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EFFECTS OF NEW RESIDENTIAL DEVELOPMENTS ON LOCAL HEALTHCARE DEMAND AND WORKFORCE: EVIDENCE FROM PRIMARY AND ACUTE PUBLIC HOSPITAL CARE IN IRELAND

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ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

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ABBREVIATIONS

ABP	An Bord Pleanála
AHB	Approved housing body
AHCP	Allied healthcare professionals
BER	Building energy rating
CHO	Community healthcare organisation
COSMO	COre Structural MOdel for Ireland
CSO	Central Statistics Office
DCC	Dublin City Council
DHLGH	Department of Housing, Local Government and Heritage
ED	Emergency department
ESRI	Economic and Social Research Institute
GP	General practitioner
HAP	Housing Assistance Payment
HFA	Housing for All
HHP	Housing and Healthcare Planning model
HIPE	Hospital In-Patient Enquiry
HIQA	Health Information and Quality Authority
HIS	Healthy Ireland Survey
HPO	Healthcare Pricing Office
HSE	Health Service Executive
ICGP	Irish College of General Practitioners
LDA	Land Development Agency
LHO	Local health office
LOS	Length of stay
LTRC	Long-term residential care
NDP	National Development Plan
NHS	National Health Service (UK)
NPF	National Planning Framework (Ireland 2040)
NPO	National planning objective
NSO	National strategic objective
NTPF	National Treatment Purchase Fund
OECD	Organisation for Economic Co-operation and Development
PBRA	Population-based resource allocation
PHI	Private health insurance

PN	Practice nurse
SILC	Survey on Income and Living Conditions
TILDA	The Irish Longitudinal Study on Ageing
WHO	World Health Organization
WTE	Whole-time equivalent

EXECUTIVE SUMMARY

INTRODUCTION

Housing and health are critical issues for policymakers and the public. Secure and affordable housing, along with quick access to required health and social care, are considered essential services for the public and are key targets for planners. In Ireland, as in many countries, the need to improve accessibility to housing and health is already understood, and support for both housing and health are fundamental parts of the social welfare system. There is also a significant synergy between the areas of housing and health. A well-established body of evidence demonstrates the link between housing conditions and health outcomes. Poor housing and insecure tenure can adversely affect health and wellbeing, and the World Health Organization (WHO) cites housing, basic amenities and the environment as primary social determinants of health.

Location of housing and healthcare are also highly correlated. In Ireland, disparities in access to health and social care services are evident across different geographic areas and demographic groups. Regions that experienced the largest population growth in recent decades consistently have the most limited healthcare resources. The establishment of a population-based resource allocation (PBRA) system within the public health sector may help reduce some of these supply inequalities. While against the backdrop of ongoing population increases and demographic shifts, policies aimed at a proportional increase in healthcare supply are crucial. This necessitates that healthcare and housing policymakers align their strategies and where possible integrate planning policies. Coordinated planning is vital to ensure that housing developments are matched with sufficient healthcare services, creating sustainable communities where residents have both secure housing and dependable healthcare.

In this report we introduce a new Housing and Healthcare Planning (HHP) modelling tool developed at the ESRI. The HHP has been developed through a research programme funded by the Department of Housing, Local Government and Heritage (DHLGH). The HHP is a macrosimulation model that follows from the ESRI's Hippocrates model developed to project healthcare demand and expenditure in Ireland. The HHP model combines information on healthcare activity rates and housing development profiles (including tenure type) to construct a healthcare demand profile for new residential developments. The model subsequently estimates the healthcare workforce and capacity requirements needed to meet this demand.

This represents the first report using the HHP model. In addition to introducing the architecture of the model, the report produces estimates of the primary care and acute public hospital healthcare demand that may arise from new residential

developments. It also estimates the potential workforce supply or capacity that may be required to meet this demand. This report focuses on key primary care services, namely general practitioner (GP) and practice nurse (PN) care, as well as public acute hospital care services, including emergency department (ED), day patient, elective inpatient and emergency inpatient care. These healthcare services were chosen owing to their central role in healthcare needs across all age groups, and the data and information available on the supply of such services in Ireland. Future developments of the HHP model will endeavour to incorporate a wider range of healthcare services, as well as social care services.

KEY FINDINGS

Socio-demographics of populations differ considerably across tenure types. While the majority of supported renters have a medical card, only a small percentage of private renters and owner occupiers possess one. Furthermore, age and sex distributions vary considerably across tenure types.

The tenure mixes of a new development, and by relation the specific demographic profile of that development, plays a large role in determining the level of healthcare provision required in the local area in which the development is being constructed.

Developments that follow a Housing for All (HFA) tenure composition (e.g., 30 per cent supported renters, 20 per cent private renters and 50 per cent owners) tend to have lower levels of GP and PN demand than developments with a higher proportion of supported renters.

However, developments that follow an HFA tenure composition tend to have higher levels of acute public hospital ED and inpatient demand than developments with a higher proportion of supported renters. This is driven by the fact that owner occupiers tend to be older than supported renters and, consequently, have a higher demand for hospital care.

POLICY IMPLICATIONS AND CONCLUSIONS

Planning authorities and policymakers should consider the impacts of home-building on the availability and accessibility of local healthcare services when planning new residential developments. This report demonstrates that the HHP model provides a robust evidence base to inform integrated planning decisions. Moreover, utilising information on the type of housing developments being constructed – considering size, tenure composition and demographic profile – enables the provision of precise demand and supply evidence.

It is anticipated that the application of the HHP modelling tool will empower planning authorities to make more informed decisions regarding the impacts of new residential developments on local healthcare systems, thereby facilitating a better integration of the two historically misaligned planning domains.

CHAPTER 1

Introduction

1.1 INTRODUCTION

1.1.1 Overview

This report presents estimates of general practice and acute public hospital healthcare demand that may arise from new residential housing developments in Ireland, and the commensurate healthcare workforce and bed capacity required to meet this demand. The estimates have been generated using a new modelling tool developed at the ESRI called the Housing and Healthcare Planning (HHP) model. The HHP model was developed at the Institute through a research programme funded by the DHLGH.

Previous modelling tools have been developed in Ireland, including at the ESRI, to separately inform the planning of healthcare services and housing requirements at a national level. The Hippocrates model was developed by the ESRI through a programme of research with the Department of Health to project demand, and expenditure and workforce requirements for a wide breadth of health and social care services (Wren et al., 2017; Keegan et al., 2020; Keegan et al., 2022; Walsh et al., 2021). Similarly, previous ESRI research has informed our understanding of national (Morgenroth, 2018; Egan et al., 2022; McQuinn, 2021) and regional (Bergin and García-Rodríguez, 2020) housing requirements in Ireland, drawing from the COSMO (COre Structural MOdel for Ireland) structural econometric model of the Irish economy.

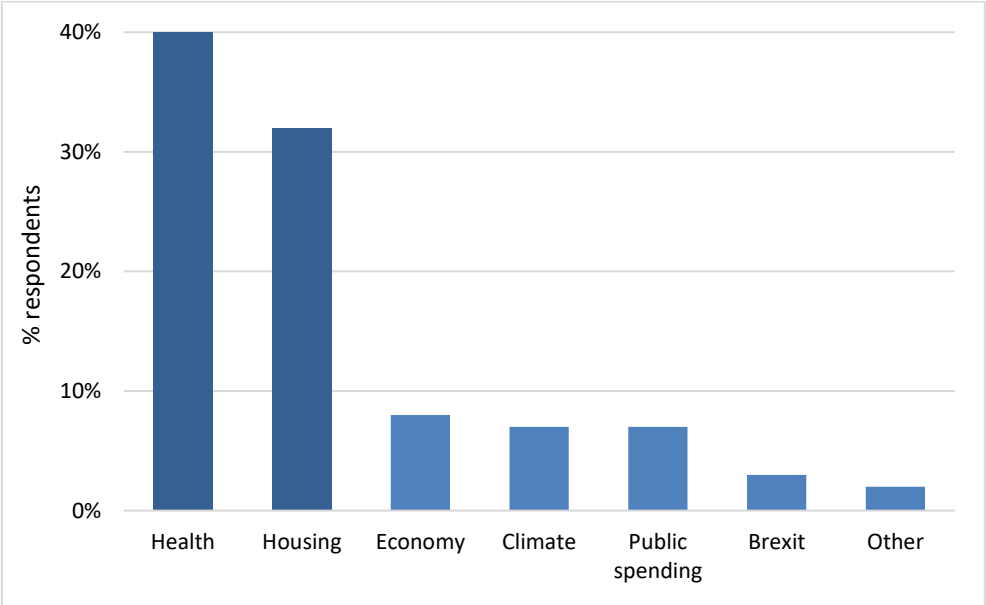
The HHP model has been developed to estimate the healthcare demand and supply implications of new housing developments in Ireland. It is the first macrosimulation model developed in Ireland to inform healthcare planning for new residential developments. The HHP model develops demand and supply estimates based upon the tenure and demographic mix of developments and has the capabilities of aiding the integration of housing and health planning at a local, regional and national level.

1.1.2 Housing and healthcare planning in Ireland

Housing and health are two of the most prescient issues for policymakers and the wider public. Both housing and health are consistently ranked as the most important issues identified by the Irish public; for example, when determining which political party or independent candidate to vote for. Prior to the 2020 general election, either housing or health were ranked as the top priority of nearly three-quarters of voters, as demonstrated by Figure 1.1. Of the respondents, 40 per cent chose health as the issue that has most influence on their voting

preference, and 32 per cent chose housing. The two issues were listed substantially higher than the next highest ranking issue, the economy, which fell at 8 per cent. While the importance of housing and health to Irish society is often noted, Figure 1.1 provides clear evidence of the joint salience of the two issues in Ireland. The continued structural problems facing the housing and health sectors also mean that the importance of these two issues will remain at the forefront of national and local policy discussion.

FIGURE 1.1 'WHICH OF THE FOLLOWING ISSUES WILL HAVE THE MOST INFLUENCE ON WHICH PARTY OR INDEPENDENT CANDIDATE YOU VOTE FOR IN THE UPCOMING ELECTION?'



Source: Irish Times/Ipsos MRBI opinion poll, General Election 2020.

This report, and the development of the HHP model specifically, are therefore important in the context of the importance of housing and healthcare as public policy concerns. Greater alignment of planning across housing and healthcare can help to reduce the existing issues in these sectors and help to ensure that new residential developments alleviate, rather than exacerbate, healthcare supply and accessibility issues at both the national and local level.

1.2 INTEGRATING HOUSING AND HEALTH PLANNING IN IRELAND

The link between housing and health outcomes is now well established in the international literature. The WHO lists 'housing, basic amenities and the environment' as one of the key social determinants of health. Access to adequate housing and healthcare are fundamental to a good quality of life, and the lack of either can have significant implications for the other. The planning of housing and healthcare is of central importance to national and local policymakers, and the benefits of greater integration of housing and healthcare planning have become increasingly clear. Better integration of housing and healthcare planning can help ensure that housing policy can focus on health outcomes.

Poor quality housing, such as housing that suffers from dampness, cold or overcrowding, can negatively impact mental and physical health outcomes and childhood development (Howden-Chapman et al., 2007; Rolfe et al., 2020). Therefore, housing and planning policies that target these negative attributes of housing quality can have significant positive impacts on health. Furthermore, policies designed to combat negative environmental externalities can greatly influence health outcomes. For example, adequate barriers for radon, a significant health concern in Ireland (Dempsey et al., 2018a), may help reduce the incidence of lung cancer. Thus, regulations and policies for new housing in Ireland can be designed to directly improve health outcomes. Other forms of housing and planning policies that prioritise social amenities and environmental factors, such as green space within residential developments, may further improve the overall public health of a local population (Dempsey et al., 2018b).

Adequate healthcare supply planning in regions where population increases will occur via new residential developments is essential to guarantee access to necessary healthcare and treatments both for new residents and people already residing in the surrounding communities. Ultimately, failure to account for increases in healthcare demand driven by new developments, without a commensurate healthcare supply increase, leads to overcrowding in healthcare facilities such as hospital EDs and longer waiting times for overburdened GPs. Policymakers and national and regional planners therefore require information on the likely impacts new housing developments may have on healthcare demand and supply. Currently, there exists an information gap on this issue in Ireland. The HHP model has been developed to inform the process of matching healthcare supply to local population changes resulting from new residential developments.

The importance of integrating housing and healthcare planning is particularly relevant in the current context. Ireland is experiencing severe shortages in housing, especially affordable housing (Russell et al., 2021). Projected population increases in the coming years are likely to exacerbate this problem. Shortages also currently exist for various healthcare services. However, plans that can effectively increase supply of both housing and healthcare services have the ability to temper supply shortage and waiting list issues. In addition, plans to increase housing supply may also have downstream impacts on healthcare supply.

Evidence from the ESRI highlights that increasing annual housing output from 25,000 completions per annum to 30,000 per annum could reduce housing prices by 12 per cent by 2030 (Egan et al., 2022). This, in turn, would improve access to affordable housing. However, such increases in housing output could potentially have a different effect on healthcare, as they could increase demand for healthcare services in those areas where housing output increases. The potential downstream effects of this on healthcare accessibility should be accounted for in the construction of new residential developments.

Currently, healthcare in Ireland is facing staffing and capacity shortages, particularly in the public healthcare system. The public acute hospital system is estimated to have a shortfall of 1,000 inpatient beds in 2023 (Walsh and Brick, 2023). These shortfalls result in long waiting lists for various services due to insufficient supply. Additionally, healthcare supply in Ireland is often characterised by geographic inequalities, with large variations in per capita healthcare supply across counties (Smith et al., 2019). Research shows that the greater Dublin commuter belt counties, such as Kildare, Meath and Wicklow, have the lowest level of per capita healthcare provision (Smith et al., 2019). It has also been shown that these counties have experienced the largest increases in population in recent decades (Morgenroth, 2018; Bergin and García-Rodríguez, 2020). These findings indicate a lack of planning of healthcare services, both at the local level and within the healthcare system, as the planning of appropriate health and social care services to meet new demand has often lagged behind demographic shifts and rapid population growth in certain regions.

A crucial determinant of the unequal distribution of healthcare resources across various regions in Ireland is the absence of a resource allocation mechanism within the healthcare system. In contrast to many healthcare systems, such as the UK's National Health Service (NHS), the Irish healthcare system has not implemented a mechanism to apportion resources to health and social care services based on areas with the highest demand. The necessity of such a mechanism was an important outcome highlighted by the Sláintecare report (Burke et al., 2018). In 2023, the Department of Health published a report outlining a PBRA criteria for healthcare (O'Malley et al., 2023). The proposed PBRA criteria recommends the equitable distribution of Health Service Executive (HSE) expenditure across six newly created HSE Health Regions based on their respective healthcare requirements. The PBRA mechanism will allocate resources based on population size, as well as other socio-demographic factors such as age, gender, rates of deprivation and the rurality of each Health Region's population. The implementation of this proposed mechanism is anticipated to commence in 2024.

The implementation of a PBRA mechanism could potentially enhance the effectiveness and equality of healthcare supply. It would also underscore the potential benefits of a tool such as the HHP model in providing evidence to national and local planners on how best to meet the healthcare demand of new housing developments in practice. In this context, PBRA could augment the HHP model's capacity to directly inform local healthcare planning policies. Given the growing population of Ireland and escalating demand for housing and healthcare, coordinated thinking across both domains will promote fair and efficient allocation of resources across various geographic regions and socioeconomic groups. Outputs from the HHP model have the potential to aid this coordinated thinking.

1.3 HOUSING AND HEALTHCARE PLANNING MODEL

Healthcare demand is driven by socio-demographic factors such as age, sex and socioeconomic status (Wren et al., 2017). Similarly, housing developments invariably differ by their socio-demographic profile as well as their attributes, specifically their size, location and tenure composition. Therefore, the HHP model estimates healthcare demand according to underlying socio-demographic factors and the tenure composition of the developments. In particular, HHP model outputs are estimated at the tenure level for three different tenure types: homes occupied by homeowners ('owner' – owned outright or through a mortgage); homes that are privately rented ('private renters'); and homes occupied by renters receiving state support ('supported renters'). The model also produces results according to development size, which we relate to the geographic location of the development (rural/suburban/urban).

The model is parameterised using demographic information for each tenure type, including age and sex composition, household size and public healthcare coverage (medical card or GP visit card) status. The latter parameter, as demonstrated in the report, is vital to include to account for the central role played by medical cards and GP visit cards in improving accessibility and increasing healthcare utilisation in the Irish healthcare system. The majority of the model's demographic data are derived from the Survey on Income and Living Conditions (SILC).

This report produces demand and supply estimates for key primary care services, namely GP and PN care, as well as public acute hospital care services, including ED, day patient, elective inpatient and emergency inpatient care. These healthcare services were chosen owing to their central role in meeting healthcare needs across all age groups, and the information available on the supply of such services in Ireland. Future developments of the HHP model will endeavour to incorporate a wider range of healthcare services, as well as social care services designed to support specific subgroups such as older people and people living with a disability.

The HHP model is a cell-based macrosimulation model. This modelling approach was chosen as the analyses build upon the Hippocrates model of healthcare demand, supply and expenditure that was developed at the ESRI (Wren et al., 2017). Such models involve grouping individuals into strata – known as 'cells' – according to certain demographic characteristics. In the case of the HHP model, cells are grouped by age, sex and public healthcare coverage status. The benefit of this approach is that healthcare demand can be 'constructed' according to population demographics, such as age and sex. It thereby enables us to model demand across housing developments that vary by size and tenure composition. Additionally, while the Hippocrates model projects healthcare demand at a national or aggregated regional level, such as the HSE Health Regions (Keegan et al., 2020; Keegan et al., 2022), the HHP model is more localised in nature, examining the healthcare needs of populations in new residential developments.

This enables a higher degree of disaggregation of previously projected demand, workforce and capacity requirements. Furthermore, it provides planning authorities with a useful tool for gauging how their planning decisions will interact with the healthcare system at the local level.

Building on previous work (Humes et al., 2023), analyses in this report also examine the relationship between housing and health in Ireland. Housing and neighbourhood characteristics have been identified as key social determinants of health by the WHO. Despite housing and health being consistently highlighted as key concerns for the Irish population, there has to date been little coordinated planning in the delivery of these services. The report also explores the relationship between housing, health and healthcare coverage, and the nuances that exist as a result of a fragmented, two-tier healthcare system in Ireland. This analysis contributes new evidence to our limited existing knowledge base on these relationships. The results from our early analyses and Humes et al. (2023) are subsequently used to precisely parameterise the HHP model.

This report presents the first findings from the HHP model. Subsequent research employing the HHP model is expected to forecast future healthcare demands as residential developments and communities evolve, and as the demographic profile of residents shifts. Additionally, it is envisaged that future research using the model will examine the specific infrastructure requirements resulting from increased healthcare demand. Given that both housing and health policies are prone to change, the model has been constructed to accommodate this potential variability and enable the study of emerging policies in both the housing and health sectors.

1.4 RESEARCH OBJECTIVES

The overall objectives of the report are to:

- provide comprehensive estimates of the potential healthcare demand implications of new housing developments using benchmark examples;
- provide estimates of the healthcare workforce and capacity supply that may be required to meet increased demand;
- examine how tenure composition of developments, in the context of the HFA policy, impacts healthcare demand and supply;
- examine in greater detail the relationship that exists between housing, health and healthcare coverage in Ireland. In particular, the report aims to increase understanding of how two arms of the social welfare system (housing supports and medical cards/GP visit cards) are related and can indirectly impact healthcare demand; and
- finally, to develop a modelling framework that allows policymakers to analyse the impact of policy changes such as those outlined in Sláintecare and HFA on healthcare requirements, and inform future planning frameworks developed in Ireland.

1.5 STRUCTURE OF THE REPORT

Chapter 2 provides an overview of the Irish housing and healthcare systems. Chapter 3 outlines the relationship between housing, health and healthcare demand and supply. This chapter also provides detail on other jurisdictions that have implemented some degree of integration between housing and healthcare planning. Chapter 4 gives an overview of the HHP model, including its construction and data inputs. Chapters 5 and 6 present outputs from the HHP model, highlighting how variation in the size and tenure composition of new residential developments will have implications for healthcare need and supply in a given locality. Chapter 7 summarises the results and offers concluding remarks and reflections.

CHAPTER 2

Housing and healthcare in Ireland

2.1 INTRODUCTION

This chapter examines the housing and healthcare systems in Ireland, with a focus on their integration, or lack thereof, in the current planning landscape. The chapter provides a short overview of the housing and healthcare systems in place. It also discusses the relationship between health and housing in Ireland.

2.2 HOUSING IN IRELAND

2.2.1 Current challenges

The housing sector in Ireland faces a multitude of challenges, including in relation to affordability, quality and supply. In recent years, the country has experienced a housing crisis marked by a lack of affordable and suitable homes. While many factors underpin these issues, the root cause can be attributed to the growing population and changes in demographic profiles (Bergin and García-Rodríguez, 2020), which have led to a significant shortfall in the supply of affordable and suitable homes (Russell et al., 2021; Egan et al., 2022). The current level of new housing supply in Ireland is significantly below historical levels (Slaymaker et al., 2022). Policies are now focused on addressing the challenges of supply and affordability.

The challenges facing housing are also reflected in tenure composition changes. Recent years have seen changes in the tenure composition of households in Ireland. In 2000, only 18 per cent of households were rented (privately or supported), with 82 per cent of households being homeowner-occupied dwellings. However, in 2020, 29 per cent of households were rented (Doolan et al., 2022). This change in tenure composition has been further illustrated in Census 2022, where 66 per cent of households were found to be homeowner occupied.[1] This trend towards renting and away from homeownership is likely to continue for future generations (Slaymaker et al., 2022).

2.2.2 Housing governance

Governance of housing policy in Ireland is split between national and local levels. At the national level, the DHLGH is responsible for developing and implementing national policies and strategies related to housing and planning. It also plays a role

[1] See https://www.cso.ie/en/releasesandpublications/ep/p-cpsr/censusofpopulation2022-summaryresults/dwellingcharacteristics/#:~:text=Housing%20Tenure&text=The%20proportion%20of%20owner%2Doccupied,or%20loan%20increased%20by%2011%25.

in supporting sustainable development and the protection of the environment. The DHLGH oversees the planning system, including the development and implementation of the National Planning Framework (NPF) and the National Development Plan (NDP). Through these roles, the DHLGH supports the delivery of infrastructure projects and promotes sustainable urban and rural development. The DHLGH administers various housing-related schemes including the Housing Assistance Payment (HAP) and the Rebuilding Ireland Home Loan (O'Toole and Slaymaker, 2022). It is responsible for setting national housing standards, regulating the private rental sector and addressing homelessness through initiatives such as the Housing First programme.

At the local level, local authorities (i.e., county and city councils) are responsible for the delivery of housing within their own electoral boundaries. Across many state programmes, local authorities are empowered to take a more proactive approach to housing supply and planning. They also have some autonomy over income thresholds for statewide programmes like HAP. The growing recognition of the need for a more coordinated and integrated approach to housing policy has resulted in the establishment of bodies such as the Land Development Agency (LDA) and the Housing Agency. These are state bodies established to aid in the planning, coordination and delivery of housing in Ireland.

In the past, housing policy in Ireland was primarily focused on homeownership (Corrigan et al., 2019), with government supports for the construction of new homes and the provision of affordable mortgages. However, the increased shift towards private renting in Ireland (Slaymaker et al., 2022) has resulted in policies focused on increasing the supply of affordable housing, improving the quality and standards of rental accommodation and addressing homelessness. The Government has introduced a range of measures to support these objectives.

From a supply viewpoint, the LDA provides finance for housing developments and Local Housing Infrastructure Activation Funds to reduce construction costs. From an affordability aspect, the Help to Buy scheme and the Rebuilding Ireland Home Loan were introduced to support homeowners. Schemes such as the HAP support and the Rental Accommodation Scheme provide additional housing for state-supported tenants by contracting private rental accommodation and subsidising the rental payments, while Rent Pressure Zones seek to place a price ceiling on rental properties more generally by capping any rent increases at 2 per cent per annum. Finally, a dedicated programme to address homelessness in Ireland – Housing First – has been established to aid those whose access to housing is impeded by challenges they face in relation to their mental health, physical health, substance misuse, social or behavioural issues.

Despite these schemes, housing provision in Ireland remains a major policy challenge, with significant pressure on the rental market and many households

struggling to afford suitable accommodation. There also exist concerns about the quality (i.e., overcrowding) and standards of housing in some parts of the country, particularly in urban areas and in homes rented from local authorities (Grotti et al., 2018).

2.3 THE IRISH HEALTHCARE SYSTEM

The Irish healthcare system is characterised by a mixture of public and private healthcare coverage and funding. The two key stakeholders in the Irish health system are the Department of Health and the HSE. Public healthcare policy creation, development and implementation is overseen by the Department of Health. It provides oversight to public health bodies, monitoring their performance to ensure efficiency, cost effectiveness and quality of care. The Department of Health has developed increased oversight of the social determinants of health and provides public health information. In recent years, it has overseen broader policies that often integrate with housing and planning, including the Healthy Ireland framework and the Ageing in Place policy.

The HSE is funded by the Department of Health and administers and organises all publicly funded health and social care services. The HSE replaced the former regional health boards (established in the 1970 Health Act), and a number of reorganisations of the HSE have occurred since its establishment (Smith et al., 2019). In recent years, responsibility for the delivery of primary and community care services has fallen to local health offices (LHOs) and community healthcare organisations (CHOs). Further to this, seven regional Hospital Groups were established to organise and provide acute care services at a regional level. Further substantial changes to the HSE are planned following proposals outlined in the Sláintecare report. Greater autonomy is planned for local health policymakers in new HSE Health Regions, a change that will be important to consider when designing integrated housing and healthcare policy. PBRA, as discussed in Chapter 1, will be administered at the Health Region level.

2.3.1 Healthcare coverage

While Ireland does have a public healthcare system it does diverge somewhat from many other European countries in that the private sector also plays a significant role in the financing and delivery of healthcare (Connolly and Wren, 2019). As a result, a ‘two-tiered’ healthcare system has emerged, with separate streams of funding and governance.

Public healthcare coverage

Access to public healthcare is mainly based around the medical card scheme. Medical cards are issued by the HSE and entitle the holder and their immediate family to free healthcare services in primary care and community care (e.g., occupational therapy), and in acute public hospitals. In addition, medical cards

provide free access to dental, optical and aural services, as well as reduced prescription charges. Entitlement to a medical card is determined at the level of the family or household and is predominantly contingent upon an income means test administered at the household level. The income thresholds vary based on age, with households with the lowest income and those reliant on social welfare generally meeting the criteria for eligibility. For the majority of households, the means test permits deductions for expenses such as childcare and housing costs. However, households with a member aged 70+ are subject to an income means test based solely on gross income. A small percentage of individuals holding a medical card also qualify on a discretionary basis if they have a diagnosed chronic health condition or when their medical costs are deemed to be excessively financially burdensome. As of March 2024, 1.6 million individuals were medical cardholders, representing approximately 31 per cent of the population. A detailed breakdown of the scheme can be found elsewhere (Keane et al., 2021).

The HSE also issues GP visit cards, which entitle holders to free GP visits. Eligibility for a GP visit card is primarily based on a means test, with income thresholds set approximately 50 per cent higher than for a medical card. Eligibility for a GP visit card is established at the individual rather than the family/household level. In addition, all children aged under 8 years and adults aged over 70 years and are automatically entitled to a GP visit card (if they do not already possess a medical card). In March 2024, over 640,000 people held a GP visit card, approximately 14 per cent of the population.

In the case of a small number of public healthcare services, access to care is also dependent upon illness (e.g., the Long-Term Illness Scheme) or need (the Nursing Home Support Scheme, also known as the 'Fair Deal' Scheme).

Private healthcare coverage

The majority of the population without a medical card possess supplementary private health insurance (PHI). This coverage is a voluntary insurance-based system, with three major providers offering a range of PHI plans.[2] PHI typically entitles the holder to a range of benefits not available to those with public coverage, such as a private room in hospital or more rapid access to elective care.

Individuals purchase PHI for a number of reasons. All individuals without a medical card (or GP visit card in the case of general practice) must pay out-of-pocket for primary care, community care and some public acute hospital services such as ED attendances. PHI typically provides coverage for most, or in some cases all, of the cost of receiving this care. However, the ability to access elective and outpatient care in private hospitals (or as private patients in public hospitals) more quickly is

[2] There were over 320 individual PHI plans available in 2023; see https://www.hia.ie/sites/default/files/2023-10/final_annual-report_2022_english.pdf.

often seen as the largest determinant of PHI purchase (Kapur, 2020). Over 2.4 million people hold PHI, representing approximately 48 per cent of the population.[3] Approximately 8 per cent of the population hold 'dual' coverage (i.e., both PHI and a medical card/GP visit card). This 'dual' coverage is especially common amongst those aged 70 years and older (Walsh et al., 2021). Around one-fifth of the population have no medical card, GP visit card or PHI (i.e., no public or private health coverage). This proportion is especially high among younger adults, where over one-third do not possess public or private coverage (Walsh et al., 2021). While often younger and healthier than those with public healthcare coverage, for example, this group are exposed to increased out-of-pocket costs in the event of a healthcare cost shock.

2.3.2 Healthcare utilisation

There is clear evidence in Ireland and internationally (Nolan and Smith, 2012) that possession of public or PHI impacts healthcare utilisation. This has distinct implications for modelling healthcare demand in the HHP model. Table 2.1 presents GP and PN utilisation rates per annum by medical card and PHI status. It shows adults with a medical card/GP visit card visit a GP 6.1 times per year on average. This compares to only 2.6 visits among adults without a medical card/GP visit card. Similarly, medical card/GP visit card holders visit a PN three times as often (2.1 versus 0.7) as adults without public coverage. Contrastingly, PHI is not associated with higher rates of utilisation. Overall, adults without PHI have lower GP and PN visiting rates. This is largely explained by the large proportion of those without PHI having a medical card/GP visit card.

TABLE 3.1 LTRC BED CHANGES BY OWNERSHIP TYPE, FEBRUARY 2020–DECEMBER 2022

	GP visits per annum	PN visits per annum
Medical card/GP visit card		
Yes	6.1	2.1
No	2.6	0.7
PHI		
Yes	3.4	1.0
No	4.7	1.5

Source: Authors' calculations using the *HIS,* Waves 1, 2, 4 and 5.
Note: LTRC=Long-term residential care.

Some of the higher utilisation among medical card/GP visit card holders is in part due to cardholders having greater need for care. However, the lack of a co-payment for cardholders also increases utilisation. Research has found that gaining a medical card/GP visit card increases general practice care use (O'Callaghan et al., 2018; McDonnell et al., 2022), even after controlling for a range of patient-level

[3] See https://www.hia.ie/sites/default/files/2023-10/final_annual-report_2022_english.pdf.

factors, with receiving care for free identified as the most likely mechanism underpinning utilisation increases.

The mechanisms through which public and private healthcare coverage impact healthcare utilisation are likely to be multifaceted. However, an understanding of this relationship is still vital for parameterising the HHP, especially in the context of medical card coverage varying considerably across tenure type (Humes et al., 2023). Due to the lack of evidence of a similar effect of PHI, we do not include PHI as a parameter in the HHP model in this analysis.

2.3.3 Healthcare service provision

The provision and operation of healthcare in Ireland involves a mixture of public and private providers. Private providers (e.g., GPs) play a key role in providing publicly funded services.

Primary and community care

Primary care is generally the first point of contact for those seeking healthcare. Often, preventative and curative services provided in the primary care sector are sufficient to resolve the most common healthcare needs (Macinko et al., 2003; Tussing and Wren, 2006). Primary care in Ireland also acts as a gatekeeper between patients and more advanced specialist and hospital care. There is an increasing trend in most health systems towards moving care that is currently being provided in more specialised settings (such as hospitals) into primary care, in order to: improve health outcomes (Macinko et al., 2003; McElduff et al., 2004; Shi, 2012); reduce costs (Mark et al., 1996; Engström et al., 2001; Friedberg et al., 2010); and ensure equitable access to essential healthcare (Starfield et al., 2005). This trend is also occurring, albeit at a slow pace, in Ireland. Many recent policy changes, such as the expansion of free GP care, proposals for a new Statutory Home Support Scheme and the establishment of enhanced community care programmes, typify this trend. It is intended that by improving primary care provision, the strains placed on specialist and hospital care will be reduced.

At the core of primary care is general practice, which typically consists of GPs and PNs. However, care provided by public health nurses and community registered general nurses are also key aspects of primary care. Within this analyses, due to data limitations, the only primary care services examined are GPs and PNs.

Acute hospital care

The acute hospital sector in Ireland comprises publicly owned and voluntary-owned hospitals, which are classified as ‘public’ hospitals and privately-owned for-profit hospitals. The majority of acute hospital activity, especially emergency care (regardless of a patient’s PHI status), is provided across 29 acute public hospitals (Model 3 and Model 4 hospitals), each of which are equipped with a 24/7 ED. A

number of for-profit hospitals also operate in Ireland. These mainly provide non-emergency care and, in general, patients in private hospital patients are required to pay for their care entirely, with most people funding their care through PHI.

In this analysis, we examine the implications of new housing developments on acute public hospitals. The analyses cover the following four services:

- ED attendances;
- day patient admissions;
- elective inpatient admissions; and
- emergency inpatient admissions.

These four services are vital for healthcare in Ireland and together account for a third of the HSE budget (Keegan et al., 2020).

2.3.4 Sláintecare

Recommendations published in the Sláintecare report published in 2017 represent the largest shift in healthcare in Ireland in recent decades. The report aims to expand universal healthcare in Ireland, reorient the system towards primary and community care and bring about greater devolution of decision-making to local health policymakers.

A key component of the Sláintecare reform programme that has implications for the integration of housing and health planning is a return to regionalised decision-making and healthcare provision. It has been proposed that six new Health Regions be established (see Figure 2.2), with the proposals taking effect in February 2024. The regional executive boards will be individually responsible for the planning and delivery of integrated health and social care services in their region. It is intended that the establishment of these new regional bodies 'will result in clear financial and performance accountability, empower frontline staff and devolve authority from the HSE to the local regions' (Government of Ireland, 2019).

In the future, allocation of healthcare funding will be conducted at the Health Region level, with a shift towards a PBRA funding model. Under such a system, funding levels will be determined by regional demographic and health demand variations. While the HHP model does not estimate demand at the regional level,[4] it can be used to disentangle within-region variation in healthcare demand and supply requirements as a result of increased residential development.

[4] This function is performed by the ESRI's Hippocrates model, which can project demand, expenditure and capacity requirements at both the national and regional level.

CHAPTER 3

Integrating housing and healthcare planning

3.1 INTRODUCTION

This chapter discusses the relationship between housing and health in Ireland, and the potential to integrate housing development planning and healthcare planning at national and regional levels. The relationships between housing and healthcare identified in this chapter are used to inform the parameters included in the HHP model. Further detail on the link between housing and health outcomes both in Ireland and internationally can be found in a companion paper to this report (Humes et al., 2023).

3.2 IMPACT OF HOUSING ON HEALTH

The WHO lists 'housing, basic amenities and the environment' as key social determinants of health.[5] A body of evidence shows that the local environment where a person lives impacts health outcomes. One aspect of the local environment – housing conditions – has been found to impact health in some studies. The impact of housing on health is potentially more important within vulnerable populations, such as low-income households, children and people living with certain respiratory illnesses (Howden-Chapman et al., 2007; Grotti et al., 2018; Sharpe et al., 2019; Laurence et al., 2023). However, targeted policies designed to address housing affordability, security and quality can be useful tools to promote better health outcomes for all. The size of the direct link of housing on health and healthcare utilisation is more ambiguous compared to other factors such as socioeconomic conditions, crime and availability of local services. Furthermore, the relationship between health and housing may be bidirectional (Baker et al., 2014). On one hand, poor housing conditions (e.g., inadequate ventilation, overcrowding, exposure to pollutants, and lack of access to clean water and sanitation) (Howden-Chapman et al., 2007; Rolfe et al., 2020) and tenure precarity (Rohe et al., 2013; Munford et al., 2020) can directly and indirectly worsen health and wellbeing. On the other hand, poorer health can adversely affect the type of home someone lives in. Chronic illness or disability is associated with unemployment (Walsh and Doorley, 2022) and lower earnings, which may reduce the ability to purchase a home or pay higher rent for a higher-quality home. In more extreme cases, poorer health, particularly mental health, can increase the risk of homelessness or forcing individuals into substandard housing due to financial constraints (Baker et al., 2014). The literature examining the relationship between housing and health can be partitioned into three primary channels: the

[5] Discussed here: https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1.

physical condition of housing (housing quality); neighbourhood characteristics; and security of tenure.

3.2.1 The physical condition of housing (housing quality)

Poor quality housing, such as that which suffers from inadequate ventilation or dampness, has been linked to a range of physical health issues, including respiratory diseases and cardiovascular diseases, as well as poorer mental health problems and poor child development outcomes (Howden-Chapman et al., 2007; Rolfe et al., 2020). Inadequate ventilation can lead to the accumulation of pollutants and allergens, such as dust, mould and tobacco smoke, which can cause respiratory problems and allergies. Dampness and mould, which are often associated with poor quality housing, can trigger asthma attacks and respiratory infections. Furthermore, other factors such as overcrowding can result in poorer health by increasing the risk of infectious diseases and exacerbating existing health conditions (Howden-Chapman et al., 2007; Rolfe et al., 2020).

There exists a paucity of literature on the impact of housing on health in Ireland. Research from Ireland has revealed that factors such as overcrowding, inadequate housing and unstable tenure can have negative effects on both physical and mental health in children and young people (Laurence et al., 2023). These issues are especially prevalent among individuals in lower socioeconomic status groups (Grotti et al., 2018). Additionally, these groups are often concentrated in the private rental sector, where they face uncertain rental arrangements and rising rental expenses. Future results from an evaluation of a pilot initiative called Dublin's Warmth and Wellbeing Scheme, which provided deep energy efficiency improvements (e.g., wall insulation, loft insulation) to the homes of older people in Dublin suffering chronic health conditions, will also provide important evidence on the impact of energy efficiency improvements on wider health.

3.2.2 Neighbourhood characteristics

The characteristics of an individual's neighbourhood also have an important impact on their health. Longitudinal evidence from Finland has shown that neighbourhood characteristics such as education levels, income and employment rates, and improvements in these characteristics over time, were associated with reduced risk of all-cause mortality as well as lower levels of a range of health conditions (Kivimäki et al., 2021). In Ireland, there is evidence that neighbourhood-level environmental factors, such as exposure to radon (Dempsey et al., 2018a) and distance to blue (Dempsey et al., 2018c) or green (Dempsey et al., 2018b; Grilli et al., 2020) space, can have an impact on health outcomes.

3.2.3 Security of tenure

Housing affordability and security can also affect health outcomes.[6,7] Those whose home is owned by a member of their household are consistently shown to have a higher sense of security and self-esteem, less stress and anxiety, and better general mental and psychological wellbeing (Rohe et al., 2013). Policies to increase homeownership have also been shown increase overall health. In a study that exploited variation in house-purchase subsidies in the 'Right to Buy' scheme in England, a scheme that incentivised homeownership for former local authority renters, Munford et al. (2020) found that homeownership increases individuals' subjective health ratings and reduced the average number of reported health conditions by 0.65.

High housing costs, which can be linked to security, can lead to significant financial stress, which can negatively impact mental health. A longitudinal study in Australia and the UK found associations between unaffordable housing and poor mental health (Bentley et al., 2016). The health impacts of tenure insecurity are shown to be particularly pronounced for those in the least secure tenure category: the private rental market. Unstable and unpredictable housing arrangements, such as frequent moves or the threat of eviction, can cause stress and anxiety, which can lead to poor health outcomes (Desmond et al., 2015). However, anxieties around rent and mortgage payments (which may become more important in times of house price inflation or interest rate rises) have also been shown to negatively impact mental and physical health (Chung et al., 2020; Arundel et al., 2022).

3.3 HOUSING, HEALTH AND HEALTHCARE IN IRELAND

Previous research from this project (Humes et al., 2023) has examined the relationship between housing, health and healthcare coverage in detail. The most prescient results from that research show a clear relationship between tenure type and health. Figure 3.1 illustrates large differences in self-reported health across tenure type. Across all age groups, individuals in the supported renters group have the lowest rates of good or very good self-reported health.[8] By contrast, among individuals living in owner-occupied homes, much higher rates report being in good or very good health.

However, self-reported health is subjective. Thus, in Figure 3.2, results using an objective measure – rates of chronic illness – are shown. Once more, across all age groups, individuals in the supported renter group have the poorest health outcomes, reporting the highest rates of chronic illness. By contrast, individuals living in owner-occupied homes have the lowest rates of chronic illness. The data

6 Housing affordability refers to the extent to which households can afford to pay for their housing costs.
7 Housing security refers to the stability and predictability of housing arrangements.
8 Includes those who receive direct social housing provision by a local authority or non-profit approved housing body, or indirect provision in the form of rent supports distributed by the State, such as the HAP.

highlight a consistent relationship between health and tenure type. These results follow closely those found in the international literature (Digenis-Bury et al., 2008; Kandt et al., 2016).

FIGURE 3.1 PERCENTAGE OF INDIVIDUALS WITH GOOD OR VERY GOOD SELF-REPORTED HEALTH BY TENURE TYPE AND AGE GROUP, 2021 (AGED 18+)

Source: Humes et al. (2023)

FIGURE 3.2 PERCENTAGE OF INDIVIDUALS WITH A REPORTED CHRONIC ILLNESS OR CONDITION BY TENURE TYPE AND AGE GROUP, 2021 (AGED 18+)

Source: Humes et al. (2023)

The relationship between housing and healthcare in Ireland is shaped in part by the close association between these two issues and the social welfare system. As both supported housing and public healthcare coverage fall under this system, it

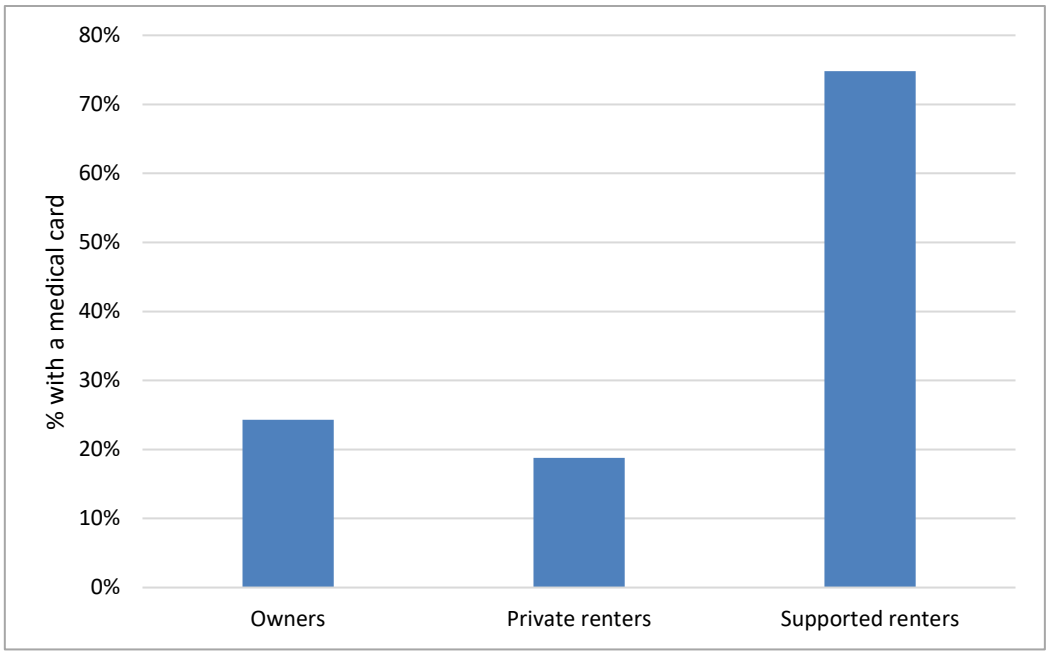
may be assumed that there is a degree of consistency across these areas. However, this is not always the case. Income thresholds for welfare benefits vary, and while housing assistance is managed locally by local authorities, policies concerning public healthcare coverage are determined at the national level by the HSE and the Department of Health. Consequently, disparities can emerge. For example, the income limits for social housing and HAP differ across local authorities, while the income threshold for medical cards remains constant across the country (though costs included in the means test may differ across regions). Households with low income in certain areas may qualify for housing support, but may not be eligible for a medical card due to the nationally fixed income threshold.

Given the complexities that often exist around access to public supports, a clearer understanding of the interplay between housing tenure and public healthcare coverage is crucial. The housing factors that impact poorer health outlined above disproportionately affect individuals and households with low to moderate incomes. Moreover, those who are currently in the private rental market, and who are more likely to belong to this income bracket, face additional challenges due to escalating rental costs and increased vulnerability to unexpected healthcare expenses. These challenges have significant implications for household disposable income and long-term health outcomes, particularly for welfare.

Figure 3.3 shows a clear relationship between medical card status and supported housing. Supported renters have by far the highest rates of medical card coverage at almost 75 per cent. These higher rates are likely due to a combination of factors, but mainly to supported renters having a lower household income and/or receiving all their income from social welfare,[9] compared to other tenure types. Private renters (19 per cent) and homeowners (24 per cent) have similar medical card rates.

9 Those who receive all of their income from social welfare automatically qualify for a medical card.

FIGURE 3.3 PERCENTAGE OF INDIVIDUALS WITH A MEDICAL CARD BY TENURE TYPE, 2007–2021 (AGED 18+)



Source: Humes et al. (2023)

This figure once more highlights the necessity of including medical card coverage (and GP visit card coverage for primary care) as a key parameter in the HHP model. Variation in public healthcare coverage across tenure types means that the tenure composition of a given new development will have a significant impact on the healthcare demand induced by that development.

3.4 HOUSING AND HEALTH PLANNING INTERNATIONALLY

In a number of other countries there have already been movements made towards greater coordination of planning for housing and healthcare services. The construction of new housing developments in many countries has begun to be more focused around the ethos of building 'healthy communities'. This includes, although is not limited to, the expansion of green spaces, reduction of pollution, facilitation of healthier modes of transport (i.e., walking and cycling) and greater integration with local health and social care systems. In this section, we provide some pertinent examples of efforts made in other jurisdictions to better tailor planning policy towards the goal of improving health outcomes and healthcare accessibility.

England has arguably been at the forefront of efforts to integrate housing and healthcare planning. Some of this may be due to the fact that a resource allocation mechanism has been in place in NHS England for a number of decades (Carr-Hill et al., 1994), aiding the ability to identify healthcare demands from new housing developments.

English policymakers have introduced the National Planning Policy Framework (NPPF) and the Planning Practice Guidance policy to better integrate health and wellbeing in development planning. The NPPF brought together planners with local NHS officials, public health professionals, and health and wellbeing bodies. To aid the understanding of these policies and foster integrated housing and healthcare planning, the NHS published *A guide to the healthcare system in England for local planning authorities (LPAs)*.[10] A core planning principle outlined in these policies was the necessity to account for local strategies to improve health and social and cultural wellbeing for local populations in addition to delivering sufficient supply to meet local needs.

The collaboration between local health authorities (known as integrated care systems in England) and NHS England was to provide information to local planning authorities on healthcare supply and infrastructure needs, particularly in terms of how these would need to develop to account for a growing population and changing demographics. Developing a similar 'guide' between national and local planning authorities and local and national health authorities in Ireland would provide significant benefits. To this end, the HHP modelling tool would be in a position to provide informed estimates of healthcare demand and supply requirements in a given local area. In recent years, NHS England has collaborated with property developers and local councils on the Healthy New Towns initiative to 'create healthier and connected communities with integrated and high-quality services'.[11]

In China, cities are being adapted and built around the goal of improvement of outcomes regarding social concerns such as health and healthcare accessibility (He et al., 2018). So-called low-carbon eco-cities are constructed with a view to achieve maximum integration of community amenities in residential areas, with all necessary services available within a 15-minute walk of every home (Weng et al., 2019). The idea of the 15-minute city has since been brought to life elsewhere, notably in Bogotá (Columbia), Paris (France) and Melbourne (Australia) (Pozoukidou and Chatziyiannaki, 2021).

In Australia and New Zealand (Rose et al. 2023) the focus has been on improving integrated models of care for older people, with a range of new developments being constructed that co-locate housing and healthcare facilities specifically catering to the needs of older inhabitants. In the Netherlands, policies seek to deal with the healthcare needs of an ageing population more systematically, while giving older people the autonomy for 'ageing in place'. Long-term care funding is available to fund not just traditional home support or residential care, but also to fully adapt a home to meet the needs of people with functional limitations, or

10 See https://www.england.nhs.uk/wp-content/uploads/2021/05/hbn08-addend1.pdf.

11 See https://www.england.nhs.uk/ourwork/innovation/healthy-new-towns/.

move to senior living complexes close to health and social care services (Bakx et al., 2023). There is now clear evidence that such ageing in place policies, particularly those that focus on allowing people live in more accessible homes, help slow reductions in physical health and reduce admission into nursing homes.

These integrated approaches to housing and healthcare planning in other countries offer models for pursuing a similar approach in Ireland. However, as has been discussed, the structural differences between housing and healthcare sectors internationally should be considered when attempting to supplant such models to the Irish context.

3.5 PLANNING FRAMEWORK IN IRELAND

The planning process in Ireland is governed by the Planning and Development Act 2000, which seeks to 'provide, in the interests of the common good, for proper planning and sustainable development'. Part III of that legislation is concerned with the provision and siting of services and facilities necessary for the community in planning, with hospitals and other healthcare facilities listed as central. The Act has most recently been amended by the Planning and Development (Amendment) Act 2018, which updates the legislation to account for new developments in planning ushered in by the introduction of the NPF, also known as Project Ireland 2040 and the NDP.

Project Ireland 2040 was launched in 2018 with the stated ambition of 'provid[ing] a comprehensive social, economic and cultural infrastructure for all our people to flourish, so that together we can build a better society'. The plan represents the first time that planning and investment have been explicitly linked in Ireland. Interlinking public planning and public investment has been a significant step forward in the development of policy, as it allows for much more considered strategic planning to be undertaken, maximising opportunities and quality of life for the Irish populace.

3.5.1 Government health policy and links to planning

Optimising home and community environments in order to ensure that all individuals can maximise their health and wellbeing is a crucial policy goal for any society. It is recognised that many of the key social determinants of health relate to the planning of the built and natural environments that people inhabit. As a result, it is increasingly clear that planning authorities have a central role to play in achieving this objective through ensuring that planning decisions constantly incorporate considerations for health and wellbeing.

Despite this, both in Ireland and internationally, there has often been a lack of coordinated planning around home and community development and the public health and healthcare needs of local populations. Instead, planning decisions are

often still driven largely by market forces, and tend to place a lesser focus on the importance of quality of life concerns, such as access to quality healthcare (Barton and Grant, 2011). While it is appreciated that a huge range of factors must be considered in the planning process, there is a case for making access to quality healthcare one of the forefront considerations.

Under the NPF and NDP, there are a number of planned investment projects that will contribute towards enhancement of population health, either directly or indirectly. In the recently published NDP 2021–2030, investment has been projected at €165 billion, with a particular focus on 'priority solutions to strengthen housing, climate ambitions, transport, healthcare, jobs growth in every region and economic renewal'. A projected €35 billion expenditure on transport projects specifically prioritises walking, cycling and public transport. This ties into ambitions for a healthier Ireland, in that it prioritises 'healthier' means of travelling and reduces potential pollution from private vehicle usage. Within the healthcare sector, the NDP sets out plans for a €5.7 billion investment in healthcare infrastructure up to 2025, with a particular focus on the development of primary care centres, community care and community nursing units.

An understanding of the operation of the healthcare system among local planning authorities is crucial to the achievement of National Strategic Outcome 10 of the NPF, which establishes the need for 'access to quality childcare, education and health services'. Indeed, when planning for the development of new residential areas, the health and wellbeing of residents should be at the forefront of considerations. Planning decisions ought to be taken such that they optimise quality of life among residents. One crucial channel through which this can be achieved is via the provision of high-quality, accessible healthcare. This also ties in neatly with the national policy objectives (NPO) outlined in the NPF, specifically NPO4, 'Proximity to acute, primary and long-term care'.

With the assistance of the HHP modelling tool, local planning authorities will have better evidence to inform their planning decisions, specifically in terms of how they interact with the local healthcare system. Such evidence is necessary for the planning process in order to ensure the creation and long-term sustainability of healthy communities.

CHAPTER 4

Housing and healthcare planning model and data

4.1 INTRODUCTION

This chapter introduces the HHP model methodology. We first offer a review of methodologies used to estimate healthcare demand and supply. Secondly, we provide a detailed discussion of the process of building the HHP model and the parameters used to populate the model. Thirdly, we outline the services included in the analyses and the data sources used for healthcare utilisation. Finally, we outline the profiles of three benchmark residential developments that form the basis of our results presentation.

4.2 MODELLING HEALTHCARE DEMAND AND SUPPLY

4.2.1 Review of healthcare modelling approaches

There are two main methodological approaches that can be adopted to simulate healthcare demand, at both the national as well as a more localised level: microsimulation models and macrosimulation models (also known as cell-based models). The key difference between the two is that microsimulation models use individuals or households as the primary unit of analysis, whereas cell-based models stratify individuals into specific groups ('cells') based on socio-demographic features.

Microsimulation models

Microsimulation models are generally used to simulate individual-level responses to policy change, either prior to policy implementation (Zucchelli et al., 2012), or as a means of conducting ex-post analysis of distributional impacts (Spielauer, 2007; Zucchelli et al., 2012). One notable example is the Population Health Model (POHEM) developed at Statistics Canada in the early 1990s (Hennessy et al., 2015), which has been used to model the healthcare demand and cost implications of various health policy interventions. More recently, a microsimulation model based on data from the Irish Longitudinal Study on Ageing (TILDA) has been used for projecting future healthcare service use among older people in Ireland (May et al., 2022).

As analysis is undertaken with individuals as the primary unit of analysis, healthcare microsimulation models are data-intensive and they require rich, highly granular and homogeneous data sources to inform projections (Astolfi et al., 2012). Development of these models tends to be complex and time-consuming, and their development is often impeded where data availability is constrained (Ringel et al.,

2010). This latter point is pertinent to the relatively limited health and social care landscape in Ireland.

Cell-based macrosimulation models

The most common approach to projecting healthcare demand involves cell-based macrosimulation models (Oderkirk et al., 2012). Their advantages over microsimulation models include the ease of development and implementation of cell-based models and the fact that they are significantly less data-intensive than microsimulation models (Matias et al., 2022). While cell-based models generally stratify the population by a small number of socio-demographic features (e.g., age and sex), they retain the flexibility required to disaggregate the population further if data availability allows, and also offer the ability to model a range of different scenarios (e.g., medical card coverage, changing policy frameworks, or different projections of population/healthcare utilisation), or to differentiate the population by healthcare coverage.

Cell-based model methodology has been used previously in Ireland to model the Irish healthcare system (Layte, 2009; Wren et al., 2017). The most sophisticated of these models, the Hippocrates model (Wren et al., 2017), is a cell-based macrosimulation model whose development was funded by the Department of Health. This model has been used to project healthcare demand, expenditure and workforce requirements at a national and regional level.

In their comparison of models examining healthcare demand, Matias et al. (2022) outlined that if the objective of researchers was to forecast or project healthcare demand (and expenditure), macrosimulation models are likely to provide the most accurate estimates. Therefore, the HHP model has been developed as a cell-based macrosimulation model owing to its relative simplicity and the heterogeneity in data quality across the Irish healthcare system. By aggregating individual observations to age-, sex- and public-healthcare-coverage-specific cells, we can achieve a strong degree of precision in demand estimates despite data availability issues.

4.2.2 HHP model construction

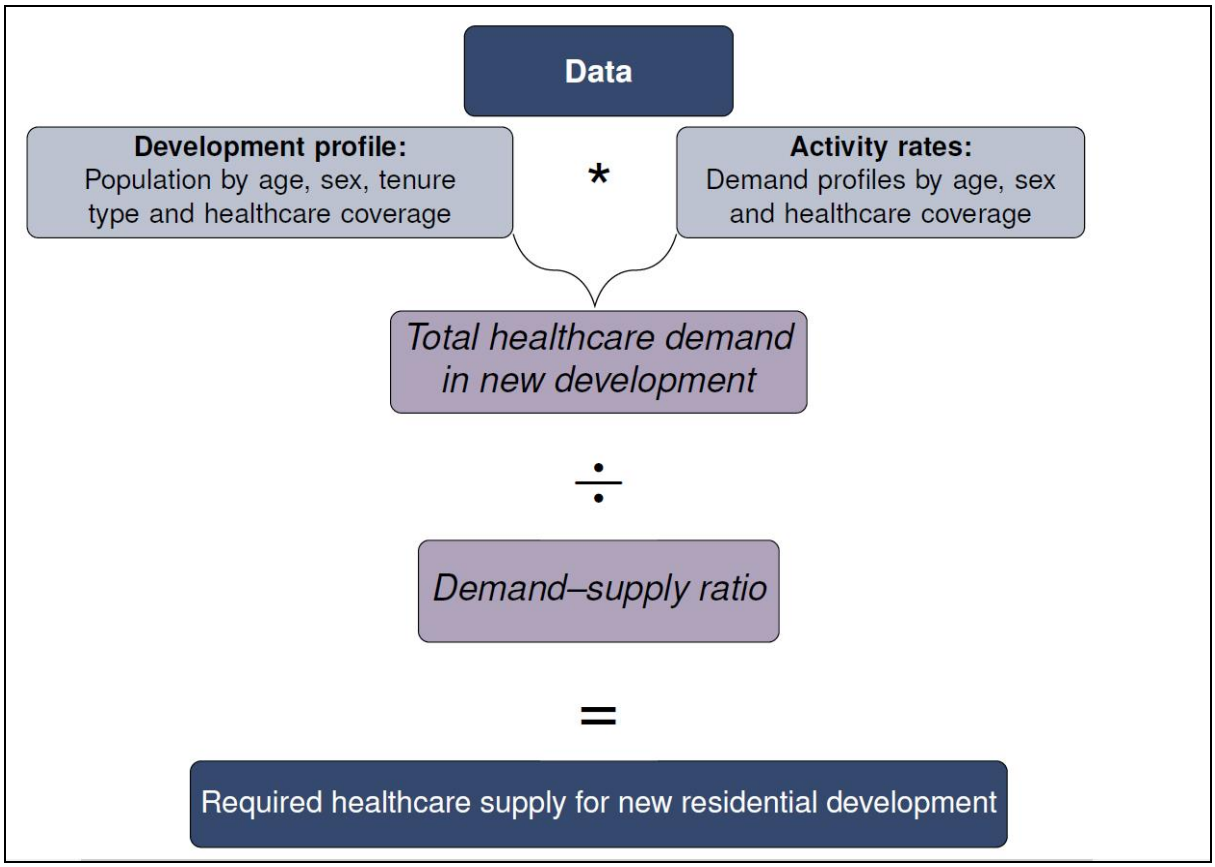
On the basis of the benefits outlined above, a macrosimulation modelling approach has been adopted for the HHP model, following a similar modelling approach used to construct the Hippocrates model. Additional parameters are included to allow for the HHP model to focus on residential developments, and account for development-level factors such as size and tenure composition, as well as demand–supply ratios. The cell-based architecture of the HHP model therefore is capable of aggregating healthcare demand profiles from age, sex and public healthcare coverage level to a benchmark (hypothetical) development level, and

subsequently translating that demand into commensurate healthcare supply metrics.

The model has the capabilities of incorporating a number of healthcare services. However, currently there is a lack of data on demand for many health and social care services, especially for services provided in the community and private healthcare (Walsh et al., 2021). Due to these data limitations, in this first report, using the HHP model, we focus on healthcare services provided in primary and acute care settings. The model is fully automated in the R programming language with subsidiary analyses undertaken in Stata and Excel.

The full application of the HHP model is illustrated in Figure 4.1. The model combines information on the socio-demographic profile of a given new development with the likely healthcare demand for that development. Healthcare demand (activity rates) is estimated by combining age-, sex- and public-healthcare-coverage-specific utilisation rates of each healthcare service included. Subsequently, a residential development's total healthcare demand is transformed into supply-side requirements. We discuss each of these elements below.

FIGURE 4.1 SIMPLIFIED DIAGRAMMATIC REPRESENTATION OF THE MODEL



Healthcare demand

Like other cell-based models of healthcare demand, the HHP model firstly estimates healthcare demand profiles for each demographic stratum included in

the analysis. We estimate national activity rates for each healthcare service, H, disaggregated by: age (a – where age may be single year of age or age group depending upon the granularity of the data); sex (s); and public healthcare coverage (e.g., medical card or GP visit card) status (p):

$$AR(H)_{a,s,p} = \frac{V(H)_{a,s,p}}{P_{a,s,p}}$$

where $V(H)_{a,s,p}$ is the volume of activity in the baseline year within each age, sex and public healthcare coverage cell, and $P_{a,s,p}$ is the corresponding population. This produces a matrix of activity rates for each service that is age, sex and public healthcare coverage status.

Next, we compute the specific population of the development being simulated within the model. In doing so, we first specify the development size (in terms of the number of houses) and, secondly, apportion the tenure composition to the development.

Tenure composition

Developments D differ by tenure composition. Let us represent the proportion of homeowners specified by the user to be *Own*, the proportion of private renters to be *PR* and the proportion of supported renters to be *SR*. The total size of the development is represented by D (e.g., 1,000 homes). Thus, $D * Own$ will give the number of owner-occupied homes, $D * PR$ the number of privately rented homes and $D * SR$ the number of social houses or houses rented with state supports, such that:

$$D = (D * Own) + (D * PR) + (D * SR)$$

Next, we construct an age, sex and public healthcare coverage status distribution for each tenure type. The population within each tenure type is calculated by multiplying the number of houses within that tenure group by the national average household size for that tenure type.[12] Thus:

$$P_{tn} = D_{tn} * \sigma_{tn}$$

[12] While average household size is treated as fixed within the model, it can ultimately be varied if desired. For example, if a development is intended for larger families (e.g., all homes have a larger number of bedrooms), the parameter values for household size could be adjusted. For the purpose of this report, we use national average household size for each tenure group.

whereby P_{tn} is the population of tenure type (tn), D_{tn} is the number of houses in the development of tenure type (tn) and σ_{tn} is the average household size of tenure type (tn).

We estimate the age, sex and public healthcare coverage distribution of the population within each tenure type tn using from SILC microdata:

$$P_{a,s,p,tn} = P_{tn} * \vartheta_{a,s,p}$$

where ϑ is the proportion of the population within each tenure type that corresponds to age (a), sex (s) and public healthcare coverage status (p). This creates a matrix of cells for each tenure type.

In the final step, we multiply the age, sex and public-healthcare-coverage-specific healthcare utilisation rates with their corresponding cells from the population matrices for each tenure type. Aggregate demand for healthcare service H within each tenure group will be given by:

$$Demand(H)_{tn} = \sum AR(H)_{a,s,p} * P_{a,s,p,tn}$$

where $Demand(H)_{tn}$ captures the use of a healthcare service (H), in a baseline year for age (a), sex (s) and public healthcare coverage status (p), within each tenure type. The metric used to describe this activity differs across service, with demand in primary care services being represented by visits per annum, demand for ED services represented by attendances and demand in day/inpatient services represented by bed days.

The resulting matrices will show the total healthcare demand for a given healthcare service, H, within the specific tenure group of the development being modelled. The model can subsequently aggregate the individual tenure-level demand figures to give the development-level demand (i.e., the demand for the entire population of the development). The HHP model also calculates more disaggregated demand profiles for specific demographic groups, such as children, older people and the combined group of renters (both supported and private market).

Healthcare supply

The final component of the HHP model within this report relates to healthcare workforce and capacity supply. This component is arguably the most challenging due to the lack of data on health and social care supply in Ireland. The model has been developed to allow for healthcare demand to be transformed into healthcare supply requirements. This transformation requires healthcare demand–supply ratios to be used to calculate our supply metrics. To calculate an appropriate supply metric, we divide the total development healthcare demand by a nationally

representative demand–supply ratio. In other words, in this analysis, demand–supply ratios are based upon current supply with the Irish healthcare system.

In the case of primary care services, we calculate whole-time equivalent (WTE) workforce requirements for GPs and PNs. WTE, as opposed to staffing numbers, is a more appropriate measure for workforce requirements. The WTE is a standardised metric for evaluating staff resources, taking into account variations in part-time and full-time work schedules (Keegan et al., 2022). The HSE national workforce reports, for example, use WTEs as their key workforce metric.[13]

In the case of acute public hospital care, we incorporate a different approach to modelling supply. While GPs and PNs work as generalists within a primary care setting, and treat patients with varied illnesses and complexities, more specialised care is performed in hospitals. Previous ESRI analyses have examined WTE workforce requirements in hospital at a national and regional level (Keegan et al., 2022). However, as workforce differs considerably across speciality such an approach is much more difficult to undertake at a sub-regional level (e.g., residential development level) due to the lack of data. Therefore, in this report, supply in acute public hospitals is based on day patient and inpatient beds and bed days. These supply metrics can be estimated directly from admissions and LOS, and have been used previously to estimate supply requirements in hospitals in Ireland (Keegan et al., 2019; Walsh and Brick, 2023).

The calculation of a WTE is derived by dividing the total hours an individual works within a given period by the normal working hours for that grade during the same timeframe. In general, overtime hours (i.e., those hours worked beyond the regular contracted hours), are not included in WTE calculations, which means a WTE value greater than one is not possible. The calculation of day and inpatient beds is derived by dividing the total beds days per annum by 365 days. In the case of day patient beds, in line with previous analyses (Keegan et al., 2019; Keegan et al., 2022), a LOS of 0.5 is assumed for all day patient admissions. The authors acknowledge that these are strong assumptions. Firstly, lower levels of supply may dampen demand for healthcare. While this is less of an issue in primary care, the acute public hospital system in particular is experiencing capacity constraints (Walsh and Brick, 2023), resulting in long waiting times for care (Brick and Keegan, 2020) and long waiting times in EDs. Secondly, it is difficult to determine appropriate supply requirements to provide care. In general, there is little information on 'safe staffing' levels. Thirdly, even if appropriate *demand–supply* ratios are outlined, data limitations often prevent access to information required to estimate this ratio.

13 See https://www.hse.ie/eng/staff/resources/our-workforce/workforce-reporting/employment-reports.html.

4.3 DATA AND SOURCES

Data for the HHP model are derived from a variety of sources. Both survey-based and administrative data collated at the national level are used. In essence, the model requires two streams of data from which to compute development-specific demand estimates: data on the socio-demographic composition of a given new development; and rates of healthcare utilisation disaggregated by age, sex and public healthcare coverage. We rely on estimates from previous literature when deriving our demand–supply ratios.

4.3.1 Development profile data

The majority of the HHP model's socio-demographic data required for the development profiles are derived from the SILC dataset and are used to inform certain parameter values within the model. SILC is an important household survey for Ireland with both cross-sectional and longitudinal samples. The latest SILC (2021) data for Ireland available at the time of the analysis are used to estimate the demographic composition of a given new development in terms of total population size, age distribution, gender split and medical card/GP visit card coverage rates.

Household size

The population size of the residential developments will be sensitive to changes in the tenure composition of that development. Therefore, the HHP model estimates household size separately for each tenure type. SILC 2021 estimates the average household size for each tenure type. Table 4.1 shows that the national average household size for Ireland is approximately 2.6 people, though there exists some degree of variation between tenure types. On average, owner-occupied households are the largest (2.65 residents), whereas private rental households are smallest (2.43 residents), with supported renter households having on average 2.57 residents.

It is important to note that future projections using the HHP model may include smaller household sizes, given the decline in household size over the past number of decades.[14] New housing developments may comprise houses that are intended for smaller or larger household units; as a sensitivity analysis we also model scenarios in which average household size in each tenure type is smaller or larger. Future outputs from the HHP model will incorporate changes in the demographic structure of a residential development over time, with changes in headship rates included in a scenario analysis.

[14] Evidence from Ireland points to average household size decreasing over time as growth in the housing stock outpaces growth in population (Conefrey and Staunton, 2019).

TABLE 4.1 AVERAGE HOUSEHOLD SIZE BY TENURE TYPE (2021)

Tenure type	Average household
Owners	2.65
Private renters	2.43
Supported renters	2.57
National	**2.60**

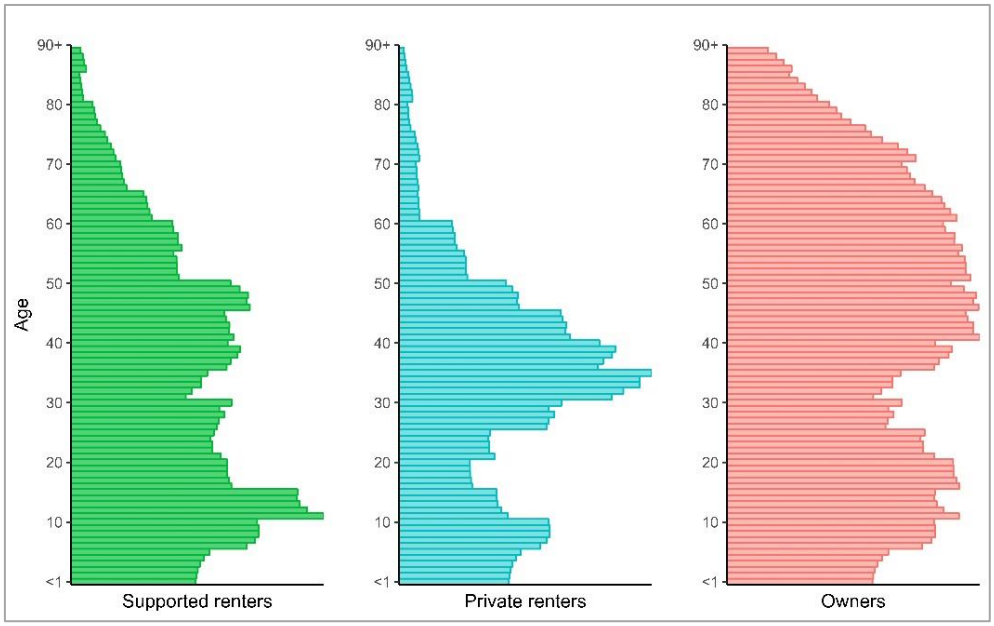
Age and sex distribution

Both age and sex are key determinants of healthcare demand. The distribution of the population by age in particular differs between tenure types, resulting in knock-on impacts for healthcare demand rates given that healthcare demand is typically positively correlated with age. Therefore, the HHP model includes the age and sex composition of households separately for each tenure type.

Data from SILC allow us to estimate the age distribution of each tenure type. Figure 4.2 shows that owner-occupied households are on average older than private or supported renter households. A large percentage of private renters are in the 25–45 year age group, with percentages tapering off at older ages as people transition into homeownership. In the supported renters group, the largest cohort consists of children. However, there is a greater percentage of older people in the supported renters group as compared to the private rental market. The implications of the age distribution by tenure type are borne out in the HHP model outputs. In general, residential developments comprising a greater degree of owner-occupied households will be older on average, whereas if the development were to be comprised primarily of private renter households then the inhabitants would typically be younger.

The HHP model further partitions age by sex for each tenure type. Table 4.2 illustrates the differences in percentage across each tenure type that are male and female by age for ease of interpretation. Some important differences are observed. In general, among the older age groups, females tend to outnumber men due to lower female mortality. There is little variation by gender in terms of the percentage of those living in owner-occupied homes. However, a greater percentage of older (65+) private renters are male (69 per cent) and a greater percentage of younger adult (25-49) private renters are female (56 per cent).

FIGURE 4.2 AGE DISTRIBUTION OF POPULATION BY TENURE TYPE



Source: Authors' calculations using SILC 2021 data.

TABLE 4.2 GENDER BREAKDOWN BY TENURE TYPE AND AGE

	Male	Female
0–14 years		
Supported renters	52%	48%
Private renters	54%	46%
Owners	51%	49%
15–24 years		
Supported renters	57%	43%
Private renters	45%	55%
Owners	50%	50%
25–49 years		
Supported renters	45%	55%
Private renters	44%	56%
Owners	51%	49%
50–64 years		
Supported renters	47%	53%
Private renters	57%	43%
Owners	49%	51%
65+ years		
Supported renters	41%	59%
Private renters	69%	31%
Owners	47%	53%

Source: Authors' calculations using SILC 2021 data.

Public healthcare coverage

Due to the crucial importance of public healthcare coverage to healthcare demand in Ireland (Ma and Nolan, 2017; Humes et al., 2023), the HHP model includes average medical card and GP visit card coverage rates disaggregated by age, sex

and tenure type. Table 4.3 presents average medical card coverage rates using data from SILC 2021.[15] These results are discussed in greater detail in Humes et al. (2023), but overall it is clear that there is important variation in medical card coverage rates across tenure type and age groups, as well as between males and females.

TABLE 4.4 MEDICAL CARD COVERAGE BY AGE, SEX AND TENURE TYPE

	Supported renters	Private renters	Owners
0–14 years			
Male	52%	67%	19%
Female	55%	63%	15%
15–24 years			
Male	67%	37%	12%
Female	66%	35%	14%
25–49 years			
Male	59%	25%	6%
Female	71%	43%	10%
50–64 years			
Male	82%	57%	14%
Female	92%	68%	19%
65+ years			
Male	99%	84%	40%
Female	97%	82%	52%

Source: Authors' calculations using SILC 2021 data.

4.3.2 Healthcare utilisation data

Data on healthcare demand and utilisation were accessed via a number of different survey-based and administrative datasets. Each of datasets allowed for utilisation rates to be estimated by age, sex and medical card/GP visit card status. No information on tenure status was available; however, using the cell-based macrosimulation and information in SILC (see previous section), it is possible to aggregate to tenure-specific utilisation rates.

Covid-19 had a substantial impact on healthcare services in Ireland. To some extent, demand for and supply of services became distorted. For example, Brick et al. (2020) showed that the use of ED services at the beginning of the pandemic reduced substantially during the pandemic. Therefore, in this report, the most recent healthcare utilisation data we have employed come from 2019.

[15] Rates are included at five-year age group level in the model, but presented for more aggregated age groups in Table 4.4 for ease of interpretation.

General practitioner and practice nurse activity rate data

Data on annual visits to GPs and PNs are taken from the Healthy Ireland Survey (HIS) – Waves 1, 2, 4 and 5.[16] The HIS is a large nationally representative face-to-face survey of individuals aged 15 years and over. It captures information on health, healthcare utilisation and healthcare coverage. Some waves of the survey included questions on the use of GP and PN services. Responses to these questions were used to estimate utilisation profiles for the HHP model.

Emergency department attendance activity rate data

Data on annual attendances to EDs in public hospitals in Ireland are taken from the Patient Experience Time (PET) dataset for 2019. PET is an administrative dataset managed by the HSE Business Information Unit. This dataset captures records for all ED attendances across the 29 Model 3 and Model 4 EDs operating in public acute hospitals. The data capture some simple demographic information including the age and sex of attendees, allowing us to examine age and sex in the analysis.

PET does not capture information on the medical card status of ED attendees. Therefore, the HIS data were used to supplement this analysis. Within the HIS, respondents were asked about their use of EDs in the previous 12 months. We estimated average ED visits by medical card status by age and sex and apportioned these rates onto the PET age and sex utilisation profiles. This provided us with an estimated ED rate across medical card status.

Day patient and inpatient activity rate data

Data on annual day patient admissions and elective and emergency inpatient admissions and length of stay are taken from the Hospital In-Patient Enquiry (HIPE) dataset for 2019. HIPE is an administrative dataset managed by the HSE Healthcare Pricing Office (HPO). Its data capture records for all admissions into public acute hospitals. The HIPE data also include a range of information on the socio-demographic profile of patients, including age, sex and medical card status, as well as information on the care provided to patients when in hospital.

- **Day patient**: A patient who is admitted to hospital on a scheduled/elective basis for care that does not require an overnight stay. Therefore, these patients' length of stay (LOS) is less than one. Day patient care is provided within a day ward.
- **Elective inpatient:** A patient who is admitted to hospital on a scheduled/elective basis for care that requires at least one overnight stay. Elective inpatient stays are measured through LOS, which is the number of days between the admission date and discharge date and is also commonly referred

[16] The HIS was conducted on the following dates: Wave 1, November 2014–August 2015; Wave 2, September 2015–May 2016; Wave 3, September 2016–June 2017; Wave 4, September 2017–June 2018; Wave 5, September 2018-September 2019.

to as a patient's 'bed days' (i.e., the amount of time they occupied a bed). Elective inpatient care is provided within an inpatient ward.

- **Emergency inpatient:** A patient who is admitted to hospital on an unscheduled/emergency basis for care that requires at least one overnight stay in hospital. Most emergency inpatients are admitted via the ED; however they may also be admitted via an Acute Medical Assessment Unit or an Acute Surgical Assessment Unit. Emergency inpatient stays are also measured through LOS or bed days. Emergency inpatient care is provided within an inpatient ward.

Using information from HIPE, we estimate the profiles of acute public hospital day patients, elective inpatients and emergency inpatients in terms of age, sex and medical card status.

4.3.3 Healthcare supply data

In order to transform healthcare demand into supply requirements, information was required on demand–supply ratios. A review of the literature was undertaken to identify studies that captured information on both supply and demand. Different methodology was used across primary and acute hospital care services.

Primary care

For GP and PN care, the HHP model requires information on visits per WTE per annum. No national dataset currently exists that captures the total number of GP and PN visits in Ireland annually. Furthermore, there is significant debate regarding the number of GP and PN WTEs. The Irish College of General Practitioners (ICGP) has stated that in 2022 there were 4,187 GPs practicing in Ireland, which translated into 2,807 GP WTEs (ICGP, 2022). By comparison, as of March 2023, the Primary Care Reimbursement Scheme reports that the HSE holds contracts with 3,100 GPs. While this latter estimate discounts the small number of GPs who may operate entirely privately financed practices, the variation between the numbers raises some concerns over using either source. Therefore, for this report we used information captured in a survey of ICGP-registered GPs, which was conducted by Collins and Homeniuk (2021).

Collins and Homeniuk's (2021) survey took place in February 2020 (notably, before the onset of the Covid-19 pandemic). It targeted all GPs who were members of the ICGP. The survey solicited responses on the volume of GP and PN visits recorded on the previous day in the respondent's practice. In addition, information was gathered on the WTE staff levels of GPs and PNs who delivered these services. Out of the total membership, 507 general practices engaged in the study by providing the requested information. Findings from the survey found that, on average, a GP completed 29 GP visits (or consultations) per working day. Using information on WTE and an estimate that GPs have 253 working days per annum, this equates to 7,337 GP visits per 1 GP WTE per annum.

A similar process was used to estimate PN visits per annum. The 510.3 PN WTEs included in the study completed 13,161 PN visits per annum, or 26 visits each per working day on average. Using information on WTE, and an estimate that PNs have 253 working days per annum, this equates to 6,587 PN visits per 1 PN WTE per annum. These demand–supply ratios are used in the HHP model to transform GP and PN demand estimates from new residential developments into workforce requirements.

The authors also extrapolated their findings to a national level and estimated there were over 21.35 million GP visits and 7.75 million PN visits annually. This annual estimate of GP and PN visits is consistent with recent estimates using the HIS (Walsh et al., 2021; Connolly et al., 2023).

Acute hospital care

In our acute hospital care analyses, we do not transform demand into workforce requirements. Care provided in hospitals varies significantly across patients and the type of workforce used is more specialised. Moreover, workforce WTEs have changed considerably within the HSE and acute public hospitals in recent years in terms of levels and skill mix (Fleming et al., 2022). Therefore, we transform acute hospital care demand into capacity (i.e., hospital beds).

For day patient care, we assume that care provided to a day patient uses 0.5 day ward beds (i.e., each day ward bed is used twice per data). This assumption follows the approach taken in previous ESRI research (Keegan et al., 2022) and reflects the approach applied by the HPO to day patient care. Therefore in the HHP model, a 2:1 day-patient-to-bed ratio is included. For elective and emergency inpatient care, we use LOS as a measure of bed days, in line with Keegan et al. (2022) and the approach applied by the HPO to inpatient care. In the HHP model, a 1:1 inpatient-to-bed ratio is included. For ED care, as no equivalent supply or capacity measure exists, attendances are used in the analyses.

TABLE 4.4 DEMAND–SUPPLY RATIOS EMPLOYED IN THE HHP MODEL

Service	Demand/supply ratio	Source
GP	7,337 visits per WTE	Collins and Homeniuk, 2021
PN	6,587 visits per WTE	Collins and Homeniuk, 2021
Emergency department	Cell-specific average attendances	PET 2019 data
Day patient	0.5 bed days per admission	HIPE 2019 data
Elective inpatient	Cell-specific average LOS	HIPE 2019 data
Emergency inpatient	Cell-specific average LOS	HIPE 2019 data

Source: Estimates of visits per WTE assume a standard 253 working days per year.

4.4 DATA AND SOURCES

The HHP model allows us to produce estimates for particular developments or sets of developments – e.g., Strategic Development Zones or Local Area Plans – but we

do not undertake such analyses in this report. While this approach can be used in future outputs using the HHP model,[17] in this analyses results are presented using example, or benchmark developments. Housing developments differ according to a range of attributes, most notably location, size, housing type composition and tenure type composition. Therefore, to illustrate HHP model outputs, we have defined three different development types that differ according to tenure composition. These benchmarks show the capabilities of the HHP model and are closely aligned to the DHLGH's HFA policy. These different development types allow us to illustrate the tenure composition dynamics of the HHP model, as we vary the proportions of each tenure type in a hypothetical new development and assess the resultant healthcare demand and supply differences. We present three different benchmark developments: HFA development; public housing development; and private market housing development.

(a) HFA development

The HFA development type follows the proposed HFA composition. In this development type, 50 per cent of homes are assumed to be owner occupied, 20 per cent are part of the private rental sector and the remaining 30 per cent of homes are occupied by supported renters.[18]

(b) Public housing development

The 'public housing' development type emphasises social housing and supported renters. In this sense, it follows the proposed public housing schemes. In this development type, 10 per cent of homes are assumed to be owner occupied, 10 per cent form part of the private rental sector and the remaining 80 per cent of homes are occupied by supported renters.

(c) Private market housing development

The 'private housing' development type emphasises the private rental and owner occupier tenure types. In this development type, 50 per cent of homes are assumed to be owner occupied, 40 per cent are part of the private rental sector and the remaining 10 per cent of homes are occupied by supported renters.

Development size is kept fixed at 1,000 units across benchmarks to retain comparability. We do not try to model housing size (i.e., number of bedrooms, number of people living in the household) in these chapters, as this will vary across

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17 Future developments of the HHP model will endeavour to include a wider range of development characteristics, such as composition of housing type (i.e., houses vs apartments).

18 This composition is based on a projected supply of 33,000 homes per year, as outlined by DHLGH's Housing Need and Demand Assessment (HDNA) model, comprising 11,800 new private ownership homes, 6,500 private rental homes, 4,100 affordable homes and 10,300 social housing homes. For the purpose of this analysis, we combine private ownership homes and affordable homes into the 'owners' tenure category.

developments. Instead, the average household size for each tenure type follows the average household size estimated in SILC 2021.

The benchmarks are all mixed-tenure in composition, with variations in which tenure type is the largest. This is in line with current government policy, with the recent HFA plan committing to 'continuing the policy of having mixed-tenure communities … to ensure that social and affordable housing are part of the mix across housing developments'. Table 4.5 presents the specific tenure compositions of each of our three benchmark scenarios.

The changes in tenure composition illustrate the various dynamics at play within the model. Generally speaking, developments that contain a younger demographic (for example, developments with a lot of private market renters) will require less healthcare. However, counterbalancing this, developments with a high degree of public healthcare coverage – particularly those comprised primarily of supported renters – will require more healthcare services on average due to greater accessibility and the high correlation between public healthcare coverage and poorer health outcomes. The HHP model takes all of these factors into account to calculate the most precise estimates of healthcare utilisation.

TABLE 4.5 TENURE COMPOSITIONS IN REPORT'S BENCHMARK DEVELOPMENTS

BENCHMARK	Supported renters	Private renters	Owners
(a) HFA	30%	20%	50%
(b) Public housing	80%	10%	10%
(c) Private housing	10%	40%	50%

CHAPTER 5

Results: Demographic profiles of healthcare utilisation

5.1 INTRODUCTION

This chapter presents findings for primary – GP and public nurse (PN) – and acute public hospital healthcare utilisation across the key activity parameters included in the HHP model: age, sex and public health insurance (PHI) status. It also presents healthcare utilisation across our three tenure groups. Results from this chapter are used to inform development-level demand and supply estimates presented in Chapter 6.

5.2 PRIMARY CARE UTILISATION

Table 5.1 presents average GP and PN visits per annum across sex, age and medical card/GP visit card status using data from the HIS. Overall, the average GP and PN visits per annum are 4.1 and 1.3, respectively, for the entire population. For adults (18+), utilisation rates are slightly higher at 4.5 and 1.4, respectively. Results are similar to previous evidence (Walsh et al., 2021) using the HIS and compare favourably to calculations based on recent administrative data from GP practices in Collins and Homeniuk (2021).[19]

TABLE 5.1 AVERAGE ANNUAL GP AND PN VISIT RATES

	GP visits/annum	PN visits/annum
Population		
Total	4.1	1.3
Excl. children	4.5	1.4
Gender		
Male	3.5	1.1
Female	4.8	1.5
Age bracket		
0–14 years	3.3	0.7
15–24 years	2.9	0.7
25–49 years	3.5	0.9
50–64 years	4.6	1.5
65+ years	6.8	2.5
Medical card/GP visit card		
Yes	6.1	2.1
No	2.6	0.7

Source: Authors' calculations using the HIS, Waves 1, 2, 4 and 5.

GP and PN utilisation rates are on average higher among females than among males. GP and PN visits tend to increase with age and are highest in the oldest age group. Individuals aged 65+ report 6.8 GP and 2.5 PN visits per annum on average.

[19] The authors estimate that the average Irish person consults a GP 4.3 times per year and a PN 1.6 times per year, based on data from a survey of GPs conducted in February 2020.

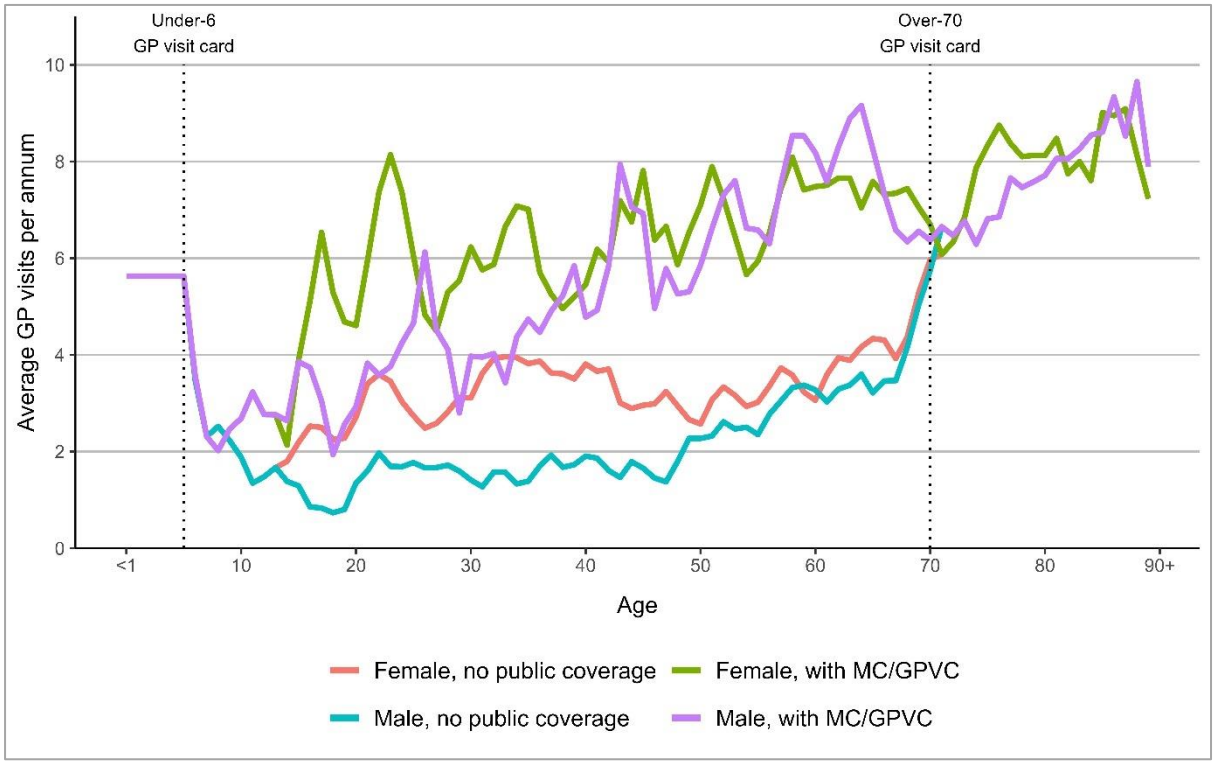
Young adults (15–24 years) utilise GP services least frequently, with rates of 2.9 and 0.7 visits to GPs and PNs respectively. Large differences in visiting rates across public healthcare coverage (medical card/GP visit card) status are also evident. Individuals with a medical card/GP visit card report 6.1 GP visits per annum, compared to 2.6 visits among those without a card. The difference is similarly pronounced for PN visits: individuals with a medical card/GP visit card report 2.5 PN visits per annum, compared to 0.7 visits among those without public healthcare coverage.

Figures 5.1 and 5.2 present average visiting rates per annum across ages for males and females with and without a medical card/GP visit card. In this analysis, for both GP and PN visits, we assume all those under six years[20] and all those over 70 years have access to a GP visit card (if not in possession of a medical card) and therefore the average number of GP and PN visits in these groups corresponds to rates among medical card/GP visit card holders.

In general, GP and PN visiting rates increase across age for males and females and for those with and without a medical card/GP visit card. For some age groups, particularly younger adults, females tend to have higher utilisation rates than males. No differences are observed among children. However, there is some variation in GP visits between males and females at older ages, and we therefore include separate male and female visitation rates among those aged 70 years and older.

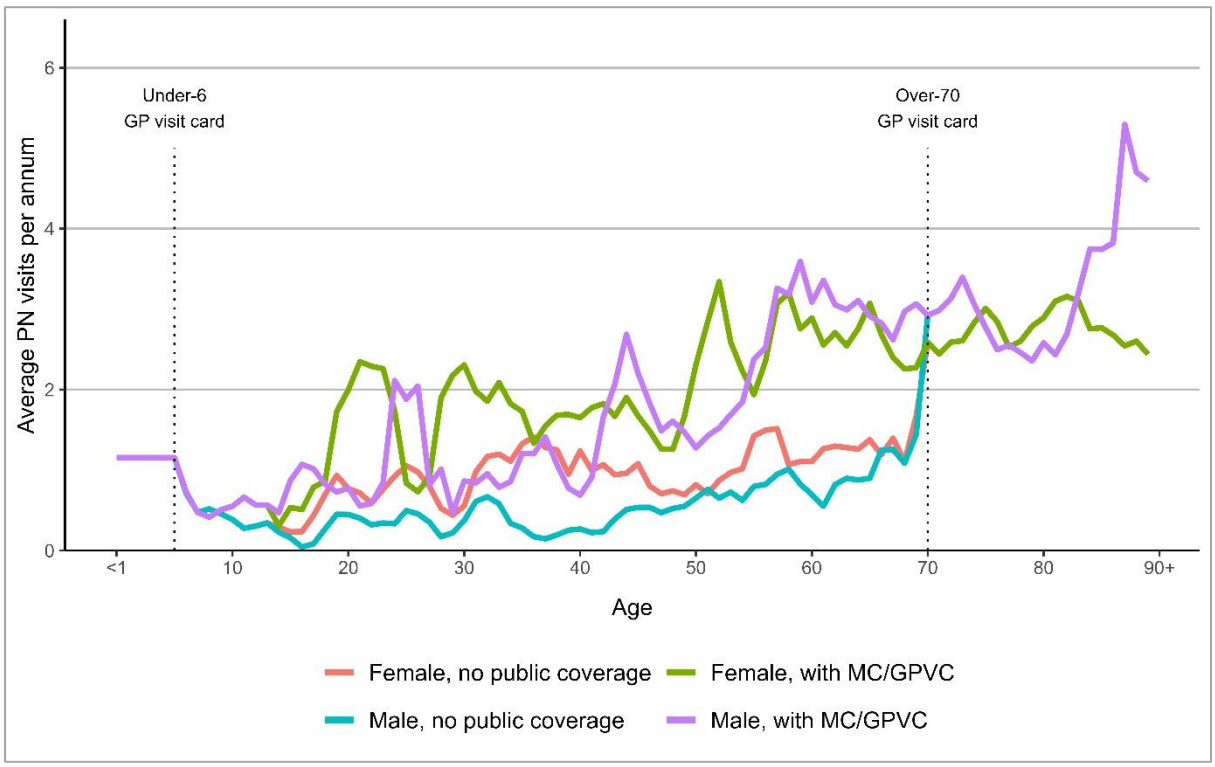
[20] In 2019, the time period covered by data in this report, all under sixes were entitled to free GP and PN care via a GP visit card. Since August 2023, entitlement to GP visit cards has been expanded to all under eights. See https://www.gov.ie/en/press-release/1b13e-minister-for-health-encourages-families-to-register-for-free-gp-care-for-children-aged-6-and-7/.

FIGURE 5.1 AVERAGE GP VISITS PER ANNUM BY AGE, SEX AND PUBLIC HEALTHCARE COVERAGE



Source: Authors' calculations using the HIS, Waves 1, 2, 4 and 5.

FIGURE 5.2 AVERAGE PN VISITS PER ANNUM BY AGE, SEX AND PUBLIC HEALTHCARE COVERAGE



Source: Authors' calculations using the HIS, Waves 1, 2, 4 and 5.

5.3 ACUTE PUBLIC HOSPITAL CARE UTILISATION

Table 5.2 presents annual admission rates for day patient and inpatient care (partitioned by elective and emergency) in acute public hospitals, as well as average annual attendance rates at public hospital EDs. Utilisation rates are disaggregated by age, sex and medical card status. Acute public hospital care utilisation differs considerably across demographic group, while utilisation rate differences are also observed across each service examined.

For ED care, there are 0.36 attendances per population per annum. Males report slightly higher numbers of attendances compared to females (0.37 vs 0.34). While ED attendance rates are similar across the age groups of 0–14 years and 50–64 years, they increase substantially at older ages. Medical cardholders have slightly higher ED attendance rates.

For day patient care, males have higher admission rates than females (0.46 vs 0.35 admissions per annum). Admission rates increase significantly with age, with day patient admission rates among the oldest age group (65+) being over 10 times higher than that for young adults. Medical cardholders also report higher admission rates than non-medical cardholders (0.44 vs 0.37).[21]

Elective inpatient admission rates are much lower than for other public acute hospital services. This is a feature of the composition of elective care, the long waiting lists that exist in Ireland and the high level of elective care that occurs in private hospitals. The largest differences in elective inpatient care is seen across age groups, with the 65+ age group showing the highest rates of utilisation.

The emergency inpatient utilisation profile is similar to that seen for ED attendances, which follows logically from the fact the emergency inpatients are generally admitted from an ED. Males report slightly higher utilisation compared to females (0.19 vs 0.15). There are substantial increases across age, with the oldest age group (65+) having admission rates over seven times higher than that for younger adults. Medical cardholders report much higher admission rates compared to non-Medical cardholders (0.20 vs 0.14).

[21] This result is in part driven by the fact that many people without a medical card, and who hold PHI, receive day patient care within private hospitals (Keegan et al., 2020).

TABLE 5.2 AVERAGE ANNUAL ACUTE PUBLIC HOSPITAL UTILISATION RATES

	ED attendances	Day patient admissions	Elective inpatient admissions	Emergency inpatient admissions
Population				
Total	0.36	0.41	0.03	0.17
Excl. children	0.37	0.50	0.04	0.20
Gender				
Male	0.37	0.46	0.04	0.19
Female	0.34	0.35	0.03	0.15
Age Bracket				
0–14 years	0.30	0.04	0.01	0.06
15–24 years	0.28	0.08	0.01	0.06
25–49 years	0.27	0.16	0.01	0.07
50–64 years	0.25	0.36	0.02	0.11
65+ years	0.56	1.01	0.08	0.41
Medical card				
Yes	0.37	0.44	0.04	0.20
No	0.34	0.37	0.03	0.14

Source: Authors' calculations using PET 2019, HIPE 2019.

Within inpatient services, for the purpose of this research, it is important to also report LOS in hospital. This provides us with a more meaningful capacity metric that can be converted into inpatient bed days, the key supply metric in inpatient care in this analysis. Table 5.3 presents average LOS across age, sex and medical card status for elective and emergency inpatient admissions separately. Average LOS for elective inpatient admissions is longer than for emergency inpatient admissions (5.66 vs 4.63). Average LOS was slightly higher for males compared to females. Similar to results in Table 5.2, utilisation (average LOS), increases with age and is higher among those with a medical card.

TABLE 5.3 AVERAGE INPATIENT LENGTH OF STAY PER ADMISSION

	Elective inpatient LOS	Emergency inpatient LOS
Population		
Total	5.66	4.63
Excl. children	6.07	5.08
Gender		
Male	5.86	4.81
Female	5.45	4.45
Age bracket		
0–14 years	4.12	2.89
15–24 years	3.30	2.43
25–49 years	4.44	3.20
50–64 years	5.28	4.66
65+ years	8.83	7.85
Medical card		
Yes	5.82	4.91
No	5.49	4.35

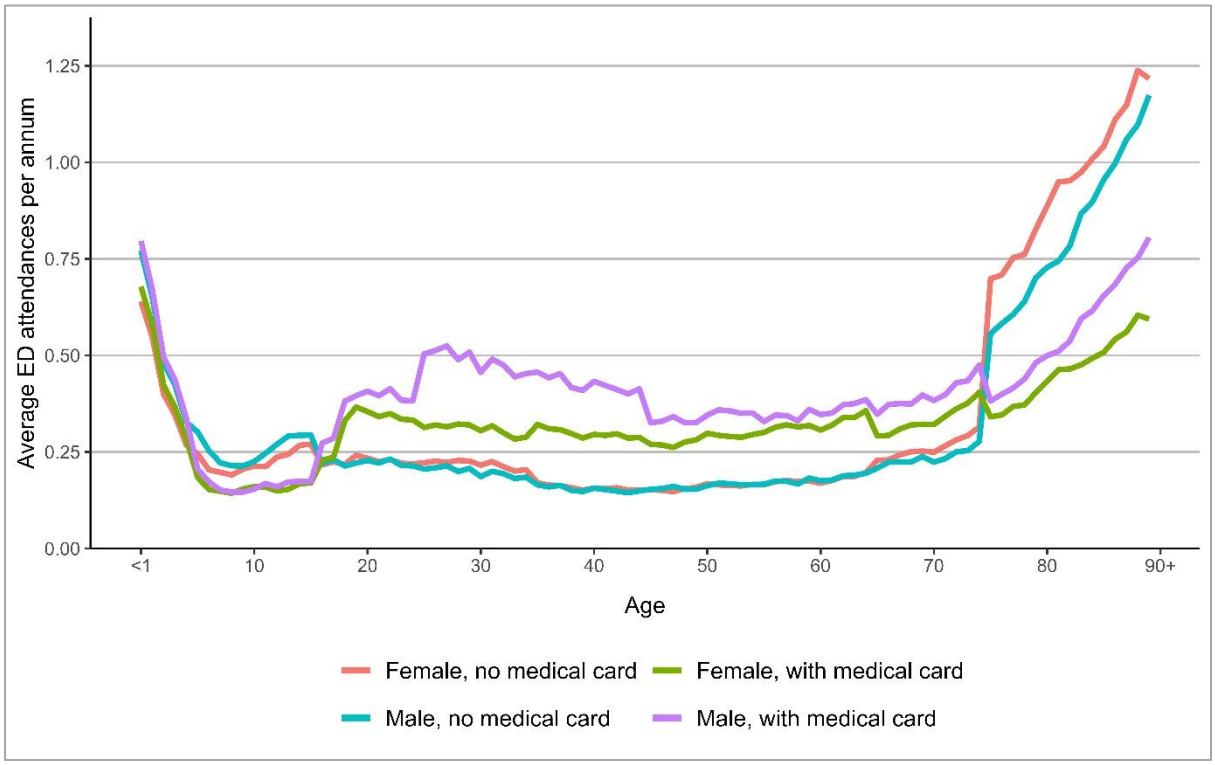
Source: Authors' calculations using HIPE 2019.

Tables 5.2 and 5.3 above show large variations in utilisation across demographic and healthcare coverage groups. Figures 5.3–5.6 in the following sections highlight how utilisation differs across the age distribution for males and females with and without a medical card.

Emergency department attendances

Figure 5.3 presents average annual attendances at public hospital EDs disaggregated by age, sex and medical card status. ED attendance rates are high for very young children, before falling and stabilising for older children and the working-age population. From age 75 onwards, ED attendance rates increase rapidly. While there is relatively little variation in ED attendances by sex, attendance rates are much higher for those with a medical card. This can likely partially be attributed to the statutory public charge of €100 for attending ED without a GP referral for those without a medical card.

FIGURE 5.3 AVERAGE ANNUAL EMERGENCY DEPARTMENT ATTENDANCES IN PUBLIC HOSPITALS BY AGE AND MEDICAL CARD STATUS

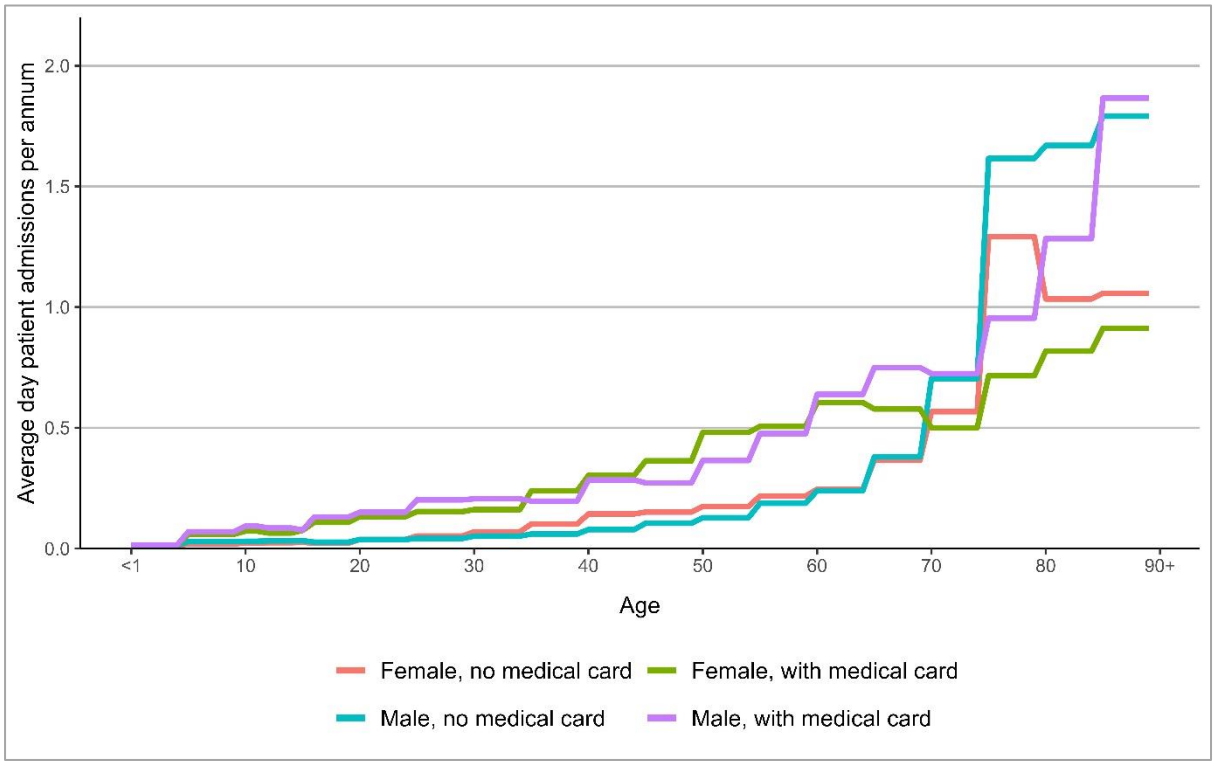


Source: Authors' calculations using PET 2019.

Day patient admissions

Figure 5.4 presents day patient admissions per annum across ages, for males and females with and without a medical card. The overall rate of day patient admissions is low in the child and younger adult populations, but increases at older ages. No significant variation across sex is observed for most age groups; however, at older age groups, males have higher rates of day patient admissions. There is large variation observed across medical card status among working-age adults. At older ages, day patient admission rates are actually higher among those without a medical card. However, the small number of individuals aged 70+ without a medical card means these differences have little effect on the HHP model outputs. Some of the variation across medical card status may also be explained by individuals with PHI (who predominantly do not possess a medical card) receiving day patient care in private hospitals.

FIGURE 5.4 AVERAGE ANNUAL DAY PATIENT ADMISSIONS IN PUBLIC HOSPITALS BY AGE AND MEDICAL CARD STATUS

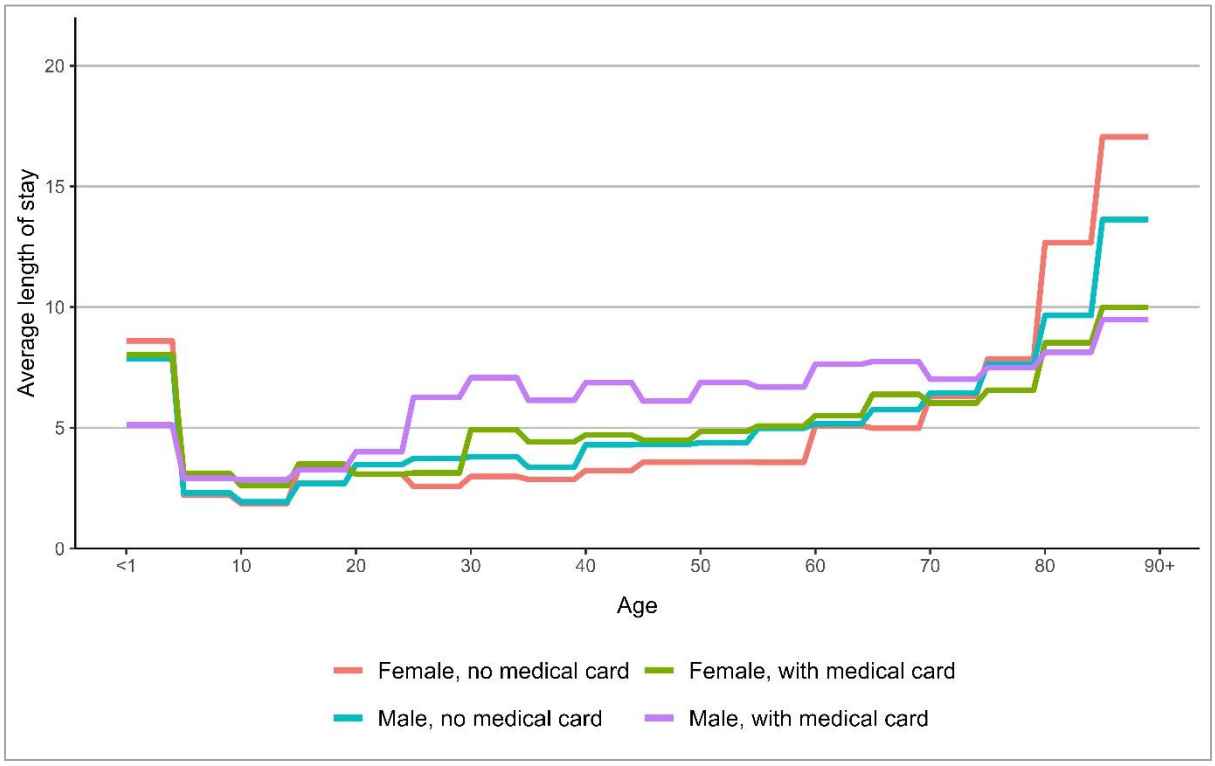


Source: Authors' calculations using HIPE 2019.
Note: Age corresponds to five-year age groups.

Elective inpatient LOS

Figure 5.5 presents elective inpatient LOS (which can be interpreted as bed days) per annum across ages, for males and females with and without a medical card. The overall LOS rate is similar across children and adults (with a dip among older children in line with previous findings (Wren et al., 2017)). However, LOS increases considerably at older ages. Variation across sex is observed, with males tending to have higher LOS compare to females. There is large variation across medical card status among working-age adults.

FIGURE 5.5 AVERAGE LOS FOR ELECTIVE INPATIENTS IN PUBLIC HOSPITALS BY SINGLE YEAR OF AGE AND PUBLIC HEALTHCARE COVERAGE STATUS

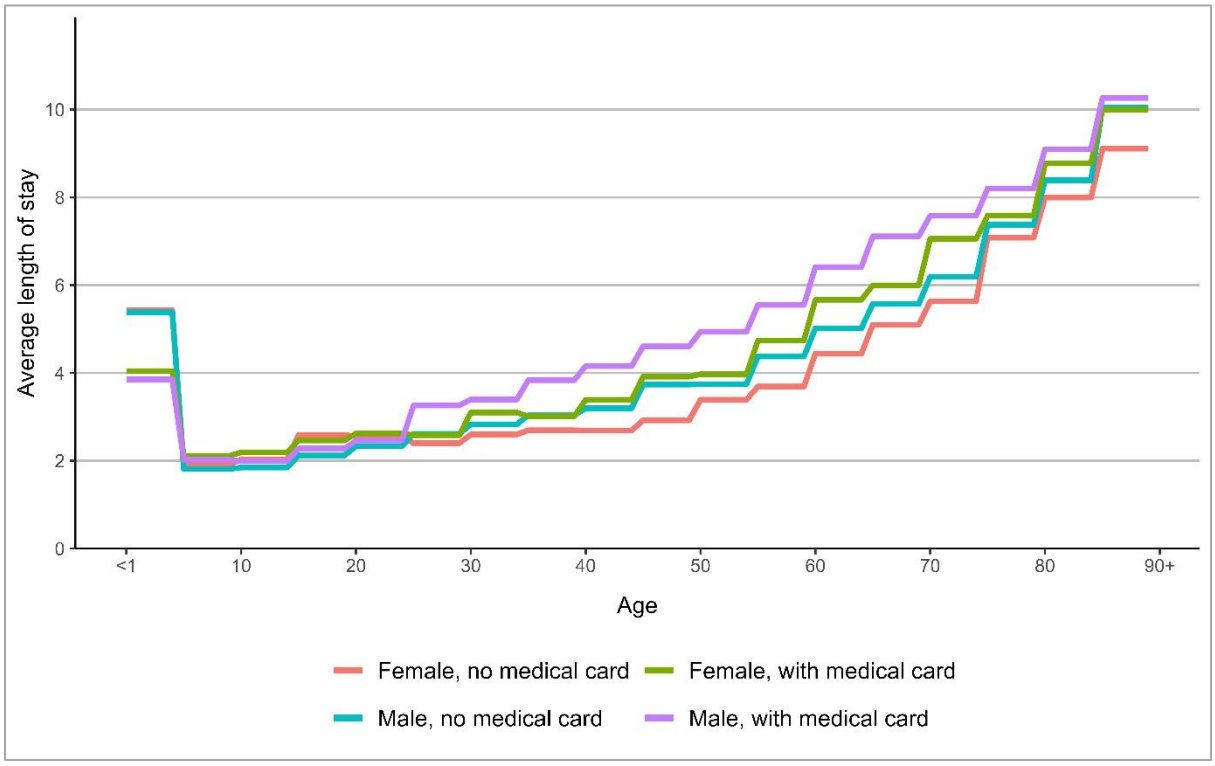


Source: Authors' calculations using HIPE 2019.
Note: Age corresponds to five-year age groups.

Emergency inpatient LOS

Figure 5.6 presents emergency inpatient LOS (which can be interpreted as bed days) per annum across ages, for males and females with and without a medical card. There is a clear age gradient observed, with LOS increasing consistently across age and relatively higher LOS among the youngest children (in line with previous findings (Wren et al., 2017)). Variation across sex is observed, with males tending to have higher LOS compared to females. Variation across medical card status is observed, with those with a medical card having higher LOS across all ages.

FIGURE 5.6 AVERAGE LOS FOR EMERGENCY INPATIENTS IN PUBLIC HOSPITALS BY SINGLE YEAR OF AGE AND PUBLIC HEALTHCARE COVERAGE STATUS



Source: Authors' calculations using HIPE 2019.
Note: Age corresponds to five-year age groups.

5.4 PRIMARY CARE UTILISATION PROFILES BY TENURE TYPE

This section uses information from Section 5.2 to estimate the profile of GP and PN utilisation across each of our three tenure groups and across all households (where tenure groups are combined). The profiles combine information on utilisation rates across each demographic parameter, with the age, sex, medical card status and average headcount of each tenure type estimated using SILC data.

Figures 5.7 and 5.8 present the distribution of GP and PN visits across age for each tenure type. The combination of utilisation across parameters, married with the projected demographic composition of each tenure type, presents very different healthcare utilisation distributions across tenure types. Homes with owner occupiers display an older GP and PN profile, and are followed in this by supported renters. Within the private renters group, there is a bi-modal distribution, with peaks in younger children and in younger working-age adults. This in part reflects the high proportion of parents and their young children in the private rental tenure group. Supported renters illustrate a similar distribution, albeit one shifted further towards the upper age range due to the larger proportion of older people living in supported rental housing vis-à-vis private rental housing.

FIGURE 5.7 DISTRIBUTION OF GP VISITS ACROSS TENURE TYPES

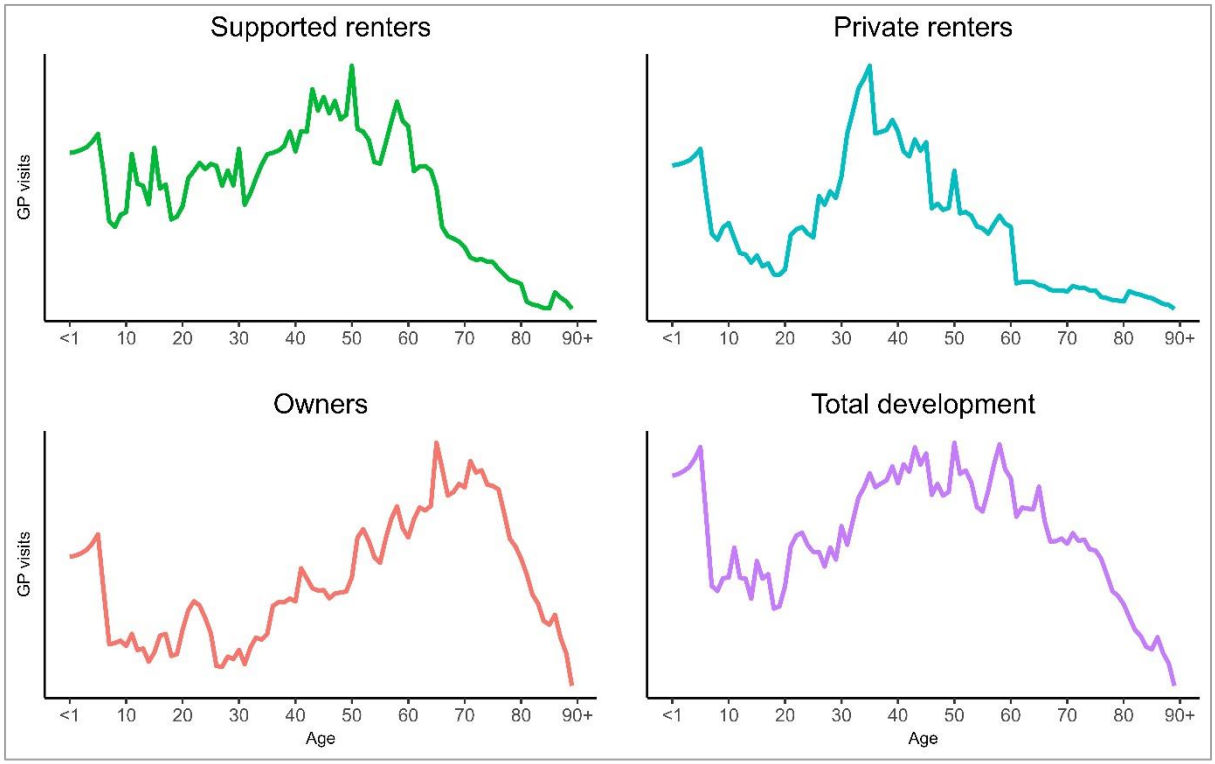
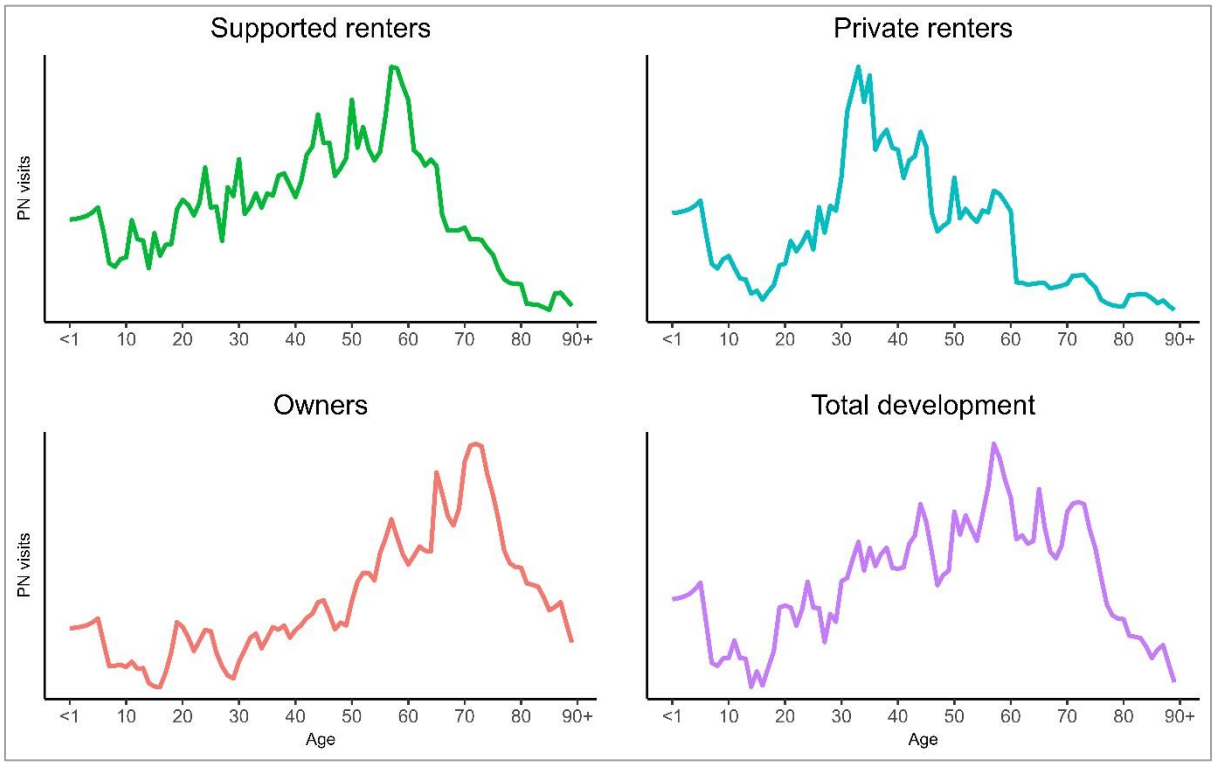


FIGURE 5.8 DISTRIBUTION OF PN VISITS ACROSS TENURE TYPES



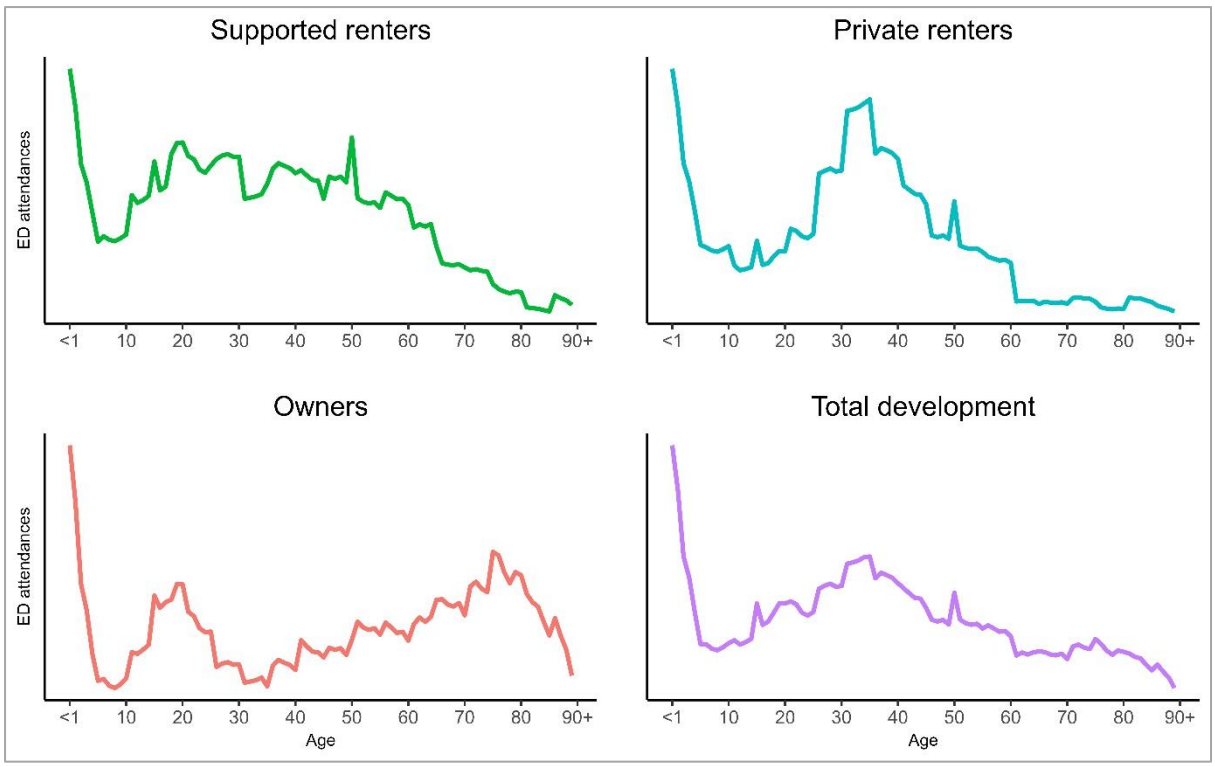
5.5 ACUTE PUBLIC HOSPITAL UTILISATION PROFILES BY TENURE TYPE

This section uses information from Section 5.3 to estimate the profile of acute public hospital utilisation for each tenure type. The profiles combine information on utilisation rates across each demographic parameter, with the age, sex, medical card status and average headcount of each tenure type being accounted for in the modelling process. These profiles are used to estimate demand–supply ratios in Chapter 6 for ED, day patient, elective inpatient and emergency inpatient in the HHP model. The combination of utilisation across parameters with the demographic composition of each tenure type presents very different healthcare utilisation distributions.

5.5.1 Emergency department

Figure 5.9 presents the distribution of ED attendance across age for each tenure type. Across all tenure types, ED attendance is highest among children aged less than one year old. In the homeowner tenure group, those aged over 70 years comprise the next largest driver of ED demand. By comparison, for those in the private and supported renter categories, a large part of ED demand is centred around the working-age adult population.

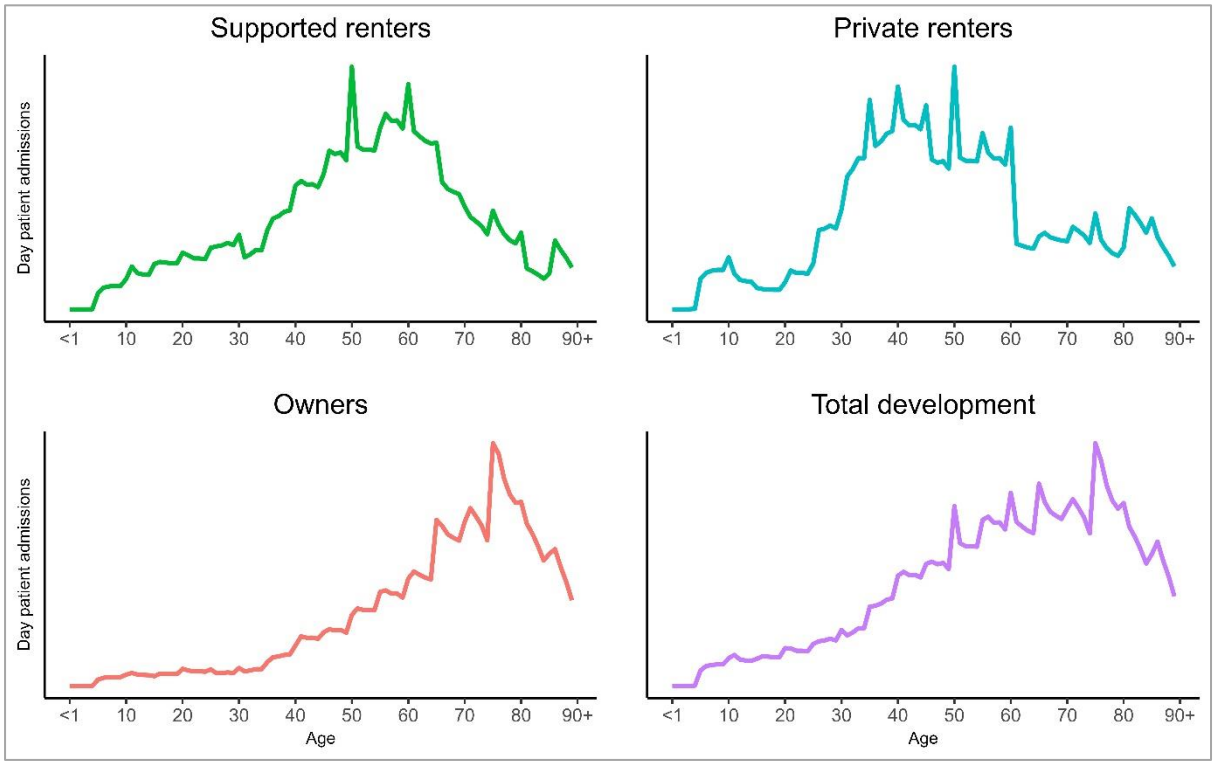
FIGURE 5.9 DISTRIBUTION OF EMERGENCY DEPARTMENT ATTENDANCES ACROSS TENURE TYPES



5.5.2 Day patient

Figure 5.10 presents the distribution of day patient admissions across age for each tenure type. A different pattern is observed compared to ED attendances. Across all tenure types, day patient admissions are lowest among children and rise steadily with age. However, for both supported renters and private renters, there is a drop at older ages, with the opposite observed in the homeowner tenure type. This distribution difference largely reflects that fact that the majority of older people live in owner-occupied homes.

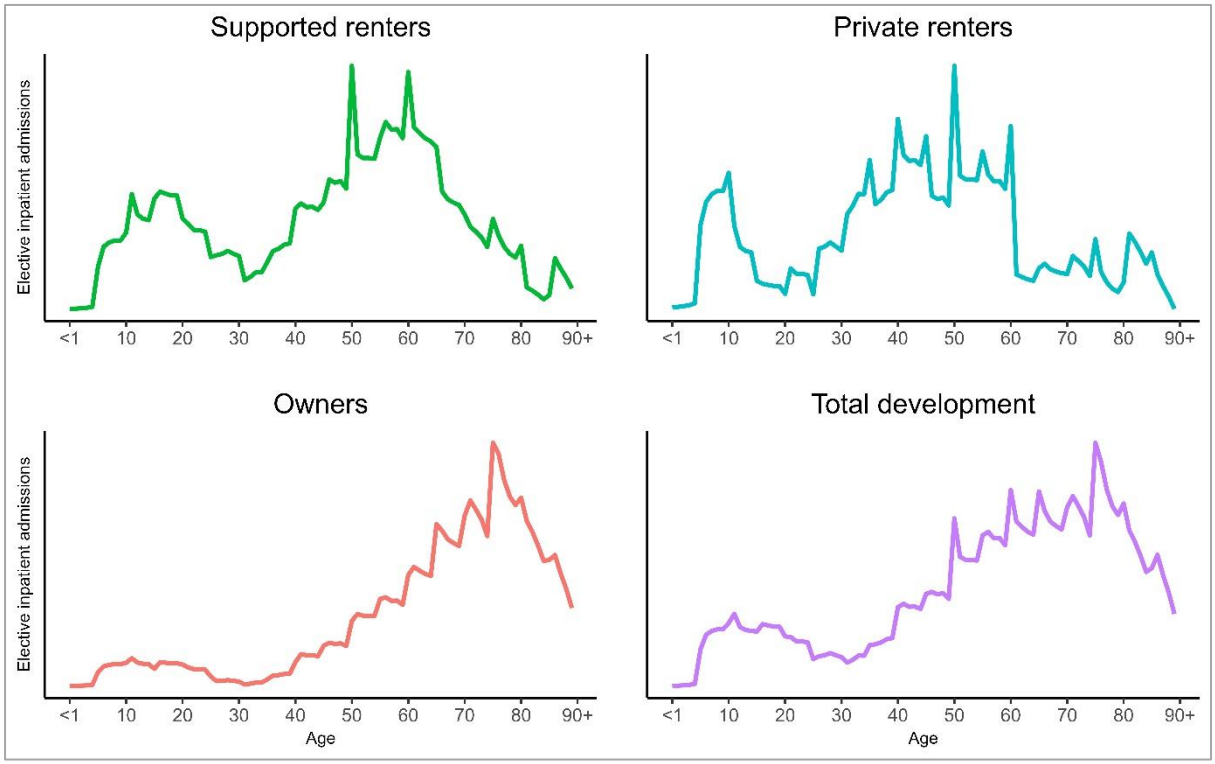
FIGURE 5.10 DISTRIBUTION OF DAY PATIENT CARE ACROSS TENURE TYPES



5.5.3 Elective inpatient

Figure 5.11 presents the distribution of elective inpatient LOS (bed days) across age for each tenure type. A slightly different pattern is observed as compared to the distribution of day patient admissions seen above. Firstly, in each of the private and supported rental categories, there is a distinct spike in demand among children, which is not observed in the homeowner tenure type. Moreover, for both supported renters and private renters, the highest bed days are observed among older working-age adults. By comparison, the homeowner tenure type sees a more typical increase in demand with age, with a minor decrease towards the uppermost end of the distribution, reflecting the fact that the population aged 80+ is relatively small, even in the homeowner tenure group.

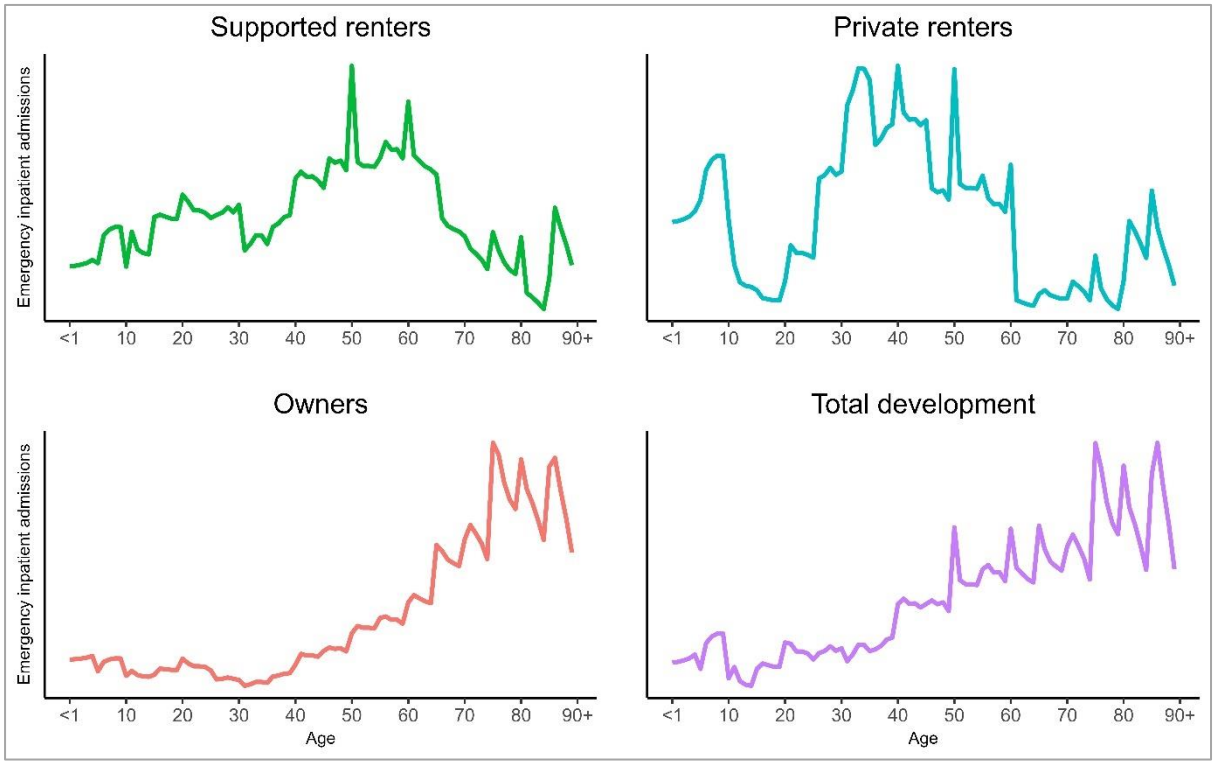
FIGURE 5.11 DISTRIBUTION OF ELECTIVE INPATIENT CARE ACROSS TENURE TYPES



5.5.4 Emergency inpatient

Figure 5.12 presents the distribution of emergency inpatient LOS (bed days) across age for each tenure type. For households in an owner-occupied home, the distribution is once again largely correlated with age, with older people driving most demand. For the supported renters and private market renters, the distribution is more volatile, though bed day usage is highest among the working-age adult population. A slight increase in bed day usage at the oldest ages is also seen in the rental categories, although it is less pronounced there than in the homeowner category.

FIGURE 5.12 DISTRIBUTION OF EMERGENCY INPATIENT CARE ACROSS TENURE TYPES



CHAPTER 6

Results: Healthcare demand by development type

6.1 INTRODUCTION

This chapter presents findings for primary care and acute public hospital healthcare demand, and the healthcare supply requirements to meet the estimated demand within new residential development. The results aggregate the tenure-level demand profiles presented in Chapter 5 to development-level demand profiles. We present three specific benchmark development types (HFA, public housing and private market housing) with 1,000 homes that differ according to their tenure composition.

6.2 PRIMARY CARE

6.2.1 GP and PN demand and supply

Tables 6.1 and 6.2 provide estimates of the total number of GP and PN visits, and the WTE supply required for this level of demand, for each of our three benchmark developments. These estimates provide the aggregated development-level results of the tenure-level age demand distributions in Figures A.1 and A.2.

For GP care, within the 1,000-unit HFA development, we estimate demand for almost 11,000 GP visits per annum. Based upon demand–supply ratio estimates in Collins and Homeniuk (2021), this demand would require an estimated 1.5 GP WTEs to provide care.

Within a public housing development of the same size, total demand is higher at over 12,000 visits per annum. We highlight in Appendix Figure A.1 that the higher demand in the public housing development is largely a consequence of higher GP demand among supported renters who, despite having a younger age profile than owners, tend to have higher rates of chronic illness and higher rates of public healthcare coverage, and thus greater demand for GP care. Such demand would require the equivalent of 1.64 GP WTEs (9.3 per cent more than the HFA development).

In the private housing development, overall demand is lower, at approximately 10,500 GP visits per annum, with a commensurate GP WTE requirement of 1.43 (4.6 per cent less than HFA development). Appendix Figure A.1 illustrates that the lower demand and supply requirements compared to the HFA development are due to the typically younger age profile and lower demand from private renters, who make up a larger share of the overall development in this benchmark.

For PN care (Table 6.2), a similar variation in demand and supply requirements across development types is observed. Within the 1,000-unit HFA development, the model estimates a demand of 3,213 PN visits, equating to a WTE requirement of 0.49 PN WTEs. There is relatively little variation in PN demand and supply requirements across development type: the WTE requirement is slightly higher in the public housing development and slightly lower in the private housing development.

TABLE 6.1 COMPARISON OF GP DEMAND AND SUPPLY IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total GP visits	10,979	12,014	10,514
GP WTEs required	1.50	1.64	1.43

TABLE 6.2 COMPARISON OF PN DEMAND AND SUPPLY IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total PN visits	3,213	3,433	3,056
PN WTEs required	0.49	0.52	0.46

Appendix Figures A.1 and A.2 illustrate the distribution of GP and PN visits across age for each benchmark development separately.

6.2.2 Universal primary care

In recent years, a number of extensions have been made to the GP visit card scheme, including free care for all those under six since 2015. In the previous section, free GP and PN care is assumed for all those under 6 in accordance with this change, as well as for all those aged 70+. A number of other extensions took

place in 2023, including entitlement to GP visit cards for all those aged under 8 and all individuals earning less than the median annual income.[22]

These extensions seek to move us closer to the wider goal of universal primary care to the full population, as outlined in Sláintecare. Such expansion will increase demand for GP and PN care in line with recent evidence (O'Callaghan et al., 2018; McDonnell et al., 2022). Recent research at the ESRI has estimated the potential expenditure required for the implementation of universal primary care (Connolly et al., 2023).

As discussed in Chapter 4, the HHP model has been developed with the flexibility to examine specific policy changes if data are available on such changes. In Appendix A.3, we use the HHP model to estimate the potential GP demand and supply implications of universal primary care. We estimate that in a 1,000-unit HFA development, expansion of universal primary care to all would increase demand by 20 per cent. This would require a commensurate increase in GP WTEs to meet this demand. These increases in demand would be predominantly driven by adults aged 25–60 years who currently have relatively low rates of medical card or GP visit card coverage. More discussion on the results can be found in Appendix A.3. This example highlights the capabilities of the HHP model to examine the potential demand and supply implications of future healthcare policy changes.

6.3 ACUTE PUBLIC HOSPITAL DEMAND AND SUPPLY

6.3.1 Emergency department

Table 6.3 provide estimates of the total number of ED attendances for each of our three benchmark developments. In the 1,000-unit HFA development, the HHP model estimates that an estimated 669 ED attendances would be expected to occur. Unlike results shown in the previous section for GP care, there is relatively little variation in attendances across development types. However, ED demand is slightly higher (4.3 per cent) in the public housing development and slightly lower (-3.7 per cent) in the private housing development.

As highlighted in Appendix Figure A.3, similar demand profiles are estimated across ages, and the HHP estimates are relatively insensitive to tenure composition changes. For example, in the HFA development, ED attendances are highest among young children, and remain relatively stable across age thereafter. In the public housing development, a similar age profile is observed but due to the tenure composition supported renters are driving demand.

[22] See https://www.citizensinformation.ie/en/health/medical-cards-and-gp-visit-cards/gp-visit-cards/.

TABLE 6.3 COMPARISON OF ED ATTENDANCES IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total ED attendances	669	698	644

6.3.2 Day patient

Table 6.4 provides estimates of the total number of day patient admissions, day patient beds and day patient bed days for each of our three benchmark developments. In the 1,000-unit HFA development, the HHP model estimates a demand of 590 day patient admissions, which equates to a bed requirement of 0.75 day patient beds (assuming a 0.5 day average LOS). Similar to results for ED attendances, there is less variation in demand and supply requirements across development type compared to GP care. In general, demand is 3.7 per cent and 5.9 per cent lower in the public housing and private housing developments, respectively.

Once more, as shown in Figure A.4, the age distribution differs little across development types, while the tenure type driving demand does vary.

TABLE 6.4 COMPARISON OF DAY PATIENT ADMISSIONS, BED DAYS AND REQUIRED BEDS IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total admissions	590	568	555
Bed days	295	284	277
Beds	0.75	0.78	0.76

6.3.3 Elective inpatient

Table 6.5 provide estimates of the total number of inpatient admissions, bed days and commensurate inpatient bed requirements for each of our three benchmark developments. In the 1,000-unit HFA development, the HHP model estimates a demand of 52 elective inpatient admissions and 335 elective inpatient bed days, which equates to a bed requirement of 0.92 inpatient patient beds.

Compared to ED and day patient demand, we estimate large variations in demand across development types. Compared to the HFA development, elective inpatient demand, as measured in bed days, is approximately 14 per cent lower in the public housing development and 5.4 per cent lower in the private housing development. Appendix Figure A.5 shows that, compared to the HFA development, the public housing development sees a peak in older children and again in older working-age adults; demand is much lower among older people owing to their lower relative population within the development as a whole. In the private housing development, the distribution for total development is similar to that of the HFA one, though the young adult population is more represented in the overall demand profile.

TABLE 6.5 COMPARISON OF ELECTIVE INPATIENT ADMISSIONS, BED DAYS AND REQUIRED BEDS IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total admissions	52	50	48
Bed days	335	288	317
Beds required	0.92	0.79	0.87

6.3.4 Emergency inpatient

Table 6.6 provide estimates of the total number of emergency inpatient admissions, bed days and commensurate inpatient bed requirements for each of our three benchmark developments. In the 1,000-unit HFA development, the HHP model estimates a demand of 244 emergency inpatient admissions and 1,448 emergency inpatient bed days, which equates to a bed requirement of just under 4 beds per annum. This is much higher than observed for elective inpatient care and reflects the fact that up to 85 per cent of all acute public hospital inpatient admissions are admitted as emergencies (Walsh and Brick, 2023). Compared to the HFA development, emergency inpatient bed days are 13.6 per cent lower in the public housing development and 5.4 per cent lower in the private housing development. As shown in Appendix Figure A.6, these differences are driven by variations in the age distribution of demand. In the HFA development, total admissions generally increase with age, with the greatest demand at the upper end of the age distribution. In the public housing development, by contrast, much of the demand is focused on the working-age adult population, with relatively less found among the older population. The private housing development is reasonably similar to the HFA development, although with a greater representation of young adults in the overall distribution driven by an increased share of the development being comprised of private renters.

TABLE 6.6 COMPARISON OF EMERGENCY INPATIENT ADMISSIONS, BED DAYS AND REQUIRED BEDS IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total admissions	244	241	230
Bed days	1,448	1,251	1,370
Beds required	3.97	3.43	3.75

In Appendix Table A.1 we combine elective inpatient and emergency inpatient results.

6.4 CONCLUSIONS

Compared to primary care, acute public hospital demand is much more highly correlated with age. For all services included, older people typically require more hospital care than younger people. There is also a lower correlation between acute public hospital demand and medical card status compared to primary care services. Consequently, in most new developments the magnitude of demand for hospital services is largely determined by the age distribution of that development. Of note, developments comprised primarily of homeowners (who are on average older) will typically have higher acute healthcare demand and thus greater supply is necessary.

CHAPTER 7

Summary and conclusions

7.1 INTRODUCTION

This report presents the first outputs of the HHP model, a modelling tool developed at the ESRI to aid planning authorities and policymakers in Ireland in planning for healthcare provision for new residential developments. The development of this model represents the first attempt to quantify the impacts of building new housing developments on local healthcare services in Ireland. A key aim of the HHP model is to provide an evidence-based foundation upon which to base planning for localised healthcare supply and infrastructure. It is intended that the model can be used to help inform healthcare demand and supply needs arising from new residential developments.

In this report, we focus on key primary care services – GP and PN care – and acute public hospital services – ED, day patient, elective inpatient and emergency inpatient. We estimate the demand for care within new residential developments for each of these services. We subsequently identify the level of supply that would need to be provided to meet the estimated demand, using national demand–supply ratios. The HHP model has been developed to incorporate a wide range of health and social care services, and the model has been constructed to allow for differing residential development profiles to be examined. Future outputs from the HHP model will endeavour to incorporate a wider array of services and regional development profiles. However, current data limitations, particularly surrounding healthcare supply metrics and development profiles, prevented the inclusion of other important health and care sectors in this report.

This chapter summarises the key findings derived from this application of the HHP model and offers reflections on how they may impact policy formation and planning decisions for healthcare services in Ireland. We also discuss the potential drawbacks of the model. In presenting the results, we stress that the estimates are projections as opposed to forecasts. While they are well-founded in empirical terms, a number of assumptions must be made to ensure the tractability of the model. Finally, we discuss extensions to the model that would ensure greater precision of our estimates.

7.2 KEY FINDINGS

7.2.1 Healthcare demand by tenure type

Figures 7.1 and 7.2 show that the distribution of GP and PN visits across different ages varies considerably by tenure type. This variation is attributable to both

differences in baseline activity rates and the estimated demographic structure of each tenure type. We find that GP and PN utilisation rates are highly correlated with age and public healthcare coverage status.

Similar to primary care, acute public hospital care utilisation is strongly correlated with age. The notable exception is ED attendance, which exhibits a relatively even utilisation distribution across age groups. In contrast to primary care, acute public hospital care utilisation (with the exception of emergency inpatient demand) is less influenced by variations in medical card coverage among different tenure types.

7.2.2 Healthcare demand and supply for housing developments

We find that for the 1,000-unit HFA development, the HHP model estimates a demand of almost 11,000 GP visits and over 3,200 PN visits per annum. This demand translates to a supply requirement of 1.5 WTE GPs and 0.49 WTE PNs. Demand is slightly higher in the public housing development and marginally lower in the private housing development, predominantly due to differences in the demographic profiles of these developments.

The patterns of demand for acute public hospital care – and thus supply requirements – are slightly different compared to those for primary care services, partly due to demographic factors. For ED attendance, the highest demand is observed in the public housing development. This may be attributed to poorer health outcomes among those in the supported rental sector in Ireland, and possibly to medical card holders' exemption from the statutory €100 charge for an ED attendance. The HFA development registers the next highest demand, largely due to the older age profile of homeowners. The lowest demand is noted among residents of the private housing development, who typically have a younger demographic.

For inpatient and day patient services, demand correlates most strongly with age, with public healthcare coverage status playing a less significant role. Consequently, developments with an older average age profile will generally require more proximate acute public hospital services than those with a younger demographic. This pattern is reflected in the model: the HFA development, predominantly comprising homeowners (who are usually older), shows the highest demand for inpatient and day patient services, in terms of both admissions and required bed days. The public housing and private housing developments exhibit lower, yet comparable, demand and supply requirements.

7.3 FUTURE EXTENSIONS TO THE HHP MODEL

The HHP model is a useful tool for informing housing and healthcare policymakers and planners in Ireland. But other factors cannot necessarily be captured within the context of a modelling tool of this type. For example, ESRI research has

examined the implications of residential construction increases and has shown the potential constraints in the Irish economy of meeting the demand for housing (Egan et al., 2022). Similarly, workforce and capacity deficits in the healthcare sector are also difficult to overcome in the short-term. Nevertheless, the HHP model is an important step in the process of aligning housing and healthcare planning. It is envisaged that future iterations of the HHP model will expand it scope and look to incorporate more complex modelling using updated and new model parameters.

7.3.1 HHP model parameters

The HHP model is parameterised using demographic and healthcare utilisation data from both survey and administrative sources. The major drivers of variation in healthcare utilisation identified in this study and much of the broader literature (Wren et al., 2017; Keegan et al., 2020; Keegan et al., 2022; Walsh et al., 2021) are age, sex and healthcare coverage status. As identified in this report and previous research (Humes et al., 2023), these factors vary across tenure types. By accessing granular data for each of these factors across healthcare services and tenure types, the HHP model can link tenure and healthcare utilisation profiles to estimate the healthcare demand of a given new residential development type. Using national demand–supply ratios for each healthcare service, we can then calculate the corresponding required supply metric for each service.

When developing the HHP model, several other parameters were considered for inclusion. However, often due to the lack of high-quality microdata, it was not possible to examine their impact on the overall modelling process.

Housing quality and healthcare demand

More research into the link between housing quality and health, from an Irish perspective, would be of clear importance to both housing and healthcare policymakers. New homes are likely to be built to higher specifications and will be more energy-efficient (with building energy ratings (BER) of A2 and above), which will potentially reduce healthcare demand. Such information would therefore be invaluable for the HHP model and for projecting future healthcare service requirements.

The extent of the effect of energy efficiency on health is not routinely found, however. Maidment et al. (2014), in a meta-analysis of the association between energy ratings and health, found that, on average, improvements in household energy efficiency led to only marginal health benefits. The authors also highlighted the need for future studies to investigate the long-term health benefits of energy efficiency interventions. A Cochrane review examining the literature on housing improvements and health outcomes (Thomson et al., 2013) found similarly modest effects. A literature review of the impacts of retrofitting homes to improve energy

efficiency highlighted that without accompanying ventilation improvements, indoor pollutants and mould can increase (Collins and Dempsey, 2018).

Research from the UK indicates that energy efficiency measures such as boiler upgrades, window glazing and insulation have mixed effects on healthcare usage (Sharpe et al., 2019). The authors observed that an increase in the mean energy performance score of a home was associated with a 0.5 per cent *increase* in admission rates for asthma and cardiovascular diseases and a 1 per cent increase for chronic obstructive pulmonary disease (Sharpe et al., 2019). They emphasised the complexity of the relationship between housing and healthcare outcomes, which complicates the identification of causal mechanisms. Based on the mixed evidence and the scarcity of quality data, we did not include household energy efficiency as a parameter in the model for this report. Future iterations of the model will aim to incorporate sensitivities around energy efficiencies and healthcare demand informed by findings in the literature.

Tenure type

This report demonstrates that the tenure composition of new housing developments is significant in determining healthcare demand and supply, and that tenure security is found to improve health (Munford et al. 2020). We use three broad tenure types that align with previous ESRI analyses (Slaymaker et al., 2022; Doolan et al., 2022), with data from SILC enabling us to examine the demographic characteristics of these tenure types. We acknowledge that new tenure types, specifically cost rental and affordable housing, are emerging as significant. While the supported rental tenure groups included in this report's analysis may cover these other groups, as information on the characteristics of new tenure types becomes available, it could be incorporated into future outputs from the HHP model.

7.3.2 Current healthcare supply and capacity

This report underscores the HHP model's capability to estimate the healthcare demand implications of new residential developments with varying parameters. It also estimates the equivalent healthcare supply and capacity requirements to meet such demand. With data on development size and composition, housing and healthcare planners can use the HHP model to estimate the potential healthcare supply needed in a local area to meet the increased demand for care.

The healthcare demand–supply ratios used in the analysis are based on current national ratios. However, this approach may introduce a margin of error for two primary reasons. Firstly, due to regional heterogeneity in healthcare supply in Ireland, a national supply–demand ratio may not accurately capture the required supply in an area currently experiencing a relative undersupply of healthcare services. Secondly, and relatedly, previous research has indicated supply

constraints in both the acute public hospital (Walsh and Brick, 2023) and primary care (Connolly et al., 2023) sectors in Ireland. Consequently, the estimates in this report might underestimate the actual supply and capacity requirements.

The HHP model will be refined as more detailed healthcare supply metrics become available. For instance, future versions of the model will endeavour to include an analysis of waiting lists for elective inpatient and outpatient services.

7.3.3 Community and social care services

This report concentrates on key primary and acute public hospital care services. Future research using the HHP model will aim to encompass a broader range of services, particularly community care (e.g., physiotherapy, occupational therapy, public health nursing) and social care services (e.g., home support for older people and personal assistance for children and adults with disabilities). However, the data landscape for many of these services is currently too limited for their inclusion. Ongoing research at the ESRI is investigating community and social healthcare workforce requirements in Ireland. The findings from this research will significantly facilitate the inclusion of community and social care in future iterations of the HHP model.

7.3.4 Future demand and supply

The HHP model's development as a macrosimulation tool will enable future versions to assess projected future demand and the healthcare supply and capacity requirements of housing developments. These projections will build on demographic parameters such as healthy ageing, as seen in the Hippocrates model developed at the ESRI (Wren et al., 2017). The composition and size of household units are also expected to evolve over time. As a development matures, so will its demographic profile. Consequently, demand for services such as home support for older individuals, which is likely in new residential developments, will increase as the developments age. The HHP model will be equipped to evaluate such services.

The absence of a resource allocation mechanism for health and social care services hinders the ability to inform local planning adequately. The Sláintecare report outlines the ambition for a 'resource allocation model … that allows for equity of access to health services across different geographic areas, taking into account population need, demographics, deprivation and other measures' to be developed to distribute healthcare resources more efficiently and equitably. The establishment of PBRA will enhance the planning for healthcare supply to meet demand at the regional level. The success of PBRA will thus depend on the subsequent equitable distribution of services at a more localised level, i.e., within HSE Health Regions. The development of PBRA and the increased devolution of decision-making on healthcare resourcing to the Health Region level also increases the potential usefulness of the HHP model and outputs from the model. This model

has the potential to provide more precise estimates of healthcare supply requirements for local areas based upon planned residential developments. This information can be used to help design plans in a timely manner to meet the increased demand from new developments, and also consider current supply deficits that may exist within the vicinity of proposed developments.

7.3.5 Unmet need

An important feature of the Hippocrates model is its ability to account for unmet demand when projecting future healthcare demand in Ireland. We have designed the HHP model to be similarly adaptable. However, we have not yet incorporated unmet demand into HHP analyses. Including unmet demand, especially for acute public hospital care, is crucial. Ireland has long waiting lists for outpatient and day patient/inpatient care. Ideally, capacity requirements should reflect this unmet demand. Future versions of the model will include unmet demand and, where evidence exists, appropriate staffing levels.

7.3.6 Changing policy frameworks

The HHP model has been developed to allow for the examination of specific policy changes. It can be used to assess the demand and supply implications of healthcare policy shifts. In Section A.3, we illustrate the model's flexibility, which enables it to incorporate such changes, by examining the demand and supply implications of universal primary care.

When planning for new residential developments, it is clear that planning authorities must also consider the impact of evolving policy frameworks in healthcare. The introduction of universal primary care, a priority under the current Programme for Government, is likely to significantly alter the profile of healthcare demand in any given new residential development. As a result, planning for an increased supply of primary care and the associated infrastructure must also be part of the planning process for new residential developments.

7.4 CONCLUSIONS AND REFLECTIONS

The current changes in housing and health policies being implemented offer health and housing policymakers a unique opportunity to better integrate healthcare and housing policies. Within healthcare, the introduction of some Sláintecare initiatives to increase the provision of care in the community, alongside the establishment of new HSE Health Regions, means that more autonomy will be provided to local healthcare decision makers. In particular, the establishment of Health Regions offers, for the first time, the ability to implement a PBRA mechanism to allow for a more equitable allocation of funding across regions in Ireland (O'Malley et al., 2023). This means that, in theory, healthcare supply can be linked with local population needs for the first time in Ireland.

A dearth of housing supply in Ireland means that policies outlined in the NDP and the NPF aim to expand housing supply extensively in the coming years. The national housing plan, Housing for All – A New Housing Plan for Ireland (HFA), outlines pathways for actions to be taken by national and local planners and other state agencies to achieve 33,000 housing units per annum. However, better integration of these housing plans and healthcare planning is key. Other countries, notably England, New Zealand and the Netherlands, have begun to better integrate planning for housing and healthcare by focusing on strategic collaboration at a national and local level. With the establishment of HSE Health Regions, more overt attempts to undertake such strategic collaboration should be close to the top of policymakers' agendas. This will require defined targets, communication and in-depth plans to ensure that increased housing in an area will be accompanied by proportionate increases in key health and social care services.

New tools such as the Hippocrates model and the HHP model provide a basis to inform healthcare system needs at a national, regional and more localised level. In particular, the HHP model can provide guidance for planners to make informed decisions about the healthcare supply requirements of new housing developments. Such guidance may allow planning authorities to take a holistic approach to modelling new developments. Adopting a more integrated approach to the provision of housing and health and social care services creates an opportunity to ensure the development and growth of healthy, sustainable communities in Ireland. Moreover, appropriate planning for healthcare services in new residential developments will allow planners to mitigate, rather than exacerbate, previously observed disparities in healthcare accessibility across the country. The HHP model, or the macrosimulation approach adopted by the model, could also be adopted to model demand requirements arising from residential developments for other key services such as education and recreational amenities.

A primary contribution of this report is to highlight how new residential developments of varying compositions will contribute to the demand for healthcare services in a local area. We have shown that variations in the tenure type of a new development will induce variations in the overall demand for healthcare, and consequently, the healthcare supply that will be required. Of particular note, developments comprising individuals who are, on average, older will require more healthcare services, as will those with a large number of people with public healthcare coverage (medical cards and GP visit cards).

While *exact* estimates of healthcare demand and supply requirements are not possible due to the complexity of modelling the Irish healthcare system, the HHP model offers planning authorities a robust estimate of the potential healthcare service implications of building new residential developments. By integrating tenure-level demographic information with granular data on healthcare utilisation

profiles, we can construct detailed estimates of aggregate healthcare demand as well as demand arising from specific subgroups.

The structure of the HHP model allows for further development and greater precision as new data become available. Notably, future iterations will endeavour to include a broader range of health and social care services, to project healthcare demand and supply as a residential development evolves over time, and to offer insights into the infrastructural requirements and capital investment needed to accommodate healthcare services. Furthermore, with the availability of more detailed socio-demographic data, the precision of our estimates will be enhanced.

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APPENDIX

A.1 PRIMARY CARE DEMAND PROFILES ACROSS BENCHMARK DEVELOPMENTS

FIGURE A.1 GP VISITS BY AGE IN BENCHMARK DEVELOPMENT TYPES

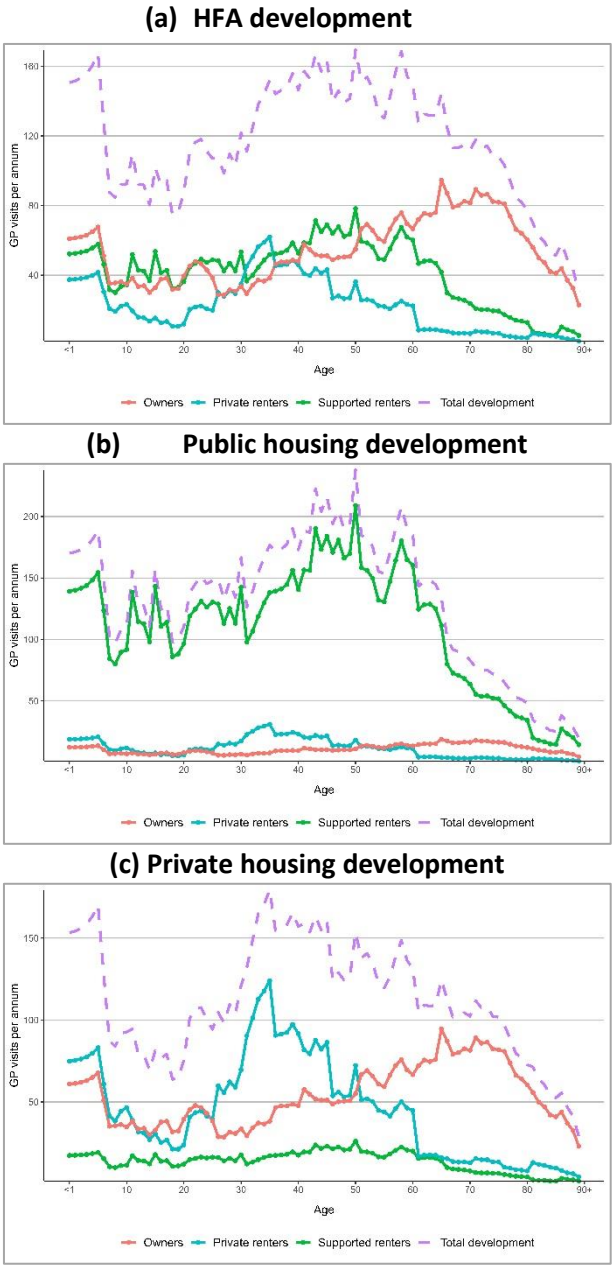
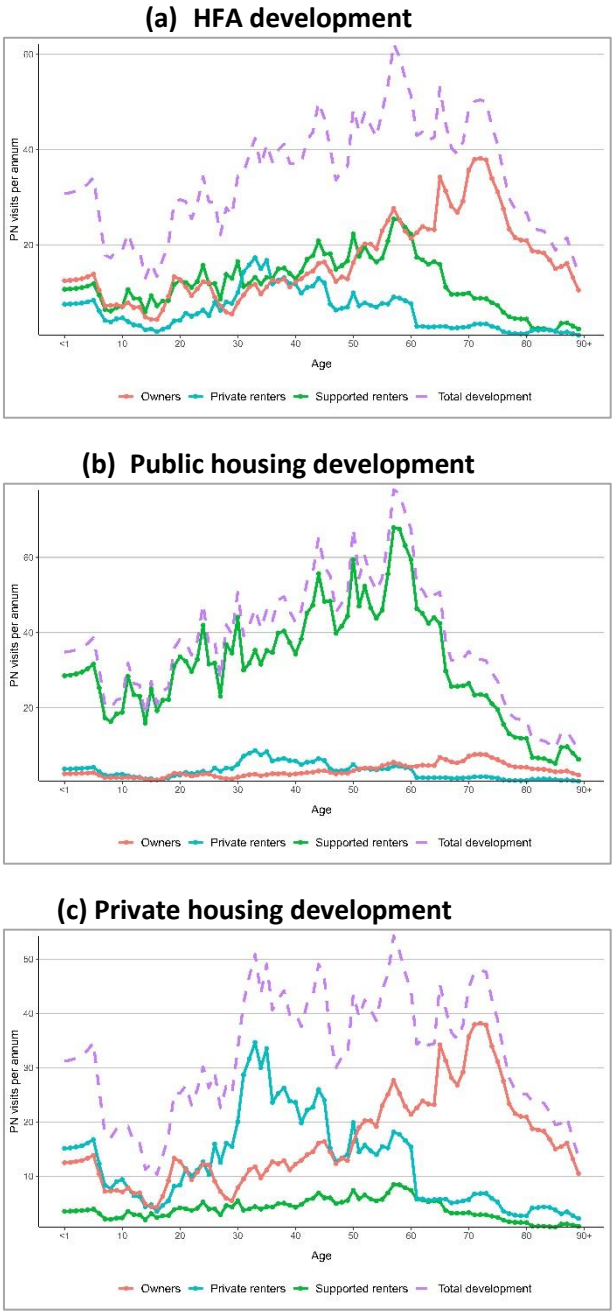


FIGURE A.2 PN VISITS BY AGE IN BENCHMARK DEVELOPMENT TYPES



A.2 ACUTE PUBLIC HOSPITAL DEMAND PROFILES ACROSS BENCHMARK DEVELOPMENTS

FIGURE A.3 EMERGENCY DEPARTMENT ATTENDANCES BY AGE IN BENCHMARK DEVELOPMENT TYPES

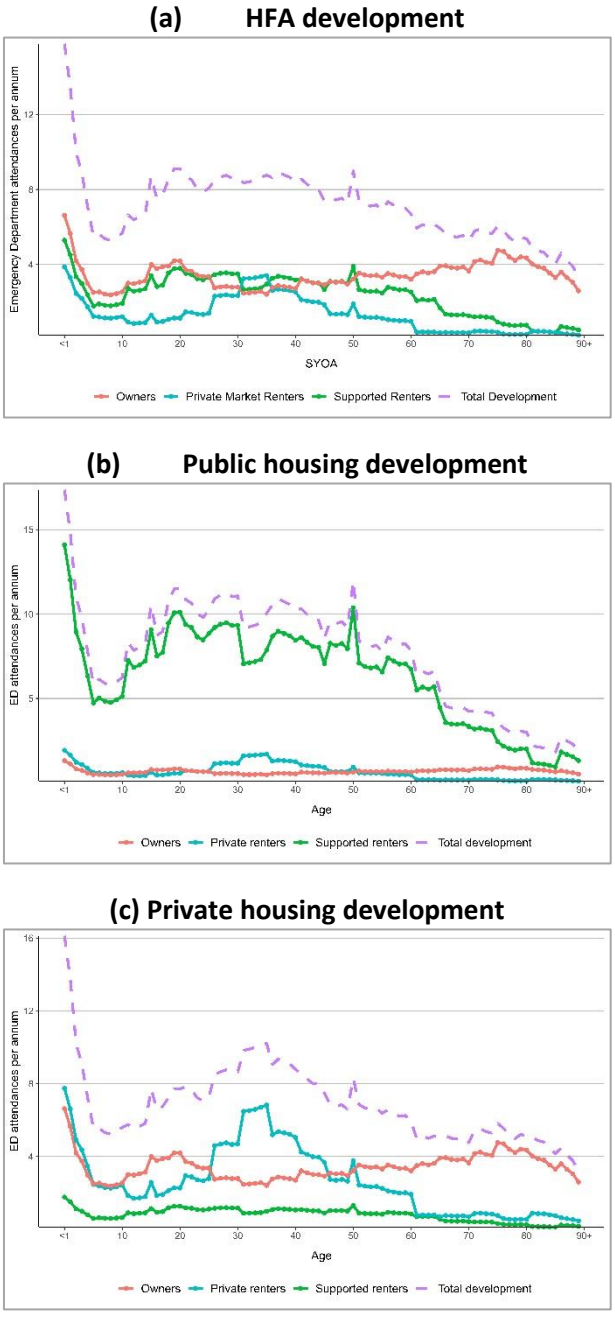
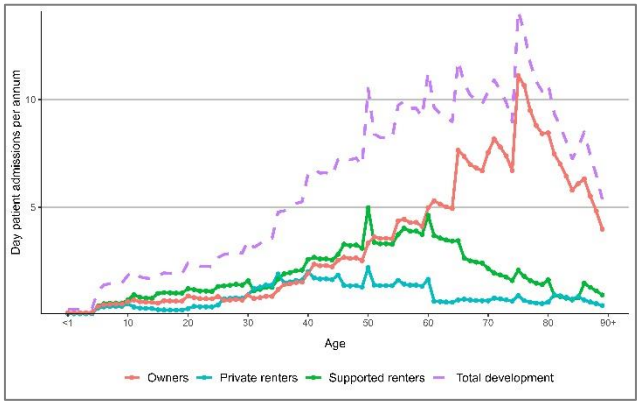
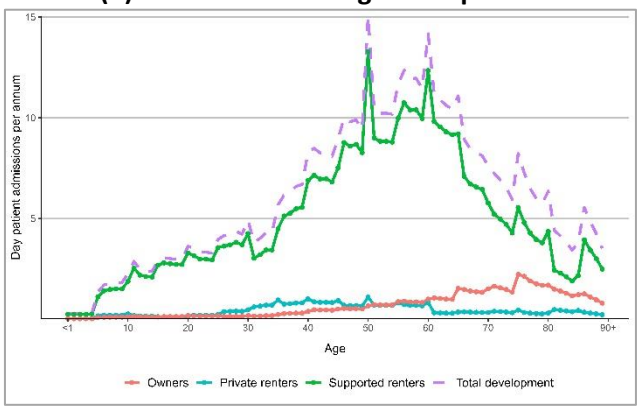


FIGURE A.4 DAY PATIENT ADMISSIONS BY AGE IN BENCHMARK DEVELOPMENT TYPES

(a) HFA development



(b) Public housing development



(c) Private housing development

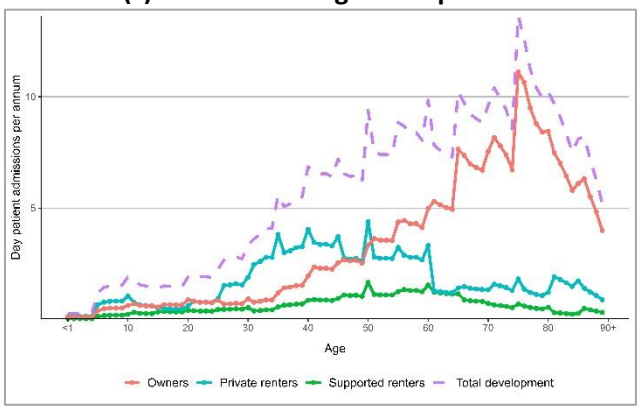
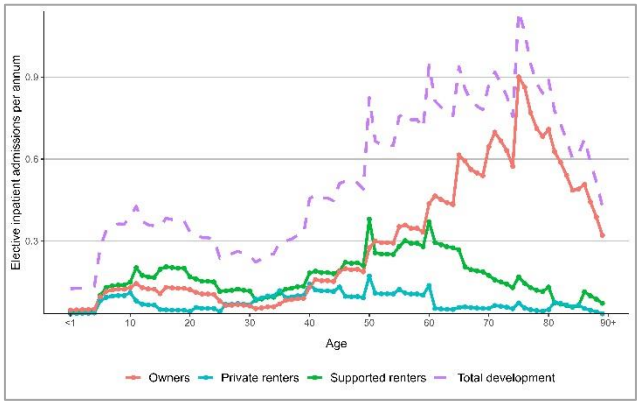
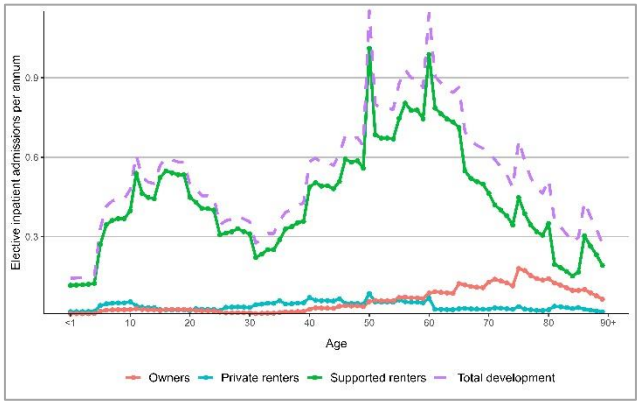


FIGURE A.5 ELECTIVE INPATIENT ADMISSIONS BY AGE IN BENCHMARK DEVELOPMENT TYPES

(a) HFA development



(b) Public housing development



(c) Private housing development

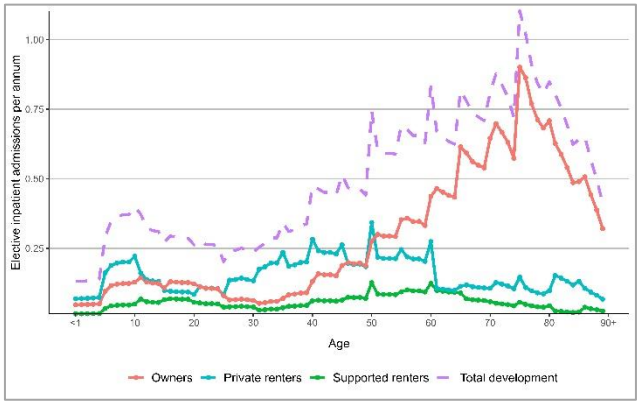


FIGURE A.6 EMERGENCY INPATIENT ADMISSIONS BY AGE IN BENCHMARK DEVELOPMENT TYPES

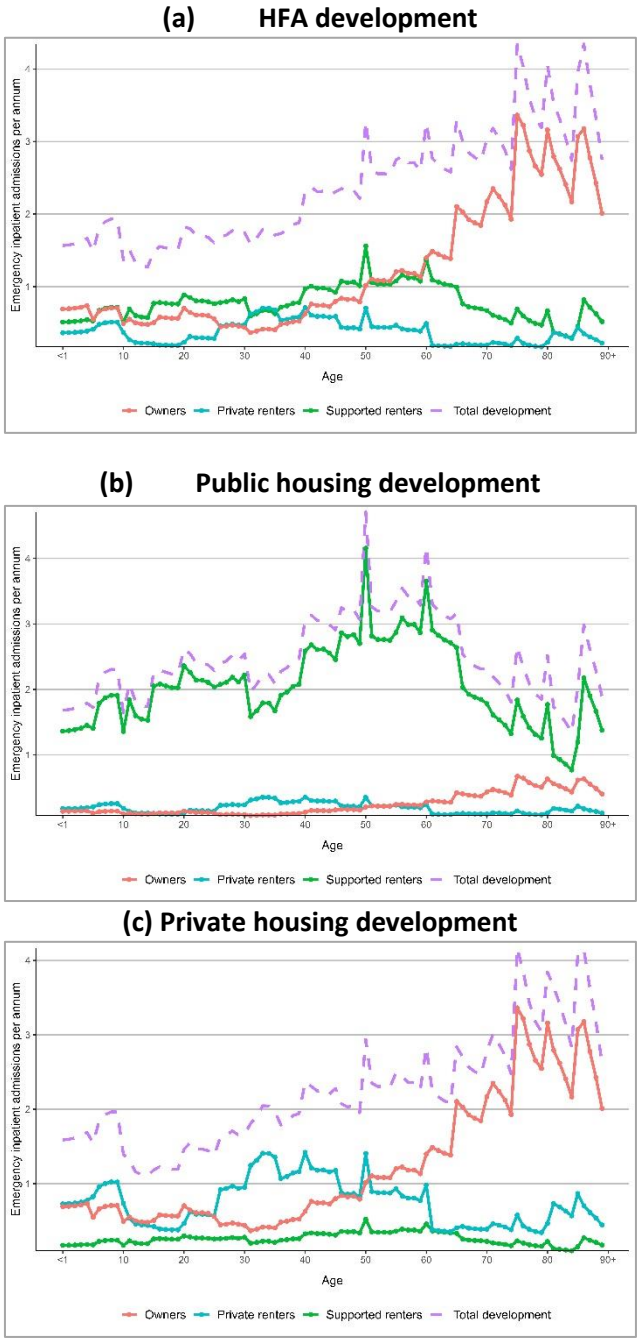


TABLE A.1 COMPARISON OF TOTAL INPATIENT (ELECTIVE + EMERGENCY) ADMISSIONS, BED DAYS AND REQUIRED BEDS IN BENCHMARK DEVELOPMENT TYPES

Parameters	(a) HFA	(b) Public housing	(c) Private housing
Development size	1,000	1,000	1,000
Total population	2,580	2,564	2,554
Supported renter %	30	80	10
Private renter %	20	10	40
Owner %	50	10	50
Total inpatient admissions	296	291	278
Bed days	1,783	1,539	1,687
Beds required	4.89	4.22	4.55

A.3 POLICY CHANGES EXAMPLE – UNIVERSAL PRIMARY CARE

The HHP model has also been developed to allow us to examine specific policy changes. To highlight the flexibility of the model to incorporate such changes, below we examine the demand and supply implications of a key Sláintecare policy goal: the expansion of free primary care to the full population. Previous research has shown that future policy change – such as the expansion of public healthcare coverage – could significantly alter healthcare demand profiles. Indeed, receipt of a medical card or GP visit card has been estimated to increase an individuals' annual demand for GP services by between 0.5 and 1.3 visits depending on age (see Table A.2).

Applying these average increases to our benchmark GP demand profiles, we get an indication of what the GP demand profile of a new development would look like under a policy framework of universal primary care.[23]

TABLE A.2 INCREASE IN GP VISITS PER PERSON ON RECEIPT OF A MEDICAL CARD OR GP VISIT CARD

Age	Additional visits/annum	% increase	Source
0–5	0.5	29%	O'Callaghan et al., 2018
6–15	0.5	63%	Nolan and Layte, 2017
16–54	0.9–1.3	27–39%	Nolan, 2008
55–70	1.3	43%	Ma and Nolan, 2017

In the example below (Table A.3), we compare a 1,000-unit HFA development under two different policy scenarios: one that estimates demand based on retrospective demand profiles; and another which considers likely demand under a policy framework of universal primary care. The HHP model suggests that demand for GP care could increase from almost 11,000 visits per annum to over 13,250 visits per annum, a 20.7 per cent increase. Under this scenario, GP WTE supply would need to increase by an equivalent amount in order to meet the healthcare needs of the same development under a universal primary care scenario. The scale of this increase would rise accordingly with the proportion of homeowners and private renters in the new development, as free primary care would be expanded to a relatively higher number of people (i.e., a greater proportion of the residents previously did not possess public healthcare coverage).

As Figure A.7 shows, the introduction of universal primary care would on average shift demand for healthcare upwards across most age groups. The demand profile for those aged under 6 and over 70 years would not be impacted by the policy,

[23] The increases are only prescribed to the utilisation rates of those who do not currently hold a medical card or GP visit card. This is the most appropriate approach as it controls for baseline differences in health outcomes between holders and non-holders of public healthcare coverage, thus disentangling the demand change caused by a change in the *cost* of GP services.

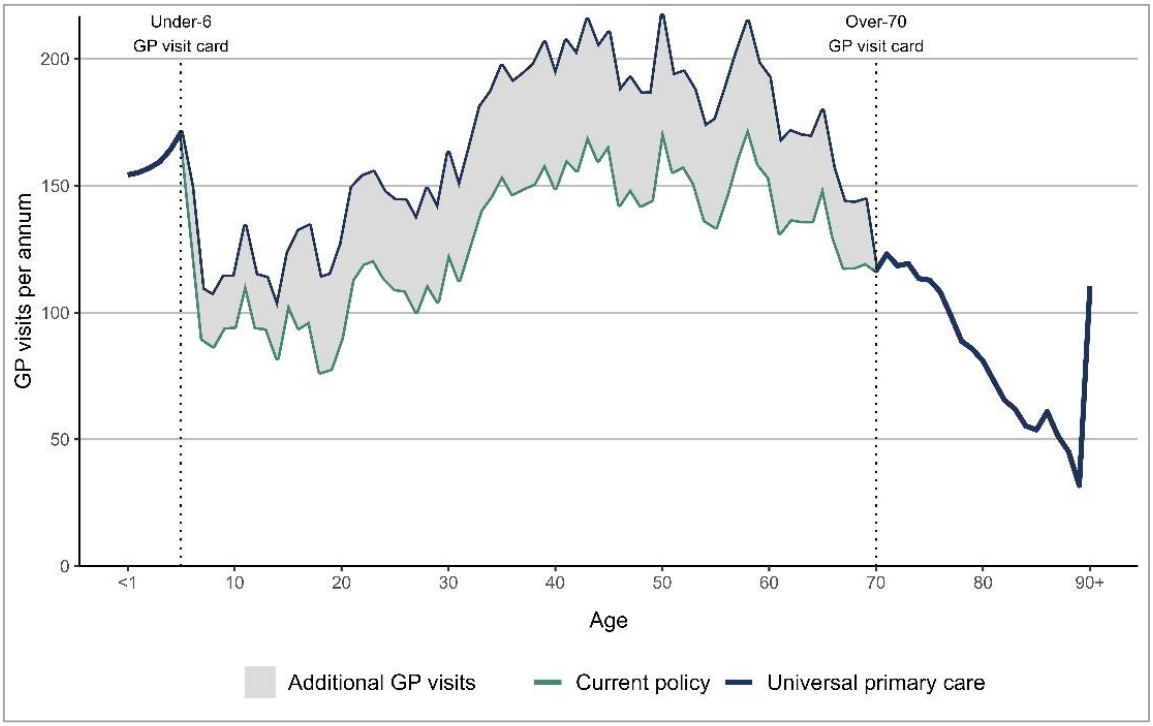
given that they are already entitled to free GP care. The greatest increases in demand would arise among working age adults, particularly those in the 25–60 age bracket.

Thus, when planning for new residential developments, it is evident that planning authorities must also consider the impact of changing policy frameworks in the healthcare sphere. The introduction of universal primary care, considered a priority under the current Programme for Government, is likely to particularly alter the profile of healthcare demand in any given new residential development. As a result, planning for increased supply of primary care and the associated infrastructure must also form part of the planning process for a new residential development.

TABLE A.3 COMPARISON OF THE IMPLICATIONS FOR GP DEMAND AND SUPPLY IN A 1,000-UNIT HFA DEVELOPMENT WITH AND WITHOUT UNIVERSAL PRIMARY CARE

Parameters	Current policy	Universal primary care
Development size	1,000	1,000
Total population	2,580	2,580
Supported renter %	30	30
Private renter %	20	20
Owner %	50	50
Total GP visits	10,979	13,254
GP WTEs required	1.50	1.80

FIGURE A.7 COMPARISON OF GP VISITS IN 1,000-UNIT HFA DEVELOPMENT WITH AND WITHOUT UNIVERSAL PRIMARY CARE



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