horizon. Formally,

$$AR_{um\_adj}(t)_{h,s,a} = AR(t)_{h,s,a} + AR_{um}(2015)_{h,s,a}$$

Where

$$AR_{um}(2015)_{h,s,a} = \frac{AV_{um}(2015)_{h,s,a}}{Pop(2015)_{s,a}}$$

here $AR_{um\_adj}(t)_{h,s,a}$ equals the activity in year *t* for service *h*, sex *s and* age *a* adjusted to account for unmet need. $AV_{um}(2015)_{h,s,a}$ and $AR_{um}(2015)_{h,s,a}$ represent the volume and rate of unmet need, respectively for base year 2015 for service *h*, sex *s,* and age *a.*

However, the approach to estimating volumes of unmet need differs across services and is heavily influenced by the type and availability of data. For instance, where survey data are utilised, self-reported levels of unmet need (e.g. for GP services) are converted into a measure of activity (e.g. a GP visit). However, for many services administrative waiting list data are used as our measure. Where waiting list data are employed we measure the volume of unmet *demand* (i.e. the number of people on a waiting list for a particular service) and not necessarily total unmet *need*. Waiting list data do not capture any need for services that exists outside those on the waiting lists and therefore may not capture the full level of unmet need for these services.

Employing waiting list data in our projections requires that we measure waiting list activity at year end to avoid double-counting of individuals who may have come off the list at earlier points in the year and received care. In estimating demand for public hospital outpatient and elective care, we apply national and international waiting time targets to develop alternative measures of society's view of acceptable waiting times, which we refer to as thresholds.[20] Data availability and variation in international and national waiting time targets supported applying three such thresholds (see Section 3.5 for a detailed description of these methods). For allied healthcare professionals, we calculate unmet demand as those waiting in excess of 12 weeks for first time assessment, based on the available HSE data on waiting for these services. In the case of long-term care, unmet demand is calculated by combining numbers of patients waiting for discharge from acute hospitals to long-term care settings and people waiting for long-term care financing after their need for care has been assessed and their funding approved.

[20] We acknowledge that the approach we have taken to analysing waiting times for acute care is likely to underestimate unmet demand because the data available to this analysis do not allow us to analyse total waits. Best practice internationally measures waits as the time from referral to treatment. These data are not collected in Ireland. The data available to the analysis are instead numbers on a list at a moment in time. It was not possible for this analysis therefore to follow patients from their GP referral through their wait on the outpatient and inpatient lists to their eventual treatment.

Finally, a critical assumption underlying this approach to measurement of unmet need or demand is that it is made on a 'static activity rate' basis. That is for projection year *t* we assume that the rate of unmet demand/need remains unchanged from the 2015 baseline and that any changes in volumes of unmet need or demand will be a function of changes in the size and structure of the population. This approach therefore makes no attempt to model any effects policy or capacity-related shocks may have on changing rates of unmet need in future years. Nor do we attempt to project unmet need or demand based on previous trends, where the data would also allow us to do so (for instance, hospital list waiting data). This is consistent with the overall approach to activity rate projection (discussed in Section 3.3.7) where the scope of this current analysis places limits on the number of activity rate adjustments it is possible to model in this iteration of the report.

Particularly in relation to waiting list data it follows from this approach that we assume some structural dimension to unmet demand in the system. We therefore assume that this demand is not merely 'pent-up' so that, once met, it would not arise to the same extent in the future. For hospital waiting list data, based on analysis of past trends, we examined the merits of assuming some structural persistence in the level of unmet demand for care that can be reasonably expected to endure through the projection horizon. Current data deficiencies limit our ability to examine this and other issues, discussed in Appendix 4, so that possibilities exist of both over- and underestimation of unmet demand from waiting list data. Future research could help address many of these issues in estimation provided there is improved collection and availability of waiting list data.

A detailed description of the data sources and methods applied to measuring unmet need or demand for each of the services in this report is provided in Section 3.5.

3.3.7 Scope for additional activity rate adjustments

In summary, adjustments made to activity rates in this report focus on modelling the impact of healthy ageing and, where applicable, the effect of (a constant rate of) unmet need or demand through the projection horizon. However, the activity rate adjustments applied in this report are not exhaustive and there are additional adjustments that could reasonably warrant examination. For instance, where time series data on healthcare use exist, an argument can be made for additional scenario analyses that extrapolate past trends into future projections. However, for the services covered in this report data availability on trends through time is limited (see Table 3.1). Where data series exist over time, other limitations render analysis on a trend basis challenging and potentially misleading. In terms of public hospital care, for instance, trends based on past activity cannot be understood or usefully extrapolated without an understanding of activity taking place in private hospitals over the same period given the close relationship that exists between these sectors. In the case of PCRS prescribed pharmaceutical use prior to 2015 (see Chapter 8), utilisation in previous years has been particularly influenced by the effects of the recent economic crisis on eligibility for schemes. As a consequence, it is unlikely that past trends in activity in this area will provide a reliable guide to future use.

More generally, scenarios modelled in this report do not address the impact that future policy change (for instance future shifts in models of care or eligibility) may have on projected demand for different services and sectors. Defining and examining policy effects are outside the scope of this current report. However, providing an evidence base for policymakers on the impact proposed reforms may have on future service use will represent an important future application of the Hippocrates model.

3.3.8 Impact of age aggregation on projected demand

As noted in Section 3.2, where possible, data are analysed at the level of SYOA and sex, with the most disaggregated age cohort included if SYOA data are not available. We consider more disaggregated age data preferable because information on activity variation across the age distribution will inevitably be lost with greater aggregation of data. The greater the level of aggregation (i.e. the fewer age cohorts), the less sensitive projections will be to changes in the age structure of the population. This has the consequence of understating the effect of increasing numbers of older people on healthcare demand and leads to understated demand projections.

Greater aggregation may also reduce the impact healthy ageing shifts have on projected demand relative to services where more granular age data are available. This introduces some uncertainty when comparing effects across services that employ different data aggregations in projections; particularly, services where activity is concentrated in older ages may be more at risk of this aggregation effect. Fortunately, the services in this analysis that best fit this description and could be considered most at risk of this aggregation bias (i.e. long-term residential care, home care services) predicate analysis on age data at the SYOA level. The effects that different aggregations of data have on projected demand are illustrated in Appendix 5 using HIPE public hospital data.

3.3.9 Decomposing growth in demand

In each chapter, for each category of care, a demand decomposition analysis is undertaken for a comparator projection (showing the effect of population growth alone without healthy ageing assumptions) and the preferred projections. This exercise identifies the share of projected demand growth (in percentage terms) between 2015 and 2030 which can be attributed to population growth, to changes in the structure of the population (the proportions in different age cohorts) and to meeting unmet need or demand. This method has been adapted from an approach by Ha et al. (41). The method is implemented by firstly deriving the demand growth share attributable to population growth, by measuring the increase in demand which would be projected for the 2030 population if it had the 2015 population age distribution. Secondly, the demand growth share attributable to the change in the structure of the population is calculated by subtracting the population growth share from the actual projected increase in demand for 2030. Finally, the demand growth share attributable to adding unmet need or demand in the base year to activity rates in that year is derived by subtracting the demand projection without unmet demand from the demand projection with unmet demand. (See more detailed methodology in Appendix 6).

3.4 DETAILED METHODS TO ESTIMATE BASELINE UTILISATION

This section describes in detail the methods applied to derive our findings for baseline utilisation which are presented in Chapters 5 to 11. The data sources are further described in Appendix 2.

3.4.1 Acute public hospital services (Chapter 5)

Name	Data
HSE Emergency Dept. Attendance Data	• Total number of Emergency Department (ED) attendances at 30 public hospital designated EDs in 2015. Disaggregated by age group (0-15, 15-64, 65+).
HSE Patient Experience Time (PET) Data	• Total number of ED attendances at 28 public hospital designated EDs in 2015. Disaggregated by SYOA and sex.
HSE Public Outpatient Dept. (OPD) Attendance Data	• Total number of outpatient attendances at 50 public outpatient clinics in 2015. Disaggregated by age cohort (0-15, 16-64, 65+).
Hospital Inpatient Enquiry (HIPE) Data	• Total number of inpatient and day-patient discharges in 53[21] acute public hospitals 2015.[22] Disaggregated by SYOA and sex.

Methods

Emergency Department Attendances

- To estimate ED attendance rates by SYOA and Sex, HSE Attendance data and PET data are used. As data were missing from both data sources, a number of adjustments are made.

  To account for missing age and sex in the PET database, age and sex are imputed based on the distribution of these variables in the PET database from 2016.[23]

  To account for the differences in the numbers of attendances reported in the PET and the HSE Attendance database[24] adjustments have been made for the differences in the number of attendances at the aggregate level with attendances added as per the age and sex distribution in the available 2016 PET data.

  People attending who 'did not wait'[25] are not counted as attendances because they did not receive any treatment and are excluded from the analysis.

Outpatient Department Attendances

- To estimate OPD utilisation rates, baseline utilisation rates are calculated by taking age cohort (0-15, 16-64, 65+) volumes of public outpatient attendances captured in the HSE Public OPD Attendance data for 2015 and dividing by corresponding age-specific population volumes for 2015.

Inpatient and Day-patient Admissions and Bed Days

- To estimate inpatient and day-patient (day case) (IPDC) utilisation rates, SYOA-specific and sex-specific volumes of utilisation (e.g. day patient, emergency inpatient, elective inpatient) in HIPE 2015 are divided by corresponding age- and sex-specific population volumes for 2015.

  Utilisation in HIPE can be measured both in terms of the number of discharges or the number of bed days. Bed days are calculated as the product of the number of discharges and their average length of stay (LOS) for each age and sex cohort.[26] In this analysis the predominant focus is on discharges as a measure of utilisation. The reason for this focus is that discharges will be used as the basis for costing in the second phase of this project where demand is converted to expenditure. However, bed days provide a useful measure of utilisation that better account for variation in resource use and can also be readily converted into estimated annual bed numbers to examine capacity requirements.

  Maternity utilisation, that is those who were admitted in relation to their obstetrical experience (from conception to six weeks post-delivery), are considered separately. This approach is justified in that maternity discharges represent a unique subset of hospital activity. All maternity discharges are female and are within a narrow age range. Additionally, maternity discharges report a very narrow range of diagnoses and procedures and tend to have a shorter inpatient average length of stay compared to non-maternity discharges (42).

---

21 We exclude 62 hospice discharges reported to HIPE in 2015. Additionally, two long-stay hospitals are excluded which are included in the analysis in Chapter 9.

22 This chapter also examines trends in total hospital discharges between 2006 and 2015, however these trends are not used as a basis for projections.

23 BIU provided data from January to June 2016 and contained a lower proportion of missing values than the 2015 data.

24 For three hospitals only new attendances were reported to the PET while all attendances (new and return) were returned to the attendance database. A further three hospitals were returning ED clinic activity to PET which should not have been included and a further three did not report PET data for some or all of 2015.

25 There is a variable in the PET Database which reports the discharge destination. One category is 'did not wait'; these are patients who registered their attendance but left the ED before they were treated. In 2015, an estimated 60,100 attendances 'did not wait' for treatment.

26 In this analysis 'same-day' inpatients (i.e. inpatients admitted and discharged on the same day) are given a LOS of 1. We do not exclude them from the analysis nor do we attempt to attach a part day LOS (e.g. 0.5) to their period of care.

3.4.2 Private hospital services (Chapter 6)

Name	Data
Healthy Ireland Survey Wave 2 Data	• Private hospital inpatient utilisation for those aged 15 years and over. Data are disaggregated by age cohort[27] and sex.
Health Insurance Authority (HIA) Risk Equalisation Returns	• Captures the number of day-patient admissions[28] and inpatient hospital days claimed on private health insurance (for the four open market insurers). Data are disaggregated by SYOA and sex.

Methods

- The (weighted) total number of private hospital admissions by age and sex is divided by the (weighted) number of total sample respondents in their corresponding age and sex cohort to calculate an inpatient private hospital admission rate.
- HIA data did not allow for the direct calculation of private hospital activity rates as activity data that were collected were not disaggregated in terms of whether the insured activity took place in public or private hospitals. As such, the following procedure is employed to estimate private hospital *insured* day-patient admission and inpatient bed day activity. To estimate private hospital insured day-patient activity first we calculated the total number of privately-insured day-patient discharges in HIPE by single year of age and sex.[29] Then we subtracted these values from total privately-insured day-patient activity submitted to the HIA to leave estimates of private hospital insured day-patient activity by single year of age and sex.[30] The same method is employed to estimate private hospital insured inpatient bed days by single year of age and sex. Finally, we divided these single year of age and sex utilisation estimates by their corresponding population volumes to calculate private hospital insured admission (day patient) and bed days (inpatient) rates by single year of age and sex.

3.4.3 General practice services (Chapter 7)

Name	Data
Health Ireland Survey Wave 1	• GP visit rate in 2015 for those aged 15 years and older. Disaggregation by age cohort[31] and sex. • Practice nurse visit rate in 2015 for those aged 15 years and older. Disaggregation by age cohort and sex.
Growing Up in Ireland Data	• Infant Cohort Wave 1: GP visit rate in 2007-2008 for nine-month-olds. • Infant Cohort Wave 2: GP visit rate in 2011-2012 for three-year-olds. • Infant Cohort Wave 2: Practice nurse visit rate in 2011-2012 for three-year-olds. • Child Cohort Wave 1: GP visit rate in 2008-2009 for nine-year-olds. • Child Cohort Wave 2: GP visit rate in 2011 for 13-year-olds. • Child Cohort Wave 2: Practice nurse visit rate in 2011 for 13-year-olds.

Methods

- To estimate GP visit rates in those aged younger than 15 years, the GP visit rate from *Growing Up in Ireland* (GUI) Infant Cohort Wave 1 are multiplied by 1.33 (as the rates apply to nine-month-olds) applied to those children aged less than 1; the GP visit rate from GUI Infant Cohort Wave 2 is applied to those children aged 1-5 years old; the GP visit rate from GUI Child Cohort Wave 1 is applied to those children aged 6-11 years old; the GP visit rate from GUI Child Cohort Wave 2 is applied to those children aged 12-14 years old.

---

27 Age cohorts: 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, and 75+.

28 We follow HIA terminology and refer to day-patient activity as an admission (43). In HIPE the same activity is referred to as a discharge.

29 In HIPE, all those with a private discharge status are asked their private health insurance status. Responses available are *Named Health Insurer/Not Stated/Other/No Insurance* (44). In 2015, 96.3 per cent of private inpatient and 91.4 per cent of private day-patient discharges reported having private health insurance. However, this may represent an underestimation of the number of private discharges with insurance if some patients fail to disclose their insurer.

30 An assumption underlying the approach is that the definition of a day patient in HIPE is comparable to the HIA day-patient definition. For instance, if HIA data also capture some private side-room or more outpatient-orientated care in their day-patient activity this would impact on our estimates somewhat.

31 Age cohorts: 15-19, 20-24, 25-29, …, 85-89, 90+.

- To estimate GP visit rates in those aged 15 years and older, the GP visit rates from Healthy Ireland Wave 1 is applied to the respective age and sex cohorts.
- To estimate practice nurse visit rates in those aged younger than 15 years, the practice nurse visit rate from GUI Infant Cohort Wave 2 is applied to those children aged 1-5 years old; the practice nurse visit rate from GUI Child Cohort Wave 2 is applied to those children aged 6-14 years old.
- To estimate practice nurse visit rates in those aged 15 years and older, the practice nurse visit rates from Healthy Ireland Wave 1 is applied to the respective age and sex cohorts.
- General practice visit rates are estimated by adding the respective GP visit and practice nurse visit rates.

3.4.4 Pharmaceuticals and pharmacy services in the community (Chapter 8)

Name	Data
PCRS Drug Reimbursement Data	• Number of prescription items in the General Medical Services Scheme (GMS), Drugs Payment Scheme (DPS), Long-Term Illness (LTI) Scheme, and High Tech Drugs (HTD) Scheme. Data are disaggregated by age cohorts[32] and sex.
QNHS 2010 Quarter 3 Health Module	• Number of pharmaceutical consultations recorded by respondents in the last 12 months prior to survey. These data are disaggregated by age cohorts[33] and sex.

Methods

- To estimate PCRS prescription items rates the number of prescription items for GMS, DPS, LTI and HTD schemes are divided by their corresponding age- and sex-specific population volumes for 2014. At the time of analysis 2015 data were not available to the research team. Consequently 2014 activity rates are assumed for 2015.
- To estimate the pharmaceutical consultation rate the (weighted) number of pharmaceutical consultations by age and sex is divided by the (weighted) number of total sample respondents in their corresponding age and sex cohort. 2010 activity rates are assumed for 2015.

3.4.5 Long-term and intermediate care services (Chapter 9)

Name	Data
HSE Social Care Division Data	• Total number of residents in NHSS-funded long-stay beds at 31 December 2015. Data disaggregated by SYOA and sex. • Total number of residents in publicly-financed long-stay beds under legacy schemes at 31 December 2015. Data disaggregated by SYOA/age cohort and sex. • Short-stay public and voluntary beds not included in the HIQA register at end 2015.
HIQA Bed Register Data	• Total number of beds and beds by category of ownership in HIQA-registered long-term care centres at 31 December 2015.
DoH Long-Stay Activity Statistics (LSAS)	• Age cohort and sex distribution of patients in limited-stay beds in 2014.
Nursing Homes Ireland 2014/2015 Survey Data	• Proportion of privately-financed residents in 2014. Proportion of short-stay residents in 2014.

Methods

- Undertaking this baseline utilisation analysis required overcoming data inadequacies by combining evidence from administrative data sources and from surveys. While numbers of beds registered with the Health

---

32 Age cohorts: <5, 5-11, 12-15, 16-24, 25-34, 35-44, 45-54, 55-64, 65-69, 70-74, and 75+.

33 Age cohorts: 18-19, 20-24,... , 80-84, 85+.

Information and Quality Authority (HIQA) and numbers of long-term residents financed by the NHSS (and, in the case of 2015 data, by some but not all legacy funding schemes)[34] are published by the Department of Health (45), the HIQA series does not include all the beds in this sector and the published numbers of residents exclude short-stay and privately-financed residents. Therefore, to estimate long-term care utilisation by SYOA and sex, a number of steps are undertaken:

HIQA-registered beds and unregistered short-stay public and voluntary bed numbers supplied by the HSE Social Care Division are summed to give total beds. HIQA data included the numbers of public, voluntary, and private nursing home beds. The apportionment of private beds between long- and short-stay is assumed to be in proportion to residents in these categories (46). The apportionment of public and voluntary beds between long- and short-stay was supplied by the HSE Social Care Division.[35]

- Numbers of residents in each category of facility are estimated as follows:

NHSS-funded long-stay residents	• Data available by SYOA and sex
Publicly-financed long-stay residents under legacy schemes	• Data available by SYOA and sex for some schemes and by age cohort and sex for others. Age-cohort data further disaggregated assuming the distribution by SYOA within the cohort of the other legacy-funded schemes.
Privately-financed long and short-stay residents	• Privately-financed proportion of private nursing home residents is estimated at 12 per cent based on 2014 Nursing Homes Ireland survey (46), assuming bed occupancy at 94 per cent (47). Estimated total residents disaggregated assuming NHSS-funded SYOA and sex distribution, on the assumption that all long-stay residents have a similar age distribution
Short-stay residents in private nursing homes excluding private payers	• Short-stay proportion of private nursing home residents estimated at 8 per cent based on 2014 Nursing Homes Ireland survey (46), assuming bed occupancy at 94 per cent (47). Estimated total residents disaggregated assuming age cohort and sex distribution of residents in limited-stay beds in 2014 (47). Age cohort data further disaggregated assuming the distribution by SYOA within the cohort of the NHSS-funded residents.
Short-stay residents in public and voluntary units	• Estimated by assuming occupancy of public and voluntary short-stay beds at 91.5 per cent (47). Estimated total residents disaggregated assuming age cohort and sex distribution of residents in limited-stay beds in 2014 (47). Age cohort data further disaggregated assuming the distribution by SYOA within the cohort of the NHSS-funded residents.

- Total residents are calculated as the sum of the resident categories above. Due to data limitations, these numbers are estimates. The aggregate estimate of residents has been validated by calculating an overall occupancy rate as total residents divided by total beds at 94 per cent, which is marginally higher than the 93.4 per cent occupancy rate in 2014 but is consistent with the reduction in NHSS waiting times during 2015 and providers' subjective experience at end-2015.[36] Baseline residential long-term care utilisation rates are estimated as numbers of residents at end-2015 by single year of age (SYOA) and sex dividing by corresponding age- and sex-specific population volumes for 2015.

---

34 Personal communication from Department of Health, 27 April 2017.

35 Despite detailed interrogation of the HIQA and HSE Social Care bed registers, there remained some discrepancies in bed counts in different categories. Any resulting possible over-statement of numbers of residents is estimated at one per cent.

36 Personal communication, NHI, April 21 2017.

3.4.6 Home care services (Chapter 10)

Name	Data
HSE Social Care Division Administrative Data	• Total number of publicly-financed (public) home help recipients, Home Care Package (HCP) recipients, and public home help hours in 2015. No disaggregation by age or sex.
TILDA Wave 3 Data	• Recipient rate of public home help, privately-purchased (private) home help, and HCPs. Disaggregation by age cohort[37] and sex. • Rate of public home help hours. Disaggregation by age cohort and sex.

Methods

Recipients

- To estimate the recipient rate across age cohorts for public home help and HCPs, the distribution of recipient rates from TILDA data is apportioned to the HSE administrative data using the following steps. Firstly, public home help recipient rates across age cohorts are estimated using TILDA data. Within each TILDA age cohort, the SYOA age distribution from the long-term care analysis is applied. Secondly, these rates are multiplied by the number of people in each cohort using 2015 population estimates. Thirdly, the SYOA age distribution of public home help from step 2 is apportioned to the overall number of public home help and HCP recipients recorded by the HSE administrative data.
- No administrative data were available for private home help recipients; the recipient rates for each age cohort are estimated using TILDA data.

Hours

- To estimate the public home help hour rate across age cohorts the distribution of hour rates from TILDA data is apportioned to the HSE administrative data using the following steps. Firstly, public home help hours across age cohorts are estimated using TILDA data by multiplying the average number of days they received home help in the previous month by 12, and multiplying this by the average number of hours they received on a given day. Within each TILDA age cohort, the SYOA age distribution from the long-term care analysis is applied. Secondly, these rates are multiplied by the number of people in each cohort using 2015 population estimates. These numbers provided an age distribution to be estimated. Thirdly, the SYOA age distribution of public home help from step 2 is apportioned to the overall number of public home help hours recorded by the HSE administrative data.
- No data were available for private home help hours. The average public home help hours from TILDA data for each age cohort are applied to private home help recipients.

[37] Age Cohorts: 65-69, 70-74, 75-79, 80-84, and 85+.

3.4.7 Public health nursing and community therapy services (Chapter 11)

Name	Data
HSE BIU Data	• Total number of attended referrals in non-acute settings, in each month, for public health nurses, physiotherapists, occupational therapists, and speech and language therapists, in 2015. Data disaggregated to the level of four age cohorts (0-4, 5-17, 18-64, and 65+) for public health nurses, occupational therapists, and speech and language therapists, and three age cohorts (0-17, 18-64, and 65+) for physiotherapists. No disaggregation by sex.
TILDA Wave 3 Data	• Recipient (accepted referral) and visit rate of public allied healthcare professionals' services. Disaggregation by age cohort[38] and sex. • Rate of public allied healthcare professionals' service visits. Disaggregation by age cohort and sex.

Methods

Referrals

- To estimate accepted referral rates, the number of accepted referrals in each 0-4, 5-17, and 18-64 age cohort from the HSE BIU data are included directly. The distribution of recipients (referrals) from TILDA data is apportioned to the official HSE BIU data for those aged 65 and older using the following steps. Firstly, referral rates across age cohorts are estimated using TILDA data. Secondly, these rates are multiplied by the number of people in each cohort using 2015 population estimates. These numbers provided an age and sex distribution to be estimated. Thirdly, the age and sex distribution from step 2 is apportioned to the number of accepted referrals in the HSE BIU data for those aged 65 and older.

Visits

- To estimate the visiting rate for public health nursing, the number of visits in the 0-4, 5-17, and 18-64 age cohorts from the HSE BIU data is included with an adjustment factor of 1.45 used for the 5-17 and 18-64 age cohorts to account for data gaps in the HSE data.39 To account for extra visits among young children, five extra visits are included (at the appropriate SYOA) for the 0-4 age cohort. The visiting rate for those aged 65 and older disaggregated by five-year age cohort is included from TILDA data due to the data gaps which exist for public health nursing visits in the BIU data.
- To estimate the visiting rate for physiotherapy the total number of physiotherapy visits from HSE administrative data is divided by the total number of referrals from the HSE administrative data to provide an estimate of the average number of visits per referral. This estimate is multiplied by the number of referrals in each 0-17, 18-64, 65+ age cohort. The distribution of visits from TILDA data is apportioned to the official HSE BIU data for those aged 65 and older using the steps outlined for public health nursing above.
- To estimate the visiting rate for occupational therapy and speech and language therapy, the visiting rate from TILDA is applied to referrals in each age cohort (0-17, 18-64, 65+). The distribution of visits from TILDA data is apportioned to the official HSE BIU data for those aged 65 and older using the steps outlined for public health nursing above.

3.5 DETAILED METHODS TO ESTIMATE UNMET NEED AND DEMAND

The next sections describe in detail the methods applied to derive unmet need and demand in the report. Due to data limitations, no unmet need or demand is estimated for private hospital services, pharmaceuticals in the community or ED services.

[38] Age Cohorts: 65-69, 70-74, 75-79, 80-84, and 85+.

[39] The visit rate in TILDA for those aged 65 and older is 45 per cent higher than that reported in HSE BIU data for public health nursing visits where data gaps exist.

3.5.1 Unmet demand for public hospital care (Chapter 5)

Name	Data
National Treatment Purchase Fund (NTPF) Waiting List Data	• The number of outpatient (OPD) waiting list cases archived at end December 2015. Disaggregated by SYOA and sex. • The number of day-patient and inpatient waiting list cases at end December 2015. Disaggregated by SYOA and sex.

Methods

For OPD, cases that have and have not been allocated an appointment date are included as waiting, which is the same methodology used by the NTPF in their published figures. The total number of cases included in the analysis is 375,435.

For IPDC, cases in categories included as waiting in the analysis are 'active' (cases awaiting a treatment date) and 'pre-admit' (cases assigned a treatment date). The NTPF do not include 'pre-admit' in their published figures. Exclusion of patients on the NTPF planned procedures list in this analysis may understate waiting volumes however.[40] After dropping a small number of cases with inadequate information the total number of cases for inclusion amounts to 106,585, 72.0 per cent classified as routine cases and 28.0 per cent as urgent.

Waiting time thresholds were identified following a review of national and international waiting time targets. Using this evidence, three threshold scenarios are applied for OPD:

- Low Volume scenario: A case has been waiting for longer than 365 days which corresponds to the HSE National Service Plan's (2016) target for 85 per cent of first time appointments to occur within 52 weeks (49);
- Medium Volume scenario: A case has been waiting longer than 180 days which corresponds to New Zealand's maximum time from referral to first specialist assessment (50);
- High Volume scenario: A case has been waiting longer than 70 days for an outpatient appointment[41] which corresponds to the Oireachtas Committee on the Future of Healthcare's *Sláintecare Report* that recommend that no one should wait longer than ten weeks for an outpatient appointment (51).

Three threshold scenarios are applied for IPDC:

- Low Volume scenario: A case has been waiting for longer than 140 days (a child aged 15 years and under) or 240 days (an adult aged 16 years and older) which correspond to the HSE National Service Plan's (2016) targets (49);[42]
- Medium Volume scenario: A case has been waiting longer than 30 days if they are classified as urgent (high priority) and more than 120 days if classified as routine. The 30 days threshold is used in Australia for cases in which the patient's health has the potential to deteriorate quickly (50), while the 120 days threshold is used for reporting by the Commonwealth Fund (52, 53);
- High Volume scenario: A case has been waiting longer than 15 days if they are classified as urgent (high priority) and more than 84 days if classified as routine. The 15 days threshold is used for high priority patients as a maximum waiting time guarantee in Norway and Portugal (50), while the 84 days corresponds to the Oireachtas Committee on the Future of Healthcare's *Sláintecare Report* that recommend that no one should wait longer than 12 weeks for an IPDC admission.

---

40 There are two categories of patients waiting for treatment on the IPDC waiting list; those on the active 'waiting list' and those on the 'planned procedures' list. The NTPF defines a planned procedure as referring to a patient who requires a recall for further stage, or a series of admissions, or a timed procedure in the future as part of their ongoing clinical care and/or treatment (48). There has, however, been criticism of this NTPF definition and further research is required to identify if some of these patients would be considered as waiting in other countries – or indeed would not be required to wait. In response to this criticism, the Minister for Health, Mr Simon Harris, has stated that the NTPF is undertaking a project to examine updated international best practice on waiting list data publication models (Dáil Debates, 9 February 2017).

41 While there is differentiation made between routine and urgent cases in the OPD waiting list data it is not included as there are a high number of missing values, and thresholds for urgent waiting times in other countries tend to be specialty- or condition-specific.

42 HSE targets do not distinguish between urgent and routine cases.

Unmet demand volumes (based on relevant thresholds) are then calculated for each single year of age and sex cohort for the IPDC analysis and for each aggregate age cohort for the OPD analysis. In the IPDC analysis unmet demand is also measured in terms of elective inpatient bed days at the end of 2015 for each age and sex cohort. Cases are converted into bed days by attributing, to each age and sex cohort, the cohort-specific average elective inpatient LOS recorded in the IPDC dataset in 2015. Rates of unmet demand for 2015 are calculated by dividing age- and sex-specific volumes of demand by age- and sex-specific population volumes in 2015.

Summary of OPD and IPDC Unmet Demand Thresholds				
	Classification of Waiting	Unmet Demand Thresholds		
		Scenario 1	Scenario 2	Scenario 3
OPD	Has appointment date Has no appointment date	Waiting > 365 days	Waiting > 180 days	Waiting > 70 days
IPDC	Active waiter Pre-admit	Children waiting > 140 days Adults waiting > 240 days	Routine cases waiting > 120 days Urgent cases waiting > 30 days	Routine cases waiting > 84 days Urgent cases waiting >15 days

3.5.2 Unmet need for GP practice services (Chapter 7)

Name	Data
QNHS 2010 Quarter 3 Health Module Data	• Rate of unmet need for a GP visit in 2010 for those aged 18 years and older. Disaggregation by age cohort[43] and sex. (See question on unmet need in Appendix 2).
Methods	
• To estimate the unmet need for GP and general practice, unmet need rates in QNHS 2010 Module 3 are applied to respective age and sex cohorts. The unmet need rates for those aged 18-19 are applied to those aged less than 18 years old.	

3.5.3 Unmet demand for long-term care services (Chapter 9)

Name	Data
Nursing Home Support Scheme (NHSS) Data	• The number of individuals on the National Placement List (NPL) of the NHSS at 31 December 2015 who have been approved for NHSS funding but who had not yet received funding. Disaggregated by SYOA.
HSE Delayed Discharge Data	• The number of patients in acute public hospitals with a delayed discharge[44] or who were clinically ready for discharge but whose discharge was delayed in 2015. Disaggregated by SYOA and sex.
Methods	
• In this analysis, unmet demand for long-stay places is estimated based on numbers waiting for NHSS funding and numbers waiting for hospital discharge to long-stay settings. To ensure consistency and to avoid double-counting, these categories of waiters are as at 31 December 2015 and exclude those waiters for NHSS funding, who are already in long-stay facilities. This is described as a measure of unmet demand not of unmet need, because for our baseline year our data scoping did not identify survey or other evidence of unmet need for residential LTC. The measure of numbers waiting for NHSS funding is numbers on the NHSS National Placement List (NPL) at end-2015. Restricting this measure	

43 Age cohorts: 18-19, 20-24, 25-29, …, 85+.

44 A delayed discharge is formally defined as 'A patient who remains in hospital after a senior doctor (consultant or registrar grade) has documented in the medical chart that the patient can be discharged.' (54)

of unmet demand to approved applicants on the NPL is a conservative measure of waiters at end-2015.[45] From seven referral categories on the list, all in long-stay units are excluded, leaving four categories of waiters who are included in this analysis and who were referred from acute services, community, mental health or 'other'. Data on these waiters by SYOA but not by sex were supplied by HSE Social Care. The male/female split of NHSS residents by SYOA is assumed to apply to these waiters.

- Numbers waiting for hospital discharge to long-stay settings is derived from the HSE BIU delayed discharge dataset at end-December 2015. This dataset includes 27 reasons why a hospital patient has been added to the delayed discharge list. Of these, 11 categories of patient are included as waiters for long-stay care. Reasons why these patients' discharges have been delayed include need for: convalescence, dementia-specific services, palliative care, high physical dependency nursing care needs and awaiting NHSS financial determination (and therefore not on the NPL). To avoid double-counting between the NHSS and delayed discharge categories of waiters, those waiters for hospital discharges who were on the NHSS National Placement List and had been approved funding are excluded. Data on these waiters were available to this analysis by SYOA and sex.
- To estimate unmet demand, these two categories of waiters are summed. The sum of these categories of waiters by SYOA and sex is then added to baseline estimates to derive an estimate of utilisation at end-2015, were this demand met.

3.5.4 Unmet demand for home care services (Chapter 10)

Name	Data
HSE Social Care Division Administrative Data	• The total number of people waiting for public home help or a HCP at the end of December 2016.
Methods	
• To estimate the unmet demand for public home and HCP, the numbers on a waiting list from HSE administrative data at the end of December 2016 are used.[46] These data are not disaggregated by age or sex. The age distribution of public home help recipients and HCP from the baseline analysis is applied to the HSE waiting numbers respectively.[47] Rates are estimated by dividing estimate numbers waiting in each age and cohort by the population in each cohort.	

3.5.5 Unmet need and demand for public health nursing and community therapy services (Chapter 11)

Name	Data
HSE BIU Data	• The total number of people waiting for a first time assessment for more than 12 weeks for physiotherapy, occupational therapy, and speech and language therapy in 2015. No disaggregation by age or sex.
TILDA Wave 3 Data	• Unmet need for public health nursing. Disaggregation by age cohort and sex.
Methods	
• To estimate the unmet demand for physiotherapy, occupational therapy, and speech and language therapy, the total number of people waiting for a first time assessment for more than 12 weeks from HSE BIU administrative data are used. The HSE administrative data include the proportion of allied healthcare professionals' referrals seen within 12 weeks as a key quality and safety score (56). These data are different for each therapy. For physiotherapy and occupational therapy, the percentage of patients not seen for assessment within 12 weeks in the last 12 weeks (October, November, and	

45 Once applicants to the scheme have been assessed as needing long-term residential care and have been approved for NHSS funding, they are placed on the NPL in order of when their application was fully approved (55). At end-2015, the wait time for funding to come through for such approved applicants was 3-4 weeks. This would have been preceded by their wait for approval, which averaged a further four weeks.

46 As these data were collected for the first time in 2016, the data became more accurate in later months, therefore data from December were included. Based upon personal correspondence with HSE Social Care Division April 2017.

47 This implicitly assumes that the 'waiters' have (proportionately) the same age and sex characteristics as recipients.

December) of 2015 is used. For speech and language therapy, the numbers waiting for an assessment for at least 12 weeks at the end of December 2015 is used. Rates are estimated by dividing estimated numbers waiting in each age and cohort by the population in each cohort. For public health nursing, as no data were available from the HSE BIU on numbers waiting, data from TILDA Wave 3 are used to estimate the proportion of those with an unmet need in those aged 65 years and older.

3.6 CONCLUSION

This chapter (and the accompanying Appendix 2) reviews in detail the data sources used in the analysis in this report, the approach taken to applying the data to the analysis, detailed methods of estimation of baseline activity for a wide range of services and methods of estimation for unmet need and demand. The chapter has also outlined the architecture of the Hippocrates cell-based macro-simulation model and the application of the evidence reviewed in Chapter 2 to develop preferred projection scenarios by sector. Chapter 4 next describes the development of the population projections applied to the modelling, while Chapters 5 to 11 present the findings by sector from the analyses and projections.

REFERENCES

1. OECD (2017). 'OECD Health Statistics 2017, Definitions, Sources and Methods'. http://stats.oecd.org.

2. OECD (2015). 'Health at a Glance 2015: Health care activities, Hospital beds' [cited 30 June 2017]; Available from: www.oecd-ilibrary.org/sites/health_glance-2015-en/06/03/index.html?itemId=/content/chapter/health_glance-2015-32-en&mimeType=text/html.

3. Bagust, A., M. Place and J.W. Posnett (1999). 'Dynamics of bed use in accommodating emergency admissions: stochastic simulation model'. *BMJ*; 319(7203):155-8.

4. McGrail, K., B. Green, M.L. Barer, R.G. Evans, C. Hertzman and C. Normand (2000). 'Age, costs of acute and long-term care and proximity to death: evidence for 1987-88 and 1994-95 in British Columbia'. *Age and Ageing*. 2000;29(3):249-53. Epub 2000/06/16.

5. Karlsson, M. and F. Klohn (2011). 'Some notes on how to catch a red herring: Ageing, time-to-death & care costs for older people in Sweden'. Darmstadt Discussion Papers in Economics.

6. Werblow, A., S. Felder and P. Zweifel (2007). 'Population ageing and health care expenditure: a school of 'red herrings'?' *Health Economics*. 2007;16(10):1109-26. Epub 2007/02/22.

7. Klijs, B., J.P. Mackenbach and A.E. Kunst. 'Future disability projections could be improved by connecting to the theory of a dynamic equilibrium'. *Journal of Clinical Epidemiology*. 2011;64(4):436-43. Epub 2010/08/31.

8. Przywara, B. (2010). 'Projecting future health care expenditure at European level: drivers, methodology and main results'. Brussels: European Commission.

9. Zweifel, P., S. Felder and M. Meiers (1999). 'Ageing of population and health care expenditure: a red herring?' *Health Economics*. 1999;8(6):485-96. Epub 1999/11/02.

10. Yang, Z., E.C. Norton and S.C. Stearns (2002). 'Longevity and health care expenditures: the real reasons older people spend more'. *The Journals of Gerontology Series B, Psychological Sciences and Social Sciences*. 2003;58(1):S2-10. Epub 2002/12/24.

11. Lubitz, J., L. Cai, E. Kramarow and H. Lentzner (2003). 'Health, life expectancy, and health care spending among the elderly'. *The New England Journal of Medicine*. 2003;349(11):1048-55. Epub 2003/09/12.

12. Polder, J.J., J.J. Barendregt and H. van Oers (2006). 'Health care costs in the last year of life-the Dutch experience'. *Social Science & Medicine*. 2006;63(7):1720-31. Epub 2006/06/20.

13. Seshamani, M. and A. Gray (2004). 'Ageing and health-care expenditure: the red herring argument revisited'. *Health Economics*. 2004;13(4):303-14. Epub 2004/04/07.

14. de Meijer, C., M. Koopmanschap, T.B. d'Uva and E. Van Doorslaer (2011). 'Determinants of long-term care spending: Age, time to death or disability?' *Journal of Health Economics*. 2011;30(2):425-38.

15. Wong, A., P.H. van Baal, H.C. Boshuizen and J.J. Polder (2011). 'Exploring the influence of proximity to death on disease-specific hospital expenditures: a carpaccio of red herrings'. *Health Economics*. 2011;20(4):379-400. Epub 2010/03/17.

16. Walter, S., H. Beltran-Sanchez, E. Regidor, C. Gomez-Martin, J.L. Del-Barrio, A. Gil-de-Miguel et al. (2016). 'No evidence of morbidity compression in Spain: a time series study based on national hospitalization records'. *International Journal of Public Health*. 2016;61(7):729-38. Epub 2016/05/29.

17. Moore P.V., K. Bennett and C. Normand (2017). 'Counting the time lived, the time left or illness? Age, proximity to death, morbidity and prescribing expenditures'. *Social Science & Medicine*. 2017;184:1-14.

18. Jagger, C., R.J. Matthews, F.E. Matthews, N.A. Spiers, J. Nickson, E.S. Paykel et al. (2007). 'Cohort differences in disease and disability in the young-old: findings from the MRC Cognitive Function and Ageing Study (MRC-CFAS)'. *BMC Public Health*. 2007;7(1):156.

19. Parker, M.G., K. Ahacic and M. Thorslund (2005). 'Health changes among Swedish oldest old: prevalence rates from 1992 and 2002 show increasing health problems'. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences.* 2005;60.

20. Rosen, M. and B. Haglund (2005). 'From healthy survivors to sick survivors — implications for the twenty-first century'. *Scandinavian Journal of Social Medicine.* 2005;33(2):151-5.

21. Crimmins, E.M. and H. Beltrán (2011). 'Mortality and Morbidity Trends: Is There Compression of Morbidity?' *Journal of Gerontology: Social Sciences.* 2011;66B(1):75-86.

22. Freedman, V.A. and L.G. Martin (2000). 'Contribution of chronic conditions to aggregate changes in old-age functioning'. *American Journal of Public Health.* 2000;90(11):1755-60. Epub 2000/11/15.

23. Puts, M.T., D.J. Deeg, N. Hoeymans, W.J. Nusselder and F.G. Schellevis (2008). 'Changes in the prevalence of chronic disease and the association with disability in the older Dutch population between 1987 and 2001'. *Age and Ageing*. 2008;37(2):187-93. Epub 2008/02/06.

24. Christensen, K., G. Doblhammer, R. Rau and J.W. Vaupel (2009). 'Ageing populations: the challenges ahead'. *Lancet*. 2009;374(9696):1196-208. Epub 2009/10/06.

25. Parker, M.G. and M. Thorslund (2007). 'Health trends in the elderly population: getting better and getting worse'. *The Gerontologist.* 2007;47(2):150-8. Epub 2007/04/19.

26. Chatterji, S., J. Byles, D. Cutler, T. Seeman and E. Verdes (2015). 'Health, functioning, and disability in older adults-present status and future implications'. *Lancet.* 2015;385(9967):563-75. Epub 2014/12/04.

27. Freedman, V.A., J.G. Martin and R.F. Schoeni (2002). 'Recent trends in disability and functioning among older adults in the United States: a systematic review'. *Jama*. 2002;288(24):3137-46. Epub 2002/12/27.

28. Cutler, D.M., K. Ghosh and M.B. Landrum (2013). *Evidence for Significant Compression of Morbidity in the Elderly US Population*. National Bureau of Economic Research.

29. Schoeni, R.F., J. Liang, J. Bennett, H. Sugisawa, T. Fukaya and E. Kobayashi (2006). 'Trends in old-age functioning and disability in Japan, 1993-2002'. *Population Studies* (Camb). 2006;60.

30. Lafortune, G. and G. Balestat (2007). 'Trends in Severe Disability among Elderly People: Assessing the Evidence in 12 OECD Countries and the Future Implications'. OECD Health Working Papers. Paris: OECD; 2007.

31. Crimmins, E.M., M.D. Hayward, A. Hagedorn, Y. Saito and N. Brouard (2009). 'Change in disability-free life expectancy for Americans 70-years-old and older'. *Demography*. 2009;46(3):627-46. Epub 2009/09/24.

32. Layte, R., M. Barry, K. Bennett, A. Brick, E. Morgenroth, C. Normand, et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland*. ESRI. Dublin.

33. Wren M., C. Normand, D. O'Reilly, S.M. Cruise, S. Connolly, C. Murphy (2012). *Towards the Development of a Predictive Model of Long-Term Care Demand For Northern Ireland and the Republic of Ireland*. Dublin: Centre for Health Policy and Management, Trinity College Dublin.

34. Matthews, F.E., A. Arthur, L.E. Barnes, J. Bond, C. Jagger, L. Robinson et al. (2013). 'A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the Cognitive Function and Ageing Study I and II'. *Lancet.* 2013;382(9902):1405-12. Epub 2013/07/23.

35. Langa, K.M., E.B. Larson, J.H. Karlawish, D.M. Cutler, M.U. Kabeto, S.Y. Kim, et al. (2008). 'Trends in the prevalence and mortality of cognitive impairment in the United States: is there evidence of a compression of cognitive morbidity?' *Alzheimer's & Dementia: the Journal of the Alzheimer's Association*. 2008;4(2):134-44. Epub 2008/07/18.

36. Murphy C. (2015). 'Demographic and health profile of older adults utilising public health nursing services in Ireland: Findings from The Irish Longitudinal Study on Ageing (TILDA)'. Trinity College, Dublin 2.

37. Blanco-Moreno, A., R.M. Urbanos-Garrido and I.J. Thuissard-Vasallo (2013). 'Public healthcare expenditure in Spain: measuring the impact of driving factors'. *Health Policy*. 2013;111(1):34-42. Epub 2013/04/20.

38. European Commission (2009). *The 2009 Ageing Report: Underlying Assumptions and Projection Methodologies.* Brussels: European Commission.

39. European Commission (2012). *The 2012 Ageing Report: Underlying Assumptions and Projection Methodologies.* Brussels European Commission.

40. European Commission (2014). *The 2015 Ageing Report: Underlying Assumptions and Projection Methodologies.* Brussels: European Commission.

41. Ha, N.T., D. Hendrie and R. Moorin (2014). 'Impact of population ageing on the costs of hospitalisations for cardiovascular disease: a population-based data linkage study'. *BMC Health Services Research*. 2014;14:554. Epub 2014/11/14.

42. Healthcare Pricing Office (2015). *Activity in Acute Public Hospitals in Ireland Annual Report, 2014.* Dublin: Health Service Executive.

43. Health Insurance Authority (2017). *Guide to Risk Equalisation Scheme 2017*. Dublin: Health Insurance Authority.

44. Healthcare Pricing Office (2015). *Hospital Inpatient Enquiry (HIPE): Data Dictionary 2015* Version 7.0. Dublin.

45. Department of Health (2016). *Health In Ireland: Key Trends 2016*. Dublin: Department of Health.

46. Nursing Homes Ireland (undertaken by BDO) (2016). *Annual Private Nursing Home Survey 2014/2015*. Nursing Homes Ireland.

47. Department of Health (2017). 'Long-Stay Activity Statistics 2014'. Supplied by Department of Health.

48. National Treatment Purchase Fund (2017). 'National Inpatient, Day Case, Planned Procedure (IDPP) Waiting List Management Protocol'. Dublin: National Treatment Purchase Fund.

49. Health Service Executive (2015). *National Service Plan 2016.* Dublin: Health Service Executive.

50. Siciliani, L., M. Borowitz and V. Moran (editors) (2013). *Waiting Time Policies in the Health Sector What Works?*: OECD Publishing.

51. Houses of the Oireachtas Committee on the Future of Healthcare (2017). *Sláintecare Report*. Dublin: Houses of the Oireachtas.

52. Schoen, C., R. Osborn, D. Squires, M.M. Doty, R. Pierson and S. Applebaum (2010). 'How health insurance design affects access to care and costs, by income, in eleven countries'. *Health Affairs* (Millwood). 2010;29(12):2323-34. Epub 2010/11/23.

53. OECD (2015). 'OECD Health Statistics 2015: Definitions, Sources and Methods 2015'. Available from: http://stats.oecd.org/wbos/fileview2.aspx?IDFile=839106ea-625f-4ff4-87a8-1201a8647af5.

54. Health Service Executive (2016). *Health Service Executive Delayed Discharges National Report: 26 April 2016*. Health Service Executive.

55. Department of Health (2015). *Review of the Nursing Homes Support Scheme, A Fair Deal.* Department of Health.

56. Health Service Executive (2016). *Health Service Performance Report: December Perfomance Report.*

CHAPTER 4

Demographic projections

4.1 INTRODUCTION

A key building block for the Hippocrates model is demographic projections of the size and structure of the population. The aim of this chapter is to develop demographic projections by sex and by single year of age (SYOA) for each year up to 2030, in a flexible framework, where assumptions can be altered to examine alternative scenarios.[48]

Ireland's demographic structure is somewhat unusual in comparison to other Western European countries. Following the post-Second World War baby boom, the birth rate remained uniquely high in Ireland until the early 1980s, while it fell much earlier in other European countries. The high birth rate until the 1980s means that there is now a large cohort of people of working age. Today the 30 to 39 age cohort is much larger than any other cohort. In addition, the high level of emigration in Ireland up to the 1960s means that many of the people born in Ireland who are now in their seventies and eighties emigrated, reducing the numbers in the older cohorts of the population, thereby reducing the old age dependency ratio.[49] Such a favourable position ameliorates the pressures on pension provision and health and social care services arising from ageing populations that have arisen in many other EU and OECD countries.

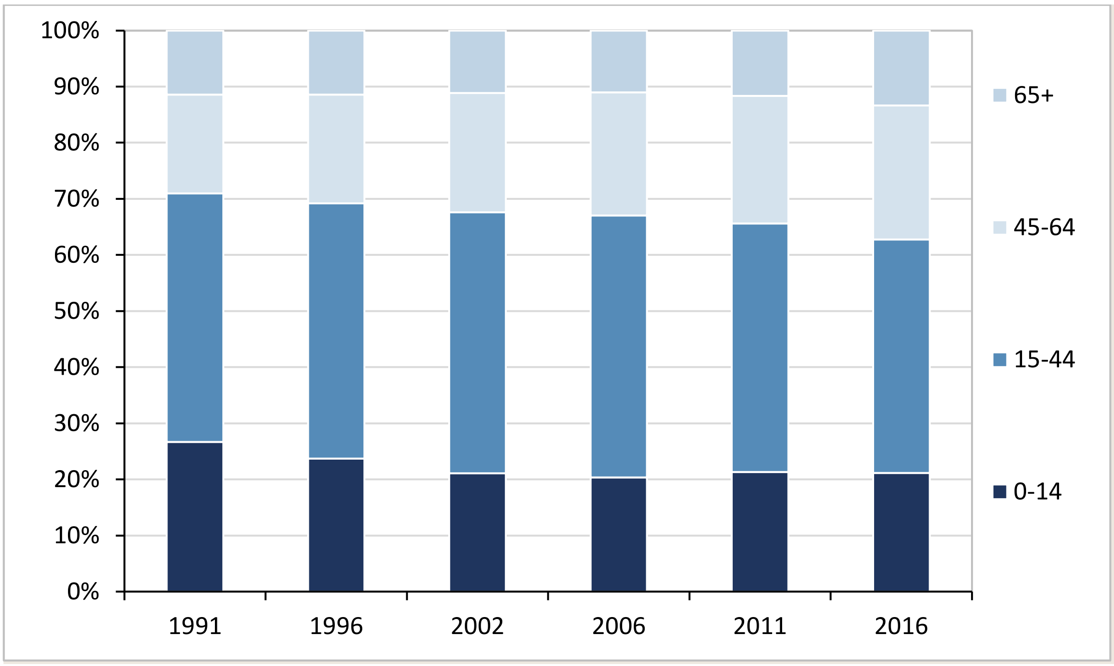
Furthermore, Ireland has experienced and continues to experience rapid population growth which, again, is somewhat unusual in a European context. Ireland's population increased by 31 per cent (or 1.136 million) in the twenty years 1996 to 2016. Over the same time period, although some other countries such as Luxembourg and Cyprus experienced rapid population growth, the average population growth in the EU28 was 6 per cent. Although the current age profile in Ireland appears favourable in terms of prevailing dependency ratios, this masks growth in the absolute numbers of older people within the context of rapid overall population growth. It is also important to note that even in a period when Ireland's age profile looked relatively young, the absolute numbers in older age cohorts were growing and placing pressure on services. Between 1996 and 2016, the population aged 65 and over grew by 54 per cent (or just under

48 While the CSO produces population projections, they are only updated every five years. As such, they do not take account of the most recent data and also do not permit user-defined alternative assumptions on fertility, mortality and migration.

49 Dependency ratios show the proportion of the old and young population to the population of working age. The old age dependency ratio is the proportion of the population over the age of 65 relative to the population aged 15 to 64.

224,000). Figure 4.1 shows the age structure of the population over time for Census years. Even in the context of rapid population growth, the ageing of the population is apparent with the proportions of the population in the 0-14 and 15-44 age groups falling over time and the proportions in the 45-64 and 65+ age groups rising over time.

FIGURE 4.1 AGE STRUCTURE OF THE POPULATION, 1991 TO 2016



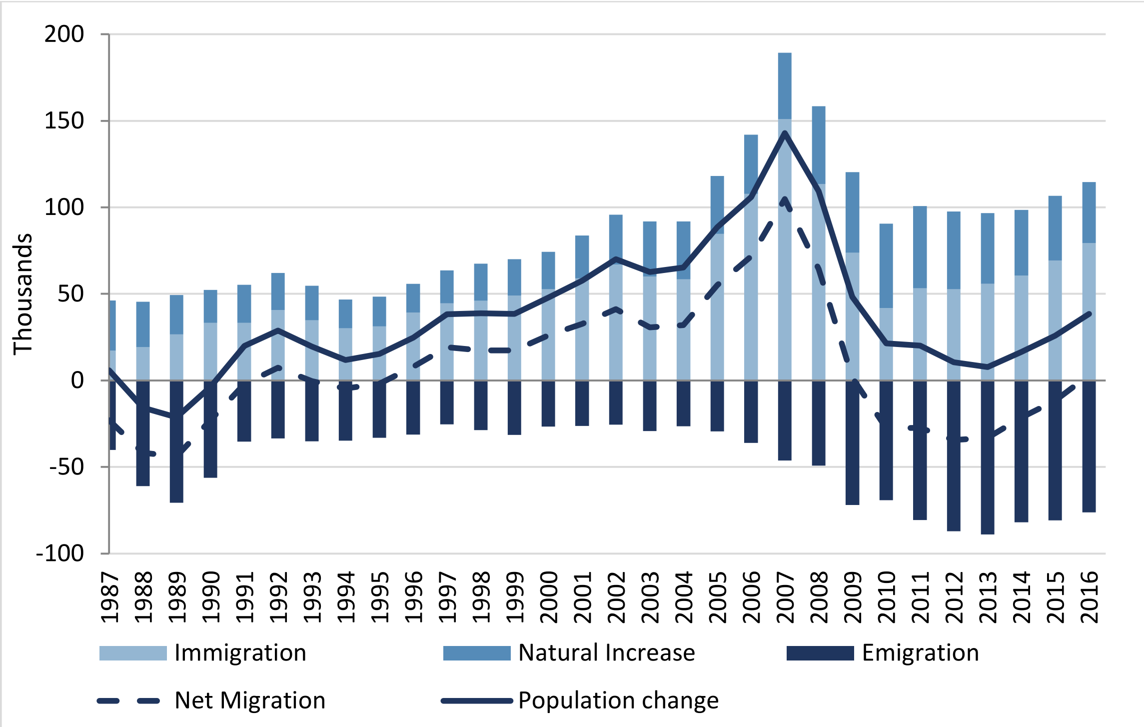
Source: Central Statistics Office, Census data, various years.

The demographic profile has significant ramifications for many aspects of the economy both now and in the future. It is thus pertinent for policymakers to incorporate such effects into medium- and long-term plans. Changes in the demographic profile can have important effects on the potential growth rate of the economy, mainly through their effect on labour supply and dependency ratios. Population ageing also has strong implications for many areas of government expenditure, especially social welfare and health spending (1). The somewhat young age structure of the population looks set to diminish in the long term, as the now relatively young population ages.

Over the time period considered in this report (up to 2030), the population structure is likely to remain broadly favourable (i.e. with a relatively low dependency rate). However, population ageing becomes more apparent towards the end of the projection horizon.

The cohort component methodology is used to generate the population projections in this chapter. This method projects the population by gender and SYOA for each year according to the components of population change: fertility, mortality and net migration. Figure 4.2 shows the contribution of the components of population change to overall population change in Ireland since 1987. The graph shows that migration has long played a dominant role in driving population change in Ireland. The figure also reveals that migration flows are quite volatile which has a consequent knock-on effect on population changes. For example, for 2016, the CSO's preliminary estimate of the population is 84,000 below that of the Census figure for 2016 and this discrepancy is likely to be driven by migration.[50]

FIGURE 4.2 COMPONENTS OF POPULATION CHANGE, 1987 TO 2016

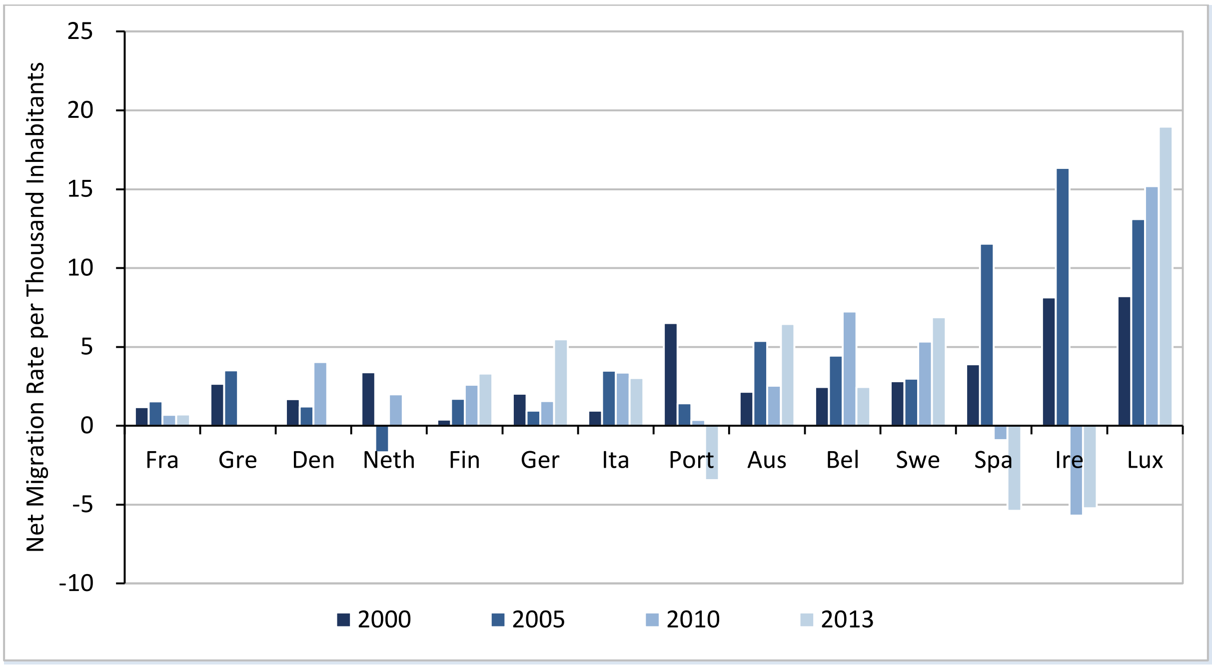


Source: Central Statistics Office, Population and Migration Estimates April 2016.

Migration flows are particularly sensitive to economic conditions, both domestically and in the source countries for immigrants or the destination countries for emigrants. The issue of the volatility of these flows is more pertinent for Ireland than for many other European countries. Figure 4.3 shows the net migration rate per 1,000 population for a range of European countries for various years. The graph reveals that not only does Ireland have one of the highest net migration rates but it also has one of the most volatile migration rates and, as such, migration is the most difficult component of population change to predict.

50 The preliminary figure for 2016 is based on the usual resident concept rather than the de facto definition of population (i.e. all persons present in the State on Census night) that is used in the Census (2). However, the difference in definitions is very unlikely to be the main cause of the discrepancy between the two numbers. For example, a similar discrepancy emerged following the 2011 Census that resulted in the population estimate for that year being revised up by 96,400 and most of this revision was attributable to migration (3).

FIGURE 4.3 NET MIGRATION RATE (PER 1,000 POPULATION) IN VARIOUS WESTERN EUROPEAN COUNTRIES



Source: OECD Population and Vital Statistics
Notes: Data for 2010 were not reported for Greece and data for 2013 were not reported for Greece, Denmark and the Netherlands

Given the uncertainty inherent in any projection exercise, this chapter examines three scenarios. The main Central scenario considers a continued improvement in mortality rates that slowly converge to a standard rate of improvement, unchanged fertility rates (from 2015) and a moderate migration projection that is determined by the ESRI's macroeconomic model. A High population growth scenario and Low population growth scenario are also considered. These variant projections are intended to provide an indication of uncertainty and sensitivity to alternative assumptions. The High population growth scenario assumes a combination of high fertility, high life expectancy improvements and high net migration and the Low population growth scenario assumes a combination of low fertility, low life expectancy improvements and low net migration.

The remainder of this chapter is structured as follows: Section 4.2 provides an overview of the methodology used in generating the demographic projections; Section 4.3 outlines the mortality assumptions for each of the scenarios; Section 4.4 details the link between migration and the macro-economy and describes how the projections for migration are determined; Section 4.5 discusses past trends and future prospects for fertility; Section 4.6 brings all the assumptions together to examine the size and structure of the population in the three scenarios and Section 4.7 concludes and considers some of the implications of the projections.

4.2 METHODOLOGY

This section describes the cohort-component methodology that is used to generate the population projections by gender and single year of age on an annual basis to 2030 under the three scenarios. This is a commonly employed methodology by national statistical offices (4-6) and international organisations (7). In this method, the components of population change (fertility, mortality, and net migration) are projected separately for each birth cohort (persons born in a given year) on the basis of past trends. The base population is progressed forward each year by using projected mortality rates and net international migration. Each year, a new birth cohort is added to the population by applying the projected fertility rates to the female population. One of the advantages of this method is that it projects the structure of the projected population (by gender and SYOA) and not just the total size. The projected structure of the population is used as an input for the Hippocrates model.[51]

4.2.1 Overview of Cohort-Component method

The method used to produce the projections is illustrated in Figure 4.4. The projections begin with an estimated base population for 2015 which is disaggregated by age (under 1 to 99 and 100+) and gender.[52,53] For each year, from 2015 to 2030, the population is advanced one year of age using projected age and gender-specific mortality rates for that year. This creates a surviving population for each year that is then adjusted for the level of net migration for that year. The flows of inward and outward migration are distributed by gender and SYOA on the basis of rates estimated for the intercensal period 2006 to 2011.[54] A new birth cohort is added to the population in each year by taking the projected female population and applying the fertility rate applicable to their age group during that year. The total number of births in a year is assumed to be divided between the sexes in the proportions of 51.3 per cent males and 48.7 per cent females in line with recent experience.[55] Births are then adjusted for infant mortality and migration to form the population under one year of age and when added to the survived population adjusted for migration this yields the total population for that year.

51 As mentioned in Section 2.3 future healthcare demand is driven by a range of factors including the size of the population and its structure together with health status. There are a range of other factors not directly considered in the model such as income and wealth and consumer behaviour that may also influence healthcare demand.

52 The baseline population data for 2015 are estimated using 2011 and 2016 Census disaggregated population data and estimates from the 2016 Census of net migration over the five years to 2016. This approach is adopted rather than using estimates for 2015 from the CSO's Population and Migration Estimates (2). The recently released 2016 Census data imply that the CSO's estimates of the population for the intercensal years, including 2015, will be revised upwards in the future. Also, the projections in this chapter are on a de facto basis rather than a usual residence concept of the population.

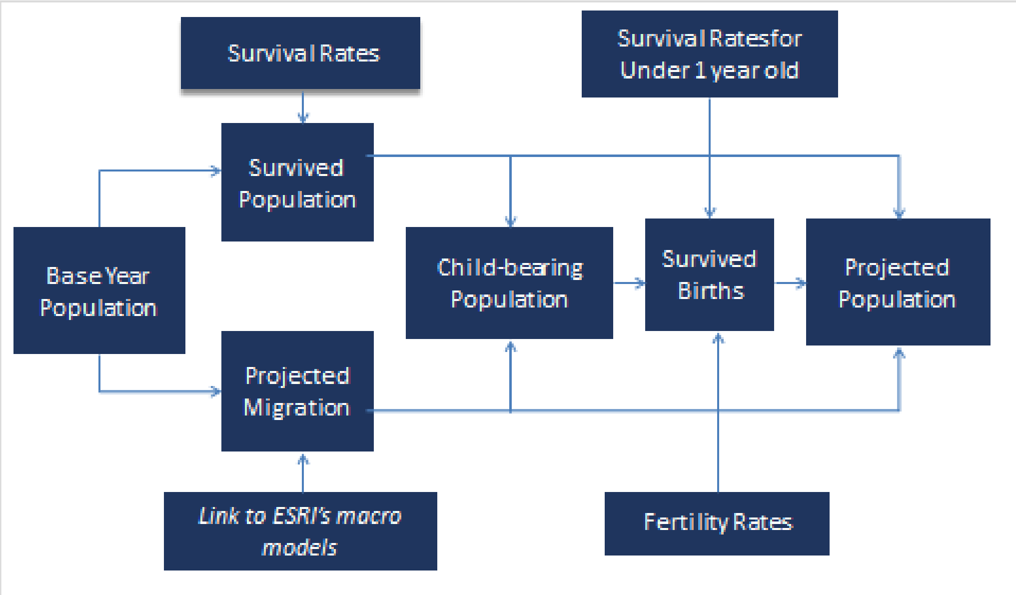
53 In the Hippocrates model itself, age is disaggregated by single year from those aged less than one year to 98 with those aged 99 plus in a separate category. There is slightly more detail in the demographic model to allow for alternative assumptions and methods to be applied to each year of age.

54 These weights were provided by the CSO.

55 This is the average proportion of male and female births over the 10-year period up to 2015.

These projections are driven by assumptions about each of the components of population change and the detailed assumptions governing mortality, migration and fertility are described in sections 4.3 to 4.5 of this chapter.

FIGURE 4.4 OVERVIEW OF COHORT-COMPONENT METHOD



Source: Authors' illustration of modelling method.

4.3 MORTALITY

4.3.1 Future prospects for life expectancy

On the basis of the trends in life expectancy already described in Chapter 2 Section 2.6.2, it is likely that there will be continued improvements over the projection period. However, there is considerable uncertainty surrounding the degree of improvement that might reasonably be expected.[56]

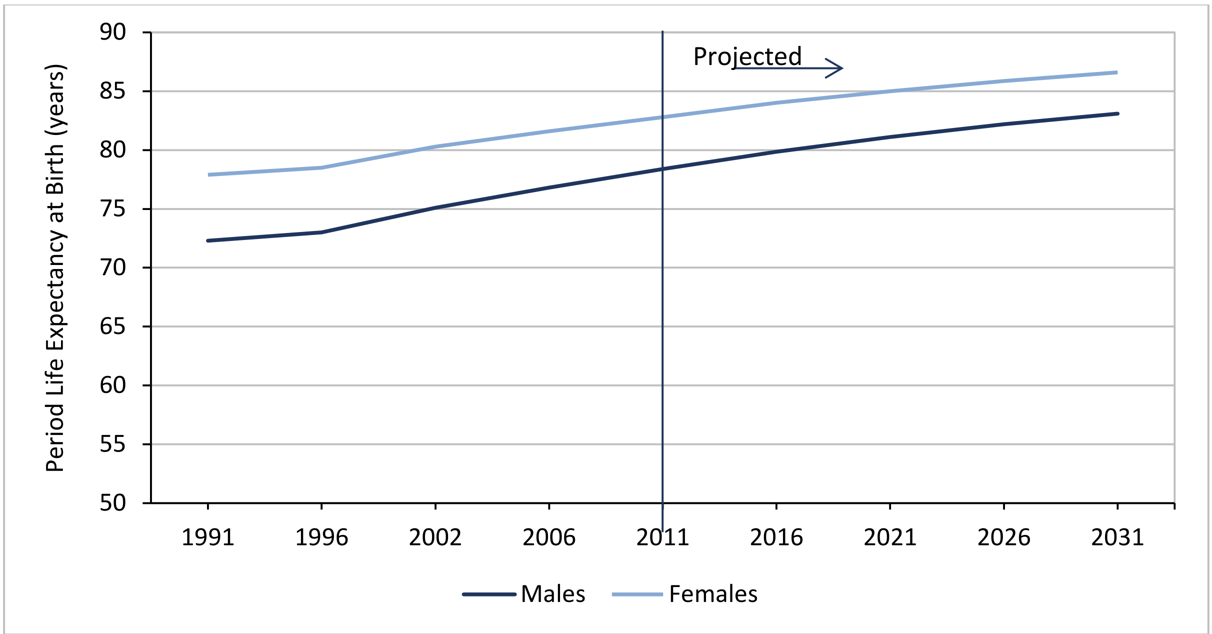
4.3.1.1 Central assumptions

For our Central scenario, we follow the assumptions of the CSO (4).[57] A 'targeting' approach is adopted, whereby separate short and long-term mortality trends are estimated and then interpolated over some appropriate time period.[58] The CSO estimated the average rate of mortality decline by age and gender and it averages approximately 3 per cent per annum for males and 2.5 per cent per

56 There has been a tendency in official projections to underestimate mortality improvements (8, 9).
57 Assumptions on mortality rates (by age and gender and year) are used in developing the population projections. These assumptions are also used to calculate summary measures of the mortality level of a population, such as life expectancy at birth.
58 For a complete discussion of the methodology see Whelan (8).

annum for females across most age groups.[59] These short-term rates of improvement are assumed to decline to a long-term rate of 1.5 per cent per annum by 2030 for both males and females for all ages up to 90. For each year the mortality decline is calculated by linear interpolation.[60] It was assumed that there would be no mortality improvements at age 100 years and upwards. For those aged between 90 and 100, the annual rate of improvement was estimated by linear interpolation between the assumed rate of improvement at 90 years and 100 years.[61] The implications of these assumptions for life expectancy at birth and at age 65 in the Central scenario are shown in Figures 4.5 and 4.6 respectively. Figure 4.5 shows a projected increase in life expectancy at birth for males from 78.4 in 2011 to 82.9 years in 2030 and for females from 82.9 in 2011 to 86.5 years in 2030. The assumptions adopted imply a narrowing of the gender gap in life expectancy at birth from approximately 4.5 years in 2011 to around 3.6 years by 2030. Figure 4.6 reveals that projected life expectancy at age 65 will improve for males from 17.7 in 2011 to 21.2 years in 2030 and for females from 20.6 in 2011 to 23.8 years in 2030 again showing a slight narrowing in the gender gap of around 0.3 years.

FIGURE 4.5 PERIOD LIFE EXPECTANCY AT BIRTH ACCORDING TO MORTALITY RATES EXPERIENCED IN GIVEN YEARS



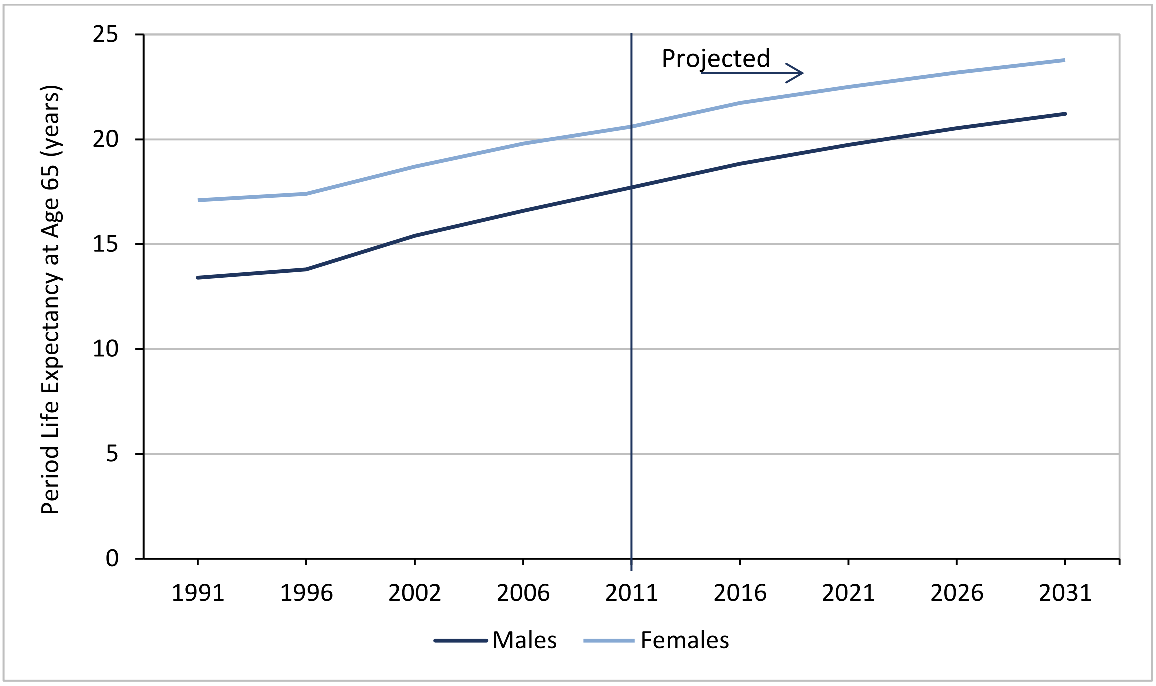
Source: Central Statistics Office and ESRI Projections.

[59] This was estimated over the period 2006 to 2010.

[60] Interpolation is a way to determine the value of an unknown data point based on the values of known surrounding data points. Linear interpolation assumes a straight line relationship between the known points.

[61] This approach implicitly assumes that migrants will have comparable mortality rates to those of the same age in the population. There is very little evidence on the health status of migrants in Ireland and whether or not there is a 'healthy immigrant effect' whereby immigrants are healthier than the native-born population. Nolan (10) finds only limited evidence in favour of a 'healthy immigrant effect'.

FIGURE 4.6 PERIOD LIFE EXPECTANCY AT AGE 65 ACCORDING TO MORTALITY RATES EXPERIENCED IN GIVEN YEARS



Source: Central Statistics Office and ESRI Projections

4.3.1.2 Sensitivity analysis: high and low life expectancy variants

The CSO do not consider alternative scenarios for life expectancy in their demographic projections (4). However, it is prudent to examine alternative assumptions for mortality. For example, innovations in diagnoses and treatment of serious medical conditions could help improve mortality rates (see, for example, Layte et al. (11)), while increases in substance abuse etc. can have the opposite effect.

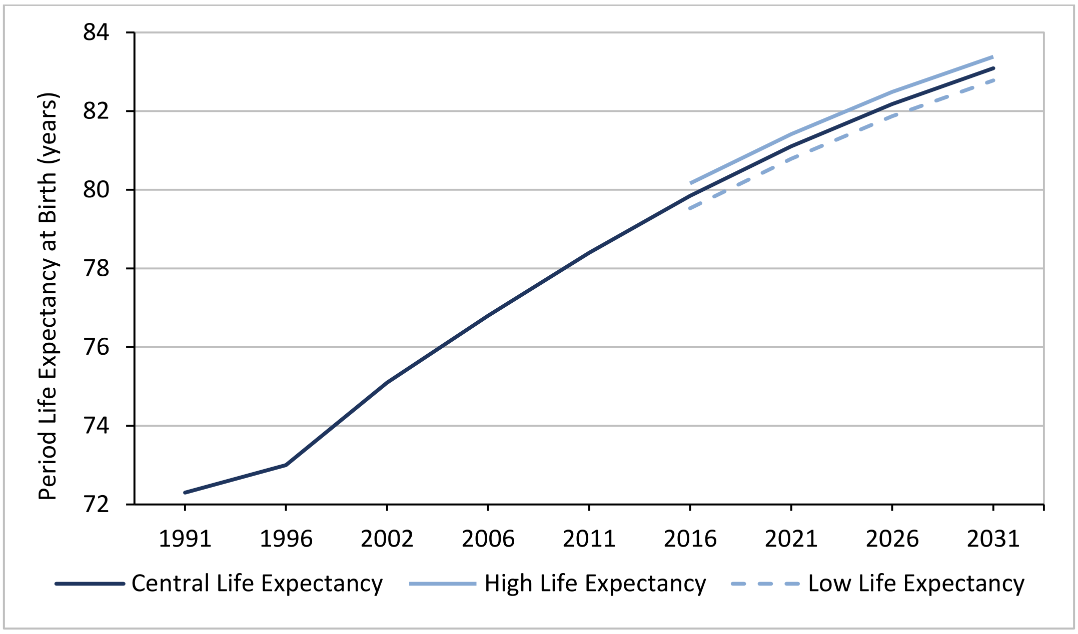
To generate alternative assumptions for mortality, we follow the approach of the UK's Office for National Statistics which is to alter the target rates of mortality change (12). In the High population growth scenario we add an additional three percentage points to both the short- and long-term rates of mortality improvements for both males and females for all ages up to 90. In the Low population growth scenario an additional three percentage points is subtracted from both the short- and long-term rates of mortality improvements for both males and females for all ages up to 90.[62] These assumptions were chosen to illustrate the impact of different mortality rates on life expectancy and ultimately the population. They are similar to the assumptions made in (12). Similar to the Central scenario, in both the High population and Low population growth scenarios for each year the mortality decline is calculated by linear interpolation.

62 This assumption translates into a continued improvement in life expectancy over the projection horizon but at a lower rate than in the other scenarios.

It is assumed that there would be no mortality improvements at age 100 years and upwards. For those aged between 90 and 100, the annual rate of improvement is estimated by linear interpolation between the assumed rate of improvement at 90 years and 100 years.

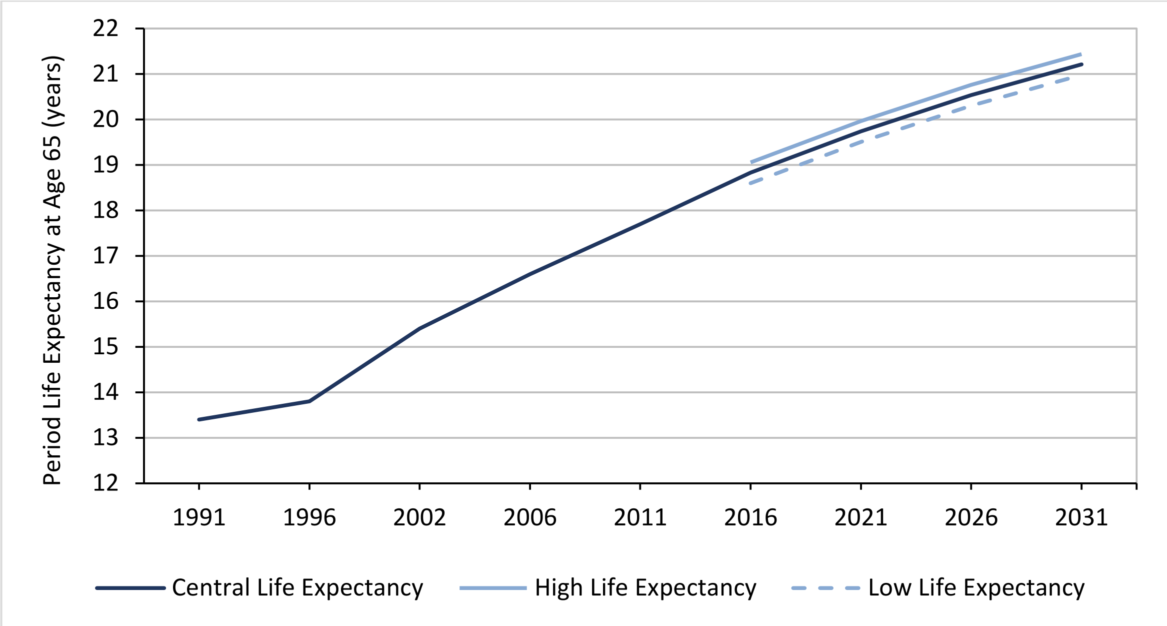
The implications of these alternative assumptions on life expectancy for males at birth and at age 65 are shown in Figures 4.7 and 4.8 while Figures 4.9 and 4.10 show the implications for female life expectancy. The figures show that, compared to the Central scenario, there is an increase in male life expectancy of approximately 0.3 years at birth and approximately 0.22 years at age 65 by 2030 in the High population growth scenario, and a symmetric dis-improvement in life expectancy for males at the two ages in the Low population growth scenario. The comparable increases in female life expectancy in the High population growth scenario are approximately 0.26 years at birth and 0.2 years at age 65 by 2030 with a symmetric reduction in the Low population growth scenario.

FIGURE 4.7 MALES: PERIOD LIFE EXPECTANCY AT BIRTH IN CENTRAL, HIGH AND LOW LIFE EXPECTANCY VARIANTS



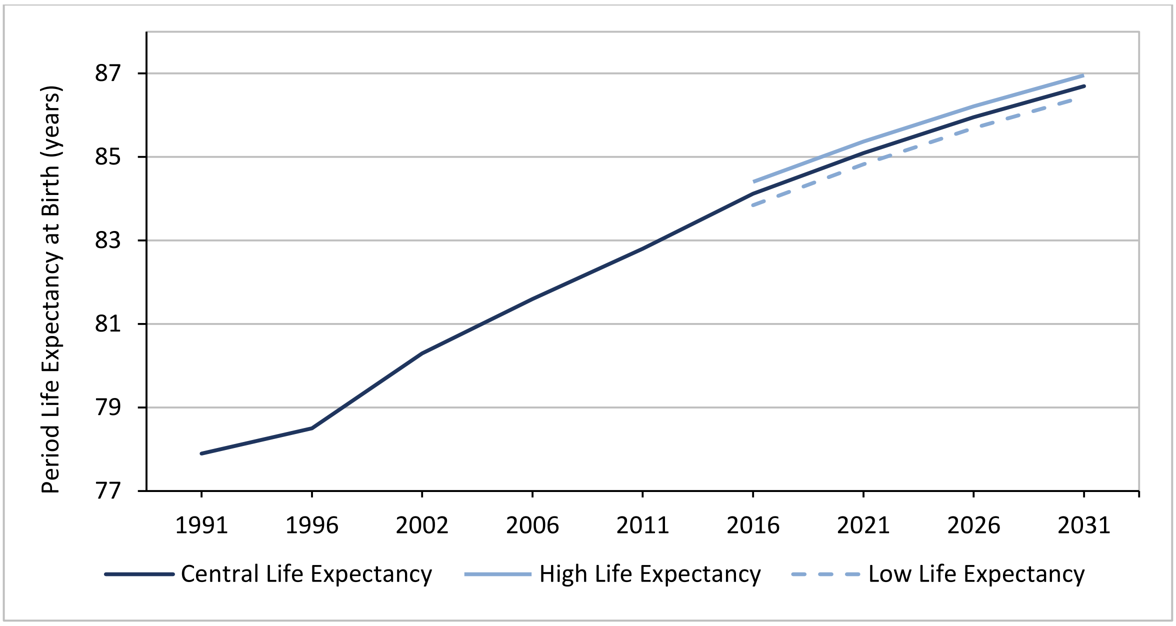
Sources: Central Statistics Office and ESRI Projections.

FIGURE 4.8 MALES: PERIOD LIFE EXPECTANCY AT AGE 65 IN CENTRAL, HIGH AND LOW LIFE EXPECTANCY VARIANTS



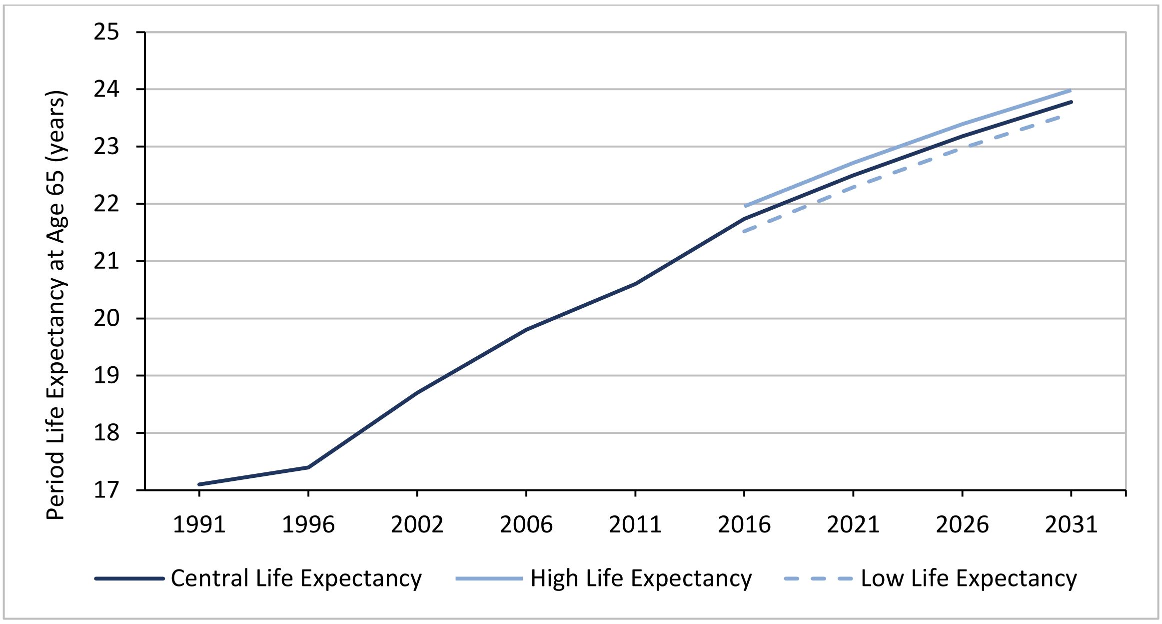
Sources: Central Statistics Office and ESRI Projections.

FIGURE 4.9 FEMALES: PERIOD LIFE EXPECTANCY AT BIRTH IN CENTRAL, HIGH AND LOW LIFE EXPECTANCY VARIANTS



Sources: Central Statistics Office and ESRI Projections.

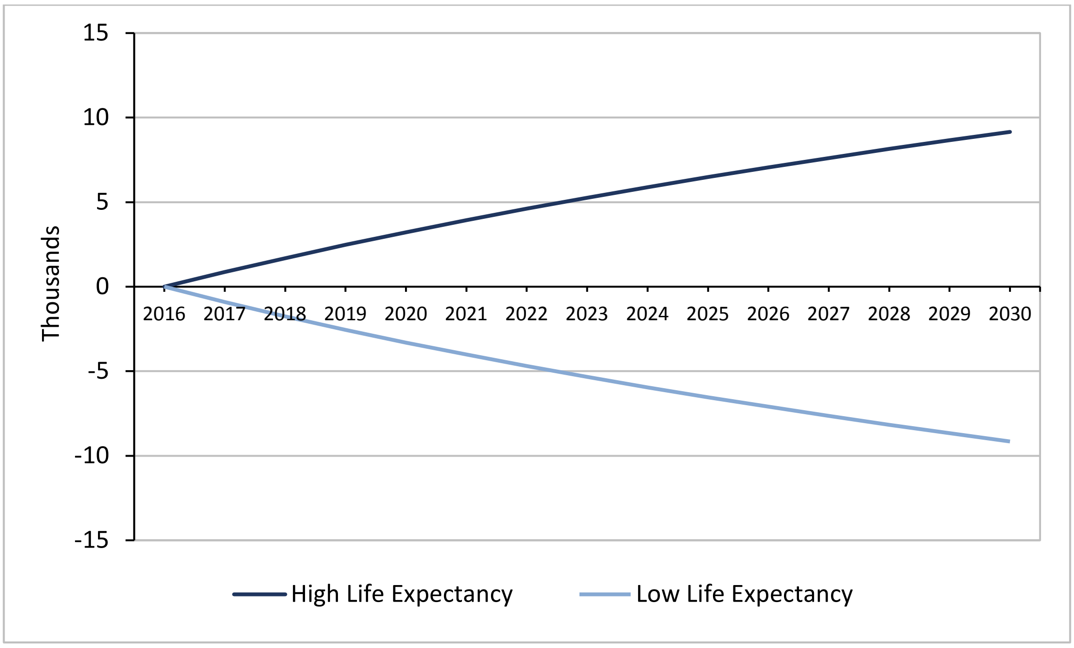
FIGURE 4.10 FEMALES: PERIOD LIFE EXPECTANCY AT AGE 65 IN CENTRAL, HIGH AND LOW LIFE EXPECTANCY VARIANTS



Sources: Central Statistics Office and ESRI Projections.

Figure 4.11 shows the impact of the alternative assumptions on mortality on the total size of the population. It takes the population underlying the Central scenario as a base and shows the change in the total population using the High and Low population life expectancy assumptions. To isolate the impact of the alternative mortality assumptions the remaining assumptions on fertility and migration (which will be discussed in the next sections) are unchanged from the Central scenario. Overall, the impact of the alternative mortality assumptions on the size of the population is quite small; the high (low) life expectancy variant increases (decreases) the total population by around 9,000 by 2030.

FIGURE 4.11 IMPACT OF HIGH AND LOW LIFE EXPECTANCY VARIANTS ON CENTRAL POPULATION, 2016 TO 2030



Source: ESRI Projections.

4.4 MIGRATION

4.4.1 Migration and the macroeconomy

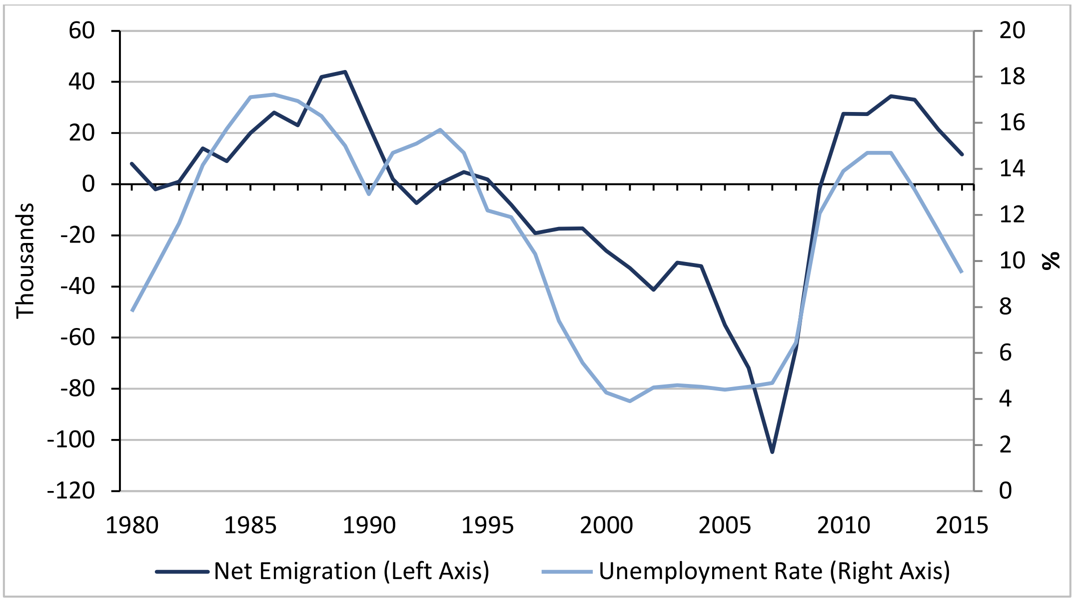
Irish migration flows in the post-Second World War years have been significant both in terms of their absolute size and in their variability, with some periods characterised by net emigration and others characterised by net immigration. Research shows that these flows are sensitive to economic circumstances not only in Ireland but also in the main destinations where migrants traditionally go (13).

In the 1980s, high unemployment rates in Ireland, when compared to other labour markets to which Irish people had access, encouraged many people to emigrate. The bulk of those who emigrated were younger and better educated than the typical emigrants of the past, leading to fears of a 'brain drain'. In the first half of the 1990s net migration was flat as employment prospects abroad deteriorated relative to Ireland. In the second half of the 1990s, strong economic growth and a tighter labour market encouraged inflows into the country about half of whom were non-Irish nationals. The majority of immigrants, Irish or non-Irish, over this period were highly skilled (13). With the enlargement of the EU in 2004 creating a much larger pool of labour, there was a further step-up in net immigration into Ireland, with the bulk of the net inflow being non-Irish citizens rather than returning emigrants (14).

The Great Recession led to a reversal of net immigration starting in 2010 with net emigration over the 2010 to 2014 period estimated at around 30,000 per annum. Following the recovery in the Irish economy from around 2013, net emigration figures began to reduce and the CSO estimated a small amount of net immigration in 2016 (2). However, these data are expected to be revised in the future. The 2016 Census reveals that over the five years to 2016, total net emigration is estimated at 22,500. Migration flows are closely linked to the economic prospects of the country. Figure 4.12 shows net emigration and one indicator of the state of the economy, namely the unemployment rate, over time. The graph shows an element of a common cycle between the two variables with outflows tending to increase when the unemployment rate is high and vice versa.

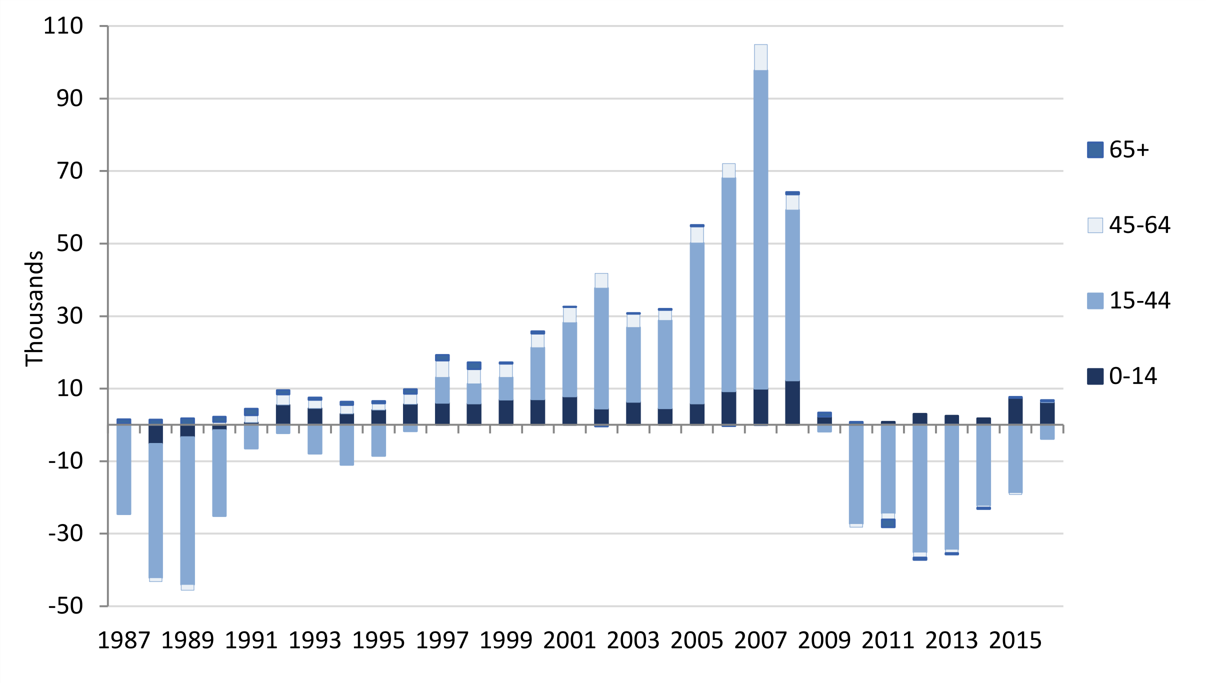
As mentioned in the Introduction, migration is a key driver of population change. In addition, it has helped to shape Ireland's demographic structure. Figure 4.13 shows the contribution of various age groups to net immigration. The graph shows that the vast majority of migrants are concentrated in the 15 to 44 age group, with some migration in the 45 to 64 age group and very little in the 0 to 14 and 65+ age groups. This concentration in younger age groups applies to both male and female migrants. In addition, the gender split in both emigration and immigration has been broadly equal over time.

FIGURE 4.12 NET EMIGRATION AND THE UNEMPLOYMENT RATE, 1980 TO 2015



Sources: Central Statistics Office, Population and Migration Estimates; ESRI Databank.

FIGURE 4.13 AGE PROFILE OF NET IMMIGRATION, 1987 TO 2016

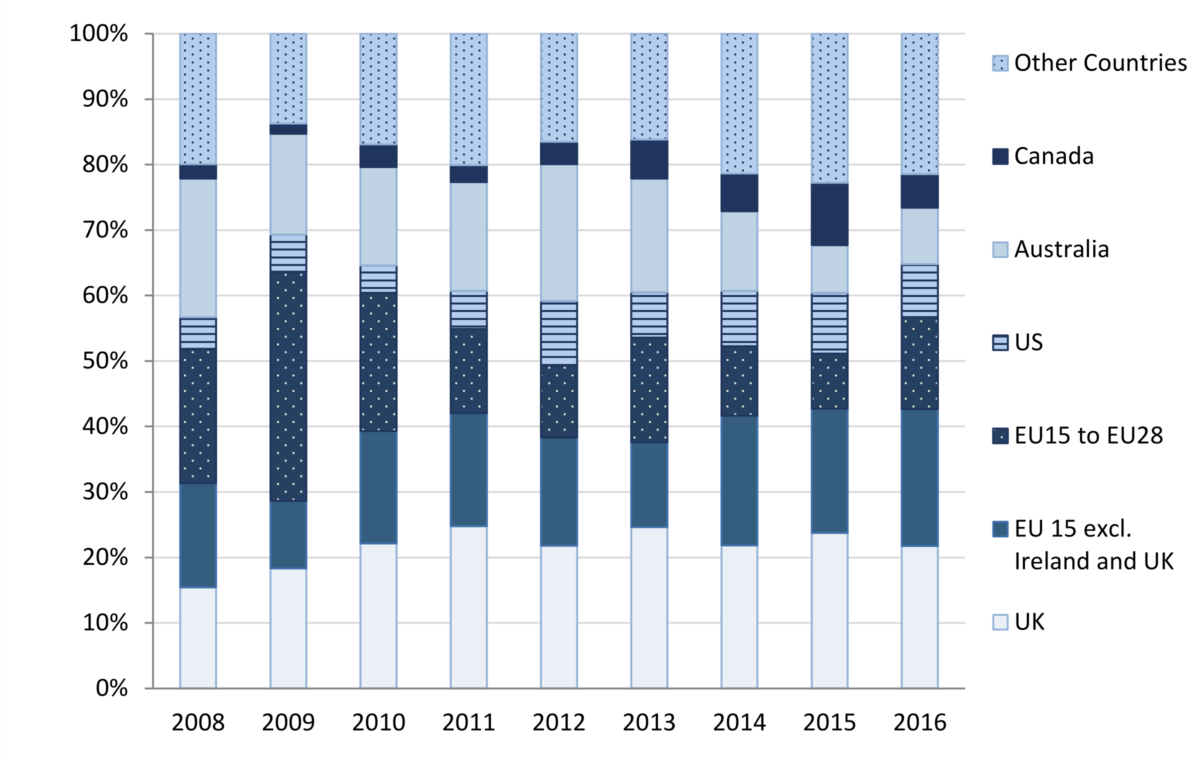


Sources: Central Statistics Office, Population and Migration Estimates.

The UK has historically been a key destination for emigrants. In fact empirical studies have found that in the long run the UK unemployment rate is a major determinant of the Irish unemployment rate through migration.[63] However, from Figure 4.14 which shows the destination of emigrants at a broad level from 2008 to 2016, it is clear that in more recent years there has been a wider range of destinations for emigrants. The origin of immigrants at a broad level from 2008 to 2016 is shown in Figure 4.15 and here the picture is quite mixed. In 2008, around 70 per cent of immigrants were from the EU (either EU15 or the rest of the EU); however their share in total immigration has fallen over time, especially for EU immigrants from non-EU15 countries, to less than 50 per cent of immigrants by 2016. There has been also been a rise over time in the share of immigrants from other countries.

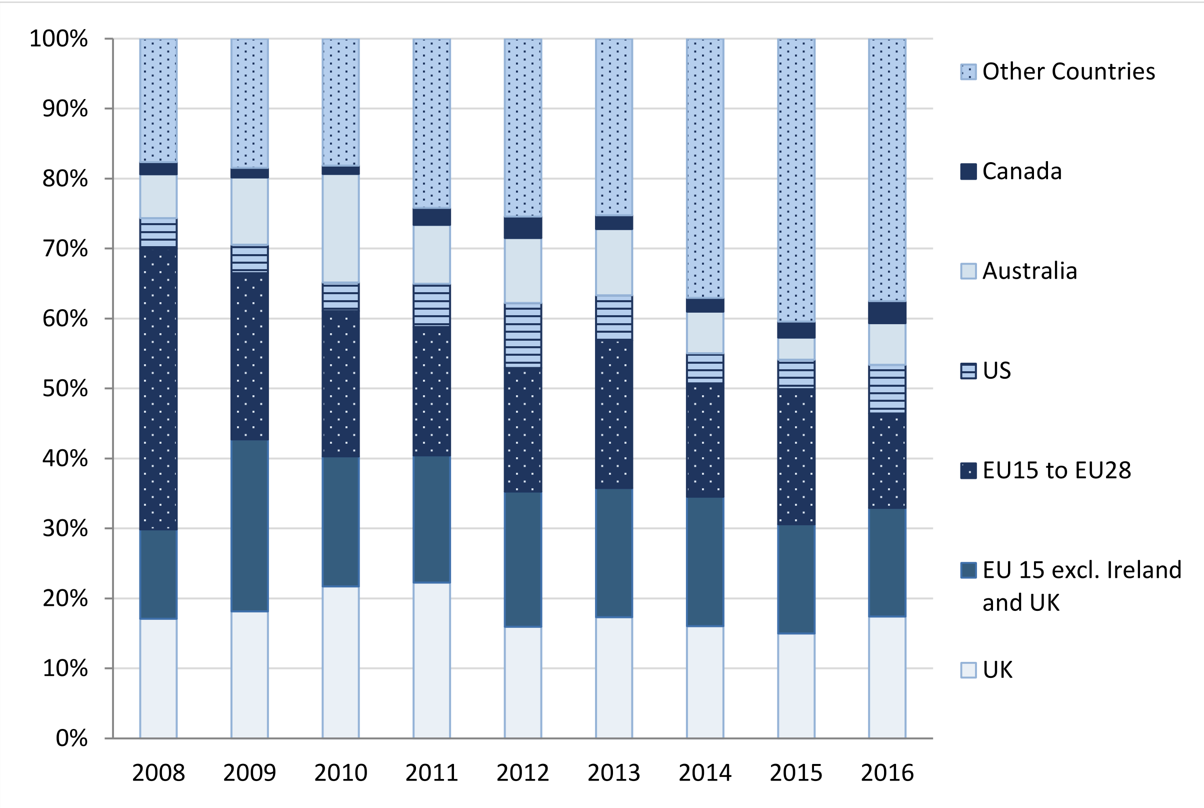
63 For more details see the discussion on p.23 in Honohan and Walsh (15): 'Net emigration has long seemed to place a ceiling on the gap between Irish and UK unemployment'.

FIGURE 4.14 DESTINATION OF EMIGRANTS FROM IRELAND, 2008 TO 2016



Sources: Central Statistics Office, Population and Migration Estimates.

FIGURE 4.15 ORIGIN OF IMMIGRANTS TO IRELAND, 2008 TO 2016



Sources: Central Statistics Office, Population and Migration Estimates.

Since the 1960s, the behaviour of net migration has been explained using a model where the flow of net emigrants is driven by differences in unemployment rates in the origin (Ireland) and destination (UK) labour markets (a specification based on work by Harris and Todaro (16)). This model explaining migration behaviour has been re-estimated on quite a number of occasions (17-20). In successive ESRI *Medium Term Reviews* (21-24), the flow of migration was explained by the difference between the expected returns to living in Ireland relative to the UK. This was modelled as a function of the expected real after tax wage rate and of the probability of being unemployed/employed in the two countries.

However, the nature of migration has changed somewhat over recent years. From the mid-1990s, immigration into Ireland by returning emigrants and by non-Irish immigrants has played a very important role. The growing numbers of non-Irish citizens in the migration flows means that past behaviour may be a less reliable guide to future population movements than it was in the past. Because of the changing nature of migration, in the ESRI's new macro model of the Irish economy, COSMO, gross migration flows are modelled (25). In COSMO, emigration is determined by the relative attractiveness of alternative labour markets. For example, if the returns to working in Ireland disimprove relative to the UK, measured in terms of real after-tax earnings, there will be a tendency for outflows of migrants to start up or accelerate. Similarly, if the Irish unemployment rate increases relative to the Australian rate, then there will be a tendency for emigration to occur. Immigration is partly exogenous in the model. An initial level of immigration is assumed in the model and initial projections for variables like wages and the unemployment rate consistent with that level of immigration are generated. The level of immigration is then adjusted if large changes occur in domestic economic conditions. The level of migration implied by projections from the macro model is fed into the demographic model.

4.4.2 Future Prospects for migration

For our Central scenario we incorporate the migration projections from the Central scenario contained in the ESRI's 2016 Economic Outlook. Overall, this scenario would see average growth in output of around 3.75 per cent per annum in the second half of the decade (for more details see Bergin et al. (26)). Underpinning this economic scenario is net immigration averaging around 9,000 per annum until 2021 and thereafter net immigration of around 13,000 per annum.[64]

[64] This is closest to but different from the M2 assumptions in the CSO's demographic projections for 2016 to 2046 (4). The M2 assumptions are that net migration will return to positive territory by 2018 and rising thereafter to +10,000 by 2021.

As already stated, migration flows are very sensitive to economic conditions both in the domestic economy and abroad and can be very volatile. If economic conditions in Ireland are ultimately much stronger (weaker) relative to abroad than anticipated, net immigration (emigration) flows will also likely be higher. Other uncertainties further compound the difficulty in projecting future migration flows. One such uncertainty is Brexit and what will happen to future EU migration. This will ultimately depend on the new, as yet to be determined, relationship between the UK and the EU. Barrett et al. argue that Brexit could divert immigration to Ireland from the EU that would otherwise have gone to the UK, although it is impossible to quantify the magnitude of this effect (27). Migration can be part of a process of investment in human capital (28). Good English language skills are a valuable form of human capital and this factor combined with Ireland's favourable growth prospects may mean that potential EU migrants will be willing to move to Ireland if they are no longer able to go to the UK. Therefore, migration could be significantly higher than anticipated in the Central scenario.

To highlight the sensitivity to migration of both the size of the population and its structure, we consider two alternative scenarios. In the High population growth scenario we assume net immigration of around 39,000 per annum to 2021 and 28,000 per annum thereafter.[65] In the Low population growth scenario we assume net emigration of 1,000 per annum to 2021 and then net immigration of around 12,000 per annum thereafter.[66] Migration flows are distributed by gender and SYOA on the basis of historical weights.

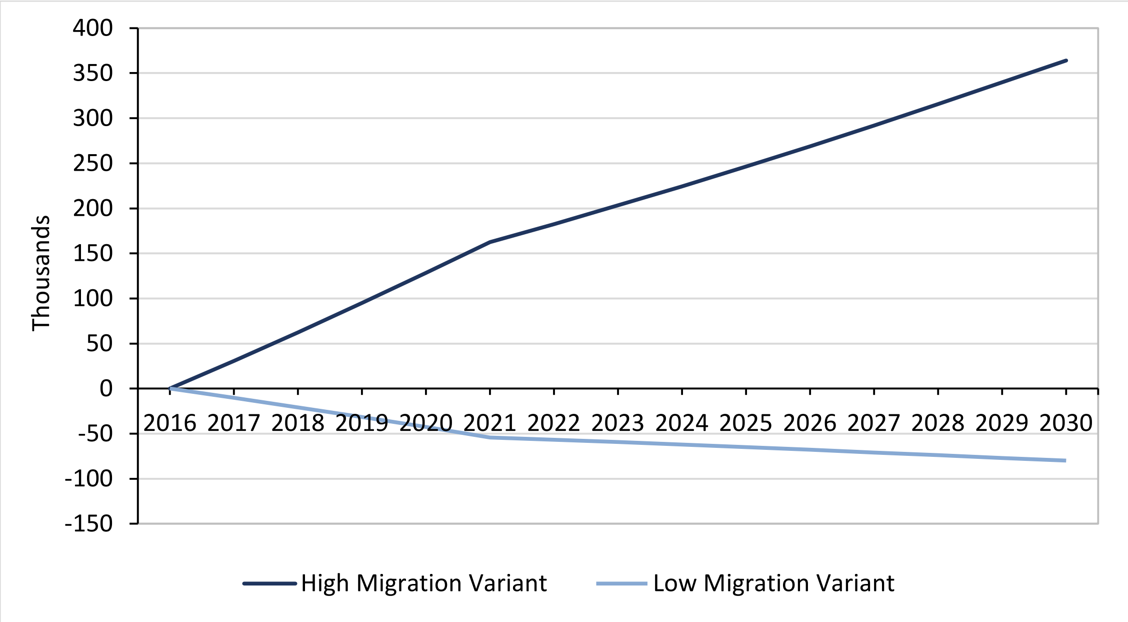
Figure 4.16 shows the impact of the alternative assumptions on migration on the total size of the population. It takes the population underlying the Central scenario as a base and shows the change in the total population using the high and low migration assumptions. Following the same technique as in the previous section, to isolate the impact of the alternative migration assumptions the assumptions on mortality (discussed in Section 4.3) and fertility (discussed in Section 4.5) are unchanged from the Central scenario. Overall, the impact of the alternative migration assumptions on the size of the population is extremely strong as the alternative assumptions around the scale of net migration encompass a wide range. The high migration variant leads to the total population being over 360,000 above that of the Central scenario by 2030. The low migration

65 The High population growth scenario assumes that, compared to the Central scenario, net immigration will be 30,000 higher out to 2021 and around 15,000 higher thereafter. Total net immigration to the UK over the period 2014 to 2016 averaged 300,000 (across all nationalities) (29). The High population growth scenario is based on taking 10 per cent of this figure for the years to 2021 and 5 per cent out to 2030.

66 This lower level of net immigration, especially in the near-term, when compared to the Central scenario is chosen to reflect the uncertainty around any macroeconomic projection and the fact that growth may not be as high as projected.

variant reduces the total population, compared to the Central scenario, by around 80,000 by 2030.

FIGURE 4.16 IMPACT OF HIGH AND LOW MIGRATION VARIANTS ON CENTRAL POPULATION, 2016 TO 2030



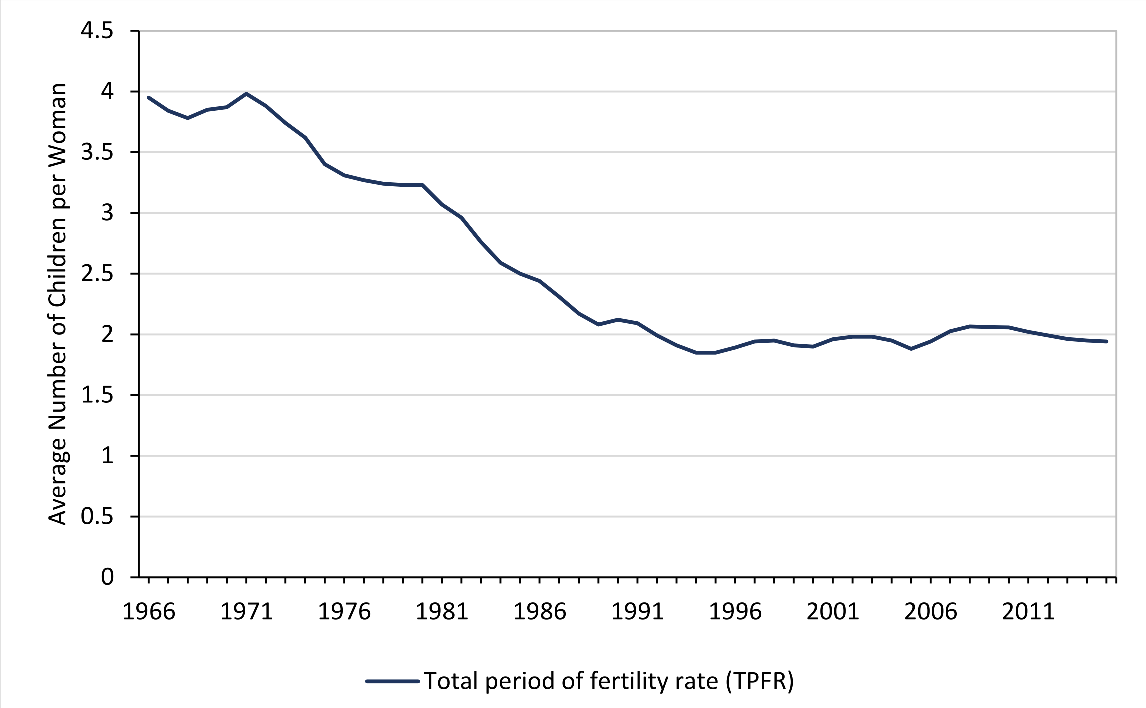
Sources: ESRI projections.

4.5 FERTILITY

4.5.1 Past trends in fertility

The total fertility rate (TFR – a measure of the number of children that a representative woman will have over her lifetime) has undergone significant change over the last 50 years, and is an important factor accounting for the changing demographic profile in Ireland over time. Figure 4.17 shows the fertility rate for Ireland over time. From the early 1980s to the mid-1990s the fertility rate fell dramatically from 3.23 in 1980 to 1.85 in 1995. Since then it has remained broadly stable at around 1.96.

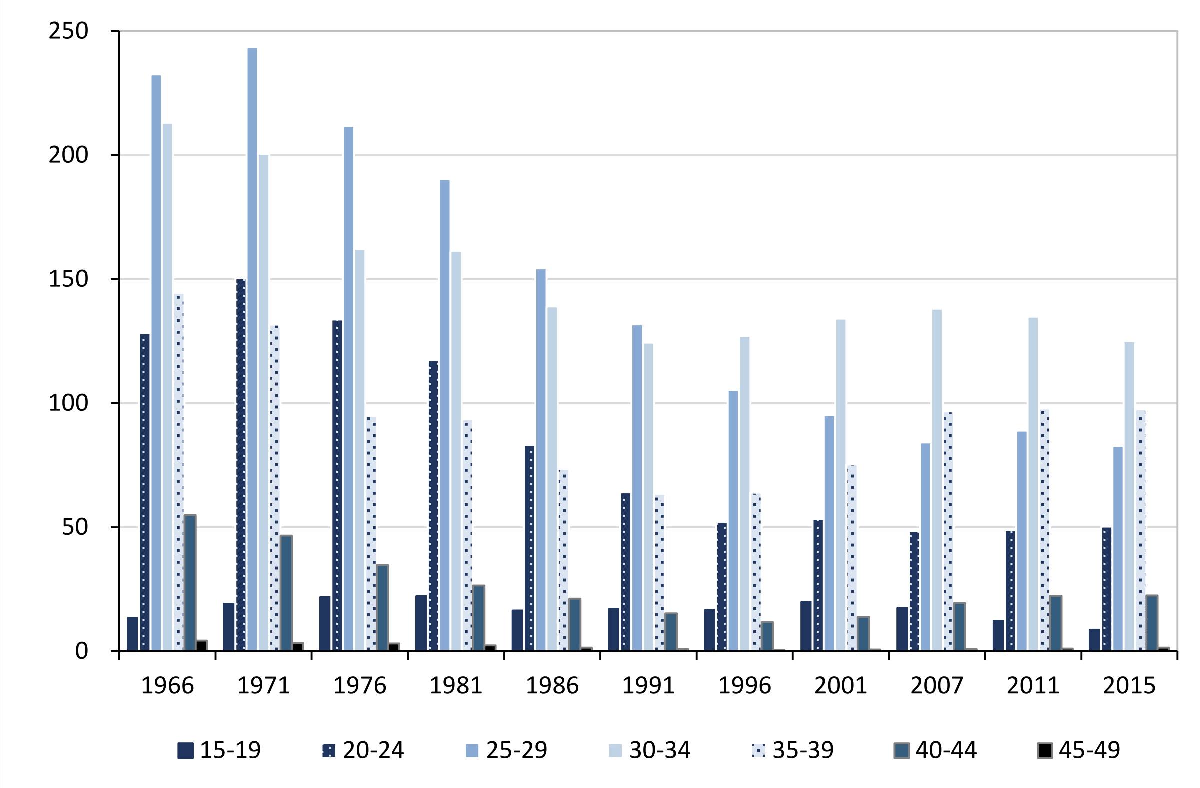
FIGURE 4.17 TOTAL PERIOD FERTILITY RATE* (TPFR), 1966 TO 2015



Sources: Central Statistics Office, Vital Statistics, various issues.
Note: * The TPFR represents the theoretical average number of children who would be born alive to a woman during her lifetime if she were to pass through her child bearing years (ages 15-49) conforming to the age-specific rates of a given year. The rate refers to a theoretical female cohort.

Examining age-specific fertility rates over time helps to unpack the pattern in the TFR. These are shown in Figure 4.18. Between the early 1980s and mid-1990s the fertility rates for women in their twenties fell dramatically, while the rates for women over the age of 30 experienced a much more modest decline. Since the mid-1990s there has been some further decline in fertility rates for women under the age of 35, especially for those in the 25 to 29 age group. In addition, there has been a rise in fertility rates for women over the age of 35.

FIGURE 4.18 AGE-SPECIFIC FERTILITY RATES,* VARIOUS YEARS



Sources: Central Statistics Office, Vital Statistics, various issues.
Note: * The age-specific fertility rate for a particular age group is the number of live births to women in that age group per 1,000 females in the same age group.

Table 4.1 shows prevailing TFRs for a range of countries. The TFR for the EU28 as a whole was 1.58 in 2015. This is below the replacement level (the level of fertility at which a population exactly replaces itself from one generation to the next) of 2.1 children per woman. The table reveals that the current Irish TFR is well above that of all EU countries with the exception of France. Analysis by the CSO which examined whether the existing Irish fertility rate is driven by trends in immigration, found that recently arrived immigrant women in Ireland have much closer fertility rates to Irish rates rather than those prevailing in their own countries (4).

TABLE 4.1 TOTAL FERTILITY RATES FOR SELECTED COUNTRIES, 2015

Country	Total		Country	Total
Georgia	2.21		Czech Republic	1.57
Turkey	2.14		Slovenia	1.57
Azerbaijan	1.98		Switzerland	1.54
France	1.96		Bulgaria	1.53
Ireland	1.92		Germany	1.50
Sweden	1.85		Former Yugoslav Republic of Macedonia, the	1.50
United Kingdom	1.80		Austria	1.49
Iceland	1.80		Luxembourg	1.47
Montenegro	1.74		Serbia	1.46
Norway	1.72		Hungary	1.45
Denmark	1.71		Malta	1.45
Belgium	1.70		Croatia	1.40
Latvia	1.70		Slovakia	1.40
Lithuania	1.70		Liechtenstein	1.40
Albania	1.67		Italy	1.35
Netherlands	1.66		Greece	1.33
Finland	1.65		Spain	1.33
Armenia	1.62		Cyprus	1.32
European Union (28 countries)	1.58		Poland	1.32
Estonia	1.58		Portugal	1.31
Romania	1.58			

Source: Eurostat.

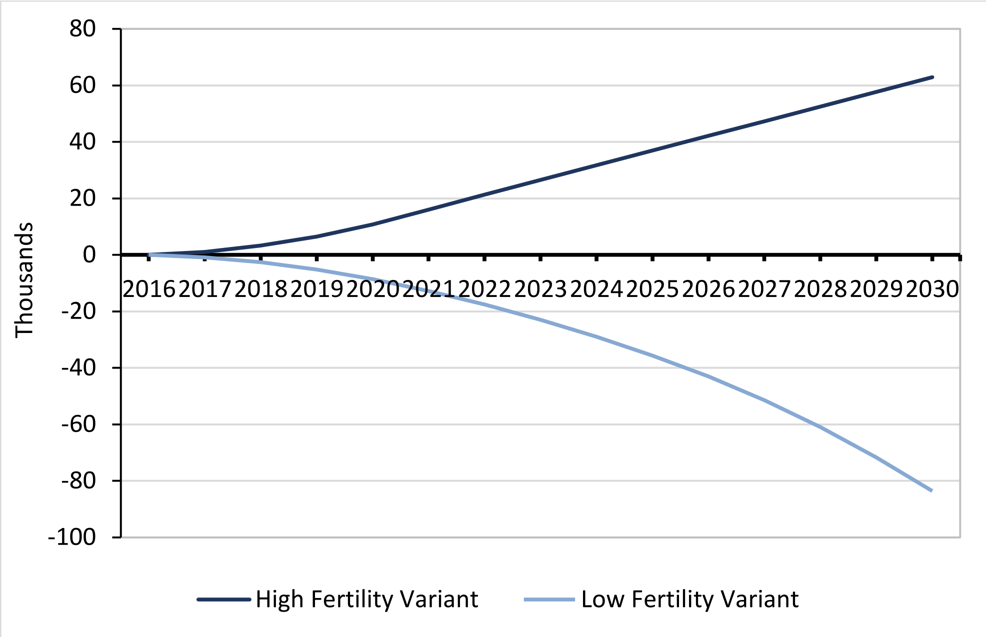
4.5.2 Assumptions about fertility

For our Central scenario we assume that the overall fertility rate will remain unchanged from the 2015 rate of 1.94 over the projection horizon.[67] However we incorporate some different patterns of fertility for women according to their age. In particular, we assume a further moderate decline in fertility rates for women in their twenties and a modest increase in fertility rates for women in their thirties out to 2021 and thereafter hold rates unchanged. In the High population growth scenario we assume that the TFR rises to 2.1 (the replacement level) by 2021 and remains constant thereafter. In the Low population growth scenario we assume that the TFR declines to 1.8 by 2021 (the current UK fertility rate) and that it declines further to 1.58 by 2030 (the current EU28 average fertility rate). The impact of the alternative fertility assumptions on the total size of the population is shown in Figure 4.19. As before, the analysis takes the population underlying the Central scenario as a base and shows the change in the total population using the high and low fertility assumptions leaving the assumptions on mortality (discussed in Section 4.3) and migration (discussed in Section 4.4) unchanged from the Central scenario. The impact of the alternative fertility assumptions on

[67] This overall fertility rate for 2015 comes from (30) and differs slightly from the Eurostat figure reported for Ireland for 2015. We have chosen to use the CSO figure as it is the national statistics office that compiles these data for Ireland.

the size of the population is relatively substantial. The high fertility variant leads to the total population being just over 60,000 above that of the Central scenario by 2030. The low fertility variant reduces the total population by around 85,000 compared to the Central scenario by 2030.

FIGURE 4.19 IMPACT OF HIGH AND LOW FERTILITY VARIANTS ON CENTRAL POPULATION, 2016 TO 2030



Source: ESRI Projections.

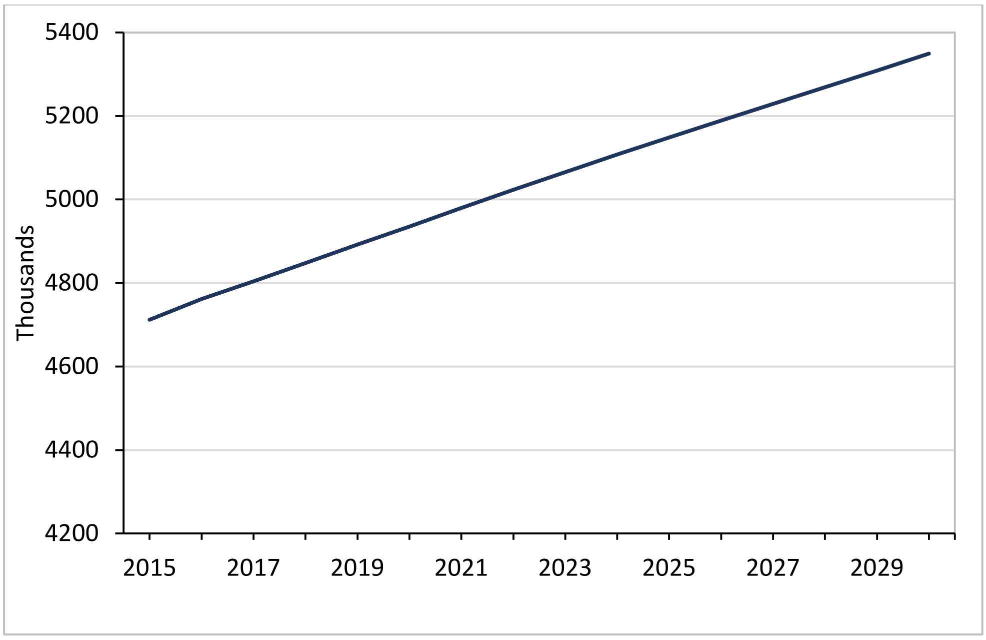
4.6 DEMOGRAPHIC PROJECTIONS

4.6.1 Central scenario

In this section we bring together the central assumptions on mortality, migration and fertility to generate the Central scenario. The projected evolution of the population in the Central scenario is shown in Figure 4.20. The projections show strong growth in the total population over the projection horizon. The graph indicates that between 2015 and 2030 the population will increase by over 635,000 or around 14 per cent, leaving the total population approximately 5,350,000 in 2030.[68]

[68] Our Central population growth scenario is broadly consistent with the baseline scenario produced by Eurostat (2017). By 2030 the total population is 200,000 above that in Eurostat (31). This is largely driven by differences in the early years of the projection horizon (e.g. our scenarios incorporate Census data for 2016), stronger migration assumptions and slightly stronger improvements in life expectancy over the projection horizon.

FIGURE 4.20 CENTRAL SCENARIO: TOTAL POPULATION, 2015 TO 2030



Source: ESRI Projections.

In the Central scenario the age structure of the population will also change over time. Figure 4.21 shows population pyramids comparing the age structure of the population in 2016 and 2030. The population pyramids show the percentage of the total population in each year of age. In 2016, 21 per cent of the population is aged between 0 and 14, 65 per cent is aged between 15 and 64, and 13 per cent is over the age of 65. This compares to EU28 averages of 15 per cent in the 0 to 14 age group, 66 per cent in the 15 to 64 age group and 19 per cent in the over 65 age group.[69]

However, the ageing of the population is readily observable when we compare the 2016 and 2030 population pyramids which show the proportion of the population aged 65 and over rising from 13 per cent in 2016 to 18 per cent by 2030. Over the same time period, the proportion of the population in the 15 to 64 age group remains stable and the percentage of the population in the 0 to 14 age group decreases from 21 to 18 per cent. These figures translate into a young-age dependency ratio (i.e. the size of the 0-14 to the 15-64 population) of 32 per cent in 2016 falling to 29 per cent by 2030. Over the same period there is a rise in the old-age dependency ratio (i.e. the size of the 65+ to the 15-64 population) from 20 per cent to 29 per cent.

[69] Source: Eurostat, data refer to 2014.

FIGURE 4.21 CENTRAL SCENARIO: POPULATION PYRAMIDS FOR 2016 AND 2030

Source: ESRI Projections.

4.6.2 High and Low population growth scenarios

Given the uncertainty in any projection exercise and, in this case in particular the likely future path of migration, we examine two alternative scenarios. The High (Low) population growth scenario uses the high (low) variant assumptions for each of the components of population change (fertility, mortality and migration). For ease of comparison across the scenarios, Table 4.2 summarises the key assumptions underpinning each scenario.

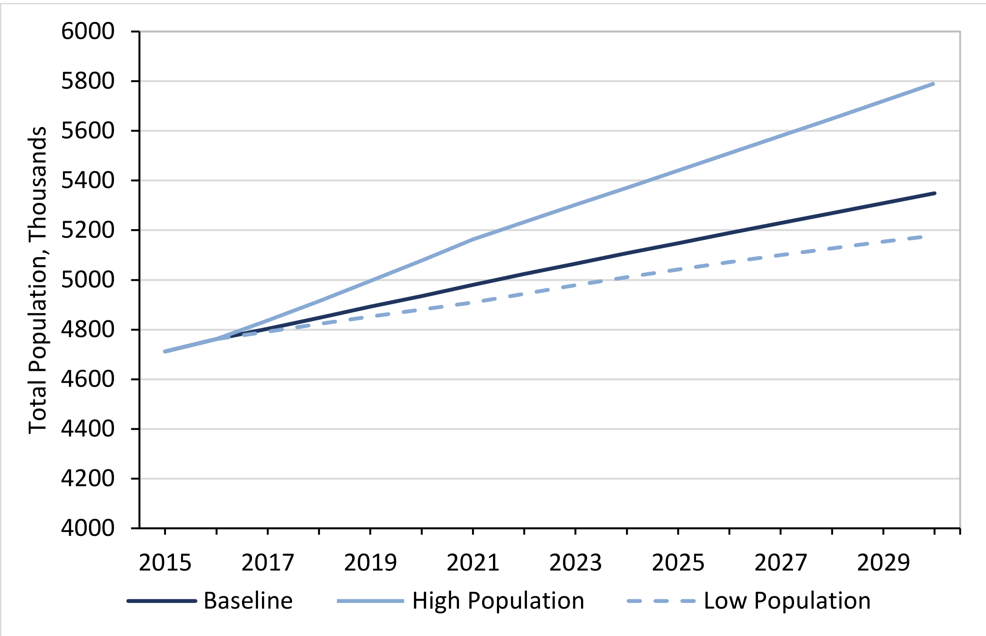
TABLE 4.2 SUMMARY OF ASSUMPTIONS FOR POPULATION GROWTH SCENARIOS

	Central scenario	High population growth scenario	Low population growth scenario
Mortality Mortality rates assumed to decrease with gains in life expectancy at birth from 78.4 years for males and 82.9 years for females in 2011 to:	82.9 years for males and 86.5 years for females 2030	83.2 years for males and 86.8 years for females 2030	82.6 years for males and 86.3 years for females 2030
Migration Net immigration over the projection horizon:	Averaging 9,000 p.a. to 2021 and 13,000 p.a. thereafter	Averaging 39,000 p.a. to 2021 and 28,000 p.a. thereafter	Averaging 1,000 p.a. to 2021 and 12,000 p.a. thereafter
Fertility Total Fertility Rate:	Unchanged from 2015 rate of 1.94	Rises to 2.1 by 2021 and constant thereafter	Declines to 1.8 by 2021 and to 1.58 by 2030

Source: ESRI Projections.

Figure 4.22 shows the path of the total population under the three scenarios. By 2030 the total population in the High population growth scenario is around 5.79 million and over 440,000 above that of the Central scenario. In the Low population growth scenario the total population stands at approximately 5.18 million by 2030, around 170,000 below that of the Central scenario. The difference between High and Low population growth scenarios is over 600,000 by 2030.

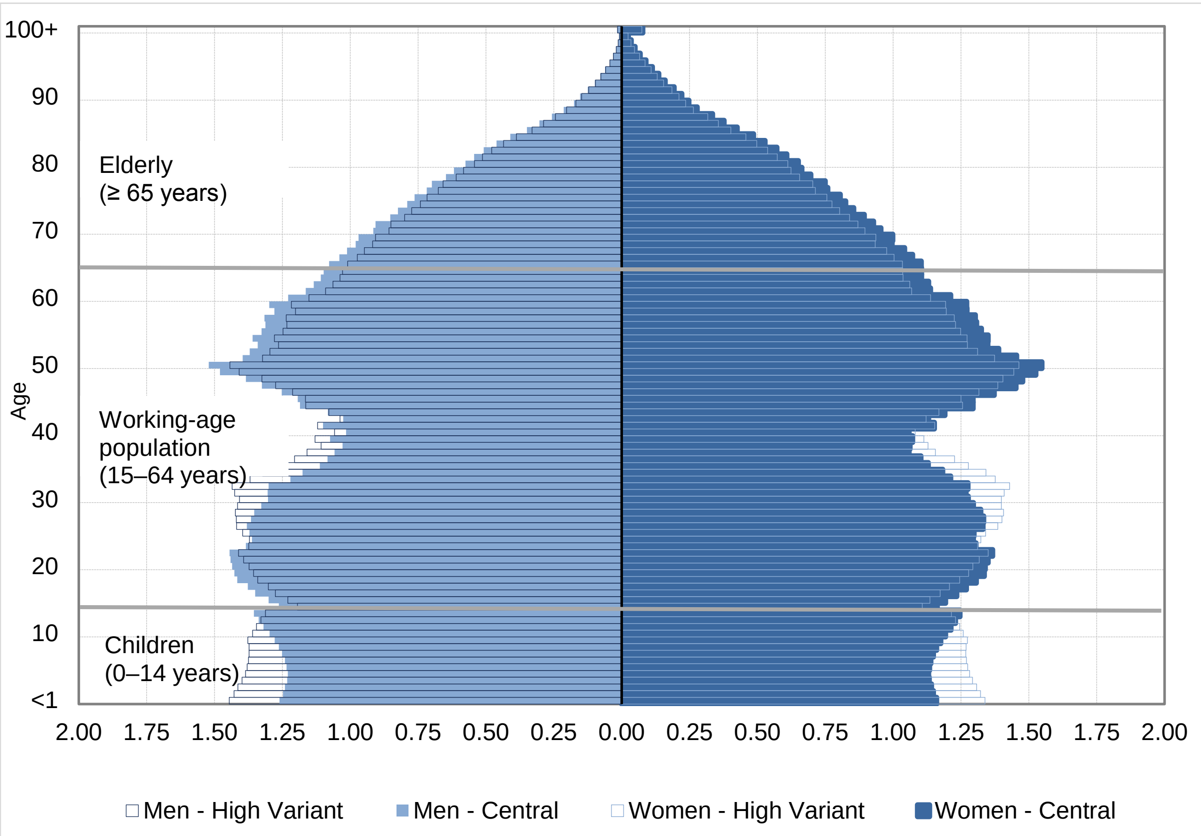
FIGURE 4.22 TOTAL POPULATION: CENTRAL, HIGH AND LOW POPULATION GROWTH SCENARIOS, 2015 TO 2030



Source: ESRI Projections.

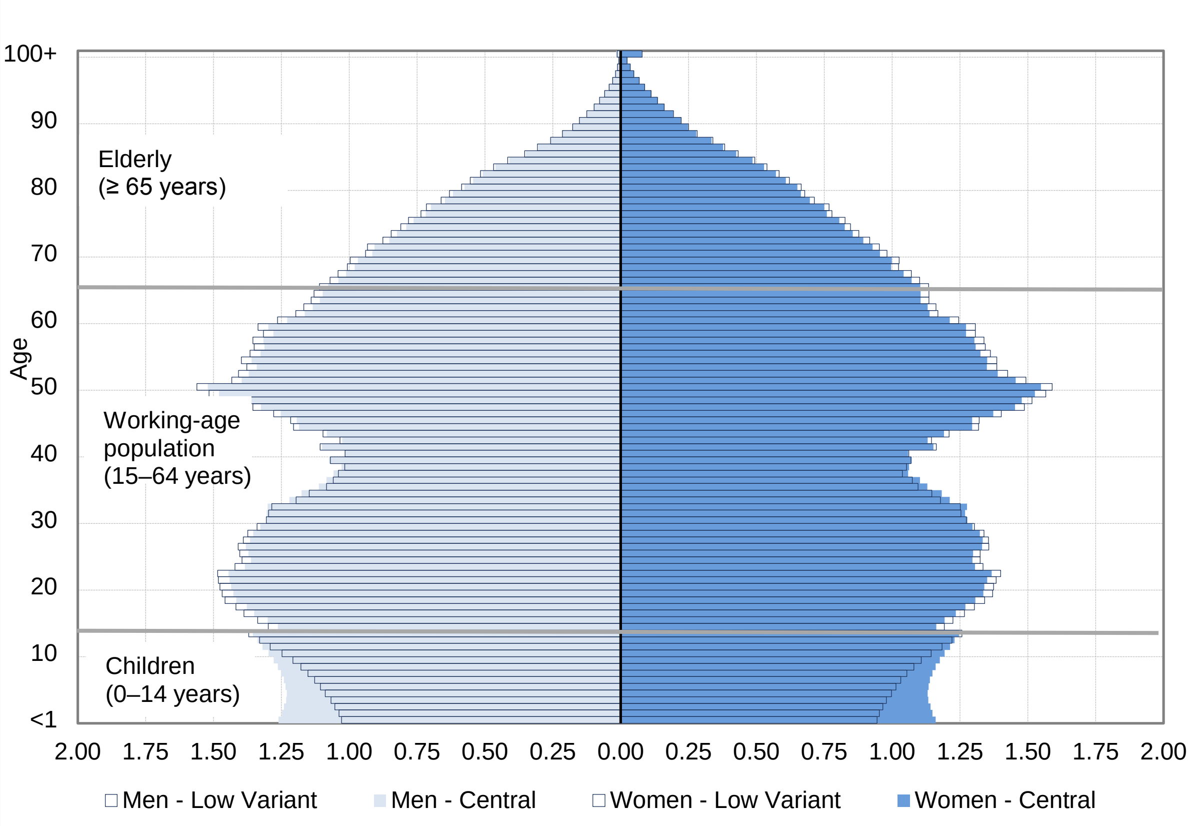
The alternative scenarios also have implications for the change in the structure of the population over the projection horizon. Figures 4.23 and 4.24 show the population pyramids for 2030 comparing the Central and High population growth scenario and the Central and Low population growth scenarios respectively. Figure 4.23 shows that in the High population growth scenario that the proportion of the population in the 0 to 14 age group is around 1.5 percentage points higher, the proportion in the 15 to 64 age group is around 0.4 percentage points lower and the proportion in the over 65 age group is around 1.1 percentage points lower relative to the Central scenario in 2030. Figure 4.24 shows that in the Low population growth scenario the proportion of the population in the 0 to 14 age group is around 1.4 percentage points lower, the proportion in the 15 to 64 age group is around 1 percentage point higher and the proportion in the over 65 age group is around 0.4 percentage points higher relative to the Central scenario in 2030.

FIGURE 4.23 COMPARISONS OF CENTRAL AND HIGH POPULATION GROWTH SCENARIOS: POPULATION PYRAMIDS FOR 2030



Source: ESRI Projections.

FIGURE 4.24 COMPARISONS OF CENTRAL AND LOW POPULATION GROWTH SCENARIOS: POPULATION PYRAMIDS FOR 2030



Source: ESRI Projections.

4.7 CONCLUSIONS

This chapter has used the cohort component methodology to generate detailed demographic projections for Ireland out to 2030. In order to take account of the uncertainty in projections three scenarios have been considered, namely a Central scenario and two alternative scenarios, a High and Low population growth scenario. Each scenario shows the total size of the population increasing over the projection horizon. In the Central scenario the size of the population increases by 14 per cent between 2015 and 2030, whereas the comparable increases are approximately 23 per cent and 10 per cent in the High and Low population growth scenarios respectively. All the scenarios show considerable growth, especially given the already substantial historical population growth of 31 per cent over the 1996 to 2016 period. We think the more likely demographic scenario is the Central scenario as it is linked to the most recent medium- to long-term macroeconomic projections for the Irish economy. However, given the uncertainty around future migration flows, especially in the context of Brexit and the possibility of diversion of potential EU immigrants to Ireland, the High population growth scenario is also considered likely and is therefore built into the higher preferred projections for healthcare demand in the following chapters.

Table 4.3 shows the absolute change and percentage growth in the male and female populations over the 2015 to 2030 period for the Central and High population growth scenarios. It also shows the change and growth for various age cohorts that are of particular relevance for subsequent chapters of the report. The strong growth in the older age cohorts relative to the overall population is apparent in the table. The table also shows the growth rates for the older age male population are stronger than those for the older age female population. This is in part driven by the projections in life expectancy. Also, it is important to note that the change in absolute terms in the male older age population over the 2015 to 2030 period is quite similar to that of the female population. However, the base older male population in 2015 is significantly smaller than the female older population and so the growth rate for the male older population over the period is much higher. There is a fall over time in the population aged under 15 in the Central scenario. This is largely driven by lower numbers of females in some of the key child bearing age cohorts, particularly those in their thirties, in this scenario. A combination of higher fertility rates and higher net immigration results in an increase in the population aged under 15 in the High population growth scenario.

TABLE 4.3 CENTRAL AND HIGH POPULATION GROWTH SCENARIOS: GROWTH IN VARIOUS AGE COHORTS FROM 2015 TO 2030

Cohort	Males		Females		Total	
	% Increase	Absolute Increase, ('000)	% Increase	Absolute Increase, ('000)	% Increase	Absolute Increase, ('000)
	Central population growth scenario					
<15	-3	-15.3	-4	-18.6	-3	-33.9
15-64	9	144.7	11	164.2	10	308.9
65+	62	173.3	58	189.3	60	362.6
80+	114	62.4	74	65.6	89	128.0
85+	136	29.6	72	32.2	93	61.8
All Ages	13	302.7	14	334.9	14	637.6
	High population growth scenario					
<15	13	68.7	12	61.4	13	130.2
15-64	18	275.5	19	292.9	18	568.5
65+	65	183.0	60	197.6	63	380.5
80+	121	65.9	78	69.1	94	135.0
85+	145	31.5	77	34.4	99	66.0
All Ages	23	527.3	23	552	23	1,079.2

Source: ESRI Projections.

Table 4.4 summarises the numbers in various age cohorts in both 2015 and in 2030 for the three scenarios considered in the chapter. In each scenario, growth and ageing of the population over time is apparent and this has implications for healthcare demand. The proportion of the population in the 0 to 14 age group falls over time and the absolute numbers could also fall. This is driven by changes in the numbers of women in some of the child bearing age groups in the scenarios. The total number of births per annum would be lower in 2030 in both the Central and Low population growth scenarios, while they would be higher in the High population growth scenario. Although the percentage of the population in the 15 to 64 age group remains broadly flat over the projection horizon, their numbers increase over time by between 8 and 18 per cent. The population share of people aged 65 and over increases from 13 per cent to between 17 and 19 per cent. However, the number of people aged 65 and over is projected to increase by between 58 and 63 per cent. The old age dependency ratio increases in all scenarios from 20 in 2015 to 29 in 2030 in the Central and Low population growth scenarios and to 27 in the High population growth scenario. Of particular significance for long-term care demand, the numbers of people aged 80 and over is projected to increase by between 85 and 94 per cent.

TABLE 4.4 SUMMARY OF POPULATION SCENARIOS, PROJECTED NUMBERS AND POPULATION SHARES

	1996		2006		2015		Central-2030		High Population-2030		Low Population-2030	
Cohort	Number of People ('000)	%	Number of People ('000)	%	Number of People ('000)	%	Number of People ('000)	%	Number of People ('000)	%	Number of People ('000)	%
0-14	859.4	24	864.4	20	1,011.3	21	977.4	18	1,141.5	20	872.1	17
15-64	2,352.8	65	2,907.5	69	3,091.4	66	3,400.3	64	3,659.9	63	3,345.1	65
65+	413.9	11	467.9	11	608.8	13	971.4	18	989.4	17	961.5	19
Total	**3,626.1**		**4,239.8**		**4,711.6**		**5,349.1**		**5,790.8**		**5,178.7**	
Young-Age Dependency Ratio	0.37		0.30		0.33		0.29		0.31		0.26	
Old-Age Dependency Ratio	0.18		0.16		0.20		0.29		0.27		0.29	

Source: Central Statistics Office and ESRI projections.

REFERENCES

1. Barrett, A. and A. Bergin (2005). *Assessing Age-related Pressures on the Public Finances 2005 to 2050*. Dublin: Economic and Social Research Institute (ESRI), 2005. Budget Perspectives 2006/1.

2. Central Statistics Office (2016). 'Population and Migration Estimates, April 2016'. Central Statistics Office [cited 2017 30 March]; Available from: www.cso.ie/en/releasesandpublications/er/pme/populationandmigrationestimatesapril2016.

3. Central Statistics Office (2012). 'Revisions to labour market estimates, November 2012'. Information Notice. Central Statistics Office.

4. Central Statistics Office (2013). 'Population and Labour Force Projections: 2016-2046'. Central Statistics Office.

5. Office for National Statistics (2015). 'National Population Projections: 2014-based projections. Office for National Statistics' [cited 2017 27 March]; Available from: www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/compendium/nationalpopulationprojections/2015-10-29.

6. Bohnert, N., J. Chagnon and P. Dion (2015). 'Population Projections for Canada (2013 to 2063), Provinces and Territories (2013 to 2038)'. Statistics Canada.

7. United Nations DoEaSA (2017), 'Population Division World Population Prospects: The 2017 Revision, Key Findings and Advance Tables'. [Working Paper]. In press 2017.

8. Whelan S. (2008). 'Projecting population mortality for Ireland'. *Journal of the Statistical & Social Inquiry Society of Ireland*. 2008;37:135-63.

9. European Commission (2015). *The 2015 Ageing Report: Economic and budgetary projections for the 28 EU Member States (2013-2060)*. Brussels: European Commission, 2015.

10. Nolan A. The 'healthy immigrant' effect: Initial evidence for Ireland. *Health Economics, Policy and Law,* 2012,*7*(3): 343-362. doi:10.1017/S174413311000040X

11. Layte, R., S. O'Hara and K. Bennett (2011). 'Explaining structural change in cardiovascular mortality in Ireland 1995-2005: a time series analysis'. *European Journal of Public Health.* 2011;21(5):597-602. Epub 2010/08/06.

12. Office for National Statistics (2016). Variants, 2014-based national population projections reference volume. Office for National Statistics [cited 2017 27 March]; Available from: www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/compendium/nationalpopulationprojections/2014basedreferencevolumeseriespp2/chapter6variants2014basednationalpopulationprojectionsreferencevolume.

13. Barrett, A., J. FitzGerald and B. Nolan (2002). 'Earnings inequality, returns to education and immigration into Ireland'. *Labour Economics.* 2002;9(5):665-80.

14. Barrett, A., A. Bergin, E. Kelly and S. McGuinness (2016). 'Ireland's Recession and the Immigrant-Native Earnings Gap'. In: Kahanec M, Zimmermann KF, editors. *Labor Migration, EU Enlargement, and the Great Recession*. Berlin, Heidelberg: Springer Berlin Heidelberg; 2016. p.103-22.

15. Honohan, P. and B. Walsh (2002). 'Catching up with the leaders: the Irish hare'. *Brookings Papers on Economic Activity.* 2002;2002(1):1-57.

16. Harris, J.R. and M.P. Todaro (1970). 'Migration, Unemployment and Development: A Two-Sector Analysis'. *The American Economic Review.* 1970;60(1):126-42.

17. Walsh B.M. (1968). 'Some Irish Population Problems Reconsidered'. General Research Series Paper No. 42.

18. Keenan J. (1981). 'Irish migration all or nothing resolved?' *The Economic and Social Review*. 1981;12(3):169-86.

19. Honohan P. (1984). *The Evolution of the Rate of Unemployment in Ireland 1962-1983.* Dublin: Economic and Social Research Institute.

20. Bradley, J., J. FitzGerald, D. Hurley, L. O'Sullivan, A. Storey (1993). *HERMES: A macrosectoral model for the Irish economy.* HERMES: Harmonised Econometric Research for Modelling Economic Systems, North Holland.

21. Bergin, A., J. Cullen, D. Duffy, J. Fitzgerald, I. Kearney, D. McCoy (2003). *Medium-Term Review 2003-2010*, No. 9. Dublin: Economic and Social Research Institute.

22. Fitzgerald, J., A. Bergin, I. Kearney, A. Barrett, D. Duffy, S. Garrett et al. (2005). *Medium-Term Review 2005-2012*, *No. 10.* Dublin: Economic and Social Research Institute, 2005 0707002435.

23. Fitzgerald, J., A. Bergin, T. Conefrey, A. Diffney, D. Duffy, I. Kearney et al. (2008). *Medium-Term Review 2008-2015*, *No. 11*. Dublin: Economic and Social Research Institute.

24. Fitzgerald, J., I. Kearney, A. Bergin, T. Conefrey, D. Duffy, K. Timoney et al. (2013). *Medium-Term Review: 2013-2020, No. 12*. Dublin: Economic and Social Research Institute, 2013.

25. Bergin, A., N. Conroy, A. Garcia-Rodriguez, D. Holland, N. McInerney, E. Morgenroth, et al. (2017). 'COSMO: A new COre Structural MOdel for Ireland'. Dublin: Economic and Social Research Institute, Working Paper No. 553.

26. Bergin, A., A. Garcia-Rodriguez, N. Mc Inerney, E. Morgenroth (2016). 'Baseline: Methodology, Assumptions and Projections'. *Ireland's Economic Outlook*. Dublin: Economic and Social Research Institute.

27. Barrett, A., A. Bergin, J. FitzGerald, D. Lambert, D. McCoy, E. Morgenroth et al. (2015). *Scoping the possible economic implications of Brexit on Ireland.* Dublin: Economic and Social Research Institute.

28. Barrett, A. and J. Goggin (2010). 'Returning to the Question of a Wage Premium for Returning Migrants'. *National Institute Economic Review.* 2010;213(1):R43-R51.

29. Office for National Statistics (2017). *Migration Statistrics Quarterly Report; August 2017* available from www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/migrationstatisticsquarterlyreport/august2017#main-points.

30. Central Statistics Office (2017). *Vital Statistics Yearly Summary 2016*. available at: www.cso.ie/en/releasesandpublications/ep/p-vsys/vitalstatisticsyearlysummary2016.

31. Eurostat (2017). http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data.

CHAPTER 5

Demand for public acute hospital services

5.1 INTRODUCTION

This chapter presents findings for baseline activity in 2015 and projections of demand to 2030 for public acute hospitals and for voluntary hospitals, which are predominantly publicly-funded. Findings for private, for-profit hospitals are presented in Chapter 6. The organisation and categorisation of hospitals in Ireland was described in Chapter 2, while the data sources and methods applied in this chapter are described in Chapter 3.

In this chapter we analyse activity in 53 hospitals which participated in the HIPE scheme in 2015.[70] Public hospitals in Ireland may differ in the care they provide: three children's hospitals offer care to children and younger people only; six maternity hospitals offer largely maternity and neonatal care. A small number of hospitals offer specialised services such as for eye and ear conditions, orthopaedic or rehabilitation services. Although included in the analysis in this chapter, some of these hospitals would not be considered 'acute' in the sense of offering emergency care and could equally have been included in the analysis in the long-term care chapter, which encompasses convalescent and rehabilitative care. However, due to their inclusion for historical reasons in the HIPE dataset and not in other service registers, we analyse their activity within the acute hospital grouping.

This chapter presents findings for five primary forms of hospital activity: inpatient care (IP); day-patient care (DC); maternity care; Emergency Department (ED) attendance; and Outpatient Department (OPD) attendance. Within inpatient care, findings are present for two major categories of patients: elective inpatients who are admitted for planned procedures; and emergency inpatients who constitute the majority of inpatients. In the Irish public hospital system, most non-elective inpatients are admitted through Emergency Departments and are hence categorised as 'emergency' inpatients. ED attendances, on the other hand, include both those patients who are subsequently admitted as emergency inpatients, and other patients who attend the ED but are not admitted as inpatients. As outlined in Chapter 3 and Appendix 2, the primary dataset for analysis of public hospital activity, the HIPE dataset, records hospital discharges and has no individual patient identifier. Hence activity in a given year may include multiple discharges for the same individual. For this reason analysis in this

70 Excluding two long-term care hospitals, which are included in the analysis in Chapter 9.

chapter refers to numbers of discharges and attendances and not numbers of patients.

The public acute hospital sector in Ireland receives the largest component of public healthcare funding, accounting for 34 per cent of non-capital HSE expenditure in 2015 (1). Public hospitals are funded by a combination of tax-financing allocated through the HSE, by payments from private health insurers for private patient care and by out-of-pocket payment of charges. The system of access and eligibility is further described in Chapter 2.

In December 2015, there were 12,499 beds (10,473 inpatient beds and 2,026 day-case beds) in public hospitals reporting to HIPE (2). Between 2007 and 2012, there was a 13 per cent reduction in inpatient beds, though a levelling-off or small increase occurred after 2012. A significant increase in day-patient beds has occurred, with a 42 per cent increase observed between 2007 and 2015 (2). In December 2015, there were 2,724 consultant hospital doctors working in public hospitals.[71] Consultants in public hospitals may also undertake work in a private capacity depending upon their contract of employment. Contract categories allow: work in a public capacity only; work in a public and private capacity in hospitals or facilities operated by the HSE (or co-located private facilities); or work in a public and private capacity in hospitals or facilities operated by the HSE (or co-located private facilities) and in private hospitals or facilities (3). In public hospitals, there are long waiting times for many services, which are a significant reason for purchasing private health insurance (4). The collection of waiting list data is undertaken by the National Treatment Purchase Fund (NTPF) (5). The methods adopted to estimate unmet demand applying these data were outlined in Chapter 3.

The next section describes findings from an analysis of trends in public activity between 2006 and 2015. Section 5.3 presents findings for baseline utilisation in 2015 under the headings: day-patient, inpatient and maternity discharges; inpatient bed days; and ED and OPD attendances. Section 5.4 presents findings for unmet demand for elective inpatient and day-patient care and for outpatient care. Section 5.5 presents findings for projected demand to 2030 for all categories of hospital care analysed in Section 5.3. Section 5.6 discusses and concludes.

[71] There were 2,891 approved consultant permanent posts in 2015. www.hse.ie/eng/staff/leadership_education_development/met/consultantapplications/rep1/annual-report-consultant-establishment-as-at-31st-dec-2015.pdf.

5.2 FINDINGS – TRENDS

A total of 14.6 million discharges for all categories of inpatient and day-case activity were reported to HIPE over the period 2006 to 2015.[72] The number of discharges in 2015 was 1,661,990, an increase of 34.2 per cent since 2006 representing a mean annual growth rate of 3.3 per cent. In the remainder of this chapter maternity discharges, that is those who were admitted in relation to their obstetrical experience (from conception to six weeks post-delivery), are presented separately.

Figure 5.1 disaggregates discharges (excl. maternity) and the discharge rate per 1,000 population by patient type. Inpatients are disaggregated by elective and emergency discharges and as a large component of day-patient activity is related to dialysis, chemotherapy and radiotherapy (39.0 per cent in 2015) these discharges are presented separately to other day-patient discharges.[73] Discharge rates provide a comparison of the growth in discharges reported to HIPE to that of the population over the period while growth in discharges reflects population growth also. There was a 35.1 per cent increase in the total number of discharges (excl. maternity) reported to HIPE over the period. The compares to a 21.6 per cent increase in the discharge rate per 1,000 population. This means that over the period the growth in discharges (excl. maternity) exceeded the growth in population.

The difference in growth rates between number of discharges and the discharge rate varies by patient type. The number of dialysis, chemotherapy, and radiotherapy day-patient discharges increased by 38.7 per cent between 2006 and 2015 compared to a 24.8 per cent increase in the discharge rate for this group. The mean annual growth in discharges for this category of day patients between 2006 and 2015 was 3.8 per cent per annum compared with growth of 16.0 per cent between 2014 and 2015.[74] For other day-patient discharges there was a 65.0 per cent increase in the number of discharges between 2006 and 2015 (5.8 per cent mean annual growth) compared to a 48.5 per cent increase in the discharge rate per 1,000 population.

---

72 As outlined in Section 3.3.7 we do not use trends in public hospital activity over this period as a basis for projections of demand in this chapter given the lack of comparable trend data available on activity in private hospitals. Given the interrelationships that exist between public and private hospitals in terms of meeting demand for acute care it would be inappropriate to extrapolate trends in public hospital care based on past activity without an understanding of activity taking place in private hospitals over the same period.

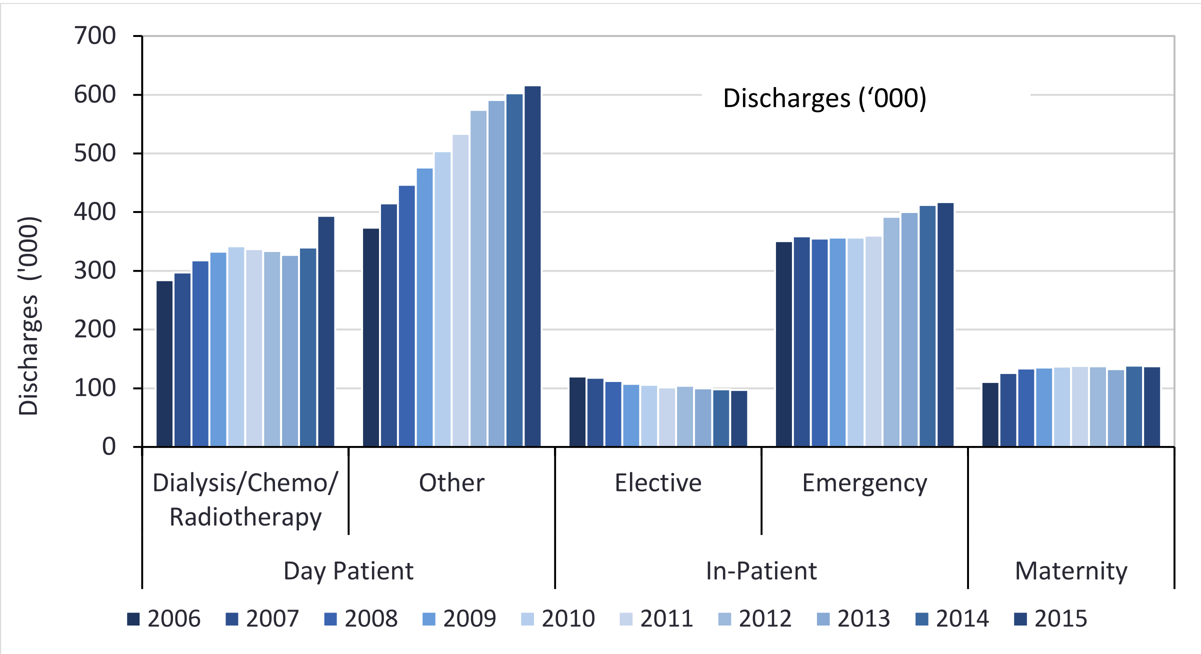
73 Dialysis includes day-patient discharges with a principal procedure of haemodialysis (ACHI procedure block 1060), chemotherapy includes day-patient discharges with a principal diagnosis of pharmacotherapy session for neoplasm (ICD-10-AM diagnosis code Z51.1), radiotherapy includes day-patient discharges with a principal diagnosis of radiotherapy session (ICD-10-AM diagnosis code Z51.0).

74 Due to restructuring of the hospital system a large number of discharges from St. Luke's Radiation Oncology Network were not being returned to HIPE since its establishment in April 2011 to 2014. The Healthcare Pricing Office estimated that approximately 53,000 day-patient discharges received radiotherapy from St. Luke's Radiation Oncology Network in 2014. In 2015, these discharges (approximately 49,000) are included in the day-patient figures (6).

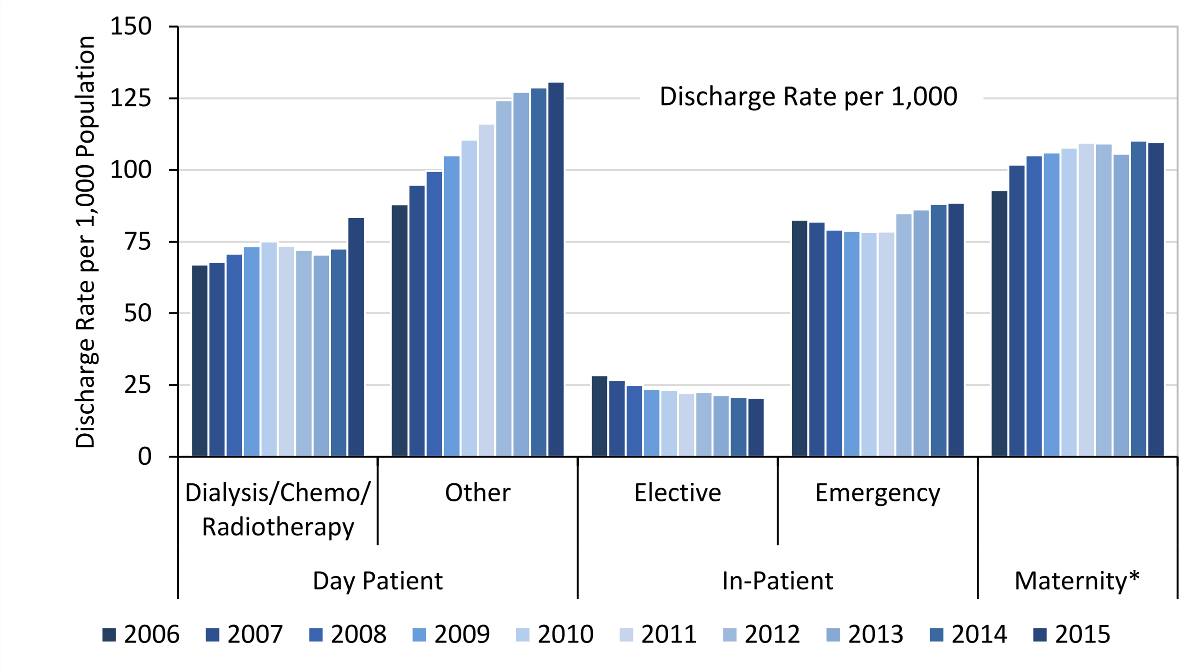
For inpatients there was a 19.0 per cent increase in the number of emergency inpatients compared to a 7.1 per cent increase in the discharge rate. Unlike all other patient types elective inpatients are the only group where the change in the discharge rate (-27.3 per cent) was greater than the change in the number of discharges (-19.2 per cent). The increase in the number of emergency inpatient discharges from 2012 is an example of how a change in reporting can impact on the trends seen in the data. From 2012 onwards there was an increase in the number of AMU/AMAU/MAUs operating.[75] Patients admitted from these units are classified as emergency inpatients.

For maternity discharges an increase in the number of discharges is evident between 2006 and 2009 at which point it stabilises. Between 2006 and 2015 maternity discharges grew by 24.4 per cent. Over the same period the discharge rate increased by 18.1 per cent. The discharge rate per 1,000 population for maternity discharges is calculated from the female population aged 14 to 51 years.

FIGURE 5.1 DISCHARGES AND DISCHARGE RATE PER 1,000 POPULATION BY PATIENT TYPE, 2006 TO 2015



75 A Medical Assessment Unit (MAU) also referred to as an Acute Medical Assessment Unit (AMAU) or an Acute Medical Unit (AMU), is a consultant-led unit that accepts direct referrals from GPs. It offers priority access to diagnostic facilities (7).



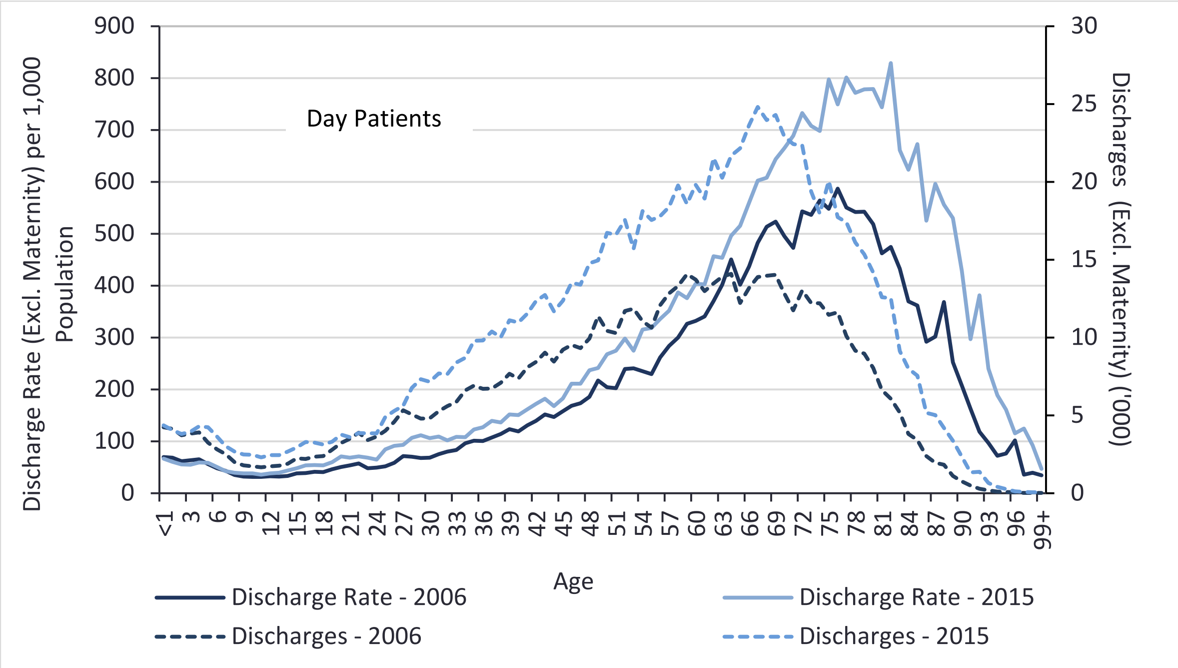
Sources: HIPE, 2006-2015; ESRI population data, 2006–2015.
Note: * The maternity discharge rate is calculated from the female population aged 14–51 years.

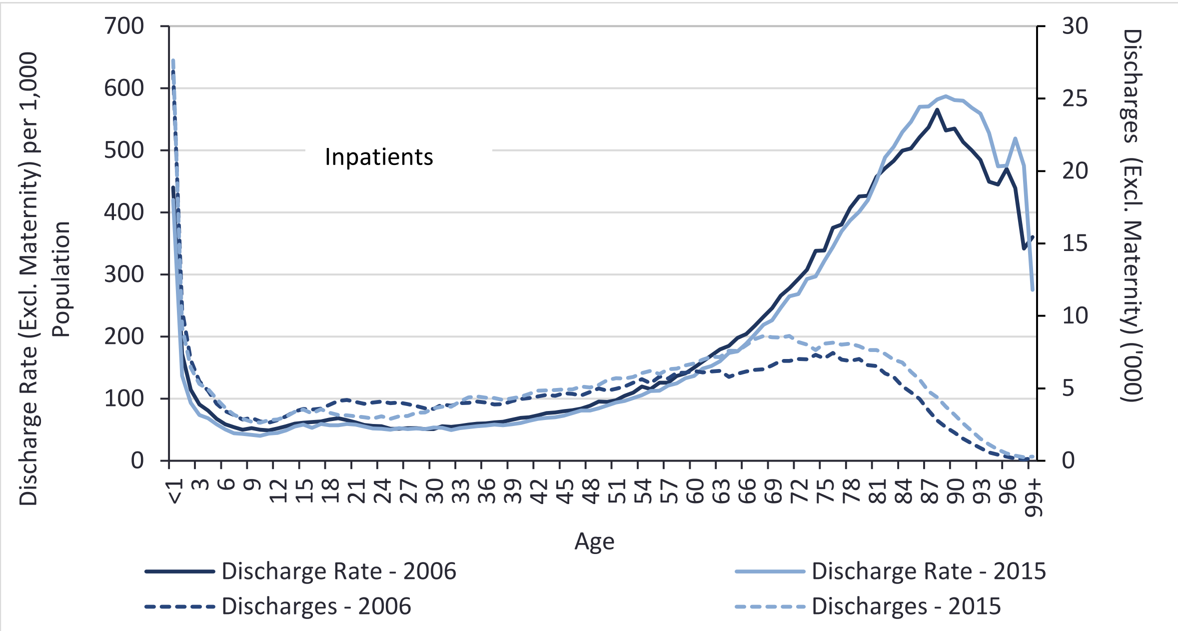
When disaggregated by patient type and single year of age (Figure 5.2) the biggest increases in both numbers of discharges and discharge rates between 2006 and 2015 are observed for day patients in the 75–84 years (76.5 per cent and 49.8 per cent respectively) and 85 years and over (153.5 per cent and 96.6 per cent respectively) age groups. The only age groups for which the growth in the day-patient discharge rate is higher than the growth in absolute numbers of discharges are for those aged 15–24 years (32.0 and 17.6 per cent respectively) and 25–34 years (41.2 and 34.0 per cent respectively).

Older inpatients are observed to have much higher discharge rates than younger inpatients but the absolute number of discharges is evenly distributed across the age groups, with the exception of the cohort aged under one year.[76] This is in contrast to day patients where there are significant increases in both volume of discharges and the discharge rate with age. For inpatients, while there have been small increases in the number of discharges in all age groups 35 years and over, there has been a decrease in the age-specific discharge rates over time in almost all of these groups. The oldest age cohort, 85 years and over, was the only age group where an increase in discharges (50.2 per cent) was accompanied by an increase in the discharge rate per 1,000 population (9.7 per cent).

[76] The absolute number of discharges and the discharge rate per 1,000 population is high for those aged under one year. A large proportion of discharges aged under one year in 2015 are in the admission type 'newborn' in HIPE (43.9 per cent). These are patients aged between 0–27 days who are categorised as inpatients following delivery due to conditions such as being preterm, respiratory issues, neonatal jaundice, or observation for infection. It should be noted that well new-born babies are not coded in Ireland and so do not appear as discharges in HIPE (Irish Coding Standard 1607).

FIGURE 5.2 AGE-SPECIFIC DISCHARGE RATE PER 1,000 POPULATION AND DISCHARGES (EXCL. MATERNITY) BY PATIENT TYPE, 2006 AND 2015





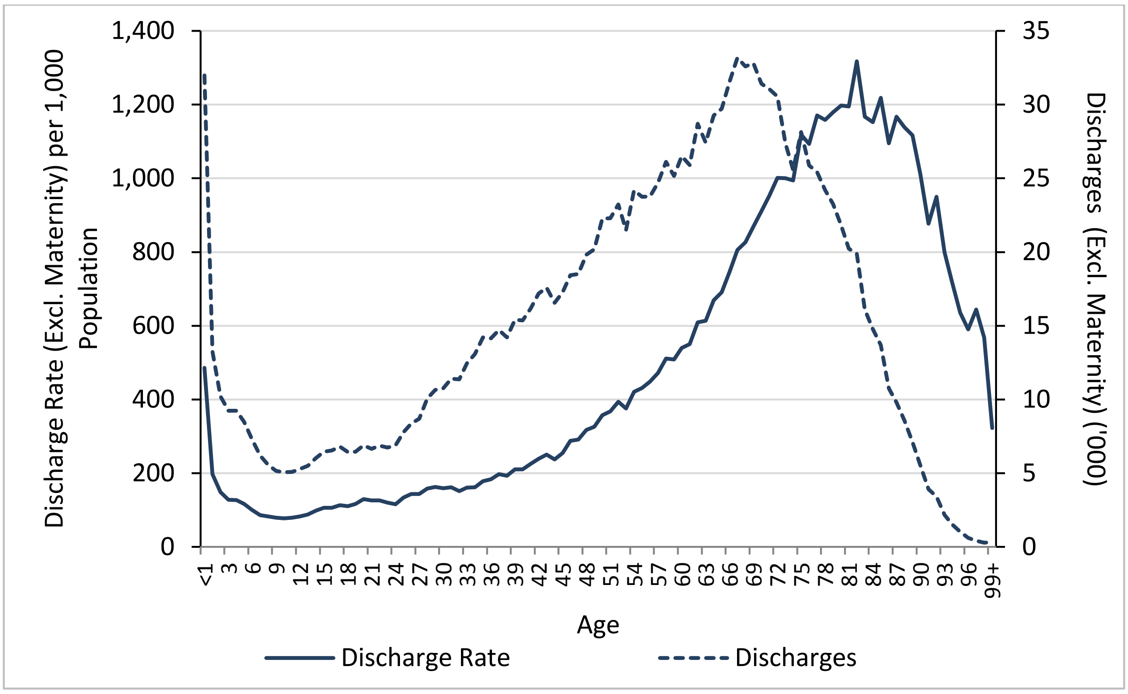
Sources: HIPE, 2006-2015; ESRI population data, 2006–2015.

5.3 FINDINGS – BASELINE UTILISATION

5.3.1 IPDC discharges (excl. maternity), 2015

Excluding maternity discharges, there were a total of 1,524,362 public hospital discharges (including day-patient and inpatient discharges) reported in 2015. Figure 5.3 illustrates the difference between the absolute number of discharges (excl. maternity) and the discharge rate per 1,000 population by single year of age. The age distribution for the absolute number of discharges peaks at 67 years in 2015, while the distribution of discharges per 1,000 population peaks at 82 years. For every 1,000 members of the population aged 82 years old there were 1,318 acute public hospital discharges.

FIGURE 5.3 AGE-SPECIFIC DISCHARGE RATE PER 1,000 POPULATION AND DISCHARGES (EXCL. MATERNITY), 2015

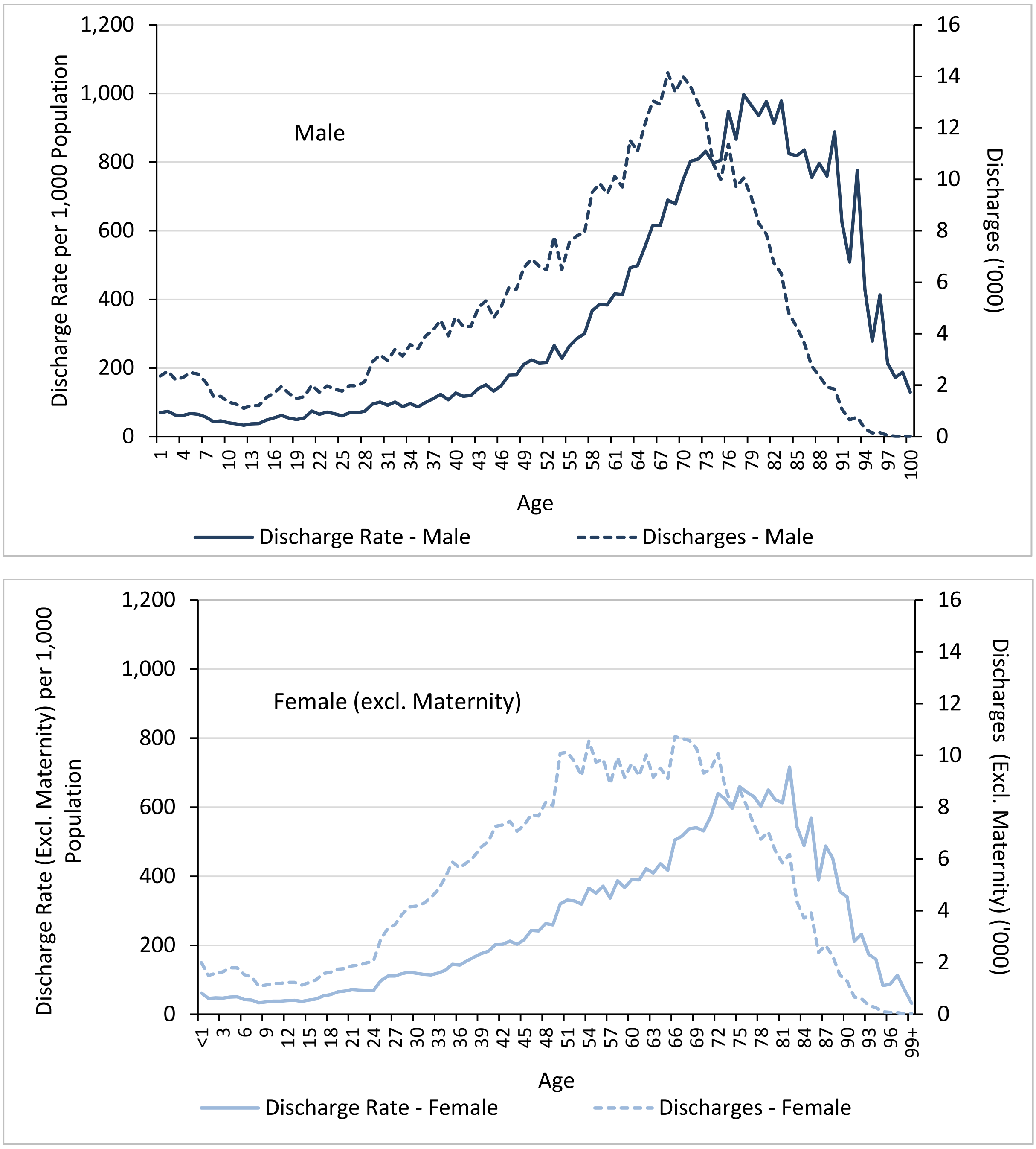


Sources: HIPE, 2015; ESRI population data, 2015.

Day-patient discharges

Figure 5.4 presents the age-specific discharges and discharge rates per 1,000 population for day patients (excl. maternity) in 2015 by sex. In 2015, there were 1,010,022 day-patient discharges recorded in acute public hospitals. Both the number of day-patient discharges and the discharge rate increase steadily with age for both males and females. Volumes of discharges are higher for females than for males from 23 to 56 years at which point the number of female discharges levels off, and the number of male discharges increases, peaking at 67 years. The discharge rate for females (excl. maternity) was higher than that for males between the ages of 23 and 56. The male discharge rate exceeded the female discharge rate for all age cohorts 59 years and older. The discharge rate for females peaked at 82 years (716.3 discharges per 1,000 population) compared to 77 years for males (996.5 discharges per 1,000 population).

FIGURE 5.4 AGE-SPECIFIC DISCHARGE RATE PER 1,000 POPULATION AND DISCHARGES (EXCL. MATERNITY) DAY PATIENTS BY SEX, 2015



Sources: HIPE, 2015; ESRI population data, 2015.

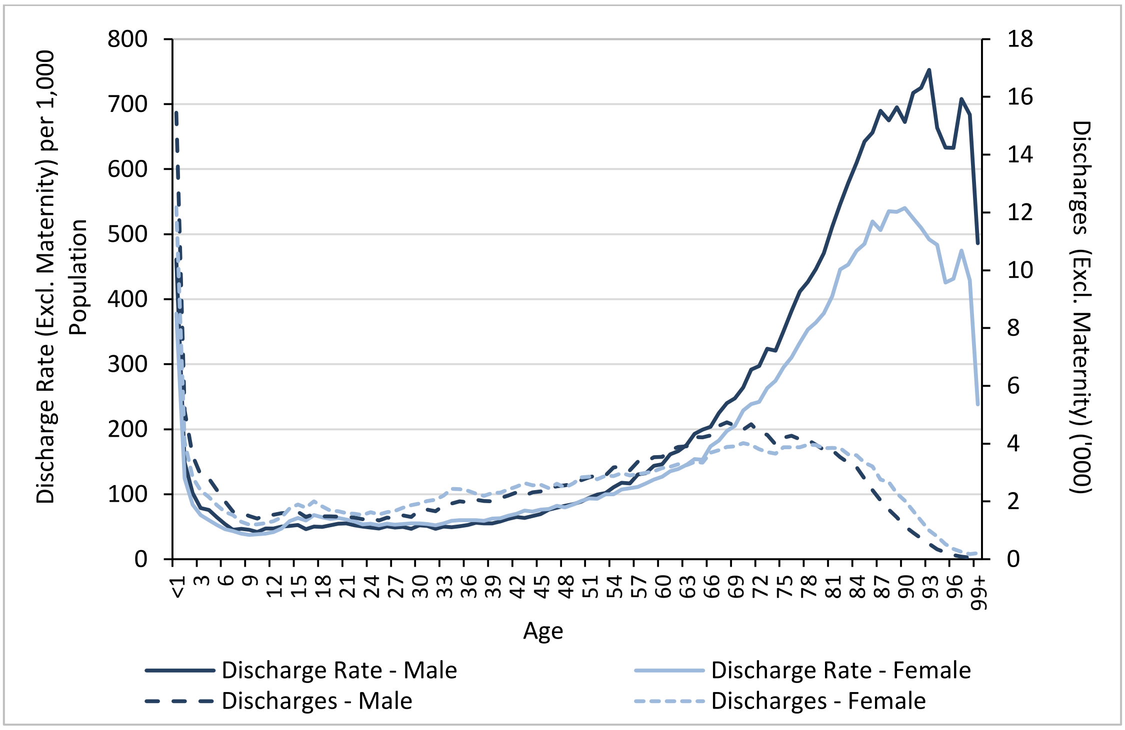
Inpatient discharges

Figure 5.5 disaggregates the age-specific inpatient discharges (excl. maternity) and discharge rates per 1,000 population by sex. In 2015, there were 514,340 inpatient discharges recorded in acute public hospitals. The volume of total inpatient discharges increases gradually with age, following high absolute numbers and discharge rates for the group aged under one year,[77] in contrast to

[77] See previous footnote.

the discharge rate which increases sharply with age in older age groups. Volumes of inpatient discharges were similar for males and females in 2015; however the patterns of discharge rates differed for older age groups. Discharge rates are higher for males than for females from approximately the age of 50 with the differential increasing substantially for the oldest discharges (85 years and over). The male inpatient discharge rate peaks at 93 years of age at a rate of 752.8 inpatient discharges per 1,000 population. In contrast, the female rate peaks at 90 years of age at 539.9 inpatient discharges per 1,000 population. This disparity in utilisation rates between men and women for the oldest old could be associated with higher rates of residential long-term care use by females at the end of life which can act as a substitute to more costly public acute care (8). This phenomenon is considered again in Chapter 9.

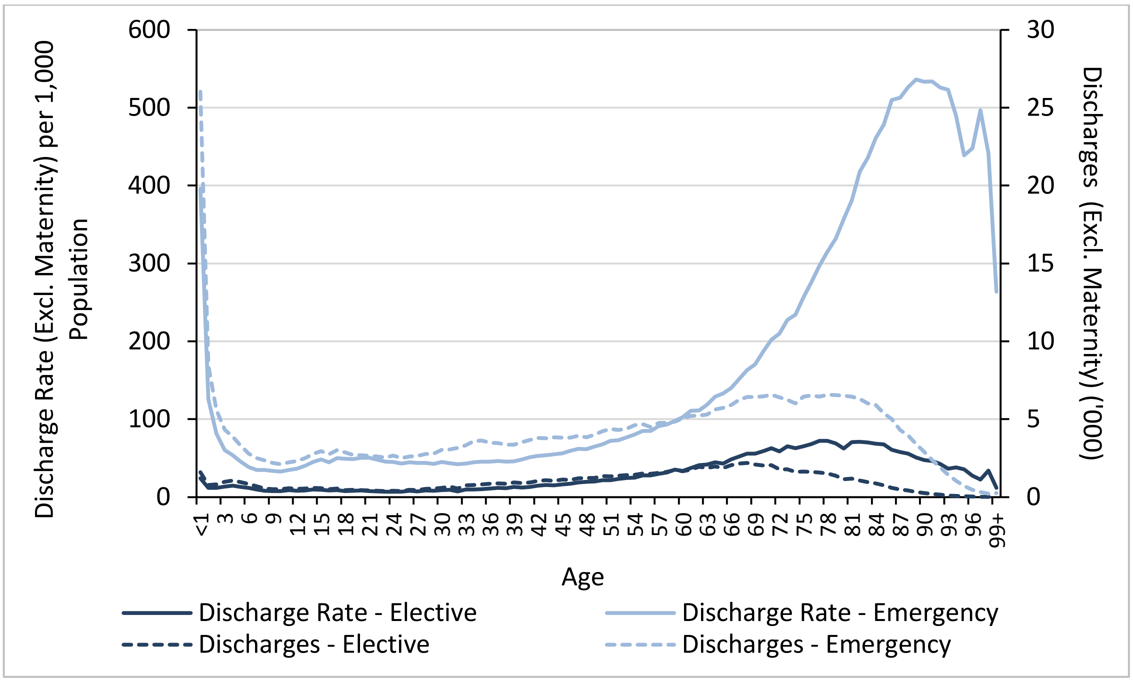
FIGURE 5.5 AGE-SPECIFIC DISCHARGE RATE PER 1,000 POPULATION AND DISCHARGES (EXCL. MATERNITY) INPATIENTS BY SEX, 2015



Sources: HIPE, 2015; ESRI population data, 2015.

Figure 5.6 presents age-specific inpatient discharge rates per 1,000 population (excl. maternity) and numbers of inpatient discharges disaggregated by admission type (elective and emergency). Elective inpatient discharges accounted for 18.9 per cent of total inpatient discharges in 2015 with emergency discharges accounting for the remaining 81.1 per cent. Elective inpatient discharge volumes and the discharge rate follow a very similar pattern, increasing steadily with age and peaking earlier for volumes of discharges (68 years) than the discharge rate (78 years). For emergency discharges the number of discharges peaks at under one year old while the discharge rate peaks at 89 years. Compared to the elective discharge rate, there is a considerably more pronounced increase in the emergency discharge rate at older ages.

FIGURE 5.6 AGE-SPECIFIC DISCHARGE RATE PER 1,000 POPULATION AND DISCHARGES (EXCL. MATERNITY) INPATIENTS BY ADMISSION TYPE AND SEX, 2015

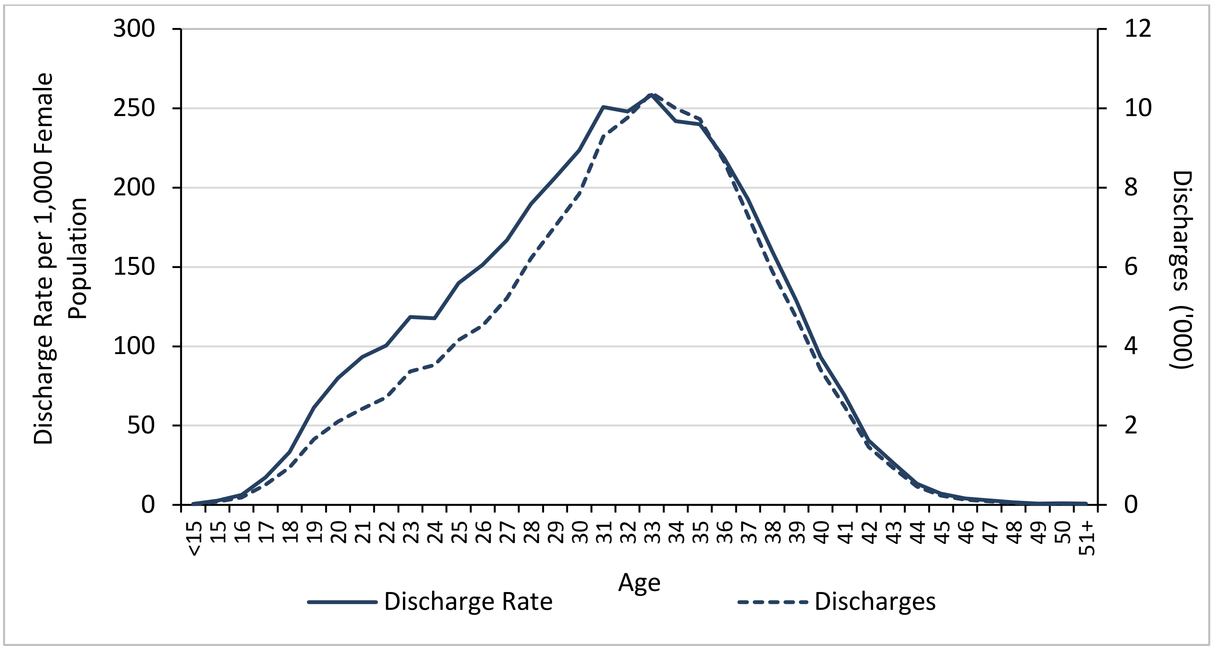


Sources: HIPE, 2015; ESRI population data, 2015.

5.3.2 Maternity discharges

Figure 5.7 presents age-specific maternity discharges and the discharge rate (per 1,000 population), in 2015. In this year, 137,628 discharges from HIPE were classified as maternity. Maternity discharges capture both delivery and non-delivery episodes of care. It should be noted that all delivery episodes of care are classified as inpatients and for maternity discharges no distinction is made between elective and emergency inpatients. In 2015, 64,115 (46.6 per cent) of total maternity discharges were classified as delivery. The distribution of discharges and the discharge rate follow a similar pattern with both the age-specific volume of maternity discharges (10,387) and the rate of discharge (258.5 discharges per 1,000 population) peaking at 33 years of age.

FIGURE 5.7 AGE-SPECIFIC MATERNITY DISCHARGE RATE PER 1,000 FEMALE POPULATION AND DISCHARGES, 2015



Sources: HIPE, 2015; ESRI population data, 2015.
Note: Includes delivery and non-delivery episodes of care.

5.3.3 Inpatient bed days, 2015

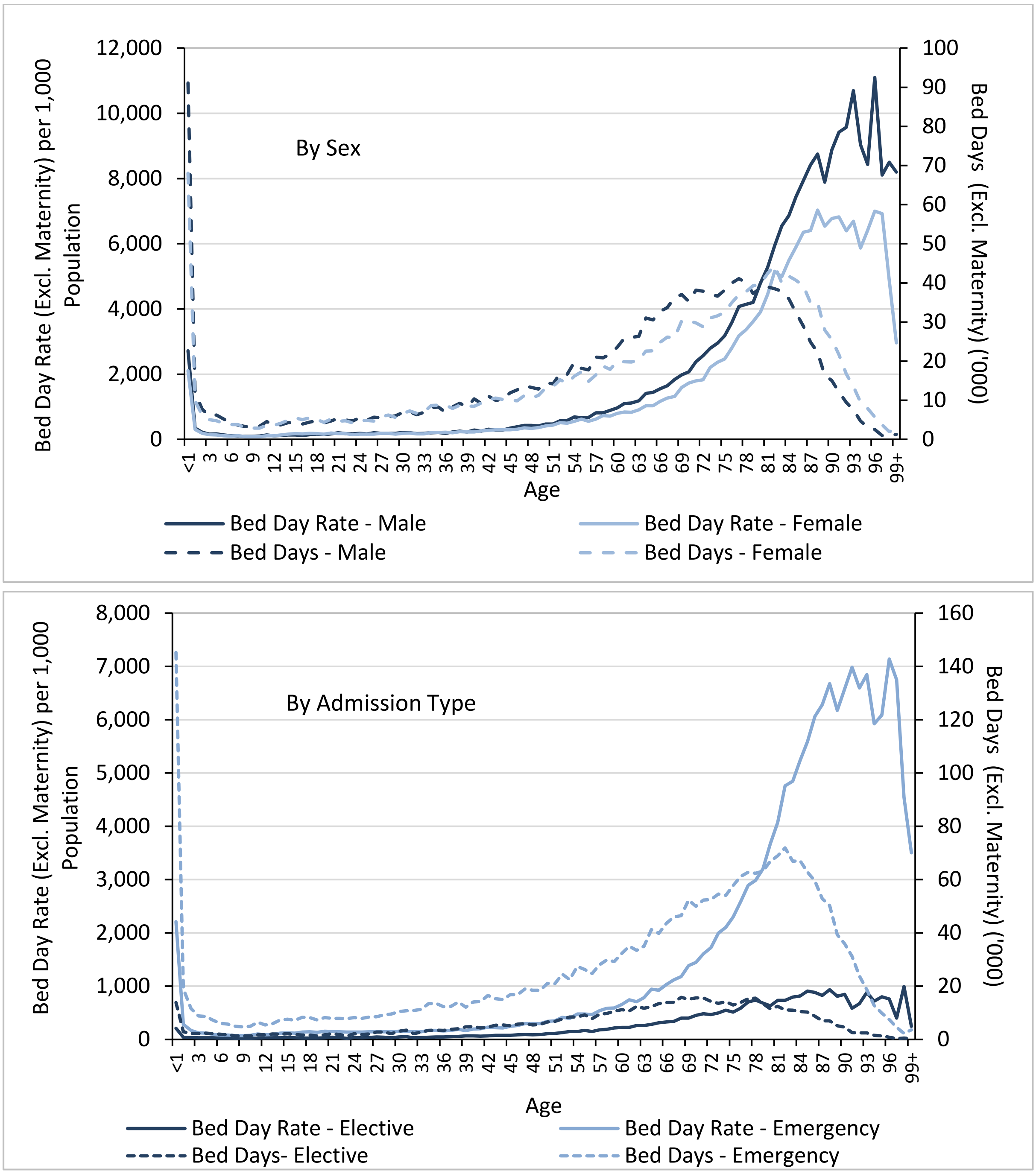
Figure 5.8 presents age-specific inpatient bed day rates per 1,000 population and bed days (excl. maternity) by sex for 2015. In total there were 3,272,950 inpatient bed days recorded in 2015 with 49.1 per cent attributed to female inpatients and the remaining 50.9 per cent attributable to male inpatients. For both sexes, and similar to the distribution of inpatient discharges, the number of bed days increase gradually with age, following high absolute numbers and bed day rates for the group aged under one year. In contrast, the bed day rate increases sharply with age in older age cohorts for both sexes. The bed day rate peaks at age 88 (7,033 bed days per 1,000) for females and at 98 years for males[78] (11,908 bed days per 1,000 population). Similar to the pattern observed for discharge rates, the male bed day rate exceeds the female bed day rate at older ages.

Figure 5.8 also presents age-specific inpatient bed day rates per 1,000 population and bed days (excl. maternity) by admission type (elective and emergency) for 2015. In 2015, emergency inpatients accounted for 80.9 per cent of total bed days while elective inpatients accounted for the remainder. This is very similar to the share of inpatient emergency (81.1 per cent) and elective (18.9 per cent) discharges. Elective inpatient bed days and the bed day rate increase steadily with age. The number of bed days peaks at 68 years while the bed day rate peaks

[78] Although there is strong variability evident in the male inpatient bed day rate at older ages.

later at 98 years. For emergency bed days, the number of bed days peaks at less than one year old while the bed day rate peaks at 96 years. There is a very pronounced increase in the emergency bed day rate at older ages, which is not observed for the elective bed day rate.

FIGURE 5.8 AGE-SPECIFIC INPATIENT BED DAY RATE PER 1,000 POPULATION AND BED DAYS (EXCL. MATERNITY), BY SEX AND ADMISSION TYPE, 2015

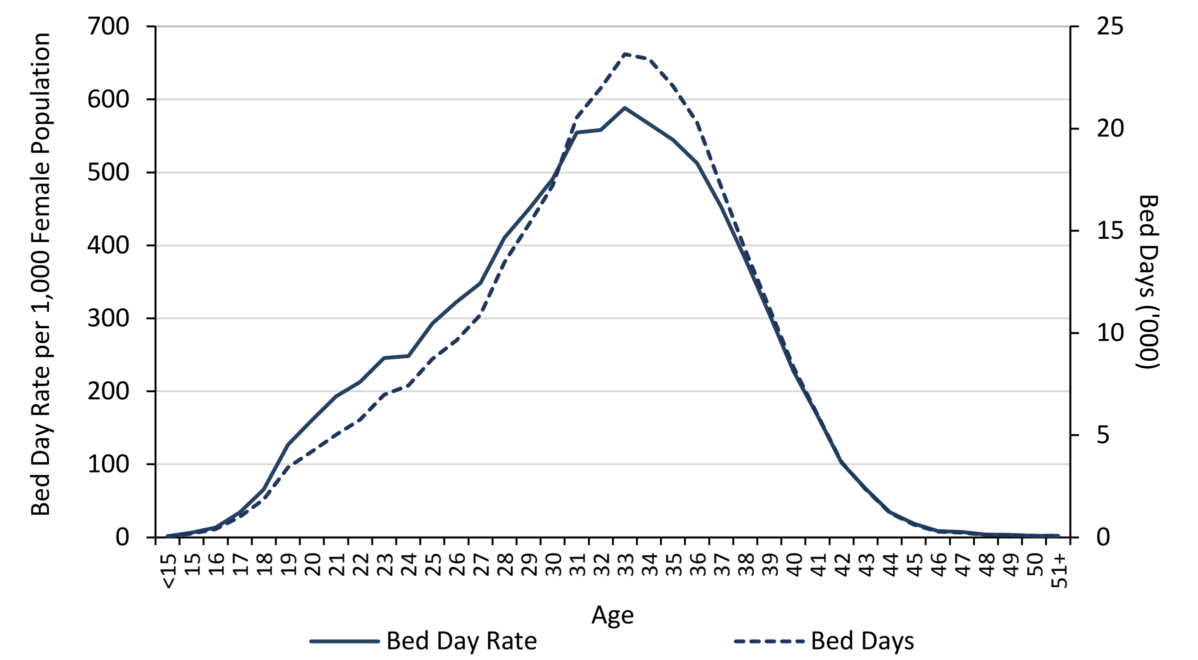


Sources: HIPE, 2015; ESRI population data, 2015.

Figure 5.9 presents age-specific inpatient maternity bed day rate (per 1,000 population) and bed days for 2015. In total there were 308,995 maternity inpatient bed days recorded in 2015. The distribution of inpatient bed days and bed day rates follow a similar pattern to the volume of total discharges and the discharge rate, both peaking at 33 years of age.

Combining inpatient bed days (excl. maternity) and maternity inpatient bed days and converting this demand for bed days into beds available using the formula presented in Chapter 3 suggests there were 10,440 inpatient beds available in Irish public hospitals in 2015, applying the cited 94 per cent average bed occupancy rate estimated for Irish public hospitals (10). This inpatient bed figure is very similar to the number recorded by the DoH (10,473) for 2015 and acts as a useful validation of the baseline inpatient bed day activity volumes presented in this chapter.

FIGURE 5.9 AGE-SPECIFIC MATERNITY INPATIENT BED DAY RATE PER 1,000 FEMALE POPULATION AND BED DAYS, 2015



Sources: HIPE, 2015; ESRI population data, 2015.

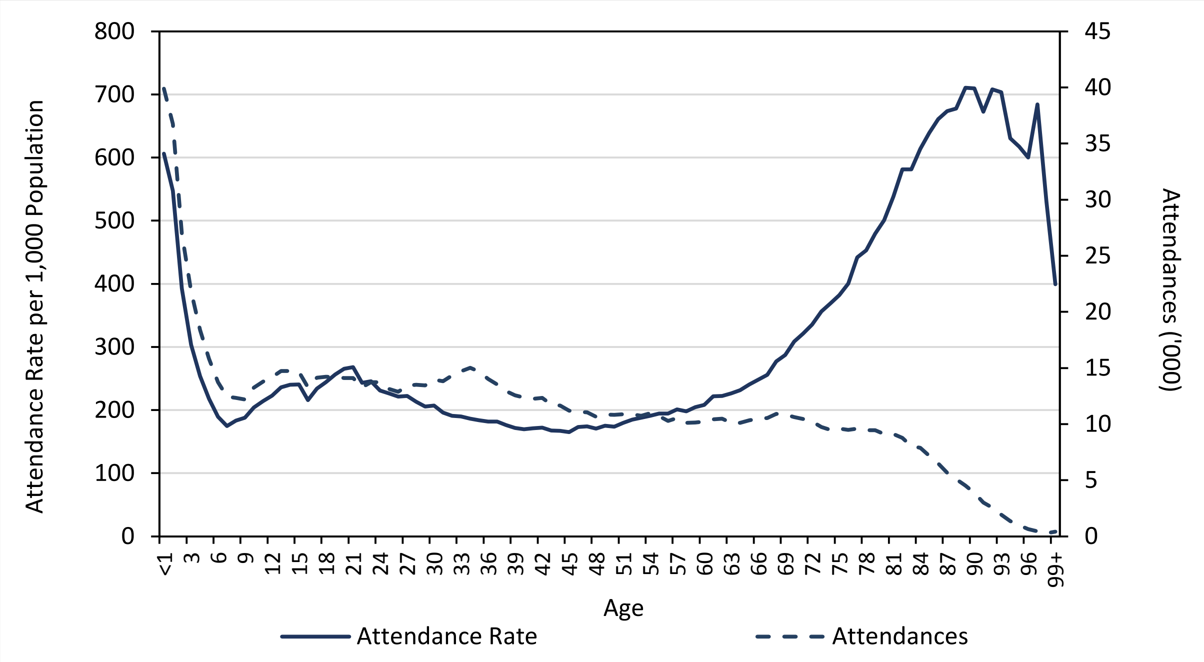
5.3.4 Public hospital Emergency Department attendances - 2015

A total of 1,137,650 ED attendances are accounted for in the data for 2015.[79] Figure 5.10 presents the age-specific number of attendances and attendance rate per 1,000 population for total attendances in 2015. While the number of ED attendances generally decreases with age, the rate shows more fluctuation. There are relatively high attendance rates for children under the age of six years,

79 The total number of patient attendances reported in the PET database, before adjustments, in 2015 was 1,136,468 (see Section 3.4.1).

particularly those less than one year old for whom there are also a high number of attendances. There is a subsequent increase in activity around the age of 20 years. The highest attendance rates are associated with older age cohorts (85 years and over) though they account for the lowest absolute numbers of attendances.

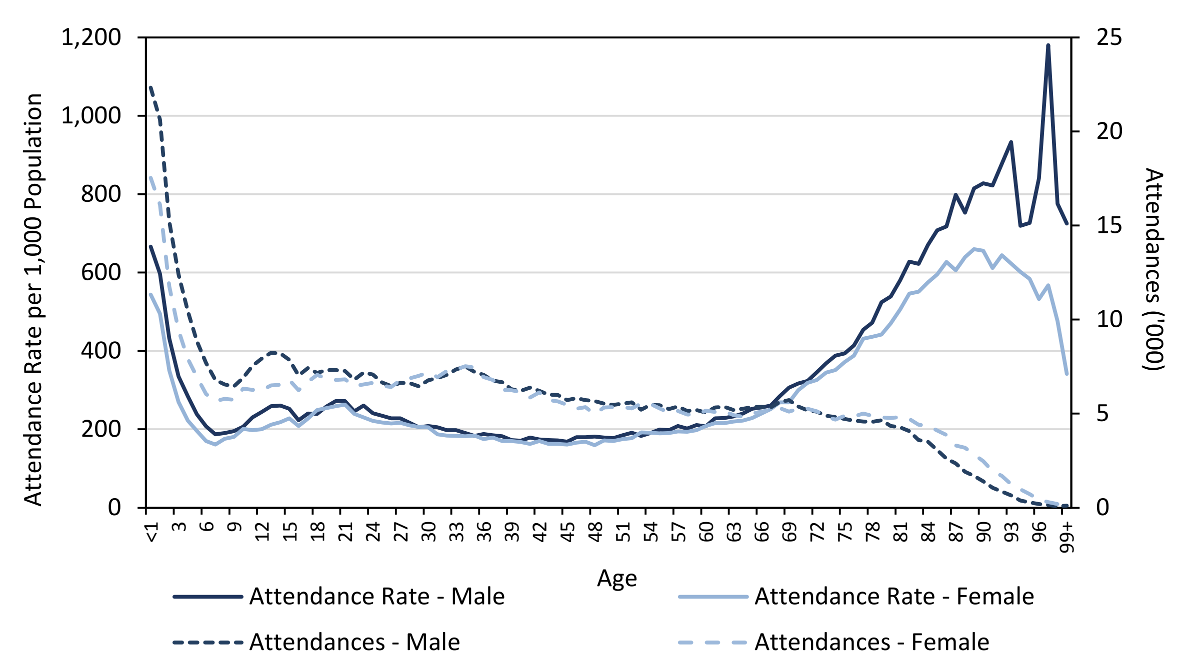
FIGURE 5.10 AGE-SPECIFIC EMERGENCY DEPARTMENT ATTENDANCE RATE AND ATTENDANCES, 2015



Sources: HSE BIU – Emergency Department Attendance Data and Patient Experience Time Data; ESRI population data, 2015.

Figure 5.11 which disaggregates ED attendance data by sex shows similar patterns for males and females. The analysis shows higher rates per 1,000 population for males than females in the older age groups but with low absolute numbers of attendances for both. The higher ED attendance rates for males relative to females at older ages are noteworthy. Similar patterns were observed for hospital discharge rates at older ages (see Figure 5.5). As with hospital discharge activity, this finding might be related to gender disparity in the use of long-term residential care services. Long-term residential care services may partly act as a substitute for acute care, in this instance ED attendance, at the end of life and the higher utilisation of long-term residential care services by females may be reducing their need for ED, in these older age cohorts, relative to males.

FIGURE 5.11 AGE AND SEX-SPECIFIC EMERGENCY DEPARTMENT ATTENDANCE RATE AND ATTENDANCES, 2015



Sources: HSE BIU – Emergency Department Attendance Data and Patient Experience Time Data; ESRI population data, 2015.

5.3.5 Public hospital outpatient attendances – 2015

Table 5.1 presents the volume of OPD attendances by age cohort and attendance type in 2015. There were 3.3 million attendances, comprised of 28 per cent new attendances and 72 per cent return attendances. The majority of attendances were by adults (16–64 years) while the highest attendance rate was for older adults (65+) at 1,400 per 1,000 population.

TABLE 5.1 OUTPATIENT ACTIVITY DATA, 2015

		Age	2015		Rate*
			N	%	
(i)	New Children	0-15	134,053	4.1	
(ii)	New Adults	16-64	604,605	18.3	
(iii)	New Older Persons	65+	184,722	5.6	
(i)+(ii)+(iii)	**New Attendances (Total)**	**All**	**923,380**	**28.0**	
(iv)	Return Children	0-15	277,223	8.4	
(v)	Return Adults	16-64	1,435,157	43.5	
(vi)	Return Older Persons	65+	663,108	20.1	
(iv)+(v)+(vi)	**Return Attendances (Total)**	**All**	**2,375,488**	**72.0**	
(i)+(iv)	Total Children	0-15	411,276	12.5	383.6
(ii)+(v)	Total Adults	16-64	2,039,762	61.8	673.1
(iii)+(vi)	Total Older Persons	65+	847,830	25.7	1,392.6
(i)+(ii)+(iii)+(iv)+(v)+(vi)	**Total Attendances (New + Return)**	**All**	**3,298,868**	**100.0**	**700.2**

Sources: HSE BIU – Emergency Department Attendance Data; ESRI population data, 2015.
Note: * Outpatient Attendance Rate per 1,000 Population.

5.4 FINDINGS – UNMET DEMAND

In this section, for ease of presentation, all findings are presented in table form. For the inpatient and day-patient analyses, single-year of age rates and volumes are presented in terms of 10-year age cohorts.

5.4.1 IPDC public hospital discharges, unmet demand 2015

Table 5.2 presents unmet demand estimates for day-patient treatment at the end of 2015 across different thresholds of unmet demand.[80] The rate of unmet demand for day-patient care broadly increases with age peaking in the 80-89 age cohort across all thresholds. For this age cohort, under the high volume threshold which largely reflects maximum waiting time targets recently proposed by the Oireachtas Committee on Healthcare Reform (9), there were 37.3 cases of unmet demand for day-patient care per 1,000 of the population recorded at the end of 2015.

Under the low volume threshold, there is an estimated overall unmet demand of over 15,700 day-patient cases at the end of 2015 corresponding to a rate of 3.3 cases per 1,000 population. In comparison, under the high volume threshold, there is an estimated unmet demand of over 49,500 day-patient cases at the end of 2015 corresponding to a rate of 10.5 day-patient cases per 1,000 population.

[80] For a detailed description of the unmet demand threshold applied in this analysis, see Section 3.5.1.

TABLE 5.2 AGE-SPECIFIC UNMET DEMAND – DAY-PATIENT TREATMENT, 2015

Age	Low Volume Threshold[1]		Medium Volume Threshold[2]		High Volume Threshold[3]	
	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand
<10	2.2	1,508	2.8	1,973	3.5	2,410
10-19	1.4	863	2.6	1,620	3.3	2,030
20-29	2.0	1,168	5.2	2,998	6.4	3,723
30-39	2.3	1,725	6.5	4,833	8.2	6,123
40-49	3.1	2,073	8.7	5,889	10.9	7,359
50-59	3.8	2,141	10.6	5,932	13.4	7,448
60-69	5.2	2,269	14.6	6,362	18.3	7,980
70-79	8.7	2,274	23.4	6,139	28.8	7,545
80-89	12.9	1,545	30.9	3,710	37.3	4,488
90+	5.8	135	15.7	365	18.8	438
Total	**3.3**	**15,701**	**8.5**	**39,821**	**10.5**	**49,544**

Sources: NTPF, 2015; ESRI population data, 2015.
Notes: 1. Children waiting > 140 days; Adults waiting > 240 days.
2. Routine cases waiting > 120 days; Urgent cases waiting > 30 days.
3. Routine cases waiting > 84 days; Urgent cases waiting >15 days.

Table 5.3 presents unmet demand estimates for elective inpatient treatment at the end of 2015. For all thresholds, children aged under ten years have relatively high rates of unmet demand and volumes compared to adults up to the age of 40. For the remainder of the age distribution, and across all thresholds, there is a gradual overall increase with age in the rate of unmet demand at the end of 2015, peaking in the 70-79 age cohort. Under the low volume threshold, there is an overall rate of unmet demand of 1.5 cases per 1,000 which corresponds to an unmet demand of 7,107 elective cases at the end of 2015. However, the medium and high volume thresholds, reflecting international practice and Oireachtas Committee targets, classify considerably more inpatient elective waiting list cases as unmet demand at the end of 2015. For instance, under the high volume threshold, the rate of unmet demand more than doubles (3.7 per 1,000 population) compared to the Low volume threshold (1.5 per 1,000 population). This corresponds to over 10,000 additional elective inpatient cases.

TABLE 5.3 AGE-SPECIFIC UNMET DEMAND – ELECTIVE INPATIENT TREATMENT, 2015

Age	Low Volume Threshold[1]		Medium Volume Threshold[2]		High Volume Threshold[3]	
	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand
<10	1.7	1,192	2.3	1,595	2.8	1,941
10-19	1.3	793	2.0	1,245	2.4	1,462
20-29	1.0	581	2.1	1,227	2.4	1,400
30-39	0.9	684	2.0	1,501	2.3	1,751
40-49	1.2	822	2.7	1,800	3.1	2,099
50-59	1.7	967	4.1	2,258	4.8	2,653
60-69	2.4	1,032	5.7	2,491	6.9	2,999
70-79	3.0	775	7.7	2,019	9.0	2,351
80-89	2.1	250	5.6	675	6.5	784
90+	0.5	11	1.6	37	1.9	44
Total	**1.5**	**7,107**	**3.2**	14,848	**3.7**	17,484

Source: NTPF, 2015; ESRI population data, 2015.
Notes: 1. Children waiting > 140 days; Adults waiting > 240 days.
2. Routine cases waiting > 120 days; Urgent cases waiting > 30 days.
3. Routine cases waiting > 84 days; Urgent cases waiting >15 days.

Table 5.4 presents estimates of unmet demand for elective inpatient bed days at the end of 2015. As noted in Section 3.5.1, in estimating bed days not realised at the end of 2015 we assume that each cohort of elective inpatient waiters would have, if treated, recorded their cohort-specific average elective inpatient LOS reported in HIPE in 2015. Compared to the distribution of unmet demand for elective treatment presented in Table 5.3, there are greater rates and volumes of unmet demand for bed days concentrated in older age cohorts. For instance, under the medium unmet demand threshold, 35 per cent of elective inpatient cases were concentrated in the 60 and over age cohorts, but this rises to 50 per cent when unmet demand is measured in terms of bed days. Similar relationships are evident for the other thresholds. This reflects the longer hospital stays after elective procedures of older people. Under the high volume threshold we estimate an unmet demand for 99,138 elective inpatient bed days at the end of 2015, reflecting an overall unmet bed day rate of 21.0 beds days per 1,000 population.

TABLE 5.4 AGE-SPECIFIC UNMET DEMAND – ELECTIVE INPATIENT BED DAYS, 2015

Age	Low Volume Threshold[1]		Medium Volume Threshold[2]		High Volume Threshold[3]	
	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand
<10	4.4	3,033	6.0	4,202	7.5	5,202
10-19	4.2	2,578	6.6	4,049	7.7	4,748
20-29	4.5	2,591	9.6	5,567	10.9	6,349
30-39	4.1	3,060	8.9	6,701	10.4	7,810
40-49	5.9	4,000	13.0	8,756	15.1	10,209
50-59	9.9	5,516	23.1	12,872	27.2	15,143
60-69	15.8	6,864	38.2	16,613	46.0	20,025
70-79	24.9	6,522	65.0	17,004	75.6	19,785
80-89	24.0	2,888	65.0	7,813	75.7	9,101
90+	7.9	184	27.2	632	33.0	767
Total	**7.9**	**37,237**	**17.9**	**84,209**	**21.0**	**99,138**

Source: NTPF, 2015; HIPE, 2015; ESRI population data, 2015.
Notes: 1. Children waiting > 140 days; Adults waiting > 240 days.
2. Routine cases waiting > 120 days; Urgent cases waiting > 30 days.
3. Routine cases waiting > 84 days; Urgent cases waiting >15 days.

5.4.2 Public Outpatient Department care, unmet demand 2015

Table 5.5 presents unmet demand estimates for public Outpatient Department care at the end of 2015. The volume of unmet demand is highest in the 16-64 age cohort across all three thresholds. However when converted into rates of unmet demand the oldest age cohort (65+) experiences a relatively larger burden of unmet demand for OPD care. Under the low volume threshold, there is an unmet demand rate of 7.9 attendances per 1,000 population at the end of 2015. However, under medium and high volume thresholds, there is a substantial increase in the rate of unmet demand to 30.8 attendances per 1,000 population (medium volume) and 54.2 attendances per 1,000 population (high volume), respectively. Under the high volume threshold there is an unmet demand of in excess of 255,000 OPD attendances at the end of 2015.

TABLE 5.5 AGE-SPECIFIC UNMET DEMAND – PUBLIC OUTPATIENT CARE, 2015

Age	Low Volume Threshold[1]		Medium Volume Threshold[2]		High Volume Threshold[3]	
	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand	Unmet Demand Rate (per 1,000 population)	Unmet Demand
0-15	4.9	5,287	21.7	23,281	38.2	40,940
16-64	8.1	24,684	30.8	93,364	53.6	162,438
65+	11.8	7,193	46.4	28,261	85.3	51,950
Total	**7.9**	**37,164**	**30.8**	**144,906**	**54.2**	**255,328**

Sources: NTPF, 2015; ESRI population data, 2015.
Notes: 1. Waiting > 365 days.
2. Waiting > 180 days.
3. Waiting > 70 days.

5.5 FINDINGS – PROJECTIONS

As with projections presented in all other sectoral chapters, we present findings in terms of comparator and preferred projections. The comparator projections refer to projections of demand based purely on changes in our Central population growth assumption, holding activity rates constant, through the projection period. The preferred projection scenarios are those the authors consider most likely to be realised based on best available evidence (see Chapter 3). For IPDC and ED care, where proximity to death may be an important driver of demand, we argue it is reasonable to adopt a dynamic equilibrium healthy ageing assumption when modelling this type of care. For OPD care, the availability of only aggregated age cohorts does not facilitate the application of healthy ageing activity shifts. Furthermore, our comparator scenario (where no healthy ageing takes place) is considered as one of our preferred projections. Since demand for OPD care is likely to increase with the rising burden of chronic disease, it therefore differs from other acute services analysed in this chapter. As a consequence, a more conservative approach to healthy ageing may not be unreasonable. As with all chapters we focus on Central and High population growth projections as it is felt these are the more likely to be realised. Where unmet demand is applicable we apply the High Unmet Demand assumptions to model the impact the application of the Oireachtas Committee waiting time targets may have on projected demand.

5.5.1 IPDC public hospital discharges, projections 2015-2030

Figure 5.12 and Table 5.6 presents projections of demand for IPDC acute public hospital care from 2015 to 2030 based on these scenarios (with differing scenarios for maternity care below):

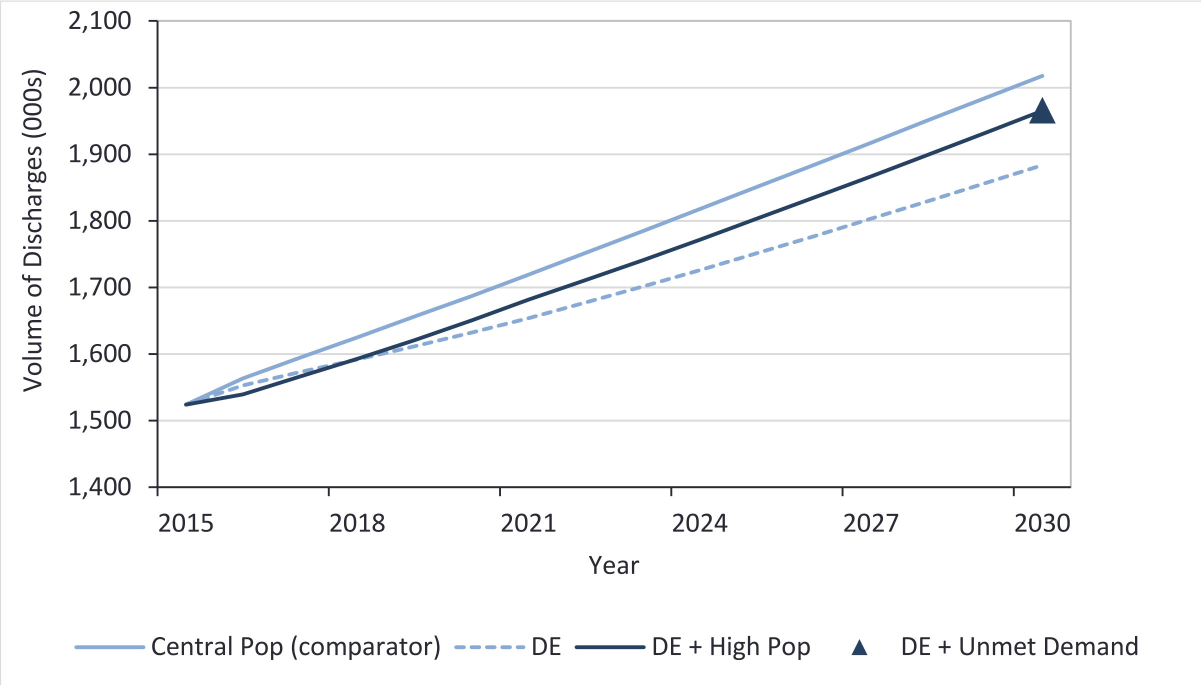
- *Comparator Central Population Growth scenario*: Assuming our Central population growth assumption alone (with no adjustments made to activity rates to account for healthy ageing or unmet demand) total discharge demand is projected to reach nearly 2.02 million in 2030. This is an increase of 32.4 per cent on 2015. Similar projected growth rates in demand are observed when total projected discharge volumes are disaggregated by day patients (32.5 per cent), total inpatients (32.1 per cent), elective inpatients (30.6 per cent) and emergency inpatients (32.4 per cent). The relative increase in projected bed day demand is greater than for projected discharge demand. Demand for total, elective, and emergency inpatient bed days is expected to be 47.4 per cent, 41.9 per cent and 48.7 per cent higher, respectively, in 2030 than 2015. This reflects older individuals' use of services more intensively as well as more frequently; and as the population ages, growth in projected inpatient bed day demand exceeds projected growth in discharge demand. None of these projections, however, represents a preferred projection and they may be pessimistic since no adjustment is made to reflect the impact future healthy population ageing may have on projected demand.

Preferred projection scenarios

- *Dynamic Equilibrium:* Applying the same population growth assumption but assuming Dynamic Equilibrium, total discharge demand is projected at 1.89 million in 2030. This represents a 23.6 per cent increase over demand in 2015. However, the increase in demand is 8.8 percentage points lower than under the comparator projection scenario. Lower overall increases in demand were also observed for day-patient and inpatient care breakdowns. In particular, our healthy ageing assumptions have a larger impact on projected demand growth for bed days. Under dynamic equilibrium, demand for total, elective, and emergency inpatient bed days is projected to be 32.2 per cent, 28.2 per cent and 33.4 per cent higher, respectively, in 2030 than 2015.
- *Dynamic Equilibrium with High Population Growth:* The High population growth projection with assumed Dynamic Equilibrium yields projected discharge demand of 1.96 million in 2030. This represents a 28.9 per cent increase over the 2015 baseline. The relative effect on demand for care under the High population growth assumption is driven primarily by higher assumed inward migration which primarily affects the size of younger age cohorts. While demand does increase relative to the DE and Central population growth assumption, its effect is perhaps muted slightly given lower observed activity rates among younger adults.
- *Dynamic Equilibrium and High Unmet Demand:* A Central population growth assumption, with assumed Dynamic Equilibrium and the addition of high Unmet Demand at baseline, projects demand for 1.97 million public hospital discharges in 2030. This represents a 29.0 per cent

increase over the 2015 baseline. The addition of unmet demand to utilisation in the base year leads to an addition to projected demand of 61,300 day-patient cases, 20,500 elective inpatient cases and 122,100 elective inpatient bed days in 2030.

FIGURE 5.12 PROJECTED DEMAND FOR TOTAL IPDC DISCHARGES, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.

TABLE 5.6 PUBLIC IPDC HOSPITAL CARE DEMAND PROJECTIONS 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

Activity		Baseline Activity -2015	Percentage change 2015-2030			
			Comparator	Preferred projections		
		Volumes of discharges/ bed days	Central Population Only % change	Dynamic Equilibrium % change	Dynamic Equilibrium + High Population % change	Dynamic Equilibrium + Unmet Demand % change
Total Discharges	Male	762,809	34.9	24.1	29.5	29.2
	Female	761,553	29.8	23.0	28.3	28.7
	Total	**1,524,362**	**32.4**	**23.6**	**28.9**	**29.0**
Day-patient Discharges	Male	503,648	35.6	24.5	29.2	30.3
	Female	506,374	29.5	22.3	27.0	28.6
	Total	**1,010,022**	**32.5**	**23.4**	**28.1**	**29.4**
Total Inpatient Discharges	Male	259,161	33.7	23.8	30.8	27.7
	Female	255,179	30.4	23.2	29.6	27.4
	Total	**514,340**	**32.1**	**23.5**	**30.2**	**27.5**
Total Inpatient Bed Days	Male	1,667,551	50.5	33.4	38.2	37.7
	Female	1,605,399	44.2	31.0	35.1	34.7
	Total	**3,272,950**	**47.4**	**32.2**	**36.7**	**36.2**
Elective Inpatient Discharges	Male	47,811	32.6	22.7	28.6	43.8
	Female	49,204	28.7	21.2	26.4	42.3
	Total	**97,015**	**30.6**	**21.9**	**27.5**	**43.0**
Elective Inpatient Bed Days	Male	315,941	43.5	29.7	34.9	49.1
	Female	310,552	40.2	26.7	30.4	46.3
	Total	**626,493**	**41.9**	**28.2**	**32.6**	**47.7**
Emergency Inpatient Discharges	Male	211,350	34.0	24.0	31.4	-
	Female	205,975	30.8	23.2	29.8	-
	Total	**417,325**	**32.4**	**23.6**	**30.6**	**-**
Emergency Inpatient Bed Days	Male	1,351,610	52.1	35.4	40.7	-
	Female	1,294,847	45.1	31.3	35.6	-
	Total	**2,646,457**	**48.7**	**33.4**	**38.2**	**-**

Activity		Baseline Activity - 2015	Percentage change 2015-2030			
		Numbers of Discharges/Bed Days	Central Population Only % change	High Population Only % change		
Maternity Discharges	Total	137,628	-5.2	9.4	-	-
Inpatient Maternity Bed Days	Total	308,995	-6.0	8.6	-	-

Source: Authors' calculations.
Note: We do not apply healthy ageing shifts to projected demand for maternity care as services are predominantly used by younger women.

Preferred projection scenarios for maternity care

- *Central Population Growth scenario*: Notably, discharge (bed day) demand for maternity care is projected to decrease by 5.2 (6.0) per cent by 2030 based purely on changes in our Central population growth assumption, which is one of our preferred scenarios for this service. We do not apply healthy ageing shifts to projected demand for maternity care as services are predominantly used by younger women. The decline in the absolute numbers in the 30 to 39 age cohort over time coupled with the fact that they have the highest age-specific fertility rates leads to births being lower over time in this scenario. Positive net migration helps to dampen this effect somewhat (so the decline in births would be stronger in the absence of migration).
- *High Population Growth scenario:* Under our High population growth assumption, with no healthy ageing assumed, the volume of maternity discharges (bed day) is expected to be 9.4 (8.6) per cent higher in 2030 compared to 2015. The large level of net inward migration assumed under this scenario, coupled with an assumed higher fertility rate, explain the projected increase in maternity discharge and bed day volumes.

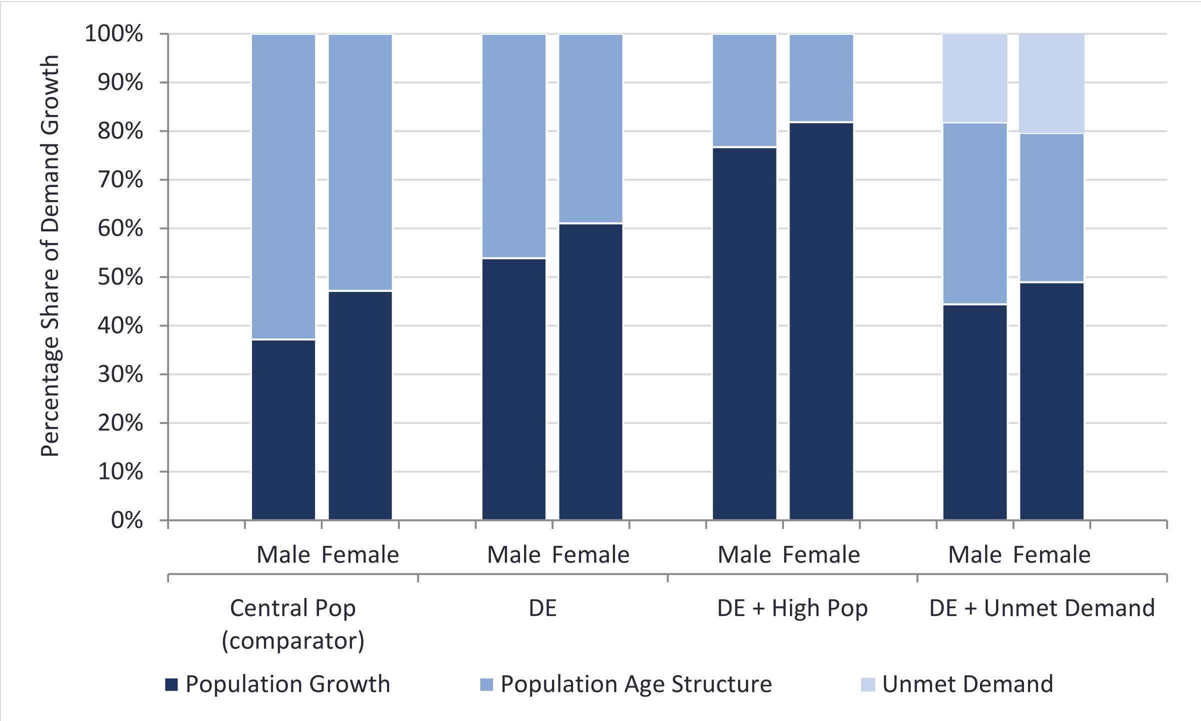
5.5.2 Analysis of drivers of demand for IPDC care, 2015 to 2030

Figures 5.13 to 5.15 present decompositions of the projected demand growth for the comparator and preferred projection scenarios for total discharges, inpatient discharges and inpatient bed days, respectively. These figures illustrate the respective contributions of population growth, changes in the population age structure and unmet demand to projected demand growth. Decomposition of the growth in total (i.e. inpatient and day patient) and inpatient discharges report similar findings across scenarios. Under our comparator scenarios, change in the age structure of the population is the principal driver of activity growth. However, the contribution of changes in the population age structure is reduced under Dynamic Equilibrium assumptions. Assuming High population growth (relative to our Central population growth assumption) reduces the impact of changes in population age structure further. The inclusion of high unmet demand explains approximately 20 per cent of the growth in total discharges for females and 18 per cent of the growth in total discharges for males.

Growth in bed day demand is projected to exceed growth in discharges over the projection horizon and demand growth decompositions reveal that changes in the age structure of the population are a more important factor in explaining growth in demand for bed days. The changing age structure of the population is the primary driver of bed day growth under our Central population growth assumption even when assuming dynamic equilibrium. Under the High population growth assumption, the changing nature of the population age structure is a more important driver for bed day volumes relative to discharge volumes. Projecting unmet bed day demand at baseline explains approximately 11 per cent of demand growth for both males and females under this scenario.

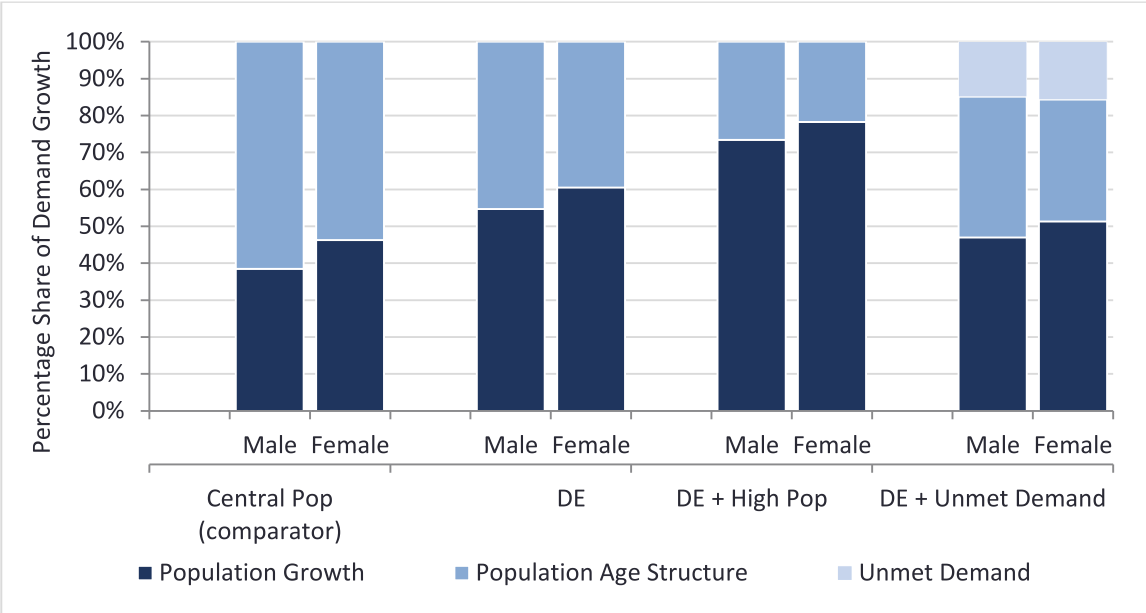
For discharge and bed day activity and across all scenarios, change in the population age structure is a more important driver of changes in male discharge volumes compared to female discharge volumes, reflecting the relatively greater projected growth in older age cohorts for men. The difference between the male and female population growth rates largely reflects greater projected increases in life expectancy for men than women in Ireland in this period.

FIGURE 5.13 TOTAL DISCHARGES PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



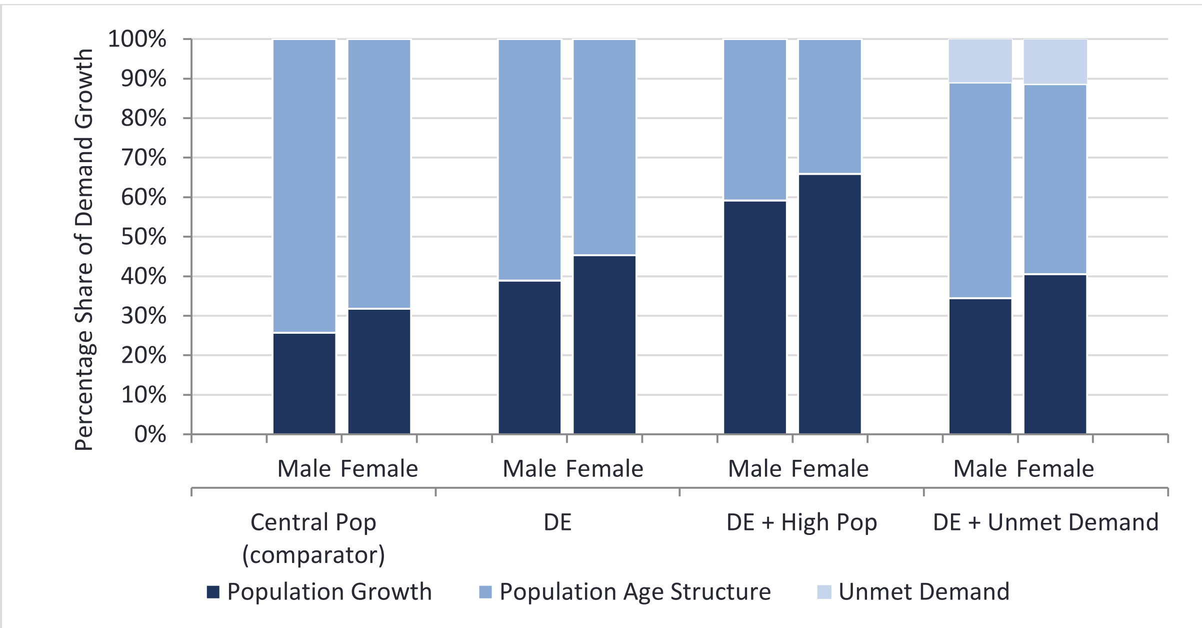
Source: Authors' calculations.
Note: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing.

FIGURE 5.14 INPATIENT DISCHARGES PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Source: Authors' calculations.
Note: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing.

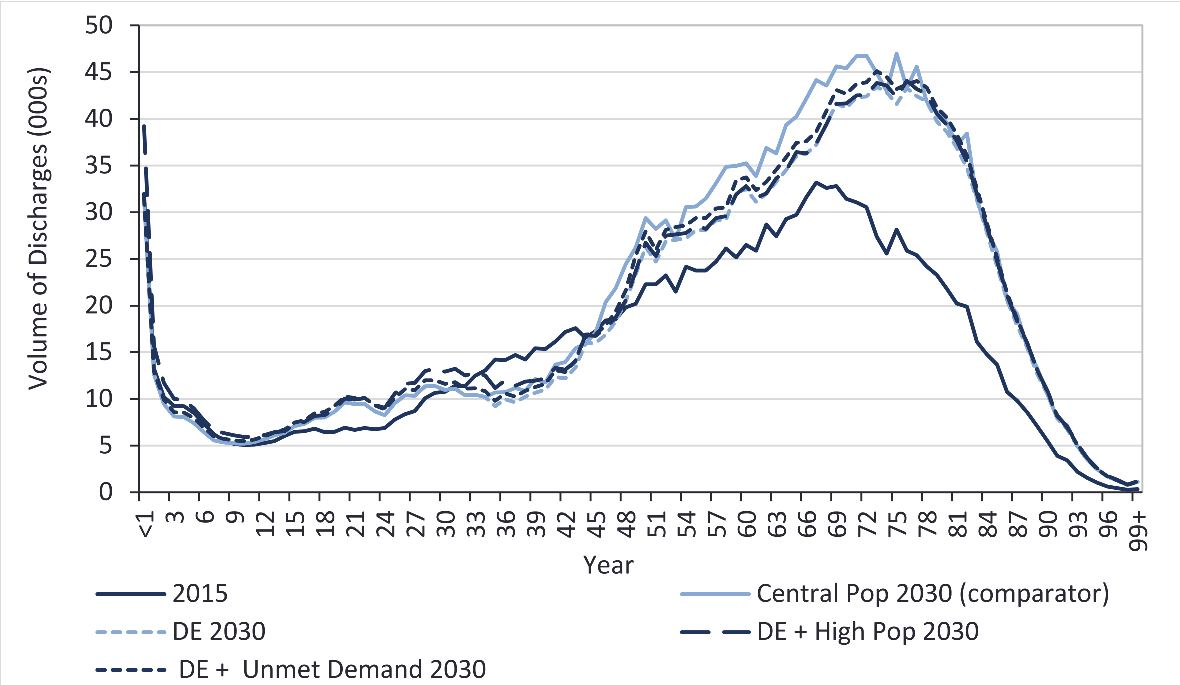
FIGURE 5.15 INPATIENT BED DAYS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Source: Authors' calculations.
Note: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing.

Figure 5.16 illustrates the projected change in demand between 2015 and 2030 across the age distribution for comparator and preferred projection scenarios. Reflecting changes in the population size and structure, a large proportion of the overall growth in demand takes place at older ages. The figure clearly illustrates the impact of the Dynamic Equilibrium healthy ageing assumption on reducing demand growth at older ages relative to our comparator scenario (where no healthy ageing is assumed). Central and High population growth assumptions project relatively similar trends in demand growth at older ages. This is consistent with the fact that the primary difference between these assumptions is the relative effect of net inward migration which largely impacts on population volumes at younger ages.

FIGURE 5.16 PROJECTED DEMAND FOR PUBLIC HOSPITAL DISCHARGES, BY AGE, 2015 AND 2030 –COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.
Note: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing.

5.5.3 Public ED attendances, projections 2015-2030

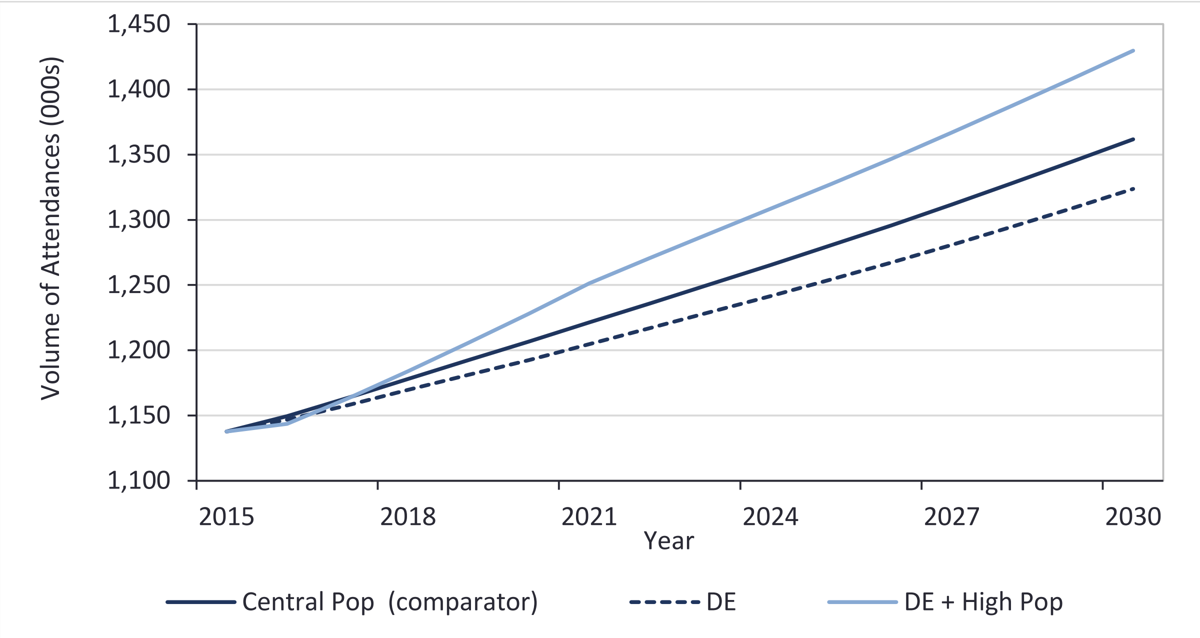
Figure 5.17 and Table 5.7 presents projections of demand for public ED attendances from 2015 to 2030 based on these scenarios:

- *Comparator Central Population Growth scenario:* Assuming our Central population growth assumption alone (with no adjustments made to activity rates to account for healthy ageing or unmet demand) demand for ED attendances is projected to exceed 1.36 million in 2030. This is an increase of 19.7 per cent on 2015. The relative growth in demand for ED care is notably lower than for IPDC care. This is explained by the shape of the activity rate curve for ED attendances (Figure 5.10) which sees relatively less activity concentrated in older ages. The ageing of the population will therefore have comparatively less of an impact on demand for ED services.

Preferred projection scenarios

- *Dynamic Equilibrium:* Using the same population growth assumption but assuming dynamic equilibrium, total attendance demand is projected at 1.32 million in 2030. This represents a 16.3 per cent increase over demand in 2015. Compared to IPDC care, healthy ageing has less of a relative impact on tempering activity growth for ED care, again explained by the differences in the distribution of activity across the population age cohorts.
- *Dynamic Equilibrium with High Population Growth:* The High population growth projection with assumed Dynamic Equilibrium yields projected attendance demand of 1.43 million in 2030. This represents a 25.7 per cent increase over the 2015 baseline. Notably, changing the population growth assumption has a large effect on demand for ED attendances. As noted, this is driven mainly by assumed higher net inward migration under the High population growth scenario which increases volumes of ED attendances in younger adult age cohorts.

FIGURE 5.17 PROJECTED DEMAND FOR PUBLIC ED ATTENDANCES, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.

TABLE 5.7 PUBLIC ED ATTENDANCES DEMAND PROJECTIONS 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

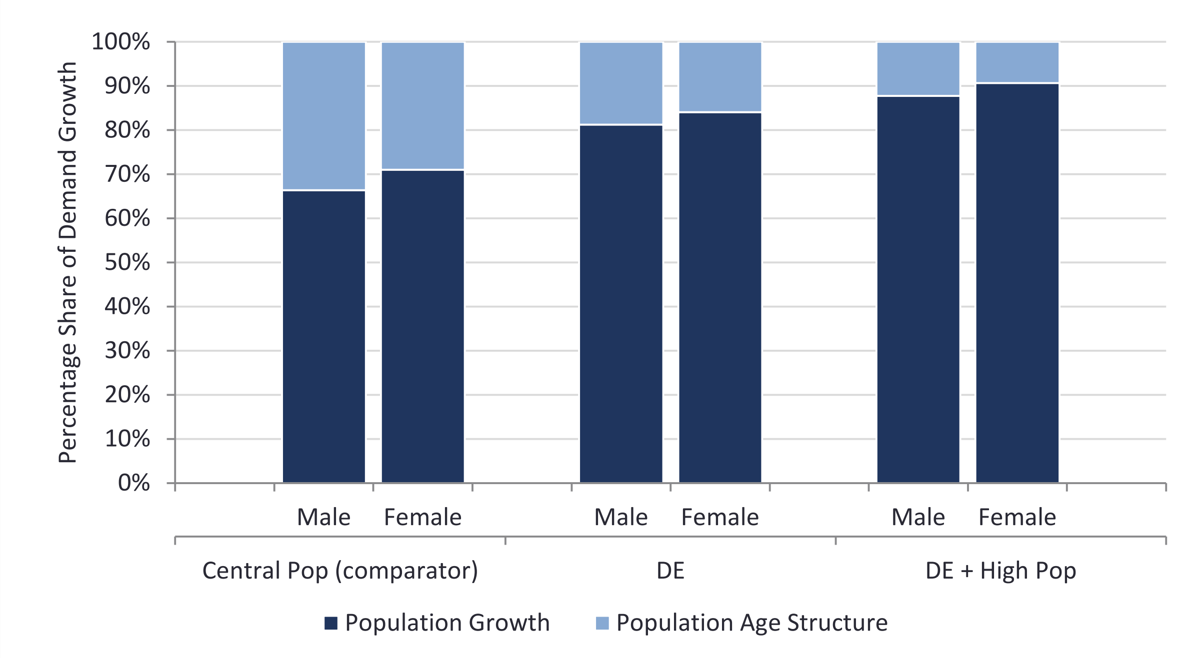
Activity		Baseline Activity - 2015	Percentage change 2015-2030		
			Comparator	Preferred Projections	
			Central Population Only % Change	Dynamic Equilibrium % Change	Dynamic Equilibrium + High Population % Change
Total ED Attendances	Male	582,821	19.6	16.0	25.8
	Female	554,830	19.8	16.7	25.6
	Total	**1,137,650**	**19.7**	**16.3**	**25.7**

Source: Authors' calculations.

5.5.4 Analysis of drivers of demand for Public ED attendances, 2015 to 2030

Figure 5.18 presents decompositions of the projected demand growth for the comparator and preferred projection scenarios for ED attendances. This figure illustrates the respective contributions of population growth and changes in the population age structure on demand growth between 2015 and 2030. This figure reinforces that population growth, rather than changes in the population age structure, is the primary driver of growth in ED attendances over the projection horizon. The importance of population growth as a driver of ED attendance growth increases, respectively, when Dynamic Equilibrium is applied and when Dynamic Equilibrium is combined with the High population growth assumption. The effect of population ageing is marginally greater for ED attendance demand for males relative to females. As noted, this observed difference is consistent with greater projected increases in life expectancy for men than women in Ireland in this period.

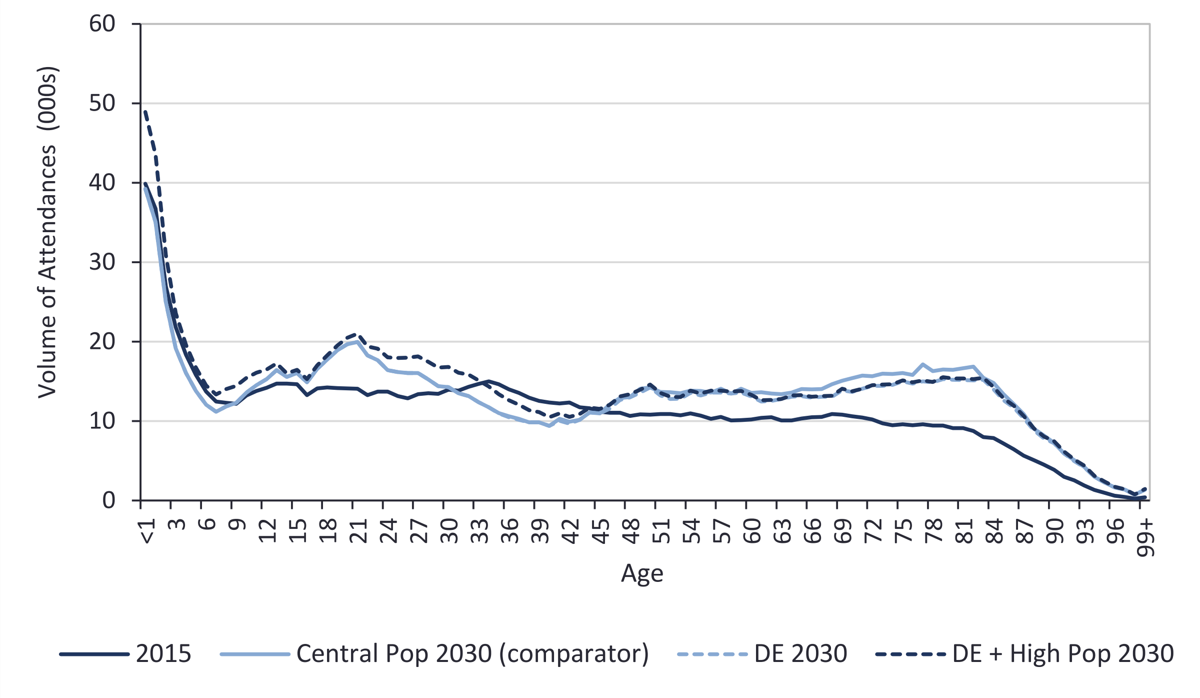
FIGURE 5.18 PUBLIC ED ATTENDANCES PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Source: Authors' calculations.

Figure 5.19 illustrates the projected change in the volume of ED attendances between 2015 and 2030 across the age distribution for comparator and preferred projection scenarios. The distribution of both baseline activity and projected demand differs considerably to that presented for IPDC care in Figure 5.16. Increases in demand volumes between 2015 and 2030 are clearly evident both for younger adults and for those aged 45 and over. Due to higher assumed net inward migration, greater levels of care demand are observed for younger adults in 2030 under the High population growth assumption relative to projections based on the Central population growth assumption. While, in contrast to IPDC care, it is more difficult to clearly identify the effect of dynamic equilibrium ageing shifts at older ages.

FIGURE 5.19 PROJECTED DEMAND FOR PUBLIC ED ATTENDANCES, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.

5.5.5 Public OPD attendances, projections 2015-2030

Figure 5.20 and Table 5.8 presents projections of demand for public OPD attendances from 2015 to 2030 based on these preferred projection scenarios.

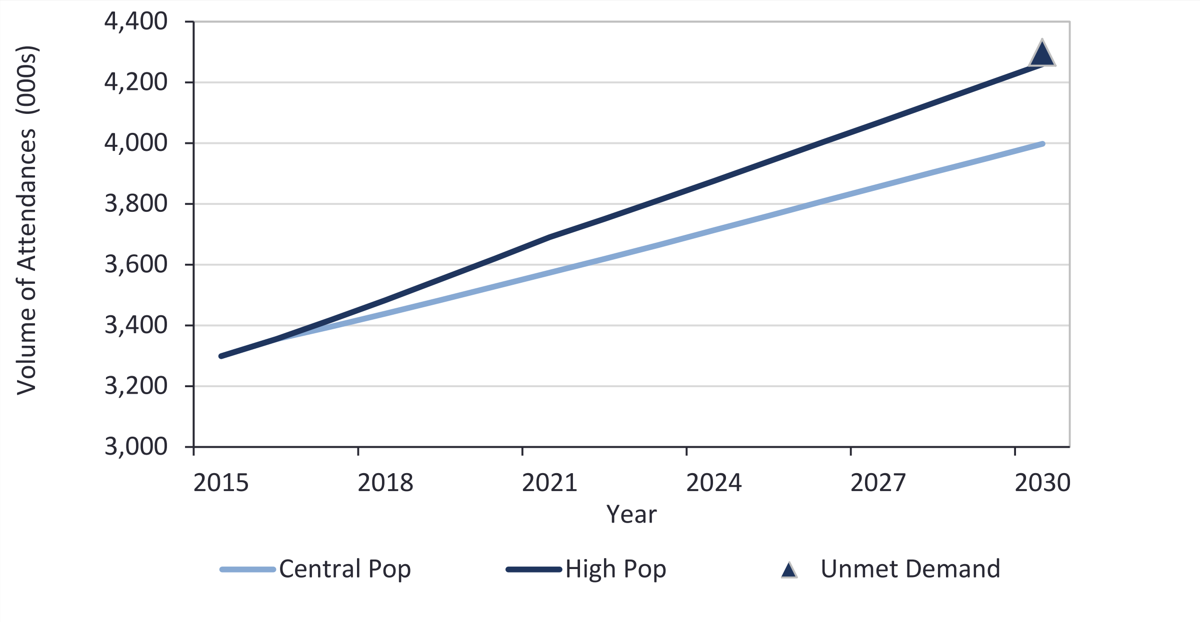
Preferred projection scenarios

- *Central Population Growth only:* As noted at the beginning of Section 5.5 we consider projections of demand based on pure population growth (under our Central population growth assumption) a preferred projection for OPD care. While the aggregated nature of the OPD data available to this study made it impracticable to apply healthy ageing shifts, it may be less of a concern relative to other acute services. OPD care is more likely to be impacted by chronic disease compared to other acute services and assuming strong healthy ageing effects may in fact be unreasonable.

  Under this scenario, total demand for OPD attendances is projected at just under 4.0 million in 2030. This represents a 21.2 per cent increase over baseline demand in 2015. This growth in OPD care demand mirrors more closely the relative increase in demand for ED care rather than IPDC care, for comparator scenarios. However, it may be misleading to make this comparison. The aggregated nature of the OPD data, particularly at older ages, makes it difficult to model the impact of demographics on future demand for services and to compare with other acute services (see Appendix 5).

- *High Population Growth only:* The high population growth projection yields a projected demand for public OPD attendances of 4.26 million in 2030. This represents a 29.1 per cent increase over the 2015 baseline.
- *Central Population Growth with High Unmet Demand:* The Central population growth projection with the addition of high unmet demand at baseline yields demand of 4.30 million OPD attendances in 2030. This represents a 30.3 per cent increase over the 2015 baseline. This addition of high unmet demand to utilisation in the base year yields an additional projected demand of in excess of 300,000 attendances in 2030.

FIGURE 5.20 PROJECTED DEMAND FOR PUBLIC OPD ATTENDANCES, 2015 TO 2030 – PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.

TABLE 5.8 PUBLIC OPD ATTENDANCE PROJECTIONS 2015-2030, PREFERRED PROJECTIONS

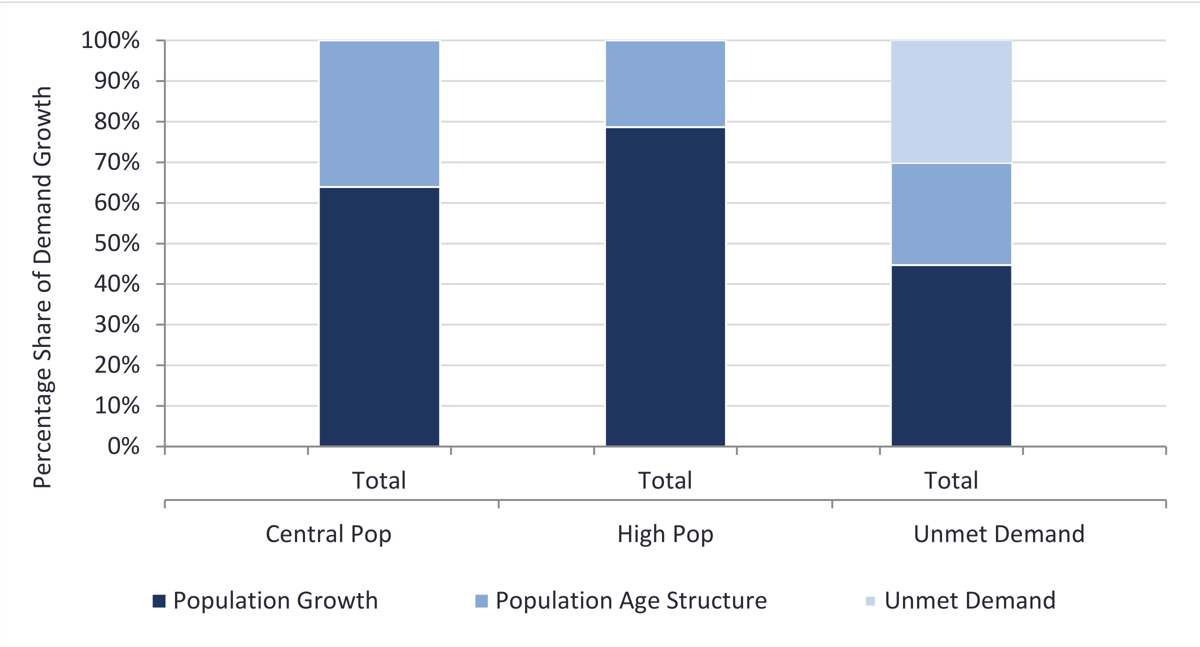
Activity		Baseline Activity - 2015	Percentage change 2015-2030		
			Preferred projections		
			Central Population Only % Change	High Population Only % Change	Central Population + Unmet Demand % Change
Total OPD Attendances	0-15	411,276	-2.6	12.8	7.1
	15-64	2,039,762	10.0	18.5	18.8
	65+	847,830	59.6	62.5	69.3
	Total	**3,298,868**	**21.2**	**29.1**	**30.3**

Source: Authors' calculations.

5.5.6 Analysis of drivers of demand for OPD attendances, 2015 to 2030

Figure 5.21 decomposes projected change in demand for OPD care into shares attributable to population growth, changes in the age structure of the population and high unmet demand. Under our Central population and High population growth scenarios only, population growth is the primary driver of increases in demand over the projection horizon. The inclusion of high unmet demand at baseline explains approximately 30 per cent of the growth in demand for OPD care. Under this scenario, unmet demand is a more important driver of demand growth than changes in the age structure of the population. This is perhaps not surprising given the large numbers, and time spent, on outpatient waiting lists at present. However, and as noted previously, care must be taken when comparing these findings with the other acute services in this chapter given the aggregated nature of the age data on which OPD projections are based.

FIGURE 5.21 PUBLIC OPD PROJECTED DEMAND GROWTH DECOMPOSITION FOR PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Source: Authors' calculations.

5.6 DISCUSSION AND CONCLUSIONS

This chapter is the first in this report that provides estimates of baseline activity and projections for healthcare demand in the Irish system. This focus of this chapter was on comprehensively capturing baseline demand for a range of public hospital services and types of care and, as with other healthcare services in this report, projecting forward demand to 2030 under a range of alternative assumptions.

The baseline analysis alone provides a detailed and more comprehensive analysis of current demand for, and utilisation of, public hospital services than has been available hitherto for Ireland. The baseline analysis identified that while demand for acute public hospital services tends to increase with age, there is large variation in the shape of activity rate curves across acute services. For instance, emergency hospital discharges tend to show activity peaks not just in the elderly but also in the youngest (less than one year) as any new-borns requiring treatment will be categorised as emergency inpatients. When compared to discharge activity, bed day activity is even more pronounced in older ages; a function of both frequency and intensity of service use increasing with age. Prior to hospital admission, attendance rates in EDs tend to show less concentration of care in older ages. An interesting insight from this analysis is that men and women tend not to use hospital services with the same frequency at the end of life. This disparity may be related to the important substitutive role the long-term care sector plays in providing end-of-life services to residents, who largely tend to be women. This interaction between acute and long-term care services is revisited in Chapter 9.

The variation in the shape of activity curves across these services forms the basis for variation in projected growth in demand for services. Based on our preferred projection scenarios, total discharge demand is projected to increase by between 23.6 and 29.0 per cent in 2030 while demand for inpatient bed days is projected to increase by between 32.2 and 36.7 per cent in 2030. In contrast, growth in demand for ED care is projected to be more varied across scenarios and perhaps relatively less pronounced. Under our preferred projection scenarios, demand for ED care is projected to increase by between 16.3 and 25.7 per cent. Accounting for the effect of healthy ageing – in the form of dynamic equilibrium in these projections – provides a more optimistic view of future demand growth for acute services in Ireland than has previously been considered (11, 12). Even so, it is clear from our analysis that demographic change will still have an important impact on future demand for these services.

In particular, our findings suggest that changes in the population age structure will be an important driver of demand growth for most IPDC care, most notably demand for bed days. In contrast, demand for ED care may be relatively less sensitive to changes in the population age structure but more influenced by the assumptions we make on future population growth.

OPD care is projected to increase by between 21.2 and 30.3 per cent by 2030, comparable to projections made by Layte et al. (13) on a similar basis that OPD services in Ireland would increase by nearly 25 per cent between 2006 and 2021. However, compared to our projected demand for IPDC and ED care, our analysis of OPD demand was limited by poor data availability. Less granular age breakdowns and no sex breakdown limited our ability to make useful comparison between projections of demand for OPD and other acute services. Better collection and publication of data on activity in public OPD departments is vital to better inform projections.

An important contribution is the analysis of unmet demand for acute healthcare services which is rarely considered in a projection model context despite its policy relevance. Meeting proposed waiting time targets recommended by the Oireachtas Committee on the Future of Healthcare would have a considerable effect on future activity levels, particularly for outpatient services. However, as waiting list data capture unmet demand for care only, it is acknowledged that our findings may represent an underestimation of actual unmet need for outpatient and elective hospital care if a need for services exists outside those captured on waiting lists. Furthermore, the data are inadequate to capture the full wait for care from GP referral to treatment which would better reflect the actual extent of unmet demand in the system. Measuring demand on an attendance or discharge basis does not capture any variation in intensity of resource use that is likely to increase with age. This was partly captured for inpatient care through the examination of bed day rates that better reflect activity variation across the age distribution. However, a more detailed treatment of variation in intensity and complexity of public hospital care will take place in the next stage of the projection model development through appending complexity-adjusted unit costs of care to demand.

Finally, projections presented in this chapter, as with other chapters in this report, did not take into account any trends in activity, eligibility or shifts in models of care. For instance, findings in this chapter highlighted an increase in day-patient activity in recent years, yet there may be uncertainty over the sustainability of such growth. Additionally, following the recession the percentage of individuals holding private health insurance is increasing which, if the trend continues, may affect demand (both met and unmet) for acute public services as individuals demand more care from private providers. In fact, the role and contribution of the private hospital system to the provision of acute healthcare services in Ireland has received comparatively little research attention to date and is largely unknown. As such, establishing an understanding of baseline demand for private hospital services in Ireland and projecting forward this demand to 2030 is the focus of Chapter 6.

REFERENCES

1. Department of Health (2017). 'Statistics by topic: Health expenditure Table 2 – HSE non-capital Vote allocation in millions of Euro, 2009 to 2015' http://health.gov.ie/publications-research/statistics/statistics-by-topic/health-expenditure/: Department of Health; [13 June 2017].

2. Department of Health (2016). *Health In Ireland: Key Trends 2016*. Dublin: Department of Health.

3. Health Service Executive (2014). 'Consultants' Contracts - As of 8th December 2014' Available from: https://hse.ie/eng/staff/Resources/Terms_Conditions_of_Employment/c contract/ccontract2008081214.pdf.

4. Harmon, C. and B. Nolan (2001). 'Health insurance and health services utilization in Ireland'. *Health Econ*. 2001;10(2):135-45. Epub 2001/03/17.

5. National Treatment Purchase Fund (2016). *Annual Report 2015*.

6. Healthcare Pricing Office (2016). *Activity in Acute Public Hospitals in Ireland Annual Report, 2015*. Dublin: Healthcare Service Executive.

7. Healthcare Pricing Office (2015). *Activity in Acute Public Hospitals in Ireland Annual Report, 2014*. Dublin: Healthcare Service Executive.

8. Jakobsson, E., T. Johnsson, L-O. Persson and F. Gaston-Johansson (2006). 'End-of-life in a Swedish population: demographics, social conditions and characteristics of places of death'. *Scandinavian Journal of Caring Science.* 2006;20:10-7.

9. Houses of the Oireachtas Committee on the Future of Healthcare (2017). *Sláintecare Report.* Dublin: Houses of the Oireachtas.

10. OECD (2015). 'Health at a Glance 2015: Health care activities, Hospital beds' [cited 30 June 2017]; Available from: www.oecd-ilibrary.org/sites/health_glance-2015-en/06/03/index.html?itemId=/content/chapter/health_glance-2015-32-en&mimeType=text/html.

11. Health Service Executive (2017). *Planning for Health: Trends and Priorities to inform Health Service Planning 2017*. Dublin: HSE.

12 Health Service Executive (2015). *Planning for Health: Trends and Priorities to inform Health Service Planning 2016*. Dublin: Health Service Executive.

13. Layte, R., M. Barry, K. Bennett, A. Brick, E. Morgenroth, C. Normand, et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland*. Dublin.

CHAPTER 6

Demand for private hospital services

6.1 INTRODUCTION

This chapter presents findings for baseline utilisation in independently funded private hospitals in 2015 and projections of demand to 2030. Currently there are 19 private hospitals in Ireland who are members of the Private Hospitals' Association (PHA), providing acute healthcare services. Yet despite the seemingly sizeable role played by the private hospital sector, the lack of coherently collected and comparable (with the public hospital system) data on private hospital activity makes it very challenging to assess and validate the true contribution of private hospital services to healthcare provision in Ireland. The PHA, however, do provide some indicative figures on private hospital activity in Ireland (1, 2). For instance, private hospitals appear to carry out a significant role in the provision of elective procedures and diagnostic testing in Ireland. Analysis in this chapter estimates that private hospitals accounted for an estimated 23 per cent of total hospital admissions, 31 per cent of day-patient admissions and accounted for 15 per cent of inpatient bed days, when public and private activity are combined. Private hospitals also provide some emergency care, with the PHA estimating Emergency Departments and/or Medical Assessment Units now operate in half of private hospitals (1).

Individuals who opt for care in private hospitals must pay the full cost of treatment and maintenance (3). This is largely financed through private health insurance plans that cover care in private hospitals.[81] The CSO estimates that, in 2014, private health insurance accounted for 92 per cent of private hospital financing, with the remainder accounted for by out-of-pocket payments (5 per cent), other voluntary payments (2 per cent), and government financing (1 per cent).[82] Insurers reimburse private hospitals based on negotiated fixed price rates for surgical and diagnostic procedures (4). This is in contrast to reimbursement for private care in public hospitals which is based on per diem rates that differ between room designation and hospital type (5). The use of private hospital services and privately-financed hospital care in general,[83] has traditionally been supported by public subsidisation through tax relief on private health insurance premia. Subsidisation may also take place indirectly through the training of private medical staff by the public system and the employment in private

81 Basic health insurance plans only cover some or all of the costs for a semi-private or private room in a public hospital.

82 Based on a presentation given by the CSO at the CSO Health Accounts Seminar on 10 November 2016, at the Royal College of Physicians in Ireland, Dublin.

83 Privately-financed care can also take place in acute public hospitals. Analysis of demand projections for acute public hospitals is presented in Chapter 5.

hospitals of hospital consultants on contracts which permit working across both sectors.[84]

Some public funding of private hospital care also takes place through the National Treatment Purchase Fund (NTPF). The NTPF was established in 2002 to reduce waiting lists in the public hospital sector through the purchasing of private care for public patients among other functions. In 2011, this commissioning function was suspended until 2016 when it was re-activated. In the last full year of purchasing activity (2010) the NTPF funded private treatment for over 20,000 inpatients and referred just fewer than 10,000 cases for private outpatient appointments (6). Prices for care are negotiated directly between the NTPF and providers. Other public funding of private hospitals may also take place where hospitals or hospital groups contract directly with private hospitals to address specific backlogs in treatment (1). The private hospital system therefore has traditionally acted as a means of managing capacity constraints in the public system through public purchase of private care.

Data limitations make it difficult to follow trends in the scale of private hospital provision over time. Based on our estimate of private hospital inpatient bed days presented in this chapter, and under an assumed average occupancy rate of 85 per cent, we estimate that there were 1,975 inpatient beds available in the private hospital system in 2015 (see methodology in Chapter 3 Section 3.3.1). Between 2002 and 2010 it was estimated that the number of day-care and inpatient (excl. psychiatric) beds in private hospitals increased considerably (by 194 per cent and 33 per cent, respectively) (7). In more recent years, less information exists on overall capacity change in the sector. While the Mater Private Cork was opened in 2013[85] (8), Mount Carmel private hospital was closed in early 2014 resulting in the loss of 130 beds[86] (9).

In summary, available information suggests that the private hospital sector accounts for a sizeable proportion of overall hospital activity in Ireland. Moreover, growth in private hospital capacity has been aided by favourable Government policy of public subsidisation of private care (although some unwinding of this subsidisation has taken place (10)) and public purchase of private care. However, a better understanding of the nature and importance of the private hospital sector has previously been limited due to a lack of co-ordination in data collection and poor availability of existing data. And while these issues still exist, an important first step of this analysis will be to provide,

84 Although some unwinding of this subsidisation has taken place.

85 Some of the extra capacity introduced by the opening of the Mater Private Cork (75 beds) represented the transfer of some existing capacity (44 beds) from the closure of Shanakiel Hospital at that time (8).

86 This hospital was, however, purchased by the HSE and converted into a public intermediate care facility (see Chapter 9).

using a combination of recent survey and administrative based data sources, baseline estimates of the demand for private hospital care in Ireland in 2015. From a system perspective it is also vital to contextualise these baseline estimates in terms of their relation to demand for public hospital services (both public and private) as very little is known in Ireland about the relative contribution of the private hospital system. This analysis therefore will also present where appropriate comparable baseline estimates of public hospital activity as a means to advancing understanding of the contribution of private hospital care in the Irish healthcare system. Following the estimation of baseline demand for private hospital care this analysis will project demand for these services to 2030. Section 6.2 presents findings for baseline utilisation. Section 6.3 presents projections for private hospital activity. Section 6.4 discusses and concludes.

6.2 FINDINGS – BASELINE UTILISATION

6.2.1 Baseline utilisation of inpatient private hospital care and public hospital care comparison 2015

Figure 6.1 shows age-specific private inpatient hospital admission rates (per 1,000) and volume of admissions, aged 15 and over, in 2015 based on Healthy Ireland (Wave 2) data. Admission rates are lowest for those aged 15-24 and rise with age, peaking at 93 admissions per 1,000 for those aged 75 and over. Similarly, volumes of admissions are lowest for those aged 15-24 while the largest volume of admissions is recorded for those aged 75 and above at over 23,600.

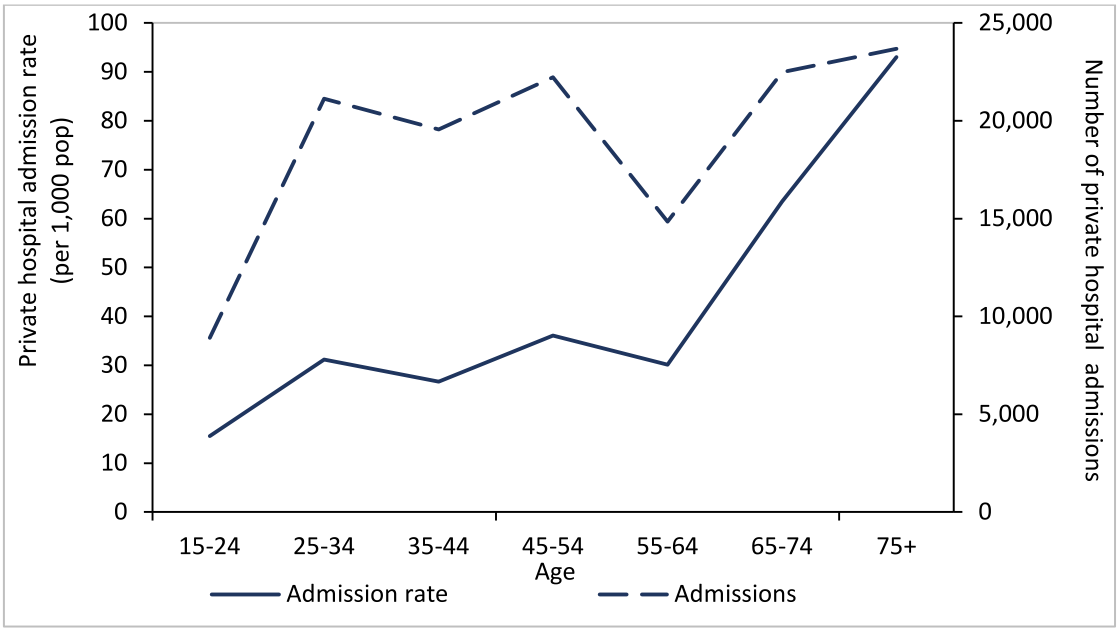
The Healthy Ireland Survey records the number of total inpatient admissions of respondents in addition to the number of private inpatient admissions. This facilitates the comparison of public and private hospital admissions in 2015,[87] presented in Table 6.1. Not surprisingly, public hospital activity rates across all age bands are greater than corresponding private hospital activity rates. Overall, the private hospital activity rate is 35.9 inpatient admissions per 1,000 compared to the public hospital inpatient admission rate of 121.0 per 1,000. In volume terms, it is estimated that nearly 23 per cent of inpatient hospital activity (measured by numbers of admissions or discharges) took place in private hospitals.[88] Both public and private activity rates peak for those aged 75 and over. Additionally, 31 per cent of admissions for those aged 75 and over took place in private hospitals, the highest proportion of all age bands.

---

87 Public inpatient hospital admissions are estimated as the difference between total inpatient hospital admissions and private hospital inpatient admissions.

88 This compares to findings from the 2010 QNHS Q3 Special Health Module that reported 18 per cent of hospital stays taking place in private hospitals (11). This suggests an increase in the share of private hospital use over time.

FIGURE 6.1 AGE-SPECIFIC INPATIENT ADMISSION RATE PER 1,000 POPULATION AND INPATIENT ADMISSIONS, 2015



Sources: Healthy Ireland Wave 2; ESRI Population Data

As a validation of the survey data, Table 6.1 also provides a comparison with inpatient care in public hospitals in 2015 captured in HIPE. The overall activity rate in public hospitals estimated in the Healthy Ireland data (121.0 per 1,000) is somewhat lower than that recorded in the HIPE administrative data (131.0 per 1,000). However, significant variation is observed within age bands. Particularly, for the oldest age cohort, the Healthy Ireland Survey estimate of the public hospital inpatient activity rate is considerably lower than that recorded in HIPE. HIPE also records those discharged to other settings such as nursing homes, rehabilitation facilities, and those who died in hospital. This might inflate activity rates for older age groups compared to the household-based Healthy Ireland Survey estimates. Therefore in order to facilitate comparison the HIPE discharge rates presented in Table 6.1 include only those discharged home or self-discharged. Therefore, the remaining discrepancy observed between rates may suggest some under-reporting of public hospital inpatient activity in older age groups in the Healthy Ireland Survey. Previous studies have identified the under-reporting of healthcare utilisation by older age groups as a concern of using self-reported data (12). This also raises a concern in terms of potential age-related under-reporting of private hospital utilisation in Table 6.1; however, in the absence of comparable administrative data on private hospital inpatient admissions, it is not possible to explore this further.

TABLE 6.1 AGE-SPECIFIC INPATIENT ADMISSION (DISCHARGE) RATES TO PUBLIC AND PRIVATE HOSPITALS, 2015

Age	Healthy Ireland Wave 2 Survey			HIPE
	Inpatient admission rate - private hospitals (per 1,000 pop)	Inpatient admission rate - public hospitals (per 1,000 pop)	% volume of activity in private hospitals	Inpatient discharge[1,2] rate - public hospitals (per 1,000 pop)
15-24	15.6	63.8	19.6	81.8
25-34	31.2	130.0	19.4	144.4
35-44	26.7	109.4	19.6	109.1
45-54	36.1	108.3	25.0	82.5
55-64	30.1	123.0	19.7	122.6
65-74	63.5	178.3	26.3	197.2
75+	93.0	205.8	31.1	310.4
Total (15+)	**35.9**	**121.0**	**22.9**	**131.0**

Sources: Healthy Ireland Wave 2; HIPE 2015, ESRI Population Data.
Notes: 1. HIPE data record information on those discharged from public hospitals while the Healthy Ireland Survey asks respondents to record the number of admissions to hospital. However as the Healthy Ireland Survey is a household survey admissions recorded should equal discharges.
2. HIPE considers a number of discharge categories (for example to a nursing home, discharged as dead, transferred to another hospital etc.). To ensure as accurate a comparison as possible between Healthy Ireland Survey and HIPE activity rates, HIPE discharges are filtered to include only those discharged either home or recording a self-discharge. For a similar reason, and in contrast to analysis in Chapter 5, maternity discharges are also included in the HIPE discharge rate.

6.2.2 Insurer-financed hospital activity in public and private hospitals, 2015

Figure 6.2 presents age-specific privately insured inpatient bed day rates (per 1,000 population) recorded in HIPE for public hospitals and estimated for private hospitals by sex for 2015. That is, we are here comparing the inpatient private hospital activity financed by insurers in public hospitals to the activity financed by insurers in private hospitals.

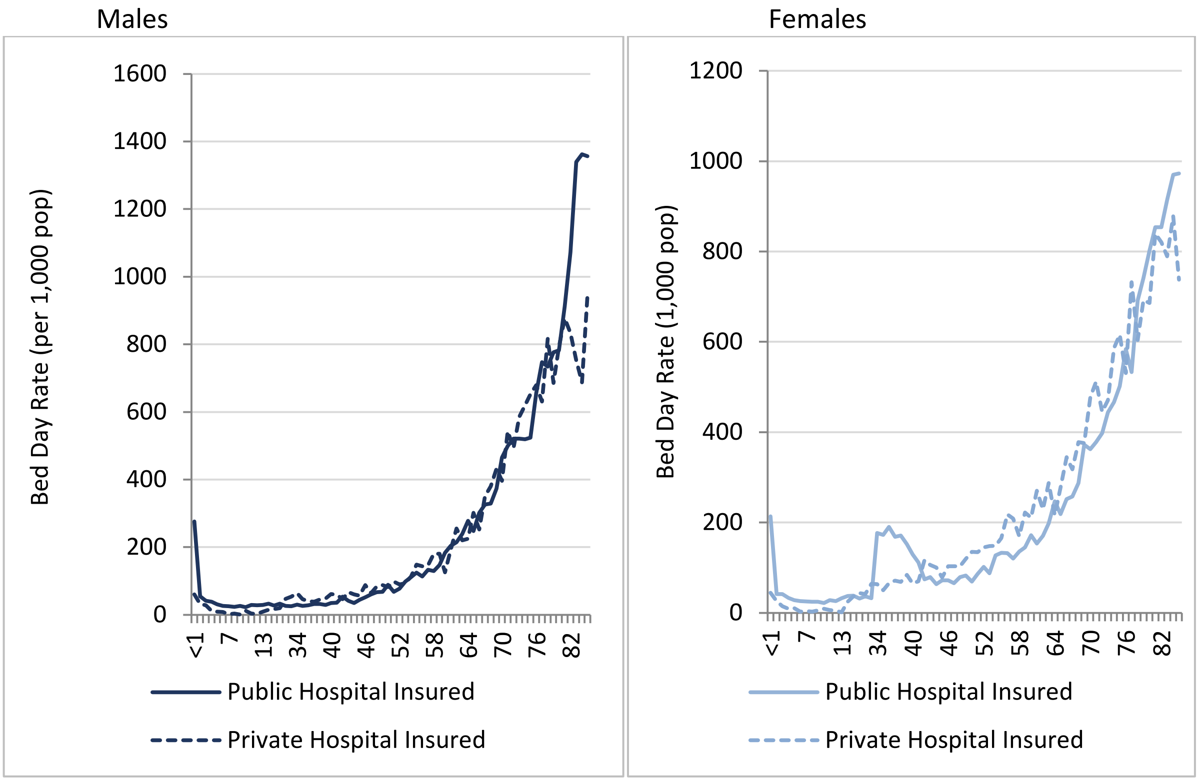
For both males and females, remarkably similar insured bed day rates are reported across both public and private hospitals for most of the age distribution. Deviations are evident, however, for both sexes at the tails of the distribution. For those aged less than or equal to one, the privately-insured rates (males 275.7 per 1,000 population; females 213.3 per 1,000 population) in public hospitals are higher than in private hospitals (males 60.7 per 1,000 population; females 44.1 per 1,000 population). The relatively high rates in this age group for those privately-insured in public hospitals relates largely to the recording of new-borns (0-27 days) as admitted to hospital following delivery when they require observation or treatment.[89] A similar spike is not observed in the private hospital activity curve as all private maternity care now takes place in public hospitals.

89 Many of these discharges would be admitted following delivery for conditions such as being preterm, respiratory issues, neonatal jaundice, or observation for infection. It should be noted that well babies are not coded in Ireland and so do not appear as discharges in HIPE (Irish Coding Standard 1607).

Similarly, for the oldest old, a higher bed day rate is observed for those privately-insured in public hospitals. One explanation is that public hospitals may be better equipped to meet the more complex care needs of very elderly patients. However, the disparity between rates for this elderly cohort is much more pronounced for males compared to females. As discussed in Chapter 9, this is likely related to gender disparities in the use of long-term residential care services. Long-term residential care may act partly as a substitute for public hospital acute care at end of life and the higher utilisation of long-term residential services by females may be reducing their need for public acute care services relative to males.

As a final point, it is worth commenting on the notably higher bed day activity in public hospitals for privately insured females aged between 30 and 40 years. Again, this is explained in that private maternity care takes place in public hospitals only.

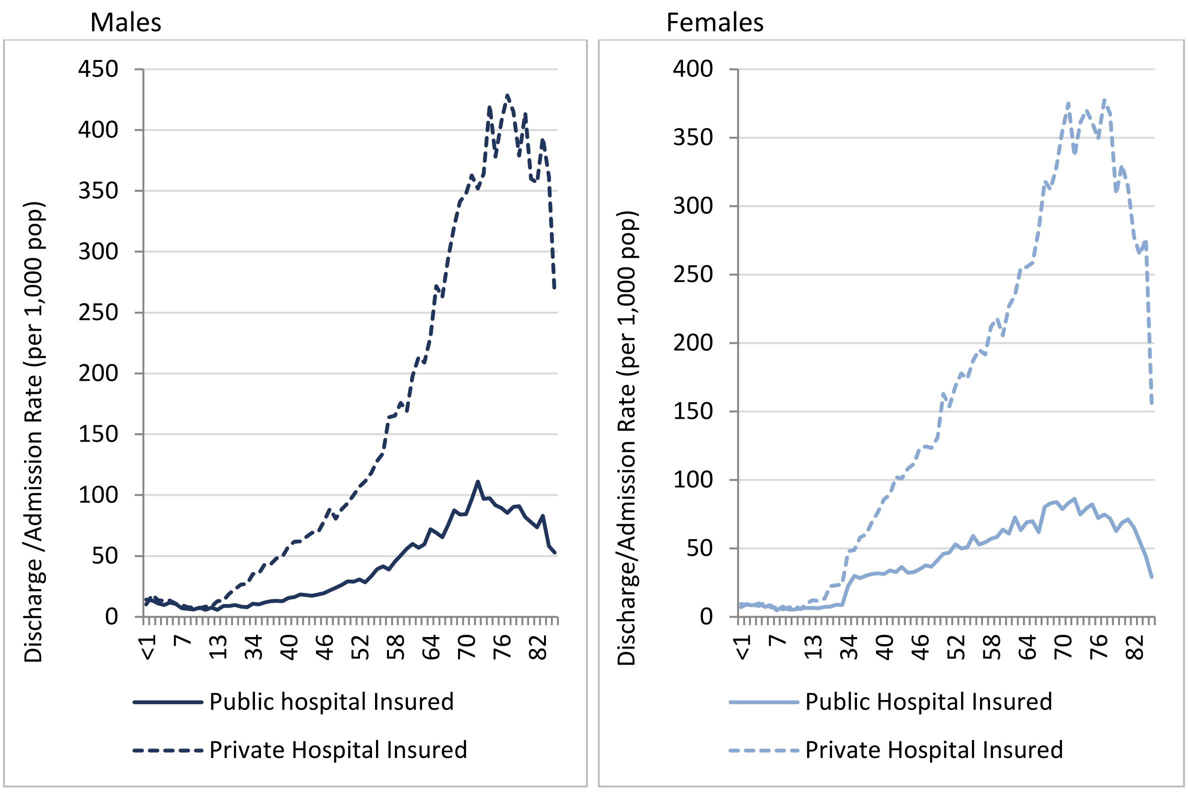
FIGURE 6.2 AGE-SPECIFIC INSURED INPATIENT BED DAY RATE PER 1,000 POPULATION, BY SEX, 2015



Sources: Private hospital insured bed day activity is estimated as a residual based on HIA Risk Equalisation Returns data and HIPE data for 2015 (see Section 3.4.2); ESRI Population Data.

Turning to insured day-patient activity, Figure 6.3 presents age-specific privately insured day-patient rates (per 1,000) recorded in HIPE and estimated (see Section 3.4.2) for private hospitals, by sex, for 2015. We are therefore here comparing insured day-patient activity in public and private hospitals. Figure 6.3 presents a contrasting picture of the balance across sectors of privately insured day-patient activity compared to the privately insured inpatient activity presented in Figure 6.2. Most noticeably, private hospitals appear to carry out significantly more privately insured day-patient activity than public hospitals, with this disparity increasing with age. For instance, for males, privately insured day-patient activity in private hospitals is estimated to peak at 428.4 admissions per 1,000 compared to 111.2 discharges per 1,000 for privately insured public hospital day-patient discharges. Although these differences are striking, the purely elective nature of day-patient care facilitates its provision by private hospitals and it is not unexpected to find a large share of this activity to be provided by private hospitals.[90]

FIGURE 6.3 AGE-SPECIFIC INSURED DAY-PATIENT RATE PER 1,000 POPULATION, BY SEX, 2015



Sources: Private hospital insured bed day activity is estimated as a residual based on HIA Risk Equalisation Returns data and HIPE data, for 2015 (see Section 3.4.2); ESRI Population Data.

Finally, Figure 6.4 presents overall bed days for inpatients, and admission/discharges for day patients,[91] by sex, in terms of whether the care was publicly financed in public hospitals, insurer-financed in public hospitals, or insurer-financed in private hospitals. The publicly-financed public hospital system

90 An assumption underlying the approach is that the definition of a day patient in HIPE is comparable to the HIA day patient definition. For instance, if HIA data also capture some private side-room or more outpatient-orientated care in their day-patient activity this may impact on comparisons.

91 We follow HIA terminology and refer to day-patient activity as an admission (13). In HIPE activity is captured as a discharge.

recorded in excess of 2.91 million inpatient bed days in 2015 while privately-insured care in the public hospital system contributed over an additional 650,300 bed days. Based on our estimation, private insurance financed 612,600 inpatient bed days in the private hospital system in 2015. Converting this demand for bed days into beds available using the formula presented in Chapter 3 suggests there were 1,975 inpatient beds available in Irish private hospitals in 2015, assuming an average occupancy rate of 85 per cent.[92]

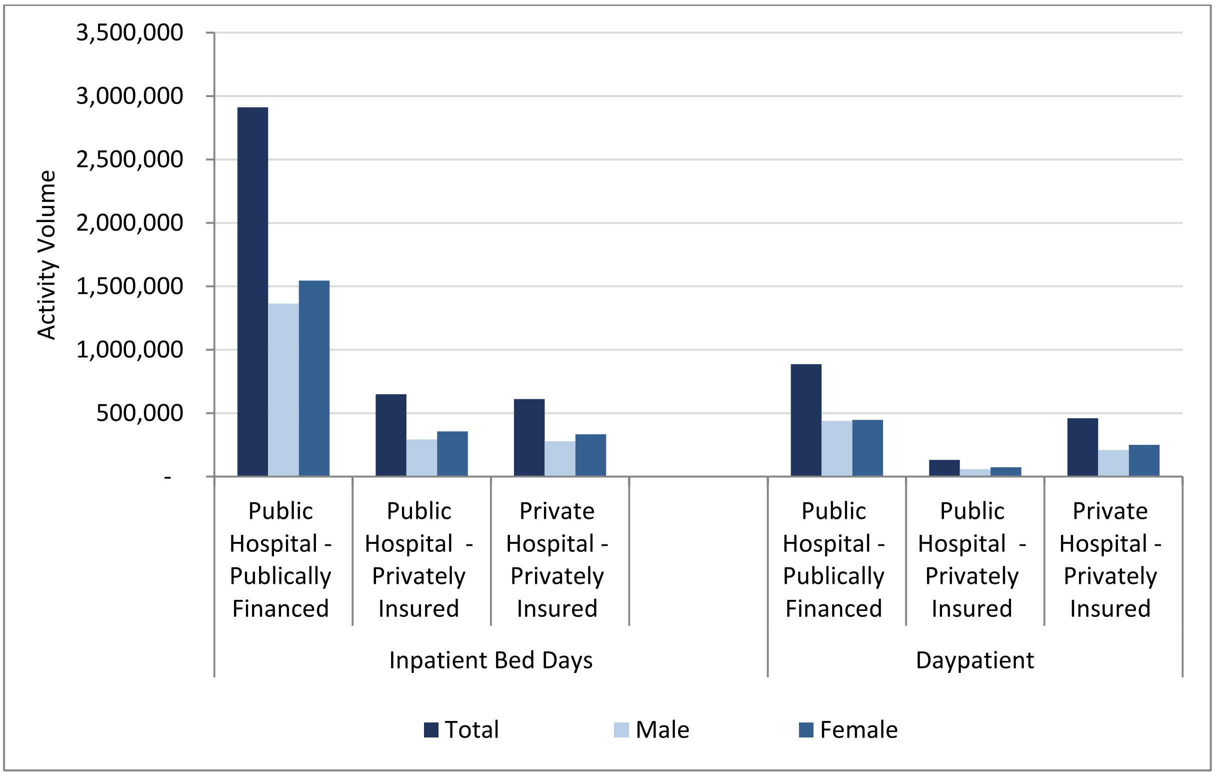
Private hospitals therefore are estimated to contribute 14.7 per cent of total public and insurance-financed bed days. This compares to private hospitals accounting for an estimated 22.9 per cent of total hospital admissions (Table 6.1). Although these figures are not directly comparable,[93] it does point towards shorter average length of stay in private hospitals. This would likely be explained by more complex care, as well as end-of-life care (particularly for males, see Figure 6.2) being undertaken in public hospitals.

In terms of day-patient activity, over 886,000 public discharges from public hospitals were recorded in HIPE in 2015. An estimated additional 590,000 day-patient admissions/discharges were financed through private health insurance. As suggested by Figure 6.3, the majority (78 per cent) of insurer-financed day-patient activity took place in private hospitals. This relates to in or around 31 per cent of combined publicly-funded and privately insured hospital day-patient activity. Proportionately therefore Figure 6.4 suggests private hospitals contribute more towards total hospital system provision of day-patient care than inpatient care.

92 As our conversion does not include any inpatient bed days that may have been financed exclusively out-of-pocket, which is likely to be very small, we may understate available beds slightly.

93 HIA data do not capture any private inpatient care that may be financed exclusively out-of-pocket while Healthy Ireland data only record activity for those aged 15 and over.

FIGURE 6.4 VOLUME OF ACTIVITY FOR INPATIENT (BED DAYS) AND DAY-PATIENT CARE, BY PUBLIC FINANCING IN PUBLIC HOSPITALS, PRIVATELY INSURED FINANCING IN PUBLIC HOSPITALS AND PRIVATELY-INSURED FINANCING IN PRIVATE HOSPITALS, BY SEX, 2015



Sources: HIA Risk Equalisation Returns; HIPE 2015.
Note: Estimates of private activity focus on insurer-financed activity only.

6.3 FINDINGS – PROJECTIONS

The comparator scenario refers to projections of demand based purely on changes in our baseline population growth assumption, holding activity rates constant, through the projection period. The preferred projection scenarios are those the authors consider most likely to be realised based on best available evidence (see Chapter 3). We make the same assumptions for our preferred projection scenarios for private hospital activity as were applied in Chapter 5 to the analysis of inpatient and day-patient public hospital demand projections. That is we assume proximity to death may be an important driver of demand, and therefore argue it is reasonable to adopt a Dynamic Equilibrium healthy ageing assumption to model projections of demand for private hospital care. As with all chapters we focus on Central and High population growth projections as it is felt these are the more likely to be realised. In contrast to Chapter 5, however, none of our preferred projections incorporate unmet demand for care. No published information exists on waiting times for private hospital elective care and any unmet demand is likely to be small.

Projections for private hospital demand, 2015-2030

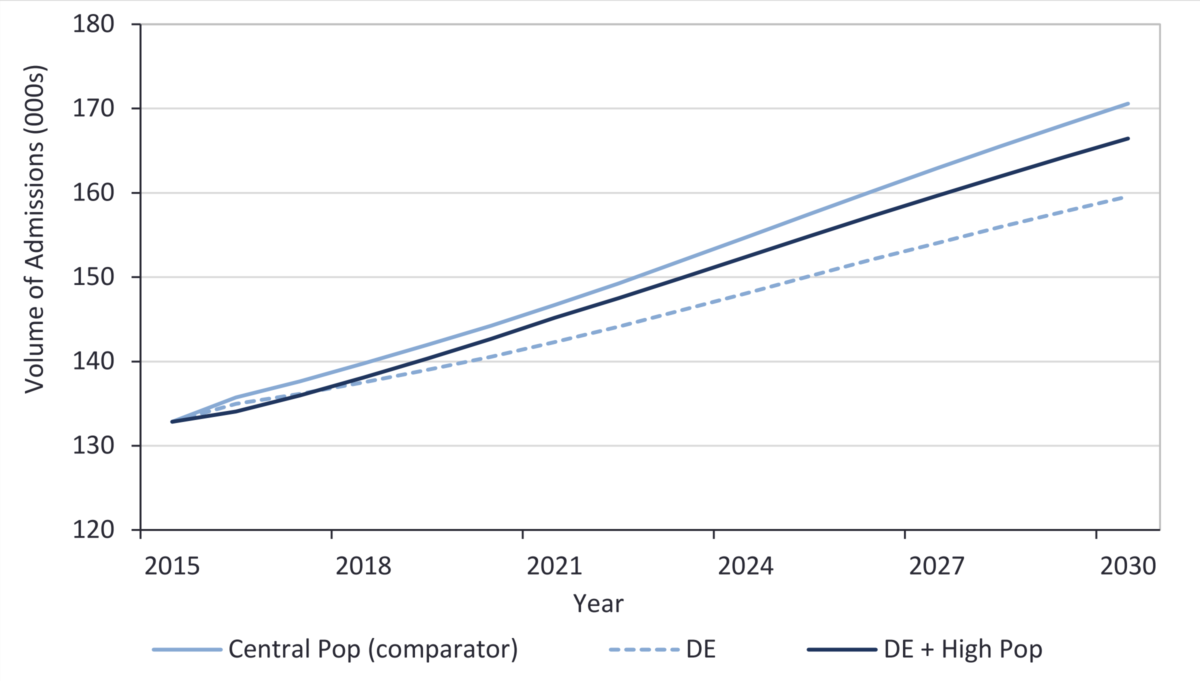
Figure 6.5 and 6.6 and Table 6.2 present projections of demand for private hospital admissions (15 and over) and private hospital insured day-patient admissions and inpatient bed days between 2015 and 2030 based on comparator and preferred projection scenarios.

- *Comparator Central Population Growth scenario:* Projecting demand for private hospital inpatient admissions (based purely on our Central population growth assumption) would yield demand for just under 171,000 inpatient admissions (15 and over) in 2030. This would represent a growth rate of 28.4 per cent on 2015 activity. Under this scenario, demand for insured private hospital day-patient admissions is projected to increase to in excess of 619,000 in 2030. This equates to a 34.8 per cent growth in demand relative to 2015 activity. For private hospital insured inpatient bed days the growth rate of demand between 2015 and 2030 is projected to be even larger at 43.9 per cent. Similar high demand growth rates were projected for inpatient public hospital bed days in Chapter 5. This equates to a projected demand for 882,000 inpatient bed days in 2030. However, these projections are likely to overestimate projected future demand given no attempt is made to account for the effects of healthy ageing.

Preferred projection scenarios

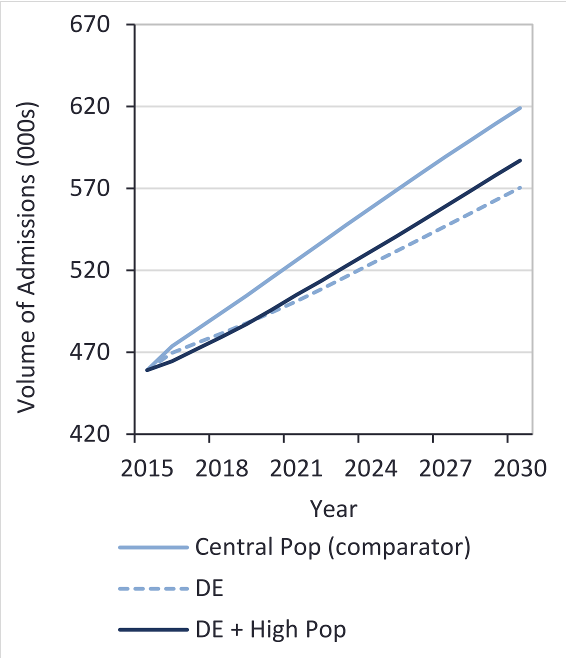
- *Dynamic Equilibrium:* Applying the same population growth assumption but applying the Dynamic Equilibrium healthy ageing assumption, private hospital inpatient admissions (15 and over) are projected at nearly 160,000 in 2030 (an increase of 20.1 per cent). Under this set of assumptions, private hospital insured day-patient demand is projected at 570,000 admissions in 2030 while nearly 785,000 inpatient bed days are projected in 2030. Respectively, these represent projected increases of 24.2 and 28.1 per cent on 2015 activity. Notably, while healthy ageing assumptions have a considerable effect in moderating future projected demand, the largest observed effect is for projected bed day demand. A similar finding was observed in Chapter 5.

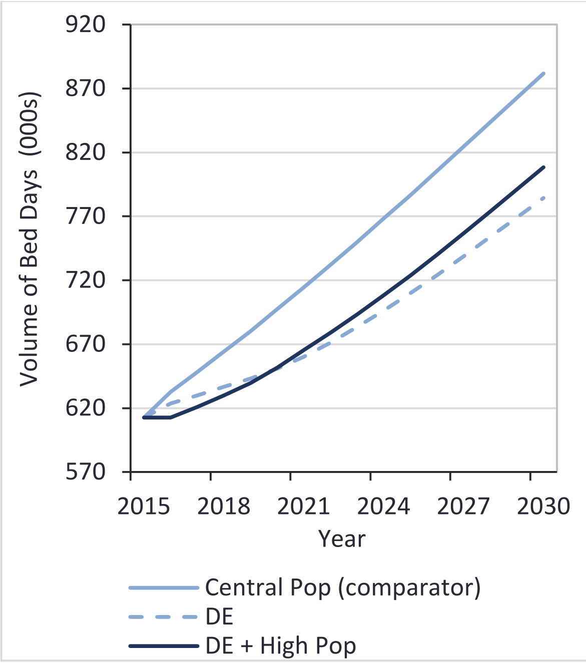
FIGURE 6.5 PROJECTED DEMAND FOR PRIVATE HOSPITAL ADMISSIONS (15 AND OVER), 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Note: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing.

FIGURE 6.6 PROJECTED DEMAND FOR PRIVATE HOSPITAL INSURED DAY-PATIENT ADMISSIONS AND INPATIENT BED DAYS, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS





Sources: Authors' calculations.
Notes: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing. These projections do not include any private hospital activity financed out-of-pocket (5 per cent of financing in 2014) through non-insurer based voluntary payments (2 per cent) or by government (1 per cent) (see Section 6.1).

- *Dynamic Equilibrium with High Population Growth:* Maintaining our Dynamic Equilibrium assumption but applying our High population growth assumption yields a projected demand for private hospital inpatient admissions of over 166,000 in 2030, representing an increase of 25.3 per cent on 2015 activity. Demand for private hospital insured day-patient admissions is projected at over 587,000 (an increase of 27.9 per cent on 2015 activity) in 2030 and demand for private hospital insured inpatient bed days is projected at over 809,000 (an increase of 32.0 per cent on 2015 activity) in 2030. Similar to public hospital activity, projections seem to be more sensitive to the impact of healthy ageing effects than population growth assumptions.

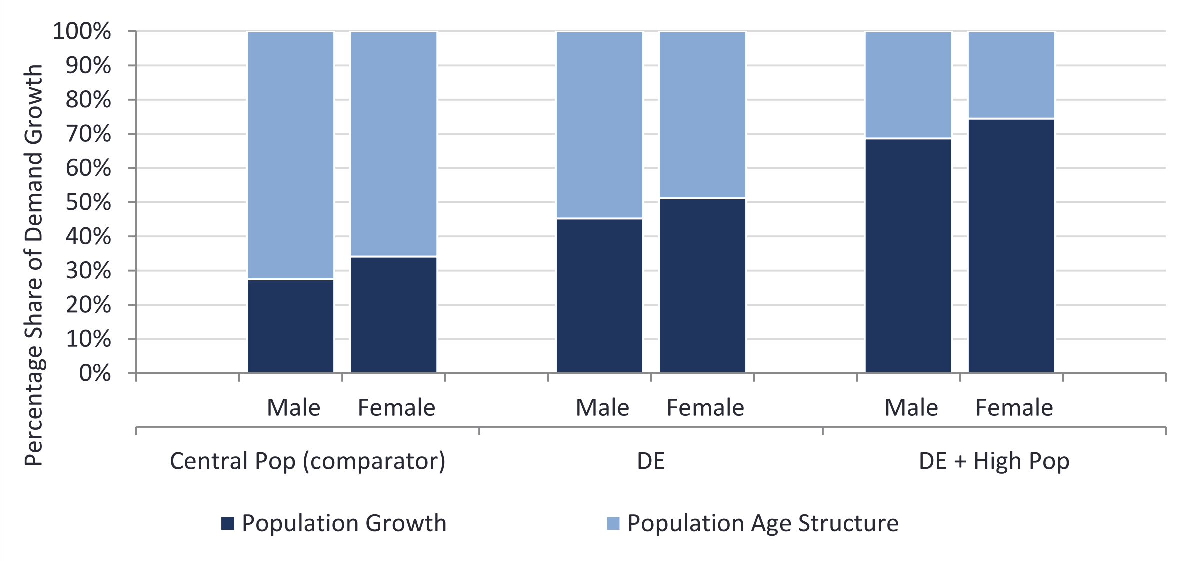
TABLE 6.2 PRIVATE HOSPITAL CARE DEMAND PROJECTIONS, 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

Activity		Baseline Activity 2015 ('000)	% change 2015-2030		
			Comparator	Preferred Projection	
			Central Population Only	Dynamic Equilibrium	Dynamic Equilibrium with High Population
			% change	% change	% change
Total Inpatient Admissions	Male	68.6	32.4	22.1	27.0
	Female	64.2	24.2	18.0	23.5
	Total	**132.8**	**28.4**	**20.1**	**25.3**
Day-patient Admissions	Male	209.4	36.8	24.3	28.1
	Female	249.8	33.2	24.2	27.7
	Total	**459.2**	**34.8**	**24.2**	**27.9**
Inpatient Bed Days	Male	277.8	47.2	28.7	33.0
	Female	334.8	41.2	27.5	31.1
	Total	**612.6**	**43.9**	**28.1**	**32.0**

Sources: Authors' calculations.
Notes: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing. For day-patient and inpatient bed days, projections do not include any activity financed out-of-pocket (5 per cent of financing in 2014) through non-insurer based voluntary payments (2 per cent) or by government (1 per cent) (see Section 6.1).

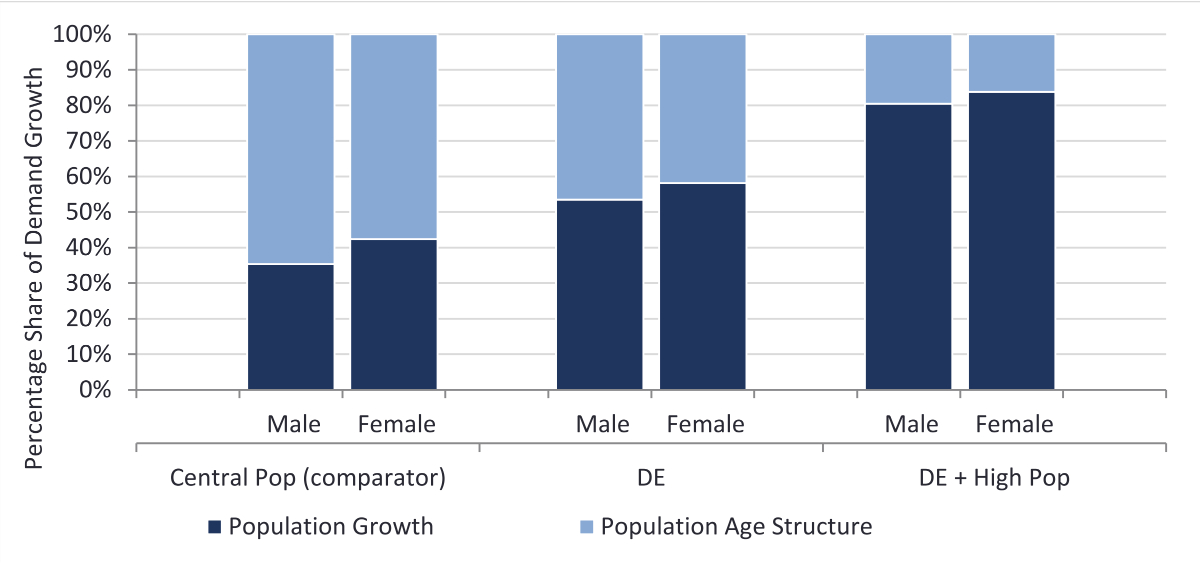
Figure 6.7 and 6.8 present decompositions of the drivers of the projected demand growth for the comparator and preferred projection scenarios for insured day-patient admissions and insured inpatient bed days, respectively. These figures illustrate the respective contributions of population growth and changes in the population age structure to projected demand growth. For both day-patient admissions and inpatient bed days changes in the population age structure are the primary drivers of growth. However, the contribution of population age structure change to explaining demand growth reduces when healthy ageing (dynamic equilibrium) effects are modelled. Moving from the Central population growth assumption to the High population growth assumption reduces the impact of population age structure change further. Across both types of care and all scenarios, a greater share of male activity growth is attributable to changes in the age structure of the population. This is consistent with projected larger relative life expectancy increases for males relative to females over the projection period (see Chapter 4).

FIGURE 6.7 PRIVATELY INSURED DAY-PATIENT ADMISSIONS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, BY SEX, 2015 TO 2030



Sources: Authors' calculations.
Notes: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing. These projections do not include any private hospital activity financed out-of-pocket (5 per cent of financing in 2014) through non-insurer based voluntary payments (2 per cent) or by government (1 per cent) (see Section 6.1).

FIGURE 6.8 PRIVATELY INSURED PRIVATE HOSPITAL INPATIENT BED DAYS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, BY SEX, 2015 TO 2030

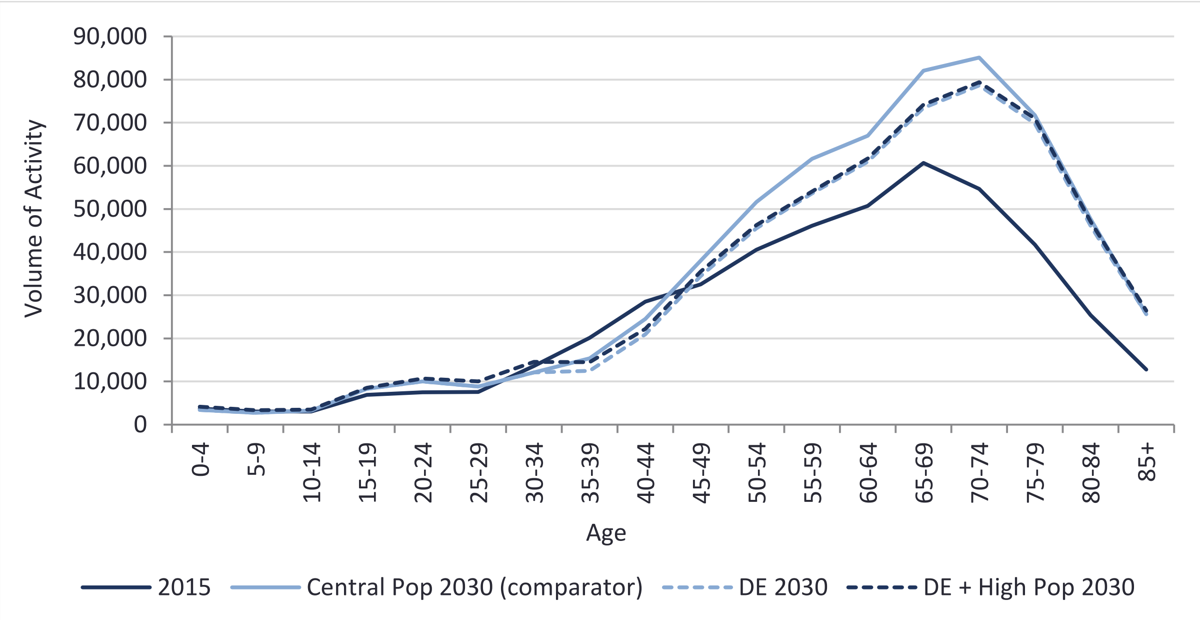


Sources: Authors' calculations.
Notes: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing. These projections do not include any private hospital activity financed out-of-pocket (5 per cent of financing in 2014) through non-insurer based voluntary payments (2 per cent) or by government (1 per cent) (see Section 6.1).

Figures 6.9 and 6.10 provide a breakdown of projected demand in 2030, by scenario and five-year age cohorts, for day-patient admissions and inpatient bed days, respectively. For both types of care, and across all scenarios, projected growth in activity over the projection horizon is largely concentrated in older populations. Moreover, there are points in the middle of the age distribution, evident on both graphs, where volumes of activity in 2030 are lower than in 2015, reflecting lower absolute population volumes in these age cohorts in 2030.

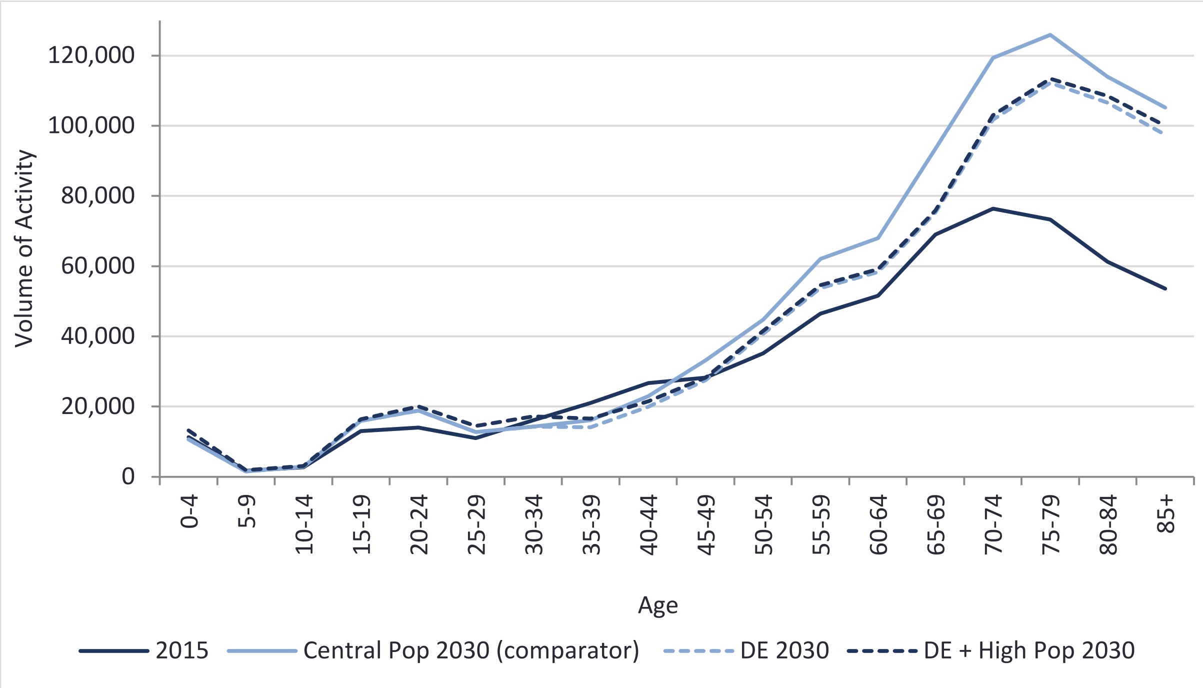
Particularly, large demand increases for insured inpatient bed days are most evident for those aged 70 and over. However, as expected, lower increases in activity volumes are reported in older ages under the Dynamic Equilibrium healthy ageing assumptions for both types of care. For older ages little variation in activity volumes are evident between the Central and High population growth assumptions when incorporating healthy ageing. However, under these scenarios for both types of care marginally higher volumes of demand are projected in 2030 in the middle of the age distribution under the High population growth assumption relative to demand in 2030 under the Central growth population growth assumption. This is largely reflective of the assumption of higher net immigration over the projection period relative to baseline population growth (see Chapter 4).

FIGURE 6.9 PROJECTED DEMAND FOR INSURED PRIVATE HOSPITAL DAY-PATIENT ADMISSIONS, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing. These projections do not include any private hospital activity financed out-of-pocket (5 per cent of financing in 2014) through non-insurer based voluntary payments (2 per cent) or by government (1 per cent) (see Section 6.1).

FIGURE 6.10 PROJECTED DEMAND FOR INSURED PRIVATE HOSPITAL BED DAYS, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Healthy ageing shifts are only applied at age ≥ 35 and where activity rates are increasing. These projections do not include any private hospital activity financed out-of-pocket (5 per cent of financing in 2014) through non-insurer based voluntary payments (2 per cent) or by government (1 per cent) (see Section 6.1).

6.4 DISCUSSION AND CONCLUSIONS

To the best of our knowledge this is the first published analysis to examine not only projections of demand for private hospital care but also baseline utilisation of these services in the Irish health system. Available data suggest that the private hospital system makes an important contribution to the provision of healthcare services in the Irish system. Recently collected Healthy Ireland Survey data suggest that just less than 23 per cent of inpatient hospital admissions (15 and over) take place in private hospitals. While similar volumes of insured inpatient bed day activity were estimated to take place in public and private hospitals, the majority (78 per cent) of insured day-patient care was estimated to take place in private hospitals. Similar to demand for other public hospital activity, activity rates for private hospital care increase with age and insured inpatient bed day rates in public and private hospitals are very similar across most of the age distribution. However, notably, insured bed day rates in public hospitals are higher for the youngest young and oldest old. Particularly, the considerably greater inpatient bed day rate for older men is likely reflective of public hospital services (but not private) acting as a substitute for long-term care services at the end of life which are more likely to be utilised by older women.

Existing evidence would suggest that is it reasonable to expect that future healthy ageing of the population may moderate future increase in demand for acute care to some extent (see Chapter 2). While healthy ageing does impact on demand growth, as in the case of acute public hospital services, we still project that demographic changes will have a considerable impact on future demand for acute private hospital services. For instance, based on our preferred projection scenarios and accounting for healthy ageing, we project that demand for private day-patient care could increase by between 24.2 and 27.9 per cent while demand for inpatient bed days could increase by between 28.1 and 32.0 per cent, by 2030. For 2015, we estimate 1,975 available beds in the private hospital system under an assumed occupancy rate of 85 per cent.

Not surprisingly, across all scenarios, the largest increase in demand is projected to take place at older ages. This increase in demand is reflective of both pure population growth and changes in the age structure of the population. However, the share of demand growth attributable to changes in population age structure is sensitive to the assumptions specified. Changes in the age structure contribute relatively less to projected demand increases under a High population growth assumption and where adjustments are made to account for healthy ageing. Projected growth in demand is higher for males than females across all types of care examined. This is consistent with changes in the age structure of the population having a greater relative impact on growth in demand for male private hospital care. This is reflective of some convergence in male and female life expectancy over the projection period.

In interpreting the findings it is important to be aware of the limitations of this analysis, which was constrained by lack of available data. While a number of administrative data sources do exist that could potentially be used to examine private hospital activity in Ireland, accessing and utilising these data for the purposes of research has traditionally presented difficulties. Private hospitals' administration systems could provide a direct source of discharge-level activity in private hospitals. At present, however, no centralised system exists to capture activity in all private hospitals and private hospitals are not required to make returns to HIPE. Private health insurer data is another administrative source of private hospital activity. As noted, a large majority of activity in private hospitals is funded through private health insurance; however, these data have not traditionally been made available for research due to concerns about commercial sensitivity.

Administrative insurer data collected by the HIA and made available to the authors informed some of the analysis in this chapter. However, as outlined (Chapter 3), these data were not collected for the purpose of analysis of private hospital care and estimates of private hospital utilisation by single-year-of-age and sex had to be derived. Moreover, these data do not capture the, albeit small, contribution of non-insured financed private hospital activity.

For these reasons the analysis in this chapter also made use of recently available survey data on utilisation of private hospital services in Ireland. However, caveats also accompany the use of these data. The activity data captured were confined to inpatient stays in private hospitals for those aged 15 and over. No information was collected on day-patient admissions to private hospitals or utilisation of either private hospital Emergency Departments or outpatient services. Recorded use of private inpatient hospital services in the sample was quite low. Some uncertainty therefore exists as to how well our sample activity rates may reflect population activity rates. Self-reported 12-month recall of utilisation could also result in some inaccurate reporting of true utilisation levels. This concern was highlighted in that there appeared to be an under-reporting of public hospital services by older individuals compared to administrative data captured in HIPE.

Finally, due to lack of available data it was not possible to examine unmet demand for private hospital care in Ireland. However, any unmet demand for private hospital services, if it exists, is likely to be small. Those paying privately for hospital care tend to access services more rapidly than those relying on the public system (15). Indeed one of the most common reasons reported for holding private health insurance is lack of access to public services (16).

The research team has made progress in accessing administrative data directly from individual private hospitals and open-market health insurers; however these data were not available in time for this report. It is hoped future iterations of this analysis will be able to incorporate these data and build on findings presented in this chapter. Future research using the Hippocrates model will analyse projected expenditures for private hospital services and can investigate the effects that changes in the model of care or in private health insurance take-up might have on demand for private hospital services.

REFERENCES

1. Private Hospitals Association (2016). 'PHA Submission to the Oireachtas Commitee on the Future of Health Care'. Dublin [cited 9 February 2016]; Available from: http://privatehospitals.ie/wp-content/uploads/2017/01/Private-Hospitals-Association-Submission-August-2016.pdf.

2. Private Hospitals Association (2017). 'Private Hospitals' contribution to the Irish Healthcare System'. [cited 2017 21/04]; Available from: http://privatehospitals.ie/private-hospitals-in-ireland.

3. Citizens Information Board (2014). 'Overview of hospital services'. [cited 2017 04/01]; Available from: www.citizensinformation.ie/en/health/health_services/gp_and_hospital_services/hospital_services_introduction.html.

4. McLoughlin, P. (2014). *Review of measures to reduce costs in the private health insurance market 2014: Independent report to the Minister for Health and Health Insurance Council.* Dublin: Department of Health.

5. Citizens Information Board (2016). 'Charges for hospital services'. [cited 2017 04/01]; Available from: www.citizensinformation.ie/en/health/health_services/gp_and_hospital_services/hospital_charges.html.

6. National Treatment Purchase Fund (2010). *Annual Report 2010*. Dublin.

7. Brick, A., A. Nolan, J. O' Reilly and S. Smith (2010). *Resource allocation, financing and sustainability in health care: Evidence for the Expert Group on Resource Allocation and Financing in the Health Sector*. Dublin, Ireland: Economic and Social Research Institute.

8. McLoughlin, P. (2014). *Review of measures to reduce costs in the private health insurance market 2014*: Independent report to the Minister for Health and Health Insurance Council. Dublin.

9. McAnenly, P. (2014). Joint Oireachtas Committee on Health and Children: 'Closure of Mount Carmel Hospital – Discussion'. Tuesday, 18 February 2014. 2014 [cited 2017 05/05]; Available from: www.kildarestreet.com/committees/?id=2014-02-18a.409.

10. Turner B. (2015). 'Unwinding the State subsidisation of private health insurance in Ireland'. *Health Policy.* 2015;119(10):1349-57. Epub 2015/09/01.

11. Central Statistics Office (2011). 'Health Status and Health Service Utilisation: Quarterly National Household Survey, Quarter 3 2010'. [cited 2017 28/04]; Available from: www.cso.ie/en/media/csoie/releasespublications/documents/labourmarket/2010/healthstatusq32010.pdf.

12. Bhandari, A. and T. Wagner (2006). 'Self-reported utilization of health care services: improving measurement and accuracy'. *Medical Care Research and Review*: MCRR. 2006;63(2):217-35. Epub 2006/04/06.

13. Health Insurance Authority (2017). *Guide to Risk Equalisation Scheme 2017*. Dublin: Health Insurance Authority.

14. Delaney, M. (2014). 'Bed occupancy far above safe levels.' *The Irish Times.* 23/9/2014 www.irishtimes.com/bed-occupancy-far-above-safe-levels-1.1921911.

15. Collins, C. and M. T. O' Shea (2016). *Access to Diagnostics Used to Detect Cancer.* Irish College of General Practioners.

16. Health Insurance Authority (2016). *A review of Private Health Insurance in Ireland.* Health Insurance Authority.

CHAPTER 7

Demand for general practice services

7.1 INTRODUCTION

Primary care in Ireland includes all formal health and social care services outside of the hospital setting and consists of a large range of different professionals and services.[94] General Practitioners (GPs) and practice nurses play a central role in primary care and are the focus of this chapter; other primary care professionals and services will be discussed in subsequent chapters. There are approximately 3,000 GPs (1) and 1,800 practice nurses (2) in Ireland. Most GPs operate as sole traders or as partners and many directly employ practice nurses. GPs provide services to both medical card holders and non-medical card holders (3). With the exception of Emergency Department (ED) visits, general practices are generally individuals' first point of contact with the healthcare system. They provide a variety of diagnostic services and medical treatments in a community setting. General practices provide certain services such as immunisation, family planning, insurance and pre-employment medicals, and minor surgery (4). GPs also act as gatekeepers for access to secondary care services in many cases in Ireland (4).[95]

Patients with a medical card are entitled to free GP care, and GPs are reimbursed through the General Medical Services (GMS) scheme by the HSE for this care. Under the GMS scheme, GPs are paid an annual capitation payment (which includes a weighting for age and sex) for each eligible patient on their list as well as a range of other fees and allowances (5). The GP visit card was introduced in 2005, and has been extended to those aged under six years and 70 years and older. For non-medical/GP visit card holders, GPs are largely reimbursed on a fee-for-service basis from individual patients. In 2010, the average fee for a GP consultation was estimated to be €51 (6), representing one of the highest co-payments for primary care in Europe (7). The relatively high fees for GP visits in Ireland for those without a medical card or GP visit card may act as a barrier to accessing GP services, with evidence finding that 19 per cent of patients (4 per cent of non-paying patients and 26 per cent of paying patients) had a medical problem in the previous year but had not consulted a GP because of cost (8).

Internationally there is increasing emphasis on the development of a strong and effective primary care system as a means of improving overall health system performance (7). In Ireland, significant reform of the primary care system was

---

94 Including GPs, practice nurses, public health and community nurses, physiotherapists, occupational therapists, dentists, opticians, psychologists and pharmacists.

95 For example, free specialist or ED care is provided through a GP referral.

proposed in the 2001 *Primary Care: A New Direction* report (9). The document acknowledged the central role of primary care in the future development of the health service and proposed the introduction of an multidisciplinary team-based approach, based around primary care teams (PCTs). PCTs would include a multidisciplinary group of health and social care professionals, including GPs and allied healthcare professionals, located in a single primary care system; it was envisaged that 400-600 of these teams would be established by 2011 (10). A commitment to the development of primary care and PCTs was restated in the 2012 Department of Health publication *Future Health* (11). Progress has been relatively slow and at the end of 2012, the HSE reported that there were 426 PCTs (10); however, questions have been raised about whether these PCTs are operating as envisaged or whether they are PCTs in name only (12). The Oireachtas Committee *Sláintecare Report*, published in 2017, recommends greater emphasis on primary care as the provider of healthcare and introducing universal GP and primary care which would remove fees for GP care (13).

The next section presents findings for baseline utilisation in 2015 of GP and practice nurse services. Section 7.3 presents findings for unmet need for GP services. Section 7.4 presents projections of general practice demand to 2030 while Section 7.5 discusses and concludes.

7.2 FINDINGS – BASELINE UTILISATION

This analysis of GP and practice nurse visiting is based on survey evidence, outlined in Chapter 3 and Appendix 2. Figure 7.1 illustrates the GP visit rate (per 1,000 population) and volume of GP visits in 2015 across age and sex cohorts. The rate of GP visits increases with age for adults in a similar fashion for males and females, though rates in the middle of the age distribution are lower than rates for young children. Females' GP visit rates increase between the ages of 15 and 54 years. A steeper increase in visiting rates is observed for both males and females from 70 years of age which may reflect, in addition to greater need, the higher proportion of those aged 70 years and older who have a medical card or GP visit card due to lower income thresholds for medical cards.[96]

Overall, there were an estimated 17.55 million GP visits in 2015. The volume of GP visits increases from the ages of 12-14 up to 60-64 before decreasing in the older age cohorts for males. In the younger age cohorts, volumes are almost identical for males and females; however, females have much higher volumes between the ages of 15 and 44 years and volumes are slightly higher in the oldest age cohorts for females.

[96] Due to the timing of the survey evidence on which it is based, the analysis does not cover the potential increase in visit rates for those aged 70 years and older after the extension of GP visit cards to those who did not qualify for a medical card from August 2015.

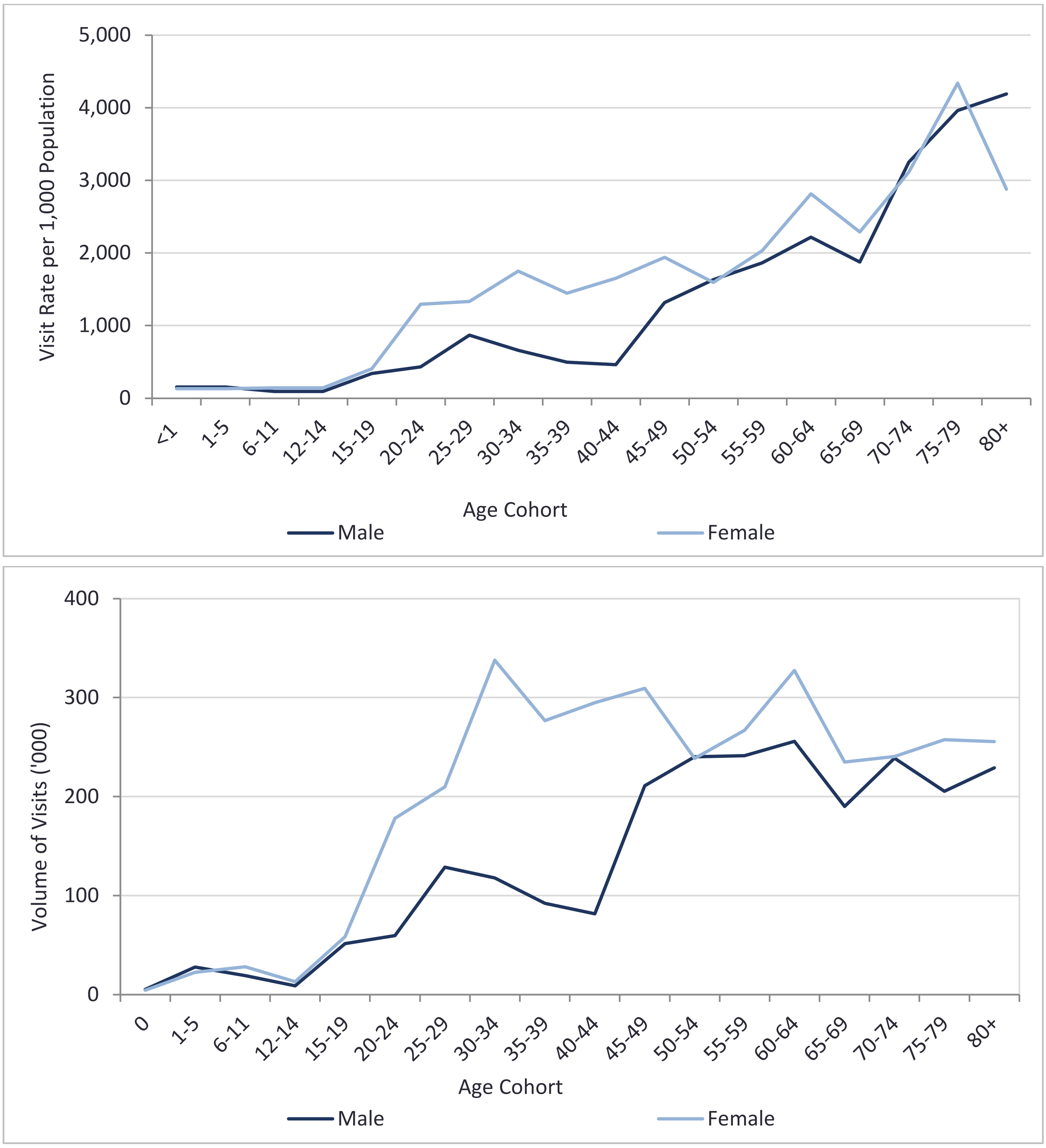
FIGURE 7.1 GENERAL PRACTITIONER (GP) VISITS, 2015

Sources: *Growing Up in Ireland* data; Healthy Ireland Wave 1 data; ESRI population data, 2015.

Figure 7.2 illustrates the practice nurse visit rate (per 1,000 population) and volume of practice nurse visits in 2015. The results follow a very similar pattern to GP visits in Figure 7.1. The rate of practice nurse visits increases with age for adults in a similar fashion for males and females and rates are low for children. Females have higher practice nurse visit rates between the ages of 15 and 59 years. A steeper increase in the visiting rate is observed for both males and females from 65 years of age.

Overall, there were an estimated 5.94 million practice nurse visits in 2015. The volume of practice nurse visits increases substantially from the ages of 15-19 up to 50-54, and remains constant in the older age cohorts, for both males and females. Volumes are very similar for males and females in the older cohorts, however females have much higher volumes between the ages of 15-19 and 50-54 years.

FIGURE 7.2 PRACTICE NURSE VISITS, 2015



Sources: *Growing Up in Ireland* data; Healthy Ireland Wave 1 data; ESRI population data, 2015.

7.3 FINDINGS – UNMET NEED

Estimates of unmet need for GP care apply survey evidence from the QNHS Health Module of 2010 which found that 6.5 per cent of people reported that they needed to see a GP but had not (see data sources and methods in Chapter 3 and Appendix 2). Figure 7.3 illustrates the rate (per 1,000 population) of unmet need for a GP visit (not including practice nurse visits) assuming one additional GP visit which is in line with the increase in visits seen after gaining a medical card (14, 15). The flat rate in younger age cohorts is a result of the unmet need rate of 15- to 19-year-olds being applied to those aged 14 years and younger, who were not included in the survey. Unmet need rates are consistently higher amongst females. For females, there is an increase in rates at ages 15 to 19 (56.1 per 1,000 population) to ages 50 to 54 (100.6 per 1,000 population), with a reduction thereafter. There is an increase in rates from ages 15 to 19 (41.7 per 1,000 population) to ages 35 to 39 (79.3 per 1,000 population) for males, with a reduction thereafter. The lowest rates of unmet need are reported in the oldest age cohorts.[97]

FIGURE 7.3 NUMBERS WITH UNMET NEED FOR A GENERAL PRACTITIONER (GP) VISIT

Source: QNHS 2010 Quarter 3 Health Module data.

7.4 FINDINGS – PROJECTIONS

For projection of general practice demand, we take a less optimistic view of the effects of healthy ageing than in the case of the acute hospital services discussed in Chapters 5 and 6. The assumptions underlying the preferred projections in this chapter were outlined and discussed in Chapter 3 and are based on the evidence reviewed in Chapter 2. While other chapters include the Central population projection as a comparator, in this chapter this projection is part of our preferred projection range. Without a healthy ageing assumption, this projection implicitly

97 The rates of unmet need in the oldest age cohorts may not be representative due to the nature of the QNHS survey (see Section 7.5).

assumes Expansion of Morbidity, which we consider a valid assumption given the evidence of a growing burden of chronic disease, which would be expected to increase demand for GP services. The other preferred projection scenarios applied are the more optimistic Moderate Healthy Ageing and Moderate Healthy Ageing with High population growth. Finally, we applied Moderate Healthy Ageing and unmet need.

7.4.1 Projections for general practice visits, 2015-2030

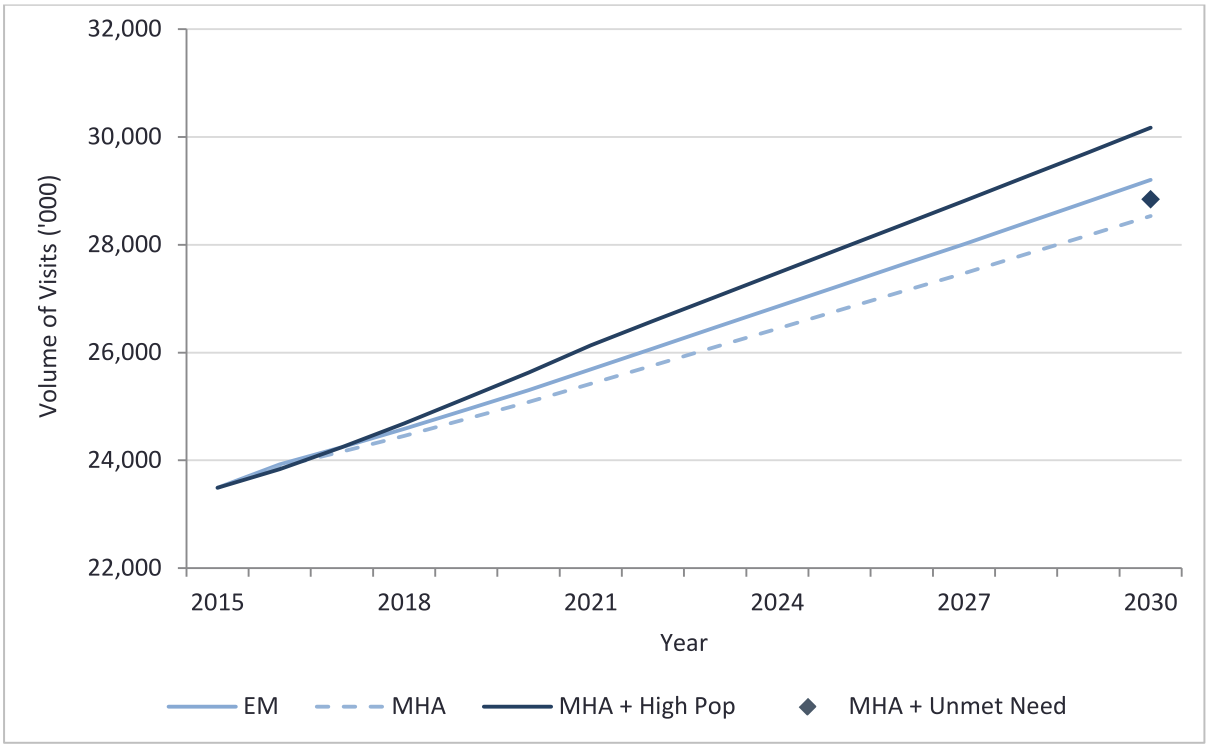
Figure 7.4 and Table 7.1 presents projections of demand for general practice care visits from 2015 to 2030 based on these scenarios.

Preferred projection scenarios

- *Expansion of Morbidity:* If population growth alone drove general practice utilisation and gains in longevity are accompanied by additional years with chronic disease, we project a demand for 29.2 million general practice visits in 2030 which equates to a 24.3 per cent increase. A slightly lower increase, 22.8 per cent, is projected for GP visits and a slightly higher increase, 28.8 per cent, is projected for practice nurse visits. Demand for visits is projected to increase more for males in all scenarios.
- *Moderate Healthy Ageing:* Applying the Central population growth with Moderate Healthy Ageing assumption, we project demand for 28.5 million general practice visits in 2030 which equates to a 21.5 per cent increase. This is lower than the previous projection with assumed Expansion of Morbidity because disease-free years increase to a greater extent than in the Expansion of Morbidity scenario. A slightly lower demand increase, 20.0 per cent, is projected for GP visits and a slightly higher demand increase, 25.7 per cent, is projected for practice nurse visits.
- *Moderate Healthy Ageing with High Population Growth:* Applying the Moderate Healthy Ageing with High population growth projection assumption yields a projected demand for 30.2 million general practice visits in 2030 which equates to a 28.4 per cent increase. Therefore, assuming higher population growth increases general practice demand. This is due in part to the increases in the younger adult population, who have high rates of general practice visits (see Figures 7.1 and 7.2). A slightly lower demand increase, 27.3 per cent, is projected for GP visits and a slightly higher demand increase, 31.7 per cent, is projected for practice nurse visits.
- *Moderate Healthy Ageing and Unmet Need:* Incorporating unmet need into the Moderate Healthy Ageing assumption yields a projected demand for 28.8 million general practice visits in 2030 (22.8 per cent increase). A

slightly lower demand increase, 21.8 per cent, is projected for GP visits. The small increase in projected demand above the Moderate Healthy Ageing scenario arises because only one additional GP visit is included in the case of unmet need. This conservative approach to estimating unmet need was adopted because the survey question on which it is based did not ask people reporting unmet need how many GP visits they required.

FIGURE 7.4 PROJECTED DEMAND FOR GENERAL PRACTICE (GP AND PRACTICE NURSE) VISITS, 2015 TO 2030 – PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.

Notes: Pop = population; EM = expansion of morbidity; MHA = moderate healthy ageing.

TABLE 7.1 GENERAL PRACTICE VISITS DEMAND PROJECTIONS, 2015 TO 2030, PREFERRED PROJECTIONS

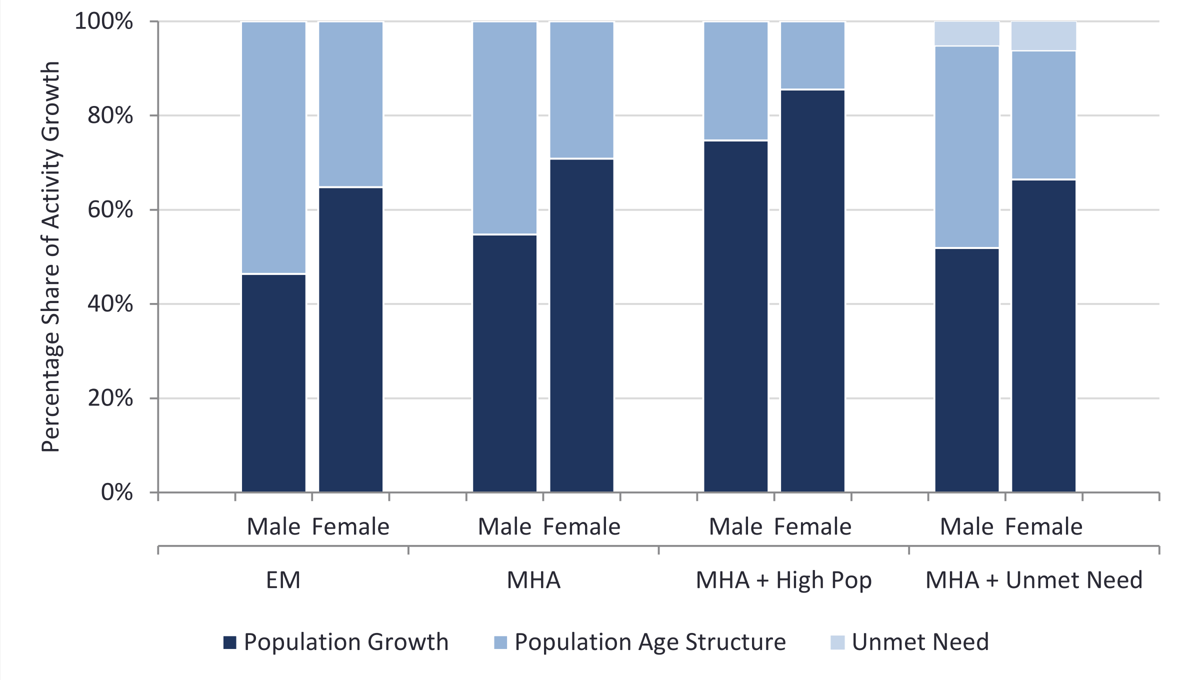
	Scenario	Baseline Activity (2015)	% change 2015-2030			
			Preferred Projections			
			Expansion of Morbidity	MHA	MHA + High Population	MHA + Unmet Demand
		Number of Visits ('000)	% Change	% Change	% Change	% Change
GP visits	Male	7,319.3	25.6	21.7	28.7	23.5
	Female	10,231.4	20.8	18.8	26.3	20.5
	Total	**17,550.7**	**22.8**	**20.0**	**27.3**	**21.8**
Practice Nurse visits	Male	2,400.6	35.2	29.8	35.1	-
	Female	3,543.6	24.4	23.0	29.3	-
	Total	**5,944.2**	**28.8**	**25.7**	**31.7**	-
General Practice visits	Male	9,719.9	28.0	23.7	30.3	25.0
	Female	13,774.9	21.7	19.8	27.1	21.2
	Total	23,494.8	**24.3**	**21.5**	**28.4**	**22.8**

Source: Authors' calculations. The healthy ageing assumption which appears better supported by the evidence is combined with High population or Unmet Need/Demand.
Note: This analysis may understate practice nurse activity since visits where a patient saw both the GP and the practice nurse are coded as GP visits in the Healthy Ireland survey (see Appendix 2).

7.4.2 Preferred projection scenarios and demand decompositions, 2015 to 2030

Figure 7.5 decomposes the drivers of projected demand growth over the projection period by sex into changes in the size or the age structure of the population for general practice visits (GP and practice nurse visits combined). Under the Expansion of Morbidity assumption, changes in the population age structure explain 54 per cent of the increase in activity for males and 35 per cent for females. Under the Moderate Healthy Ageing assumption, there is a reduction in the share of activity explained by changes in the population age structure (45 per cent for males, 29 per cent for females). The share of activity explained by changes in the age structure falls further when the Moderate Healthy Ageing with High population growth assumption is applied. Unmet need explains 5 per cent and 6 per cent of activity for males and females respectively when included in the Moderate Healthy Ageing assumption. If more than one visit were estimated for unmet need, the percentage explained by unmet need would increase. Across all scenarios, a greater share of male activity growth is attributable to changes in the age structure of the population. This is consistent with projected greater life expectancy increases for males over the projection period (see Chapter 4), and results follow similar patterns to results in other chapters.

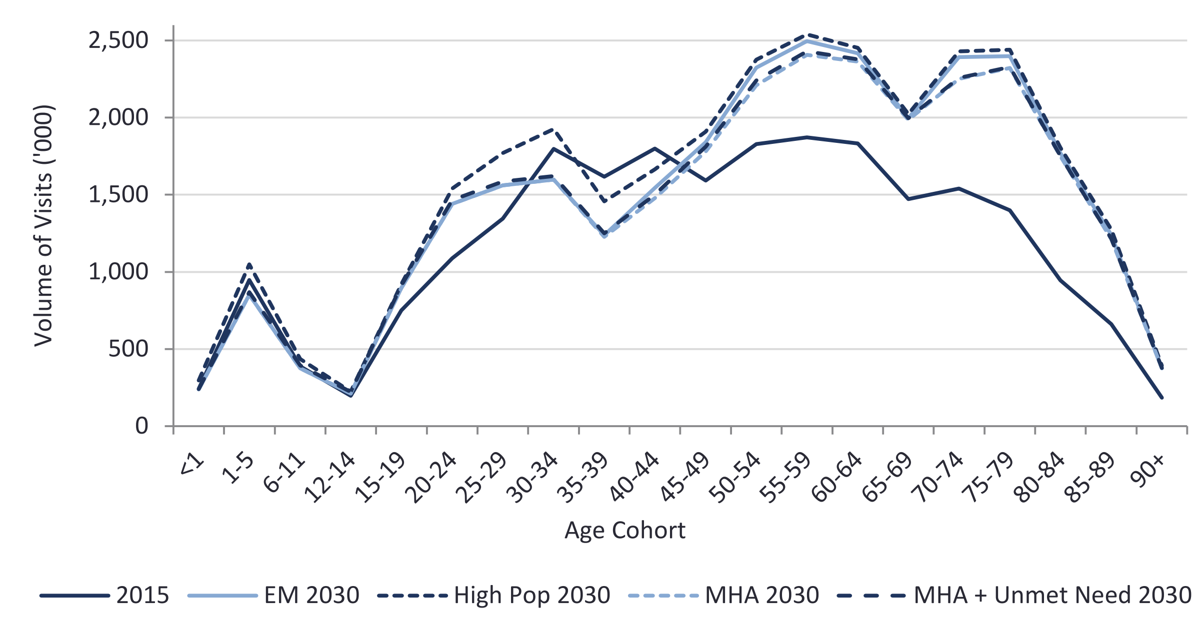
FIGURE 7.5 GENERAL PRACTICE VISITS PROJECTED DEMAND GROWTH DECOMPOSITION FOR PREFERRED PROJECTION SCENARIOS, BY SEX, 2015 TO 2030



Source: Authors' calculations.
Notes: Pop = population; EM = expansion of morbidity; MHA = moderate healthy ageing.

Figure 7.6 illustrates the baseline and projected demand for general practice visits across age cohorts for different population and healthy ageing scenarios. For almost all age cohorts, demand is projected to be higher in 2030 than in 2015. However, demand is projected to be lower for those between the ages of 30 to 45 in the projections applying Expansion of Morbidity and Moderate Healthy Ageing assumptions. This drop in demand reflects a projected decline in population numbers in this age range in 2030. A lesser projected decrease in this age cohort in the High population growth scenario explains the difference in projected demand observed for these age cohorts. Unmet need increases volumes slightly across age cohorts, though as we assume only one GP visit for unmet need, the difference is difficult to distinguish in the figure.

FIGURE 7.6 PROJECTED DEMAND FOR GENERAL PRACTICE (GP AND PRACTICE NURSE) VISITS, BY AGE, 2015 TO 2030 – PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.
Notes: Pop = population; EM = expansion of morbidity; MHA = moderate healthy ageing.

7.5 DISCUSSION AND CONCLUSIONS

This chapter presents findings for baseline demand for GP and practice nurse visits in 2015 and projects demand forward to 2030. In 2015, there were an estimated 23.5 million general practice visits overall, with 17.6 million GP visits and 5.9 million practice nurse visits. Previous evidence using 2006 as the base year projected 13.35 million GP visits in 2015 for those aged 16 years and older (16). In the baseline estimates in this chapter, there are an estimated 15.91 million GP visits in those aged 15 years and older.

These results show that practice nurse visits constitute a substantial part of general practice activity so that analysing general practice activity using GP visits alone to quantify demand is not sufficient to get a true picture of activity. GP and practice nurse visiting rates increase with age, and are generally higher among females, with females in the middle of the age distribution having especially high rates.

Previous work has shown that due to the changing structure of GP supply and increased demand from changing patient demographics, more GPs will be required (1, 16). Concerns have been raised about the resourcing of GP services and a potential shortage of GPs by GP organisations including the Irish College of General Practitioners (19) and the National Association of General Practitioners

(20). Recent estimates suggest there are 64 GPs per 100,000 population in Ireland, significantly lower than the European average of 91 GPs per 100,000 (1).

Demand for general practice visits is projected to increase by between 21.5 per cent and 28.4 per cent over the projection period, 2015-2030, across the preferred projections. Population growth explains the majority of the increase in projected demand growth for females. Across each scenario, changes in the age structure of the population between 2015 and 2030, explains a greater share of projected demand growth amongst males. Males are projected to see the largest increase in demand for visits from 2015-2030.

The findings may underestimate future demand given the extension in the summer of 2015 of eligibility for GP visit cards to all children under six years of age and to people aged 70 and over, who did not previously qualify for a medical card or GP visit card. The extended eligibility for children under six was also accompanied by changes to the model of care for children. These changes occurred too late in 2015 to be captured in the baseline survey data so that activity in the baseline may be understated. Future iterations of the model will capture these changes. The estimated visits in 2015 are derived from analysis of a number of different survey datasets which include different recall periods, which may also result in understated demand.[98]

The findings for unmet need may additionally underestimate the demand for general practice care. Previous analysis has found that gaining a medical card increases the number of GP visits by 0.9-1.3 visits (15). Using this as a proxy for unmet need, a previous study has found that expansion of medical cards to all could increase demand for GP care by 18.2 per cent (21).

A pertinent issue highlighted in the preparation of this chapter is the lack of a survey (or alternative source) which includes information on GP use for all ages in Ireland. For the purpose of this analysis it was necessary to use a number of different surveys to identify general practice utilisation for different age cohorts. Differences in survey design, survey questions and time periods also undermine the comparability of the utilisation rates across the different age cohorts and over time. Therefore, a recommendation emerging from this analysis is that there is a need for a data source which provides up-to-date data on GP utilisation for the total population. This may also afford the estimate of more accurate

98 There are differences in recall periods across surveys. QNHS, GUI, and TILDA use 12-month recall, while Healthy Ireland uses four-week recall. There is no one ideal recall period with the preferred length of recall depending on the objective of the analysis (17). However a systematic review found that inaccuracy of reporting increases with longer recall periods and that under-reporting was a substantially more frequent problem at 12 months than over-reporting (18), providing support for a shorter recall period.

capitation rates within the GMS to better reflect differences in general practice utilisation in different groups.

There are a number of further data limitations in this chapter. Due to the dates of surveys used for this analysis, the baseline estimates may not capture the expected increase in general practice use amongst those under six years of age and aged 70 years and older, to whom free GP care was extended from July and August 2015 respectively. However, future iterations of the model will be able to incorporate the recent changes into general practice demand and projected demand. Data on unmet need for the analysis presented in this chapter also have a number of limitations. They are based on QNHS survey data from 2010 and it is possible that there have been changes in the level of unmet need for GP services since then. The survey is community-based and does not include respondents in long-term care facilities, so that results for older age cohorts may not be representative. It only includes people aged 18 and over and there is a lack of comparable data on unmet need for younger age cohorts. Finally, the question on unmet need included asks if the respondents needed to visit a GP but did not attend; there is no information on how many GP visits were required or if the individual subsequently visited the GP. The percentage of people reporting that they needed to see a GP but had not in the QNHS health module (6.5 per cent) is relatively low when compared to the finding from O'Reilly et al. that 19 per cent of respondents reported having a medical problem in the previous year but had not consulted the doctor because of cost (8). This evidence may therefore understate unmet need.

REFERENCES

1. Teljeur, C., E. Tyrrell, A. Kelly, T. O'Dowd, S. Thomas (2014). 'Getting a handle on the general practice workforce in Ireland'. *Irish Journal of Medical Science*. 2014;183(2):207-13. Epub 2013/08/01.

2. Irish Practice Nurses Association (2014). General Information Leaflet.

3. Ma, Y. and A. Nolan (2016). 'Public Healthcare Entitlements and Healthcare Utilisation among the Older Population in Ireland'. *Health Economics*. Epub 2016/10/04.

4. Nolan A. (2007). 'The financing and delivery of GP services in Ireland'. In: Nolan B, editor. *The provision and use of health services, health inequalities and health and social gain.* Dublin, Ireland: Economic and Social Research Institute.

5. Brick, A., A. Nolan, J. O'Reilly and S. Smith (2010). *Resource allocation, financing and sustainability in health care.* Dublin, Ireland: ESRI and Department of Health and Children.

6. National Consumer Agency (2010). 'Doctor and dentists survey'. Dublin: National Consumer Agency.

7. Kringos, D., W. Boerma, Y. Bourgueil, T. Cartier, T. Dedeu, T. Hasvold, T. et al. (2013). 'The strength of primary care in Europe: an international comparative study'. *The British Journal of General Practice: the Journal of the Royal College of General Practitioners.* 2013;63(616):e742-50. Epub 2013/11/26.

8. O'Reilly, D., T. O'Dowd, K.J. Galway, A.W. Murphy, C. O'Neill, E. Shryane et al. (2007). 'Consultation charges in Ireland deter a large proportion of patients from seeing the GP: results of a cross-sectional survey'. *The European Journal of General Practice*. 2007;13(4):231-6. Epub 2008/03/08.

9. Department of Health and Children (2001). *Primary care: A new direction.* Dublin, Ireland. The Stationery Office.

10. Oireachtas Library and Research Service (2014). *GPs and the Irish Primary Care System: towards Universal Primary Care.* Dublin, Ireland. Oireachtas Library and Research Service.

11. Department of Health (2012). *Future Health - A strategic framework for reform of the health service 2015-2015*. Dublin, Ireland.

12. Houston, M. (2012). 'Little progress on primary care teams says College CEO'. *Irish Medical Times*. 16 May 2012.

13. Houses of the Oireachtas Committee on the Future of Healthcare (2017). *Sláintecare Report*. Dublin: Houses of the Oireachtas.

14. Nolan, A. and Layte R. (2017). 'The impact of transitions in insurance coverage on GP visiting among children in Ireland'. *Social Science & Medicine*. 2017;180:94-100.

15. Nolan A. (2008). 'Evaluating the impact of eligibility for free care on the use of general practitioner (GP) services: a difference-in-difference matching approach'. *Social Science & Medicine*. 2008;67(7):1164-72. Epub 2008/07/22.

16. Layte, R., M. Barry, K. Bennett, A. Brick, E. Morgenroth, C. Normand, et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland*. Dublin.

17. Kjellsson, G., P. Clarke, U.G. Gerdtham (2014). 'Forgetting to remember or remembering to forget: a study of the recall period length in health care survey questions'. *Journal of Health Economics.* 2014;35:34-46. Epub 2014/03/07.

18. Bhandari, A. and T. Wagner (2006). 'Self-reported utilization of health care services: improving measurement and accuracy'. *Medical care research and review*: MCRR. 2006;63(2):217-35. Epub 2006/04/06.

19. Irish College of General Practitioners (2016). 'Submission to the Oireachtas committee on the future of healthcare: general practice is key to sustainable healthcare' Dublin, Ireland. Irish College of General Practitioners.

20. National Association of General Practitioners (2015). 'Initial NAGP submission on contract issues affecting general practice'. Dublin, Ireland. National Association of General Practitioners.

21. Wren, M., S. Connolly and N. Cunningham (2015). *An examination of the Potential Costs of Universal Health Insurance in Ireland.* Dublin, Ireland: Economic and Social Research Institute.

CHAPTER 8

Demand for pharmaceuticals and pharmacy services in the community

8.1 INTRODUCTION

The CSO estimated that Ireland spent approximately €2,636 million on pharmaceuticals expenditure in 2014.[99] This accounted for almost 14 per cent of current healthcare expenditure (1). Approximately 75 per cent of this was publicly-funded, just under 6 per cent was on prescribed medicines for which individuals paid out-of-pocket (OOP) and the remainder was OOP expenditure on non-prescribed medicines sold over-the-counter (OTC).[100]

Public financing of pharmaceuticals takes place through the Primary Care Reimbursement Service (PCRS). The PCRS is responsible for making payments to healthcare professionals such as GPs, dentists and pharmacists, for free or reduced cost health services they provide to the public, under a variety of community schemes. Four schemes account for just under 99 per cent of all prescription items claimed under the service. The schemes involved relate to the General Medical Services (GMS) Scheme, Drugs Payment Scheme (DPS), Long-Term Illness (LTI) Scheme and the High Tech Drugs (HTD) Scheme.

The GMS or medical card scheme is the largest of the community schemes operating in Ireland. At the end of 2015 over 1.7 million individuals were eligible for medical cards under the GMS scheme, equating to 37.4 per cent of the population (2). Eligibility for the GMS Scheme is decided mainly based on income, but eligibility may also be based on age and family characteristics (see further in Chapter 2). In some circumstances, full medical cards can be awarded on a discretionary basis to individuals with ongoing medical conditions that may otherwise lead to undue hardship (3). In general an individual with medical card eligibility will present a complete prescription to a pharmacist contracted with the HSE to dispense prescription items. However, in rural areas a small number of GPs hold contracts to dispense drugs and medications to GMS cardholders directly (4). Prior to October 2010 all individuals within the GMS scheme were entitled to prescription medications free of charge. However, at that time, in the context of reductions in the public healthcare budget in response to the

---

99 This figure relates to pharmaceutical expenditure associated with retailers of medical goods (largely pharmacies). The CSO also records an additional €123 million of expenditure associated with non-healthcare providers (mainly supermarkets).

100 This breakdown is not published and was provided by the CSO to the ESRI on request – it is an approximation based on best available data.

economic and fiscal crisis, a prescription fee of €0.50 was introduced for each item dispensed, which has since been increased to €2.50 (subject to a maximum of €25 per month per person or family).[101] Evidence suggests that this has reduced medication use by GMS patients (6).

Those not eligible for medical card cover are eligible for the DPS. The DPS ensures that individuals or families in Ireland only pay up to a specified amount for approved prescribed medications each month. Any costs above this threshold are paid by the State. Government cost-shifting policy over the period of the economic crisis has seen this threshold gradually increased from €85 per month, prior to 2008, to its current level of €144 per month (introduced in 2013).

Those with certain long-term illnesses or disabilities may qualify for the LTI scheme. This scheme provides free medications directly related to the treatment of specified illnesses irrespective of income. Currently there are 16 listed medical conditions on the scheme. Examples of these conditions include intellectual disability, epilepsy and cystic fibrosis (7). Finally, the HTD scheme (introduced in 1996) facilitates the supply and dispensing of certain 'high tech' drugs through community pharmacies which had been previously only supplied in hospitals (8). Examples of such drugs include anti-rejection drugs for transplant patients or medicines associated with chemotherapy or hormonal therapy. Pharmacists receive a patient care fee for supplying these drugs (4).

Despite public cost-saving measures contributing to reduced expenditure on pharmaceuticals by 2.5 per cent per year on average between 2009 and 2013, pharmaceutical spending in Ireland is still among the highest across OECD countries (9). Ireland spends approximately 26.6 per cent more per person on pharmaceuticals than the OECD average. Both price and volume contribute to this relatively high spending. For instance, the OECD notes that Ireland has relatively high prescription rates for a number of pharmaceuticals such as benzodiazepines[102] and antibiotics and while there has been an increase in generic prescribing in Ireland, the share of generics in total prescription pharmaceuticals (29 per cent) is still much lower than in other countries (e.g. 83 per cent in the UK) (9). In analysis of these expenditures at a later stage in this project, the relative contributions of price and volume to this relatively high spend will be analysed. The focus of this chapter will be on analysing the demand for pharmaceuticals in Ireland and projecting forward this demand to 2030. Specifically, the main focus of this chapter is on analysing current and future

[101] Since 1 March 2017, this maximum charge was reduced to €20 per month for those over the age of 70 (5).

[102] In Ireland, 63 per 1,000 elderly patients receive long-term prescriptions for benzodiazepines and related drugs. This is considerably higher than the OECD average of 29 per 1,000 (10). Recently, however, the *Misuse of Drugs (Amendment) Act 2016* which came into effect on 4 May 2017, among other changes, has introduced tighter controls of benzodiazepines (10).

trends in community-based publicly-financed prescription pharmaceuticals. Lack of data on utilisation of privately-financed prescription pharmaceuticals and non-prescribed medications prevent analysis on these areas from being included.[103] Moreover, we do not consider analysis of pharmaceuticals dispensed in hospitals because they are costed in the hospital sector and will be captured in the analysis of acute hospital expenditures at a later stage in this project. Additionally we examine pharmaceutical demand from the perspective of service use, that is, volume of pharmaceutical consultations. Data limitations necessitate that for the projection analysis we assume 2014 activity rates for projection of PCRS prescription pharmaceuticals and 2010 activity rates for projection of pharmaceutical consultations (see Section 3.4.4).

The structure of this chapter is as follows: Section 8.2 presents findings for trends in prescribing and baseline activity in 2015. Section 8.3 presents the findings for projected demand to 2030. Section 8.4 discusses and concludes.

8.2 FINDINGS – TRENDS AND BASELINE UTILISATION

8.2.1 Trends in prescription items and scheme eligibility, 2010-2014

Table 8.1 presents trends in the number of prescription items by scheme, and the percentage of the population eligible for these schemes, between 2010 and 2014. Across all schemes, there was a total of 71.5 million prescription items recorded in 2014. The GMS scheme is by far the largest of all the community based schemes, accounting for 83 per cent of all prescription items in 2014. Between 2010 and 2013 there was a year-on-year rise in the number of GMS prescription items with over 62.1 million prescription items in 2013. In 2014, this figure fell to 59.3 million prescription items. Trends in the number of prescription items over the period were strongly correlated with GMS eligibility rates. Between 2010 and 2012 there was an overall increase of 4.6 percentage points in the proportion of individuals eligible for the scheme. The increased eligibility was a consequence of rising unemployment and falling incomes over the period of economic crisis rather than any changes to eligibility criteria which remained fixed (11). A fall in the eligibility rates between 2013 and 2014 (a result of improving economic conditions) saw the number of prescription items on the scheme also fall. In addition to eligibility changes, the introduction of prescription charges in 2010 and their subsequent increase in 2013 and 2014 was also likely to have negatively affected demand for GMS prescription items.

[103] For those who exceed the monthly DPS threshold, the PCRS does capture the sub-threshold expenditure, but not activity i.e. the nature of what is purchased. No information is captured on those who do not exceed the monthly DPS threshold. The Household Budget Survey records households' expenditure out-of-pocket on prescribed and over-the-counter medications but does not record the nature or number of the items purchased.

Between 2010 and 2014 there was a year-on-year reduction in the number of DPS prescription items recorded. Similar to GMS scheme trends, there is a strong association evident between declining eligibility rates over this period and the number of DPS prescription items recorded. Declining eligibility for the DPS was largely a consequence of Government cost-shifting policy over the period of economic crisis which saw a number of consecutive increases in the DPS threshold from €85/month (pre-2008) to €144/month by 2013 (11). This contributed to a decline in the number of items recorded on the DPS from 10.8 million in 2010 to 6.9 million by 2014. Eligibility for the LTI scheme gradually increased between 2010 and 2013. This was accompanied by a steady increase in the number of items recorded on this scheme over that period. However, between 2013 and 2014 there was a significant increase in the number of items recorded under the LTI, jumping from 3.0 million in 2013 to 4.6 million in 2014 (an increase of 55 per cent). This was most likely partly a result of the steep rise in eligibility for the scheme between these years. A part of this increase, however, may be a consequence of a HSE review in October 2013, following pressure from the Ombudsman, that concluded that LTI entitlement be granted to children suffering from attention-deficit-hyperactivity disorder (ADHD) under the LTI category of mental illness (for children under 16) (12).[104] Moreover, following the elimination in July 2013 of a 20 per cent retail mark-up payable to pharmacists for supplying items on the LTI scheme, those qualifying for both GMS and LTI schemes can now access medication for their qualifying LTI condition(s) under the LTI scheme. Prior to this it was HSE policy that those qualifying for both schemes obtained their medication through the GMS scheme (13). Given that prescription charges apply to the GMS scheme and not to the LTI scheme this move likely shifted some demand for medication off the GMS scheme and onto the LTI scheme.

Finally, a gradual increase in eligibility rates and volumes for the HTD scheme was also observed between 2010 and 2014. High tech drugs accounted for under one per cent of the total volume of prescription items on the community drug schemes in 2014. However, this masks the fact that the relative unit costs of these drugs tend to be very high.

[104] Prior to this there was controversy over whether ADHD constituted a mental illness under the scheme with significant regional variation in eligibility across the country (12).

TABLE 8.1 TRENDS IN PRESCRIPTION ITEMS AND SCHEME ELIGIBILITY, 2010-2014

	2010	2011	2012	2013	2014
GMS					
Number of items	53,730,308	57,731,339	61,825,521	62,055,525	59,329,500
% of Population[1]	35.5	36.9	40.1	39.8	37.8
DPS					
Number of items	10,849,551	9,984,260	9,252,650	7,577,149	6,946,216
% of Population[2]	34.1	33.0	31.7	30.1	28.5
LTI					
Number of items	2,627,146	2,646,975	2,849,473	2,966,567	4,602,122
% of Population	2.3	2.5	2.7	2.9	3.6
HTD					
Number of items	422,720	483,997	514,877	548,198	574,913
% of Population	4.6	4.8	4.9	5.0	5.5

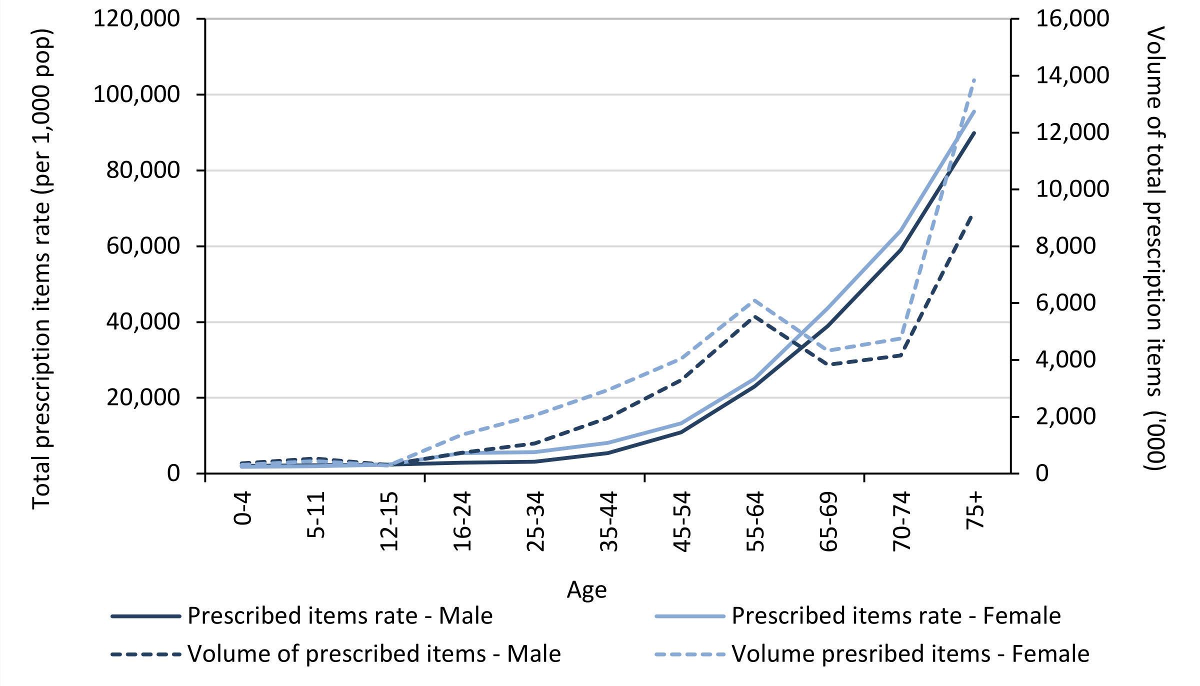
Source: PCRS Claims Data 2010-2014; ESRI Population Data 2010-2014; Key Trends in Ireland 2015.
Notes: 1. Eligibility is based on figures provided in Key Trends in Ireland 2015 (14) and is net of GP card eligibility which does not entitle holders to publicly-financed pharmaceuticals. All other eligibility rates are based on numbers eligible provided directly to the ESRI by PCRS.
2. Eligibility in this sense refers to individuals who reached the DPS threshold for state-reimbursement of prescription pharmaceuticals.

8.2.2 Age and sex distributions of prescription items, volume and rates, 2014

Figure 8.1 presents the age and sex-specific total prescription items rates and volumes for 2014.[105] The total prescription items rate for both males and females remains relatively flat up to age 35-44 after which the prescription item rate increases with the rate of increase rising with age. For males aged 75 and over the total prescription item rate reaches 89,905 items per 1,000, while for females belonging to the same age cohort the rate peaks at 95,536 items per 1,000. While, all else equal, polypharmacy (use of multiple medications by patients) can be expected to increase with age due to greater disease burden in older ages (15), eligibility effects are also likely influencing the shape of the prescription item rate curve. Particularly, the more generous GMS scheme income eligibility thresholds for those 70 and over, which is by far the largest of the community drug schemes (see Table 8.1), is likely also driving increase prescribing rates in these older age cohorts. For instance, in 2014, around 48.5 per cent of those aged 65-69 were GMS eligible, while this jumped to 84.1 per cent for those aged 70 and over.[106] The absolute number of prescription items also increases across age groups for both males and females, albeit falling slightly for those aged between 65 and 69. At age 75 and over, females recorded 4.6 million additional GMS prescription items compared to males.

105 This baseline analysis considers 2014 rates and volumes due to the unavailability of 2015 PCRS activity data at the time of analysis.
106 Calculated based on 2014 PCRS eligibility data combined with 2014 ESRI population estimates.

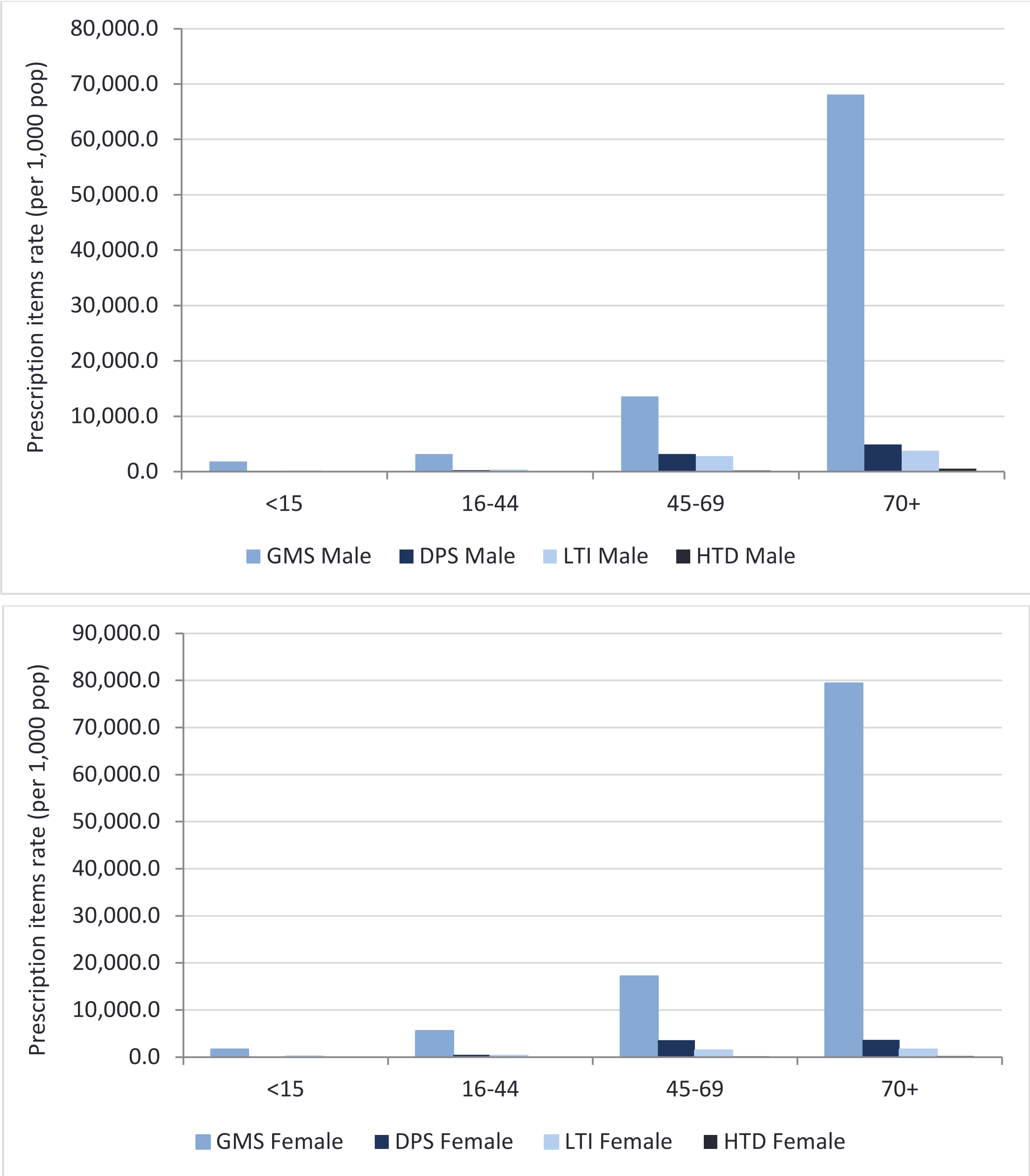
FIGURE 8.1 AGE AND SEX-SPECIFIC BREAKDOWN OF TOTAL PCRS PRESCRIPTION ITEMS, RATE AND VOLUMES, 2014



Source: PCRS Claims Data 2014; ESRI Population Data 2014.

Figure 8.2 presents age and sex-specific breakdowns of prescription item rates for GMS, DPS, LTI and HTD items in 2014. The GMS prescription item rate increases steeply with age peaking for those aged 70 and over for both males (68,127 items per 1,000 population) and females (79,354 items per 1,000 population). For DPS, males aged 70 and over record a prescription item rate of 4,923 prescription items per 1,000 population, while females aged 70 and over record a prescription item rate of 3,683 prescription items per 1,000. Across the other community drug schemes prescription item rates also increase with age and peak for those aged 70 and over.

FIGURE 8.2 AGE AND SEX-SPECIFIC GMS,DPS, LTI AND HTD ITEMS RATES, 2014



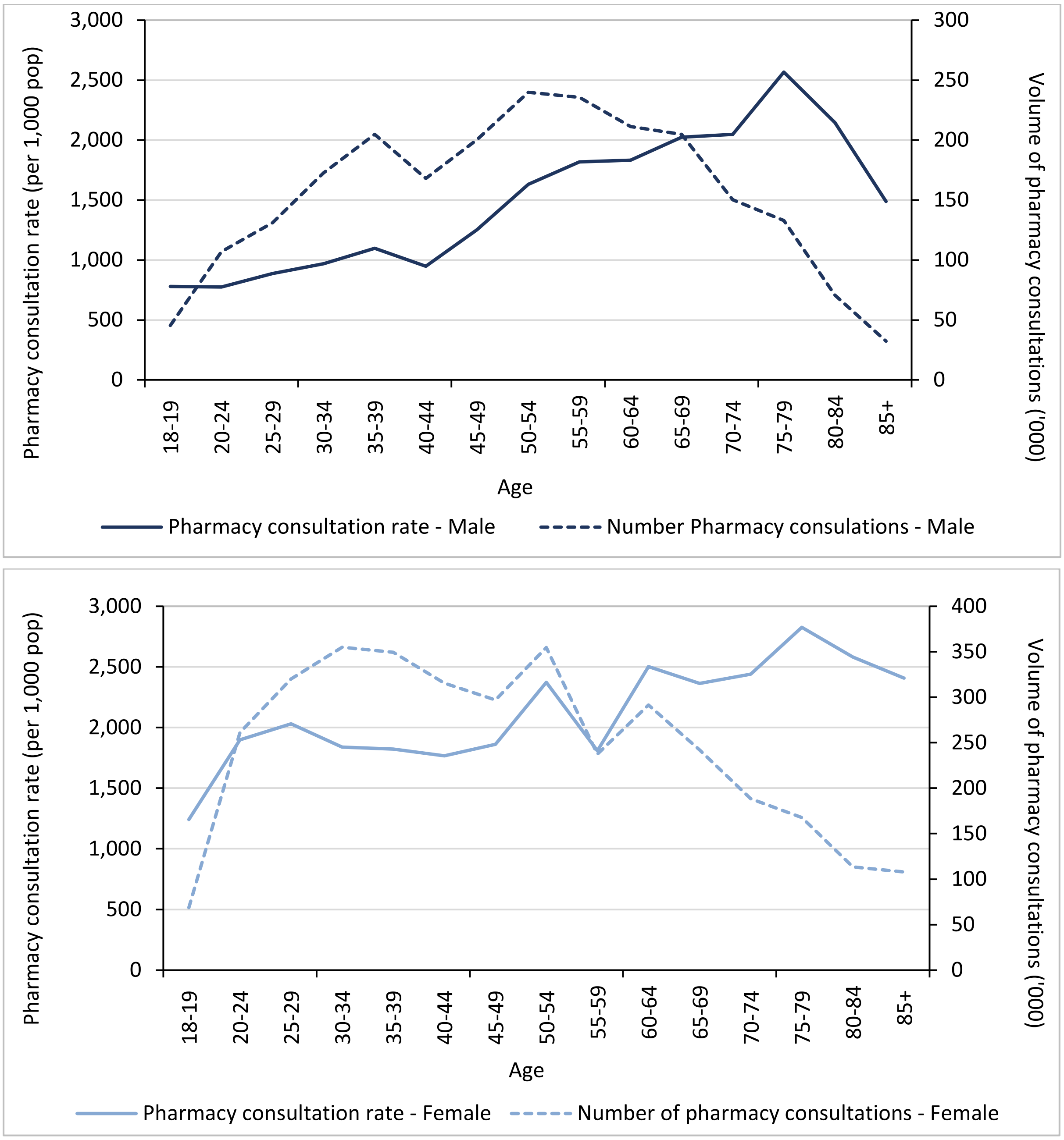
Source: PCRS Claims Data 2014; ESRI Population Data 2014.

8.2.3 Age and sex distributions of pharmacy consultations, volumes and rates, 2015

Figure 8.3 presents age and sex-specific pharmacy consultation volumes and rates for the population aged 18 and older in 2015, applying rates derived for 2010 to the population in 2015. Pharmacy consultations refer to the provision of health advice by pharmacists, including but not exclusively advice given while attending for prescription or over-the-counter medicines or for health screening or vaccinations. Consultations are measured by asking survey respondents how many times in the past year they have consulted a pharmacist in relation to their own health (See Appendix 2). Overall, it is estimated that females had nearly 3.7

million pharmacy consultations in 2015. This is compared to just over 2.3 million consultations for males. Activity rate curves for both males and females increase with age, peaking in the 75-79 age cohort for both sexes (males, 2,567 per 1000; females 2,827 per 1000). However, the consultation rate is consistently higher for females across the age distribution and this variation is particularly large in younger age cohorts.

FIGURE 8.3 AGE AND SEX-SPECIFIC PHARMACEUTICAL CONSULTATIONS, RATES AND VOLUMES, 2015



Sources: QNHS 2010 Special Health Module; ESRI Population Data 2014.
Note: 2010 activity rates assumed for 2015.

8.3 FINDINGS – PROJECTIONS

The comparator projections refers to projections of demand based purely on changes in our Central population growth assumption, holding activity rates constant, through the projection period. The preferred projection scenarios are those the authors consider most likely to be realised based on best available evidence. The assumptions underlying the preferred projections in this chapter were outlined and discussed in Chapter 3 and are based on the evidence reviewed in Chapter 2. Little evidence exists on the impact healthy ageing may have on pharmaceutical demand. However, recent studies by Moore et al. suggest proximity to death is important in explaining prescribing patterns in older individuals in New Zealand and Ireland (16, 17). As a result, we employ Dynamic Equilibrium as our healthy ageing assumption for our preferred projections. As with all chapters we focus on Central and High population growth projections as it is felt these are the more likely to be realised.

8.3.1 Projections for PCRS prescription pharmaceuticals and pharmaceutical consultations, 2015-2030

Figure 8.4 and Table 8.2 presents projections of demand for PCRS prescription pharmaceuticals and pharmaceutical consultations between 2015 and 2030 based on these scenarios:

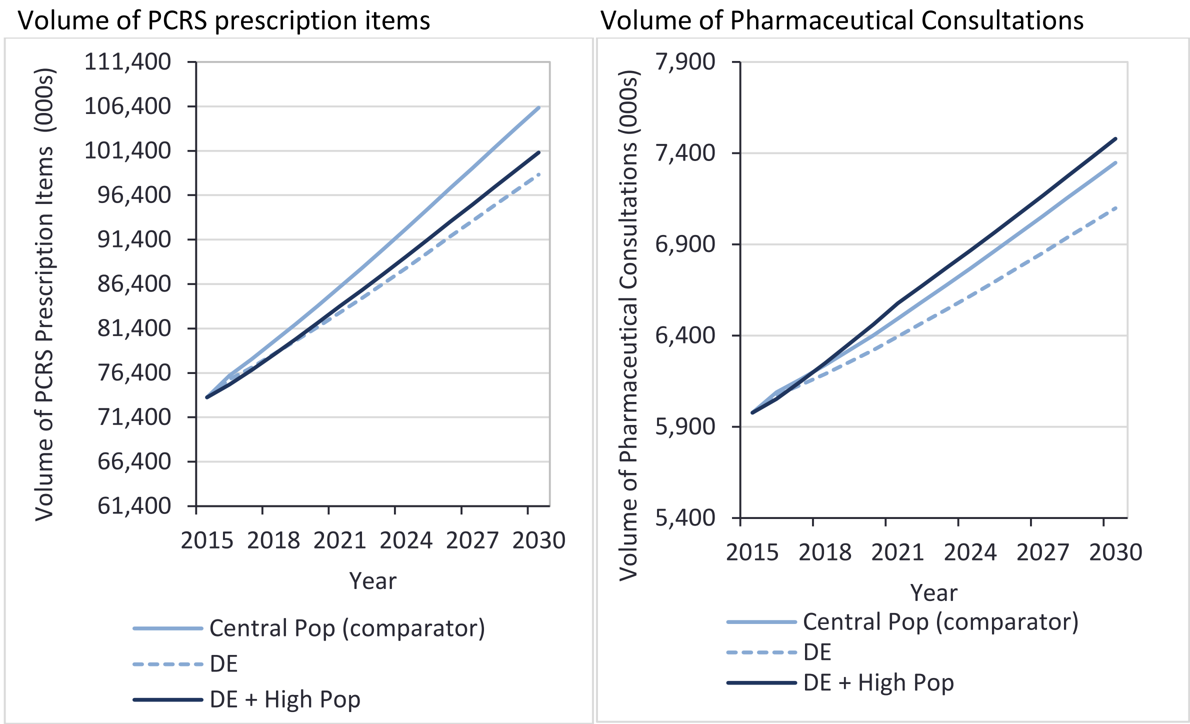
- *Comparator Central Population Growth scenario:* Projecting demand for PCRS prescription pharmaceuticals based purely on our Central population growth assumption (with no adjustments of activity rates to account for healthy ageing) would result in an increase to demand of nearly 106 million PCRS prescription items by 2030. This reflects a 44.4 per cent increase on 2015. This large growth in demand is driven mainly by demand for GMS prescription items where due to a combination of morbidity and eligibility increases, activity rates rise significantly at older ages. In contrast, under this same set of assumptions, demand for pharmaceutical consultations (18 and over) is projected to exceed 7.3 million in 2030, representing a 22.9 per cent increase on 2015. However, these projections may overestimate projected future demand given no attempt is made to account for the effects of healthy ageing.

Preferred projection scenarios

- *Dynamic Equilibrium:* Using the same population growth assumption but assuming dynamic equilibrium we project demand for 98.0 million PCRS prescription items in 2030, which would represent a 34.1 per cent increase over the 2015 baseline. For total pharmaceutical consultations (18 and over) this set of assumptions projects demand of just under 7.1 million in 2030. This equates to an 18.8 per cent growth in demand on 2015.

- *Dynamic Equilibrium with High Population Growth:* The High population growth projection with assumed dynamic equilibrium yields a projected demand just under 101 million prescription items in 2030. This equates to a 37.5 per cent increase on demand in 2015. Demand for pharmaceutical consultations (18 and over) is expected to increase by 25.1 per cent between 2015 and 2030. In volume terms, this equates to a demand for just fewer than 7.5 million consultations in 2030. Notably, demand for pharmaceutical consultations is considerably more sensitive to change in population growth assumptions than demand for PCRS prescription items. This reflects the relatively greater concentration of activity in the middle of the age distribution for pharmaceutical consultations, where activity growth will be particularly sensitive to higher assumed net inward migration for younger adults.

FIGURE 8.4 PROJECTED DEMAND FOR PCRS PRESCRIPTION PHARMACEUTICAL ITEMS AND PHARMACEUTICAL CONSULTATIONS, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.

TABLE 8.2 PRESCRIPTION ITEMS AND PHARMACEUTICAL CONSULTATIONS DEMAND PROJECTIONS, 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

Activity		Baseline Activity (2015) ('000)	% change 2015-2030		
			Comparator	Preferred Projections	
			Central Population Only	Dynamic Equilibrium	Dynamic Equilibrium + High Pop
Total Prescription items (GMS, DPS, LTI, HTD)	Male	31,782.2	46.8	34.6	38.1
	Female	41,277.2	42.6	33.8	37.0
	Total	**73,059.5**	**44.4**	**34.1**	**37.5**
Total Pharmaceutical Consultations	Male	2,307.7	24.5	18.8	24.6
	Female	3,669.5	22.0	18.7	25.4
	Total	**5,977.2**	**22.9**	**18.8**	**25.1**

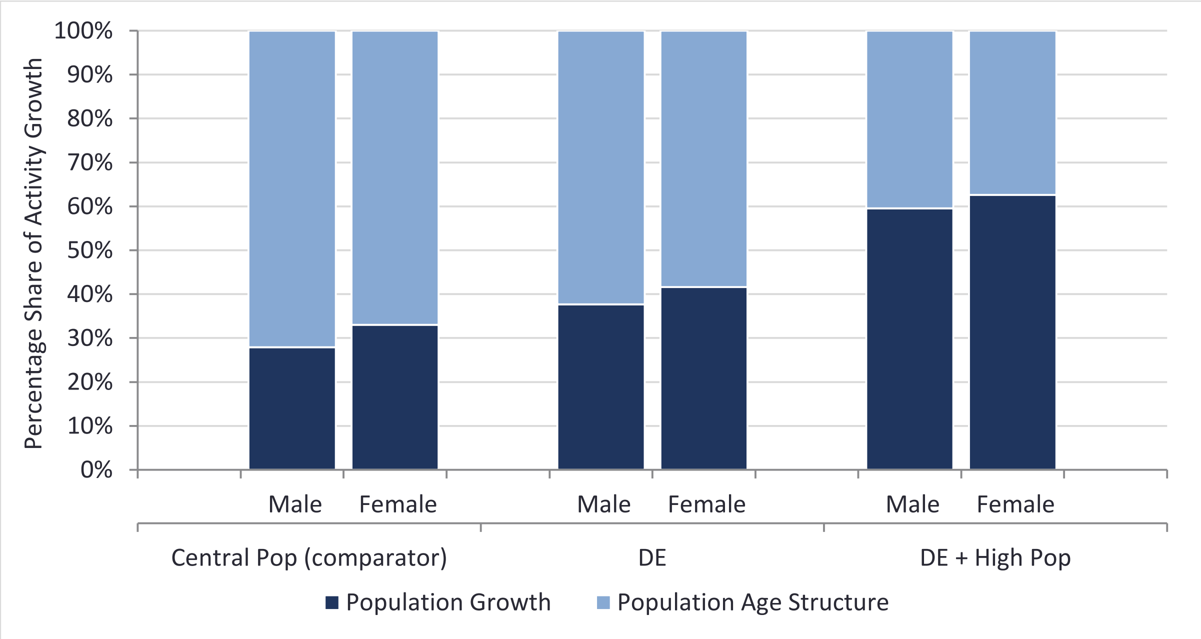
Source: Authors' calculations.

8.3.2 Analysis of the drivers of demand for prescription pharmaceuticals, 2015 to 2030

Figure 8.5 presents decompositions of the drivers of the projected demand growth for the comparator and preferred projection scenarios for PCRS prescription items. This figure illustrates the respective contributions of population growth and changes in the population age structure to projected demand growth. The strong projected increase in future demand for these items, under the Central population growth scenarios, is driven mainly by changes in the age structure of the population. Assuming no healthy ageing and the Central population growth projection, changes in the age structure of the population account for 72.1 per cent of the projected increase in demand for males and 67.0 per cent of the projected increase in demand for females. Under a High population growth scenario, pure population growth plays a relatively larger role. Across all scenarios, a greater share of male activity growth is attributable to changes in the age structure of the population. This is consistent with projected greater life expectancy increases for males relative to females over the projection period (see Chapter 4).

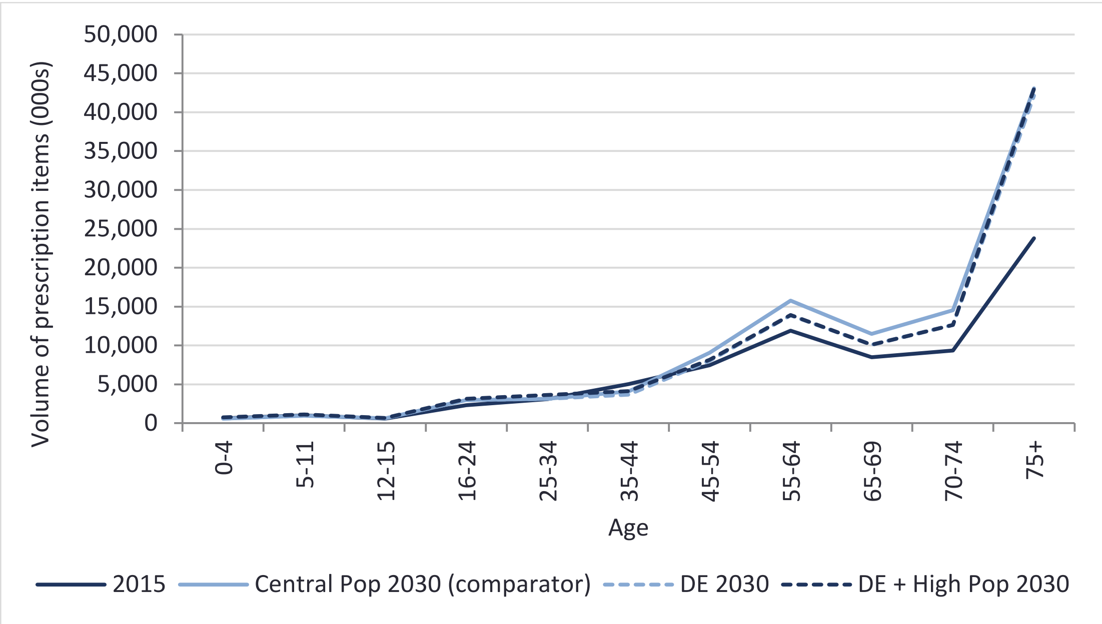
Figure 8.6 provides a breakdown of demand growth for total PCRS prescription items by age cohort and scenario. Across all scenarios it is evident that most of the volume of increased demand for PCRS prescription items will take place in the 75 and over age cohort. Across all scenarios demand for PCRS prescription items for those aged 75 and over is projected to increase by between 18.4 (Central population and dynamic equilibrium) and 19.2 (Central population only) million. For older age cohorts, Central and High population growth assumptions affect increases in projected demand for prescription items in much the same way, with the Dynamic Equilibrium healthy ageing assumption dominating. As described in Chapter 4, the High population growth scenario is driven mainly by assumed higher inward migration by younger adult groups, age cohorts in which PCRS prescription item activity rates are relatively low.

FIGURE 8.5 TOTAL PRESCRIPTION ITEMS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Source: Authors' calculations.

FIGURE 8.6 PROJECTED DEMAND FOR PCRS PRESCRIPTION ITEMS, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Source: Authors' calculations.

8.4 DISCUSSION AND CONCLUSIONS

The total PCRS prescription items rate rose steeply with age in 2014, the year on which our estimates for baseline activity in 2015 are based. This was driven mainly by the GMS scheme. The relationship between this activity rate and age is likely to be a combination of both morbidity and eligibility effects. Polypharmacy increases with age but those aged 70 and over also face more generous income thresholds to qualify for free medication on the GMS scheme. The future demand for community drugs for an ageing population could therefore be considerable. Previously, Layte et al. (18) projected that, over an earlier 15-year period, demand for PCRS prescription items would rise from approximately 54 million in 2006 to between 75 and 100 million in 2021 depending on whether projections were based on pure demographic change or incorporated past trends on pharmaceutical prescribing. The pure demographic change scenario (75 million in 2021) equated to a growth rate of demand of 39 per cent over this period. In contrast, our comparator scenario projects demand for PCRS pharmaceuticals to grow by 44 per cent between 2015 and 2030. However, based on Irish evidence on the relationship between pharmaceutical demand and ageing presented in Chapter 3, we favour a projected range for PCRS prescription pharmaceuticals demand growth of between 34.1 and 37.5 per cent over the projection horizon. These preferred projections incorporate a Dynamic Equilibrium healthy ageing assumption and project demand based on the realisation of either our Central or High population growth assumptions.

Our preferred projection range still suggests that future growth in PCRS prescription items will be considerable, even accounting for the impact of dynamic equilibrium. Indeed changes in the age structure of the population remain the primary driver of activity growth under our Central population and Dynamic Equilibrium scenario and explain a considerable share of activity growth under our High population growth with Dynamic Equilibrium scenario. A caveat to these findings, however, is that PCRS age-related activity curves are driven to a large extent by eligibility effects, in addition to morbidity effects, and consequently may not represent an ideal basis on which to model healthy ageing shifts.

Limited availability of data on non-publicly prescribed pharmaceutical use and over-the-counter medication use confined our analysis of projected medication use to PCRS-funded items. As a consequence, we also examined pharmaceutical use from the perspective of service use, that is, demand for pharmaceutical consultations. However, consultation rates in the analysis were based on information collected in the 2010 QNHS Health Module which may not fully reflect, and may perhaps understate, true activity rates in 2015. Particularly, the role of community pharmacists has been enhanced in recent years through, for example, the requirement for all retail pharmacies to provide a private designated consultation area on premises for more direct patient care.[107]

This caveat aside, under our preferred projection scenarios, demand for annual pharmaceutical consultations (for those aged 18 and over) is projected to increase by between 18.8 and 25.1 per cent between 2015 and 2030. Compared to PCRS activity, the distribution of consultation rates is less concentrated in older ages and consequently projected demand growth is more conservative. However, projections of consultations are more sensitive to assumed high population growth, whereby higher net inward migration of young adults may positively and significantly impact on projected demand growth.

As described in Chapter 3, no attempt was made in this analysis to incorporate past prescribing trends to project future demand, given observed eligibility rate changes in recent years were impacted by the effects of the economic crisis. However, accuracy of our future projections would be affected were eligibility for PCRS schemes or policy towards the number and type of publicly-financed medications to change over the projection horizon. Finally, it is important to realise that high projected demand for publicly-financed prescription pharmaceuticals over the next number of years does not necessarily provide good guidance on the trajectory of pharmaceutical expenditure growth over the same period. For instance, in recent years a series of measures to encourage the prescription and consumption of cheaper generic drugs have been introduced while in 2016 a Framework Agreement on the Supply and Pricing of Medicines was agreed between the Department of Health and the Irish Pharmaceutical Healthcare Association (IPHA) (20). Information on these patterns and trends in pharmaceutical costs needs to be combined with activity data before a full picture, in terms of current and future pharmaceutical expenditures in the Irish system, can be presented.

---

107 This requirement was introduced through the *Regulation of Retail Pharmacy Businesses Regulations 2008* (S.I. No. 488 of 2008) in November 2008. All retail pharmacies were required to have a consultation area on premises by November 2010 (19).

REFERENCES

1. Central Statistics Office (2016). ‘System of Health Accounts CSO’ [cited 2016 04/08]; Available from: www.cso.ie/en/releasesandpublications/er/sha/systemofhealthaccounts 2014.

2. Department of Health (2016). *Health In Ireland: Key Trends 2016*. Dublin: Department of Health.

3. Citizens Information Board (2016). ‘Medical Cards’. [cited 2017 06/01]; Available from: www.citizensinformation.ie/en/health/medical_cards_and_gp_visit_card s/medical_card.html.

4. Health Service Executive (2015). *Primary Care Reimbursement Service: Statistical Analysis of Claims and Payments*. Dublin, Ireland: Health Service Executive.

5. Department of Health (2017). *Press Release*: ‘Minister Harris cuts prescription charges for 390,000 people’. Dublin: Department of Health; [cited 2017 12 May]; Available from: http://health.gov.ie/blog/press-release/minister-harris-cuts-prescription-charges-for-over-390000-people.

6. Sinnott, S.J., C. Normand, S. Byrne, N. Woods and H. Whelton (2016). ‘Copayments for prescription medicines on a public health insurance scheme in Ireland’. *Pharmacoepidemiology and Drug Safety.* 2016;25(6):695-704. Epub 2015/12/24.

7. Citizens Information Board (2015). ‘Long-Term Illness Scheme’. [cited 2017 02/03]; Available from: www.citizensinformation.ie/en/health/drugs_and_medicines/long_term _illness_scheme.html.

8. McDaid, D., M. Wiley, A. Maresso, E. Mossialos (2009). ‘Ireland: Health system review’. *Health Systems in Transition*. 2009;11(4):1-268.

9. OECD (2016). ‘OECD Health Policy Overview: Health Policy in Ireland’ [cited 2017 03/05]; Available from: www.oecd.org/ireland/Health-Policy-in-Ireland-February-2016.pdf.

10. Department of Health (2017). ‘Noticeboard: Commencement of the Misuse of Drugs (Amendment) Act 2016 and associated Ministerial Regulations and Orders’. 2017 [cited 2017 9 May]; Available from: http://health.gov.ie/blog/noticeboard/commencement-of-the-misuse-of-drugs-amendment-act-2016-and-associated-ministerial-regulations-and-orders.

11. Nolan, A., S. Barry, S. Burke and S. Thomas (2014). *The impact of the financial crisis on the health system and health in Ireland*. Copenhagen.: The World Health Organisation.

12. Hayden, J., M. Flood and F. McNicholas (2016). ‘ADHD in children: a path to free medicines’. *Irish Journal of Medical Science*. 2016;185(1):171-5. Epub 2015/02/13.

13. Dail Eireann (2014). 'Prescription Charges' (Volume 845 No. 2 - 25 June 2014). Available from: http://oireachtasdebates.oireachtas.ie/debates%20authoring/debateswebpack.nsf/takes/dail2014062500005?opendocument.

14. Department of Health (2015). *Health In Ireland: Key Trends 2015*. Dublin: Department of Health.

15. Richardson, K., P. Moore, J. Peklar, R. Galvin, K. Bennett, R.A. Kenny (2012). *Polypharmacy in adults over 50 in Ireland: Opportunities for cost saving and improved healthcare*. Dublin: The Irish Longitudinal Study on Ageing.

16. Moore, P.V., K. Bennett and C. Normand (2014). 'The importance of proximity to death in modelling community medication expenditures for older people: evidence from New Zealand'. *Applied Health Economics and Health Policy*. 2014;12(6):623-33.

17. Moore, P.V., K. Bennett and C. Normand (2017). 'Counting the time lived, the time left or illness? Age, proximity to death, morbidity and prescribing expenditures'. *Social Science & Medicine*. 2017;184:1-14.

18. Layte, R., M. Barry, K. Bennett, A. Brick, E. Morgenroth, C. Normand, et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland.* Dublin.

19. Pharmaceutical Society of Ireland (2015). *Guidelines on Patient Consultation Areas in Retail Pharmacy Businesses.*

20. Department of Health (2016). *Press Release*: 'State to make major savings under new drug pricing deal'. Dublin [cited 2017 03/03]; Available from: http://health.gov.ie/blog/press-release/state-to-make-major-savings-under-new-drug-pricing-deal.

CHAPTER 9

Demand for long-term and intermediate care services

9.1 INTRODUCTION

9.1.1 Scope of the chapter

This chapter examines utilisation of, and unmet need for, long-term and intermediate care in Ireland; and projects demand for care to 2030. Long-term care (LTC) utilisation analysed in this chapter encompasses care provided outside acute hospital settings and may be of varying duration. Thus, shorter stays for respite, rehabilitation, convalescence and palliative care are also included in the analysis in this chapter and can be categorised as intermediate care.[108] In analysis and discussion in this chapter, the term long-term care should be understood to include such intermediate care. Although longer stays occur in some public acute and rehabilitation hospitals[109] included in the analysis in Chapter 5 which is based on HIPE data, activity in these hospitals is excluded from the analysis in this chapter to avoid double counting. While the majority of the recipients of care in long-term care settings in this chapter are aged 65 and older, there are also younger people with needs for care in these settings, whose care utilisation is included in the analysis. Long-term residential care for younger people with disabilities is not examined in this chapter but will be examined in future developments of the projection model.

The next sub-sections provide an overview of long-term care in Ireland and internationally, discussing: the role of long-term care in healthcare systems; expenditure on LTC in Ireland; categories of long-stay institution; and forms of LTC financing. The remainder of the chapter presents the findings of our LTC sector analysis. The data and methods have been described in Chapter 3. Section 9.2 presents findings for baseline utilisation of LTC in 2015. Section 9.3 presents evidence on trends in LTC utilisation and in characteristics of the LTC resident population. Section 9.4 presents analysis of unmet demand, based on evidence of delayed discharges from acute hospitals and numbers waiting for long-term care funding. Section 9.5 presents our projections for LTC demand to 2030 and analyses and discusses the drivers of that demand. Section 9.6 concludes.

---

108 The definition of long-term care in this chapter is the definition applied by the Department of Health in its Long-Stay Activity Statistics volumes, which distinguish between long-stay beds and limited-stay beds. Long-stay beds include those for: extended/continuing care for people who have been assessed as being in need of long-term care; psychiatry of old age, for specialised psychiatric services; and 'young chronic sick' for young people with long-lasting illness which is usually irreversible and may be progressive. Limited-Stay Beds include beds for rehabilitation or convalescence after an illness/injury; palliative care for patients at a time 'when the medical expectation is no longer cure'; and respite, for 'the planned admission of dependent persons for short periods of time in order to assist carers in their task of caring' (1:16).

109 Inpatient and day-patient utilisation in the National Rehabilitation Hospital, for instance, is included in Chapter 5.

9.1.2 Role of long-term care in healthcare systems

Understanding long-term care supply and utilisation and the drivers of long-term care demand is important to understanding the dynamics of healthcare demand in a country. There is evidence that acute and long-term care substitute for one another (2, 3). It has also been found in some countries that expenditure on more narrowly-defined healthcare (in hospitals, for instance) may decline for the 'oldest old' groups while expenditure on long-term care rises with age (4, 5). A Swedish policy initiative, which reduced acute hospital bed numbers by over 40 per cent from 1993 to 2003 and steeply increased numbers of LTC beds in nursing homes, was found to have placed great strains on municipalities, with the transfer of many ill, older people into their care, caused greater targeting of home help services and increased informal care demands (6-8). This international evidence suggests that assumptions about the effects of changes in the model of care in either the acute or long-term care setting should not be seen in isolation from its effects on demand for care in the other setting.[110]

9.1.3 Expenditure on the long-term care sector in Ireland

The Central Statistics Office (CSO) has estimated that long-term residential care accounted for €3.6 billion or 19 per cent of overall (public and private) non-capital healthcare expenditure in Ireland in 2014 (9). This total encompasses care for older people and care for people with disabilities. This expenditure was financed largely by Government (73 per cent), and also substantially by out-of-pocket payments (23 per cent), with the remaining share financed by private health insurance (1 per cent) and other voluntary payments such as by charities (3 per cent) (9). HSE non-capital expenditure on the care of older persons programme (both residential and community) was €1.57 billion in 2015 (10) and comprised 12.2 per cent of overall HSE non-capital expenditure compared to 12.9 per cent on care of people with disabilities. HSE non-capital expenditure on long-term residential care amounted to €968 million in 2015 (11).

9.1.4 Categories of long-stay institution

Ireland has broadly three kinds of residential long-term care institution, as defined by form of ownership: public, private or voluntary. Public and voluntary institutions had been the predominant setting for care. However from the early 2000s tax incentives encouraged an increase in private nursing home provision, while public care provision has been affected by fiscal constraints, public employment ceilings and regulatory requirements for upgraded facilities (12). Voluntary facilities include voluntary welfare homes and long-stay facilities (1).

110 This international evidence is informing a current Health Research Board-funded study at the ESRI on the substitution of care between settings in Ireland, which will provide evidence to develop future modelling of the effects of changes in supply in one setting on demand in the other.

Public long-stay units include HSE welfare homes and HSE extended care units (1), which encompass former Health Board geriatric homes, geriatric hospitals, district hospitals and community hospitals. Local community and district hospitals are non-acute hospitals that provide a range of health services which may include long-term and short-term residential care. While community hospitals have been predominantly a feature of care outside Dublin, the HSE purchase and commissioning of the former private Mount Carmel Hospital in 2015 has been described as 'a significant first step in expanding this service in Dublin' (12: 58).

Within public long-stay facilities, distinctions are made based on duration or nature of stay. While the Department of Health in its publications distinguishes between long-stay (over three months) and limited-stay beds (1), a further sub-category of beds are referred to as short-stay. While shorter stays occur in both private and public facilities, short-stay beds in facilities that are run and operated by the HSE may be attached to a community hospital, community nursing homes or in some cases may be stand-alone units, and may include respite, convalescent, rehabilitation, assessment and palliative care beds (12). Since 2012, in response to delayed discharge and waiting list pressures on acute hospitals and inadequate funding for the 'Fair Deal' scheme (described below), a new category of intermediate care beds has been developed, described as transitional care beds. These beds are funded directly by the HSE in private nursing homes[111] and may be used for rehabilitation or assessment of long-term care need (12).

9.1.5 Long-term care financing, access and eligibility

The current system of access to and eligibility for publicly-funded or subsidised residential care was established on a statutory basis in 2009 with the introduction of the Nursing Homes Support Scheme (NHSS), also referred to as the 'Fair Deal' scheme. The NHSS was introduced with the aim of making state support consistent and equitable across all settings (13). Applicants under the NHSS must have a care needs assessment carried out by a health professional. The NHSS requires a co-payment from the resident based on a financial assessment of their income and assets, including their family home. The resident contributes up to 80 per cent of assessable income and up to 7.5 per cent per annum of the value of any assets above €36,000 for an individual or €72,000 for a couple. The asset-based contribution may be deferred and collected from the person's estate. When deferred, it is referred to as the 'Nursing Home Loan'. The principal residence is only included in the financial assessment for the first three years of a person's time in care, thus limiting the proportion of the value of their family home that must be contributed to their care (14).

111 Personal communication from HSE Social Care Division, 3 May 2017.

Residents may choose care in any nursing home on a HSE list of public, voluntary and approved private nursing homes that are participating in the scheme. The resident pays their contribution to the nursing home and the HSE pays the balance of the cost of care. The average out-of-pocket contribution has been estimated as amounting to approximately 25 per cent of the cost of care (12).

From the introduction of the NHSS, it was determined that anyone who was resident in a nursing home could not lose financially due to the scheme and residents were given an option to continue with the arrangements they had in place. The HSE continues to finance the care of a decreasing proportion of long-stay residents under these 'legacy funding' methods.[112] Public short-stay beds are also substantially financed by the State with patients subject to a maximum charge of €175 per week where in excess of 30 days services have been received over the previous 12-month period (12). Further categories of beds that are entirely state-financed and funded without means-testing are transitional care beds.

Private payments may arise in a number of ways: in the form of out-of-pocket co-payments by residents who are state subsidised under the NHSS; as out-of-pocket payments by residents who do not qualify for the NHSS (due to the assessment of their needs, their means or the duration of their stay); or as out-of-pocket payments by residents who have moved to a nursing home before their NHSS application is processed. Residents who pay out-of-pocket for their care are eligible for tax relief on such payments. Further sources of nursing home finance are private insurance (typically for short-stay convalescence/rehabilitation) and respite stays, financed by non-governmental, frequently condition-specific charities.[113]

112 'Legacy funding' methods include four categories: (i) subvention, (ii) contract, (iii) Section 39 and (iv) public/Section 38: (i) Under the Nursing Homes (Subvention) Regulations 1993, the HSE provided financial support towards the cost of nursing care in a registered private nursing home, prior to the commencement of the *NHSS Act 2009*. Subvention payments were based on a clinical assessment of need and a financial assessment of ability to pay. People who were in receipt of subvention when the NHSS commenced could continue with their existing arrangements. (ii) Contract Beds were directly funded by the HSE for long-term residential care, with many in the Dublin area, resulting from 'Delayed Discharge Initiatives'. People in contract beds in 2009 had the option not to change their funding. (iii) From the commencement of the NHSS in 2009, voluntary agencies funded by HSE block grant under Section 39 of the *Health Act 2004* for the provision of long-term residential care services were deemed to be private nursing homes. People in such facilities in 2009 had the option not to change their funding. (iv) Public/Section 38: publicly funded nursing homes managed by the HSE, and long-stay nursing homes operated by voluntary agencies, which are funded under Section 38 of the *Health Act 2004* and provide long-term residential care services for and on behalf of the HSE, are included under this heading. Residents in these facilities who were publicly-funded prior to 2009 could remain so. (Personal communication from HSE Social Care, 3 May 2017).

113 Personal communication from Nursing Homes Ireland, 5 May 2017.

9.1.6 Regulation of long-term care facilities

Under the *Health Act (2007)* all nursing homes (both public and private) must register with the Health Information and Quality Authority (HIQA) and comply with the conditions and requirements set by HIQA. HIQA can inspect nursing homes for registration purposes and to ensure quality standards. This regulatory framework was established following a report into deaths at the Leas Cross nursing home, which while arising from issues in an individual nursing home, raised issues of more general concern about regulation, standards and funding in the sector (15).

9.2 FINDINGS – BASELINE UTILISATION

In this chapter, we analyse baseline utilisation of and project demand for all forms of care outlined in the previous section. While the Department of Health publishes two data series for long-stay care; numbers of beds registered with the Health Information and Quality Authority (HIQA); and numbers of long-term residents financed by the NHSS (16), these are neither a complete count of beds nor residents. Data that are not routinely published include some public short-stay beds that are not registered with HIQA; and short-stay and privately-financed residents. The data sources and methods which have informed the analysis of baseline utilisation and unmet demand presented in this chapter are described in Chapter 3 and Appendix 2.

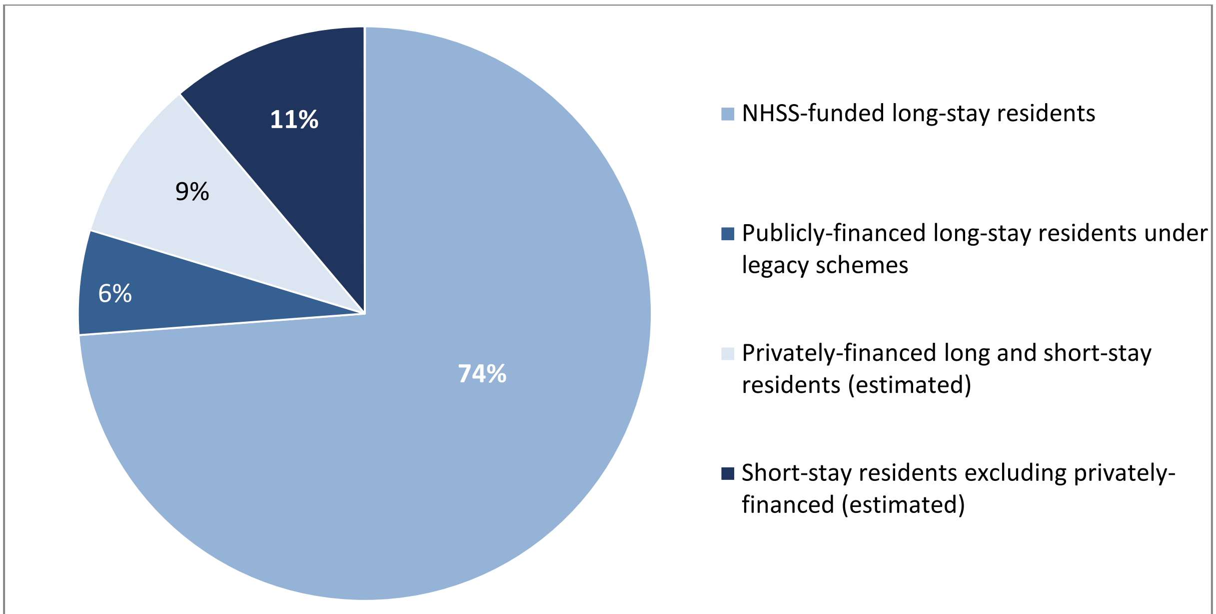
Applying the methods described in Chapter 3, we estimate that there were just fewer than 29,000 residents in long-term and intermediate care settings in 2015, of whom 95 per cent were aged 65 and over (Table 9.1). As Figure 9.1 illustrates, 74 per cent of total residents were long-stay residents funded by the NHSS; a further 6 per cent were long-stay residents who were publicly funded under the legacy schemes that pre-dated the establishment of the NHSS in 2009. An estimated 9 per cent of all long and short-stay residents were private i.e. paying for their care entirely out-of-pocket (as opposed to making an out-of-pocket co-payment under the NHSS). Finally, the remaining estimated 11 per cent were short-stay residents financed by a variety of methods but assumed to be publicly funded in the main. Table 9.1 shows estimated bed numbers and numbers of residents by category of stay and source of funding. From estimated numbers of residents aged 65 and over, we find a residential long-term care utilisation rate for this cohort of 4.5 per cent.

TABLE 9.1 LONG AND LIMITED-STAY RESIDENT AND BED NUMBERS, END-2015, BY CATEGORY OF STAY, FUNDING AND AGE

Category	Number of residents	Number of residents aged 65 and over
NHSS-funded long-stay residents[1]	21,248	20,238
Publicly-financed long-stay residents under legacy schemes[1]	1,882	1,618
Privately-financed long and short-stay residents (estimated)[2]	2,634	2,508
Short-stay residents excluding privately financed (estimated)[3]	3,229	3,059
Total estimated residents	**28,992**	**27,423**
Total beds available in HIQA registered facilities[4]	30,106	
Additional unregistered public and voluntary short-stay beds[1]	750	
Total estimated long-stay and limited-stay beds	**30,856**	
Occupancy rate	94%	
Proportion of population aged 65 and over in residential LTC (estimated)		4.5%

Source: Authors' estimates – see Chapter 3 for Data and Methods. Totals do not sum exactly due to rounding.
Notes: 1. HSE Social Care Division.
2. Derived from 2014 Nursing Homes Ireland survey (15).
3. Derived from 2014 Nursing Homes Ireland survey (15) and Department of Health Long-Stay Activity Statistics 2014 (16).
4. HIQA Bed Register.

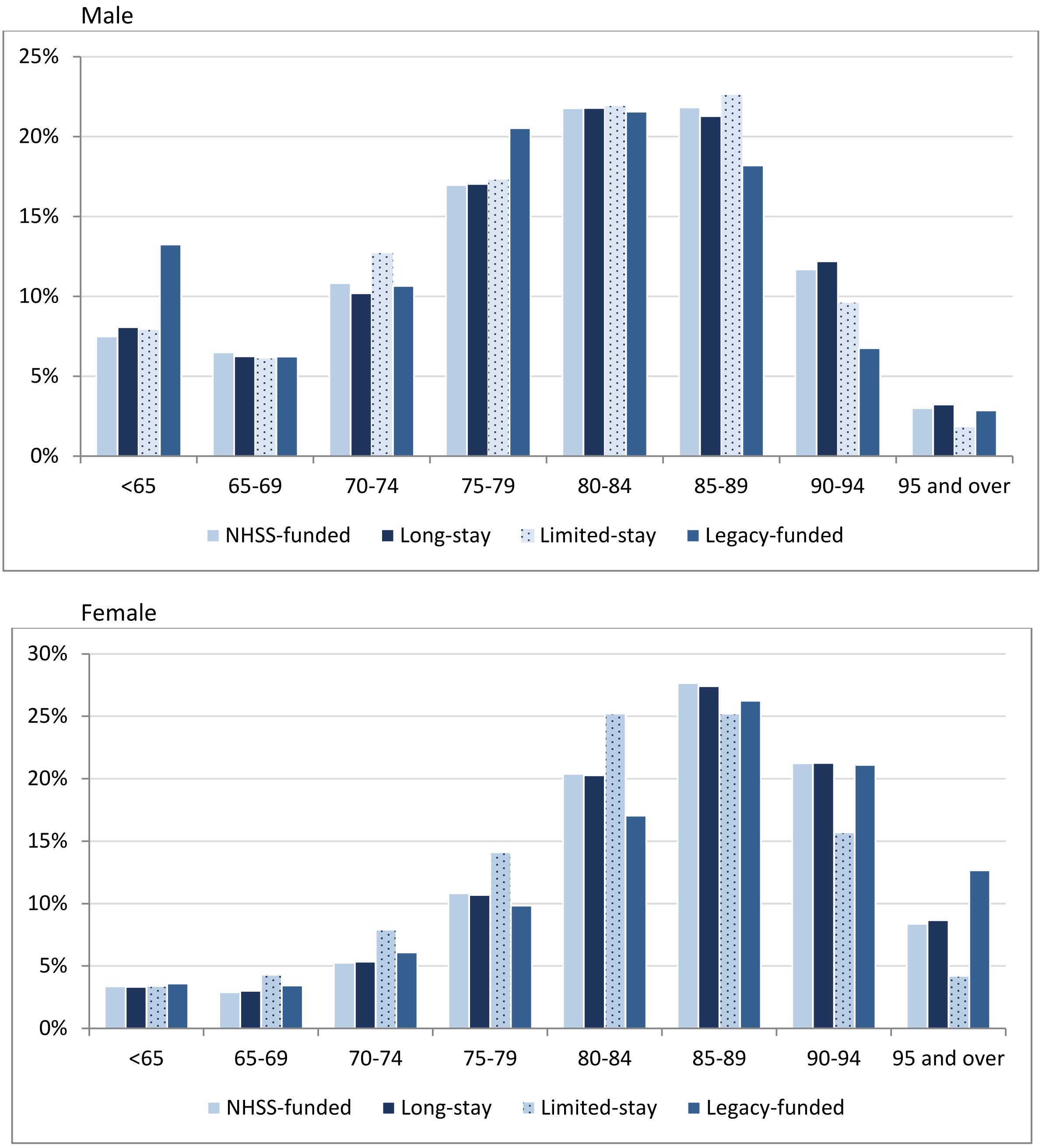
FIGURE 9.1 PROPORTIONS OF LONG-STAY RESIDENTS BY FUNDING SOURCE AND LENGTH OF STAY, AGED 65 AND OVER



Source: See Table 9.1.

The age distributions of residents differ for males and females and by category of resident (Figure 9.2). The 85-89 age cohort accounts for the greatest proportion of female residents and a relatively low proportion of female residents are aged under 80. Females in limited-stay beds have a younger age distribution than in other categories, while legacy-funded female residents are older. There is a different pattern in male legacy-funded residents with a higher proportion among the younger old – aged under 80 – and among under 65s. The proportion of male residents aged 90 and over is lower than the proportion in these cohorts of women. Figure 9.2 also shows the age distributions for long-stay residents from the Department of Health survey for 2014, which is seen to be very close across all cohorts to the 2015 NHSS-funded long-stay residents' age distribution (17).

FIGURE 9.2 AGE COHORT DISTRIBUTIONS OF LONG-STAY RESIDENTS BY FUNDING AND LENGTH OF STAY CATEGORY

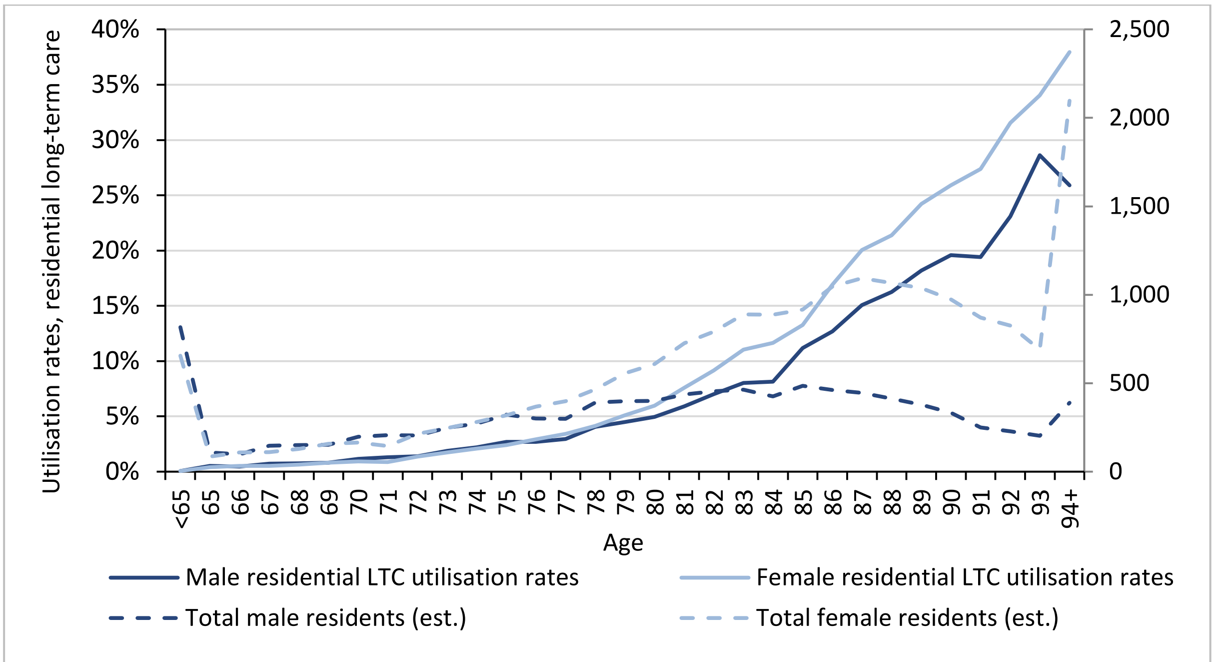


Sources: HSE Social Care Division for NHSS-funded and legacy-funded distributions at end-December 2015. Department of Health Long-Stay Activity Statistics 2014 for long-stay and limited-stay distributions in 2014.

Figure 9.3 shows total male and female resident numbers and utilisation rates by single year of age for ages 65 to 93 and aggregated for under 65s and ages 94 and over (to smooth the effects of small numbers in some years of age). Utilisation rates express residents as a percentage of their age cohort in the population. When male and female volumes are shown together, it is clear that women make up the greater proportion of long-stay residents. Female utilisation rates exceed male rates at all ages over 75. While female utilisation rates continue to increase with age, male utilisation rates decrease at ages above 93. This differentiation in utilisation patterns by gender is the mirror image of the differentiation observed in Chapter 5 in the analysis of bed day utilisation by males and females in public acute hospitals (Figure 5.8). Male acute hospital bed day rates in 2015 from age 60 and over were found to be higher than female bed day rates, with greater divergence for the older old.

These contrasting utilisation patterns suggest that older men are more likely to be admitted to hospital when they become ill and when they are close to death, a consequence of longer female life expectancy and men's greater likelihood of living at home with partners in older age (18). Older women on the other hand are more likely to live alone at older ages, a predictor of nursing home admission (19, 20). Once an older person is resident in a long-term care facility, there is a greater likelihood that they will eventually die there, whereas older people who are resident and receive care at home are more likely to be admitted to hospital close to death (21).

FIGURE 9.3 AGE-SPECIFIC LONG-TERM CARE UTILISATION RATES AND NUMBERS OF RESIDENTS, BY SEX, END-2015



Source: See Table 9.1, with ESRI population estimates for 2015.

While we have found that the utilisation rate of long-term care for people aged 65 and over in aggregate was 4.5 per cent in 2015, this rate is exceeded for women from the age of 79 and for men from the age of 80. Women's utilisation rate increases to 38 per cent for the age cohort aged 94 and over and is close to 40 per cent for the age cohort aged 95 and over. Men's utilisation rate increases to 29 per cent at age 93 and reduces to 26 per cent for the age cohort aged 94 and over.

For purpose of comparison with estimated utilisation in acute hospitals, we convert our estimate of long-term care utilisation from an estimate of resident numbers/residential places occupied at a moment in time, 31 December 2015, to an estimate of long-term care bed days in the year 2015. To make this conversion we assume that the bed occupancy rate and the numbers of residents remained the same throughout the year, which may marginally over-state average residents and annual bed days given evidence of longer waits for NHSS funding in the first quarter of 2015 compared to the final quarter.[114] On the assumption of a constant bed occupancy rate and constant resident numbers through 2015, we estimate there were 10.58 million long-term care bed days in 2015.

9.3 FINDINGS – TRENDS

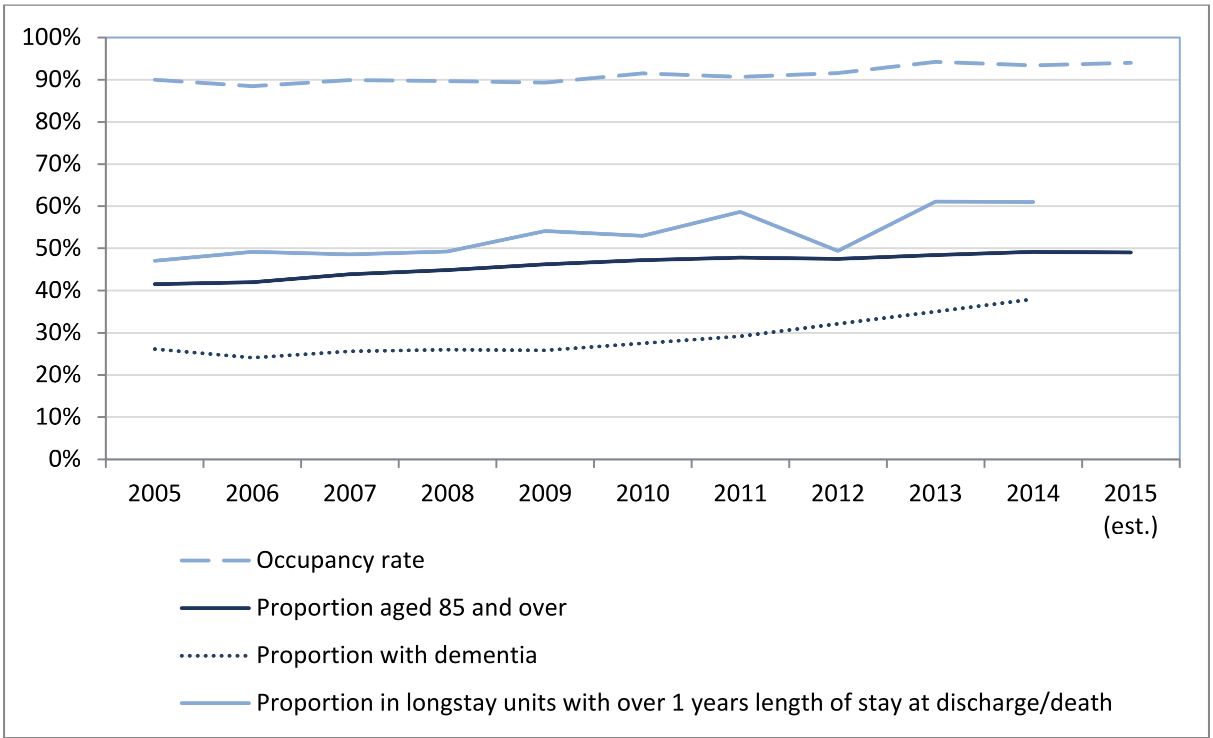
In this section we analyse some selected trends in long-stay utilisation over the last ten years. While response rates to the surveys conducted by the Department of Health have been variable, they averaged 79 per cent over the years 2005 to 2014. These surveys remain a valuable source of data over time and are the primary source for the trends in selected aspects of long-stay utilisation shown in Figure 9.4. The proportion of residents recorded with dementia increased from 26 per cent to 38 per cent over the years 2005-2014. This proportion was higher at 40 per cent in 2014, if limited-stay residents are excluded. The rate of dementia in long-stay residents may however be under-reported in these surveys.[115] Occupancy rates have also increased from an average of 90 per cent in 2005 to 93.4 per cent in 2014, with estimated occupancy at 94 per cent for 2015 from our baseline analysis. The proportion of long-stay residents aged 85 and older increased over the years 2005-2014 from 42 per cent to 49 per cent, a proportion which we estimate as constant in 2015.

114 Personal communication, 2 February 2017, HSE Social Care Division.

115 The Department of Health's long-stay activity surveys recorded resident numbers by their 'principal medico/social status'. Numbers with dementia are therefore only counted in accordance with this definition. Residents who have dementia along with another condition which is judged to be their 'principal medico/social status' are therefore excluded from the count.

When length of stay is measured as the proportion of residents in long-stay as opposed to limited-stay units, who at discharge or death have stayed for over one year, an increase is observed for the years 2005-2014 from 47 per cent to 61 per cent. This observed trend contrasts with findings of reduced length of stay in nursing home residents from 3.6 years in 2009 to 2.9 years in 2014 (16) and with findings of reduced average length of stay since the NHSS scheme commenced (12). While contrasting, these trends may be nonetheless consistent and indicate an increase in the proportion of residents staying for one to three years, with fewer staying for shorter or longer periods.

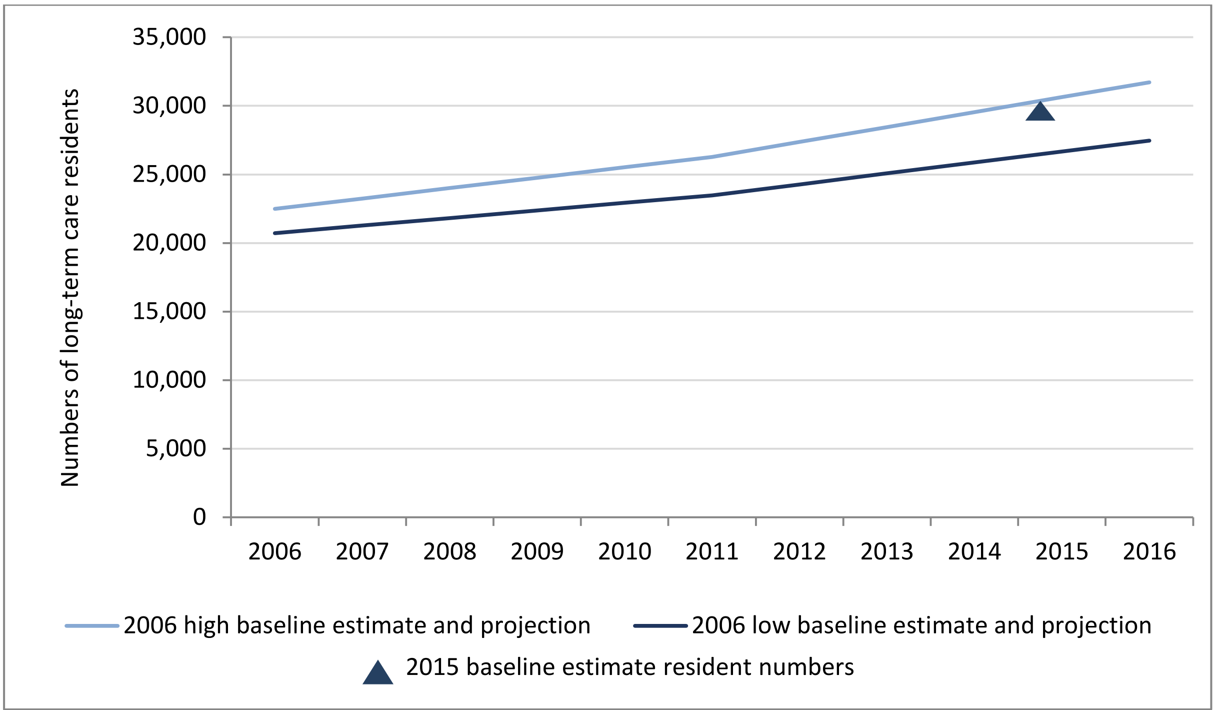
FIGURE 9.4 CHARACTERISTICS OF LONG-STAY RESIDENTS AND FACILITIES 2005 TO 2015



Sources: Department of Health Long-Stay Activity Statistics volumes 2005-2014 for occupancy rates, share of residents aged 85 and over, proportion of residents with dementia and proportion with length of stay exceeding one year at discharge/death. Authors' estimates for occupancy rate and share of residents aged 85 and over in 2015.

The data do not support a trend analysis of numbers of long-stay residents, since a comprehensive count is not routinely collected. However, a previous study by Wren et al. (18) adopted a similarly comprehensive approach to estimating long-stay residents in 2006 (with a high and low estimate based on differing data sources) and projected demand on varying assumptions from these two bases (18). Figure 9.5 demonstrates that estimated baseline utilisation for residents aged 65 and over in 2015 falls close to the lower of the two projected trends shown (the preferred projections in that analysis). The utilisation rate of long-stay care by people aged 65 and over in 2006 was estimated at between 4.4 and 4.8 per cent (18), which compares to the baseline utilisation estimate in this analysis of 4.5 per cent for 2015.

FIGURE 9.5 LONG AND LIMITED-STAY STAY RESIDENT NUMBERS, AGED 65 AND OVER, 2006 TO 2016, ESTIMATES AND PREVIOUS PROJECTIONS

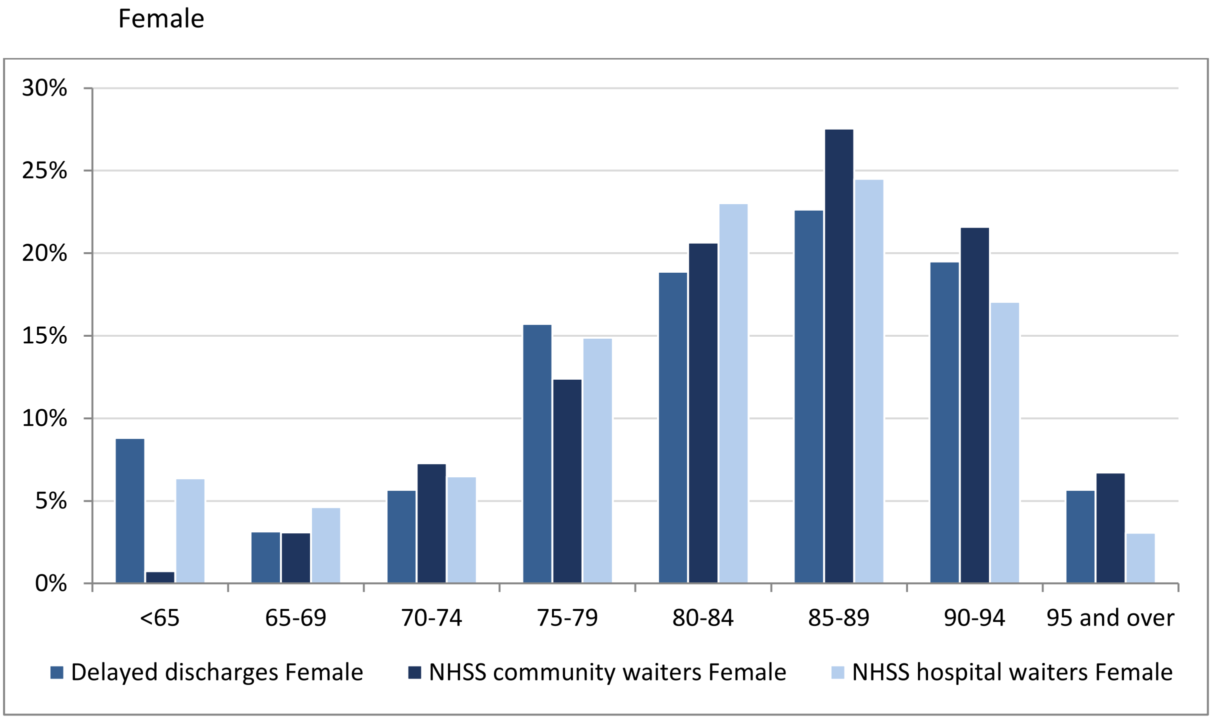


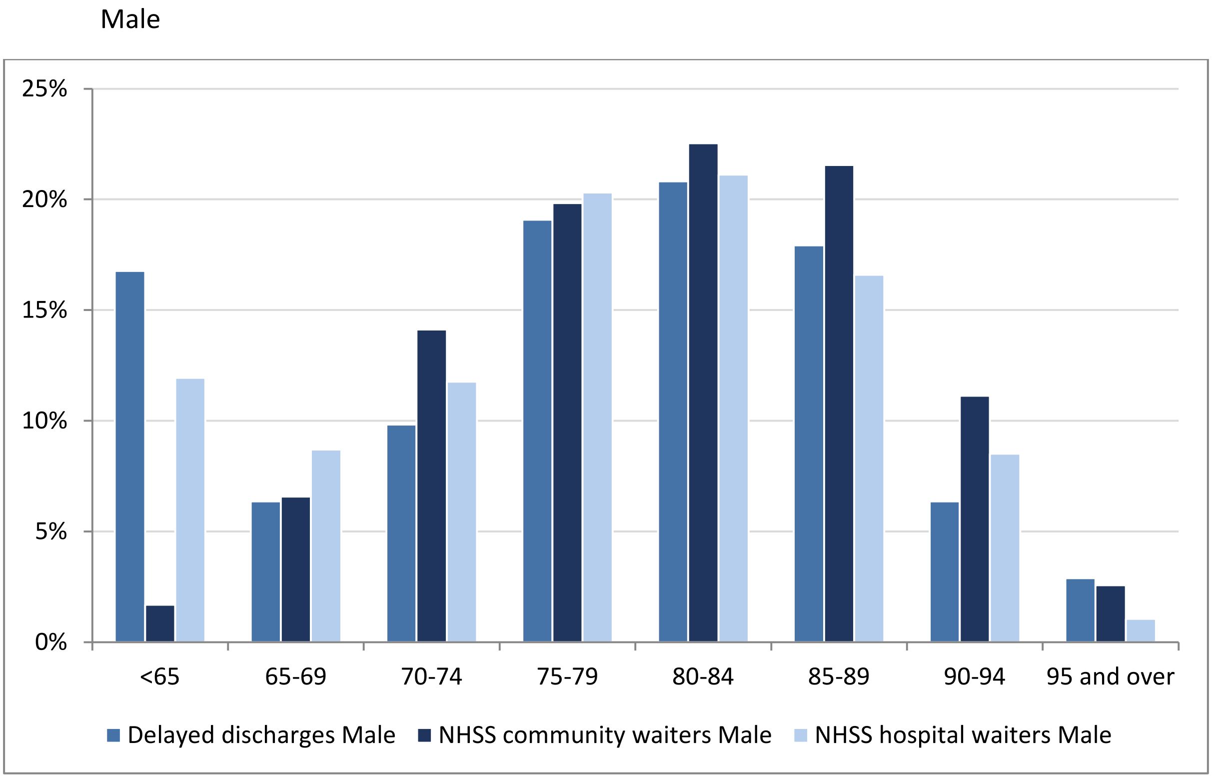
Sources: Wren et al. (18) for baseline estimates of numbers of residents aged 65 and over in 2006 and projections to 2016; Authors' estimate for baseline numbers of residents aged 65 and over in 2015.

9.4 FINDINGS – UNMET DEMAND

Our analysis of unmet demand combines numbers waiting on the NHSS National Placement List (NPL) and waiting for discharge to long-term care from acute hospitals. The approach to analysing these data is described in Chapter 3. Combining the NHSS NPL and delayed discharge categories yields an estimate of 556 people waiting for long-term care at end-2015. Since these waiters' need for care had been assessed and their funding approved, or their unmet need for care was causing them to occupy an acute hospital bed when they were deemed ready for discharge, we consider these two categories of wait to represent unmet demand. This could be considered a conservative estimate of unmet demand because we only count people on the NPL who had been approved for NHSS funding but who had not yet received funding at end-2015, excluding applicants waiting for approval. Of total waiters, 90 per cent were aged 65 and over. The age distributions of these waiters differ by gender and by other characteristics. Both male and female waiters for NHSS funding referred from the community are proportionately older than waiters referred from acute hospitals. Female waiters have a similar pattern to female residents with the 85- to 89-year-old age cohort accounting for the highest proportion of female waiters. Male delayed discharges and hospital waiters on the NHSS list are proportionately more represented than females in the under 65 and younger old age cohorts.

FIGURE 9.6 AGE COHORT DISTRIBUTION OF UNMET DEMAND FOR LONG-STAY CARE, END-2015

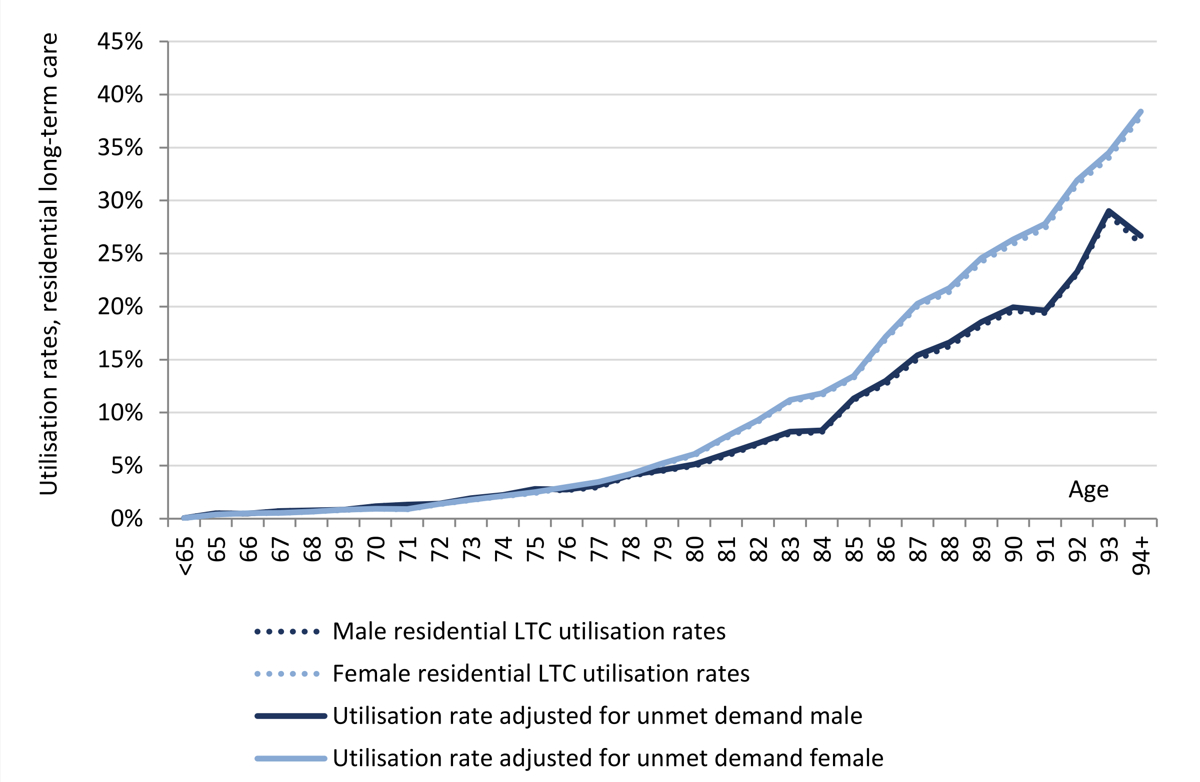




Sources: NHSS National Placement List; HSE BIU Delayed Discharges.

The sum of these categories of waiters by SYOA and sex is added to baseline estimates to derive an estimate of utilisation at end-2015, were this demand met. This estimated unmet demand adds 2 per cent approximately to our baseline estimate of utilisation and is fairly evenly spread across the baseline utilisation age distribution (Figure 9.7).

FIGURE 9.7 AGE-SPECIFIC LONG-TERM CARE UTILISATION RATES ADJUSTED FOR UNMET DEMAND, END-2015



Sources: As in Table 9.1, with NHSS National Placement List; HSE BIU Delayed Discharges; and ESRI population estimates for 2015.

9.5 FINDINGS – PROJECTIONS

For projection of long-term care demand, we take a relatively optimistic view of healthy ageing. The assumptions underlying the preferred projections in this chapter were outlined and discussed in Chapter 3 and are based on the evidence reviewed in Chapter 2. Severe disability is a predictor of demand for long-term care (22) and there is Irish and international evidence of declines in disability which may exceed gains in life expectancy leading to a compression of morbidity and gain in disability-free life years. We therefore favour a Compression of Morbidity assumption. However, given the mixed evidence internationally on trends in disability rates, we also include a Dynamic Equilibrium assumption in our preferred projection range. These assumptions therefore generate a preferred projection range, which reflects the mixed evidence and uncertainty about disability trends.

Consequently in this chapter and in the following chapters, where services are largely concerned with care of older people with age-related disability (e.g. home help and occupational therapy), the preferred projection scenarios are: Dynamic Equilibrium (DE); Compression of Morbidity (CM); CM with High population growth; and CM with Unmet Demand. This chapter also presents projections with no assumption about healthy ageing, based purely on the Central population growth scenario, as a comparator to demonstrate the effects of healthy ageing assumptions.

9.5.1 Projections for long-term care resident numbers, 2015-2030

Figure 9.8 and Table 9.2 presents projections of demand for long-term care resident places from 2015 to 2030 based on these scenarios:

- *Comparator Central Population Growth scenario:* If population growth alone drove residential LTC utilisation and we therefore assume constant age- and sex-specific rates of LTC utilisation, assuming the Central population growth projection would give rise to a projected demand for 52,400 residential LTC places in 2030. This would be an 81 per cent increase on 2015 and equate to a 5.2 per cent utilisation rate for people aged 65 and over compared to 4.5 per cent in 2015. This projection largely reflects high projected growth in absolute numbers of older people in 2030 (even in this Central population projection), with a projected 89 per cent increase in numbers aged 80 and over compared to a projected 14 per cent increase in the population as a whole. This is not, however, a preferred projection scenario for residential LTC since we assume improved disability rates and reduced age-specific residential LTC utilisation.

Preferred projection scenarios

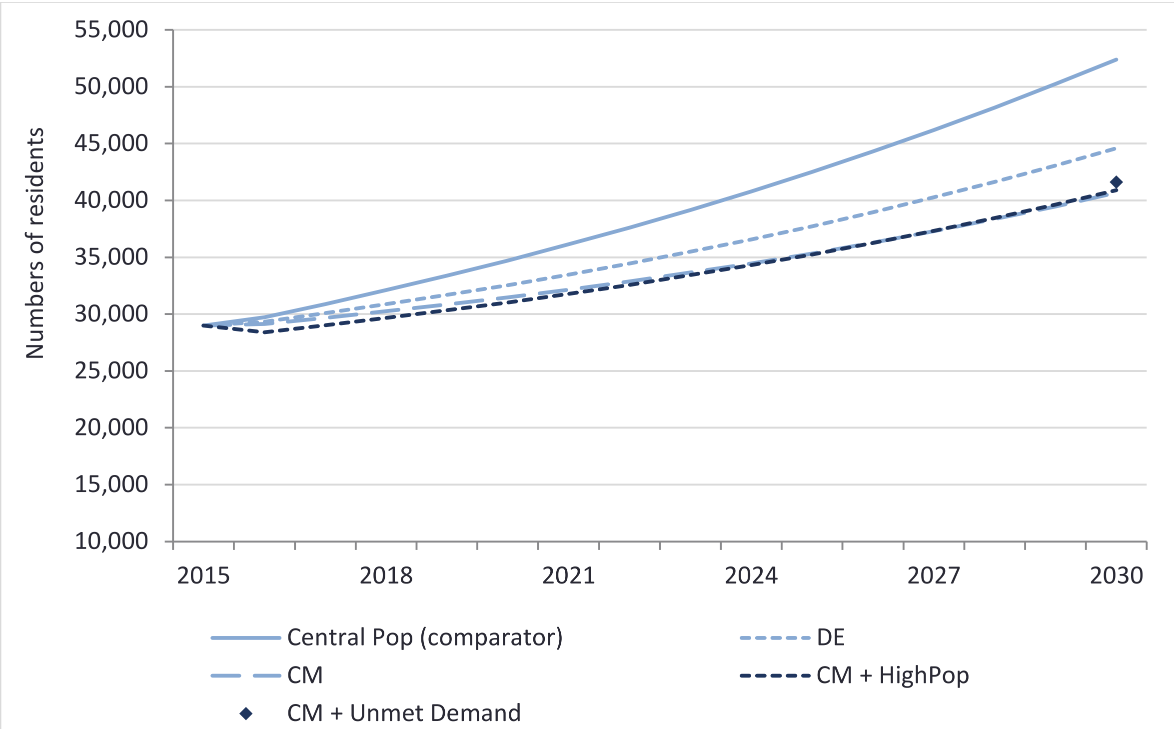
- *Dynamic Equilibrium:* Using the same population growth assumption but assuming Dynamic Equilibrium (with gains in disability-free life expectancy mirroring gains in life expectancy), we project demand for 44,600 residential LTC places in 2030, which would represent a 54 per cent increase over the 2015 baseline and equate to a 4.4 per cent utilisation rate for people aged 65 and over, reducing from 4.5 per cent in 2015.
- *Compression of Morbidity:* Using the same population growth assumption but assuming Compression of Morbidity (in this instance disability), we project demand for 40,700 residential LTC places in 2030, which would represent a 40 per cent increase over the 2015 baseline and equate to a 4.0 per cent utilisation rate for people aged 65 and over, reducing from 4.5 per cent in 2015.
- *Compression of Morbidity with High population growth:* The High population growth projection with assumed Compression of Morbidity yields a projected demand for 40,900 residential LTC places

in 2030. This represents a 41 per cent increase over the 2015 baseline and equates to a 3.9 per cent utilisation rate for people aged 65 and over. The relatively small addition to projected demand compared to the previous scenario arises because the primary factor driving high population growth is higher assumed inward migration, which primarily affects the size of younger age cohorts.

- *Compression of Morbidity with Unmet Demand:* A Central population growth assumption with assumed Compression of Morbidity and the addition of Unmet Demand at baseline yields projected demand for 41,600 residential LTC places in 2030. This represents a 44 per cent increase over the 2015 baseline and equates to a 4.1 per cent utilisation rate for people aged 65 and over. The addition of unmet demand to utilisation in the base year leads to an addition to projected demand in 2030 of over 900 residential places.

Figure 9.8 illustrates the range in our preferred projections for residential LTC. The assumption of DE can be seen to generate greater projected LTC demand than the CM assumption. The varying of the population growth assumption has very little effect on projected demand. The healthy ageing assumptions reduce projected demand of 52,400 residents on a pure population basis to a range of from 40,700 to 44,600. This compares to 29,000 residents in the base year.

FIGURE 9.8 PROJECTED DEMAND FOR LTC PLACES, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.

TABLE 9.2 LONG-TERM CARE DEMAND PROJECTIONS, 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

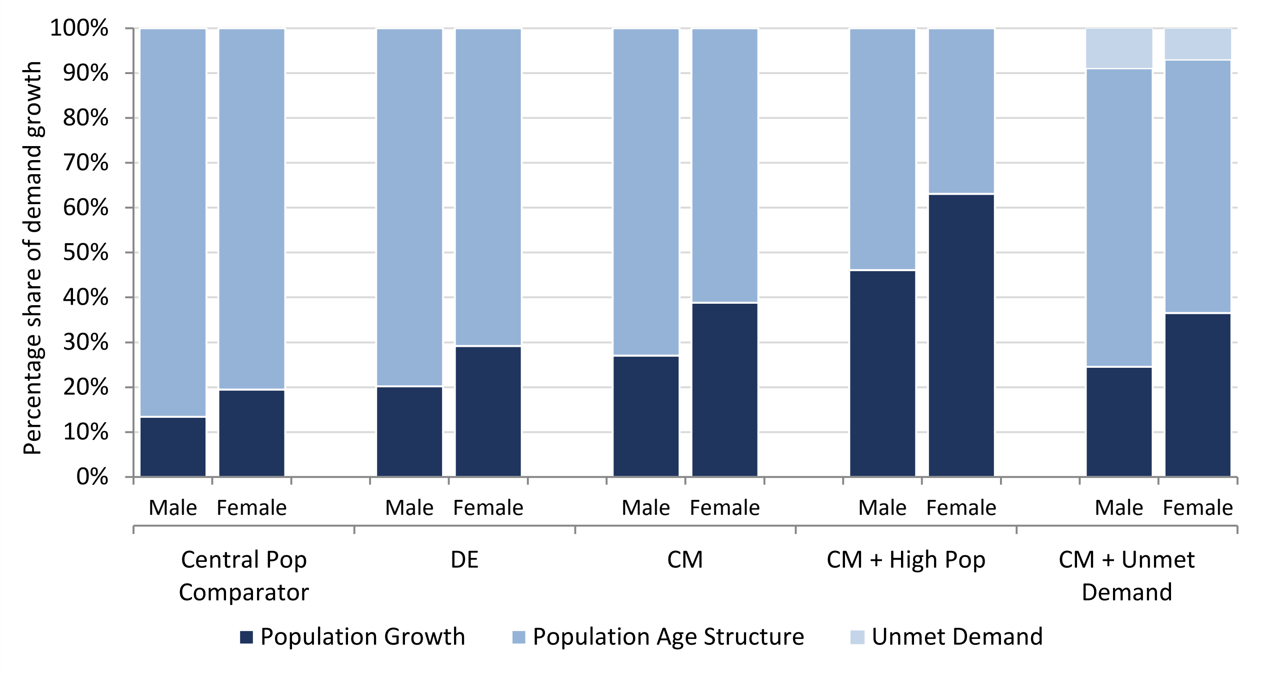
Scenario		Baseline Activity (2015)		Percentage change 2015-2030				
			Comparator	Preferred projection range				
			Central Population Only	Dynamic Equilibrium	Compression of Morbidity	Compression of Morbidity + HighPop	Compression of Morbidity + Unmet demand	
		No. of residents	% change	% change	% change	% change	% change	
Long-term care resident numbers	Male	10,075	96.9	64.3	48.1	49.1	53.0	
	Female	18,917	72.0	48.2	36.2	36.7	38.4	
	Total	**28,992**	**80.7**	**53.8**	**40.3**	**41.0**	**43.5**	

Sources: Authors' calculations. The healthy ageing assumption which appears better supported by the evidence is combined with High population or Unmet Need/Demand.
Note: Long-term and intermediate care residents included in baseline and projections. See Table 9.1.

9.5.2 Analysis of drivers of demand for LTC, 2015 to 2030

Figure 9.9 presents decompositions of the drivers of projected demand growth for the comparator and preferred projection scenarios for long-term care. As in previous chapters, this figure illustrates the respective contributions of population growth, changes in the population age structure and unmet demand to projected activity growth. For LTC, change in the age structure of the population (i.e. relatively greater increases in the older and oldest age cohorts), is the primary driver of projected increased demand in all scenarios except where we assume our High population growth projection, when population growth plays an increased role. The effect of population ageing is greater for male than female LTC demand, reflecting the relatively greater projected growth in older age cohorts for men. Over the years 2015 to 2030, numbers of men aged 85 and over are projected to increase by 136 per cent compared to 72 per cent for women of the same age and 14 per cent for the total population. The difference between the male and female population growth rates largely reflects greater projected increases in life expectancy for men than women in Ireland in this period. Assuming Dynamic Equilibrium or Compression of Morbidity reduces the population age effect but it remains dominant. Our estimate for unmet demand at baseline, which we have acknowledged to be conservative, is a relatively weak driver of activity growth. However, although it only adds 2 per cent to baseline demand, it accounts for 7 per cent of demand growth in the preferred projection scenario shown.

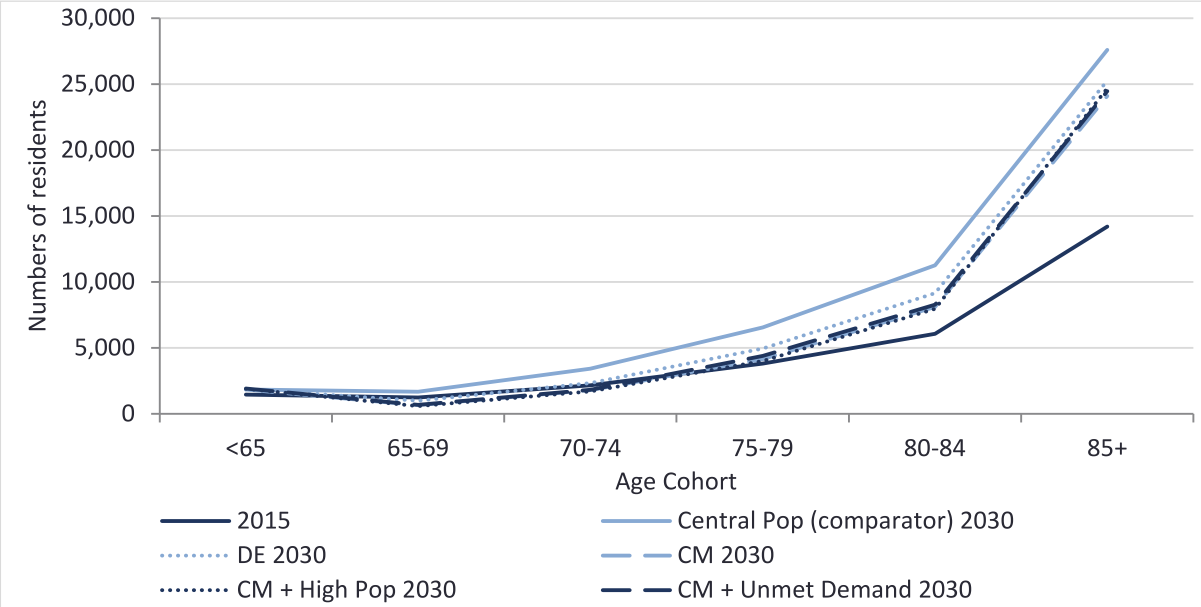
FIGURE 9.9 LONG-TERM CARE RESIDENTS/PLACES PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Sources: Authors' calculations.

Figure 9.10 illustrates the 2015 baseline resident numbers and projected numbers for the comparator and preferred scenarios. For most age cohorts, resident numbers are projected to be higher in 2030 than in 2015, although assumed DE reduces projected numbers in residential LTC in the 65 to 69 age cohort while assumed CM reduces projected numbers in the 65 to 69 and 70 to 74 age cohorts. The comparator Central population projection without a healthy ageing effect would increase numbers at all ages. For the preferred projections, the resident LTC population is therefore projected to become on average older than in 2015, continuing the 2005 to 2015 trend, with the proportion in the oldest cohort aged 85 and over projected to increase from 49 per cent of residents to between 57 to 60 per cent.

FIGURE 9.10 PROJECTED DEMAND FOR LTC PLACES, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.

9.6 DISCUSSION AND CONCLUSIONS

This chapter presents findings for baseline utilisation and unmet demand for care in long-term and intermediate care settings in 2015 and projects demand forward to 2030. This is a changing sector, which is largely publicly-financed and privately-delivered. The majority of residents are now financed through the NHSS scheme introduced in 2009. But there remain categories of residents funded under legacy arrangements, privately-funded or in short-stay beds. Short-stay beds do not qualify for the NHSS and may be HSE-funded or financed from other sources like insurance and charities. A proportion of public and voluntary short-stay beds are not registered with HIQA. Achieving a total count of residents in all these categories has been an important objective of this analysis, since analysis based solely on the NHSS-financed residents, for instance, would understate baseline activity and likely future demand.

The long-term care sector plays an important and significant role in healthcare systems. There are approximately three times as many long-stay beds as there are inpatient beds in public acute hospitals in Ireland and we estimate that, correspondingly, there were approximately 10.6 million resident bed days in LTC in 2015 while there were 3.3 million inpatient bed days in public acute hospitals. The inter-dependence of the long-stay and acute hospital sectors has been evident in the recent introduction of transitional HSE-funded beds in nursing homes to reduce pressures on acute hospitals, in the tradition of earlier 'winter initiatives'. Similarly, HSE funding for the NHSS scheme has been increased at times of rising numbers of delayed discharges.

Further evidence of the close relationship between the roles played by the LTC and acute hospital sectors is the finding in this chapter that female utilisation rates exceed male rates at all ages over 75, a mirror image of the finding in Chapter 5 that male inpatient hospital utilisation rates were higher than women's at older ages. We hypothesise in this chapter that in line with findings in other countries, this is a manifestation of the role of household composition and informal care in determining healthcare utilisation. Men are more likely to have a surviving spouse so that they remain at home during the disabilities of older age and are admitted to hospital when they are critically ill; while women are more likely to outlive their spouse and when they experience the disabilities of older age, may require admission to a nursing home, where they may receive end-of-life care.

Although we favour a relatively optimistic interpretation of the evidence on the evolution of disability rates and consequently assume either Dynamic Equilibrium or Compression of Morbidity in our preferred projection scenarios in this chapter, we nonetheless find that ageing is the major driver of LTC utilisation and projected demand is highly sensitive to healthy ageing assumptions. We explore this further in our sensitivity analyses in the concluding Chapter 12 of this report. Demand for residential LTC is projected to increase by approximately 40 to 54 per cent over the projection period from 2015 to 2030, with demand for resident places projected to increase from 29,000 to from 40,700 to 44,600. This projected demand is notwithstanding our projection that residential LTC utilisation rates among people aged 65 and over will drop from 4.5 per cent to between 3.9 and 4.4 per cent. The rapid growth in demand and the projected proportion of residents at ages 85 and over will pose challenges for providers, for the regulatory authorities and for the Exchequer to ensure that an appropriate standard of care and level of funding for care is provided for these vulnerable residents with intense care needs.

Despite welcome new detailed data sources from HSE Social Care and HIQA, a limitation of this analysis has been the inadequacy of published data, which necessitated combining multiple administrative and survey data sources to estimate total counts of residents and beds at baseline. It is hoped that the Department of Health or HSE will develop such comprehensive data series to allow regular updating of these projections, including residents in intermediate settings including short-stay beds; and beds that are not registered with HIQA. While the Department of Health's annual Long-Stay Activity surveys had variable response rates, along with NHI surveys, they have been a valuable source of data for this and previous analyses and it is also hoped that the comprehensive scope of these surveys will be maintained.

We have acknowledged that our estimate of unmet demand for residential LTC is conservative and may understate such unmet demand. Furthermore, we recognise that residential LTC demand should not be seen in isolation from supply of alternative forms of care for the disabilities of older age by formal and informal carers in the community. The next chapter analyses home care in Ireland, while we envisage that future development of the Hippocrates model will include analysis of informal care supply and the inter-relationships between these sectors of care, building on earlier studies for Ireland and elsewhere (18, 23).

REFERENCES

1. Department of Health (2014). Long-Stay Activity Statistics 2013. Dublin: Department of Health.

2. Carr-Hill, R., G. Hardman, S. Martin, S. Peacock, T. Sheldon and P. Smith (1994). *A formula for distributing NHS revenues based on small area use of hospital beds.* Centre for Health Economics, The University of York: 1994 Contract No. 22.

3. Forder J. (2009). 'Long-term care and hospital utilisation by older people: an analysis of substitution rates'. *Health Economics*. 2009;18:1322-38.

4. Werblow, A., S. Felder and P. Zweifel (2007). 'Population ageing and health care expenditure: a school of 'red herrings'?' *Health Economics.* 2007;16(10):1109-26. Epub 2007/02/22.

5. European Commission (2001). *The Budgetary Challenges faced by Ageing Populations.* Brussels: European Commission Directorate-General for Economic and Financial Affairs.

6. Trydegard, G-B. (2004). *Welfare services for the Elderly in Sweden at the Beginning of the 21st Century - Still in Line with the Nordic Welfare State Model? Social policy as if people matter*; Adelphi University, New York.

7. Glenngård, A.H., F. Hjalte, M. Svensson, A. Anell and V. Bankauskaite (2005). *Health Systems in Transition: Sweden.* Copenhagen: WHO Regional Office for Europe on behalf of the European Observatory on Health Systems and Policies.

8. Rauch D. (2007). 'Is There Really a Scandinavian Social Service Model?: A Comparison of Childcare and Elderlycare in Six European Countries'. *Acta Sociologica*. 2007;50.

9. Central Statistics Office (2016). 'System of Health Accounts, Ireland's System of Health Accounts, Annual Results 2014'. Dublin: Central Statistics Office.

10. Department of Health (2017). 'HSE non-capital Vote allocation in millions of Euro, 2009 to 2015'. http://health.gov.ie/publications-research/statistics/statistics-by-topic/health-expenditure/2017.

11. Health Service Executive (2016). *Putting people at the heart of everything we do: Health Service Annual Report and Financial Statements 2015*. Health Service Executive.

12. Department of Health (2015). *Review of the Nursing Homes Support Scheme, A Fair Deal.* Department of Health.

13. Pierce, M., S.H. Fitzgerald, V. Timonen (2010). *Summary and Comparison of Key Social Provisions for Older People in the Republic of Ireland and Northern Ireland.* Centre for Ageing Research and Development.

14. Citizens Information Board (n.d.). 'Nursing Homes Support Scheme'. [cited 2017]; Available from: www.citizensinformation.ie/en/health/health_services/health_services_for_older_people/nursing_homes_support_scheme_1.html.

15. O'Neill, D. (2006). *Leas Cross Review*, Health Service Executive.

16. Nursing Homes Ireland (undertaken by BDO) (2016). *Annual Private Nursing Home Survey 2014/2015*. Nursing Homes Ireland.

17. Department of Health (2017). 'Long-Stay Activity Statistics 2014'. Supplied by Department of Health.

18. Wren, M., C. Normand, D. O'Reilly, S.M. Cruise, S. Connolly and C. Murphy (2012). *Towards the Development of a Predictive Model of Long-Term Care Demand For Northern Ireland and the Republic of Ireland.* Dublin: Centre for Health Policy and Management, Trinity College Dublin.

19. Wittenberg, R., L. Pickard, A. Comas-Herrera, B. Davies, R. Darton (1998). *Demand for long-term care: projections of long-term care finance for elderly people.* PSSRU:University of Kent.

20. Crepaldi, C., M.S. Lodovici and M. Corsi M. (2009). 'Access to healthcare and long-term care; equal for women and men?' *Final synthesis report, Expert Group on Gender Equality and Social Inclusion, Health and Long-Term Care Issues* (EGGSI). European Commission.

21. Jakobsson, E., T. Johnsson, L-O. Persson and F. Gaston-Johansson (2006). 'End-of-life in a Swedish population: demographics, social conditions and characteristics of places of death'. *Scandinavian Journal of Caring Science.* 2006;20:10-7.

22. Schulz E. (2004). 'Use of Health and Nursing Care by the Elderly' ENEPRI Research Report, 2.

23. Comas-Herrera, A., J. Costa-Font, C. Gori, Ad. Maio, C. Patxot, L. Pickard, et al. (2003). 'European Study of Long-Term Care Expenditure: Investigating the sensitivity of projections of future long-term care expenditure in Germany, Spain, Italy and the United Kingdom to changes in assumptions about demography, dependency, informal care, formal care and unit costs'. PSSRU Discussion Paper 1840: PSSRU, LSE Health and Social Care, London School of Economics.

CHAPTER 10

Demand for home care services

10.1 INTRODUCTION

Home care refers to health and domestic care provided to individuals in their own homes (1). Home care is generally delivered to older people and/or those with an illness or disability, and is increasingly acknowledged as a cost-effective substitute for acute care (2). Home care is both publicly-financed and privately-purchased in Ireland. Publicly-financed home care can be provided by a range of staff who are directly employed by the state, or by voluntary or private organisations that are contracted by the state to supply services on its behalf. Individuals can also directly purchase care from private organisations and carers. Home care is largely provided by home helps or personal care attendants, or through publicly-financed home care packages (HCPs) (which include personal care attendants/home helps). The Home and Community Care Ireland organisation estimates that approximately 40,000 people are employed in the home care sector across public, voluntary, and private organisations (3).

Provision of public home help and HCPs are under the remit of the Social Care Division of the Health Service Executive (HSE). In 2015, €289 million was allocated to home care by the HSE, which represented 2.1 per cent of HSE expenditure in that year (4). Access to home care is organised through one of the 32 local health offices (LHOs). A standardised single assessment tool (SAT) is currently being introduced which will assess the health and social care needs of individuals across LHOs (5).

The next sub-sections describe the roles of home help and HCPs, whose services are the focus of this chapter. Section 10.2 presents findings for baseline utilisation of their services. The data sources and methods applied to estimate baseline utilisation are detailed in Chapter 3. Section 10.3 presents findings on unmet demand. Section 10.4 presents projections of demand to 2030. Section 10.5 discusses and concludes.

10.1.1 Home help

Home helps and personal care attendants are included together in this analysis, because they provide a similar range of services, and to allow consistency with previous work based on TILDA survey data (1). Home helps and personal care attendants provide domestic and personal care to individuals in their own home to help support their continued living at home. Home help has been an important part of publicly-provided health and social care in Ireland since the *1970 Health Act* (1). Home help services often complement healthcare being provided to the individual in their home or the community, and informal care being provided by other members of the household or neighbours. Home help services include both essential domestic tasks and personal care, and may range from helping the person dress in the morning, to more health-focused services such as prompting taking of medicine.

Publicly-financed home help hours (outside those provided as part of a HCP) are provided under HSE Social Care services. Care is provided largely, but not exclusively, to individuals aged 65 and over, though it may also be provided for younger people with specific care needs. State services are provided by directly employed home helps, or contracted from voluntary or private organisations. Home help hours purchased privately from private providers have increased as a proportion of the services delivered by the home care sector and there is evidence that the care provided through the private sector is more flexible in meeting patient demands (6). However, unlike publicly-financed home care, which is regulated by the HSE, the private home care sector is not regulated in terms of the quality of service provided (7).

10.1.2 Home care packages (HCPs)

A HCP is a publicly-provided set of health and domestic services provided under the non-statutory Home Care Package Scheme. A HCP includes a non-fixed set of domestic and health services, provided largely, but not exclusively, to those aged 65 and over,[116] to allow recipients to remain and be cared for in their own home (8). The HCP Scheme was introduced in 2006, and has seen a large increase in numbers of HCPs provided since its introduction. HCPs are targeted towards individuals with medium or high dependency needs (9). They are often provided following a hospital stay and HCPs may allow for earlier discharge from acute care and in general can act as a substitute for hospital or long-term residential care. In addition to regular HCPs, a small number of 'intensive HCPs' (190 in 2015) are also provided which provide an even greater level of care to individuals with very high care needs, such as those with dementia.[117] A HCP is tailored to individuals' needs, and services provided are flexible though normally include some mix of home help, nursing services, and therapy services. The services provided as part of the HCP can be provided by staff directly employed by the HSE, or staff of voluntary or private organisations whose services are financed by the HSE. A package provides an enhanced level of community services, above normal levels

116 Occasionally HCPs will be provided to younger people with specific care needs (i.e. early onset dementia, physical disability) (8).

117 The number of intensive HCPs was expected to increase to 250 in 2016 (10). Some intensive HCPs are provided under the HSE & Genio Dementia Programme for patients with Dementia (11).

available, and is not a replacement of any existing services which the person may receive (10).

A HCP is provided free of charge to recipients,[118] and access to a HCP is in principle not income-means tested nor is access dependent upon possession of a medical card. However, while a HCP is provided based upon assessment of need, accessing the package, and the supports included in the package, is subject to the resources available in each LHO (8). It has been argued by others that inadequate provision of care existed in the past (7), with geographic variations in provision observed (12). The assessment of need for both home help and HCPs is based on healthcare need and dependency and is determined across a number of measures, including the ability to carry out activities of daily living (ADL) such as bathing, dressing, etc.; other health services provided; and family, social and community supports available (8).

10.2 FINDINGS – BASELINE UTILISATION

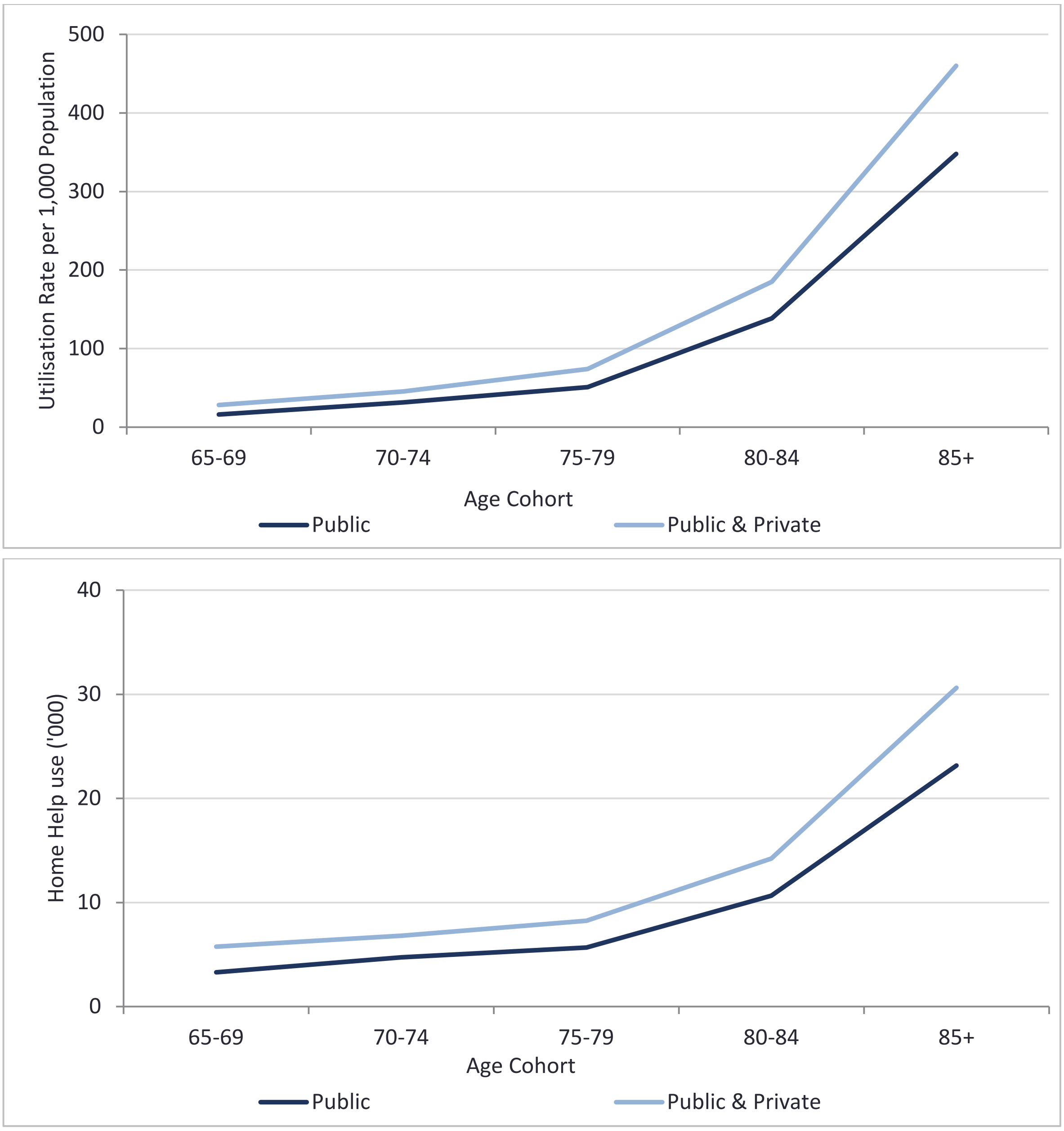
10.2.1 Home help recipients

Figure 10.1 illustrates the utilisation rate (per 1,000 population) and the volume of recipients (expressed in thousands) of publicly-financed (public) home help in 2015. Additionally, Figure 10.1 illustrates the combined volume of public and private (privately-purchased) home help in 2015. As discussed in Chapter 3, it is possible for individuals to use both public and private services. Due to potential duplication, when public and private receipt of home help is combined, we interpret this as a measure of home help use not as numbers of recipients. Private home help is not examined separately due to data limitations.

Overall, there were 47,500 individuals in receipt of public home help in 2015, and rate of use increases with age. An estimated 18,160 individuals used private home help in 2015, and adding private home help use to public home help use, and accounting for individuals using both, there were an estimated 65,660 instances of public or private home help use in 2015. The utilisation rate increases with age once more.

[118] Recipients may also supplement publicly-financed home care with further care purchased privately.

FIGURE 10.1 HOME HELP USE, 2015



Sources: TILDA Wave 3; HSE Social Care Division Administrative data; ESRI population data, 2015.

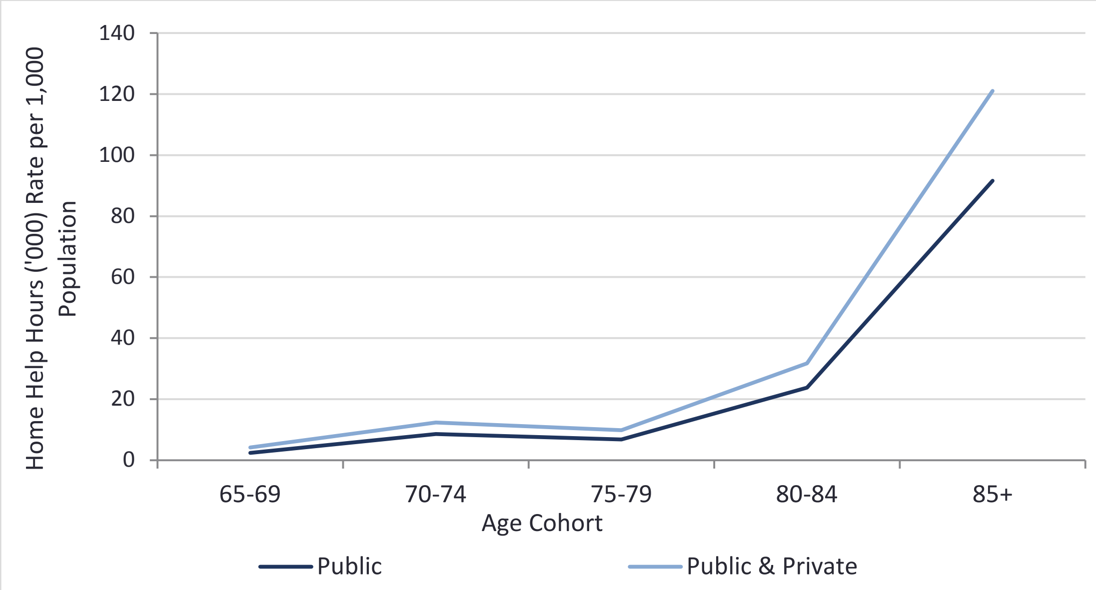
10.2.2 Home help hours

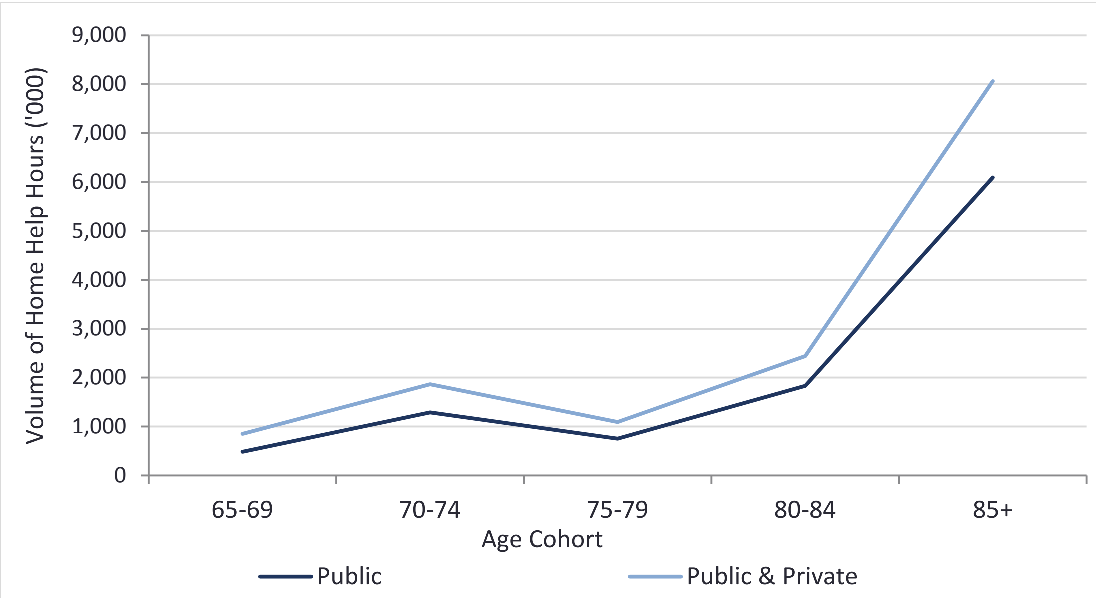
Figure 10.2 illustrates the home help hours' rate (per 1,000 population) and the volume of home help hours (expressed in thousands) of public and public and private home help hours combined in 2015. The utilisation rate of hours increases with age, with a similar trend observed to Figure 10.1.

Overall, there were an estimated 14.31 million home help hours provided in 2015, of which 10.46 million were provided by the HSE and an estimated 3.86 million were privately-purchased. An estimated 8.06 million home help hours, or

56 per cent of total hours, were provided to people aged 85 years and older in 2015, of which an estimated 6.10 million were provided by the HSE.

FIGURE 10.2 HOME HELP HOURS, 2015



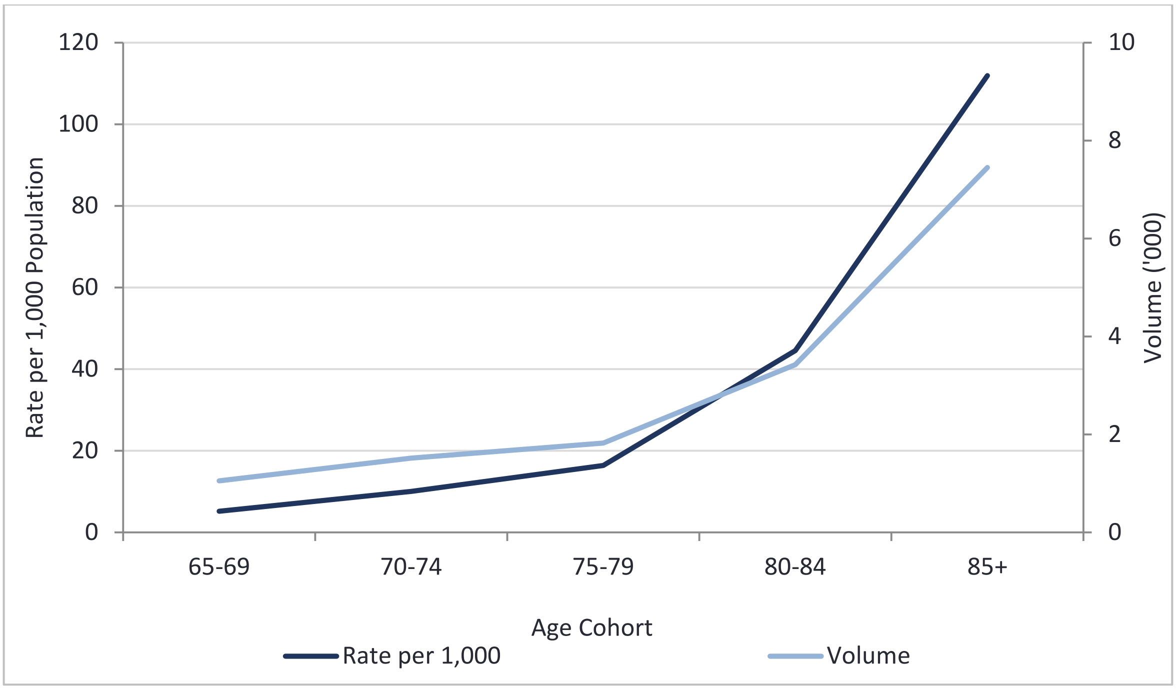


Sources: TILDA Wave 3; HSE Social Care Division data; ESRI population data, 2015.

10.2.3 Home care packages

Figure 10.3 illustrates the rate of HCP recipients (per 1,000 population) and the volume of HCP recipients in 2015. There is a sharp increase in both the rate and volume of recipients with older age, with over two-thirds of estimated HCP recipients in the 80 to 84 and 85 years and older cohorts. This suggests that need for home care is greater amongst older people.

FIGURE 10.3 HOME CARE PACKAGE RECIPIENTS, 2015

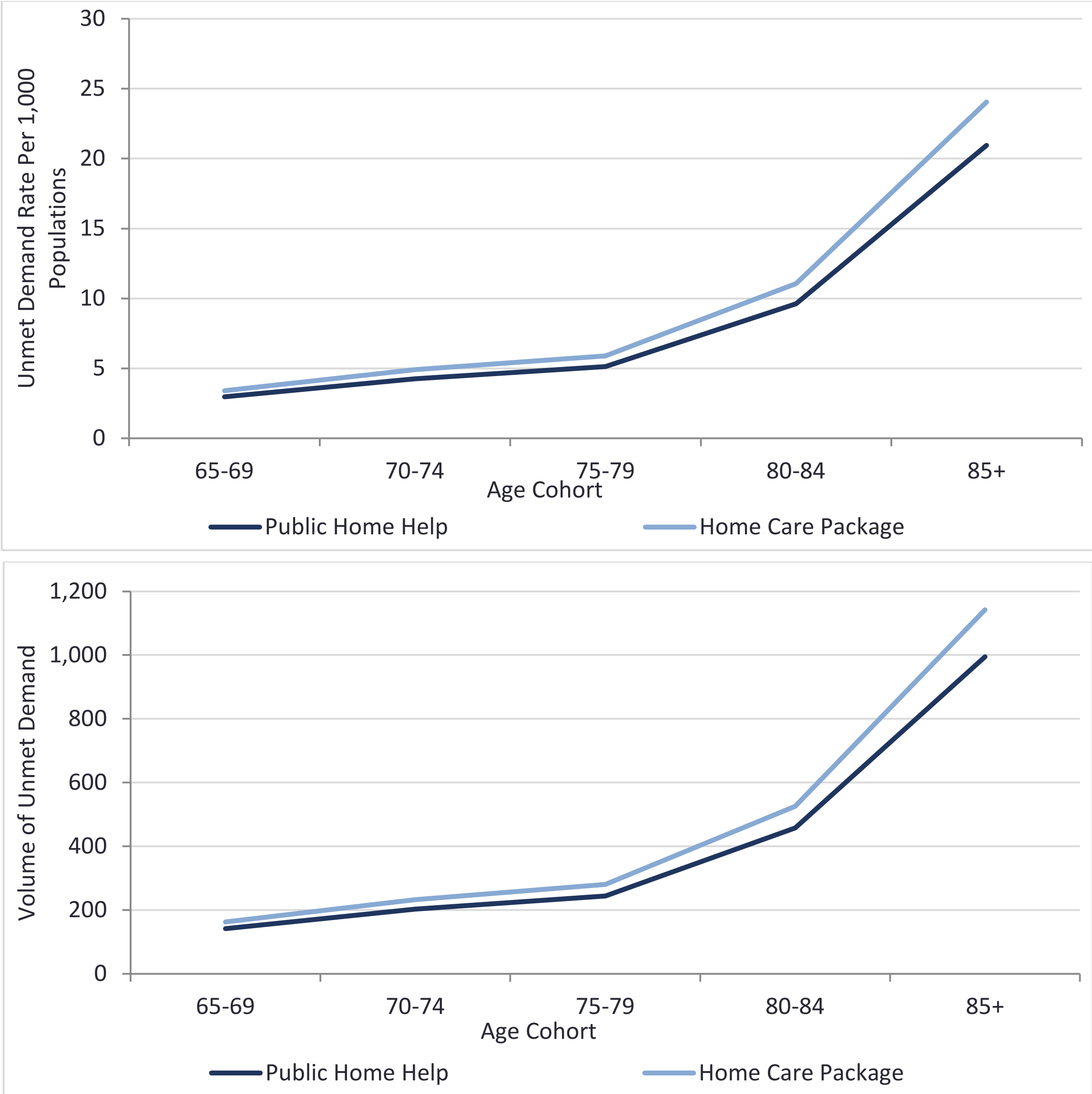


Sources: TILDA Wave 3; HSE Social Care Division Administrative data; ESRI population data, 2015.

10.3 FINDINGS – UNMET DEMAND

Based on HSE administrative waiting list data, at the end of December 2016, there were 2,039 people waiting for public home help and 2,342 people waiting for a HCP. These data were not available for 2015. If these 2016 waits are applied to 2015 baseline, this corresponds to 4.29 per cent and 15.34 per cent of the total number of people who received public home help or a HCP in 2015 respectively.

FIGURE 10.4 NUMBERS WAITING FOR PUBLIC HOME HELP OR A HOME CARE PACKAGE



Sources: TILDA Wave 3; HSE Social Care Division Administrative data; ESRI population data, 2015.
Notes: Numbers waiting at the end of December 2016. Figures not collated pre-2016.

10.4 FINDINGS – PROJECTIONS

For projection of home care demand, we take a relatively optimistic view of healthy ageing. This is consistent with the analysis undertaken for long-term care, and community therapy services. The assumptions underlying the preferred projections in this chapter were outlined and discussed in Chapter 3 and are based on the evidence reviewed in Chapter 2. Evidence points to declines in disability which may exceed gains in life expectancy leading to a compression of morbidity, and gains in disability-free life years. We therefore favour a Compression of Morbidity assumption. However, given the mixed evidence internationally on trends in disability rates, we also include a Dynamic Equilibrium assumption in our preferred projection range. These assumptions therefore generate a preferred projection range, which reflects the mixed evidence and uncertainty about disability trends.

Consequently in this chapter, where services are largely concerned with care of older people with age-related disability, the preferred projection scenarios are: Dynamic Equilibrium (DE); Compression of Morbidity (CM); CM with High population growth; and CM with Unmet Demand. This chapter also presents projections with no assumption about healthy ageing, based purely on the Central population growth scenario, as a comparator to demonstrate the effects of healthy ageing assumptions.

10.4.1 Home help and home care package recipients, projections 2015-2030

Figure 10.5 and Table 10.1 present projections of demand for public home help hours, public and private home help hours and HCP recipients from 2015 to 2030 based on these scenarios. The percentage increase for each of the home care services is partly a result of using the same age distribution to apportion services (see Chapter 3 for methods).

- *Comparator Central Population Growth scenario:* Projecting demand for home care based purely on our Central population growth assumption (with no adjustments of activity rates to account for healthy ageing) we project 120,000 uses of public and private home help services in 2030 which equates to a 83.0 per cent increase. Based on the current pattern of public and private provision, we project 87,600 publicly-financed recipients which equates to an increase of 84.5 per cent. For HCP recipients, this scenario projects 28,200 HCP recipients in 2030 which equates to an increase of 84.5 per cent.

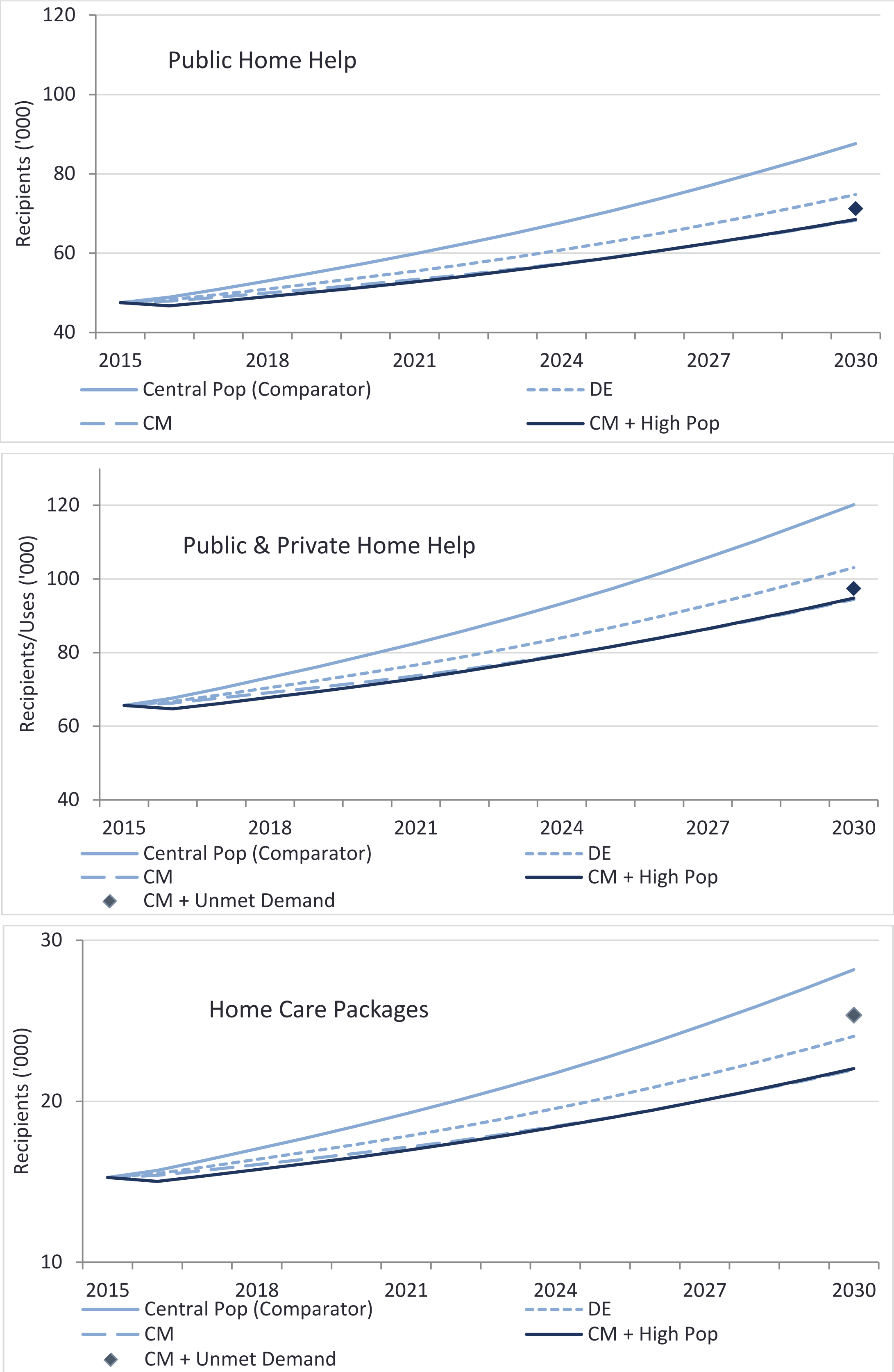
Preferred projection scenarios

- *Dynamic Equilibrium:* Applying the Central population growth assumption but assuming Dynamic Equilibrium, we project 103,000 uses of public and private home help services in 2030 which equates to a 56.9 per cent increase. Based on the current pattern of public and private provision, we project 74,700 publicly-financed recipients which equates to a 57.4 per cent increase. For HCP recipients, this scenario projects 24,000 HCP recipients in 2030 which equates to a 57.4 per cent increase.
- *Compression of Morbidity:* Applying the Central population growth assumption but assuming Compression of Morbidity (in this instance disability), we project demand for 94,500 uses of public and private home help services in 2030 which equates to a 43.9 per cent increase. Based on the current pattern of public and private provision, we project demand for 68,300 publicly-financed recipients which equates to a 43.8 per cent

increase. For HCP recipients, this scenario projects demand for 22,000 HCP recipients in 2030 which equates to a 43.8 per cent increase.

- *Compression of Morbidity with High Population Growth:* Applying the High population growth assumption but assuming Compression of Morbidity (in this instance disability), we project demand for 94,800 uses of public and private home help services in 2030 which equates to a 44.4 per cent increase, with 68,500 being publicly-financed which equates to a 44.3 per cent increase. For HCP, this scenario projects demand for 22,000 HCP in 2030 which equates to a 44.3 per cent increase.
- *Compression of Morbidity with Unmet Demand:* Applying the Central population growth with Compression of Morbidity scenario with Unmet Demand at baseline yields projected demand for 97,400 public and private home help services in 2030, a 48.4 per cent increase, with 71,200 being publicly-financed which equates to a 50.0 per cent increase. For HCP, this scenario projects demand for 25,300 HCP in 2030 which equates to a 65.9 per cent increase. The addition of unmet demand for home care leads to an addition to projected demand in 2030 of 2,900 public home help recipients and 3,400 HCP recipients.

FIGURE 10.5 PROJECTED DEMAND FOR HOME HELP USE AND HOME CARE PACKAGE RECIPIENTS, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Pop = population; DE= Dynamic Equilibrium; CM = compression of morbidity.

10.4.2 Home help hours, projections 2015-2030

Figure 10.6 and Table 10.1 present projections of demand for public home help hours, private home help hours and HCP recipients from 2015 to 2030 based on these scenarios:

- *Comparator Central Population Growth scenario:* Projecting demand for home care based purely on our Central population growth assumption (with no adjustments of activity rates to account for healthy ageing) we project 26.6 million home help hours in 2030 which equates to a 85.6 per cent increase of which 19.5 million hours are projected to be publicly-financed.

Preferred projection scenarios

- *Dynamic Equilibrium:* Assuming Dynamic Equilibrium we project 22.0 million home help hours in 2030 which equates to a 53.7 per cent increase, of which 16.12 million hours are projected to be publicly-financed.
- *Compression of Morbidity:* Applying the Central population growth assumption but assuming Compression of Morbidity (in this instance disability), we project demand for 19.72 million home help hours in 2030 which equates to a 37.8 per cent increase, of which 14.41 million hours are projected to be publicly-financed.
- *Compression of Morbidity with High Population Growth:* Applying the High population growth assumption but assuming Compression of Morbidity (in this instance disability), we project demand for 19.74 million home help hours in 2030 which equates to a 37.9 per cent increase, of which 14.43 million hours are projected to be publicly-financed.

FIGURE 10.6 PROJECTED DEMAND FOR HOME HELP HOURS 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS

Sources: Authors' calculations.
Notes: Pop = population; CM = compression of morbidity; DE= Dynamic Equilibrium.

TABLE 10.1 HOME CARE DEMAND PROJECTIONS, 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

Scenario		Baseline Activity (2015)	Percentage change 2015-2030				
			Comparator	Preferred Projections			
			Central Population Only	DE	CM	CM + High Population	CM + Unmet Demand
		Number of Recipients/Hours ('000s for Hours)	% Change	% Change	% Change	% Change	% Change
Public home help recipients	Total	47,500	84.5	57.4	43.8	44.3	50.0
Public and private home help recipients/ uses	Total	65,659	83.0	56.9	43.9	44.4	48.4
Public home help hours	Total	10,456	86.7	54.2	37.9	38.0	-
Public and private home help hours	Total	14,311	85.6	53.7	37.8	37.9	-
Home care package recipients	Total	15,300	84.5	57.4	43.8	44.3	65.9

Sources: Authors' calculations. The healthy ageing assumption which appears better supported by the evidence is combined with High population or Unmet Need/Demand.

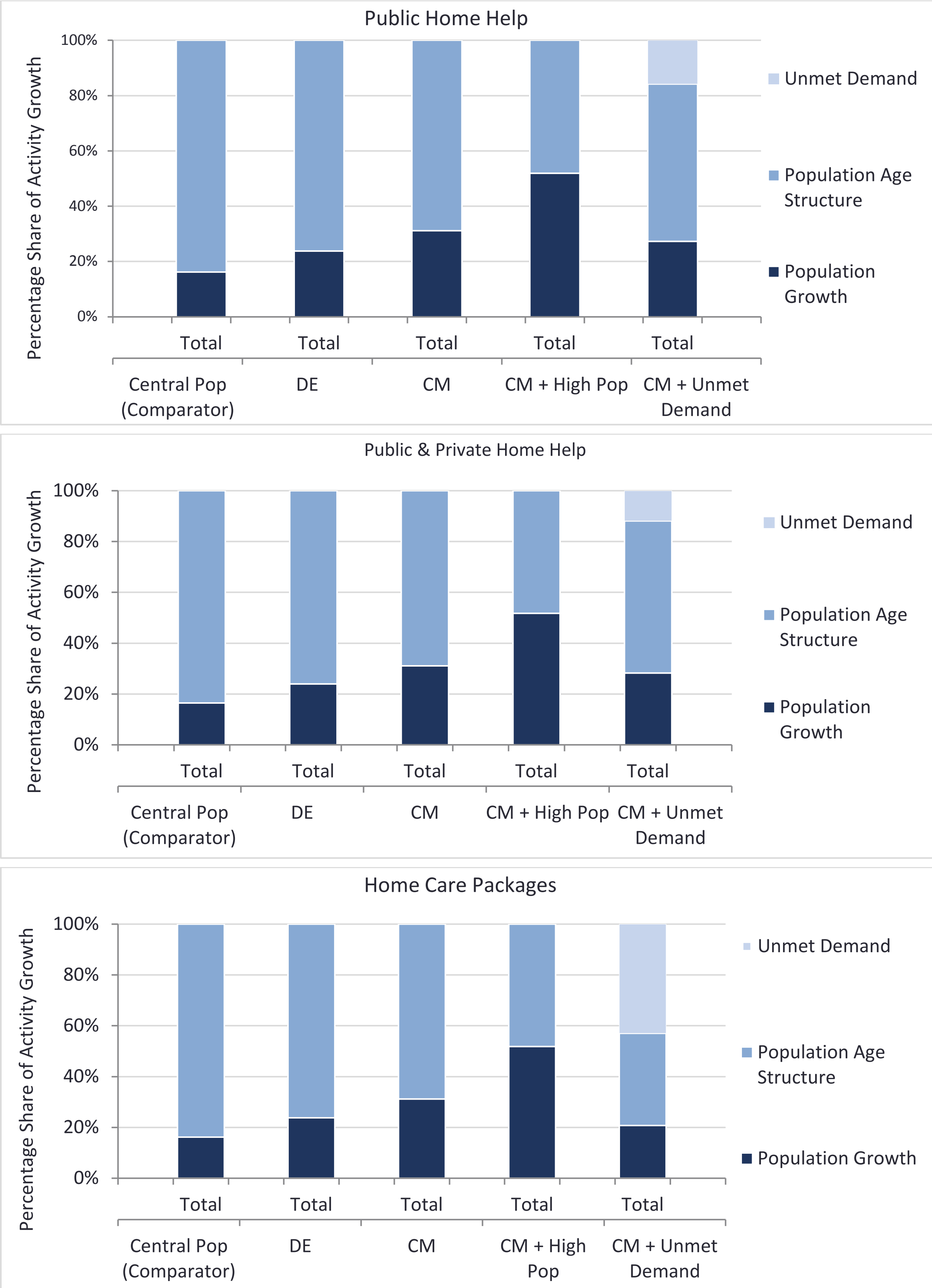
10.4.3 Preferred projection scenarios and demand decompositions, 2015 to 2030

Figures 10.7 and 10.8 decompose the drivers of growth in demand over the projection period between changes in the size or in the age structure of the population. Figure 10.7 shows the decomposition of these drivers for public home help recipients, public and private home help uses, and home care package recipients respectively. Figure 10.8 shows decompositions for public home help hours and public and private home help hours combined. As home care services provided to those aged 65 years and older are the focus of this chapter, the interpretation of the decomposition analysis differs slightly compared to in those chapters which examine service uses across the full age distribution (e.g. acute hospital services, or general practice services). For example, there are projected to be 18,000 more individuals aged 65 years and older in the High population growth assumption (see Chapter 4), as compared to the Central population growth assumption, and this increase will be captured within the population growth parameter. Furthermore, the increase in life expectancy assumed in High population growth, means that healthy ageing scenarios reduce the impact of the changes in the age structure of the population by a larger amount than in the Central population growth assumption.

Applying the Dynamic Equilibrium assumption, Table 10.1 shows that demand for home help and HCP recipients is projected to increase by approximately 57.4 per cent, and Figure 10.7 illustrates that projected changes in the age structure of the population would explain most of this increase. Applying the Compression of Morbidity assumption, Table 10.1 shows that demand for home help and HCP recipients is projected to increase by approximately 43.8 per cent, and Figure 10.7 illustrates that projected changes in the age structure of the population would explain most of this increase. Under the Compression of Morbidity with High population growth assumption, demand for each service is projected to increase by 44.3 per cent, and Figure 10.7 illustrates that, with this healthy ageing assumption and higher population growth, changes in the age structure of the population over time explain less than half of this increase. Therefore, while projected demand is similar for both the Central and High population growth assumptions, the dynamics driving the projected demand differs across these population growth assumptions. Similar patterns are observed in Figure 10.8, which shows decompositions of the drivers of growth in demand for public home help hours and public and private home help hours combined respectively.

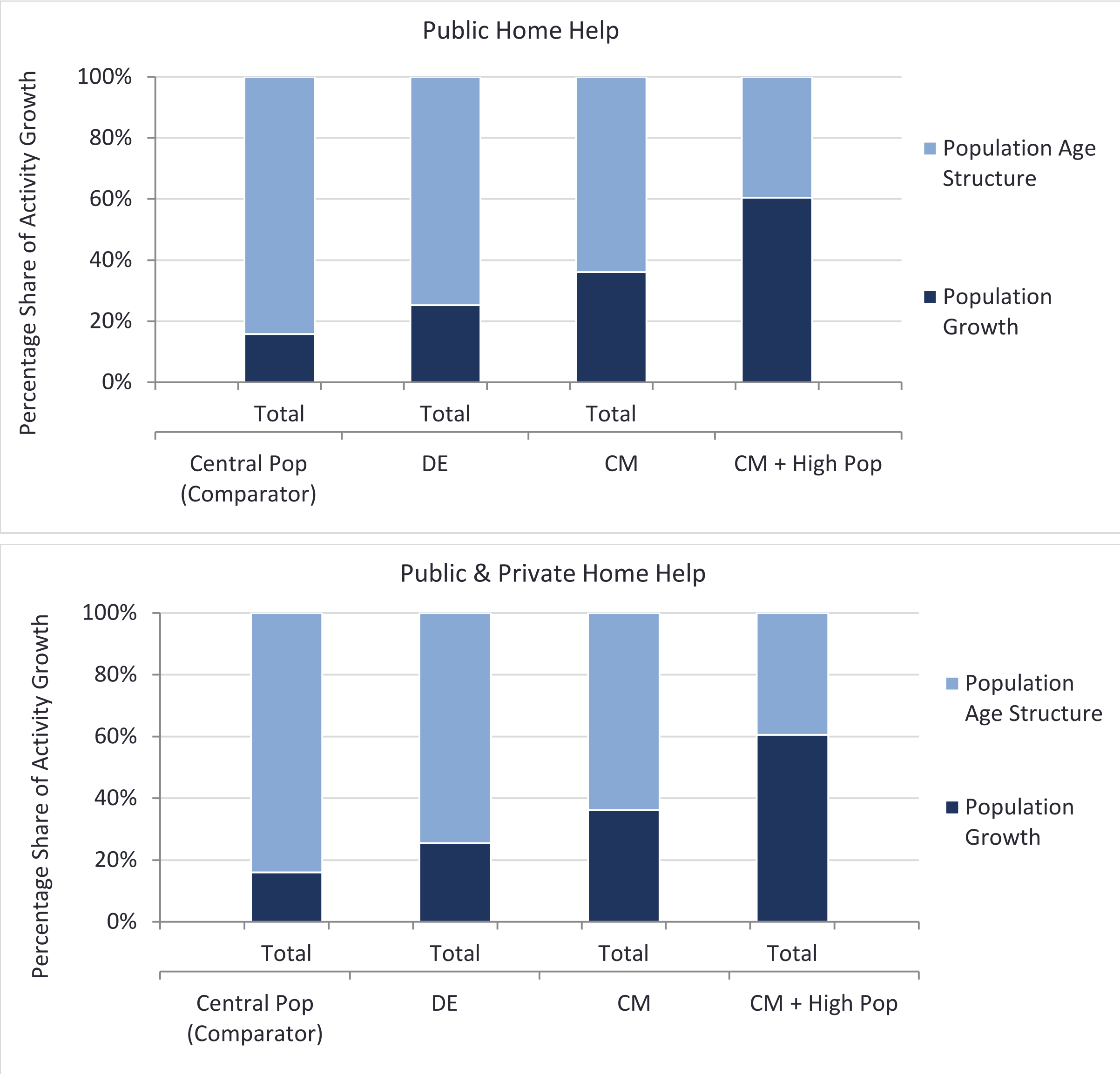
Incorporating unmet demand with the Compression of Morbidity assumption, demand is projected to increase by 50.0 per cent, 48.4 per cent, and 65.9 per cent for public home help, public and private home help, and HCP respectively (Table 10.1). Unmet demand explains approximately 16 per cent, 12 per cent, and 44 per cent of the projected increase in demand for public home help, public and private home help, and HCP respectively (Figure 10.7). As the rates of unmet demand differ across services (see Figure 10.5), where waiting numbers are relatively greater, in particular for HCP, unmet demand becomes a key driver of growth when incorporated into the projections.

FIGURE 10.7 HOME HELP USE AND HOME CARE PACKAGE RECIPIENTS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Sources: Authors' calculations.
Notes: Pop = population; CM = compression of morbidity; DE=Dynamic Equilibrium.

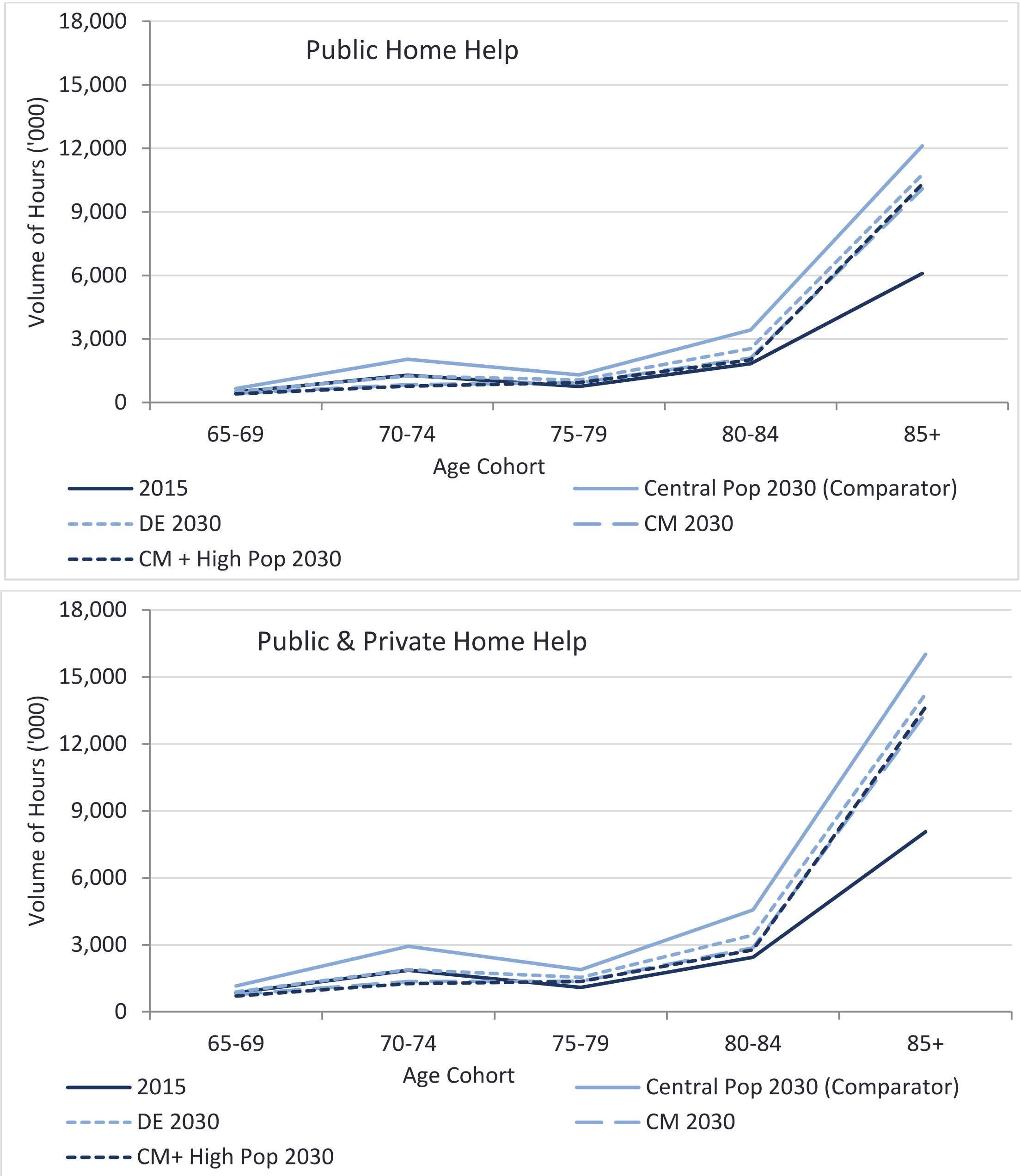
FIGURE 10.8 HOME HELP HOURS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030

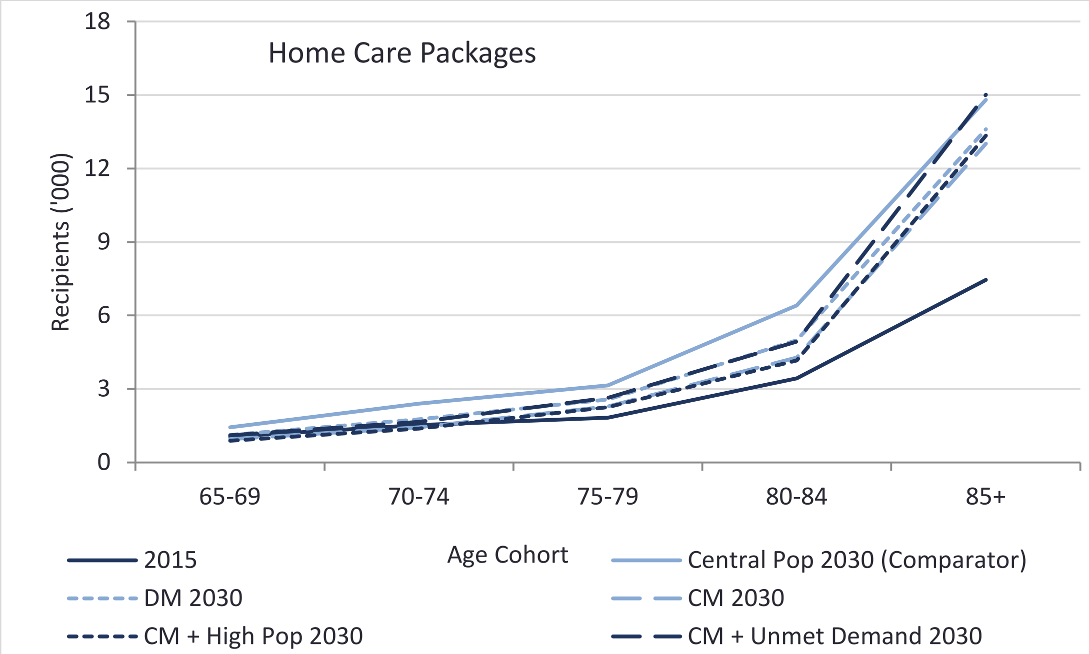


Sources: Authors' calculations.
Notes: Pop = population; CM = compression of morbidity; DE=Dynamic Equilibrium.

Figure 10.9 illustrates the volumes of public home help hours and public and private home help hours combined across age cohorts for different population and healthy ageing scenarios, including the preferred projections outlined above. For all services, the volume of demand is projected to increase most in the oldest age cohort. The volume of public home help hours is projected to increase significantly for those aged 85 years and older, from an estimated 6.10 million public home help hours in 2015, to an estimated 10.31 million public home help hours in 2030 under the Compression of Morbidity with High population growth assumption. Figure 10.9 also illustrates the volumes of HCP recipients across age cohorts for different population and healthy ageing scenarios, including the preferred projections outlined above. The volume of HCP recipients is projected to increase significantly for all age cohorts and again by most for those aged 85 years and older. The impact of healthy ageing on demand for home help in the older cohorts can be seen in the difference in projected demand between the comparator assumption (Central population 2030) and the Compression of Morbidity scenario. Volumes are much higher before the Compression of Morbidity healthy ageing assumption is applied.

FIGURE 10.9 PROJECTED DEMAND FOR HOME HELP HOURS AND HOME CARE PACKAGES, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS





Sources: Authors' calculations.

10.5 DISCUSSION AND CONCLUSIONS

This chapter presents findings for the baseline demand for public and private home care in 2015 and projects demand forward to 2030. This analysis provides an estimate of the respective contributions of publicly-financed and privately-purchased home care for the first time. It is clear that while public home help constitutes the majority of home care, private home help provides approximately one-quarter of all home help hours; in 2015, there were an estimated 14.31 million home help hours, of which 10.46 million hours were publicly-financed. As compared to previous years, public home help hours seem to have reduced. In 2006, there were 46,500 home help recipients (13) and 11.43 million annual hours of home help (14). However, this apparent reduction may reflect changes in the delivery of public home care during this period: HCPs were introduced in 2006 and targeted individuals with greater dependency needs. The number of HCPs has increased steadily since their introduction.[119] In this context, the proportion of older people who are (public) home care recipients has increased, even after accounting for the increase in the older population over the last decade (7). However, as our analysis shows, the increase does not account for all demand, since a substantial unmet demand for public home help and HCPs was evident in 2015.

Demand for home help hours is projected to increase from 2015 to 2030 by almost 38 per cent, under the preferred projections, with demand for HCPs projected to increase at the slightly higher rate of 44 per cent. Incorporating

[119] In 2008 there were 8,990 HCPs as compared to 15,272 in 2015 (15).

unmet demand however, increases the projected increase in demand for home help to 48.4 per cent and for HCPs to 65.9 per cent by 2030. This is a significant increase and the largest projected increase in demand for care in this report.

The projected increase in demand for all home care is largely due to population ageing under the Central population growth assumption. Under the High population growth assumption, population ageing explains a smaller proportion of the increase in demand as the dynamics driving the projected demand differs across population growth assumptions. Across all scenarios the largest increases in demand are seen for those aged 85 years and older. Increasing demand in the oldest age cohorts may change the type and intensity of home care demanded in 2030 as compared to 2015.

In interpreting the findings in this chapter it is important to be aware of the limitations of this analysis. A major drawback is that the HSE Social Care Division administrative data do not provide a breakdown by age and sex. TILDA Wave 3 data on home help utilisation were used to provide five-year age breakdowns which were further assigned a SYOA distribution from long-term care residents. However, the SYOA distribution for home care, while expected to increase with age similar to long-term care, may differ slightly. These analyses do not provide a breakdown of the services provided. Additionally, intensity of care is greater for HCP than home help recipients, but it was not possible to measure differences in care intensity. No question on privately-purchased home help hours was included in TILDA Wave 3. Therefore, in this analysis public home help hour rates were apportioned by age and sex to private home help recipients. No waiting lists were available for publicly-financed home help and HCPs in 2015. While information was available for 2016, these figures may not reflect the actual numbers waiting in 2015. Furthermore, the age distribution of numbers waiting may not be similar to the age distribution of those who were provided with care.

Previous evidence has shown that demand for long-term care including home care is affected by a range of factors including informal care supply, long-term care supply and demographic determinants such as life expectancy, disability rates, household composition and female labour force participation (13). While informal care is the largest source of home care, it is beyond the scope of this report.

REFERENCES

1. Murphy, C.M., B.J. Whelan and C. Normand (2015). 'Formal home-care utilisation by older adults in Ireland: evidence from the Irish Longitudinal Study on Ageing (TILDA)'. *Health & Social Care in the Community.* 2015;23(4):408-18. Epub 2014/12/03.
2. Lichtenberg, F.R. (2012). 'Is home health care a substitute for hospital care?' *Home Health Care* Serv Q. 2012;31(1):84-109.
3. Home and Community Care Ireland (2016). 'Presentation to the Joint Oireachtas Committee on Jobs, Enterprise and Innovation: Planning for future demand in the home care sector'. Available from: www.oireachtas.ie/parliament/media/committees/jobsenterpriseandinnovation/HCCI-presentation.pdf.
4. Health Service Executive (2016). *Social Care Division operational plan 2015.*
5. Health Service Executive (2017). 'Single Assessment Tool: Assessment and Care of Older People using the Single Assessment Tool (SAT)'. Available from: www.hse.ie/eng/services/list/4/olderpeople/sat/single-assessment-tool-.html.
6. Timonen, V. and M. Doyle (2007). 'Worlds apart? Public, private and non-profit sector providers of domiciliary care for older persons in Ireland'. *Journal of Aging Studies*. 2007;21(3):255-65.
7. Timonen, V., M. Doyle and C. O'Dwyer (2012). 'Expanded, but not regulated: ambiguity in home-care policy in Ireland'. *Health & Social Care in the Community*. 2012;20(3):310-8. Epub 2011/12/16.
8. Health Service Executive (2017). 'Home Care Packages'. [cited 2017 17/02/2017]; Available from: www.hse.ie/eng/services/list/4/olderpeople/homecarepackages.
9. Brick, A., A. Nolan, J. O'Reilly and S. Smith (2010). *Resource Allocation, Financing and Sustainability in Health Care: Evidence for the Expert Group on Resource Allocation and Financing in the Health Sector (Volume 1).* ESRI. Dublin.
10. Health Service Executive (2016). 'Social Care Division - Older Persons KPI Metadata based on Division Operational Plan 2015'. Available from: www.hse.ie/eng/services/publications/KPIs/olderpeoplekpi15.pdf.
11. Genio (2016). 'HSE & Genio Dementia Programme'. Available from: www.genio.ie/innovation-funding/hse-genio-dementia-programme.
12. NESF (2009). 'Implementation of the Home Care Package Scheme'.
13. Wren M. (2009). 'Long-term health and social care'. Richard Layte (Ed), Aoife Brick, *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland 2009*. p. 100-43. ESRI. Dublin.
14. Layte, R., M. Wiley, J. O'Reilly, P. Homes, E. Morgenroth, M. Barry, et al. (2007). *Report 1: Recent Demographic Trends and their Impact on the Delivery of Health Care in Ireland.* ESRI. Dublin.
15. Care Alliance Ireland (2016). *Analysis of Home Care Supports Funded by the HSE 2008–2016*. June 2016.

CHAPTER 11

Demand for public health nursing and community therapy services

11.1 INTRODUCTION

This chapter focuses on services provided by public health and community nurses and non-acute allied healthcare professionals (AHCP), namely physiotherapists, occupational therapists, and speech and language therapists. In future development, the Hippocrates model will include other AHCPs such as psychologists and social workers. This chapter presents findings for baseline utilisation of these professionals' services in 2015, estimates unmet need and demand, depending on data availability, and projects demand to 2030.

Services provided by these professionals are often co-ordinated in primary care and, like home care, these services in the community can often be substitutes for care provided in acute hospitals. Non-acute allied healthcare professionals provide services to patients in health centres or within individuals' homes. Services are also often provided with home care including within home care packages (HCPs).[120] The 2001 Primary Care Strategy sought to integrate therapy services within a primary care team (PCT) model (1). However, until recently, progress in implementing PCTs has been slow (2). Access to public health nursing and allied healthcare professionals is free at the point of use for medical card patients (3). While non-medical card holders referred to a public allied healthcare professional may also receive free care, this often depends upon availability in local areas (3). A significant role is also played by private sector allied healthcare professionals in Ireland. However, due to the lack of comparable data on private non-acute care utilisation, this chapter focuses on publicly-financed care only. While public health and community nurses are all employed by the state, and the majority of occupational therapists are publicly-employed or financed, the lack of data on private physiotherapy and speech and language therapy use in particular has been a limitation to this analysis.

The next sub-sections describe the roles of the professionals, whose services are the focus of this chapter. Section 11.2 presents findings for baseline utilisation of their services. The data sources and methods applied to estimate baseline utilisation are detailed in Chapter 3 and Appendix 2. Section 11.3 presents findings on unmet need and demand. Section 11.4 presents projections of demand to 2030. Section 11.5 discusses and concludes.

120 HCPs are tailored health and domestic care packages to allow people to remain in their own home after illness. While we have examined home care provision within HCPs in Chapter 10, in this chapter we are estimating overall utilisation of public health nursing and community therapy services.

11.1.1 Public health nursing

Public health nurses and community registered nurses deliver community nursing services (4). These nurses provide a range of services across maternal and neo-natal health, child health, elderly health, health promotion, and primary care (5). Public health nurse teams may include other healthcare professionals such as community nurses, and health and social care assistants (4). One important aspect of public health nurses' work is the co-ordination of care with other care workers including midwives, personal-care assistants, and home helps (6). Public health nurses in Ireland are registered general nurses (i.e. community nurses), but distinct to other community nurses, they have a postgraduate higher diploma in public health nursing (4). Provision of public health nurses is co-ordinated on a geographic basis through one of 32 Local Health Offices (LHOs). However, the role of public health nurses in co-ordinating services such as home care (7) differs across LHOs.

An important part of care provided by public health and community nurses is the provision of community care to pre-school and school children (up to the age of six). This care includes immunisation and health and development screening. The Best Health for Children Programme and the more recent Right From The Start strategies (public health programmes for children run by the HSE) have advised that there should be five public health nurse visits at regular time intervals; within 72 hours post-discharge from hospital following birth,[121] at three months, between seven and nine months, between 18 months and two years, and at three years (8).

11.1.2 Physiotherapy

According to the national representative body for physiotherapists, physiotherapy is concerned with helping to restore individuals' health and wellness following an injury, pain or disability, thereby allowing the individual to develop, maintain and restore movement and functional ability (9). Physiotherapy is offered in both the acute and non-acute sectors, and is provided by public, private, and voluntary organisations. Physiotherapy is a key feature of rehabilitation for a number of illnesses including trauma and stroke care (10). Physiotherapists may also work in multidisciplinary PCTs, and have gradually integrated into working within teams rather than working apart from other professionals as a standalone form of care (11). There is evidence that physiotherapists are also moving from generalised physiotherapy to more specialised care provision (11). Previous evidence has shown that uptake of

121 This visit also ensures that new-borns are offered Blood Spot Screening if the test was not performed in the hospital (7).

physiotherapy services is higher among medical card holders, with user fees deterring those without a medical card (12).

11.1.3 Occupational therapy

According to the representative body of occupational therapists in Ireland, an occupational therapist's primary goal is to enable individuals to participate in the activities of their everyday life (occupations) (13). Occupational therapy is offered in both the acute and non-acute sectors. Occupational therapy allows individuals to partake in those occupations in which they wish to engage through supporting their occupational engagement or modifying their home environment to support these occupations. Often help is given to improve functional activities to reduce the impact of disability or illness. Occupational therapy is often a key component of HCPs. Non-acute occupational therapy is a crucial part of home care and long-term care more generally. Like physiotherapists', occupational therapists' roles have gradually changed to working in multidisciplinary PCTs.

11.1.4 Speech and language therapy

A speech and language therapist is a qualified professional who provides care to individuals who present with speech, language, and communication difficulties (14). Speech and language therapy is offered in both the acute and non-acute sectors. Speech and language therapists may also work in multidisciplinary PCTs. Often care is provided for other functions including eating, drinking, or swallowing. Speech and language therapists provide care to younger children who have speech difficulties such as stammers, and older people who have acquired speech and language disorders as a result of an illness or injury. Speech and language therapists often specialise in the care of a particular group of individuals, such as children or older people with an acquired brain injury.

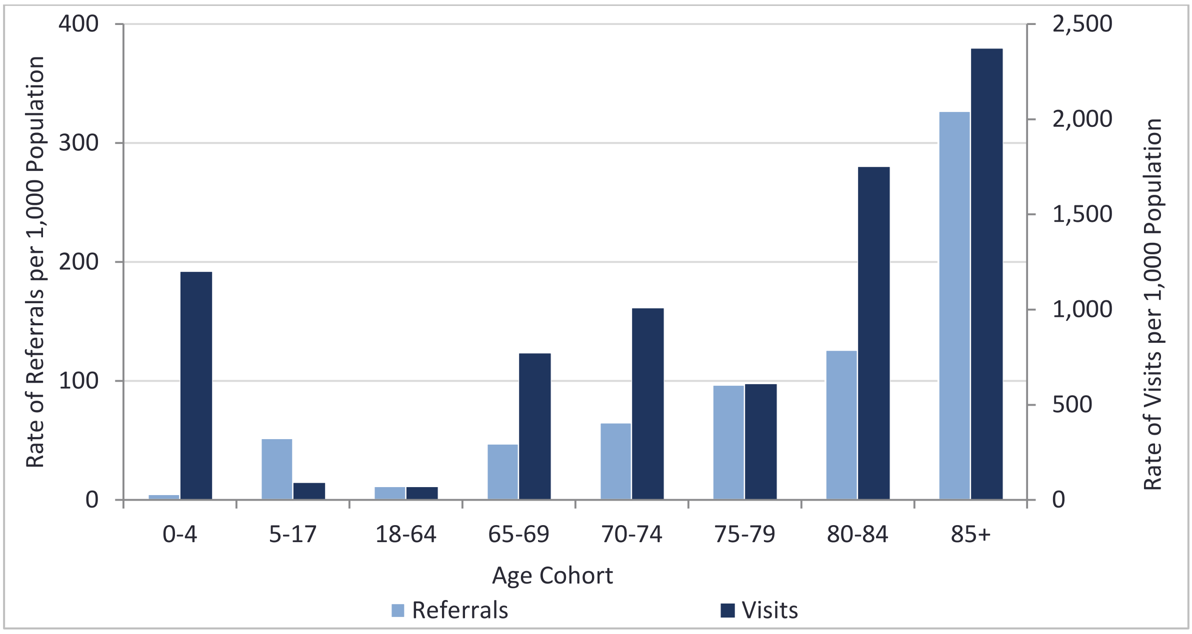
11.2 FINDINGS – BASELINE UTILISATION

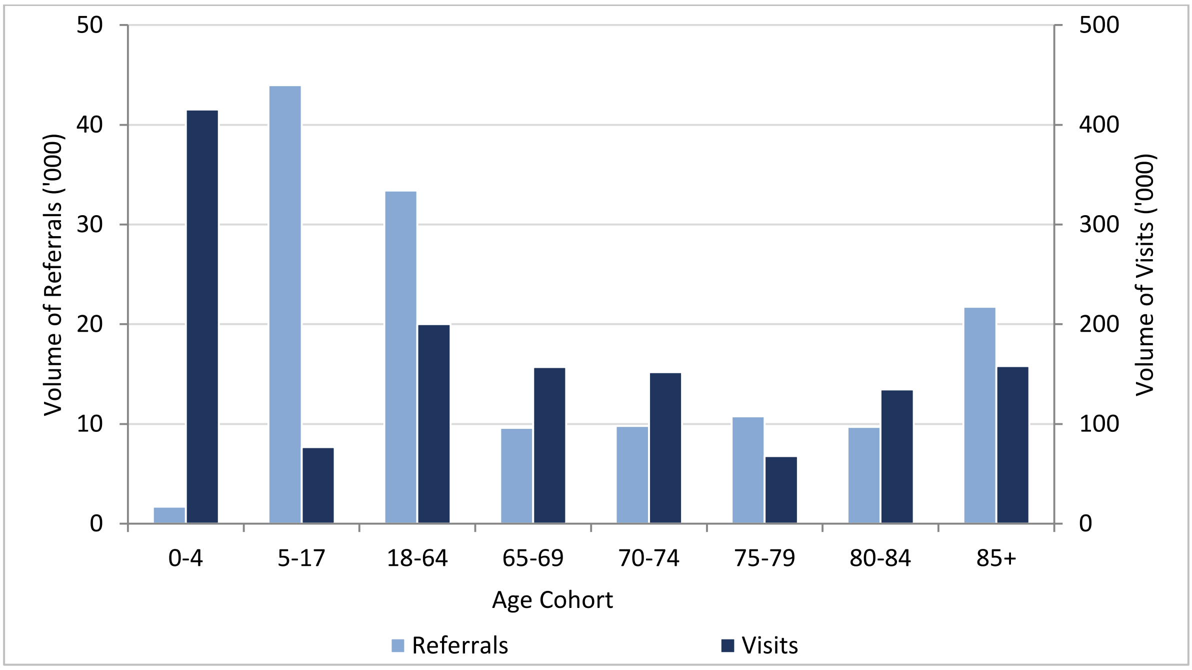
11.2.1 Public health nursing

Figure 11.1 illustrates the rate (per 1,000 population) of accepted referrals to public health nursing, and the volumes of referrals and visits in 2015. While the volume of referrals is highest in the five to 17 and 18 to 64 age cohorts, due to the size of the populations in each, the referral rates are much lower in these age cohorts. Overall, the referral rate increases with age, with the highest rate seen in those aged 85 years and older. Visit rates are highest among the youngest children (1,240.0 visits per 1,000 population) largely as a result of the child health screening programme where five visits with a public health nurse are included in the visiting estimate. The visit rate increases with age, with rates highest in those aged 85 years and older with an estimated 2,370.0 visits per 1,000 population.

Visit rates are relatively low among those aged five to 17 and 18 to 64. Overall there were an estimated 1.36 million public health nursing visits in 2015. These results focus on public health nurse care for the youngest and the oldest in the population, with an estimated 415,000 visits (30.0 per cent of the total) among those aged zero to four, and 669,000 visits (49.0 per cent of the total) in those aged 65 years and older. However activity is understated due to the exclusion of the school vaccination programme.

FIGURE 11.1 PUBLIC HEALTH NURSING REFERRALS* AND VISITS, 2015



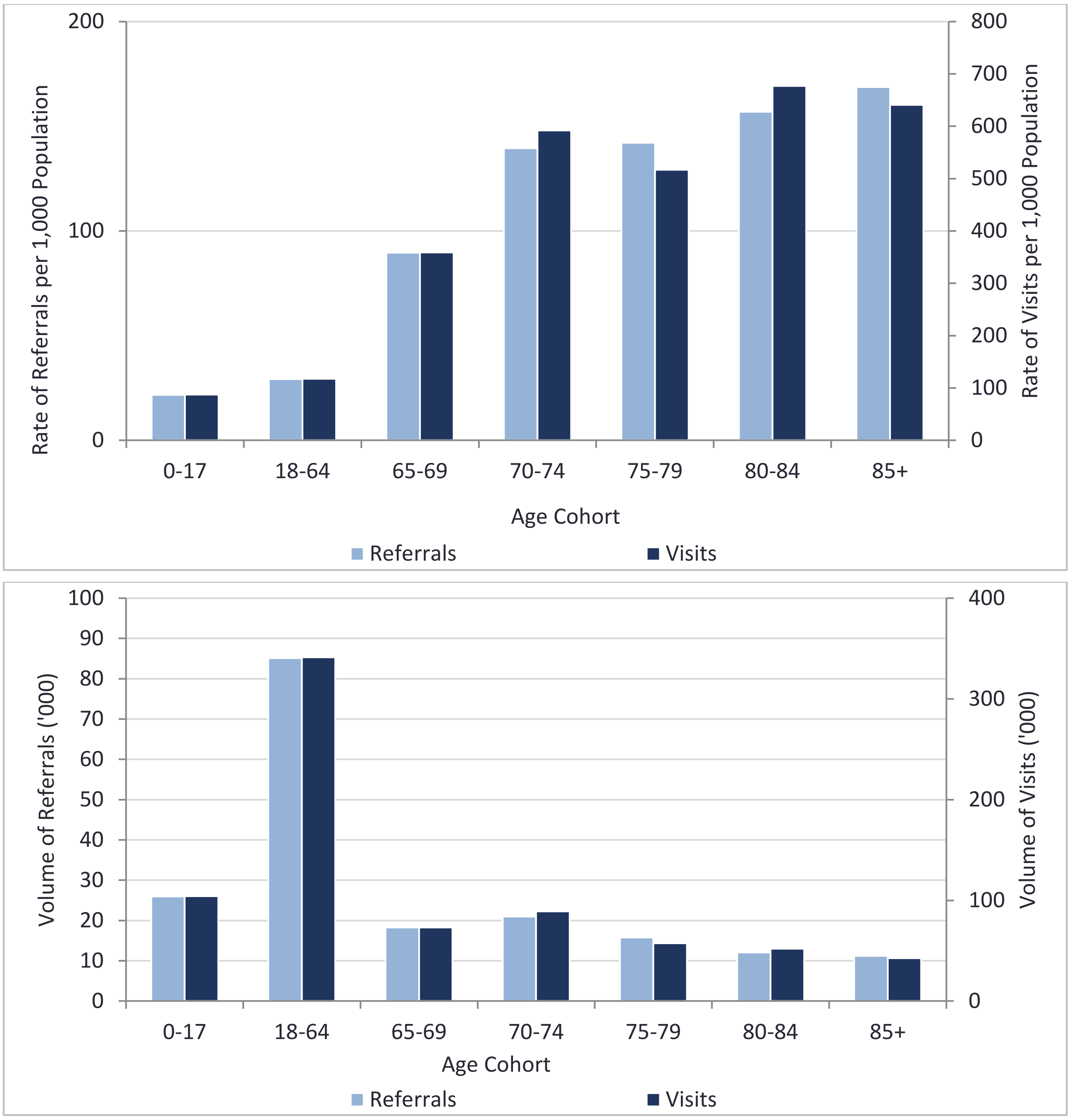


Sources: HSE BIU, 2015; TILDA Wave 3; ESRI population data, 2015.
Note: * Referral numbers do not include any referrals undertaken as part of The Child Health Screening and Surveillance programme.

11.2.2 Physiotherapy

Figure 11.2 illustrates the rate (per 1,000 population) of accepted referrals and visits to public physiotherapists and the volumes of referrals and visits in 2015. While the volume of referrals is highest in the 18 to 64 age cohort, the referral rates are much lower in this cohort. Overall, the referral rate increases with age with the highest rates seen in those aged 85 years and older. Visit volumes were similarly highest in the large 18 to 64 age cohort. Visiting rates are highest among the oldest in the population, with rates much lower in those aged 0 to 17 and those aged 18 to 64. In the 80 to 84 age cohort and the 85 years and older age cohort, estimated visiting rates of 677.1 and 640.9 per 1,000 population respectively occurred. Overall, there were 760,000 public non-acute physiotherapy visits in 2015. These findings estimate public community physiotherapy visits only. Other research at the ESRI (15), has found that there were 874 public physiotherapist Whole Time Equivalents (WTEs) in the non-acute sector in 2015. The corresponding figure for private physiotherapists was 899 WTEs. Applying the average public visit rates to private physiotherapists produces an estimated 780,000 private non-acute physiotherapy visits in 2015. Summing this number to the 760,000 public visits provides an estimated total of 1.54 million non-acute physiotherapy visits in 2015. Due to the lack of a distribution of private physiotherapy visits by age, these estimates are not included within the projection model.

FIGURE 11.2 PHYSIOTHERAPIST REFERRALS AND VISITS, 2015

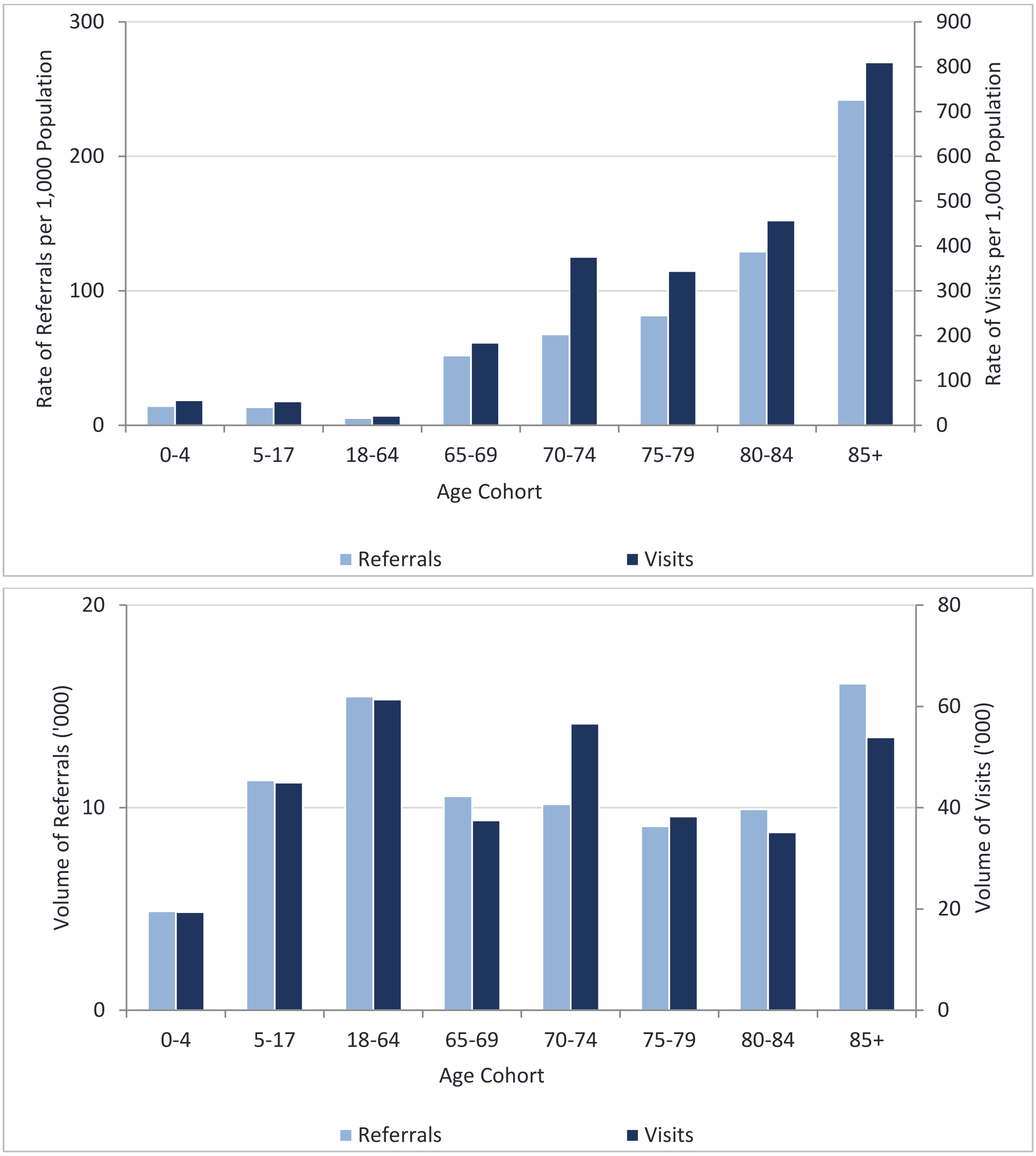


Sources: HSE BIU, 2015; TILDA Wave 3; ESRI population data, 2015.

11.2.3 Occupational therapy

Figure 11.3 illustrates the rate (per 1,000 population) of accepted referrals and visits to public occupational therapists and the volumes of referrals and visits in 2015. While the volume of referrals is highest in the 18 to 64 age cohort the referral rates are much lower relative to other cohorts. Overall, the referral rate increases steadily with age, with the highest rate seen in those aged 85 years and older. Visit volumes and visit rates follow similar patterns to referrals and are highest among the oldest cohorts. There were an estimated 809.6 visits per 1,000 population in the 85 years and older age cohort. Relatively, visit rates are very low among those aged younger than 65. Overall, there were an estimated 347,000 non-acute occupational therapy visits in 2015.

FIGURE 11.3 OCCUPATIONAL THERAPIST REFERRALS AND VISITS, 2015

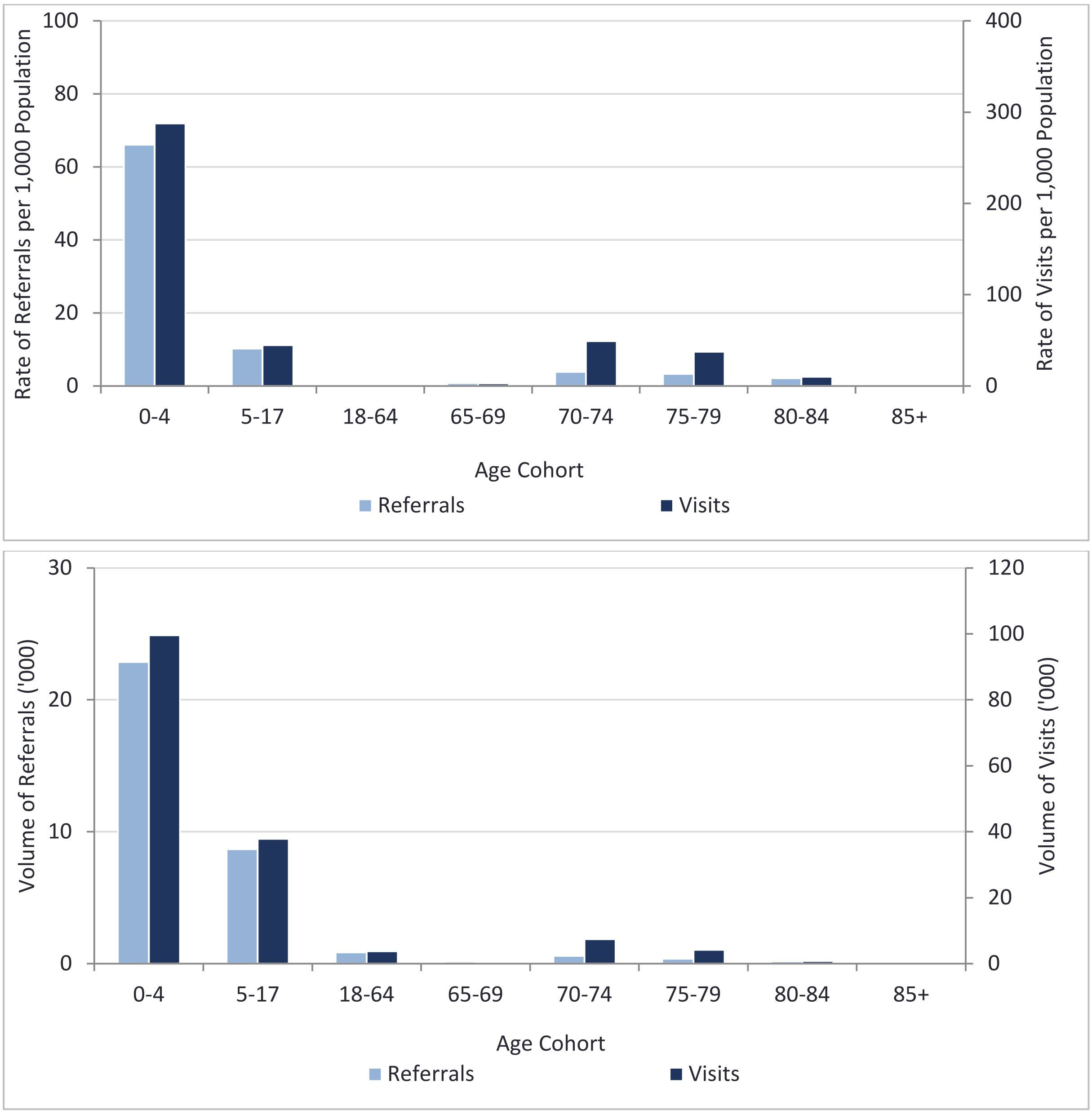


Sources: HSE BIU, 2015; TILDA Wave 3; ESRI population data, 2015.

11.2.4 Speech and language therapy

Figure 11.4 illustrates the rate (per 1,000 population) of accepted referrals and visits to speech and language therapists and the volumes of referrals and visits in 2015. The pattern of demand is very different to other forms of allied healthcare examined in this chapter. The referral and visit volumes and the rates of referrals and visits are highest in the zero to four age cohort, with an estimated 66.0 referrals and 287.7 visits per 1,000 population in this age cohort. There is a sharp reduction in referrals and visits in older cohorts. This high visiting rate may reflect greater need for speech and language therapy in the very young. It may also reflect health system practice that older patients with a need for this service receive care as hospital inpatients or outpatients. Validation of these results has been undertaken using *Growing Up in Ireland* data, with similar referral (any use) results found. Overall, there were 33,655 accepted referrals and 147,000 non-acute speech and language therapy visits in 2015.

FIGURE 11.4 SPEECH AND LANGUAGE THERAPIST REFERRALS AND VISITS, 2015

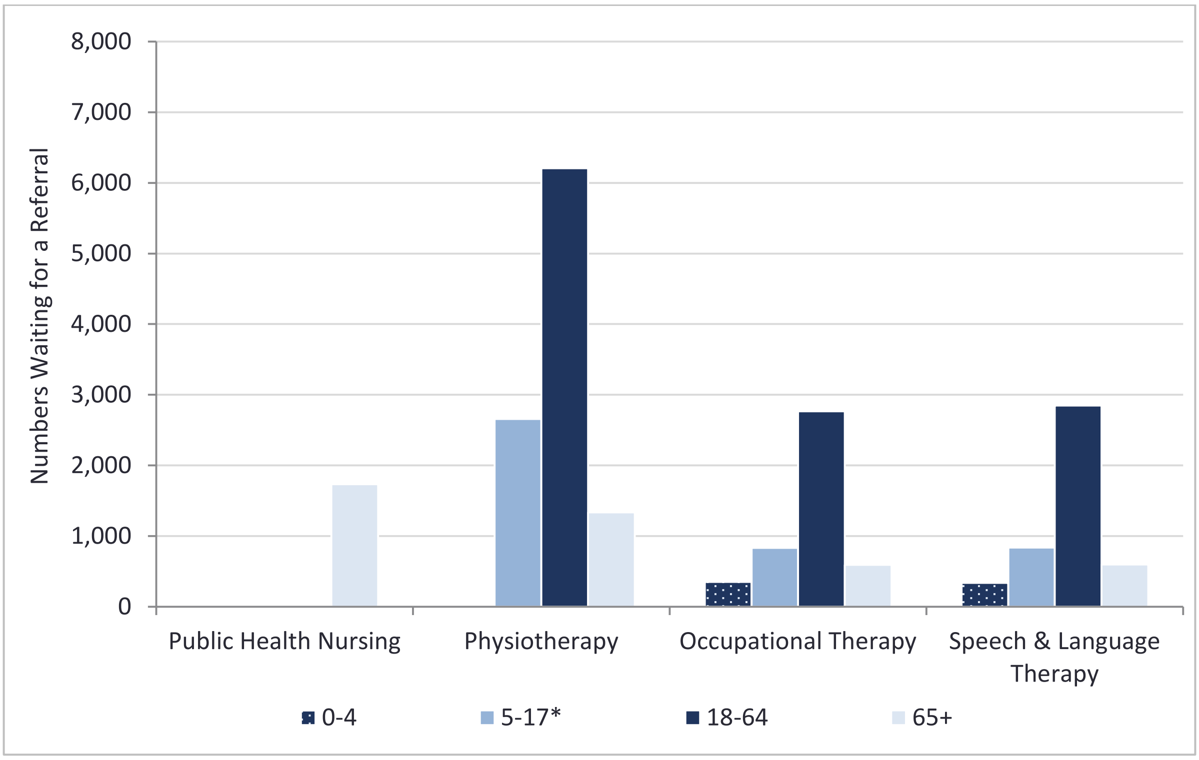


Sources: HSE BIU, 2015; TILDA Wave 3; ESRI population data, 2015.

11.3 FINDINGS – UNMET NEED AND DEMAND

Figure 11.5 illustrates the number of people in each age cohort waiting for physiotherapy, occupational therapy, and speech and language therapy referrals for more than 12 weeks at the end of 2015. Due to no age disaggregation, the unmet demand rate is the same across all age cohorts, in each of the respective therapies.[122] This figure also illustrates the number of people aged 65 and over with a subjective need for public health nursing that was not met, based on survey data.[123] Given the differing nature of administrative and survey data and the difference between need and demand, care should be taken when comparing unmet need/demand across services. Adding those with an unmet demand for therapy to referral recipients in 2015 would increase the number of attended referrals by 5.39 per cent for physiotherapy, 3.23 per cent for occupational therapy, and 13.74 per cent for speech and language therapy.

FIGURE 11.5 NUMBER OF INDIVIDUALS WAITING 12 WEEKS FOR A REFERRAL (PHYSIOTHERAPY, OCCUPATIONAL THERAPY, AND SPEECH AND LANGUAGE THERAPY) OR WITH A STATED UNMET NEED (PUBLIC HEALTH NURSING), 2015



Sources: HSE BIU, 2015; TILDA Wave 3; ESRI population data, 2015.
Notes: Unmet demand for public health nursing is a subjective assessment of need among people aged 65 and over. The numbers waiting rate for physiotherapy, occupational therapy, and speech and language therapy is the same across each age cohort for each respective therapy. The 5-17 age group includes those aged 0-4 for physiotherapy.

11.4 FINDINGS – PROJECTIONS

Figure 11.6 and Table 11.1 present projections for public health nursing visits between 2015 and 2030 based on the preferred projection scenarios listed below.

122 2.0 per 1,000 population for physiotherapy, 1.0 per 1,000 population for occupational therapy, 1.0 per 1,000 population for speech and language therapy.
123 2.6 per 1,000 population for those aged 65 years and older.

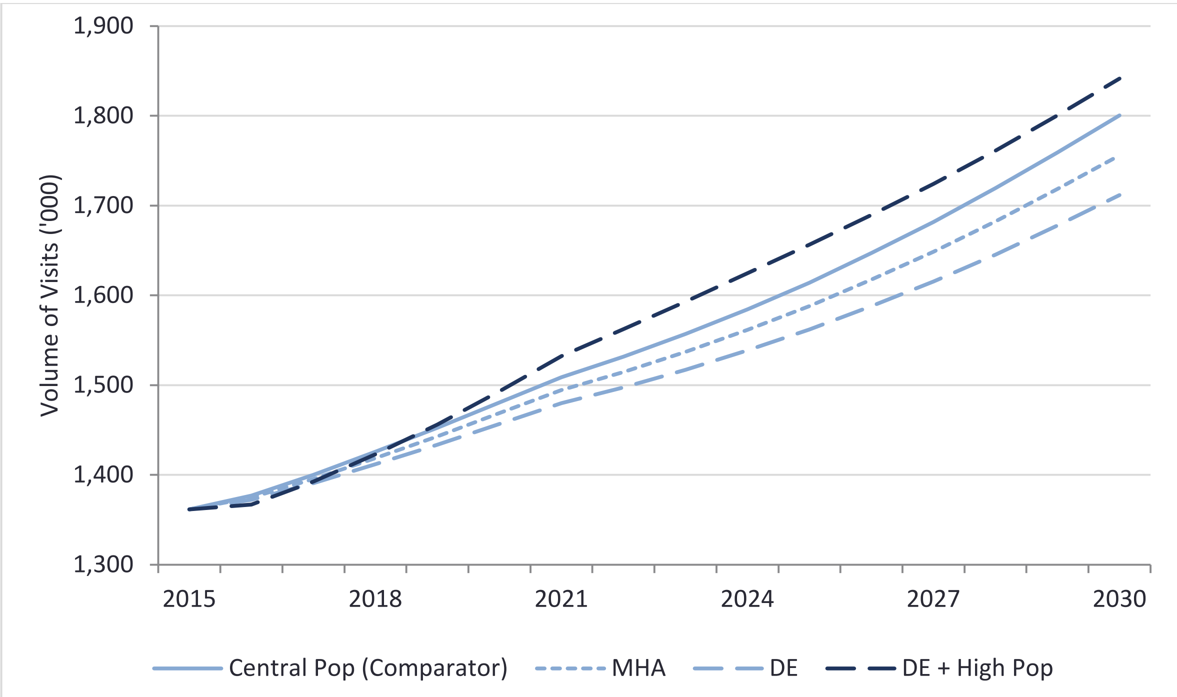
- *Comparator Central Population Growth scenario (Public Health Nursing):* Projecting demand for public health nursing visits based purely on our Central population growth assumption (with no adjustments of activity rates to account for healthy ageing) we project 1.80 million visits in 2030 which equates to a 32.2 per cent increase.

Preferred projection scenarios (public health nursing):

- Moderate Healthy Ageing
- Dynamic Equilibrium
- Dynamic Equilibrium with High population growth

Applying the Moderate Healthy Ageing (MHA) scenario, 1.76 million public health nursing visits are projected in 2030, which equates to a 29.0 per cent increase. Applying the Dynamic Equilibrium scenario yields 1.71 million projected visits in 2030, a 25.7 per cent increase. Applying the Dynamic Equilibrium with High population growth scenario yields higher projections of 1.84 million public health nursing visits in 2030, which equates to a 35.2 per cent increase. As shown in Figure 11.13, the differences in demand projections across these two scenarios is largely driven by the increase in projected numbers of younger people in the High population growth scenario.

FIGURE 11.6 PROJECTED DEMAND FOR PUBLIC HEALTH NURSING VISITS, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Pop = population; MHA is moderate healthy ageing; DE is dynamic equilibrium.

Figures 11.7 – 11.9 and Table 11.1 present projections of demand for community therapy referrals and visits from 2015 to 2030 based on the preferred projections. These preferred scenarios are used for physiotherapy and occupational therapy only, and are not the preferred projection scenarios applied to speech and language therapy. It would be inappropriate to apply healthy ageing scenarios in the speech and language therapy demand projections because these services are predominantly used by young children, and therefore will not be affected by improvements in health (reduced disability and/or morbidity) in the older age cohorts. Therefore only projections using two assumptions, Central population and High population growth, were estimated.

In addition, for physiotherapy and occupational therapy referrals, projections applying the Compression of Morbidity assumption with Unmet Demand were estimated, due to availability of data.

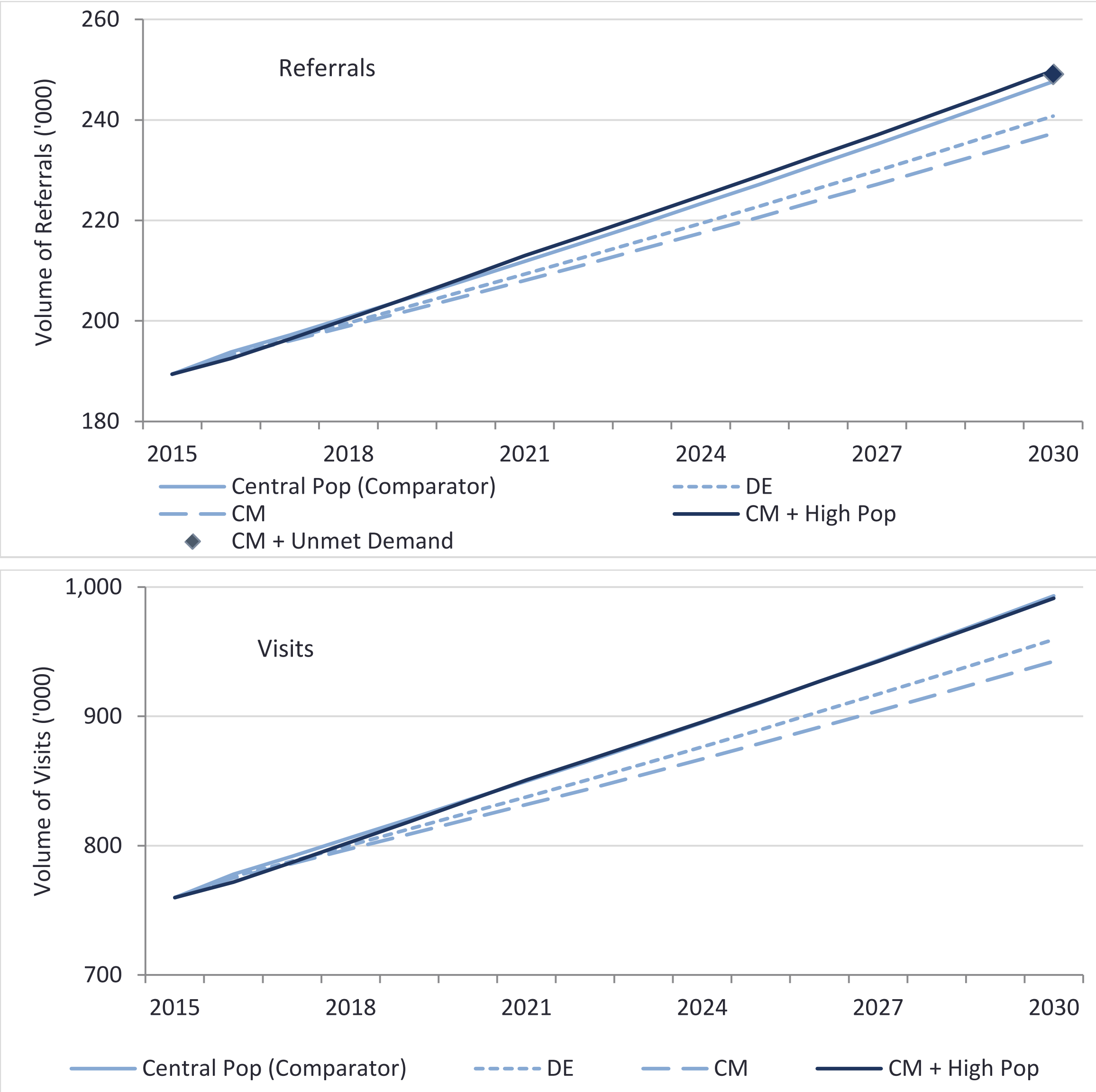
Preferred projection scenarios (occupational therapy and physiotherapy):

- Dynamic Equilibrium
- Compression of Morbidity
- Compression of Morbidity with High population growth
- Compression of Morbidity with Unmet Demand

Figure 11.7 (and Table 11.1) presents projections for public physiotherapy referrals and visits between 2015 and 2030 based on the comparator and preferred projection scenarios listed above. Projecting demand for physiotherapy referrals and visits based purely on our Central population growth assumption (with no adjustment of activity rates to account for healthy ageing) we project 0.248 million referrals and 0.993 million visits in 2030 which equates to a 30.8 per cent and a 30.7 per cent increase respectively. Applying the Dynamic Equilibrium scenario, 0.241 million physiotherapy referrals are projected in 2030, which equates to a 27.1 per cent increase. Applying the Compression of Morbidity scenario, 0.237 million physiotherapy referrals are projected in 2030, which equates to a 25.3 per cent increase. The Compression of Morbidity scenario with High population growth yields larger projections of 0.250 million physiotherapy referrals in 2030, which equates to a 31.9 per cent increase. The Compression of Morbidity scenario with Unmet Demand yields projections of 0.249 million physiotherapy referrals in 2030, which equates to a 31.5 per cent increase.

Applying the Dynamic Equilibrium scenario with Central population growth, demand for 0.960 million physiotherapy visits is projected in 2030, which equates to a 26.2 per cent increase. Applying the Compression of Morbidity scenario with Central population growth, demand for 0.943 million physiotherapy visits is projected in 2030, which equates to a 24.0 per cent increase. The Compression of Morbidity scenario with High population growth yields larger projections of demand for 0.991 million physiotherapy visits in 2030, which equates to a 30.4 per cent increase.

FIGURE 11.7 PROJECTED DEMAND FOR PUBLIC PHYSIOTHERAPY REFERRALS AND VISITS, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



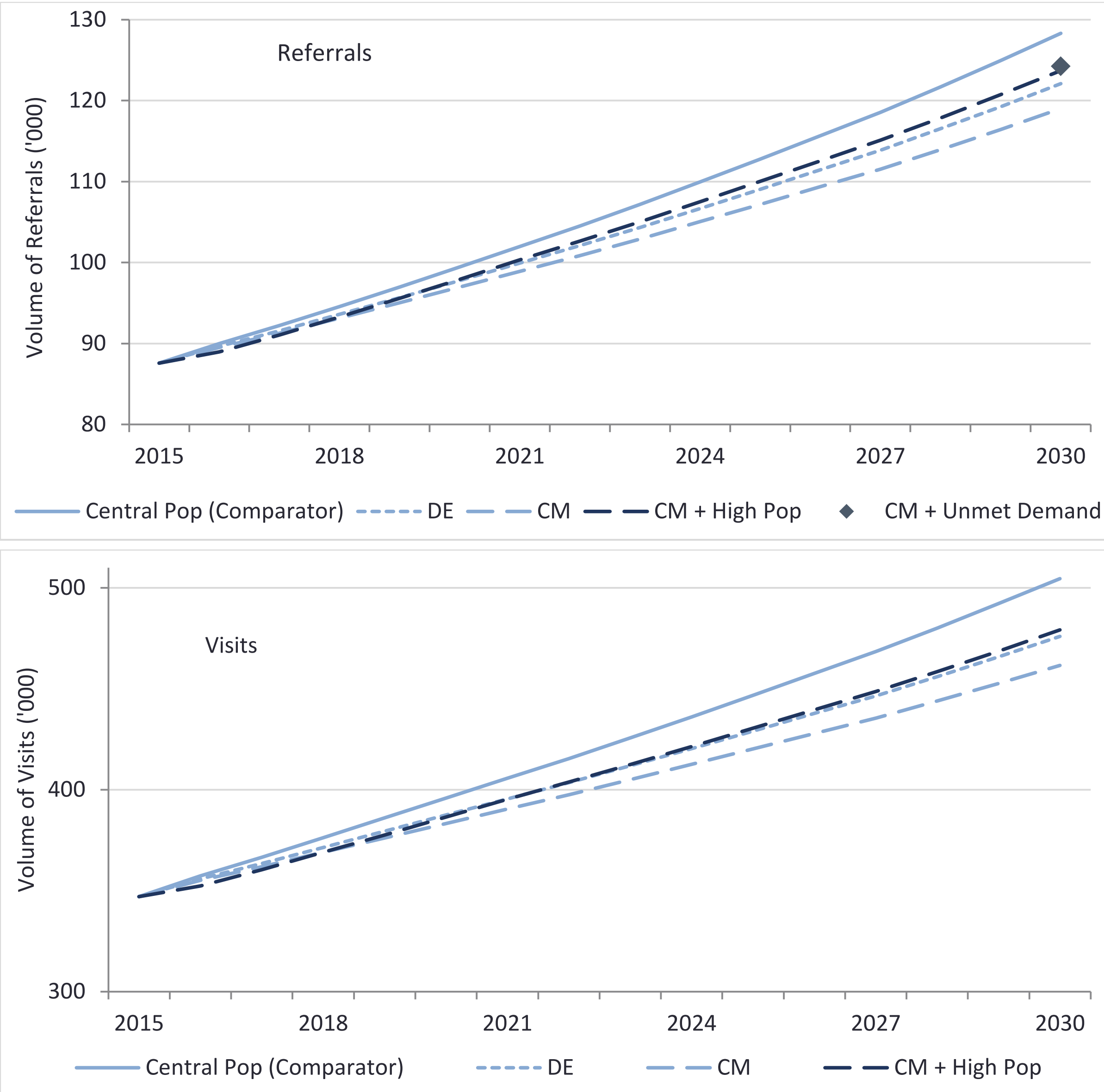
Sources: Authors' calculations.
Notes: Pop is population growth; DE is dynamic equilibrium; CM is compression of morbidity.

Figure 11.8 (and Table 11.1) presents projections for public occupational therapy referrals and visits between 2015 and 2030 based on the preferred projection scenarios listed above. Applying the Dynamic Equilibrium scenario, 0.122 million occupational therapy referrals are projected in 2030, which equates to a 39.4 per cent increase. Applying Compression of Morbidity scenario, 0.119 million occupational therapy referrals are projected in 2030, which equates to a 35.9 per cent increase. The Compression of Morbidity scenario with High population growth yields larger projections of 0.124 million occupational therapy referrals in

2030, which equates to a 41.3 per cent increase. The Compression of Morbidity scenario with Unmet Demand also yields projections of 0.124 million occupational therapy referrals in 2030, which equates to a 41.9 per cent increase.

Applying the Dynamic Equilibrium scenario with Central population growth, 0.48 million occupational therapy visits are projected in 2030, which equates to a 37.1 per cent increase. Applying the Compression of Morbidity scenario, 0.46 million occupational therapy visits are projected in 2030, which equates to a 33.0 per cent increase. The Compression of Morbidity scenario with High population growth yields larger projections of 0.48 million occupational therapy visits in 2030, which equates to a 38.1 per cent increase.

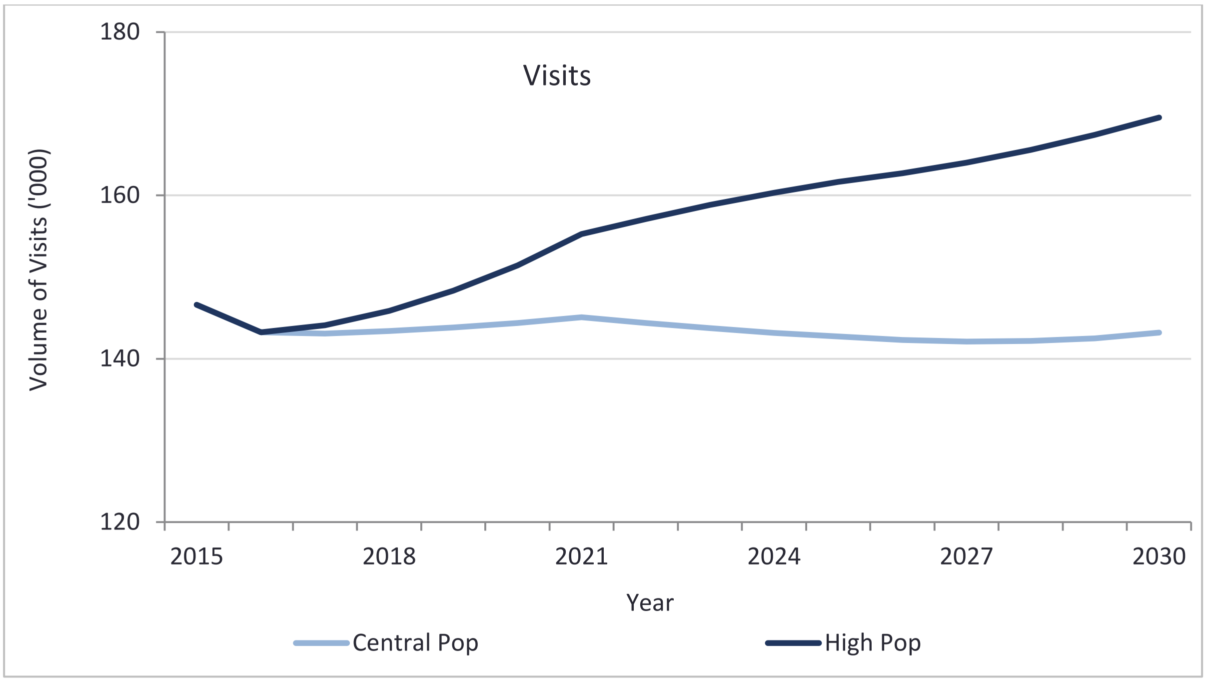
FIGURE 11.8 PROJECTED DEMAND FOR OCCUPATIONAL THERAPY REFERRALS AND VISITS, 2015 TO 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Pop is population growth; DE is dynamic equilibrium; CM is compression of morbidity.

Figure 11.9 (and Table 11.1) presents projections of demand for speech and language therapy. The preferred projections for speech and language therapy, Central population growth and High population growth assumptions, yield projections of demand for 0.143 million and 0.170 million visits in 2030 respectively. This equates to a -2.3 per cent to 15.6 per cent change relative to 2015 visit volumes. The differences in demand projections across these two scenarios are largely driven by the projected numbers of younger people being much higher in the High population growth scenario. The projected number of those aged under 15 years falls between 2015 and 2030 under the Central population growth assumption, resulting in a small projected decrease.

FIGURE 11.9 PROJECTED DEMAND FOR SPEECH AND LANGUAGE THERAPY VISITS, 2015 TO 2030 –PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Note: Pop is population growth.

TABLE 11.1 PUBLIC HEALTH NURSING AND ALLIED HEALTHCARE PROFESSIONALS DEMAND PROJECTIONS, 2015-2030, COMPARATOR AND PREFERRED PROJECTIONS

Scenario		Baseline Activity (2015)	Percentage change 2015 to 2030			
			Comparator	Preferred Projections		
			Central Population Only	MHA	DE	DE + High Pop
		Number of Visits ('000)	% Change	% Change	% Change	% Change
Public health nursing visits	Total	1,361.7	32.2	29.0	25.7	35.2

Scenario		Baseline Activity (2015)	Percentage change 2015 to 2030				
			Comparator	Preferred Projections			
			Central Population Only	DE	CM	CM + High Pop	CM + Unmet Demand
		Number of Referrals/Visits ('000)	% Change	% Change	% Change	% Change	% Change
Physiotherapy Referrals	Total	189.4	30.8	27.1	25.3	31.9	31.5
Physiotherapy Visits	Total	760.0	30.7	26.2	24.0	30.4	-
Occupational Therapy Referrals	Total	87.6	46.5	39.4	35.9	41.3	41.9
Occupational Therapy Visits	Total	347.0	45.4	37.1	33.0	38.1	-

Scenario		Baseline Activity (2015)	Percentage change 2015 to 2030	
			Preferred Projections	
			Central Population Only	High Population
		Number of Visits ('000)	% Change	% Change
Speech and Language Therapy Visits	Total	146.6	- 2.3	15.6

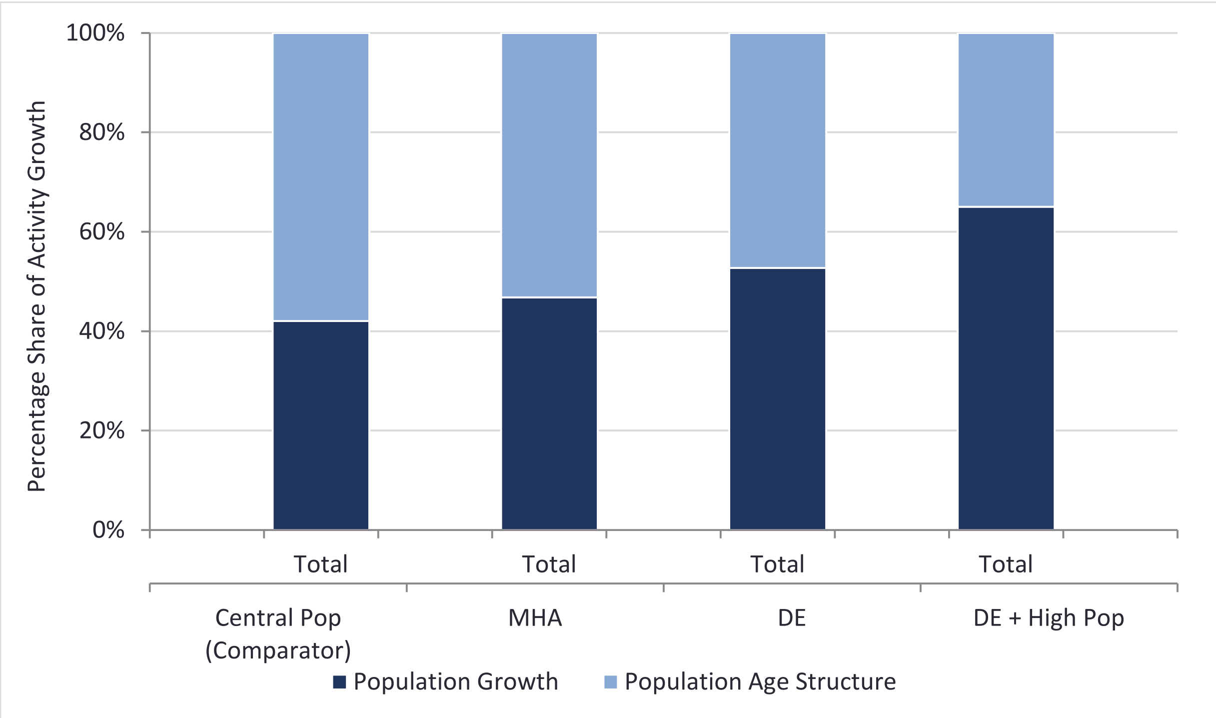
Sources: Authors' calculations. The healthy ageing assumption which appears better supported by the evidence is combined with High population or Unmet Need/Demand.

11.4.1 Preferred projection scenarios and demand decompositions, 2015 to 2030

Figure 11.10, 11.11 and 11.12 decompose the drivers of growth in demand over the projection period into changes in the size or age structure of the population for public health nursing visits, physiotherapy referrals and visits, and occupational therapy referrals and visits. Under Moderate Healthy Ageing assumptions, population growth is a less significant driver than the population age structure of public health nursing visits. When Dynamic Equilibrium is assumed, population growth becomes a more significant driver. A similar pattern is seen in the case of physiotherapy referrals and visits but with age structure playing a greater role than in the case of public health nursing. The role of age structure is however much reduced when Compression of Morbidity and High population growth are assumed. When unmet demand is incorporated into Compression of Morbidity scenario, it explains approximately 20 per cent of the increased demand for physiotherapy referrals.

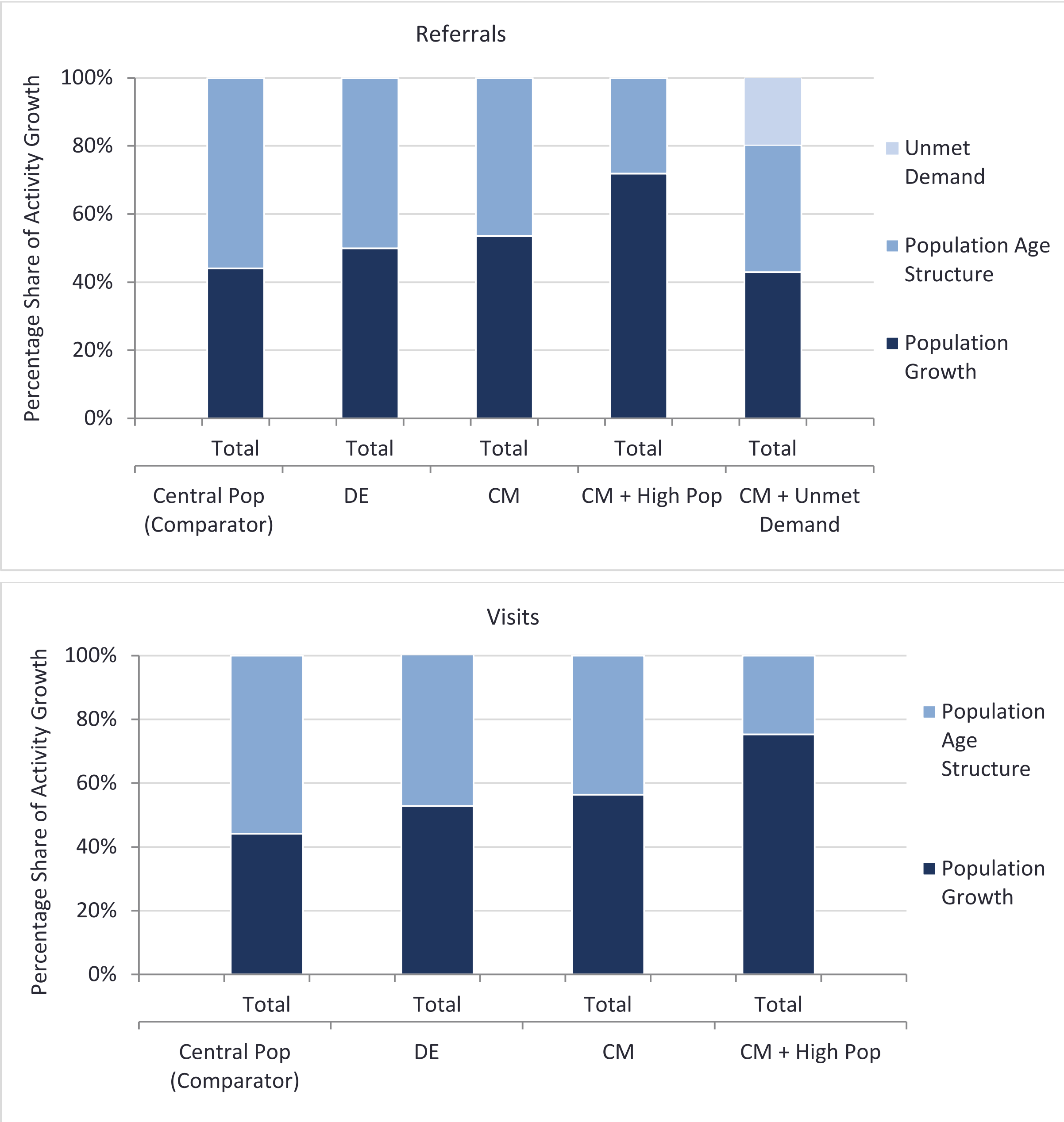
However, in the case of occupational therapy, population age structure remains a more significant driver of demand than population growth, unless High population growth is assumed. When unmet demand is incorporated into the Compression of Morbidity scenario, it explains approximately 14 per cent of the increased demand for occupational therapy referrals. As in the case of physiotherapy referrals, including unmet demand reduces the impact of both the population age structure and population growth to some degree.

FIGURE 11.10 PUBLIC HEALTH NURSING VISITS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



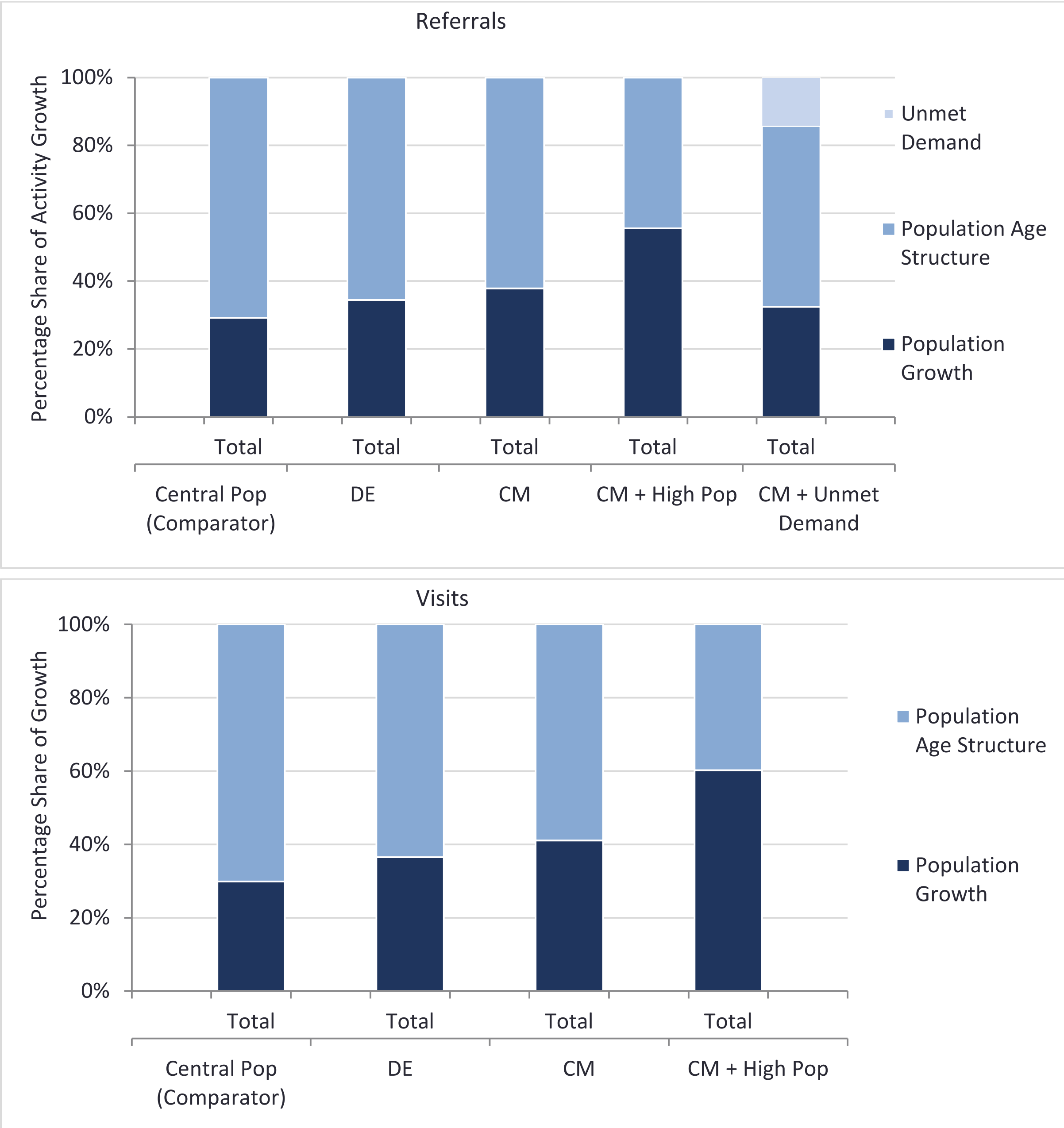
Sources: Authors' calculations.
Notes: Pop is population growth; MHA is moderate healthy ageing; DE is dynamic equilibrium.

FIGURE 11.11 PHYSIOTHERAPY VISITS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Sources: Authors' calculations.
Notes: Pop is population growth; DE is dynamic equilibrium; CM is compression of morbidity.

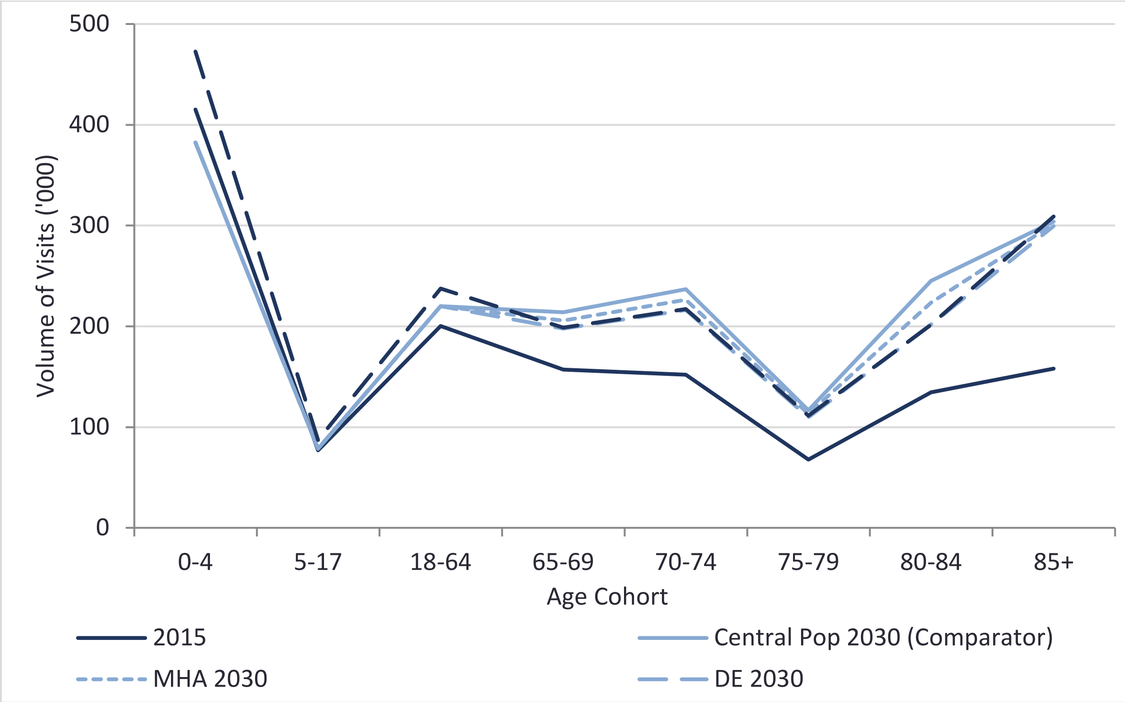
FIGURE 11.12 OCCUPATIONAL THERAPY VISITS PROJECTED DEMAND GROWTH DECOMPOSITION FOR COMPARATOR AND PREFERRED PROJECTION SCENARIOS, 2015 TO 2030



Sources: Authors' calculations.
Notes: Pop is population growth; DE is dynamic equilibrium; CM is compression of morbidity.

Figure 11.13 illustrates the volumes of public health nursing visits across age cohorts for each preferred projection scenario. Visit volumes are projected to be higher in 2030 than in 2015 for all age cohorts when the Dynamic Equilibrium with High population growth assumption is considered. The largest absolute difference in public health nursing visits in 2030 relative to 2015 is observed in the oldest age cohorts, with demand projected to increase from 158,000 to 309,000 under the Dynamic Equilibrium with High population growth assumption for those aged 85 years and older.

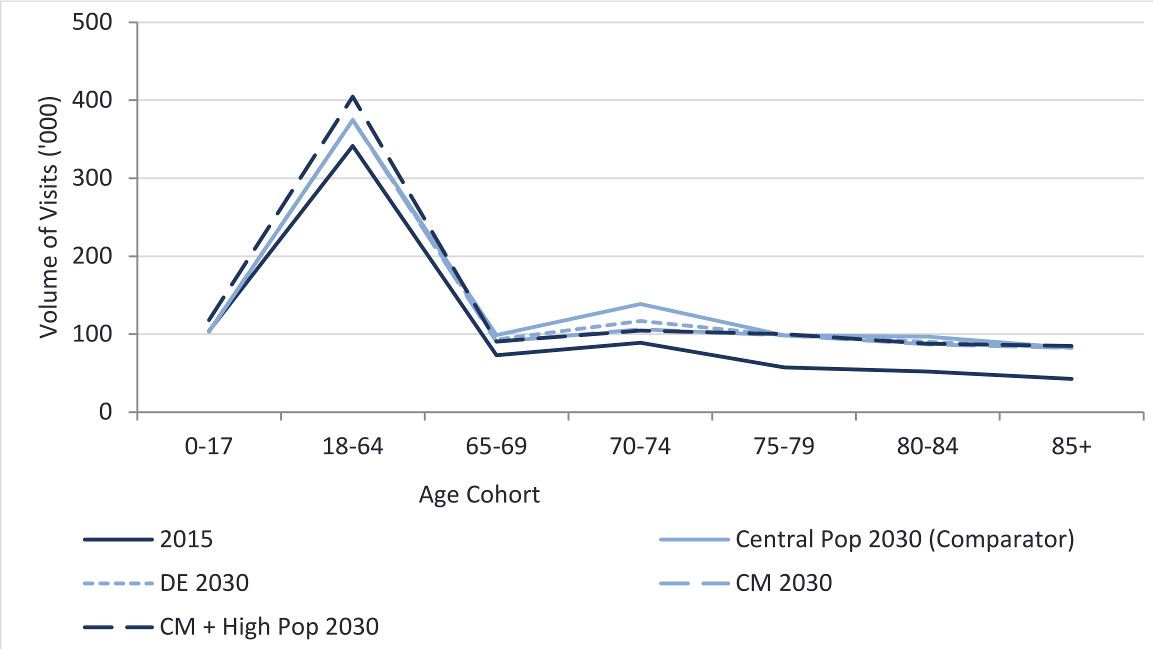
FIGURE 11.13 PROJECTED DEMAND FOR PUBLIC HEALTH NURSING VISITS, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Pop is population growth; MHA is moderate healthy ageing; DE is dynamic equilibrium.

Figure 11.14 illustrates the volumes of physiotherapy visits across age cohorts for each preferred projection scenario. Visit volumes are projected to be higher in 2030 than in 2015 for all age cohorts for all preferred projections. Large increases are projected in the 18 to 64 age cohorts, though this may be high due to the size of the population in the cohort. Large increases are projected in all older age cohorts, with demand projected to increase from 42,700 to 84,900 under the Compression of Morbidity with High population growth assumption for those aged 85 years and older.

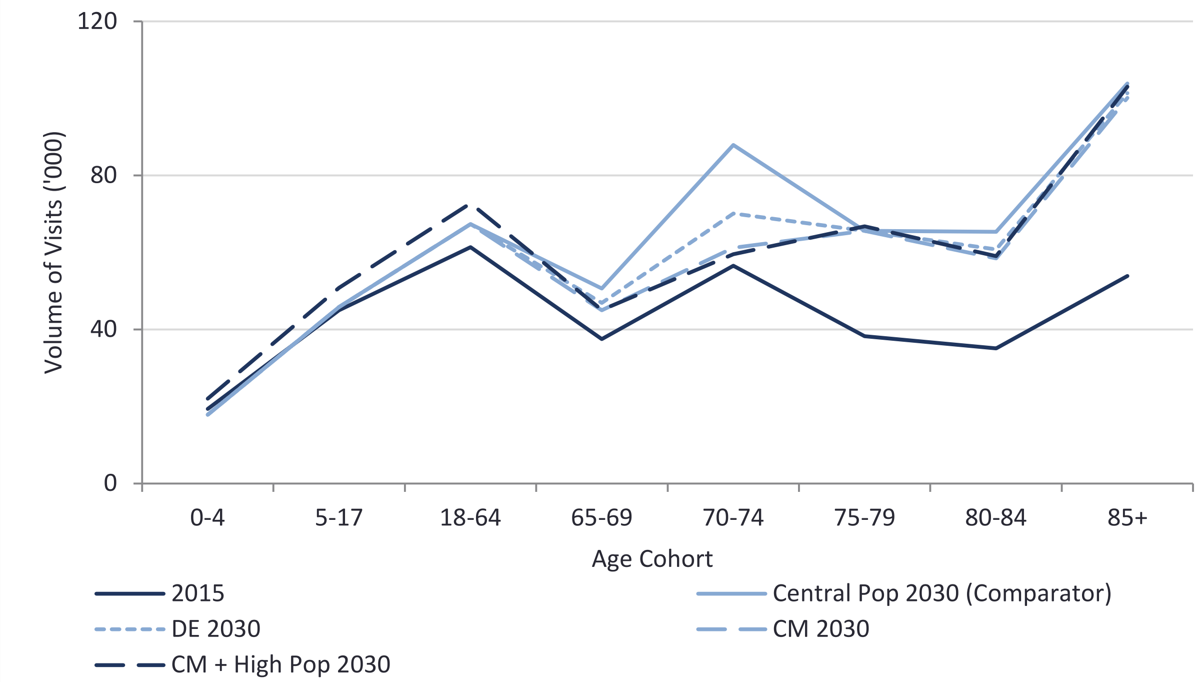
FIGURE 11.14 PROJECTED DEMAND FOR PHYSIOTHERAPY VISITS, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Pop is population growth; DE is dynamic equilibrium; CM is compression of morbidity.

Figure 11.15 illustrates the volumes of occupational therapy visits across age cohorts for each preferred projection scenario. Visit volumes are projected to be higher in 2030 than in 2015 for all the middle and older age cohorts, for all preferred projections. Large increases are projected in the 74 to 84 age cohorts. The largest increase is once more projected in the 85 years and older cohort, with demand projected to increase from 53,900 to 103,100 under the Compression of Morbidity with High population growth assumption.

FIGURE 11.15 PROJECTED DEMAND FOR OCCUPATIONAL THERAPY VISITS, BY AGE, 2015 AND 2030 – COMPARATOR AND PREFERRED PROJECTION SCENARIOS



Sources: Authors' calculations.
Notes: Pop is population growth; DE is dynamic equilibrium; CM is compression of morbidity.

11.5 DISCUSSION AND CONCLUSIONS

This chapter presents findings for baseline utilisation of public health nursing and community-based therapy services in 2015 and projects demand to 2030. This is believed to be the first Irish estimate of the total annual number of public health nursing, physiotherapy, occupational therapy, and speech and language therapy referrals and visits. Overall, for these four services, in 2015 there were an estimated 2.62 million visits; 1.36 million public health nursing visits, 0.76 million physiotherapy visits, 0.35 million occupational therapy visits, and 0.15 million speech and language therapy visits. The large number of visits highlights the importance of community care to health and social care in Ireland. In particular, the high number of visits by public health nurses is a consequence of the broad range of services they provide and broad range of needs they meet; pre-school children's health, elderly health, health promotion, and primary care (5). Furthermore, public health nurses play a central role in organising access to many services including home care.

Projected demand for public health nursing services and allied healthcare professionals' services to 2030 differs according to the type of care being examined. Applying our preferred projections, the largest relative increase in demand is projected for occupational therapy, which is projected to increase by between 33.0 per cent and 38.1 per cent between 2015 and 2030.[124] Demand for public health nursing and public physiotherapy visits is projected to increase by between 25.7 and 35.2 per cent, and 24.0 and 30.4 per cent, respectively. Furthermore, the age structure of the population who will require community care services will change in the future. For each of the services above, the largest increase in demand is projected for the oldest in the population, who may often require different or more intensive types of care.

Unlike the other types of community care examined, demand for speech and language therapy is projected to decrease slightly under the Central population growth assumption, and increases by 15.6 per cent with the High population growth scenario. This reflects the current configuration of speech and language therapy services which are predominantly delivered to younger children. Estimates in Chapter 4 highlight that under the Central population growth assumption, the number of children aged under 15 years is projected to decrease by 33,900, a 3 per cent decrease from 2015 to 2030. In this event, potential extra capacity could be used to reduce unmet demand for speech and language therapy amongst children and improve the service provision to older adults. Recent evidence has shown that the supply of speech and language services may not be sufficient for stroke patients' rehabilitation in Ireland, with only half of stroke rehabilitation units having access to speech and language therapy five days per week, which is much lower than other types of therapy (10). Were the model of SLT care to change, however, from the current hospital-centred service for older people, this projected demand would increase. Furthermore, analysis of utilisation and need for SLT services among people with disabilities (services not examined in this study) could also affect this projection. However our alternative preferred projection scenario based on High population growth projects an increase of 15.6 per cent for public speech and language therapy services, as currently configured.

Population growth and population ageing also have disparate impacts on the projected demand for each community service across our preferred scenarios. The dominant drivers of demand growth for each service reflect the age distributions of those who use the service. Therefore, the impact of changes in the age structure of the population is reduced both relatively, and absolutely, under the High population growth assumption. Population growth is the largest driver of increased demand for public health nursing, especially in the High population growth scenario where an increase in numbers of children is projected. Population growth is the largest driver of projected demand for physiotherapy, though the impact is not as large as for public health nursing. Change in the population age structure, under the Central population growth

[124] Public health nurse visits are projected to increase by the greatest absolute amount.

with Compression of Morbidity assumption, is the major driver of projected demand for occupational therapy.

In interpreting the findings in this chapter it is important to be aware of the limitations of this analysis. A major drawback is that the HSE BIU administrative data do not provide a disaggregation by sex, or by SYOA, and in many cases by age cohorts (e.g. for physiotherapy waiting list data). While other data analysis was applied to overcome this issue (detailed in Chapter 3) due to the remaining level of aggregation, the projections may understate future demand on the one hand, and on the other hand may not sufficiently capture healthy ageing trends, specifically when applying the Compression of Morbidity assumption (see Chapter 3 and Appendix 5).

A significant limitation of this chapter is the lack of data available on private allied healthcare professional use. While public health nursing and the majority of occupational therapy is state-supplied, the lack of data on private physiotherapy and speech and language therapy use in particular has been a limitation to this analysis. A significant role is played by private physiotherapists and speech and language therapists in Ireland. Allied healthcare professional activity occurring in the acute sector, while not explicitly examined in this report, is captured in baseline acute activity in Chapters 5 and 6. It is also acknowledged that not all public health nursing activity is captured by this analysis leading to an understatement of present activity and projected demand.

REFERENCES

1. Department of Health and Children (2001). Primary Care A New Direction: Quality and Fairness - A Health System for You Health Strategy.

2. Tierney, E., M. O'Sullivan, L. Hickey, A. Hannigan, C. May, W. Cullen et al. (2016). 'Do primary care professionals agree about progress with implementation of primary care teams: results from a cross sectional study'. *BMC Family Practice*. 2016;17(1):163.

3. Citizens Information (2017). 'Community Care Services'. Available from: www.citizensinformation.ie/en/health/health_services/care_in_your_community/community_care_services.html.

4. Hanafin, S. and E. Dwan O'Reilly (2015). 'Multiple stakeholder views on changes in delivery of public health nursing services in Ireland'. *British Journal of Community Nursing*. 2015;20(8):389-93. Epub 2015/08/08.

5. McDonald, A., K. Frazer, C. Duignan, M. Healy, A. Irving, P. Marteinsson et al. (2015). 'Validating the 'intervention wheel' in the context of Irish

public health nursing'. *British Journal of Community Nursing.* 2015;20(3):140-5. Epub 2015/03/11.

6. Pye, V. (2015). 'Reshaping Public Health Nursing in the Republic of Ireland'. *British Journal of Community Nursing*. 2015;20(7):348-50, 52-3. Epub 2015/07/04.

7. Office of the Nursing and Midwifery Services Director (2012). *Report Prepared for the Management Team on Public Health Nursing Services in HSE* Dublin Mid-Leinster.

8. Department of Children and Youth Affair (2013)s. *Right from The Start: Report of the Expert Advisory Group on the Early Years Strategy*. Dublin, Ireland.

9. Irish Society of Chartered Physiotherapists (2017). 'What is Physiotherapy?' Available from: www.iscp.ie/why-choose-chartered/what-is-physiotherapy.

10. McElwaine, P., J. McCormack, J. Harbison, on behalf of the National Stroke Programme (2016). 'Irish Heart Foundation/HSE National Stroke Audit Rehabilitation Units 2016'. Dublin.

11. French, H.P. and R. Galvin (2016). 'Musculoskeletal services in primary care in the Republic of Ireland: an insight into the perspective of physiotherapists'. *Physiotherapy*. Epub 2016/09/22.

12. McNamara, A., C. Normand and B. Whelan (2013). *Patterns and Determinants of Health Care Utilisation in Ireland.*

13. Association of Occupational Therapists of Ireland (2017). *What is Occupational Therapy?* [15/02/2017]; Available from: www.aoti.ie/page.aspx?contentid=51.

14. Irish Association of Speech and Language Therapists (2017). 'What is a Speech and Language Therapist?' Available from: www.iaslt.ie/newFront/about_whatwedo.php.

15. Eighan, J., S. Smith, M. Wren, E. Morgenroth, S. Barron and B. Walsh (2017). 'A Profile of Public and Private Physiotherapy Supply in Ireland', Forthcoming Working Paper. Dublin, Ireland: Economic and Social Research Institute.

CHAPTER 12

Summary of findings and concluding discussion

12.1 INTRODUCTION

This is the first report to be published applying the Hippocrates projection model of Irish healthcare demand and expenditure which has been developed at the ESRI in a programme of research funded by the Department of Health. Development of the model has required a very detailed analysis of the services used in Irish health and social care in 2015. This is the most comprehensive mapping of both public and private activity in the Irish healthcare system to have been published for Ireland.

The development of this model has been an unprecedented undertaking for Ireland. The Hippocrates model has potential for a wide range of applications, extending beyond the projections of demand to 2030 presented in this report. The scope of the model includes, to the degree that the data support: all health and social care services (acute hospital, primary, community and long-term and intermediate care); and public and private services (including private hospitals and privately-purchased GP visits and home help hours). The objective of the development of the Hippocrates model is to supply a tool which will: inform health and social service planning in Ireland; inform financial planning for the healthcare system; inform planning for capacity, services and staffing; and identify future demand pressures.

Although the analyses in this report assume no change in the model of care and no policy changes, the model can be applied to examine a range of policy scenarios and potential system changes and reforms. These could encompass changing the system of financing healthcare, or the model of care to meet more care in the community, or extending eligibility for services like free general practitioner (GP) care, or developing a new system of eligibility for home care. By incorporating demand in public and private systems, the model can also examine such policy issues as the implications for the public hospital system if services were transferred from private hospitals or vice versa. Future ESRI research will analyse the capacity implications of the demand projections in this report. In the next phase of the development of the model, it will be extended to incorporate projections of healthcare expenditure and facilitate analysis of the drivers of expenditure as well as demand.

This first report has analysed baseline activity in 2015 and projected demand to 2030 for a wide range of Irish health and social care services. This chapter brings together these analyses to present a broad picture of activity in Irish healthcare and analyses of future demand and its drivers. The inclusion of activity delivered in the private sector and of estimated unmet need and demand has widened the scope of this analysis compared to previous such studies. These demand projections have been developed in a consistent framework which will facilitate an understanding of the future needs of the system in terms of expenditure, capital investment and future staff requirements. In recognition of uncertainty with regard to key assumptions concerning population growth, changes in population health and the extent of unmet need or demand, alternative projection scenarios have been developed for each service analysed in this report. These projection scenarios yield a range of demand projections for each sector analysed. The alternative projection scenarios vary the population projection applied, adopting either the Central or High population growth projections developed in this report. They additionally vary assumptions about healthy ageing, i.e. the future relationships of health and disability to extended life expectancy, based on evidence from Ireland and internationally about the evolution of health and disability and how it impacts on demand for specific health services. The most optimistic of the assumptions, Compression of Morbidity, assumes that additional years lived in good health will exceed additional years of life. The most pessimistic assumption, Expansion of Morbidity, assumes that years lived in bad health or severe disability will increase as life expectancy increases. Dynamic Equilibrium assumes that additional healthy life years will match additional life years. Moderate Healthy Ageing is more optimistic than Expansion of Morbidity but less optimistic than Dynamic Equilibrium and assumes that some of the gain in life expectancy will be spent in ill health but to a lesser extent than in the Expansion of Morbidity assumption.

Where evidence is available, these scenarios also model the effect on demand of addressing unmet need and demand. Additionally, in this chapter, sensitivity analyses are presented to demonstrate the sensitivity of our projections to changes in such key assumptions. In subsequent phases of the analysis which will develop expenditure projections, uncertainty with regard to such factors as trends in healthcare costs and technological change will be examined.

The next section summarises and discusses this report's main findings about baseline activity in 2015 and projected demand in 2030 from Chapters 5 to 11. Section 12.3 discusses the sensitivity of our preferred projections to alternative assumptions about population growth, healthy ageing and unmet need or demand. Section 12.4 decomposes and compares the drivers of demand for a range of the services examined in this report. Section 12.5 summarises and discusses our findings about unmet need and demand. Section 12.6 examines the implications of our demand projections for policy, reflects and concludes.

12.2 SUMMARY AND DISCUSSION OF FINDINGS ON PROJECTED DEMAND AND BASELINE UTILISATION

12.2.1 Summary and discussion of preferred projections

Demand is projected to increase across virtually all sectors of Irish health and social care in the years 2015-2030. Table 12.1 summarises and discusses this report's findings for projected demand in 2030 and baseline utilisation in 2015 for the major categories of activity analysed in Chapters 5 to 11.[125] As we have outlined throughout this report, these projections are based on current utilisation patterns rather than past trends and assume no policy change and no change to the model of care in any of these services.

A major driver of the projected increase in demand for health and social care is the projected increase in the Irish population. The projected rates of increase and recent rates of increase in population in Ireland are highly unusual in recent experience for Europe. Demographic change is therefore likely to have a greater impact on future service demand in Ireland than in other European countries. From 2015 to 2030 total population is projected to increase by 14 per cent in our preferred Central population growth projection and by 23 per cent in our preferred High population growth projection (See Chapter 4). This follows an increase of 31 per cent over the period 1996 to 2016. From 2015 to 2030 the population share of people aged 65 and over is projected to increase from 13 per cent to between 17 and 19 per cent. However, the number of people aged 65 and over is projected to increase by between 58 and 63 per cent. Projected increases are greatest for the oldest cohort and older men in particular, with 136 per cent and 145 per cent increases projected for numbers of men aged 85 and over in the Central and High population growth projections respectively (Chapter 4 Table 4.3). The High population growth projection differs also, however, in the projected numbers in younger age cohorts due to higher assumed net inward migration, with a projected 18 per cent increase in numbers aged 15 to 64, compared to a 10 per cent projected increase in the central projection. Numbers of children aged under 15 are projected to decrease by 3 per cent in the Central population growth projection whereas they are projected to increase by 13 per cent in the High population growth projection, also largely a function of the assumed inward migration of their parents. The effects of these alternative projections can be seen in the range of demand projected for services which are delivered proportionately more to children and to older people.

125 Within the chapters, findings are presented on a more disaggregated basis (e.g. elective and emergency inpatients in Chapter 5). A range of projected demand and percentage increases in demand is shown for each service, reflecting uncertainty about key assumptions such as the rate of population growth and the effects of healthy ageing. The evidence base for the healthy ageing assumptions, which differ by sector, was developed in Chapter 2 and presented in Chapter 3 Tables 3.2 and 3.3. The rationale for the two preferred population projections was developed and discussed in Chapter 4.

TABLE 12.1 SUMMARY OF FINDINGS FOR MAJOR CATEGORIES OF ACTIVITY, 2015 BASELINE AND 2030 PROJECTIONS, PREFERRED PROJECTION RANGE BY SECTOR

Sector	Measure of activity	Baseline findings Volume of activity in 2015/ end 2015[1] ('000)	Projected percentage increase in demand 2015-2030		Projected demand volume 2030	
			Projection range excluding unmet need/ demand %	Lower end projection range plus unmet need/demand %	Projection range excluding unmet need/demand ('000)	Lower end projection range plus unmet need/demand ('000)
Public hospitals	Inpatient discharges[2]	514	24 - 30	28	640 - 670	660
	Day-patient discharges[2]	1,010	23 - 28	29	1,250 - 1,290	1,310
	Inpatient bed days[2]	3,273	32 - 37	36	4,330 - 4,470	4,460
	ED attendances	1,138	16 - 26	-	1,320 - 1,430	-
	OPD attendances	3,299	21 - 29	30	4,000 - 4,260	4,300
Private hospitals[3]	Inpatient admissions	133	20 - 25	-	160 - 170	-
	Day-patient admissions	459	24 - 28	-	570 - 590	-
	Inpatient bed days	613	28 - 32	-	780 - 810	-
General practice	GP visits	17,551	20 - 27	22	21,060 - 22,340	21,370
	Practice nurse visits	5,944	26 - 32	-	7,470 - 7,830	-
Community pharma.	Prescription items (public)	73,059	34 - 37	-	98,000 - 100,450	-
	Total consultations[4]	5,977	19 - 25	-	7,100 - 7,480	-
Long-term care	Residents/places	29	40 - 54	44	41 - 45	42
	LTC bed days	10,582	40 - 54	44	14,852 - 16,275	15,185
Home care	Home help service	66	44 - 57	48	94 - 103	97
	HCP recipients	15	44 - 57	66	22 - 24	25
	Home help hours	14,311	38 - 54	-	19,720 - 22,000	-
Public health nursing and community therapy	Public PT referrals	189	25 - 32	32	237 - 250	249
	Public OT referrals	88	36 - 41	42	119 - 124	124
	PHN visits[5]	1,362	26 - 35	-	1,710 - 1,840	-
	Public PT visits	760	24 - 30	-	940 - 990	-
	Public OT visits	347	33 - 38	-	460 - 480	-
	SLT visits	147	-2 - 16	-	140 - 170	

Sources: See Chapters 5 to 11.

Notes: 1. Long-term care residents' places are estimated at end-2015; other measures are for total activity in 2015.
2. These estimates are exclusive of maternity activity in public hospitals which is analysed separately in Chapter 5.
3. Private hospitals' day patient admissions and inpatient bed days derive from data for private insurance-funded activity in private hospitals and do not capture the very small fraction of activity financed solely out-of-pocket. Private hospitals' inpatient admissions are for ages 15+. 4. Total consultations for ages 18+. 2010 activity rates are assumed for 2015. 5. Excludes schools vaccination programme.

The largest percentage increases in health and social service demand are projected in those areas of activity where services are delivered primarily to older people. These projections of relatively high demand arise despite the adoption of relatively optimistic healthy ageing assumptions for these services, reflecting evidence of reduced disability rates at older ages in Ireland and internationally (reviewed in Chapter 2). Demand for long-term and intermediate care places is projected to increase by between 40 to 54 per cent from 29,000 to between 40,700 and 44,600 over 15 years. The demand for home help hours is projected to increase by between 38 to 54 per cent, representing an increase from 14.3 to between 20 and 22 million home help hours. The greatest projected demand increase is for the Home Care Package service, combinations of intense care provided largely to older people in their homes, with over two-thirds of all HCP being supplied to people aged 80 and over in 2015. The demand for HCPs is projected to increase by between 44 to 66 per cent from 15,300 in 2015 to up to 25,300 in 2030. This high projected demand also reflects a relatively high level of unmet demand in 2015. Other sectors with relatively high projected demand, which reflects their important role in the treatment and care of older people, are public pharmaceuticals and public occupational therapy visits, for which demand is projected to increase by 34 to 37 per cent and 33 to 38 per cent respectively.

In the acute hospital sector, the greatest projected demand increases arise for both public hospital and private hospital inpatient bed days at 32 to 37 and 28 to 32 per cent respectively. As discussed in Chapters 5 and 6, these high projected increases in demand reflect to some degree the relatively long length of hospital stays for older people. In combination, this represents an increase in inpatient bed day demand from 3.9 million to up to 5.3 million. Public hospital inpatient and day-patient discharges are projected to increase by between 24 to 30 per cent and 23 to 29 per cent respectively, while private hospital day-case admissions are projected to increase in a similar range of from 24 to 28 per cent. These projected increases in demand arise despite our assumption that demand for hospital care will develop in accordance with evidence that proximity to death more so than age determines acute care utilisation rates so that growth in healthy ageing is assumed to mirror growth in life expectancy (see Chapters 2 and 3 for review and methodological application of this evidence).

Reflecting evidence of a growing burden of chronic disease in countries with older populations (discussed in Chapter 2), with a consequent requirement for greater resourcing of treatment in the community, we adopted our least optimistic assumptions for healthy ageing effects in the case of general practice services, where treatment for chronic diseases such as diabetes is likely to occur. GP visits are projected to increase by 20 to 27 per cent on these assumptions, and practice nurse visits by 26 to 32 per cent. Services which treat proportionately greater numbers of younger people show lower projected increases in demand.

Such services are Emergency Department attendances, Public Health Nurse visits and Speech and Language Therapy visits. Demand for these services is nonetheless projected to increase by up to 26 per cent in the case of ED attendances and up to 35 per cent in the case of PHN visits. The projection of reduced demand for SLT visits at the lower end of our preferred projection range reflects the fact that this service, as currently configured in the community, is largely delivered to children (see Chapter 11), whose numbers are projected to fall in this scenario. Were the model of SLT care to change, however, from the current hospital-centred service for older people, this projected demand would increase. Furthermore, analysis of utilisation and need for SLT services among people with disabilities (services not examined in this study) could also affect this projection. At the upper end of our preferred projection range applying the High population growth projection, in which numbers of children increase by 13 per cent, demand for this service is projected to increase by 16 per cent.

Section 12.3 examines the sensitivity of these projections to changing key assumptions.

12.2.2 Summary and discussion of baseline findings

The summary overview in Table 12.1 of the baseline findings for services delivered in Irish health and social care in 2015 affords new insights into the relative roles played by different sectors of health and social care. Thus, while public hospitals deliver the majority of services in the acute hospital sector, the role played by private hospitals is now largely quantified for the first time, notwithstanding major data challenges in this area. Our baseline findings estimate that in 2015 public hospitals delivered approximately 85 per cent of total inpatient bed days[126] and 69 per cent of day-patient services, while private hospitals delivered approximately 15 per cent of inpatient bed days and approximately 31 per cent of day-patient services.[127] The contribution to hospital activity of private hospitals and the limitations of the comparability of these data are discussed further in Chapter 6.

The relative importance of the long-term and intermediate care sector in delivering inpatient bed days is also illustrated in the baseline findings in Table 12.1. The estimated 10.6 million bed days in long-term care settings in 2015 is over twice the estimated 4.2 million inpatient bed days in public and private

126 Including 0.3 million maternity bed days.

127 Estimated private hospital inpatient bed day and day-patient activity is based on insured activity which accounted for 92 per cent of private hospital financing in 2014. This may be an understatement to some extent. However, we most likely capture more than 92 per cent of private hospital activity because even hospital stays and treatments which are partly financed by insurance and partly out-of-pocket are captured in activity estimates.

acute hospitals combined.[128] While long-term and intermediate care settings and acute hospitals play differing roles in the healthcare system, there are some overlaps in function, particularly in caring for the diseases of older age, providing palliative end-of-life care and in the delivery of convalescent and rehabilitative care. Furthermore, unmet demand for long-term care can manifest as delayed discharge from acute hospitals of patients who are deemed ready for discharge. The complementary and supplementary roles of long-term residential care and acute hospital care are further discussed in Chapter 9. With reduced length of stay in acute hospitals, the convalescent and rehabilitative role of this sector has become more important. Contrasting utilisation patterns for older men and women in long-term care and hospitals have been observed in this analysis. In long-term care settings, female utilisation rates exceed male rates at all ages over 75 whereas in acute hospitals male inpatient bed day rates were found to be higher than female bed day rates from age 60 and over, with greater divergence for the older old. Referencing international evidence, the discussion in Chapter 9 suggests that older men are more likely to be admitted to hospital when they become ill and when they are close to death, a consequence of longer female life expectancy and men's greater likelihood of living at home with partners in older age. Older women on the other hand are more likely to live alone at older ages, a predictor of nursing home admission, and to receive nursing home care when they are close to death.

The model of primary care in Ireland can be seen to be heavily dependent on GP delivery of services. Thus, the estimated 17.6 million visits to GPs in 2015 contrast with just under 6 million visits to practice nurses and over 1.3 million visits to public health nurses (not including the schools vaccination programme). With greater emphasis on the role of primary care in the Irish healthcare system and proposals for universal GP and primary care (1), it appears there may be potential to deliver additional care by altering this skill-mix. We conservatively estimate that the community pharmacy sector delivered nearly 6 million consultations in 2015. This is another sector which has the potential to contribute further to primary care provision (e.g. by administering vaccinations).

Within care of older people in particular, home help services and residential long-term care services may be substitutes for one another. Greater delivery of care in the community may delay or prevent altogether admission to more costly residential long-term care. Yet there is no statutory system of eligibility for home care and evidence of regional variation in supply. Much home help care is purchased out-of-pocket. Findings presented in Chapter 10 estimate that privately-purchased home help services accounted for 27 per cent of the estimated 14.3 million home help hours delivered in 2015.

---

[128] Including 0.3 million maternity bed days.

Data deficiencies presented the greatest challenge in the important area of provision of services by public health nurses and allied healthcare professionals in the community. Thus, the analysis in Chapter 11 has been limited to publicly-provided services. While there is no private sector equivalent to the public health nurse role and occupational therapy is largely a public role also, there are known to be significant numbers of private sector physiotherapists and speech and language therapists. Consequently, although we estimate that there were 760,000 visits to public physiotherapists in 2015, analysis of numbers of private physiotherapists referenced in Chapter 11 suggests that they may have delivered a comparable volume of care in 2015. The baseline utilisation, on which we base projections of demand, is therefore incomplete for both PTs and SLTs. Better data are essential to understand volumes and patterns of utilisation, with a view to deriving more informative projections of future demand and, indeed, analyses of the potential effects of changes in eligibility for publicly-provided care.

12.3 SENSITIVITY ANALYSIS

Table 12.2 illustrates the projected demand in 2030 arising from assuming our Central population projection and examines the percentage change in demand if key assumptions are altered, independently of other assumptions.

This sensitivity analysis shows that while population growth assumptions can significantly alter projected demand, this sensitivity is greatest in services which are delivered across young, middle and older population age cohorts, such as PHN and GP visiting, ED attendances and public hospital discharges. Applying our low or high population growth projections affects demand for these services to a greater extent than other services. Conversely, varying the population growth assumption has relatively little impact on demand for services delivered to a greater extent to older people, such as long-term and intermediate care, home care or prescription pharmaceuticals. This differing impact of the population growth assumptions arises because the major driver of the difference in population projections is the assumed level of migration, which affects numbers in younger and middle-age cohorts (see Chapter 4).

The Central population projection implicitly assumes an expansion in morbidity, meaning more years lived in ill health or disability, because it does not alter age-specific rates of healthcare utilisation despite assuming increased life expectancy. Consequently, any of the healthy ageing assumptions can be seen in Table 12.2 to have the effect across all services of reducing projected demand to some extent. As we have outlined throughout this report, the application of healthy ageing assumptions by sector to develop our preferred projections is based on detailed interrogation of the available national and international evidence. This sensitivity analysis demonstrates the potential effects on demand of uncertainty about the evidence applied to those projections.

TABLE 12.2 SENSITIVITY ANALYSES – EFFECT ON PROJECTED DEMAND FOR MAIN SERVICE CATEGORIES OF VARYING KEY ASSUMPTIONS

Sector		Public Acute Hospitals[1]				Private Acute Hospitals		GP Services	Pharmaceuticals		Long-Term Care	Home Help			Public health nursing and community therapy[2]		
Activity		Day-patient discharges	Inpatient discharges	Inpatient bed days	ED attendances	Day-patient admissions	Inpatient bed days	GP and PN visits	Presc. Items	Consults.	Resident	Home care packages	Any home help services	Any home help hours	PHN visits	PT visits	OT visits
		Projected 2030 demand volumes based on Central population projection only (Unit '000)															
Comparator		1,339	679	4,824	1,362	619	882	29,204	105,514	7,348	52	28	120	26,558	1,800	993	505
Assumption		Percentage effect on 2030 demand volumes of changing one assumption (Unit %)															
Pop.	Low	-1	-3	-2	-4	-1	-1	-2	-1	-1	-2	-2	-2	-2	-5	-2	-2
	High	4	6	4	8	3	3	6	3	6	3	3	3	3	8	5	4
Healthy Ageing	MHA	-3	-3	-5	-1	-4	-6	-2	-4	-2	-7	-7	-7	-9	-2	-2	-3
	DE	-7	-6	-10	-3	-8	-11	-5	-7	-3	-14	-15	-14	-17	-5	-3	-6
	CM	-10	-10	-15	-4	-12	-17	-7	-11	-5	-22	-22	-21	-26	-7	-5	-9
Unmet Need/ Demand	Low	1	1	1				1			2	15	3				
	Med	4	3	2													
	High	5	3	3													

Sources: Authors' calculations based on application of the Hippocrates model to develop alternative demand projections, sources as in Chapters 4 to 11.

Notes: 1. These estimates are exclusive of maternity activity in public hospitals which is analysed separately in Chapter 5.

2. Findings for unmet demand for referrals to community therapy services are presented in Chapter 11.

The greatest reduction in projected demand compared to the pessimistic Central projection occurs with the assumption of Compression of Morbidity (CM), while projected demand reduces by least in the case of the Moderate Healthy Ageing assumption (MHA), with Dynamic Equilibrium (DE) falling between these two. Table 12.2 demonstrates that in general variations in future demand trajectories are most sensitive to the assumptions we adopt regarding healthy ageing. This is particularly true for sectors which deliver most care or a high proportion of care to older people, such as LTC and home care and therefore future demand projections for these services are perhaps subject to the most uncertainty. Reflecting uncertainty in evidence about the evolution of disability rates, the preferred projection range for long-term care includes the CM assumption, which can be seen to reduce projected demand by 22 per cent, and also the DE assumption which reduces demand by 14 per cent. This sensitivity analysis demonstrates that, if disability-free life years increase by more than increased life expectancy, there will be greater increases in demand than projected in Table 12.1. The same assumptions have been applied in projecting demand for home care, and PT and OT visits, so that the same caveat applies to our preferred projections for those services.

In the case of GP services for which we adopt relatively pessimistic assumptions due to the anticipated increased demand for treatment arising from chronic disease, no healthy ageing effect is assumed in our upper preferred demand projection and Moderate Healthy Ageing in our lower preferred demand projection. It can be seen that if these assumptions are too pessimistic, demand will increase by less than our projections. However, since demand for services such as GP services is less affected by healthy ageing assumptions (relative, for example, to long-term care) future projections for GP services appear less sensitive to the assumptions adopted.

In preferred projections for acute hospital care, Dynamic Equilibrium is assumed, reflecting evidence on proximity to death as a greater driver of hospital care demand than age. If this assumption is too pessimistic, demand will be below our projections; if too optimistic, demand will exceed our projections. In the case of projected inpatient bed days in public acute hospitals, for instance, the preferred projections for additional demand of between 1.1 and 1.2 million bed days (Table 12.1) compare to potential additional demand of 0.8 million bed days if CM applies and 1.6 million bed days if Expansion of Morbidity applies. Neither alternative assumption, however, is supported by the evidence for the hospital sector reviewed in this report.

For those services where data are available to include the effect of addressing unmet need or demand in our projections, it can be seen that unmet need or demand generally has a lesser effect on demand projections than altering healthy ageing assumptions. Inpatient discharges, for instance, could increase by up to 3 per cent depending on the unmet demand threshold applied, whereas the DE healthy ageing assumption adopted in this case reduces demand by 6 per cent. The largest effect of unmet demand on a service arises for Home Care Packages where it contributes 15 per cent to projected demand. The unmet need and demand findings are discussed further in Section 12.5 and in Appendix 4.

12.4 DISCUSSION OF FINDINGS ON DRIVERS OF DEMAND

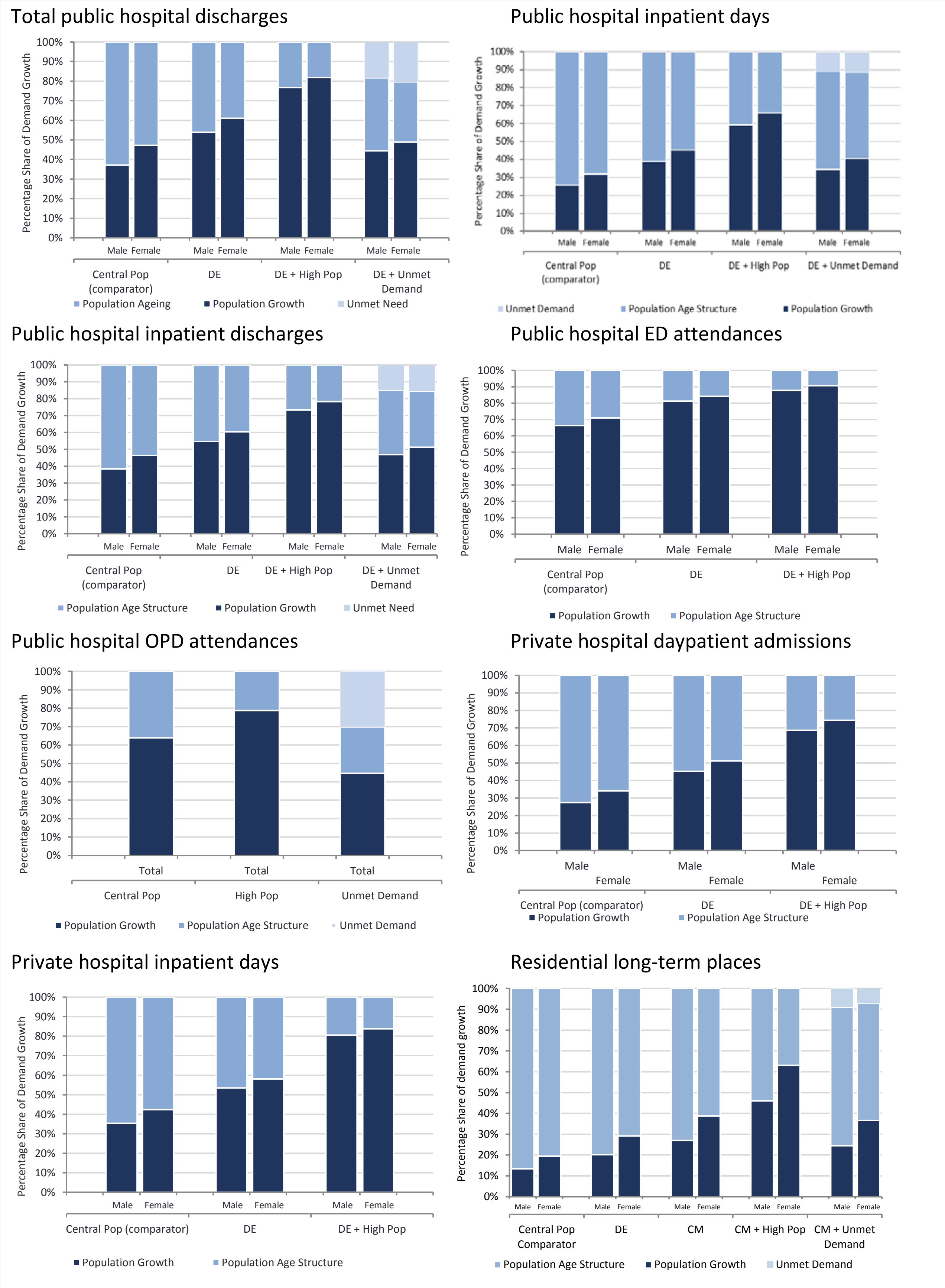
This section compares the decomposition analyses for selected measures of activity from Chapters 5 to 11. Figures 12.1 and 12.2 compare across sectors the drivers of projected increased demand in our comparator Central population projection, with no assumed healthy ageing effect, and in our preferred projections. The figures show the shares of projected increased demand, which are attributed respectively to growth in population, changes in the age structure of the population and unmet need or demand.

Comparison of demand decompositions for the hospital and residential LTC sectors in Figure 12.1 shows that changes in population age structure contribute the highest proportion of projected additional demand in the cases of long-term care and inpatient bed days. These are services in which older people are the major service users and projected increases in future demand are largest. For such services the increased demand for care for older people may also affect the type and intensity of care demanded. More optimistic healthy ageing assumptions and higher population growth assumptions can be seen to reduce the share of projected demand attributable to changes in the population age structure and increase the share attributable to population growth.

Population growth, on the other hand, contributes a higher proportion of projected additional demand for services like ED and OPD attendances. With High population growth scenarios, population growth dominates as the driver of projected demand. Unmet demand is also a contributor to projected demand growth when it is included in the projections, with the largest share occurring in the case of OPD attendances, reflecting the relative size of outpatient waiting lists.

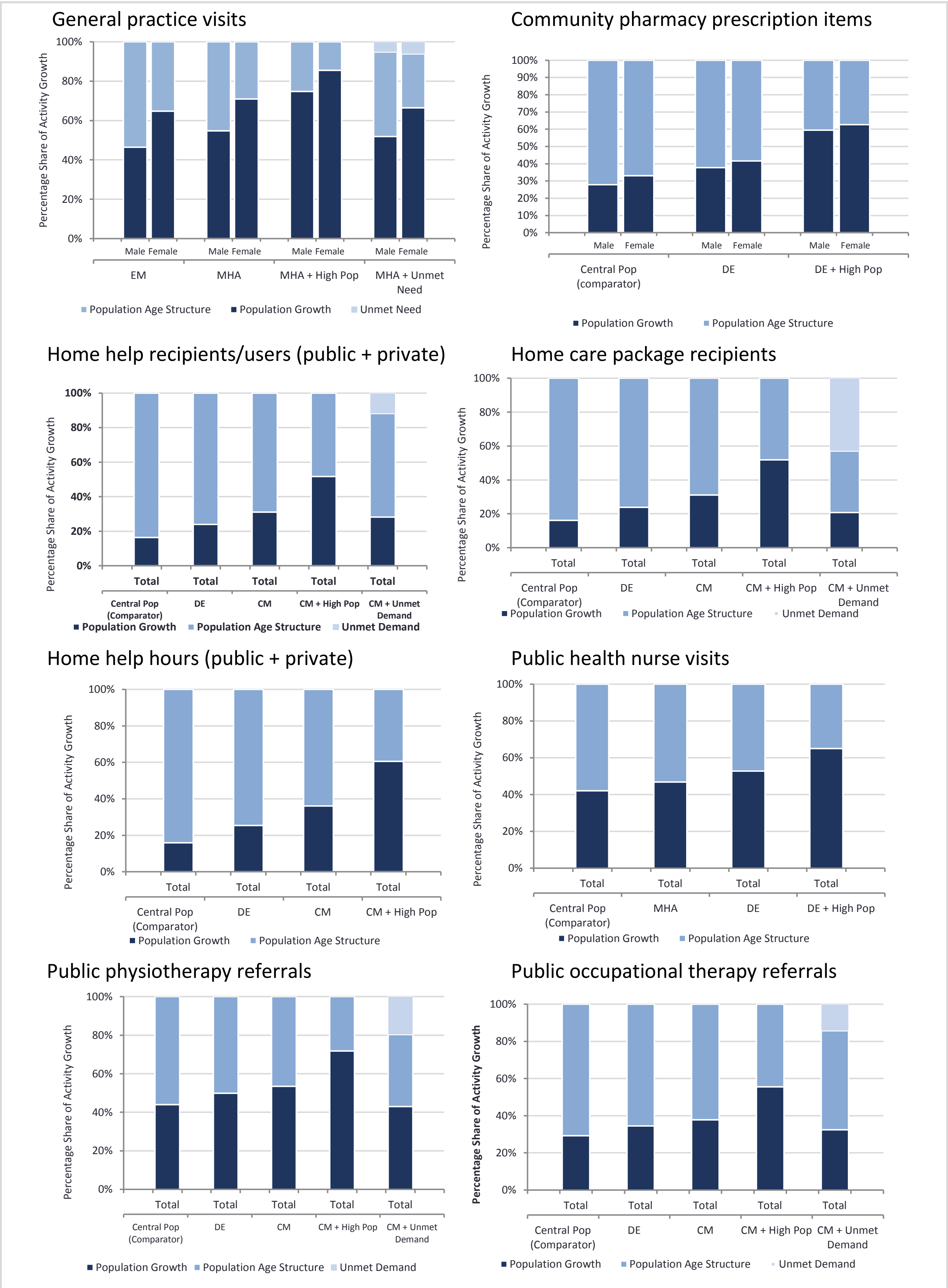
In Figure 12.2, which compares demand decompositions for primary and community care services, the population age structure again dominates as a driver for all forms of home care, for OT referrals and for community pharmacy prescription items. Population growth is a more important driver in the case of general practice, public health nurse and physiotherapy visits. Healthy ageing assumptions and higher population projections increase the role played by population growth. The effect on projected demand of adding unmet demand can be seen to be greatest for home care packages.

FIGURE 12.1 PROJECTED DEMAND GROWTH DECOMPOSITIONS, HOSPITAL AND LONG-TERM CARE SERVICES COMPARED



Source: *Authors' calculations.*

FIGURE 12.2 PROJECTED DEMAND GROWTH DECOMPOSITIONS, PRIMARY AND COMMUNITY CARE SERVICES COMPARED



Source: Authors' calculations.

12.5 SUMMARY AND DISCUSSION OF UNMET NEED AND DEMAND ANALYSES

An important contribution of this report is the analysis of unmet need and demand, which is rarely considered in a projection model context despite its policy relevance. As we discuss in reviewing the literature in Chapter 2 and in outlining our methods in Chapter 3, need and demand differ. In this report, we have included estimates of unmet need and demand to the degree that data availability would allow. While unmet need is analysed using self-reported survey data, unmet demand is analysed using administrative waiting list data. Data availability has determined whether a single measure of unmet demand or a range of measures could be applied. Accessing and interpreting such data is challenging so that the estimates in this report are not presented as definitive counts of unmet need or demand in Ireland. We acknowledge that there are limitations in the existing research on unmet need and in the data sources available to this analysis.

As explored in Chapter 2, a potential limitation of the use of survey data to identify self-reported unmet need is that some types of unmet need remain undetected. For instance, recent Irish research using TILDA data and discussed in Chapter 2 found examples of undiagnosed medical issues among the older population of Ireland. Furthermore, while survey data may elicit an unmet need, quantifying the resources required to meet this need is not straightforward. Thus, in analysing unmet need for GP care in Chapter 7, while there was survey evidence of self-reported unmet need, there was no information on how many GP visits were required, so that our measure of unmet need is likely to be an underestimate.

In our analysis of unmet demand for acute healthcare services using administrative waiting list data, we find in Chapter 5 that meeting the proposed waiting time targets recommended by the Oireachtas Committee on the Future of Healthcare would have a considerable effect on future activity levels, particularly for outpatient services. However, since waiting list data capture unmet demand for care only, it is acknowledged that our findings may represent an underestimation of actual unmet need for outpatient and elective hospital care if a need for services exists outside those captured on waiting lists. Furthermore, the data are inadequate to capture the full wait for care from GP referral to treatment which would better reflect the actual extent of unmet demand in the system.

To facilitate comparison across sectors, Table 12.3 compares estimated unmet need or demand as a percentage of baseline 2015 activity. The evidence analysed in this report shows a range of unmet demand and need in 2015. For public hospital activity, thresholds based on national and international waiting time targets show unmet demand as a proportion of baseline activity to be as high as 5 per cent in the case of day patients and 8 per cent in the case of outpatient attendances. As noted earlier, within home care, there is a particularly high level of unmet demand for HCP at 15 per cent. Even apparently low proportions of unmet demand can have significant implications for future service requirements.

TABLE 12.3 SUMMARY OF UNMET NEED AND DEMAND ANALYSIS

Sector	Activity	Nature of measure	Unmet need/demand estimate as percentage baseline activity %
Public hospitals	Elective inpatient discharges	Demand, waiting list	1 -3
	Day-patient discharges	Demand, waiting list	2 - 5
	Outpatient attendances	Demand, waiting list	1 - 8
General practice	GP visits	Need, survey	2
Long-Term Care	Residential LTC places	Demand, waiting lists	2
Home Care	Home care packages	Demand, waiting list	15
	Home help	Demand, waiting list	3
Public health nursing and community therapy	Physiotherapy referrals	Demand, waiting list	5
	Occupational therapy referrals	Demand, waiting list	5
	PHN visit	Need, survey, aged 65 and over	0.3

Source: As developed in Chapters 5 to 11, Data and Methods in Chapter 3 and Appendix 2.

12.6 POLICY IMPLICATIONS, REFLECTIONS AND CONCLUSIONS

The main finding of this report is that due to projected continued rapid population growth, demand for health and social care is projected to increase across all sectors in the years to 2030. Furthermore, the even greater increases in older age cohorts reflecting extended life expectancy will substantially increase demand for those forms of care which are particularly required by older people and may also alter the type and complexity of care required. These projected increases in population and demand come after two decades of rapid population growth, a decade of cutbacks in public provision of care and a consequent build-up of unmet need and demand for care. The additional demand projected in this report for the years to 2030 will give rise to demand for additional expenditure, capital investment and expanded staffing and will have major implications for capacity planning, workforce planning and training. Additional investment will be required in most forms of care to meet the needs of a rapidly growing and ageing population. The projected population growth will, however, also increase numbers at work and contribute to national income and the revenue base. In further development of the Hippocrates model, the capacity and expenditure implications of projected demand and the drivers of expenditure will be analysed and modelled.

This report projects that demand for public hospital services could increase by up to 37 per cent in the case of inpatient bed days and up to 30 per cent in the case of inpatient discharges. Private hospitals too are projected on present patterns of utilisation to face up to a 32 per cent increase in demand for inpatient bed days and up to a 25 per cent increase in demand for inpatient admissions. Even greater percentage increases in demand are projected for long-term and intermediate care places at 40 to 54 per cent. Similar magnitudes of demand increase are projected for home care, increasing projected hours by up to 54 per cent. Home care packages are projected to show the greatest increase in demand of 66 per cent reflecting a high level of unmet demand. Demand for GP visits is projected to increase by up to 27 per cent.

These estimates assume no change to models of care yet such changes could alter how demand manifests. This report does not forecast what will happen; it provides projections of demand based on clear assumptions about the drivers of population growth in Ireland, trends in healthy ageing and evidence on unmet need and demand. Policy developments could lessen demand in some sectors but increase it in others, adding shifts in the balance of care to the existing projected demand. It could be the case that requirements for additional acute bed capacity to meet projected increases in demand for bed days, for instance, might be reduced by a new policy emphasis on and investment in care in other settings. Greater use of day procedures might reduce the projected demand for additional inpatient beds but, equally, this might have the effect of increasing requirements for convalescent care in other settings particularly for older people.

Even with changes to models of care, given the projected rapid, continued population growth and the steep projected increases in numbers of people at older ages, demand can be expected to increase across all sectors. Conversely, if services do not increase to meet demand in some sectors, even greater demand pressures will manifest in other sectors. If GP services do not increase to meet projected demand, for instance, this could add to projected demand pressures on acute hospital services. Similarly, if home care does not increase to meet demand, demand pressures on residential long-term care are likely to exceed these projections.

Additional analysis currently being undertaken at the ESRI is examining substitutability of acute and non-acute care and will inform further research on the capacity implications of these projections. Consideration of the capacity requirements to meet the demand projected in this report therefore requires deeper review of the models of care which underlie baseline activity, the skill-mix in the delivery of care and the feasibility of making changes in the manner in which care is delivered over the relatively short time horizon to 2030.

This report has placed particular emphasis on pursuing evidence on which to base assumptions about the extent to which more years lived in good health will accompany increases in life expectancy. Healthy ageing effects can be subtle, the evidence reveals, and differ across sectors. For instance, additional care is necessary to treat chronic disease in primary care settings to achieve the continued reductions in disability and dependency which are assumed in our relatively optimistic projections of demand for long-term care. While this report has examined the effects of uncertainty, the projections for many services apply optimistic assumptions about healthy ageing trends. Current trends of declining disability in older people may not, however, be sustained in younger age cohorts. If increased obesity and other risk factors reverse declines in disability at older ages, there could be increases in demand for some forms of care, which exceed the preferred projections in this report. On balance, however, this report takes the view that such effects are unlikely to be evident within the projection horizon to 2030.

Need and demand for health and social care can reflect developments in society such as the effects of rising female labour force participation and smaller family size on the availability of informal carers; or developments in the economy such as the effect of rising incomes on uptake of private health insurance or private purchase of care. Such effects are not modelled in this report but will be examined in future development of the model. While changes in models of care may reduce the impact of population growth on demand in some sectors, the likelihood is that they will shift demand elsewhere. The linkage of the Hippocrates model to a wide range of data sources will facilitate future modelling of such effects. In ongoing development of the model, data sources will continue to be extended and improved, to include analysis of demand for mental health and disability services, for instance, which were not within the scope of this first report.

In addition to projections of demand, this report has developed a detailed and unparalleled analysis of activity in Irish health and social care. The complex, mixed Irish system of public and private financing and public and private delivery has been shown to extend across sectors: hospitals, long-term and intermediate care, home care and primary care. Understanding how a health service is both funded and provided is essential in projecting resource requirements. Examples of publicly-funded and privately-provided services such as GMS funding of GP care for medical card patients are long-standing features of the Irish healthcare system. More recently, public financing of private provision has become a more general feature of the system. Instances are NTPF purchase of care in private hospitals for public patients; and NHSS financing of residents in private nursing homes. Conversely, privately-financed and publicly-delivered care arises in public acute hospitals in the form of private health insurance financing for private patients’ care. This close relationship between the public and private sectors in Irish health and social care underlines the need to take a comprehensive, whole system approach to analysis to understand the inter-relationships of need, demand, supply, demography and population health.

While data limitations have restricted analysis of some sectors, activity in most has been analysed in this report by drawing on a wide range of data sources. The existing scope of the model, encompassing public and private sectors and measures of unmet need and demand, will further facilitate analysis of proposals for changes in the systems of eligibility, access and delivery, such as those of the Oireachtas Committee on the Future of Healthcare, published in May 2017 (1). The model contains many additional measures of activity that have not been applied to the analysis in this report, such as activity by form of financing or eligibility category, which would facilitate such analysis. As additional data become available, for private community care utilisation for instance, the scope of the model will broaden. The introduction of an Individual Health Identifier (IHI) would facilitate analysis of patients' care across time and sectors providing invaluable evidence to inform the development of integrated care.

This report's findings underline the need for public policy on health service planning and resourcing to be informed by up-to-date population projections and detailed analysis of current utilisation of care. As the discussions of data limitations in this report have shown, improvement is needed in both administrative and survey data sources for Irish health and social care. It is hoped that the analysis in this report will be helpful to policymakers in planning for health and social care services to meet population needs and in identifying areas for improved data collection to inform planning.

REFERENCES

1 Houses of the Oireachtas Committee on the Future of Healthcare (2017). *Sláintecare Report*. Dublin: Houses of the Oireachtas.

APPENDIX 1

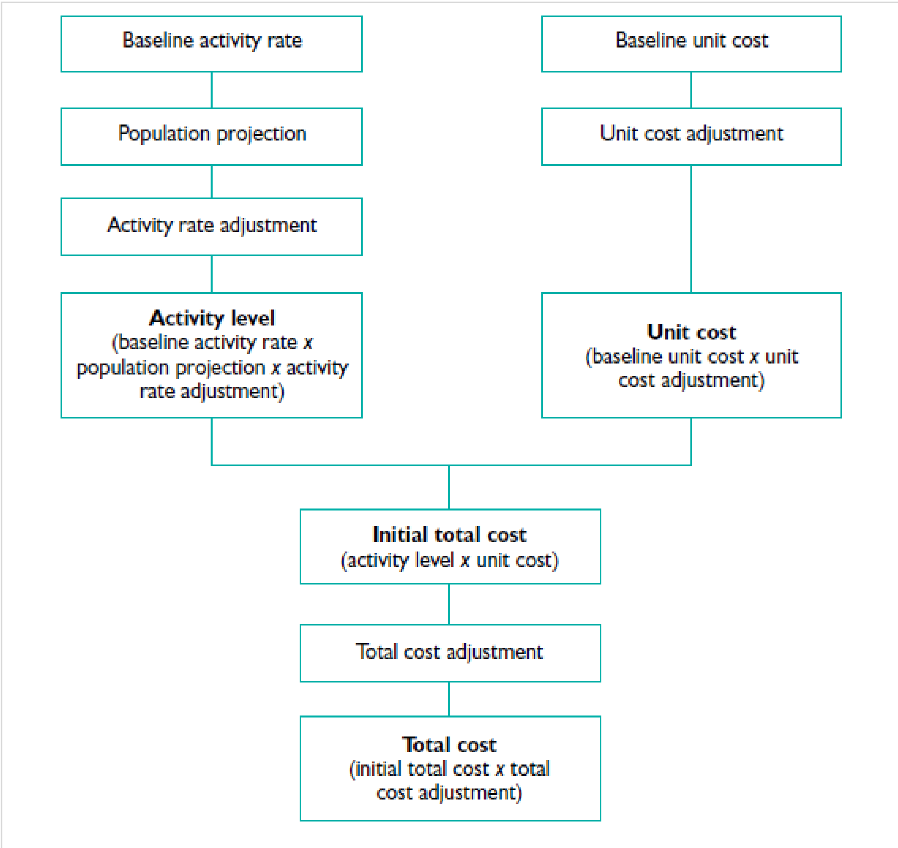
Macro-simulation models

This appendix reviews some examples internationally and in Ireland of the application to health and social care projections of macro-simulation modelling methods.

UK – WANLESS, 2002

Wanless (1) used a cell-based projection model to examine long-term trends affecting health services in the UK as far as 2022-2023. The vast majority of data were disaggregated by five-year age groups (births, 0-4,…, 95+) and sex. Some further disaggregation, where possible, took place at the disease and decedent/survivor status level. Multiplying activity data by information on the cost of providing a unit of activity gave details of expenditures. Baseline estimates were then projected forward over a 20-year period. Various scenarios were modelled by making adjustments to the activity, unit cost or total cost, respectively. Activity adjustments related mainly to factors that impacted on the demand for care (e.g. alternative assumptions about life expectancy, changes in the rate of ill health as population ages). Unit cost adjustments, principally related to quality of care (e.g. changes in future quality/productivity). Total cost adjustments accounted mainly for factors that could not be apportioned to activity or unit costs (e.g. the impact of technological change). Total health spending was projected to increase from 7.7 per cent (2002-2003) to between 10.6 and 12.5 per cent of GDP (2022-2023, depending on the modelling scenario).

FIGURE A1.1 PROJECTION METHODOLOGY



Source: Wanless (1).

NEW ZEALAND – MINISTRY OF HEALTH, 2004

The Ministry of Health in New Zealand (2) used a projection model to examine trends in New Zealand health expenditure between 2002 and 2051.The cell-based macro-simulation approach disaggregated the New Zealand population (between 1951 and 2051) by age, sex and health status. Health status was defined in terms of mortality and morbidity. Costs for each age and health state captured non-demographic factors such as technology, government policy, expectations and input price inflation. A range of alternative scenarios were examined through changing assumptions around the future impact of these drivers. Under the central model assumptions, government health expenditure was projected to increase from 6.2 per cent (2002) to 9.2 per cent of GDP (2051), driven mainly by non-demographic factors.

AUSTRALIA – GOSS, 2008

Goss (3) provided projection of expenditures by disease for Australia between 2003 and 2033. The projection model worked by combining changes in expected demographic (population ageing and growth) and non-demographic factors (disease rate change, volume of services per treated case, treatment proportion change, excess health price inflation) to project forward health and residential aged care expenditure by disease. For each of the diseases modelled there were 16 areas of expenditure and 20 age-sex profile cells, five time period cells and four non-demographic factors, giving a total of 6,400 separate parameters. Under central model assumptions, total expenditure was projected to increase from 9.3 per cent in 2002/2003 to 12.4 per cent of GDP in 2032/33. Increases in volume of services accounted for half the increase, followed by population ageing (23 per cent) and population increase (21 per cent).

US – HARRIS ET AL., 2008

In the United States, the US Department of Veterans' Affairs relied on the Enrollee Health Care Projection Model to forecast future resource requirements (4). Total expenditures per year were calculated by combining enrolment level, utilisation rates and unit cost data. Each of these sub-components was disaggregated by 58 medical services. Further disaggregation then occurred by age category, whether enrolment took place prior to or after eligibility reforms, by priority level and by geography. The enrolment component was projected forward using historic enrolment rates. The utilisation component was adjusted for factors such as national trends in healthcare utilisation and specific trends in management efficiency. Finally, unit costs were projected forward based on inflation and intensity trends.

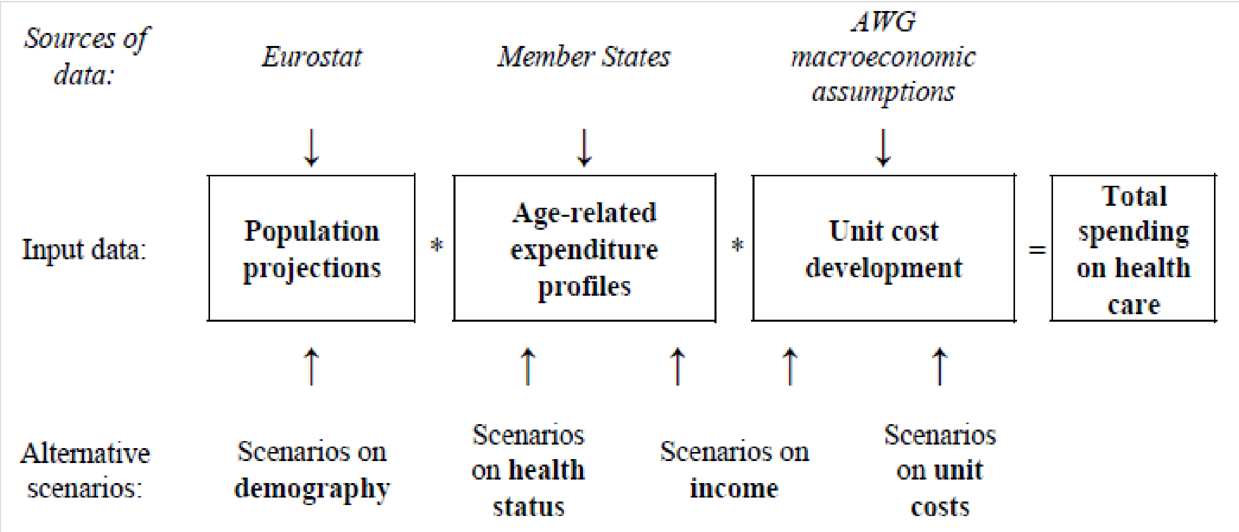
NETHERLANDS – BESSELING AND SHESTALOVA, 2011

The authors presented a model for forecasting health expenditures in the Netherlands between 2011 and 2015 (5). The model distinguished between six major sub-sectors (Hospitals and specialist practices; GP, dentists, paramedics; Psychiatric care; Medicines and appliances; Nursing; and Healthcare for handicapped) and decomposed health expenditure growth into four drivers: demography, epidemiology, budgetary, and a residual term. Estimates were disaggregated into 20 age groups of five years. Overall, findings indicated an increase in net real public health expenditure of 3 per cent over the projection period.

EU – EUROPEAN COMMISSION AGEING REPORTS

The European Commission has, in recent times, published a number of reports on long-term projections of the budgetary impact of population ageing. The three most recent published reports (2009, 2012, 2015) examined expenditure projections up to 2060 (6-8). Data were collected on EU member countries and Norway, each building and updating on previous reports. Each report assessed projections for a number of areas such as pensions, healthcare, long-term care and unemployment benefit. The methodology for health expenditure projection is set out in Figure A1.2. A number of alternative scenarios were considered to reflect alternative assumptions around demography, health status, income elasticity and unit costs. The most recent iteration of the report (2015), suggested that demographic factors alone could add 1.1 percentage points of GDP to healthcare expenditures between 2013 and 2060 (increasing from 6.9 to 8 per cent of GDP). For Ireland, specifically, it is estimated that over this period overall public health expenditure increase will be slightly higher, at 1.3 percentage points of GDP (6.0 to 7.3 per cent of GDP between 2013 and 2060). The significant ageing of Ireland's population relative to other EU countries over the coming years has been put forward as an explanation.

FIGURE A1.2 PROJECTION METHODOLOGY EUROPEAN COMMISSION AGEING REPORTS



Source: European Commission (8).

MACRO-SIMULATION FOR PROJECTIONS OF LONG-TERM CARE

The model developed by the Personal Social Services Research Unit (PSSRU) to project demand for and expenditure on long-term care for older people in England has evolved through a number of iterations (9-12). The PSSRU undertakes social and healthcare research supported mainly by the Department of Health in England and has branches at the Universities of Kent and Manchester and the London School of Economics. The PSSRU model is a cell-based macro-simulation which takes the form of an Excel spreadsheet and has five main parts. The first part estimates numbers of older people with different levels of disability by age, gender, household type/informal care and housing tenure; and creates up to 1,000 population sub-groups or cells. The second part attaches a probability of receiving health and social care services and disability benefits to each cell. The third part estimates total health and social services expenditure, which in the fourth part is allocated to the various sources of funding. A fifth part projects the numbers of social care staff required to deliver the projected services (9). The base case assumes unchanged age-specific dependency and unchanged relationships between receipt of care and age, dependency and household type.

Alternative scenarios are modelled according to alternative sensitivity assumptions.

Comas-Herrera et al. (13) investigated the sensitivity of projections of future long-term care expenditure in Germany, Spain, Italy and the United Kingdom to changes in assumptions about demography, dependency, informal care, formal care and unit costs. This European Commission-funded study adjusted pre-existing LTC forecasting models for the UK, Germany and Spain and developed a model for Italy (with three regional variants) to enable comparable projections and sensitivity analyses.

IRISH APPLICATIONS OF MACRO-SIMULATION MODELLING

Barret and Bergin, 2006

Barrett and Bergin (14) as part of an analysis looking to quantify the impact of population ageing on public financing between 2005 to 2050 projected that spending on health, as a percentage of GNP, would increase from 7.7 per cent to 11.0 per cent over the period.

Barret et al., 2007

Under a shorter projection horizon, Barret et al. (15) projected that population ageing would increase health spending, as a percentage of GNP, modestly from 6.3 per cent in 2006 to 6.5 per cent in 2022. When the effect of technological change was incorporated, projected health spending rose to 8.8 per cent of GNP in 2022.

Layte et al., 2009

Layte et al. (16) projected healthcare utilisation in Ireland forward to 2021 across five areas of healthcare: primary care, hospital outpatient services, inpatient discharges and day patients/procedures, pharmaceuticals, and long-term care. Projections were carried out by estimates of demographic change disaggregated by age and sex with current patterns of utilisation by services area and a growth trend. Utilisation projections were also inflated to model the effects of trends in morbidity and healthcare demand (a result of income and technological changes).

Wren et al., 2012

Wren et al. (17) projected long-term care utilisation from 2006-2021 for the Republic of Ireland and Northern Ireland, including residential long-term care, home care and informal care in these projections. Using macro-simulation modelling, these projections were based on projected population growth and applied evidence of trends in disability rates to project future population with disability and need for long-term care, whether formal or informal. Evidence from the 2006 National Disability Survey was applied to analyse baseline utilisation of care including by category of informal care-giver.

HSE, 2015, 2017

In 2015, the Health Service Executive (HSE) published a report which, incorporating a macro-simulation approach, used population projections and current utilisation levels to project forward activity for a range of publicly-funded healthcare services between 2014 and 2021 (18). For instance, over the projection period, and based solely on population projections, it was estimated that inpatient public hospital discharges would increase from 481,130 to 531,280 while day-case discharges would increase from 892,974 to 992,760. In 2017 these projections were updated using 2015 as the base year with estimates suggesting that volumes of inpatient and day-patient discharges would increase to 595,264 and 1,093,606, by 2022, respectively (19).

Society of Actuaries, 2016

In 2016, the Society of Actuaries used macro-simulation methods to examine inflationary pressures on the Irish health insurance market and concluded that demographic changes would contribute approximately 1.3 per cent per year to health insurance premium increases to 2046 (20).

REFERENCES

1. Wanless D. (2002). *Securing our Future Health: Taking a Long-Term View.* London: HM Treasury Office of Budget Responsibility.

2. Ministry of Health (2004). *Ageing and Health Expenditures: New Zealand 2002-2051*. Wellington: Ministry of Health.

3. Goss J. (2008). *Projection of Australian health care expenditure by disease, 2003 to 2033*. Canberra: Australian Institute of Health and Welfare.

4. Harris, K.M., J.P. Galasso, C. Eibner (2008). Review and Evaluation of the VA Enrollee Health Care Projection Model. California: RAND Corporation.

5. Besseling, P., V. Shestalova (2011). *Forecasting public health expenditure in the Netherlands.* The Netherlands Bureau of Economic Policy Analysis.

6. European Commission (2012). *The 2012 Ageing Report: Economic and budgetary projections for the 27 EU Member States (2010-2060)*. Brussels European Commission.

7. European Commission (2009). *The 2009 Ageing Report: Economic and budgetary projections for the EU-27 Member States (2008-2060).* Brussels European Commission.

8. European Commission (2015). *The 2015 Ageing Report: Economic and budgetary projections for the 28 EU Member States (2013-2060).* Brussels: European Commission.

9. Wittenberg, R., L. Pickard, A. Comas-Herrera, B. Davies, R. Darton (1998). *Demand for long-term care: projections of long-term care finance for elderly people.* PSSRU:University of Kent, 1998.

10. Wittenberg, R., A. Comas-Herrera, D. King, J. Malley, L. Pickard, R. Darton (2006). 'Future demand for long-term care, 2002 to 2041: projections of demand for long-term care for older people in England'. PSSRU Discussion Paper, 2330. London.

11. Wittenberg, R., L. Pickard, J.DK. Malley, A. Comas-Herrera, R. Darton (2008). 'Future Demand for Social Care, 2005 to 2041: Projections of Demand for Social Care for Older People in England' PSSRU Discussion Paper 2514. PSSRU2008.

12. Malley, J., A. Comas-Herrera, R. Hancock, A. Juarez-Garcia, D. King, L. Pickard (2006). *Expenditure on social care for older people to 2026: projected financial implications of the Wanless Report.* PSSRU Discussion Paper, 2332: LSE Health and Social Care, London School of Economics.

13. Comas-Herrera, A., J. Costa-Font, C. Gori, Ad. Maio, C. Patxot, L. Pickard et al. (2003). 'European Study of Long-Term Care Expenditure: Investigating the sensitivity of projections of future long-term care expenditure in Germany, Spain, Italy and the United Kingdom to changes in assumptions about demography, dependency, informal care, formal care and unit costs'. PSSRU Discussion Paper 1840: PSSRU, LSE Health and Social Care, London School of Economics.

14. Barrett, A., A. Bergin (2006). *Assessing Age-related Pressures on the Public Finances 2005 to 2050.* Dublin: Economic and Social Research Institute (ESRI). Budget Perspectives2006/1.

15. Barrett, A., A. Bergin, Y. McCarthy (2007). 'A Fiscal Window of Opportunity? Projecting Public Spending Out to 2022'. In: Callanan M, editor. *Ireland 2022: Towards One Hundred Years of Self Government* Dublin: Institute of Public Administration.

16. Layte, R., M. Barry, K. Bennett, A. Brick, E. Morgenroth, C. Normand, et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland.* Dublin.

17. Wren, M., C. Normand, D. O'Reilly, S.M. Cruise, S. Connolly and C. Murphy (2012). *Towards the Development of a Predictive Model of Long-Term Care Demand For Northern Ireland and the Republic of Ireland*. Dublin: Centre for Health Policy and Management,Trinity College Dublin.

18. Health Service Executive (2015). *Planning for Health: Trends and Priorities to inform Health Service Planning 2016.* Dublin: Health Service Executive.

19. Health Service Executive (2017). *Planning for Health: Trends and Priorities to inform Health Service Planning 2017.* Dublin: HSE.

20. Society of Actuaries of Ireland (2016). *Research paper on inflationary pressures in the Irish Private Health Insurance market*. Dublin, Ireland.

APPENDIX 2

Detailed data sources

ALLIED HEALTHCARE PROFESSIONALS AND PUBLIC HEALTH NURSING DATA

Data on publicly-financed public health nursing and allied healthcare professional referrals and visits were sourced from the Planning and Business Information Unit (BIU) at the Health Service Executive (HSE). These data are included in Chapter 11. These are anonymised data include the number of attended referrals, in each month, for public health nurses (PHNs), physiotherapists (PTs), occupational therapists (OTs), and speech and language therapists (SLTs), in 2015. There is no disaggregation by single year of age (SYOA) or by sex. The total number of attended referrals was disaggregated to the level of four age cohorts for PHN, OT and SLT, and three age cohorts for PTs.[129] These data include the total number of PHN visits, disaggregated by the four age cohorts and the total number of PT visits, with no disaggregation by age cohort, in 2015. Significant data gaps for PHN visits exist in these data. No information on OT or SLT visits was available.

These data provided information on the total number of people waiting for a first time assessment for more than 12 weeks for physiotherapy, occupational therapy, and speech and language therapy in 2015.[130] The waiting data were measured differently for each therapy. The percentage of new referrals seen within 12 weeks was provided for PT and OT, with no age or sex disaggregation. This was used to estimate the number waiting for a referral in the last 12 weeks (October, November, and December) of 2015, which is used as the measure of unmet demand in the analysis. These data provided information on the numbers waiting for a SLT referral for at least 12 weeks, with no age or sex disaggregation.[131] As these data were provided as a running total,[132] to avoid double-counting, the number of individuals waiting at least 12 weeks at the end of December was used as the unmet demand measure in the analysis. No information was available for PHN waiting numbers.

CENSUS OF POPULATION 2011 AND 2016

The Census of Population 2011 Data were sourced from the Central Statistics Office (CSO). Anonymised data estimates from Census 2011 and 2016 were used

129 Age cohorts: 0-4, 5-17, 18-64, and 65+ for PHN, OT and SLT; 0-17, 18-64, and 65+ for PT.
130 This variable was differently across each therapy.
131 This is disaggregated further: Number Waiting Initial Assessment - four months and one day to eight months; eight months and one day to 12 months; 12 months and one day to 18 months; and 18 months and one day to 24 months.
132 The total number waiting is updated each month.

to estimate the number of people by SYOA and sex in each intercensal year, including 2015 for the baseline population statistics (details in Chapter 4).

DEPARTMENT OF HEALTH LONG-STAY ACTIVITY STATISTICS (LSAS)

The Department of Health (DoH) Long-Stay Activity Statistics (LSAS) were sourced from the DoH for long-term care utilisation from 2006 to 2014 (1, 2). LSAS is an annual survey of public, private, and voluntary long-stay units between 1980 and 2014 with findings generally based on the end of year point in time.[133] These anonymised data were used in Chapter 9 to estimate trends in patient characteristics and average occupancy rates in long-stay units, and to supply the age cohort and sex distribution of residents in limited-stay beds in 2014.

EMERGENCY DEPARTMENT BIU ATTENDANCE DATA

Emergency Department (ED) Attendance Data from 2015 were sourced from the BIU at the HSE on attendances at 30 public hospitals designated EDs.[134] These anonymised data were used to estimate ED demand in Chapter 5. Data are provided at hospital- rather than patient-level. These data are disaggregated by monthly new and return attendances and age cohort (0-15, 15-64, 65+) with no disaggregation by sex. An aggregated triage category is also available. It is not possible to identify where a single patient has attended multiple times.

GROWING UP IN IRELAND (GUI)

Growing Up in Ireland (GUI) is a longitudinal study of children. The study follows the progress of two groups of children, who started as nine-year-olds and nine-month-olds. The nine-year-old cohort includes over 8,500 children who were selected randomly through the National School system. Data collection for Wave 1 and Wave 2 occurred between September 2007 and June 2008, and between August 2011 and March 2012, respectively. The nine-month-old cohort includes over 10,000 children randomly selected from the Child Benefit Register. Data collection for Wave 1 and Wave 2 occurred between September 2008 and April 2009, and between January and August 2011, respectively. The surveys gather information on a range of topics including healthcare use. In Chapter 7 these data were used to estimate the number of GP visits. For the nine-month-old cohort, Wave 1, the following question was asked of the primary care-giver:

> *'Since <baby> was born, how many times have you seen or talked on the telephone with a general practitioner or family physician about <baby's> physical health (exclude at the time of birth)?'*

For the nine-year-old cohort, Wave 1, the following question was asked:

---

133 Patients in residence on 31 December.

134 Emergency presentations for four standalone maternity hospitals are not included in these figures as they are not classified as a dedicated ED.

'In the last 12 months, how many times have you seen or talked on the telephone with a general practitioner about the study Childs physical, emotional or mental health?'

Responses to these questions were used to estimate GP utilisation for children. In Chapter 11, nine-month-old cohort Wave 2 and nine-year-old cohort Wave 2 were used to validate SLT use results from other data sources.[135]

HEALTH INFORMATION AND QUALITY AUTHORITY (HIQA) LONG-TERM CARE BED REGISTER

Health Information and Quality Authority (HIQA) Long-Term Care Bed Register data were sourced from HIQA for centres registered with HIQA on 31 December 2015.[136] Information on registered centres were used to estimate long-stay utilisation at a moment in time, 31 December, 2015, in Chapter 9.

HEALTH INSURANCE AUTHORITY (HIA) RISK EQUALISATION RETURNS DATA

Health Insurance Authority (HIA) Risk Equalisation Returns Data were sourced from the HIA.[137] These anonymised data include information from all open-market insurers[138] on the number insured, and utilisation and claims expenditure disaggregated by SYOA and sex. These data disaggregate expenditure data by public and private hospitals, but do not disaggregate utilisation data by public and private hospitals. These data were used to estimate private hospital utilisation in 2015 in Chapter 6.

HEALTHY IRELAND SURVEY DATA

The Healthy Ireland Survey, Wave 1 and Wave 2, were sourced from the DoH. This survey is a cross-sectional, interviewer-administered face-to-face survey of the health and wellbeing of a representative sample of the population aged 15 and older living in Ireland. This survey was commissioned by the DoH and prepared on their behalf by Ipsos MRBI. Wave 1 of the survey consisted of 7,539 interviews and occurred between November 2014 and August 2015 (5). Wave 2

135 In Wave 2 for the nine-month-old cohort (three years old) parents were asked: *'Has <child> received any treatment for his/her speech or language problem?'* In Wave 2 for the nine-year-old cohort (13 years old) parents were asked: *'Please indicate if <child> receives support from any of the following <u>IN SCHOOL</u>'* and *'Please indicate if <child> receives support from any of the following <u>OUTSIDE SCHOOL</u>' - Speech and Language Therapist.*

136 All centres for older people are required to be registered with HIQA (3).

137 These data were originally collected by the HIA through a Statutory Instrument.

138 Vhi Healthcare, Laya healthcare, Aviva Health Insurance and Glo Health. Individuals who share common occupational or vocational arrangements may also be insured by restricted membership schemes (e.g. ESB Staff Medical Provident Fund, Prison Officers Medical Aid Society). Data related to these restricted membership schemes are not included in the HIA data. The CSO estimate that the seven restricted membership schemes in operation in Ireland account for less than 5 per cent of expenditure funded by private health insurance) (4).

consisted of 7,948 and occurred between September 2015 and May 2016 (6). The survey included questions on healthcare use. Wave 1 was used to estimate GP practice use for adults in Ireland in Chapter 7. The survey included a two-part question on GP and practice nurse use:

> *'When was the last time you consulted a GP or family doctor [practice nurse] on your own behalf? This includes home visits and phone consultations but excludes nurse-only consultations?'*

Possible responses to this question included *less than 12 months* and *more than 12 months*. Respondents who answered less than 12 months, were then asked the following question:

> *'How often in the last four weeks did you consult a GP [practice nurse] on your own behalf excluding nurse-only consultations?'*

Responses to these questions were multiplied by 13[139] and used to estimate annual GP visits, practice nurse visits and GP practice visits by 5-year age cohorts and sex. Wave 2 was used to help estimate private hospital utilisation in Chapter 6. The survey included a two-part question on inpatient hospital use:

> *'During the past 12 months, how many times have you been admitted to a hospital as an inpatient?'*

For those who recorded at least one admission the following question was asked:

> *'How many of these inpatient stays were in a private hospital?'*

Responses to these questions were used to estimate private hospital utilisation by age cohort[140] and sex.

HEALTH SERVICE EXECUTIVE DELAYED DISCHARGE DATA

HSE public hospital delayed discharge data were sourced from the BIU of the HSE. These are anonymised data of patients in acute public hospitals with a delayed discharge or who were clinically ready for discharge but whose discharge was delayed,[141] by SYOA and sex at end 2015. Data include 27 reasons why a patient has been added to the delayed discharge list with 11 reasons relating to waiting

---

139 (4 weeks*13 = 52 weeks).

140 Age cohorts: 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, and 75+.

141 A delayed discharge is formally defined as 'A patient who remains in hospital after a senior doctor (consultant or registrar grade) has documented in the medical chart that the patient can be discharged.' (7)

for long-stay care.[142] These data were used in Chapter 9 to help estimate unmet demand for residential long-term care at the end of 2015.

HEALTH SERVICE EXECUTIVE HOME HELP AND HOME CARE PACKAGE DATA

Data on home help and Home Care Packages (HCPs) were sourced from the Social Care Division at the HSE. These anonymised administrative data provide the total number of publicly-financed home help and HCPs recipients, and publicly-financed home help hours in 2015 (8). These data are not disaggregated by age or sex. Data on the number of people on publicly-financed home help and HCP waiting lists in each month in 2016 were also included. These data are not disaggregated by age or sex. In Chapter 10 these data were used to measure publicly-financed home help and HCP use in 2015, while those waiting for the respective services at end December 2016 were used as a measure of unmet demand.[143]

HOSPITAL INPATIENT ENQUIRY (HIPE) DATA

Hospital Inpatient Enquiry (HIPE) Data were sourced from the Healthcare Pricing Office (HPO) for 2006-2015. The HIPE scheme is a health information system which collects clinical and administrative data on discharges from, and deaths in, acute public hospitals in Ireland. Each HIPE record, known as a discharge, represents one episode of care (day or inpatient). As there is currently no unique individual health identifier (IHI), it is not possible to follow patients across discharges. In 2015, the HPO estimated that 99.9 per cent of day and inpatient discharges in HIPE were coded and returned (9). Data are disaggregated by many demographic variables including SYOA, sex, medical card status, and public/private status. Clinical data on each discharge are also available.[144]

In Chapter 5 HIPE data were firstly used to estimate trends in inpatient and day-case (IPDC) discharges in public hospitals between 2006 and 2015. Secondly, these data were also used to estimate elective inpatient, emergency inpatient, and day-patient discharges by SYOA and sex in public hospitals in 2015. Thirdly, these data were used to estimate bed days in public hospital in 2015. In Chapter 9, HIPE 2015 data were compared to the HIQA Long-Term Care Bed Data to avoid double-counting of facilities in that were included in Chapter 5.

---

142 Reasons include need for: convalescence, dementia-specific services, palliative care, high physical dependency nursing care needs and awaiting NHSS financial determination (and therefore not on the National Placement List – NPL).

143 No waiting list information was available from 2016. As the quality of the collection of these surveys increased through 2016, numbers waiting in December 2016 were used in lieu of numbers waiting in earlier months.

144 Discharges are coded using the International Statistical Classification of Diseases and Related Health Problems, Australian Modification, Tenth Revision (ICD-10-AM), Australian Classification of Health interventions (ACHI), Australian Coding Standards (ACS), and Irish Coding Standards (ICS).

NATIONAL TREATMENT PURCHASE FUND WAITING LIST DATA

National Treatment Purchase Fund (NTPF) Waiting List Data were sourced from the NTPF for 2015. The NTPF is an independent statutory body which arranges the provision of treatment for those waiting for care in the public system and collects and collates public hospital waiting list data (10). In Chapter 5, these anonymised data were used to estimate unmet demand for public outpatient services and IPDC elective hospital care, using the number waiting for care at the end of 2015. A detailed explanation and justification for using waiting list data as a measure of unmet demand is provided in Chapter 3 Section 3.3.

NURSING HOME SUPPORT SCHEME (NHSS) DATA

The Nursing Home Support Scheme (NHSS) Data were sourced from the Social Care Division of the HSE. These data are anonymised, and provide the number of people on the NHSS (Fair Deal) at 31 December 2015 by SYOA and sex. These data also include the number of people on the National Placement List (NPL) of the NHSS at 31 December 2015 by SYOA who have been approved for NHSS funding but who had not yet received funding. These data were used in Chapter 9 to estimate residential long-term care use and unmet demand for long-term care. In estimating unmet demand for residential long-term care in Chapter 9, from seven referral categories on the NPL, all in long-stay units are excluded, leaving four categories of waiters who are included and who were referred from acute services, community, mental health or 'other'.

NURSING HOMES IRELAND SURVEY DATA

The Nursing Homes Ireland (NHI) survey for 2014/2015 (11) examined private and voluntary nursing home use in Ireland for the year to 31 December 2014 i.e. patients in residence over that year.[145] In Chapter 9, these survey findings were used to help estimate the number of residents paying privately for their care and number of short-stay residents in private nursing homes.

PATIENT EXPERIENCE TIME (PET) DATA

Patient Experience Time (PET) Data on ED attendance from 2015 and 2016 were sourced from the BIU at the HSE. These anonymised data include attendances at 28 public hospitals' designated EDs.[146] Most hospitals were providing data at the level of the attendance patient, disaggregated by SYOA and sex, though data on SYOA and sex were missing in some hospitals. These data include information on referral type, mode of arrival, and discharge destination. Information on the patient arrival time and ED departure time allows for the calculation of the total

145 The survey had a 35 per cent response rate.
146 This is a relatively new database and in the baseline year of 2015 had not yielded full compliance from all hospitals.

time duration a patient spends in the ED. These anonymised data were used to estimate ED demand in Chapter 5.

PRIMARY CARE REIMBURSEMENT SCHEME (PCRS) DRUG REIMBURSEMENT DATA

The Primary Care Reimbursement Scheme (PCRS) Drug Reimbursement Data were sourced from the PCRS at the HSE for the years 2010 to 2014.[147] In Chapter 8, these data were used to estimate the pharmaceutical prescribing patterns (number of prescription items) within a number of drug schemes; General Medical Services (GMS) Scheme, Drugs Payment Scheme (DPS), Long-Term Illness (LTI) Scheme, and High Tech Drugs (HTD) Scheme. Data on prescribing are disaggregated by 11 age cohorts[148] and sex.

PUBLIC OUTPATIENT DEPARTMENT (OPD) ATTENDANCE DATA

Public Outpatient Department (OPD) Attendance Data were sourced from the BIU at the HSE on attendances at 50 public outpatient clinics in 2015. These anonymised data are included at specialty clinic level by hospital rather than at patient-level. These data relate specifically to consultant-led clinics.[149] These data were included in Chapter 5 to estimate outpatient care utilisation in public hospitals. These data are disaggregated by monthly attendance type (new attendances and return attendances) and by aggregated age cohort,[150] but not by sex. As there is currently no unique individual health identifier (IHI), it is not possible to follow patients across attendances. The HPO confirmed that outpatient activity is currently entirely funded through the block grant and is not currently linked to the volume of activity.[151]

QUARTERLY NATIONAL HOUSEHOLD SURVEY (QNHS)

The Quarterly National Household Survey (QNHS) was sourced from the Irish Social Science Data Archive (ISSDA) and the CSO. QHNS is a survey of households in Ireland designed to produce quarterly labour force estimates that include the official measure of employment and unemployment for the State. The survey began in 1997 and includes special modules on different social topics each quarter. In 2010, Quarter 3, a special module on health status and health service utilisation was undertaken. This survey consisted of 15,673 people aged 18 and over and occurred between June and August 2010. This module includes

---

147 Data for 2015 were not made available to the research team at the time of analysis.
148 Age cohorts: under 5, 5-11, 12-15, 16-24, 25-34, 35-44, 45-54, 55-64, 65-69, 70-74, and 75+.
149 Data on nurse-led and allied health professional-led clinics were not available.
150 Age cohorts: 0-15, 15-64, and 65+.
151 There is a pilot study ongoing to assess patient level OPD data for completeness so that a national collection mechanism can be put in place. To date only a small number of hospitals have provided data (HPO Correspondence 27/07/16).

questions on healthcare use. In Chapter 7, the following question was used to measure unmet demand for GP care:

'During the past 12 months was there any time when, in your opinion, you needed to visit a GP for a medical examination or treatment for a health problem but you did not attend?'

Responses to this question were used to estimate unmet demand for GP care across age cohorts, sex and medical card status.[152] In Chapter 8, the following question was used to measure pharmacy consultations:

'During the past 12 months, how many times have you consulted with a Pharmacist in relation to your own health?'

Responses to this question were used to estimate the rate of pharmacy consultations across age cohorts and sex. Pharmacy consultations refer to the provision of health advice by pharmacists, including but not exclusively advice given while attending for prescription or over-the-counter medicines or for health screening or vaccinations.[153]

In Chapter 2 QNHS was used to estimate the rate of ADL difficulty by sex and age for the years 2010 to 2016 to allow analysis of trends in prevalence of ADL difficulty over those years. These findings were used to inform healthy ageing scenarios in the report.

THE IRISH LONGITUDINAL STUDY ON AGEING (TILDA)

Wave 3 Data were sourced from the ISSDA and TILDA. TILDA is a large representative multidisciplinary study of individuals in Ireland aged 50 years and over, which gathers information in three principal areas: health, economics, and social circumstances. A number of questions on home care and community care were included in Wave 3. Questions in home care included:

'In the last 12 months, did [you] pay any individual or private company to provide home help or personal care?'

'In the last 12 months, did [you] receive any of the following State services?

Home help (a person employed by State to help [you] with household chores such as cleaning and cooking);

152 The number of visits needed is not measured. An unmet need is assumed to correspond to one GP visit.
153 See further detail of survey methodology at www.cso.ie/en/methods/qnhs/qnhsmethodology/healthmodule.

Personal care attendant (a person employed by the State to assist [you] with bathing, showering, bodily care etc.);

Home Care Package.'

These were used to estimate publicly-financed home help,[154] privately-purchased home help, and HCP recipients disaggregated by age cohort and sex for those aged 65 years and older. In addition questions on the number of days and hours which were received were also questioned:

'Let's think for a moment about the home help (personal care attendant help) [you] received. During the last month, on about how many days did [you/he/she] receive home help (personal care attendant help)?'

'On the days when [you] received home help (personal care attendant help), for about how many hours per day did [you] receive help?'

These questions were used to estimate the publicly-financed home help hour rate in the previous 12 months disaggregated by age cohort and sex. In Chapter 11 data from Wave 3 were used to help estimate publicly-financed public health nursing and community therapy use; questions included:

'In the last 12 months, did [you] receive any of these other State services?

Public Health or Community Nurse

Occupational therapy

Physiotherapy services

Speech and Language Therapist'

These respondents who responded in the affirmative to the above questions were additionally asked:

'In the last 12 months, how many times did [you/he/she] use the state service from the previous question?

These questions were used to estimate publicly-financed community therapy use (used as a proxy for attended referral) and the number of community therapy visits disaggregated by age cohort and sex for those aged 65 years and older. Data from Wave 3 were also used to estimate unmet need rates for PHN disaggregated by age cohort and sex using the following question:[155]

[154] Recipients of home help and personal care attendants were combined in line with previous research (12).
[155] No respondent who was a recipient of public health nursing in TILDA answered the question above in the affirmative.

'Thinking of all these services, are there any that [you] do not now receive which [you] feel [you] have a need for?
Public Health Nursing'

UNREGISTERED SHORT-STAY PUBLIC AND VOLUNTARY BEDS COUNT

Data on numbers of unregistered short-stay public and voluntary beds on 31 December 2015 were sourced from the Social Care Division of the HSE. These data were used in Chapter 9 to provide information on short-stay beds which were not registered with the HSE.

REFERENCES

1. Department of Health. *Long-Stay Activity Statistics volumes 2005-2013.* Department of Health, 2006-2014.

2. Department of Health (2017). *Long-Stay Activity Statistics 2014.* Supplied by Department of Health.

3. Health Information and Quality Authority (2016). *Annual overview report on the regulation of designated centres for older people — 2015*. Health Information and Quality Authority.

4. Central Statistics Office (2015). *Mapping of the Structure of Health Care Financing in Ireland to the Health Care Financing Schemes Classification (ICHA - HF) within the System of Health Accounts.* Cork: Central Statistics Office.

5. Department of Health (2016). *Healthy Ireland Technical Report.*

6. Department of Health (2016). *Healthy Ireland Survey 2016: Summary of Findings.* Dublin, Ireland. Department of Health.

7. Health Service Executive (2016). *Health Service Executive Delayed Discharges National Report: 26 April 2016*. Health Service Executive.

8. Health Service Executive Social Care Division (2016). *Older Persons KPI Metadata based on Division Operational Plan 2015*. Available from: www.hse.ie/eng/services/publications/KPIs/olderpeoplekpi15.pdf.

9. Healthcare Pricing Office (2016). *Activity in Acute Public Hospitals in Ireland Annual Report, 2015*. Dublin: Healthcare Service Executive.

10. National Treatment Purchase Fund (2016). *Annual Report 2015.*

11. Nursing Homes Ireland (undertaken by BDO) (2016). *Annual Private Nursing Home Survey 2014/2015*. Nursing Homes Ireland.

12. Murphy, C.M., B.J. Whelan and C. Normand (2015). 'Formal home-care utilisation by older adults in Ireland: evidence from the Irish Longitudinal Study on Ageing (TILDA)'. *Health and Social Care in the Community.* 2015;23(4):408-18. Epub 2014/12/03.

APPENDIX 3

Disability rate evidence and healthy ageing assumptions

In sectors of health and social care such as residential long-term care and home care, where disability rates are a predictor of utilisation, we assume that utilisation is primarily driven by the ADLd rate, based on evidence from TILDA and Census 2011, of ADLd rates among users of home care and nursing homes respectively. This required developing assumptions about the evolution of ADLd rates for the years 2015-2030, based on international and Irish evidence.

Previous projections of demand for long-term care and home care in Ireland have applied Irish evidence to project future disability rates, based on analysis of declining disability between Census 2002 and Census 2006 (1, 2). These studies projected disability, applying a methodology employed in mortality rate projections (3) which converges recent rates of mortality decline to a long-run rate of decline. In the absence of long-run longitudinal evidence on Irish disability rates, these studies assumed that the rate of reduction in disability rates would converge to projected base rates in an earlier study (4), which had proven less optimistic than the subsequent evolution of disability rates in Ireland (1).

Due to changes in Census disability questions, it is not possible to derive a rate of change for Irish disability rates over the period from Census 2002 to 2011. Census findings on disability in 2016 had not been published at the time of this analysis. Analysis for this study of the most recent evidence of trends in Irish disability rates, described in Chapter 2 (Section 2.7), was therefore based on the QNHS for the years 2010 and 2016 and found no statistically significant differences in male rates and divergent trends for women over time. There were statistically significant increases in ADL difficulty rates in the female population aged 15 to 54 years and statistically significant and steep decreases in ADLd rates in the 75 to 84 and the 85 and over older age cohorts. Due to caveats about the interpretation of these findings (particularly in the younger age cohorts), discussed in Chapter 2, and due to the continuing inadequacy of evidence for long-run disability rate trends in Ireland, in this study these trends have not been directly applied to projecting future disability rates.

However, the QNHS evidence of declining disability rates for older women, and the balance of the international evidence reviewed in Chapter 2, supports applying a range of assumptions about the evolution of disability-free life expectancy with dynamic equilibrium as the more pessimistic assumption, and compression of morbidity as the more optimistic assumption. Our methodology to project demand for those sectors where disability is a predictor of utilisation does not require the intermediate step of projecting a population with ADLd, since modelling these assumptions requires only that age-specific utilisation rates shift in proportion to changes in life expectancy (see further Chapter 3). However, in Table A3.1 we demonstrate the effect on the rate of change in ADLd rates over the years 2015-2030 of assuming dynamic equilibrium and compression of morbidity. The ADLd rates under dynamic equilibrium are derived by assuming that additional life years are equal to additional disability-free life years (DFLY). Two Compression of Morbidity approaches are shown, in one of which the additional DFLY exceed additional life years by 50 per cent and in the second by 100 per cent. The Table compares these projected rates of change in ADLd rates to equivalent projections in the Mercer (2002) study (4) and to the annual average rates of change found for QNHS 2010-2016 (statistically insignificant findings in brackets). The ADLd rates assumed for 2015 are derived by applying the age and sex-specific rates from Census 2011 to the relevant year of age cohort in 2015. QNHS rates for 2015 are not applied because they are limited to the community-dwelling population.

TABLE A3.1 PROJECTED ANNUAL AVERAGE RATE OF CHANGE IN ADLD RATES, HIPPOCRATES APPROACH COMPARED TO MERCER (2002) AND ACTUAL TRENDS IN QNHS 2010-2016

	Projected annual average rate of change in ADLd rates, HIPPOCRATES model			Projected annual average rate of change in ADLd rates, Mercer (2002: 71-73)			Annual average rates of change, QNHS
	Dynamic Equilibrium (∂=1)	Compression of Morbidity (∂=1.5)	Compression of Morbidity (∂=2)	Dynamic Equilibrium	Optimistic		Observed trend
Age cohort	Men 2015-2030			Men 2001-2031		Age cohort	Men 2010-2016
0-39	-0.26%	-0.31%	-0.35%			15-54	*(4.0%)*
40-64	-0.62%	-1.20%	-1.83%	-0.33%	-1.00%	55-64	*(1.2%)*
65-84	-0.90%	-1.55%	-2.25%	-0.67%	-1.00%	65-74	*(3.8%)*
85+	-0.72%	-1.04%	-1.37%		-0.67%	75-84	*(-1.6%)*
						85+	*(-1.4%)*
	Women 2015-2030			Women 2001-2031			Women 2010-2016
0-39	-0.35%	-0.42%	-0.48%			15-54	*9.0%*
40-64	-0.50%	-0.95%	-1.43%		-0.67%	55-64	*(-3.6%)*
65-84	-0.91%	-1.54%	-2.23%	-0.90%	-1.35%	65-74	*(-2.0%)*
85+	-0.30%	-0.55%	-0.82%		-0.90%	75-84	*-6.5%*
						85+	*-4.6%*

Source: Authors' calculations and Mercer (2002).

As Table A3.1 shows, the rates of reduction in ADLd rates with the assumption of CM are greater than with the assumption of DE. It can also be seen that in the two CM scenarios the higher the assumed factor by which DFLY increases relative to additional life years, the greater the projected rates of reduction in disability. However, the less optimistic of the two CM scenarios already projects higher rates of reduction in disability rates than the optimistic assumption adopted by Mercer (2002) (4). On the other hand, the statistically significant findings from the QNHS for reduced ADLd rates in the oldest age cohorts for women in the years 2010-2016 exceed those in the more optimistic of the CM scenarios. However, it would be methodologically incompatible with the approach to projecting life expectancy in this study to apply these recent trends without converging to longer-run rates of change in disability rates, which would be expected to have the effect of reducing the annual average rates of decline. Furthermore, the statistically significant findings of increased disability prevalence in the younger female age cohort, while requiring further research to assess whether this reflects changes in the sample population due to deinstitutionalisation, nonetheless cautions against adopting an overly optimistic approach in the CM scenario. It is for this reason that the less optimistic of the two CM scenarios is applied in this study.

REFERENCES

1. Layte, R., M. Barry, et al. (2009). *Projecting the Impact of Demographic Change on the Demand for and Delivery of Health Care in Ireland*. ESRI Research Series. Dublin.

2. Wren, M.-A., C. Normand, et al. (2012). *Towards the Development of a Predictive Model of Long-Term Care Demand For Northern Ireland and the Republic of Ireland.* Dublin, Centre for Health Policy and Management, Trinity College Dublin.

3. Whelan, S. (2008). 'Projecting population mortality for Ireland.' *Journal of the Statistical and Social Inquiry Society of Ireland* 37: 135-163.

4. Mercer (2002). *Study to examine the future financing of long-term care in Ireland*. Department of Social and Family Affairs. Dublin, Stationery Office.

APPENDIX 4

Trends in public hospital waiting lists

INTRODUCTION

The purpose of the analysis in this Appendix is to provide a basis for the methodology described in Chapter 3 and applied in Chapter 5 to incorporate unmet demand in our public hospital projections. These methods implicitly assume an underlying degree of structural persistence in unmet demand that will continue through the projection horizon. While trend data are not available to support such an analysis for other sectors, data availability does allow an examination of evidence for this assumption in public hospital care. This Appendix therefore examines trends in waiting list numbers in recent years for public inpatient, day-patient and outpatient care to assess the degree of persistence in unmet demand.

DATA AND METHODS

The detailed data provided by the NTPF applied to analysis of unmet demand for public hospital care in 2015 are not available for previous years. Consequently it is not possible to examine trends in waiting list numbers and times in a comparable manner to 2015. However, monthly waiting list information can be used to examine indicative trends in waiting list numbers in previous years. Data for this Appendix were obtained from two sources. Firstly, inpatient and day-case waiting list data from January 2008 to July 2011 were obtained from the HSE monthly performance reports.[156,157] Secondly, inpatient and day-case waiting list data from August 2011 to July 2017 and outpatient waiting list data from March 2013 to July 2017 were obtained directly from the NTPF.[158] These data record the number of cases (not individuals) on each waiting list at the end of each month, disaggregating the amount of time the cases have been on each waiting list into three-month categories (0-3, 3-6, 6-9, 9-12, 12-15, 15-18 and 18+ months).

The structure of these data does not allow direct comparison over time of trends in waiting lists for the unmet demand thresholds applied in Chapter 5. However, to provide indicative understanding of unmet demand over time we examine trends in those waiting over one year and waiting over three months for IPDC care; and waiting over one year and waiting over six months for an OP

156 There are gaps in the inpatient and day-case series from May to August 2008 and January to May 2010 as for those months data were either not recorded in the HSE performance reports or the reports themselves were unavailable.

157 The NTPF records separate lists for IPDC endoscopy and non-endoscopy procedures - in this analysis these lists have been merged.

158 The NTPF only commenced recording the outpatient list in March 2013.

appointment. These wait times provide approximate comparisons to the low and high volume unmet demand thresholds for adult IPDC services and the low and medium volume unmet demand thresholds for adult outpatient services specified in Chapter 3 and applied in Chapter 5. To estimate monthly rates of waiting list cases per 1,000 population, ESRI population estimates were linearly interpolated for every month between April of each year.[159]

FINDINGS

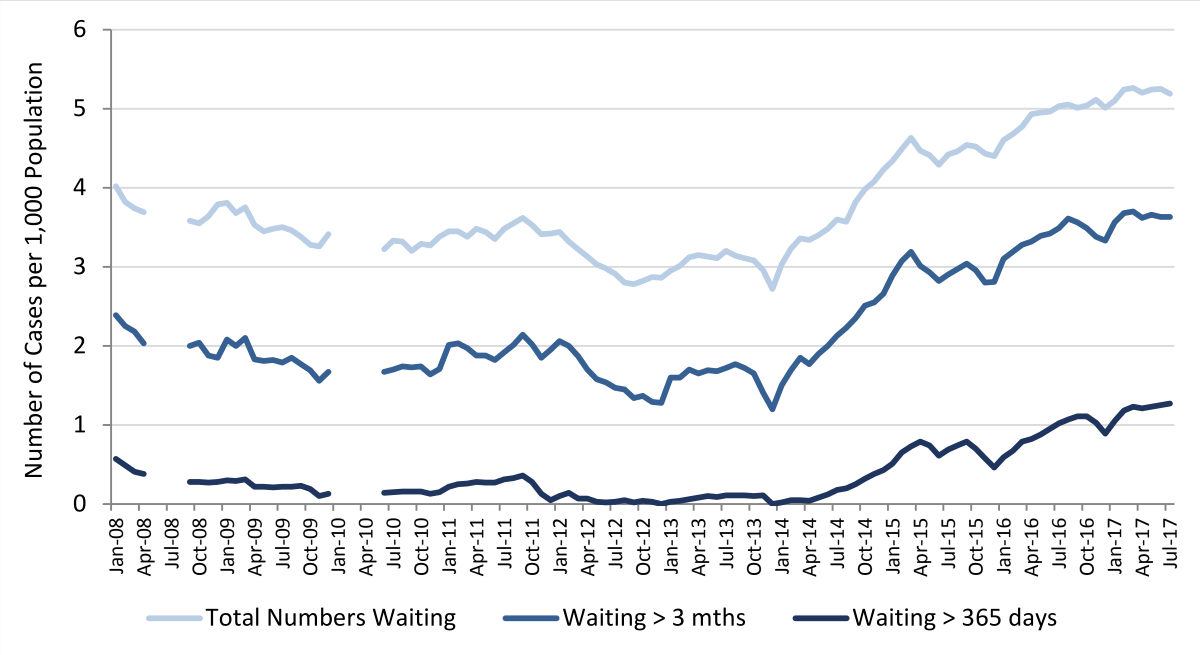
Figure A.4.1 shows the ratios to 1,000 population of the total number of cases waiting, the number of cases waiting over three months and numbers waiting over one year on the inpatient waiting list by month from January 2008 to July 2017. While there were initial modest declines in these waiting list rates, from January 2014 onwards large percentage increases in the number of cases per 1,000 population are observable.[160] For inpatients, total and threshold waiting numbers experience small declines at the end of each year. This can be explained by government initiatives to help decrease waiting list numbers also seen with the day-case and outpatient waiting lists.[161]

159 As the Irish census is recorded in April the ESRI population estimates are for April in each intercensal year.

160 Between January 2014 and July 2017, the total numbers on the inpatient waiting list increased by 72 per cent. The numbers waiting over three months and over one year increased by 142 per cent and 5,250 per cent respectively.

161 These include the 2013, 2015 and 2016 initiatives: http://health.gov.ie/blog/press-release/95-reduction-in-outpatients-waiting-over-12-months/; http://health.gov.ie/blog/press-release/2015-initiatives-to-target-waiting-lists/; http://health.gov.ie/blog/press-release/minister-harris-announces-action-plan-on-waiting-lists.

FIGURE A4.1 MONTHLY NUMBERS OF CASES WAITING PER 1,000 POPULATION ON THE INPATIENT WAITING LIST, JANUARY 2008 – JULY 2017



Source: NTPF (August 2011- July 2017); HSE Performance Reports (January 2008- July 2011); ESRI Population Data.

Notes: a. Missing coverage from: Naas Hospital (May 2012); St. Michaels Hospital, Dun Laoghaire (Jan 2014-Oct 2015); University Hospital Limerick (July 2015 -Sept 2015); St John's Hospital Limerick (Mar 2016 - May 2016); Nenagh Hospital (Oct 2016). Cork University Maternity Hospital was included in the Inpatient reporting from April 2017.

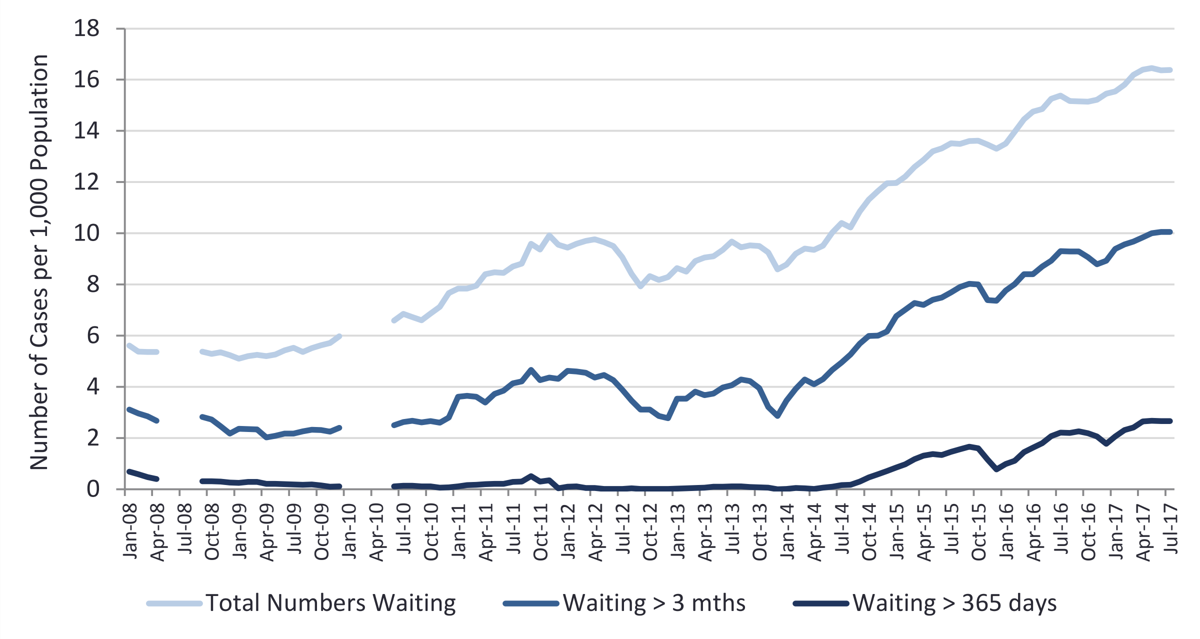
b. Excludes pre-admits.

c. No data available for May – Aug 2008 and Jan – May 2010.

d. Monthly numbers per 1,000 population are calculated on the basis of the number on the list in each given month and the estimated/count of population in each month of that year, calculated by linear interpolation between the estimates for April of each year.

Figure A.4.2 shows the ratios to 1,000 population of the total number of cases waiting, the number of cases waiting over three months and over one year on the day-case waiting list by month from January 2008 to July 2017. Cases per 1,000 above the two thresholds on the day-case waiting list remained largely stable until late 2014. However, since September 2014 the rate of waiting list activity for those waiting over one year has grown by just under 780 per cent. The number of cases waiting over three months has increased by 77 per cent since September 2014.

FIGURE A4.2 MONTHLY NUMBERS OF CASES WAITING PER 1,000 POPULATION ON THE DAY-CASE WAITING LIST, JANUARY 2008 – JULY 2017



Source: NTPF (August 2011- July 2017); HSE Performance Reports (January 2008- July 2011); ESRI Population Data.

Notes: a. Missing coverage from: Naas Hospital (May 2012); St. Michaels Hospital, Dun Laoghaire (Jan 2014-Oct 2015); University Hospital Limerick (July 2015 -Sept 2015); St John's Hospital Limerick (Mar 2016 - May 2016); Nenagh Hospital (Oct 2016). Cork University Maternity Hospital was included in the Inpatient reporting from April 2017.

b. Excludes pre-admits.

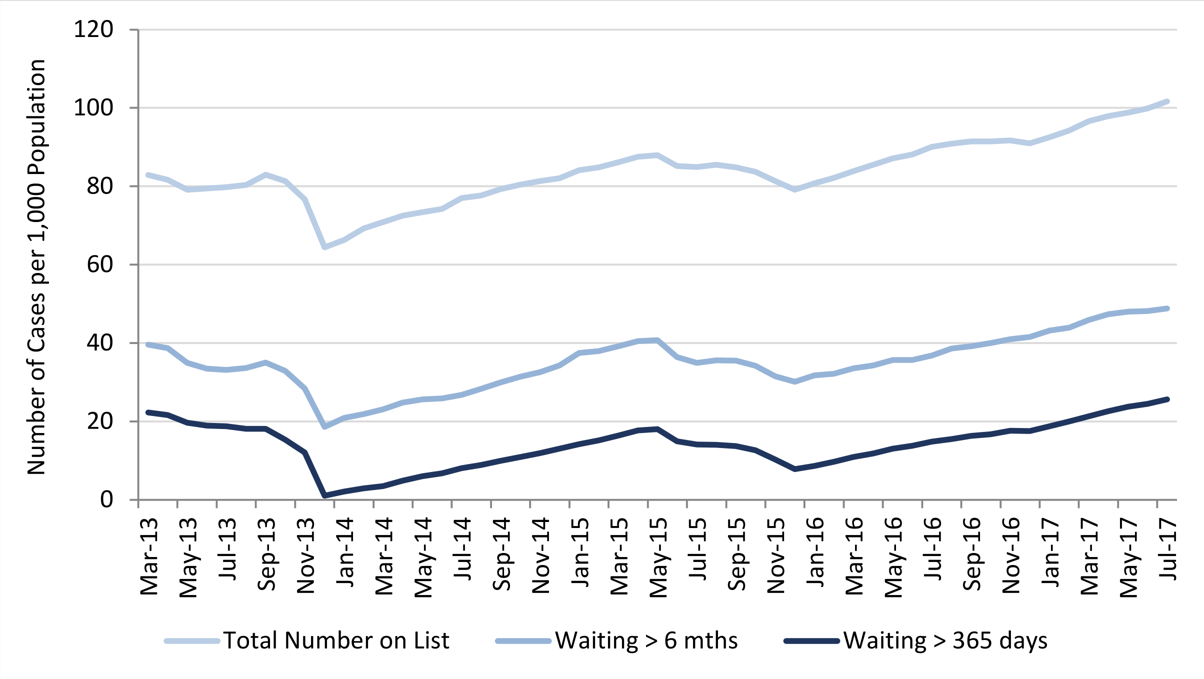
c. No data available for May – Aug 2008 and Jan – May 2010.

d. Monthly numbers per 1,000 population are calculated on the basis of the number on the list in each given month and the estimated/count of population in each month of that year, calculated by linear interpolation between the estimates for April of each year.

Figure A.4.3 shows the ratios to 1,000 population of the total number of cases waiting, the number of cases waiting over six months and over one year on the outpatient waiting list by month from March 2013 to July 2017. Over this period, the outpatient waiting list has seen smaller proportional increases than either the inpatient or day-case waiting lists, with total numbers and numbers waiting over one year increasing by 23 and 15 per cent respectively. Outpatient waiting list numbers reached their lowest point with an initiative to clear the waiting list in 2013, with numbers waiting over six months and one year dropping to 18.5 and 1.06 per 1,000 population.[162] A second initiative to reduce numbers on the waiting list in the latter half of 2015 also briefly impacted activity trends observed across all three metrics, as Figure A.4.3 demonstrates.

162 2013 Initiative to reduce the waiting list: http://health.gov.ie/blog/press-release/95-reduction-in-outpatients-waiting-over-12-months.

FIGURE A4.3 MONTHLY NUMBERS OF CASES WAITING PER 1,000 POPULATION ON THE OUTPATIENT WAITING LIST, MARCH 2013 – JULY 2017



Source: NTPF (March 2013 – July 2017); ESRI Population Data.
Notes: a. Missing coverage from: Nenagh Hospital (Oct 2016); University Hospital Limerick (July- Sept 2015). Rotunda, Coombe and Cork Maternity Hospitals were included only from Aug 2015, March 2017 and April 2017 respectively.
b. Coombe Women and Infants University Hospital was included in the outpatient reporting from March 2017.

DISCUSSION AND CONCLUSIONS

Waiting list numbers for inpatient and day-case care relative to population remained relatively stable up to 2014 when rates began to increase. Outpatient waiting rates, albeit over a shorter time horizon, remained relatively stable over time. Initiatives to reduce waiting list numbers have been largely unsuccessful, suggesting that one-off measures to address 'pent-up' demand may not be effective. This would be consistent with structural persistence in unmet demand. This evidence provides support for the approach adopted in this report to project forward unmet demand for hospital care on a constant activity rate basis, subject to some important caveats. For instance, if the recent rates of increase in unmet demand for IPDC care were to persist through the projection horizon, our projections could understate future unmet demand to some extent. Our measure of unmet demand may also be conservative given that waiting list data collected in Ireland, and made available to this analysis, do not follow patients from their GP referral through their wait on outpatient and inpatient lists to their eventual treatment. Another concern is that some unmet demands for previous years may be captured in 2015 leading to inflated baseline activity volumes. More detailed time series data not available to this analysis would be required to explore this issue. As such there are possibilities of both over and underestimation to consider. Future research could help address many of these issues in estimation provided there is improved collection and availability of waiting list data.

APPENDIX 5

Data aggregation and projected demand

As described in Chapter 3, where possible, data have been analysed at the level of SYOA and sex, with the most disaggregated age cohort attainable included where SYOA data were not available. We follow this approach because the greater the level of aggregation (i.e. the fewer age cohorts), the less sensitive projections will be to changes in the age structure of the population. This has the consequence of understating the effect of increasing numbers of older people on healthcare demand and leads to understated demand projections. When healthy ageing assumptions are applied, the effect of greater aggregation is to lessen the healthy ageing effect.

The purpose of this Appendix is to illustrate these aggregation effects by projecting demand for public hospital care while varying the level of age aggregation of the data on which the projections are based. We make use of HIPE public hospital data for this example because it is recorded at SYOA level across the entire age distribution (<1, 1, 2, 98, 99+). This facilitates comparing the effects on projected demand of using a SYOA basis and alternative age aggregations. We examine age aggregation effects on projected demand growth for both total acute public hospital discharges and for total acute public hospital inpatient bed days. The results of this exercise are provided in Table A5.1.

This table presents a number of important findings. Firstly, projections based on greater data aggregation project lower rates of demand growth compared to projections based on more disaggregated data breakdowns. This is illustrated clearly in the Comparator Population Growth column (where no adjustments are made for healthy ageing). Particularly, in these examples, growth rates based on age cohort aggregation of ten or more years (i.e. with greater aggregation and fewer cohorts) begin to deviate noticeably from SYOA projections.

TABLE A5.1 PROJECTED DEMAND GROWTH FOR PUBLIC ACUTE HOSPITAL CARE, 2015-2030, BY LEVEL OF DATA AGGREGATION AND HEALTHY AGEING SCENARIO

Level of age data aggregation	Baseline Total Discharges 2015	% Growth 2015-2030		
		Comparator Population Growth projection without healthy ageing effects	Dynamic Equilibrium	Compression of Morbidity
3 age cohorts[1]	1,524,362	28.3	24.5	22.6
5 age cohorts[2]	1,524,362	28.4	22.8	20.1
15 year[3]	1,524,362	31.6	24.5	20.9
8 age cohorts[4]	1,524,362	32.4	25.4	21.8
10 year[5]	1,524,362	32.1	24.4	20.5
5 year[6]	1,524,362	32.4	23.8	19.5
SYOA[7]	1,524,362	32.4	23.6	19.2
Level of age data aggregation	**Baseline Total Inpatient Bed Days 2015**	**% Growth 2015-2030**		
		Comparator Population Growth projection without healthy ageing effects	**Dynamic Equilibrium**	**Compression of Morbidity**
3 age cohorts[1]	3,272,950	37.4	34.2	32.6
5 age cohorts[2]	3,272,950	40.5	34.5	31.6
15 year[3]	3,272,950	45.5	36.1	31.4
8 age cohorts[4]	3,272,950	46.1	36.6	31.8
10 year[5]	3,272,950	46.3	35.3	29.9
5 year[6]	3,272,950	47.1	33.9	27.2
SYOA[7]	3,272,950	47.4	32.2	24.6

Source: Authors' calculations.
Notes: 1. 0-15, 16-64. 65+. These three age cohorts were those available from HSE BIU for analysis of public outpatient data used in this report.
2. 0-5, 6-17, 18-64, 65-84, 85+.
3. <1, 1-14, 15-29, 30-44, 45-59, 60-74, 75-89, 90+. These eight cohorts are in 15-year bands up to 90+.
4. 0-1, 1-6, 7-15, 16-44, 45-64, 65-74, 75-84, 85+. These eight cohorts are unevenly aggregated, with greater disaggregation at older ages.
5. <1, 1-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+.
6. <1, 1-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-59, 70-74, 75-59, 80-84, 85+.
7. <1, 1, 2, 3,........,97, 98, 99+.

Secondly, projected demand is less sensitive to healthy ageing effects where data aggregation is greater. For instance consider the difference in projected demand growth rates for total discharges when based on three age cohorts and when based on SYOA between the Comparator Population Growth and Compression of Morbidity columns. With three age cohorts, compression of morbidity results in 22.6 per cent projected demand growth between 2015 and 2030 compared to 28.3 per cent where no healthy ageing shifts are applied. Under SYOA, compression of morbidity results in 19.2 per cent projected demand growth between 2015 and 2030 compared to 32.4 per cent where no healthy ageing shifts are applied. Finally, projected demand for services where more activity is concentrated in older ages may be more sensitive to aggregation effects. This is illustrated by the 10.0 percentage point difference in projected growth rates in the Comparator Population Growth column between the three age cohort and SYOA age aggregations for inpatient bed days compared to the 4.1 percentage point difference for total discharges.

APPENDIX 6

Decomposition methods

This appendix details the approach adopted in this report to decompose demand growth over the projection horizon into its constituent parts, namely population growth, changes in the population age structure and unmet need or demand. The decomposition method follows a similar approach employed by Ha et al., 2014 (1).

The volume of demand attributable purely to changes in the population age structure is estimated by applying 2015 population age shares to overall 2030 population volumes. That is,

$$Pop_p(2030)_a = \sum_{a=1}^{N} Pop(2030)_a * \frac{Pop(2015)_a}{\sum_{a=1}^{n} Pop(2015)_a} \quad (1)$$

Where[163]

$Pop(2030)_a$ = 2030 population by age *a*

$Pop(2015)_a$ = 2015 population by age *a*

$Pop_p(2030)_a$ = 2030 population volumes by age *a* based on 2015 population proportions.

The proportion of total demand change explained by population growth alone can then be calculated by isolating the impact population growth alone has on total demand change[164] as follows;

$$\frac{\sum_{a=1}^{N}[Pop_p(2030)_a * AR(2015)_a] - \sum_{a=1}^{N}[Pop(2015)_a * AR(2015)_a]}{Total\ Change\ in\ Demand\ 2015 - 2030} \quad (2)$$

Where

$AR(2015)_a$ = 2015 activity rate by age *a*

The volume of demand change attributable to changes in the population age structure is then estimated as a residual and can be measured in terms of

163 For simplicity area of activity h and sex s indices included in equations in Chapter 3 have been dropped.

164 The total change in demand will differ based on the assumptions being applied. For instance where no unmet need or healthy ageing shifts are applied the denominator of the decomposition equations can be specified as $\sum_{a=1}^{N}[Pop(2030)_a * AR(2030)_a]$ - $\sum_{a=1}^{N}[Pop(2015)_a * AR(2015)_a]$, where $AR(2015)_a = AR(2030)_a$.

proportion of overall demand change as follows,

$$\frac{\sum_{a=1}^{N}[Pop(2030)_a * AR(2015)_a] - \sum_{a=1}^{N}[Pop_p(2030)_a * AR(2015)_a]}{Total\ Change\ in\ Demand\ 2015-2030} \quad (3)$$

The effect that unmet need or demand (where included) has on total demand change can then be isolated and represented in terms of share of demand growth as follows,[165]

$$\frac{\sum_{a=1}^{N}[Pop(2030)_a * AR_{um\_adj}(2015)_a] - \sum_{a=1}^{N}[Pop(2030)_a * AR(2015)_a]}{Total\ Change\ in\ Demand\ 2015-2030} \quad (4)$$

Where

$AR_{um\_adj}(2015)_a$ = 2015 activity rate inclusive of unmet need or demand by age *a*

The effect of healthy ageing shifts, where applied,[166] can then be isolated in a similar manner and be presented in terms of share of demand growth as follows,

$$\frac{\sum_{a=1}^{N}[Pop(2030)_a * AR_{um\_adj}(2015)_{a-\partial\Delta LE(2030,2015)a}] - \sum_{a=1}^{N}[Pop(2030)_a * AR_{um\_adj}(2015)_a]}{Total\ Change\ in\ Demand\ 2015-2030} \quad (5)$$

Where

$\partial\Delta LE(2030, 2015)a$ = shift made to activity rates in proportion to changes in life expectancy between 2015 and 2030 to reflect healthy population ageing. The strength of the shift is determined by ∂ (see Chapter 3).

The total effect of changes in the population age structure is then estimated by combining the effects of Equations (3) and (5).

REFERENCES

1. Ha, N.T., D. Hendrie and R. Moorin (2014). 'Impact of population ageing on the costs of hospitalisations for cardiovascular disease: a population-based data linkage study'. *BMC Health Services Research.* 2014;14:554. Epub 2014/11/14.

165 Where no unmet need or demand is assumed $AR_{um\_adj}(2015)_a = AR(2015)_a$.

166 Where no healthy ageing is assumed $\partial = 0$ so that $AR_{um\_adj}(2015)_{a-\partial\Delta LE(2030,2015)a} = AR_{um\_adj}(2015)_a$.

APPENDIX 7

Preferred projection ranges by service and projection year

The tables in this appendix provide the preferred projection ranges by sector, unit of activity and projection year from the estimated activity in the 2015 base year with projections for the years 2016-2030. These projection ranges reflect those developed in the chapters of the report and should be read in conjunction with those chapters and the sensitivity analysis in Chapter 12, to understand the assumptions applied and the caveats about uncertainty and data limitations. The projections assume no changes in the models of care in the sectors concerned.

TABLE A7.1 PROJECTED DEMAND FOR PUBLIC HOSPITAL SERVICES, 2015-2030 ('000)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Total Inpatient and Day-Case Discharges (Excl. Maternity)															
DE	1,524	1,553	1,573	1,592	1,612	1,632	1,654	1,677	1,701	1,726	1,751	1,777	1,803	1,830	1,857	1,884
DE + High Pop	1,524	1,540	1,566	1,593	1,621	1,650	1,682	1,711	1,741	1,772	1,803	1,835	1,867	1,899	1,932	1,965
DE + High UD	1,591	1,621	1,642	1,662	1,683	1,704	1,727	1,752	1,777	1,802	1,829	1,855	1,883	1,910	1,938	1,966
	Day-Case Discharges (Excl. Maternity)															
DE	1,010	1,030	1,041	1,053	1,065	1,077	1,091	1,107	1,124	1,140	1,157	1,175	1,192	1,210	1,228	1,246
DE + High Pop	1,010	1,019	1,034	1,050	1,067	1,085	1,106	1,125	1,145	1,166	1,187	1,208	1,230	1,251	1,273	1,294
DE + High UD	1,060	1,081	1,093	1,105	1,117	1,131	1,146	1,162	1,179	1,197	1,215	1,233	1,251	1,270	1,289	1,307
	Total Inpatient Discharges (Excl. Maternity)															
DE	514	522	530	536	543	550	557	565	573	581	590	598	607	616	626	635
DE + High Pop	514	518	529	539	549	560	571	581	592	602	613	624	635	646	658	670
DE + High UD	532	539	548	555	562	569	576	584	592	601	609	618	627	637	646	656
	Total Inpatient Bed Days (Excl. Maternity)															
DE	3,273	3,334	3,395	3,447	3,502	3,558	3,620	3,687	3,757	3,829	3,904	3,982	4,064	4,149	4,236	4,327
DE + High Pop	3,273	3,295	3,372	3,440	3,512	3,588	3,670	3,747	3,827	3,910	3,996	4,086	4,178	4,275	4,374	4,475
DE + High UD	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372	3,372
	Elective Inpatient Discharges (Excl. Maternity)															
DE	97	99	100	101	102	103	105	106	108	109	111	112	114	115	117	118
DE + High Pop	97	98	99	101	103	104	106	108	110	112	114	116	118	120	122	124
DE + High UD	114	117	118	119	120	122	123	125	127	128	130	132	133	135	137	139
	Elective Inpatient Bed Days (Excl. Maternity)															
DE	626	638	646	653	660	669	679	691	703	716	730	744	758	773	788	803
DE + High Pop	626	628	638	648	659	672	687	701	715	731	746	762	779	796	813	831
DE + High UD	726	739	747	755	764	773	785	798	812	827	843	858	874	891	908	925
	Emergency Inpatient Discharges (Excl. Maternity)															
DE	417	423	429	435	440	446	452	458	464	471	478	485	492	500	508	516
DE + High Pop	417	420	429	437	446	455	464	472	480	489	498	507	516	525	535	545

Contd

TABLE A7.1 CONTD.

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Emergency Inpatient Bed Days (Excl. Maternity)															
DE	2,646	2,693	2,743	2,784	2,828	2,873	2,925	2,981	3,040	3,101	3,165	3,232	3,302	3,376	3,451	3,530
DE + High Pop	2,646	2,659	2,723	2,777	2,837	2,901	2,969	3,034	3,102	3,172	3,245	3,321	3,401	3,484	3,569	3,657
	Total Maternity Discharges															
Central Pop	138	137	135	133	131	129	128	126	125	125	125	125	126	127	129	131
High Pop	138	137	137	137	136	137	137	137	137	138	139	141	143	145	148	151
	Maternity Inpatient Bed Days															
Central Pop	309	308	304	299	295	291	287	283	281	279	278	279	280	283	286	290
High Pop	309	308	307	307	306	306	307	306	307	308	311	314	319	324	330	336
	Public Emergency Department Attendances															
DE	1,138	1,147	1,158	1,170	1,181	1,192	1,205	1,217	1,229	1,242	1,254	1,267	1,281	1,295	1,309	1,324
DE + High Pop	1,138	1,144	1,163	1,184	1,206	1,228	1,251	1,271	1,290	1,308	1,327	1,347	1,367	1,387	1,408	1,430
	Outpatient Department Attendances															
Central Pop	3,299	3,355	3,395	3,439	3,483	3,528	3,573	3,619	3,665	3,713	3,760	3,809	3,856	3,903	3,950	3,997
High Pop	3,299	3,355	3,417	3,483	3,551	3,619	3,690	3,751	3,812	3,876	3,939	4,004	4,067	4,132	4,195	4,259
Central Pop + High UD	3,554	3,614	3,657	3,704	3,751	3,799	3,847	3,896	3,945	3,996	4,047	4,098	4,148	4,199	4,249	4,298

Source: Authors' calculations

TABLE A7.2 PROJECTED DEMAND FOR PRIVATE HOSPITAL SERVICES, 2015-2030 ('000)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Total Inpatient and Day-Case Admissions															
DE	133	135	136	138	139	141	142	144	146	148	150	152	154	156	158	160
DE + High Pop	133	134	136	138	140	143	145	147	150	152	155	157	160	162	164	166
	Day-Case Admissions															
DE	459	470	476	482	488	494	501	508	516	524	531	539	547	555	563	570
DE + High Pop	459	465	472	479	487	496	505	514	523	532	540	550	559	569	578	587
	Inpatient Bed Days															
DE	613	624	630	637	643	651	660	671	683	696	710	724	739	754	769	784
DE + High Pop	613	613	621	630	640	652	665	679	693	708	724	740	757	774	791	808

Source: Authors' calculations.

Notes: Day-patient admissions and inpatient bed days derive from data for private insurance-funded activity in private hospitals and do not capture the very small fraction of activity financed solely out-of-pocket.

TABLE A7.3 PROJECTED DEMAND FOR GENERAL PRACTICE SERVICES, 2015-2030 ('000)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	GP Visits															
EM	17,600	17,800	18,100	18,300	18,600	18,800	19,100	19,400	19,600	19,900	20,200	20,400	20,700	21,000	21,300	21,500
MHA	17,600	17,800	18,000	18,200	18,400	18,600	18,900	19,100	19,400	19,600	19,800	20,100	20,300	20,600	20,800	21,100
MHA + High Pop	17,600	17,800	18,100	18,400	18,700	19,100	19,400	19,800	20,100	20,400	20,700	21,000	21,400	21,700	22,000	22,300
MHA + Unmet Need	17,800	18,100	18,300	18,500	18,700	18,900	19,200	19,400	19,700	19,900	20,100	20,400	20,600	20,900	21,100	21,400
	Practice Nurse Visits															
EM	5,944	6,084	6,178	6,280	6,387	6,495	6,608	6,723	6,841	6,957	7,079	7,196	7,312	7,429	7,543	7,654
MHA	5,944	6,073	6,156	6,247	6,342	6,437	6,538	6,639	6,745	6,848	6,957	7,061	7,164	7,270	7,372	7,474
MHA + High Pop	5,944	6,060	6,174	6,298	6,426	6,556	6,692	6,816	6,944	7,069	7,200	7,326	7,451	7,578	7,702	7,826
	Total General Practice Visits															
EM	23,500	23,900	24,200	24,600	24,900	25,300	25,700	26,100	26,500	26,800	27,200	27,600	28,000	28,400	28,800	29,200
MHA	23,500	23,900	24,200	24,500	24,800	25,100	25,400	25,800	26,100	26,400	26,800	27,100	27,500	27,800	28,200	28,500
MHA + High Pop	23,500	23,800	24,200	24,700	25,200	25,600	26,100	26,600	27,000	27,500	27,900	28,400	28,800	29,300	29,700	30,200
MHA + Unmet Need	23,800	24,200	24,400	24,700	25,100	25,400	25,700	26,100	26,400	26,700	27,100	27,400	27,800	28,100	28,500	28,800

Source: Authors' calculations.
Notes: The projected demand figures for GP visits and total general practice visits are rounded to the nearest 100,000.

TABLE A7.4 PROJECTED DEMAND FOR PHARMACEUTICALS AND PHARMACY SERVICES IN THE COMMUNITY, 2015-2030 ('000)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Total Prescription items															
DE	73,100	75,000	76,400	77,900	79,400	80,900	82,600	84,200	85,800	87,500	89,300	91,100	92,800	94,600	96,300	98,000
DE + High Pop	73,100	74,500	76,100	77,800	79,600	81,400	83,300	85,100	86,900	88,800	90,700	92,700	94,600	96,600	98,500	100,500
	Total Pharmaceutical Consultations															
DE	5,977	6,073	6,129	6,190	6,254	6,321	6,394	6,468	6,542	6,618	6,694	6,775	6,855	6,936	7,017	7,098
DE + High Pop	5,977	6,053	6,148	6,249	6,354	6,462	6,576	6,673	6,770	6,867	6,965	7,067	7,169	7,272	7,375	7,478

Source: Authors' calculations.
Notes: The projected demand figures for pharmaceutical items are rounded to the nearest 100,000.

TABLE A7.5 PROJECTED DEMAND FOR LONG TERM CARE SERVICES, 2015-2030

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	LTC Residents															
DE	29	29	30	31	32	33	33	34	35	37	38	39	40	42	43	45
CM	29	29	30	30	31	31	32	33	34	34	35	36	37	38	39	41
CM + High Pop	29	28	29	30	30	31	32	33	33	34	35	36	37	38	40	41
CM + Unmet Demand	30	30	30	31	31	32	33	34	34	35	36	37	38	39	40	42

Source: Authors' calculations.
Notes: Resident numbers are rounded to the nearest thousand.

TABLE A7.6 PROJECTED DEMAND FOR HOME CARE SERVICES, 2015-2030 ('000)

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Public Home Help Recipients															
DE	48	48	50	51	52	54	55	57	59	61	63	65	67	70	72	75
CM	48	48	49	50	51	52	53	55	56	57	59	61	62	64	66	68
CM + High Pop	48	47	48	49	50	51	53	54	56	57	59	61	62	64	66	69
CM + Unmet Demand	50	50	51	52	53	54	56	57	58	60	61	63	65	67	69	71
	Public + Private Home Help Recipients/Uses															
DE	66	67	69	70	72	74	77	79	81	84	87	90	93	96	99	103
CM	66	66	68	69	71	72	74	75	77	79	82	84	86	89	92	94
CM + High Pop	66	65	66	68	69	71	73	75	77	79	82	84	86	89	92	95
CM + Unmet Demand	68	68	70	71	73	74	76	78	80	82	84	87	89	92	94	97
	Public Home Help Hours															
DE	10,500	10,600	10,900	11,100	11,500	11,800	12,100	12,400	12,800	13,200	13,600	14,000	14,500	15,000	15,500	16,100
CM	10,500	10,500	10,700	10,900	11,100	11,300	11,500	11,700	12,000	12,300	12,500	12,900	13,200	13,600	14,000	14,400
CM + High Pop	10,500	10,200	10,400	10,600	10,800	11,100	11,300	11,600	11,900	12,200	12,500	12,800	13,200	13,600	14,000	14,400
	Public + Private Home Help Hours															
DE	14,300	14,500	14,900	15,300	15,700	16,100	16,600	17,000	17,500	18,000	18,600	19,200	19,800	20,500	21,200	22,000
CM	14,300	14,300	14,600	14,900	15,200	15,500	15,800	16,100	16,400	16,800	17,200	17,600	18,100	18,600	19,100	19,700
CM + High Pop	14,300	13,900	14,200	14,600	14,900	15,200	15,500	15,900	16,300	16,700	17,100	17,600	18,100	18,600	19,100	19,700
	Home Care Package Recipients															
DE	15	16	16	16	17	17	18	18	19	20	20	21	22	22	23	24
CM	15	15	16	16	16	17	17	18	18	18	19	19	20	21	21	22
CM + High Pop	15	15	15	16	16	17	17	17	18	18	19	19	20	21	21	22
CM + Unmet Demand	18	18	18	19	19	19	20	20	21	21	22	22	23	24	25	25

Source: Authors' calculations.
Notes: The projected demand figures for public home help hours and public and private home help hours are rounded to the nearest 100,000.

TABLE A7.7 PROJECTED DEMAND FOR PUBLIC HEALTH NURSING AND COMMUNITY THERAPY SERVICES, 2015-2030

Scenario	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Public Health Nursing Visits															
MHA	1,360	1,380	1,400	1,420	1,440	1,470	1,500	1,520	1,540	1,560	1,590	1,620	1,650	1,680	1,720	1,760
DE	1,360	1,370	1,390	1,410	1,430	1,460	1,480	1,500	1,520	1,540	1,560	1,590	1,620	1,650	1,680	1,710
DE + High Pop	1,360	1,370	1,390	1,420	1,460	1,490	1,530	1,560	1,590	1,630	1,660	1,690	1,720	1,760	1,800	1,840
	Physiotherapy Referrals															
DE	189	193	196	200	203	206	209	213	216	219	223	226	230	233	237	241
CM	189	193	196	199	202	205	208	211	214	217	221	224	227	231	234	237
CM + High Pop	189	193	196	200	205	209	213	217	221	225	229	233	237	241	245	250
CM + Unmet Demand	200	204	207	210	213	216	219	222	225	229	232	235	239	242	246	249
	Physiotherapy Visits															
DE	760	776	788	800	813	825	838	850	863	876	890	904	917	931	945	959
CM	760	775	786	798	809	820	832	843	855	867	879	892	904	917	930	943
CM + High Pop	760	772	787	803	819	835	851	866	881	896	911	927	943	959	975	991
	Occupational Therapy Referrals															
DE	88	90	92	94	96	98	100	102	104	107	109	111	114	117	119	122
CM	88	90	91	93	95	97	99	101	103	105	107	109	112	114	116	119
CM + High Pop	88	89	91	93	96	98	100	103	105	108	110	113	115	118	121	124
CM + Unmet Demand	92	94	96	98	100	102	104	106	108	110	112	114	117	119	122	124
	Occupational Therapy Visits															
DE	347	356	363	371	379	387	395	403	412	420	429	438	446	456	466	476
CM	347	355	362	369	376	383	390	397	405	412	420	428	435	444	453	462
CM + High Pop	347	352	360	369	378	386	395	404	412	421	430	440	449	458	469	479
	Speech and Language Therapist Visits															
Central Pop	147	143	143	143	144	144	145	144	144	143	143	142	142	142	143	143
High Pop	147	143	144	146	148	151	155	157	159	160	162	163	164	166	167	170

Source: Authors' calculations.

APPENDIX 8

Members of the Steering Group

Professor Tim Callan, Economic and Social Research Institute (Chair from July 2017)

Ms Laura Casey, Department of Health

Ms Emer Brady, Department of Health (2016)

Dr Teresa Maguire, Department of Health (Chair from July 2016 to July 2017)

Mr Robert Murphy, Department of Health

Dr Anne Nolan, Economic and Social Research Institute (Chair from July 2015 to July 2016)

Professor Charles Normand, Trinity College Dublin

Mr David Smith, Department of Health (2016)

Mr Kevin Coleman, Department of Health

Dr Maev-Ann Wren, Economic and Social Research Institute.

The ESRI and the Department of Health each nominate four members to the Steering Group. Members listed include current and previous members for 2016 and 2017. The Chair of the Steering Group rotates annually between the Department and the ESRI.

Whitaker Square,
Sir John Rogerson's Quay,
Dublin 2
Telephone **+353 1 863 2000**
Email **admin@esri.ie**
Web **www.esri.ie**
Twitter **@ESRIDublin**
ISBN **978-0-7070-0443-3**

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE