Rising demand for health care: The sustainability of community general practice in the Waikato

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Abstract

Community general practice is the cornerstone of New Zealand's health system, providing first contact health care, care coordination and acting as gatekeeper to expensive hospital services. An ageing population now brings increasing demand for the care provided in general practice, with chronic conditions a major contributing factor. This rising demand, alongside limited workforce capacity will seriously test general practice sustainability.

These evolving and multifaceted challenges are within the context of long-standing health access and outcome inequalities, particularly for Māori (and more recently the Pacific population) compared with Pākehā. The pursuit of equity is inherent in all health sector strategies, but any meaningful improvement will necessitate wide-ranging reform of current planning, funding and service delivery pathways across traditional sector boundaries.

The sustainability of general practice is about the sustainability and efficiency of the entire health system. To better measure the contribution of general practice care to the system, and improve demand projections, an expanded service use measure was developed, combining services of a general practice nature from Emergency Department and Accident & Medical settings with services delivered in community general practice.

Drawing on approaches from demography, epidemiology and health services research, linked demographic and health administrative data were used to undertake a retrospective, observational study of service use for 235,666 people enrolled with the Pinnacle Midlands Health Network in 2013/14. Using the new expanded measure, service use levels at a locality level were established by age, gender, ethnic group, chronic condition status, practice funding model, high needs status, income and geography of residence.

Significant variation was found in annual average consults (1.0 to 13.4 consults in 2013/14). Statistical analysis identified age, chronic conditions and gender as the key demand drivers responsible for such variation, with regional level results masking significant spatial variation. Where the cost of care was lower, people used a higher level of services in the enrolled practice setting and a lower level outside of it, suggesting the importance of affordable care. Māori and Pacific used

significantly fewer services than Pākehā although there was substantial sub-regional variation. Using the expanded measure, the vast majority of care was delivered in the enrolled setting, including for those with chronic conditions.

Demand projections, based on the expanded measure of general practice, out to 2038 show the uneven geography of future demand due to disordered cohort flows and sub-regional population contexts. Overall, demand for services is projected to rise by 34 per cent to almost two million consults across the Waikato District Health Board catchment, with this driven predominantly by services for those aged 65+ years (or 45+ years in Hamilton City, Waikato and Waipa Districts).

Models of care are being transformed as general practices and Primary Health Organisations look to the future. Reorganisation of work roles, improved use of health information and use of emerging health technologies will be required to re-configure general practice in preparation for an ageing future, and to eliminate recalcitrant health inequalities. Real and inclusive collaboration across traditional system boundaries is perhaps the greatest challenge to general practice sustainability.

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List of Abbreviations

A&M	Accident and medical centre
ACC	Accident Compensation Corporation
ACSC	Ambulatory care sensitive condition
ASH	Ambulatory sensitive hospitalisation
BSMC	Better, Sooner, More Convenient
CSC	Community services card
DHB	District Health Board
ED	Emergency Department
ERP	Estimated resident population
GMS	General Medical Subsidy
GP	General Practitioner
ICD-10	International Classification of Disease version 10
MCNZ	Medical Council of New Zealand
MoH	Ministry of Health
NZDep	New Zealand Deprivation Index
NZHS	New Zealand Health Strategy
NZNC	New Zealand Nursing Council
Pinnacle MHN	Pinnacle Midlands Health Network
Other	'Other' in the study population refers to Pākehā (the majority), Asian, Middle Eastern/Latin American and Africa and all other minorities
Pākehā	People of New Zealand European, European ethnicity
PHCS	Primary Health Care Strategy (2001)
PHO	Primary Health Organisation
PN	Practice Nurse
RNZCGP	Royal New Zealand College of General Practice
SDT	Second demographic transition
TA	Territorial Authority
VLCA	Very low cost access (refers to a type of practice funding)
Waikato DHB	Waikato District Health Board

1 Introduction

1.1 Background

New Zealanders want to access health care when they deem it necessary. Every week hundreds of thousands of people interact with the health system and the vast majority of resulting services are provided in the community, by the health professionals in general practice (Ministry of Health, 2011, p. 2). As such, general practice is the cornerstone of the health system, referring not only to the proportion of all health care occurring in that setting, but to the traditional role of general practice as gatekeeper and co-ordinator of access to hospital based services (Ministry of Health, 2011). Given these fundamental roles, it is imperative that health planners and policy makers understand how the sustainability of general practice will be challenged by the expected future increases in demand for services.

The anticipated increase in service demand is primarily due to population ageing. This ageing process will accelerate as the baby boomers (generally considered those born from 1946 to 1965)[1] move into retirement ages in rising numbers over the next three decades, the first baby boomers having reached age 65 years in 2011. In the national media, concern around the ageing population often centres around the "impending burgeoning of the elderly population" (Khawaja & Boddington, 2010, p. 131). There is concern around the implications an ageing population will bring for policy development, funding and planning in the health sector and the expected increase in the health and age care services share of the national budget (Kerse, Lapsley, Moyes, Mules, & Edlin, 2016; Khawaja & Boddington, 2010; Minister of Health, 2016).

The shift-share to there being proportionally more older people in the population is a historic first and, as such, is unchartered territory for the health sector. Population ageing is an important achievement in itself, given it is the result of declining mortality at younger ages and the concomitant increase in life expectancy. This has been a long term 'good news' story in human development. While population ageing is often portrayed as a somewhat gloomy future, there is no benchmark or ideal population age structure – merely variations over time (Vaupel & Edel, 2017).

[1] Statistics New Zealand defines the baby boom as occurring between 1946 and 1965. Pool, Dharmalingam and Sceats (2007) have argued that it covered the period 1943-1973 (when a baby boom is defined as sustained high fertility, as measured by a Total Fertility Rate of 3.0 and above).

It is widely recognised in the health sector that a future of rising demand for services will place significant strain on general practice, at the same time as there will be increasing workforce losses, as baby boomer general practitioners (GPs) and practice nurses (PNs) decrease their working hours or fully retire in increasing numbers (Crettenden et al., 2014, p. 1; Pinnacle Group Limited, 2007a, 2007b, 2010; Royal New Zealand College of General Practice, 2015, 2017a). These demand side and supply side challenges, will (and are) occurring simultaneously. While this study focuses predominately on the demand side of service use, the workforce supply side is recognised as a critically important sustainability component.

The demographic transition provides a framework in which to situate this study into current and future demand for general practice services. The demographic transition is a macro-level theory, describing how societies have differentially transformed from regimes of high fertility and high mortality to that of low fertility and low mortality. Alongside the demographic transition is another macro level transition - the epidemiological transition, this covers the long term shift from infectious disease morbidity and mortality towards that of chronic conditions. These long term transitions have been occurring in tandem, the effects of which, in concert, create the key demand drivers for general practice services.

New Zealand's transition to an ageing population is driven by the majority non-Māori non-Pacific population (termed 'Other' in subsequent analysis chapters). The vast majority of these individuals are of New Zealand European/European ethnicity (referred to in this study as Pākehā). At a simplistic level the impacts of population ageing will include a larger pool of older people, living longer and consuming a rising proportion of the services provided in general practice. The situation however, is rather more complex and multifaceted. In New Zealand, at the macro level there are two distinct ethnic populations (Pool, Baxendine et al, 2009) – indigenous Māori and Pākehā. The age structures of these two populations have long been dissimilar and will continue to be so for the foreseeable future. Alongside this, there are growing minority populations of Pacific peoples, at both the national level and in the Waikato DHB catchment (Waikato District Health Board, 2017). From a demographic and health service planning perspective the small Pacific population in this study has been combined with Māori (further discussed in Chapter 1.3). For planners there remain two key populations to be accounted for - the middle-ageing Māori and Pacific population and the old ageing Pākehā population.

The ageing population, and inherent implications, are much discussed in all strategic health documents and generally refer to the Pākehā population. The Pākehā population are a critical factor, given the baby boom was a Pākehā phenomenon (Pool, 2005; Pool, Prachuabmoh, & Tuljapurkar, 2005). The Māori and Pacific population did not have a post war baby boom, instead continuing with high levels of fertility throughout the period (Pool, 2007; Pool, Prachuabmoh, et al., 2005). The transition of the Pākehā baby boom population from retirement age through into the oldest ages is expected to bring many profound changes for society as a whole (Hugo, 2013).

General practice services are delivered in a dynamic health environment. The health sector as a whole has undergone considerable re-organisation since the implementation of the New Zealand Health Strategy (NZHS) in 2000, the Primary Health Care Strategy (PHCS) in 2001, the Disability Strategy (2001), Māori Health Strategy (2002) and the Health of Older People Strategy (2002). These strategies reference and were in part a response to widening inequalities particularly for the Māori and Pacific population, resulting from the implementation of neo-liberalist policies and subsequent restructuring of the welfare state and industrial sector during the 1980s and 1990s (Pearce & Dorling, 2006, p. 597; Robson & Harris, 2007; Came, 2012; Davis, Graham & Pearce, 1999; Statistics New Zealand, 2002). While the socio-economic environment of that time widened inequalities, this study acknowledges the genesis of health disadvantage for Māori arising from the processes of colonisation (Walker, Lovett, Kukutai, Jones & Henry, 2017, p. 2022; Reid & Robson, 2006; Robson & Harris, 2007; Axelsson, Kukutai & Kippen, 2016).

The Ministry of Health (MoH) released the refreshed Māori Health Strategy in 2014, the NZHS in 2016 along with the new Health of Older Persons strategy (now termed the Healthy Ageing Strategy). While strategies abound, the NZHS, as the key direction setting strategy for the health system, acknowledges the focus on general practice as a core sector strength, as well as the multifaceted challenges posed by an ageing population. It sees the current model of care as inherently unsustainable and states the need to remodel the way health care services are both organised and delivered, across the entire system (Ministry of Health, 2016).

This study is about current and future demand for general practice services. Community general practice, however, is not the only place that people access the health system to receive the type of care that general practice offers – the other two settings are Accident & Medical (A&M) centres and Emergency Departments (EDs). The care individuals seek through these three settings may be preventative in focus, focused on chronic conditions management or be an acute presentation (or a mix of these). General practice typically deals with all three types of care, with perhaps A&Ms and EDs focused more on acute care. For general practice, one critical issue in the scenario of rising demand is the place of consults for chronic care management. GP's are crucial in diagnosing and triage, but increasingly their time will be taken up by routine care of older people with chronic health conditions. This will cause flow on effects for everyone seeking the services provided through community general practice.

The effects of an ageing population will be across the board in terms of policy, planning and service provision. The challenge for general practice will include meeting the rising health care demand of the majority Pākehā population moving into old age, while simultaneously meeting the needs of the middle ageing Māori population (where the Crown has Treaty of Waitangi[2] obligations) and the middle ageing Pacific population, as well as the needs of other minority populations.

Aligned with this, a key component of the current health service model that is generally seen as unsustainable is the recent rise in use of EDs (Ministry of Health, 2016). This issue is focused around 'walk ins', particularly those individuals who after clinical assessment are categorised as low acuity to treat and with a principal diagnosis pertaining to an ambulatory sensitive condition – that is, care considered to be amenable to or best delivered in general practice. This ambulatory sensitive grouping is a small sub-set of all the care delivered in EDs, but an important one, that continues to attract significant attention particularly from hospital based managers, service planners and periodically, the media[3].

[2] The Treaty of Waitangi is New Zealand's founding document, signed on 6 February 1840, between the British Crown and many (but not all) Māori rangatira (chiefs).
[3] Periodic reporting in the Waikato Times notes ED overload issues and the link with general practice capacity https://www.stuff.co.nz/national/health/95176802/busy-hamilton-clinics-turn-away-ambulances and http://www.stuff.co.nz/national/health/81900333/People-using-hospital-emergency-departments-like-a-GP

Alongside more recent issues such as the rise in ED use, are some longstanding whole of sector challenges, including access to services and health outcome inequalities between population groups. There are well documented historical and continuing inequalities for Māori (also for the Pacific population) compared to Pākehā (Ajwani, Blakely, Robson, Tobias & Bonne, 2003; Baker, Barnard, Kvalsvig, Verrall, Zhang, et al, 2012; Came, McCreanor, Doole & Rawson, 2016; Cram, 2014; Ministry of Health, 2002a). Tackling inequalities remains at the core of all key health sector strategies, visions and objectives – particularly since health sector reorganisation from 2000 onwards, although inequalities have been evident for longer (Pearce & Dorling, 2006). The call to work in collaboration and partnership with Māori (particularly, but also with Pacific and other minority groups) are inherent in all sector strategic documents with a key component being the need to develop culturally appropriate services (Ministry of Health, 2014a, 2014c, 2018) as part of the push to eliminate health inequalities. These changes, if implemented at scale will present challenges to the predominant western medical model of health and disease, under which most of the health system is structured (Ajwani et al., 2003; Reid & Robson, 2006; Came, 2012). Given that inequalities remain signals hard questions must be asked right across the system about how to restructure the institutional arrangements of the sector to facilitate equality.

For health planners, a central concern is that a general practice sector under future strain due to rising demand may no longer be able to play its traditional cornerstone provider of care, coordinating and gatekeeping roles. If this occurs and sustainability is strained (or general practice starts to fail) there will be flow on consequences in terms of increasing use of secondary care services as well as higher secondary care costs due to increased complications of poorly managed chronic conditions. These consequences will be felt across the health sector, albeit with differing effects regionally, including a threat to New Zealanders ability to access health care in their community when they deem it necessary.

In all these health sector challenges the role of demography is central to understanding the issues that surround general practice sustainability. Population is primarily a demand side variable, but also has supply side effects in terms of supply labour (the workforce) (Pool, 1994, p. iii) . Pol and Thomas (2000, p. 12) support this, noting that health planners and funders must know the demography of their service users alongside the health needs and health outcomes of all populations.

1.2 The problem, theoretical approach and contribution to knowledge

This section has three aims; firstly to clarify the problem under investigation, secondly to show how this study fits into existing knowledge of current and future demand for services and the sustainability of general practice. Finally, this section shows where the findings make a contribution to the current body of knowledge.

Clarifying the problem

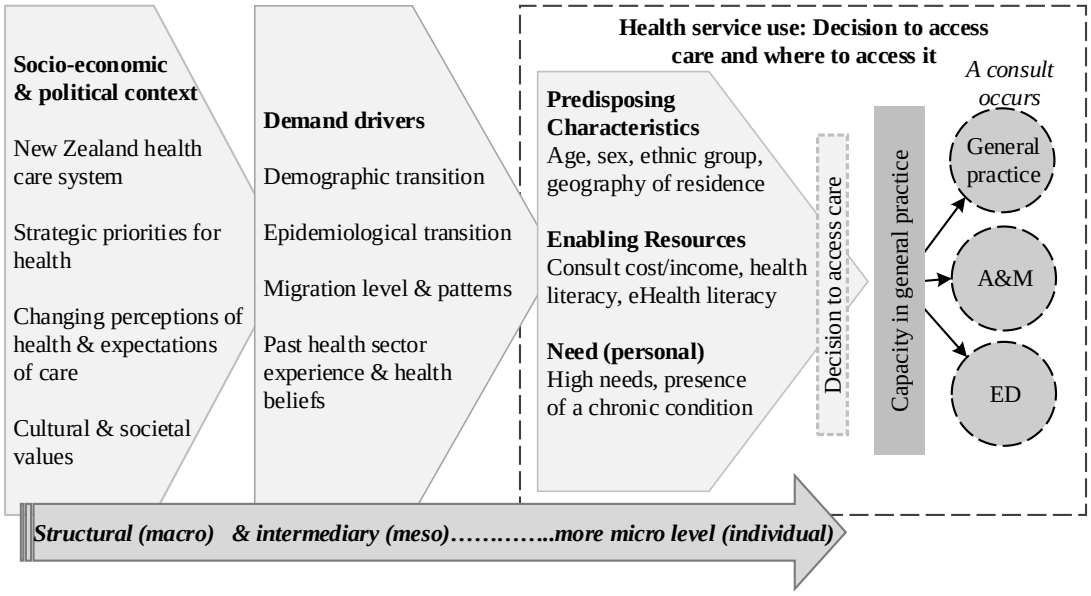
As the cornerstone of the health system, general practice must remain sustainable and able to provide its traditional role as provider of first-point of contact care, coordinator of care and gatekeeper of access to secondary health care services. An ageing population brings increasing demand for general practice health care services, with the presence of chronic conditions a central contributing factor. This future demand will challenge the very sustainability of general practice as workforce constraints deepen. In order to discuss sustainability, this study looks at current and projected demand for general practice services at the sub-regional and DHB level in the Waikato.

There are three settings where general practice care is delivered. The vast majority of services are delivered in the enrolled or community general practice setting but A&M centres and hospital EDs also deliver care that can be considered to be of a general practice nature. This study is interested in the care being delivered in all three settings and uses a new expanded measure of the size of general practice. This is done by combining service use locations into (1) within the enrolled general practice setting, (2) outside of the enrolled setting and (3) total use of general practice services. Administrative service use data held by the Pinnacle Midlands Health Network (MHN), in its role as a Primary Health Organisation (PHO), were used to link service use records – from where individuals accessed the services they deemed necessary rather than (perhaps) where the sector would have preferred the services were delivered. These combined records were then linked to socio-demographic enrolment data held by the PHO. This allowed analysis of 2013/14 demand levels and of the independent variables driving demand, with the projection of future demand based on the new measure of total general practice service use. The resulting findings allow a wider discussion of sustainability within the dynamic socio-economic and political context in which all health care is delivered.

Theoretical approach

This study draws on theoretical approaches from demography, epidemiology and health services research. Researchers have long advocated that the perspectives of different disciplines in the study of population change (and social and policy effects of that change) is a necessity in terms of the interpretation of the effects of change ((Mayer, 1962) in Omran, 2005 p. 731). This approach provides the sustainability lens in the context of an ageing regional population, both in explanation of 2013/14 service use levels as well as in the projection of future demand. Investigation of service use, with this new approach to measurement, and using PHO held administrative data provides new knowledge to assist planners and funders to ensure the right services (and the level of service) are available in the right place at the right time. Figure 1.1 presents the model for general practice service demand.

Figure 1.1 Theoretical model for general practice health service utilisation



Andersen's (1995) model of access to health care services has been used to situate and interpret the socio-demographic factors related to established levels of service use in 2013/14. At the more individual level are constructs from the wider social science fields of medical sociology and social psychology - the latter concerns the behavioural pathway from health need perceptions, deciding to seek health care to the realisation or 'materialising' of intentions into actual health care use. Following this, the study looks at what Pool, Prachuabmoh, et al. (2005), call 'time varying age waves' and 'multiple age waves' at the sub-regional level of the Waikato DHB. This is done by analysing demand projections at the Territorial Authority (TA) level

from the 2013/14 baseline out to 2038. The processes developed in this study are replicable. They could be expanded on by the Pinnacle MHN in the future to monitor service use metrics, for any population group of interest.

The contribution to knowledge from this study

This study is at the heart of both the call by Downs (2017) for a sector wide approach to looking at general practice in the ED setting, and that of quantifying the contribution of general practice to the sector by using the data generated in general practice to better effect (Ernst & Young, 2016). This study has linked health service use records across the sector, including services delivered in the enrolled practice setting with general practice type services delivered outside of the enrolled setting. The Pinnacle MHN, in its function as a PHO, now routinely collects this administrative data on service use. Other PHOs may have access to similar service use data from their affiliated general practices (and DHB), but it is noted that DHBs and the MoH do not have access to this level of GP service use activity.

Taken together, the Downs and Ernst & Young reports highlight longstanding knowledge gaps for general practice. The Downs (2017) report[4] was titled "From theory to practice: The promise of primary care in New Zealand". This report made a number of recommendations, the detail of which included;

> "…there are no system-wide analyses that link patients' utilisation of health care services across the primary and secondary sectors…As New Zealand collects data to increase collaboration between general practice and hospital services, high-level questions in this phase could include…
>
> - To what extent is low primary care utilisation associated with higher secondary care utilisation and in which populations (analysed by disease burden, geography, ethnicity, income)? How could this be managed differently?
> - How often are individuals presenting in the emergency department with conditions that can be treated in primary care? How does this vary by enrolees in different general practices? How does this vary by disease

[4] Amy Downs, Vice President of the Colorado Health Institute, researched access and equity in New Zealand's primary health care system and was hosted by The Treasury (health section) under a Fulbright Fellowship.

> burden, geography, ethnicity, income? Where prevalence is high, how might this issue be managed differently?" (Downs, 2017, pp. 28,29).

The Ernst & Young report was titled "A national primary care data repository". It aligns with the Downs report in terms of espousing the need for 'whole system health intelligence' for planning purposes that demonstrate the contribution of general practice to the wider system, using measures of relevance to general practice – including using the data captured in general practice to better effect (Ernst & Young, 2016, p. 8). This report has since been followed, in late 2017, by an expression of interest (EOI) process for the establishment of such a national primary care data service that will facilitate the sectors "...understanding of population health, quality improvement initiatives and health system planning".[5]

In summary, this study develops new knowledge to facilitate planning processes and build understanding of the demography of general practice service use. The size and contribution of general practice has been more accurately measured through the linking of service use data and the establishment of service use patterns at the regional and sub-regional level, including for those with chronic conditions. Planning for a sustainable general practice sector has been aided through the projection of the expanded measure of service use for the two key populations in transition - middle ageing Māori and Pacific and the old ageing Pākehā population.

1.3 Ethnic groupings used in this study

A central tenet of this study is age structural change in the population of the Waikato DHB area, and the sustainability of general practice in anticipating and providing for this population future. This study recognises the enduring Treaty of Waitangi relationship between the Crown and Māori and the on-going commitments this brings, in terms of ensuring equity of access to health care services and equity of health outcomes.

This study has aggregated individuals into two groups dependent on their ethnicity coding in the Pinnacle MHN administrative data. Ethnicity data were available at some granularity[6]. Individuals coded as Māori or Pacific have been aggregated into a Māori Pacific study population and all 'Others' – a population made up

[5] From the EOI for establishment of a National Primary Care Data Service, www.healthit.org.nz
[6] Ethnicity at level two – Ethnicity New Zealand Standard Classification 2005 version 2.0.

predominately of those coded as New Zealand European or European (Pākehā). The Other population includes those minority populations coded as Asian along with all those classified as Middle Eastern/Latin American/African and all Other Ethnicity[7] minority groups.

Grouping the two populations this way was partially based on New Zealand's experience of the demographic and epidemiological transitions (detailed in Chapter Three). For both these high level processes, essentially there have been two populations in transition – Māori and Pākehā (Pool, Baxendine, et al., 2009; Jackson, 2011a). While it is not possible to analyse the transition experiences of the Pacific[8] population in the same way, it is considered likely that the Pacific transition pathway has been, and will continue to be, similar to that of Māori (Pool, Baxendine, et al., 2009, p. 172). Other contributing reasons include:

- The current age structure of the Māori and Pacific populations are similar and both are significantly dissimilar to Pākehā. There is a growing Pacific population in the Waikato DHB region, particularly located in Hamilton City and the South Waikato District (Waikato District Health Board, 2017). As noted, the Pacific demographic and epidemiological transition pathway is considered similar to that of Māori, with both populations having higher levels of health need (Pool, Baxendine, et al., 2009). A Statistics New Zealand (2002, p. 17) report has noted that in many respects, the Pacific population has a similar social and economic profile of the Māori population.
- The Waikato DHB's strategic imperatives include health equity for high needs populations, which include the Pacific population (Waikato District Health Board, 2016, 2017) aligning with the 2016 NZHS and the MoH's Pacific Health and Wellbeing Plan (Ministry of Health 2014a).
- The MoH definition of the 'high needs' population used for planning and funding purposes combines the Māori population, Pacific

[7] As classified by the Ethnicity New Zealand Standard Classification 2005 version 2.0.
[8] The Pacific population is made up of a number of different ethnic groups, including Samoan, Cook Islands, Tongan, Niuean (Statistics New Zealand, 2002).

population and those Pākehā (and all Others) resident in a geographical area of high deprivation (based on the New Zealand Deprivation Index).

- The MoH includes both the Māori and Pacific populations as priority groups in terms of the impact of long term conditions on higher rates of illness, disability and death (Associate Minister of Health, 2016), particularly in comparison to Pākehā (Ministry of Health, 2002a, p. vii).
- Results from recent New Zealand Health Surveys show that both Māori and Pacific populations share many of the same issues around inequitable access to general practice (Scott & Lawrenson, 2015; Ministry for Pacifc Peoples, 2017), unmet need for general practice care, unmet need for pharmaceuticals and disparities in health outcomes (Ministry of Health, 2015, 2016d; Ministry for Pacific Peoples, 2017).
- There is recent evidence that the uneven burden of infectious disease remains an important health sector issue for Māori and Pacific communities (Baker et al., 2012).

This study acknowledges that even given the practical planning and service delivery reasons noted above, there is a tension in the aggregation of the enrolled Māori and Pacific population into a single ethnic grouping. The tension is in regards to the Treaty of Waitangi partner focus, where for the purposes of monitoring various aspects of Māori health status comparisons are generally made with non-Māori (Ministry of Health, 2002a).

The Māori and Pacific study population

Table 1.1 shows the detail of the ethnic groups. In total there were 40,979 Māori and Pacific individuals in the study population. Of this aggregated group, Pacific people made up 11.1 per cent. Those individuals coded as Pacific within the Māori Pacific grouping are residentially concentrated in Hamilton City and the South Waikato District, where 76.5 per cent of all Pacific people were resident. Outside of these TAs, there were small numbers of individuals enrolled with Pinnacle MHN and coded with Pacific ethnicity.

Table 1.1 The Māori and Pacific study population

TA of residence	Ethnic group			Total	Per cent Māori Pacific	Per cent Pacific in Māori + Pacific
	Other	Pacific	Māori			
Hamilton	76,685	2,278	13,583	92,546	17.1	5.6
Hauraki	6,858	39	882	7,779	11.8	0.1
Matamata-Piako	14,807	92	1,515	16,414	9.8	0.2
Ōtorohanga	5,797	64	1,979	7,840	26.1	0.2
Ruapehu	3,134	36	1,443	4,613	32.1	0.1
South Waikato	5,249	1,168	3,355	9,772	46.3	2.9
Thames-Coro	16,098	134	2,138	18,370	12.4	0.3
Waikato	23,662	271	4,261	28,194	16.1	0.7
Waipa	37,572	265	4,582	42,419	11.4	0.6
Waitomo	4,825	158	2,736	7,719	37.5	0.4
Total	**194,687**	**4,505**	**36,474**	**235,666**	**17.4**	**11.1**

To ascertain if there were any difference in results, statistical analysis (negative binomial regression) was undertaken for the Māori population only and compared with the combined group of Māori Pacific in Hamilton City and South Waikato District. The results confirmed that the Pacific population being included with Māori does not change statistical results at the aggregated level (see Appendix One).

1.4 The Pinnacle Midlands Health Network in the Waikato

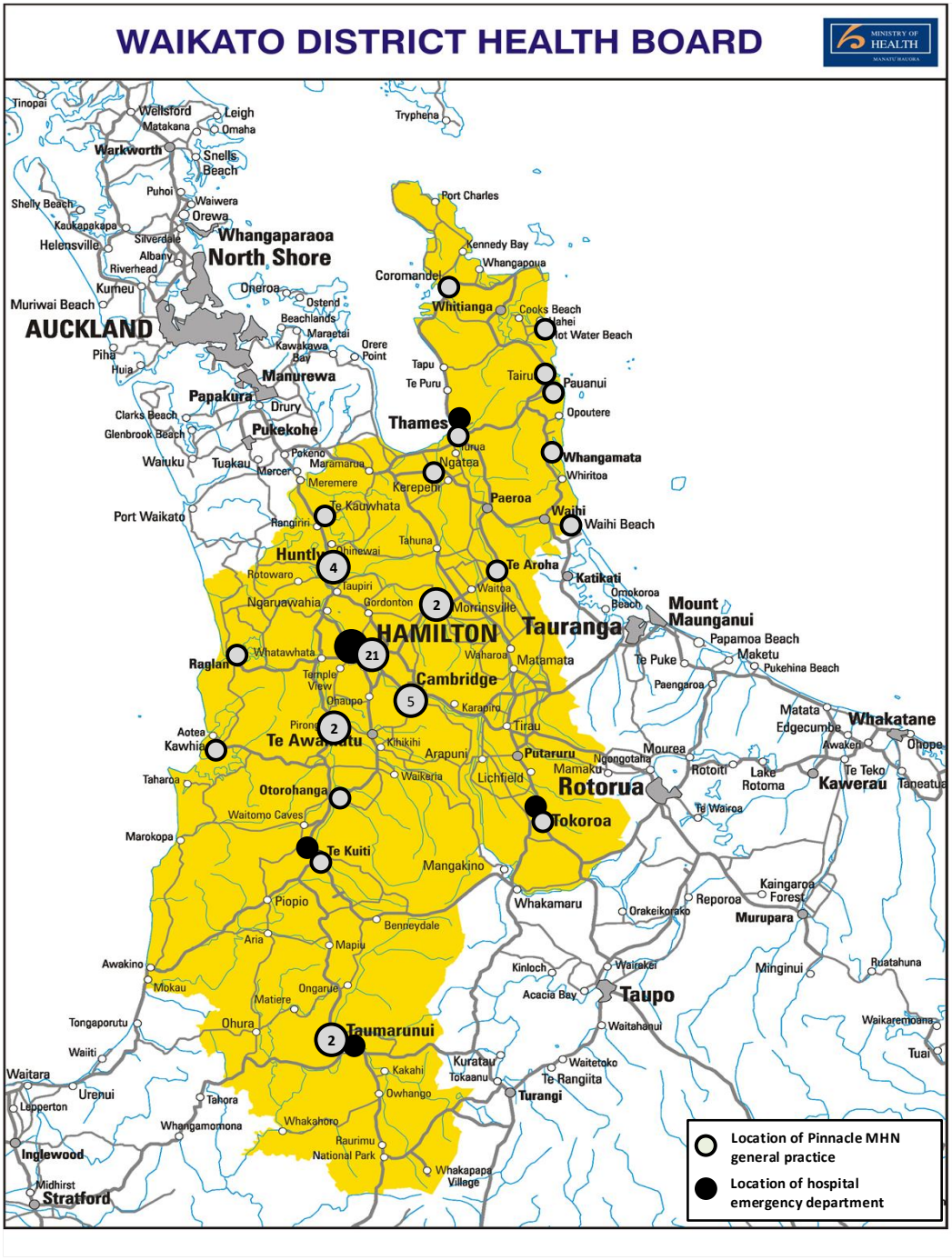
The Pinnacle MHN is one of 32 PHOs nationwide and works on behalf of Pinnacle Incorporated (a network of GP members). The PHO spans four DHB catchments, with this study focused solely on the Waikato. The Waikato region of Pinnacle MHN covers the geographic area aligned with the Waikato DHB[9] (Figure 1.2).

In March 2013 there were 51 affiliated general practices providing health care services to over 279,000 enrolled individuals. Pinnacle MHN, like all PHOs, is funded by the MoH via DHBs to provide health care services to their enrolled population, mainly through community based general practices. This is the main avenue through which the Government's primary health care objectives are implemented. Pinnacle MHN has been very active around the challenges of managing future service demand to ensure a sustainable practice model. The PHO is progressively implementing model of care changes that began as part of the MoH

[9] There is one exception - the inclusion of a general practice located in Waihi Beach (owned by Primary Health Care Limited a subsidiary of Pinnacle Incorporated) which is located just inside the Bay of Plenty DHB boundary.

2009 “Better, Sooner, More Convenient” initiative. These changes, while not a central tenet of this study until the Discussion chapter, are part of the context in which some practices were operating in 2013/14. Figure 1.2 shows the location of Pinnacle MHN affiliated general practices. The black dots identify the location of the EDs. There are five of these, the main one located in Hamilton City. Where there are numbers located within dots, this signifies the number of affiliated general practices in that location (in 2013/14).

Figure 1.2 The location of Pinnacle MHN general practices in 2013



Source: Adapted from Ministry of Health (www.health.govt.nz)

1.5 Thesis structure

This section provides an outline for each of the following chapters.

Chapter Two: Research topic, objectives, questions and hypotheses

This chapter defines the research topic and breaks it down into the principal research question, research objectives with sub-questions and aligned hypotheses.

Chapter Three: Theoretical approach to health service demand and use

This chapter provides the framework for where this study is situated and where the original contribution is located. It looks at the socio-economic and political context and the demand drivers around service use. The theories of demographic and epidemiological transition are major components, alongside the central issue of health inequalities in New Zealand. Andersen's model of health care service use is presented, as well as an overview of what is currently known about general practice health service use – both in the community and ED setting.

Chapter Four: Research methods

This chapter covers the approaches taken by the study, as a whole, and of specific components of the study approach and design.

Chapter Five: Results - establishing the study population

Establishing the study population is described, along with the findings on 'enrolment churn', cross administrative boundary flows and comparison of the study population to the Estimated Resident Population (ERP) of the Waikato DHB.

Chapter Six: Establishing service use (in 2013/14)

This chapter presents the levels and patterns of general practice care received by a number of socio-demographic variables in the baseline 2013/14 year. The new methodological approach allows for better measurement of the size of general practice health care – irrespective of whether the care is delivered in the general practice setting or outside of it. Service use is shown in the enrolled setting, outside the enrolled setting and as total service use.

Chapter Seven: Service use and chronic conditions

This chapter focuses on the general practice service use of individuals with one or more of four chronic conditions; diabetes, chronic obstructive pulmonary disease (COPD), heart failure and ischemic heart disease. Service use for this subset of the

study population is compared by a number of socio-demographic variables, as well as to the study population without any of the selected chronic conditions.

Chapter Eight: Demographic and health factors in service use

This chapter presents the results of negative binominal regression modelling. Eight independent variables were included in the modelling which was undertaken within each of the region's ten TAs and for the Waikato DHB as a whole. Variables include, age, gender, ethnic group, geography of residence, high needs status, cost of a consult (based on practice funding type), income (using holding of a community services card as a proxy) and presence of a chronic condition.

Chapter Nine: Projected demand for service use

The results shown here take the service use levels for the study population in the 2013/14 year and apply that to the Waikato DHB ERP at 30 June 2013. Once the estimated baseline is established, demand for general practice services is projected forward in Census year intervals out to 2038. The resulting projected levels of demand, under several scenarios, are presented.

Chapter Ten: Discussion

This chapter brings together the key findings and new knowledge gained from previous chapters. Within this, consideration is given to general practice sustainability through the themes of; the tale of two populations, the increasing importance of chronic disease, equity of access and the elimination of health inequalities and the transformation of general practice. Finally, the strengths and limitations of this study are presented with recommendations for future research.

Chapter Eleven: Conclusion

Final comments on the topic and its importance are made in the context of the strategic direction of the health sector.

There is a summary of results section as well as a discussion section at the end of Chapters Five through Seven. Chapters Eight and Nine have an integrated summary and discussion section. Chapter Three (review of the literature) also has a summary section bringing together the many sub-sections in that Chapter. Given this structure in the results orientated chapters, and the integration of findings into the discussion of sustainability themes in Chapter Ten, there is no re-stating of findings in Chapter Eleven: Conclusion.

2 Research Topic, Objectives, Questions and Hypotheses

Chapter One introduced the series of challenges facing general practice connected with the rising demand for its services, outlined the theoretical approach and the contribution of this study to knowledge. This chapter sets out the research plan and shows how the measurement of current and future demand for services and general practice sustainability will be approached. It does this by outlining the research topic, the principal research question, research objectives and questions (with aligned hypotheses). The research hypotheses are based on both confirming and extending what is known about general practice service use in New Zealand.

In 2008 (when the author commenced employment with Pinnacle MHN), the administrative data held by the PHO were largely undeveloped and service use data across the sector were not routinely available for analysis (resulting in hypotheses of what might be occurring, without the ability to robustly test it). From 2012, with the development of the PHOs data warehousing functionality the analysis of service use within and outside of the enrolled practice become a reality. A critical component of this study was the development of a cross sector measure of the size of general practice care using linked administrative records (the detail being in Chapter Four: Research Methods). This service use linkage allows a fuller picture of the 'size' of general practice related to the type of care delivered rather than where the care was accessed. Establishing this data has allowed the statistical testing of key independent variables of service use.

2.1 Principal research statement and hypothesis

The principal research statement had three constituent parts; what were the levels and patterns of general practice service use from across the sector in 2013/14, what were the main predictors of that service use and based on those findings, what is the projected demand for general practice health care across the Waikato out to 2038?

The principal hypothesis was that demand for services will have been primarily driven by age, gender, ethnic group and presence of a chronic condition, but these factors will differ by geography of residence. Future demand will be increasingly driven by the ageing population, with chronic conditions a key component of that demand.

2.2 Research objectives, questions and hypotheses

To investigate the principal research statement, there were four objectives, with sub-questions to test the underlying hypotheses. Figure 2.1 shows how this fits together.

Figure 2.1 Principal research question and research objectives

Principal research question

What were the levels of cross sector general practice service use in 2013/14, what were the main predictors of service use and based on those findings, what is the projected demand out to 2038 for general practice services in the Waikato?

Hypothesis: Demand for services will have been driven primarily by age, sex, ethnic group and the presence of a chronic condition but these factors will differ by geography of residence. Future demand will be increasingly driven by the ageing population with chronic conditions a key component of that demand.

↓

Objective 1: Establish the study population.

Objective 2: Establish the utilisation levels of general practice services, both within and outside of the enrolled practice setting.

Objective 3: Establish the utilisation levels of general practice services for those individuals with chronic conditions, both within and outside of the enrolled practice setting.

Objective 4: Establish the socio-demographic and/or health factors that had the most influence on the use of general practice services, both within and outside of the enrolled general practice setting.

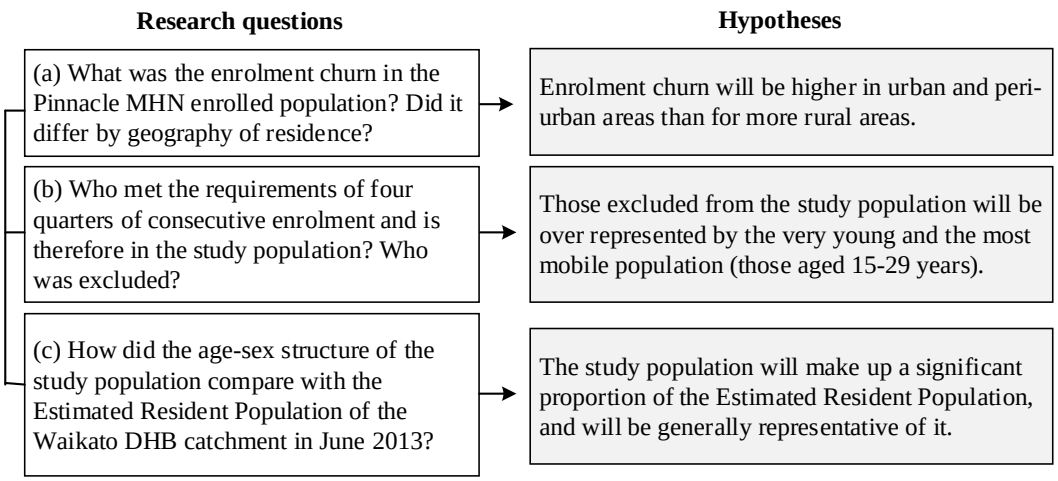
Objective 5: Establish the picture of future demand for general practice services across the Waikato DHB over the period 2013-2038.

↓

Objective 6: Interpret the findings of the baseline 2013/14 service use, the independent predictors of service use and projected demand for general practice services in a regional population undergoing macro level demographic and epidemiological transition. What do the study findings mean for the sustainability of community general practice across the Waikato?

The first four objectives establish the levels of service use, providing the platform to answer the second part of the principal question about future demand for services. The final objective integrates all preceding results into a wider discussion on general practice sustainability. Further detail on the objectives, with aligned sub questions and hypotheses are provided in this section.

<u>Objective one</u>: Establish the study population.



Question (a) was required as the first step in establishing the study population. Measuring enrolment 'churn' – or individuals coming and going from a general practice register was needed to establish the population that were enrolled for four consecutive quarters (1 April 2013 to 31 March 2014). All individuals enrolled for the full baseline year became the study population (see Chapter Four – Methods).

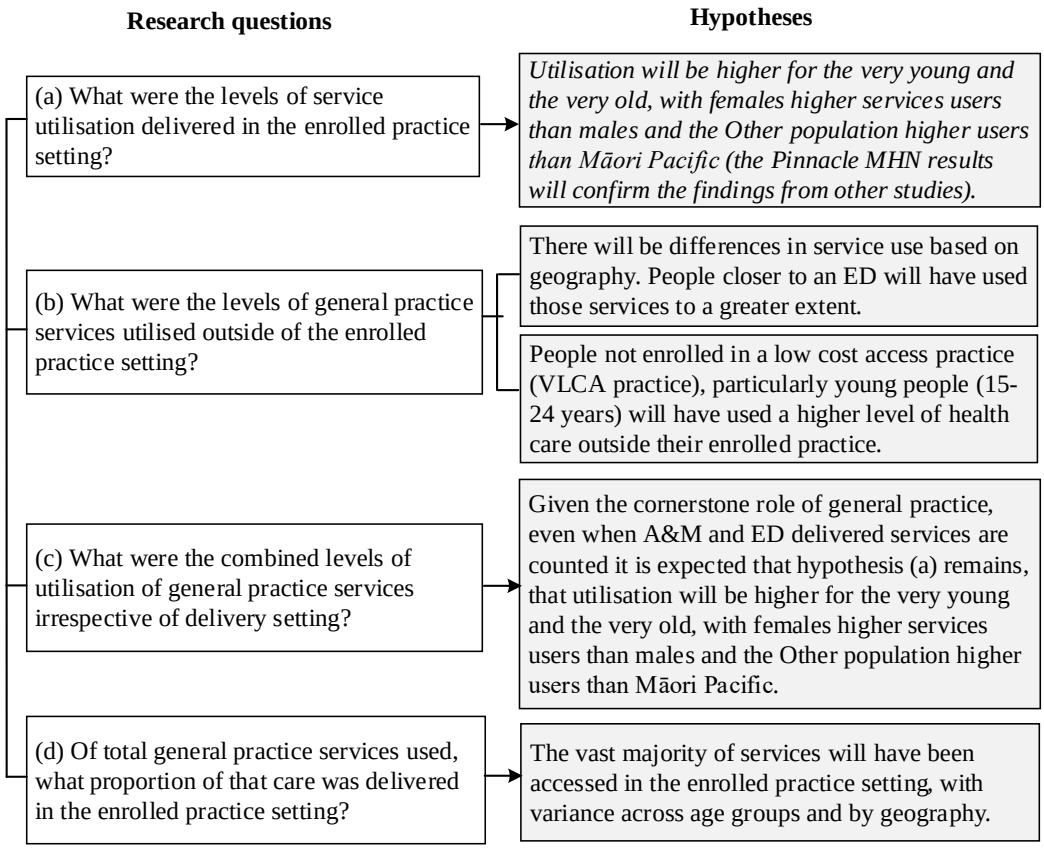
People enrolled in every general practice (and the Network) are essentially an open population – that is, people can move in and out of a practice's enrolment register by enrolling or un-enrolling with a general practice (technically when a person enrols in a new practice they exit their previous practice register). People can exit a practice by enrolling elsewhere, migrating overseas, by not attending their enrolled practice for three consecutive years (which triggers the practice to initiate a re-enrolment process) or exit due to death. When an individual enrols in a new general practice they may also change PHO at the same time, depending on the network to which the new practice is affiliated. People can, and do, move from a practice and then re-enrol in that same practice at a later date.

The second part of question (a) was to establish whether enrolment churn differed spatially, that is by TA area. The hypothesis was that enrolment churn will have been higher in urban and peri-urban areas than rural areas. This hypothesis however, was based on purely anecdotal evidence as detailed information around enrolment churn was previously unavailable.

Question (b) was about establishing 'who', following the measurement of enrolment churn, met the requirements for inclusion in the study population and who by definition were excluded. The hypothesis was that those individuals excluded from the study would be over represented by the young, as some would not have been old enough to have been enrolled for a full year, and those aged 15-29 years who were expected to be the most mobile population.

Question (c) built on the previous question and compared the study population with the estimated resident population (ERP) of the Waikato DHB in June 2013. The hypothesis being that the study population would constitute a significant proportion of the ERP and be generally representative of it. There were, however, expected to be differences across TAs, particularly in areas where other PHOs were operating.

<u>Objective two</u>: Establish the utilisation levels of general practice services, both within and outside of the enrolled practice setting.



Having established the study population, the second research objective used administrative data to establish service use levels for the baseline year. Research question (a) established the levels of service use within the community setting –

that is, people accessing health care within the practice they were formally enrolled. It was expected that the study population's use of services in the enrolled setting would confirm findings from other New Zealand studies (outlined in Chapter Three). The hypothesis was that the level of service use would be highest among the very young (0-4 years) and the very old (85+), that females would use comparatively more services than males and that service use for the Māori Pacific population would be at a lower level than for Others.

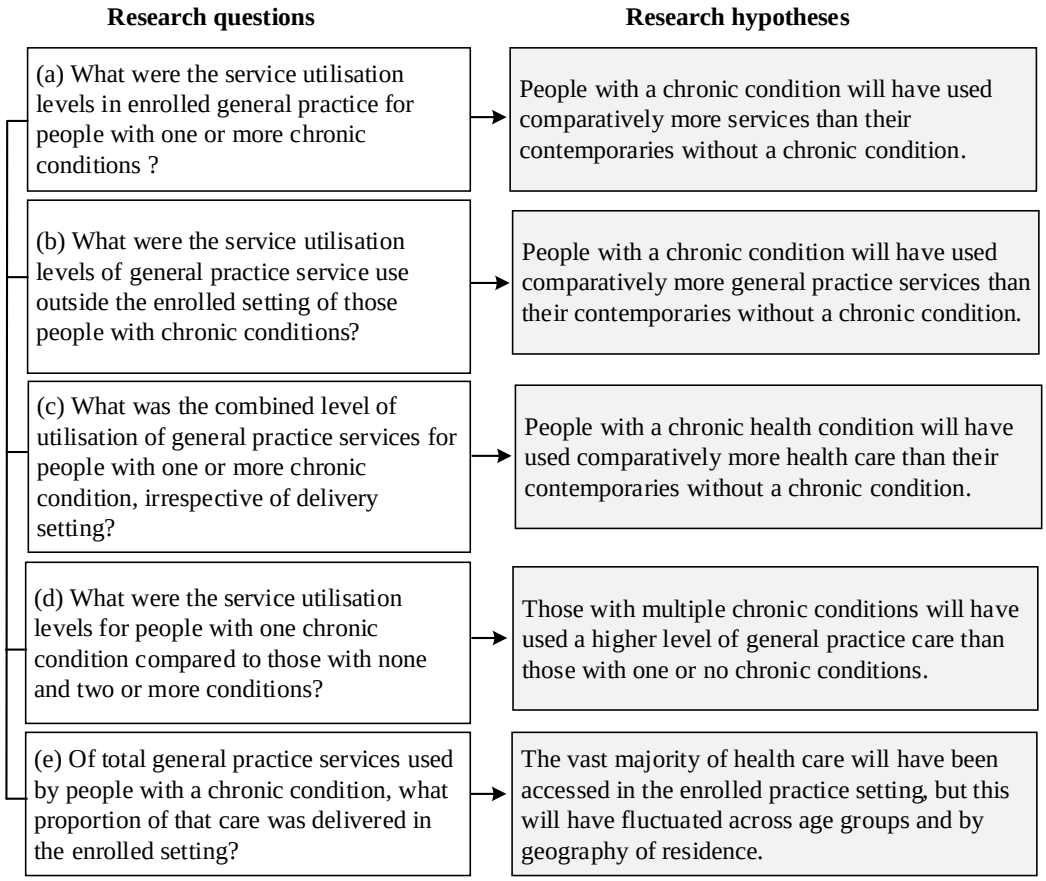
Question (b) established the levels of service use of general practice care outside of the enrolled practice setting. All presentations to EDs are coded using the International Classification of Disease (see Chapter Four: Research Methods) known as ICD-10 (version 10). Within this hierarchical classification there is a set of clinical codes for what are known as 'ambulatory sensitive conditions'. It is (generally) agreed that these codes cover health conditions that, had there been a timely therapeutic intervention in general practice, the individual may not have presented to the ED seeking health care. The hypothesis was that young people (15-24 years) would have used a higher proportion of general practice health care outside of the enrolled practice setting, particularly those not enrolled in Very Low Cost Access (VLCA) practices, where the financial cost of a consult to the individual was higher (than for those enrolled in VLCA funded practices). Alongside this, the other hypothesis was geography based, being that individuals with easier access to A&M and ED services would use them to a greater extent. Establishing (and confirming) this for the Pinnacle MHN study population was important, given the data had not been analysed this way before.

Question (c) established the total (across sector) use of general practice services. This was the combination of service use from questions (a) and (b). Given that the vast majority of care is delivered in the general practice setting, it is expected that the level of service use outside of the enrolled setting will not have been of a sufficient level to materially change the results of hypothesis (a) - concerning services delivered in the enrolled practice setting.

Question (d) was to establish the proportion of total general practice services that were undertaken in the individual's enrolled practice. The aligned hypothesis was that the vast majority of care accessed would have been through the enrolled setting.

There were expected to be differences by geography of residence, partly due to people's travel proximity to A&M and/or ED services.

<u>Objective three</u>: Establish the utilisation levels of general practice services for those individuals with chronic conditions, both within and outside of the enrolled practice setting.



Objective three is essentially a subset of objective two (in that the population of individuals with chronic conditions is a subset of the study population). This objective is focused on individuals with one or more of four selected chronic conditions; diabetes, chronic obstructive pulmonary disease (COPD), heart failure and ischaemic heart disease. These chronic conditions were chosen partially as they were considered to be diagnostically sensitive, be of high quality in terms of the coverage of coding across general practices, and due to the expected impact of these chronic conditions on service use.

The questions here follow the same pattern as in the previous objective, which is to establish service use in the enrolled practice setting, outside that setting and as a combined measure. Alongside this, the service use of those with one chronic

condition is compared to those without, or with two or more conditions. Each question has an aligned hypothesis, focused predominately on the establishment of service levels to allow comparison between those with one or more conditions and their same age counterparts without those conditions (or with two+ conditions).

New knowledge was established via these processes in three ways. Firstly, in the sense that Pinnacle MHN has not previously established service use levels for a large population with chronic conditions, in the enrolled setting. Secondly, the data has not been available in the format to link service use for this population group across general practice, A&M and ED to establish a more robust picture of general practice service use. Finally, having these data available and service use established, allows comparison of the effects of practice funding type, the type of chronic condition and geography of residence. These issues have historically been considered in the PHO, but the data were not available in a format allowing statistical analysis. As in the previous section, the measure of proportion of total health care accessed in the enrolled practice setting was undertaken.

<u>Objective four</u>: Establish the socio-demographic and/or health factors that had the most influence on the use of general practice services, both within and outside of the enrolled general practice setting.

Research questions	Research hypotheses
(a) Which socio-demographic and/or health factors influenced the use of enrolled general practice health services?	Age, sex and presence of a chronic condition will be the top predictors of health service use.
(b) Which socio-demographic and/or health factors influenced the use of general practice health services outside of the enrolled practice setting?	Age, sex and presence of a chronic condition will be the top predictors of demand. The younger age groups; 0-4, 5-14 and 15-24 years will be the highest users. Males will be higher users in this setting than females (opposite to enrolled practice service use).
(c) Which socio-demographic and/or health factors influenced the use of total general practice health services, irrespective of delivery setting?	Results are expected to be very similar to the results for service use in the enrolled practice setting (due to the vast majority of general practice health care being delivered in that setting).

Objective four moves on from the measurement of baseline service use levels to statistical analysis of the independent predictors of that service use. The statistical modelling was undertaken by geographical residence of the enrolled individual – at the TA level. Three negative binomial regression models were run in each of the

ten TA areas. The first model for consults delivered in the enrolled practice setting, the second for general practice consults delivered outside the enrolled setting, with the third model being total service use irrespective of the delivery setting. Models were also established for an 'urban' and 'rural' category based on geographic residence. Hamilton City and Waikato District were classed as 'urban' and all eight other TAs were classed as 'rural'. The Waikato District was considered urban given the results of enrolled patient 'boundary crossing' (objective 1) where 49 per cent of enrolled people living in the Waikato District were enrolled with a general practice physically located within Hamilton City. Waipa District, while also bordering Hamilton City, did not have the same high level of boundary crossing for general practice service use (detailed in Chapter Five: Establishing Service Use).

When looking at the predictors of service use this study looked at two facets. Firstly univariate analysis - where one category is the reference group against which the other(s) were measured. For example, for age group, those aged 25-44 years were the reference category against which the service use of all other age groups were referenced. Secondly, the study looked at the relative model effects of the independent variables (multivariate analysis).

The eight independent predictors or socio-demographic and health factor variables tested with statistical modelling methods were; age group, gender, cost of a consult (based on enrolled general practice funding type), income (holding of a Community Services Card), presence of a chronic condition, high needs status and the geo-coded residence of individuals.

<u>Objective five</u>: Establish the picture of future demand for general practice services across the Waikato DHB over the period 2013-2038.

Research questions

- (a) What is the projected population profile of the Waikato DHB (and 10 sub-regional Territorial Authorities) over the period 2013-2038?
- (b) What was the estimated level of demand for total general practice services across the Waikato DHB in the 2013/14 baseline year?
- (c) What is the projected demand for total general practice health care for the Waikato DHB catchment as a whole from 2013-2038 and for the ten sub-regional TAs, using Statistics New Zealand low, medium and high series population projections?

Objective five did not have aligned research hypotheses. The first step in establishing projected demand was to apply the baseline service use levels for the Pinnacle MHN population (the results of objective two), to the total ERP for the Waikato DHB as of June 2013. The assumption made here was that service use levels for the 37 per cent of the DHB population not enrolled with Pinnacle MHN affiliated practices were the same as the study population in the baseline year (63 per cent of the ERP). It is important to note that there are two separate populations in those not enrolled in Pinnacle MHN practices, those enrolled with practices affiliated with a different PHO and those individuals who are not enrolled with any PHO. The Pinnacle MHN as a PHO only receives information on service use regarding those individuals enrolled in that PHO.

This objective is about setting a range for the projected future demand for general practice services across the Waikato DHB. Service use projections are based on the combination of general practice services used within and outside of people's enrolled practice. In this sense, it is not about where any future service might be delivered (in terms of community or ED setting), it's about the potential level of total demand for these health care services, and how that demand might be spatially distributed within the DHB catchment. The mix of demand level and spatial distribution, in combination, bring the challenge of ongoing sustainability, not just for Pinnacle MHN general practices but for all general practice services.

Objective six: To interpret the findings of baseline 2013/14 service use, the independent predictors of service use and projected demand for general practice services in a regional population undergoing macro level demographic and epidemiological transition. What do the study findings mean for the sustainability of community general practice across the Waikato?

The aim of this objective was to consider the sustainable provision of general practice health care across and within the Waikato DHB catchment, in light of the results of all research objectives and questions. The discussion is within the context of ongoing demographic and epidemiological transition with the region.

3 The Literature: Health Service Demand and Use

3.1 Introduction

This chapter expands on the framework outlined in Chapter One (Theoretical approach and contribution to knowledge). It identifies the relevant literature and looks at the key ideas, ascertaining the scope of the study and the choice of research methods. This approach also allows the identification of the place of the new knowledge generated from this study.

Figure 1.1 showed the theoretical framework for this study as being inclusive of macro level factors influencing demand for services (the socio-economic and political context), as well as the more macro-meso level demand drivers. This macro-meso level includes the demographic and epidemiological transitions as key drivers of demand. The more micro level factors in the framework is where Andersen's (1995) model of health care utilisation is used to organise and test the use of general practice services in the study population.

3.2 Socio-economic and political context

There are four inter-related macro-structural influences noted here as being of a socio-economic and political context nature – including the New Zealand health system, the strategic priorities for health advocated for by the MoH (particularly the elimination of inequalities), and the evolving social and cultural values of New Zealand society. The place of general practice in the health care system is also important – this covers the centrality of general practice as the cornerstone of the country's health care system and system changes since the introduction of the NZHS and PHCS. Aligned with these aspects are the changing perceptions of health and societal expectation of (and for) health care. Of interest to this study is the rise of population health and integration of population health principles into the setting and daily work of general practice.

The New Zealand health system is not typical when compared to the usual country (and system) peers such as the United Kingdom and Australia. At the strategic level there are similarities (e.g. with the National Health Service in the United Kingdom) in terms of leadership by a central government agency, were they are clear lines of accountability, strategic direction setting and monitoring across the system (Ettelt, Fazekas, Mays, & Nolte, 2012). Atmore (2017, p. 224) maintains the New Zealand

system is somewhat of an anomaly, in that the care provided in hospital is free to the patient (including any general practice type care delivered in ED) while in community general practice patients largely have to provide co-payments. While New Zealand has a predominately tax funded primary care system most, but not all, general practices are privately owned businesses. Individuals enrol with a local general practice for all first point of contact health care, and coordination of care across the sector. For prospective patients, enrolment is incentivised by lower co-payments for a GP consult in the enrolled practice. There are currently no co-payments for a GP consult for those aged under 13 years of age.

3.2.1 The New Zealand health system – selected aspects

The New Zealand health system is situated in an international community with a wide variety of interests, standpoints and agendas for health. There are a number of World Health Organisation (WHO) initiatives to which New Zealand is a signatory. While this may seem removed from the detail of this study, it is an important component in terms of the context of the overall health system, how it is structured and the system priorities (and resulting strategic and operational policies).

The Declaration of Alma-Ata was adopted at the International Conference on Primary Health Care in 1978. The declaration articulated the agreed need for global action by governments to protect and promote the health of all people. It was the first such declaration underlining the importance of accessible and affordable primary health care and its role in the wider health system (World Health Organisation, 1978, p. 3). In 2008, the WHO held the 30th anniversary conference in Almaty (previously Alma-Ata) reflecting on the experiences of nations implementing the original Declaration[10]. The issues facing primary care policy and delivery remain reminiscent of that at the time of the original declaration, including issues of access and affordability (Banerji, 2003; Frenk, 2009; Koskinen & Puska, 2009; Pillay, 2008). The Alma-Ata declaration of 1978 is noted here as it has important links with public health and primary care in New Zealand, including the implementation of population health principles into the general practice setting. This is so particularly from 2000 onwards, with the implementation of the NZHS, New Zealand Disability Strategy, PHCS and the Māori Health Strategy.

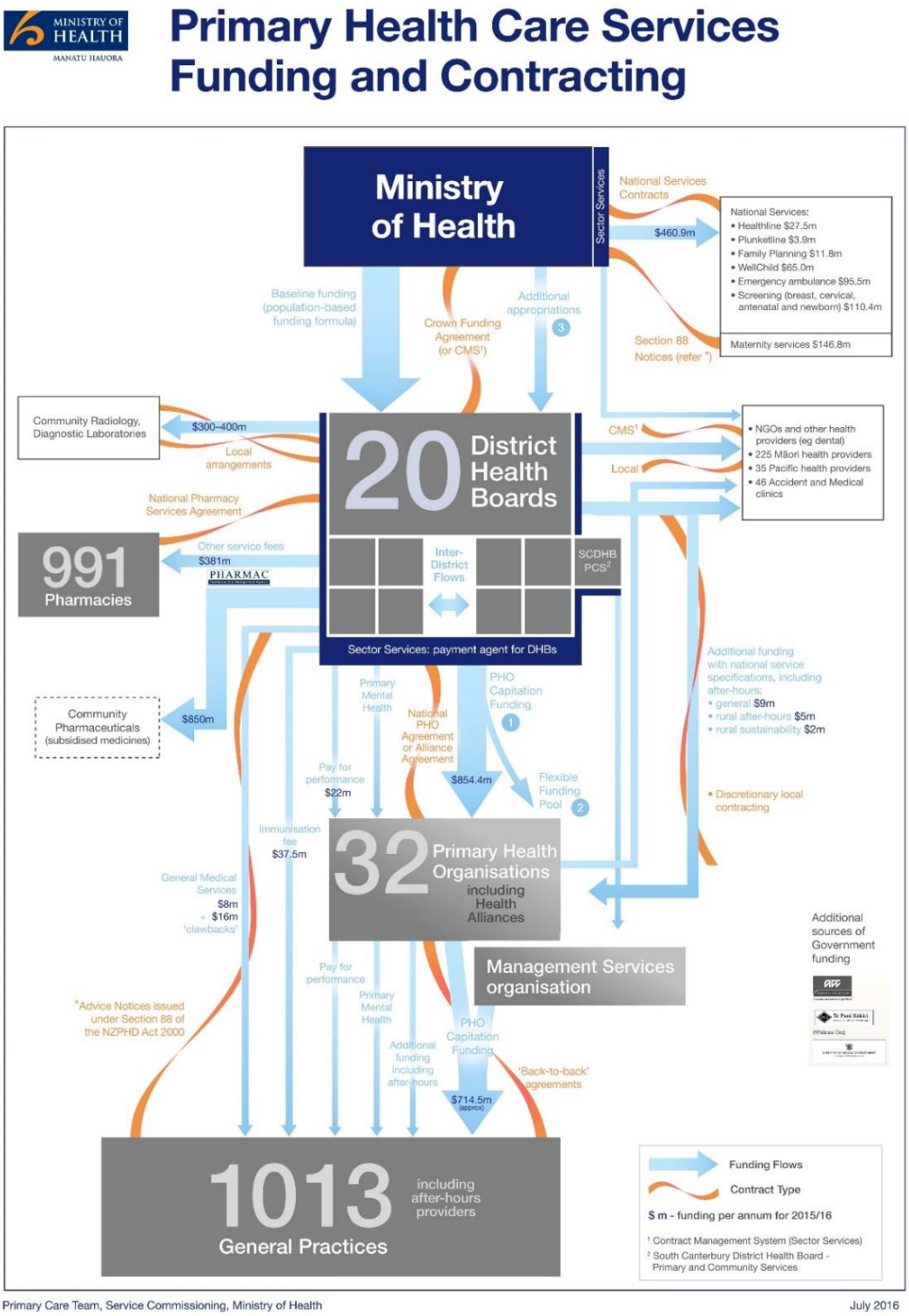
[10] From a WHO media release accessed at http://www.who.int/mediacentre/events/meetings/alma_ata/en/

In New Zealand there is a large network of government and non-government organisations delivering health services, with a central MoH leading the health and disability system. The current system of geographically based regional DHBs was implemented by the Labour-led coalition government following the 1999 general election. It is the role of DHBs to plan for and purchase health services for the resident population of their district, this includes funding the provision of primary health care through PHOs. These PHOs are made up of member general practices, the majority of which are privately owned businesses. PHOs are responsible for enrolling individuals, receiving funding and for contracting the required health care services from their network of affiliated practices (Minister of Health, 2016; Ministry of Health, 2010).

Large numbers of PHOs were established in the five years following the implementation of the 2001 PHCS. Prior to this most people, for the purposes of first contact health care, had been under the care of GP owned organisations or IPAs – Independent Practitioner Associations – since the early 1990s (of which the now Pinnacle MHN PHO was one). The vast majority of GPs working in general practice became part of a PHO. At the same time, funding changed from a fee for service payment system to capitated payment at the PHO level based on a practice's enrolled population, resulting in reduced co-payments for people seeking care. One reason for this was to reduce cost barriers to care and to encourage continuity of first point of contact health care. (Emery et al., 2015; Love & Blick, 2014; Ashton & Tenbensel, 2012).

In 2009 there were 84 PHOs across the country, although this number had reduced to 32 by mid-2016. PHOs apart from being enrolment and funding conduits are tasked with range of responsibilities, including the reduction of health inequalities between population groups (Sheridan, Kenealy, Connolly, Mahony, Barber, Boyd., et al., 2011, p. 3). General practices receive additional funds to provide care for individuals deemed as high need, aimed at making it easier for those people to access the services they require. The MoH view of the system is shown in Figure 3.1.

Figure 3.1 The New Zealand health system – the Ministry of Health view



Source: Ministry of Health (www.health.govt.nz)

The MoH estimated in January 2017[11] that 94 per cent of the New Zealand population were enrolled with a PHO, though enrolment rates differ geographically

[11] Data can be found at www.health.govt.nz

and between population groups. For the Waikato DHB, enrolment was estimated at 95 per cent overall (with 93 per cent for Māori and 97 per cent for the Pacific population). It is estimated that a lower proportion of those aged 15-24 years old were enrolled compared to those aged 65+ years. As noted earlier, there are financial incentives for people to be enrolled in a practice, given the often considerable difference in the cost of care. It is not possible to know whether the estimated five per cent of unenrolled people resident in the Waikato DHB catchment are broadly similar, or not, to the 95 per cent of enrolled people.

So what is primary care? The definition of primary care provided by Starfield (1994, p. 1129) is that "Primary care is first-contact, continuous, comprehensive, and coordinated care provided to populations undifferentiated by gender, disease, or organ system". While there are other definitions, Starfield notes that most of those include those elements of first contact, continuity, comprehensiveness and coordination (Starfield, 1994; also Shi, 2012). Starfield (1998) differentiated between 'primary care' and 'primary healthcare'. Essentially the latter is an extension of the former, with primary healthcare encompassing the wider goals of health education, disease prevention, and community participation. For the purposes of this study, the term 'general practice' is used given the focus on the use of services in that community based space. As noted in the introductory chapter, general practice is the cornerstone of the health care system and as such must be an area of focus when addressing broader health system challenges (Shi, 2012). In seminal research into the impact that primary care has on overall health system performance, Starfield, Shi, and Macinko (2005) concluded that "a greater emphasis on primary care can be expected to lower the costs of care, improve health through access to more appropriate services and reduce inequities in the population's overall health."

However useful the Starfield (1994) definition of primary care and 1998 definition of primary healthcare; the World Health Report 2003 (World Health Organisation, 2003, p. 106) notes that "no uniform, universally applicable definition of primary health care exists" but it is generally understood to mean the first level of care in developed countries, including the services of family physicians, nurse practitioners, nurses, pharmacists, and others" (World Health Organisation, 2003, p. 108). The same report stressed the importance of how primary health care was placed (and operationalised) within the health sector as a whole. It put forth a position of the

health of the population being on a continuum, incorporating health promotion and other aspects typical of public health into the realm of 'effective disease practice', aspects that usually take place in general practice (World Health Organisation, 2003). This incorporation of aspects of public health into the delivery of individual health care in general practice has been important since the implementation of the PHCS (more on this issue in a subsequent section of this chapter).

In 2009 the National Government released its "Better, Sooner More Convenient Health Care in the Community" (BSMC) approach to the planning and delivery of integrated health care between general practice and secondary services. The intended outcomes of the policy for people seems inherent in its title (although better, sooner or more convenient than 'what' remains unknown). This approach advocated, among other things, that a better health service starts in the community. Following this (and also in 2009), the MoH called for expressions of interest (EOI) to deliver BSMC primary care. In the EOI document (Ministry of Health, 2009a), interested parties were asked to design in collaboration (primary, secondary sector and allied health etc.) services to deliver transformational care that would contribute to a "more personalised primary health care system that provides services closer to home, makes Kiwis healthier and reduces pressure on hospitals"[12] (Ministry of Health, 2009a, p. 2).

A key part of the BSMC policy called for not only integration but greater efficiency and cost reduction components to be built in (Lovelock et al., 2017, p. 2). This included plans to reduce ED admissions and ambulatory sensitive hospitalisations (with associated efficiencies and cost reductions expected as a result) – although as Lovelock et al. (2017) note these are very blunt measures of positive outcomes. Alliance contracting between DHBs and PHOs introduced shared governance and accountability for contracting– this approach was aimed at fostering collaboration rather than competition (Atmore, 2017, p. 222). The focus moves back to BSMC and collaboration in Chapter Ten: Discussion.

[12] There were nine successful business cases across the country with Pinnacle MHN (then Midlands Health Network) being one of the successful organisations.

3.2.2 Eliminating health inequalities: a continuing strategic priority

The Crown and Māori have a special relationship under the Treaty of Waitangi. In the context of the health sector, this relationship has been expressed through the NZHS, the PHCS and the Māori Health Strategy (King, 2001; Minister of Health, 2016; Ministry of Health 2014c). The Māori Health Strategy confirms the following principles, which if incorporated in policy development, planning of programmes and delivery of services would facilitate the elimination of long standing inequalities;

- Partnership: working with iwi, hapū, whānau and Māori communities to develop strategies for Māori health gain and appropriate health and disability services;
- Participation: involving Māori at all levels of the health and disability sector, including in decision-making, planning, development and delivery of health and disability services; and
- Protection: working to ensure Māori have at least the same level of health as non-Māori, and safeguarding Māori cultural concepts, values and practices (Ministry of Health, 2014c, p. 12).

Health equity is defined by the WHO as 'the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically or geographically' (Associate Minister of Health, 2016, p. 20). This equity, however, is not necessarily about access to more services, as Matheson and Loring (2011) note "for those who get through the door", but equity in access to that front door across the entire population. Once in the front door, it is also about continued equity, for example to diagnostics and treatments in a timely way (Cram, 2014, p. 5). These access concerns are a central tenet of the 2001 PHCS, as well as the NZHS as it is for other sectors to consider the health equity impacts of policy (Matheson & Loring, 2011, p. 9).

The PHCS, through all PHOs, seeks to reduce health inequalities through a "population health approach to the planning and delivery of primary care services" (Neuwelt et al., 2009, p. 98). The strategy aimed to provide clear direction, ensuring that the sector could play this central role in the health system (King, 2001). The new arrangements for the sector regarding funding and oversight were embedded in the New Zealand Public Health and Disability Act 2000, which conferred on

DHBs responsibility for assessing the health and disability needs of communities in their geographic regions (King, 2001, p. viii; Ministry of Health, 2003). For DHBs the role of the PHCS was to guide their role of funding and monitoring, to ensure the needs of residents are met (King, 2001, p. 2).

The association between health need, health demand and equity of access to appropriate general practice care is multifaceted. Butler, Petterson, Phillips, and Bazemore (2013, p. 541) contend that "health need can be understood to mean the requirement for health services, deemed reasonable, or expected within society, taking into account factors such as the socioeconomic, age, and health profile of a community". Health 'demand' is shown through service use that is, how available services are used by a population. Health demand however, does not necessarily reflect the need of a particular population for health care. A disparity between health need, demand for services and supply of appropriate services can result in inequity in the population, and consequently result in poor health outcomes (Andersen, 1995; Butler et al., 2013, p. 541).

The concept of access to general practice care is not well defined (Ansari 2007b, p. 80), and given this lack of definition it is not surprising there is also no generally agreed way to measure it, despite the importance of access to care to policy-makers, planners and those on the front line of service delivery (Ansari, 2007b, p. 83). Jacobs, Ir, Bigdeli, Annear, and van Damme (2012) agreed with this lack of definition and suggest the work of Peters, Garg, and Bloom (2008) who incorporated timeliness of service use based on need as a component of access. The WHO 1978 definition on the other hand, incorporates the interplay of geographic, financial, cultural and functional characteristics (Ansari, 2007b, p. 83), while Andersen's 1995 definition incorporates the end result and outcome – both health status and patient satisfaction as important components of access (Ansari, 2007b, p. 84; Andersen, 1995). As noted, this study uses Andersen's model of health care utilisation. One reason for doing so is Andersen's inclusion of the end result of the service use process, in that the framework acknowledges that barriers to accessing care can occur at any point throughout the process of care seeking. Barriers to care can occur even in the moments that care is being received (Corscadden et al., 2017), and even after an episode of care (or consult) is finished. The inclusion of access issues being important throughout the process of care is useful for the New Zealand context given this country's long standing health inequalities – it gives recognition

that there are ongoing access issues for some population groups, more than others, even once the 'front door' of any health service has been successfully negotiated.

There are many barriers that can impede access to care (Jacobs et al., 2012, p. 288) presumably no matter how access is defined, but particularly if it is widely defined. The authors argue for four barrier dimensions to be considered, being; geographical access, availability, affordability and acceptability. Corscadden et al. (2017, p. 223) take the notion of access a step further by incorporating meeting the need for care from the patients perspective – and if this does not occur, then full access has not occurred. Perhaps no matter how access is defined, it needs to encompass both factors on the demand and supply side, which as Jacobs et al. (2012) note may not be mutually exclusive in nature, and may in fact both influence and interact as a mix of barriers to access.

In terms of reducing inequalities, in New Zealand, Matheson, Reidy, Tan and Carr (2015) see that health care policy changes over the 2002-2014 period have improved equity of outcomes between ethnic groups – when looking at ambulatory sensitive hospitalisation rates for children, especially for those aged 0-4 years. There were however, increased inequalities between ethnic groups at the older ages. Matheson et al. (2015, p. 14) note the key aspects of change as including the implementation of the NZHS, PHCS, creation of DHBs and PHOs as well as the national-level free health care for under six years policy in 2008. Alongside this, the Health Quality and Safety Commission's 2017 primary care experience survey report found cost barriers and care coordination experiences had marked ethnic differentials, with Pākehā reporting more positive personal experiences than all other groups (Health Quality and Safety Commission, 2017a, p. 3). Further concentration on eliminating inequalities must remain and efforts strengthened in terms of gaining equality of outcomes for adults (Matheson et al, 2015). In mid-2015 the MoH implemented the extended 'Zero Fees for Under 13s' policy. The aim was to reduce access barriers, including to after-hours care. It is not possible to investigate the effect of this 2015 policy change in the administrative data for this study, given the baseline data covers the period of 1 April 2013 to 31 March 2014.

Returning to the issue of health inequalities for Māori, Harris, Tobias, Jeffreys & Waldegrave et al. (2006) looked at the role of racial discrimination and identified two main types of discrimination - interpersonal and institutional (also Robson &

Harris, 2007). The authors report (using the New Zealand Health Survey 2002/03 and self-reported experiences of discrimination) that both types of discrimination affect Māori health outcomes. As such, interpersonal and institutional discrimination could be expected to be a contributing factor as to why health inequalities remain, despite being a sector strategic priority for many years. In Chapter One it was maintained that health inequalities for Māori were a result of the processes of colonisation (Axelsson et al, 2016; Robson & Reid, 2006; Came, 2012; Came et al, 2016), Czyzewski (2011, p. 10) extends this arguing that as such, colonialism should be treated as an underlying complex and multifaceted cause of current health disadvantage. That discrimination - a result of colonialism (Czyzewski, 2011, p. 2; Robson & Reid, 2007, p. 4) remains strikes at the core of the NZHS, PHCS and the Māori Health Strategy (as well as at the Crown's Treaty of Waitangi responsibilities). The nature of inequalities can also be looked at from an ethical and human rights viewpoint – where such long standing inequalities simply should not exist (Robson & Harris, 2007; Sheridan et al, 2011). In the influential 'decades of disparities' report Ajwani et al. (2003) made a clear case for "non-random" health inequalities, adding weight to the dire need for a greater partnership approach with Māori.

Evaluative work by Russell et al. (2013, p. 6) confirmed that barriers for Māori to general practice health care include social, cultural, economic and geographical barriers. While this may not be surprising (in light of previous comments), the authors offer an important insight, particularly around identifying and ameliorating social barriers. They note the disjuncture in this space between the medical model (disease orientated model, sometimes called the 'western model') and Māori models of health and wellbeing (also Sheridan et al, 2011; Came, 2013, Came et al, 2016). Oetzel et al. (2017) have advocated in this space also, in relation to prevention and management of chronic disease under a kaupapa Māori approach. A wider incorporation of this approach (as in wider than isolated pilots) would necessitate more of a sector change than the reduction of economic and geographical barriers. This is because change would go to the heart of what Russell et al. (2013, p. 7) term "privileged medical and western views on health and wellbeing" and the established way policies and programmes are developed, funded, monitored, measured and evaluated (Came et al., 2016; Kukutai & Taylor, 2013; Reid & Robson, 2006; Robson & Harris, 2007).

The reality of persistent health inequalities remains a whole of sector concern, requiring a collaborative whole of sector response to a much greater extent than is currently the case. The MoH has long included direction for the reduction or elimination of inequalities in sector strategic documents, and researchers have clearly shown that inequalities remain, despite sector efforts to date. This lack of system responsiveness (Robson & Reid, 2006) plays a part in the continued existence of inequalities, perhaps pointing to a lack of focus on addressing inequality below the strategic level (Sheridan et al, 2011) and the complexity of delivering system level change at the funding and programme development level (Sheridan et al., 2011; Came, 2012) in what essentially remains a system of mono-cultural practice (Came et al., 2016, p., 74; Harris et al, 2006; Robson & Harris, 2007). So while the health sector acknowledges and calls for collaboration and Māori participation (among others) in order to eliminate inequalities there remains the yawning gap between strategy and operationalisation or the actual delivery of culturally appropriate services. Sheridan et al. (2011, p.1) refer succinctly to this as the "struggle to put equity principles into practice, indicating will without enactment".

Perhaps unsurprisingly, adults living in more socio-economically deprived areas have higher levels of unmet need for health care particularly due to cost, though levels of GP use may be similar, than people living in less deprived areas (Ministry of Health 2016d, p. 12; Ajwani et al., 2003). The study, noted earlier, into the effects on health of discrimination concluded that it is the combination of deprivation and discrimination that has the most effect on disparity in outcomes (Harris et al., 2006, p. 2007). Those resident in more deprived areas are more likely to be in poorer health, and may in reality need a higher level of GP use, with adults residing in the most deprived areas being "2.5 times more likely to rate themselves as being in fair or poor health compared with adults living in the least deprived areas, after adjusting for age, gender and ethnicity" (Ministry of Health, 2016d, p. 12).

There are particular issues for people living in rural areas when it comes to accessing services (Office for Senior Citizens, 2015, p.29). Planning and funding functions across the health sector need to ensure that people living in rural areas are not disadvantaged. Cumming, Stillman, Liang, Poland, and Hannis (2010, p. 456) found some evidence that access might be more difficult for certain individuals – with GP utilisation being lower in more rural areas, with travel distance to services

a factor. Internal (unpublished) mapping work undertaken while the study author was employed by Pinnacle MHN showed that many rural general practices (in the network) had small percentages of enrolled patients that resided 50 kilometres or more away (by road travel) from their enrolled practice. In the case of eight states in the United States, research by Laditka, Laditka, and Probst (2009, p. 761) found that for people who lived rurally there were higher levels of ambulatory care sensitive hospitalisations, suggestive of access issues. In the context of the United Kingdom, Farmer et al. (2006) have noted that rural people use a lower level of primary health care than their urban counterparts – which is also reported as the case in Australia (Britt, Miller, & Valenti, 2001).

One often stated barrier to accessing general practice, which may result in an ED visit, is the cost of a consult (Jones & Thornton, 2013). In the 2011/12 New Zealand Health Survey some 14 per cent of people interviewed reported experiencing (in the previous 12 months) an unmet need for general practice care due to cost, with seven per cent stating an unmet need for after-hours care because of cost (Ministry of Health, 2012, p. 94). It is not only the cost of the GP consult but also the cost of any prescription resulting from that interaction. In the same 2011/12 Health Survey eight per cent of adults (aged 15+ years) reported they had not filled a prescription due to cost in the previous year (Ministry of Health, 2012, p. 94).

In seeming contrast to the Health Survey findings, Jones and Thornton (2013, p. 15) concluded that cost was only a barrier for a minority of individuals. Their systemic review of cost as a barrier contributing to ED use, found that only two per cent of patients directly asked about cost (across various studies) stated it as a reason for their current ED visit. The extent that cost is a barrier can depend on other contributing factors such distance to an ED and the cost of travel, the availability of transport and the economic situation of the individual seeking care (Gray, 2014, p. 87). The real effect of the cost of a consult in general practice versus the free consult in ED, albeit with often long wait times, appears to remain contested (further detail on ‘general practice in the ED’ in subsequent sections).

3.2.3 Changing societal attitudes to ageing and health

“Nothing is inherently special about the age of 65” (Lutz, 2014, p. 34). Across the world societal attitudes and perceptions of health and of ageing, including ‘what age is old’? and ‘who is old?’ are changing. Societal attitudes, norms and mores

constantly evolve, this is true for New Zealand as for any other country. The very idea of what it means to be 'old' is in flux , along with ideas on how chronologically old is 'old' (House of Lords, 2013, p. 26). This change may be because chronological age is no longer seen as such a predictor of health status or the ability to be both independent and actively contributing to wider societal life (Ministry of Health, 2002).

In the New Zealand context Glasgow (2013, p. 282) explored baby boomers changing values, attitudes and expectations around ageing. Like the House of Lords report, what is considered old age is shifting to those of much later years (Glasgow, 2013, p. 282). Very old age is now seen as a permeable stage where individuals become frail and dependent. This age and stage differs by individual, dependent on previous life experiences and morbidities (Gilleard & Higgs, 2014) with essentially any aspect of health and older age becoming more individually contextualised.

Population change, including population ageing does not occur in a vacuum. It is part of wider societal change as a whole – including cultural, economic, health and social developments (Pool, 2017, p. 11). An example of these evolving expectations are the pressures on individuals to conform to changing societal expectations of health in terms of lifestyle changes (Vaupel & Edel, 2017, p. 2) perhaps especially for those with a chronic condition – or close to being diagnosed with one. This thread of increased personal responsibility is also evident in New Zealand (and within the Pinnacle MHN as a PHO). This is in terms of the model of care changes and the growing importance of a partnership approach to health, where an individual works in collaboration with the health professionals in general practice to take both preventative measures, to avoid developing a chronic condition (for example), or to effectively manage a condition. Although not directly referred to, this partnership approach is also within the planning documents of the Waikato DHB (Waikato District Health Board, 2016) and the MoH (Ministry of Health, 2010, p. 6). This evolving space of societal expectations is part of the context in which general practice operates, and this has an influence on the perceived role of the care delivered in general practice.

The New Zealand government released its first Positive Ageing Strategy in 2001, its aim being to create an environment in which people could age positively by ensuring their societal contributions were recognised, and issues for older people

captured within the wider policy framework. The strategy promoted these constructive approaches to ageing (Glasgow, 2013, p. 63) alongside expectations of older peoples contributions to society past the traditional age of retirement eligibility. This positive ageing 'talk', which Glasgow (2013, p. 284) maintains has successfully contributed to a reduction in the 'dependency discourse' of older age, is a central tenet of the 2002 Health of Older People Strategy (Kerse et al., 2016; Ministry of Health, 2002) and in the refreshed replacement of that strategy in 2016 – the Healthy Ageing Strategy. The Healthy Ageing Strategy has a focus on prevention, wellness (including living well with chronic conditions) and support for independence but it also recognises the role of family and the wider community in this (Associate Minister of Health, 2016, pp. iv, 2; Glasgow, 2013; Ministry of Health, 2002, 2017). Aligned with positive ageing or ageing well principles, a recent review by Douglas, Georgiou, and Westbrook (2017) looked at social participation as an indicator of successful ageing and found it was positively associated with most aspects of health (Douglas et al., 2017, p. 455; Ministry of Health, 2016). This has implications, wider than the health sector, in providing ways for older people to remain connected, in ways they value, to their community as part of meeting health and wellbeing needs.

3.2.4 Changing definitions of health

Alongside, and part of these societal changes in attitudes to ageing have been changes in the perceptions of health and morbidity. Pol and Thomas (2000) argue that since the mid-1960s there have been significant shifts in the conceptualisation of health and disease, arising from the perceived lessening relevance of the medical model of care. There have also been terminology shifts as subtle as the change from 'medical care' to 'health care' as a descriptor of the sector. Pol and Thomas (2000, p. 9) see this as part of the slow changeover to a new paradigm which encompasses a much broader view of health and morbidity, incorporating aspects that are thought to have more relevance for contemporary health issues (Pol & Thomas, 2000, p. 9).

The concept of health has long been vague and a somewhat abstract notion. Siegel (2012, p. 10) maintains that issues arise with defining health because it is a complex and moving continuum comprised of physical, psychological and social factors. Writing 45 years ago Dolfman (1973, p. 491) saw some particular words including health as having various meanings dependent on "the purpose, the time, and the circumstances which govern their use". Likewise, Bergner and Rothman (1987)

considered the term to not be easily understood even by those familiar with the health care sector, stemming from the lack of an agreed definition.

There are many definitions of health available, with perhaps the most commonly quoted originating from the WHO over half a century ago; being "a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity" (Saracci, 1997, p. 1409; World Health Organisation, 2006, p. 1). Although the WHO proposed this very broad definition, now perhaps the classical definition, agreement has been hampered by the fact that few have tried to operationalise it (Bergner & Rothman, 1987, p. 191), or as Dolfman (1973, p. 495) explained it; it is useful as a strategic goal for a worldwide health focused organisation but it "lacks the specificity needed for practical situations". The reality of the WHO definition in this study, on the demand for and use of general practice services in a regional New Zealand population, is that it is essentially unachievable. Developing an operational definition has become even more challenging as emphasis in the health sector has moved increasingly towards health-related quality of life and holistic concepts of 'wellness' and away from the more traditional focus of measuring health and the health of a population via higher level quantitative indicators including decreases in mortality and increases in longevity (Bergner & Rothman, 1987, p. 191). Dolfman (1973, p. 493) also provided a useful summary comment on what this ambiguity means for research in the health sector, in that "the situation has arisen that one group's understanding and meaning of the word has often been only a superficial aspect of another's".

3.2.5 The rise of 'population health' in New Zealand general practice

Alongside the many contradictions in theoretical and conceptual meanings of health, and how it might be defined, there is also no clarity or common understanding at an international level around the definition and meaning of 'population health' (Friedman & Starfield, 2003; Kindig & Stoddart, 2003). Well over a decade after this viewpoint was written this still appears to be the case, especially within the New Zealand primary care environment (Neuwelt et al., 2009, p. 98) where 'population health' has been a key component since the launch of the PCHS in 2001.

Batchelor (2012, p. 12) views the term 'population health', with its vagueness of definition, as becoming part of the public health lexicon as recently as the last 20-30 years. Labonte (1995, p. 165) had earlier added another argument to the mix,

contending that terminology around health promotion (long considered a component of public health) was being replaced by the new 'jargon' of population health. Batchelor (2012) saw the development of population health, and its use as an approach in the health sciences, as part of the natural evolution of, in this case, the discipline of epidemiology which had its own genesis several hundred years ago. That author argues that this process of discipline evolution carries with it a disruption to established practices and terminologies, as new concepts expand on accepted approaches within disciplines (Batchelor, 2012, p. 13), in this case integration of the concepts of a life course approach and the contribution of wider long-term determinants of health.

Following implementation of the PHCS, a group of public health clinicians and academics (Winnard et al., 2008) identified the need for a shared understanding of what constituted a population health approach. In a separate paper from a similar group (Neuwelt et al., 2009, p. 98), titled "Putting population health into practice through primary care" it was argued the PHCS offered the opportunity to take a population health approach to the planning and delivery of general practice care. This area is contested, however, with some in the sector supporting the move of public health principles and work into the general practice setting and some voicing opposition. The approach by Winnard et al. (2008, p. 2) suggested the following as a working definition of a population health approach in New Zealand;

> "That a population health approach refers to explicitly taking account of all the influences on health and how they can be tackled to reduce inequalities. This approach also recognises the importance of the Treaty of Waitangi and ongoing commitment to Māori health in general and participation in governance, planning and delivery of services" (Winnard et al., 2008, p. 2).

In a 2005 paper titled "The seduction of general practice and illegitimate birth of an expanded role in population health care", the authors (Buetow & Docherty, 2005, p. 397) took issue with what they saw as traditional general practice being pressured into taking a more depersonalised population health approach, and being reshaped into the image of primary health care as defined in the 1978 Alma-Ata Declaration. The concern was that GPs were taking on this redefined role without adequate consideration of what it meant as key providers of personal care (Buetow &

Docherty, 2005, p. 397). The crux of the argument was that a population health approach emphasised preventative care and the appropriateness of this in general practice is questionable, in that it may serve to decrease personal care, and involve health promotion activity of (often) unknown safety and effectiveness (Buetow & Docherty, 2005, pp. 397-398). Another way of looking at this, is that by moving to a funding system of capitation payments, GPs essentially moved from being paid for delivering personal care to being paid based on their enrolled population. It is perhaps also a matter of conflicting priorities, where an intervention under a population health approach may have marginal personal effect but significant side effects – which may result in better overall public health that does not acknowledge personal cost. In a later article, Buetow, Getz, & Adams (2008, p. 761) looked at how population care could be best operationalised while protecting personal care using the nomenclature of "individualised population care". They acknowledged population health as the prevailing discourse, but noted the grey area between personal care (perhaps focused on solving the issue the patient presents with on the day) and the whole population health goals which may be quite closely linked.

In conclusion, the health needs of practice populations are changing due to the long term demographic and epidemiological transition effects on population structures. There is nothing in the refreshed 2016 NZHS that is at odds with the prevailing population health approach, or in any of the supporting health, wellbeing and ageing strategies released or refreshed since 2014. The 2001 PHCS has not been refreshed as such, but from the overarching and direction setting NZHS the approach remains the same – perhaps with further detail on collaboration and explicitness on working together to achieve health gain and reduce (and eliminate) health inequalities.

3.3 Demand drivers

The theoretical framework (Figure 1.1) noted four main demand drivers for general practice health care. This section covers those drivers, being demographic and epidemiological transition, the changing role of migration and the inter-related effects of health beliefs and personal past health sector experience. The section on demographic transition theory briefly covers the first and second demographic transition in terms of broad theory and the New Zealand context. This covers the long run trends in fertility and mortality underpinning these transitions and the aberrant post WWII baby boom for Pākehā (central to this thesis). This section also

looks at the concepts of disordered cohort flows and population momentum in the planning context, as outcomes of transition. The section on the epidemiological transition theory covers Omran's (1973) theory of sequential stages of epidemiological transition, as well as subsequent stages suggested by other researchers. The migration levels and patterns in regional New Zealand are also considered – looking at the changing drivers of inter and intra-regional migration. This section covers recent research on the period effects of migration, in very recent years, and why migration patterns and trends (and the drivers thereof) might be different in the Waikato now compared with past drivers.

3.3.1 Demographic Transition Theory

> "In traditional societies, fertility and mortality are high. In modern societies, fertility and mortality are low. In between there is demographic transition" (Demeny, 1972, p. 153).

Demographic transition theory is essentially a summary theoretical model of population change over time. It encapsulates the pathways by which different populations move from the situation of what Demeny referred to as high fertility and mortality – with subsequent low population growth – to a situation of low fertility and mortality – again with low subsequent growth. Demeny's 'in between' part is the part of interest here, with the demographic transition taking place over multiple generations (and hundreds of years), with the timing and pace of change differing between populations. This demographic transition theory, or the main elements of it, can act as a lens within which to compare and contrast the experience of different populations. It can also assist in looking at the near future, and the far horizon, given the long term effects of differing population transition histories.

The demographic transition model has four high level stages. Pool and Kukutai (2011) describe these in summary as:

> "Stage one is characterised by high birth and death rates, creating a relatively stable population. In stage two mortality rates fall and the population experiences rapid growth. A drop in fertility rates signals entry into stage three. The final stage sees a return to relative stability, with mortality rates close to fertility levels and no natural increase".

In New Zealand where there are two key populations with diverse histories (Pool, 1991) being the indigenous Māori population and the majority Pākehā population (of predominately Anglo-Celtic origin). There are distinct differences in the timing and the speed of the demographic transition between the two populations. The demographic literature houses multiple versions of transition theory, but a common view is that all versions share a basic view of populations passing through a sequence of defined stages (Reher, 2011; Spicer, Trlin, & Walton, 1994, p. 14).

The Pākehā Transition

In demographic transition theory there are two recognised high level phases of transition that apply to Pākehā, simply referred to as the first and second demographic transitions. The first or 'classic' transition (Notestein, 1945) refers to the original declines in fertility and mortality from about 1870-1960 in many Western countries (including north-western Europe, North America, Australia and in New Zealand applies to the Pākehā population) and from the second half of the 20th century in the rest of the world (Lesthaeghe, 2011, p. 179; 2014; Pool & Bedford, 1997). The stage, referred to as stage two by Pool and Kukutai (2011), started with a decline in previously high levels of mortality, triggered by the effects of higher standards of living and improved hygiene practices (partially due to evolving medical practices). The age distribution of mortality shifted, in other words, the force of mortality was no longer focused at the youngest ages resulting in higher infant and childhood survival rates.

As fertility did not immediately decline following mortality decline there was a temporary period of high population growth (alongside continuing immigration, mainly from Europe). Then fertility did begin to decline, perhaps as adaption to a mix of increasing infant and childhood survivorship and the influence of changing societal norms and mores and rising standards of living (Lee & Reher, 2011; Pool, Dharmalingham, & Sceats, 2007; Reher, 2011). This stage was associated with societal norms strongly favouring family values, where family relations where based around investment in children, with the family dependant on the father's employment (Pool, 1992, p. 75). In the Pākehā population, this transition towards low levels of fertility continued until the post-World War II 'baby boom', which is considered an aberration at the end of this long running first transition (Pool & Bedford, 1997, p. 5). This baby boom was a Pākehā phenomenon, given that Māori fertility was high and remained so until the 1960s (Pool, Jackson, & Dickson, 1998).

In the case of Pākehā, there were other important factors contributing to the context of change in this first transition, including that from around 1865 to the 1940s, Pākehā were a pioneer population in terms of increasing life expectancy among western countries (Vallin & Mesle, 2004).

The concept of a second demographic transition (SDT) was introduced in 1986 by demographers Lesthaeghe and van de Kaa (Lesthaeghe, 2010, p. 212). The term refers to the significant changes in fertility and family formation occurring since the 1960s (van de Kaa, 1987, p. 4). In the international context, Lesthaeghe (2010, p. 212) sees the early signs of the SDT as emerging in the 1950s, with fertility falling from the second half of the 1960s onwards in many western societies. In the case of Pākehā, the rapid fertility declines in the early 1970s signal the beginning of the SDT (Pool et al., 1998, p. 95).

The SDT essentially "predicts unilinear change toward very low fertility and a diversity of union and family types" (Zaidi & Morgan, 2017, p. 473). In most developed countries the SDT has seen a rapid paced return to longer term trends of sustained low replacement level fertility and in some countries sub-replacement levels, a variety of living arrangements outside of legal marriage and the disconnect between marriage and child-bearing (Lesthaeghe, 2011, p. 180). Like the first transition, this SDT was essentially a Pākehā experience (Pool & Bedford, 1997).

The Māori Transition

The significant differences in the age structure of the Māori and Pākehā population, are due to differences in the speed and timing of their respective demographic transitions. While the Māori population is ageing it remains relatively youthful in comparison to Pākehā. The pathway taken by Māori is significantly different (than Pākehā) and is referred to as a transitional variant of the delayed model (Pool & Bedford, 1997, p. 18). Prior to colonisation and around the time of British explorer James Cook's 1769 visit, Māori were in what is termed the first stage of demographic transition (Pool & Kukutai, 2011), where fertility and mortality were both high resulting in a relatively young but stable population. Following European arrival and subsequent colonisation – particularly rapid after the Treaty of Waitangi was signed in 1840 - there were increased levels of mortality across all ages, partly due to the introduction of new disease vectors, although the force of mortality was concentrated in the early years of life (Pool, 1991; Pool & Kukutai, 2011).

From about 1900 there was a period of population growth, or perhaps recuperation (Pool & Kukutai, 2011). Māori also benefitted from public health initiatives and slowly rising standards of living, one result of which was rising levels of fertility, with mortality declining gradually, including at the youngest ages (Pool, 1991, p. 160). Māori social and economic deprivation as a result of colonisation have long been recognised as major issues in the health sector (Robson & Harris, 2007; Walker et al., 2017; Axelsson et al., 2016; Came, 2012; Came et al., 2016) and these issues remain real and constant, and recognised, in the health sector in terms of inequity of access to health care services and health outcome disparities. The refreshed 2016 NZHS recognises the inequitable nature of health outcomes for Māori (Minister of Health, 2016, p. 9), though it does not make a link with colonisation per se.

Following WWII the Māori population grew – although it should be noted that Māori fertility had remained high – with rates above those of Pākehā even at the peak of the Pākehā baby boom (Jackson, Pool, & Cheung, 1994; Pool, 1991). This was essentially the second stage of the demographic transition, given that mortality also decreased and population growth was rapid. Pool and Kukutai (2011, p. 4) note some of the factors contributing to this stage of population change as including a broad range of government policies and programmes, particularly related to housing and sanitation. It was during this time that urbanisation of Māori continued at a very fast pace, by 1971 almost three-quarters of Māori were living in urban areas, compared with a quarter of Māori in 1945 (Pool, 1991, p. 4; Pool & Kukutai, 2011).

Since the 1980s there has been a move towards convergence of fertility patterns and rates between Māori and non-Māori (Jackson et al, 1994, p. 1). Pool and Kukutai (2011, p. 5) state that in 2010 the Māori population was in the third stage of demographic transition – defined as being the stage where fertility is declining, but not yet in the final or fourth stage of 'population stability' where mortality rates and fertility rates are relatively stable, resulting in no natural increase. The authors also maintain that the "demography of Māori has been inextricably linked to their historical disadvantage relative to the Pākehā majority, in terms of health, political authority and access to resources" (Pool & Kukutai, 2011, p. 5; Robson & Harris, 2007). This of course is pertinent for the health sector as a whole, and general practice particularly, as providers of personal care under a population health approach (as noted earlier) with a view to the elimination of health inequalities.

Of interest to this study, Pool (1991, p. 5) notes that Pacific population are following the same general demographic transition patterns as Māori. The Pacific population also has a relatively youthful age structure compared to Pākehā, closely resembling the age structure of Māori. The Pacific population in the Waikato DHB area is much smaller in total than Māori and concentrated particularly in Hamilton City and the South Waikato (Waikato District Health Board, 2017).

Critiques of Demographic Transition Theory

The main criticism of demographic transition theory is its limited applicability beyond North-western Europe and the mainly European origin populations of the USA, Canada, Australia and New Zealand. Alongside this is the criticism of a unidirectional timeline, even for European countries with many similarities and shared experiences. Coleman (2004, p. 14) ascertained that a 'transition should be complete and irreversible' as well as covering most individuals across the population of interest (in Zaidi & Morgan, 2017). This point is aligned with fertility recuperations in some populations following the 'transition' to low fertility. Zaidi & Morgan (2017, pp. 480, 483) see this failure to account for variation in low fertility populations, and poor accounting for within country low fertility variation, as a general failure of the theory. The authors do note that only Lesthaeghe has referred to the SDT as a theory, while in more recent work van de Kaa tends to use it more in the role of a historical descriptor (Zaidi & Morgan, 2017). This leads to the critique that perhaps in terms of understanding fertility fluctuations, in a very low fertility environment, that the SDT now has little more to offer researchers. In response to these (and other) criticisms, Lesthaeghe responded by noting that;

> "..new theoretical frameworks were needed to explain features such as the baby bust, the systematic postponement of marriage and parenthood, sub replacement fertility, the rise of alternative forms of partnerships, and parenthood outside marriage. The "second demographic transition" (SDT) theory is such an attempt (Lesthaeghe, 2014, p. 1112).

For this study, demographic transition theory is one important contextual lens, useful for understanding (perhaps more at a strategic level) population change over the last one hundred plus years for both Māori and Pākehā populations. The concept of the SDT has influenced research on fertility and family formation over the last 30 years (and continues to do so). This study also recognises the continuing

emergence of a critical New Zealand Indigenous demography, and the need for the ongoing development of ways of analysis that are inclusive of Māori ways of being and knowing (Kukutai & Taylor, 2013; Sheridan et al, 2011; Czyzewski, 2011; Cram, 2014; Durie, 1999, 2003).

3.3.2 Epidemiological Transition Theory

Alongside demographic transition the other key macro level approach is Omran's epidemiological transition model. In 1971 Omran's seminal paper titled "the epidemiological transition: a theory of the epidemiology of population change" was published. Omran's theory was the first attempt to provide a framework in which to locate the extensive advances made in health care in industrialised countries since the 18th century (Vallin & Mesle, 2004, p. 11). Omran's theory focused on the complex and changing interplay between health and disease and the demographic, economic and sociologic determinants of those (Omran, 2005, p. 731). Omran hypothesised the gradual displacement of infectious disease pandemics by "degenerative and man-made diseases" (Caldwell, 2001, p. 159), in other words, over time chronic diseases replace infectious diseases as the primary cause of morbidity and death (Corruccine & Kaul, 1983). This section summarises the stages of epidemiological transition, as proposed by Omran and subsequent researchers who have suggested additional phases or variants within phases.

Stage 1: The age of pestilence and famine

This stage was where mortality was high and fluctuating, caused predominately by infectious disease and the force of mortality fell with the young. There was no sustained population growth, with low life expectancy (Caldwell, 2001).

Stage 2: The age of receding pandemics

Continuing mortality decline was the key feature of this stage, with the rate of decline accelerating as epidemic peaks decreased in frequency (Caldwell, 2001, p. 159). Life expectancy increased and population growth was sustained and began to be exponential. The stage ended in the middle of the 20th century for most developed countries (Lussier, Bourbeau, & Choiniere, 2008). In terms of the conditions supporting change, Vallin and Mesle (2004) refer to societal investments in public health initiatives such as safe drinking water and sewerage systems. There were also key advances in medicine, including pasteurisation, antibiotics and immunisation for infectious diseases. The development of social security systems

in some countries provided an extra level of protection against many infectious diseases (Lesthaeghe, 2014; Sobotka, 2008; Vallin & Mesle, 2004, p. 15).

Stage 3: The age of chronic and degenerative disease

In this stage mortality continued to decline and eventually approached stability at a relatively low level and "where the disappearance of infectious disease increases the visibility of degenerative disease, and man-made diseases become more and more frequent" (Olshansky & Ault, 1986; Omran, 2005; Vallin & Mesle, 2004, p. 12). In addition, the force of mortality now fell at the oldest ages and female longevity significant exceeded male (Pool & Bedford, 1997, p. 17).

The decade of the 1970s are seen by epidemiologists as key in this stage. van de Kaa (1999, p. 314) referred to this stage as reflecting the "lagged effect of preventive action taken by individuals (healthier eating habits, refraining from smoking, etc.)". Given the lag effect, the assumption is that the underlying behaviour change required for the commencement of this transition stage began in the early 1960s (van de Kaa, 1999, p. 314). This change has occurred at a rapid pace. At the turn of the twentieth century most illness was caused by disease contagions, where acute disease 'attacked' without respect for gender, ethnicity or age (Pol & Thomas, 2000, p. 8). The decline of acute conditions has seen the rise, quite dramatically, and now dominance of chronic conditions as the cause of the majority of morbidity and mortality. These conditions are less likely to originate external to the individual and may have a modifiable lifestyle component (Bergner & Rothman, 1987; Pol & Thomas, 2000; Ministry of Health, 2016c).

Stage 4: The age of delayed chronic and degenerative disease (or the compression of morbidity and mortality)

Omran's original model did not include this stage. In the 1980s researchers suggested a stage associated with the reduction of age-specific death rates of degenerative disease, and the accompanying increase in life expectancy at older ages (Caldwell, 2001; Lussier et al., 2008; Olshansky & Ault, 1986). Olshansky and Ault (1986) were first to propose this stage arguing that the trend was important enough to distinguish it as a stage. Similarly, Vallin and Mesle (2004, p. 12) noted that it was the successful fight against cardiovascular disease with medicine and lifestyle factors of the 1970s that ushered in this period. However, they argued that the theory itself needed revision, advancing that Omran's theory should be

incorporated into a broader scheme, one that acknowledged a wider view of health transition, taking into account both advances in health and the diversity of situations evident across the globe (Vallin & Mesle, 2004, p. 37)[13].

Olshansky and Ault (1986) proposed three stage characteristics:

1. Rapidly declining death rates concentrated mostly in advanced ages and occurring at nearly the same pace for males and females;
2. A relatively unchanged age pattern of mortality by cause, but a progressive shift towards older ages of the age distribution of deaths by degenerative causes; and
3. Relatively rapid movements in survival concentrated in those of advanced ages (Lussier et al., 2008, p. 533).

Brilleman and Salisbury (2013) saw that the management, education and support of those with chronic conditions was now a major focus of primary care in most developed countries. Crimmins (2004, p. 79) had earlier noted that health among older persons had improved, by most dimensions measured, but the prevalence of most diseases has increased. It may be that disease is now less disabling than it was in the past, patients are better educated to self-manage chronic conditions than they previously were (with higher health literacy and eHealth literacy) or that conditions are being diagnosed earlier meaning progression to disablement can be avoided.

Hazra and Gulliford (2017) analysed data from 1990 to 2014 with reference to individuals aged 80+ years (in the United Kingdom), looking for evidence that this fourth stage of the epidemiological transition was shifting non-communicable disease to advanced ages. A lower risk of coronary heart disease, stroke and COPD in those aged 80-84 years was found (in 2010-2014 compared with 1995-1999) but an increased risk of type II diabetes, cancer, dementia, cognitive impairment and musculoskeletal pain was evident. This finding is seen as consistent with the theorised fourth stage, with the increased risk showing emerging epidemiological patterns at the oldest ages (Hazra & Gulliford, 2017, pp. 1,3,9).

[13] Vallin & Mesle (2004:13) make an interesting point (outside the scope of this study) in one argument for theory revision being that revision needs to include the impact of AIDs and recognition that infectious disease cannot be eradicated completely, only bought under control with constant effort. They note instances when previous health gains have been lost – in situations where infectious disease has been fought in unfavourable conditions.

In the case of New Zealand, the MoH released a study in late 2016 with key findings on health expectancy and the compression of morbidity. The report looked at health loss as "an accepted measure of how much healthy life is lost due to early death, illness or disability" (Ministry of Health, 2016c, p. iii). New Zealand is reported as being at an advanced stage of transition, with the vast majority of health loss now due to non-communicable conditions (Ministry of Health, 2016c). Although this was the overall direction of change, not all population groups had benefitted equally and while health loss has declined overall, inequalities remain (Ministry of Health, 2016c). This knowledge has been used to drive the strategic direction of health policy – the MoH noting its value for the refresh of the NZHS in 2016 (Ministry of Health, 2016c, pp. iii,ix). Alongside this good news of living longer in good health, is that some people are also living longer in poor health. Again this has important implications for the health care undertaken by general practice. The MoH sees one of way of lessening the impact of chronic conditions on health and quality of life as being through a combination of disease prevention and improved disease management (Ministry of Health, 2016c, p. ix).

Stage 5: Age of emergent and re-emergent Infections

This stage is seen as having limited application to some regions of the world (Agyei-Mensah & De-Graft Aikins, 2010), including New Zealand, given the emphasis on parasitic infection. Given the 're-emergent' aspect associated with this stage, it does not fit sequentially as a stage as Omran suggested in his original model.

Stage 6: Protracted-polarised transition

In the late 1980's Frenk, Bobadilla, Sepulveda, and Lopez-Cervantes (1989) proposed an additional stage, a stage considered to be both 'protracted' and 'polarised'; characterised by a protracted double burden of disease, both infectious and chronic - both being major causes of morbidity and mortality (Agyei-Mensah & de-Graft Aikins 2010, pg 879). The polarised part of the equation was from findings that the protracted nature of disease was polarised across social class, with socio-economically advantaged communities experiencing higher risk of chronic disease but less advantaged communities a 'double burden' of infectious and chronic disease (Agyei-Mensah & De-Graft Aikins, 2010, p. 879).

While the protracted-polarised stage is not considered to be occurring in New Zealand, there is recent evidence that infectious disease remains an important health

sector issue, particularly for Māori and Pacific communities. Baker et al. (2012) reported on a national study investigating hospital admissions relating to infectious and non-infectious diseases over the period 1989-2008. While looking at hospital admissions is an imperfect measure of the total burden of disease, they found that "infectious diseases made the largest contribution to hospital admission of any cause. Their contribution increased from 20.5% of acute admissions in 1989-1993 to 26.6% in 2004-2008" (Baker et al., 2012, p. 1112).

In addition, and similar perhaps to aspects of the socio-economic polarisation found by Frenk et al. (1989) and Agyei-Mensah and De-Graft Aikins (2010), the burden of infectious disease generally falls more heavily on the less socio-economically advantaged groups. Baker et al. (2012) while not referring to this stage of transition per se, found ethnic and socio-economic disparities in New Zealand for serious infectious diseases like tuberculosis, acute rheumatic fever and meningococcal (alongside skin infections). Referring also to the 2009 H1N1 influenza pandemic, they note that hospital admissions for Māori were three times and Pacific peoples over six times higher than for those of Pākehā or other ethnic groups (Baker et al., 2012, p. 1112). These data perhaps speak also to the historical and continuing inequalities in both access to health care and in health outcomes.

Critiques of epidemiological transition theory

Omran's original theory, with additions by others has not been without its critics. Lussier et al. (2008, p. 534) particularly notes the arguments of Robine (2001) against "the addition of two stages *(Omran's degenerative diseases and Olshansky & Ault's stage of delayed degenerative disease)* after studying the evolution of dispersion of life spans". Other researchers have also noted, some agreeing with Olshansky & Ault's stage of delayed degenerative disease, questions around the exclusion of deaths due to social pathologies not being included in Omran's theoretical framework (Lussier et al., 2008, p. 534; Rogers & Hackenberg, 1987). Others have noted that macro level perspectives have ignored within-country or between population group inequalities (Guntupalli, 2014). At a more strategic level, the problem with simplifying often complex transitions occurring across time and space into a high-level model, is that it does not (and essentially cannot) fit the experience of every population group. Caselli, Mesle, and Vallin (2002) refer to some of Omran's stages as suffering 'many exceptions'.

Omran's initial three stages were fitted more closely to the experience of populations in Europe (and the mainly European origin populations in places like New Zealand). Other researchers have built further stages, not necessarily sequential, which both extend and complicate the original model and it has been used to study the experience of other population groups in varying regions of the world. Mackenbach (1994, p. 329) has noted the problematic nature of locating in time the beginning and end of any phase of the transition. That author also states that this epidemiological transition was initially not well known among epidemiologists, but had been taken up in the preceding 20 plus years with more enthusiasm by demographers and geographers.

Omran identified several models in his transition paradigm, theorising that different populations (and sub-populations) would experience transition differentially. This was certainly the case for New Zealand which has two very different populations and continues to experience two epidemiological transitions. The Pākehā experience has been termed as a 'classical or western model', along with most populations in Australia, North America and Western Europe and occurred in the 19th century. For Māori the transition was experienced much later in the 20th century and is considered a transitional variant of the delayed model (Pool & Bedford, 1997, p. 18). Pool, Baxendine, et al. (2009, p. 172) note that while it is not possible to identify the transition experiences of the other populations in New Zealand, it is likely that the experience of the Pacific population has been similar to that of Māori. Again this points to the reality that in the New Zealand context, and pertinent for this study, is the reality of two distinct populations for which health planners, funders, policy makers and providers must account for.

3.3.3 Migration and age structural change

The effects of migration on age structure tend to be of short duration and as such do not alter the longer term transition to an older age structure (Pool, Prachuabmoh, et al., 2005; Statistics New Zealand, 2009, p. 3). Pool (2005, p. 2) also stated that "unless a population is exposed to extremely high levels of migration, moreover, cohort size is set down at birth" noting that in the case of New Zealand any changes in cohort size due to migration are at the 'margins of significance'. Others have agreed (Reher, 2015, p. s61) noting that while other factors are at play it is fertility that primarily drives the age structure of a population, while Vaupel & Edel (2017)

state that in the case of an ageing population (using Germany as an example) migration gains will not prevent future population decline, just act to slow down the inevitable process. Recent New Zealand research, however, notes that while migration is not a key driver (of change) in the traditional demographic transition sense, it's role may be changing in a future progressing towards sub-national depopulation and its influence is increasingly making the study of the progression of age structural change more complex at the sub-national level (Jackson, 2017, p. 3; Jackson & Brabyn, 2017) given that national averages obscure substantial heterogeneity (Bryant, 2003, p. 12).

It is not within the scope of this study to look at the drivers of immigration or migration as such, but it is recognised that a wide set of economic drivers are critical – including employment opportunities and access to services (Brabyn, 2017) and perhaps in the New Zealand context the increasing influence of lifestyle factors - rural living and lifestyle block living - within employment distance of urban areas or smaller towns (Brabyn, 2017, p. 38; Poot, 2008). In the region covered by this study there has been a significant increase in the prevalence of lifestyle blocks around Hamilton City, but also around smaller towns in both the Waikato and Waipa Districts (e.g. Te Kauwhata, Morrinsville, Cambridge and Te Awamutu). These changes are conventionally referred to as peri-urbanisation but Pool (2017) notes a derivation of peri-urbanism – called "rurbanisation' (the influence of rural society on urban life or vice versa[14]) but referring here to life style blocks which may be located long commuting distances away from urban areas, thus completely separating geographical place of employment from place of residence. This long distance commuting is now thought to be considerably altering New Zealand's population geography (Jackson, 2017, p. 5; Pool, 2017). Related to this issue, The Waikato Times (the major newspaper in the Waikato DHB region) recently made reference to 'super commuters' as those who face drives of over 100 plus kilometres between home and work (each way) every working day. They note that this is well-known in metropolises overseas and that the trend is now emerging in New Zealand[15]. This includes not only those living in more rural areas and travelling into towns and cities for work but also those commuting between cities/major urban areas for work.

[14] As defined by the Oxford English Dictionary (online), https://en.oxforddictionaries.com
[15] https://www.stuff.co.nz/life-style/96728162 (16 September 2017).

Over recent years sub-national population projections from Statistics New Zealand indicate structural ageing across all regions, albeit at varying pace (a reflection of current age structure, projected levels of fertility and the perhaps differential influences of migration in each region). Alongside these sometimes marked differences in the spatial distribution of population ageing, Khawaja and Boddington (2010) make a pertinent point for the region covered in this study, being that those geographical areas with a history of out-migration in search of employment or educational opportunities generally have an older age structure. This includes sub-regions such as the Thames Coromandel District to which older migrants are drawn during retirement years – magnifying the ageing effect (and the flow on effects for the provision of services delivered in general practice). Of particular note for Pinnacle MHN (in its planning role as a PHO) are those areas that Statistics New Zealand projections indicate will have 30 per cent or more of the population aged 65+ years by 2031. These areas include the Thames Coromandel (32.1 per cent) and Hauraki Districts (32.0 per cent), the Matamata-Piako District is projected to reach this threshold not long afterwards (Khawaja & Boddington, 2010, p. 131). While population ageing has been discussed and publicly debated for some time, this has not necessarily progressed into integrated planning. With the first of the Pākehā baby boomers reaching retirement ages in 2011, these regions are now at the fore of developing strategies and planning for the effects of population ageing at the sub-regional and local level.

Age structural change, and the potential influence of migration interacting with structural change, are important components of this study in terms of regional, sub-regional and local level health planning. The recent New Zealand research, noted above by Jackson and colleagues, looked at the role of migration (overall and gender and age-selective) in terms of the extent that "migration is accelerating or ameliorating structural ageing, and with it hastening or slowing the theorized shift to the ending of population growth; and, does the situation unfold differently at national and subnational level? (Jackson, 2017, p. 3). The national context is one of a still relatively high (but fluctuating) fertility rate and a high level of both international and internal migration (Jackson, 2017, p. 3; Jackson & Brabyn, 2017).

An example of these high levels of migration was evident in the national population estimates for the year ended 30 June 2017. Statistics New Zealand (2017a) noted the largest ever increase in New Zealand's population for a June year – an increase

of 100,400 people. At the national level the population is projected to remain relatively youthful for some time with the onset of sub-national depopulation unfolding at "different times, in different ways" (Jackson, 2017, p. 4).

Although migration is not conventionally considered a driver of age structural change, Jackson (2017, p. 4) made the point that because of this "there is a danger that affected areas will not see the timely policy development that is required: in New Zealand, policy development on advanced structural ageing is not yet on the agenda". Brabyn (2017, p. 37) ascertains that predicting (or projecting) and understanding "spatial patterns in population change has significant implications for infrastructure, property investments, and national spatial planning", and there are certainly implications for health service planning. Future migration patterns of those at the oldest ages within the Waikato DHB area may play an increasing role in health service planning. It could be that at a certain age (different for each individual) there is a move/migration back towards available health facilities (secondary and tertiary level hospital care services) or towards smaller towns with appropriate facilities.

3.4 Population momentum and disordered cohort flows

Regardless of the contested theoretical nature of Lesthaeghe and van de Kaa's original theory of demographic transition and Omran's epidemiological transition, there are both numerical and structural change effects (and outcomes) from these ongoing transitions. Within the lens of demographic transition are the interwoven concepts (and effects) of population momentum and disordered cohort flows. These concepts are important for understanding the complexities of health planning and service delivery, at both the regional and local level.

The forces of population momentum are essentially derived from birth cohort size (Pool, 2005; Statistics New Zealand, 2006) and are now the key element of growth and change in New Zealand with change being irregular and non-linear (Pool, 2005; Pool et al., 2007; Pool, Prachuabmoh et al., 2005, p. 1). Population momentum brings with it challenges for policy makers and planners, and not only in the health sector, but across society. These challenges of changing age structures, in a disordered pattern, will test current institutional and social structures as the needs of an ageing population change and flux (Pool, Prachuabmoh, et al., 2005, p. 1). Aligned with this, Rowland (1996, p. 41) stresses the usefulness of the momentum

concept lies in its emphasis on cohort flows and variations in flows over time, where such variations have both short and long term implications for policy and planning. This concept of momentum was first identified in terms of 'growth potential' and became more widely used as a key demographic concept from the early 1970s, following publication of demographer Nathan Keyfitz's seminal paper titled "on the momentum of population growth" (Rowland, 1996, p. 41).

Another way of conceptualising the effects on policy and planning of momentum and cohort flows is to refer to birth cohorts. When you are born you become part of a 'birth cohort' which you are only parted from by death. Birth cohorts, quite obviously, move through the life course together, having varying effects depending on cohort size, on demand for particular services as they move through the life course, such as early childhood education, primary school, secondary school and tertiary education (or general practice health care for the purposes of this study). Cohort membership in this sense is a constant, unlike other demographic variables which over the life course may change multiple times, such as legal marital status or educational attainment. Pool (2005) has called these changeable aspects 'comings and goings'. In this sense, population momentum can be conceptualised as "a demographic behavioural pattern followed by cohorts: most commonly it is the impetus built up by a cohort for some phenomenon" (Pool, 2005, p. 4).

In New Zealand, while cohort size is fairly well set at birth, there remains the effects of disordered cohort flows primarily due to the Pākehā baby boom. This boom was prolonged, lasting into the early 1970s, where in other western developed countries similar baby booms finished in the mid to late 1960s (Pool et al., 2007). The momentum effects of the Pākehā baby boomers, as those disordered cohorts move through the life course, are important for this study and add another layer of complexity to the health planning and policy making processes, as policies tend to address need at a particular life style stage (Pool, Baxendine, Cochrane, & Lindop, 2005). This makes analysis of momentum and the ongoing effects of disordered cohort flow all the more important (Pool, 2005; Reher, 2015; Statistics New Zealand, 2006). These demographic related challenges will dominate the social and health care agenda of many countries (Hazzard, 2001) where the oldest cohorts are the fastest growing segment of the population and will subsequently drive demand for health care until those baby boom cohorts transition through the life course.

3.5 Growth, ageing-driven growth and depopulation

The previous sections have given an overview of past demographic change and how these long term processes of fertility and mortality have set the scene for the situation in which this study is placed – that in which the demand for general practice health care is projected to significantly increase over the period 2013-2038. The nature of demographic change in New Zealand is perhaps more complex than most people recognise (Pool, 2012) given the mix of numerical and structural ageing playing out. Population ageing and its effects become increasingly multifaceted when moving to the sub-regional level where differing sets of factors may come into play. This section looks briefly at numerical ageing, structural ageing, ageing driven growth, the baby boom generations and the longer term shift towards natural decline and absolute population decline. Each of these stages will occur differently at the sub-regional level across the Waikato DHB catchment, with planning and service delivery implications for general practice as the cornerstone provider of health care services.

New Zealand as a whole has experienced steady growth over the last quarter century and that steady growth is expected to continue (Jackson, 2014). This growth however, has historically not been evenly spread geographically, and is not expected to be so into the near future. At the regional and sub-regional level there are a number of scenarios unfolding in what Jackson (2014, p. 4) calls "deepening decline amidst the overall growth" referring particularly to the majority of growth between 2006 and 2013 being shared between the country's cities, with some (small level of) growth in 36 Districts, with the remaining 20 Districts either in stagnation or experiencing decline. The Waikato DHB region in which this study is situated has both high growth Districts (TAs) and those already experiencing natural decline.

Jackson and Cameron (2016) explain the progression from growth to ageing-driven growth to depopulation with four dimensions of population ageing (also Jackson, 2007, 2011; Pool, 2007, 2012), being numerical ageing, structural ageing, natural decline and absolute decline (or depopulation). Numerical ageing simply refers to the increase in the number of people aged 65+ years. Numerical ageing is expected to occur in every TA over the 2013-2043 period (Jackson & Cameron, 2016, p. 2). Structural ageing is about the increasing proportion of older people in the population (mainly a result of declining fertility), and given ongoing increases in life expectancy and low fertility this process is expected to continue.

The baby boom Pākehā population began to enter the ranks of "older people" in 2011 as the oldest members started turning 65 years old. In this sense the baby boomers are now contributing to both numerical and structural ageing, but they are not the primary cause of either (Jackson and Cameron 2016, p. 2). New Zealand was already on the long term pathway to age structural change, with declining fertility and mortality well before the baby boom occurred – in this sense the baby boomers are indeed an aberration (Pool & Bedford, 1997), having perhaps masked the long term processes underway as they moved through the younger ages.

The third step in the progression to population decline is the end of 'natural increase' and the start of 'natural decline' – where a population experiences more deaths than births. This starts to occur a decade or so following when a population has more elderly than children (Jackson and Cameron, 2016, p. 2). The authors note that once there are above 20 per cent of a population aged 65+ ("hyper ageing stage") natural decline starts to occur. The last stage of absolute decline begins where natural decline ends, when net migration becomes a part of the equation. Migration loss is sometimes referred to as the old form of decline – the new form of decline being a mix of the effect of net migration loss, in conjunction with natural decline (Jackson & Cameron, 2016).

The topic of population ageing has been discussed for several decades. The discussion started perhaps around the potential for economic stress under a growing aged care and social services budget. This has not been an uncommon experience for countries on a similar ageing pathway. Vaupel & Edel (2017) note the case for Germany, where a more alarmist public debate has over time changed into broader discussion on the societal effects of an ageing population. The authors note that with this turn of debate "…some observers appear to believe that the topic of ageing has already been dealt with, even though the challenges that were initially flagged have not changed, and the effects of this demographic change are now being felt for the first time" (Vaupel & Edel, 2017 p. 1). It's unknown if this is also the case in New Zealand, and if so, to what extent. Jackson (2017, p.4) has noted however, the subject of advanced structural ageing is not yet recognised.

3.6 Health services use and the general practice workforce

This section looks at the micro level or individual level factors that affect the decision to seek and use general practice care. Of central importance is Andersen's model of health care utilisation (the original 1973 version was refreshed in 1995) with its inherent concepts and nomenclature of predisposing factors, enabling factors and need factors (Andersen, 1995). This section also looks at what is known about the demand for general practice services in general (and in the Waikato DHB region). On the supply side, also covered are aspects of the general practice workforce in New Zealand – while this study is situated on the demand side, it is critical to understand the main issues at play on the supply side of the equation. This is particularly pertinent for the discussion and conclusion chapters. In order to place demand in the context of supply (both current and projected) this topic covers the key issues, particularly for the Waikato and for rural general practice, looking at issues raised by the Royal New Zealand College of General Practice, the Rural General Practice Network and the New Zealand Nursing Council.

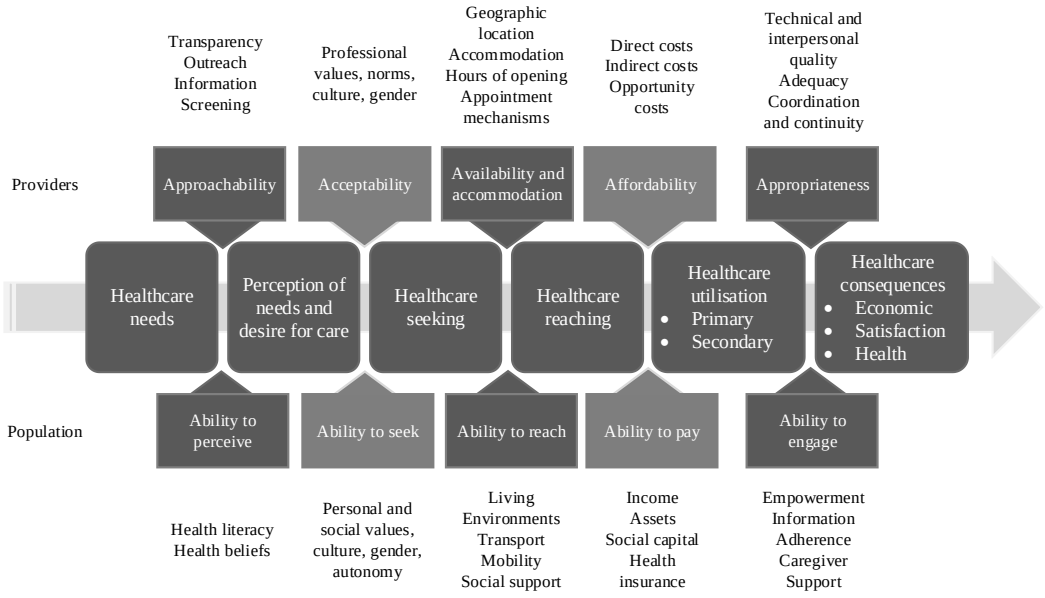
General practice service use – a conceptual model

Need for health care and the use of that health care are "assumed to be functions of the health system characteristics, demographic characteristics, social and economic characteristics, and population health together with characteristics that are unique to each state" (Laditka et al., 2009, p. 763). There are a number of conceptual models concerning people's use of health services that are cognisant of the above factors, and which include both the demand and supply side of service use, which could be applied (data dependent) in a general practice study setting. One such conceptual framework around access to health care – but also including use and outcomes – has been advanced by Corscadden et al. (2017, p. 224) as shown in Figure 3.2. This conceptual framework is comprehensive – including just about all possible factors considered to play a part in individuals accessing (or not accessing) health care. It covers the 'provider' and 'population' side, referred to in this study as supply and demand.

Using a systematic quantitative assessment methodology, Corscadden et al. (2017) looked at adult access to primary health care in eleven countries, using the organisational themes of approachability, availability, affordability and appropriateness (noted as the 'provider' side in Figure 3.2). New Zealand ranked

positively in approachability ("is there one GP or doctors group usually attended for medical care?" related questions). This result might be impacted by the financial incentives to be enrolled in a general practice. Similarly, New Zealand ranked about middle for care availability. However, the ranking for affordability of care was not as positive, with New Zealand ranking second worst for individuals not attending when needing care due to cost, and/or skipping treatment due to cost (Corscadden et al., 2017, p. 225). In summary – compared to ten other countries[16] often used for comparative purposes – New Zealand ranks middling to positive on dimensions other than affordability in the Corscadden framework, where the findings were not comparatively positive (Corscadden et al., 2017). The quantitative study review did not include components of the population (demand side) in Figure 3.2 including dimensions of perceiving, seeking, reaching and engaging with health care.

Figure 3.2 A conceptual framework for access to health care



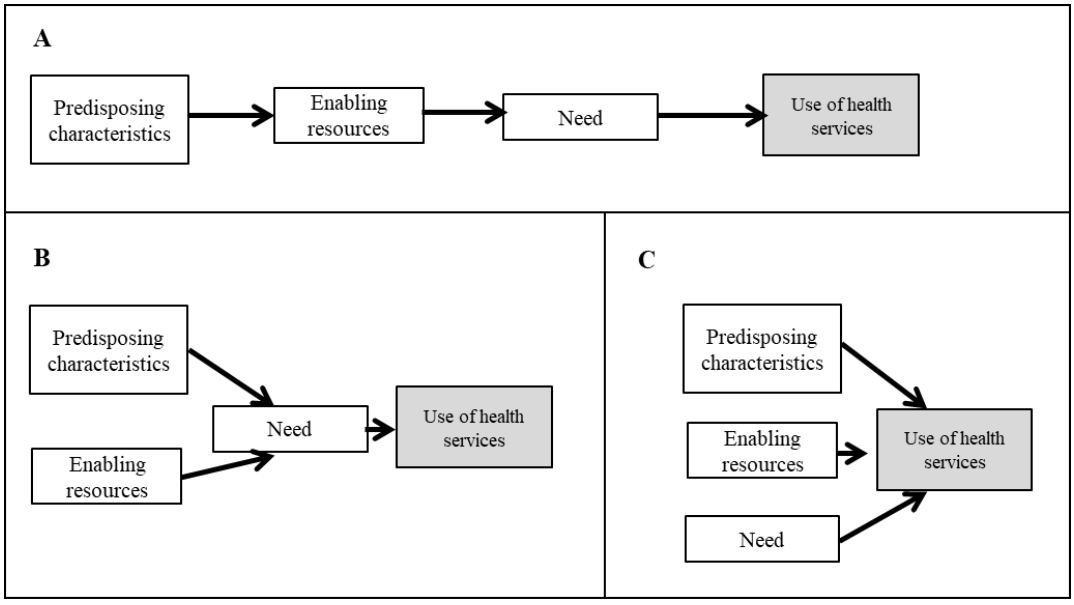
Source: Corscadden et al. (2017, p. 224) as adapted from Levesque, Harris, and Russell (2013).

Turning towards another framework related to both access and service use, one of the most well-known models is Andersen's model of health care utilisation, from a medical sociology approach (Hausmann-Muela, Muela-Ribera and Nyamongo, 2003, p. 9). McDonald and Conde (2010) state the Andersen framework is often used in studies of health service use – having been further refined by several iterations over time since it was first published in 1973. The model includes societal

[16] Including Australia, Canada, France, Germany, Netherlands, Norway, Sweden, Switzerland, UK and USA.

determinants and influences within the health system that effect health seeking behaviour (outside of individual determinants). This model of health service use identified three factors most likely to be the determinants of service use (1) predisposing factors (such as age and gender); (2) personal need factors (such as presence of a health condition) and (3) enabling factors (such as an individual's socio-economic status and the cost of a consult) (McDonald & Conde, 2010). Three configurations of the Andersen model are shown in Figure 3.3.

Figure 3.3 Three configurations of Andersen's model of health service use



Source: Graham, Hasking, Brooker, Clarke, and Meadows (2017, p. 171)

Other researchers have noted that aspects such as how health services are organised should be included in the model as a possibly 'enabling factor' (Wolinsky, 1994; Wolinsky & Johnson, 1991), for example including how many GPs there are for the population being served. Graham et al. (2017, p. 171) note that in the above model configuration "A" was how Andersen first presented the model (in a linear mode). Andersen later suggested configuration "C" when considering equity of access to health care services (Andersen, 1995). There has been debate about how these three factors interact, in particular the relationships between variables within each factor, as well as how any independent variables combine to form higher order constructs, and then in turn how those constructs relate to actual health service use in any given population (Andersen, 1995; Andersen & Newman, 1973; Babitsch, Gohl, & von Lengerke, 2012; Graham et al., 2017).

Hausmann-Muela et al. (2003, p. 9) also state that in general, health seeking and utilisation models (including Andersen's and perhaps that of Corscadden et al., 2017) when applied often serve more as catalogues of relevant variables deserving consideration in research design rather than models as such (the Corscadden model is certainly comprehensive, in terms of a listing of all possible factors to consider in any study of health service use). In addition, researchers frequently adapt the models to various research scopes, or combine models with the aim to increase the repertoire of possible key factors rather than to achieve theoretical advancements (Hausmann-Muela et al., 2003). In this context, Babitsch et al. (2012) add confirmation to this view, but note in their systematic review of studies published between 1998 and 2011, that researchers were mainly using secondary data and as such were confined to the variables collected at the time of service use. In this study there is some truth to both Hausmann-Muela et al. (2003) and Babitsch et al. (2012) comments, namely as secondary administrative data is being used.

The administrative data used in this study is collected when an individual interacts with their enrolled practice, and for general practice services outside of the enrolled setting. Because of this, and because it contains no survey data, it is well suited to using Andersen's model. McDonald et al. (2007), looking at Andersen's model from a quality improvement perspective, noted that the categorising of independent variables into the conceptual model was based on an individual's point of view, itself perhaps coming from where the person (making the call) is situated within the health system.

Figure 3.4 shows the conceptual framework for this study, adapted from Andersen's model, used to explore service use in the Pinnacle MHN study population. Under each of Andersen's 'predisposing characteristics, enabling resources and need' are the variables available for this study – based on the Pinnacle MHN administrative data available.

Figure 3.4 Demand for general practice health care, the conceptual model

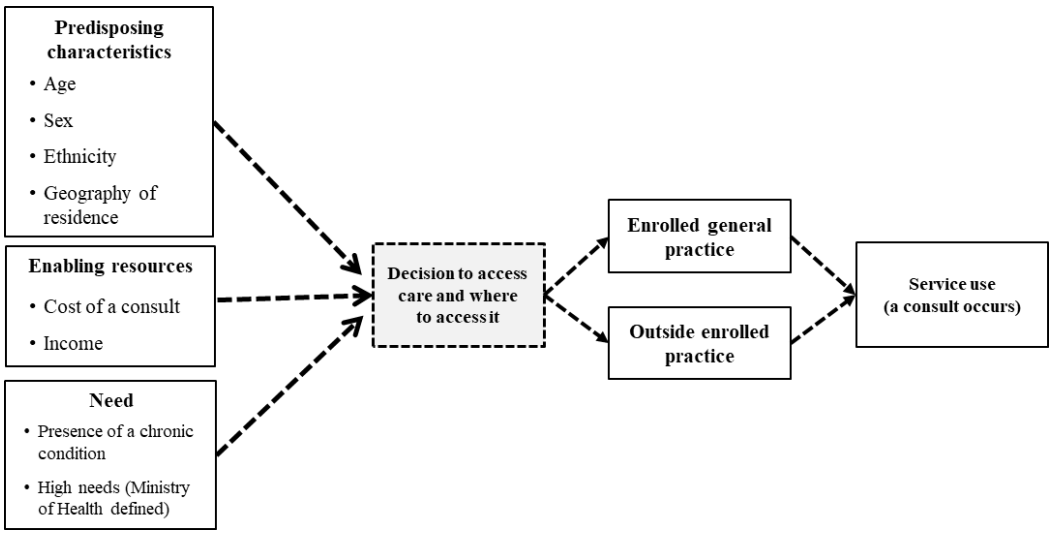


Figure 3.4 is configured under Andersen's option 'C' (Figure 3.3). This is partly to recognise that decisions to seek health care are not linear and, in this case for Pinnacle MHN individuals enrolled, the 'place' (or effect) of the eight independent variables and their effect on demand for general practice healthcare is unknown in terms of statistical significance. This option (as noted earlier) perhaps best incorporates the role of equity in service use. It should also be noted that the effects of potentially enabling resources such as health literacy, eHealth literacy and practice accessibility cannot be measured using administrative service use data.

Figure 3.4 also recognises that prior to potential demand progressing to actual demand (that is, a consult occurs), there is a decision point on where to access the care deemed necessary – through the enrolled general practice or outside of the enrolled setting. This decision is expected to be at least partially dependent on geography of residence (predisposing characteristics) and cost of a consult in enrolled general practice and A&M, as well as income (both categorised here as 'enabling resources'). Where actual demand meets the professional system, to use the terminology of Babitsch et al. (2012), likely depends on variations of the same variables considered in the decision to seek care.

The nomenclature of Andersen's model: Ethnicity as a 'predisposing characteristic' in this study

Ethnicity variables are regularly used in health service use research. How ethnicity is operationalised as well as how to interpret ethnicity remains an issue, given the lack of a universal definition and the ongoing debate about the use of ethnicity in

biological research (Moscou, 2008; Kukutai, 2010). This section looks at the terminology of Andersen's model and provides more explicit articulation of what ethnicity 'means' in this study, as a variable for analysis.

In the Pinnacle MHN administrative data, ethnicity is self-identified, albeit within the confines of a statistical classification. This self-identification occurs at the time when an individual joins a general practice in the network (and by default the PHO). The PHO uses a generic enrolment form, which all prospective enrolees complete in order to be enrolled and funded (that is receive subsidised or free health care services) through that particular general practice. The categories available for selection are based on, and conform to, the Statistics New Zealand "Ethnicity New Zealand Standard Classification[17]" (Kukutai, 2010; Statistics New Zealand, 2005).

Ethnicity, in this study, refers to individuals with a shared history or those with certain common experiences or outcomes, though this does not suggest any sense of internal group homogeneity (see Kukutai, 2010, p. 5). Ethnicity does not include any measurement of biology, values or behaviour (LaVeist, 1994; Morning, 2008; Statistics New Zealand 2005). It is important to note that an individual's ethnicity is not fixed (Statistics New Zealand, 2005) and people can (and do) change the way they identify in differing contexts, including in official statistics over time. In this sense there may be a fluidity to self-identification.

In this study, ethnicity has been categorised using Andersen's terminology of 'predisposing characteristics'. For the operationalising of ethnicity, this category label refers to, and seeks to acknowledge, the importance and ongoing influence of the wider (including historical) context of the health system. This recognises the long standing inequalities in health (both access and outcomes) that Māori have experienced, since colonisation, and that the largely mono-cultural health system plays a part in the continuance of established inequalities. This 'pre-disposing' includes contested ideas of the existence (and importance) of institutional racism. As Came (2012, p. 286) notes this racism (or Pākehā privilege) is often not overt, it may even be subconscious, but nevertheless it manifests as a "pattern of behaviour privileging one group while systematically disadvantaging another".

[17] Currently Ethnicity New Zealand Standard Classification 2005 version 2.0 (www.stats.govt.nz)

For those individuals self-identifying as Pacific people's, this 'predisposing' encompasses that as a group, they also experience ongoing health access and outcome inequalities. These experiences, however, are different to Māori and do not include the Māori experience of colonisation. The outcomes of both experiences are partially manifested in New Zealand's well documented health inequalities. Also like Māori, Pacific peoples are marginalised compared to Pākehā across a broad range of socio-economic measures (and outcomes) wider than the health system (Ministry of Pacific Peoples, 2017; Minister of Health, 2016; Ministry of Health, 2002a, 2012, 2014c, 2015, 2016d; Kukutai, 2010). This encapsulates the shared and ongoing experience of inequalities at the heart of poor health outcomes, with the elimination of inequalities a strategic priority right across the health sector.

It is also noted that under the 'need' category in this study model there is the high needs variable (as defined by the MoH – see Chapter Four: Research Methods) which has a combined ethnicity and geographical component, in that it includes all those of Māori or Pacific ethnicity and all Others resident in the most socio-economically deprived geographical areas.

The increasing role of health literacy and eHealth literacy

Higher levels of health literacy are recognised as an important factor for individuals in terms of the decision making pathway towards using health care services – perhaps more at the perception of need for health care and the decision to seek health care. Health literacy is linked to literacy and covers "people's knowledge, motivation and competence to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course" (New Zealand Medical Association, 2017, p. 6). Lower health literacy has been linked to inefficient use of health services, sub-optimal communication with health care providers, medication errors and increased health care costs overall (New Zealand Medical Association, 2017; Tennant et al., 2015). Increasing health literacy also has the potential to improve quality of care and health outcomes (Vellar, Mastroianni, & Lambert, 2017).

The concept of eHealth literacy builds on health literacy, with Tennant et al. (2015, p. e71) defining eHealth literacy as "the ability to seek, find, understand, and appraise health information from electronic sources and apply that knowledge to

solving a health problem or making a health-related decision". Part of the growing interest in eHealth literacy may be due to the way it could allow people to become more active participants in their health care working alongside health professionals, or in groups focused on disease management and quality of life.

General practice service use in New Zealand

This section focuses on what is known about service use in New Zealand general practice. It overviews some key studies from the 1980's to mid-2000s, including knowledge on service use from the New Zealand Health Survey and the recent LiLACS NZ (Life and Living in Advanced Age in New Zealand) study. It is noted that the approach taken in this study to combine general practice type care from across the sector, in an expanded measure of general practice, is original and not directly comparable to any New Zealand research found. It is expected that data from administrative sources will result in higher service use results than data from health surveys given the effects of survey respondent recall and non-response rates (OECD, 2015, p. 100). It is also timely to note as Crampton, Dowell, Woodward, and Salmond (2000) have previously done, that in terms of service use, there is no 'gold standard' to apply to rates of service use in any population. A mix of predictor variables (such as those noted in the previous sections) will be at play in any population in any geographical area.

The WaiMedCa and NatMedCa service use studies

The 1991/92 Waikato Medical Care survey (WaiMedCa) gathered data from 169 GPs in the Waikato Health Board area. The National Primary Medical Care Survey (NatMedCa) in 2001 was a nationwide survey, with a Waikato based sample of 52 GPs (Crengle, Lay-Yee, Davis, & Pearson, 2005; McAvoy, Davis, Raymont, & Gribben, 1994; Ministry of Health, 2004). The surveys, particularly NatMedCa, covered a number of facets, including; the number of visits in the past 12 months, whether the patient was new to the GP or the practice, the rapport between patient and GP (GP reported), the number of health issues identified and consult duration. The NatMedCa survey was undertaken just prior to implementation of the PHCS. While data on the number of visits in the previous 12 months were collected from the surveys (WaiMedCa 7.6 visits; NatMedCa 6.6 visits; NatMedCa Waikato sample 6.6 visits) (Crengle et al., 2005; McAvoy et al., 1994; Ministry of Health, 2004) the data are not comparable to this study. This is due to the use of survey data (for example NatMedCa physicians recorded data on every fourth consult)

compared with administrative data where 'zero' was recorded if an individual in the study population did not use any services. The NatMedCa survey also captured data on the use of A&M services with the main finding being that it provides "episodic treatment for relatively young patients mainly related to a new, short-term problem, particularly an injury or a respiratory illness" (Hider, Lay-Yee, & Davis, 2007, p. 2538).

Crampton, Jatrana, Lay-Yee, and Davis (2007) used the NatMedCa data to estimate the average number of visits and average population exposure (measured in minutes per year spent with a GP) to general practice over 12 months. They found that exposure to care was highest for those aged 65+ years with higher exposure for European compared with Māori, Pacific and Asian groups. Alongside this, no significant difference in exposure to care across socio-economic quintiles was found (using NZDep2001 quintiles) (Crampton et al., 2007, p. 1).

The New Zealand Health Survey[18]

The New Zealand Health Survey provides much of the information for sector planning. Some of the indicators developed have the status of official statistics, as designated by Statistics New Zealand (Ministry of Health, 2014b). The survey became a continuous survey in 2011 with subsequent annual reporting. It collects data on service use in general practice from over 13,000 adults and from the parents or caregivers of over 4,000 children. A number of measures are of interest here, particularly; frequency of contact with general practice, timely access to care, unmet need and barriers to services. The mean number of annual visits to a GP by all adults in 2013/14 was 2.9 (for males 2.6 and females 3.3 visits). As expected there were differences by age group with those aged 15-24, 25-34 and 35-44 years having mean visits of 2.3, 2.5 and 2.4 respectively (males and females combined). Mean visits rose by age group to highs of 4.1 and 4.4 for those aged 65-74 and 75+ years respectively.

In the same 2013/14 survey, the mean number of annual visits to a PN was 0.7. Again, visits were higher for females than males (0.8 and 0.6 respectively). Similar patterns to GP visits were seen with PN only visits rising from 0.5 for those aged

[18] This section uses data from the 2014/15 NZHS. Files are available on the MoH website. https://www.health.govt.nz/publication/annual-update-key-results-2013-14-new-zealand-health-survey

15-17 years to 1.5 for those aged 75+ years. For after-hours care (visits to an ED are not included) the mean annual average was reported to be 0.2 for all adults, with 0.1 for males and 0.2 females. Patterns by age group were for higher use at the younger adult ages (those aged 15-44 years).

The SoFIE survey

The Survey of Family Income and Employment (SoFIE) was a household panel survey which ran from October 2002 to September 2010 in annual waves (Imlach-Gunasekara, Carter, Crampton, & Blakely, 2013). There was a starting adult sample of 22,300 adults (11,500 households). Data were collected in each wave on people's demography and socio-economic situation. Additional information on health was included in waves three, five and seven (Imlach-Gunasekara et al., 2013, p. 501). A key aim of the health module was to determine the contribution of access, continuity and co-ordination of care to self-reported health status and social inequalities (Carter, Hayward, & Richardson, 2008, p. 11)

The three SoFIE health waves collected information on use of general practice (termed primary care provider) but not service use in general practice (as a count) in the previous 12 months. There were however, data collected on access to, continuity and coordination of primary care including unmet need for care. This covered some of the unmet need questions in the New Zealand Health Survey (Carter et al., 2008, p. 37) .

Life and Living in Advanced Age in New Zealand (LiLACS NZ)

The "LiLACS NZ" study was a longitudinal study commencing in 2010 with another five annual collection points (Kerse et al., 2016), including record review of general practice service use. The study population was resident in the Bay of Plenty DHB and Lakes DHB (both bordering the Waikato DHB) and it was the first study of advanced age in an indigenous population. This was a study strength as the number of Māori participants allowed for a level of comparison with non-Māori (Kerse et al., 2016, pp. 14,19). The study included the aim to "determine the predictors of successful advanced ageing and understand the trajectories of health and wellbeing in advanced aged" (Kerse, 2014b).

The health professional seen by most people of advanced age were GPs and pharmacists, with nearly all people having had seen a GP in the previous year and 46 per cent a PN (Kerse, 2014c, p. 1). Consults with a GP did vary by

socioeconomic deprivation of residence where more residents in more socioeconomically deprived areas saw their GP than residents of less deprived locations (Kerse, 2014c, p. 2). However, respondents were not asked to recall the number of GP or PN visits (or any other health professional). In terms of continuity of care, Kerse (2014b, pp. 1,4) found that for people of advanced age, both Māori and non-Māori, seeing the same GP was important. Some data were also collected concerning use of after-hours clinics and hospital visits (though it is unclear whether the hospital visit was to ED and whether it would have been ambulatory sensitive or not). Some 12 per cent of respondents had used an after-hours medical service at least once, and that women resident in more deprived areas were more likely to have received care in that setting than women in less deprived areas (Kerse, 2014a, p. 4)

Other selected studies of interest – number of GP visits (2001-2017)

Cumming et al. (2010) studied the determinants of GP visits using data from the 1996/97 and 2002/03 waves of the New Zealand Health Survey. The research was undertaken at the time the PHCS began to be implemented, but the system was still under the funding regime where there was free GP care for those aged under six years while adults paid the full cost of consult (unless a community services card was held). Gender, age, and ethnicity were found to be significantly related to service use (Cumming et al., 2010, p. 451).

A Wellington based qualitative study by McKinlay, Kljakovic, and McBain (2009) looked at the issue of men's care in general practice. This is of interest for two reasons, firstly given all studies noted have the effects of gender (males accessing less care than females) as an important predictor of service use. The second reason being that this study is quantitative based, and as such does not investigate any decision making processes around accessing care – when and where (in enrolled practice or outside of it). The McKinlay et al. (2009, pp. 302,304) study found that health professionals noted a number of system and structural barriers (including general practice opening hours). Men also noted barriers, including waiting times and the general incongruence with their working day (the same barrier as noted by GPs but from a different perspective). Some men reported that care was more focused on the needs of women and children. Alongside this, cost was not a barrier for men when it came to the care of their family – but was a barrier when it came to their decisions about their own care (McKinlay et al., 2009, p. 307).

Schluter et al. (2014, p. 171) from their study of general practice service use in Canterbury (n=388,424) report average annual average visits of 2.6, with variation by age, ethnicity and gender. A focus of the study was on the characteristics of non-attenders (zero recorded consults) compared with attenders. The study did not count general practice care received outside of the enrolled setting, where some of the non-attenders of their enrolled practice may have received general practice care.

Loh and Dovey (2015, p. 17) reported the results of a survey of service users at Dunedin's free clinic, compared with service users in a traditional general practice. They noted that while access had been improved for children, that there still remained "significant levels of unmet health need among New Zealand adults" despite implementation of policy to reduce barriers. At the same time, the 2015/16 Health Survey report noted increasing rates of people experiencing one or more types of unmet need, but they point to a main driver of this being more adults and children unable to get an appointment within 24 hours at their usual medical centre, rather than the unmet need being due to cost (Ministry of Health, 2016b pg. ix).

Although not focused on demand and service use, in late 2017 the Health Quality and Safety Commission released the results of a quarterly survey taken across four PHOs (the Pinnacle MHN was not included). This first annual report was based on the 2016/17 year with 12,466 survey responses[19] across 151 general practices (Health Quality & Safety Commission, 2017a). At the national level, respondents reported concerns with care coordination and continuity of care. This included delays in follow up, and health professionals not always being as aware of an individual's medical history as the individual would like. An important finding, in the context of model of care change, was that many people reported not being involved in their own care to the desired extent (Health Quality & Safety Commission, 2017, p. 3).

General practice in the emergency department

New Zealand, like many other countries has been on a reform track to refocus and expand access to, and use of, community services and reduce the use of hospital services where appropriate (Robinson, Verrall, Houghton, & Zeita, 2015). Ten DHB regions saw significant increases in overall ED attendance rates between

[19] All responding individuals had received a service from their enrolled general practice in the week of the survey.

2010/11 and 2014/15, including the Waikato DHB (Ministry of Health, 2016, p. 6; Waikato District Health Board, 2016). This is due in part to the rise in care seeking, where the care received might have been best delivered in general practice. While there may be many reasons for this, on the demand side age structural transition and the increasing prevalence of chronic conditions are considered to be at the fore (Robinson et al., 2015).

There are notable issues with defining and identifying 'general practice care' within the ED setting – outside of the general agreement of the ICD-10 definitions of what constitutes ambulatory sensitive care (see Chapter Four: Research Methods). Allen et al. (2015) looked at low acuity and general practice type presentations (from a rural ED perspective) in Tasmania between 2009 and 2013. Four categorisation methods were used to identify the proportion of general practice type care. One finding "was the wide variation in the proportion of low acuity and GP-type presentations estimated by the four different methods", ranging from 15 per cent to 69 per cent. The low acuity to treat (triage 4 and 5) categories were used in two of the methods, however ICD codes identifying ambulatory sensitive presentations (as used in this thesis study), were not part of the Tasmanian study – making the results not easily comparable. There remains on-going and considerable debate in what constitutes the definition of a presentation that is best suited to being seen by a GP (Allen et al., 2015, p. 115). The study results finish by stating that "at present, there is no gold standard to estimate true GP-type ED presentations" (Allen et al., 2015, p. 118). Nagree et al. (2013) agree, and report from a multi-methodology approach in three Perth hospitals that 10-12 per cent of ED attendances may have been ambulatory sensitive in nature.

Nagree et al. (2013) see that inaccurate estimation of the number of 'GP type patients' leads to misguided ED reduction or avoidance strategies by hospitals. In a similar paper on the determining the "true burden of general practice patients in the emergency department" Nagree, Gosbell, McCarthy, Moore, and Mountain (2013) maintain that strategies such as super clinics, clinics close to EDs and after-hours phone consults, while touted as solutions to ED overcrowding, are misguided (Nagree et al., 2013, p. 487).

These measurement issues and questions hold true in the New Zealand context. In a 2001 study, Gribben (2003) had 12 GPs undertake a retrospective review of 300

randomly selected ED discharge summaries, with the aim of estimating the proportion of cases that could have been treated in general practice. The mean percentage judged as treatable in community general practice was 56 per cent, with a wide range from 38 per cent to 81 per cent. There was unanimous agreement in only 10 per cent of cases (Gribben, 2003, p. 3). Jones & Thornton (2013) cited ongoing interest in the appropriateness of ED presentations in New Zealand in undertaking their systematic review of the role of cost as a barrier to accessing community general practice (noted earlier in Chapter Three). Those authors report there being a persistent misconception that ED presentations are mostly related to minor illnesses and injury, and that this misconception remains, despite evidence to the contrary (including from New Zealand Health Survey results).

Due to increasing demand for ED services in the Waikato DHB, there has been a focus on reducing presentations to ED for care that could be delivered in general practice. One component of this has been the development of programmes around ED redirection. For Pinnacle MHN this has been part of the Primary Options programme[20] (noted in Chapter Four: Research Methods). An important component of the programme (over the baseline period), was the additional funding allowing general practice to treat individuals they would have previously referred to ED. It is unknown however, what effect this programme has had on overall inappropriate presentations by enrolled individuals. A recent study on preschool aged children (with pneumonia) in Auckland, concluded that accessible general practice with continuity of care was associated with decreased ED presentation and hospital admission (Emery et al., 2015, pp. 8,9).

A recent article in the New Zealand "GP Research Review" perhaps illustrates the ongoing interest in this area. The review reports on the results of a Scottish Health programme evaluation of ED redirection to primary care.

> "…there is a worldwide problem of over and inappropriate use of Emergency Departments by patients with triage level 4 and 5 problems. These are more appropriately managed in general practice. In New Zealand, Emergency Room (ER) visits are free to the patient and in some areas this is a big incentive for attendance. The underlying costs of an ER visit,

[20] https://www.midlandshn.health.nz/programmes/primary-options

> however, are astronomical as compared with infrastructure costs of primary care. What is not realised is that nothing is free – including ER visits" (Reid, 2017, p. 4).

There remains a great deal of interest in general practice in the ED, how much of it there actually is, and how to potentially move that care back to the community, where it is deemed more appropriate. While there is interest, there is not much agreement on any aspect of general practice in the ED.

The supply side – capacity in the general practice workforce

Although this study is focused on the demand side of general practice services the other side of the equation – the 'supply' of care is critical. Two broad areas are generally accepted - that the Waikato DHB region has an ageing population and the region has longstanding general practice workforce issues, particularly in rural general practice. The Waikato DHB, like some others in New Zealand is essentially between "a rock and a hard place" on some workforce supply issues. If this study only presented the future demand side of the equation, without the context of the future supply side, it would be only presenting the 'rock'. This topic summarises recent literature about the 'hard place' of workforce supply at the national level and the Waikato DHB level. These workforce issues are not new or unique to New Zealand and are being referenced by researchers in many of the countries whose data is used for comparative purposes (Crettenden et al., 2014; Dall et al., 2013; Joyce, Wimalaratne, & McNeil, 2003; Laurence & Kamon, 2016; Pedersen, Andersen, & Sondergaard, 2012).

The ageing of the population that is the locus of the demand side of general practice sustainability is also a major factor on the supply side – in that the medical workforce as a whole is ageing – with many GPs and PNs being of the baby boom generation. In 2013, 36 per cent of GPs were aged over 55 years (Ministry of Health, 2016a). The 2016 workforce survey undertaken by the Royal New Zealand College for General Practice (RNZCGP) reported that a higher proportion of rural GPs were aged 60 years or older (Royal New Zealand College of General Practice, 2017b, p. 2). Alongside this the MoH has noted that there is 'geographical maldistribution' of the general practice workforce (Ministry of Health, 2016a, p. 3).

The RNZCGP regularly undertakes a survey of the general practice workforce, including college fellows (vocationally registered GPs), non-members as well as

GP trainees (those undertaking the vocational registration requirements). Their 2016 report estimated that at the national level 44 per cent of the workforce intended to retire in the next ten years (RNZCGP., 2016, p. 2) and that a significant portion of those GPs were considering a reduction in working hours prior to retirement. Gray (2017) writing as a GP in The Specialist (the magazine of the Association of Salaried Medical Specialists) takes this a step further, arguing in a piece titled 'resolving the general practice workforce crisis' that general practice will soon be in crisis (Gray, 2017, p. 13). The origins of this workforce dilemma has several contributors outside of many GPs being members of the baby boom generation. Gray (2017) makes two important points, firstly that part of the current (and near horizon) GP workforce problem relates to the failure to train or recruit enough GPs during the 1980s and 1990s. Secondly, that the modest increase in recruitment and training of GPs from 2007 "cannot possibly be sufficient for the inevitable retirement of the doctors currently aged between 50 and 60" years (Gray, 2017, p. 13). While the number of GP registrars[21] has increased in recent years, it remains below the aim of equal numbers entering the GP workforce training scheme as entering the hospital specialist training routes.

Gray (2017) has also noted the inequity in funding as one important barrier to potential GPs entering the workforce. There is a lack of financial support for GP registrars in training compared with their hospital based colleagues (Gray, 2017). Another barrier is one of perception around the value of the work done by general practice right from the start of medical training, and which perhaps extends into the workforce. This includes the perception (real or otherwise) of the incomes of GPs (business owners or salaried employees) compared with hospital based specialists (Adams, 2013, p. 32; Gray, 2017, p. 14).

Despite recognition of the current and near horizon workforce shortages, Gray (2017, p. 14) sees a general acceptance that an increasing number of tasks should move from the hospital sector to general practice to "lessen pressure on the hospital sector". The refreshed 2016 NZHS also reiterates this view that has been increasingly mentioned since the launch of the 2009 BSMC related policies and programmes. However, in order for general practice to take on an expanded role in

[21] A GP registrar is a qualified doctor with several years' experience who is undertaking advanced training in the vocational scope of general practice (to meet the qualification requirements of the Royal New Zealand College of General Practitioners).

the system, and within the context of the ageing population, population growth and the ageing workforce there will need to be an increasing number of GPs (more than just a 'keep up' with population growth scenario). Aligned with this and the previously noted proportion of GPs intending to retire by 2025, Christie, Wynn-Thomas, and McKinnon (2017, p. 225) note the need to support the current GP workforce to navigate providing care, alongside the stress that workforce shortages bring to the workplace. This is perhaps part of assisting those baby boomer GPs to stay in the workforce for longer, perhaps in part time positions, where workforce stressors may have previously helped make a decision to fully retire.

In 2013, the Nursing Council of New Zealand released a report titled "The Future Nursing Workforce: Supply Projections 2010-2035", analysing workforce needs in the context of population growth, an ageing population and the reality of the ageing nursing workforce. It was estimated that by 2035 some 50 per cent of the current nursing workforce will have retired (Nana, Stokes, Molano, & Dixon, 2013, p. 2). The upshot of this is that the future supply of nurses must take account of not only population growth and the increasing needs of an older population, but must also replace a large group of currently middle aged nurses. The workforce modelling notes that the sector cannot rely on continuing to attract internationally qualified nurses in that period - given that there is expected to be a simultaneous worldwide demand for those nurses (Nana et al., 2013, p. 4).

Pinnacle MHN, in its role as a PHO, has undertaken workforce surveys of GPs, PNs, practice managers and practice administrators across its network (which also includes general practices in the DHB regions of Lakes, Taranaki and Gisborne). Publicly available survey results are available for the surveys undertaken in 2006, 2007 and 2009. All the above mentioned workforce issues, at the national level, are present for the Pinnacle MHN general practice workforce (Pinnacle Group Limited, 2010, pp. 2,7).

3.7 Summary

The demographic reality is that the current numerical and structural ageing that New Zealand is undergoing has its origins in the last one hundred plus years, and the mix of sub-national population structures and dynamics varies across geographical regions in complex ways. Past patterns of fertility and mortality (and to a lesser extent migration) have acted in concert to create both the current situation and

future scenarios. There are two populations in transition for whom the health sector must provide for, the old ageing Pākehā population that is currently driving the process of structural ageing and the Māori Pacific population that is middle ageing. An outcome of the demographic transition are disordered cohort flows and these will bring complexity for planning at all levels of the system.

In recent years, increases in life expectancy have continued. Early on in the transition the increase in life expectancy was driven by health improvements in infants and younger children, whereas latterly these gains have continued, largely driven by reduced mortality at older ages. As Kerse et al. (2016) point out those who reach 80 years of age in New Zealand now can expect to live a further 8.4 years (men) and 9.8 years (women). Although the gap has narrowed, life expectancy for Māori remains lower than for non-Māori. This remains a concern in terms of access to health services across the lifespan and issues of equity across the health system.

Rural areas are ageing quickly, more quickly than Hamilton City as the main urban area within the Waikato DHB. "By 2033 every city and district will have more older people than children, with the exception of Auckland and Hamilton, bringing challenges for local economies that already face shortages of health staff, carers, and other issues" (Office for Senior Citizens, 2015, p. 7). While this study concentrates on measuring demand for health care, the supply side is a critical part of the mix. Health Workforce NZ has projected that all health professionals will likely be in short supply in the future, in part due to the ageing of that workforce. This is not just a general practice issue but a sector wide quandary.

Patterns of morbidity have also changed as part of the ongoing epidemiological transition and this has important implications for general practice. Omran's original theory of transition was that infectious disease would be gradually replaced by degenerative and chronic conditions as the major causes of morbidity and death. This has generally been the trajectory for New Zealand, with some exceptions. The MoH has reported that in terms of the epidemiological transition, New Zealand is now at an advanced stage but an important aspect remains that not all population groups have benefitted equally. Inequalities in access to services and health outcomes remain entrenched, and therefore the elimination of these inequalities remains a key strategy at the national, regional and local level.

Aside from these demographic and epidemiological transitions there are other factors that drive demand. At the macro level - changes in the way the health sector is organised and funded, changes in the care available (and the philosophy behind that care) and in the way care is accessed. At the micro level it's about the way or process by which people make decisions to seek (or not) the care they believe they need, and the factors that variably influence those decisions. There are complex processes behind the scenes around deciding to access general practice care at the micro level, which then translate to the meso level in the navigation of the system and its processes. All of this before the individual even interacts with a health professional in general practice – whether that is now by phone, email, text, face-to-face together or face-to-face apart – using new and emerging technology options.

The MoH, as leader of the health system, plays an obviously direct role as funder and setter of policy and strategic direction. But it is not just about the MoH. All DHBs have key legislative roles in terms of the provision of health care for their resident population. DHB attention tends to be focused on the provision of secondary care, but they have responsibility to ensure that general practice remains sustainable. DHBs are also tasked with ensuring that access to services based on need is equitable and accessible to the population they serve. Equitable access to services no matter who you are, and where you live, will remain a challenge for health sector planners, funders and health professionals. This was a key premise of the 2001 PHCS and will continue to be so.

Both the MoH and DHBs have called for more and deeper collaborative relationships with general practice. This must become more of a reality, and that means translating collaboration from strategic documents through to the planning spaces at national, regional and local levels, then to actual targeted and culturally appropriate service provision. For this to happen there has to be a re-orientation of the system and a greater focus on general practice. This must include real commitment to working outside of the dominant western based models of health and wellbeing, if as Starfield et al. (2005) maintain the costs of care are to be lowered, health improved through access to the right services at the right time and inequalities between population groups are to be consigned to the past (Came et al., 2016; Reid & Robson, 2006).

Projections of future demand are presented (later) in this study. But how many GPs and PNs will be required to deliver the projected demand out to 2038? This would be a difficult question even if general practice stayed structurally (and operationally) the same as it is now. To meet those future needs, glimpsed at in the demand forecasting, 'how many staff' is only part of the issue, and perhaps the real question is how will they do their work? Organisations including the RNZCGP, Medical Council and NZ Nurses Council have approached this (and other thorny issues) in different ways. But just like the demand side of the equation, the supply side gets complicated quickly. It's not just a case of training more health professionals and hoping they want to work in the most needed areas – there needs to be structures to support working differently, nationally, regionally and locally (Ministry of Health, 2018).

While working differently is required (and this is acknowledged across the sector), working 'really differently' is also required. All health sector strategic documents call for the elimination of health inequalities between population groups, and the development of more culturally appropriate services. Extending this to the magnitude required to see change in the statistics around inequalities will be a difficult prospect across the system. This will challenge what Russell, Smiler, and Stace (2013) have called the privileged views of the western medical model of health (this is revisited in Chapter Ten: Discussion). Facing these challenges in collaborative planning processes may well be confronting for many policy makers, funders and planners at all levels of the system.

From previous research into health service use in New Zealand it is known that men tend to use a lower level of general practice care than women and that Māori are generally lower users of general practice care than non-Māori (the majority of non-Māori being Pākehā). Those at either end of the age spectrum (the very young and very old) tend to use a higher level of general practice services. It is also widely acknowledged that there are particular access issues for rural communities (inclusive of workforce capacity issues). The aforementioned issues of inequalities, in terms of access to services and health outcomes across the sector, hold true in the Waikato DHB region as they do across the country. Alongside this, definitions of health and wellbeing are evolving and societal expectations from the health sector are also changing, with individuals perhaps expecting health care to be available as soon as they deem it necessary.

Recent New Zealand research has confirmed that continuity of care in general practice remains important, both for older and younger people (Emery et al., 2015; Kerse, 2014c; Kerse et al., 2016). Continuity of care is also one goal of health planners and funders across the national, regional and local level. Issues of unmet need for general practice health care remain important. The New Zealand Health Survey provides key important for sector direction setting and the annual findings provide reminders that unmet need (and the cost of care) remain as long term planning issues. Alongside continuity of care and unmet need, general practice in the ED remains a contested space in terms of how much general practice care is actually delivered in that setting (and if it is there, how it is best managed?)

The PHCS provided a new direction for primary care with a greater emphasis on population, the role of the community (though this community was not always defined), health promotion and prevention and the addition of other professionals into the traditional primary care sector – making first level care wider than general practice (Buetow & Docherty, 2005; Buetow et al., 2008; King, 2001; Ministry of Health, 2003). The new direction of the PHCS however, did not provide detail on implementation (King, 2001, p. ix) but expected that change would be evolutionary as collaboration occurred - presumably between a long list of potential collaborators, including clinicians in general practice, PHOs and DHB planners and funders, policy developers, Māori and Pacific health service providers, public health professionals and the community as users of services. This new direction, alongside the ethos of evolutionary change has resulted in a continuing lack of clarity around terminology and definition in the sector, when terms such as 'population health' (among others) are used differently across the sector.

The MoH released their refreshed NZHS in 2016. The strategy acknowledges that change will continue to be required in the way that all health services are planned and delivered, with the patient at the centre of service delivery. The strategy also incorporates the 'investment approach' to health and the contribution this makes across people's lives and over the life course. This investment funding approach terminology has appeared in recent years across central government and aims to focus providers on long term impacts of funding and to "value them alongside immediate, and short-terms gains" (Minister of Health, 2016, p. 6). The strategy

gives continued recognition to ‘working together’ collaboratively, not only in the sector but across other agencies to capture the many factors that impact health.

In New Zealand (and the Waikato) health care is delivered in silos and the way the sector prefers people to access the health care they think they need, is not always the way it happens. If people cannot, for any number of reasons, access care in their enrolled practice they go elsewhere to find it (or go nowhere and essentially experience unmet need for health care). This can include seeking their health care in two other settings – in A&M or in the ED. As noted earlier, an aim of this study was to extend what is known about the size of general practice across the sector by combining general practice care from multiple settings, by testing important demographic and health service predictors of service use and by projecting future demand. In this sense, this study aligns well with the recommendations from the recent Fulbright Fellowship report titled “From theory to practice: The promise of primary care in New Zealand” by Downs (2017) and the recent report to PHOs about developing the future potential of a national primary care data repository (Ernst & Young, 2016). This study shows how administrative data from a large PHO can be linked and used in new ways to answer questions that have direct planning implications.

4 Research Methods

This chapter describes the broad methodological approach and the methods adopted to examine the use of general practice health care services. The main components covered include this study's approach and design within the context of the increasing use of health administrative data for research purposes. The steps undertaken in establishing the study population are outlined, followed by the process of developing the study dataset, including the development of the three general practice service use scenarios employed to establish the 2013/14 baseline results. Finally, the chapter outlines the statistical modelling approach used to establish the demographic and health factors driving service use.

4.1 Increasing use of administrative data for research

At an international and national level, many organisations (including national statistical agencies) have been considering more efficient use of routinely collected administrative data for a number of years. Laux, Baigorri, and Radermacher (2009) discuss the move towards greater use of routinely collected administrative data. They report the major drivers in the increasing interest in administrative data to include:

- Increasing demand for the timely measurement of new phenomena.
- An environment that while requiring the production and availability of more statistical measures, requires respondent burden to be limited (or considerably reduced).
- An environment where, in general, survey response rates are declining.
- A constrained funding environment where more information needs to be developed and produced for less resource input (Laux et al., 2009).

The collection of routine continuous health service data provides an increasingly feasible alternative to collection of health data from surveys (Gissler, Hemminki, Louhiala, and Jarvelin, 1998). The main reasons include the reduced load on potential survey participants, larger sample size availability and the cost in terms of time and financial resources (particularly costs for prospective cohort studies) given the data is already available (Gissler et al, 1998) but perhaps not in the required format.

The cost effective possibilities of administrative data use (and linking of such data sources within or across sectors) have also been noted by Tew, Dalziel, Petrie, and Clarke (2017, p. 394) who ascertain the linking of hospital administrative data has significant potential to inform health planning and policy, including through research into health service research and the "examination of variations in healthcare" over time for populations of interest. Grosse, Boulet, Amendah, and Oyeku (2015) refer particularly to the larger sample size and the greater generalisability of results (in their case when compared with clinic based data).

There are potential negative implications of greater use of administrative data and these are important to recognise. Gissler et al. (1998) have noted the down side issues of variation in the content of administrative data, aspects of data quality and concerns around privacy issues. In terms of data collected in general practice Lawrenson, Williams, and Farmer (1999) point to issues of patient churn and the structure of databases often not allowing for easy analysis (without skilled staff). Aligned with this is that the data were collected for another purpose, possibly by multiple administrators who may (or may not) have data quality as a key goal. Grosse et al. (2015, p. s557) refer to this in terms of the potential for disease under reporting alongside data misclassification – data cleaning and quality analysis and testing therefore becomes of vital importance. As noted previously, administrative data can lack the richness gained from surveys, for example as to why an individual used a health service (or not) and the process of that decision making.

Statistics New Zealand, as the national statistical agency, has in recent years moved to greater use of administrative data in the production of both official statistics and development of an administrative data infrastructure. One aim has been to allow researchers to conduct policy evaluation and research on appropriately de-identified data concerning a variety of lifecycle and business related transitions and outcomes. At the strategic level, Statistics New Zealand has a programme of work tasked with looking at the possibilities provided by linking cross government administrative data with a coverage survey and statistical model, to develop estimates for the resident population and dwellings, that meets the needs of official statistics and wider stakeholder requirements (Bycroft, Reid, McNally, & Gleisner, 2016; Gibb & Shrosbree, 2014; O'Bryne, Bycroft, & Gibb, 2014; Statistics New Zealand, 2016).

4.2 Ethics approval for data use

The dataset used in this study was constructed while the author was employed by the Pinnacle MHN PHO. The author was subject to both an employment code of conduct and confidentiality agreement covering access to and use of Pinnacle MHN owned and held administrative data.

Through the University of Waikato ethics process permission was granted by Pinnacle MHN management that allowed administrative data record linkage to be undertaken. This record linkage occurred within the secure data warehouse environment at Pinnacle MHN. Once data were de-identified the study dataset could be used while the author was enrolled at the University of Waikato. Although de-identified, the study data set was not stored on the University of Waikato server nor was it available to any other researcher (although this was not part of the official ethics agreement, it was agreed verbally by the author and the acting CEO of Pinnacle MHN in May 2013). Ethics approval was granted by the University of Waikato's Faculty of Arts and Social Sciences Human Research Ethnics Committee (dated 18 June 2013). As noted, approval was granted by Pinnacle MHN (dated 9 May 2013).

This study complies with the ethical requirements outlined in the University's Student Research Regulations 2008. These regulations include compliance with the Ethical Conduct in Human Research and Related Activities Regulations when the research involves collecting data about and from people and organisations.

4.3 Research approach and design

This study takes a quantitative approach using administrative data, which was routinely collected in the course of everyday business for Pinnacle MHN as a PHO. This administrative data is created as people enrol with general practices in the Network and then as they access health care services across both the primary and secondary parts of the health system. The strengths of a quantitative approach such as this (within the PHO environment particularly) include:

- The ability to involve a large number of subjects records and summarise large data sets and make comparisons over time and between categories.
- The ability to use large administrative data sets for secondary analysis is financially efficient (from the perspective of Pinnacle MHN as a PHO).

- Allowing for generalisation of results and possibly greater objectivity (using accepted methods of ensuring validity and reliability).
- The application of methodology and statistical measures means that the research can be replicated, and/or analysed and compared with similar studies (or future 'research re-runs' using more recent PHO data).

Quantitative research perhaps presumes to have a level of objectivity in its approach to research, where data is controlled and measured. However, while the results may be statistically significant they may miss contextual detail and be humanly insignificant or lack real world application (Babbie, 2010). Data are not collected in a vacuum and the choice of what data to collect is in itself a social and political choice and as such, all data in the end are both political and context specific (Came, 2012; Kukutai & Taylor, 2013). Other potential limitations of this quantitative approach may include, overall, a less flexible process of research where results do not typically include any narrative on people's personal behaviour, attitudes or motivation (Babbie, 2010; Singh, 2007).

A major component of this study was to make more comprehensive use of available administrative datasets in way that answered questions in a health planning environment, but was not financially prohibitive. Within Pinnacle MHN, in its role as a PHO, there has been movement towards better use of available data in an environment where monitoring and reporting requirements to funders and policy makers (at both regional and national levels) are increasingly complex, without burdening general practice with further reporting requirements. There are several design aspects to note regarding the development of the study dataset.

Dataset development started with an open cohort design. The definition of open cohort here is based on people enrolling in the Pinnacle MHN - essentially joining the population by enrolling with an affiliated practice - and having the potential to exit via several means, including via emigration, death or enrolling in another PHO (by enrolling in a non-affiliated practice). The definition of whether a person belongs to the initial study population was whether they were enrolled with Pinnacle MHN as their PHO, and were therefore capitation funded patients in any one quarter. This open approach means that the date of entry and exit from the Pinnacle MHN population is individually defined and therefore, the size of the enrolled population is not constant over time.

The second stage of dataset development was the identification of individuals who had been enrolled for four consecutive quarters, starting with the quarter commencing on 1 April 2013 and finishing with the quarter ending 31 March 2014 (the baseline year). The initial study population commenced with 279,805 individuals who had been enrolled for one or more quarters in the baseline period. Once individuals with less than four quarters of data were excluded, there were 235,666 individuals remaining (84.2 per cent of the initial population).

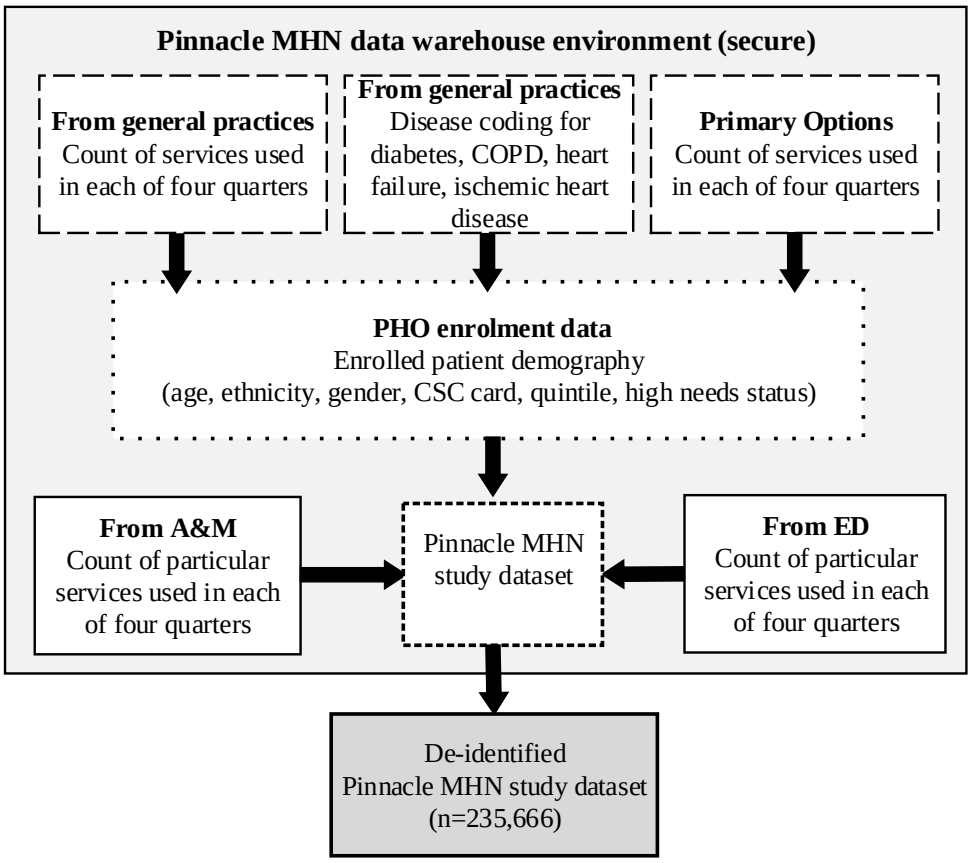
This research had a longitudinal design component in that multiple data points were collected for each enrolled individual. If a person met the above criteria to be involved in the study population then four data points of data were available. If an enrolled individual did not use any general practice services (in any of the service delivery settings) then a service use record was still created, with the cumulative count of services used in that quarter being zero.

4.4 Building the study data set

Dataset construction was realised by combining service use occurring in the general practice setting with general practice type service use occurring in the A&M and ED setting. This was a multi-step process at each phase (simplified in Figure 4.1).

A summary record was built for each individual capturing their service use in general practice. The same process was then used to combine service use records outside of the practice setting (each individual had a summary record even if no services had been used outside the enrolled practice). For Pinnacle MHN enrolled individuals, in total there were 1,885,328 records (235,666 individuals having a record for service use in each of four quarters in their enrolled general practice and outside of that setting). Summary records were then combined into a single record for each individual. The 235,666 service use records were then linked using NHI (National Health Index) number to selected socio-demographic variables held in the Pinnacle MHN patient enrolment data set (updated quarterly and also stored separately in the PHOs secure data warehouse).

Figure 4.1 Building the study data set



Once record linkage was complete, a unique code was created for each individual (not related to NHI). Other steps were taken to ensure additional data de-identification, including the construction of aggregated variables (age and age group) based on date of birth, meaning the date of birth variable was not required in the analysis dataset. Other variables were also aggregated in the secure environment, including ethnic group and residence variables.

The initial record linkage was undertaken using a combination of Excel and the R package software. Once the data were de-identified, the data set was imported into SPSS (v22) for analysis[22]. Table 4.1 lists the variables available for analysis.

[22] IBM SPSS Statistics for Windows, Version 22.0.

Table 4.1 Variables from finalised administrative study dataset

Variable name	Existing, modified or new	Data description
Patient_ID	New	Unique code to the study dataset. Created as part of de-identification process following record linkage using NHI.
Age_end_of_quarter	New	Numerical value created from Pinnacle MHN date of birth variable. Age at end of second quarter was used.
Age_group_analysis	New	Eight age group categories created from age_end_of_quarter.
Age_pryamid	New	Created from age_end_of_quarter. Five year age groups to construct population pyramids (to compare study population to ERP of Waikato DHB).
Ethnic_group	Modified	Categories of Māori/Pacific and Other created from enrolment data (Stats NZ level 2 classification of ethnicity). Aggregated grouping assisted with de-identification. Data captured at point of enrolment.
CSC_ID	Existing	If the individual held a Community Services Card (or not) during the baseline year.
Gender_ID	Existing	Female or male.
Practice_ID	Existing	The Pinnacle MHN ID of the practice of enrolment (4 digit numerical code) used to create TA_of_Practice variable and whether the practice was VLCA or non-VCLA funded.
TA_of_practice	New	Created from Practice_ID. General practices coded to the TA of physical geographic location.
VLCA_practice	New	Practice funding – whether the enrolled practice was a Very Low Cost Access (VLCA) practice or not.
TA_residence	New	Result of a multi-step process to code geographical residence of each individual into a TA of residence. Created from a mix of meshblock data and XY co-ordinates.
Urban_rural_residence	New	Created from TA_residence. Residents of Hamilton City and Waikato District TA coded ‘urban’, all others ‘rural’.
HighNeeds_MOH	Existing	Based on the MoH definition of ‘high need’. Was the individuals coded as high needs or not.
QuintileID_MOH	Modified	1-5 coded. Based on MoH data. Multi-step process for some missing data being imputed from meshblock of geographical residence held in PHO enrolment data.
Diabetes_ever_recorded	Existing	Yes (1) or No (0). Based on diagnostic READ codes recorded in general practice.
Heart_failure_ever_recorded	Existing	Yes or no. Based on diagnostic READ codes recorded in general practice.

Ischaemic_HF_ever_recorded	Existing	Yes or no. Based on diagnostic READ codes recorded in general practice.
COPD_ever_recorded	Existing	Yes or no. Based on set of diagnostic READ codes recorded in general practice.
Chronic_condition	New	Yes or no. Created from 4 variables (diabetes ever recorded, heart failure ever recorded, ischaemic heart disease ever recorded and COPD ever recorded administrative data).
Chronic_count	New	Count of 1-4 (subset of Chronic_condition). Created from 4 variables (diabetes ever recorded, heart failure ever recorded, ischaemic CVD ever recorded and COPD ever coded). If Chronic_condition=0, then 0.
Cumulative_in_GenPractice	New (see notes below)	The number of medical consults in general practice in the 2013/14 year. A multi-step method using lag processes to count the number of consults in general practice each quarter and sum to an annual count. This was based on data from the Pinnacle MHN data warehouse on service use in the enrolled practice.
Cumulative_outside_GenPractice	New (see notes below)	The number of general practice type consults outside the enrolled general practice in the 2013/14 year. A multi-step method using lag processes to count the number of consults outside of general practice in each quarter and sum to an annual count. This was based on data from the Pinnacle MHN data warehouse on service use outside of the enrolled practice.
Total_general_practice_consults	New	Created from the addition of two new variables - Cumulative_in_GenPractice, plus Cumulative_outside_GenPractice.

4.5 Three service utilisation measures

For the purposes of investigating the study objectives and aligned hypotheses three service use measures were developed:

Enrolled practice consults includes for each individual the number of consults delivered in the enrolled general practice setting over the entire baseline year (cumulative count). This measure includes general medical subsidy or 'GMS' consults which is the vast majority of consults undertaken. It includes consultations undertaken by PNs, where those were recorded electronically in the practice. The cumulative count of consults also includes Primary Options consults (see detail below). This scenario does not include immigration medicals, services provided by midwives (ante and post-natal), driving medicals and some select service use captured under fee for service contracts (in 2013/14). The diabetes annual review

programme was discontinued in 2014, but was in play during the baseline year (meaning this one free GP consult was not included in the cumulative service count).

Outside enrolled practice consults consists of general practice services delivered in the A&M setting (medical coded consults), and services delivered in the five Waikato DHB EDs that met the two conditions of;

- Being coded as triage 4 or 5 (low acuity to treat); and
- Where there was an ICD-10 principal diagnosis code relating to an ambulatory sensitive condition.

Total general practice consisting of enrolled practice consults + outside enrolled practice consults.

Table 4.2 Three scenarios for general practice consultations, 2013/14

Scenario	Inclusions	Exclusions
"Enrolled practice"	• General medical subsidy (GMS) consults. • Practice Nurse consults (if electronically recorded). • Primary options coded and funded consults.	• ACC consults. • Services delivered to casual patients. • Telephone or email consults for enrolled patients. • Services provided under specific fee for service contracts; long term contraception, sexual health <25 years, diabetes annual reviews. • Immigration medicals. • Driving medicals.
"Outside enrolled practice"	• All ED presentations coded as triage 4 or 5 with a principal diagnosis (ICD) code relating to ambulatory care sensitive conditions. • GMS consults in the A&M setting.	• ACC consults in the Accident & Medical setting. • ED presentations with a principal diagnosis code relating to ambulatory care sensitive conditions where the triage category was 1-3. • Non-ambulatory sensitive coded ED presentations (all triage codes).
"Total general practice"	"enrolled practice" + "outside enrolled practice".	As noted above.

Primary Options – programme to reduce ED presentations

The Primary Options service was established by Pinnacle MHN in late 2012. It gave Pinnacle MHN practices in Hamilton City and surrounding towns (36 practices, two combined general practices and A&M centres and one dedicated A&M centre) area access to a "range of funded community, diagnostic, therapeutic treatment and logistical services to help treat patients with acute illness in the community and reduce the number of referrals to hospitals[23]". The data checking and quality phase included checking for any double counting (an ED presentation and an A&M presentation within 12 hours – if an ED presentation ended in referral).

In April 2013, the Primary Options programme was extended to cover the Waikato Hospital ED (Hamilton City and the region's main ED). The reality of this was that, subject to agreed criteria (after triage by ED staff), walk in patients could be diverted to the (close by) 24 hour A&M provider in Hamilton City for treatment covered by the Primary Options programme.

4.6 The independent variables

This section provides further detail on the eight independent variables. Table 4.3 provides additional summary data to that in Table 4.1 (variables in the finalised study dataset). Here they are aligned with the nomenclature from Andersen's (1995) model of health service use.

Table 4.3 Independent variables aligned with Andersen's model

Andersen's model nomenclature	Pinnacle MHN: Independent or predictor variable	Independent or predictor variable detail
Predisposing characteristics	Age group (ordinal)	• 0-4 years ('young children') • 5-14 years ('children') • 15-24 years ('young adults') • 25-44 years ('adults') • 45-64 years ('middle age') • 65-74 years ('early retirement') • 75-84 years ('seniors') • 85+ years ('elderly')
	Gender (binary)	Female/male
	Ethnic grouping (binary)	Māori Pacific / Other

[23] https://www.pinnacle.co.nz/programmes/primary-options

	Geography of residence (10 categories)	The Territorial Authority area where the individual was resident (within the Waikato DHB's boundaries).
Enabling resources	Cost of a consult (binary)	An individual is enrolled in a Very Low Cost Access (VLCA) practice or not.
	Income (binary)	An individual holds a Community Service Card or not. A proxy for those on a lower income, where financial constraints may impact the decision to (a) utilise a service and (b) impact where the service is accessed.
Need	Chronic condition (binary)	If the individual has one or more of the selected chronic conditions of diabetes, chronic obstructive pulmonary disease, heart failure or ischaemic heart disease.
	High needs status (binary)	If the individual meets the MoH definition of 'high needs' status or not (being, Māori or Pacific or Other resident in an area of high deprivation).

Community Services Card (CSC)

To hold a CSC individuals must be at least 18 years old (or 16–17 years old in full-time tertiary study), on a low to middle income and be a citizen or permanent resident (refugees may be eligible). Holding a CSC can reduce the cost of a consult (in some practices), reduce prescription fees, reduce fees for after-hours visits or visits to a practice in which the holder is not enrolled. The card can be used for dependent children (under 18 years).

4.7 Clinical coding in general practice

Clinical coding of disease in the general practice environment was developing in the late 1970's in the United Kingdom. One of the early coding systems was developed by Dr James Read. These 'Read codes' went on to become the standard hierarchical coding system used in general practice in New Zealand. Read codes have allowed a common clinical coding scheme and are related to diagnosis of injury and disease (Benson, 2011; Lawrenson et al., 1999).

Under the direction of the MoH, the health sector is moving to the SNOMED CT (Systematized Nomenclature for Medicine – Clinical Terms) system. SNOMED CT is a merger of the Read codes with SNOMED TR – the original SNOMED reference terminology developed by the American College of Pathologists (Benson, 2011; Ministry of Health, 2016b). While the MoH has a programme in place for moving

to SNOMED CT the timing for completion is unclear.[24] In this study, pertaining to the coding of the selected four key chronic conditions, Read codes were used to categorise for diabetes (I and II), COPD, heart failure and ischaemic heart disease (see Section 10.2 Strengths and limitations of the study regarding clinical coding in general practice).

4.8 International classification of disease

The International Classification of Disease, now in its tenth version (ICD-10) is the official classification scheme designed for the organisation of diseases and procedures that occur within a hospital setting. The Waikato DHB also records ICD-10 codes for all ED presentations across the five EDs in its catchment (not all DHBs ICD-10 code ED presentations that do not end in a hospital admission).

The WHO owns, develops and maintains the ICD coding system and national health agencies (among others) around the world implement the classification. As well as classifying morbidity and hospital procedures the ICD-10 is used to classify mortality (Pol & Thomas, 2000, p. 66). Those authors note that while the ICD was originally designed to enable an agreed basis for statistical record keeping, allowing both epidemiological and health quality research, it has been increasingly used as a coding scheme. New Zealand hospitals use the WHOs ICD-10 Australian modification (ICD-10-AM), the Australian Classification of Health Interventions (ACHI) and the Australian Coding Standards with the MoH providing oversight and determining the timing of any classification upgrades[25].

4.9 Australasian triage score used in emergency departments

The Australasian Triage Score (ATS) is a numeric priority system with a 1-5 scale, with 1 being immediately life-threatening to 5 being non-urgent (including administrative) (Robinson et al., 2015). All New Zealand hospitals use this ATS system to manage patient flow as individuals arrive in an ED with a wide range of injuries or illnesses, with varying degrees of seriousness. For each of the five triage categories there is a specified time (considered appropriate) in which medical assessment and treatment should start. For the purposes of this study, triages 4 and

[24] https://www.health.govt.nz/nz-health-statistics/classification-and-terminology/new-zealand-snomed-ct-national-release-centre
[25] http://www.health.govt.nz/nz-health-statistics/classification-and-terminology/icd-10-am-achi-acs/icd-10-am-achi-acs-development

5 (Table 4.4), sometimes referred to as 'low acuity to treat' presentations are of particular interest when those codes are used in combination with particular ICD-10 codes – identified in the following section on ambulatory care sensitive conditions.

Table 4.4 The Australasian Triage Score

Category	**Description**	**Maximum Clinically Appropriate Triage Time**
1	Immediately life-threatening	Immediate simultaneous triage and treatment
2	Imminently life-threatening, or important time-critical	10 minutes
3	Potentially life-threatening, potential adverse outcomes from delay > 30 min, or severe discomfort or distress	30 minutes
4	Potentially serious, or potential adverse outcomes from delay > 60 min, or significant complexity or severity, or discomfort or distress	60 minutes
5	Less urgent, or dealing with administrative issues only	120 minutes

http://www.health.govt.nz/our-work/hospitals-and-specialist-care/emergency-departments/emergency-department-triage

4.10 Ambulatory care sensitive conditions

Ambulatory sensitive hospitalisations (ASH), sometimes called ambulatory care sensitive conditions (ACSC) are considered to be hospital admissions due to a generally agreed set of diagnosed medical conditions (using ICD codes), "that could be avoided by provision of adequate primary care" (Basu & Brinson, 2008, p. iii). In another similar definition, Jackson and Tobias (2001) consider ASH as being mostly acute admissions that are considered potentially reducible, or avoidable, through timely prophylactic or therapeutic interventions deliverable in primary care. They also note that ASH rates are used as a measure of access to general practice. Those rates are important in the New Zealand health sector given that a reduction in ASH admissions is one goal of health policy (aligned with the emphasis on universal access to primary care). Alongside this, the measurement of access to health services (and any subsequent use) is of interest to both health service

planners and policy makers, both in knowing the overall level, patterns and trends of service use as well as to "evaluate the impact of changes in the way health care is delivered" (Ansari, 2007a, p. 92).

There is debate within the sector concerning both the definition of ASH and the appropriateness of its measurement. While it can (and is) used as a measure of access to general practice, it is recognised that there are other components of the health care system (outside of general practice) that can affect this measure. The Health Quality and Safety Commission [26] notes that both hospital supply, configuration and ED management can affect ASH rates. Basu and Brinson (2008) report the conditions accounting for most of the prevalence of ASH in New Zealand in the 2000-2008 period were (in alphabetical order);

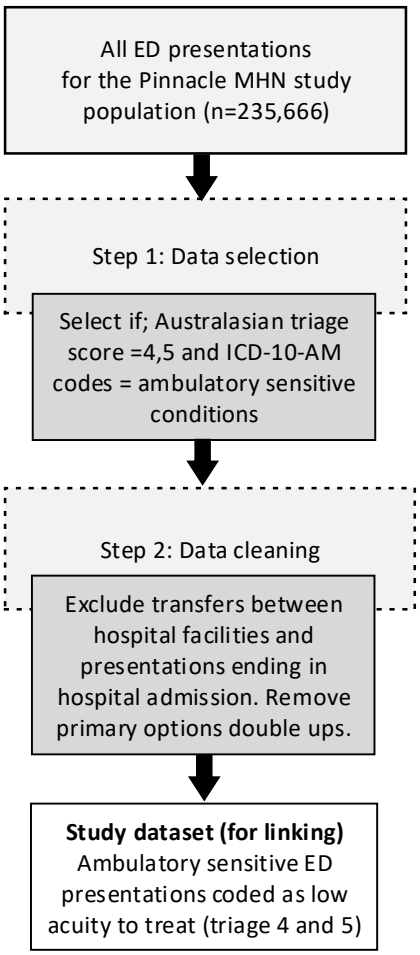
- Angina
- Bronchial Asthma
- Cellulitis
- Chronic Heart Failure
- Diabetes
- Ear, Nose and Throat (ENT) infections
- Epilepsy
- Gastroenteritis and
- Lower Respiratory Tract infections.

The concept of ambulatory care sensitive presentations to ED (used in this study) is a subset of all ED presentations (see Appendix Two for the list of conditions that fall under the category of ambulatory sensitive hospitalisations or ambulatory care sensitive conditions). The concept used here includes all the same codes as included in a measure of ASH, but is a subset of ASH in that only presentations to ED are counted, if they did not end in a hospital admission, and the triage category on arrival at ED was coded as 4 or 5 (low acuity to treat). Given the ambulatory sensitive coding, in combination with the triage coding it was considered for the purposes of this study that these presentations to ED may have been better suited to being seen in a general practice community setting. Conversely, it is assumed that those individuals with a triage code of 1-3 should have been in the ED for treatment

[26] www.hqsc.govt.nz

– although it is recognised that perhaps a 'timely' consult (as noted above) in general practice may have prevented the need for an ED visit. The data do not allow for any investigation of this aspect. Figure 4.2 shows the process of data selection.

Figure 4.2 Ambulatory sensitive presentations



There are several issues to note in regards to ambulatory care sensitive presentations to ED concerning very young children (0-4 years) and those aged 75+ years. These are summarised as;

- Young children - Craig, Anderson, Jackson, and Jackson (2012, p. 46) note that in paediatric populations it is acute infections and respiratory related morbidity that make up the majority of conditions meaning "as a consequence, the window of opportunity available for primary care to prevent a hospitalisation may be relatively narrow (e.g. hours/1-2 days), making access to same day appointments, or after hours (e.g. evenings or weekends) care of particular importance".
- Older people (75+ years) – typically ASH rates do not include persons aged 75+ years given issues around multi morbidity, reduced resilience

to illness, potential poly-pharmacy (two or more regular medications) and the inherent issues with the assigning of a principal diagnosis code. Coding older people in this respect becomes increasing complex. There is however, a precedent for including those aged 75+ in the analysis. The Health Quality and Safety Commission has developed an online Atlas of Healthcare Variation. Data is available publicly and it can be used to highlight variations by geographic areas (based on DHB boundaries) around health service use and provision. Regarding ASH and the variation data, the Commission notes that it has included those aged 75-84 years "because it was considered important to encourage debate as to how older people are cared for and particularly in relation to rest home care and hospital length of stay."[27] The Commission also notes that an individual's frailty, home situation and social support may also affect hospital admission [and the original ED presentation].

In this study, all age groups (0-85+ years) are included in the ambulatory care sensitive data and so are part of the measure of 'outside enrolled practice' general practice consultations. Rather than remove the health service use records of older people, it was decided to adopt the Commission's approach and include not only those aged 75-84 years but those aged 85+ years in the data. Part of this decision was recognition of the fact that clinical coders are working under the provisions and guidelines of the ICD-10-AM and so coding of those aged 75+ across the Waikato DHB EDs will be standardised.

4.11 Population estimates and projections

Population estimates

This study has used Statistics New Zealand population estimates, namely the Census year ERP at 30 June 2013 for the Waikato DHB (publicly available from the Statistic New Zealand website). This ERP was used for two purposes;

- To allow estimation of the coverage of the Pinnacle MHN study population against the ERP of June 2013.

[27] https://www.hqsc.govt.nz/our-programmes/health-quality-evaluation/projects/atlas-of-healthcare-variation/older-adult-ambulatory-sensitive-hospitalisations. As of 22 January 2018 it is noted that this data is no longer available on the HQSC website.

- To estimate the 'size' of general practice across the Waikato DHB region in the baseline year. This was done by applying the levels of general practice service use in the Pinnacle MHN study population to the ERP by age group, gender, ethnic group and geography of residence.

The ERP of the Waikato DHB at 30 June 2013 is based on the census usually resident population counts updated for:

- Non-response to the census ethnicity question.
- Net census undercount (as measured by a post-enumeration survey).
- Residents temporarily overseas on census night.
- Births, deaths and net migration between the census night (5 March) and 30 June 2013.
- Reconciliation with demographic estimates at the youngest ages[28].

Due to these adjustments the census year ERP is not directly comparable with the census usually resident population count.[29] Subnational population estimates are developed using a component methodology, where estimates of the components of population change (births, deaths, and migration) are used to update a base population (Bascand, 2012). Concerning estimates of net migration at the subnational level – it is recognised that there are some additional uncertainties, particularly in the estimation of net migration. Uncertainty also increases as population estimates are broken down by age, gender, and geographic area. In this study, TA is the geographical area used for both residence of individuals in the study population and the location of the general practices those individuals are enrolled in. For smaller areas (such as estimates at the census area unit level) estimates have more inherent uncertainty than larger area estimates. This is due to needed information on migration not being readily available (Bascand, 2012; Gibb & Shrosbree, 2014; Statistics New Zealand, 2013, 2016).

[28] http://datainfoplus.stats.govt.nz/item/nz.govt.stats/6e81f19e-484f-4aae-9afe-635962e62988
[29] http://datainfoplus.stats.govt.nz/item/nz.govt.stats/6e81f19e-484f-4aae-9afe-635962e62988

Population projections

This study used population projections from Statistics New Zealand. These 2013-2038 projections were a customised set produced according to agreed assumptions. The agreed assumptions were;

- The Total population projections are based on the official subnational projections released in February 2015 (whole TAs) and in September 2015 (for area units).
- The projections for Waikato and Ruapehu Districts are for the parts of those TAs that are geographically located in the Waikato DHB region.
- The Māori Pacific population projections are based on the official Māori and Pacific ethnic group projections for TAs that were released in September 2015.
- The Other (non-Māori non-Pacific) ethnic group population projections were derived by subtracting the Māori Pacific population projections from the Total population projections.
- There are some irregularities between the high, medium and low variant projections for the Other ethnic group. This is due to the methodology adopted to derive the Other ethnic group projections, and also because the Māori Pacific population projections have greater uncertainty than the Total projections, in regards to the fertility, mortality and net migration assumptions.

Projections are not predictions and they "give an indication of the future size and structure of the population" (Bascand, 2012, p. 6). Statistics New Zealand projections are deterministic and use the cohort component methodology (current international best-practice). They are scenarios based on stated assumptions about the components of change – fertility, mortality and migration. Multiple projections are produced in recognition of the uncertain nature of the future and that a single projection scenario would not meet the needs of all stakeholders (Bascand, 2012). It is noted that Statistics New Zealand produced its first set of stochastic projections in its 2011 base national population projections.

4.12 Establishing service use, estimating and projecting demand

In order to establish the level of service use, administrative data (following linking and de-identification) were imported into SPSS. The first step in the process of establishing service use and estimating and projecting demand was to aggregate four quarters of cumulative counts of service use into an annual count. Counts were established for in general practice and outside of it (subject to meeting thresholds to be ambulatory sensitive coded and a low acuity to treat in ED).

Establishing 'annual average service use'- This measure used the aggregated cumulative service use counts (for various sub-populations) as the numerator and used as the denominator the various sub-population group of interest.

Establishing the 'proportion of general practice care in the enrolled setting'- This measure used the count of all services delivered (regardless of setting) as the denominator with the count of all services in the enrolled setting as the numerator.

Establishing service use for the study population with chronic conditions - Service use measures for the sub-set of the Pinnacle MHN study population with chronic conditions; namely 'annual average' service use and the measure 'proportion of all general practice care delivered in the enrolled setting' were developed in the same way as for the total study population.

Direct age standardisation- Age standardised measures were developed for the study population with chronic conditions. This was in recognition of the role age plays in the prevalence of the chronic conditions included in this study (diabetes, COPD, heart failure and ischaemic heart disease). Age standardisation is a procedure for adjusting rates designed to minimise the effects of differences in age composition when comparing rates for different populations (Basu & Brinson, 2008, p. 103). The study population was standardised to the 2013 ERP of the Waikato DHB.

Estimating 2013 demand and demand projections to 2038 - For the DHB wide estimation of general practice demand the levels (by age group, gender and ethnic group) found in the 2013/14 year in the study population were applied to the ERP as at 30 June 2013. From this 2013 base point, service use levels were applied to the five-yearly projections out to 2038. Inherent in this approach is the assumption

(a) that the service use in 2013/14 was the same in the population outside of the Pinnacle MHN study population (the study population was estimated to cover 63 per cent of the ERP), and (b) that service use levels stay the same over time.

Projections, however, are not predictions and this approach essentially takes a middle way. There are many factors that will impact on future use of general practice, including future prevalence rates of chronic conditions, the cost of a GP consult, the capacity of general practice to provide services, past experience of the health sector and an individual's ability to negotiate the health sector of the future. How these factors (and others) will interact over time and affect demand for care is unknown – both at the regional level and local level. This makes it impossible to estimate whether the projections methodology (assuming constant age-gender ethnic specific rates) will result in an under or over projection of demand.

4.13 Demographic and health factors – regression modelling

The dependent variable in the regression model scenarios were count outcomes, or more specifically non-negative integers, counts of general practice consults during the 2013/14 baseline year. While count variables can be modelled with linear regression, linear models can yield negative predicted values whereas counts by default are never negative (although may be zero). Count variables are frequently highly skewed, often breaking the normality assumption of linear regression (Long, 2006).

The two most common count models are Poisson regression and negative binomial regression. Negative binomial regression is an extension of Poisson regression and is used to model over dispersed Poisson data. Negative binomial regression adds an ancillary parameter that allows for over dispersion (Long, 1997; Long, 2006). Given that over dispersion is the norm this method has more generality than the Poisson model (Long & Freese, 2006). Poisson models are widely used in econometric research but early applications also took place in biostatistics and demography (Rutaremwa, 2000).

The structure of the Pinnacle MHN administrative data was tested against the following five Poisson regression model assumption tests:[30]

[30] https://statistics.laerd.com/spss-tutorials/poisson-regression-using-spss-statistics.php

1. The dependent variable consists of count data (integer data that must be zero or greater) and there is no limit (or censoring) to the right of the data. *The Pinnacle MHN data met this assumption.*
2. There are one or more independent variables which are measured on a continuous, ordinal or nominal/dichotomous scale. *The data met this assumption*.
3. The data has independence of observations (each observation is independent of the other observations). *The data met this assumption*.
4. The distribution of the count data follows a Poisson distribution (not normally distributed). *The data met this assumption*.
5. The mean and variance of the model are identical (a consequence of assumption 4 being met). If the variance in the model is greater than the model mean (the equi-dispersion assumption is violated) then the data is over dispersed and a negative binomial model should be used. *The data did not meet this assumption as it was over dispersed.*

As the administrative data was over dispersed it was considered fit for using a negative binomial regression model for analysis. The aim of negative binominal regression is the same as that of Poisson regression – to model the relationships between predictors and the likelihoods of certain count outcomes (Long, 2006). The probability distribution that is utilised – the negative binomial distribution – takes into account the issue of over dispersion in the data.

Testing the independent variables for multicollinearity

Multicollinearity occurs when two independent or predictor variables are highly correlated and used in the same regression model. Undetected multicollinearity can result in unstable and biased standard errors which lead to ”very unstable p-values for assessing the statistical significance of predictors, which could result in unrealistic and untenable interpretations” (Vatcheva, Lee, McCormick, & Rahbar, 2016).

In this study, the independent variables were checked for multicollinearity by analysing the variance inflation factor (VIF) in the regression model as a diagnostic. The VIF measures the inflation on the variances of the parameter estimates (Vatcheva et al., 2016, p. 5). A high VIF value is a sign of multicollinearity, although Vatcheva et al. (2016, p. 10) state that there is no universal agreement on

cut-off values for detecting multicollinearity. They suggest a VIF greater than five or even greater than 10 be used to detect multicollinearity. Melliana, Setyorini, Eko, and Purhadi (2013, p. 256) suggest that multicollinearity occurs if there is a VIF of greater than ten. All VIF measures in the three study models were <2.6 (shown in Tables 4.5-4.7). As expected the 'ethnic group' and 'high needs' group measure had higher VIF scores given there is some overlap in group membership, however at 2.466 (ethnic group) and 2.573 (high needs) both were under the generally excepted cut-offs of VIF>5 or even >10.

Table 4.5 Consults in enrolled practice – collinearity statistics

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.401	.061		23.040	.000		
	DimCSCId	1.492	.035	.120	42.698	.000	.928	1.078
	Eth_numbered	1.623	.056	.124	29.193	.000	.405	2.466
	Sex_numbered	.786	.027	.079	28.863	.000	.993	1.007
	VLCA_Practice	.649	.032	.058	20.123	.000	.887	1.127
	HighNeeds_MoH	.708	.049	.063	14.434	.000	.389	2.573
	AgeGrpN_Regression94	-.011	.000	-.078	-28.454	.000	.982	1.019
	Chronic_regression	4.857	.044	.311	111.326	.000	.945	1.058

a. Dependent Variable: cumulative_inGenPrac

Table 4.6 Consults outside enrolled practice – collinearity statistics

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.136	.007		18.590	.000		
	DimCSCId	.004	.004	.003	.851	.395	.928	1.078
	Eth_numbered	.002	.007	.002	.346	.729	.405	2.466
	Sex_numbered	-.004	.003	-.004	-1.208	.227	.993	1.007
	VLCA_Practice	-.022	.004	-.018	-5.674	.000	.887	1.127
	HighNeeds_MoH	-.019	.006	-.015	-3.206	.001	.389	2.573
	AgeGrpN_Regression94	.000	.000	-.019	-6.279	.000	.982	1.019
	Chronic_regression	.031	.005	.018	5.927	.000	.945	1.058

a. Dependent Variable: cumulative_outsideGenPrac_regression

Table 4.7 Total general practice consults – collinearity statistics

Coefficients[a]

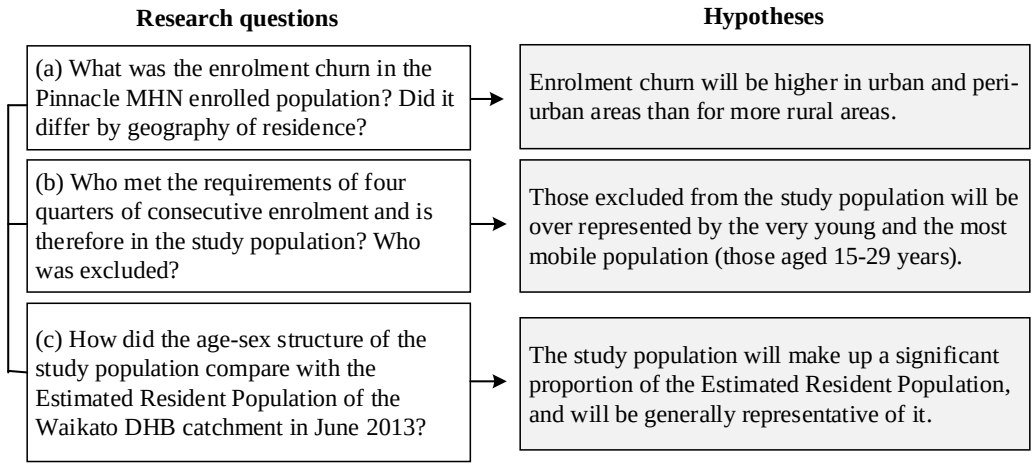
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.536	.062		24.734	.000		
	DimCSCId	1.496	.036	.118	41.892	.000	.928	1.078
	Eth_numbered	1.625	.057	.122	28.614	.000	.405	2.466
	Sex_numbered	.783	.028	.077	28.109	.000	.993	1.007
	VLCA_Practice	.627	.033	.055	19.030	.000	.887	1.127
	HighNeeds_MoH	.689	.050	.060	13.751	.000	.389	2.573
	AgeGrpN_Regression94	-.011	.000	-.078	-28.588	.000	.982	1.019
	Chronic_regression	4.888	.045	.307	109.661	.000	.945	1.058

a. Dependent Variable: cumulative_scenario2

5 Results – Establishing the Study Population

This section presents the results of objective one, being to establish the study population on which analysis of the remainder of the objectives, research questions and hypotheses are founded. The research objective and associated questions and hypotheses were:

<u>Objective one</u>: Establish the study population.



Four areas were investigated (based on the research questions);

- Identification of enrolment churn – how many individuals moved in and out of the open population, based on enrolment status over the 12 month baseline period? How many individuals were enrolled for the full baseline period?
- Enrolment churn by geographical area of residence – were there differences in enrolment churn based on the ten TAs within the Waikato DHB area?
- Cross border flows – where were individuals geographically resident compared with the geographical location of their enrolled general practice?
- The study population – this group was established as a result of the enrolment churn analysis. The population is described and those individuals excluded from the study are also briefly described.

5.1 Enrolment churn 2013/14

The process of identifying the study population started with the 279,805 individuals who had been enrolled with any one of the 51 general practices, for at least one quarter, during the period 1 April 2013 to 31 March 2014. Based on the analysis of enrolment length there were found to be 15 enrolment pathways (Table 5.1).

Table 5.1 Enrolment experiences: 279,805 individuals enrolled in 2013/14

No.	Quarter 1 1 April-30 June 2013	Quarter 2 1 July-30 Sept 2013	Quarter 3 1 Oct-31 Dec 2013	Quarter 4 1 Jan-31 March 2014	Number (per cent)	Detail on churn
1	Enrolled	Enrolled	Enrolled	Enrolled	235,666 (84.2%)	
2	Enrolled	*Not enrolled*	*Not enrolled*	*Not enrolled*	7,541 (2.7%)	Death=492 Move=7,049
3	*Not enrolled*	Enrolled	Enrolled	Enrolled	7,122 (2.5%)	
4	*Not enrolled*	*Not enrolled*	Enrolled	Enrolled	7,023 (2.5%)	
5	*Not enrolled*	*Not enrolled*	*Not enrolled*	Enrolled	6,720 (2.2%)	
6	Enrolled	Enrolled	*Not enrolled*	*Not enrolled*	6,393 (2.4%)	Death=503 Move=5,890
7	Enrolled	Enrolled	Enrolled	*Not enrolled*	5,677 (2.0%)	Death=433 Move=5,244
8	*Not enrolled*	Enrolled	*Not enrolled*	*Not enrolled*	965 (0.3%)	Death=18 Move=947
9	*Not enrolled*	*Not enrolled*	Enrolled	*Not enrolled*	868 (0.3%)	Death=12 Move=856
10	Enrolled	*Not enrolled*	Re-enrolled	Enrolled	557 (0.2%)	
11	Enrolled	Enrolled	*Not enrolled*	Re-enrolled	548 (0.2%)	
12	Enrolled	*Not enrolled*	*Not enrolled*	Re-enrolled	345 (0.1%)	
13	*Not enrolled*	Enrolled	Enrolled	*Not enrolled*	319 (0.1%)	Death=12 Move=307
14	*Not enrolled*	Enrolled	*Not enrolled*	Re-enrolled	41 (0.02%)	
15	Enrolled	*Not enrolled*	Re-enrolled	*Not enrolled*	20 (0.008%)	

Of the original 279,805 individuals enrolled for at least one quarter out of four, some 1,470 (0.5 per cent) had a recorded date of death in the administrative data at some point in that period with another 20,293 (7.3 per cent) being ineligible due to moving in or out of the network in the baseline year. It was not possible from the administrative data collected to differentiate those people who moved to another practice in the same area, belonging to a different PHO, from those individuals moving further away. This data may be accessible at the practice level given that medical records are moved electronically between practices using the GP2GP[31] system. This level of data, however, has not been collected in a summary record by the PHO. Almost all general practices now use computerised practice management systems. The GP2GP system enables medical records to be securely transferred electronically between practices in a structured and searchable format.

The 15 enrolment pathways (Table 5.1) have been aggregated into five groupings:

1. Enrolled in all four consecutive quarters (no.1) = 235,666 (84.2 per cent)
2. Enrolled in any one quarter only (nos.2, 5, 8, 9) = 16,094 (5.8 per cent)
3. Enrolled in two consecutive quarters (nos.4, 6, 13) = 13,735 (4.9 per cent)
4. Enrolled for three consecutive quarters (nos.3, 7) = 12,799 (4.6 per cent)
5. All other experiences (nos.10, 11, 12, 14, 15) = 1,511 (0.5 per cent)

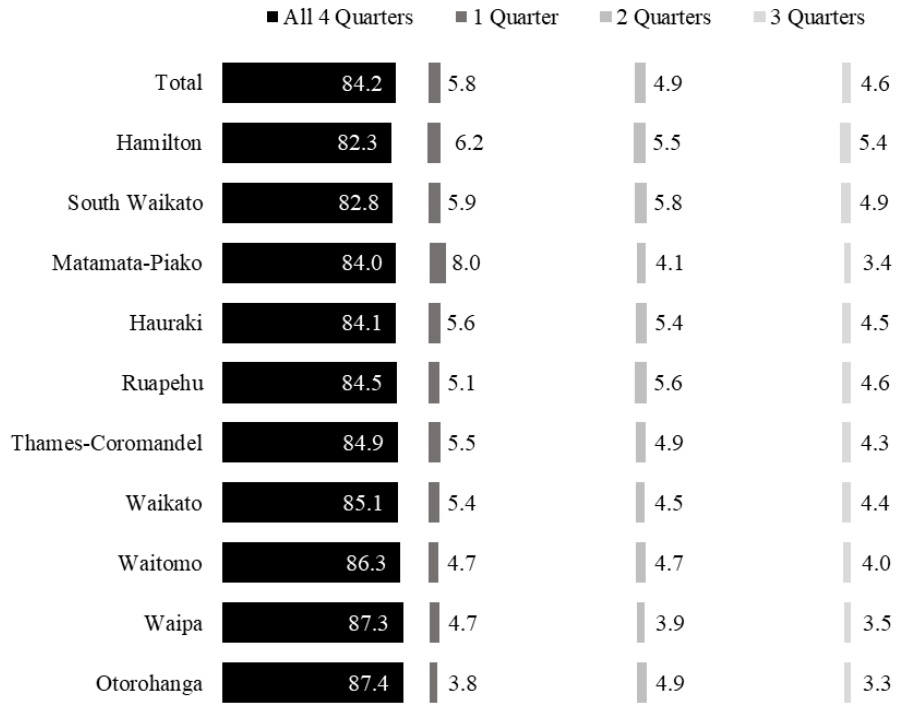
The majority of individuals enrolled (84.2 per cent) were enrolled for all four quarters, followed by those enrolled for one quarter (any quarter) at 5.8 per cent. It is possible that some of the churn in these categories was due to administrative issues, although it is not possible to ascertain how much. Some of these individuals may not have accessed services in their enrolled practice for a period of three years. The practice may have been in the process of contacting them for the purposes of re-enrolment, according to MoH guidelines.

[31] http://www.patientsfirst.org.nz/services-products/gp2gp

5.2 Enrolment churn at the Territorial Authority level

This section looks at enrolment churn at the TA level based on an individual's geographic residence. The 15 enrolment categories have been summarised in the same five groups as in the previous section and shown in Figure 5.1 (note the very small category of 'other' enrolment types is not shown). This churn was made up of individuals moving into the PHO by being born (and enrolled), or migration and conversely those exiting due to outmigration or death.

Figure 5.1 Enrolment churn, Territorial Authority of residence



As noted, 84.2 per cent of individuals were enrolled continuously across the baseline year, with this ranging from 82.3 per cent in Hamilton City to 87.4 per cent for those resident in Ōtorohanga District. Matamata-Piako District had the highest proportion enrolled for only one quarter (any quarter) at eight per cent (with a low of 3.8 per cent in Ōtorohanga District). Those enrolled for any two consecutive quarters made up between 3.9 per cent (Waipa District) to 5.8 per cent (South Waikato District). There were very small proportions in all TAs in the combined 'other enrolment scenarios' category, as perhaps expected (not shown).

Enrolment churn was found to be higher in Hamilton City (17.7 per cent) but not in the peri-urban Waikato (14.9 per cent) or Waipa Districts (12.7 per cent). Other PHOs have strong representation in both Thames Coromandel and Hauraki Districts but this did not translate through into a higher level of churn among the Pinnacle MHN enrolled population. In terms of reasons for enrolment churn, there is only one sure reason – that being when a date of death is recorded in the enrolment record. Enrolment churn can also be analysed at the practice level as well as by any defined population groups.

5.3 Cross border flows - Territorial Authority boundaries

The study looked at the TA in which individuals in the study population were resident compared with the geographical location of their enrolled general practice. While not 'enrolment churn' as such, cross border flows were of interest given the potential difference between where people reside and where they access their health services, and the implications for planning. In addition to this, the population projections produced by Statistics New Zealand, and used in Chapter Nine (Projected Demand for Service Use) are based on geographical residence.

Table 5.2 shows that for six of the ten TAs, over 90 per cent of residents in that TA were also enrolled in a general practice located in the same TA. For example, 98.4 per cent of Thames Coromandel residents were enrolled in a practice in their 'home TA'. Conversely, 41.8 per cent of people resident in the Waikato District were enrolled in their home TA – with almost half (49.5 per cent) being enrolled in a practice across the administrative border in Hamilton City. Ōtorohanga and Hauraki Districts had some of the lower home TA proportions with 62.1 per cent and 75.1 per cent respectively. Such differences may be reflective of travel for work patterns, but it was not possible to ascertain from the administrative data.

Table 5.2 Enrolled patient residence and location of enrolled practice, percentage by Territorial Authority of residence

Territorial Authority of residence	Territorial Authority of enrolled general practice										
	Hamilton	Hauraki	Matamata-Piako	Otorohanga	Ruapehu	South Waikato	Thames-Coro	Waikato	Waipa	Waitomo	Total
Hamilton	**97.9**		0.3					0.4	1.3		100
Hauraki	0.8	**75.1**	3.1				20.4	0.3	0.2		100
Matamata-Piako	4.4	0.2	**93.0**	0.1		0.1	0.2	0.2	1.8		100
Otorohanga	2.4		0.1	**62.1**				0.1	29.8	5.4	100
Ruapehu	0.5			0.1	**97.0**				0.3	2.1	100
South Waikato	1.7		0.3	0.2		**93.2**		0.1	4.3	0.1	100
Thames-Coro	0.6	0.5	0.2				**98.4**	0.1	0.2		100
Waikato	49.5	0.8	2.2	0.1			0.2	**41.8**	5.3		100
Waipa	10.2	0.0	0.2	0.6				0.1	**88.7**	0.1	100
Waitomo	0.5			6.4				0.1	1.8	**91.3**	100

5.4 The study population

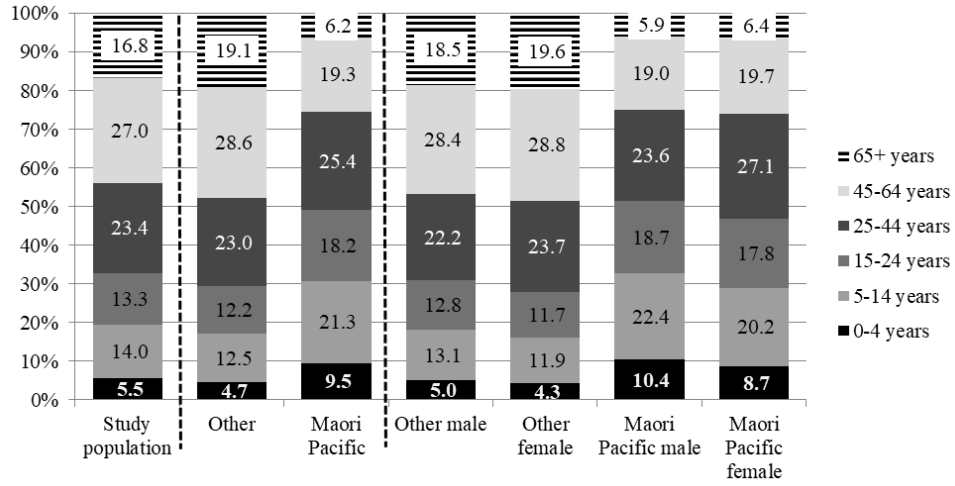
These results pertain to the first research question under objective one – that is "who makes up the study population after establishing enrolment churn?" Table 5.3 shows the study population.

Table 5.3 The study population, by age group and ethnic group

Age Group	Study population	Other	Māori Pacific	Male Māori Pacific	Female Māori Pacific	Male Other	Female Other
0-4	12,977	9,068	3,909	2,071	1,838	4,702	4,366
5-14	33,000	24,277	8,723	4,471	4,252	12,218	12,059
15-24	31,265	23,789	7,476	3,736	3,740	11,967	11,822
25-44	55,179	44,763	10,416	4,716	5,700	20,721	24,042
45-64	63,588	55,665	7,923	3,785	4,138	26,476	29,189
65-74	22,566	20,820	1,746	850	896	10,212	10,608
75-84	12,334	11,677	657	289	368	5,344	6,333
85+	4,757	4,628	129	46	83	1,688	2,940
Total	235,666	194,687	40,979	19,964	21,015	93,328	101,359

The Māori Pacific population made up 17.4 per cent (40,979) of the study population, and the Other population 82.6 per cent. The two populations have very different underlying age structures (Figure 5.2), where 19.1 per cent of the Other population were aged 65+ compared with 6.2 per cent of the Māori Pacific population (who conversely had a higher proportion of the population aged under 25 years of age).

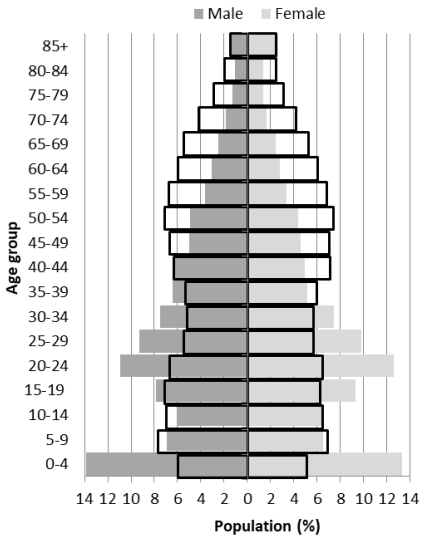
Figure 5.2 The study population, by age group, gender and ethnic group



5.5 Individuals excluded from the study population

There were 279,805 individuals enrolled for at least one quarter in the 2013/14 year. Of those 235,666 (84.2 per cent) were enrolled for all four quarters, leaving 44,139 individuals (15.8 per cent) excluded. The combined ethnic group, age-gender pyramid for those excluded is shown in Figure 5.3. For comparison purposes, this has been overlaid with the study population pyramid (black outline). Those excluded due to not meeting the requirements of four consecutive quarters of enrolment, were over represented by the very young (0-4 years), who may not have been old enough to meet this requirement and young people aged 20-29 years (a very mobile age). It was expected that these groups would be over represented.

Figure 5.3 Excluded individuals and the study population (black outline)

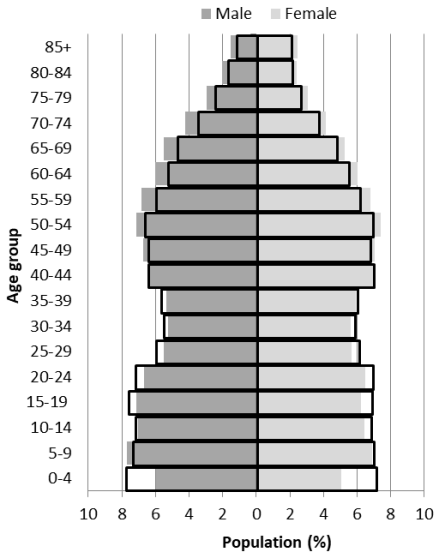


5.6 The study population and the Waikato DHB estimated resident population

This section reports on the second part of objective one, how the age-gender structure of the study population compared to the Waikato DHB estimated resident population (ERP) in June 2013. The hypothesis was that the study population would be a significant proportion of the ERP, and be generally representative of it.

Figure 5.4 compares the population pyramid of the Pinnacle MHN study population with the ERP (black outline). The study population made up 63 per cent of the ERP within the geographical boundary of the Waikato DHB, and was generally representative of it. At the TA level there were differences in coverage based on the location and number of general practices not affiliated to Pinnacle MHN (mainly in Hamilton City, Hauraki, Matamata-Piako and South Waikato Districts). At the overall level, the study population is slightly older than the ERP. By age group, the largest variation is for those aged 0-4 years. An important aspect to note is one component of how the study population was established – specifically the requirement to be enrolled for four consecutive quarters. This particularly affects the numbers in the 0-4 year age group, given some individuals will not have been old enough to meet the enrolment requirement. This will allow for most of the variation between the enrolled population and the ERP.

Figure 5.4 Waikato DHB estimated resident population (black line) compared with the study population



5.7 Results summary

Continuity of care within general practice provides the best opportunity for care for an individual, particularly those with one or more chronic conditions. The Pinnacle MHN, as a PHO, is an advocate of continuity of care, particularly in the future of an ageing population and increasing numbers of people living with chronic conditions. The PHO advocates that the GP-patient relationship is at the core of model of care re-design that is the Health Care Home (more on this in Chapter Ten: Discussion) (Midlands Regional Community Trust, 2017). Enrolment churn is not only important in the context of continuity of care, but in terms of general practice knowing their enrolled population, and playing the central role of gatekeeper to and coordinator of access to hospital based care to best effect. The reality is that continuity of care can be problematic in practice, for any number of reasons, of which enrolment churn is one.

The funding system provides incentives for individuals to enrol with a chosen practice, including the lower cost of a consult with a GP. This incentive works to encourage continuity of care by having individuals attend one practice, and perhaps the same GP, but that does depend on how individual practices operate (and there are workforce capacity issues to consider). The same system that incentivises individuals to enrol in a practice has been identified by GP themselves, and their representative bodies, as being not fit for purpose – for both meeting the needs of today and the expected demand for general practice care into the future. There has been much discussion on the funding of general practice, in particular the VLCA component. The newly formed Labour-led government announced (in late 2017) a review of the funding system, with the central involvement of general practice representatives[32].

Going back to churn - enrolment churn is important as general practices deliver services primarily to individuals who are enrolled with them. For most practices 'casual' or non-enrolled patients make up a small proportion of the workload, the exception being for those practices located in the summer holiday hotspots, particularly over the Christmas/New Year holiday period. From previous analysis

[32] https://www.nzdoctor.co.nz/article/news/green-light-minister-primary-care-led-funding-review

(not included here and undertaken while the author was employed by Pinnacle MHN), the consult spike of casual patients over this period is primarily due to acute care and ACC consult needs that arise while people are on holiday.

General practice essentially provides three types of care – care that is preventative in focus, care focused on chronic conditions management or an acute presentation (or perhaps the reality is a mix of two or three of these in any one consult). While individuals can and do access care outside of the enrolled practice setting, A&Ms and ED are providers of mainly acute care. Continuity of care is particularly important for prevention and care management, perhaps especially for those with chronic conditions or at risk of developing one.

Enrolled individuals in every practice (and therefore across the PHO) are essentially an open cohort – that is, people can move in and out of the practice register by enrolling or un-enrolling. Individuals can exit a practice by enrolling elsewhere in the country, migrating overseas, by not attending their enrolled practice for three consecutive years or exit due to death. When a person enrols in a new practice they may also change PHOs at the same time, depending on the network to which their new general practice is affiliated (people may not be aware they are changing PHO). Patients can, and do, move from a practice and then re-enrol in that same practice at a later date. Patient registers in a practice therefore are not static. Enrolment data are updated by the MoH on a quarterly basis. Practices can also change PHOs, taking with them all the enrolled individuals at the agreed date of exit.

Enrolment churn at the Pinnacle MHN level was previously unknown, but was expected to be higher in urban and peri-urban locations. This expectation was based on anecdotal evidence regarding patient choice, the residence areas of the more mobile population (ages 15-29 years) and expectations around the location of general practices affiliated to other PHOs. Patient churn and cross border flows do have planning implications. Continued enrolment churn is a given, whether it is at the level found in this study or alternatively higher or lower is unknown. Cross border flows of ‘administrative borders’ bring implications for planning purposes. These flows were expected to be considerable around Hamilton City, particularly for the Waikato and Waipa districts where administrative borders are shared with

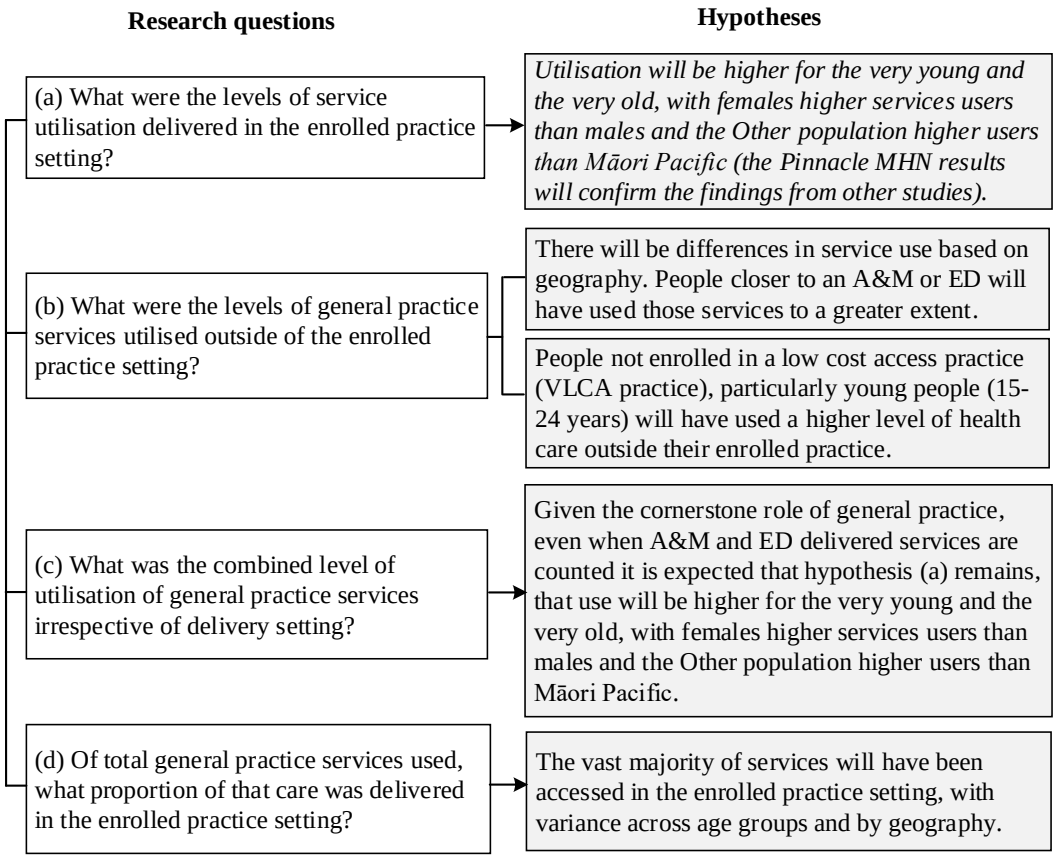
Hamilton City. The finding was that the flow is strong for Waikato District residents but not so for residents in Waipa District. A major reason for the strength of these flows is expected to be the travel to work scenario, where people enrol with a practice close to their place of employment. It was not possible in this analysis to test this hypothesis. People are probably not even aware of these administrative borders used for planning (and they probably don't need to be). Nevertheless, when planning for service provision consideration of the strength of these border flows is important, alongside the fact that the enrolled population is an open cohort with, as found in this study, multiple enrolment scenarios creating movements in practice registers and affecting the provision of continuity of care.

6 Results – Establishing Service Use

Having established the study population and compared it to the ERP, this chapter presents the results of objective two – establishing general practice service use in the baseline year. While much of this chapter is descriptive in nature, this study has established a new measure of service use – that of across sector general practice service use. This measure gives a more accurate measure of the size of general practice care - regardless of the setting where an individual accessed the care. At the individual level, this total measure consists of all medical consults in enrolled general practice, combined with medical consults in A&M (including after-hours) and any presentations to an ED that were considered to be of a general practice nature (also including after-hours ED presentations).

The objective, research questions and aligned hypotheses were:

<u>Objective two</u>: Establish the utilisation of general practice services in the baseline period of 1 April 2013 to 31 March 2014.



6.1 Service use levels – an overview

This section presents results for the established level of service use by selected socio-demographic variables (age group, gender and ethnic group). A spatial lens is applied, using geography of residence. Three measures are used here to present baseline 2013/14 service use levels and patterns:

1. Consults within enrolled practice – this is presented as annual average service use by age group, gender and ethnic group.
2. Outside of the enrolled practice - this 'outside' measure is a combination of service use in A&M and ED. The measure is presented as consults per 100 enrolled individuals.
3. The proportion of all of general practice care that occurred in the enrolled practice setting – this third measure was the simply the consults undertaken in the enrolled practice setting divided by the total number of general practice consults.

Results are shown at the Pinnacle MHN level and for each TA. The three summary measures detailed above are each shown separately. Note that in this results chapter (at the TA level), that rates are not shown for the Māori Pacific population (males or females) aged 85+ years where there were small numbers of enrolled individuals in that age group (taken as n<16). The above measures are based on the enrolled individual's TA of geographic residence, rather than the TA in which their enrolled practice was physically located. TA of residence is used because it is the unit at which the Statistics New Zealand population projections are provided and on which the future demand for general practice services are based (Chapter Nine).

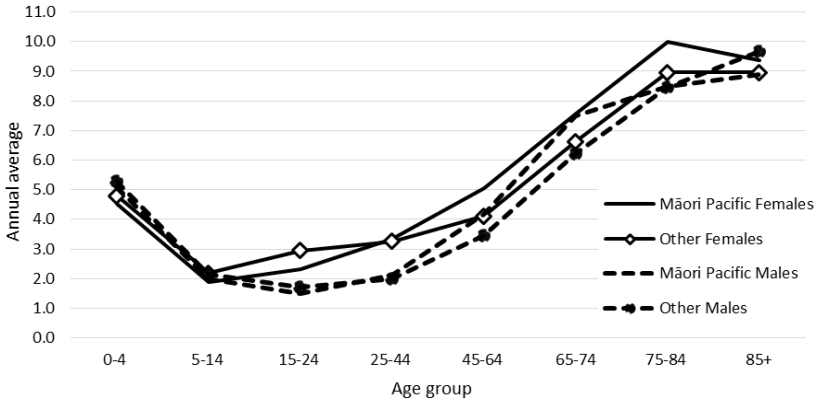
6.2 Service use levels – Pinnacle MHN

Annual average use of health care in the enrolled practice, at the network level, ranged from a low of three consults per year for Māori Pacific males to a high of 4.3 consults per year for Other females (not shown in Figure 6.1). There were, however, considerable differences by age group. In general, those at the youngest and oldest ages had the highest level of average consults per year in their enrolled general practice. The group with the lowest annual average use were Māori Pacific males aged 15-24 years (1.5 consults), followed by Other males of the same age

(1.7 consults). Māori Pacific females aged 75-84 years had the highest annual average use in the baseline year at 10 consults.

Service use for those aged 0-4 years was very similar across the four population groups, at around five consults per year, dropping to around two consults for all groups at age 5-14 years. Over the next two age groups (15-24 and 25-44 years) females in both ethnic groups had on average more consults than their male counterparts. From age 45 service use levels for Māori Pacific males rose, as did those for Other males – who had the highest utilisation for those at 85+ years.

Figure 6.1 Annual average use of enrolled general practice, by age, gender and ethnic group, 2013/14

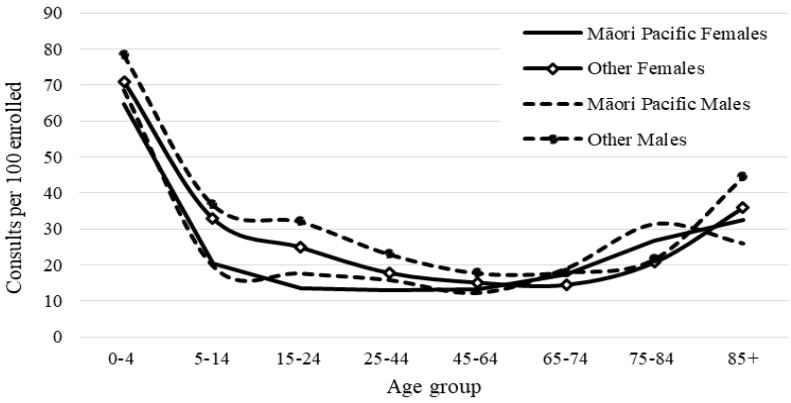


Data for older persons are often reported in an aggregated grouping, using age 65+ years. For this study the 65+ age group was disaggregated into 65-74 years, 75-84 years and 85+. Because of the underlying age structures and numbers in each group, if only the 65+ group were used then the annual average would have been dampened by the greater numbers in the 65-74 age group, meaning that the utilisation pattern in Figure 6.1 would have been more of a 'U shaped' curve than an 'elongated tick'.

Figure 6.2 shows use of general practice services outside of the enrolled setting. Due to the smaller numbers (compared with enrolled practice service use) service use data are shown by 'consults per 100 enrolled' individuals. Service use levels were highest for those aged 0-4 years, declining significantly to those aged 5-14 years (to rates at least half that of the youngest enrolled). Up to age 45 years, service use was higher for Other females and other males (males especially at age 15-24 years). There was convergence to lower rates of service use among the middle aged

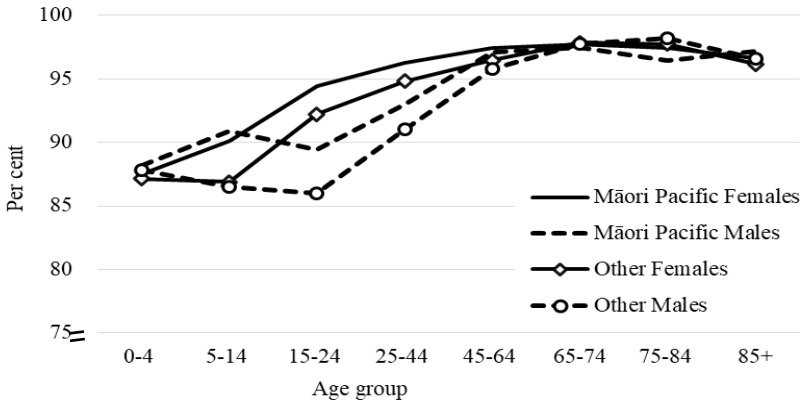
and those in early retirement (65-74 years), rates then increasing until those aged 85+ had service use broadly similar to those aged 5-14 years in the baseline year. Other males had the highest rates right through until age 65 years.

Figure 6.2 Pinnacle MHN – general practice consults outside of enrolled practice per 100 enrolled population, 2013/14



There were considerable differences by age group and ethnic group for the proportion of care delivered in the enrolled setting (Figure 6.3). For those aged 0-4 the proportions are similar with around 87 per cent of all general practice care delivered in the enrolled setting, with proportions again being similar in the middle age group (45-64 years) through into those of retirement ages. To facilitate comparison between groups – note the scale used on the y-axis (in Figure 6.3) and all figures relating to the proportion of care delivered in the enrolled practice setting.

Figure 6.3 Pinnacle MHN, per cent of all general practice health care delivered in enrolled practice



Overall, service use levels were most spread in the 15-24 years age group, with the range being from a low of 86 per cent for Other males to a high of 94 per cent for

Māori Pacific females. The proportion of total care received in the enrolled practice increased for all groups from 25-44 years, reaching convergence again at age group 45-64 years.

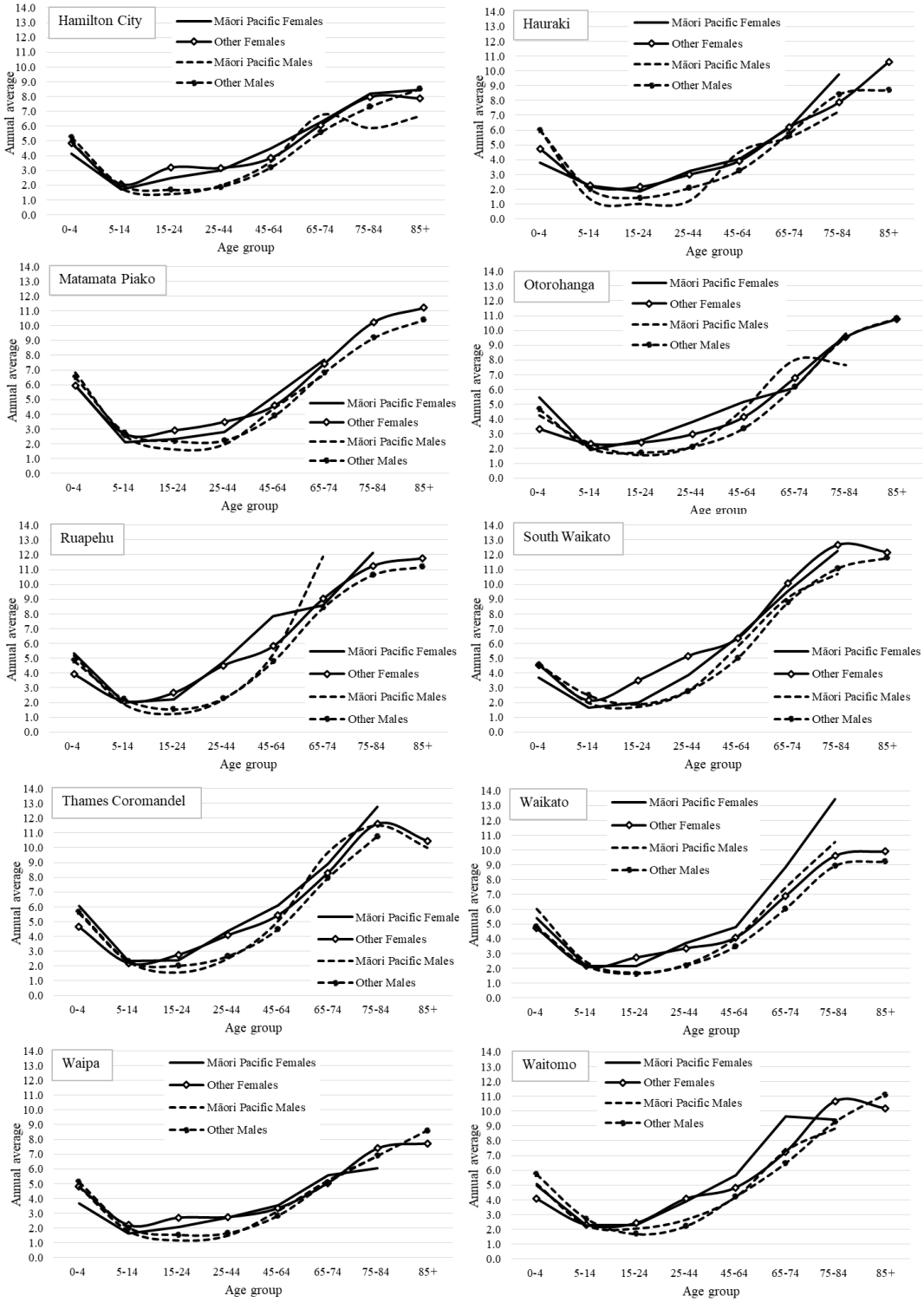
6.3 Service use levels – by TA of residence

This section presents the levels of general practice service use within each TA area, for services delivered in the enrolled setting, outside of it, and as the proportion of all care that was delivered in the enrolled setting.

Table 6.1 Annual average use of enrolled general practice, by age and ethnic group, 2013/14

		Territorial Authority Area									
Ethnic group	**Age**	Hamilton City	Hauraki	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coro	Waikato	Waipa	Waitomo
Māori Pacific females	**0-4**	4.1	3.8	6.0	5.5	5.3	3.7	6.1	5.4	3.7	5.0
	5-14	1.7	2.2	2.1	1.9	2.0	1.6	2.3	2.1	1.6	2.3
	15-24	2.5	1.9	2.3	2.6	2.2	2.0	2.4	2.1	2.1	2.3
	25-44	3.0	3.2	2.8	3.8	4.8	3.9	4.4	3.7	2.7	3.9
	45-64	4.5	4.1	5.2	5.2	7.8	6.4	6.1	4.8	3.5	5.7
	65-74	6.3	6.1	7.7	6.1	8.6	9.6	8.9	8.8	5.6	9.6
	75-84	8.2	9.8		9.8	12.1	12.2	12.8	13.4	6.1	9.4
	85+	8.5									
	Total	**3.2**	**3.5**	**3.9**	**4.0**	**5.1**	**4.1**	**4.9**	**3.8**	**2.8**	**4.1**
Other females	**0-4**	4.8	4.7	5.9	3.3	3.9	4.5	4.7	4.7	4.8	4.1
	5-14	2.1	2.2	2.7	2.3	2.1	2.2	2.2	2.2	2.2	2.3
	15-24	3.2	2.2	2.9	2.4	2.7	3.5	2.8	2.7	2.7	2.4
	25-44	3.2	3.0	3.5	3.0	4.5	5.2	4.1	3.4	2.8	4.1
	45-64	3.8	3.9	4.6	4.1	5.8	6.4	5.4	4.1	3.4	4.8
	65-74	6.1	6.2	7.4	6.8	9.0	10.1	8.3	6.9	5.1	7.2
	75-84	8.0	7.9	10.2	9.5	11.2	12.7	11.6	9.6	7.4	10.7
	85+	7.9	10.6	11.2	10.8	11.8	12.2	10.5	9.9	7.7	10.2
	Total	**4.0**	**4.1**	**4.9**	**4.1**	**5.9**	**6.4**	**6.1**	**4.1**	**3.6**	**4.9**
Māori Pacific males	**0-4**	4.9	6.0	6.8	4.3	5.2	4.7	5.6	6.0	4.8	5.1
	5-14	1.8	1.4	2.6	2.3	1.9	2.0	2.3	2.4	1.8	2.3
	15-24	1.4	1.0	1.6	1.6	1.2	1.7	1.6	1.7	1.2	2.0
	25-44	2.0	1.2	2.0	2.2	2.2	2.8	2.5	2.2	1.5	2.6
	45-64	3.6	4.5	4.4	4.7	5.3	5.8	5.0	4.0	3.2	4.2
	65-74	6.7	5.5	6.7	8.0	11.9	9.1	9.7	7.4	5.2	7.3
	75-84	5.9	7.3		7.7		10.7	11.5	10.5	6.9	8.8
	85+	6.7									
	Total	**2.7**	**3.1**	**3.2**	**3.3**	**3.8**	**3.6**	**3.8**	**3.3**	**2.4**	**3.3**
Other males	**0-4**	5.3	6.0	6.5	4.7	4.8	4.6	5.7	4.8	5.1	5.7
	5-14	2.0	2.0	2.8	2.0	2.3	2.5	2.3	2.2	2.0	2.7
	15-24	1.7	1.4	2.2	1.7	1.5	1.9	2.0	1.6	1.5	1.7
	25-44	1.9	2.1	2.2	2.1	2.3	2.8	2.7	2.2	1.7	2.2
	45-64	3.2	3.2	3.9	3.4	4.8	5.0	4.5	3.5	2.8	4.2
	65-74	5.6	5.7	6.8	6.2	8.4	8.8	7.9	6.0	5.1	6.5
	75-84	7.3	8.4	9.2	9.5	10.6	11.1	10.8	8.9	6.9	9.3
	85+	8.5	8.7	10.4	10.8	11.2	11.8	12.9	9.2	8.6	11.1
	Total	**3.1**	**3.6**	**4.1**	**3.5**	**4.9**	**5.1**	**5.4**	**3.4**	**3.0**	**4.0**

Figure 6.4 Annual average use of enrolled general practice, by age and ethnic group, 2013/14 by Territorial Authority of residence



Levels and patterns of service use in the enrolled practice setting

The hypothesis concerning utilisation by age was partially met. The very old (85+) did have high levels of service use, but often those aged 75-84 years had the same

or even higher levels of service use. Those aged 0-4 years, on the whole, had service use levels below those of people aged 75-84 years and in some TAs had levels on par with those aged 65-74 years or those aged 45-64 years. However, the service use story at the sub-regional level did not always follow the established pattern at the Pinnacle MHN level.

In general, the youngest males had the same or slightly higher service use than same age females. This changed however, particularly for those aged 15-24 and 25-44 years, where in general females showed a higher level of service use in their enrolled practice. A level of convergence appeared from age 45 years and older when male service use was similar again to females. There was fluctuation on this theme at the sub-regional level. This finding fits with those from the 2014/15 New Zealand Health Survey, in terms of access to care in general practice and gender differentials in the level of service used (Ministry of Health, 2015, p. 29).

Levels and patterns of service use outside the enrolled practice setting

The study hypotheses were that (1) there would be differences in service use outside the enrolled practice based on geography of residence and (2) that people enrolled in a non-VLCA funded practice, particularly those aged 15-24 years would use a higher level of services outside of their enrolled practice. If looking only at the high level Pinnacle MHN results the hypotheses were not confirmed – but as often the case the summary level results masked other patterns occurring at the sub-regional level. It is not possible to compare this result with findings from the 2014/15 New Zealand Health Survey. This is due to the survey measuring care in an after-hours medical centre only, whereas this study includes ambulatory sensitive low acuity to treat ED presentations in the measure of "outside of enrolled practice". The Health Survey results do show however, that for adults those aged 15-24 years were the highest users of after-hours care (Ministry of Health, 2015, p. 30).

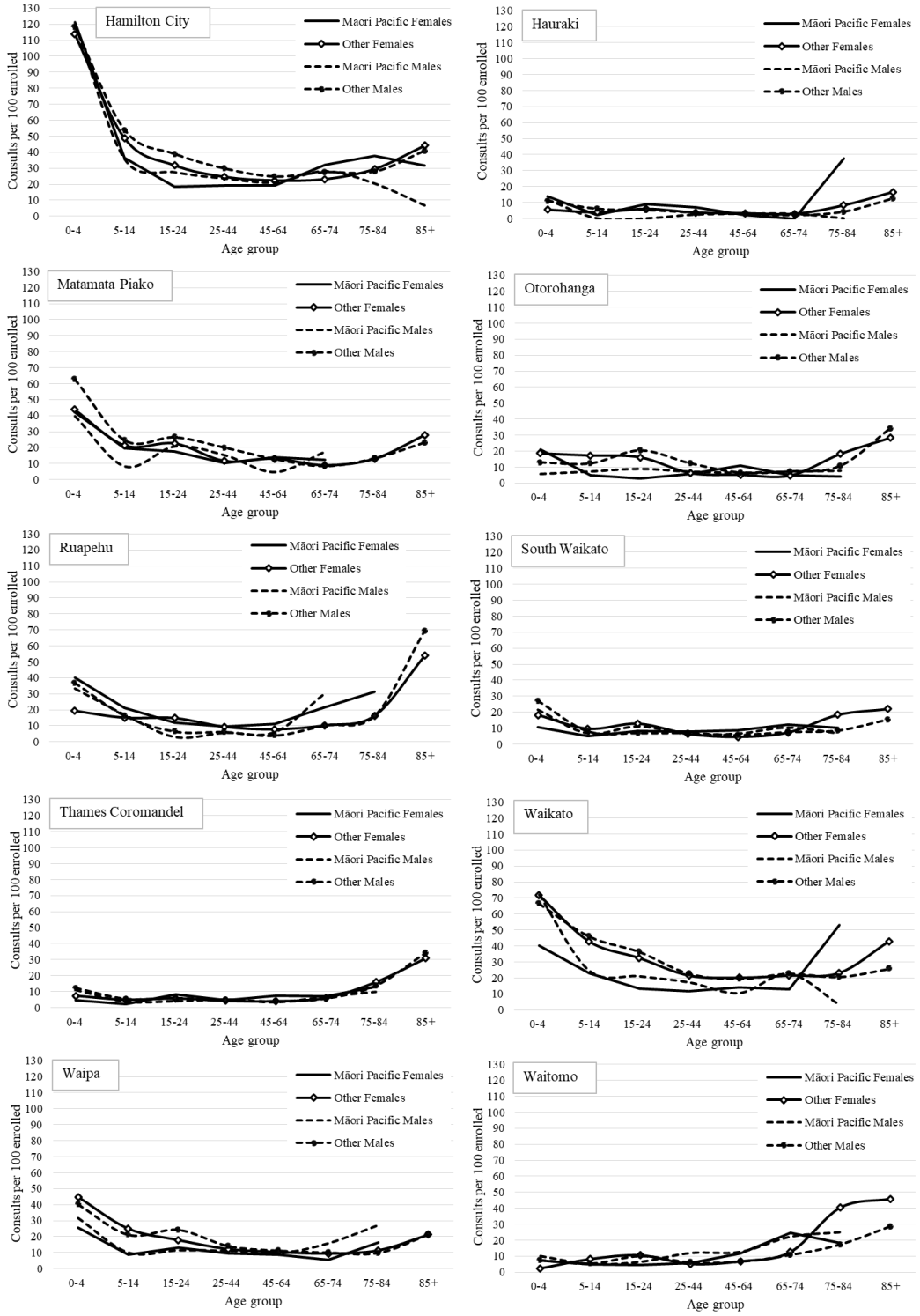
At the Pinnacle MHN level those aged 0-4 years used the highest level of general practices services outside their enrolled setting. The unexpected result was that those aged 5-14 and 15-24 years had similar levels of service use outside their enrolled practice to those aged 75-84 years and 85+ years. Hamilton City residents aged 0-4 years had a particularly high level of service use outside their enrolled

practice (between 112 and 121 consults per 100 enrolled). This was very high compared with, for example, use by those of the same age resident in Hauraki District on between eight and 15 consults per 100 enrolled, Waikato District residents of the same age at 40-72 consults per 100 enrolled, and South Waikato residents at 10-28 consults per 100 enrolled. Due to the numbers at this age resident in Hamilton City, this high level drives the overall Pinnacle MHN level result.

Table 6.2 General practice consults outside of enrolled practice, per 100 enrolled population, 2013/14

		Territorial Authority Area									
Ethnic group	**Age**	Hamilton City	Hauraki	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coro	Waikato	Waipa	Waitomo
Māori Pacific females	**0-4**	121	14	42	21	40	11	5	40	26	7
	5-14	37	2	20	5	21	5	2	23	9	5
	15-24	18	9	18	3	12	8	8	13	13	5
	25-44	19	7	10	6	10	8	4	12	9	6
	45-64	19	2	14	11	11	9	7	14	9	12
	65-74	32	0	13	5	22	12	7	13	5	25
	75-84	38	38		4	31	10	13	53	16	18
	85+	32									
	Total	**33**	**7**	**19**	**8**	**16**	**8**	**6**	**18**	**11**	**8**
Other females	**0-4**	114	6	44	19	19	18	7	72	45	2
	5-14	49	4	21	17	15	10	5	43	25	8
	15-24	32	6	23	16	15	13	6	32	18	11
	25-44	25	4	12	6	9	6	4	21	12	5
	45-64	22	3	13	5	8	5	4	20	10	7
	65-74	23	3	9	5	10	7	6	22	9	13
	75-84	30	8	13	18	16	18	16	23	11	40
	85+	44	17	28	28	54	22	31	43	21	46
	Total	**32**	**4**	**17**	**10**	**13**	**8**	**7**	**28**	**15**	**11**
Māori Pacific males	**0-4**	120	12	40	6	33	22	11	72	32	10
	5-14	35	0	8	7	17	7	4	24	10	5
	15-24	27	0	21	9	3	11	4	21	11	7
	25-44	23	2	15	7	6	6	5	17	11	12
	45-64	21	3	5	6	6	7	3	10	9	13
	65-74	28	3	17	7	30	11	7	22	16	22
	75-84	20	0		8		7	10	3	27	25
	85+	7									
	Total	**38**	**3**	**16**	**7**	**12**	**9**	**5**	**23**	**13**	**10**
Other males	**0-4**	118	11	63	13	37	27	12	67	40	8
	5-14	54	6	24	12	16	8	5	46	21	5
	15-24	39	5	26	20	6	7	6	36	24	10
	25-44	30	4	20	12	6	7	5	23	14	6
	45-64	25	3	13	6	4	6	4	20	11	7
	65-74	27	2	8	7	10	7	6	23	10	11
	75-84	28	4	13	11	16	8	14	21	10	17
	85+	41	13	23	34	69	15	34	26	21	29
	Total	**38**	**4**	**20**	**11**	**11**	**8**	**7**	**29**	**16**	**8**

Figure 6.5 General practice consults outside of enrolled practice, per 100 enrolled population, 2013/14 by Territorial Authority of residence



The proportion of all general practice care delivered in the enrolled practice

Looking at the results for at the Pinnacle MHN level, out of the 360 population sub-groups (by age and ethnic group in ten TAs) in total 74.2 per cent of all sub-groups

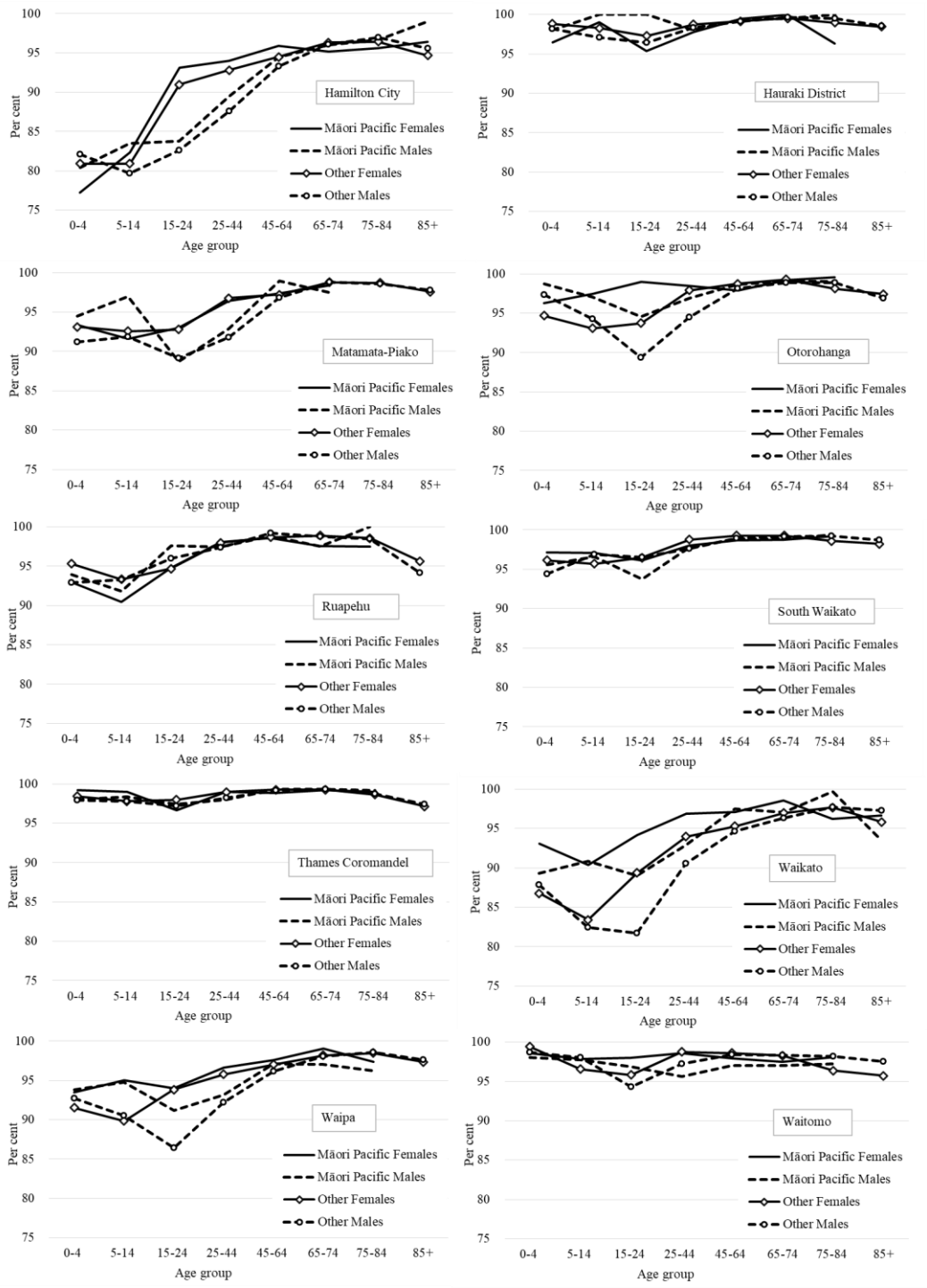
had 95 per cent or more of their total general practice health care delivered in their enrolled practice setting. Of the 25.8 per cent not meeting the 95 per cent threshold, some 66 of those sub-groups (18.3 per cent) were measured at 90 to 94 per cent.

At the Pinnacle MHN level, for all those aged 45+ years over 95 per cent of all the general practice health care used was delivered in the enrolled setting, with little difference by ethnic group and gender. For those age groups in the 0-44 years range the result was for over 85 per cent of general practice care delivered in the enrolled practice – but there was considerable difference between ethnic and gender groupings aged 5-14, 15-24 and 25-44 years.

Table 6.3 Per cent of all general practice health care delivered in the enrolled practice setting, 2013/14

		Territorial Authority Area									
Ethnic group	**Age**	Hamilton City	Hauraki	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coro	Waikato	Waipa	Waitomo
Māori Pacific females	**0-4**	77.2	96.4	93.4	96.3	93.0	97.2	99.2	93.1	93.5	98.6
	5-14	82.3	99.0	91.6	97.4	90.4	97.1	99.0	90.4	95.0	97.9
	15-24	93.1	95.4	93.0	98.9	94.8	96.1	96.7	94.1	94.0	98.0
	25-44	94.0	97.8	96.4	98.5	98.0	98.0	99.0	96.9	96.6	98.6
	45-64	95.9	99.5	97.4	97.9	98.6	98.7	98.8	97.1	97.5	97.9
	65-74	95.1	100.0	98.4	99.2	97.5	98.7	99.2	98.6	99.1	97.5
	75-84	95.6	96.3		99.6	97.5	99.2	99.0	96.2	97.4	98.1
	85+	96.4							96.6		
	Total	**90.7**	**98.0**	**95.3**	**97.9**	**96.9**	**98.1**	**98.8**	**95.5**	**96.3**	**98.1**
Other females	**0-4**	80.9	98.8	93.1	94.7	95.3	96.1	98.4	86.8	91.5	99.4
	5-14	80.9	98.3	92.6	93.1	93.3	95.7	97.8	83.4	89.8	96.6
	15-24	91.0	97.3	92.8	93.7	94.7	96.5	98.0	89.4	93.8	95.8
	25-44	92.8	98.8	96.8	97.9	98.0	98.8	99.0	94.0	95.7	98.8
	45-64	94.5	99.2	97.2	98.7	98.7	99.3	99.3	95.3	97.0	98.6
	65-74	96.3	99.5	98.8	99.3	98.9	99.3	99.3	97.0	98.2	98.3
	75-84	96.4	99.0	98.7	98.1	98.6	98.6	98.6	97.7	98.5	96.4
	85+	94.7	98.5	97.6	97.4	95.6	98.2	97.1	95.8	97.3	95.7
	Total	**92.5**	**98.9**	**96.7**	**97.6**	**97.9**	**98.7**	**98.8**	**93.6**	**95.9**	**97.8**
Māori Pacific males	**0-4**	80.4	98.0	94.5	98.7	93.9	95.6	98.0	89.3	93.8	98.0
	5-14	83.5	100.0	96.9	97.0	91.8	96.6	98.4	90.8	94.7	97.7
	15-24	83.8	100.0	88.8	94.5	97.6	93.8	97.4	89.0	91.2	96.8
	25-44	89.5	98.0	92.9	96.9	97.5	97.7	98.0	92.9	93.2	95.6
	45-64	94.5	99.4	99.0	98.7	98.8	98.9	99.3	97.5	97.1	97.0
	65-74	96.0	99.5	97.5	99.1	97.5	98.9	99.3	97.1	97.1	97.0
	75-84	96.6	100.0		99.0	100.0	99.4	99.1	99.7	96.2	97.2
	85+	99.0							93.4		
	Total	**87.6**	**99.1**	**95.3**	**97.9**	**96.9**	**97.5**	**98.6**	**93.4**	**94.8**	**97.0**
Other males	**0-4**	82.1	98.2	91.2	97.3	92.9	94.4	97.9	87.8	92.7	98.7
	5-14	79.7	97.1	91.9	94.2	93.3	96.9	97.7	82.4	90.5	98.0
	15-24	82.6	96.4	89.2	89.4	96.0	96.5	97.2	81.7	86.4	94.3
	25-44	87.6	98.3	91.8	94.5	97.4	97.6	98.2	90.5	92.2	97.2
	45-64	93.3	99.2	96.8	98.1	99.2	98.9	99.2	94.7	96.2	98.4
	65-74	96.1	99.7	98.8	98.8	98.8	99.2	99.3	96.4	98.1	98.3
	75-84	97.0	99.5	98.6	98.9	98.5	99.2	98.7	97.7	98.6	98.2
	85+	95.6	98.6	97.8	96.9	94.2	98.7	97.4	97.3	97.6	97.5
	Total	**89.9**	**98.9**	**95.3**	**96.8**	**97.9**	**98.5**	**98.7**	**92.2**	**94.8**	**97.9**

Figure 6.6 Per cent of all general practice health care delivered in the enrolled setting, by Territorial Authority of residence, 2013/14



Note on results regarding service use for those enrolled in VLCA funded practices: The research hypothesis included that young people (aged 15-24 years) enrolled in non-VLCA practices would utilise a higher level of services outside of

the enrolled practice setting than those of the same age enrolled in VLCA funded practices. This part of the hypothesis was tested in Chapter Eight (Demographic and Health Factors in Service Utilisation) and results are presented in that chapter.

Table 6.4 shows previously presented data in a different format to allow for easier comparison. If the table cell is blank then the corresponding result for that population group was above 95 per cent of total general practice services being delivered in the enrolled setting. The 95 per cent threshold was not chosen prior to the data analysis taking place. The study hypothesis was that "the vast majority" of care would be delivered in an individual's enrolled setting, but given that this analysis had not been previously undertaken, an exact level was not hypothesised. There is nothing particularly special about '95 per cent' per se, and it is not based on any clinical or planning criteria – it was simply chosen as a point around which to organise results (new knowledge) for comparative purposes (and because 95 per cent in hindsight seemed to fit the 'vast majority' wording in the study hypothesis).

Those population groups not meeting the threshold were predominately resident in Hamilton City and the Waikato District (with Waipa and Matamata Piako District residents at third and fourth respectively). The age groups driving this result were predominately the youngest, particularly those aged under 25 years of age. For example, for Hamilton City residents aged 0-4 years only 77.2 per cent of all their general practice care was delivered in their enrolled practice in 2013/14.

Table 6.4 Population groups for which <95 per cent of total general practice services were delivered in the enrolled setting

		Territorial Authority Area									
Ethnic group	**Age**	Hamilton City	Hauraki	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coro	Waikato	Waipa	Waitomo
Māori Pacific females	**0-4**	77.2		93.4		93.0			93.1	93.5	
	5-14	82.3		91.6		90.4			90.4		
	15-24	93.1		93.0		94.8			94.1	94.0	
	25-44	94.0									
	45-64										
	65-74										
	75-84										
	85+										
	Total	**90.7**									
Other females	**0-4**	80.9		93.1	94.7				86.8	91.5	
	5-14	80.9		92.6	93.1	93.3			83.4	89.8	
	15-24	91.0		92.8	93.7	94.7			89.4	93.8	
	25-44	92.8							94.0		
	45-64	94.5									
	65-74										
	75-84										
	85+										
	Total	**92.2**							**93.6**		
Māori Pacific males	**0-4**	80.4		94.5		93.9			89.3	93.8	
	5-14	83.5				91.8			90.8	94.7	
	15-24	83.8		88.8	94.5		93.8		89.0	91.2	
	25-44	89.5		92.9					92.9	93.2	
	45-64	94.5									
	65-74										
	75-84										
	85+										
	Total	**87.6**							**93.4**	**94.8**	
Other males	**0-4**	82.1		91.2		92.9	94.4		87.8	92.7	
	5-14	79.7		91.9	94.2	93.3			82.4	90.5	
	15-24	82.6		89.2	89.4				81.7	86.4	94.3
	25-44	87.6		91.8	94.5				90.5	92.2	
	45-64	93.3							94.7		
	65-74										
	75-84										
	85+					94.2					
	Total	**89.9**							**92.2**	**94.8**	

6.4 Discussion

One of the issues right at the start of this study, during the time the author was employed by Pinnacle MHN, was the question of the size of 'general practice' if health care considered to be of a general practice nature was combined across settings (where people have accessed it – rather than where the sector prefers it to be delivered). Wondering about this issue usually took place in the context of discussions about how to keep people out of ED for things they should see the health professionals in their enrolled practice for. However, the magnitude of the issue was never clear for the Pinnacle MHN enrolled population and there was no viable

way to easily combine service use data and investigate. In order to better gauge the size of general practice, this study took administrative service use data from across the sector data 'silos,' to establish a measure of the size of general practice care. This was done for the April 2013 to March 2014 year. This time period was chosen partly to align with the timing of the 2013 Census, given that demand projections out to 2038 are an important component of this study.

Aligned with getting a better sense of the size of general practice was the potential to then discover how much of that care was being delivered in the enrolled setting (where the sector prefers it to be). The findings from this are new knowledge for Pinnacle MHN. Establishing this has identified the contribution of general practice and allows discussion between general practices, the PHO and DHB, particularly on the topical issue of general practice care being delivered in the ED setting.

The higher level of service use outside of the enrolled practice, found for younger residents of Hamilton City and Waikato District, translated into a lower proportion of total care being delivered in the enrolled setting. This is perhaps not unexpected given the comparatively closer access to both A&M and ED facilities. However, given there are four other EDs open 24/7 within the region (located in Thames, Tokoroa, Te Kuiti and Taumarunui hospitals) it is interesting to see that use of ED services outside of Hamilton City is lower. This includes in the South Waikato (Tokoroa) where the ED is situated in the same building – right next door to the Pinnacle MHN affiliated general practice, where the ED is free compared with a GP consult of $17.50 during the study period. It is noted that the general practice move to the Tokoroa hospital site occurred in December 2013, part way through the baseline year. Residents in Ōtorohanga District are a reasonable travel distance from an after-hours A&M clinic or an ED. However, Other males aged 15-24 years particularly, did travel for general practice care as 11 per cent of their general practice care was delivered outside of the enrolled setting.

Another consideration in terms of the use of services outside the enrolled practice for males aged 15-24 years, is that perhaps until the early teenage years most young people will visit their GP with a parent or caregiver. Some in the 15-24 years group may be experiencing both attending a GP visit without a parent or caregiver and

quite possibly having to pay for it as well – perhaps one reason more choose to visit the free ED setting. It is also possible that concepts around the importance of continuity of care do not feature strongly at this age, partly as illness in this age group tends to be sporadic, acute presentations of unrelated illness types, and so is very different to chronic disease in this sense. Alongside this could be issues around changing expectations of care. In general, there been a move to expecting care to be available right away, or at least very soon after the decision is made that care is needed. Referring back to the theoretical model (changing societal expectations) and Andersen's conceptual model of care seeking behaviour, this could be an important part of the decision on where to access care, once the decision is made to seek care, although this is not possible to quantify from the administrative data.

It is important to note the potential effects of the national policy change and implementation of free GP consults for those aged under 13 years of age, including care in A&Ms. This may have had the effect of lowering presentations in ED, with a resulting rise in A&Ms and in the enrolled practice, although the effects may have been tempered by the capacity in general practice to provide additional consults. This workforce capacity is expected to differ geographically across the region (as the impact and severity of workforce issues do).

The issues referred to in Chapter Four (Methodology) regarding ambulatory care sensitive presentations to EDs for the oldest age groups should be noted here. The diagnoses of ambulatory sensitive conditions (particularly the making of a principal diagnosis) in those aged 65+ years is more difficult in the presence of a chronic condition(s). The Health Quality and Safety Commission had previously included those aged 75-84 years in a version of the Atlas of Variation on ambulatory sensitive hospitalisation (ASH).[33] However, this was before the new system level measures for the health sector were announced in early 2016 – the measure for ambulatory sensitive hospitalisations is now focused on hospitalisation rates for 0-4 year olds. This study followed that earlier precedent and extended the analysis of ambulatory sensitive presentations past age 84 years. While there may be ongoing debate over

[33] This information has only recently been removed from their website, www.hqsc.govt.nz

age based inclusion, making the data available for analysis at least allows the levels of service use to be seen and discussed, cognisant of these methodological issues.

A question raised from this measurement approach is "is what is currently considered ambulatory sensitive a good indication of general practice type care in the ED?" From the media the picture often seems to be one of hordes of people using ED in the same way they would their general practice (but without having to pay for the consult). Yet, using (generally) agreed ICD-10 coding to identify ambulatory sensitive conditions, and the concept of low acuity to treat, this study found that over all the vast majority of care was delivered in people's enrolled practice – at least for this study population of 235,666 individuals.

It is worthwhile exploring these issues as they have implication for future service planning – particularly under a collaborative cross sector approach as advocated by all sector strategic documents. There are also documented differences in ED presentations by day of the week and the time of day (or night). These differences are in both volume and the characteristics of individuals attending and the reason for attending (not shown in this study but available from the PHO administrative data). Aligned with this, an often raised question is how much A&M and/or ED use occurs within general practice opening hours? The MoH reports that in the 2014/15 year one in three of all presentations to ED occurred during a weekend (Ministry of Health, 2016) when most practices are closed or defaulting to their afterhours provider. The administrative data from ED include a 'time date stamp' in the record – based on when an individual has their details entered into the system (usually at a reception desk and prior to the triage process occurring).

So how much of an issue are 'inappropriate presentations' to ED that should be seen in general practice? There appears to be mixed evidence and varying points of view from those within the sector. In a recent New Zealand Doctor article (elaborately) titled "Emergency measures: behind and beyond the tide of misery flooding our emergency departments"[34], the former ED Clinical Director at Waikato Hospital noted that "it's a myth that patients who would be best cared for in general practice

[34] https://www.nzdoctor.co.nz/article/news/spotlight/emergency-measures-behind-and-beyond-tide-misery-flooding-our-emergency on 11 October 2017 (Liane Topham-Kindley).

are the problem….ED overcrowding is not generally due to a glut of patients with minor injuries and illnesses". This compares to the view of the Marlborough PHO chief executive who reported that "around 35 to 40 per cent of presentations are deemed to be more appropriately treated in primary care" (also noting a senior executive of the Waikato DHB saying the situation with ED presentations in Taumarunui was similar). As the MoH notes, ED's provide care and treatment for 'real or perceived, serious injuries or illnesses" (Ministry of Health, 2016, p. 1).

Could some of the noise around general practice presentations in ED be more about funding and the cost to DHBs of ED presentations? No reliable data could be found for this study on what a presentation or an 'inappropriate presentation' might cost (the system). It would be interesting to compare this to the cost of treatment (for the same issue) under a GP visit. Given that DHBs (including Waikato DHB) are often in the media around funding concerns this may be viewed as one area in which costs could be shifted to another part of the sector. If the view expressed by the former ED Clinical Director at Waikato Hospital (noted earlier) is correct there may be little to gain from a continued focus on inappropriate presentations to ED.

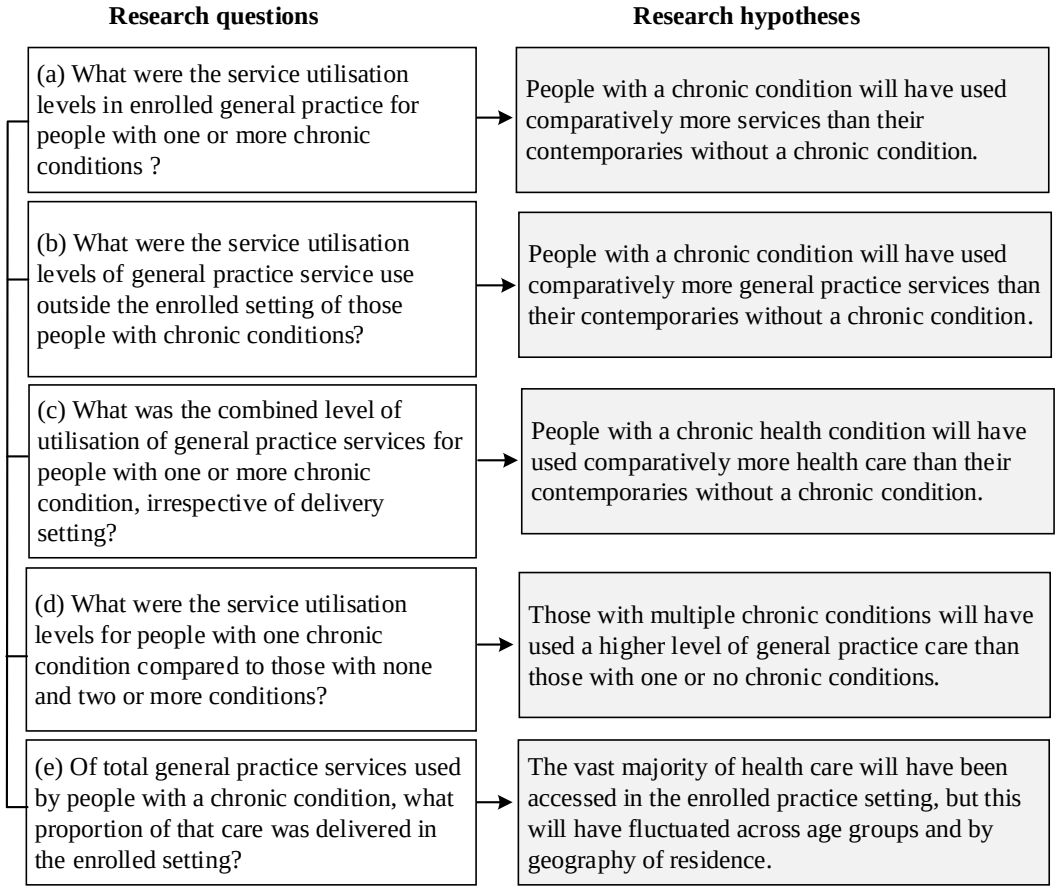
Chapter Three noted the work by Allen et al. (2015) looking at general practice presentations in the rural Tasmanian context, where there were wide variations in the estimation of event volumes based on four different methodologies. The authors concluded that there was on-going and considerable debate over inappropriate presentations and type of presentations best suited to general practice, and this appears to be the case in the Waikato. This study has taken a more general practice focused approach by looking at the issue from the perspective of measuring the size of general practice and how much of that care (or proportion of services) was delivered in the enrolled practice setting - which is the ideal setting.

The findings here relate back to Chapter 1.2 around the contribution to knowledge made by this study. The report by Downs (2017) noted in that section posed the question of *"how often are individuals presenting in the emergency department with conditions that can be treated in primary care?...How does this vary by disease burden, geography, ethnicity, income"?* The results presented here allow these questions in the context of this study to be discussed.

7 Results – Service Use and Chronic Conditions

This section focusses on an important sub-group of the study population, those coded in general practice as having one or more of four chronic conditions. The conditions selected for inclusion were, diabetes (type I and II), chronic obstructive pulmonary disease (COPD), heart failure and ischaemic heart disease. These conditions are considered key conditions, in terms of the ongoing need for clinician and patient interaction and management – and self-management by the individual. In a very practical sense, these conditions were also those where the disease coding data in general practice were considered to be good in terms of coverage.

<u>Objective three</u>: To establish the service use levels in the period 1 April 2013 to 31 March 2014 of those people coded as having one (or more) of the chronic conditions of diabetes, COPD, heart failure and ischaemic heart disease.



7.1 The study population with chronic conditions

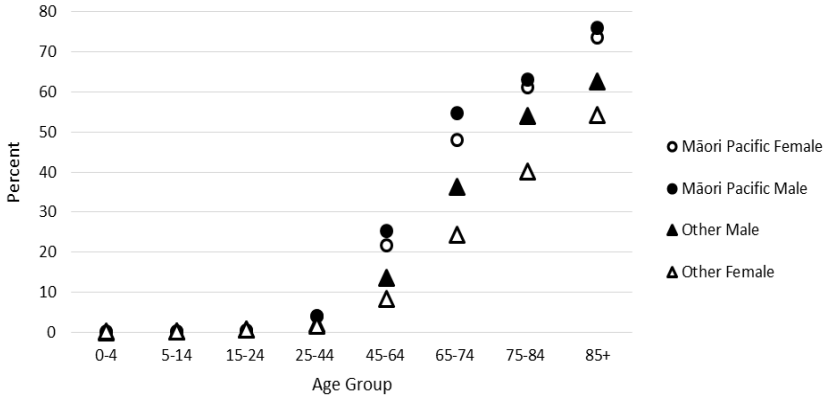
Of the total 235,666 people in the study population some 25,167 (10.7 per cent) were coded as having one or more of the four selected chronic conditions (Table 7.1). Of those with a condition 6,541 (26.0 per cent) had two or more conditions (2.8 per cent of the study population). The Māori Pacific population has a younger structure than the Other population, which is one reason why the percentage with at least one chronic condition differed between the broad ethnic groupings.

Table 7.1 Number with one or 2+ of the selected chronic conditions

	1 chronic condition	2+ chronic conditions	Total	Per cent of related study population
Māori Pacific Female	1,346	510	1,856	8.8
Other Female	7,141	2,500	9,641	9.5
Māori Pacific Male	1,305	560	1,865	9.3
Other Male	8,834	2,971	11,805	12.6
Total	**18,626**	**6,541**	**25,167**	**10.7**

Figure 7.1 shows that from age 45 years the Māori and Pacific population had a higher percentage with at least one of the four chronic conditions. By age 85+ some 76.1 per cent and 73.5 per cent of Māori Pacific males and females respectively were coded with at least one condition. For the Other population this was 62.7 per cent for males and 54.2 per cent for females.

Figure 7.1 Per cent of study population with chronic conditions



7.2 Service use levels and patterns

A key component of this study was to establish the use of general practice services within and outside of the enrolled practice for individuals with a chronic condition. A further step was to compare the levels of service use, firstly to those without chronic conditions and, secondly to examine service use by the type of chronic condition.

Figure 7.2 shows the pattern, at the Pinnacle MHN level, of annual average service use in enrolled general practice by age group, gender and presence of a chronic condition. Given the smaller numbers of younger people diagnosed with any of the four selected conditions, an aggregated age group of 0-14 years is used. It is important to note that the majority of those aged 0-14 years with a chronic condition had type 1 diabetes and often receive health care services via the DHBs paediatric diabetic service.

Figure 7.2 Service utilisation in enrolled general practice by age, gender and presence of a chronic condition, Pinnacle MHN, 2013/14

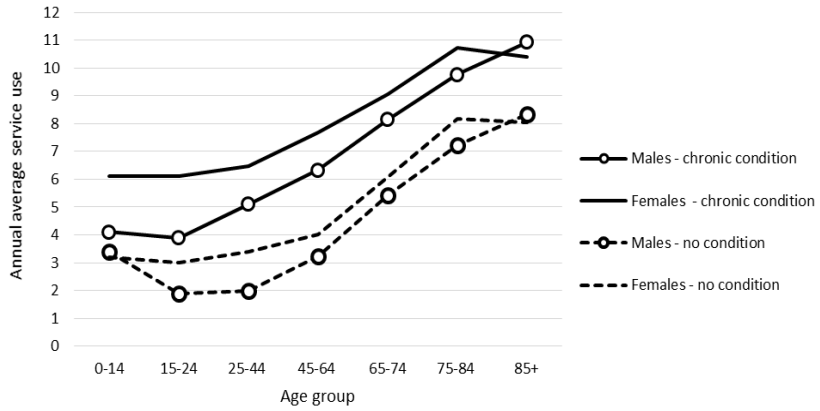


Figure 7.2 shows that at all ages those people with one or more chronic conditions used comparatively more services in their enrolled practice than those of the same age and gender without a chronic condition. This was expected, however there are some important differences by age group. For those with a chronic condition, annual average service use was higher for females than males from the youngest age (0-14 years) to age 75-84 years. A cross over occurred at age 85+ years where annual average service use for males with a chronic condition slightly surpassed that of females (this was also the case for those without a condition).

Given the different age structure of the Māori Pacific population compared to Others, direct age standardisation was used to compare rates of service use within and outside of the enrolled general practice. These variables are all included in the negative binomial regression modelling (as independent predictor variables) in Chapter Eight: Demographic and Health Services Factors in Service Use.

The following sections show age standardised results for the use of general practice services for key variables, including; presence of a chronic condition, number of chronic conditions, practice funding type by itself then alongside type of chronic condition, then by geography of residence. All age standardised rates in this chapter use the ERP of the Waikato DHB in 2013 as the reference population.

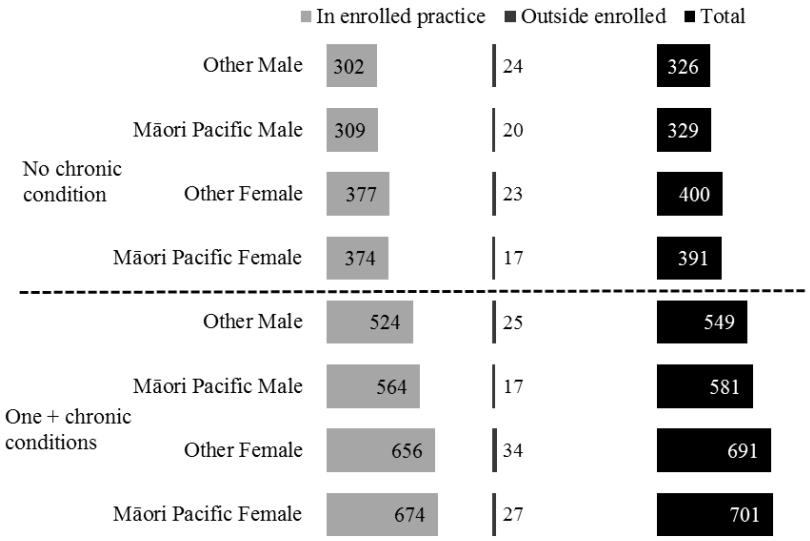
7.3 Presence of a chronic condition and service use

Figure 7.3 presents results at the Pinnacle MHN level and shows service use rates within enrolled general practice, service use outside and total service use. Those without a chronic condition had lower levels of service use in their enrolled practice and lower levels of total service use. Other males and Māori Pacific males had very similar levels of use, as did Other and Māori Pacific females (although higher than their male counterparts). Service use out of the enrolled practice was similar across all four groups at between 17-24 consults per 100 enrolled people.

For those with a chronic condition the same patterns within and between population groups were evident, in that males used fewer health services and rates were similar between Other and Māori Pacific. Māori Pacific females with a chronic condition were the highest service users, using in the baseline year 674 consults per 100 enrolled in their enrolled practice and 701 consults per 100 enrolled in terms of total general practice services (enrolled practice + outside enrolled practice).

Overall, those with a condition used a higher level of general practice services in the enrolled practice. However, rates for service use outside the enrolled setting were very similar, when comparing males with one or more condition to those with none. This was not the case for females however, with those with no condition using about 10 consults per 100 enrolled people fewer than those with a condition.

Figure 7.3 Age standardised rates per 100 enrolled, consults by delivery setting, by gender, ethnic group and presence of a chronic condition



7.4 Number of chronic conditions and service use

As previously noted, in the study population there were 25,167 people coded with at least one of the four chronic conditions. Of those 18,626 had one condition and the remaining 6,541 had two or more conditions. Service use outside the enrolled practice was similar in five of the six groups – at around 23 consults per 100 enrolled individuals. The exception was for females with one chronic condition where service use outside the enrolled setting was 32 consults per 100 enrolled.

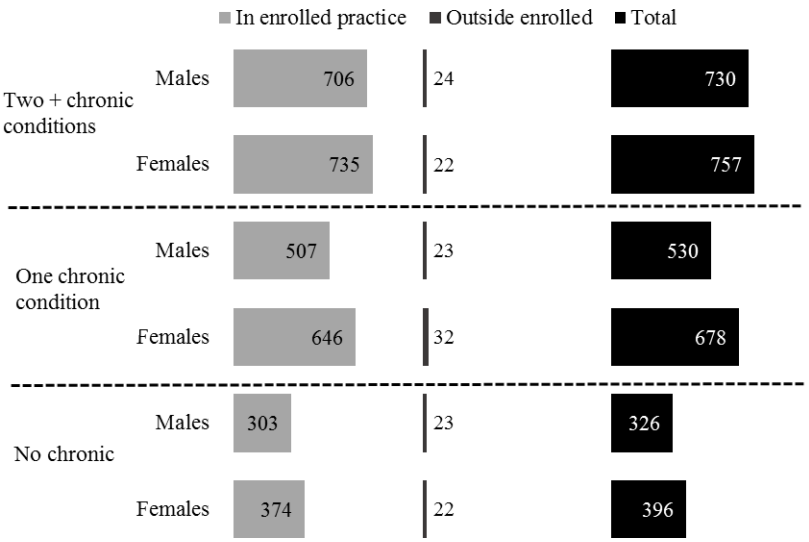
Figure 7.4 shows the effect the number of chronic conditions had on service use in enrolled general practice, outside of it and total general practice service use in 2013/14. For both males and females (but more so for females) it is the presence of one chronic condition that makes the real difference in service use. Female rates at 646 consults per 100 in enrolled practice and 678 consults per 100 total consults, were considerably higher than their male counterparts, with 507 per 100 in the enrolled setting and 530 consults per 100 total. Males with 2+ conditions used 2.3 times more services in general practice and 2.2 more services in total than males with no chronic conditions.

Those with two or more conditions used a higher level of services in enrolled practice and total general practice services. Females with two or more conditions

registered the highest level of service use at 735 consults per 100 enrolled in the enrolled setting, and 757 consults per 100 enrolled in terms of total service use.

Service use outside the enrolled practice was similar in five of the six groups – at around 23 consults per 100 enrolled individuals. The exception was for females with one chronic condition where service use outside the enrolled setting was 32 consults per 100 enrolled.

Figure 7.4 Age standardised rates per 100 people enrolled, none, one or 2+ chronic conditions by gender, Pinnacle MHN level



7.5 Practice funding type and service use

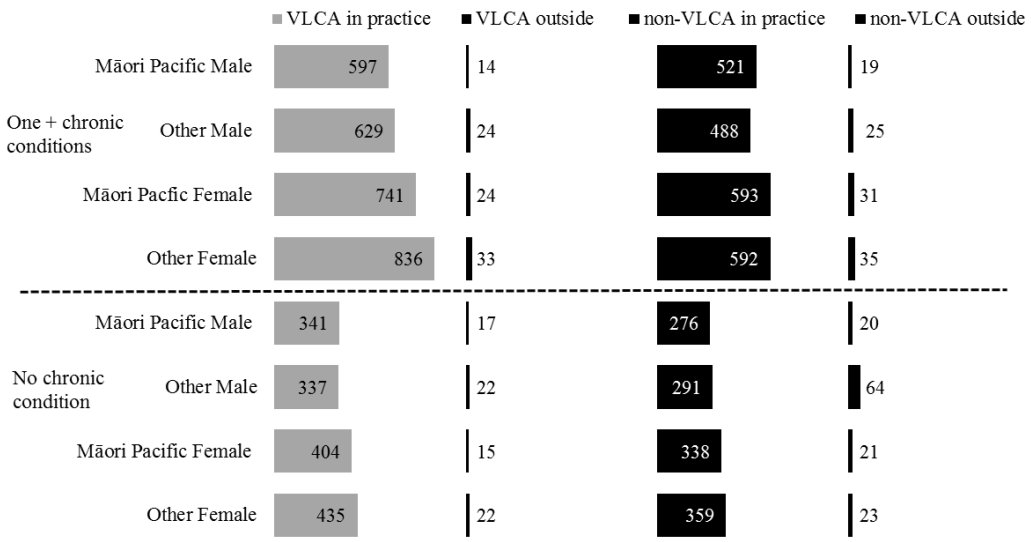
The type of funding a practice receives to deliver services to its enrolled population influences the amount a consult costs an individual. VLCA funded practices cost an individual less for a consult, $17.50 during the study baseline year compared with up to $50 in non-VLCA funded practices. Figure 7.5 shows the age standardised rate of services used per 100 enrolled people by the type of funding, ethnic grouping, gender and presence or absence of a chronic condition.

Across each group, those individuals enrolled with a VLCA funded practice used a higher level of health care in their enrolled general practice than those in non-VLCA funded practices. In some cases there was a considerable difference – particularly for Other females with a chronic condition (592 consults per 100 enrolled in non-

VLCA compared with 836 consults per hundred in VLCA funded practices). This was also the case for Other males and Māori Pacific females with a chronic condition. The difference was less prominent for Māori Pacific males with a chronic condition (521 per 100 in non VLCA practices compared with 597 per 100 enrolled in VLCA funded).

There are also interesting findings for the level of outside practice service use when comparing practices by funding type. Across all groups, individuals enrolled with non-VLCA practices used a higher level of outside practice services than those in VLCA practices – whether or not a chronic condition was present (though for some groups the difference was small). The group with the highest level of outside enrolled practice service use were Other males with no chronic conditions (64 consults per 100 enrolled). In comparison, the next highest level was 35 consults per 100 enrolled for Other females with one + chronic conditions. The previous chapter showed high use of services outside the enrolled setting for Other males, particularly aged 15-24 years, almost across the board but particularly those resident in Hamilton City and the Waikato District.

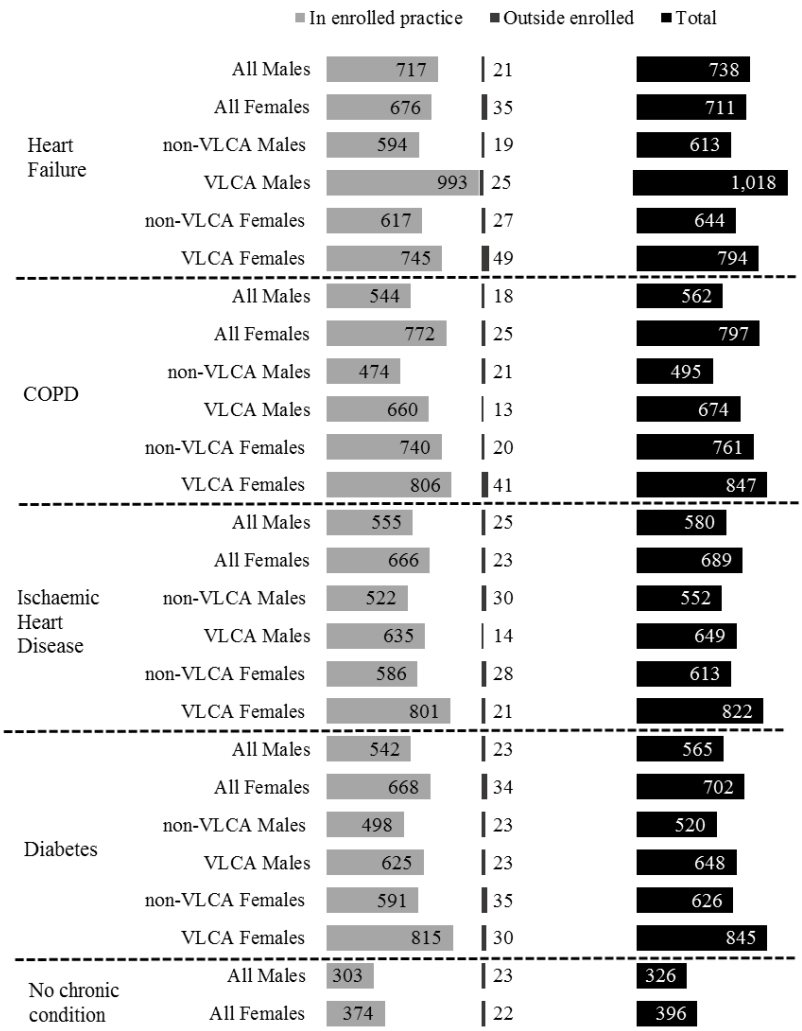
Figure 7.5 Age standardised rate per 100 enrolled, by ethnic group, gender, presence of chronic condition and practice funding type



7.6 Type of condition, practice funding type and service use

This section looks at service use for each of the four chronic conditions in terms of the effects of practice funding type and gender. As the length of time living with a chronic condition is not known, it is problematic to make meaningful comparisons between groups. There are a few differences to note however, including the highest service use in enrolled practice being for males with heart failure enrolled in VLCA practices (993 consults per 100 enrolled) compared with 594 consults per 100 enrolled for males in a non-VLCA practice. Perhaps the point to note is the difference in service use for those with a chronic condition and those without.

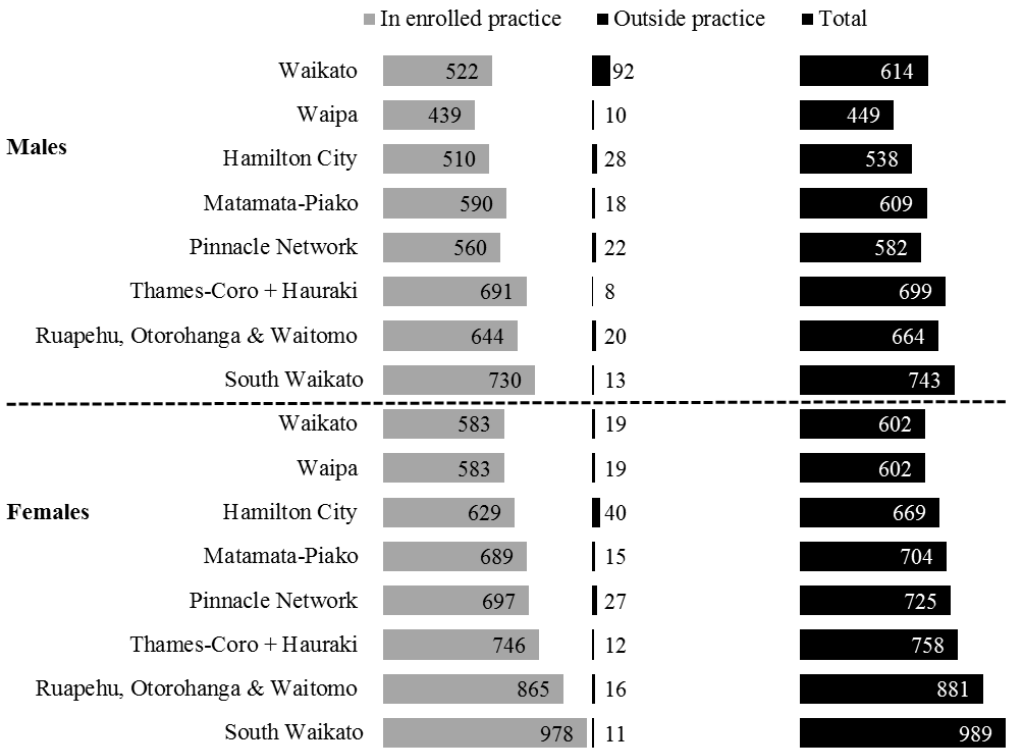
Figure 7.6 Age standardised rate per 100 enrolled, by type of chronic condition, location of service, gender and practice funding



7.7 Chronic conditions and geography of residence

In this section several of the TAs with smaller populations with chronic conditions were combined in order to support the process of direct age standardisation. Hauraki District data were combined with Thames Coromandel District and the three districts of Ruapehu, Ōtorohanga and Waitomo were combined into one area. Figure 7.7 shows the age standardised rate for service use per 100 enrolled for consults in the enrolled practice, outside of and for total use.

Figure 7.7 Age standardised rate per 100 consults for those with chronic conditions, in enrolled practice, outside enrolled and total general practice, by gender and geographical residence



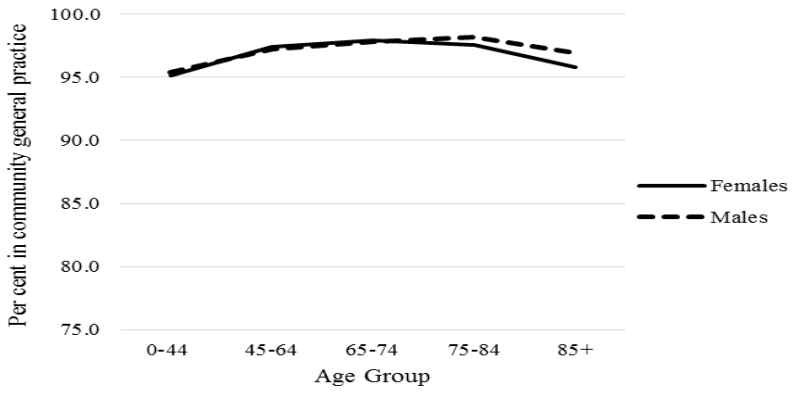
There are several points of interest. Females with chronic conditions across all but the Waikato District were higher users of enrolled general practice and total general practice services than their male counterparts. Also, in all but that one Waikato case the total (combined) general practice service use of males was lower than the use of services in the enrolled practice by females. This exception, as noted was the Waikato District where males had a higher total use of services, due to their higher use of services outside of their enrolled setting. There are also considerable differences in service use outside the enrolled practice by TA, for example Waikato

District versus the combined Thames Coromandel and Hauraki District utilisation rates for males (92 consults per 100 enrolled compared with eight per 100 enrolled respectively).

7.8 Proportion of services delivered in the enrolled practice

As with service use for the total study population, this study was interested in the proportion of total general practice care that was delivered in an individuals' enrolled practice. There are two reasons for this, firstly, chronic conditions, particularly in the 65+ age group are a key driver of demand for general practice health care and secondly, continuity of care is important. Results are presented at the Pinnacle MHN level and then by TA area. The youngest age groups have been aggregated to 0-44 years, due to smaller numbers of children and young people with one or more of the four selected chronic conditions. Also, as in the previous section, several of the TA areas have been combined to assist with analysis.

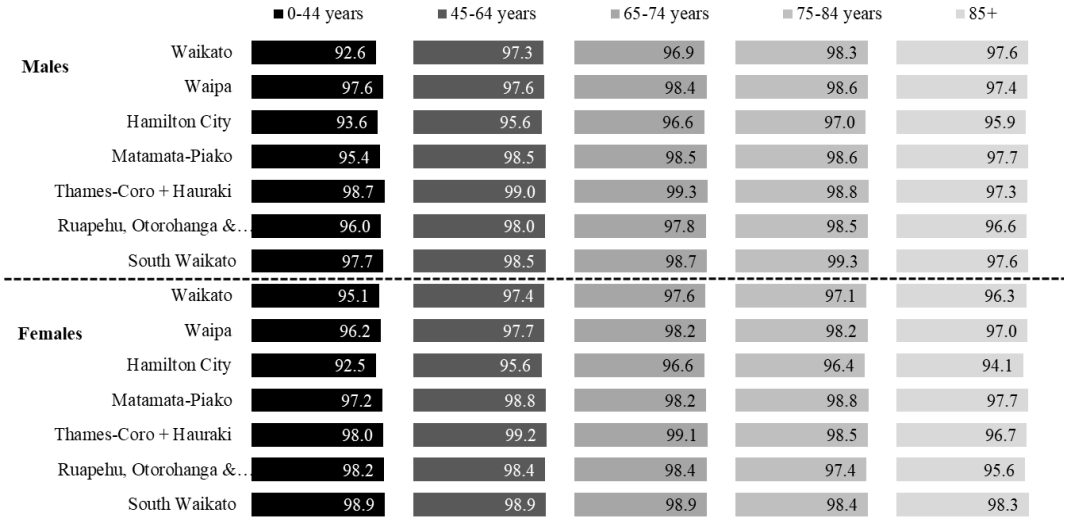
Figure 7.8 Proportion of all general practice health care delivered in enrolled practice, Pinnacle Midlands Health Network



Overall, the vast majority of general practice health care for people with one or more chronic conditions was delivered in the enrolled setting. At the Pinnacle MHN level 95 per cent to 98 per cent of all general practice services were delivered in the enrolled setting (Figure 7.8). In terms of patterns by age group, those aged 0-44 years along with those aged 85+ used more general practice care outside of their enrolled practice than those aged 45-84 years. Results were very similar for females and males in the three age groups up to age 74 years. At ages 75+ females had slightly less of their total general health care services delivered through the enrolled

setting. For the same TA combinations as in the previous section (combined Thames Coromandel with Hauraki District and Ruapehu, Ōtorohanga and Waitomo Districts combined) results are shown in Table 7.2.

Table 7.2 Per cent of general practice care delivered in enrolled practice, by TA of residence, gender and age group



		0-44 years	45-64 years	65-74 years	75-84 years	85+
Males	Waikato	92.6	97.3	96.9	98.3	97.6
	Waipa	97.6	97.6	98.4	98.6	97.4
	Hamilton City	93.6	95.6	96.6	97.0	95.9
	Matamata-Piako	95.4	98.5	98.5	98.6	97.7
	Thames-Coro + Hauraki	98.7	99.0	99.3	98.8	97.3
	Ruapehu, Otorohanga &..	96.0	98.0	97.8	98.5	96.6
	South Waikato	97.7	98.5	98.7	99.3	97.6
Females	Waikato	95.1	97.4	97.6	97.1	96.3
	Waipa	96.2	97.7	98.2	98.2	97.0
	Hamilton City	92.5	95.6	96.6	96.4	94.1
	Matamata-Piako	97.2	98.8	98.2	98.8	97.7
	Thames-Coro + Hauraki	98.0	99.2	99.1	98.5	96.7
	Ruapehu, Otorohanga &..	98.2	98.4	98.4	97.4	95.6
	South Waikato	98.9	98.9	98.9	98.4	98.3

Although the vast majority of general practice care is delivered in an individuals enrolled practice there is spatial variance. There are two TA areas where the proportion of general practice care delivered in enrolled practice was below 95 per cent for some population groups. These being males and females aged 0-44 years and females aged 85+ in Hamilton City along with males aged 0-44 years resident in the Waikato District.

7.9 Results Summary

The majority of findings in this section on general practice health care for those with chronic conditions are new knowledge. The Pinnacle MHN administrative data had not been available in the appropriate format before this study dataset was developed. The key findings of the research questions and hypotheses are presented in this section.

Service use within the enrolled practice setting

At the Pinnacle MHN level those with one or more chronic conditions used a higher level of services than their counterparts without any condition. With the exception

of age 85+ years, females with chronic conditions used a higher level of services in their enrolled practice than males. The presence of a second chronic condition made a difference, particularly for males in the use of services in their enrolled practice – but not in terms of services used outside of their enrolled practice - where males with 2+ conditions had the same level of service use outside their enrolled practice as males with no chronic condition.

Service use outside of the enrolled practice setting

Age standardised consult rates per 100 enrolled by gender, ethnic grouping and presence of a chronic condition showed, in general, that while those with chronic conditions used a considerably higher level of services in their enrolled practice this did not carry forward to using a higher level of services outside of the enrolled practice. The general finding was instead that those with a chronic condition often had similar levels of service use outside their enrolled practice than those without a chronic condition. That said however, of interest was that Māori Pacific males with a chronic condition used a lower level of services outside the enrolled setting than their counterparts without a chronic condition. For females of both ethnic groups the opposite was true – those with chronic conditions used more care outside of their enrolled practice.

Those with chronic conditions using the highest level of services outside of the enrolled practice were males resident in the Waikato District (92 consults per 100 enrolled) followed by females resident in Hamilton City (40 consults per 100 enrolled) and Hamilton City males (28 per 100 enrolled). The lowest levels were for males in Thames Coromandel and Hauraki Districts (combined) with eight consults per 100 enrolled.

The number of chronic conditions present

Using direct age standardisation those with one chronic condition used a higher level of services than those without a chronic condition, and those with two or more conditions used a higher level of services than those with one condition. Overall, females (at the Pinnacle MHN level) with two or more conditions used the highest level of services with an age standardised rate of 735 consults per 100 enrolled

people in the general practice setting and 757 consults per 100 enrolled people in terms of total general practice services.

There were also differences in age standardised utilisation rates between TA sub-populations with one or more chronic conditions. Females in the South Waikato District used the highest level of services in enrolled practice at 989 consults per 100 enrolled people. For males, those also in the South Waikato District used the highest level of services in the enrolled practice at 743 consults per 100 enrolled.

Proportion of care delivered in the enrolled practice setting

Using the level of 95 per cent as the threshold (as in Chapter Six), the vast majority of total general practice care was delivered to those with chronic condition in their enrolled practice. At the Pinnacle MHN level, across all age groups 95 per cent or more of all general practice health care was delivered in the general practice setting for individuals with chronic conditions. At the TA level there were a few differences found. There were two TAs where the proportion of general practice care delivered in enrolled practice was below 95 per cent for some population groups. These were males and females aged 0-44 years and females aged 85+ in Hamilton City and males aged 0-44 resident in the Waikato District (all being geographically closer to 24/7 A&M and ED services in Hamilton City).

Other findings – VLCA funding, type of chronic condition and geography

Although not part of the original research hypotheses (partly due to the data not before being available for analysis) data were able to be disaggregated to look at the effects of VLCA funding, the type of chronic condition and geography of patient residence. Some summary comments can be made concerning these variables in relation to individuals with one or more chronic conditions. These include;

VLCA compared with non-VLCA practices

Results concerning the practice funding type were interesting. Individuals with one or more chronic conditions enrolled in a VLCA practice used a higher level of services in their enrolled practice than those in a non-VLCA practice. For those with no condition, all groups in VLCA funded practices used a higher level of services in their enrolled practice (and total services). However, all those enrolled

in non-VLCA practices used a higher (sometimes only marginally higher) level of services outside their enrolled practice.

Other males with no chronic conditions enrolled in non-VLCA funded practices used the highest level of general practices services outside the practice (64 consults per 100 enrolled individuals). The next highest rate of service use were Other females with one or more chronic conditions enrolled with non-VLCA practices (35 consults per 100 enrolled). Although use of services outside the enrolled practice was higher in those enrolled in non-VLCA funded practices, for many groups it was only marginally higher (Other males without a condition, as noted above, were perhaps somewhat of an exception).

Service use levels by type of chronic condition

It is difficult to make anything more than general comments on service use by type of condition. The main reason for this is that it is unknown how long individuals have had their particular condition(s) and disease severity is also unknown. However, it can be noted that the type of chronic condition alongside the practice funding type made a difference in some population groups. Across all the four chronic conditions, age standardised rates of use in enrolled practice were higher for all groups enrolled with VLCA practices. Conversely, generally - but not across the board - age standardised use outside of the enrolled practice were higher for those enrolled in non-VLCA practices. However, for males with diabetes, utilisation rates outside the practice were the same for those in VLCA and non-VLCA funded practices. Particularly higher total levels of service use were found for VLCA males with heart failure (1,018 consults per 100 enrolled), VLCA females with COPD (849 per 100 enrolled), VLCA females with ischaemic heart disease (847 per 100 enrolled) and VLCA females with diabetes (845 per 100 enrolled).

Geography of patient residence

There were considerable differences in service use when data were disaggregated by TA of residence. South Waikato residents had the highest level of use in both male and female groups, this was built on the back of service use in the enrolled practice rather than high levels of outside service use. Males resident in the Waikato

District had the highest level of service use outside of their enrolled practice at 92 consults per 100 enrolled individuals, this was followed by females resident in Hamilton City on 40 consults per 100 enrolled people. The lowest level of total service use was for males resident in Waipa – with total service use of 449 consults per 100 enrolled.

7.10 Discussion

Being able to compare service use patterns of those individuals with chronic conditions and those without across the sector has not been undertaken before for Pinnacle MHN enrolled individuals. This knowledge can play an important step in planning for the future where demand for chronic care management will place significant and increasing demands on general practice.

As hypothesised, those with one or more chronic conditions used a higher level of services in their enrolled practice than their same age counterparts without any of the four selected conditions. But while people with chronic conditions were using a higher level of services in their enrolled practice, males were not using a higher level of care outside the enrolled setting than their counterparts without a chronic condition - while females, both Māori Pacific and Other were. This was an interesting finding and is not what was originally hypothesised. Why might this be the case? There is no doubt a mix of reasons, including the 'Hamilton and Waikato' effect – where an earlier finding of this study was concerning the high use of A&M and ED services for males resident in Hamilton City and the Waikato District (those two populations combined make up a considerable portion of the male study population). In addition there will be the effect of practice funding type. As noted earlier - individuals with one or more chronic conditions enrolled in a VLCA practice used a higher level of services in their enrolled practice than those in a non-VLCA practice. For those with no chronic condition, all groups in VLCA funded practices used a higher level of services inside their enrolled practice (and total services). However, all those enrolled in non-VLCA practices used a higher (sometimes only marginally higher) level of services outside their enrolled practice.

These results are essentially a good news story for Pinnacle MHN affiliated general practices. The good news is that those with chronic conditions are receiving the vast majority of their health care in their enrolled practice. This is arguably best for the individual (continuity of care) and good for the system in terms of funding efficiency, although it is not known what the cost of an ED presentation really is compared to the cost of the same care delivered in general practice. While general practice is doing well on this front at present, the coming challenges of an ageing population, more individuals with a chronic conditions (or co or multi morbidities) and workforce capacity issues on the horizon (or already in some locations), keeping doing this well may be a challenge. Ensuring this positive finding can continue into the future will need collaboration across the sector. The MoH (and DHBs) in their key strategic documents acknowledge the increasing need to work outside of sector silos alongside the needed increase in collaboration with Māori and Pacific providers and with service users. This increased collaboration will be required at all phases, including planning, funding and service delivery aspects (this is further considered in Chapter Ten: Discussion).

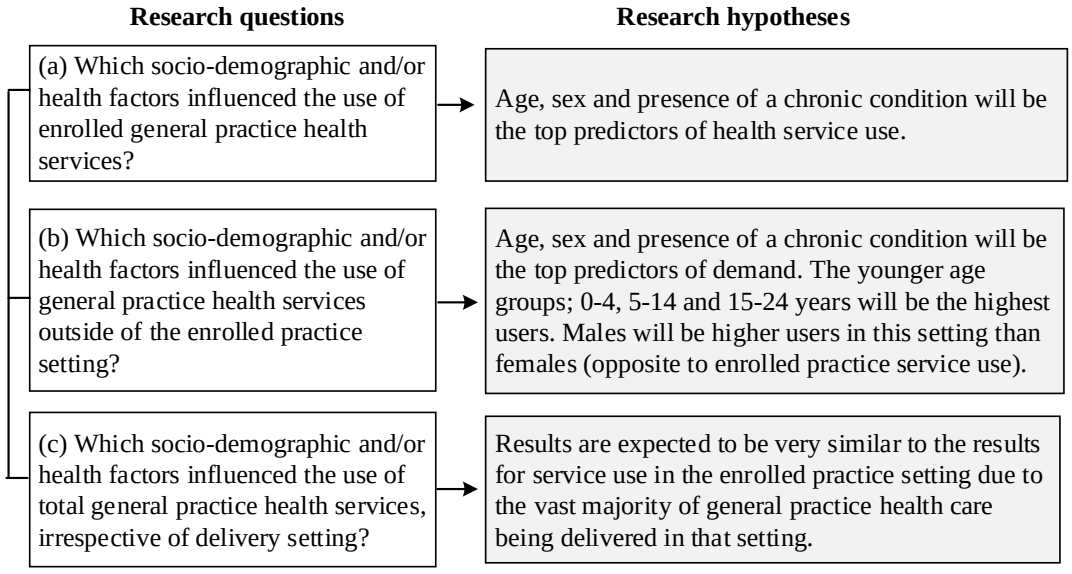
Like the previous chapter, the knowledge contribution concerning the service use of those with chronic conditions contributes to the wider service use questions posed by Downs (2017), particularly around disease burden, service use in the enrolled setting and outside of it. There is scope for further research in this space and the findings presented here could provide a basis for further work of benefit to Pinnacle MHN in its function as a PHO. An interesting area to study would be the drivers of utilisation variance at the sub-regional level between general practices.

8 Results - Demographic and Health Factors in Service Use

8.1 Introduction to the statistical modelling

This chapter presents the results of negative binominal regression modelling of the independent socio-demographic and health variables expected to influence general practice service use. A series of regression models were developed to test the research questions and aligned hypotheses. The stated objective, research questions and aligned hypotheses for this chapter were:

<u>Objective four</u>: Establish the socio-demographic and/or health factors that had the most influence on the utilisation of general practice services, both within and outside of the enrolled general practice setting, in the baseline period of 1 April 2013 to 31 March 2014.



Having established the levels and patterns of general practice service use in the enrolled practice setting, outside of it and for total services used, the study moved to looking at which independent factors or variables were of most importance in the 2013/14 baseline levels in each service delivery setting. The dependent variable was the count of general practice services used (in each of the two identified delivery settings and the combined total).

The eight independent socio-demographic and health factor variables tested were detailed in Chapter Four while Chapter Three presented Andersen's conceptual model of health services use. Those chapters described the use of the model (and adaption) to use for this study including the available Pinnacle MHN administrative data (and constructed variables). The eight variables were a mix of independent socio-demographic and health factors, shown in Andersen's original categories of 'pre-disposing characteristics', 'enabling resources' and 'need' factors.

Given the nature of the administrative data, there was no information available on the 'decision on where to access care' portion of the pathway towards a general practice consult occurring (regardless of the delivery setting). Andersen's model is used in this section to as a framework to present and describe the key results from the regression modelling. It is important to note that the construction of the data set and inclusion of independent variables was undertaken being cognisant of the concerns raised by Babitsch et al. (2012, p. 14) in their systematic review of studies published using Andersen's behavioural model of health services use over the period 1998-2011. They concluded that;

> "…it is nearly impossible to identify the factor having the "strongest influence" on health services utilisation. Even for age, a seemingly simple indicator of service utilisation, the findings show inconsistencies in the strength and direction of this association. Since none of the studies used complex statistical methods, such as the testing of multivariate models, it is impossible to adequately assess the correlations between the examined variables. Therefore the explanatory power of the results is restricted and is often limited to single indicators".

The development of the study dataset and construction of variables was done with the intention of being able to test using regression modelling using both univariate and multivariate analysis. As noted in Chapter Four (Research Methods), the Pinnacle MHN data was best suited to negative binomial regression modelling. However, Babitsch et al. (2012) also advocate for other complex statistical models such as path analysis that adequately reflect the complexity inherent in Andersen's model of health service use (this could be a future step).

Statistical modelling was undertaken by the geographical residence of the enrolled individual – at the TA level. The geography of residence was used rather than the geographic location of the enrolled general practice as Statistics New Zealand population estimates and projections are based on geographical residence. Results presented in Chapter Five (Establishing the study population) are noted, in particular the level of cross border flow between the TA of residence of an individual and the TA in which their enrolled practice was physically located. Cross border flows were high for those resident in the Waikato District with just under half (49.5 per cent) enrolled with a practice located in Hamilton City.

Three negative binominal regression models were run in each of the ten geographical areas and at the combined Pinnacle MHN level (33 models overall). As in previous results there three models were:

(1) For general practice consults delivered in the enrolled practice setting.
(2) For general practice consults delivered outside of the enrolled practice setting (in A&M and in the ED setting).
(3) For the total count of general practice services delivered, irrespective of delivery setting.

In addition, the ten TAs were categorised into binary 'rural' and 'urban' categories, providing an additional six models. This categorisation was based on the results of the cross border flows (noted above). The 'urban' category consisted of 120,740 individuals resident in Hamilton City (where 97.9 per cent were enrolled in a practice physically located within the city boundary) and individuals resident in the Waikato District, where 41.8 per cent were enrolled in a practice located in that same District, but 49.5 per cent were enrolled in a practice physically located in Hamilton City. This was not the case for the Waipa District although like the Waikato District it shares a border with Hamilton City. In Waipa 10.2 per cent of residents were enrolled in a Hamilton City practice and 88.7 per cent were enrolled in a practice within their home TA. The remaining eight TAs were classed as 'rural' for the purposes of this analysis as the majority of the 114,922,residents were enrolled in a practice in their home TA or another TA outside of Hamilton City and the Waikato District.

8.2 Predictors of general practice service use - overview

The characteristics of the study population, by geographic area of residence are shown in Table 8.1. In the people and practice related variables across the TAs there are some important differences to note in terms of understanding the context of the results of the regression modelling, for both the univariate and multivariate analysis.

Pre-disposing characteristics – gender, ethnic group and age group

Most of the TAs had more females than males (Hamilton 53 per cent females to 47 per cent males and Ōtorohanga District[35] with 49 per cent and 51 per cent female/male respectively were the range). The proportion of enrolled Māori Pacific individuals compared with Other showed a higher level of difference. The Matamata Piako District had the lowest proportion of Māori Pacific individuals at 10 per cent and South Waikato District the highest at 46 per cent.

Age group is the third predictor variable in the set of 'predisposing characteristics'. Looking at the aggregated urban/rural categories, the rural category has an older age structure evident with a total of 19 per cent of individuals aged 65+ years compared with 14 per cent of those in the urban category (being dominated by Hamilton City). By TA, the Thames Coromandel District had the highest proportion aged 65+ at 30 per cent followed by its neighbour Hauraki District at 22 per cent. At the other end of the range Hamilton City, Ōtorohanga and Waikato Districts all had 14 per cent of their enrolled population aged 65+ years.

Enabling resources – community services card and practice funding type

Both of the indicators used to study the effects of enabling resources on service use are essentially political constructs and may be subject to change in the future. In the lead up to the 2017 general election there were renewed calls in the general practice sector for a review of funding and the Labour led government has committed to such a review[36].

There was a high level of variance in the proportion of enrolled people who held a CSC. The highest proportions with a CSC were in South Waikato and Ruapehu

[35] There are male prison populations in both Ōtorohanga and Waikato Districts. Males in prison facilities are 'enrolled' with the Department of Corrections and are not on a general practice register – although in some cases a general practice may be contracted to provide services.

[36] https://www.nzdoctor.co.nz/article/news/green-light-minister-primary-care-led-funding-review

Districts with 34 per cent and 30 per cent respectively. Those with the higher proportions not holding a CSC were Waikato and Waipa Districts at 85 per cent.

Practice funding type is the second 'enabling resource' predictor variable and a binary category – individuals are either enrolled in a VCLA or non-VCLA funded practice. The difference is about the financial cost to the patient of a consult, with a VLCA practice costing a patient around $17.50 (adult) for a GP consult compared with up to around $50 for an enrolled adult in non-VLCA funded practices (in 2013/14). Almost all residents in the Hauraki District (100 per cent when rounded, 99.8 per cent unrounded) were enrolled in non-VLCA practices, followed by Matamata-Piako District residents on 98 per cent. At the other end of the scale 99 per cent of residents in Ruapehu District and 98 per cent in Waitomo District were enrolled in a VLCA funded practice. Note that this does not necessarily mean those people are enrolled in VLCA practices in those Districts – there is a percentage of individuals who cross administrative boundaries between their geographical residence and the geographical location of the general practice they are enrolled in (see findings on flows in Chapter Five: Establishing the study population).

Need – high needs (MoH defined) and presence of a chronic condition

The 'high needs' category is MoH defined as being all Māori, all Pacific and all those from the Other population who are resident in a quintile five area. Quintile 5 is an aggregation of NZDep deciles 9 and 10 (equating to the 20 per cent most deprived geographical areas – this is relative and deciles are measured at the national level rather than within each TA). The range within TAs of those coded as high needs was 16 per cent of residents in the Waipa District to 67 per cent of residents in the South Waikato District.

The second predictor variable in the Need category was presence of a chronic condition. The presence of one or more chronic conditions had a range of nine per cent in Waikato, Waipa and Ōtorohanga Districts to 16 per cent in Thames Coromandel District. This in itself was not unexpected given the age structure of the enrolled population resident in those TAs.

Table 8.1 Characteristics of the study population

			Geographical area of residence (Territorial Authority)											Urban/Rural	
			Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	Female	53%	51%	51%	49%	50%	51%	51%	51%	52%	50%	52%	53%	51%
		Male	47%	49%	49%	51%	50%	49%	49%	49%	48%	50%	48%	47%	49%
	Ethnic group	Māori Pacific	17%	12%	10%	26%	32%	46%	12%	16%	11%	37%	17%	17%	18%
		Other	83%	88%	90%	74%	68%	54%	88%	84%	89%	63%	83%	83%	82%
	Age group	0-4 years	6%	5%	6%	6%	6%	6%	4%	5%	5%	6%	6%	6%	5%
		5-14 years	13%	13%	14%	16%	14%	15%	11%	16%	14%	17%	14%	14%	14%
		15-24 years	15%	12%	13%	14%	12%	15%	9%	12%	13%	14%	13%	14%	13%
		25-44 years	27%	18%	22%	22%	19%	22%	17%	23%	22%	22%	23%	26%	21%
		45-64 years	25%	30%	27%	27%	30%	26%	30%	29%	28%	27%	27%	26%	28%
		65-74 years	8%	13%	10%	9%	12%	10%	17%	9%	10%	9%	10%	8%	11%
		75-84 years	4%	7%	6%	4%	6%	5%	9%	4%	6%	4%	5%	4%	6%
		85+ years	2%	2%	2%	1%	2%	1%	4%	1%	2%	2%	2%	2%	2%
Enabling Resources	Community Services Card	No	82%	77%	82%	80%	70%	66%	75%	85%	85%	77%	81%	82%	80%
		Yes	18%	23%	18%	20%	30%	34%	25%	15%	15%	23%	19%	18%	20%
	Practice funding	non-VLCA	73%	100%	98%	32%	1%	6%	90%	56%	93%	2%	71%	69%	73%
		VLCA	27%	0%	2%	68%	99%	94%	10%	44%	7%	98%	29%	31%	27%
Need	High needs (MoH)	No	70%	79%	82%	65%	49%	33%	77%	73%	84%	48%	72%	71%	73%
		Yes	30%	21%	18%	35%	51%	67%	23%	27%	16%	52%	28%	29%	27%
	Chronic condition	No	90%	87%	88%	91%	86%	86%	84%	91%	91%	90%	89%	90%	88%
		Yes	10%	13%	12%	9%	14%	14%	16%	9%	9%	10%	11%	10%	12%
	TOTAL (N)		92,546	7,779	16,414	7,840	4,613	9,772	18,370	28,194	42,419	7,719	235,666	120,740	114,922

8.3 Predictors of general practice service use – univariate analysis

Findings from the univariate regression models are presented as adjusted rate ratios for the modelled independent variables in Table 8.3 for service use in enrolled practice, Table 8.4 for service use outside of enrolled practice and Table 8.5 for total general practice service use. The model results are described here using Andersen's model of health care use as a framework.

Pre-disposing characteristics – gender, ethnic group, age group and geography

The effect of gender

Females were the reference category (females=1). At the Pinnacle MHN level males accessed 17 per cent less (0.83, p<0.01) care in the enrolled general practice in the baseline year (Table 8.3). Across all TA areas and urban and rural categories female residents used a higher level of services in the enrolled setting than males, however, there was spatial variation. In terms of the range of results; in Hamilton City males used 25 per cent fewer services (0.75, p<0.01) than Hamilton City females and in both Matamata Piako and Ōtorohanga Districts some 13 per cent less (0.87, p<0.01). For urban and rural categories, males used 24 per cent (0.76, p<0.01) and 19 per cent (0.81, p<0.01) fewer services respectively.

The picture is quite different regarding for service use outside the enrolled setting (Table 8.4). At the Pinnacle MHN level males used two per cent (1.02, p=ns) more services than females - but this was not statistically significant. Again there were spatial differences. In five TAs male use of these services were higher than that of females, but this was not always statistically significant. Matamata Piako District males used a higher level services (1.14, p<0.01) as did males resident in Hamilton City (1.03, p<0.05). Conversely, in Ruapehu District males used 20 per cent less services outside of their enrolled practice and this was a significant result (0.80, p<0.05). Males in the urban category used a higher level of services (1.03, p<0.05), driven by the Hamilton City result, while the result for males in the rural category was essentially the same as the female reference category (1.01, p=ns).

Results for total general practice services used were similar to those for enrolled practice results (given that the vast majority of care occurred in the enrolled setting).

All results here (TAs and the urban/rural split) were statistically significant at the p<0.01 level – with males having 20 per cent fewer consults than females at the Pinnacle MHN level. Overall the Ruapehu District had the highest disparity in the level of service use between males and females (0.76 or 24 per cent less followed by Hamilton City at 0.78 or 22 per cent less), with Matamata Piako having the least 'gap' at 0.84 (16 per cent less). In terms of the urban and rural categories, at the total level males in urban areas used 22 per cent less services (0.78, p<0.01) and rural males 18 per cent less (0.82, p<0.01).

The effect of ethnic group

Those of Other ethnicity were the reference group. At the Pinnacle MHN level Māori Pacific individuals used 15 per cent (0.85, p<0.01) fewer services in the enrolled setting. Across all TAs, the Māori Pacific population used less general practice care than Others - however these results were only statistically significant in three of the ten TAs. Comparative levels were lowest in South Waikato (0.81, p<0.01) whereas comparatively the highest in Waitomo and Thames Coromandel Districts, both at 0.89 (p<0.01). In the urban/rural categories the Māori Pacific population used a lower level of services than their Other counterparts at 0.86 (p<0.01) and 0.83 (p<0.01) respectively.

For services outside the enrolled practice the Māori Pacific population used a lower level of services in eight of the ten TAs but these results were not statistically significant in five of those eight results. At the Pinnacle MHN level, Māori Pacific individuals used 23 per cent fewer services 0.77 (p<0.01) compared with Others. Results in Hamilton City, Ōtorohanga and Waipa Districts were statistically significant, with Māori Pacific individuals having used 17 per cent (p<0.01), 28 per cent (p<0.05) and 19 per cent (p<0.05) fewer consults respectively. There were two TAs (South Waikato and Waitomo District residents) where Māori Pacific population results were for comparatively higher service use than the Other reference category, but neither result was statistically significant.

In terms of total general practice services, those of Māori Pacific ethnicity used fewer general practice services than Others in all of the ten TAs, with this being statistically significant in nine of those TAs (the exception being for residents of

the Ruapehu District). The range was from 0.82 ($p<0.01$) in the South Waikato District to 0.90 ($p<0.01$) for those resident in the Waitomo District. At the Pinnacle MHN level, Māori Pacific individuals used 16 per cent (0.84, $p<0.01$) fewer general practice health care services in the baseline year. The urban and rural results were 0.86 ($p<0.01$) and 0.83 ($p<0.01$) respectively.

The effect of age

Those aged 25-44 years were the reference group. For Pinnacle MHN, the reference group used a lower level of service in their enrolled practice than those aged 0-4 years (1.67, $p<0.01$) and all of the older age groups (from 1.36 to 2.17, all statistically significant at $p<0.01$). Those aged 5-14 and 15-24 years used a lower level of services than the reference group - these Pinnacle MHN level patterns generally held true across all the TAs, although there were some difference in levels and one anomaly. In Matamata Piako District those aged 5-14 years used slightly less (0.98) services than the reference group but this was not statistically significant (the anomaly being the non-significant nature of the result).

An interesting result was the service use of the elderly (85+ years) in comparison to the reference group and those aged 75-84 years. Across eight of the TAs the level of service use for those aged 85+ was equal to, or less than, those aged 75-84 years (less than in five TAs as well as at the Pinnacle MHN level). While there was no research hypothesis about the service use of those aged 85+ years it was generally expected that this oldest age group would have utilised a higher level of services than those aged 75-84 years. This was not always the case when both groups are compared to the reference group. At the urban/rural level, those aged 85+ used fewer services in enrolled practice than those aged 75-84 years in the urban category and results between these groups were similar in the rural category. One possible reason for this could be selection bias, in that within the 85+ population many individuals with high levels of morbidity have already died.

The situation regarding service use outside of the enrolled setting was quite different than that in the enrolled setting. Those aged 0-4 years used a higher level of services, often a lot higher, but this time so did those aged 5-14 years and 15-24 years (though this was not uniformly significant across all TAs). At the Pinnacle

MHN level those aged 0-4 years used a much higher level (4.11, $p<0.01$) of general practice services than the reference group (driven by the Hamilton City results) with those aged 5-14 years using 71 per cent more services and those 15-24 years some 35 per cent more general practices services outside of the enrolled setting. The results for those aged 85+ years compared to the reference group (and the 75-84 year olds) was interesting – where across all TAs those in the oldest age group used more services. These patterns carried through to the urban and rural categories also.

For total general practice services, some clear patterns emerged. Compared to the reference group (25-44 years), across all TAs those aged 0-4 years old used a higher level of services – ranging from South Waikato (1.36, $p<0.01$) to Matamata Piako (2.38, $p<0.01$) and Pinnacle MHN (2.15, $p<0.01$). Across all TAs (and urban/rural categories) those aged 5-14 years and 15-24 years used a lower level of services than the reference group. Those older than the reference group used a higher level of services across all TAs, at the Pinnacle MHN level and in the urban and rural categories. As mentioned prior in the enrolled practice setting results – those aged 85+ years often had a similar or lower level of service use than those aged 75-84 years (when both were compared to the reference group).

Enabling resources – community services card and practice funding type

The effect of holding a community services card (CSC)

Those individuals with a CSC were the reference category. For services delivered in the enrolled setting across all TAs those without a CSC used a lower level of services (all results, including Pinnacle MHN level and urban/rural categories were significant at the $p<0.01$ level). The range was from 22 per cent less (0.78) in the Thames Coromandel District to ten per cent less (0.90) in Ruapehu District. The Pinnacle MHN result was 17 per cent fewer services (0.83) for those without a CSC.

Results for service use outside of the enrolled setting were again quite different, with mixed results across the TAs. At the Pinnacle MHN level those without a CSC used a higher level of services – some 11 per cent more (1.11, $p<0.01$). Results were not statistically significant in four TAs (Hauraki, Matamata Piako, Ōtorohanga and Waitomo Districts). There were two 'opposing' results with Hamilton City, Waikato and Waitomo District residents without CSC cards using significantly

more services (1.06, 1.26 and 1.18 respectively, all at p<0.01) outside their enrolled practice and residents of Ruapehu, South Waikato and Thames Coromandel Districts without CSC cards using significantly less services (at 0.74, 0.78 and 0.75, all p<0.01).

Total general practice service use results were similar to those for use in enrolled setting. The Pinnacle MHN level result showed that those without a CSC used 16 per cent fewer services (p<0.01). The results for the urban and rural categories were along the same lines with urban residents without a CSC using 13 per cent less services (0.87, p<0.01) and rural residents 18 per cent less (0.82, p<0.01).

The effect of practice funding type

Those enrolled in a VLCA funded practice were the reference category. There were three Districts with smaller numbers of residents in either the reference category or non-VLCA category (note that for all residents, given 'boundary crossing' the TA of residence is not necessarily the same TA as where their enrolled practice is physically located). Results for Hauraki and Ruapehu District residents are noted here as there are smaller numbers in one of the two categories (see Table 8.2).

Table 8.2 Numbers enrolled in VLCA practices by TA of residence

TA of residence	**Enrolled in a VLCA practice**	**Enrolled in a non-VLCA practice**
Hamilton City	27,457	65,089
Hauraki	29	7,750
Matamata Piako	261	16,153
Ōtorohanga	5,356	2,484
Ruapehu	4,581	32
South Waikato	9,197	575
Thames Coro	1,775	16,595
Waikato	12,476	15,718
Waipa	2,894	39,525
Waitomo	7,555	164
Pinnacle MHN	**69,291**	**166,375**
Urban	**35,025**	**85,715**
Rural	**31,648**	**83,274**

For those resident in Hauraki District there were 29 residents enrolled in a VLCA practice compared with 7,750 enrolled in a non-VLCA practice, for Ruapehu District residents the situation was reversed with 32 enrolled in a non-VLCA

practice and 4,581 enrolled in the VLCA practice. In the negative binomial regression modelling however, there were enough individuals in those categories to run the model successfully (however, the results have wider confidence intervals).

For service use in the enrolled practice there were statistically significant results for seven of the ten TAs, and in all of these seven TAs those enrolled in a non-VLCA practice used a lower level of services. The range was 43 per cent less for residents of Waitomo (0.57, $p<0.01$), 42 per cent less (0.58, $p<0.01$) for South Waikato and Ruapehu Districts (0.58, $p<0.05$) compared with 11 per cent less for Hamilton City residents (0.89, $p<0.01$). At the Pinnacle MHN level those enrolled in a non-VLCA practice used 16 per cent (0.84, $p<0.01$) fewer services. The result for all urban residents was 18 per cent fewer services and rural 16 per cent fewer for those enrolled in a non-VLCA funded practice.

For general practice services outside of the enrolled practice there was an almost opposite picture. At the Pinnacle MHN level those in non-VLCA practices used seven per cent (1.07, $p<0.01$) more services than the reference category. Most of the TAs with statistically significant results (seven) had results where those in non-VLCA practices used considerably more outside enrolled practice services – including Ōtorohanga residents (1.45, $p<0.01$), South Waikato (1.46, $p<0.01$) and Thames Coromandel residents (1.49, $p<0.01$). Residents in the Waipa District were somewhat of an anomaly using 31 per cent fewer services (0.69, $p<0.01$) than those enrolled with VLCA funded practices. There was some difference between urban and rural category for this funding variable – for urban residents those in non-VLCA practices used ten per cent more services outside their enrolled practice compared with 16 per cent for rural residents (1.16, $p<0.01$). *The result for Ruapehu resident also appears to be an anomaly at 4.59, $p<0.01$ and it is noted that the intervals for Exp(B) are wide at 2.26 (lower) and 9.22 (upper)(not shown in Table 8.4). This will be a consequence of the smaller numbers enrolled in non-VLCA practices as noted in Table 8.2).*

For total general practice services the findings were similar to those for the services delivered in the enrolled setting. At the Pinnacle MHN level, those in a non-VLCA practice used 15 per cent fewer services that those in a VLCA funded practice (0.85,

p<0.01). Across all the TAs, all statistically significant results were for those in non-VLCA practices to use fewer services than those in the reference category. In Hamilton City the result for non-VLCA enrolled individuals was ten per cent fewer services used (0.90, p<0.01). Results for urban and rural residents were similar at 15 per cent fewer (0.85, p<0.01) and 14 per cent fewer (0.86, p<0.01) respectively.

Need factors – high needs (MoH defined) and presence of a chronic condition

The effect of 'high needs'

Individuals meeting the MoH criteria of high needs were the reference category. Six of the ten TAs had statistically significant results and in all of those residents defined as non-high needs used fewer services in the enrolled setting. The TA results ranged from non-high needs individuals resident in the Waikato District using 13 per cent (0.87, p<0.01) fewer services to those in Hamilton City using three per cent fewer (0.97, p<0.05). The result at the Pinnacle MHN level was significant (p<0.01) where non-high needs residents used eight per cent fewer services (0.92). For urban and rural residents, results were seven per cent fewer services (0.93, p<0.01) and 11 per cent fewer (0.89, p<0.01) respectively.

For those services accessed outside the enrolled practice setting only three TAs had statistically significant results, being residents of Ruapehu District where those who were non-high needs used 25 per cent (0.75, p<0.05) fewer services. The results were in the opposite direction for residents of Waikato District (1.52, p<0.01) and Waipa District (1.22, p<0.01). Results at the Pinnacle MHN level were not significant (showing equal levels of service usage).

For total general practice services the findings were very similar to those seen for service use in the enrolled practice. Six of the ten TAs had statistically significant results, all those being that non-high needs individuals used a lower level of services than the high needs reference group. Results at the Pinnacle MHN level and for rural and urban were all significant at seven per cent less (0.93, p<0.01), six per cent less (0.94, p<0.01) and nine per cent less (0.91, p<0.01) respectively.

The effect of having one or more chronic conditions

Those people coded with one or more chronic conditions were the reference category. All results regarding the level of services used in the enrolled practice were statistically significant ($p<0.01$). In every TA those with no chronic conditions used fewer services, for example, residents in Waitomo District without a chronic condition used 48 per cent (0.52) fewer services. The result at the Pinnacle MHN level was that those without a chronic condition used 39 per cent (0.61) less consults.

Outside the enrolled practice the findings were generally similar in that almost across the board all residents without chronic conditions used significantly fewer services. Hauraki District residents had the only result that was not statistically significant (0.79, $p>0.05$t). At the Pinnacle MHN level those without chronic conditions used 30 per cent fewer services (0.70, $p<0.01$). There was some difference between urban residents (0.77, $p<0.01$) and rural residents (0.61, $p<0.01$).

For total services used the results were again very similar to those for services used in the enrolled setting. All results were statistically significant at $p<0.01$. Waitomo residents without a condition used 42 per cent (0.58) fewer services and those resident in Waipa 38 per cent fewer (0.62). At the Pinnacle MHN level those without a condition used 39 per cent less (0.61) services. Results for urban and rural residents with no conditions were very similar, having used 39 per cent fewer (0.61) and 38 per cent fewer (0.62) respectively.

Table 8.3 Negative binomial regression model one: consults delivered in enrolled general practice, adjusted odds ratio.

			Geographical area of residence (Territorial Authority)											Urban/Rural	
			Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	Female	1	1	1	1	1	1	1	1	1	1	1	1	1
		Male	0.75**	0.82**	0.86**	0.86**	0.77**	0.85**	0.83**	0.80**	0.79**	0.82**	0.83**	0.76**	0.81**
	Ethnic group	Other	1	1	1	1	1	1	1	1	1	1	1	1	1
		Māori Pacific	0.88**	0.87*	0.84**	0.87**	0.93	0.81**	0.89**	0.83**	0.85**	0.89**	0.85**	0.86**	0.83**
	Age group	0-4 years	2.11**	2.21**	2.33**	1.72**	1.50**	1.33**	1.69**	1.90**	2.30**	1.69**	1.67**	2.06**	1.97**
		5-14 years	0.81**	0.84**	0.98	0.83**	0.63**	0.58**	0.70**	0.82**	0.95*	0.78**	0.78**	0.82**	0.83**
		15-24 years	0.92**	0.69**	0.89**	0.76**	0.56**	0.63**	0.68**	0.78**	0.93**	0.67**	0.68**	0.87**	0.78**
		25-44 years	1	1	1	1	1	1	1	1	1	1	1	1	1
		45-64 years	1.33**	1.37**	1.45**	1.37**	1.52**	1.45**	1.41**	1.31**	1.36**	1.37**	1.36**	1.33**	1.46**
		65-74 years	1.97**	2.05**	2.18**	2.00**	2.20**	1.97**	2.14**	1.98**	2.04**	1.85**	1.84**	1.99**	2.14**
		75-84 years	2.25**	2.56**	2.68**	2.38**	2.44**	2.22**	2.49**	2.42**	2.56**	2.16**	2.17**	2.23**	2.55**
		85+ years	2.22**	2.82**	2.82**	2.39**	2.31**	2.08**	2.31**	2.39**	2.65**	2.06**	2.09**	2.16**	2.53**
Enabling Resources	Community Services Card	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.86**	0.87**	0.86**	0.86**	0.90**	0.85**	0.78**	0.85**	0.82**	0.83**	0.83**	0.85**	0.81**
	Practice funding	VLCA	1	1	1	1	1	1	1	1	1	1	1	1	1
		non-VLCA	0.89**	1.08	1.08	0.62**	0.58*	0.58**	0.86**	0.74**	0.98	0.57**	0.84**	0.82**	0.84**
Need	High needs (MoH)	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.97*	0.95	0.94	0.89*	0.90*	0.98	0.93**	0.87**	0.98	0.91*	0.92**	0.93**	0.89**
	Chronic condition	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.60**	0.65**	0.65**	0.60**	0.59**	0.61**	0.64**	0.59**	0.66**	0.58**	0.61**	0.59**	0.62**
	Goodness of fit	Pearson Chi-Square	0.931	0.841	0.815	0.882	0.789	0.900	0.898	0.835	0.910	0.789	0.913	0.911	0.93
	Omnibus Test	Likelihood ratio chi-square	15589.52	1646.50	3363.56	1826.49	1399.15	2945.29	4866.43	5878.58	6942.07	1616.87	48006.20	21263.06	26125.29
		df	13	13	13	13	13	13	13	13	13	13	13	13	13
		Sig.	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	** = p<0.01; *= p<0.05; N=235,666														

Table 8.4 Negative binomial regression model two: consults delivered outside enrolled general practice, adjusted odds ratio.

			Geographical area of residence (Territorial Authority)											Urban/Rural	
			Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	Female	1	1	1	1	1	1	1	1	1	1	1	1	1
		Male	1.03*	0.82	1.14**	1.06	0.80*	0.99	0.96	1.03	1.05	0.96	1.02	1.03*	1.01
	Ethnic group	Other	1	1	1	1	1	1	1	1	1	1	1	1	1
		Māori Pacific	0.83**	0.88	0.90	0.72*	0.92	1.04	0.88	0.96	0.81*	1.26	0.77**	0.85**	0.84**
	Age group	0-4 years	4.84**	2.55**	3.40**	1.83**	4.44**	2.81**	2.09**	3.31**	3.24**	1.08	4.11**	4.55**	3.02**
		5-14 years	1.90**	1.13	1.43**	1.44**	2.21**	1.04	1.05	1.92**	1.64**	0.87	1.71**	1.88**	1.47**
		15-24 years	1.27**	1.44	1.57**	1.73**	1.10	1.48**	1.34*	1.48**	1.56**	1.22	1.35**	1.31**	1.53**
		25-44 years	1	1	1	1	1	1	1	1	1	1	1	1	1
		45-64 years	0.86**	0.76	0.81**	0.72**	0.75	0.73*	0.80*	0.86**	0.80**	1.07	0.78**	0.85**	0.76**
		65-74 years	0.85**	0.54*	0.55**	0.54**	1.13	0.76	0.98	0.96	0.70**	1.51**	0.71**	0.86**	0.66**
		75-84 years	0.95	1.59	0.85	1.06	1.22	0.97	1.89**	1.06	0.80**	2.73**	0.88**	0.95	1.01
		85+ years	1.45**	3.25**	1.62**	2.58**	3.64**	1.22	3.69**	1.83**	1.53**	3.45**	1.56**	1.49**	1.97**
Enabling Resources	Community Services Card	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	1.06**	1.01	1.11	0.88	0.74**	0.78**	0.75**	1.26**	1.18**	1.04	1.11**	1.08**	1.04
	Practice funding	VLCA	1	1	1	1	1	1	1	1	1	1	1	1	1
		non-VLCA	1.04*	0.57	0.97	1.45**	4.59**	1.46**	1.49**	1.13**	0.69**	0.98	1.07**	1.10**	1.16**
Need	High needs (MoH)	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.98	0.86	1.16	1.04	0.75*	1.08	0.91	1.52**	1.22**	1.15	1.00	1.04*	1.16**
	Chronic condition	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.76**	0.79	0.84*	0.47**	0.45**	0.42**	0.48**	0.79**	0.78**	0.44**	0.70**	0.77**	0.61**
	Goodness of fit	Pearson Chi-Square	2.255	1.797	2.260	2.292	1.282	1.872	1.544	2.354	2.305	1.793	2.367	2.288	2.176
	Omnibus Test	Likelihood ratio chi-square	6572.82	71.71	544.55	176.82	273.84	162.26	665.84	1260.37	1147.86	232.75	10637.25	7646.59	2498.147
		df	13	13	13	13	13	13	13	13	13	13	13	13	13
		Sig.	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	** = p<0.01; *= p<0.05; N=235,666														

Table 8.5 Negative binomial regression model three: total general practice consults delivered, adjusted odds ratio.

			Geographical area of residence (Territorial Authority)											Urban/Rural	
			Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	Female	1	1	1	1	1	1	1	1	1	1	1	1	1
		Male	0.78**	0.82**	0.84**	0.83**	0.76**	0.83**	0.83**	0.82**	0.81**	0.82**	0.80**	0.78**	0.82**
	Ethnic group	Other	1	1	1	1	1	1	1	1	1	1	1	1	1
		Māori Pacific	0.87**	0.86*	0.84**	0.87**	0.92	0.82**	0.89**	0.83**	0.85**	0.90**	0.84**	0.86**	0.83**
	Age group	0-4 years	2.35**	2.22**	2.38**	1.71**	1.57**	1.36**	1.69**	2.00**	2.35**	1.67**	2.15**	2.27**	2.01**
		5-14 years	0.91**	0.84**	1.00	0.85**	0.67**	0.59**	0.71**	0.91**	0.99	0.78**	0.89**	0.91**	0.86**
		15-24 years	0.95**	0.71**	0.93*	0.79**	0.57**	0.64**	0.69**	0.83**	0.96	0.68**	0.87**	0.91**	0.81**
		25-44 years	1	1	1	1	1	1	1	1	1	1	1	1	1
		45-64 years	1.28**	1.36**	1.41**	1.35**	1.51**	1.44**	1.40**	1.28**	1.33**	1.36**	1.34**	1.28**	1.39**
		65-74 years	1.87**	2.03**	2.09**	1.95**	2.18**	1.95**	2.13**	1.90**	1.96**	1.84**	2.00**	1.88**	2.08**
		75-84 years	2.13**	2.54**	2.58**	2.34**	2.41**	2.20**	2.48**	2.32**	2.47**	2.17**	2.38**	2.19**	2.50**
		85+ years	2.15**	2.82**	2.75**	2.39**	2.36**	2.06**	2.34**	2.32**	2.58**	2.09**	2.37**	2.08**	2.51**
Enabling Resources	Community Services Card	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.87**	0.87**	0.87**	0.86**	0.89**	0.85**	0.78**	0.87**	0.83**	0.83**	0.84**	0.87**	0.82**
	Practice funding	VLCA	1	1	1	1	1	1	1	1	1	1	1	1	1
		non-VLCA	0.90**	1.06	1.08	0.67**	0.68	0.59**	0.86**	0.76**	0.95*	0.92*	0.85**	0.85**	0.86**
Need	High needs (MoH)	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.97*	0.95	0.95	0.89*	0.90*	0.98	0.93**	0.89**	0.99	0.92*	0.93**	0.94**	0.91**
	Chronic condition	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
		No	0.61**	0.65**	0.65**	0.60**	0.59**	0.61**	0.64**	0.60**	0.66**	0.58**	0.61**	0.61**	0.62**
	Goodness of fit	Pearson Chi-Square	0.909	0.884	0.812	0.884	0.792	0.896	0.895	0.828	0.907	0.796	0.899	0.892	0.899
	Omnibus Test	Likelihood ratio chi-square	13841.16	1617.61	3111.33	1718.01	1356.18	2859.65	4854.31	5058.82	6388.31	1608.51	43523.67	18716.024	24728.426
		df	13	13	13	13	13	13	13	13	13	13	13	13	13
		Sig.	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	** = p<0.01; *= p<0.05; N=235,666														

8.4 Predictors of general practice service use – multivariate analysis

The preceding section reported the results of difference in service use across delivery settings within each of the independent variables categories (univariate analysis). This section moves the analysis a step further by presenting the findings of multivariate analysis or effects at the model level.

The following provides a summary description of the results shown in Table 8.6 (enrolled setting), Table 8.7 (outside enrolled setting) and Table 8.8 (total general practice services). For all three multivariate models, run at the TA level and then for the aggregated categories of Pinnacle MHN, urban and rural, the independent variables have been ranked from one to seven based on the results of the negative binomial regression results. Data are presented this way for ease of analysis (see Appendix Three for the Wald chi-square and level of significance). In addition, the use of one asterisk signifies that the underlying result was statistically significant at the $p<0.05$ level and two asterisk that significance was at the $p<0.01$ level (presented this way to make a less cluttered results table).

Model one summary – general practice consults in the enrolled practice

Across all TAs the importance of two of the independent variables is immediately obvious, being age group (a 'predisposing characteristic' using Andersen's nomenclature from the model of health service use) and the presence of a chronic condition (a 'need' characteristic).

The following points summarise the multivariate findings regarding consults in the enrolled practice;

- Age group was the independent variable with the greatest effect on the count of consults in the enrolled practice across all ten TAs, at the Pinnacle MHN level and across both urban and rural categories.
- Presence of a chronic condition (a 'need characteristic') was the second most important independent variable for all categories <u>except</u> for residents of Ōtorohanga District where practice funding (an 'enabling resource') was ranked second, followed by presence of a chronic condition.

- For six of the ten TAs, Pinnacle MHN and the urban and rural categories, gender was the third ranked independent variable, all statistically significant at $p<0.01$ (as noted above residents of Ōtorohanga District were different). For the following districts, gender was ranked fourth and the third ranked independent variable is noted in brackets: South Waikato residents (practice funding), Thames Coromandel residents (CSC) and Waikato District residents (practice funding). The presence of the CSC and practice funding are both being 'enabling resources' in Andersen's model.
- Whether an individual held a CSC had mixed influence findings across the TAs and other aggregated categories. At the more significant end, in Thames Coromandel this was ranked third and ranked fourth in Hamilton City, Hauraki, Matamata Piako, Ruapehu, Waipa and Waitomo Districts (as well as for rural residents). Holding a CSC was ranked fifth in Ōtorohanga and Waitomo Districts as well as for Pinnacle MHN and those resident in urban areas.
- An individual's ethnic group was ranked either fifth or sixth (out of seven variables) for residents in all but one TA (as well as for Pinnacle MHN and both urban and rural categories). For those resident in the Ruapehu District the multivariate results from negative binomial regression did not show any level of statistical significance.
- For five of the ten TAs the high needs variable was ranked lowest but was still statistically significant (as well as for Pinnacle MHN and urban and rural categories). High needs was ranked sixth for residents in Ruapehu District but was not statistically significant (and so not shown in the Table) for residents of Hauraki, Matamata Piako, South Waikato and Waipa Districts.

Model two summary – consults outside of the enrolled practice

There are some similarities and some important differences between model two and model one. The similarities include;

- Age group being the most important independent predictor variable for consults outside of the enrolled practice setting – just as it was in model

one (and subsequently model three). This was the case across all TAs and aggregated categories. Age group was the only independent variable of statistical significance for those resident in the Hauraki District in terms of a predictor variable of general practice service use outside of an individual's enrolled practice setting.

- The presence of a chronic condition was also important in model two but not to the same extent as in model one. This independent variable was ranked second in six of the ten TAs and third in Matamata Piako and Waipa Districts. For residents in the Waikato District there was a difference – presence of a chronic condition was of equal importance as practice funding.
- In terms of third ranked variables across all TAs and aggregated categories there was spatial difference. At the Pinnacle MHN level ethnic group was ranked third (also in Hamilton City). However for Ōtorohanga and Ruapehu Districts, urban and rural categories ethnic group was the fourth ranked predictor variable.
- An individual's gender was ranked as third or fourth important predictor variable in model one but this did not translate through to model two to the same extent. For Matamata Piako District residents however, this was an exception as gender was the number two ranked predictor variable for service use outside the enrolled practice.
- The independent variable of high needs (as defined by the MoH and a 'need' variable in this adaption of Andersen's model) had mixed findings in model two, being ranked second for residents of the Waikato District, fourth in the aggregated rural category, fifth in both Ruapehu and Waipa Districts and seventh (last) for the aggregated urban category. It was not ranked – that is it was not statistically significant in all the other TAs or at the overall Pinnacle MHN level.

In the Waitomo District there were only two independent variables that were of statistical significance, being age group and presence of a chronic condition. For residents of Matamata Piako District there were three important independent variables; age group, gender and presence of a chronic condition (in that order). For

the urban and rural categories the top three predictor variables were the same (age group, presence of a chronic condition and gender). The fourth ranked was ethnic group for urban residents compared with high needs for rural residents (followed by ethnic group at fifth). For rural residents the predictor variables of gender and CSC were not statistically significant in model two.

Model three summary – total general practice consults

The results for total general practice were very similar to model one, given that the vast majority of general practice consults occurred in the enrolled setting.

There are three 'shifts' to report in terms of findings, that is the effects of model two (consults outside of the enrolled practice) being added to model one. Firstly, in the Ruapehu District there was a change in the 5th and 6th placed rankings (practice funding and high needs). In the total model findings, practice funding has dropped from the table and high needs moved from 6th ranked in model one to 5th ranking in the total consults model. Secondly, in the Waikato District the 5th and 6th placed independent variables in model one have swapped places in model three. Ethnic group has moved to fifth and holding a CSC moved to 6th (both remain statistically significant at $p<0.01$). The final shift was in the Waipa District where practice funding was unranked (and not statistically significant) in model one. In model three considering total consults, practice funding emerges as the sixth ranked variable ($p<0.05$).

Table 8.6 Multivariate analysis, model one: consults in enrolled general practice, independent variables ranked by importance

		Geographical area of residence (Territorial Authority)											Urban/Rural	
		Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	3**	3**	3**	4**	3**	4**	4**	4**	3**	3**	3**	3**	3**
	Ethnic group	6**	5*	5**	6**		5**	6**	6**	5**	6**	6**	6**	6**
	Age group	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**
Enabling resources	Community Services Card	4**	4**	4**	5**	4**	6**	3**	5**	4**	4**	5**	5**	4**
	Practice funding	5**			2**	5*	3**	5**	3**		5**	4**	4**	5**
Need	High needs (MoH)	7*			7*	6*		7**	7**		7*	7**	7**	7**
	Chronic condition	2**	2**	2**	3**	2**	2**	2**	2**	2**	2**	2**	2**	2**

** = p<0.01; *= p<0.05; N=235,666

Table 8.7 Multivariate analysis, model two: consults outside of enrolled general practice, independent variables ranked by importance

		Geographical area of residence (Territorial Authority)											Urban/Rural	
		Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	5=**		2**		5=**							6*	
	Ethnic group	3**			4*					6*		3**	4**	5**
	Age group	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**
Enabling resources	Community Services Card	4**				4**	3**	3**	3**	4**		4**	5**	
	Practice funding	5=**			3**	3**	4**	4**	4=**	2**		5**	3**	3**
Need	High needs (MoH)					5=**			2**	5**			7*	4**
	Chronic condition	2**		3**	2**	2**	2**	2**	4=**	3**	2**	2**	2**	2**

** = p<0.01; *= p<0.05; N=235,666

Table 8.8 Multivariate analysis, model three: total general practice consults, variables ranked by order of importance

		Geographical area of residence (Territorial Authority)											Urban/Rural	
		Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	3**	3**	3**	4**	3**	4**	4**	4**	3**	3**	3**	3**	3**
	Ethnic group	6**	5*	5**	6**		5**	6**	5**	5**	6**	6**	6**	6**
	Age group	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**
Enabling resources	Community Services Card	4**	4**	4**	5**	4**	6**	3**	6**	4**	4**	5**	5**	4**
	Practice funding	5**			2**		3**	5**	3**	6*	5**	4**	4**	5**
Need	High needs (MoH)	7*			7*	5*		7**	7**		7*	7**	7**	7**
	Chronic condition	2**	2**	2**	3**	2**	2**	2**	2**	2**	2**	2**	2**	2**

** = p<0.01; *= p<0.05; N=235,666

8.5 Summary and Discussion

In this section the results of the research questions and aligned hypotheses are summarised and aspects discussed. The discussion is based on whether the findings for this study population align with current knowledge (outlined in Chapter Three). There are two levels of findings reported under each research question and aligned hypothesis. Firstly, univariate findings (e.g. male compared with female as the reference category) and secondly, multivariate effects (age group compared with ethnic group for example). The univariate findings were described in the previous chapter using Andersen's model of health service use and the categories of; 'predisposing characteristics' (age group, gender, ethnic grouping and geography of residence); 'enabling resources' (cost of a consult/practice funding model and income/CSC) and 'need' (including the presence of a chronic condition and high needs status).

8.5.1 Factors influencing use of services in the enrolled setting

In the multivariate regression findings, age group, gender and presence of a chronic condition were found to be overall the most important (highest ranked) predictor variables for service use in the enrolled practice – however not in the particular order hypothesised. While age group was first ranked (at the Pinnacle MHN, urban, rural and Districts of residence), presence of a chronic condition was ranked second (with the one exception of residents in Ōtorohanga District) and gender was third ranked in six of the ten TAs and in all of the other categories. In the other four TA areas presence of a chronic condition was ranked above gender in Ōtorohanga District, practice funding was third in Waikato and South Waikato Districts with CSC for Thames Coromandel District residents.

Confirming the top predictors of service use in general practice is new knowledge for the Pinnacle MHN (as a PHO). The important role of age and gender was not wholly unexpected given existing knowledge in the sector concerning the importance of these factors on service use. The testing of the presence of chronic conditions alongside age and gender was of interest and ultimately new knowledge in terms of confirmation of presence of a chronic condition being of higher importance than gender. Of additional interest is that practice funding was the third most important predictor in both the Waikato District and South Waikato District concerning service use in the enrolled practice setting. At the Pinnacle MHN level (and for urban residents) practice funding was fourth ranked, following age, presence of a chronic condition and gender (and so higher than holding a CSC, ethnic group and high needs). For rural residents the first three predictors held true (age, presence of a chronic condition and gender) but the fourth predictor variable was holding a CSC (followed by practice funding type).

For the second part of the research hypothesis *(…the youngest and the oldest aged individuals will use comparatively more services and females will use more than males)* the key findings came from the univariate analysis. While this seemed almost a given from what is already established knowledge there were some interesting findings for this large study population and the original hypothesis was not entirely confirmed. While the youngest (those aged 0-4 years) and oldest (85+ years) did use high levels of service (in comparison to the reference group), it was

often those aged 75-84 years who had the highest service use comparatively. This was unexpected and was the case in five of the ten TAs and at the Pinnacle MHN level and in the aggregated rural category (but not the urban category), but as noted earlier, may be due to selection bias where those with higher morbidity levels have died before reaching the oldest age group. In six TAs (and at the Pinnacle MHN level and in the rural category) those aged 65-74 years used a comparatively higher level of services than those aged 0-4 years – this also had not been anticipated in the original research hypothesis. Testing what was already known around age was one of the reasons that age group in the study population was disaggregated into three 'older groups' for those 65+ years.

In terms of females using a higher level of enrolled practice consults in their enrolled practice the hypothesis was confirmed. Across all ten TAs, at the Pinnacle MHN level and for both urban and rural categories females used a statistically significant (at $p<0.01$) greater level of services than males. This finding for the study population aligns with current knowledge from the New Zealand Health Survey and other New Zealand research (detailed in Chapter Three).

While difficult to compare with previous studies given the linked administrative data and study design, the results here do partially align with previous findings where gender, age and ethnicity were all found to be significantly related to health care use (Cumming et al., 2010, p. 456). The difference in this study is the effect of ethnicity. In the univariate regression modelling - where individuals of Other ethnicity were the reference category – the Māori Pacific population used a lower level of services compared with Others; 15 per cent less at the Pinnacle MHN level (14 per cent fewer for urban Māori Pacific population and 17 per cent fewer for rural, all statistically significant at $p<0.01$). However, in the multivariate modelling, the effect of ethnicity was ranked sixth out of seven predictor variables in all but four TAs (where it ranked 5th in Hauraki, Matamata Piako, South Waikato and Waipa Districts). This shows the importance of age, chronic conditions, gender and funding overall within the complex mix of service use – but it remains an issue in terms of equity of access to general practice services (and ultimately health outcomes) that the Māori Pacific population use fewer services than the Other population.

8.5.2 Factors influencing use of services outside the enrolled setting

The first part of the hypothesis *(age, gender and presence of a chronic condition will be the top predictors of demand)* was partially confirmed. As in model one, age group was the most important predictor of demand – and this was true across all TAs, for Pinnacle MHN and both aggregated categories. Gender was second ranked as a predictor in only one TA (Matamata Piako District residents) and was fifth (equal) for Hamilton City residents and Ruapehu District residents. Presence of a chronic condition was ranked second (instead of third as hypothesised) as a predictor variable in six TAs and the three aggregated categories.

The second part of the research hypothesis was that...*all of the younger age groups; 0-4, 5-14 and 15-24 years are expected to be the highest users.* This hypothesis overall was only partially met, and at the TA level was only met by residents in the Waipa District. In five other TAs, at the Pinnacle MHN level and in the urban category those residents aged 85+ years had a comparatively higher level of service use than those aged 15-24 years (but lower than those aged 0-4 and 5-14 years). In the Hauraki, Ōtorohanga, Thames Coromandel and Waitomo Districts those aged 85+ years had the highest level of service use outside the enrolled practice. An interesting point here is that those aged 85+ often used a higher level of services outside the enrolled practice than those aged 75-84 years but a lower level in their enrolled setting.

The third part of the research hypothesis was that*…males will be higher users of services outside the enrolled setting than females.* Again the results were mixed across reporting categories and at the overall level the hypothesis was only partially met. The hypothesis only held true in the case of Hamilton City, Matamata Piako District and urban category residents (being driven by the Hamilton City results). Results were statistically significant for those areas and for Ruapehu District where males used 20 per cent fewer services than female residents ($p<0.05$). No other TA level results were statistically significant.

8.5.3 Factors influencing use of total general practice health services

While not a research hypothesis as such, results for model three were expected to be very similar to those for model one given that the vast majority of all consults were undertaken in the enrolled practice. Some total level results moved by one or two per cent in the independent variables of gender, ethnic group, CSC, high needs and presence of a chronic condition, but there was no change in the level of statistical significance of the result for those variables.

There were changes in the results for the predictor variable 'practice funding' (cost of a consult to the patient) between models one and three (the change coming from the addition of consult counts from model two). Change was seen in the Ōtorohanga, Ruapehu, Waipa and Waitomo Districts. The result for residents of Ōtorohanga went from 0.62 ($p<0.01$) to 0.67 ($p<0.01$) a movement of five per cent (remembering that the reference group for this within category modelling was those enrolled in a VLCA funded general practice). For Ruapehu residents the result changed from 0.58 ($p<0.05$) in model one to 0.68 (p=ns) in model two. Waipa moved from 0.98 (p=ns) in model one to 0.95 ($p<0.05$), becoming statistically significant in model three.

The finding concerning the effect of practice funding (VLCA) was particularly interesting. Looking across the three regression models it appears that being enrolled in a VLCA funded practice improves access to the enrolled GP and reduces outside of the enrolled practice service use. The results for service use for those with chronic conditions (Chapter Seven) indicate that this is also the case for males with one or more chronic conditions (it is not the case for females with chronic conditions – they use a higher level of care in enrolled practice and they also use a higher level of outside practice care). These findings are new knowledge for Pinnacle MHN in this large study population. For a number of years, general practice (through PHOs and other representative bodies) have been calling for a review of the VLCA / non-VLCA funding system. These findings are also noted in Chapter Ten: Discussion.

9 Results – Projected Demand for Service Use

This section reports the results of objective five - the projected population profile of the Waikato DHB out to 2038, the estimated demand in 2013/14 for general practice health care across the Waikato DHB, followed by the projection of that baseline demand through to 2038.

<u>Objective five</u>: Establish a picture of future demand for general practice services for the period 2013-2038 across the Waikato DHB.

Research questions

- (a) What is the projected population profile of the Waikato DHB (and 10 sub-regional Territorial Authorities) over the period 2013-2038?
- (b) What was the estimated level of demand for total general practice services across the Waikato DHB in the 2013/14 baseline year?
- (c) What is the projected demand for total general practice health care for the Waikato DHB catchment as a whole from 2013-2038 and for the ten sub-regional TAs, using Statistics New Zealand low, medium and high series population projections?

The first step in estimating demand in 2013/14 was to apply the baseline service use levels for the Pinnacle MHN population, some 63 per cent of the DHBs ERP, to the total ERP for Waikato DHB at June 2013. The assumption made was that the service use levels for the remaining 37 per cent of the DHB resident population <u>not</u> enrolled with Pinnacle MHN affiliated general practices, used a similar level of general practice services as the 63 per cent of the population who were.

The second step in establishing demand involved applying the established baseline service use rates to the projected population by age group, gender and ethnic group out to 2038. Demand projections were made at the TA level and results for the ten TAs built to the population level results for the Waikato DHB. The demand projections used customised Statistics New Zealand low, medium and high series projections.

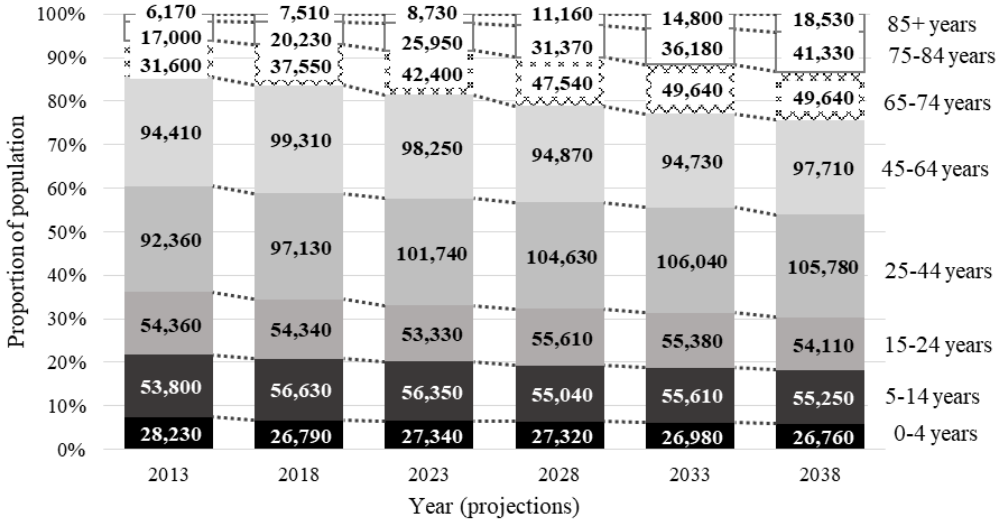
Service use projections under Objective Five (question c) were based on total general practice services used in the baseline year. In this sense, it is not about the future setting in which services might be delivered, it's about the potential level of total demand for the type of health care delivered in general practice and how that

demand might be spatially distributed within and across the Waikato DHB, by age group and ethnic group. It is the mix of demand level and spatial distribution, in combination, which will bring the challenge of ongoing sustainability, not just for Pinnacle MHN general practices but for all general practices within the region.

9.1 Projected population profile - the Waikato DHB

This section gives an overview of the population projections (medium series) out to 2038 for the DHB as a whole by age group and broad ethnic group. Figure 9.1 shows both the projected number of residents by age group and the proportion that age group contributes to the total population.

Figure 9.1 Waikato DHB, Total population by age group, 2013-2038



Overall, there are declining numbers projected at ages 0-4 years (from 28,230 in 2013 to 26,760 in 2038) with low and fluctuating growth in the number of young children aged 5-14 years and a fairly static number of 15-24 year olds across the 25 year time period (Figure 9.1). Declines at these three younger ages are projected in the Other population but overall, the increases projected in the Māori Pacific population partly ameliorate those declines. Those aged 25-44 years in 2038 are projected to number 105,780 (up from 92,360 in 2013). Substantial numerical increases are projected in the 75-84 years age group (from 17,000 to 41,330 people) and also for those aged 85+ (6,170 to 18,530 people). These are predominately the Pākehā baby boomers transitioning through the older ages.

Figure 9.2 shows the projected numbers in the Māori Pacific population and Figure 9.3 the changing proportions of each age group projected to make up that population. While there are numerical increases across all age groups, differences in projected growth rates within each age grouping account for the changing proportions. The population is essentially 'middle ageing'.

Figure 9.2 Waikato DHB, Māori Pacific projected numerical population by age group, 2013-2038

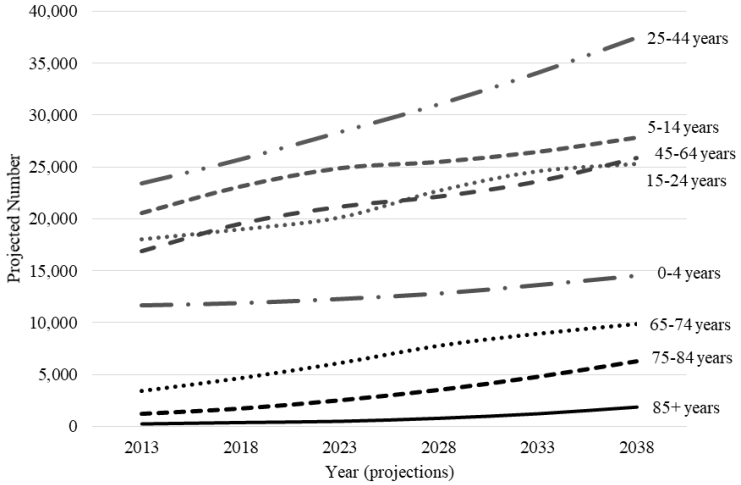
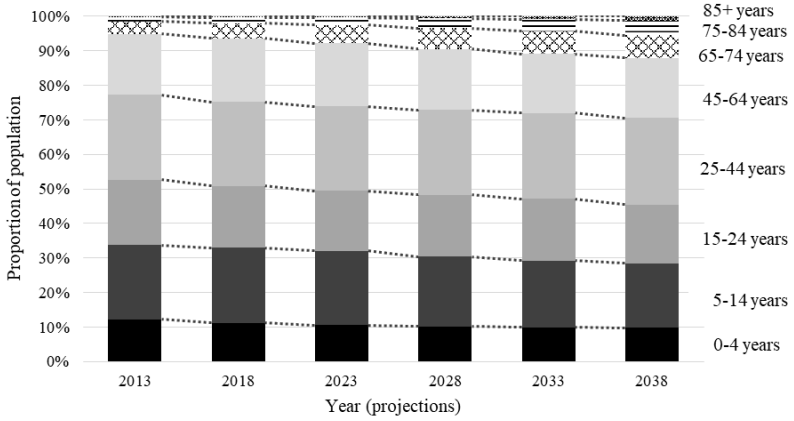


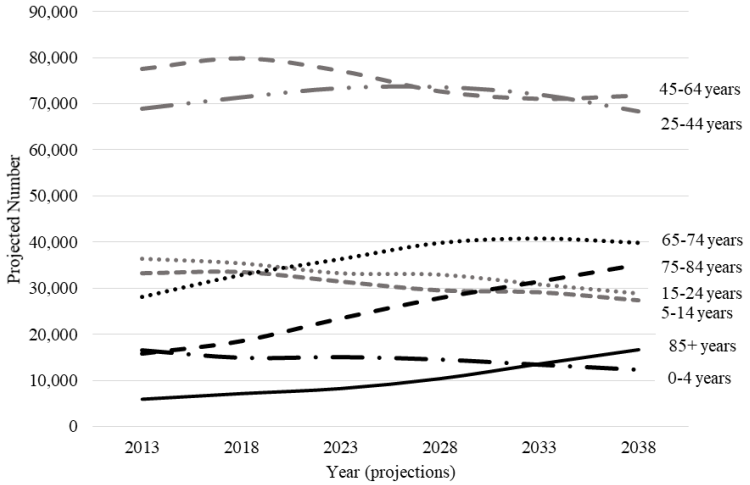
Figure 9.3 Waikato DHB, Māori Pacific projected proportion of population by age group, 2013-2038



For the Other population the projected changes are very different than the Māori Pacific population in terms of movement in numbers (Figure 9.4) and the underlying age structure (Figure 9.5). There are several points to note. Firstly, there are several population 'cross overs' projected, including in 2018 where the number of 65-74 year olds is projected to surpass both the number of 5-14 year olds and 15-

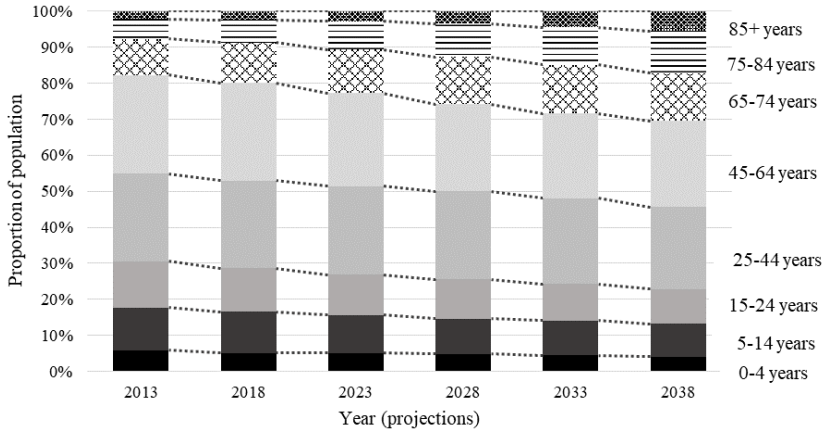
24 year olds. In 2028 the number of 45-64 year olds is projected to equal those aged 25-44 years. In 2033 three more 'cross overs' are projected to occur, with those aged 85+ projected to equal and then outnumber those aged 0-4 years as well as those aged 75-84 years being similar in numbers to both those aged 5-14 years and 15-24 years (then surpassing both in 2038).

Figure 9.4 Waikato DHB, Other projected numerical population by age group, 2013-2038



These projected numerical changes are mirrored in the projected age structure of the Other population (Figure 9.5). In 2013 those aged under 24 years made up about 30 per cent of the Other population, this is projected to decline to 22 per cent in 2038. At the other end of the age spectrum those aged 65+ are projected to account for 30 per cent of the Other population in 2038 (up from 18 per cent in 2013). Within this changing structure there are important changes at the oldest ages, with those aged 75+ increasing from around eight per cent of the Other population to about 18 per cent. These individuals are the baby boomers transitioning through the oldest ages. The first of the baby boomers turned 65 years old in 2011, those remaining in that 1946 cohort in 2038 will be turning 92 years old.

Figure 9.5 Waikato DHB, Other projected proportion of population by age group 2013-2038



9.2 Future demand for general practice services - overview

In this section the established demand for total general practice services for the study population in the 2013/14 year was applied to the 2013 ERP of the Waikato DHB. Results were first built at TA level and then summed to DHB level. The 2013/14 utilisation rates by age, gender and ethnic group were applied to the Statistics New Zealand medium series projected population out to 2038.

Table 9.1 shows the overall results at the TA level and for the Waikato DHB as a whole. Altogether four pieces of data are shown, including; the estimated baseline consults, the projected number of general practice consults, the percentage change within the five Census periods out to 2038 and the total percentage change projected for the 2013-2038 period.

Table 9.1 gives an overview of the change projected at the total (all ages) level by geographical area. In the 'percentage change in projected consults' columns the relevant number is given with either no additional symbol for negative change, a blank circle (=>0 but <5 per cent change projected), a grey circle (>= 5 but <10 per cent change) or a black circle where projected change is >= 10 per cent.

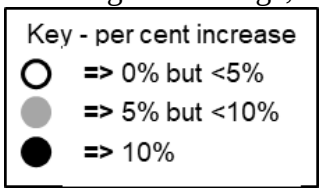
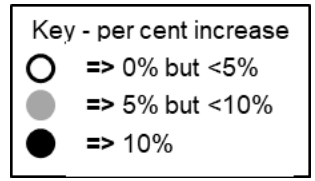


Table 9.1 Total population, projected number and percentage change of general practice consults, by geographical area, 2013-2038

	Baseline consults	Number of projected consults (demand)					Percentage change in projected consults					2013-2038 percent change
Geographical area	**2013**	**2018**	**2023**	**2028**	**2033**	**2038**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
Waikato DHB	**1,456,462**	1,569,227	1,674,009	1,777,631	1,872,957	1,963,040	7.7	6.7	6.2	5.4	4.8	**34.8**
Hamilton City	**548,810**	600,235	648,525	697,966	746,644	796,212	9.4	8.0	7.6	7.0	6.6	**45.1**
Hauraki District	**68,838**	72,432	76,282	78,664	80,230	80,567	5.2	5.3	3.1	2.0	0.4	**17.0**
Matamata Piako District	**149,539**	158,477	165,170	171,497	176,366	180,686	6.0	4.2	3.8	2.8	2.4	**20.8**
Otorohanga District	**36,085**	37,868	38,947	39,898	40,169	40,579	4.9	2.8	2.4	0.7	1.0	**12.5**
Ruapehu District	**40,736**	40,510	40,109	39,389	37,877	36,110	-0.6	-1.0	-1.8	-3.8	-4.7	**-11.4**
South Waikato District	**114,394**	119,176	122,114	124,317	124,273	124,150	4.2	2.5	1.8	0.0	-0.1	**8.5**
Thames Coromandel District	**149,093**	158,140	166,339	173,009	176,726	178,444	6.1	5.2	4.0	2.1	1.0	**19.7**
Waikato District	**200,425**	217,617	235,142	253,970	273,721	293,293	**8.6**	**8.1**	**8.0**	**7.8**	**7.2**	**46.3**
Waipa District	**163,418**	177,483	190,912	204,221	216,413	227,264	**8.6**	**7.6**	**7.0**	**6.0**	**5.0**	**39.1**
Waitomo District	**39,784**	40,354	40,726	41,138	40,872	39,973	**1.4**	**0.9**	**1.0**	**-0.6**	**-2.2**	**0.5**



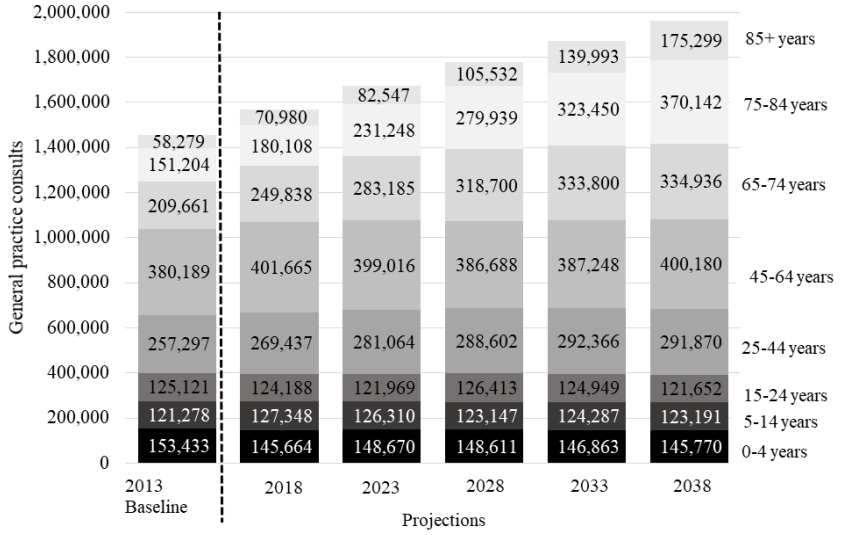
The Ruapehu District is the only TA where there is projected to be fewer general practice consults undertaken in 2038 than in the baseline year of 2013, with an overall change projected of -11.4 per cent (from 40,736 to 36,110 consults). There was also one TA, Waitomo District, with a 'white circle' indicating that overall change is projected to be in the =>0 but <5 per cent range. For this area there is growth in the first three periods covering 2013-2028, followed by decline. There is also one TA, being South Waikato District with an overall 'grey dot' where change over the 2013-2038 period was projected to be 8.5 per cent (with all that growth in the first three time periods). All other TA areas have overall growth of =>10 per cent projected, but that growth is often fluctuating over time as cohorts flow through.

Looking at the projected numbers and aligned percentage change only tells part of the story of demand. The following sections look at the projected demand in each of the ten TAs. Demand is disaggregated by ethnic group and age and these show the complexity of the projected change when looking at factors of disordered cohort flows and population momentum. Cleary shown are the considerable differences in population structures and futures between the two transitioning populations.

9.3 Waikato DHB demand projections

There were an estimated 1.45 million general practice consults undertaken within the Waikato DHB area in 2013 (Figure 9.6). In 2038 it is projected, if the levels and patterns in 2013/14 hold true, there will be 1.96 million consults. In percentage change terms this is a 35 per cent increase from baseline (or in numerical terms an additional 506,578 consults). However, this increase will not be spatially uniform across the region and there are significant differences by age group and ethnic group underlying this overall projected level of demand.

Figure 9.6 Waikato DHB, consults projected from 2013



For the Māori Pacific population (Table 9.2) there is consult growth of 10 per cent or more projected at all ages across the 2013-2038 period (by inter-census period). Within age groups, the projected increase ranges from a low of 24.2 per cent (for 0-4 years) to a high of 674 per cent for those aged 85+. This age group had a (low) base of 2,279 consults, projected to increase to 17,646 in 2038. The projected picture for the Other population (Table 9.3) is for decline overall across all the 0-64 years age groups and increases across all age groups 65+ years, but particularly so for 75-84 and 85+ groups. Consults for those aged 85+ were estimated at 56,000 in 2013 and are projected to almost treble to reach 157,653 in 2038 (+181 per cent). At the overall level there is projected to be an increase of almost 24 per cent out to 2038.

Table 9.2 Waikato DHB, Māori Pacific population, percentage change in consults by Census period

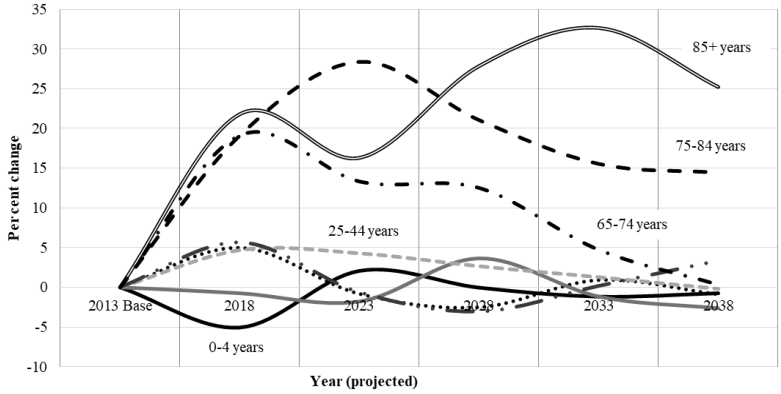
Waikato DHB	Baseline consults	Māori Pacific - percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**64,088**	1.8	3.3	4.2	6.3	6.5	**24.2**
5-14 years	**43,847**	12.5	7.7	2.4	3.8	5.2	**35.5**
15-24 years	**37,088**	4.7	6.0	12.8	8.3	3.0	**39.7**
25-44 years	**68,385**	9.6	9.6	8.8	9.4	9.5	**56.6**
45-64 years	**80,372**	15.8	8.3	4.6	6.5	9.5	**53.1**
65-74 years	**26,489**	35.9	30.9	27.2	14.8	10.4	**186.9**
75-84 years	**11,735**	41.5	45.7	40.0	35.8	31.2	**414.0**
85+ years	**2,279**	54.4	32.3	59.0	56.3	52.5	**674.5**
Total	**334,282**	**12.9**	**11.4**	**11.1**	**10.9**	**11.0**	**72.0**

Table 9.3 Waikato DHB, Other population, percentage change in consults by Census period

Waikato DHB	Baseline consults	Other -percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**89,345**	-10.0	1.1	-3.6	-7.9	-8.3	**-25.9**
5-14 years	**77,431**	0.7	-6.2	-6.1	-1.4	-6.0	**-17.7**
15-24 years	**88,032**	-3.0	-5.3	-1.0	-6.7	-6.4	**-20.7**
25-44 years	**188,912**	3.0	2.3	0.1	-2.3	-5.1	**-2.2**
45-64 years	**299,817**	2.9	-3.4	-5.7	-2.3	0.8	**-7.6**
65-74 years	**183,172**	16.7	10.4	9.6	2.4	-2.3	**41.4**
75-84 years	**139,470**	17.2	26.6	18.8	12.8	11.7	**122.1**
85+ years	**56,000**	20.5	15.5	26.0	30.9	22.8	**181.5**
Total	**1,122,180**	**6.2**	**5.2**	**4.5**	**3.4**	**2.4**	**23.7**

The tables above give an indication of the effects of disordered cohort flows on general practice consults. Another way of showing this is illustrated in Figure 9.7. Shown is the projected percentage change in the number of consults between Census years by age group with 2013 as the base. This illustrates that the changes projected are not linear and there are ebbs and flows over time. This is of interest to the sustainability of front line general practice as different age groups use a different mix or type of service. While there is the considerable ageing driven by the Other population, general practice will still have to provide services to all age groups, and there will be proportionally more services provided to baby boomers as they transition to old age at the same time the Māori Pacific population is middle-ageing.

Figure 9.7 Waikato DHB, per cent change in the number of consults by age group, 2013-2038 (total population)



The Statistics New Zealand medium series projections have been utilised in the preceding results. The following two figures show the 2013 baseline estimated number of consults by ethnic group and age group with the low, medium and high series projections for the 2038 year shown. All the series are shown to present the range of possible future scenarios in terms of the projected numbers of consults

These figures show the middle ageing of the Māori Pacific population and the old ageing for the other population - shown by the shift to the right of the 'peak' of consults. Results are shown at the same scale for comparative purposes.

Figure 9.8 Waikato DHB, Māori Pacific consults with low, medium and high series projections

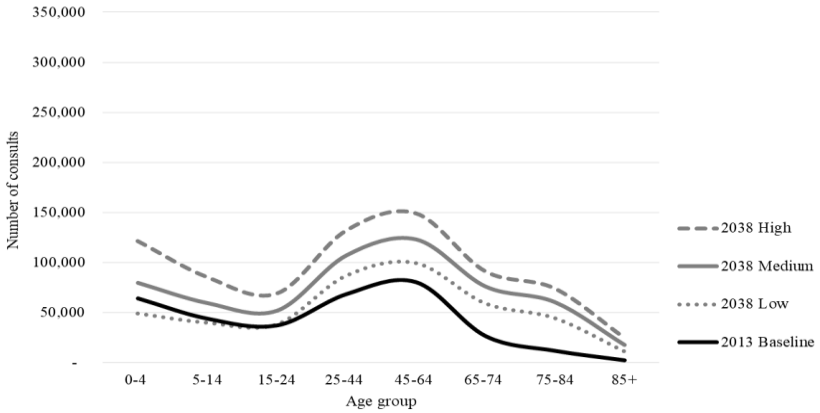
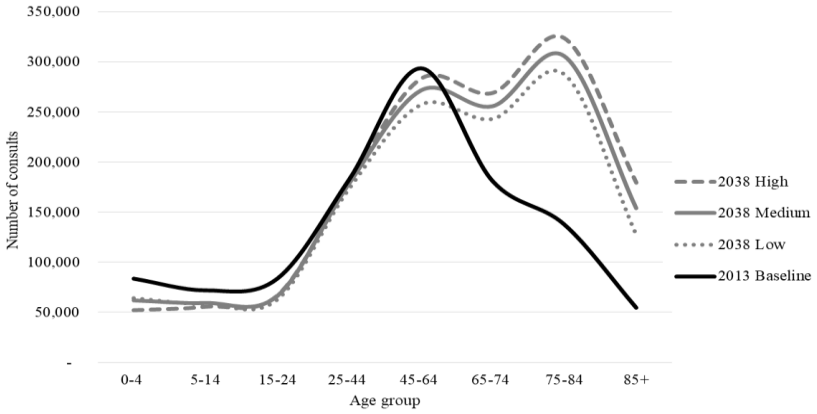


Figure 9.9 Waikato DHB, Other consults with low, medium and high series projections



In the following sections, for each TA area the data are presented in the same order and format as this section. This approach highlights the complexity of each sub-regional context (and the flow on effects for front line service delivery).

9.4 Hamilton City demand projections

There were an estimated 548,810 general practice consults undertaken for Hamilton City residents in 2013. In 2038 it is projected that the number of consults, if the levels and patterns in 2013/14 hold, will be close to 800,000 (at 796,212), an overall increase of 45.1 per cent from baseline. However, this increase is not projected to be uniform across key age groups, ethnic groups or time periods.

Figure 9.10 Hamilton City, consults projected from 2013

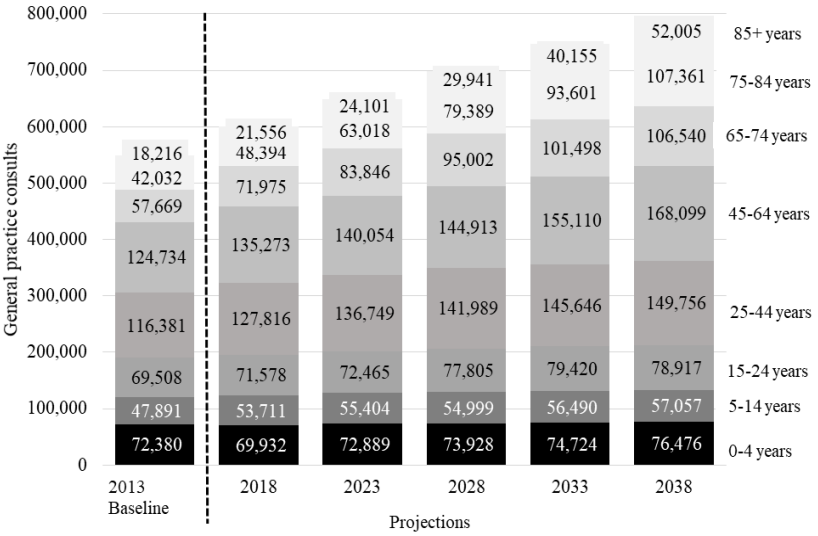


Table 9.4 Hamilton City, Māori Pacific population, percentage change in consults by Census period

Hamilton City	Baseline consults	Māori Pacific - percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**28,092**	8.4	5.7	5.5	7.3	8.2	**40.2**
5-14 years	**16,845**	19.9	15.1	6.7	5.6	6.1	**65.0**
15-24 years	**18,514**	2.4	3.8	17.3	14.2	6.8	**52.2**
25-44 years	**27,900**	18.1	14.8	9.7	9.2	10.2	**79.0**
45-64 years	**24,573**	23.3	16.8	13.0	14.0	16.8	**116.8**
65-74 years	**7,131**	39.9	34.6	33.3	24.3	17.7	**267.2**
75-84 years	**2,566**	47.1	49.5	44.0	39.6	39.3	**515.6**
85+ years	**486**	86.1	24.6	62.9	56.6	55.4	**819.3**
Total	**126,105**	**17.0**	**14.2**	**13.4**	**13.2**	**13.3**	**94.3**

Table 9.5 Hamilton City, Other population, percentage change in consults by Census period

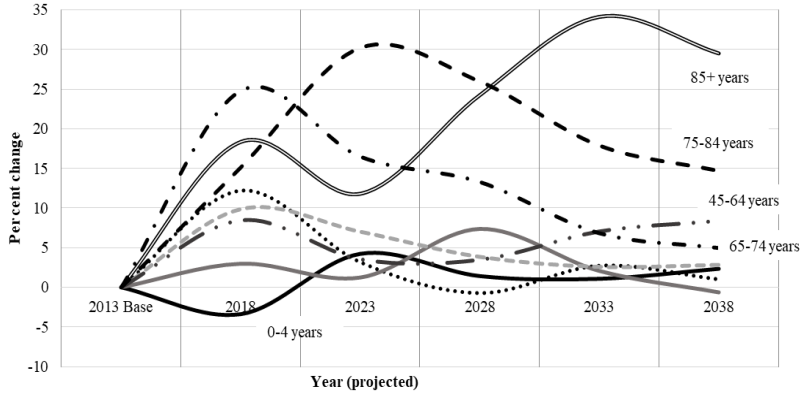
Hamilton City	Baseline consults	Other -percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**44,288**	-10.8	3.1	-1.8	-4.2	-3.2	**-16.3**
5-14 years	**31,046**	8.0	-4.1	-6.1	0.3	-3.4	**-5.8**
15-24 years	**50,995**	3.2	0.3	3.7	-3.1	-4.3	**-0.5**
25-44 years	**88,481**	7.2	4.3	1.6	-0.2	-0.5	**12.8**
45-64 years	**100,160**	4.8	-0.3	0.3	4.4	4.8	**14.6**
65-74 years	**50,537**	22.7	13.6	9.5	2.8	1.4	**59.0**
75-84 years	**39,466**	13.1	28.6	24.2	15.4	11.3	**132.0**
85+ years	**17,731**	16.5	11.2	22.3	32.6	27.5	**168.1**
Total	**422,704**	**7.1**	**6.0**	**5.6**	**4.6**	**3.9**	**30.4**

In 2013, general practice consults for the Māori Pacific population made up 22.9 per cent of the total estimated consults, this is projected to rise to 30.7 per cent in 2038, with the proportion of Other consults declining from 77.0 per cent to 69.2 per cent. Overall, consults for Māori Pacific are projected to increase by 94.3 per cent to 2038 (Table 9.4), with 30.4 per cent for the Other population (Table 9.5).

For projected demand by age group over the 2013-38 period, for Māori Pacific the projected increases are substantial, from 40.2 per cent for the very young (0-4 years) up to 819.3 per cent for those aged 85+ years (though the latter comes from a small base). For the Other population the projections show a very different story. While the overall increase, as noted, is 30.4 per cent, there are projected declines in consults for all groups aged under 25 years. Conversely, at all older age groups there are projected increases from 12.8 per cent (25-44 years) to 168.1 per cent for those aged 85+ years.

Figure 9.11 illustrates that the changes projected are not linear and there are ebbs and flows across age groups over time in the number of consults projected (when compared with the 2013 baseline) as people age and transition through the key age groups, requiring differing levels of care.

Figure 9.11 Hamilton City, per cent change in the number of consults by age group, 2013-2038 (total population)



The following two figures show the 2013 baseline estimated number of consults by ethnic group and age group with the 2038 year low, medium and high series projections. Like the results at the DHB level, the Māori Pacific population is middle ageing and the Other population is old ageing with two peaks evident in the move to the right, with projected consult peaks at ages 45-64 years and 75-84 years in 2038 (Figure 9.13).

Figure 9.12 Hamilton City, Māori Pacific consults with low, medium and high series projections

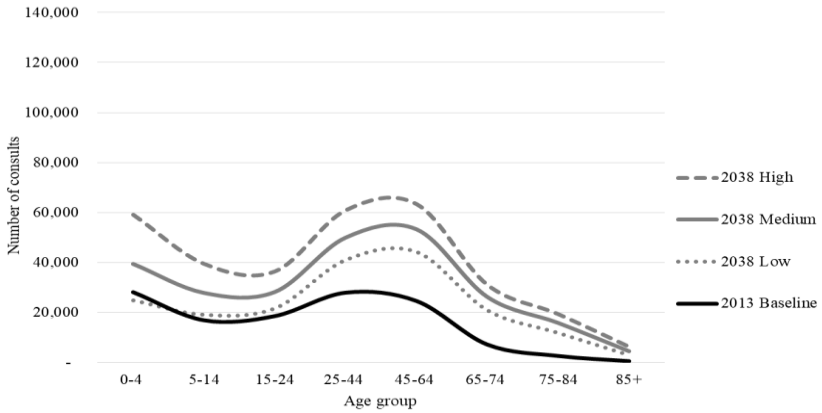
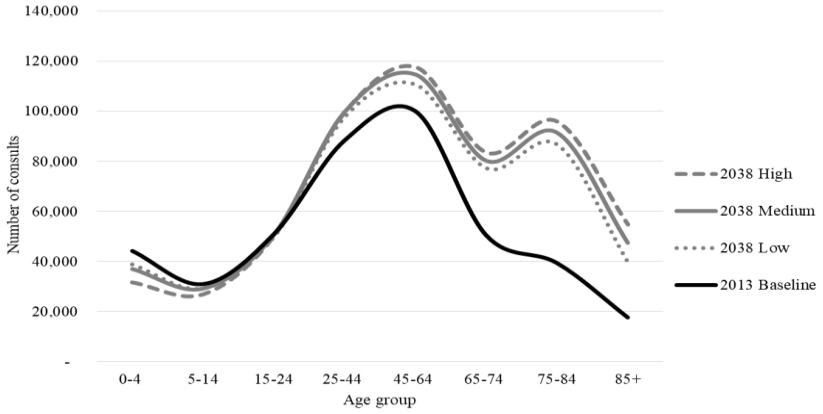


Figure 9.13 Hamilton City, Other consults with low, medium and high series projections



9.5 Hauraki District demand projections

In 2013 there were an estimated 68,838 general practice consults undertaken for residents in this District. In 2038, it is projected that the number of consults will increase to 80,567 (some 11,729 more than in 2013, an increase of 17.0 per cent). However, as for Hamilton City and the Waikato DHB as a whole, the projected increase is not constant across age groups, ethnic groups or time periods.

In 2013, general practice consults for the Māori Pacific population made up 18.6 per cent of the estimated total consults, being projected to rise to 28.4 per cent in 2038. Overall, consults for the Māori Pacific population are projected to increase by 78.9 per cent. There is growth across all age groups with the exception of the youngest (0-4 years) where consults are projected to decline by -2.8 per cent, particularly over the 2013-2028 period. Significant increases, sometimes from a small 2013 base, were projected for all other ages, especially ages 65 and older.

Again, for the Other population the projections show a differing story. The projected overall change is a much lower 2.9 per cent, with declines in consults projected for all age groups under 45 years and increases of 8.4 per cent for the Other population aged 65-74 years, 86.2 per cent for those aged 75-84 years and 182.1 per cent for those aged 85+ years.

Figure 9.14 Hauraki District, consults projected from 2013

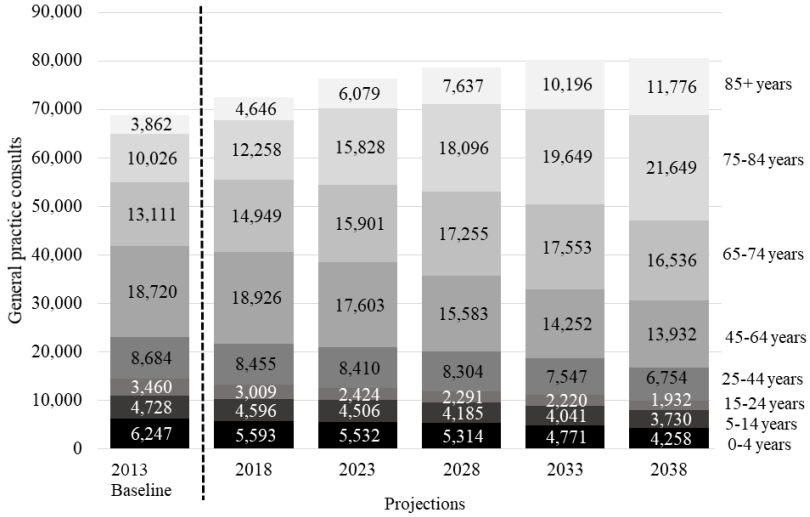


Table 9.6 Hauraki District, Māori Pacific population, percentage change in consults by Census period

Hauraki District	Baseline consults	Māori Pacific - percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**2,862**	-9.8	0.0	0.0	2.4	5.3	**-2.8**
5-14 years	**1,537**	20.9	7.1	-5.2	-0.7	0.7	**22.6**
15-24 years	**1,021**	-11.6	-1.0	29.8	11.1	-6.8	**17.6**
25-44 years	**2,091**	14.1	4.9	2.8	0.7	7.5	**33.2**
45-64 years	**3,576**	16.8	9.4	2.7	7.4	10.2	**55.2**
65-74 years	**1,051**	50.3	40.9	28.7	12.4	7.4	**229.2**
75-84 years	**521**	100.0	59.7	37.4	39.2	24.1	**658.3**
85+ years	**147**	0.0	161.4	38.3	72.3	42.0	**784.1**
Total	**12,805**	**14.6**	**14.5**	**10.5**	**11.7**	**10.4**	**78.9**

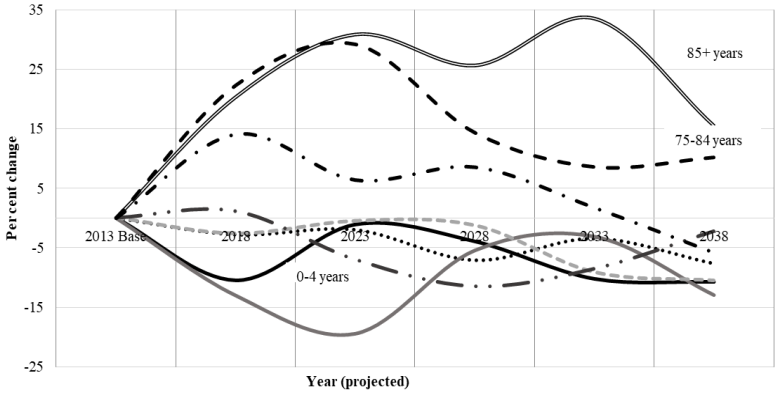
Table 9.7 Hauraki District, Other population, percentage change in consults by Census period

Hauraki District	Baseline consults	Other -percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**3,386**	-11.1	-2.0	-7.4	-22.1	-30.7	**-56.4**
5-14 years	**3,191**	-14.2	-8.1	-8.6	-5.7	-15.0	**-42.2**
15-24 years	**2,439**	-13.6	-27.4	-26.1	-17.7	-21.4	**-70.0**
25-44 years	**6,593**	-7.9	-2.7	-3.0	-13.5	-19.9	**-39.8**
45-64 years	**15,144**	-2.6	-11.6	-16.4	-15.4	-9.1	**-44.7**
65-74 years	**12,061**	10.9	2.3	5.2	-0.4	-8.8	**8.4**
75-84 years	**9,505**	18.0	26.3	11.6	4.2	7.5	**86.2**
85+ years	**3,715**	21.1	26.6	24.8	30.6	12.9	**182.1**
Total	**56,033**	**3.1**	**3.0**	**1.0**	**-1.0**	**-3.1**	**2.9**

The two tables above give an indication of disordered flows and these flows are also shown in Figure 9.15. In the case of Hauraki District the interaction between the lines representing those aged 65-74, 75-84 and 85+ years show the effects of

the ageing of those groups across the Census time periods and the consequential changes in numbers of consults that may need to be delivered.

Figure 9.15 Hauraki District, per cent change in the number of consults by age group, 2013-2038 (total population)



The following figures show the 2013 baseline estimated number of consults by ethnic group and age group with the low, medium and high series projections identified for the 2038 year. The Māori Pacific population is projected to have almost two peaks in 2038, at ages 45-64 and 75-84 years (Figure 9.16). The Other population is old ageing, with the consult peak moving to the right, with consult peaks at ages 45-64 years in 2013 moving across to 75-84 years in 2038 (Figure 9.17).

Figure 9.16 Hauraki District, Māori Pacific consults with low, medium and high series projections

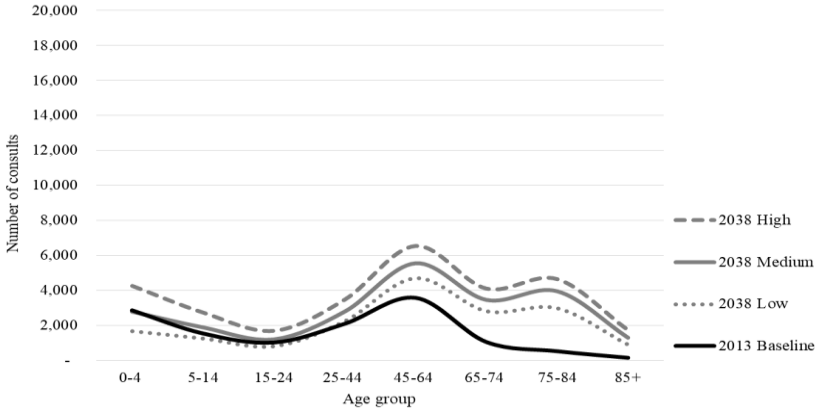
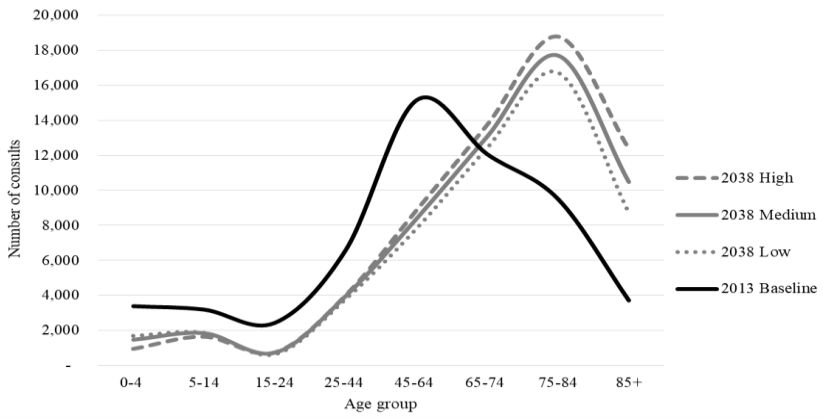


Figure 9.17 Hauraki District, Other consults with low, medium and high series projections



9.6 Matamata Piako District demand projections

An estimated 149,539 general practice consultations were undertaken for resident in this TA in 2013. There is projected to be an increase of 20.8 per cent out to 2038, to reach 180,686 consultations. The story of this TA, like others, is that the projected overall increase masks important differentials within and between ethnic groups and age groups.

In 2013, general practice consults for Māori and Pacific made up 13.6 per cent of the total estimated consults, this is projected to rise to 19.6 per cent in 2038 (with a concomitant decline in consults for the Other population). Overall, consults for the Māori Pacific population are projected to increase by 74.6 per cent over the 25 year period (from 20,306 to 35,449). For the Other population, the projected overall change is 12.4 per cent. Underneath this summary statistic are projected declines across all five age groups under 45 years. There are significant declines projected for the 0-4 years (-36.2 per cent) and 15-24 years age groups (-37.9 per cent) from baseline. The growth is all at ages 65+ years, from 31.4 per cent for age 65-74 per cent to 166.3 per cent for those aged 85+ years. Across the five time intervals overall growth is projected to slow to under three per cent from 2028 onwards.

Figure 9.18 Matamata Piako District, consults projected from 2013

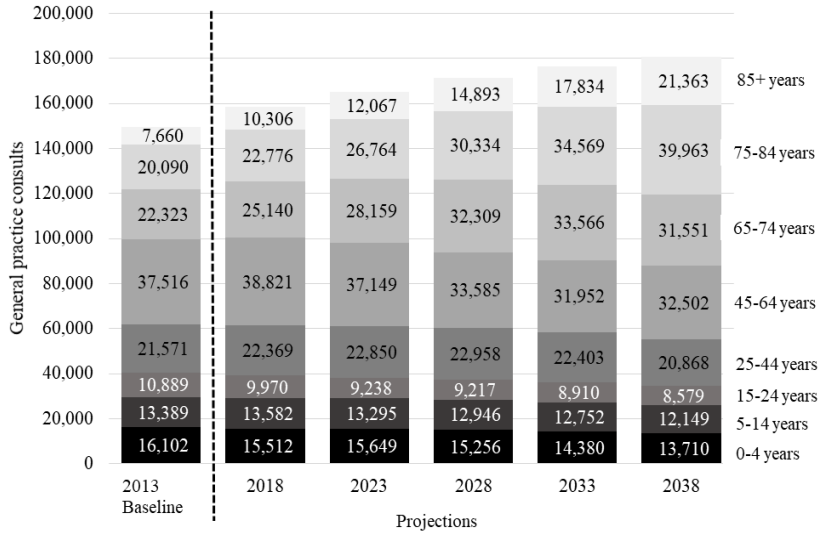


Table 9.8 Matamata Piako District, Māori Pacific population, percentage change in consults by Census period

Matamata Piako	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**4,976**	-4.2	5.7	9.5	9.9	9.0	**32.8**
5-14 years	**3,182**	12.5	4.2	0.0	6.7	10.0	**37.6**
15-24 years	**2,157**	10.4	12.5	12.3	4.1	0.8	**46.3**
25-44 years	**3,247**	9.0	8.4	11.9	14.3	12.0	**69.3**
45-64 years	**4,559**	17.3	6.5	4.1	3.6	7.4	**44.7**
65-74 years	**1,400**	48.2	25.0	20.0	13.8	14.4	**189.5**
75-84 years	**604**	86.0	64.2	34.5	29.1	16.2	**516.2**
85+ years	**180**	50.0	33.3	75.0	42.9	60.0	**700.0**
Total	**20,306**	**13.7**	**11.7**	**11.3**	**11.0**	**11.2**	**74.6**

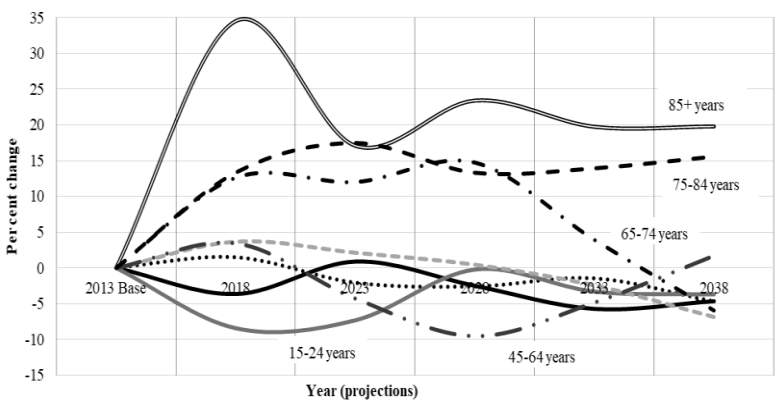
Table 9.9 Matamata Piako District, Other population, percentage change in consults by Census period

Matamata Piako	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**11,125**	-3.4	-1.3	-8.2	-14.6	-14.6	**-36.2**
5-14 years	**10,207**	-2.0	-4.4	-3.7	-4.8	-11.4	**-23.9**
15-24 years	**8,732**	-13.1	-13.6	-5.3	-6.9	-6.2	**-37.9**
25-44 years	**18,324**	2.8	1.0	-1.8	-6.3	-12.1	**-16.1**
45-64 years	**32,956**	1.6	-6.0	-12.1	-6.7	0.4	**-21.4**
65-74 years	**20,922**	10.2	10.8	14.2	2.8	-8.4	**31.4**
75-84 years	**19,486**	11.1	15.1	11.8	12.6	15.5	**86.0**
85+ years	**7,480**	34.2	16.7	21.8	18.7	17.7	**166.3**
Total	**129,233**	**4.8**	**2.9**	**2.4**	**1.2**	**0.5**	**12.4**

In this District, the effect of disordered cohort flows on the percentage change in numbers of consults is evident. There are initial increases for all groups aged 65+

years out to 2023 followed by stabilisation (and decline in numbers for those aged 65-74 years from 2028, heading back towards 2013 levels). All other age groups show undulating movements in percentage change from 2013.

Figure 9.19 Matamata Piako District, per cent change in the number of consults by age group, 2013-2038 (total population)



The following two figures show the 2013 baseline estimated number of consults by ethnic group and age group with the 2038 low, medium and high series projections identified. For the Māori Pacific population (Figure 9.20) the low, medium and high series projections are all for increases from 2013 levels (except for the low series for those aged 0-4 and 5-14 years). There is growth projected across all age groups 65+ years, although from a lower base in 2013. The Other population clearly shows the "peak" age in 2013 (45-64 years) ageing 25 years to be the peak in 2038 (Figure 9.21).

Figure 9.20 Matamata Piako District, Māori Pacific consults with low, medium and high series projections

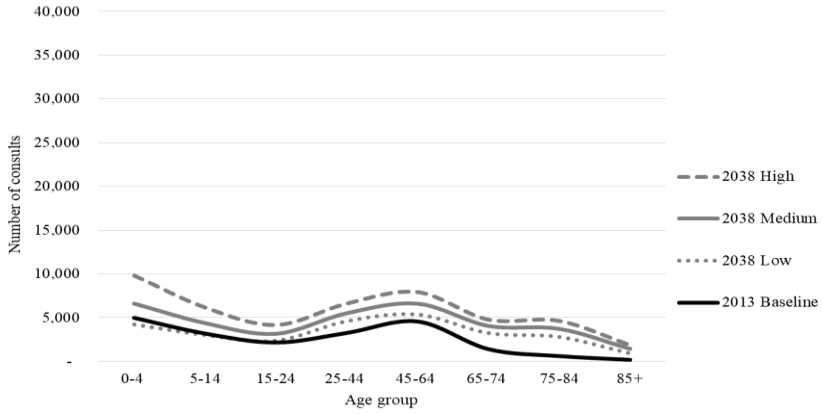
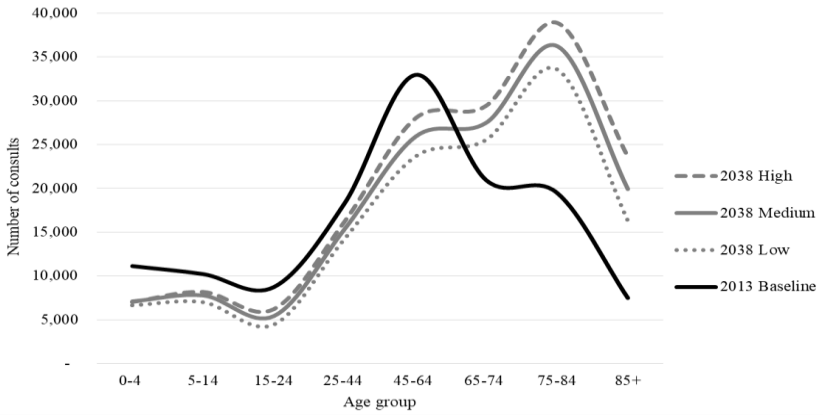


Figure 9.21 Matamata Piako District, Other consults with low, medium and high series projections



9.7 Ōtorohanga District demand projections

At baseline there were an estimated 36,085 general practice consults undertaken for residents. In 2038 it is projected that the number will increase to 40,579 (some 4,494 more or an increase of 12.5 per cent). However, as evident in previous sections, the summary data mask a number of important differences.

In 2013, general practice consults for the Māori Pacific population made up 28.1 per cent of the estimated total consults, this is projected to rise to 31.3 per cent in 2038. Overall, consults for Māori Pacific are projected to increase by 25.1 per cent, equivalent to an additional 2,552 consults (Table 9.10). There is growth across all age groups with the exception of the middle aged (45-64 years), particularly over the 2018-2028 period. Significant increases, sometimes from a small 2013 base, are projected for all other ages. Across the five time periods the overall growth projected is fairly even, between 3.2 per cent and 6.1 per cent (2013-2018).

For the Other population the projections show a contrasting picture. For Others, the projected overall change is lower at 7.5 per cent, with declines projected for all age groups under 45 years and increases for all older age groups. The total 7.5 per cent growth consists of smaller increases across the first three time periods (2013-2028) followed by decline.

Figure 9.22 Ōtorohanga District, consults projected from 2013

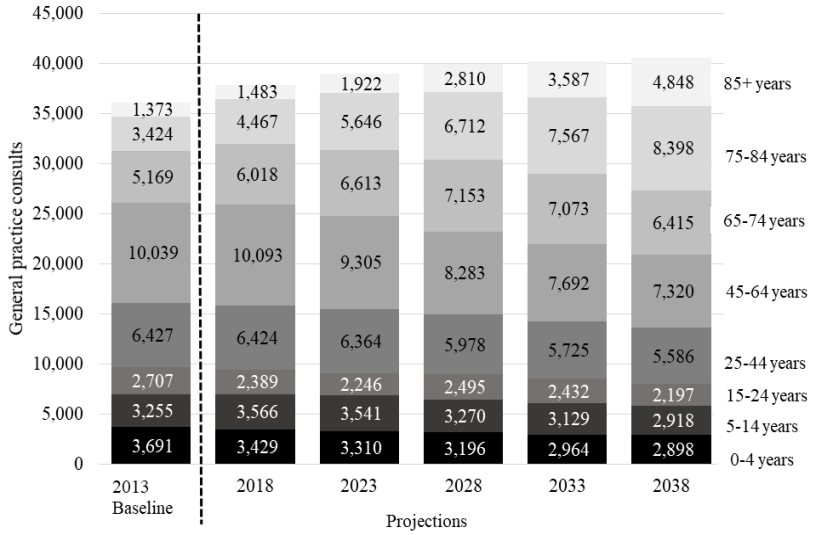


Table 9.10 Ōtorohanga District, Māori Pacific population, percentage change in consults by Census period

Otorohanga District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**1,652**	-0.8	0.0	6.1	5.7	5.4	**17.3**
5-14 years	**1,248**	6.7	6.9	-2.8	3.2	6.1	**21.4**
15-24 years	**993**	12.6	10.8	7.7	2.5	-0.7	**36.7**
25-44 years	**1,946**	6.8	4.3	10.5	8.6	9.6	**46.6**
45-64 years	**2,765**	3.4	-8.7	-11.3	-2.1	0.7	**-17.4**
65-74 years	**872**	14.1	26.6	17.7	-9.6	-10.6	**37.4**
75-84 years	**527**	14.7	-12.8	18.7	43.8	28.1	**118.7**
85+ years	**153**	0.0	68.0	0.0	0.0	59.5	**168.0**
Total	**10,156**	**6.1**	**3.2**	**3.7**	**4.0**	**5.9**	**25.1**

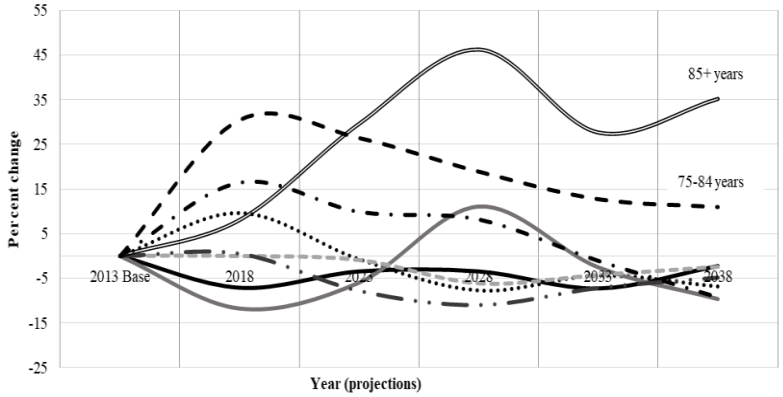
Table 9.11 Ōtorohanga District, Other population, percentage change in consults by Census period

Otorohanga District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**2,039**	-12.2	-6.6	-12.8	-22.8	-14.7	**-52.9**
5-14 years	**2,007**	11.3	-5.3	-10.9	-9.8	-17.6	**-30.2**
15-24 years	**1,714**	-25.8	-20.7	15.3	-8.3	-21.1	**-51.0**
25-44 years	**4,481**	-3.0	-3.4	-14.6	-12.8	-12.5	**-39.0**
45-64 years	**7,274**	-0.6	-7.5	-10.8	-9.1	-7.1	**-30.8**
65-74 years	**4,296**	16.9	6.6	5.9	1.1	-9.0	**21.4**
75-84 years	**2,897**	33.3	32.5	18.9	9.5	8.7	**150.1**
85+ years	**1,220**	9.1	25.2	53.4	30.4	33.3	**263.9**
Total	**25,930**	**4.5**	**2.7**	**2.0**	**-0.7**	**-1.1**	**7.5**

The two tables above give an indication of disordered flows with the effects of cohort flows also shown in Figure 9.23, which again illustrates that the projected

changes are not linear. In this District there are projected to be increases at the oldest ages (75+) and fluctuating change from baseline over time for all other age groups.

Figure 9.23 Ōtorohanga District, per cent change in the number of consults by age group, 2013-2038 (total population)



The next two figures show the estimated baseline number of consults by ethnic group and age group with the 2038 low, medium and high series projections. For the Māori Pacific population (Figure 9.24) in this District there is a move to the left, that is in 25 years' time (2038) it is projected that there will be consult peaks for those aged 25-44 years compared to the 2013 peak for those aged 45-64 years. This is the only TA where there is projected to be movement to the left (a consequence perhaps of the interacting complexities of sub-regional fertility, mortality and migration). For the Other population (Figure 9.25) there is again a shift to the right evident and fewer consults for those aged under 64 year old.

Figure 9.24 Ōtorohanga District, Māori Pacific consults with low, medium and high series projections

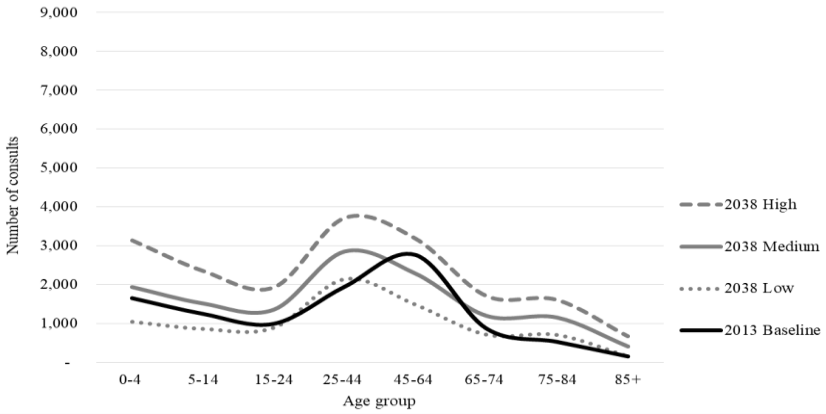
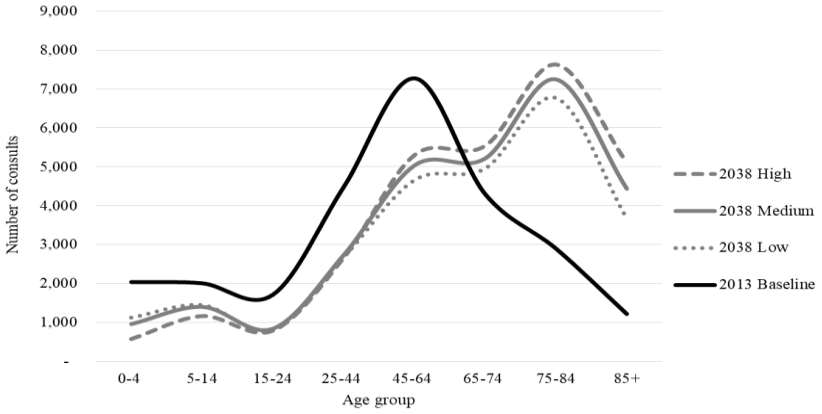


Figure 9.25 Ōtorohanga District, Other consults with low, medium and high series projections



9.8 Ruapehu District demand projections

Those resident in this District (the geographical part covered by the Waikato DHB) had an estimated 40,736 general practice consultations in the baseline year. If the levels of service use in the baseline year hold true, it is projected that the number of consults may decline to 36,110 in 2038, a reduction of 4,625 consults or -11.4 per cent over the 25 year period.

In 2013, general practice consults for the Māori Pacific population made up 38.6 per cent of estimated total consults, this is projected to rise to 42.0 per cent in 2038 Overall, consults for Māori Pacific are projected to decline by -3.6 per cent (from 15,747 at baseline to 15,177 in 2038). By age group, there are declines projected across all age groups aged less than 65+, while there is projected growth in the three older age groups. These increases however, are from low baseline numbers of consults and do not offset the decline evident across the younger age groups.

For the Other population the projections also show an expected overall decline (-16.2 per cent) from an estimated 24,989 consults at baseline to 20,933 in 2038. Over the 2013-2038 period the decline ‘speeds up’ from -0.4 per cent in 2013-2018 to -6.8 per cent in 2033-2038. By age group there are declines projected for all groups under 75 years (although there are initial increases across 2013-2023 for the 65-74 age group and an initial decline for those aged 85+ years over the same period).

Figure 9.26 Ruapehu District, consults projected from 2013

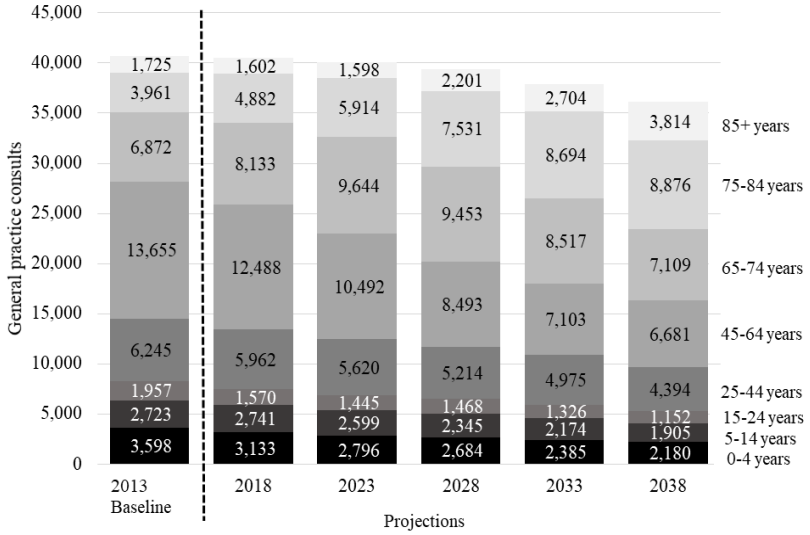


Table 9.12 Ruapehu District, Māori Pacific population, percentage change in consults by Census period

Ruapehu District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**2,471**	-20.5	-17.2	-6.9	-7.4	-8.0	**-47.8**
5-14 years	**1,649**	6.6	-10.8	-20.6	-13.8	-12.0	**-42.8**
15-24 years	**983**	-12.1	8.3	12.7	-13.8	-30.2	**-35.4**
25-44 years	**2,749**	-4.4	-13.0	-11.7	-0.3	-2.4	**-28.5**
45-64 years	**5,208**	-2.6	-7.9	-14.8	-10.7	-4.5	**-34.7**
65-74 years	**1,679**	23.0	39.0	17.7	-1.6	-15.3	**67.7**
75-84 years	**744**	33.3	37.5	45.5	25.0	25.0	**316.9**
85+ years	**265**	0.0	0.0	43.4	69.7	58.9	**286.8**
Total	**15,747**	**-0.9**	**-0.1**	**-0.2**	**-1.0**	**-1.5**	**-3.6**

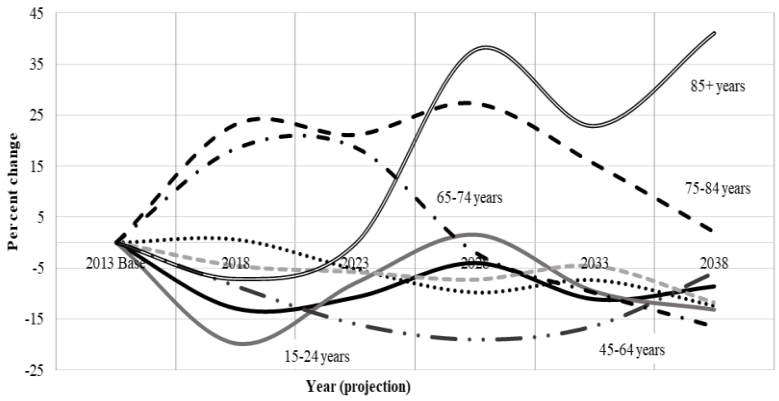
Table 9.13 Ruapehu District, Other population, percentage change in consults by Census period

Ruapehu District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**1,128**	3.6	0.0	0.0	-15.9	-9.5	**-21.1**
5-14 years	**1,073**	-8.4	4.9	6.7	0.0	-12.7	**-10.5**
15-24 years	**974**	-27.6	-27.9	-18.9	1.0	24.0	**-46.9**
25-44 years	**3,496**	-4.6	0.0	-4.2	-7.3	-18.0	**-30.5**
45-64 years	**8,448**	-12.2	-21.5	-22.5	-21.4	-7.4	**-61.2**
65-74 years	**5,193**	16.9	11.6	-10.3	-14.5	-17.3	**-17.3**
75-84 years	**3,217**	20.9	17.0	21.9	12.0	-7.1	**79.5**
85+ years	**1,460**	-8.4	-0.3	36.6	13.1	35.5	**91.0**
Total	**24,989**	**-0.4**	**-1.5**	**-2.8**	**-5.7**	**-6.8**	**-16.2**

The tables above give an indication of disordered flows and those flows can also be seen in Figure 9.27. For this District the projected increase in consults for

individuals aged 85+ years starts post 2023, although increases for those aged 65-74 and 75-84 years begin earlier, though both fall back to 2013 levels from 2028.

Figure 9.27 Ruapehu District, per cent change in the number of consults by age group, 2013-2038 (total population)



The following figures show the 2013 estimated consults by ethnic group and age group with the 2038 low, medium and high series projections identified. For the Māori Pacific population (Figure 9.28) it is projected there will be less consults below age 45 years and more at all ages 45+ years. The medium series for 2038 shows two 'peaks' at age groups 45-64 years and 75-84 years (although the difference in numbers between the low and high series is recognised as quite wide). For the Other population (Figure 9.29) there is projected to be less consults for people aged under 75 years. There is movement of the 'peak' to the right from age 45-64 years to a peak at age 75-84 years.

Figure 9.28 Ruapehu District, Māori Pacific consults with low, medium and high series projections

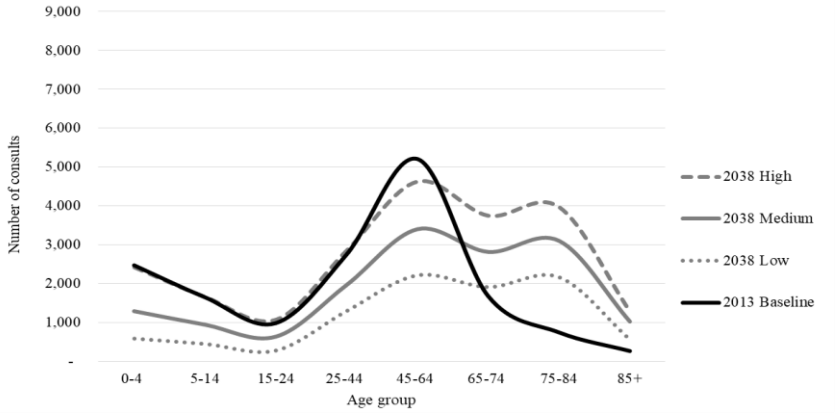
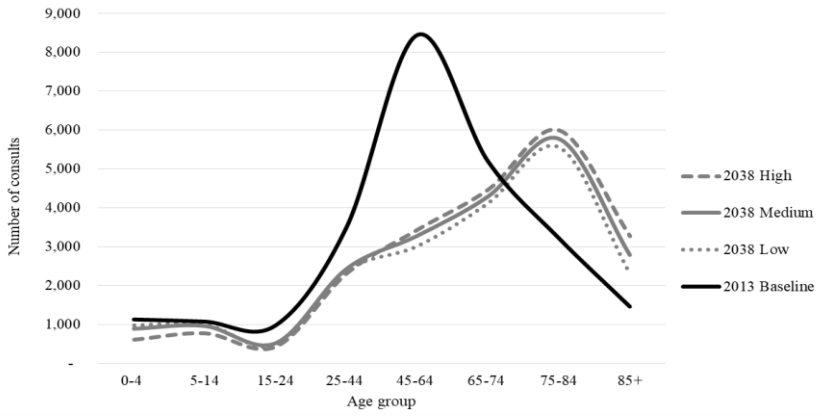


Figure 9.29 Ruapehu District, Other consults with low, medium and high series projections



9.9 South Waikato District demand projections

In 2013 those people resident in South Waikato District had an estimated 114,394 general practice consults. In 2038 it is projected that consults will reach 124,150. This is an overall increase of 8.5 per cent from baseline (9,757 additional consults).

In 2013, consults for the Māori Pacific population made up 33.3 per cent of the total estimated consults, this is projected to rise (marginally) to 34.3 per cent in 2038 (with the proportion of Other consults declining from 66.6 per cent to 65.6 per cent). Overall, consults for the Māori Pacific population are projected to increase by 11.8 per cent over the 2013-38 period, for the Other population the projected overall change is 6.9 per cent. For projected demand by key age group over the 2013-38 period, for Māori Pacific there are both projected significant decreases across the younger ages and increases at the oldest ages. The largest projected decline in consult numbers is for those aged 0-4 years but there are also significant decreases for those aged 5-44 years. The oldest three age groups see significant increases, though it is important to note that the latter comes from a very low base in 2013.

For the Other population the projections show a similar story. While the overall increase is 6.9 per cent, there are projected declines in consults for those aged under 45 years. At all older age groups there are projected increases across the five time intervals (but overall growth is projected to slow and then decline from 2028-2038).

Figure 9.30 South Waikato District, consults projected from 2013

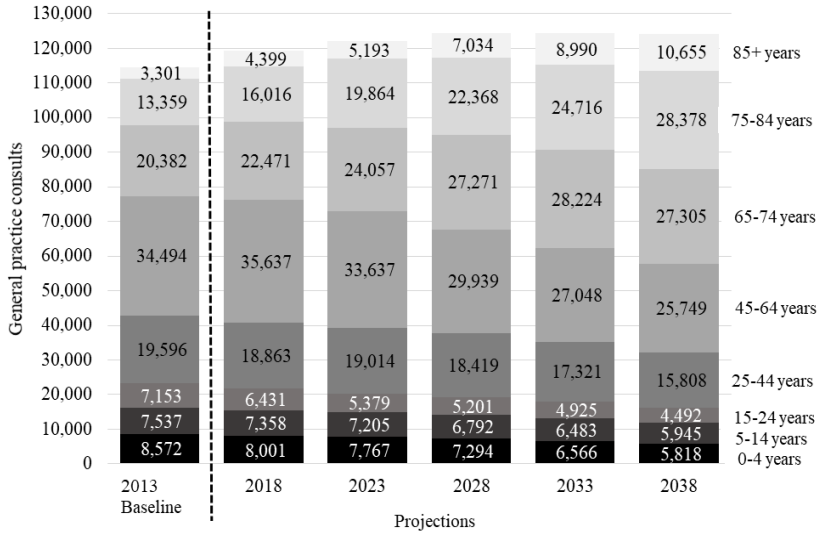


Table 9.14 South Waikato District, Māori Pacific population, percentage change in consults by Census period

South Waikato	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**5,093**	0.0	-10.2	-11.4	-8.6	-6.0	**-31.6**
5-14 years	**3,954**	4.7	6.0	-5.1	-10.3	-10.5	**-15.4**
15-24 years	**3,242**	-13.2	-12.0	7.9	9.7	-5.9	**-14.9**
25-44 years	**7,705**	-1.6	-1.0	-6.5	-8.7	-7.6	**-23.1**
45-64 years	**11,648**	9.3	-0.5	-4.8	-4.1	-0.5	**-1.2**
65-74 years	**4,256**	13.4	13.7	25.8	10.9	6.3	**91.3**
75-84 years	**1,959**	24.4	29.8	21.9	24.4	28.9	**215.8**
85+ years	**252**	0.0	72.8	57.9	36.7	34.1	**400.0**
Total	**38,109**	**4.6**	**2.1**	**1.8**	**0.8**	**2.1**	**11.8**

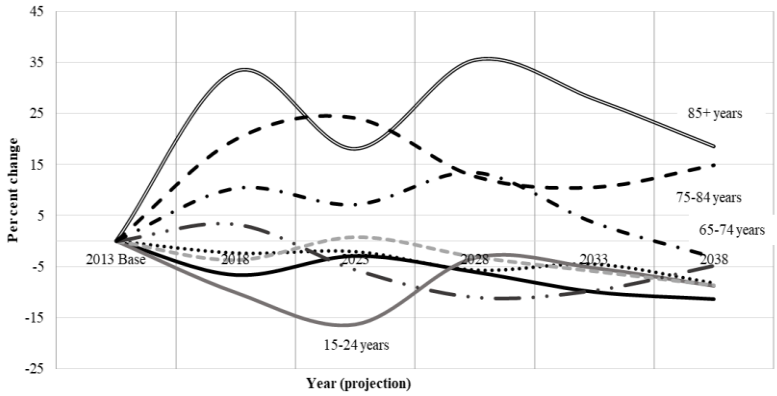
Table 9.15 South Waikato District, Other population, percentage change in consults by Census period

South Waikato	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**3,479**	-16.4	9.8	1.5	-11.8	-18.3	**-32.9**
5-14 years	**3,583**	-10.2	-12.6	-6.7	4.6	-5.3	**-27.4**
15-24 years	**3,912**	-7.6	-19.8	-12.9	-21.2	-13.0	**-55.7**
25-44 years	**11,891**	-5.1	2.0	-0.9	-4.3	-9.4	**-16.9**
45-64 years	**22,845**	0.3	-8.5	-14.7	-13.4	-8.0	**-37.7**
65-74 years	**16,126**	9.4	5.2	9.7	1.0	-6.8	**18.8**
75-84 years	**11,400**	19.1	23.0	10.8	7.6	11.4	**94.7**
85+ years	**3,049**	36.0	14.7	33.4	26.8	16.7	**208.1**
Total	**76,285**	**4.0**	**2.7**	**1.8**	**-0.4**	**-1.2**	**6.9**

Figure 9.31 illustrates that the projected these changes are not linear. For this District there are projected to be fluctuating increases in consultations for those aged 75-84 and 85+ years based on 2013 levels. For those aged 65-74 years there

is fluctuation with levels returning to baseline levels around 2033. For all other ages, there are also ebbs and flows but the direction of change is towards less consults (due to less individuals in all those age groups).

Figure 9.31 South Waikato District, per cent change in the number of consults by age group, 2013-2038 (total population)



The following figures show the 2013 estimated number of consults by ethnic group and age group with the 2038 low, medium and high series projections identified. For the Māori Pacific population it is projected there will be less (or a similar amount of) consults below age 45 years and more at all ages 45+ years. For the Other population (Figure 9.33) there is projected to be less consults for all those aged under 75 years. Again, there is movement of the 'peak' to the right from age 45-64 years to a peak at age 75-84 years. A much higher proportion of all consults will be for those aged 65+ in 25 years' time.

Figure 9.32 South Waikato District, Māori Pacific consults with low, medium and high series projections

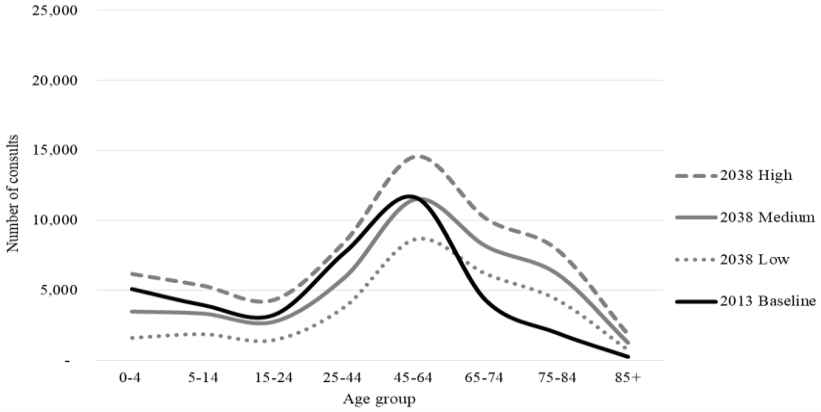
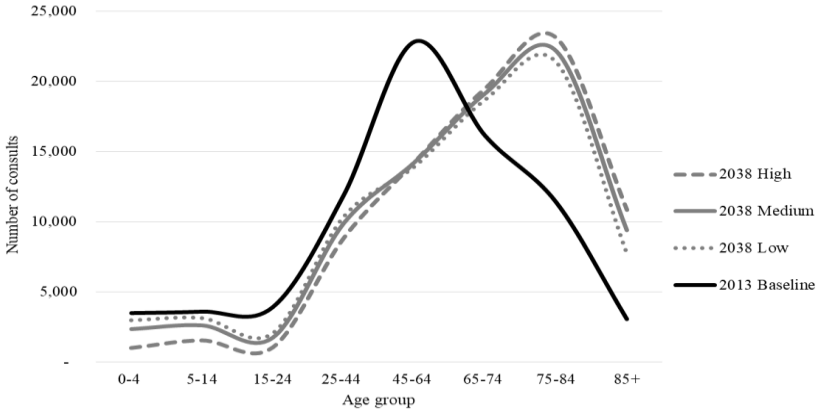


Figure 9.33 South Waikato District, Other consults with low, medium and high series projections



9.10 Thames Coromandel District demand projections

In 2013 there were an estimated 149,093 general practice consults undertaken for residents of this District. In 2038 it is projected that consults will increase to 178,444 (some 29,351 more or an increase of 19.7 per cent). Again, these summary level projections mask a number of differences.

In 2013, general practice consults for Māori Pacific made up 14.7 per cent of the estimated consults, this is projected to increase to 19.5 per cent in 2038. Overall, consults for Māori Pacific are projected to increase by 58.0 per cent over the 2013-38 period (an additional 12,793 consults). There is growth across all age groups with the exception of the middle aged (45-64 years) which is projected to decline by -6.3 per cent from baseline (particularly from 2023 onwards). Significant increases, sometimes from a small 2013 base, are projected for all older ages. Across the five time periods the overall growth projected is fairly even.

For the Other population the projections show a very different picture. The projected overall change is lower at 13.0 per cent, with declines projected for consult numbers under 65 years and increases of 1.7 per cent (65-74 years), 95.5 per cent (75-84 years) with a projected 200.5 per cent increase projected for those aged 85+ years, from 8,434 consults in 2013 to 25,346 in 2038.

Figure 9.34 Thames Coromandel District, consults projected from 2013

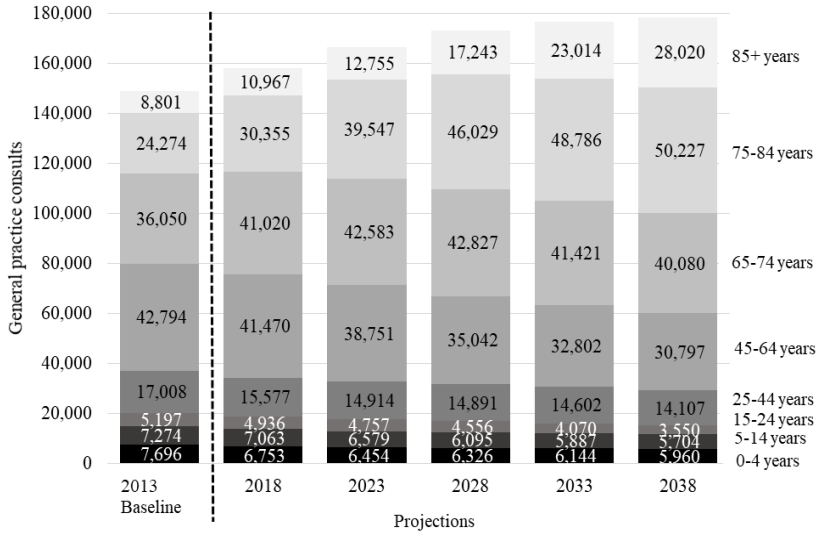


Table 9.16 Thames Coromandel District, Māori Pacific population, percentage change in consults by Census period

Thames Coromandel	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**3,294**	-21.5	6.9	10.6	9.7	7.0	**9.0**
5-14 years	**2,501**	5.6	-6.2	-8.5	8.2	9.5	**7.5**
15-24 years	**1,531**	20.7	10.6	7.5	-5.6	-9.8	**22.3**
25-44 years	**3,783**	-4.9	7.5	17.1	16.6	15.2	**60.7**
45-64 years	**6,349**	8.9	1.8	-5.7	-5.1	-5.5	**-6.3**
65-74 years	**2,616**	46.1	19.8	10.3	10.8	8.4	**132.1**
75-84 years	**1,599**	23.4	43.8	52.3	19.7	14.2	**269.4**
85+ years	**367**	29.6	27.2	60.7	62.2	69.8	**629.6**
Total	**22,040**	**8.3**	**9.9**	**10.8**	**9.6**	**9.5**	**58.0**

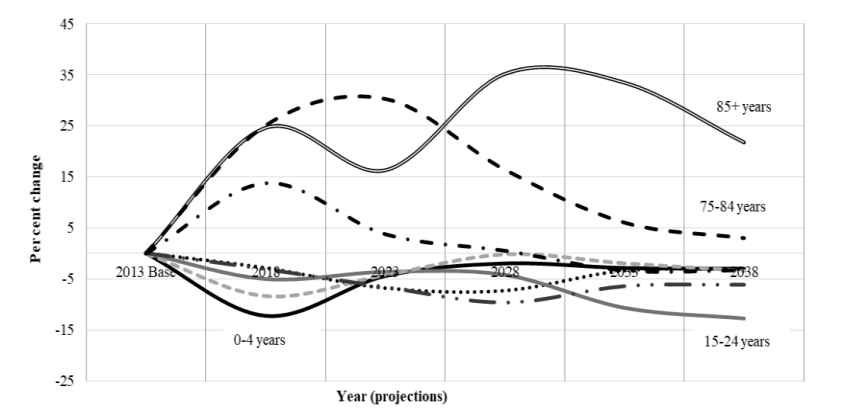
Table 9.17 Thames Coromandel District, Other population, percentage change in consults by Census period

Thames Coromandel	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**4,402**	-5.4	-11.5	-11.4	-14.6	-15.1	**-46.2**
5-14 years	**4,773**	-7.3	-7.2	-6.7	-10.3	-12.2	**-36.8**
15-24 years	**3,665**	-15.8	-12.2	-13.1	-15.5	-15.8	**-54.3**
25-44 years	**13,225**	-9.4	-7.8	-6.2	-10.0	-13.9	**-39.3**
45-64 years	**36,445**	-5.2	-8.2	-10.4	-6.7	-6.2	**-31.8**
65-74 years	**33,433**	11.3	2.2	-0.6	-5.2	-5.1	**1.7**
75-84 years	**22,676**	25.2	29.3	13.6	4.6	1.6	**95.5**
85+ years	**8,434**	24.4	15.8	33.9	31.8	18.2	**200.5**
Total	**127,053**	**5.7**	**4.4**	**2.7**	**0.7**	**-0.9**	**13.0**

The effects of disordered cohort flows on the number of consults are evident in Figure 9.35. In this District there are initial increases for all groups aged 65+ years

out to 2023 followed by stabilisation and some decline (but still above 2013 levels). All other age groups show undulating movements.

Figure 9.35 Thames Coromandel District, per cent change in the number of consults by age group, 2013-2038 (total population)



The following two figures show the baseline estimated number of consults by ethnic group and age group with the low, medium and high series projections for 2038. For the Māori Pacific population the low, medium and high series projections are very similar in terms of the number of consults for those aged under 25 years, higher for those aged 25-44, very similar for those aged 45-64 and then an increase in the number of consults for all those aged 65+ years. The Other population clearly shows the peak age in 2013 (45-64 years) ageing 25 years to be the peak in 2038 (Figure 9.37). It is projected that in 2038 there will be a much higher proportion of all consults undertaken among those aged 75+ years.

Figure 9.36 Thames Coromandel District, Māori Pacific consults with low, medium and high series projections

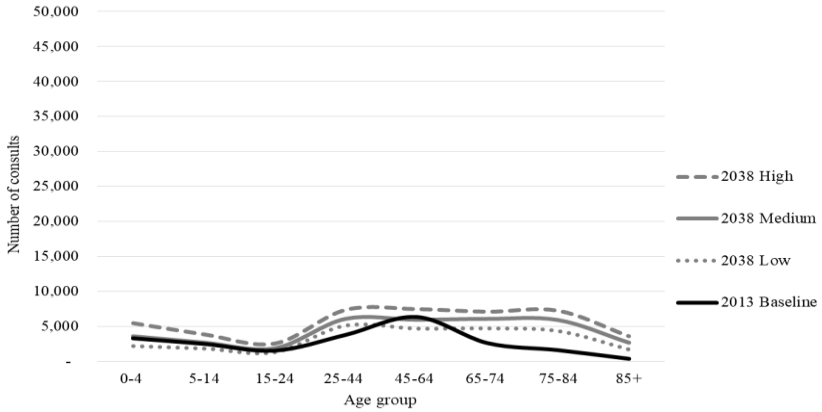
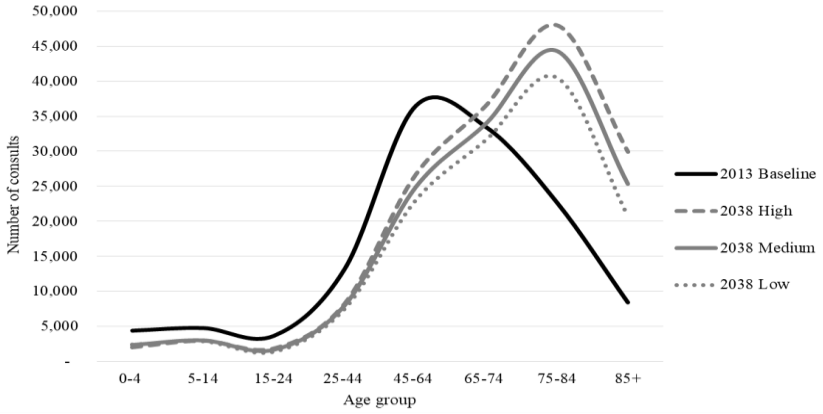


Figure 9.37 Thames Coromandel District, Other consults with low, medium and high series projections



9.11 Waikato District demand projections

Those resident in the Waikato District (the part covered by the Waikato DHB) had an estimated 200,425 general practice consults in 2013. If these levels and patterns remain it is projected that consults will increase to 293,293 (an increase of 46.3 per cent or 92,868 consults). In 2013, general practice consults for Māori Pacific made up 27.1 per cent of estimated consults, this is projected to rise to 35.5 per cent. Overall, consults for Māori Pacific are projected to grow by 91.7 per cent (to 104,138 in 2038). There is growth projected in every age group, but particularly from aged 65-74 years and older. The increase for age 85+ years is from a low baseline number of 285 consults to 2,644 consults in 2038.

For the Other population the projections also show an overall increase (29.5 per cent) from an estimated 146,101 consults at baseline to 189,155 in 2038. There are declines projected for all groups under 45 years (although there are initial increases for those aged 25-44 and 45-64 years). The highest level of projected growth is for the 75-84 years group (201.7 per cent) followed by 171.2 per cent for those aged 85+ (equivalent to an additional 10,456 general practice consults in 2038). Across the five time periods the growth slows from the 6.4 per cent projected for 2013-2018 to 4.1 per cent for the latter period of 2033-2038).

Figure 9.38 Waikato District, consults projected from 2013

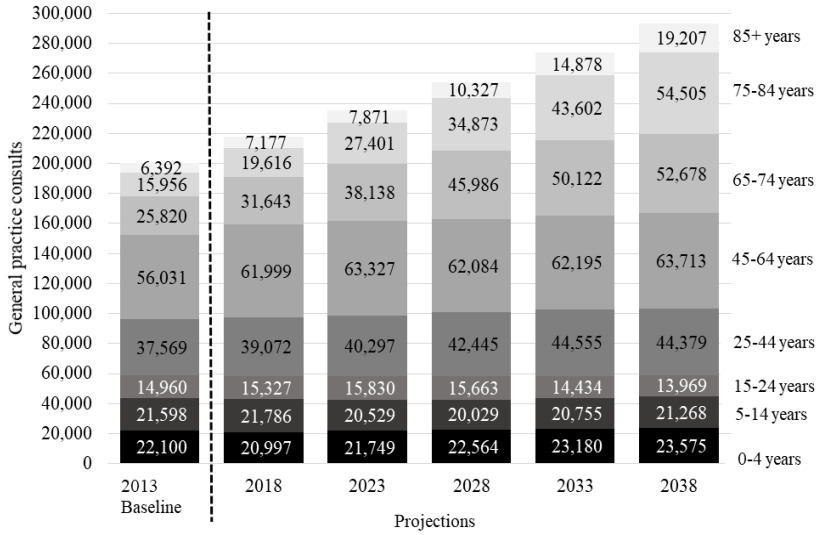


Table 9.18 Waikato District, Māori Pacific population, percentage change in consults by Census period

Waikato District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**10,279**	9.4	6.7	10.0	10.5	9.1	**54.6**
5-14 years	**8,271**	8.0	4.9	7.4	8.5	9.5	**44.5**
15-24 years	**5,071**	16.8	18.1	8.6	5.1	7.5	**69.2**
25-44 years	**11,352**	4.9	7.8	13.7	16.6	12.9	**69.2**
45-64 years	**12,440**	17.3	9.3	3.8	5.6	5.4	**48.1**
65-74 years	**4,245**	41.0	38.0	33.6	14.5	9.8	**226.8**
75-84 years	**2,382**	26.5	59.4	46.7	38.8	38.7	**469.2**
85+ years	**285**	100.0	17.4	55.6	63.1	55.5	**826.3**
Total	**54,324**	**14.4**	**14.0**	**14.5**	**13.5**	**13.1**	**91.7**

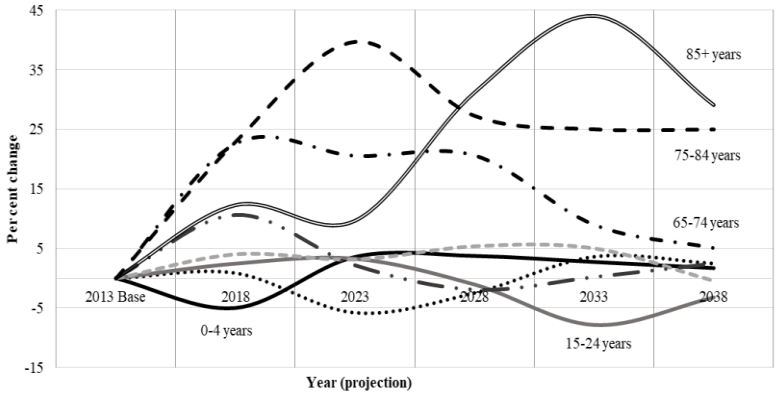
Table 9.19 Waikato District, Other population, percentage change in consults by Census period

Waikato District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**11,821**	-17.5	0.0	-3.9	-8.1	-10.8	**-35.0**
5-14 years	**13,327**	-3.5	-13.2	-10.7	-1.3	-5.3	**-30.1**
15-24 years	**9,889**	-4.9	-6.1	-8.7	-20.0	-16.4	**-45.5**
25-44 years	**26,217**	3.6	1.1	1.4	-1.1	-8.6	**-4.0**
45-64 years	**43,591**	8.8	-0.1	-3.9	-1.8	1.3	**3.9**
65-74 years	**21,575**	18.9	16.4	17.0	7.3	3.5	**79.9**
75-84 years	**13,574**	22.3	36.1	23.1	21.5	21.1	**201.7**
85+ years	**6,107**	8.2	9.0	28.9	41.9	25.7	**171.2**
Total	**146,101**	**6.4**	**5.7**	**5.2**	**5.1**	**4.1**	**29.5**

The two tables above show disordered flows but the effects of such flows are also evident in Figure 9.39, illustrating that the changes projected are not linear. For this

District the interaction between the lines representing change in the number of consults for those aged 65-74, 75-84 and 85+ years show the effects of the ageing of those groups across the five time periods (mainly the Other population).

Figure 9.39 Disordered cohort flows Waikato District



The following two figures show the 2013 estimated number of consults by ethnic group and age group. For the Māori Pacific population (Figure 9.40) it is projected there will be more a higher number of consults across all age groups but particularly the middle and older ages. For the Other population (Figure 9.41) there is projected to be less consults for all those aged under 25 years. There is projected to be two 'peaks' in consult numbers in 25 years' time, at ages 45-64 and 75-84 years (projected to increase from around 15,000 at baseline to as much as 45,000 under the high series scenario).

Figure 9.40 Waikato District, Māori Pacific consults with low, medium and high series projections

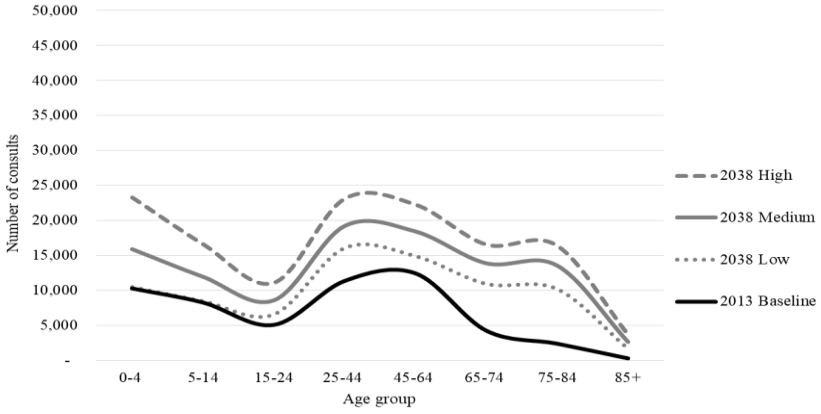
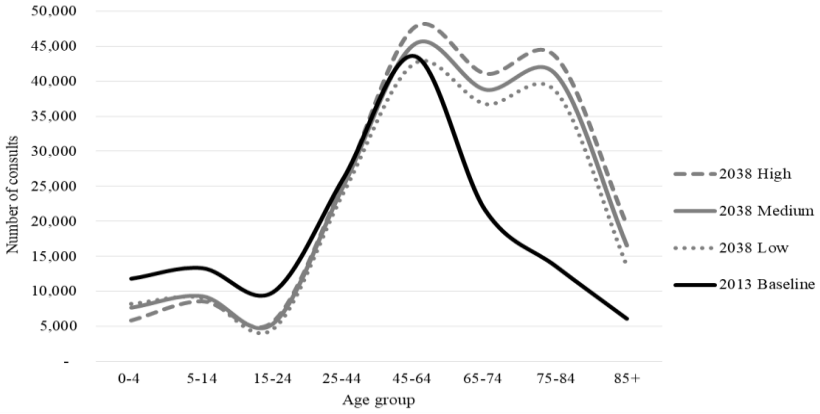


Figure 9.41 Waikato District, Other consults with low, medium and high series projections



9.12 Waipa District demand projections

There were an estimated 163,418 general practice consultation undertaken for District residents in 2013. In 2038 it is projected that this will have risen by 39.1 per cent (to 227,264 consults). Again, however, this increase is not uniform across key age groups and ethnic groups. In 2013, general practice consults for the Māori Pacific population made up 12.6 per cent of the total estimated consults, this is projected to rise to 15.5 per cent in 2038 (with the proportion of Other consults declining from 87.4 to 84.5 per cent).

Over the 2013-38 period, for the Māori Pacific population the projected increases are substantial and across every age group, from 22.6 per cent in the 45-64 age group up to 1,530.0 per cent for those aged 85+ years (Table 9.20). It is important to note that the latter comes from a very small base to increase at a considerable rate across each of the five year intervals. For the Other population the projections show a differing story (Table 9.21). While the overall increase, as noted, is 34.5 per cent the increases are predominately in the three oldest age groups.

Figure 9.42 Waipa District, consults projected from 2013

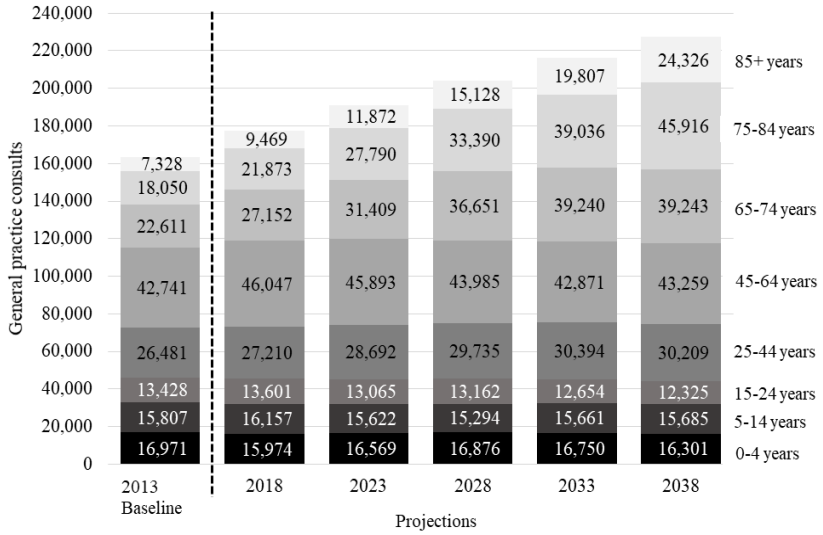


Table 9.20 Waipa District, Māori Pacific population, percentage change in consults by Census period

Waipa District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**3,917**	2.0	6.8	8.5	8.9	8.2	**39.3**
5-14 years	**3,062**	5.5	3.8	4.3	7.8	8.7	**33.8**
15-24 years	**2,281**	20.1	8.8	5.0	4.7	4.6	**50.2**
25-44 years	**4,013**	2.3	10.3	14.7	13.9	12.6	**66.0**
45-64 years	**5,048**	15.7	1.9	-1.2	2.3	2.8	**22.6**
65-74 years	**1,545**	39.1	46.4	35.0	1.3	1.3	**182.3**
75-84 years	**660**	40.6	57.7	36.6	49.5	37.9	**524.5**
85+ years	**56**	280.0	26.3	39.6	71.6	41.7	**1530.0**
Total	**20,582**	**12.7**	**11.9**	**11.5**	**10.4**	**10.2**	**71.1**

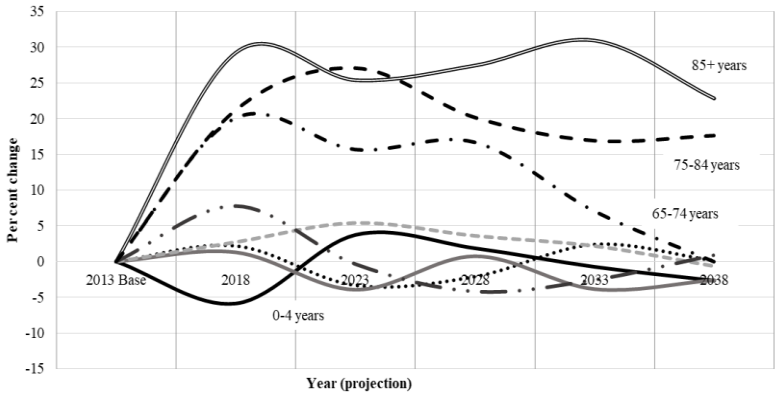
Table 9.21 Waipa District, Other population, percentage change in consults by Census period

Waipa District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**13,055**	-8.2	2.7	-0.4	-4.4	-7.4	**-16.9**
5-14 years	**12,745**	1.4	-5.1	-3.8	0.8	-2.6	**-9.1**
15-24 years	**11,147**	-2.6	-7.2	-0.5	-6.5	-5.1	**-20.2**
25-44 years	**22,468**	2.8	4.6	1.6	-0.3	-3.8	**4.8**
45-64 years	**37,693**	6.7	-0.7	-4.6	-3.3	0.6	**-1.6**
65-74 years	**21,066**	18.7	13.0	14.6	7.8	-0.2	**65.6**
75-84 years	**17,390**	20.4	25.7	19.2	14.8	15.9	**140.3**
85+ years	**7,272**	27.3	25.4	27.1	29.9	22.2	**222.1**
Total	**142,837**	**8.0**	**6.9**	**6.3**	**5.2**	**4.1**	**34.5**

The two tables above show disordered cohort flows and the effects are also shown in Figure 9.43. Shown is the percentage change in the number of consults by age

group between Census years. There is projected to be high initial growth across all three older age groups, followed by decline from 2028 for those aged 65-74 and 75-84 years, with continued high growth for those aged 85+ years from 2013 levels.

Figure 9.43 Waipa District, per cent change in the number of consults by age group, 2013-2038 (total population)



The following two figures show the 2013 baseline estimated number of consults by ethnic group and age group with the low, medium and high series projections for 2038. For the Māori Pacific population (Figure 9.44) there is projected to be increases in the number of consults across all ages (albeit it from a low base). For the Other population there is projected to be fewer consults for all ages under 25 years, with significant increases in the number of consults occurring for those aged 65+ years. Again for this population, the peak in 2013 becomes two peaks in 2038, remaining at 45-64 years but with the secondary peak at ages 75-84 years.

Figure 9.44 Waipa District, Māori Pacific consults with low, medium and high series projections

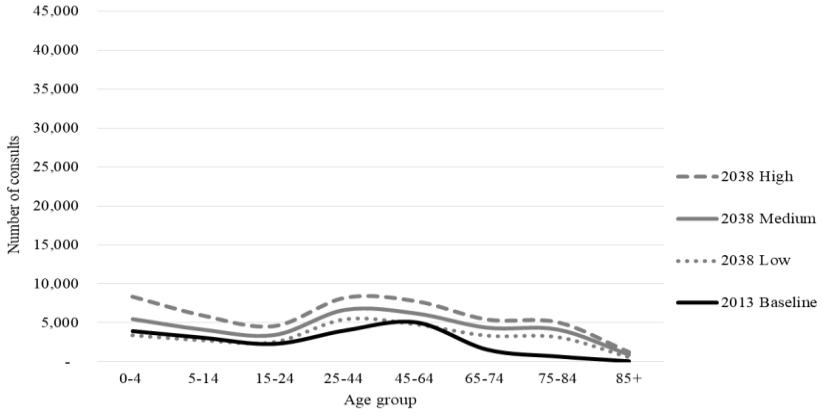
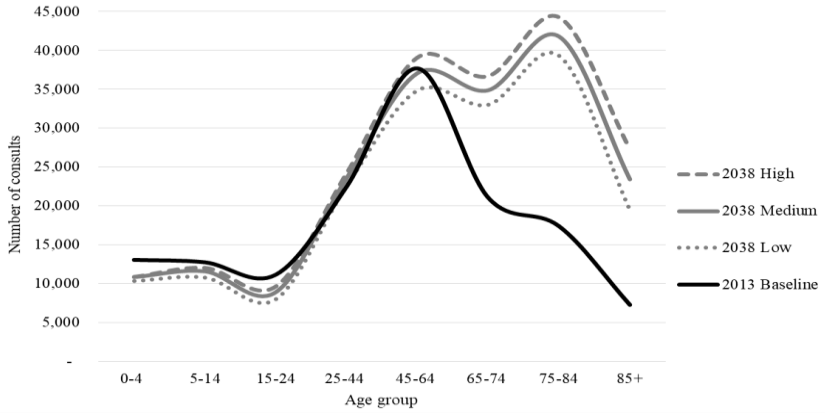


Figure 9.45 Waipa District, Māori Pacific population with low, medium and high series projections



9.13 Waitomo District demand projections

In 2013 there were an estimated 39,784 general practice consults undertaken for residents in this District. In 2038 it is projected that the number of consults, if the levels and patterns in 2013 hold true, will increase by 0.5 per cent to 39,973.

In 2013, the Māori and Pacific population made up 41.2 per cent of the estimated total consults, this is projected to increase to 51.7 per cent in 2038. Overall, consults for Māori Pacific are projected to increase by 26.3 per cent (equivalent to an additional 4,299 consults). By age group there are declines expected overall for those aged under 25 years. Conversely, there are projected to be growth in the number of consults for all age groups from 25 years and older. Across the five time periods the overall growth projected is fairly even, between 5.5 per cent (2013-2018) and 4.1 per cent (2028-2033).

For the Other population, the projections show a very dissimilar picture. For Other, the projected overall change is a decline of -17.6 per cent, with declines projected for all age groups under 75 years and increases of 99.0 per cent (75-84 years) and 119.0 per cent (85+ where consults were estimated at 1,201 at baseline and 2,629 in 2038). The total -17.6 per cent decline consists of smaller declines in the earlier three time periods (across 2013-2028) increasing to -4.7 per cent in the 2028-2033 period and -8.5 per cent in 2033-2038.

Figure 9.46 Waitomo District, consults projected from 2013

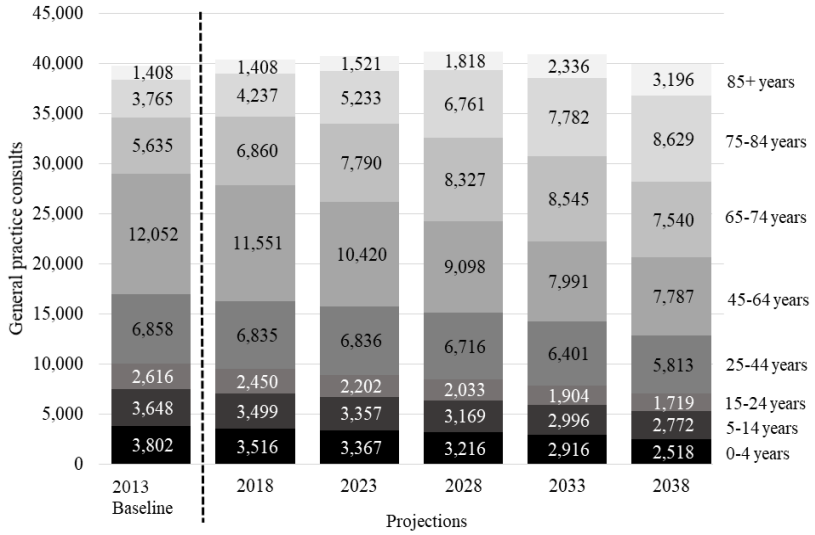


Table 9.22 Waitomo District, Māori Pacific population, percentage change in consults by Census period

Waitomo District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**2,500**	-16.4	-2.4	-2.5	-5.1	-5.4	**-28.6**
5-14 years	**2,126**	3.3	-6.3	-10.1	-3.7	-2.6	**-18.5**
15-24 years	**1,568**	1.1	-0.4	2.8	-7.9	-14.6	**-18.6**
25-44 years	**3,354**	7.6	6.0	2.6	1.2	1.8	**20.5**
45-64 years	**4,368**	5.6	3.4	3.0	0.6	7.0	**21.1**
65-74 years	**1,688**	26.5	19.8	13.6	22.2	4.9	**120.6**
75-84 years	**561**	50.5	22.8	45.4	18.4	26.3	**301.9**
85+ years	**207**	0.0	0.0	37.1	27.1	57.4	**174.2**
Total	**16,371**	**5.5**	**4.6**	**5.1**	**4.1**	**4.6**	**26.3**

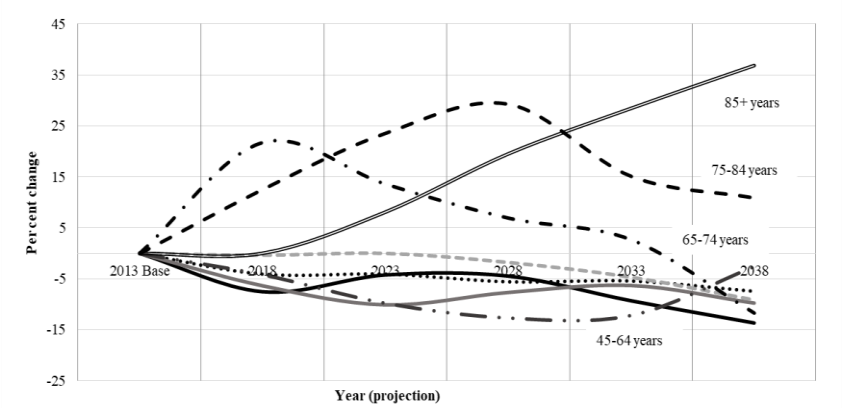
Table 9.23 Waitomo District, Other population, percentage change in consults by Census period

Waitomo District	Baseline consults	Percentage change in projected consults					2013-2038 percent change
Age Group	**2013**	**2013-2018**	**2018-2023**	**2023-2028**	**2028-2033**	**2033-2038**	**2013-2038**
0-4 years	**1,302**	9.4	-6.9	-7.5	-16.1	-28.8	**-43.7**
5-14 years	**1,522**	-14.3	-0.3	1.5	-7.8	-14.7	**-31.8**
15-24 years	**1,048**	-17.5	-27.9	-34.2	0.0	8.0	**-57.8**
25-44 years	**3,505**	-8.0	-6.7	-7.3	-13.0	-27.1	**-49.5**
45-64 years	**7,684**	-9.7	-18.6	-26.0	-27.2	-18.0	**-67.5**
65-74 years	**3,948**	19.7	10.7	3.6	-7.9	-23.6	**-3.3**
75-84 years	**3,204**	5.9	23.7	25.2	14.1	6.3	**99.0**
85+ years	**1,201**	0.0	9.5	16.8	28.7	33.1	**119.0**
Total	**23,412**	**-1.4**	**-1.8**	**-2.2**	**-4.7**	**-8.5**	**-17.6**

The effects of flows are also shown in Figure 9.47. Using 2013 as the baseline there is projected to be continued decline in the numbers of consults undertaken for those

under 65 years (although towards the end of the projection period there is expected to be an increase in numbers aged 45-64 years to return to 2013 levels). There is initial high growth for in the numbers of consults for those aged 65-74 and 75-84 years, and for those aged 85+ years from 2023 onwards.

Figure 9.47 Waitomo District, per cent change in the number of consults by age group, 2013-2038 (total population)



Looking 25 years into the future the following two figures show the 2013 baseline estimated number of consults by ethnic group and age group with the low, medium and high series projections identified for the 2038 year. For the Māori Pacific population there is projected to be more consults from ages 25+ years (looking at the medium and high series projections). There may be fewer consults at the younger ages unless the high series scenario plays out for this population. For the Other population there is a definite shift to the right where the peak will move from consults in the 45-64 years age group in 2013 to be at the 75-84 years in 2038.

Figure 9.48 Waitomo District, Māori Pacific consults with low, medium and high series projections

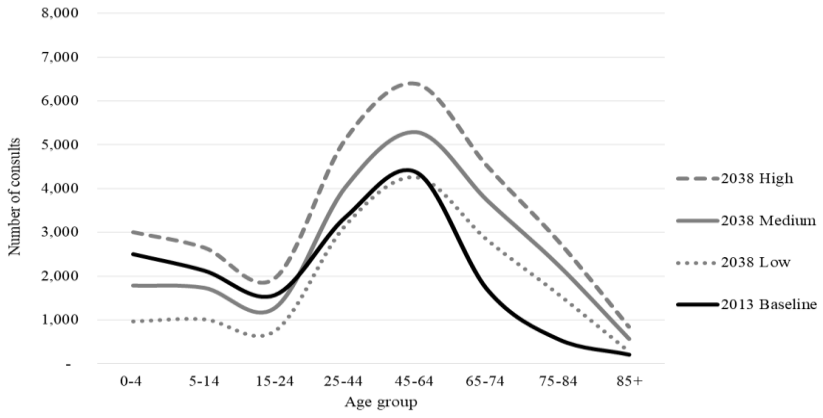
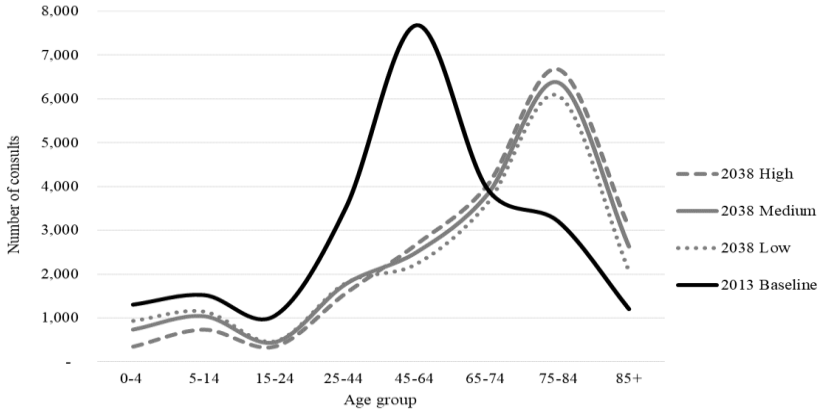


Figure 9.49 Waitomo District, Other consults with low, medium and high series projections



9.14 Summary and discussion

Following establishing the expanded size of general practice for the Pinnacle MHN study population, those levels were used to establish a Waikato DHB estimate of general practice in 2013/14. This was done by applying the service level results of the Pinnacle MHN study population to the ERP of the DHB. Doing this, it was estimated that some 1,456,462 general practice consults were undertaken in the Waikato DHB area. If the 2013/14 levels of the study population hold true, at the overall level, consults are projected to increase by 34.8 per cent across the 25 year period to reach 1,963,040 consults in 2038.

The following three questions were the focus of this chapter.

Research questions

(a) What is the projected population profile of the Waikato DHB (and 10 sub-regional Territorial Authorities) over the period 2013-2038?

(b) What was the estimated level of demand for total general practice services across the Waikato DHB in the 2013/14 baseline year?

(c) What is the projected demand for total general practice health care for the Waikato DHB catchment as a whole from 2013-2038 and for the ten sub-regional TAs, using Statistics New Zealand low, medium and high series population projections?

The research questions did not have hypotheses as such attached, other than an expectation that for (a) and (c) the middle ageing Māori Pacific population and the old ageing Pākehā, and subsequent effects on general practice consults, would

become increasing evident through the analysis along with any latent sub-regional differences. This was described for the DHB and each TA in the previous sections.

Analysis at the TA level is important when considering the future sustainability of general practice health care in both urban and rural areas across the Waikato DHB. Table 9.24 shows a summary of the projected demand for general practice services, by age group, but only for the destination year (2038) compared with the start of the period (2013). The table illustrates the 'block of black' to the right of the table, highlighting the majority of growth in demand for consults from age 65+. While this summary level change is important it doesn't show the journey between those two points in time, a journey of 25 years of ongoing service delivery.

Table 9.24 Projected percentage change in general practice consults, 2013-2038

	Projected percentage change in general practice consults, 2013-2038								
	Age group								
Area	0-4	5-14	15-24	25-44	45-64	65-74	75-84	85+	Total
Waikato DHB	-5.0	1.6	-2.8	13.4	5.3	59.8	144.8	200.8	34.8
Hamilton City	5.7	19.1	13.5	28.7	34.8	84.7	155.4	185.5	45.1
Hauraki	-31.8	-21.1	-44.2	-22.2	-25.6	26.1	115.9	204.9	17.0
Matamata Piako	-14.9	-9.3	-21.2	-3.3	-13.4	41.3	98.9	178.9	20.8
Otorohanga	-21.5	-10.4	-18.8	-13.1	-27.1	24.1	145.2	253.2	12.5
Ruapehu	-39.4	-30.0	-41.1	-29.6	-51.1	3.5	124.1	121.1	-11.4
South Waikato	-32.1	-21.1	-37.2	-19.3	-25.4	34.0	112.4	222.8	8.5
Thames Coromandel	-22.6	-21.6	-31.7	-17.1	-28.0	11.2	106.9	218.4	19.7
Waikato	6.7	-1.5	-6.6	18.1	13.7	104.0	241.6	200.5	46.3
Waipa	-4.0	-0.8	-8.2	14.1	1.2	73.6	154.4	232.0	39.1
Waitomo	-33.8	-24.0	-34.3	-15.2	-35.4	33.8	129.2	127.1	0.5

In summary, broad level trends and patterns at the DHB level masked important underlying sub-regional levels and trends by age group, ethnic group and over the five time periods during the 25 year journey. Planning for the up, down and static nature of the service demand journey is a key factor in the sustainability of general practice health care right across the region.

All sub-regions have consult growth projected for older people. These consults may well be for individuals living with one or more chronic conditions. This could involve significant resources from general practice in areas such as health literacy and eHealth literacy to get individuals to a good level of knowledge enabling self-management (in conjunction with the general practice team). Growth in such consults are expected to consume more health professional resource than may

generally be the case for consults with younger people requiring more episodic care. Harking back to the care typically provided by general practice compared with A&Ms and ED - there are (in general) three types of care – care that is preventative in focus, care focused on chronic conditions or an acute presentation. Accident and Medical centres and EDs provide mainly acute care that is episodic in nature. It is general practice that provides the continuity of care that is particularly important for disease prevention and care management, especially for those with chronic conditions or at risk of developing one (or more).

For two TAs, very low or no overall growth measured by percentage change from 2013 levels is expected. For Waitomo District there is projected to be a 0.5 per cent increase in the number of consults overall but within that there is projected growth in consults for all those aged 65+ years. For Ruapehu District there are projected to be an -11.4 per cent decline in the number of consults overall, but again within that there is projected growth in the number of consults for people aged 65+ years. For these two TAs, as well as for all others, there will still be significant numbers of individuals in those younger age groups for which services must be planned, funded and delivered (alongside the ageing population that often gets the headlines). This is also a capacity issue in terms of the general practice workforce where there are projected to be shortages, and rural areas may be hardest hit, given some of those areas are already recognised as hard to staff areas.

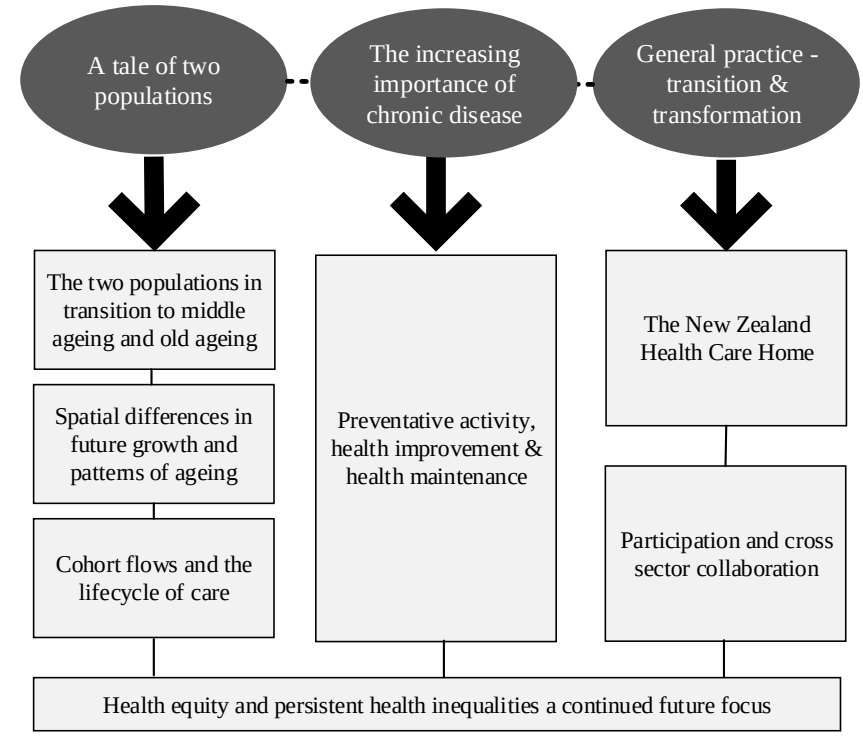
Projections however, are not predictions of the future. The projections presented in this chapter are based on the established 2013/14 service use patterns by age, ethnic group and gender of 235,666 individuals enrolled in the Pinnacle MHN PHO. The study population made up a significant proportion of the ERP of the Waikato DHB and was generally representative of it (Chapter Five). The reality over the time period out to 2038 may differ, affected by the ongoing demographic and epidemiological transitions, sub-regional migration, changing societal expectations concerning provision of health care and individuals own health (and wellbeing) alongside the disruptive and transformational change signalled as necessary for future general practice sustainability.

10 Discussion

This chapter focuses on what the mix of service use findings and demand projection scenarios, from the expanded measure of general practice, mean for the reality of planning for sustainable community general practice. Given the cornerstone nature of general practice within the New Zealand health system, the sustainability of this part of the sector is of paramount importance.

Three key sustainability themes (with inter-related components) bring together the earlier findings. The themes include; a tale of two populations in transition, the increasing importance of chronic conditions and the transformation of general practice models of care now underway in some PHOs. The topic of persistent health inequalities fits across all three sustainability themes and this is recognised in Figure 10.1. A separate section focuses on issues pertaining to "health equity and persistent health inequalities a continued future focus".

Figure 10.1 Structure of the discussion chapter



10.1 A tale of two populations – past, present and future

The reality for the health system is that the sustainability of general practice is not just about general practice per se, or up to that part of the system to address. The sustainability of general practice is about the sustainability of the entire system, due to the first-point-of-contact, coordinating and gatekeeping roles that general practice plays. The long term population processes of demographic and epidemiological transition are at the core of the sustainability discussion. These processes have led to the current state-of-play in general practice in terms of both the rising demand for health care services and on the supply side, the current and projected workforce capacity issues.

A theme throughout this study has been the reality of the 'two populations' in transition – the two populations of Māori (and Pacific) and Pākehā being not only structurally and numerically so very different, but also socio-economically different. Understanding the past demographic and epidemiological experiences of these differing populations helps to understand the present and to plan for the future. Earlier results chapters highlighted the different scenarios that may occur at the sub-regional level, given the age-structural and service use mix of the two populations. The reality for general practice is that large cohorts of Pākehā are now in middle age (45-64 years) and are simultaneously beginning to impact older age services (65+). It is the demand effects of the population, driven in a large part by age structure, that determine the mix of services delivered by general practice, and in turn the capacity of general practice to supply services to these cohorts will determine its overall sustainability. If general practice cannot cope with the demands from the baby boomers transitioning through into the oldest ages, alongside inherent workforce capacity issues, then all New Zealanders access to appropriate general practice care will be at risk – no matter which transitioning population they fit within or where they are resident or enrolled.

What does this mix and resulting scenarios mean for the reality of planning for sustainable general practice? It means being cognisant of the potential demand scenarios and cohort flows at both the DHB and sub-regional level. It means that general practices across the region will need inherent flexibility to change as

populations (groups of individuals) flow through the system with differing life cycle related health needs. The results here have (Chapter Nine) illustrated how projecting the 2013/14 consult patterns by age group, gender and ethnicity out to 2038 may translate into consults or 'workload' for general practice. At the Waikato DHB level, growth in consult numbers translated into a 34.8 per cent increase over the 2013-2038 period (in terms of consult numbers - an increase from 1.45 million to 1.96 million consults). Again the 'tale of two populations' becomes increasingly evident over time. For Māori and Pacific, there is projected consult growth across all age groups whereas for Pākehā the growth is concentrated at 45+ years, but particularly from 65+, with overall declines at younger ages.

This translation of change into numbers of consults at the sub-regional level also highlights the uneven geography of projected change, bringing perhaps a different mix of issues at different times to the sustainability discussion in different locations. This coming change - given the nature of disordered cohort flows – will be messy in terms of planning for service provision. Not only are there projected to be considerably more people at the oldest ages (with Pākehā driving this change) it will mean not only more, but more complex medical consults potentially with chronic conditions (co or multiple morbidities) in conjunction with poly-pharmacy. This highlights that not all consultations are equal in terms of the time taken (by GP or PN) and have differing implications for practice workload and capacity. These scenarios translate into general practice needing to have GPs and PNs with the right skills and experience in the right place at the right time – within the context of ongoing workforce supply issues. This may be particularly problematic for rural general practice, given that some areas within the Waikato DHB are already recognised as hard to staff areas. Many health care services are life cycle based so while general practice is gearing up to cope with demand pressures from older people, the complete range of services (and the skills to deliver those services) across the life course still need to be available. This messiness is not only for general practices however, DHBs and PHOs will also need to become much more nimble with more flexible structures that can respond quickly to fluctuating demands for these services on the front line.

The importance of continuity of care may become more important as people age (particularly if a chronic condition is present). In this study, while it is unknown if individuals always saw the same GP in their enrolled practice, the proportion of all general practice care delivered in the enrolled setting speaks to a level of continuity. Using an expanded measure of general practice, a key finding from this study was that the vast majority of general practice care, including for those with chronic conditions, was delivered in the enrolled setting. There was some variation across socio-demographic variables and by geography of residence. Essentially those people residing in closer proximity to A&M and ED facilities had a higher level of outside general practice service use – particularly for very young children and young adults (especially young adult males), however outside service use was higher for young adult males (particularly Pākehā) across the region, even in locations quite some travel distance from the TA of residence. Outside service use was especially high for young adult Pākehā males resident in Hamilton City and the Waikato District. Overall however, this high level of provision in the enrolled practice is good news for individuals, practices, PHOs and DHBs. This finding is at the heart of sustainability and general practice needs to be supported in multiple ways that enable this level of service provision to continue. If general practice cannot retain this standing under rising demand, workforce shortages, movement of services into community and the elimination of health inequalities then other parts of the health system will feel the effects as people look elsewhere for general practice care. This is a scenario that all in the sector would hope to avoid.

Aligned with continuity of care, a key finding from this study concerned service use by individuals enrolled in VLCA funded practices. Being enrolled in a VLCA funded practice seemed to improve access for individuals to their enrolled GP (more services were used in that setting) and reduce outside of the enrolled practice service use. The results for individuals with chronic conditions indicated that this is also the case for Māori Pacific females but results were not as clear for Pākehā females and males with a chronic condition. These findings also constitute a good news story for general practice (in terms of care provision) and point to the importance of affordable general practice care. From the literature, the nature of the role of affordability appears to be contested – particularly the role it plays in general

practice in the ED. From the New Zealand Health Survey however, lack of affordable care seems to play an important role in people delaying or forgoing care in general practice. This finding is interesting, particularly as the sector heads into a review of funding for general practice including potentially revisiting the VLCA scheme. Aligned with this, the effect of holding a CSC was also included in this study as a proxy for an individual's income. The main finding being that in general those without a CSC used a lower level of services in the enrolled setting but a higher level outside of the enrolled practice.

Establishing service use levels and trends for the study population allowed exploration of demand drivers across the Waikato DHB by several populations of interest. The influence of eight demand drivers was investigated. These were age, gender, ethnic group, presence of a chronic condition, holding of a CSC (proxy for income), the cost of a consult (practice funding model), whether the individual was considered 'high needs" (using the MoH definition) and geography of residence. Statistical analysis, using negative binomial regression, found the importance of age, presence of a chronic condition and gender in service use (in that order) for the Pinnacle MHN population both in service use inside of and outside of the enrolled setting. Again there were variances at the sub-regional level and these are of importance for the planning and funding of services, given that health system planners and funders (at all levels) need to know the demography and service use characteristics of the populations they serve.

The MoH, through a number of its strategic documents, continues messaging that the way forward for sector sustainability will involve a much greater level of collaboration. This is not only among the component parts of the sector but should include those who actually use services, particularly to ensure they are culturally appropriate. In the case of collaboration, the devil seems to be in the doing of it. The move towards a true collaborative approach to the planning and delivery of services will mean a change in the way general practice works, however, it will also mean considerable change in the way that the regional and national level funders and planners operate. When true collaboration occurs it may mean that the usual decision makers give away some (or much) of that decision making and control.

Collaborative planning, which may be time consuming if all involved are to have a true voice, should result in better targeted services and help guard against parts of the sector being diverted by the increasing demands of the old ageing Pākehā population.

Within the Waikato DHB, three geographical areas will dominate future population growth - Hamilton City, Waikato and Waipa Districts. There is already considerable development around Hamilton into the peri-urban areas in the Waikato and Waipa Districts and this is expected to continue. For the Waikato District this includes the areas closer to Hamilton (within commuting for work distance) and the northern border closest to Auckland City (within commuting distance to that city). For the Waipa this includes growth in and around the border with Hamilton and the towns of Cambridge and Te Awamutu. The 2013/14 data from Pinnacle MHN related to geography of residence compared with geography of enrolment showed that half of people resident in the Waikato District were enrolled in a practice physically located in Hamilton City. If this pattern continues there will be continued pressure on general practices within Hamilton City in terms of future enrolments, both for residents of the city and residents of nearby areas. These three TA areas in particular need to plan for continued numerical growth alongside growth in demand from an ageing population.

The demand projections presented in this study (Chapter Nine) show the nature of the expected uneven geography of change. Territorial Authorities outside of Hamilton City and Waikato and Waipa Districts will experience different scenarios under the continuing demographic and epidemiological transition, and perhaps as inter regional and within region migration play a more nuanced role in where people chose to live and access the health services they need. One example of this is the Thames Coromandel District, a retirement and holiday destination. This TA is one of the country's oldest with a median age of 51 years (Statistics New Zealand, 2017b) and is the TA with the highest proportion of the population aged 65+ years, at 27.0 per cent (Statistics New Zealand, 2015). While the old ageing of this District is driven by Pākehā, general practices still have to provide the full range of services, while the overall mix of services will be driven by the needs of the older population.

This example highlights that planners, funders and service providers need to be cognisant of spatial differences and the local context, knowing where (and when) there may be potential service pinch-points in terms of cohort flows and service provision. As noted, service and funding flexibility will be required to account for these cohort flow effects – of which the reality is fluctuating demand effects - on different types of services at different times.

10.2 The increasing importance of chronic conditions

The increasing prevalence of chronic conditions in the context of both the middle ageing of Māori and Pacific and the old ageing of Pākehā will be a major driver of future demand. Following statistical analysis, this study found that age and the presence of a chronic condition were the key predictor variables in the level of general practices services used. This finding confirms for general practice that the role of chronic conditions in terms of both prevention and management, will only become more important over time. This was also shown in the translation of consult projections at the sub-regional level as well as for the Waikato DHB area as a whole.

This study established that at the Pinnacle MHN level those with one or more chronic conditions used a higher level of services in their enrolled practice setting than their counterparts without any condition (this was expected). With the exception of those aged 85+ years, females with chronic conditions used a higher level of services in their enrolled practice than males. The presence of a second chronic condition made a difference, particularly for males in the use of services in their enrolled practice – but not in terms of services used outside of their enrolled practice - where males with 2+ conditions had the same level of service use outside the enrolled practice as males with no chronic condition. Indeed, while age standardised rates showed, in general, that while those with chronic conditions used a considerably higher level of services in their enrolled practice this did not carry forward to using a higher level of services outside of the enrolled setting. The general finding was instead that those with a chronic condition often had similar levels of service use outside their enrolled practice than those without a chronic condition. These results are essentially a good news story for Pinnacle MHN affiliated general practices. The good news is that those with chronic conditions are

receiving the vast majority of their health care in their enrolled practice. This is arguably best for the individual (continuity of care) and good for the system in terms of funding efficiency.

The WHO has referred to long term conditions as 'the health care challenge of the 21st Century' (World Health Organisation, 2002, p. 11). Starfield (2011, p. 1) does note, however, that a portion of this increasing prevalence may originate from lower diagnosis thresholds. This impacts on the prevalence of individuals with a single condition as well as those with co-existence and multi-morbidity. Again the importance of the two populations in transition emerges – in this case in the lifecycle timing of chronic conditions. The MoH includes Māori (and Pacific populations) as priority groups in terms of the impact of long term conditions on higher rates of illness, disability and death (Associate Minister of Health, 2016), particularly in comparison to Pākehā (Ministry of Health, 2002a, p. vii). Many health conditions are more common in the Māori and Pacific population (Best Practice Journal, 2008, 2012), and Māori develop some chronic conditions, such as diabetes and cardiovascular disease, at a younger age (Best Practice Journal, 2008, p. 15). The health burden of COPD, one of the chronic conditions included in this study, represents a condition with one of the most significant health disparities for both Māori and Pacific people in New Zealand (Best Practice Journal, 2012, p. 15).

As noted earlier, results from recent New Zealand Health Surveys show that both Māori and Pacific populations share many of the same issues around inequitable access to general practice (Scott & Lawrenson, 2015; Ministry for Pacific Peoples, 2017), unmet need for general practice care, unmet need for pharmaceuticals and disparities in health outcomes (Ministry of Health, 2015, 2016d; Ministry for Pacific Peoples, 2017). There is also evidence that the uneven burden of infectious disease remains a health sector issue for both Māori and Pacific communities compared to Pākehā (Baker et al., 2012). These now well documented inequalities remain across the system, and as Ajwani et al. (2003, p. iii) have reported, there is a cumulative disadvantage over the life course.

In relation to operationalising strategies into meaningful policies and programmes on the front line of health service delivery, Oetzel et al. (2017, p. 69) have developed an implementation framework for chronic disease intervention in Māori communities. Kaupapa Māori aspirations are at its core, including indigenous knowledge creation, theorising and methodology. Taking such an advocated approach in a collaborative manner could be a key way forward for general practice in regards to both implementing effective programmes for chronic disease prevention and management – but also in terms of ending health inequalities. Multi-morbidity is a contributor to health inequalities in New Zealand and is linked to higher service use in both primary and secondary settings (Millar, Stanley, Gurney, Stairmand et al., 2018, p.44; Ministry of Health, 2016c). Working under a collaborative approach and a culturally appropriate framework seems to embody the spirit of the sectors health strategy approaches (which are by necessity of being strategies lacking implementation detail). Similar collaborative approaches to developing services are needed for other population groups (and for example, the MoH's (2014a) 'Pathway to Pacific Health and Wellbeing Strategy' suggests exactly that). Many PHOs and DHBs are already working collaboratively in this space with a variety of local level interventions and re-organisation of services occurring.

Alongside keeping people with chronic conditions well is the role of preventative care. The future role of preventative care is at the heart of population health being delivered in the general practice environment or as Buetow et al. (2008, p. 762) phrased it 'individualised population care', with Schluter et al. (2014, p. 175) stating that "if people need to command appropriate health care resources in order to preserve or improve their health, then improving access to primary care is fundamental – especially for those with the greatest need". Within this chronic conditions space are three key aspects of care to consider;

- Prevention activities for those at risk of developing a condition. This prevention activity could encompass education on several fronts – about the disease in question and on self-management, perhaps both having health literacy and eHealth literacy components. Any prevention

programmes must account for an individual's cultural beliefs, values and practices. The sectors move to a collaborative planning approach should help with the design of such programmes, and over time contribute to the reduction of inequalities (Hindelang, 2006; Jack, Jack, & Hayes, 2012). There may also need to be more emphasis on preventative action such as targeting individuals not yet meeting the agreed clinical threshold for disease (e.g. people with pre-diabetes).

- Health maintenance for those with a diagnosed condition to keep them well and with a good quality of life. This could include ongoing monitoring and self-management aspects in conjunction with the general practice team and potentially other health professionals. The reality for general practice is that individuals may move back and forth between states of health improvement and health maintenance. Given the potential for co or multi-morbidity, in both these phases, there may need to be prevention and maintenance activity undertaken simultaneously. There will also be episodes of acute illness for people with chronic conditions where the underlying condition may impact the severity of, for example, a case of influenza.

- Health improvement for those with a chronic condition. For these individuals improvements in health literacy and eHealth literacy may be needed. This would include ongoing monitoring and self-management aspects in conjunction with the general practice team and other health professionals. Individuals may be newly diagnosed, requiring initially intensive input, or have had the condition for some time and need assistance to move (back) to health maintenance.

Alongside these aspects of prevention, health maintenance and improvement, an ageing population may cause a (re)focus of attention on screening and monitoring activity. Will there be an increased regime of national screening for both middle aged and older people? Will additional screening requirements be introduced? If so, what would that mean for the workload of general practice? And, secondly, will

there be increased monitoring of people who have a chronic condition but are well controlled? In a preventative sense – even though they have a diagnosed condition, this would mean preventing the condition getting worse and affecting both quality of life and the level of service required from general practice. People in this scenario could require support to change from a passive approach to treatment to more active self-management. Imison et al. (2017, p. 16) have pointed out that reaching the needed level of self-care requires, at least initially, a high level of health professional support and health infrastructure. It is assumed that the level of support required would be significantly increased for any individuals with co-morbidities or multi-morbidities, given that Starfield (2006; 2011, p. 1) maintains that "increases in multi-morbidity are associated with increases in costs of care, hospitalizations that should be preventable, and adverse events".

The MoH has recently noted the role that strengthening prevention activity could play in achieving health gain (Ministry of Health, 2016c). The MoH sees the opportunity through a prevention approach across the entire health system for reducing future demand – the benefits to individual health being joined by system sustainability across clinical, fiscal and economic dimensions (Associate Minister of Health, 2016; Minister of Health, 2016; Ministry of Health, 2016c, p. x). As noted, these prevention and management approaches, being delivered 'closer to home' in the community with community input are inherent in the key health sector strategies. It will be interesting to observe if the funding required for prevention activities is sustained as demand pressures increase over time, particularly as Māori transition into middle age and large cohorts of Pākehā move into the oldest ages.

10.3 Equity of access and the elimination of health inequalities

The provision of equitable health services based on need is a central tenant of New Zealand society (Bryant, Teasdale, Tobias, Cheung, & McHugh, 2004) and has been referred to many times throughout this study. Reducing health inequities was a key platform of the NZHS launched in 2000, closely followed by the Disability Strategy and the PHCS in 2001, the Māori Health Strategy (2001) and the Health of Older Persons Strategy (2002). All of these key strategies, bar the PHCS, have been refreshed and released since 2014 and the acknowledgement of existing health

inequalities between population groups remains a key message, and the elimination of inequalities a strategic priority. This is the case particularly for identified population groups including Māori, those on low incomes and those resident in lower socio-economic areas (Schluter, Bridgford, Cook, & Hamilton, 2014).

As noted in Chapter Three, research has shown that historically and currently, both Māori and Pacific populations have a higher unmet need for health care (Ministry of Health, 2016d), have higher levels of hospitalisation for communicable diseases (Baker et al., 2012) and significantly worse health outcomes over a range of health conditions (Oetzel et al., 2017, p. 69) over the life course (Ajwani et al., 2003). These inequities and disparities are long standing, are unacceptable and are recognised as such by the MoH in all its major strategy documents.

The Waikato DHB and Pinnacle MHN as a PHO also have health equity and the end of inequalities as a major focus (Midlands Regional Community Trust, 2017; Waikato District Health Board, 2016). Research has also raised the issue of the effects on health inequalities of interpersonal and institutional discrimination (Harris et al., 2006). It might be that conversations around both types of discrimination are very difficult ones to have in the policy, planning and service delivery contexts. However, if progress is to be made these conversations have to happen at all levels of the health system, including where the policy and funding decisions are made as well as in local level service delivery. This aligns with what Harris et al. (2006, p. 2006) have recommended, in that "As a health priority, interventions and policies to improve Māori health and address inequalities should consider the effects of racism". Planning also needs to acknowledge and take into account the continuing effects of colonisation and how this relates to the creation of a more responsive (and less mono-cultural) health system (Reid & Robson, 2006; Robson & Harris, 2007; Came, 2012, 2016; Sheridan et al., 2011).

While difficult to compare with previous studies given the linked administrative data and study design, the results of this study do partially align with previous findings where gender, age and ethnicity were all found to be significantly related to health care use (Cumming et al., 2010, p. 456). The difference in this study is the effect of ethnicity. In the between category regression modelling (for service use in

the enrolled practice) – the Māori Pacific population used a lower level of services compared with Pākehā (15 per cent, $p<0.01$). However, in the tests of model effects, the effect of ethnicity on service use was ranked sixth out of seven predictor variables in all but four TAs (where it ranked fifth). This shows the importance of age, chronic conditions, gender and funding overall within the complex mix of service use – but it remains an issue in terms of equity of access to general practice services (and ultimately health outcomes).

These findings also generally fit with findings reported from recent New Zealand Health Surveys in regards to the enrolled practice – other measures cannot be compared. The interpretation of these study results can be problematic given the use of administrative data rather than survey data. Survey data could have had the advantage of eliciting qualitative information on the process of care seeking and negotiating access to care. However, given that inequalities in health outcomes are widely known, it might be expected that the Māori and Pacific populations should be using a higher level of services than Pākehā, if those inequalities are to be eliminated. In the statistical modelling the effect of an individual's ethnic group was ranked either fifth or sixth (of seven independent variables) across all TAs in terms of service use in the enrolled setting (results were less clear for service use outside the general practice – although ethnic group was ranked third in Hamilton City and at the overall Pinnacle MHN level). The effects of age, presence of a chronic condition and gender were very much the key drivers of demand (although there was spatial variance).

If the health sector is to get really serious about eliminating inequalities this will pose additional challenges for the sustainability of general practice. As noted, the work to end inequalities will need to occur simultaneously while providing for the demand required to meet the needs of the old ageing Pākehā and middle ageing Māori Pacific population, and as the projected workforce shortages in general practice deepen. This study has not touched on this in the projections of demand – in that the baseline levels by age, gender and ethnicity from 2013/14 were projected forward to 2038. It could be that general practice needs to provide a higher level of service to Māori (and Pacific peoples), or mix of differing services, as part of

pursuing equity – or that prevention programmes (collaboratively designed or re-designed) need more emphasis, translating into perhaps more time from the general practice workforce on such programmes. There is the potential for the health sector to become concentrated on the needs of the old ageing Pākehā population perhaps due to the sheer numbers of consults that will be involved, but the reality is that considerable effort across the sector will be required to simultaneously meet increased need, meet unmet need and work to eradicate inequalities.

Starfield (2004, p. 10) concluded from years of equity related research that the greatest advances in equity include involving the local community in any planned intervention change and at the higher level, political level backing that supports local community level change in practice. It is heartening that these views are also at the core of the MoH's strategic direction, but the reality of the level of sector change required to make this a reality for front line service delivery seems hard, tending to almost impossible to achieve. Sheridan et al. (2011, p. 1) referred to this situation as "will without enactment". Starfield's earlier noted comments well over a decade ago remain aligned with all strategic documents in the health sector.

How cross sector collaboration and aspects of participatory health as a more disruptive paradigm fits with the required changes remains an unknown entity, although Starke (2010, p. 488) notes that New Zealand has undertaken "both radical 'big bang' and incremental health care reforms" in the past (under both left and right leaning governments). The health outcomes New Zealand is striving for will need a strong and leading national level presence willing to try (and support) new and perhaps untested approaches. This can only be done where the sector (clinicians, PHOs, DHBs and the community) are ready. There will, perhaps, need to be a mix of transformational and transitional options as there is no longer the benefit of a long lead in time to the 'pointy end' of the long term demographic and epidemiological challenges given the first of the baby boomers reached retirement age in 2011 and in 2031 will start joining the 85+ year age group. The results of this study show how those cohorts will flow through and effect demand, and the mix of service required to be delivered through general practice.

10.4 General practice transition and transformation

A growing number of PHOs and general practices have embarked on wide ranging service reform. The aims are to better meet the needs of both enrolled individuals and health professionals and address the challenges posed by the effects of ongoing demographic and epidemiological transition. The New Zealand 'Health Care Home' (HCH) model of care describes this transformation as change that "gives patients more control, the practice team an environment where quality of care and innovation can flourish and enables truly proactive, coordinated care for those that need it most"[37]. These changes have a fiscal component, seeking to make best use of scarce health resources while remaining patient centred (Hefford, 2017).

The HCH collaborative care initiative now encompasses seven PHOs[38] (supported by most DHBs, the MoH and the RNZCGP) and 89 practices across the country (Hefford, 2017, p. 231). The Pinnacle MHN PHO first developed the New Zealand version of the HCH in a clinician-led response to the MoH's 2009 call for the development of new models of care through the BSMC policy programme. The first practice began to operate under the model (that later became the HCH) in 2011.

The use of patient portals has been a focus as HCH practices aim to support individuals to use an online portal for appropriate routine health care. By introducing new ways to connect, including booking appointments, phone consults with GPs, and access to clinical notes, lab results and email functions - new technology (and using existing technology differently) is helping to evolve the interaction between individuals and general practice. Drivers for this include people having access to their own health information, freeing up more (and different) ways for health needs to be met while making the most of each health professional's time and skills. There are a variety of systems level change implications to consider with such changes, as Dovey (2017, p. 235) notes the use of portals provide process challenges in terms of "existing regulatory, payment, and communication pathways" in general practice.

[37] See http://www.healthcarehome.co.nz

[38] Covering ProCare, Pinnacle Midlands Health Network, Compass Health, Manaia Health PHO, Te Tai Tokerau PHO, Central PHO and Pegasus Health (at April 2017).

The HCH in New Zealand has seen substantial change, even transformational change for practices that have chosen the pathway, but has this change begun to make the desired impacts? Ernst & Young undertook a commissioned review of the Pinnacle MHN HCH in 2016/17[39]. They have noted that the changes made to date have seen 'promising' results regarding within practice changes in call management, enrolled patient use of IT such as patient portals as part of meeting health needs in new ways. There have also been increased staff and patient satisfaction with the new model (Ernst & Young, 2017, p. 233; Hefford, 2017).

In contrast to the Ernst & Young findings an evaluation of the reality of two other (anonymous) change initiatives, also instigated as part of the BSMC policy programme, was undertaken by Lovelock et al. (2017). The two reports noted both barriers and enabling factors affecting integration of health services. The Lovelock evaluation noted particular implications for those operationalising high level policy into on the ground change. The conclusions of that report were reasonably scathing (but important in terms of considering the strategic messaging from the MoH), where Lovelock et al. (2017) ascertain that in respect of the initiatives;

> "The business plans were shown to be overly ambitious and compromised by the size and scope of the business plans; dysfunctional governance arrangements and associated accountability issues; organisational inability to implement change quickly with appropriate and timely funding support; an absence of organisational structural change allowing parity with the policy objectives; barriers that were encountered because of inadequate attention to organisational culture; competing additional areas of focus within the same timeframe; and consequent overloading of front-line staff which led to workload stress, fatigue and disillusionment. Where success was achieved, this largely hinged on the enthusiasm of a small pool of front-line workers and their initial buy-into the idea of integrated care" (Lovelock et al., 2017, p. 1).

[39] The full EY report is available on the http://www.healthcarehome.co.nz website.

The findings of the Lovelock report are hardly a ringing endorsement of the attempt at transformational change, in a context of BSMC cross sector collaborative planning. Nevertheless, these findings do serve to provide both recognition of the complexity (and rigidity) of current health structures and highlights the distance yet to travel in this space, despite the ongoing calls for change and collaborative ways of working from the MoH. This is perhaps the reality of perusing change on the ground, and it needs to be recognised that change is difficult even when all parties involved are focused on a particular opportunity. This finding also shows the absolute importance of including front line health professionals in planning given their critical and ongoing role in service delivery.

While the US based Patient Centred Primary Care Collaborative (on which the New Zealand HCH was initially based) has published evidence which Hefford (2017) notes "indicates a positive effect on utilisation of secondary care services, and overall costs" these changes have not yet been conclusively shown in the HCH practices. Both Hefford (2017) and Ernst & Young (2017) have noted that it is too early to gauge in the New Zealand environment the impact of the HCH on other parts of the health sector. Imison et al. (2017, p. 17) agree, in the sense that transformational change takes time and that initiatives are not often "given long enough to take effect". It remains unknown as to how long the intended effects of the HCH will take to be recognised in the quantitative data. Also unknown are the effects on secondary care services of additional actions to eliminate inequalities between population groups and meet unmet need across all groups. Realistically this could increase service use and further muddy the analysis of service use data.

For a number of years one of the key messages coming from central government has been the desire to see services move from hospitals to the community – perhaps in co-location with general practice. This movement of services was a component of the BSMC policy, and remains a central message in the refreshed 2016 NZHS, the Māori Health Strategy, the Pathways to Pacific Health and Wellbeing Strategy and the Ageing Well Strategy. Some in the sector (Matheson & Loring, 2011) have raised concerns about the potential for reduced efficiency - for example the risk in urban environments of service duplication, increased costs with potentially no

improvements in health outcomes (or worse, potential for increased inequalities). In rural environments, such moves may have impacts on the viability of the local hospital (Matheson & Loring, 2011, p. 8).

For general practice, the shift of services could bring additional responsibilities for both GPs and PNs simultaneously with rising demand and workforce shortage issues. Imison et al. (2017, p. i) have noted these concerns in the UK context, and maintain that addressing workforce issues needs to occur before additional responsibilities are acquired. They argue that from the evidence so far, there have only been gains when specific populations with particular needs have been targeted (noting end of life care, dermatology and pulmonary and cardiac rehabilitation as examples) or when a service gap has been identified and is filled through this shift of care location process (Imison et al., 2017, pp. 5,6), and while care in the community may be more convenient for service users it may not cost less to provide.

Another question arising around moving services is whether general practice has the capacity for this on a larger scale (or on any scale)? Any move of services from a hospital based environment would be on top of the projected demand increases from an ageing population. As much as the major health sector strategies call for this change, and signal it, there remains the fact that there will have to be capacity to deliver it. The general practice sector itself appears somewhat united in its voice that the conditions within which they currently operate are not conducive to meeting the health needs of today, let alone preparing for the increased demand projected or from further service movement into the community. Two examples of this include recent meetings of the annual RNZCGP conference in Dunedin (July 2017) and the South GP CME in Christchurch (August 2017) where the key issues raised included the need for an overhaul of the funding of general practice"[40]. Two issues were raised within the topic of funding; being capitation funding and the VLCA (Very Low Cost Access) funding formula and the application of it. Recent reports have stated that as many as 500,000 high needs individuals have been missing out on reduced fees to access general practice due to not being enrolled in a VLCA funded

[40] http://m.nzdoctor.co.nz "No punches pulled as general practices call for sector overhaul", Liane Topham-Kindly, 11 August 2017.

practice - this equates to some 44 per cent of all high needs individuals using the MoH definition (Atmore, 2017, p. 224; Love & Blick, 2014). There have been calls for a funding review for a number of years, escalating in the run up to the 2017 general election. This has culminated in the new Minister of Health announcing that a review will occur – although the details at the time of writing are unclear. Gorman (2018, p. 3) also notes as 'probable' that "a tipping point of health system sustainability and fitness-for-purpose has been reached", calling for innovation (in the form of disruption), wider than a funding review of general practice.

Remaining with the topic of funding, transformational change may well come with both upfront funding requirements for infrastructure as well as funding for new technologies (that people may expect as part of wider societal expectations of health care delivery). If new funding is not an option, then hard decisions around prioritisation will occur, bringing with it the potential for disinvestment in current services (and possible downstream effects on access to services). While hard decisions are nothing new in the health sector, the effects of ongoing demographic and epidemiological transition may serve to make hard decisions even more complex. The need to balance the provision of a higher volume of services, while the sector is undergoing transformation and ensuring that health inequalities are reduced all needs to happen simultaneously. This said, however, it is pertinent to remember that the effects of population ageing (in New Zealand as elsewhere) are mediated or facilitated through what are in reality dynamic societal norms and mores and through the institutional structures of the health system and policies of successive governments. The effects of demographic and epidemiological change along with the indisputable evidence of continued health inequalities should provide a compelling reason for the sector (as a whole) to mobilise to a more collaborative and integrated approach to policy, planning and service delivery.

10.5 Strengths and limitations of the study

Strengths

Some researchers see that the sector still "requires evidence to prepare for increased demand for services" as well as what will keep older individuals healthy and with a good quality of life (Kerse et al., 2016, p. 13). Indeed, the sector should be well

supported by an ongoing programme of research and evaluation, including the increased use of administrative data from general practice, with a focus on using PHO administrative data, in new and expanded ways. A strength of this study is that it has shown the contribution that demography can make to the complex and multi-faceted reality of planning and service delivery. This contribution is on several fronts; firstly, looking at the numerical component of population ageing, allowing scenarios for policy and planning to be considered. Secondly, analysis of the varying characteristics of the older population in terms of incorporating those aspects into planning processes. Thirdly there is the spatial component of ageing and change over time. These can have profound effects on planning and service provision as change is unlikely to be spatially uniform and this is the reality of uneven geographies of ageing (Faulkner et al, 2016, pg.404).

Going to back to Chapter One (contribution to knowledge) this study has used general practice administrative data from across the sector in a new way, shedding light on the levels of general practice care through developing a new way to measure the size of general practice. This fits well into the current knowledge gaps as outlined by Downs (2017) and Ernst & Young (2016). This study has allowed a more comprehensive picture of the size of general practice health care by record linkage of administrative service use data across the sector. This study is replicable (and extendable) using the Pinnacle MHN held administrative data. A further strength is that the study has allowed analysis of general practice health care including that delivered in the ED setting (a very topical issue) using (generally) agreed ICD-10 codes pertaining to ambulatory sensitive conditions. This cross sector picture of general practice gives a more complete estimation of the size or scale of general practice care in the Waikato DHB in the 2013/14 year. In doing so, it allowed the projection of more complete general practice service use out to 2038.

Limitations

Even though this study had a large population (n=235,666) from Pinnacle MHN affiliated practices, when disaggregated there were smaller numbers of older Māori and Pacific individuals especially at the sub-regional level. Because of this some age groups were aggregated to support analysis. Not all chronic conditions of

interest were able to be included, mainly due to uncertainty concerning the data captured and coding coverage. Improving the quality of clinical coding for chronic conditions in primary care remains a key sector focus. This may be a potential limitation for further research, outside of the conditions utilised in this study where coding has been a particular focus for improvement within the Pinnacle MHN. Across the sector however, there has been significant improvement in data quality through continuous quality improvement programmes over the last 20 years, particularly since the PHCS was implemented and sector re-organisation into PHOs. This was alongside developments such as capitation and access funding as well as chronic disease management initiatives, for example the diabetes 'Get Checked' programme and 'Care Plus' funding (Health Quality and Improvement Commission, 2017b). PHOs continue the drive for data quality improvement through their various quality work programmes which include audits and an emphasis on best use of decision support tools at the point of care (Midlands Regional Community Trust, 2017; Health Quality and Improvement Commission, 2017b).

While the study captures the vast majority of services delivered in general practice (general medical subsidy consults) not all the services delivered by general practice health professionals are captured (as noted in Chapter Four: Research Methods). On a similar note, much of the work of PNs in general practice is not collected in the Pinnacle MHN administrative data (as a service use 'count') – although this is now changing as the role of PNs expand and nurse led services become more available (and charged for).

As noted in other studies, including Schluter et al. (2014, p. 175), those individuals not attending a general practice for a consult during the baseline year – these 'zero count' people may have been enrolled and not attended or may have recently enrolled in another practice (and so left the cohort early in the quarter). However, given the NHI system and the MoH quarterly updates, this bias is likely to be low.

Finally, the inclusion (See Chapter Four: Research Methods) of ambulatory sensitive coded ED presentation data for those aged 75+ years is not considered a limitation as such here, but an opportunity to look at the results and consider the usefulness of including these data.

10.6 Opportunities for further research

Funding issues, opportunities and challenges

Most health services are entirely publicly funded or partly subsidised. Many services are free of charge, particularly in the secondary care sector and in general practice most consults are free for children aged under 13 years (and subsidised for others). General practices are funded differentially, for example those funded through the VLCA scheme and those who are not. This makes a considerable difference for patients in terms of what a medical consult will cost in their enrolled practice (and it makes a difference for practices, especially in terms of patient choice between some practices being able to offer consults at considerably less cost). The fairness of this system has been raised in the media many times in recent years. While there appears to be an acceptance from both major political parties (in late-2017)[41] to review the VLCA scheme there may be other funding structures that could benefit from review (under a sustainability lens).

Health sector collaboration, research and evidence needs

The majority of health care happens in general practice but the expensive care happens in hospital – and DHBs are hospital focused. The 2016 Health and Independence Report (Ministry of Health, 2017) acknowledged that parts of the sector need to engage better and design services together. This includes opportunities to build 'smart systems' and become more adaptable to the innovations that technology changes can bring. Alongside this, as noted by Kerse et al. (2016) the Ministry needs evidence to support policy planning for an older New Zealand. Kerse et al. (2016, p. 22) note that this need for wider research has been boosted through the National Science Challenges[42]. Research needs include the impact of population ageing not only on the health system but on the "experiences, needs, health and wellbeing of people of advanced age". A demographic perspective has a lot to contribute in this space. New Zealand's first Health Research Strategy released in 2017 notes that the research system should

[41] http://m.nzdoctor.co.nz "No punches pulled as general practices call for sector overhaul", Liane Topham-Kindly, 11 August 2017, nzDoctor.co.nz

[42] http://www.msi.govt.nz/update-me/major-projects/national-science-challenges

have a mix of research, such as bio-medical, public health, clinical and health services research (Health Research Council, 2017, p. 11). Also well aligned, is the need to monitor health inequalities given the Crown's treaty obligations and the continued acknowledgement of this sector priority (Cormack & Harris, 2009, p. 7).

Are definitions of ambulatory sensitive care conditions fit for purpose?

The question of definition relevance arose during this study around whether the definitions used still meet health planning, funding, policy, research or evaluation needs? According to statistics and media releases from most DHBs related to ED use there has been a huge surge in walk-ins to ED for 'inappropriate' care in recent years – that is care that could be delivered in general practice. This study found that the vast majority of care based on current 'general agreements' of what constitutes ambulatory sensitive care was delivered in the enrolled setting. However, it could be that the growing numbers of low acuity to treat non-ambulatory sensitive conditions is where this growth of ED presentations is coming from (or from triage three ambulatory sensitive conditions). If so, is it appropriate to say that those consults should/could be seen in general practice? Further research could advance this topical issue and allow further discussion within the health sector.

Ambulatory care sensitive ED presentations (not ending in hospital admission)

Aligned with the definition of ambulatory sensitive care, many studies look at ambulatory sensitive hospitalisations as an indicator of access to general practice and aligned issues such as general practice resourcing. There may be a particular group of people that current messages are not reaching or for whom cost is a major factor in choosing to attend ED for a health care need episode. Research by Cowling, Cecil, Soljak et al. (2013) report that practices able to provide timely access to services had fewer self-referred ED visits. They note that "policy makers should consider improving timely access to primary care when developing plans to reduce ED utilisation" (Cowling et al., 2013, p. 1). Developing alternative measures, such as those noted by Nagree, Camarda, et al. (2013); Nagree, Gosbell, et al. (2013) in the case of Australia, could be useful in getting closer to measuring the reality of general practice care in ED.

11 Conclusion

This study used PHO administrative data in a new way, combining it with secondary care data, to establish a new expanded measure of demand for general practice health care services. The potential usefulness of administrative data has been recognised recently within the sector for its potential to explore long standing gaps in current knowledge (Downs, 2017; Ernst & Young, 2016), with resulting benefits for the sector in terms of planning and knowledge to assist in developing cross sector collaboration. This expanded measure of general practice care has facilitated new knowledge concerning levels of service use in community general practice, and outside of the community setting, including for those individuals with chronic conditions.

Projecting demand using this expanded measure (out to 2038) has shown potential growth in service demand of about one third from 2013 levels, equating to an additional 394,000 additional general practice consults at the Waikato DHB level. In order to deliver this projected demand, differentially distributed across the DHB, there will need to be a significant increase in the number of GPs and PNs. With established and well known capacity issues in the general practice workforce - including the looming partial or full retirement of baby boomer health professionals - substantially increasing capacity looks unlikely. The demand projections at the sub-regional level show significant spatial variance, with particular areas and populations pointing to impending pinch points in service demand and delivery, given the complex interaction of population momentum and disordered cohort flows at the community level.

New models of care are needed that have a significant focus on chronic conditions prevention and management as well as the elimination of recalcitrant health inequalities. Many general practices (and PHOs) have started this journey in preparation for the future of an ageing population, changing the way that their enrolled population interact with health professionals and the way services are arranged and delivered. The required model of care change is not insignificant and encompasses culture change both within general practice and between general practice and secondary care. New synergistic models and ways of working are

needed rather than competitive models. There is no destination point as such for model of care change, as the impacts of the continuing demographic and epidemiological transitions as well as workforce capacity issues will necessitate continued change, with local solutions developed and evolving to suit local level contexts right across the DHB.

An additional concern is the shift of any services, under the BSMC programme and strategic MoH policy, from hospitals into the community. Any potential shifts could bring additional responsibilities for both GPs and PNs. The sector itself, through representative bodies, has questioned the capacity of general practice to absorb the consequences of any service shifts (at any scale). The results of this study on rising demand, and the review of workforce capacity issues, also point to inadequate capacity to absorb any further health care responsibilities.

The reality is that truly collaborative ways of working and the changing of models of care (as well as mind-sets), between general practice and secondary based care remain a continuing challenge. This is perhaps one of the greatest tests facing the pursuit for sustainability almost two decades out from implementation of the PHCS. The sustainability of general practice remains a strategic priority for the entire system, but there seems to exist a yawning gap between strategic level intent and the system level change that might facilitate change on the ground. If general practice falters or fails under a future of increasing demand for services and deepening workforce supply constraints the entire health sector will be impacted. The immediate effects would include people not being able to access first level health care when they deem it necessary. Flow on effects could include a potential increase in unmet need, rising use of secondary services for the care provided in community general practice and the potential for increased inequalities in access to care and health outcomes (from already unacceptable levels).

Like many other countries, New Zealand has been on the trajectory of demographic and epidemiological transition for well over a century. For both Māori and Pākehā populations in transition in the Waikato DHB, these structural changes bring complex disordered cohort flows and understanding these flows is critical at all levels of the health sector. Policy makers, funders and planners at the MoH, DHB

and PHO levels must know the current and future demography of the communities they provide services to – and which they are required (under legislation) to meet the needs of, no matter where people are resident or which population of interest they affiliate with. Population ageing and age structural transition, however, are not new phenomena. Indeed these changes have been unfolding for decades, and signalled for just as long. In this sense, changing demand for services overall, and for particular types of services, should not come as a surprise given the long lead up to change and the generally incremental nature of it. However, the reality is that the devil really is in the detail and it is how these macro and meso level changes unfold at the community level that may hold the surprises.

General practice has entered uncharted territory in the population, health, planning nexus. There are many contextual issues to be cognisant of including, ongoing demographic and epidemiological transition, chronic conditions prevalence, workforce capacity issues, longstanding health access and outcome inequalities, multiple direction setting and messaging from central government and ongoing limited financial resources – to name but a few. Each of these issues has merit for planning purposes in its own right – and for general practice these interact and make for a complex planning, funding and service provision environment both now and into the foreseeable future.

12 References

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Appendices

Appendix 1: Māori and Māori Pacific modelling comparison

Table A1.1 Negative binomial regression, consults in enrolled general practice 2013/14 (model 1)

			Hamilton City Māori	Hamilton City Māori Pacific	South Waikato Māori	South Waikato Māori Pacific
Predisposing characteristics	Sex	Female	1	1	1	1
		Male	0.79**	0.78**	0.93*	0.92*
	Age group	0-4 years	1.97**	1.97**	1.30**	1.33**
		5-14 years	0.74**	0.74**	0.59**	0.57**
		15-24 years	0.82**	0.80**	0.59**	0.58**
		25-44 years	1	1	1	1
		45-64 years	1.38**	1.39**	1.62**	1.61**
		65-74 years	1.96**	1.94**	1.93**	2.08**
		75-84 years	1.89**	1.89**	2.64**	2.63**
		85+ years	1.83**	1.85**	1.72	1.60
Enabling Resources	Community Services Card	Yes	1	1	1	1
		No	0.87**	0.87**	0.96	0.97
	Practice funding	VLCA	1	1	1	1
		non-VLCA	0.99	0.97	0.41**	0.40**
	Chronic condition	Yes	1	1	1	1
		No	0.54**	0.54**	0.55**	0.58**
	Goodness of fit	Pearson Chi-Square	1.109	1.109	0.986	0.945
	Omnibus Test	Likelihood ratio chi-square	2032.81	2450.27	930.95	1292.01
		df	11	11	11	11
		Sig.	0.000	0.000	0.000	0.000
		Number of cases	**13,519**	**15,861**	**3,355**	**4,523**

** = p<0.01; *= p<0.05

Table A1.2 Negative binomial regression, consults outside of enrolled general practice 2013/14 (model 2)

			Hamilton City Māori	Hamilton City Māori Pacific	South Waikato Māori	South Waikato Māori Pacific
Predisposing characteristics	Sex	Female	1	1	1	1
		Male	1.08*	1.08*	1.19	1.14
	Age group	0-4 years	5.32**	5.48**	2.52**	2.33**
		5-14 years	1.66**	1.72**	0.88	0.84
		15-24 years	1.06	1.09	1.28	1.39
		25-44 years	1	1	1	1
		45-64 years	0.81**	0.86*	0.99	0.94
		65-74 years	1.15	1.19	1.23	1.12
		75-84 years	1.30	1.29	0.86	0.73
		85+ years	0.80	0.88		
Enabling Resources	Community Services Card	Yes	1	1	1	1
		No	1.25**	1.21**	0.78	0.84
	Practice funding	VLCA	1	1	1	1
		non-VLCA	1.08*	1.10*	1.55	1.22
Need	Chronic condition	Yes	1	1	1	1
		No	0.67**	0.69**	0.65	0.57**
	Goodness of fit	Pearson Chi-Square	2.153	2.108	1.552	1.501
	Omnibus Test	Likelihood ratio chi-square	1514.30	1913.40	36.80	47.33
		df	11	11	10	10
		Sig.	0.000	0.000	0.000	0.000
		Number of cases	**13,519**	**15,861**	**3,355**	**4,523**

** = p<0.01; *= p<0.05

For model two, the structure of the data was changed to accommodate the modelling. During the first run of the model, for South Waikato Māori and South Waikato Māori Pacific age groups seven (75-84 years) and eight (85+) had to be combined due to the small number of individuals in group eight who had used general practices health services outside of the general practice setting. The warning received was as follows:

> Warning: The Hessian matrix is singular. Some convergence criteria are not satisfied. The GENLIN procedure continues despite the warning(s). Subsequent results shown are based on the last iteration. Validity of the model fit is uncertain.

Following combination of age groups the criteria for the model were met (including model fit statistics). This only occurred in model two, due to the vast majority of 'counts' of general practice services used being in model one (in enrolled practice) and three (total). Given the difference in the result in the "Need" category – chronic condition for model two (South Waikato Māori cf South Waikato Māori Pacific) the estimated marginal means are included below. Results are very similar, with only small differences in the standard error and the lower and upper bounds of the 95% Wald confidence intervals.

Table A1.3 Estimated marginal means model two, South Waikato Māori, presence of a chronic condition

Estimates				
			95% Wald CI	
Chronic_regression	Mean	Std. Error	Lower	Upper
none	.10	.025	.06	.16
has one or more	.15	.046	.08	.28

Table A1.4 Estimated marginal means model two, South Waikato Māori Pacific, presence of a chronic condition

Estimates				
			95% Wald CI	
Chronic_regression	Mean	Std. Error	Lower	Upper
none	.09	.021	.05	.14
has one or more	.15	.043	.09	.26

Table A1.5 Negative binomial regression modelling, total general practice consults 2013/14 (model 3)

			Hamilton City Māori	Hamilton City Māori Pacific	South Waikato Māori	South Waikato Māori Pacific
Predisposing characteristics	Sex	Female	1	1	1	1
		Male	0.81**	0.81**	0.94*	0.93*
	Age group	0-4 years	2.24**	2.26**	1.33**	1.35**
		5-14 years	0.82**	0.81**	0.60**	0.58**
		15-24 years	0.84**	0.83**	0.60**	0.60**
		25-44 years	1	1	1	1
		45-64 years	1.33**	1.34**	1.63**	1.59**
		65-74 years	1.89**	1.87**	1.92**	2.06**
		75-84 years	1.86**	1.82**	2.60**	2.59**
		85+ years	1.77**	1.80**	1.69	1.52
Enabling Resources	Community Services Card	Yes	1	1	1	1
		No	0.90**	0.90**	0.95	0.97
	Practice funding	VLCA	1	1	1	1
		non-VLCA	0.990	0.97	0.44**	0.42**
Need	Chronic condition	Yes	1	1	1	1
		No	0.55**	0.55**	0.55**	0.58**
	Goodness of fit	Pearson Chi-Square	1.047	1.043	0.976	0.943
	Omnibus Test	Likelihood ratio chi-square	1954.48	2363.48	902.27	1251.70
		df	11	11	11	11
		Sig.	0.000	0.000	0.000	0.000
	Number of cases		**13,519**	**15,861**	**3,355**	**4,523**

Appendix 2: Conditions considered ambulatory sensitive

Table A2.1 List of conditions that fall under the category of ambulatory sensitive conditions (based on ambulatory sensitive hospitalisations)

Disease
Angina and chest pain
Asthma
Bronchiectasis
Cellulitis
Cervical cancer
Congestive cardiac failure
Constipation
Dental conditions
Dermatitis and eczema
Diabetes
Epilepsy
Gastroenteritis
Gastroesophageal reflux disease
Hypertension
Urinary tract infection
Myocardial infarction
Nutritional deficiency and anaemia
Ischemic heart disease
Peptic ulcer
Respiratory infections – pneumonia
Rheumatic fever or heart disease
Genderually transmitted diseases
Stroke
Upper respiratory tract infections
Vaccine preventable diseases

Source: Basu and Brinson (2008, p. 231).

Appendix 3: Test of model effects – detailed multivariate results

Table A3.1 Test of model effects, model one: consults in enrolled general practice, Wald chi-square and level of significance *(see Table 8.6)*

		Geographical area of residence (Territorial Authority)											Urban/Rural	
		Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	1,341**	60**	119**	57**	63**	72**	125**	251**	407**	59**	2,448**	1,565**	953**
	Ethnic group	80**	6*	16**	7**	3	44**	10**	49**	23**	7**	306**	143**	190**
	Age group	6,561**	856**	1,586**	607**	666**	1,147**	2,241**	2,181**	3,371**	639**	20,537**	8,881**	11,307**
Enabling resources	Community Services Card	237**	20**	41**	20**	7**	39**	150**	69**	157**	35**	899**	304**	571**
	Practice funding	175**	0.1	1.2	195**	6*	108**	30**	431**	1.0	34**	1,081**	645**	437**
Need	High needs (MoH)	6*	1.0	3.0	6*	5*	0.5	8**	39**	0.6	6*	106**	39**	84**
	Chronic condition	1,470**	114**	215**	119**	108**	198**	343**	459**	424**	139**	3,741**	1,923**	1,840**

** = p<0.01; *= p<0.05; N=235,666

Table A3.2 Test of model effects, model two: consults outside of enrolled general practice, Wald chi-square and level of significance *(Table 8.7)*

		Geographical area of residence (Territorial Authority)											Urban/Rural	
		Hamilton City	Hauraki District	Matamata Piako	Otorohanga	Ruapehu	South Waikato	Thames Coromandel	Waikato	Waipa	Waitomo	Pinnacle MHN	Urban	Rural
Predisposing characteristics	Sex	5*	3.0	10**	0.5	5*	0.01	0.3	0.9	3	0	2.0	6*	0
	Ethnic group	54**	0.2	1	4*	0.3	0.13	0.9	0.4	6*	3	173**	49**	19**
	Age group	6,453**	66**	524**	110**	174**	108**	225**	1,020**	1,066**	61**	10,774**	7,507**	2,283**
Enabling resources	Community Services Card	9**	0.0	3	1.0	10**	9**	17**	28**	15**	0	55**	21**	2
	Practice funding	5*	0.5	0.02	19**	18**	6.6**	10**	18**	58**	0	39**	54**	46**
Need	High needs (MoH)	1	0.6	3	0.1	5*	0.46	1	65**	7**	1	0.0	5*	20**
	Chronic condition	102**	1.6	4*	29**	32**	54**	90**	18**	19**	51**	341**	120**	236**

** = p<0.01; *= p<0.05; N=235,666

Table A3.3 Test of model effects, model three: Total general practice consults, Wald chi-square and level of significance *(see Table 8.8)*

		Geographical area of residence (Territorial Authority)											Urban/Rural	
		Hamilton City	**Hauraki District**	**Matamata Piako**	**Otorohanga**	**Ruapehu**	**South Waikato**	**Thames Coromandel**	**Waikato**	**Waipa**	**Waitomo**	**Pinnacle MHN**	**Urban**	**Rural**
Predisposing characteristics	Sex	1,098**	59**	101**	52**	64**	68**	123**	211**	357**	56**	2,138**	1,288**	879**
	Ethnic group	93**	6*	16**	8**	2	41**	10**	51**	25**	6**	348**	158**	195**
	Age group	6,110**	836**	1,469**	554**	630**	1,099**	2,202**	1,857**	3,093**	623**	18,578**	8,066**	10,515**
Enabling resources	Community Services Card	187**	19**	35**	19**	8**	40**	150**	50**	134**	33**	748**	237**	523**
	Practice funding	142**	0.1	1.0	169**	3	99**	28**	349**	4*	31**	922**	501**	384**
Need	High needs (MoH)	6*	1.2	2	5*	5*	0.4	8**	23**	0.1	5*	96**	30**	71**
	Chronic condition	1,396**	113**	207**	122**	110**	201**	349**	449**	413**	143**	3,680**	1,849**	1,845**

** = p<0.01; *= p<0.05; N=235,666