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**Analysis of Trends and Reasons for Rising
Acute Adult Medical Admissions in
Auckland's Public Hospitals**

Jagpal Singh Benipal

A thesis submitted in partial fulfilment of the requirements

for the degree of Doctor of Philosophy

The University of Auckland, 2007

The University of Auckland

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Abstract

The main purpose of this study was to examine empirically the trends and reasons for rising acute adult medical admissions at two major public hospitals in Auckland from 1997 to 2004. According to recent national and international literature published on the topic, there has been unsustainable growth in the adult medical admissions both in NZ and most of the other developed countries. Overall, the causes of this increase have not been explored sufficiently in the literature reviewed. The NZ research has largely focused on the macro-analysis of hospital throughput data from health policy points of view.

Methodology: A mixed methodology research design was applied to address the problem. Phase 1 quantitatively analysed adult medical hospital admission data (N = 277,416) obtained from the two hospitals (Middlemore and Auckland Public Hospitals), and phase 2 qualitatively explored the responses and views of the health professional expert panel (n = 16) in relation to the findings of phase 1 of the study.

Findings: Overall, the crude number of admissions and age-standardised admission rates at both hospitals increased more rapidly than actual population increases. Approximately 1/3 of the patients accounted for 2/3 of the total admissions. Five major diagnostic categories accounted for 70%-80% of total acute admissions, with circulatory and respiratory system disorders being the leading causes of medical admissions. There was a strong relationship between age and increased admissions. MMH hospital overall, and its ethnic groups separately, had significantly higher admission rates than APH. Comparison of ethnic groups highlighted significant variations in the admission rates at the two hospitals despite adjusting for age, morbidity and deprivation.

Conclusions: Overall the increase and variation in admission rates between the hospitals and ethnic groups was dependent on factors such as the characteristics of the population and patients, hospital admission and administration processes, availability of hospital beds, medical management at the hospital, and availability of primary and community care services. By making changes to those factors in the control of hospitals and District Health Boards, hospitals can potentially influence the trajectory of rising medical admissions. These factors include systems for managing patients with chronic illness, and pathways from community services to hospital. Finally, a number of future research areas, such as a large-scale study to explore the health service utilisation of the 55+ age groups, have been proposed.

Dedication

This thesis is dedicated to my wife Dr Maria Kobe, who has supported me unconditionally throughout my study period, and our daughter Ahnoor and son Ishaan for cheering me up throughout this project and for their patience, with love and thanks.

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Abbreviations

ACS	Acute coronary syndrome
ADHB	Auckland District Health Board
ADU	Assessment and Discharge Unit
AH	After hours
ALOS	Average length of stay
AMA	Acute medical admission
APH	Auckland Public Hospital
APU	Assessment and Planning Unit
ASR	Age-standardised rate
CHD	Coronary heart disease
CHF	Congestive heart failure
CI	Confidence interval
CMDHB	Counties Manukau District Health Board
COPD	Chronic obstructive pulmonary disease
CP	Chest pain
DALYs	Disability adjusted life years
DHB	District health board
DRG	Diagnostic related group
EC	Emergency Care
ED	Emergency Department
GP	General practitioner
HF	Heart failure
IHD	Ischaemic heart disease
IPA	Independent practitioner association
IQR	Interquartile range
LOS	Length of stay
MA	Medical admission
MDC	Major diagnostic category
MI	Myocardial infarction
MMH	Middlemore Hospital
NHI number	National health index number
NSTEACS	Non-ST elevation acute coronary syndrome
PCO	Primary care organization
PHO	Primary health organization
POAC	Primary options for acute care
STEMI	ST elevation myocardial infarction
TIA	Transient ischaemic attack
UTI	Urinary tract infection

Chapter 1

Introduction

The main purpose of this research was to establish empirically the nature and causes of the rise in adult medical admissions in Auckland. Demand for healthcare has continued to grow both in New Zealand (NZ) and in other developed countries such as Canada, the United States of America (USA), Australia, the United Kingdom (UK) and other OECD countries (NZHTA, 1998; Wiley, 1996; Capewell, 1996). Medical admissions are a significant contribution to all public hospital admissions in New Zealand. According to the Ministry of Health's (2000) report on hospital throughput for the year 1998/99, medical admissions of both children and adults were 68% of the total public hospital admissions in New Zealand. The throughput report also highlighted that 66.3% of the total medical discharges came from acute (unplanned) medical admissions, as compared to surgery that only had 26.4% acute (unplanned) admissions.

During the past 15 years there has been an approximately 50% increase in hospital admissions in New Zealand (Ministry of Health, 2000; 2000a; Corkill, 1997; Ministry of Health Performance Monitoring and Review Section, 1994; 1995 & 1998). Some studies have highlighted significant variations in admissions between regions. According to Intrahealth Systems Limited (2000) and Muneeb (1997) the demand on acute healthcare increased between 10%-29% per annum based on the discharge rate in the South Auckland region during 1997-2000. Similarly Jackson, Kelsall, Parr and Papa (1998) found that NZ overall has experienced consistent growth in the raw number of acute medical discharges between 1992/3 and 1996/7. An interim report published by North Health emphasized that admissions for urgent medical conditions accounted for the biggest single area of growth (Corkill, 1997).

Due to the rising number of acute admissions and their less predictable workload, the resources of hospitals and health funders have been stretched. Since 1979/80, total real expenditure on health care has grown at an average rate of 2.8% per year (Ministry of Health, 2000).

In order to reduce or stabilise the growing demand for healthcare or to better meet the health needs of the population and to control the escalating spending on health, the NZ government

has attempted to address the issues in a number of ways. In the 1990s measures included attempting to establish an internal competitive market, introducing a structural approach and attempting to shift responsibility from the state to individuals, and the ill-fated move to charge hospital inpatients for hotel costs (Ashton, 2001; Gauld, 2000). When these measures failed to rein-in demand, from 2000 on the NZ government developed the NZ Health and Disability Strategy and introduced population, disease and service specific strategies (Delvin, Maynard & Mays, 2001; Ministry of Health, 2000c, 2001c & 2002). The Ministry of Health has also implemented a number of infrastructure initiatives to support the above strategies, such as the development of District Health Boards, and Public Health Organisations supported by a primary health strategy as a way of managing hospital and health services in general (Ashton, 2001). Despite the implementation of these policies and initiatives, the number of hospital admissions has continued to grow. Yet, the evaluation of these interventions and policies, and the examination of their impact, has been very scant.

From a personal interest point of view, the researcher had the opportunity to work as a staff nurse and charge nurse manager, as well as being involved in projects for the Medical Services, at Middlemore Hospital during 1989-1998. One of the projects in which the researcher had significant involvement was related to Medical Services. The aim of this project was to investigate and possibly propose some innovative initiatives to deal with some of the critical issues related to patient quality of care, hospital bed management and poor relationship between the Emergency Department (ED) and Medical Services. This project required a detailed analysis of hospital data (quantitative and qualitative), of the processes involved in patient care and of the role of community health services. One of the major reasons for examining the above issues was related to the rapid growth in medical admissions. Despite the major undertakings by the organisation, medical admissions (MAs) continued to grow well above the expected rates. Most of the initiatives implemented by the organisation proved ineffective because the complexities of the phenomenon were not truly appreciated. As a result, the ED and medical wards were often overcrowded, which also affected the hospital's bed management, staff satisfaction and morale, financial performance of the organisation, etc. The reasons for the rapid growth have largely remained unknown, which is considered significant from this study's points of view.

Overall, the New Zealand research related to MAs has only explored the national hospital throughput data at a macro level from the health policy points of view, with some of the other

studies having described the short-term trends in admissions. But the research has not been able to explain the overall causes of the increase in MAs sufficiently. Most of the international literature published on the possible causes of increases has narrowly focused on some specific aspects and has its findings based on secondary sources of data.

This enormous change and the burden of rising MAs appears to be poorly understood, yet has a significant influence on health care providers, funding agencies, health policy and planning, and on the population that receives the services. Therefore, this study is considered significant due to the following reasons. Firstly, it provides detailed information on the trends in MAs in two hospitals servicing a large diverse population base using primary data. Secondly, the study is also expected to enhance the understanding of the nature and causes of MAs. Thirdly, the findings of the study may be of use to acute healthcare providers to support planning of services to better meet the needs of their patient population. Fourthly, it will also provide information on health service indicators, such as the number of admissions per head of population, which may help in justifying the resources invested by healthcare providers to reduce the MAs, as highlighted by Ansari et al. (2002). Overall, the findings of this study are expected to help in fulfilling some of the goals highlighted in the NZ Health Strategy (Ministry of Health, 2000c), the Primary Health Care Strategy (Ministry of Health, 2001c) and other population and disease specific strategies. Last but not least the study should also provide a reliable base for future research.

In order to carry out this research two large NZ public hospitals, Auckland Public Hospital (APH) and Middlemore Hospital (MMH), were selected. APH is NZ's largest healthcare provider, located in NZ's largest city, and serves a diverse and largely urban population and also the Hauraki Gulf islands (ADHB, 2001). Middlemore Hospital (MMH) is the second largest hospital in NZ, serving both an urban population and a considerable rural area. It is located in a socioeconomically poor area of Auckland, with large Maori and Polynesian populations (Jackson, Palmer, Lindsay & Peace, 2001). Both of these hospitals combined provide health services to around one third of NZ's total population.

Both APH and MMH provide secondary and tertiary medical hospital services such as cardiology, clinical haematology, metabolic medicine, gastroenterology & hepatology, neurology, palliative care, and diabetic, renal, respiratory, infectious diseases and rheumatology services. Oncology, more complex neurology, transplant medicine and clinical

genetics services are only provided by APH. APH is also responsible for providing specialist services nationwide and to South Pacific countries (Auckland Healthcare Services, 2000).

As discussed, the overall purpose of this study was to establish empirically the nature and causes of the rise in MAs. The study was conducted in two phases. The specific objectives for phase 1 of the study were:

1. To describe trends in adult hospital medical admissions in the Auckland Metropolitan City area (Middlemore and Auckland Public Hospitals) over the 8 year period 1997 to 2004.
2. To identify and evaluate those specific medical conditions, categorized according to the Diagnostic Related Groups (DRGs), contributing to the rise in medical admissions (MAs) in Auckland City.
3. To explain which ethnic and age groups may be significantly contributing to the rise in MAs in Auckland City.
4. To explore the relationship between socioeconomic status and admission trends.
5. To evaluate and analyse the process/es of patient referral and admission to hospitals in relation to the rise in MAs.

Phase 2 of the study was based on the findings of phase 1. The main aim of phase 2 of the project was to further explore and explain the trends in MAs identified in the hospital inpatient data analysis carried out in phase 1 of the project, from the point of view of the health professional expert panel consisting of hospital physicians, managers and nurse specialists. The specific objectives for phase 2 of the study were:

1. To identify initiatives in hospitals and the primary health sector intended to reduce hospital medical admissions and to improve management of chronically ill patients out of hospital.
2. To describe the views of hospital physicians, managers and nurse specialists on the impact of those initiatives on medical admissions, with respect to issues such as admission trends and quality of care.
3. To explore the views of hospital physicians, managers and nurse specialists on the reasons for medical admissions outside the control of the DHBs that are not amenable to such initiatives, e.g. consumer expectations, ageing population, cultural practices, national health policy and funding streams.

The next 9 chapters report the study and its findings.

Chapter 2 critically reviews the literature related to trends and causes of MAs, and discusses the rationale leading to this study. Chapter 3 gives details on the form of the inquiry, the research methods applied, research protocols followed, and the rationale for the research procedures employed.

The study findings are reported in three chapters. Chapter 4 provides the overall results related to study sample characteristics, overall admission trends including patient referral sources, emergency patient triage trends, seasonal variations, trends in length of stay and the relationship between age and length of stay. The main focus of Chapter 5 was to identify and evaluate some of the specific major diagnostic categories (MDCs) and related diagnostic group (DRG) categories contributing significantly to the rise in acute medical admissions (AMAs). Then each of the MDCs and its related DRG categories were further analysed in relation to the two hospitals and their ethnic and age groups. Chapter 6 reports on findings related to the influence of readmissions on admission trends and on identified key characteristics of high users of medical hospital services, followed by analysis of the effect of ethnicity on admissions, and the relationship between deprivation by domicile, ethnicity and acute admission trends.

Discussion on the study findings is presented in three separate chapters. Chapter 7 focuses on admission trends. The chapter begins by briefly discussing the study sample characteristics including total and acute admission trends, and continues by examining related themes such as the influence of patient management processes, patient referral trends, ED triage trends, seasonal variations, and the ageing population on acute admission rates, length of stay, and frequency of admissions. Chapter 8 discusses the morbidity trends related to the five most significantly contributing MDCs, and their leading DRG categories. This chapter also discusses how these identified diseases/disorders are managed and how they affect AMA trends. The final discussion chapter, Chapter 9, considers common themes related to the population and its socioeconomic status, and then looks at a range of population factors and a range of health service factors affecting acute hospital admissions.

Finally, Chapter 10 follows on from the study's findings and the subsequent discussion, to summarise the key findings that have influenced the admission trends. Based on these

findings, recommendations are made to the hospitals in the study, their DHBs, the Ministry of Health, and health professional academic institutions, to reduce the number of avoidable acute medical admissions to hospital, while enhancing the quality of care provided to the population. Based on the summary of findings and recommendations possible actions from both a health service management perspective and a public policy & public health perspective is proposed. The chapter concludes with suggestions for future areas of research.

Chapter 2

Acute Medical Admission Trends: A Review of the Literature

(2.0) Introduction

In NZ, an acute admission is defined as an unplanned admission on the day of presentation at an admitting health care facility (Ministry of Health Performance Monitoring and Review Section, 1998a), which is an administrative definition of an admission. From a clinical point of view an acute admission is more related to a patient requiring hospital inpatient care for an emergency condition (NZHTA, 1998). According to the NZHTA (1998) a number of terms such as ‘hospitalisations’, ‘separations’, and/or ‘discharges’ have been used in the literature in the past in research and the National Minimum Dataset of NZ, while in the international literature the term ‘emergency admission’ is also commonly used. In addition to acute admissions, there are two other hospital admission categories. The arranged admission category is defined as a ‘planned admission’, where the admission date is less than seven days after the date when the decision was made by a specialist that this admission was necessary (Ministry of Health Performance Monitoring and Review Section, 1998a). The last admission category is known as a ‘waitlist or elective admission’ which is defined as a booked admission on a date more than seven days after a specialist decision to admit, or when a patient is placed on a waiting list without a specific date being given. Therefore the literature search carried out was based on terms and keywords such as separations, discharges, admissions, hospitalizations, emergency admissions, unplanned admissions, and medical admission trends.

As the main focus of this study was to examine trends in adult medical admissions, extensive literature searches were conducted specifically to retrieve both national and international literature related to the study area, which is reflected in the selection criteria used. This literature review was restricted to literature published in the English language, and was carried out through the University of Auckland library systems. The following international databases were searched; CINAHL, Medline, PubMed, Cochrane Library, ABI, Health Star and Business Source Premier. In addition, the Ministry of Health New Zealand, New Zealand university and medical library catalogues, New Zealand Bibliographic Network, Index New

Zealand, World Health Organization, New York Academy of Medicine Library websites, materials referenced in publications obtained in course of research on the topic, and other internet sites were also searched. Further extended searches for cross-referencing, and other indirect approaches to retrieve literature related to the study topic, were also applied.

The review of the literature seeks to provide an overview of both the historical background of, and the current trends and developments in, acute medical admissions in New Zealand and overseas in relation to the study objectives. The review is broadly divided into the following five sections. First, 2.1 explores articles pertaining to general trends in acute admissions, and 2.2 looks at the influence of the NZ health reforms of the 1980s and 1990s on admissions. Literature on patient and population factors that affect acute admission numbers is investigated in 2.3, and that on hospital and health service factors in 2.4. Finally 2.5 reviews studies relating to strategies trialled or implemented to reduce or stabilize the growing demand for acute medical care.

Acute medical admissions are a significant contribution to all public hospital admissions in New Zealand (NZ), and have continued to increase well above the expected rates. According to an interim report published by North Health, admissions for urgent medical conditions accounted for the biggest single area of growth (Corkill, 1997). Due to the rising number of acute admissions and their less predictable workload, the resources of hospitals and health funders are being stretched. Noting that medical admissions are largely funded publicly, between 1979/80 and 1998/99, total real expenditure on health care has grown at an average rate of 2.8% per year (Ministry of Health, 2000a), while the real health expenditure grew at a much faster rate (4.1% per year) between 1998/99 and 2002/03 (Ministry of Health, 2005a). When comparing the trends in publicly funded health expenditure as a proportion of total health expenditure in the OECD countries, NZ ranked 10th as opposed to Australia and the USA's ranking of 13th and 29th respectively. A large number of studies reviewed here demonstrate this growing recognition and interest in acute medical admissions.

(2.1) Acute Medical Admission Trends

A number of studies have reported the trend in increased number of acute medical admissions in NZ over the last 15 years. Purchasing for Your Health, a report published by the Ministry of Health Performance Monitoring and Review Section (1994), found that the absolute number of acute medical admissions (discharges) increased between 1989/1990 to 1993/1994 by 4.9%, whereas simply from demographic considerations only a 2%-3% rise in hospital discharges would have been expected. That report published in 1994 further documented the increased complexity of cases and a reduced average length of stay (ALOS) for acute medical inpatients during the study period. Another report by the same department reviewed public hospital discharge data coded according to diagnostic related groups (DRGs) for the financial years 1988/89 to 1994/95, to investigate the causes of the increase in acute medical admissions (Ministry of Health Performance Monitoring and Review Section, 1995). That study validated the findings of the 1994 study carried out by the same department showing that more individuals were being admitted as inpatients rather than there being an increase in the number of readmissions in New Zealand. In addition the study reported that there was a significant decrease in the ALOS, but no rise in the readmission rates. However the readmission rates were only examined on a short-term basis (up to 3 months from the discharge date) rather than looking at the long-term rates of admissions of individual patients.

Again, the Ministry of Health Performance Monitoring and Review Section (1998a) compared the raw hospital throughput numbers of 1996/7 with that of 1995/6, and found that hospital discharges had increased by 2.3%. When the discharges were case mix adjusted to compare the relative throughput between regions and across years, the hospital throughput had increased by 5.1% in 1996/97 for the whole of NZ. The analysis found significant variations in regions. The Northern region had the highest growth at 7.6%, while the increases in the Southern and Central regions were smaller (5.9% and 4.5% respectively).

Counties Manukau District Health Board, which provides health services to a relatively socioeconomically deprived population of South Auckland, has made Integrated Care a strategic priority, due to the declining health status of its population and the increasing demand on acute health care services. As found by Intrahealth Systems Limited (2000), the incidence of chronic disease requiring acute intervention was generally higher in the South Auckland Region than in other regions of NZ, and the demand on acute health care continued

to increase at an alarming 10% per annum rate.

Most of the increase in total throughput has been due to an increase in acute medical admissions (Jackson, Kelsall, Parr & Papa, 1998). The Northern, Central and Southern regions have experienced consistent growth in their raw number of acute medical admissions between 1992/3 and 1996/7. By contrast, in the Midland region the number of acute medical admissions increased sharply in 1994/5 (by 24.4%), while in 1995/6 and 1996/7 there were significant reductions (7.1% and 6.9% respectively) in the number of admissions (Jackson, Kelsall, Parr & Papa, 1998).

An internal report by North Health found that acute admissions continued to rise between 1995/6 and 1996/7 (Corkill, 1997). Acute medical admissions increased during the study period by 8.2% while acute surgical admissions rose by only 2.8%. The report listed some possible explanations and recommended that a study should be undertaken into the applicability of introducing admission criteria for acute admissions to hospitals. A descriptive study undertaken by Muneeb (1997) as a part of a Master's degree found that emergency medical admissions at MMH rose by 29.8% between 1995 and 1996. The study examined a random 10% sample of all admissions for some months from each year and concluded that there had been a decrease in the average length of stay of inpatients. As this study was based on a relatively small sample size over only a few months, this affects the generaliseability of the results.

A national primary healthcare survey which included data from four public hospital Emergency Departments (EDs), general practices and accident and emergency clinics, analysed the proportion of primary care presentations seen by hospital EDs in NZ (Raymont, von Randow, Patrick, Lay-Yee & Davis, 2005). The study concluded that the overall mean ward admission rate was 40.5%, varying across all four EDs from 25.3% to 49.8%, highlighting that a large proportion of presentations were receiving primary care from hospital EDs. However the authors acknowledged that usage of an ED was also determined by the nature of the local population and the availability of other sources of care, as well as by simple clinical need.

Increasing medical admissions is not unique to New Zealand. Other countries such as Australia, the USA, Canada and the OECD countries have also experienced similar rises in

medical admissions. Kendrick (1996), who analysed hospital data, found that the annual number of emergency admissions to Scottish hospitals increased by 49.2% from 1981 to 1994. Kendrick further examined emergency readmission rates over five year periods and found a rapid increase in the number of patients who were admitted several times as emergencies in a five year period. The number of patients who were admitted four or more times in a five year period virtually doubled (an increase of 92%) between 1981-85 and 1990-94. Another large co-relational study, which supported the above findings, found that in eight out of fourteen European countries, acute admission hospital rates increased during 1980-1994 (Wiley, 1996).

The Patient Management Task Force (2001) analysed hospital admission trends data from the State of Victoria in Australia, and found that the greatly increased numbers of acute medical admissions were putting growing pressure on hospitals. Similarly, emergency admissions have also increased to hospitals in Switzerland (Santos-Eggimann, 2002; Meerding et al., 1998).

On the other hand a study by Morgan, Prothero and Frankel (1999) which analysed data related to all (medical and surgical) emergency admissions trends from 1989-90 to 1997-98 in an urban and rural population of 850,000 served by the Avon Health Authority, UK, concluded that the rise in emergency admissions was almost entirely attributable to the increased reporting of internal transfers of patients from one specialty to another specialty after admission. However, a large number of studies carried out in a similar area have reported significant rises in medical admissions in most of the developed countries. Therefore, Morgan, Prothero and Frankel's (1999) study requires further validation of its results in relation to other studies.

It is concluded from the above literature review that both in NZ and other developed countries medical admissions have continued to increase well above the expected rates despite taking the demographic considerations into account. In the literature a number of causes for the increase in acute medical admissions have been identified and explored. One of the significant causes of increased admissions in NZ was the extensive changes to social and economic structures, and the health restructuring of the 1980s and 1990s. Therefore, some of the major changes which appeared to have influenced the health outcomes of the NZ population are discussed in the following section.

(2.2) Influence of the New Zealand Structural and Health Reforms on Admissions

(2.2.1) New Zealand Health System

During the last twenty years, NZ has gone through major social and economic changes, which have influenced the health trends. Prior to the 1980s, NZ had a highly regulated economy with subsidies to control wages and prices. Low income people had access to subsidised state housing and mortgage payments and unemployment rates were relatively low (Belich, 2001). To a certain extent the past economic and social regulatory interventions were the reasons for the major change in the 1980s and 1990s.

The years 1984-1993 were a period of major change in NZ, with successive governments introducing major reforms by deregulating the financial sector, reorganising the state sector, and ending state support for industry (Belich, 2001; Gauld, 2000; Boston, Dalziel & St John, 1999; Cheyne et al., 1997). These widespread reforms resulted in a substantially flattened tax system, fully targeted income support for low-income people, goods and services tax, market rentals for state housing, privatised major public utilities, increases in user part charges for health, education and other government services, and the introduction of new employment legislation designed to facilitate ‘flexibility’ in the labour market (Mowbray 2001; Ajwani, Blakely, Robson, Tobias & Bonne, 2003). These changes resulted in substantially widened income inequalities in New Zealand. Benefit cuts in 1990 also resulted in a significant drop in income for low-income families. Literature on economic and welfare restructuring strongly indicated that these reforms have led to substantial increase in the incidence of poverty and socioeconomic variations in health (Waldegrave, King & Stuart, 1999; Howden-Chapman & Tobias, 2000), which have resulted in higher utilisation of emergency hospital and other secondary services.

Similarly to the general reforms, the NZ health system also went through radical and ongoing reforms in the 1990s. For example, according to Barnett and Barnett (1999), the government introduced a funder/provider split, a competitive model of healthcare provision, public hospitals to be run based on a business model and to make profit, introduction of managerialism to create efficiencies, spending cuts in health with capped budgets, increased ‘flexibility’ of the health workforce, restricted access to free emergency care, changes to and increases in part charges for general practitioner consultations and pharmaceuticals, and

increasing use of contracts in primary care (Barnett & Barnett, 1999; Cumming & Scott, 1998). Four regional purchasers were established and public hospitals were renamed Crown Health Enterprises and restructured as for profit businesses in 1993 (Scott, 2004; Ashton, 2001). All public and private health service providers were encouraged to compete for contracts with the regional purchasers to keep down the spending on healthcare. In fact the health expenditure per capita grew significantly post the radical restructuring of the health system (Scott, 2004; Fougere, 2001). The waiting lists for non-acute surgery also continued to increase, which is considered to be the most visible measure of the adequacy of health services provision, as seen by the public. According to Barnett and Barnett (1999) these changes had a significant impact on the health system and access to the primary care, which became more difficult for low socioeconomic groups in which Maori and Pacific Islanders are over represented. Although there was no formal evaluation of the impact of the reforms on the utilisation of health services, it has been argued in the literature that the reforms were likely to have had the deleterious effect of severely limiting access to primary care, which was possibly related to the increase in general practitioner fees and the social welfare cuts (Gauld, 2000). Despite the above criticism, the radical health reforms were able to contribute by reducing the average hospital length of stay, implementation of better information systems by the Crown Health Enterprises facilitated greater accountability and better management of capital, and Maori providers were able to attract more funding to provide culturally appropriate service (Scott, 2004; Delvin, Maynard & Mays, 2001)

Due to concerns related to costs associated with the running of four regional health authorities, they were merged into a single Health Funding Authority in 1997 and hospitals (i.e. the Crown Health Enterprises) were renamed Hospital and Health Services (Ashton, 2001). There was also a philosophical shift away from profit making and competition, to collaboration between health providers. During 2000, the Ministry of Health acknowledged that the introduction of a commercial focus into healthcare by the major health reforms of the 1980s and 1990s was starting to impede progress in health care delivery, and that the population health status was starting to slip behind that of other developed countries, especially that for the Maori and Pacific Islander groups (Ministry of Health, 2000c). Consequently, the Ministry of Health deliberately developed the 'New Zealand Health Strategy' (Ministry of Health, 2000c), the 'New Zealand Positive Ageing Strategy' (Ministry of Health, 2001g), and the 'New Zealand Disability Strategy' (Ministry of Disability Issues, 2001), to guide the health system, identify objectives and priorities, raise the health status of

the population, and reduce the health gap between Maori and non-Maori, and specified how services were to be delivered (Delvin, Maynard & Mays, 2001). Another objective of these strategies was to direct health services at areas that ensure the highest benefits for the population, with a specific focus on tackling inequalities in health in NZ. To achieve the objectives proposed in the above overarching strategies, the Ministry of Health also developed population-based strategies such as the Maori Health Strategy (Ministry of Health, 2001h), the Health of Older People Strategy (Ministry of Health, 2001i) and the Pacific Health and Disability Action Plan (Ministry of Health, 2002e), and service-based strategies such as the Primary Healthcare Strategy (Ministry of Health, 2001c).

In order to successfully implement the above strategies, a new organisational design was also implemented in January 2001. The Health Funding Authority was abolished and its functions were integrated into the Ministry of Health (Ministry of Health, 2001e; Delvin, Maynard & Mays, 2001). A new public health system structure was proposed and established during 1999-2001. The structural changes included the development of 21 District Health Boards (DHBs) replacing the Hospital and Health Services. These DHBs are responsible for the planning, provision, and evaluation of health services in the public, private, and non-governmental sectors (Ashton, 2001). The DHBs are funded based on their populations. The impact of these major health system structural changes on the health outcomes is unknown in the absence of evaluation studies. On the other hand, it is likely to take some time before the effectiveness of these reforms could be measured.

Overall, there has been very little or no research done to measure the outcomes of the major health system restructuring in NZ. A retrospective longitudinal analysis related to adult medical/surgical patients obtained from the NZ Health Information Services, the National Minimum Dataset, and also the Nursing Workforce Dataset, were used to examine the effects of the NZ health re-engineering policies on adverse patient outcomes, and on the nursing workforce, from 1989 to 2000 (McCloskey & Diers, 2005). The study concluded that nursing full time equivalent hours worked per 1000 medical/surgical patients decreased 36% between 1993 and 2000. The patient average length of stay decreased 25% for medical patients. The adverse outcomes increased significantly for decubitus ulcers, sepsis, urinary tract infections, physiological and metabolic derangement, pulmonary failure and wound infection after the health system restructuring (McCloskey & Diers, 2005).

(2.2.2) Primary Healthcare Reforms

Historically, primary healthcare has largely been provided by general practitioners (GPs) in NZ. The NZ government has paid for general medical services on a fee-for-service basis including pharmaceutical and laboratory tests since the 1940s (Cumming & Mays, 1999). On top of this, many people have had to contribute in the form of user-part charges for accessing primary medical care, with that component increasing over time. The government introduced community services cards for low-income people, and high health user cards in the early 1990s, to facilitate access to primary care for specific population groups (Cumming & Mays, 1999). The card system reduced the GP consultation costs from about \$45 dollars to \$15-\$20 per visit and pharmaceuticals from \$15 to \$3 dollars. A NZ study examined the impact of increased user-part charges on GP service utilisation and on the collection of a prescription, of patients holding community services or high health user cards (Dixon et al., 1994). Results indicated, that the effect was that 40% of patients delayed going to their doctor, and that this primarily affected the wage earner group, who carried most of the burden of the increase in primary health service charges.

Overseas studies have also produced similar results. For example, results of a telephone survey indicated that in response to increased physician co-payments, the proportion of people postponing or delaying a visit to a doctor increased from 11% to 29% from 2002 to 2004 in California (California Healthcare Foundation, 2005). For the chronically ill patients, the rate of postponing or delaying a visit to a doctor increased from 24% in 2002 to 32% in 2004, which showed a lesser increase but at a higher rate than for the general public. This group of patients tend to have higher rates of hospital admissions.

According to Crengle (1999) the fee-for-service practice did not encourage GPs to provide extended appointments to patients with complex and multiple health needs. Nor did the fee-for-service funding encourage GPs to stay or open new practices in poor and high healthcare needs areas. As a result, major barriers to access primary care have existed historically (Crengle, 1999; Malcolm, 2000 & 2002). Most of the research related to access to primary care for the low socioeconomic groups in the 1990s, has continued to show economic barriers preventing equitable access, and poor rates of primary care utilisation, including the use of other primary services, despite the introduction of the community services card (Sutton and

Crampton, 2001). Consequently, health inequalities have widened and hospital admission rates have continued to increase.

Another outcome of the health reforms of the 1990s was the development of independent practitioner associations (IPAs), a shift away from individually run general practices. The IPAs facilitated the contracts with the Health Funding Authority to hold budgets for pharmaceuticals and laboratory tests. These reforms also gave rise to other providers entering the market, who were successful in securing public funding, such as the Maori-for Maori primary health services (Davies & Booth, 2000).

Despite the major reforms of the health system, the unacceptable gap in health status between Maori and non-Maori, and between most deprived versus least deprived populations, remained in terms of overall life expectancy and the burden of disease (Ministry of Health, 1999a). Further, the primary healthcare system was considered to be fragmented and incapable of delivering population health care as per the government's health targets. For example the Ministry of Health's (2000d) discussion document on primary healthcare expressed concern that there were high levels of preventable illness; high levels of avoidable hospital admissions; and barriers in accessing primary care for some people.

A comprehensive review of the primary care organisations in NZ highlighted a number of major issues to be addressed (Malcolm, Wright & Barnett, 1999). These issues were; the perceived growth in the dominance of general practice over the other primary care providers, particularly nurses; the implementation of the population based funding and capitation; the threat posed by IPAs to GPs and Non-GP providers. Further Malcolm, Wright & Barnett (1999) highlighted that primary care was fragmented as compared to hospital care and that there were major inequities in the distribution of primary medical care and its related services, significant financial and other barriers to access, an absence or lack of information systems, and no community involvement in the development of primary care.

As a result of these issues identified with respect to primary care, the Primary Health Care Strategy (Ministry of Health, 2001c) proposed a new organisational structure, known as primary health organisations (PHOs), to address problems of access to services and the lack of co-ordination between providers. The DHBs are accountable for establishing and funding the PHOs based on the local population needs through capitation to redistribute the resources

(Davies & Booth, 2000). The prerequisite for gaining PHO status, and government initiated capitated funding, requires that half of a PHO's enrollees either be Maori and/or Pacific Islander people or be living in a high deprivation (decile 9-10) area (Ministry of Health, 2002a). According to Cumming and Mays (1999) that move to capitation was expected to benefit the vulnerable groups who were not well served by the fee-for-services. The services to be provided by all PHOs include population health services, support with chronic health problems, and assessment and treatment of general health problems. Overall, the PHOs are expected to implement the government's objectives documented in the Primary Health Care Strategy ((2001c). According to Barnett and Barnett (2004), the first two PHOs were established in South Auckland in 2002, and by April 2003 the PHOs were providing primary health services to 25% of the population. The potential benefits of the PHOs' establishment were to be improvements in population health, reductions in hospital use and greater empowerment for both co-operating providers and involved consumers. Research evaluating whether the PHOs have been successful in reducing the inequalities in health, has not yet been published. But Ashton (2005) argued that a number of barriers such as co-payments of up to \$25 dollars for a GP visit were still likely to make access to primary medical care unaffordable for some. Therefore, despite the major reforms of the primary health system a lot of work still needs to be done to fully achieve a population focused, prevention oriented, and team based primary health care system (Ashton, 2005).

There are also physical access barriers to primary healthcare services in some of the regions of New Zealand. For example, New Zealand Medical Association (2004) and Malcolm (2002) found that there were large variations in the number of GPs available per population in the country. Auckland District Health Board had the highest, and Counties-Manukau District Health Board the second lowest number of GPs per 1000 population in the country.

It is concluded that overall the health reforms of the 1990s, coming on top of social and economic structural changes adversely affecting health of communities, contributed to the increase in medical admissions, while LOS declined over the same period. The reasons for this increase in admissions were related to increased barriers to access to primary care, decline in the socioeconomic status of at-risk populations, widening of the gaps between the least and most deprived, and population ageing. In contrast the health reforms since 2000 were introduced to address the large inequalities in health of different population groups, by for example reducing access barriers to primary care, and if fully implemented are likely to have

a positive effect on the health outcomes. However there is virtually no research evaluating the recent structural and health strategy based reforms that have taken place in the health system. Some of the barriers in access to primary care have remained, especially for the low socioeconomic groups.

(2.3) Acute Admission Increases: Patient and Population Factors

Increasing numbers of admissions have resulted in bed crises in hospitals. Health professionals involved directly or indirectly in the management of patients in the UK have expressed concern over the lack of explanations for the increase in admissions, and their frustration at the inability to control the increases (Capewell, 1996). As a result, a number of studies have attempted to investigate the causes of increased admissions over the last two decades. Factors identified in the literature as causes or possible causes for the admission increases are discussed in the following. This section (2.3) deals with patient and population factors, and Section 2.4 looks at those factors that relate to hospitals and health services.

(2.3.1) Ageing Population

The New Zealand Health of Older People strategy highlighted that the NZ population, with only 11.5% of people 65 years and over, may be considered much younger than those of other developed countries. However, the proportion of older people was projected to grow to 22% by 2031 (Ministry of Health, 2002d), and there is already a growing demand for healthcare services by the older age groups. In a discussion document on the Ageing NZ and Health and Disability Services by NZIER (2004) the number of people 65+ years old was projected to grow 72% during 2001-2021. This projected increase in the proportions of 65+ year Maori, Pacific Islander and Asian groups was even greater during the same period. As a result, the costs associated with health and disability services were expected to increase rapidly with ageing, which is likely to create further funding constraints.

The impact of the ageing population has already become obvious in NZ. For example, the Ministry of Health annual per capita health costs by age showed a dramatic rise in spending from about \$2,000 per person under the age of 64 years to more than \$10,000 for the 85 years and older people during 1997/98 (Johnston & Teasdale, 1999). This increase in spending reflected the association between ageing and poorer health status, a greater number of hospital admissions and an increasing prevalence of disability. Therefore, in recognition of the growing demand for healthcare the NZ government policy is to automatically increase health spending each year by the expected rates of growth in the ageing and the general population (Johnston & Teasdale, 1999). This is further supported by NZIER (2004), which accentuated that in developed countries, per capita health expenditure for the 65+ year age group was 3 to

5 times greater than for the 15-64 age groups. According to a large NZ health survey carried out by the Ministry of Health (2004c), older people (65+ years) were more likely to have visited a general practitioner, possibly numerous times, to have issued a prescription or multiple prescriptions, and to have been admitted to a hospital in the previous year, as compared to the adult population as a whole. According to NZIER (2004), hospitalisation statistics indicated that older people accounted for approximately 25% of all discharges from acute and sub-acute admissions in NZ in 2001, but they accounted for approximately half of the total hospital bed days. The Health of Older People Strategy consultation document indicates there were approximately 520,000 publicly funded medical and surgical discharges from hospitals in 1999/00, a rate of 135/1000 people (Ministry of Health, 2001f). However, the discharge rate for people aged 65 and over was 366/1000, increasing to 456/1000 for people aged 75+, and 527/1000 for people aged 85+.

The above increase is not limited only to NZ. The older populations of other developed countries have shown similar health service utilisation trends. For example, an Australian national study which analysed public hospital case mix data found that the 12% of people 65+ years, accounted for 30% of all hospital admissions and for 43% of total bed use in 1997-1998 (Nichol, Lonergan & Mould, 2000). This study showed substantial differences between the 'young old' (65-74 years), the 'old old' (75-84 years) and the 'very old' (85+ years) age groups. The older people stayed longer at hospital, commensurate with their severity of illness. According to Wanless (2001) most of the healthcare costs increased significantly in the last months or last year of life of a person. This is also supported by the UK findings of Johnston and Teasdale (1999), who found that within age groups, the health care costs of people who die are much higher than of those who survive. Kendrick (1996) found that people aged 65+ accounted for only 15% of the Scottish population, but 37% of the emergency admissions.

Bridges, Spilsbury, Meyer and Crouch (1999) carried out a comprehensive literature review aimed at identifying, the characteristics and special needs of older people in the accident and emergency specialty, service initiatives to meet these needs, and the implications for British health policy. The findings indicated that there was a much higher percentage of older people presenting at accident and emergency departments, than their proportion of the population. Findings also indicated that older people were more likely to live alone, arrive by ambulance, be acutely ill, have a medical condition, spend longer in accident and emergency,

present with a co-morbidity, have more diagnostic tests and be admitted to hospital, compared to younger people. Similarly, Wass and Zoltie (1996) also measured the proportion of older people attending one British hospital's accident and emergency department in 1990, 1993 and 1994, and identified a 21% increase in patients aged 71–80 and a 30% increase in those aged over 80 over this time period.

A cross-sectional study was conducted to compare the adult ED resource utilisation between different age groups of patients in Brisbane, Australia (Chu, Brown & Pillay, 2001). The data relating to the Australian Triage Codes, hospital admission rates, and lengths of stay in ED were collected over six months in the second half of 2000. During the study period, there were 29,798 ED attendances by 21,471 patients. According to the findings of the study, 20.4% (95% CI 19.9%-20.8%) of total attendances were by patients aged 65+ years. The patients aged 65+ years were more likely to be triaged to higher clinical urgency categories, than adults <65 years old. They also had a higher hospital admission rate and longer lengths of stay, even after adjusting for triage category. These findings were based on only 6 months' data, and the use of surrogate markers for resource utilisation might be considered.

Another Australian prospective study of 75+ age group patients discharged from hospital ED, showed that an increasing number of older patient presentations were due to their growing number in the population. Older people were presenting more frequently, but they were more seriously ill on presentation to ED than younger people (Caplan, Brown, Croker & Doolan, 1998). A cross-sectional study supporting the above findings, examined the factors associated with the use of healthcare services by people 64+ years in the community from Albacete City, Spain (Fernandez-Olano et al., 2006). The study additionally found that most of the older people in the study had considerable health problems, a negative self-reported health status, and did not visit their general practitioner. Overall these factors influenced the utilization of health care services.

The Patient Management Taskforce (2001) report on public hospital admission trends in the state of Victoria, Australia, concluded that most of the growth in hospital use was due to a rise in the number of medical admissions and patients aged 70+, who made up about 40% of the total growth during 1995/96-1999/00. Although, the 70+ age groups only accounted for 9% of the population, they were responsible for 24% of the admissions, and 40% of patient days for all Victorian public hospitals in 1999–2000, signifying the higher health needs of older

age groups. The report further found that the group aged 85+ was the biggest contributor (34%) of all the age groups, to the rapid growth in medical admissions during 1995/96-1999/00. Ageing population was also one of the major contributors of the rise in ED presentations in Switzerland (Santos-Eggimann, 2002).

Other countries are also experiencing the growing ageing-related demand for healthcare resources, as for example reported in a study from the Netherlands carried out to determine the demand on healthcare resources related to different illnesses, age and sex (Meerding et al., 1998). This study obtained healthcare service utilisation data from 22 different health services such as hospitals, nursing homes, mental institutions, and disability services. The study concluded that the main health costs were for care and not for cure, and that costs were likely to increase rapidly in an ageing society. According to Meerding et al. (1998) healthcare costs increased slowly throughout adult life and then increased exponentially from 50 years onwards to the oldest age groups. Similarly, funding continues to be an issue in the National Health Service in the UK, due to the growing demands outstripping supply (Harrison, Dixson, New & Judge, 1997).

A large scale NZ study that analysed all public hospital admissions to examine trends in avoidable hospitalisations concluded that the 75+ age groups had the highest admission rates at 40.9/1000 compared to other age groups during 1980-1997 (Dharmalingam, Pool, Baxendine & Sceats, 2004). Avoidable admissions increased by 51% among those aged 75+ compared to 32% for all other age groups over the study period. An American study, the 2002 National Hospital Discharge Survey, analysed nationally representative data of hospital utilisation to examine trends in discharges (DeFrances & Hall, 2004). The survey results showed that the average age and age distribution of inpatients has increased dramatically from 40.7 years in 1970 to 52.1 years in 2002. The proportion of inpatients 65+ years old has also experienced changes from 20% in 1970 to 38% in 2002, while the proportion of <15 year olds declined from 13% to 8% over the same period (DeFrances & Hall, 2004).

(2.3.2) Chronic Disease

The growing burden of chronic disease on healthcare resources is one of the significant issues faced by the health systems in the developed countries at present. The number of people living with chronic disorders is rising rapidly as people are living longer with more chronic

and complex co-morbidities in NZ and other developed countries (National Health Committee, 2005). A report entitled 'Our Health Our Future: The Health of New Zealanders 1999', reporting on a comprehensive study of NZ epidemiological data, highlighted that chronic conditions were to become more prevalent in future, particularly due to the ageing population (Ministry of Health, 1999a). The data results showed that 80% of total deaths in NZ were related to chronic disorders. In another report on the burden of disease and injury in NZ, cardiovascular diseases (including stroke) accounted for 35%, cancer for 29%, and chronic respiratory disease for 6% of the total burden of premature mortality (Ministry of Health, 2001d). Intentional and unintentional injuries were the other major contributors to the premature mortality burden. This report was based on the analysis of health data related to mortality and hospital admissions, cancers, health and disability surveys, notifiable diseases, and epidemiological studies. The higher prevalence of chronic disease contributed to the major share of the growing disparity in life expectancy between Maori and Pacific Islanders, and non-Maori-non-Pacific people (Ajwani, Blakely, Robson, Tobias & Bonne, 2003). Due to growing inequalities and demand for acute care in New Zealand, the National Health Committee (2005) proposed a fundamental cultural change in the NZ health sector, from an acute episodic focus to a system that better meets the needs of a population with disability and chronic disease.

Growth in chronic disease/disorders is not limited to New Zealand, but other developed and under developed countries are also experiencing similar trends. For instance, there were approximately 58 million deaths in the world in 2005 and 35 million of these deaths were from heart disease, stroke, cancer, chronic respiratory disease and other chronic conditions (Strong, Mathers, Leeder & Beaglehole, 2005). These authors further highlighted that almost 75% of the burden of disease in those aged 30+ years was related to chronic disease and these diseases were to become the commonest cause of mortality in the world (including the poorest countries) by 2015. Approximately 50% of chronic disease deaths are attributable to modifiable risk factors, such as tobacco use, raised blood pressure, and poor diet.

The world's first large scale study undertaken by Murray and Lopez (1997) to measure the global burden of disease and to forecast future mortality and disability trends in the world, was based on the analysis of international disease and injury trends data since 1950-1990 in nine cause-of-death clusters. The authors calculated mortality rates for each cluster by different region of the world, based on gross domestic product per person, average number of

years of education, and smoking intensity. This study projected that health tends to be determined by the ageing of the world population during 1990-2020 (Murray & Lopez, 1997). Further, worldwide deaths were expected to decline from 17.2 million in 1990 to 10.3 million in 2020 from communicable, maternal, perinatal and nutritional disorders. On the contrary, mortality from chronic and non-communicable disorders was expected to rise from approximately 28 million in 1990 to 50 million in 2020 (Murray & Lopez, 1997). This study too highlighted the relationship between ageing population and chronic disease.

A Dutch cohort study analysed Netherland's Health Interview Survey data on the adult population reporting at least one chronic condition (1990-1997), to examine the relationship between chronic conditions and the volume and variety of healthcare utilisation (Westert, Satariano, Schellevis & Van Den Bos, 2001). Approximately 20% of the study population reported at least one or more chronic conditions. Findings related to health service utilisation showed that 85% of the population visited their GP in the year preceding the interview; 60% contacted a medical specialist; 9% received home care; and 30% visited a physiotherapist. One out of 7 respondents had had at least one hospital admission in the preceding year (Westert, Satariano, Schellevis & Van Den Bos, 2001). Only 7% of the respondents had not used a health service during the study period, highlighting the extent and variety of health services used by people with co-morbidities.

In response to the growing burden of chronic disease, the World Health Organization (2002) published a report on innovative care for chronic conditions, to alert decision makers about the required changes in global health, and to present healthcare solutions for managing chronic disease. The report proposed eight essential elements for improvement: a paradigm shift required to move from acute episodic model of care to a different kind of model; policy and service planners need to involve healthcare leaders, patients, families, and community members in the decision making process; integrated healthcare to prevent disease, promote health and effectively manage chronic disease; well aligned inter-sectoral policies developed to maximise health outcomes; effective use of healthcare personnel; focus healthcare on the patient and family; support patients in their communities; and emphasize prevention (World Health Organization, 2002).

In the literature, there were some specific disorders that contribute largely to acute hospital admission trends. Cardiovascular disease is considered to be one of the leading causes of hospitalisations in NZ and other developed countries. For example, cardiovascular diseases

accounted for the highest male and female rates of disability adjusted life years (DALY) loss due to any single disease group among Maori and Pacific Islander peoples. Cardiovascular disease alone accounted for 40% of all deaths in NZ in 2001 (Hay, 2002). On the other hand, the age-specific mortality rates have continued to decline but have remained higher than other developed countries such as Australia, Canada and USA (Hay, 1999). Cancers accounted for the second-highest male and female rates of DALY loss, again in both ethnic groups (Ministry of Health, 2001a). A multi-centre study monitored both fatal and non-fatal coronary events to identify trends in adults (35-64 year age group) in Auckland, NZ, and Newcastle and Perth, Australia, during 1984-1993 (Beaglehole et al., 1997). Study results showed statistically significant declines for nonfatal definite myocardial infarction rates in all centres, with estimated average changes between 2.5% and 3.7% per year during the period 1984–1993. Coronary death rates also declined significantly in all three populations. In absolute terms, there was, in general, a greater reduction in pre-hospital deaths than in deaths after hospitalization (Beaglehole et al., 1997). Therefore, part of the increase in cardiovascular admissions might be related to the fact that more people are living longer with chronic cardiovascular disease rather than dying, and are therefore presenting at hospitals for ongoing treatment.

Murray & Lopez (1997), who analysed international health data to assess the global burden of disease, concluded that ischaemic heart disease was projected to be the leading cause of disability-adjusted life years in developed countries, while cerebrovascular disease and unipolar major depression had second and third ranking respectively. Cardiovascular disease alone accounted for 20% of total disability adjusted life years for the population 30+ years in 2005, reflecting the global ageing population (Strong, Mathers, Leeder & Beaglehole, 2005). The authors used historical death registration data for 107 countries between 1950 and 2002 to model the relationship between death rates for all major causes and three variables, namely average income per capita measured as gross domestic product, average number of years of schooling in adults, and time, a proxy measure for effect of technological change on health status. Globally 58 million people are likely to have died in 2005 and 30% of these total deaths will have been related to cardiovascular disease. These rates were predicted to grow further in future, unless preventative measures were implemented (Strong, Mathers, Leeder & Beaglehole, 2005).

A cohort study analysis related to primary DRGs indicated that cardiovascular diseases were the leading cause of admissions, followed by respiratory disorders and poisoning in Glasgow, Scotland (Blatchford, Capewell, Murray & Blatchford, 1999). The five commonest specific diagnoses were chest pain (9.6%), followed by chronic obstructive airways disease (5.6%), angina (5.4%), heart failure (4.1%), and acute myocardial infarction (3.9%). Chest pain, angina pectoris, and myocardial infarction together accounted for 18.9% of all emergency medical admissions.

On the other hand, Capewell and McMurray (2000) reviewed literature related to chest pain admissions and concluded that 20%-30% of emergency medical admissions were related to chest pain. Most of these patients were admitted because of concern about unstable coronary heart disease. The authors gave examples from the literature of $\geq 50\%$ of patients not requiring admissions, nor having cardiac pain. The level of evidence supports the introduction of rapid assessment chest pain units. Such services could attract more patients, which may increase referrals for angiography and other invasive procedures.

The number of heart deaths has continued to decline in Australia, NZ, Canada, the UK and the USA in the last three decades. This decline was possibly related to better management of hypertension, health promotion and risk modification programmes introduced in these countries (Laxminarayan et al., 2006). On the other hand the prevalence of cardiovascular disease has continued to increase with the ageing of the population. For example, to estimate the prevalence of heart failure the current rates were applied to the whole Scottish population based on general practice consultation rates, and hospital admission rates by Stewart, MacIntyre, Calewell & McMurray (2003). The authors then projected these rates over the period 2000 to 2020 based on age, sex, and the expected changes in the age structure of the Scottish population. Overall findings of the study concluded that by 2020 the annual number of male and female hospital admissions associated with a principal diagnosis of heart failure was expected to increase by 34% and 12% respectively (Stewart, MacIntyre, Calewell & McMurray, 2003). These results are also supported by Lampe et al. (2001), who carried out a cohort long-term trends study, to examine whether acute coronary heart disease (CHD) event rates have influenced the burden of prevalent in CHD in UK men over time from 1978-1996. The study concluded that middle-aged British men were just as likely to have a history of diagnosed CHD as in the previous decades, but that they experienced less symptoms of angina due to better management of the disease.

Respiratory system disorders were also among the leading causes of mortality and admissions in NZ. For example, chronic obstructive pulmonary disease (COPD) is the 4th leading cause of deaths in NZ. Broad and Jackson (2003) estimated that COPD affects approximately 15% of the 45+ years adult population in NZ. Therefore according to the authors, there were likely to be at least 200,000 cases of COPD amongst adults, of whom only 1 in 4 - 5 have had the diagnosis confirmed by a doctor. Based on the hospital admission data the Maori population had more than twice the prevalence of COPD than other ethnic groups.

Similarly a study from Australia reported that a large number of older people were presenting at the public hospital EDs with chronic conditions such as circulatory, respiratory and digestive system disorders (Codde, Bowen & Lloyd, 2006).

(2.3.3) Ethnicity and Inequalities in Health in NZ

Ethnicity may be defined as a social group, whose members have one or more of the following four characteristics: share a sense of common origins; claim a common and distinctive history and destiny; possess one or more dimensions of collective cultural individuality; and feel a sense of unique collective solidarity (Smith, 1981). Inequalities in health exist between ethnic groups and social classes in NZ as elsewhere. In most countries socially and economically disadvantaged groups have poorer health, and lower access to quality health services than their more advantaged counterparts. A number of NZ reports carried out by the Ministry of Health have highlighted that Maori, Pacific Islanders, and people in lower socioeconomic groups, have a poorer health status and a higher incidence of disability than the general population (Ministry of Health, 1999a; 1999b; 1999c; 2001a, 2001b, 2001c; & 2002). A report published on 'Ethnic and Socioeconomic Inequalities in Mortality' (Ministry of Health and University of Otago, 2006), found that Maori were disproportionately represented in the lower socioeconomic strata in all cohorts. The report further concluded that different socioeconomic resources or positions of the Maori and the non-Maori ethnic groups account for at least half of the ethnic disparities in mortality for working-age adults and one-third of the disparities in mortality for older adults in NZ. Another NZ study in a similar area, showed similar results (Howden-Chapman & Tobias, 2000). They found that the Maori and Pacific Islander ethnic groups were over-represented in high deprivation areas while the European group was found more in low deprivation areas.

The report further found that regardless of age, gender and ethnicity people living in more deprived areas have higher rates of hospitalisations than the low deprived area people. A large NZ health survey also indicated significant inequalities in the health of different ethnic groups (Ministry of Health, 1999a). According to the survey these inequalities were more likely to be related to socioeconomic differences, poor housing, lower education levels, and occupation. As Howden-Chapman and Tobias (2000) found, this survey also concluded that Maori and Pacific Islanders were overrepresented in high deprivation deciles as compared to the European group.

Another report supporting the above studies emphasized that it was well established in literature that both social position and ethnicity affect people's health outcomes, with socially disadvantaged groups tending to have poorer health status, greater exposure to health risks, and less access to health services in NZ and internationally (Ministry of Health, 2000a & 2001c; National Health Committee, 2005). In addition, indigenous people tend to experience worse health than other groups. Disparities in the health status of Maori and Pacific Islanders have also been acknowledged in the New Zealand Health Strategy (Ministry of Health, 2000a), which proposed some specific objectives and goals to reduce these. Tobias and Howden-Chapman (2000) published a report on 'Social Inequalities in Health: New Zealand 1999' based on the analysis of national mortality data, hospitalisation data and data from some specific national surveys. The authors concluded that regardless of age, gender and ethnicity, populations living in high deprivation areas had higher rates of hospital admissions and day patient attendances than their low deprivation counterparts.

The New Zealand Census–Mortality Study, in which death registration data was linked to census data, found a progressive widening of the gap in survival chances between the ethnic groups during 1980-1999 (Ajwani, Blakely, Robson, Tobias & Bonne, 2003). The study findings further showed that non-Maori non-Pacific Islander people had falling mortality rates over time while Maori had stable or only modestly decreasing rates. Disease specific findings highlighted that cardiovascular mortality has decreased over the study period for all ethnic groups, but the rate of decline was slower for the Maori and Pacific Islander people than for other ethnic groups (Ajwani, et al., 2003). This cause still ranks highest as a contributor to the total ethnic gap in mortality.

Regional variations in asthma hospitalisations, prevalence and morbidity rates among Maori and Non-Maori have been studied by a number of researchers. Ellison-Loschmann, King and

Pearce (2004), analysed publicly funded hospital discharge data collected by the Ministry of Health related to asthma hospitalisations in Maori and non-Maori during 1994-2000, and concluded that asthma hospitalisation rates were higher in Maori than in non-Maori despite the similar prevalence in Maori and non-Maori children.

The National Primary Medical Care Survey described primary medical care in New Zealand, including provider characteristics, the practices they work in, the patients they see and health problems and treatment management offered (Crengle, Lay-Yee, Davis & Pearson, 2005). The experience of Maori patients in general practices was also explored. Maori accounted for 12% (n = 9,124) of the total doctor visits. According to the survey findings, Maori patients were younger than non-Maori, a high proportion (60%) of them lived in high deprivation areas, and they were more likely to hold a community services card. There were 43% more Maori patients, who required attention urgently or today, than non-Maori, which signified that they only visit a doctor when absolutely necessary. The mean consultation time for Maori patients was shorter than for non-Maori, and they had fewer investigations or diagnostic tests (Crengle, Lay-Yee, Davis & Pearson, 2005). Overall, these findings suggested that Maori may experience reduced access to primary care, and pointed to disparities in the quality of care received. Another study by McKinney (2006) found in an exploratory study that some Maori patients did not receive appropriate health education regarding their chronic disease management. A nationally representative retrospective cross-sectional survey of admissions to 13 public hospitals with more than 100 beds providing acute care was carried out, to assess possible disparities in quality of hospital care for Maori (Davis et al., 2006). The survey results concluded that Maori accounted for 15% of admissions, were on average younger, came from high deprivation areas, and had a shorter length of stay as compared to non-Maori and non-Pacific Islander people. The authors also found that 14% of the Maori admissions were related to adverse events compared with 11% for non-Maori/non-Pacific Islanders. Overall, Davis et al. (2006) concluded that the quality of care received by Maori was poorer than for non-Maori/non-Pacific Islander groups.

In order to help rank health issues among Maori and Pacific Islander groups, the Ministry of Health (2001a) developed a unitary scale of burden of disease by calculating disability adjusted life years (DALYs). The age-standardised DALYs showed that Maori experienced the highest total health loss (197/1000), Pacific Islanders the 2nd highest (169/1000), while the European/Others had the lowest (113/1000) in 1996 (Ministry of Health, 2001a). Inequality

in age-specific DALY loss rates peaked in the 45-64 age groups among Maori and Pacific Islander groups, while in comparison, the bulk of DALY loss by the European/Others group occurred in the 65+ years age group. Cardiovascular diseases were the single disease group accounting for the highest rates of DALY loss for Maori and Pacific Islander groups, with cancers the second highest again for both ethnic groups.

In NZ, the decline in cardiovascular mortality was greatest in the high socioeconomic groups, and as a result socioeconomic inequalities in cardiovascular disease have widened (Howden-Chapman & Tobias, 2000). The authors further found people residing in high deprivation deciles had two- to three-fold higher mortality rates than low deprivation decile residents, regardless of their ethnic association. According to the Ministry of Health (2001b) people residing in more deprived areas, have hospitalisation rates twice as high and a life expectancy lower by 6-9 years, compared to people living in low deprivation areas. In fact the Maori population has the poorest health status in NZ (Ministry of Health, 2001c & 2001h). According to Hay (1996) the age-standardised death rates for coronary heart disease have fallen at a slower pace in Maori than non-Maori. The largest difference was in all causes of mortality between Maori and non-Maori in the 45-64 year age groups (Ministry of Health, 1999a). The Maori excess deaths were dominated by chronic disease such as coronary heart disease, chronic obstructive pulmonary disease, diabetes and smoking related cancers.

The National Health Committee (1998), which reported on the social, cultural and economic determinants of health, concluded that there were persistent socioeconomic inequalities in health status in NZ as measured by mortality, hospitalisation, and self-rated health. The Committee further elaborated that despite the overall improvement in population health status, the socioeconomic inequalities in health have not decreased, but on the contrary may have increased. The Maori and Pacific Islanders had a poorer health status compared to other New Zealanders in most aspects (National Health Committee, 1998).

(2.3.4) Deprivation and Age

A retrospective study investigated the relationship between socioeconomic factors and hospital utilisation in Ontario (Glazier, Badley, Gilbert, & Rothman, 2000). This study used the 1991 Canadian census and 1990-92 Ontario Hospital, Toronto discharge data to calculate crude and age-sex adjusted rates of hospital admissions, bed days, and costs, by quintile of

low-income households. The study results showed that the population-based admission rates to hospital, bed days and costs were significantly related to census income bands. The researchers further found that hospital costs per person were 50% higher for the poorest quintile of neighbourhoods than for the wealthiest, and 36% higher than for the middle-income quintile. Similarly, Bernard and Smith (1998) investigated whether variations in emergency admission to hospital amongst older people in Leicestershire varied with the level of material deprivation of the area in which they live. The study extracted data from the hospital information system for patients aged 65+ admitted as an emergency admission to Leicestershire's acute and community hospitals on at least one occasion during the period October 1993 to September 1994. The results indicated that there was an increased risk of emergency medical admissions to hospital from areas characterised as economically deprived by Census-based indicators. Material deprivation may also be a proxy for other factors, such as differences in social support and the type of care received.

In its 2nd comprehensive report the Agency for Healthcare Research and Quality (2004) found pervasive disparities in healthcare among racial, ethnic and socioeconomic groups in the American population. In order to quantify the disparities systematically, the report analysed data from a wide range of sources such as surveillance, epidemiology, the Medical Expenditure Panel Survey, the Centre for Disease Control and Prevention, the National Immunisation and Health Survey, and the National Hospital Discharge Survey. The report concluded that disparities were observed in almost all aspects of healthcare. For example, across all dimensions of quality of healthcare; all dimensions of access to healthcare; different healthcare settings including primary, secondary, tertiary and community; and across many clinical conditions, and subpopulation groups (Agency for Healthcare Research and Quality, 2004). The report findings highlighted that ethnic groups such as Blacks, American Indians, Alaska Natives, Hispanics, and Asians received poorer quality of care than Whites, and had worse access to care than Whites. Poor people whose family income was less than the federal poverty level also received poorer quality of care and had worse access to care than people with a family income 400% above the federal poverty level. Similarly, Lasser, Himmeistein and Woodhandler (2006), also compared health disparities according to race, income and immigration status based on population based data in the USA and Canada. Health disparities were present in both countries, but were more pronounced in the USA than in Canada which has access to universal health insurance.

To further understand the causes of higher health service utilization by some population groups, they have been compared to other groups. Deshazo (1998) studied a number of socioeconomic, race, and life style factors and found that race was not associated with differences in rates across small areas, after adjusting for disease burden in Alberta, USA. Education appeared to be the single most critical factor in determining variations in population based hospitalisation rates. The study also explored the association between the level of education and the standards of living, lifestyles, economic status and selection of career choices. All of these factors appeared to be intertwined, and have an influence on health and health related issues. Ross (2004) examined research literature on income inequality and mortality, to explore their relationship across 528 cities in five industrialised countries. The overall review of the literature concluded that income distribution was difficult to ignore, in that populations with less income disparity had better health status. When comparing the Canadian cities against the American cities, there was little dispute that Canadian cities have a more equal income distribution and have better population health than the American cities.

The relationship between the prior use of health services and subsequent unemployment, and the acute effects of exposure to unemployment and its effect on the use of healthcare services, have also been examined (Kraut, Mustard, Walld & Tate, 2000). This study linked the 1986 census records with comprehensive healthcare information for the period 1983-1989 for over 44,629 randomly selected residents of Manitoba, Canada. The study also compared all cause and cause-specific rates of hospital admissions and ambulatory physician contacts, of 1498 unemployed and 18,272 employed persons across 4 consecutive time periods related to the onset of unemployment. The adjusted rates of hospital admission and physician contacts were higher among the unemployed across all 4 periods. Unemployed people had increased hospitalisation rates before their current spell of unemployment. Much of this difference was due to the subgroup with prior mental health treatment. However the hospitalisation rates had also increased for individuals without a mental health history prior to unemployment.

A large cohort study analysed hospital emergency medical admission data to determine demographic and socioeconomic factors associated with medical admissions in Glasgow 1997 (Blatchford, Capewell, Murray & Blatchford, 1999). The study found that patients from the most disadvantaged deprivation category had more than double the admission rates of those from the most affluent deprivation category (73.1/1000 versus 32.1/1000). The finding

related to age indicated that the crude annual admission rates increased steeply with age, doubling with every two decades of age increase, from 15.4/1000 among those aged 15-24 years old to 224/1000 in those aged 85+ years. According to Fernandez-Olano et al. (2006) socioeconomic characteristics were also strongly associated with the higher use of primary and secondary healthcare services among the elderly (64+ years) in Spain.

Reid, Cook and Majeed (1999) carried out a cross-sectional survey to quantify the extent of the variation in hospital admission rates between general practices, and to investigate whether this variation can be explained by factors related to the patient, the hospital, and the general practice. Findings indicated that patient factors such as chronic co-morbidities, were by far the most important in explaining the variation in admission rates, particularly for emergency admissions, which accounted for 45% of the variation. Socio-demographic patient factors, derived from the census data, accounted for 42% of the variation in overall admission rates; for 45% in emergency admission rates; and for 25% in elective admission rates (Reid, Cook & Majeed, 1999). There was a strong positive correlation between factors related to patient deprivation and emergency admissions signifying the influence of patient factors on admissions. In contrast, general practice characteristics only had a negligible amount of influence on hospital admissions.

Kelagher, Dunt, Day & Feldman (2006) reported that poor socioeconomic status was associated with episodes of not seeking AH care among non-users of AH care in Australia. Financial disadvantage was strongly associated with poor household health status. Similarly, Chalmers and Capewell (2001) obtained census data from the General Register Office for Scotland related to people born in 1920 that were still alive to the end of 1974. For each year from 1975 to the end of 1997, the authors examined all registered deaths by specific cause and assigned a deprivation score based on the residential postcode for each person. According to the results 47% of the total people born in 1920 were alive in 1974. Approximately half of these people died during 1975-1997. Deprivation appeared to have had a strong influence on mortality, with only 37% of the people who died in the least deprived group, as compared to 61% in the most deprived group, highlighting a 6-7 year gap in life expectancy (Chalmers & Capewell, 2001). There was no specific relationship between specific disease and deprivation. The deprived people had the same morbidity pattern as affluent people. Kendrick (1996) found a strong relationship between age, deprivation, and hospital admissions in Scotland.

Williamson et al. (2006) investigated the use of health-related services by low-income Canadians living in two large cities, by using a sampling technique to collect interview data from low-income people and key stakeholders such as service providers and advocacy group representatives. The study results showed that physicians in private practices, community health clinics, walk-in facilities and hospital emergency departments were by far the greatest used services by the low-income people. Only a few low-income participants reported that they used recreation programs and health care services not covered by provincial health care plans. The results also highlighted that low incomes made it difficult for some participants to afford transportation to health related services (Williamson, et al., 2006).

In conclusion, based on the international literature: poor socioeconomic status was strongly associated with poor health and higher health service use; ageing of the population was one of the most significant factors leading to increased admissions; and growing prevalence of chronic disease was closely associated to the ageing of the population. The NZ literature has consistently demonstrated that poorer health related to socioeconomic deprivation in NZ overlaps with ethnicity. According to the literature there was a strong relationship between early mortality and low socioeconomic status both in NZ and other countries. Low socioeconomic status was also associated with higher health service utilisation, including acute admissions at hospital. Both Maori and Pacific Islander groups had higher prevalence of chronic disease, shorter life expectancy, and higher rates of admissions to hospitals compared to the European groups. These differences are attributed to higher mortality and morbidity, lower uptake of services, delayed access, and lower quality of care.

(2.4) Acute Admission Increases: Hospital and Health Service Factors

(2.4.1) Primary Healthcare

Primary healthcare has been defined by the Ministry of Health (2001c) as ‘essential health care based on practical, scientifically sound, culturally appropriate and socially acceptable methods, that is universally accessible to people in their communities, involves community participation integral to, and a central function of, New Zealand’s health system, and the first level of contact with our health system’ (p1). This definition is closely based on the World Health Organization’s definition, and the strategy provides focus on population health, primary preventions and health promotion.

Literature related to primary care in NZ, has highlighted significant access barriers to primary care for many populations, particularly for disadvantaged groups (Coster & Gribben, 1999). One of the most common reasons for this barrier for many New Zealanders was the user part charges for accessing primary care (Ministry of Health, 1999a; Barnett, Coyle & Kearns, 2000; Malcolm, 2000). Other studies have emphasized, that NZ spends a higher proportion of the total health expenditure on hospitals (59%) and a much lower proportion on primary care, compared to other developed countries (Coster & Gribben, 1999). However, the implementation of the Primary Health Care Strategy by the NZ government has already started addressing the cost barrier issue (Ministry of Health, 2001c).

The above literature findings are well supported by the Australian literature on primary care. For example, Culvenor, Wilczynski and Wallace (2002) carried out a comprehensive literature review on barriers faced by members of disadvantaged and marginalised communities and their families in accessing after hours primary medical care in Australia. The majority of the identified barriers experienced by these groups were general in nature, such as inability to pay for either after hours or in hours care, lack of continuity of care after hours, lack of adequate information, travel and transport issues, and the inability of general practitioners to deal with special needs’ groups in a primary care setting. A report further accentuated that the highest rates of ED presentation generally occurred in the outer metropolitan areas in Western Australia, where the number of GP clinics tends to be lower, or there are a lower number of GPs available, than in the cities (Codde, Bowen & Lloyd, 2006).

Yet again other studies question whether there is a relationship between health spending and access to healthcare. A study analysed population based data obtained from the Joint Canadian/USA Survey of Health to compare health status, access to care, and utilisation of medical services both in the USA and Canada during 2002-2003 (Lasser, Himmeistein & Woodhandler, 2006). The survey findings indicated that health spending was not a significant factor. For example, Canada has a universal health insurance cover, and spends significantly less on health care per capita compared to the USA, yet Canadians have a higher life expectancy (Lasser, Himmeistein & Woodhandler, 2006). The survey results further showed that fewer USA residents had a regular doctor, and were more likely to have foregone needed medicines in the past year, than Canadians, and 7% of USA residents had unmet health needs due to financial barriers, compared to 3.5% of Canadians who had needs due to waiting time. This study highlights that it is not just the amount of funding, but also how it is spent and what are out-of-pocket charges, that make a big difference to the health outcomes.

Barnett and Barnett (2004) examined issues related to access to primary care and found despite subsidies according to income and high need in NZ, there have been inequalities in access, with low income people and Maori using primary health services at rates less than expected, given their levels of healthcare need. Other studies, both from overseas and NZ, have explored whether there was a link between avoidable hospitalisations and the underutilisation of primary care. This underutilisation was possibly associated with lower socioeconomic status of a population, other barriers to access and lack of primary health services in the community (Bindman, et al., 1995; Pappas, Hadden, Kozak, & Fisher, 1997; Jackson, Kelsall, Parr & Papa, 1998).

An Australian telephone survey, of separate random samples of user and non-user households of after hours (AH) general practice, was conducted to examine the effects of socioeconomic disadvantage on access to AH care, and episodes of not seeking AH care when needed among users and non-users of AH care during 1999-2000 (Kelahar, Dunt, Day & Feldman, 2006). The study results indicated significant inequities in access to AH care, due to accessibility and availability of general practitioner clinics. These clinics were significant barriers to the use of AH clinics among users and non-users taking financial disadvantage and health into account. The authors further concluded that financial disadvantage was associated with difficulty in accessing AH services, which in turn was associated with episodes of not using AH care. The financially disadvantaged also reported poor household health.

According to a New Zealand report entitled 'The Next Five Years in General Practice' published by the Health Funding Authority (1998), 'general practice had experienced some of the greatest changes in the health sector in NZ' (p1). The report highlighted that there was a wide variation around the country in the services provided from general practices and some practitioners saw their patients twice as often as others with a similar population. This study did not age-standardise the populations, nor did it examine the differences in deprivation or the availability of GPs per 1000 population.

According to the NZ Ministry of Health reports on the utilisation of health services, both Maori and Pacific Islanders were shown to use primary, secondary, and disability services less than the rest of the population, despite having a significantly poorer health status compared to the general population (Ministry of Health, 2001a, 2001c, & 2004c). Another Ministry of Health (1999c) report further emphasized, that the lower utilisation of primary services, combined with high acute hospital admission rates, in areas such as South Auckland, suggested that primary care services were not reaching some Maori, Pacific Islander and low socioeconomic groups. Malcolm (2000 & 2002) obtained data from the Ministry of Health, to examine variations between DHBs in expenditure on pharmaceutical and laboratory services, and compared the gap between budgets as determined by the primary care funding formula and actual expenditure on these services. Overall, the researcher concluded that Auckland DHB had over spent its allocated pharmaceutical and laboratory funds while CMDHB (South Auckland) had under spent funds, despite having the higher proportion of population with higher health needs (Malcolm, 2000 & 2002). There were also major differences in the primary care expenditure per population in the two regions of the same city.

Eastwood and Jaye (2006), using a qualitative research methodology, explored older people's (65+ years) attitudes and perceptions of barriers when seeking medical care after hours in the Hutt Valley area of NZ. The analysis of interview and focus group data indicated that transport difficulties, the total cost of accessing after hours care, lack of information, and reluctance to see a new doctor who was unfamiliar with their medical history, were the major barriers to older people seeking after hours medical care. These findings are further complemented by a quantitative study in the same area of NZ. Eastwood and Dowell (2006) compared the use of after hours health services by older people with younger adults. Conclusions of the study indicated that older people (aged 65 to 74 years) in the Hutt Valley

in 2002, used after hours health centres at a lower rate than younger adults, despite the older people having a higher rate of hospital ED presentations than the younger adults (Eastwood & Dowell, 2006). Similar barriers have also been found to after hours healthcare use in the UK, including difficulties with transport, reluctance to go out at night, distrust of telephone advice, and a preference for a familiar doctor (Foster, Dale, & Jessopp, 2001).

An international study analysed avoidable hospital admissions as an indicator of the accessibility and affordability of primary healthcare in Manhattan, USA and Paris, France (Gusmano, Rodwin & Weisz, 2006). The authors calculated the age-standardised discharge rates per population for three specific 'marker conditions', and concluded that Paris provides much better access to primary care than Manhattan. The age adjusted avoidable rates were 2.5 times higher in Manhattan. Discharge rates for low-income groups were higher in both cities, but the disparity among the high- and low-income residents was twice as great in Manhattan than in Paris.

(2.4.2) Gatekeeping by General Practitioners and the Emergency Departments

General practitioners occupy the principal gatekeeper role for admissions to hospital, and refer the majority of the patients hospitalised in NZ public hospitals (NZHTA, 1998). In 1997, the Ministry of Health (1997) carried out a review of 707 adult acute medical admissions to assess the appropriateness of admissions at the APH (formerly known as Auckland Healthcare Limited). This review concluded that GPs were the largest (51%) and ED the second largest (43%) sources of referrals to acute adult medical admissions. In contrast, the Middlemore Hospital region had the second lowest number of GPs per population in NZ, and as a result some patients were seeking primary care through hospital, indicating poor gatekeeping in the community (Jackson, Palmer, Lindsay & Peace, 2001).

A retrospective review examined the characteristics of general practices and their populations, and of general practitioner attitudes within a practice, which might influence the admission rates to a district general hospital (DGH) or a community hospital (CH), with subsequent bed usage in West Gloucestershire for patients 75+ years of age (Ambery & Donald, 2000). The study concluded that there was a five fold spread in DGH and CH admission rates for elderly emergency admissions, and a three fold spread for overall admission rates. This considerable variation between practices and admission rates was only partly explained by morbidity rates,

and no relationship between GP attitudes and admission rates was found. This finding highlighted the influence of other factors such as hospital admitting practices.

The relationship between the experience of the admitting doctor and admission rates has also been explored in the literature. A study examined the effectiveness of a dedicated medical receiving unit with senior registrar assessment of GP referrals for medical admissions (Wanklyn, Hosker, Pearson & Belfield, 1997). In the first study period, the patients' assessments were carried out by senior house surgeons or registrars. In the second period, the patients were assessed by a senior registrar, while in third period nine registrars worked on a roster basis. The same-day discharge rate increased significantly from 3.6% in period one to 29% in period two and 15% in period three. A decline in readmission rates was also apparent in periods one and two. Adamiak and Karlberg (2004) found that training level of admitting physicians in emergency departments was an independent risk factor for early readmission and concluded that it is cost-effective to have all decisions on admission to hospital care confirmed by senior doctors. Inappropriate selection of patients for inpatient care contributes to poor patient outcomes and reduces cost-effectiveness and quality of care.

The NZHTA (1998) literature review concluded that GPs and EDs were the most important gatekeepers of admissions to hospital. Therefore interventions aimed at GP and ED services have the greatest potential to reduce the number of admissions.

(2.4.3) Increasing Use of ED

Some literature has attempted to point out that there was very little or no difference between the patients accessing primary healthcare services versus those in hospital EDs in NZ. For example, a national primary medical care survey undertaken to describe primary healthcare in NZ, analysed data from four hospital EDs, general practices, accidents and emergency clinics in NZ in 2001/02 (Raymont, von Randow, Patrick, Lay-Yee & Davis, 2005). The survey results highlighted that individuals with apparently similar problems were seen at each source of care. There was some evidence that hospital ED patients were more acutely ill and were more likely to be presenting new problems, but coded diagnoses did not adequately indicate levels of urgency and severity. While more ED patients came from high deprivation areas, patients at general practices and accident and emergency clinics were more evenly spread across all levels of the NZ deprivation scale (Raymont et al., 2005).

Santos-Eggimann (2002) analysed hospital data collected from 1993-1999 for consultations of the public general hospital serving the population of 286,000 in the Lausanne area of Switzerland. According to the results the number of ED consultations increased by 24%, while the resident population only increased by 0.5%. The study findings also indicated that the number of consultations with people 80+ years old, more than doubled between 1993 and 1999. Similarly, a report on the analysis of metropolitan public hospital EDs in Western Australia highlighted a 16% increase in presentation during 2001/02 to 2004/05 (Codde, Bowen & Lloyd, 2006), a rate three times higher than the population growth.

(2.4.4) Beds and Admissions

The influence on hospital admissions of supply side factors has long been recognised in the literature. For example, the Dartmouth Atlas Project has consistently shown a positive association between the per capita supply of staffed hospital beds and the hospitalisation rates for medical disorders, highlighting the effect of hospital bed supply on hospital use, also referred to as 'Roemer's law' (Dartmouth Medical School Centre for Evaluative Clinical Sciences, 2006). Another retrospective review of adult medical inpatient hospital records examined the effect of the bed supply factor, in a health district (adult population 378,000) in England over a three year period (Round, 1997). Yearly age-standardised rates for emergency admissions were consistently higher in the population whose general practitioners had access to community hospital beds, as compared to those whose general practitioners had no access (46.1/1000 population versus 39.3/1000 in the year 1994-95, $P < 0.05$). Multivariable analysis suggested that in addition to supply factors, age, sex, morbidity and socioeconomic circumstance also influence admission rates.

Similarly, Maheswaran (1997) in an ecological study examined geographical variations in the utilisation of inpatient medical services for elderly people in a health district in England, in relation to the supply of inpatient geriatric medical care and indicators of need. The author divided the district population into three localities, each with a different supply of inpatient medical services for elderly people. Locality A had a traditional model of geriatric medical care, Locality B an integrated model and Locality C an age-related model. Localities A and C also had a high provision of general practice hospital beds. According to the study results, Locality A had the highest, and Locality B the lowest, unadjusted admission. Locality A's

admission rates remained the highest, even after excluding second and subsequent admissions over the same period. The overall results of this study suggested that factors related to the supply of inpatient medical services were associated with geographical variation in medical admissions for elderly people.

Other studies have indicated that the actual number of available hospital beds has declined in most of the developed world, while the admission rates have continued to increase. For example, Wiley (1996) examined fourteen European countries and found acute hospital admission rates have increased in eight countries. In contrast, the number of acute hospital beds per 1000 population had declined in all countries (except Spain) and consequently the average length of inpatient stay had reduced in all countries during 1980-1994. In England, despite the reductions in the lengths of stay, the hospitals have experienced net increases in bed occupancy rates due to the overall increase in emergency admission in England (Harrison, 1997). In NZ most of the growth in admissions was related to day patients, while dramatic reductions in hospital lengths of stay have occurred for most conditions due to better treatment and new technologies (Malcolm, 2006). As a result, the availability of acute care beds declined from 3.2/1000 in 1989 to 2/1000 in 2002, and it is predicted that this downward trend will continue in the future (Malcolm, 2006).

Due to the increased pressure of acute and emergency admissions on the public hospital system in Victoria, Australia, the Victorian Ambulatory Care Sensitive Conditions Study to identify a set of priority conditions was carried out, to explore whether hospital admissions could be reduced through improved prevention and primary healthcare (Ansari, Carson, Serraglio, Barbetti & Cicuttini, 2002). The study was based on the Victorian Admitted Episodes Dataset 1999-2000 related to hospital admissions for diabetes, asthma, and preventable influenza & pneumococcal pneumonia. The study found a 12-fold variation in admission rates for diabetes complications across Primary Care Partnerships, and similar variations for the other conditions. This study highlighted the potential for using these indicators for targeted public health and health services interventions, in reducing demand on hospital services in Australia. However, differences in admission rates might be due to environmental factors, and variations in disease prevalence and propensity to seek healthcare.

(2.4.5) Appropriate Bed Use

Disproportionate growth in ED presentations has been observed in developed countries, and possible causes such as inappropriate use of ED services and hospital bed use are being debated. For example, a retrospective review of 300 randomly selected discharge summaries of patients admitted only to ED was carried out by 12 GPs (Gribben, 2003). The GPs were asked to estimate the proportion of ED attendances that could have been handled in primary care. Overall results of the study showed that an average of 56% of the cases they reviewed could have been handled in their practices with no extra resources. This study highlighted the inappropriate use of hospital ED.

A study evaluated the appropriateness of 2,980 ED adult medical presentations to Elche Hospital in Spain during 1996-97. In order to estimate the proportion of inappropriate admissions, the Hospital Urgencies Appropriateness Protocol, an instrument based on explicit criteria, was applied (Sempere-Selva, Peiro, Sendra-Pina, Martinez-Espin & Lopez-Aguilera, 2001). The study concluded that approximately 30% of the total presentations were inappropriate and were related to younger age groups. One of the most frequent reasons for inappropriate ED use was the patients' greater trust of the hospital than of primary care. The appropriate evaluation protocol appeared to have some limitations, however. For example, the reviewers who were familiar with the type and range of alternatives to acute hospital care classified patients as inappropriate more often than reviewers who were unfamiliar with available services, reflecting some variability in the classification of patients, even in identical circumstances (Sempere-Selva, et al., 2001).

Acute hospital beds are an expensive and scarce resource for which there remains a continued high demand. The appropriate use of acute hospital beds continued to be investigated. Victor and Khakoo (1994) conducted a study to identify the number of inappropriate admissions and to identify the alternative types of provisions that would have more appropriately met the patients' needs. During the week of study there were 689 inpatient admissions. Overall, five patients were classified as not being appropriate for an acute bed or acute admission. During the 10 week period of follow-up, a total of 111 bed days were accrued by the inappropriate patients, with one patient accounting for 80% of these 'inappropriate' bed days.

A qualitative study was conducted across two campuses of a healthcare service network in Melbourne, to identify factors contributing to increased length of stay for two specific DRGs (Taylor et al., 2001). This study identified a number of factors influencing the length of stay, including; the differences between respiratory physicians and GPs; doctors' work routines; bed occupancy rates; nurses' case load, staffing and morale issues; and patients' co-morbidities, social support and placement issues.

A number of studies have associated decline in the average length of stay (ALOS) of patients to the growing demand for hospitalisations. According to the Ministry of Health (2001b) between 1988/89 and 1999/2000 the hospital ALOS declined from 6.5 days to 3.1 days in NZ.

One of the reasons for the decline in the ALOS was possibly related to the proliferation of same day discharges. According to Howe (2002), same day acute admission discharges increased from 39% in 1993/94 to 49% in 1999/00 in Australian public hospitals, with most of the same day discharges related to younger age groups.

(2.4.6) Avoidable Admissions

New Zealand public hospital inpatient discharge data (1980-1997) was analysed to describe the trends in hospitalisations for medical conditions that could be avoided by adequate primary care (Dharmalingam, Pool, Baxendine & Sceats, 2004). The age-standardised avoidable hospitalisation rates increased from 73 per 10,000 people in 1980–82, to 83 in 1985–87, and to 96 in 1995–97. According to the authors, in 1995–97 about 1 in 10 (10%) hospitalisations were avoidable, as compared to 7% in 1980–82. The study results also pointed out the regional differences in rates of avoidable admissions in NZ, which were possibly related the demographic and socioeconomic characteristics of the regions. The overall increase in avoidable hospitalisations between 1990–92 and 1995–97 was likely to be associated with the radical health reforms introduced in 1991, but which came into effect in 1993 (Dharmalingam, Pool, Baxendine & Sceats, 2004).

Another NZ study investigated the extent of potentially avoidable hospitalisations in the Canterbury District Health Board area and specifically identified the leading causes and trends of avoidable hospitalisations during 2001-2004 (Sheerin, Allen, Henare & Craig, 2006). Based on the avoidable admissions definition of the Ministry of Health, the study

results showed that 31% of the total admissions to Christchurch Hospital were categorised as potentially avoidable hospitalisations during 2003, which was much higher than found by previous studies. Cardiovascular disease was the leading cause of avoidable hospitalisations, with other causes of avoidable admissions being gastrointestinal, respiratory, stroke, and urinary disorders (Sheerin, Allen, Henare & Craig, 2006). The above findings are also supported by an earlier study that examined trends in potentially avoidable admissions from NZ public hospitals for acute medical/surgical discharges for 10 years from 1989-98 (Jackson & Tobias, 2001). According to the authors, 1 in 3 (30%) of all hospital admissions were theoretically avoidable. This study further revealed that people living in the most deprived areas (decile 10) had twice the probability of being hospitalised for an avoidable cause, as people living in the least deprived areas (Jackson & Tobias, 2001).

In the USA, preventable admissions are also a significant issue. There were approximately 5 million preventable hospitalisations during 2004, costing around 26.5 billion dollars (Kruzikas et al., 2004). The authors acknowledged that while some admissions were likely to have been inevitable, many could have been prevented if individuals had received high quality primary and preventable care.

(2.4.7) Readmission Rates

Readmissions are defined by the NZ Ministry of Health, as patients who are readmitted to a hospital within 30 days of discharge. Readmission rates have been used in the literature as a quality indicator for a hospital's inpatient and discharge planning or follow-up care (Blustein, Hanson & Shea, 1998). Capewell (1996) found that readmissions were one of the causes of the increase in medical admissions in Scotland. Some readmissions would have been avoidable if good quality inpatient and follow-up care had been available, and consequently readmission rates are often used as an indicator of hospital performance (Gold, Siegel, Russell & Weinstein, 1996).

A study of 75+ year old patients discharged from hospital emergency departments in Australia (Caplan, Brown, Croker & Doolan, 1998), concluded that 17% of the patients were readmitted to hospital during the 4 weeks subsequent to discharge. The major risk factors identified for readmission were dependence in activities of daily living, lack of finance and transport, and use of a community nurse.

Healthcare providers have used the unplanned readmission rate as a surrogate marker of quality of clinical care in general. According to Tierney and Worth (1995) approximately 15% of the elderly patients had readmissions. Another study supporting the above result, found a 13.2% crude readmission rate among those aged 65+ years in the Department of Healthcare of the Elderly, City Hospital, Nottingham (Pearson, Skelly, Wilman & Masud, 2002). This study compared the views of general practitioners with those of hospital staff, concerning the causes of unplanned readmissions (patients readmitted within 28 days of discharge). Both GPs and hospital staff (senior nurses or doctors) regarded relapse or complication of the original illness, and problem with carers, as the two main causes of readmission into hospital. A significantly higher proportion of GPs, than hospital staff, felt that poor health on discharge, inadequate discharge preparation, and lack of communication contributed to some readmissions (Pearson, Skelly, Wilman & Masud, 2002).

Reed, Pearlman and Buchner (1991) investigated the prevalence of hospital readmissions (in 14 days or less) and the risk factors for readmissions in a matched case control trial in Seattle, USA. The authors analysed a two-year sequential sample of males aged 65+ years old. Three risk factors associated with readmissions were: two or more admissions in the previous year; a change in medication dosage in the 48 hours prior to discharge; and a visiting nurse referral for follow-up. Discharge from the geriatrics evaluation unit acted as a protective factor for readmissions (Reed, Pearlman & Buchner, 1991).

Another case control study investigated the risk factors for early emergency readmissions in elderly (65+ years) medical patients within 28 days of hospital discharge in Hong Kong (Chu & Pei, 1999). Factors such as institutional carer, previous visiting nurse service, adverse drug reaction, chronic obstructive lung disease, chronic renal failure, and impairment in activities of daily living, were all associated with early emergency readmission to an acute care hospital.

A prospective study examined the effect of various patient and disease factors on the risk of emergency admissions to a District General Hospital in Manchester over 4.5 years (including statistical episodes data related to all (n = 20,209) live discharges) (Lyrtzopoulos, Havelly, Gemmell & Cook, 2005). The study found that significant predictors of readmission risk at 12 months were: male sex, age 75+ years, number of co-morbidities, admission via GP

referral, primary diagnosis of heart failure and chronic obstructive pulmonary disease/asthma. A higher level of deprivation was also associated with increased risk of readmissions. In contrast, Adamiak and Karlberg (2004), found in a prospective multi-center study of 7 departments of internal medicine in Stockholm county that patient contact with primary health care appeared to reduce readmissions. Other findings, such as that older age and a number of co-morbidities increased the risk for readmission, support the findings of other studies.

In conclusion, with respect to hospital and health services, there were significant access barriers to primary care for many populations, particularly for disadvantaged groups in NZ. Some of these barriers were related to affordability, while others were related to lack of or inappropriate primary care. According to the NZ literature GP patient referrals to hospitals were a significant part of hospitals' overall admissions. Senior hospital admitting doctors admitted fewer patients compared to their junior counterparts. According to the literature there was a relationship between the availability of hospital beds and admissions. A number of studies showed that a large number of admissions were inappropriate both here in NZ and in other countries, and that therefore a large number of these admissions were avoidable. Increase in readmission rates was related to older age groups, high deprivation, lack of appropriate community care, and inadequate discharge planning etc.

(2.5) Different Models of Care to Manage Growing Demand

Due to the growing demand for acute medical hospital care, there has been a major surge in studies during the 1990s evaluating different models of care and settings compared to the traditional hospital admissions. Literature related to these different models of care and settings are discussed in the following.

(2.5.1) Short Stay Units/ED Observation Wards

Due to the growing number of medical admissions, a number of studies have reported on recent initiatives or interventions applied to divert admissions and to reduce length of stay and facilitate discharge of admitted patients.

Another type of in-hospital intervention commonly practiced by most of the public hospitals in NZ and elsewhere is the creation of short stay units. According to Benipal (1998) Middlemore Hospital, Auckland was the first public hospital in NZ to develop an Assessment and Discharge Unit. This unit was based on three main principles: to reduce delays in patient admission, treatment and discharge; to target resources to meet patient need; and to focus quality of care on patient need. Overall, this unit was involved with patient assessment, and diagnostic, admission, treatment, and discharge planning processes. One of the major achievements of this unit was to be able to discharge 1 in 3 patients within 24 hours of their admission time, although most of the patients discharged from this unit were younger in age with conditions such as asthma, pneumonia, and chest pain.

The NZHTA literature review (1998) on ED observation wards found that observation wards can offer a venue for the appropriate surveillance of patients who require a period of observation to exclude serious disease, and for the early discharge of patients from hospital. There was no consensus on these units' ability to prevent or reduce admissions. However, these units did help in reducing the average LOS by discharging patients earlier than standard hospital wards. Mardis and Brownson (2003) highlighted that decreasing LOS were detrimental to the quality of care delivered to patients. They also questioned whether lower LOS was being achieved to reduce overall hospital costs. Similarly in a study of northeast Ohio hospitals between 1991 and 1997, dramatic reductions in length of stay were experienced (Baker, Einstadter, Husak & Cebul, 2004). Those authors found little evidence

that shorter length of stay was associated with higher mortality after discharge or higher readmission rates. Tokunaga and Imanaka (2002) examined patients' satisfaction related to LOS in 77 hospitals throughout Japan. The authors found no difference in the patient satisfaction in relation to longer or shorter LOS, but did note that Japanese hospitals have a much higher average LOS as compared to all of the other OECD countries (Tokunaga & Imanaka, 2002). Daly, Campbell and Cameron (2003) carried out a systematic review of literature related to short stay and observation units and concluded that these units have the potential to reduce LOS, improve the efficiency of emergency departments, improve cost effectiveness and reduce admissions.

In another study, data related to all ED medical admissions from a Dublin hospital collected during 2002 to 2004 was analysed to determine the impact of reconfiguring a medical ward to function as an acute medical admitting unit (Moloney, Barnett, O'Riordan & Silke, 2006). The reorganised admission process was successful in reducing average length of stay from 7 days in 2002 to 5 days in 2003 and 2004. Further, the median number of patients waiting in the ED for a hospital bed also reduced from 14 in 2002 to 9 in 2003 and 8 in 2004.

(2.5.2) Alternatives Models of Care

Due to the growing demand for hospital care, a number of initiatives have been trialled in the developed countries in the last 10-15 years. For example, Linnala, Aromaa & Matilla (2006) undertook a study assessing how the use of hospitals was affected by general practitioners being given an opportunity to send their patients to private specialists for consultation instead of referring them exclusively to hospital outpatient clinics in Finland over a period of 34 months. This study had an experimental group and two control groups. The overall results of the study showed that both the number of visits to hospital outpatient clinics and the number of bed days declined significantly for patients whose general practitioner had the option of referring their patients to a private specialist for consultation.

According to Howe (2002), there has been a proliferation of post acute care services in Australia to get the older people out of hospitals, such as the Commonwealth Co-ordinated Care Trails, Victoria's sub-acute program and Queensland's continuity of care initiative. Similarly, CMDHB had approximately 20 community and hospital projects being trialled during 2000-02 to influence the number of admissions coming to Middlemore Hospital

(Clarke, Howells, Wellingham & Gribben, 2003). However, as these trials only produced mixed results, they did not receive ongoing funding to sustain them.

(2.5.3) Homecare Integrated Model

The increased pressure on acute care services has encouraged research seeking to evaluate the performance of innovative healthcare delivery models regarding their efficiency, safety, quality of care, provider and patient satisfaction. Nicholson et al (2001) carried out a randomised trial to compare the cost of an integrated home based care model with traditional inpatient hospital care for acute COPD patients in Brisbane, Australia. According to the researchers 25 patients with acute COPD were randomised to either home (n = 13) or hospital (n = 12) management following a request for hospital admission. The acute care at home group costs per admission were significantly lower ($p < 0.01$) than for the hospital group, and both of the groups demonstrated equal levels of satisfaction with their care. Therefore acute care at home could be substituted for usual hospital care for some patients without compromising on quality. This study was based on a relatively small sample size, which limits generaliseability. Another randomised controlled trial supporting the above study findings also compared the cost effectiveness of hospital in the home to hospital admission for acute medical conditions in Sydney (Board, Brennan & Caplan, 2000). The study results showed that patients in the hospital in the home group incurred less than 50% of the costs compared to the hospital inpatient group. The authors found no significant differences in outcomes and user satisfaction was also greater or similar to that of the hospital group.

A multi-center randomized, controlled trial randomly assigned 1396 hospitalized patients with diabetes, chronic obstructive pulmonary disease, or congestive heart failure to receive either usual care or an intensive primary care intervention (Weinberger, Oddone, & Henderson, 1996). The intervention involved close follow-up by a nurse and a primary care physician, beginning before discharge and continuing for the next six months. Overall findings of the study concluded that the intensive primary care intervention increased rather than decreased the rate of re-hospitalisation, although patients in the intervention group were more satisfied with their care.

(2.5.4) Case Management

Case management has been defined as a process of planning, coordinating, managing and reviewing the care of people with severe and complex needs. The main aim of case management is to provide cost effective, efficiently coordinated services to improve the quality of care (Hutt, Rosen & McCauley, 2004). There is no single universally accepted case management model. However, the core elements of case management may be described as: case finding, screening, assessment, care planning, implementation, monitoring, coordination of services and review.

A comprehensive review of the literature on case management models, including randomised controlled trials (RCTs), controlled trials, and pre- and post-intervention studies, was carried out by Hutt, Rosen & McCauley (2004). Except for one study, all other 18 studies reported hospital admissions as an outcome. Two RCTs and a controlled trial found a significant difference in the control and the intervention groups' hospital utilisation, and another four studies showed reductions in hospital admissions of case management patients. The remaining research studies were more equivocal.

Eight of the RCT studies reported ED presentation as an outcome (Hutt, Rosen & McCauley, 2004). However there was only one study that showed a statistically significant reduction in ED visits with case management intervention. Six studies reported no statistically significant difference between the control and intervention groups.

Similarly, a number of case management trials were trialled in the community in conjunction with GP and hospital services to reduce the number of admissions coming to Middlemore Hospital (Clarke, Howells, Wellingham, & Gribben, 2003; Gribben, 2001a, b, c, d & e). According to the evaluation of these projects, there was only one trial, related to congestive heart failure, which was successful in reducing the number of admissions to hospital.

(2.5.5) Use of Community Hospitals

In response to the increasing number of emergency admissions in England, the National Health Service has attempted to promote use of intermediate care, which includes the use of community hospitals. Intermediate care is described in the National Service Framework for

Older people as services that improve recovery and rehabilitation, increase independent living and reduce acute hospital admissions (Department of Health, 2001). Usually these community hospitals are medically supported by GPs as opposed to hospital consultant teams, have less access to intensive therapy and investigations, and have variable input from nurses and allied health professions. Another similar study compared patient-based outcomes at six months following emergency admission to a District General Hospital (DGH) or Community Hospital (CH) by using a prospective cohort study design (Round et al, 2004). Study participants were people aged 70+ years with an acute illness requiring hospital admission, but whose condition could have been treated in either hospital setting. There were no differences in outcome between settings, with a small increase in quality of life scores at 6 months in both cohorts. Mortality and place of residence at 6 months were similar in the two groups. The number of investigations and of prescribed medications during the hospital stay was significantly higher in the DGH (Round et al, 2004). This study highlights that community hospitals could be used as alternative to general hospital care for a wide range of unplanned admissions for a specific population.

However an audit of direct admissions to newly developed CHs was carried out over the two year period 1997-1999 by Young and Sharan (2003). This audit involved the review of the CH multi-disciplinary records of all patients admitted directly from home to the CH, to determine whether the set standards were being met. The audit results indicated that 33% of the patients did not have primary assessment done by the admitting GP. Approximately 69% of the patients were not seen by a hospital practitioner within three hours of admission time. According to Young and Sharan (2003) this delay was largely related to the ambulance service bringing patients to hospital late in the afternoon, while the hospital practitioner visited the hospital earlier in the day. The assessments by relevant consultants within 12 and 24 hours of admission were not achieved for 23% and 18% of patients respectively. The authors further found that 10% of the patients had greater severity of disease than suggested by the referring GP, and therefore required admission to a District General Hospital. Critical issues which require improvement related to patient medical management and quality of care have been highlighted by this audit.

(2.5.6) Innovation in After Hours Care

There are strong indications that after hours primary care in some of the developed countries was of poor quality or that there was not enough of it. As a result, primary after hours care in most of the European countries has continued to move away from individual and group practices with local after hour call schedules, towards large scale after hour care services (Grol, Glesen & van Uden, 2006). According to the authors, based on the experiences in the UK, the Netherlands and Denmark with primary care cooperatives, this model can reduce physicians' workloads, reduce the number of face to face contacts, reduce use of emergency services and hospital admissions, and lower costs. In all three countries, these cooperatives provide telephone triage and advice, face to face contact at walk-in centers, and house calls (Hansen & Munck, 1998; Munro, Sampson & Nicholl, 2005; Grol, Glesen & van Uden, 2006). On the other hand, there were some differences in the composition and pattern of service delivery of these cooperatives within their countries and between the countries.

Another model of primary out-of-hours care trialled was the telephone triage and advice services provided by nurses. A randomised controlled trial was carried out by Lattimer et al. (1998), to compare nurses providing medical advice in the primary cooperative care environment versus traditional receptionist services. According to the study findings, nurses were able to handle about 50% of the calls without referring to a physician, which resulted in a significant decline in calls to doctors. Findings further showed a decline in walk-in consultation (38%) and house calls (23%). However this service did not reduce emergency admissions to hospitals (Lattimer et al., 1998).

A randomised controlled trial related to hospital in the home (HITH) was carried out at the Prince of Wales Hospital, Sydney, during 1995-1997 of patients with acute medical conditions admitted through the ED (Board, Brennan & Caplan, 2000). The main aim of this trial was to test the cost effectiveness of HITH in comparison to the usual hospital admission. The HITH group costs per admission (\$1,764) were significantly lower than the hospital admission control group (\$3,614) with no significant difference in clinical outcomes, and with comparable or better patient satisfaction.

In Scotland, an emerging integrated care model is the Local Health Care Cooperatives (LHCCs) as part of the internal structure of Primary Care Trusts (World Health Organization,

2002; Woods, 2001). They were intended to be local integrating organisations, bringing together primary and community health services with a range of specialist services. Participation in LHCCs by general practitioners is voluntary, but after only 2 years, the majority of medical practices in Scotland are involved. According to Woods (2001) the key feature of this model is that it attempts to promote horizontal integration of primary care and related services, while having vertical integration with secondary services through 'intermediate care' and 'managed clinical networks'. This model has the following hierarchy of care: Community Health and Well Being, Self-care, NHS 24 (24 hours confidential telephone advice), Extended Primary Care, Intermediate Care, Secondary Care, and Tertiary Care (Woods, 2001).

It is concluded from the above literature, that a number of different models of care have been trialled in developed countries. Some of these models, such as short stay units, were developed to more efficiently provide hospital services from acute care hospitals. While other alternative models, such as the home care integrated model, case management and the community hospital model, provided alternatives to hospital admissions. Both case management and community hospital models appear to have produced mixed results. The integrated home care model was a cost effective model of care, delivering a similar quality of care to traditional models of inpatient care. After hours primary care models were also effective in meeting the primary care needs of a population, through the use of face-to-face consultations and of telephone advisory services. These strategies were also helpful in preventing emergency presentations to hospitals.

(2.6) Chapter Conclusions

Overall, it is concluded from the above literature review that there has been a significant rise in adult medical admissions both in NZ and other developed countries since the 1980s. Most of the national and international literature related to admission trends reviewed, was found to have been published post 1995. The NZ research has principally focused on the macro-analysis of health data from the health policy and funding points of view. To-date, the NZ literature on hospital medical admission trends, has only explored whether medical admissions have been increasing, and then largely related this to socioeconomic and ethnic inequalities.

As discussed, the international research has also identified growing admissions as a major issue in the developed countries. An attempt has been made to understand the reasons for the growing demand for hospital care, and this has highlighted issues such as population and patient related factors and hospital and health service related factors, including the appropriateness of primary healthcare in the community. Ageing of the population coupled with the growing burden of chronic disease was one of the key factors leading to increased hospitalisations in most of the developed countries. As a result, some international studies have endeavoured to demonstrate how interventions, especially in health services and models of care, can reduce avoidable acute medical admissions. Some such new models of care have been trialled with some success in most of the developed countries.

Overall, the literature reviewed has only explained the admissions growth phenomenon in part. No published literature has been found micro-analysing hospital admission data, to identify trends and understand causes of admissions. This highlights a major gap both in international and particularly in NZ literature and research. The present study attempts to fill the identified gap in the literature and to enhance the understanding and knowledge related to acute adult medical admissions.

Chapter 3

Research Methodology

(3.1) Aim and Objectives

The literature review highlighted that while it is known that increasing acute medical admissions are putting pressure on hospitals, the reasons for this are not well understood. The purpose of this study was to explore the trends, nature and causes of the rise in adult medical admissions. The study was conducted in two phases. Phase 1 focused on the retrospective analysis of the hospital inpatient medical data (1997-2004) of Middlemore and Auckland Hospitals, and identified trends in medical admissions (MAs). To further explore and attempt to explain the identified admission trends, phase 2 of the study involved reporting on those identified admission trends to a number of key informants, who were invited to comment on these results. This was done to examine the views and practice of health professionals (physicians, nurse specialists, and hospital managers) involved in providing healthcare services to the study population. The study objectives for phases 1 and 2 follow:

Objectives: Phase 1

1. To describe trends in adult hospital medical admissions in the Auckland Metropolitan City area (Middlemore and Auckland Public Hospitals) over the 8 year period 1997 to 2004.
2. To identify and evaluate those specific medical conditions, categorized according to the Diagnostic Related Groups (DRGs), contributing to the rise in medical admissions (MAs) in Auckland City.
3. To explain which ethnic and age groups may be significantly contributing to the rise in MAs in Auckland City.
4. To explore the relationship between socioeconomic status and admission trends.
5. To evaluate and analyse the process/es of patient referral and admission to hospitals in relation to the rise in MAs.

Objectives: Phase 2

1. To identify initiatives in hospitals and the primary health sector intended to reduce hospital medical admissions and to improve management of chronically ill patients out of hospital.
2. To describe the views of hospital physicians, managers and nurse specialists on the impact of those initiatives on medical admissions, with respect to issues such as admission trends and quality of care.
3. To explore the views of hospital physicians, managers and nurse specialists on the reasons for medical admissions outside the control of the DHBs, that are not amenable to such initiatives, e.g. consumer expectations, ageing population, cultural practices, national health policy and funding streams.

The following section describes the research design, sample selection, data analysis and research approval processes undertaken to complete each phase of the study.

(3.2) Research Methodology and Research Design

Methodology may be defined as a framework associated with a particular set of paradigmatic assumptions used to conduct research (O’Leary, 2004), while a research design is defined as a structure or plan of a research project to solve a particular problem (Davis & Cosenza, 1997). Casebeer and Verhoef (1997) stress that a selected research methodology must be responsive to a particular research problem or question, and for this reason a combined or mixed research methodology was selected as appropriate to answer the research questions. Reflecting mixed methodology, a quantitative research design was used to analyse the hospital inpatient data (phase 1) to describe the trends in MAs, and a qualitative research design was applied (phase 2) to further explore and explain the identified trends from the key informants’ (health professionals’) points of view.

Denzin and Lincoln (2000) suggest using a combined or mixed research methodology within one study for the purposes of reaching a deeper understanding of the phenomenon being researched. The main reason for choosing the mixed research methodology for this project, was due to the complex nature of the topic, as it allowed the researcher to analyse both quantitative (hospital admission data) and qualitative (health professional interview data) forms of data, to gain a fuller understanding of the issues under investigation. According to Polit, Beck and Hungler (2001), when a researcher's hypothesis or model is supported by multiple or complementary types of data, the researcher can be more confident about the validity of the results. Sometimes, qualitative research can also complement quantitative work by exploring complex phenomena or areas of the phenomenon not amenable to quantitative work or vice versa (Mays & Pope, 1996). The decision to complement results of quantitative data by qualitative interviewing was indeed because while quantitative data would describe trends and patient characteristics, perspectives of key informants on those trends would further explore the complexity of the phenomenon.

(3.3) Study Design: Phase 1

As discussed, this study was carried out in two phases. In this section the issues related to phase 1 of the research design are discussed. The first part of this section describes how the sample and data were selected, and how the data was subsequently collected. The second part illustrates the specific procedures followed to screen and code the data. And finally, tools or statistical methods used to analyse the data, to draw some meaningful conclusions, have also been discussed.

(3.3.1) Sample Selection

Selection of Institutions

As discussed in Chapter 1, two large public hospitals, the Auckland District Health Board's (ADHB's) Auckland Public Hospital (Auckland City Hospital from 2003) and Counties-Manukau District Health Board's (CMDHB's) Middlemore Hospital, were selected for the study. Greenlane Hospital, which also belonged to the ADHB, was excluded from the study as it did not accept acute (unplanned) admissions. These two District Health Boards (DHBs) were expected to provide a sufficient and diverse range of populations living in their areas, as shown in Table 3.1.

Ethnic Group	ADHB			CMDHB		
	1996	2001	2006	1996	2001	2006
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Maori	31,629 (9.2)	29,142 (7.8)	29,847 (7.2)	59,466 (17.4)	61,398 (15.5)	67,245 (14.6)
European	203,703 (58.9)	228,561 (60.8)	207,951 (49.8)	180,768 (52.9)	208,272 (52.7)	193,446 (42.1)
Pacific Isl.	41,586 (12.0)	47,616 (12.7)	50,166 (12.0)	54,884 (16.1)	76,893 (19.5)	92,982 (20.3)
Asian	43,296 (12.5)	64,908 (17.2)	93,522 (22.4)	27,057 (7.9)	45,192 (11.4)	73,053 (15.9)
Others	25,551 (7.4)	5,475 (1.5)	35,862 (8.6)	19,464 (5.7)	3,474 (0.9)	32,391 (7.1)
Total Population (%)	345,765 (100.0)	375,702 (100.0)	417,334 (100.0)	341,639 (100.0)	395,229 (100.0)	459,117 (100.0)

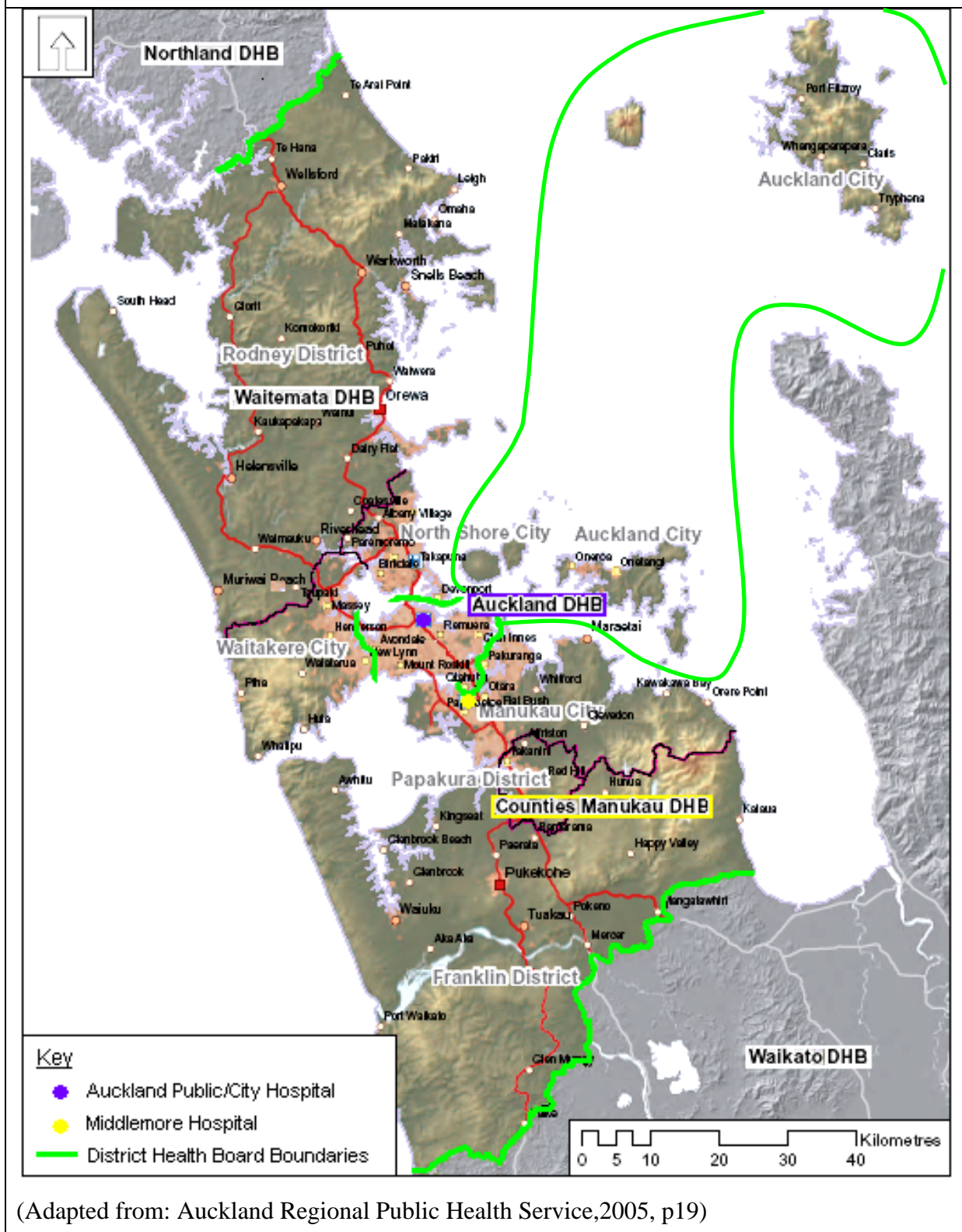
(Ministry of Health, 2000b; Statistics New Zealand, 2002 & 2006)

Thus both APH and MMH provide health services to very diverse populations, but MMH has a much higher proportion of Maori and Pacific Islander people. The regional populations for both DHBs have grown rapidly (20.7% and 34.4% for ADHB and CMDHB respectively between 1996 and 2006). According to the 2001 census, the Auckland Metropolitan City population was increasing at a faster rate than populations in other parts of the country, with the ADHB population increasing by 9%, and CMDHB's by 15% between the 1996 and 2001 censuses (Hill, Walker & Lane, 2001). Some of the apparent decline in the proportion of the European population was associated with many people choosing 'New Zealander' as an ethnicity in 2006. Increases in the population of Asian and other ethnic groups have resulted in the proportions of the European and Maori ethnic groups declining.

Approximately 34% of the MMH region's population live in areas classified as among the most deprived in New Zealand. There was a difference of 8 years in life expectancy at birth between men living in Howick (low deprivation) and men living in Otara (high deprivation) within the district. Similar differences exist for women (Jackson, Palmer, Lindsay & Peace, 2001). According to the authors CMDHB also has relatively high medical admission rates, despite having a younger population than other parts of New Zealand.

Both of these hospitals are located in the greater Auckland region approximately 15 kilometres apart as shown in the map of Figure 3.1. MMH of Counties Manukau DHB shares a territory boundary with APH of Auckland DHB. In addition MMH shares a boundary with the Waikato DHB, and APH with Waitemata DHB. The regional boundaries between the three DHBs serving Greater Auckland (the Counties Manukau, Auckland and Waitemata DHBs), have remained the same as they were under the Crown Health Enterprise structures implemented during the major health system reforms of the 1990s (Scott, 2004; Ashton, 2001). APH and MMH are NZ's largest hospitals. They differ in that APH serves a mainly urban population, while MMH's with its much larger catchment area, serves both a rural population as well as the urban population of south and east Auckland.

Figure 3.1: Map of the District Health Boards (DHBs) in the Auckland Region



(Adapted from: Auckland Regional Public Health Service, 2005, p19)

By choosing these hospitals for the study, there was also an opportunity of measuring the impact on admission trends of some major developments that were taking place during the study time at these hospitals and in the region. For example, both hospitals have moved into

new buildings or have redesigned their hospital building to better meet their organizational objectives and population health needs of their hospital regions, and APH has reduced the total number of beds by 5-8%. Another development in the greater Auckland region was the opening of the Waitakere Hospital of the Waitamata District Health Board in West Auckland from 2003. Prior to this a significant proportion of West Aucklanders had been using APH for acute care due to its closer geographical proximity than the North Shore Hospital assigned for their region. This change would have had a direct impact on demand on APH (refer 4.3).

During the study period, there has also been a philosophical shift away from profit making and competition to collaboration between health providers, as discussed in 2.2. A new public health system structural changes such as the establishment of 21 DHBs, replaced the Hospital and Health Services in 2001. These DHBs are largely responsible for meeting the health care needs of their region's population. Under the guidance of the New Zealand Primary Healthcare Strategy, the primary health organisations (PHOs) have also been established during 2000-2004, to better meet the health needs of the population. All of the above changes will have influenced medical hospital admissions.

Data Selection

The target population of this study were the adult patients admitted to the general medical specialty and its sub-specialties during the study period (1997-2004). During this period the NZ government had made some significant changes to health policy and healthcare funding, and had introduced new infrastructure initiatives to better meet the growing healthcare needs of the population. The main reason for choosing 1997 as the beginning year for the data collection time period was that electronic inpatient hospital data were only available from 1997, as NZ public hospitals only commenced comprehensive electronic data collection in 1996-1997. Another reason for choosing this study period was related to the recommendations of administrators at both hospitals, who stated that good quality of data was only available from 1997 onwards. For example data related to adult medical patients discharged from the former Auckland Public Hospital were only available from July 1997 to December 2002 and from 2003 for the new Auckland City Hospital. Middlemore Hospital data were readily available from the beginning of 1997 to 2004. These data were extracted by the Casemix section or Clinical Decision Support services of the hospital.

The hospital admission data retrieved was based on reported adult medical discharges. Therefore the term 'admission' used in this study is based on patients who were admitted and then discharged from the hospitals in the study.

Inclusion Criteria

As the focus of this study was adult medical inpatient admissions, data related to patients 15+ years of age discharged from the hospitals under study, and related to the following specialities and sub-specialities were included:

- General Medicine
- Infectious Diseases
- Cardiology
- Dermatology
- Haematology
- Medical Oncology
- Radiation Oncology
- Renal medicine
- Rheumatology
- Clinical Immunology

Exclusion Criteria

Data related to the following specialities and sub-specialities were excluded:

- Department of Critical Care
- Emergency Medicine
- General Surgery
- Orthopaedics
- Vascular Surgery
- Neurosurgery
- Oral Health
- Ophthalmology
- Liver Transplants
- Older Persons Health or A+ Links
- Urology
- Women and child Health

- Mental Health Services.
- Data related to patients under the age of 15 was also excluded.

(3.3.2) Data Collection: Phase 1

In order to achieve the research objectives of phase 1 of the study, a list of data requirements was prepared based on a literature review and in consultation with the data administrators of the hospitals under study. The following information related to adult medical inpatients admitted to the hospitals under study was collected:

- Patient National Health Index (NHI) number,
- Fiscal year,
- Admission type, date, month, year and time,
- Admission source,
- Triage codes given by the emergency department of the hospital,
- Referral source,
- Discharge type, date, month, year and time
- Discharge department or last clinical business unit,
- Discharge disposition,
- Discharge ward,
- Length of stay in hours and days,
- Primary Diagnostic Related Groups (DRGs), and
- Demographic data including age, gender, domicile, and ethnicity

Ethnicity as self-identified, is required to be reported when registering a patient on the National Health Index (New Zealand Health Information Service, 1999), and when completing admission documentation to a hospital at the start of each health event. The patients are allowed to choose up to three ethnic group codes, however the data extracted from the hospitals for this study had only the first ethnic group recorded for each of the patients.

(3.3.3) Pilot: Phase 1

Prior to data collection, a small pilot study was conducted to validate methods of analysis and identify any issues related to the appropriateness and quality of the data. Therefore hospital

adult medical admission data were collected for a period of one month from both of the hospitals. Then the data were analysed using the SPSS software to evaluate whether it would answer the proposed objectives in phase 1 of the project. No significant issues relating to the quality, reliability and appropriateness of the data were found and therefore the pilot data has been included in the study.

(3.3.4) Data Screening and Coding: Phase 1

The data was collected from the two different hospitals. Although both of the hospitals had very similar discharge data related to medical inpatients, there were still some differences in the coding of the two data sets. Therefore a criterion was established to sift through, manually match and code the data to prepare it for analysis.

Data Screening:

The discharge data provided by the ADHB was in Microsoft Excel file format, whereas the data provided by the CMDHB was in Microsoft Access format. It was decided to transfer the CMDHB data to Excel files for coding and cleaning purposes. It was then possible to code both of the databases in an identical manner.

Data provided by the CMDHB had only a few hundred discharges that did not meet the study sample selection criterion. Most of these cases were for patients under 15 years of age, and some for cases that belonged to other specialities such as general surgery, orthopaedics and women's health. Most of these cases had been miscoded and as a result they remained among the medicine patient data; all of these cases were excluded from the study.

The ADHB data required a significant amount of sifting and sorting through, as it included information related to inpatients discharged from all of the other specialities at the hospital, such as general surgery, liver transplants, urology, ophthalmology, orthopaedics and older person's health services. In order to successfully select the data related to patients discharged from the general medicine specialty and its sub-specialities, a specific set of criteria was established, which included looking at the last clinical business unit + discharge ward + DRG for each case. The criteria allowed the researcher to review each patient's last discharge specialty, the specific ward the patient was discharged from and the information on primary diagnosis. The cases that did not belong to general medicine and/or its sub-specialities were manually reviewed based on the criteria discussed above. For example, patients whose last

clinical business unit stated 'general medicine', 'cardiology', 'renal medicine', 'rheumatology', 'haematology', etc were retained in the study, while the discharges showing the last clinical business unit as 'general surgery', 'orthopaedics', 'neurosurgery' and 'ophthalmology' were removed from the database. A clinical business unit (clinical specialty) signifies the primary specialty a patient is admitted under. The medical patients admitted to non-medical wards as outliers tend to retain their general medicine specialty or the sub-specialties of general medicine. Therefore patients with the general medicine specialty and its sub-specialties have been included in the data for both hospitals. Despite having established the criteria, there were a small number of cases where the researcher was unable to make a decision whether to include or exclude the case from the study. In such cases, clinicians working in the general medicine specialty of the hospital were consulted as to whether to include or exclude the data from the study.

Data Coding

Once the data selection was completed, the process to match databases was carried out. The data related to primary diagnosis collected by the hospitals prior to July 2000 was coded using a different version of coding software than that collected from July 2000 onwards, (data from January 1997 to June 2000, was based on ICD-9AM coding and data collected during July 2000 to December 2004 was based on the ICD-10AM version). In order to code the data for analysis purposes, both of the data versions were matched manually as closely as possible. Most of the ICD-9AM and ICD-10AM data matched directly without requiring any changes. However, there were some differences between these two versions of the DRGs. In order to match these categories, some ICD-9AM codes were converted to match the corresponding ICD-10AM ones. None of these changes were expected to have an influence on the overall results of the study.

After the data selection and DRG matching had been completed, the data had to be coded or categorised for quantitative analysis. The SPSS (version 13) software package was used to analyse the data quantitatively (SPSS Inc., 2004). This required the data to be coded and categorised numerically. Therefore all of the hospital discharge data collected on different aspects was coded manually. For example, the type of admission coded in the Excel file as 'acute admission' was coded = 10; source of referral 'self-referral' was coded = 4; gender was coded as male = 1, female =2 etc. Similarly all other categories of the data were coded.

After matching the two ICD-9AM and ICD-10AM versions, all of the DRGs were categorised into major diagnostic categories (MDCs) numbered from 0 to 25, which cover all possible principal diagnoses. The diagnoses in each category correspond to a single body system or aetiology, broadly reflecting the speciality providing the care (Wikimedia Foundation, 2006). This was done to be able to identify the top five major diagnostic categories (MDCs) contributing the largest number of admissions. DRGs are a classification system established to assist categorising cases and assessing their costs. Each DRG includes a series of similar diagnoses and/or procedures, but is limited to those with similar resource needs (Raymont, 2003). After identifying the top five MDCs, the leading DRGs of each MDC were sorted in numerical or alphabetical order and then each of the DRG's disorders or conditions were coded into separate categories for SPSS analysis.

The results of the NZ Census 2001, relating socioeconomic deprivation levels with census area unit number and name were extracted from the Statistics NZ website (Ministry of Health, 2005b). After matching the census area unit number and name against each patient's hospital discharge domicile number and area name, the relevant NZDep2001 score could be entered against each of the patient's data entries. The patient domicile number and area names provided in the hospital data were identical to the Census area unit number and area name. The main purpose of this exercise was to enable the researcher to analyse the relationship between hospital admission pattern and level of socioeconomic deprivation. According to Salmond and Crampton (2002), the NZ Deprivation index combined nine variables from the 2001 census, reflecting eight dimensions of deprivation. These dimensions were related to level of income, employment, access to telephone and a car, qualifications, single parent family, owned home and living space.

DHB population estimates data for 1997-2004 were obtained from the New Zealand Health Information Service (2005), and have been used to analyse the hospital admission data in relation to population trends (Appendix 4). This data only provided statistics on the major ethnic groups such as Maori, Pacific Islander and European/Other (which included all other ethnic groups residing in the respective DHB areas), limiting the analysis to these three groupings.

(3.3.5) Data Analysis: Phase 1

Once the data coding process had been completed, a descriptive analysis of the quantitative data was carried out to understand major themes related to admission pattern and trends. Descriptive statistics are considered useful for summarising the data (Polit, Beck & Hungler, 2001). Electronic software programmes such as Microsoft Excel and Access (Microsoft Inc., 2003) and SPSS (version 13) were used to analyse the quantitative data (SPSS Inc., 2004). The descriptive analysis included procedures such as looking at percentages, means, medians, modes, standard deviations, contingency tables, histograms, graphs and the correlation between variables. The resulting statistics were compared and contrasted to identify: admission trends for each month and year; major diagnostic categories and specific DRG categories contributing to the admissions; differences in admission rates between different age and ethnic groups; and to determine the relationship between socioeconomic deprivation status and admission rates for different ethnic groups; and so on. This exercise was also helpful in identifying further advanced statistical procedures to be carried out.

The statistical methods applied to further analyse the hospital data are described in the following section. Due to the nature of the inpatient data, and in consultation with the biostatistician, it was decided to use vital statistics, which includes crude rates, age-specific rates, and age-standardised rates (ASRs) to measure and compare the admission trends within and between the hospitals, ethnic groups, morbidity and deprivation. To further evaluate the significance of results, 95% confidence intervals were also calculated. Other descriptive statistics such as mean, median and ratios were also calculated to further describe and explain the study findings. The selection of these specific mathematical tests was also influenced by the health management focus of this study, rather than an epidemiological or biological focus. How the rates related to vital statistics were calculated is discussed below.

Data on the resident population of each of the DHBs was required to carry out the above statistical tests. Therefore, New Zealand Health Information Service (2005) provided data related to estimates and projections for usually resident populations of the DHBs under study for 1997 to 2004. The data provided included information on different ages, sex, and Maori, Pacific Islander and European/Other ethnic groups.

Crude rate of admissions is a summary measure calculated by dividing the total number of AMAs to hospital in a given year by the total number of individuals in that population and further multiplied by 1000 to convert the rate to per 1000 population (Hennekens, Buring & Mayrent, 1987).

$$\text{Crude Rate (per 1000 population)} = \frac{\text{Total Number of Episodes}}{\text{Total Adult Population}} \times 1000$$

The crude rates are calculated for an entire large group or population and do not take other factors such as age and gender into account. Therefore crude rates cannot for example be used to compare disease trends among two different population groups who may have different age, sex or ethnicity structures (Le, 2003). Crude rates as measures of morbidity can be used for population description.

In contrast *age-specific rate* refers to the number of admissions occurring among individuals in each specified age group category divided by the total number of people in that stratum (Hennekens, Buring & Mayrent, 1987). For example, these rates have been used in this study to compare admission rates between older and younger age groups.

$$\text{Age-Specific Rate (per 1000 population)} = \frac{\text{65-74 Age Group Total Admissions}}{\text{65-74 Age Group Total Population}} \times 1000$$

The age-specific rate is considered more accurate than the crude rate when comparing two populations or groups (Le, 2003), however it requires the calculation of a rate for each of the different age groups (e.g. 15-24, 25-34, 35-44 and so on). Therefore it is much better to have a single summary rate for each population, which takes into account any differences in the population structure. This is achieved by the *age-standardised rate* (Hennekens, Buring & Mayrent, 1987). According to Le (2003) standardisation removes the difference in composition, with respect to a confounder such as age structure, on the summary rate. Age-standardised rates (ASRs) enable comparisons to be made between populations, which may have different age structures.

All results presented by hospital, ethnicity and deprivation level in the body of this thesis use the direct age-standardised rates methodology. These rates were standardised to the ADHB plus the CMDHB total adult (15+ years) population estimates data for the year 2004 (New Zealand Health Information Service, 2005) (Appendix 5). This standard population is closely matched to the population of the hospitals (or DHBs) in the study, and facilitated discussion on comparisons with the existing research carried out in NZ. The overall direct age-standardised admission rates for the hospitals, ethnic groups and deprivation groupings were calculated as follows:

1. Age-specific rates were calculated for each 10 year age group.
2. The expected number of cases in each 1 year age group was calculated by multiplying the age-specific rates by the corresponding standard population and then dividing by 1000 to calculate the expected number of cases.
3. The expected number of cases in each age group were added together, then divided by the total standard population, and finally multiplied by 1000 to obtain age-standardised rates (ASRs) per 1000 population (Bland, 2000).

Calculation of age-specific admission rates/1000 in area A

Year	1998	1999	2000	2001	2002	2003	2004
Admissions by Age Group 15-24	756	800	870	704	715	828	787
Population by Age Group 15-24	58,066	58,254	58,827	62,320	63,504	65,910	67,860
Age-specific Rate/1000	13.02	13.73	14.79	11.30	11.26	12.56	11.60

Calculation of expected number of admissions in Standard Population

Year	1998	1999	2000	2001	2002	2003	2004	Standard Population by Age Group 15-24
Expected No. of admissions	1768.92	1865.82	2009.32	1534.80	1529.71	1706.81	1575.68	135,865

Calculation of age-standardised rates/1000

Year	1998	1999	2000	2001	2002	2003	2004	Sum Standard Population 15-85+ Age Groups
Sum Expected Admissions 15-85+ Age Groups	26,542	29,315	30,023	28,898	29,506	30,214	30,533	
Age-standardised Rate/1000 (ASR)	39.82	43.98	45.04	43.35	44.26	45.32	45.80	666,629

Ninety-five percent confidence intervals are presented for age-standardised rates, in the text or summary tables in the body of this thesis. The confidence intervals indicate the possible

variations that may exist in such estimates purely by chance. When a difference between population sub-groups is referred to as significant, it means the difference is statistically significant at the 95 percent confidence level with no overlap in confidence intervals.

95% confidence intervals (CIs) for the ASRs were calculated using the methods presented in Le (2003), as set out below. For example the 95% CI for a calculated ASR value would be:

$$\text{ASR 95\% Confidence Interval} = \text{ASR} \pm \frac{1.96 \times \text{ASR}}{\sqrt{(\text{Sample Population})}}$$

Calculation of ASR 95% Confidence Interval (95% CI)

Year	1998	1999	2000	2001	2002	2003	2004
Age-standardised Rate/1000 (ASR)	39.82	43.98	45.04	43.35	44.26	45.32	45.80
Sample Population	278,549	283,629	289,230	294,725	301,922	312,557	321,637
$\frac{1.96 \times \text{ASR}}{\sqrt{\text{Sample Population}}}$	0.1479	0.1618	0.1641	0.1565	0.1579	0.1589	0.1583
Lower Limit of ASR 95% CI	39.67	43.81	44.87	43.19	44.10	45.16	45.64
Upper Limit of ASR 95% CI	39.96	44.14	45.20	43.51	44.42	45.48	45.96

Due to the complete data set of the study years having been used for the analysis, and to the large sample sizes, further statistical analyses were not warranted.

(3.4) Study Design: Phase 2

Phase 2 of the study was based on a qualitative research design. As discussed, the main aim of phase 2 of the project was to further explore and describe the trends in adult medical admissions identified in phase 1. The first part of this section describes the processes and criteria followed to recruit study participants. The second part of this section focuses on the sampling procedures and data collection. The third part of this section illustrates the qualitative procedures applied to analyse the interview data and to draw out some commonly occurring themes and sub-themes.

(3.4.1) Selection of Participants: Phase 2

Prior to the selection of participants, the preliminary results of phase 1 of the study were reported through presentations to the key stakeholders of both hospitals. The aim of these presentations was to share the findings of phase 1 of the study and also to encourage the involvement and participation of interested groups of health professionals in phase 2 of the study. The presentations generated a high degree of interest from the physicians, managers, nurse specialists, and researchers of both hospitals. They also made suggestions as to how these identified trends could be explored and described further. Most of these professionals made themselves available to offer their opinions and thoughts on the identified trends, due to their direct or indirect role in the management of the patient population. Another reason for choosing these health professionals for phase 2 of the study was their access to information that is not available to other groups of the population.

Approximately 16 health professionals (hospital physicians, nurse specialists, case managers, and managers) were recruited using a purposive sampling technique. According to Mays and Pope (1996), this sampling approach allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of information. The participant selection criteria were based on the health professional's personal involvement in the clinical or service management of adult medical patients, interest in the topic, and ability to identify and explain factors associated to medical admission trends. Eight participants were selected from each of the hospitals under study. The main reason for choosing this sampling technique was the researcher's theoretical reasons for undertaking the phase 2 of the study. According to Ritchie (2001), in qualitative research

the purpose for carrying out the study often suggests the appropriate sample selection. Therefore the following inclusion and exclusion criteria were applied to recruit participants:

Inclusion Criteria

Health professionals (physicians, nurse specialists and health service managers) who have directly or indirectly been involved in providing health care services to adult medical patients in the Auckland and Counties-Manukau District Health Board areas, in hospitals or the community.

Exclusion Criteria

Interested persons who were not involved in healthcare service provision, such as academics and researchers, or health professionals not employed in DHBs, were excluded.

Sampling Procedure

Potential participants were identified based on the above inclusion criteria by the researcher using a purposive sampling technique. Some of these participants were known to the researcher professionally. Others were recruited using the professional networks and there were some participants who personally made offers of participation to the researcher during the phase 1 result presentations. These identified participants (n = 16) were sent a copy of the information sheet inviting them to participate in an individual or a focus group interview, depending on the individual's personal preference (Appendix 2). Individual interviews are best suited to gather data on opinions and perceptions that are otherwise hidden in people's minds. And focus groups are also considered valuable for exploring correlations identified by quantitative work (O'Brien, 1993). Focus groups may also evoke greater spontaneity and frankness from participants, can be emotionally challenging, and generate data that are normally withheld or are left intact by other research methods (Kitzinger, 1994; Berglund, 2001).

Attached to this project information sheet and invitation to participate were the key findings derived from the analysis of the hospital medical inpatient data collected during phase 1 of the study. The reason for sending them the summary results of phase 1 was to highlight their role as participants in the study. A follow-up call was made to each of the recipients 7 days after the mail-out to enquire whether s/he was interested in being a participant in the study. All participants, who received the invitation, agreed to take part in the study, and none of the

invited participants declined the invitation. In fact, the researcher was contacted by some potential participants expressing their disappointment at not being asked to take part in the study. All of the participants were interviewed either in their own office or a meeting room chosen by them in their own organisation. In reality, it was the participants who organised the interview schedule rather than the researcher. All of the participants discussed the issues related to the study freely and openly.

(3.4.2) Data Collection: Phase 2

The participants who agreed to take part in the study were interviewed and their responses were audio taped. A semi-structured interview format supported by some core open-ended questions was adopted due to the nature of the study for both individual and focus group interviews. According to Denzin and Lincoln (2000) the interview as a means of data gathering has become a universal mode of systematic inquiry. Both qualitative and quantitative researchers tend to employ the interview as a basic method of data gathering.

There was a group of physicians (3), who wanted to be interviewed in a focus group environment, while the rest of the participants chose to have individual interviews with the researcher. All of the interviews were carried out at the workplace of the participants and were recorded using a digital audio recorder. None of the interviewees objected to having their interviews recorded. Most of the interviews were 30-45 minutes long and there were 4 interviews that went up to an hour.

(3.4.3) Data Analysis: Phase 2

In order to analyse the data collected from the individual and focus group interviews, the recorded interviews were transcribed. Transcripts provided a complete record of the interviews, which facilitated the content analysis of the discussions. The main aim of this analysis was to identify trends and patterns or themes that appeared in individual interviews, or reappeared among various interviews. Kreuger (1988) suggested that content analysis begins with a comparison of the words used in the answer (p.109). Also, the researcher must consider the emphasis or intensity of the respondents' comments. Therefore, during the transcribing process, specific attention was paid to 'how' the words or sentences had been expressed by the interviewees. Finally, all of the identified themes and sub-themes were

grouped separately in relation to Auckland and Middlemore Hospitals, and discussed in relation to the quantitative findings of phase 1 of the project.

Data Validation

In order to make sure that the information provided by the participants was transcribed (interpreted) accurately, the information had to be validated by the participants. As a result, participants were sent a copy of their interview transcript by mail for review. Appropriate changes were made to individual and group transcripts as required.

(3.5) Ethical Issues

Phase 1 of the project involved retrieval of inpatient hospital discharge data from the public hospitals under study. Phase 2 of the study sought the views of health professionals, health managers and health researchers involved directly or indirectly in the management of the adult medical patients admitted to the hospitals. Therefore, two distinct research ethics approvals were obtained from the respective organisations and the Ministry of Health's Health and Disability Ethics Committee, Auckland. The setting up and approval stages of this study included giving appropriate explanations and making formal presentations on the study proposal in order to elicit approval from:

- Auckland Public Hospital and Auckland City Hospital, Auckland District Health Board,
- Middlemore Public Hospital, Counties Manukau District Health Board, and
- The Health and Disability Ethics Committee, Ministry of Health, Auckland.

The supporting approval documents are included here as Appendix 1. Ethical approval through the Ministry of Health Ethics Committee, Auckland, ensures that details of informed consent, anonymity and confidentiality, storage of data, dissemination of results and the information provided to participants, have been appropriately addressed. These procedures serve the purpose of ensuring that the rights of the participants to whom the data belongs - health professionals and institutions involved in the study - were protected. And to ensure that the participants were happy with taking responsibility for their voluntary participation, and also that the confidence to express their views was established. The participants were not expected to suffer any adverse effects from taking part in the study.

A participant information sheet, as well as the main results of phase 1 of the study, was posted to each identified participant in phase 2, prior to the individual and group interviews. The objective of the information sheet was to explain the scope of the project and possible benefits of it, as well as providing information about the researcher. A copy of the participant information sheet is included as Appendix 2. The copy of the main results of phase 1 gave the participants some insight into the likely issues to be explored during the interview.

In order to ensure confidentiality and privacy of the patient information included in the hospital admission data (phase 1), and of the study participants (phase 2), a number of measures were taken. No personal information leading to the identification of the patients

included in hospital data and study participants have been presented. Results have been presented only in an anonymous and aggregated format and the study contains no information that might lead to the direct identification of a participant. Reports arising from the study will be written in a way that does not identify its sources. Only the researcher had access to hospital admission data and participant interview material as per researchers own undertaking to maintain confidentiality.

The participants, who agreed to take part in the study, were asked to sign a consent form (Appendix 3). Participants had the right to decline to answer any particular question(s) during the interviews.

The hospital inpatient data and the participants' interview transcripts were stored securely in the researcher's office, and will be kept for a period of 10 years, and the interview audiotapes were destroyed upon completion of the study, as per the Health and Disability Ethics Committee's approval conditions.

The hospitals and participants will have access to the copy of the research report that will be placed in the library of each of the hospitals involved in the study.

Conclusion

Using the methods described above, the data was collected and analysed over 5 years (2002-2006). The results are now presented in the following three chapters.

Chapter 4

Findings: Medical Admission Trends 1997-2004

(4.0) Introduction

The data reported in the next 3 chapters represents all medical admissions to two Auckland hospitals over the 8 year period 1997-2004. As described in the Methodology (Chapter 3), this study was conducted using a mixed methodology. Technically the hospital admission data was based on reported adult medical discharges, the method by which public hospital throughput is reported. Therefore the term ‘admission’ used in this study is based on patients who were admitted and then discharged (including deaths) from the hospitals in the study. The findings related to hospital admission trends (phase 1 of the study) have been derived by using quantitative research methods, including the use of age-standardised rates (ASRs), age-specific rates, crude rates, means, confidence intervals (CI) of the mean and median, as described in Chapter 3. Key findings based on the above statistical methods have been presented in table and/or graph formats. Questions about the hospital admission trends raised by these findings were further interrogated through the analysis of the expert panel data in phase 2. The findings of both phases have been amalgamated and presented together in this chapter.

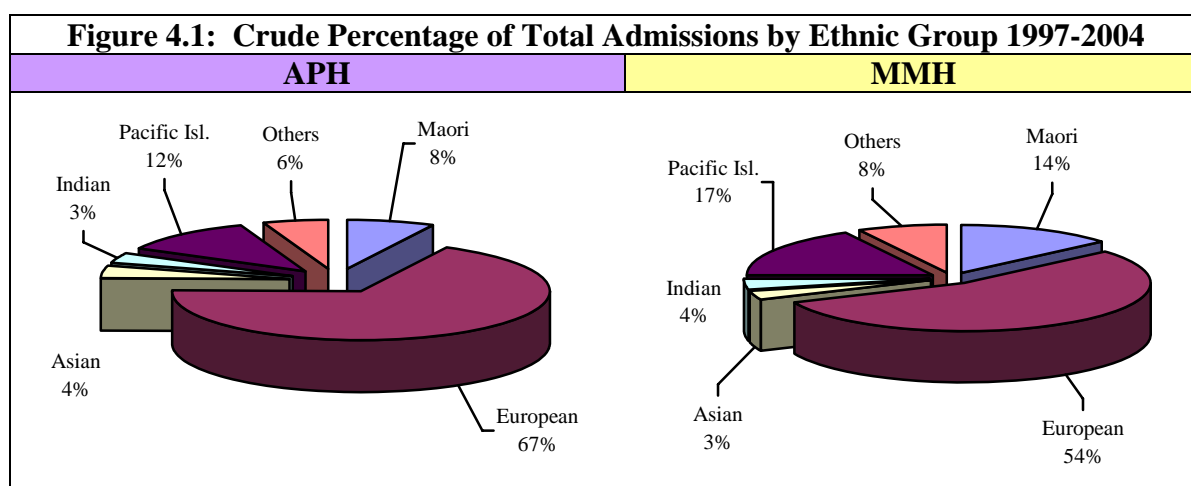
The main aim of this chapter is to present study findings related to admission trends in relation to demographic and ethnic factors. In order to present the findings in a logical manner, the chapter begins by providing results related to study sample characteristics, followed by total admission trends by age group and admission category. Subsequently, findings are presented related to acute admission trends, patient referral sources, emergency triage trends, seasonal variations, trends in length of stay and relationship between age and length of stay. Finally the chapter ends with a summary of the chapter’s key findings. Significant issues related to admissions raised in this chapter are further explored and discussed in relation to the national and international literature in the discussion chapters.

(4.1) Study Sample

The hospital data collected were related to adult medical patients admitted to Auckland Public Hospital (APH) during July 1997 to December 2004 ($n = 127,295$) and Middlemore Hospital (MMH) during January 1997 to December 2004 ($n = 150,120$). Between them the two hospitals admitted $N = 277,416$ adult medical patients over these periods. MMH's 64/1000 population and year crude admission rate was much higher than the 54 /1000 for APH over the study period.

Analysis of the data with respect to gender differences showed that the numbers of female admissions were slightly higher (51.3% and 50.8% for APH and MMH respectively) compared to the number of male admissions (48.7% and 49.2% respectively). According to almost all of the participants in the expert panel who took part in phase 2 of the study, higher numbers of female admissions were expected given that females live longer than males on average. However, some expected that the gap would have been much larger than the results demonstrated.

As discussed in the Methodology, MMH and APH provide hospital services to a culturally diverse population in Auckland metropolitan city. In order to draw some meaningful results, a large number of small ethnic groups were combined together to form 6 major ethnic groupings for the purpose of this study. The findings showed some differences in the ethnic makeup of the two hospitals (Figure 4.1).



As shown there were some differences in the ethnic makeup of the two hospitals. APH had a considerably higher proportion of European group admissions than did MMH. Equally,

MMH had a higher proportion of Maori and Pacific Islander ethnic group admissions than APH. It highlighted that the two District Health Boards (DHBs) had some marked differences in the ethnic composition of the populations they served. The differences in the two DHB populations were also emphasized by the expert panel members of both institutions. The above findings also reflect the census 1996 and 2001 data trends (Ministry of Health, 2000b; Statistics NZ, 2002).

(4.1.1) Admission Processes

Both of the hospitals have relatively similar admission and referral processes. There were three major sources of referral to hospitals. The first source of referrals was general practitioners and some community nurses who usually called the hospitals' Medical Services' registrars to notify them and to give some details of a patient that they were referring to hospital for assessment. Most of these GP referrals were seen by the Medical Services registrars and house surgeons, unless they required emergency treatment, in which case they were managed by the hospitals' Emergency Department (ED) and then referred back to the Medical Service.

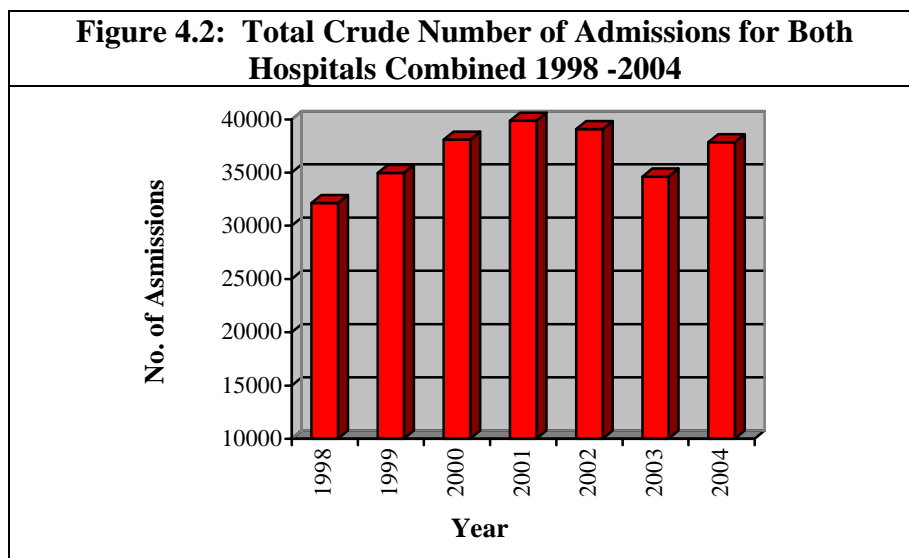
Patients brought by the Ambulance Services to hospital EDs, were at both hospitals generally attended to by the ED medical staff, and if required referred to the Medical Services for further assessment and treatment, and/or admission.

Patients referring themselves to a hospital ED were the third source of referrals. All of the self-referred patients were being seen by the ED medical staff, and if required referred to Medical Services for further treatment at both hospitals.

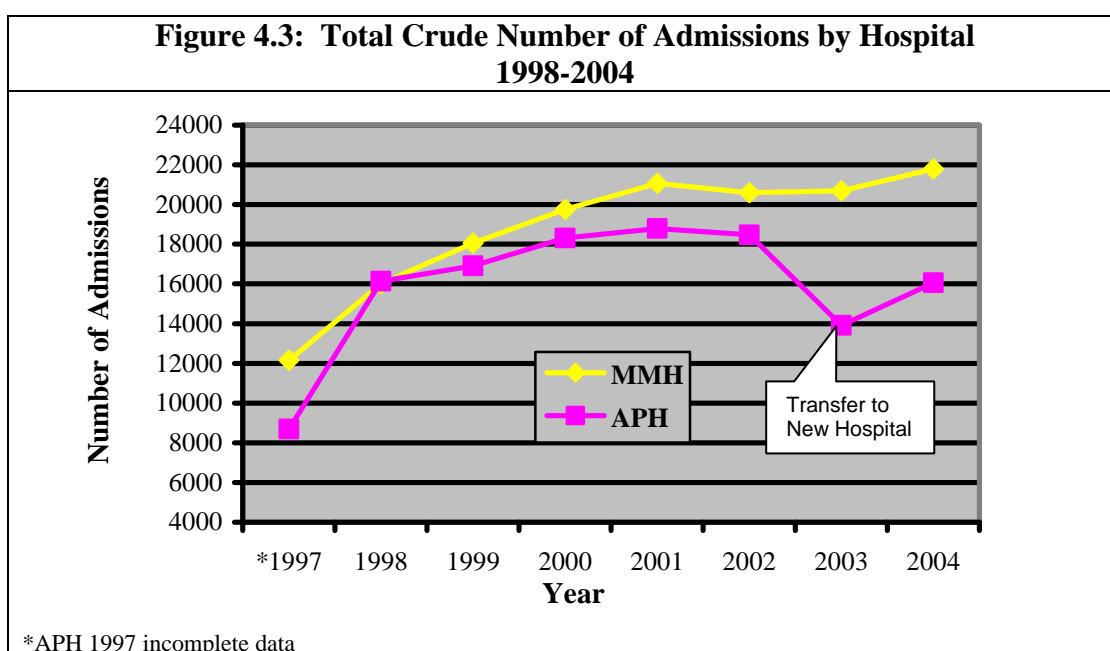
Generally, the medical patients referred to Medical Services by GPs and community nurses, and Hospital ED were assessed and admitted by the Medical Services' registrars or house surgeons. This was followed by a patient review by a Medical Services' physician within 24 hours of admission time at MMH. At APH physicians were generally present in the assessment unit to review the patients admitted by the junior doctors.

(4.2) Total Admission Trends

Overall, the total annual number of adult medical admissions increased rapidly (22%) from approximately $n = 32,000$ in 1998 to $n = 39,000$ in 2001 (Figure 4.2). The number of admissions then fell (to below $n = 35,000$ in 2003) and increased again during 2004. [APH data for the year 1997 were incomplete, and were therefore not considered for analysis in this section].



The annual crude numbers of all admissions are presented separately for each hospital in Figure 4.3, highlighting that MMH admissions have remained higher than APH admissions over the 1998 to 2004 period.



MMH hospital admissions increased rapidly from $n = 12,000$ to $n = 21,000$ between 1997 and 2001, representing an increase of approximately 73% over the 4 year period. While APH admissions also increased during 1998-2001, the increase at only 16% was less dramatic than for MMH. Both of the hospitals experienced a mild decrease in admissions during 2002. APH experienced a further decline in admissions (relatively significant at -24%) during 2003, while MMH's admissions began to increase again. At both MMH and APH the numbers of admissions in 2004 were higher than in 2003, and the gap in the number of overall admissions between the two hospitals widened further.

Therefore the expert panel was asked some specific questions regarding the above trends. For example, could the trends be explained by the population increase during the study period? If not, what were the causes of the increase in admissions during 1998-2001? And what interventions if any had been successful in reducing the admissions during 2002 and 2003 at APH?

Both managers ($n = 2$) and physicians ($n = 4$) were asked to comment on what they perceived to be the reasons for these declines in admissions and particularly the sharp decline during 2003 at APH. All of the participants from APH were surprised to see the degree of decline in admissions in 2003. When asked what may have caused the decline the commonest response was, *'the move to the new hospital'*. In 2003 a newly constructed hospital on one site took over adult health services previously delivered by three hospitals on two sites. At the same time available beds were reduced by 5%-8%. In addition, one of the managers further explained the reason for this decline by stating that, *'the ADHB had a communication team to advise general practitioners not to send inappropriate referrals to hospital, coupled with ongoing advertisements in the local newspapers and local radio stations to encourage potential patients to make better use of the primary healthcare services in the community rather than fronting up at the hospital. All these measures were specifically designed to reduce inappropriate admissions coming to the hospital while the hospital staff was busy with hospital amalgamation and transfer issues. I guess, these measures proved to be very successful'*.

In MMH there was no such decline in 2003, and nor was there a sharp increase suggesting a shift of patients from APH to MMH. These findings lend support to the theory that the

likelihood of admission as an inpatient is increased by a patient's attendance at ED, as further discussed in 4.5.

The MMH expert panel members unanimously agreed with the total admission trends. For example one of the physicians summed up the situation by stating: *'Yes, this is what I have been experiencing in my clinical practice..... rapidly growing number of admissions year after year. Although the pace of the admission rate increase appeared to have slowed in the last few years'*.

(4.2.1) Total Admission Trends by Age Group

Analysis of data related to age groups indicated large variations between the proportions of medical admissions as shown in Table 4.1.

Age Group	Hospital	1998	1999	2000	2001	2002	2003	2004
15-34	MMH	14.1	13.9	14.5	12.2	11.5	12.3	11.1
	APH	17.4	17.1	16.7	16.0	14.2	14.2	13.0
35-54	MMH	27.0	26.0	26.3	27.0	26.3	25.6	25.8
	APH	24.4	24.4	25.5	25.6	26.2	23.2	22.9
55-74	MMH	37.7	37.0	36.9	37.5	37.9	37.1	37.9
	APH	32.7	33.3	32.3	32.4	33.1	31.1	32.3
75+	MMH	21.1	23.0	22.4	23.3	24.4	25.0	25.2
	APH	25.5	25.4	25.5	26.0	26.6	31.5	31.8

The 15-34 age groups of both hospitals showed some decline in the percentage of admissions over the study period. APH's 15-34 age group had slightly higher admission rates. When analysing the 35-54 age groups, the MMH group had moderately higher admission percentages than APH. Both of the hospitals experienced a mild decline in the overall percentage of admissions for this group.

The 55-74 age groups' admission percentages remained relatively stable but were higher than all other age groups of their respective hospitals. MMH's 55-74 age group had moderately higher percentages (approximately 37%) than APH's (approximately 32%). The admission percentages for the 75+ age groups showed a very different trend than for the other age groups. The percentage of admissions for this group has shown a consistent increase. Thus APH's percentage of overall admissions for the 75+ age group increased from approximately

25% to 32% during 1998-2004, while MMH's equivalent age group's percentage of admissions increased from approximately 21% to 25% over the same period.

Overall, Table 4.1 highlighted that the proportion of the younger age group admissions has continued to decline, while the share of the older age group admissions is consistently increasing, especially for the 75+ age groups of both hospitals, highlighting the impact of the ageing population. However the crude number of admissions has not declined for the younger age groups, in fact the absolute numbers have continued to increase. Therefore, the experts were asked whether there was a relationship between the ageing population and number of admissions? And what have they experienced in their own clinical practice in this regard during the study period?

MMH's physicians (n = 4) agreed with the above findings and stated it confirmed what they experience every day. The results highlight that older age groups have significantly higher admission rates than the younger age groups. According to physicians (n = 5) and managers (n = 2) of both hospitals, the impact of the ageing population was becoming very obvious. And an APH physician supported the study findings by stating that *'there was a growing impact of the ageing population on some of the specific services provided by my unit'*.

Similarly another of APH's physician's stated that the 75+ age group's increase in admissions was related to an older or ageing population. An MMH physician found the age groups' admission trends analysis interesting, and highlighted that, *'traditionally we [physicians] thought the present health service was adequate'*. But after reviewing the study results suggested, *'that there was a need for acute care as well as dedicated health services to meet the chronic disease management needs of the elderly'*. Other physicians raised questions related to the appropriateness of the health services provided to older people, and whether community based services were preferable to hospital inpatient services. However, they did not propose any specific ideas apart from better integration of primary and secondary health services.

(4.2.2) Trends by Admission Category

The admissions examined in this study comprised three major hospital inpatient admission categories - acute (unplanned), arranged and waiting list. According to the Ministry of Health

(2004b) an acute admission may be defined as an unplanned admission on the day of presentation at the admitting healthcare facility; a planned admission is defined as where the decision date was less than seven days after the decision to admit was made by a health specialist; and a waiting list/elective admissions may be defined as any other case excluding both acute and planned admission criteria. In order to explore the admission trends related to these different admission categories, percentages of the crude number of admissions for each category and hospital were calculated and the results are discussed in the following section. The figures in Table 4.2 show that the percentages of arranged and waiting list admissions have changed significantly over the study period.

Admission Category	Hospital	1998	1999	2000	2001	2002	2003	2004
Acute/ Unplanned	MMH %	77.1	76.4	73.1	70.6	71.7	75.9	75.4
	APH %	73.4	76.0	78.1	78.9	76.3	93.3	97.1
Waitlist	MMH %	14.6	14.2	14.2	18.5	16.0	14.1	13.7
	APH %	0.3	0.2	0.1	0.1	0.2	0.0	0.0
Arranged	MMH %	8.3	9.4	12.7	10.9	12.3	10.0	11.0
	APH %	26.3	23.8	21.7	21.0	23.6	6.7	2.8

According to the data analysis there were $n = 216,236$ patients admitted under the acute admission category from the hospitals during 1997-2004. Of these admissions, $n = 103,010$ (48%) came from APH and $n = 113,226$ (52%) from MMH. Overall, the acute category admissions accounted for 75.4% of MMH's and 80.9% of APH's total admissions for the study period. However there were some variations in the acute/unplanned category admissions over the study period. For example, MMH's acute category admissions declined from approximately 77% to 71% during 1998-2001 and then increased to approximately 75% by 2002-2004. On the other hand, APH's acute admissions increased from approximately 73% to 79% during 1998-2001 and then jumped to approximately 97% in 2003-2004.

Waitlist admission category trends had significant variations between the two hospitals. There were $n = 21,095$ (14.1%) patients admitted in this category from MMH during 1998-2004. At the same time, APH only admitted $n = 196$ (0.2%) of the patients under this same category. The actual number of admissions per year has increased from approximately $n = 2,300$ to $n = 2,950$ for MMH over the study period. The percentage of waitlist admissions for MMH has remained relatively stable around 14% for the study period, except for 2001 when

it rose to 18.5% then declined to 16% during 2002. And for APH the waitlist admissions have declined from approximately 0.3% to 0.0% over the study period.

According to the analysis of arranged admission category data, there were $n = 39,889$ admissions for this category. These admissions accounted for MMH ($n = 15,799$, 10.5%) and APH ($n = 24,090$, 18.9%) of the total admissions of each of the hospitals. MMH's arranged admissions increased from approximately 8% to 13% during 1998-2000 and then remained approximately between 10%-12% for the rest of the study period. APH's percentage of arranged admissions remained much higher approximately between 21%-26% during 1998-2002, and then declined sharply down to approximately 3% during 2003-2004. The actual number of admissions also declined from approximately $n = 4,000$ per year during 1998-2002 to below $n = 500$ per year in 2004 for the arranged admission category. The main reason for this decline was related to a change in the data coding practice. One of the expert panel managers clarified it by explaining that, '*the waiting list and arranged categories were from 2004 being funded as non-DRG [diagnostic related group] cases by the DHB. Therefore these patients were no longer entered into the inpatient data*'. However a non-DRG patient requiring an admission due to an acute episode was counted as an admission.

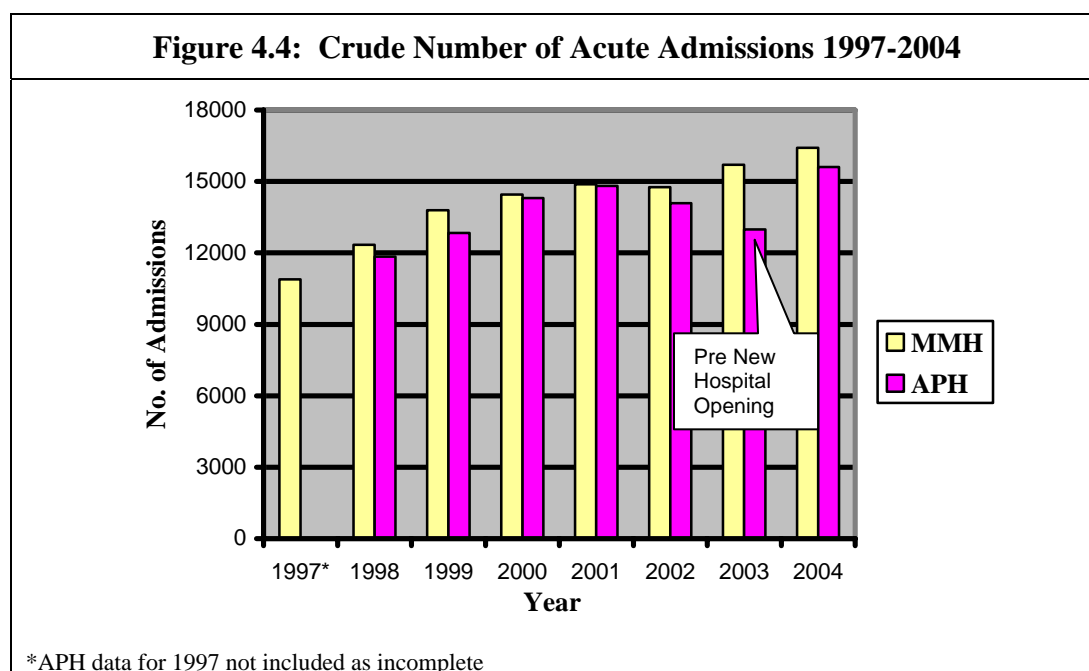
The main reason why APH had much higher numbers of arranged category patients was also related to the arranged category also including most of the waiting list category admissions. If both of these two categories for MMH were also combined and compared with APH rates, then MMH would have overall higher admission rates than APH. The data coding processes illustrate variations in coding practice and raise issues about the comparability of the data sets at national level.

In summary, the analysis of admission data showed that the total number of medical admissions increased rapidly for MMH over the study period, while APH admissions increased in the first four years of the study then experienced a large decline at the time of the amalgamation of the three hospitals. When comparing the ethnic composition of total admissions, MMH had a higher percentage of Maori and Pacific Islander group and lower percentage of European groups than APH. The *crude number* of total medical admissions has continued to increase, however the *proportion* of younger age group admissions has declined while the *proportion* for the older age groups has increased. While for both hospitals the majority of medical admissions are accounted for by acute admissions, the waitlist and

arranged categories have also increased moderately for MMH. There were very few admissions under the waitlist category for APH, but the arranged category of APH had much higher crude admissions than MMH during 1998-2002. However, APH's arranged category admissions declined significantly during 2003-2004, which was due to changed funding and data coding arrangements within the ADHB. From this point on, only acute medical admissions are analysed.

(4.3) Acute Admission Trends

As discussed in the Introduction (Chapter 1), acute medical admissions (AMAs) contribute largely to the public hospitals' unplanned and unpredictable workload in NZ. Consequently, the main focus of this study was to explore AMA trends related to acute/unplanned admissions. Therefore, data related to arranged and waiting list categories have been excluded from further analysis. As evident from Table 4.2 above acute admissions constitute the largest group of admissions, and therefore have more effect on the hospitals than the other medical admission categories. Therefore data related to the acute/unplanned category were further examined and the findings are presented in the following section. Figure 4.4 highlights the significant trends in acute admissions that occurred over the study period.



The crude acute admissions for MMH increased by 36.6% during the 1997-2001, and then again further increased by 11.2% during 2003/04. In effect, there was only one year (2002), when the admissions declined by 0.7% (n = 110). Overall MMH has experienced an approximately 50.8% (n = 5,532) increase in acute admissions over the 8 year period, while the estimated population only increased by 18% over the same period. One of expert panel physicians from MMH, supported by others (n = 3), reported that, '*the acute admissions appeared to have increased in a straight line during 1997-2001 and clinical experience was something like crazy at that time*'. These physicians were further asked what might have led

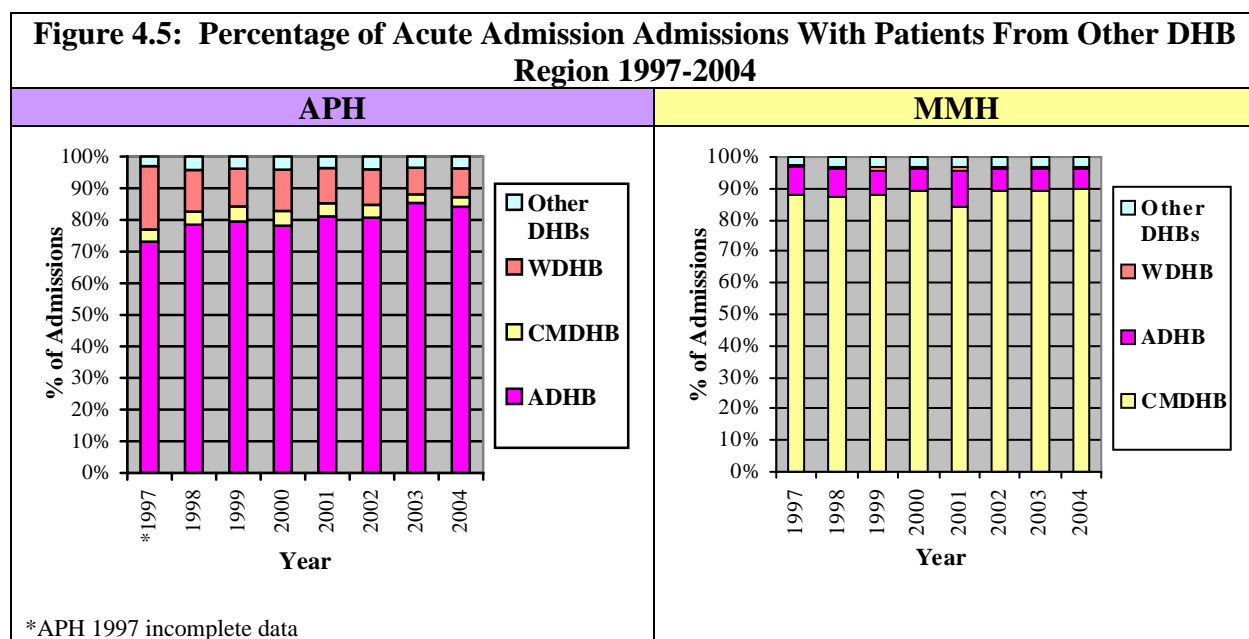
to this rise in admissions at MMH? The following statement made by one of the physicians' best summarises their responses, *'It's to do with the inappropriate community health services, demoralised general practice and the impact of the funding and health policy'*. This physician attempted to highlight the negative impact the economic and health reforms of the 1980s and early 1990s have had on the community and general practice health services in South Auckland (refer 2.2). A MMH manager thought some of the rise in acute admissions may be related to the implementation of the new information technology initiatives by MMH. According to this manager, *'some of the increase in admissions from 1997 to 2001 could be attributed to the implementation of comprehensive data keeping initiatives. For example we used to have only one computer in ED, prior to the opening of the new ED in 2000 Now we have 120 computers and all the staff members use them'*.

APH acute admissions also showed an increase of 25% during 1998-2001, which was followed by a sharp decline of approximately -12% over the next two years. However this decline was short lived as the number of admissions again increased by approximately 20% during 2004. Overall, the APH has experienced an approximately 31.6% (n = 3,753) growth in acute admissions, which was much higher than the estimated population rise of 14.5% during 1998-2004. Although both of the hospitals have experienced increases in admissions over the study period MMH appeared to have experienced a much greater increase than APH.

However, the above admission trends also included data related to patients, who though they did not reside in the catchment area of the hospitals under study, were admitted to the study hospitals. Because of offering tertiary level health services (renal medicine, haematology, cardiology, and so on), both APH and MMH have continued to admit a considerable percentage of patients coming from other DHB regions each year (Figure 4.5).

MMH's proportion of patients coming from its own Counties Manukau District Health Board (CMDHB) region has increased from approximately 87% to 90% during 1997-2004. Auckland District Health Board (ADHB) of APH, which shares a catchment boundary with CMDHB, was the largest contributor to out-of-zone patients (approximately 7%-9% each year) to MMH. Most of these admissions come from the East and West Otahuhu area of the ADHB. This is due to the closer proximity of this area (approximately 1-3 kilometre away) to MMH, than to ADHB's Auckland City Hospital (which is approximately 12-14 kilometres away). As a result, this situation is unlikely to change. All other DHBs combined, including

Waitamata District Health Board (WDHB), another DHB of Auckland, only contribute between 3%-4% of the total admissions at MMH.



In contrast, APH’s proportion of patients coming from its own DHB catchment area was only 78%-80% during 1998-2002, increasing to approximately 84% in 2004. The largest other DHB contributing patients to APH was the WDHB, although its proportion of admissions has continued to decline steadily. Most of these patients came from the West Auckland area of the WDHB, which until 2003 did not have an acute care facility. During 1998-2002, the proportion of WDHB patients declined from approximately 13% to 11%, which further declined sharply to 8% in 2003. This decline might be related to the opening of the new Waitakere Hospital of the WDHB. A further 3%-4% of the admissions were from the CMDHB region, with the remaining 3%-4% of admissions from all of the other DHBs of NZ and including some from other countries.

In order to calculate direct age-standardised admission rates to compare the admission rates of two DHB populations, the patients belonging to other DHB catchments were excluded from the analysis to minimize confounding. According to the age-standardised rates (ASRs), MMH consistently admitted 5-12 more patients per 1000 population than APH each year during 1998-2004, highlighting significant differences in the acute admission rates of the two hospital populations (Table 4.3).

Year	APH			MMH		
	ASR	(95% CI)	n	ASR	(95% CI)	n
1997*	15.46	(15.40-15.51)	4,764	36.60	(36.46-36.74)	9,556
1998	30.01	(29.90-30.11)	9,297	39.82	(39.67-39.96)	10,751
1999	32.46	(32.35-32.58)	10,204	43.98	(43.81-44.14)	12,168
2000	35.24	(35.12-35.37)	11,178	45.04	(44.87-45.20)	12,894
2001	37.51	(37.38-37.64)	12,013	43.35	(43.19-43.51)	12,498
2002	34.72	(34.60-34.84)	11,372	44.26	(44.10-44.42)	13,178
2003	32.88	(32.77-32.99)	11,071	45.32	(45.16-45.48)	14,033
2004	37.94	(37.82-38.07)	13,118	45.80	(45.64-45.96)	14,719

*APH Data Incomplete

On average MMH admissions increased by 6.75% each year during 1997-2004, and similarly APH admissions increased by 5.87% each year from 1998 to 2004. Therefore both hospitals experienced significant increases in the acute admissions during 1998-2000. The age-standardised admission rates appeared to have peaked for APH at 37.51/1000 in 2001 followed by a sharp decline to 32.88/1000 during 2002-2003 and again increased to 37.94/1000 in 2004. MMH's ASRs appeared to have increased gradually from 1999 to 45.80/1000 admissions by 2004. The crude percentage of admissions declined for the youngest age groups, while increasing for the older age groups of both hospitals (Table 4.4).

Age Group	Hospital	1998	1999	2000	2001	2002	2003	2004
15-34	MMH	14.7	14.5	15.4	12.8	12.4	13.1	11.7
	APH	15.4	15.4	14.8	13.5	12.8	14.0	12.2
35-54	MMH	25.6	24.3	24.9	24.6	24.7	24.9	25.1
	APH	20.9	21.5	22.5	22.7	21.5	22.2	21.5
55-74	MMH	36.7	35.8	35.0	35.8	35.9	34.9	35.9
	APH	31.1	29.9	29.4	30.2	31.4	30.1	31.0
75+	MMH	23.0	25.5	24.6	26.7	27.0	27.0	27.2
	APH	32.6	33.2	33.4	33.6	34.3	33.8	35.3

The 75+ age groups showed consistent rises in the percentage of admissions for both hospitals. The 35-54 and 55-74 age groups' percentage of admissions remained relatively stable for both hospitals, but MMH groups had a much higher proportion of admissions than APH groups. Despite experiencing decline in the percentage of admissions, the crude number of admissions increased even for the youngest 15-34 age group (Table 4.5).

Age Group	APH			MMH		
	1998 n	2004 n	Increase n (%)	1998 n	2004 n	Increase n (%)
15-34	1,431	1,600	169 (12%)	1,584	1,724	140 (9%)
35-54	1,943	2,826	883 (45%)	2,752	3,698	946 (34%)
55-74	2,889	4,061	1,172 (41%)	3,942	5,287	1,345 (34%)
75+	3,034	4,631	1,597 (52%)	2,473	4,010	1,537 (62%)

The crude number of acute admissions increased for all of the age groups. The oldest 75+ age groups of hospitals experienced the highest increase 62% (n= 1,537) and 52% (n = 1,597) for MMH and APH respectively between 1998 and 2004. Further sub-group analysis of the 75+ age groups indicated that 85+ age groups experienced even larger percentage increases in admissions (approximately 84% and 60% for MMH and APH respectively between 1998 and 2004). The 55-74 age groups experienced the second highest increase in the crude number of admissions but this increase was not greater in terms of percentage as compared to the 35-54 age groups of both hospitals. APH's 75+ age group had a higher number of crude admissions compared to any other age group.

The expert panel of each hospital was asked to reflect on the acute admission trends and to highlight the reasons for the significant growth in acute admissions. Experts' views are discussed in relation to these questions in the following paragraph. Some of the managers (n = 2), physicians (n = 4) and nurse specialists (n = 2) from MMH thought that higher admission rates could be related to inadequate primary healthcare services (especially after hours service) and the poor socioeconomic status of the CMDHB population. For example one of the managers from MMH expressed the view that, '*access for primary healthcare is a problem. We tell them [patients] don't come to us during the day and go to your GP, but after 10pm at night we admit them..... We have not got funded primary care overnight in the area*'. While a nurse specialist from MMH suggested the decline in admissions during 2001, was possibly related to the implementation of an initiative known as Primary Options for Acute Care (POAC). According to the nurse specialist '*the POAC gave funding access of \$300 for each event to a GP for keeping a patient in the community. The GPs were able to access health services such as GP home visiting, private hospital admission, physiotherapy, meals on wheels, access to diagnostics, and admit patients to private hospitals*'.

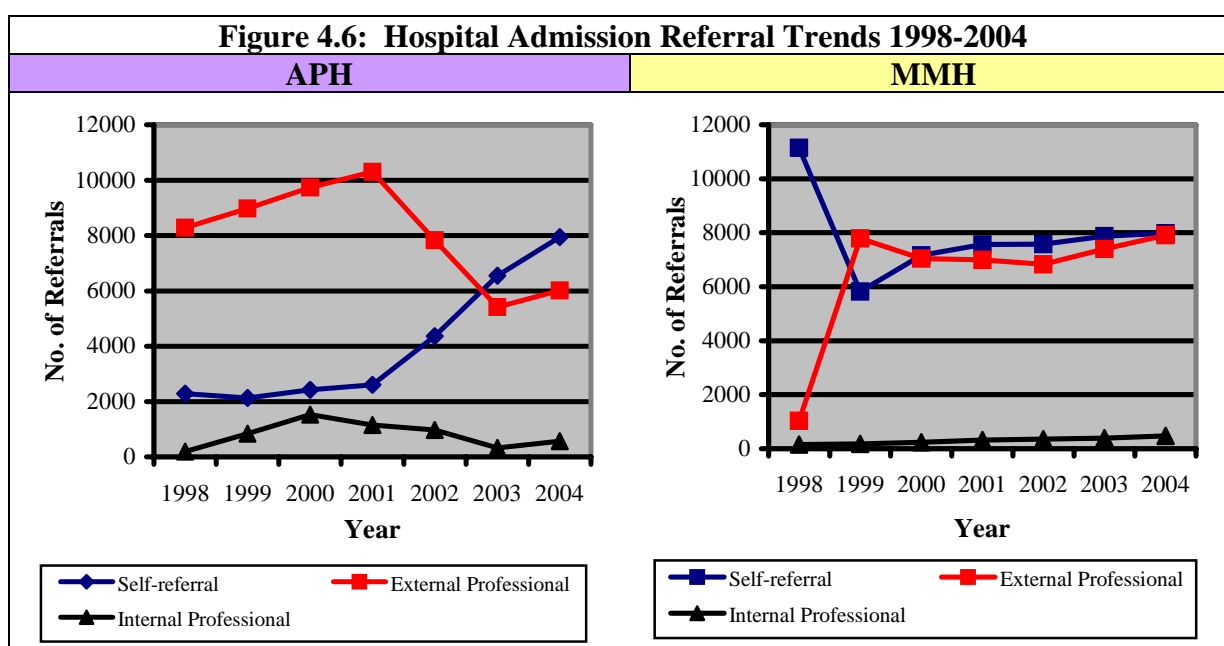
In contrast most of the APH expert panel members related the lower admission rates of their population to the better socioeconomic status of their population. For example a manager from APH stated that *'Auckland Central is relatively affluent. People living in this area make good use of primary healthcare services, and most of them also have their own private insurance, so many of them probably don't even show up at the hospital'*.

If this was true, then, the actual health service utilisation of the ADHB's population might not be seen as reflected in the public hospital data. However, private hospitals based in the ADHB area such as Mercy-Ascot and Southern Cross, when asked whether they admit medical patients acutely, responded that they focus more on providing elective surgical and diagnostic medical services. An alternative explanation is the differences in the ethnic makeup of the two DHB populations and their differing utilisation of the health service. This question will be explored in a later section.

Overall the absolute number of acute admissions has continued to grow (with some fluctuations) for both hospitals. For example, if 1998 (the first year of complete data for both hospitals) is used as the base year, then by 2004 APH and MMH have had approximately 41% and 37% increases in acute admissions respectively. MMH had higher ASRs than APH throughout the study period; these variations were likely to be related to socioeconomic status and access to primary care. The 75+ age groups have shown a consistent increase in crude number and percentage of admissions. During 2004, approximately 63% and 66% of the acute admissions came from the 55+ age groups of MMH and APH respectively.

(4.4) Patient Referral Source Trends

As discussed at the beginning of this chapter, large numbers of patients are admitted to the hospitals because of acute health issues. There were three major sources of patient referral to hospital. Many patients were being referred by an external health professional (e.g. general practitioner, private accident and emergency clinic, emergency services, or other hospital), some patients referred themselves by presenting at an Emergency Department (ED), and health professionals working at the hospital referred other patients for the treatment of medical conditions. The graphs of Figure 4.6 show the patient referral pattern trends.



According to the above, during 1998 MMH had approximately 90% of the patients referring themselves to the hospital. This situation changed dramatically in 1999, when external health professional referrals exceeded the self-referrals, and for the following 4 years, there appeared to be similar numbers of self-referrals and external-referrals. The number of internal-referrals has remained stable between 1 and 3% of the total referrals.

At APH, the self-referrals remained between 16%-21% of the total referrals during the 1998-2001 period, with external professional referrals much higher compared to those experienced at MMH. However the external professional referral rate declined around 40% from 2002 to 2004. During this time self-referral rates increased significantly. The internal professional referral rates appeared to have peaked during 2000 and since have generally remained between 2-5% of the total referrals. To further explore the referral trends age-standardised

rates (ASRs) were calculated for the self-referral and external professional referrals. In order to compare the two hospital populations, patients who did not belong to the catchment area of the hospitals under study were excluded from this analysis. The rates related to internal professional referral trends were not computed due their low numbers. As shown in Table 4.6, there were marked differences between the self-referral and external professional referral rates of the two hospitals. APH had much lower self-referral (5.04-6.26/1000) and much higher external professional (20.57-25.00/1000) ASRs during 1998-2001. APH's self-referral rates increased during 2002-2004 while external professional rates declined, which was related to a change in the coding of data.

Year	APH		MMH	
	Self-referral ASR (95% CI)	External Professional ASR (95% CI)	Self-referral ASR (95% CI)	External Professional ASR (95% CI)
1998	5.66 (5.64-5.68)	20.57 (20.50-20.64)	36.18 (36.05-36.31)	3.08 (3.07-3.09)
1999	5.04 (5.02-5.06)	22.64 (22.56-22.72)	18.39 (18.32-18.46)	24.97 (24.88-25.06)
2000	5.60 (5.58-5.62)	23.57 (23.49-23.65)	21.93 (21.85-22.01)	22.32 (22.24-22.40)
2001	6.26 (6.24-6.28)	25.00 (24.91-25.09)	21.75 (21.67-21.83)	20.56 (20.49-20.63)
2002	10.70 (10.66-10.74)	18.63 (18.57-18.69)	22.66 (22.58-22.74)	20.41 (20.34-20.48)
2003	16.17 (16.12-16.22)	13.90 (13.85-13.95)	22.46 (22.38-22.54)	21.42 (21.34-21.50)
2004	19.45 (19.39-19.51)	14.47 (14.42-14.52)	22.01 (21.93-22.09)	22.18 (22.10-22.26)

From 2000, MMH's self-referral ASRs (22-23/1000) were higher or similar to the external professional referrals (20-22/1000). In fact the self-referral rates have remained between 48%-51% of the total admissions from 2000 to 2004. The acute referral data prior to year 2000 was considered inaccurate due to coding issues. Further analysis of the admission referral trends related to each of the ethnic groups and hospitals highlighted major differences between the two hospital populations. The results related to each of the ethnic groups are presented in the following.

MMH's Maori group appeared to have much higher self-referral to hospital ASRs per population during 1998-2002 than APH's Maori group (Table 4.7). In 1998, more than 90%

of the Maori admissions were under the self-referral category. This declined to approximately 45% in 1999 and has remained between 46%-50% of the total admissions during 2000-2004. The self-referral rates for MMH's Maori group were very similar to the external professional referrals over the study period except for the year 1999. In contrast, the self-referral rates for APH's Maori group were much lower at approximately 21%-23% during 1998-2001. However, this situation changed during 2002-2004, when the ASRs increased from 8.66/1000 in 2001 to 41.98/1000 in 2004. While, the external professional referral ASRs declined from 35.67/1000 in 2001 to 29.45/1000 during 2004 (or from 76% to 41%).

Year	APH		MMH	
	Self-referral ASR (95% CI)	External Professional ASR (95% CI)	Self-referral ASR (95% CI)	External Professional ASR (95% CI)
1998	7.51 (7.41-7.61)	27.07 (26.72-27.42)	61.94 (61.32-62.56)	3.87 (3.83-3.91)
1999	6.53 (6.45-6.61)	25.20 (24.87-25.53)	33.55 (33.22-33.88)	37.76 (37.39-38.13)
2000	8.85 (8.74-8.96)	30.20 (29.81-30.59)	37.21 (36.85-37.57)	34.45 (34.12-34.78)
2001	8.66 (8.55-8.77)	35.67 (35.21-36.13)	32.45 (32.14-32.76)	27.93 (27.66-28.20)
2002	14.14 (13.96-14.32)	25.07 (24.75-25.39)	35.62 (35.29-35.95)	32.43 (32.13-32.73)
2003	32.50 (32.08-32.92)	24.39 (24.08-24.70)	38.90 (38.54-39.26)	33.63 (33.32-33.94)
2004	41.98 (41.45-42.51)	29.45 (29.08-29.82)	38.07 (37.72-38.42)	36.74 (36.40-37.08)

The referral source trends analysis for the European/Other groups of the two hospitals (Table 4.8) indicated that there were significant differences between the two hospital populations. The self-referral admission ASRs for MMH's European/Other group have remained relatively stable 14.37/1000 to 18.09/1000 population (44%-50%) during 1999-2004 except for 1998, when the ASR rate was 30.69/1000 population or approximately 90% of all admission categories. In contrast the self-referral admission rates were only 4.37/1000 to 5.50/1000 population (21%-23%) for APH's European/Other group during 1998-2001, however increasing significantly to 17.14/1000 during 2002-2004. The external professional referral ASRs declined from approximately 20.71/1000 to 14.50/1000 population (or approximately 70% to 39% of admissions) during 1998-2004. When comparing the external professional referral rates between the two hospital groups, APH's European/Other group had higher

percentages than MMH's group during 1999-2002. APH's percentages declined well below MMH's percentages in 2003-2004. Overall, APH's European/Other group appeared to have lower self-referral ASRs compared to MMH's European/Other group and APH has experienced a significant shift in the referral pattern during 2002-2004.

Year	APH		MMH	
	Self-referral ASR (95% CI)	External Professional ASR (95% CI)	Self-referral ASR (95% CI)	External Professional ASR (95% CI)
1998	5.02 (5.00-5.04)	20.71 (20.63-20.79)	30.69 (30.55-30.83)	2.79 (2.78-2.80)
1999	4.37 (4.35-4.39)	23.03 (22.94-23.12)	14.37 (14.31-14.43)	22.68 (22.58-22.78)
2000	4.84 (4.82-4.86)	24.59 (24.49-24.69)	17.48 (17.40-17.56)	20.55 (20.46-20.64)
2001	5.50 (5.48-5.52)	25.95 (25.85-26.05)	17.28 (17.21-17.35)	18.84 (18.76-18.92)
2002	9.35 (9.31-9.39)	19.66 (19.59-19.73)	18.09 (18.01-18.17)	18.29 (18.21-18.37)
2003	14.10 (14.05-14.15)	14.01 (13.96-14.06)	17.49 (17.42-17.56)	19.15 (19.07-19.23)
2004	17.14 (17.08-17.20)	14.50 (14.45-14.55)	16.85 (16.78-16.92)	19.86 (19.78-19.94)

Year	APH		MMH	
	Self-referral ASR (95% CI)	External Professional ASR (95% CI)	Self-referral ASR (95% CI)	External Professional ASR (95% CI)
1998	11.85 (11.72-11.98)	42.08 (41.61-42.55)	64.40 (63.78-65.02)	4.65 (4.61-4.69)
1999	12.03 (11.90-12.16)	46.20 (45.69-46.71)	42.08 (41.68-42.48)	33.63 (33.31-33.95)
2000	12.24 (12.11-12.37)	42.24 (41.78-42.70)	44.84 (44.42-45.26)	26.70 (26.45-26.95)
2001	12.43 (12.30-12.56)	43.08 (42.62-43.54)	43.09 (42.70-43.48)	24.70 (24.48-24.92)
2002	23.83 (23.58-24.08)	29.33 (29.02-29.64)	43.01 (42.64-43.38)	24.44 (24.23-24.65)
2003	30.03 (29.71-30.35)	15.78 (15.61-15.95)	42.91 (42.55-43.27)	26.24 (26.02-26.46)
2004	34.94 (34.57-35.31)	17.91 (17.71-18.10)	43.76 (43.40-44.12)	24.72 (24.51-24.93)

MMH's Pacific Islander group (Table 4.9) had self-referral ASRs starting from 42.08/1000 to 44.82/1000 population (ranging from 52%-60% of the total admissions) during 1999-2004, higher ASR's than all other ethnic groups including the Pacific Islander group of APH. Contrary to MMH's experience, approximately 70% of APH's Pacific Islander patients were referred by external health professionals, with ASRs from 42.08-46.20/1000 population during 1998-2001. These external referral ASRs were higher than those for the Maori and European/Other groups of both the hospitals.

Given the above trends the expert panel members were asked to discuss possible reasons for them. Why, for example, did APH have significantly lower self-referral rates as compared to MMH in some years and vice versa in others? According to one of the MMH physicians, who has done some research at the CMDHB in a similar field to the present study and has generated very similar results, *'this was a reflection of the general practice not working effectively and hospital EC [Emergency Care] admitting patients who should be looked after by the general practitioner in the community'*. The other MMH physicians (n = 3) endorsed the study findings related to patient referral trends, and one of the physicians said, *'I can recall that patients referred by general practitioners and self-referrals were very similar or showed very little difference in their presentation'*.

In contrast, the APH's self-referral rates were only 12%-24% for all of the ethnic groups during 1998-2002, but during 2002-2004 self-referral rates started to increase while external professional referral rates started to decline. According to a nurse specialist from APH, *'this was the direct result of a change in the referral coding practice. The ED of the APH started to code all of the patients brought in by ambulance as self-referrals whereas previously these patients were coded as external health professional referrals'* [so all ambulance transported patients were being coded as self-referrals even when referred by their GPs]. One of the APH's physicians further supported the above by saying, that *'If the coding was not altered then I think the data would have continued to be the same (about 20% self-referrals). At present, 63% of all patients to the Assessment and Planning Unit at APH come via their GP and only 33% of the patients come via ED which includes self-referrals and ambulance cases'* [triage 1 and 2].

Finally, another APH physician discussed the possible reasons for the lower self-referral rates at APH compared to MMH's higher rates. These were possibly related to, *'a wealthy and*

more educated population, more general practitioners per head of population, more accident and emergency and emergency clinics. And possibly the ADHB population has better access to primary care because of there being more of it. While, most of MMH's physicians (n = 4) raised issues such as lack of after hour general practitioner services in the community, a nurse specialist from MMH, who has done some research related to medical admissions, commented that, *'a large proportion of the population was not registered with a health professional (general practitioner) in the community'*. And further concluded that due to the poor socioeconomic status of a large proportion of the population at MMH, *'free care at hospital is seen as an incentive and when people get sick they come to the hospital, even if they have to wait so be it.....'* The MMH panellists unanimously agreed that the 1998 high self-referral and low external professional referral rates were related to miscoding rather than reflecting the true situation. Patient experience outside New Zealand was also considered to be one of the influencing factors of the self-referral rates by some of the expert panellists from MMH. For example, a physician stated that, *'there are few private GP services in the Pacific Islands. Hospital is often the only facility and therefore people are more used to going to hospitals and that's what they do here too'*.

One of the MMH managers raised issues related to patient dissatisfaction with the primary health services by stating, *'there are a lot of patients who self profess that they have been to their GP on a couple of occasions and have not got the outcome they wanted – so it goes back to people's expectations. When they go to their GP they like to have a prescription and some tablets regardless of the diagnosis'*.

Almost all of the MMH physicians (n = 4), nurse specialists (n = 2) and managers (n = 2), endorsed the above views expressed to them by their patients coming to the hospital. For example one of the managers stated; *'the patients, who have been to their GP are quite right in their decision making to come to the hospital. Some of them particularly have not been handled well in the community. You got the different calibre of the GPs like any other profession. For other patients it's the trust and credibility they put in the public health system and the idea that if you go to the hospital you get everything done'*.

Overall, MMH had approximately 50% of the admissions coming from self-referrals as compared to APH where more than 75%-80% of the admissions came from external professional referrals. The APH European/Other groups had the lowest self-referral rates

while the MMH Pacific Islander groups had the highest. The ASRs also highlighted similar differences between hospitals and ethnic groups.

The expert panel identified some coding practice related issues, which influenced the results at both hospitals - specifically 1998 at MMH and 2002-2004 at APH. Other significant issues related to higher MMH self-referral rates were the ineffective general practice or lack of it, especially after hours, leading to much higher rates of self-referrals. The poorer socioeconomic status of the MMH population possibly encourages patients to directly go to the hospital. In contrast the APH panel experts indicated that there were more general practitioners per population in their area and therefore the patients have better access to GP services.

(4.5) Emergency Patient Triage Trends

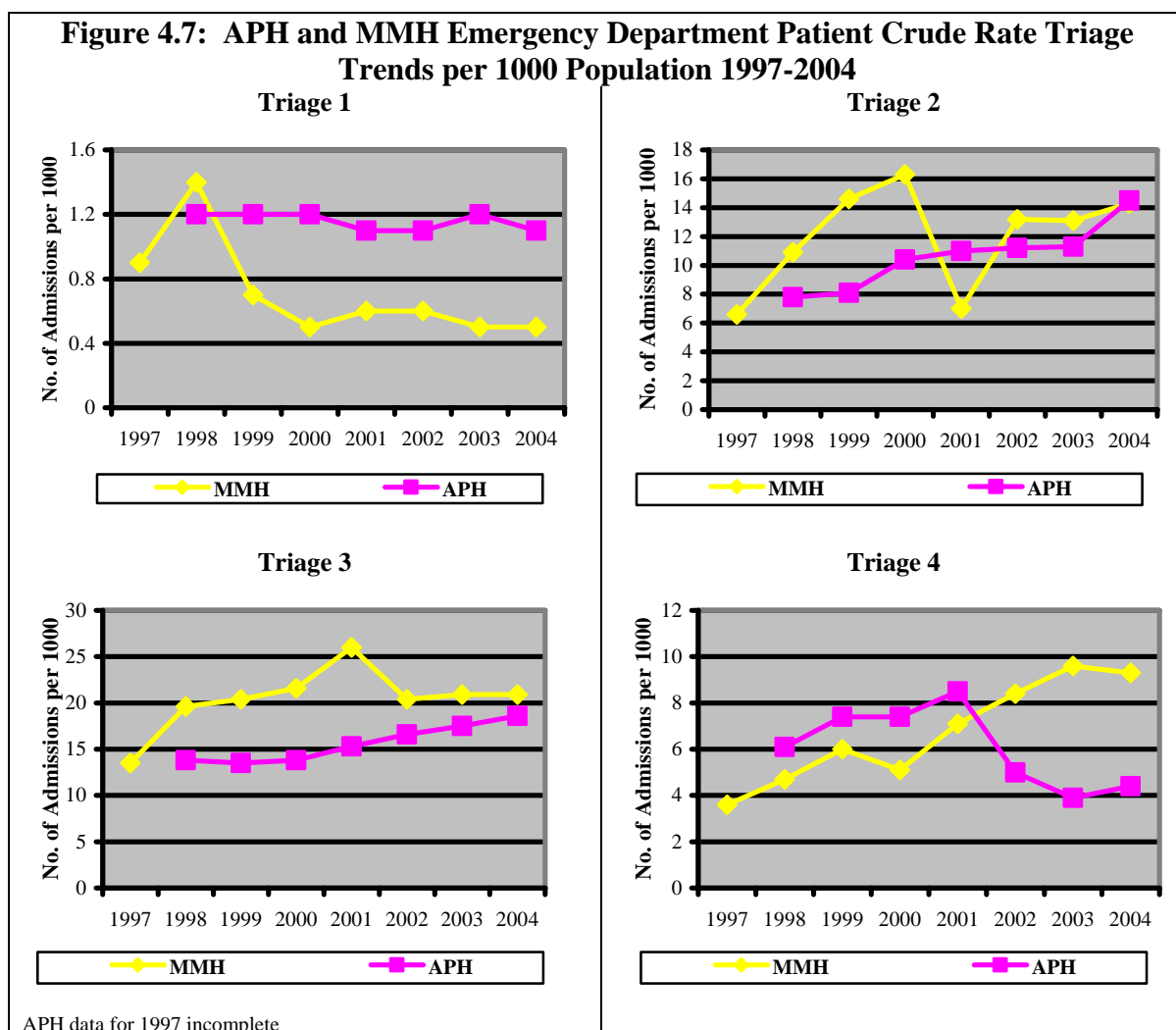
All acute medical patients admitted to both hospitals were being triaged by the nursing staff in the hospitals' emergency departments (ED). The Emergency Severity Index is a five-level (ED) triage algorithm that provides clinically relevant stratification of patients into five groups from 1 (most urgent) to 5 (least urgent) on the basis of acuity and resource needs. This scale uses numerical categories to represent five groups, based on the answer to the question "this patient deserves to wait for medical care no longer than:" immediate or most urgent (category 1), 10 minutes (category 2), 30 minutes (category 3), 1 hour (category 4) and 2 hours (category 5). The Australasian College for Emergency Medicine (1994) formalised this Emergency Severity Index (also known as the Australasian Triage Scale), which is commonly used in NZ public hospitals. Therefore the data related to the above triage categories were analysed to examine trends in patient acuity and severity on presentation to the ED (Figure 4.7). (Due to the large differences in the number of admissions per 1000 population, different y-axis scales have been used).

APH triage 1 crude rates per 1000 population remained relatively stable while MMH triage 1 rates showed a large decline from 1998 to become lower than APH's rates during 1999-2004. According to one of the APH managers, APH's higher triage 1 rates were likely to be related to the tertiary care role provided by APH to the Northern Region, resulting in more triage 1 patients to APH than MMH.

Triage 2 was the second largest category. Whereas APH crude admissions for this category increased from approximately 8/1000 to 15/1000 during 1998-2004, MMH crude admissions increased approximately 7/1000 to 16/1000 in 1997-2000, fell sharply to approximately 7/1000 in 2001, and then again increased to 13-14/1000 during 2002-2004.

The increase in triage 2 at APH was possibly related to the rise in chest pain patient admissions. These are patients who according to the chest pain pathway need to be seen within 10 minutes of their arrival time to ED and are therefore classed automatically as triage 2 patients. For example one of the APH physicians described the situation in the following manner, *'the main reason for the growth in the triage 2 was due to the large number of chest pains [CP]. We put all our CPs through ED, the reason being that they have the blood test and ECG done and if they look like having myocardial infarction, they are thrombolised and*

admitted for further care. If they are not [ED] diagnosed, then they are sent to the Assessment and Planning Unit for an exercise test and further diagnosis’.



Some MMH physicians (n = 2) raised the issue of managing chest pain patients through the GP services and nurse specialists in the community rather than admitting them to hospital. They felt that a large majority of these patients have a negative diagnosis and were thus seen as inappropriate admissions. Further discussion will be provided on this topic in a later section.

Triage 3 had the highest number of crude admissions of any triage category. The crude rates per 1000 population increased from approximately 14/1000 to 20/1000 for APH over the study period. Similarly, MMH’s crude rates increased from approximately 14/1000 to 20/1000 during 1997-1999 and then remained between 20-22/1000 except for 2001, when the crude rate jumped to 26/1000. As this was the same year MMH’s triage 2 rates showed a

similar rapid decline, these data would suggest a change in the triage coding practice during 2001. Overall, MMH has had slightly higher crude admission rates than APH for this triage category. However a MMH physician had some concerns regarding triage 3; *'.....as it could easily be coded as triage 2 or 4, ... may not reflect patient acuity, What we need is a better disposition tool, [to identify] whether the patients need to be in hospital or in the community'*. Another physician from MMH stated: *'The reason for triage 3 and 4 going up is most likely to be the elderly population presenting with multiple co-morbidities'*.

Similarly, the APH managers (n = 2) and physicians (n = 3) suggested that the increase in triage 3 was indicating that older members of the population with chronic disease were coming in with multiple co-morbidities. One of the physicians further explained that *'what this increase is showing is the large number of patients that are coming in with significant illness [chronic disorders] but not with a life threatening condition'*.

Triage 4 showed an interesting crude admission rate trend. APH's triage 4 admissions increased from approximately 6/1000 to 8/1000 population followed by a decline down to 4/1000 during 2002-2004. This trend was the opposite of that at MMH where the crude rate admissions increased from 4/1000 to 8/1000 population over the 8 year period. According to the APH managers (n = 2) triage 4 was declining and being handled by the primary health services. The MMH physicians (n = 4) were amazed at the increase in triage 4 admissions and they all agreed that other health professionals should treat these patients in the community.

After reviewing MMH's results related to triage 2, 3 and 4, one of the MMH managers said, that *'there was a lack of senior medical officer involvement in the Emergency Department and that as a result some of the patients in triage 3 and 4 categories were being admitted by the junior medical staff'*. While all four MMH physicians unanimously agreed with the sentiment that *'MMH has the largest ED in the Southern Hemisphere, and as a result attracts more admissions'*. These views were also supported by a manager who stated *'you build a big hospital, people will use it'*.

When it comes to managing patients at APH, both the hospital ED and medical doctors provided a gate keeping role. As stated by one of the managers; *'we have a very aggressive front-end policy'*. For example, if a patient was being referred to the hospital inappropriately

by the primary healthcare services, then physicians often communicated this back to the professional concerned, and *'this strategy appeared to have reduced the number of inappropriate referrals'* added a nurse specialist.

No graph for triage 5 is included in Figure 4.8 due to the very low numbers of admissions in this category at both hospitals. Crude admission rates were 0.1/1000 to 0.3/1000 during 1998-2004 for both hospitals. According to the physicians at both hospitals triage category five patients were being handled by private accident and emergency clinics and general practitioner services in the community. However in contradiction one of the MMH managers said, *'there were still a large number of triage 5 patients seen by the Emergency Care (EC) Department, but not admitted'*.

Overall, triage 2 and 3 were the leading triage categories and their admissions increased at both hospitals over the study period. Possible reasons for the increase in admissions for triage 2 were related to changes in the triage threshold for chest pain patients, while triage 3 increases were related to large numbers of older patients coming to hospital with serious but not life threatening illness. Triage 4 patient admissions increased at MMH, but declined at APH. This finding highlighted the differences in the size and management of the patients in the hospital EDs, and the availability or lack of primary care services.

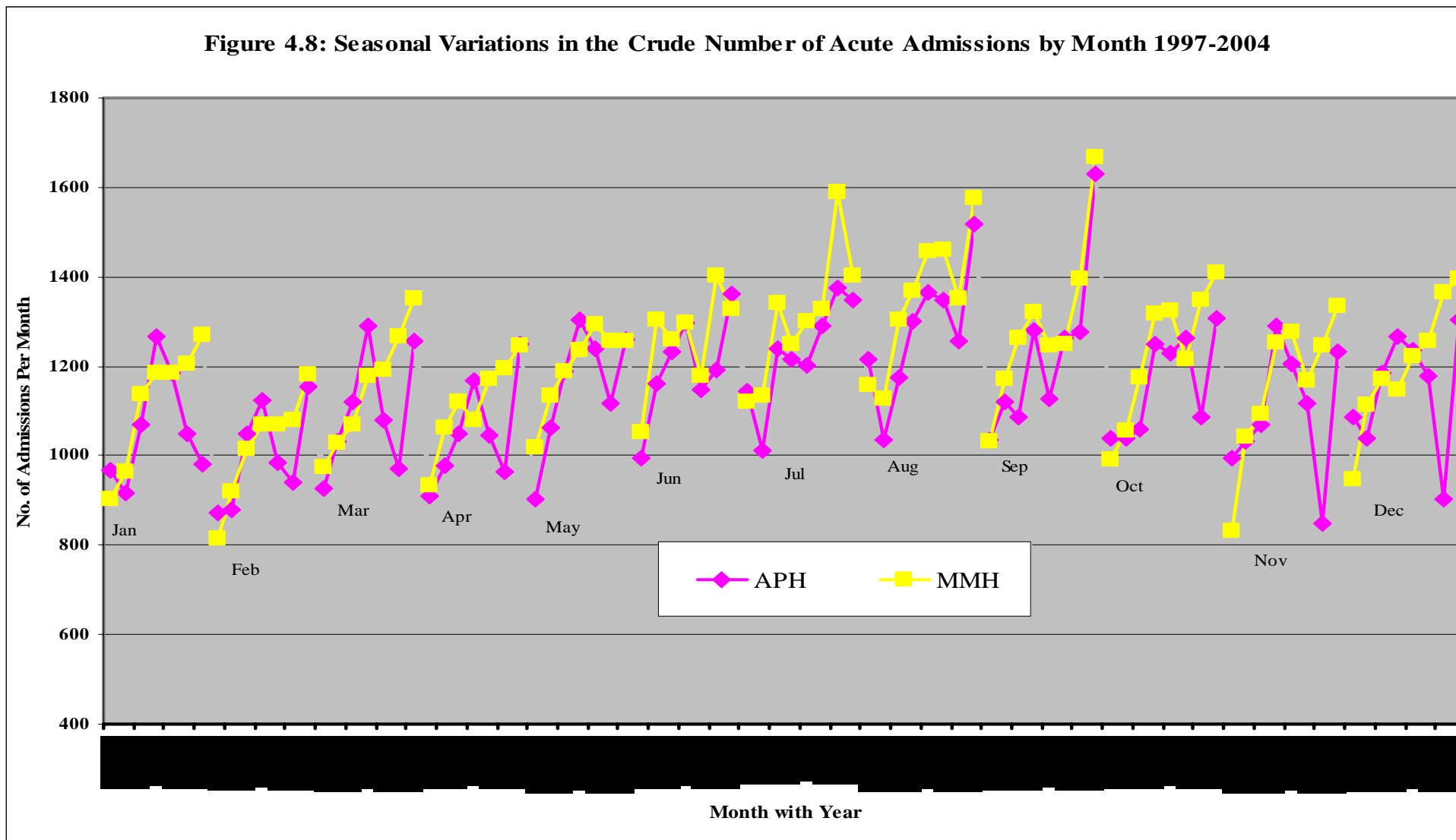
(4.6) Seasonal Acute Admission Trends

The similarities and differences between APH and MMH associated with winter and summer month admissions were analysed (Figure 4.8), with the crude numbers of acute admissions included in this part of the analysis. To highlight month-related trends the data on the graph is shown on a month-by-month basis, rather than chronologically. There appeared to be a high degree of congruence between the admission trends of the two hospitals. For the purpose of this analysis the term ‘warm months’ includes January, February, March, April, October, November and December. While the term ‘cool months’ includes May, June, July, August, and September. The warm months had the lowest number of admissions (lowest in February, closely followed by January) and the cool months June, July, and August had the highest number of admissions each month. Also of interest is that September 2004 had the highest number of admissions compared to any other month over the study period at both of the hospitals.

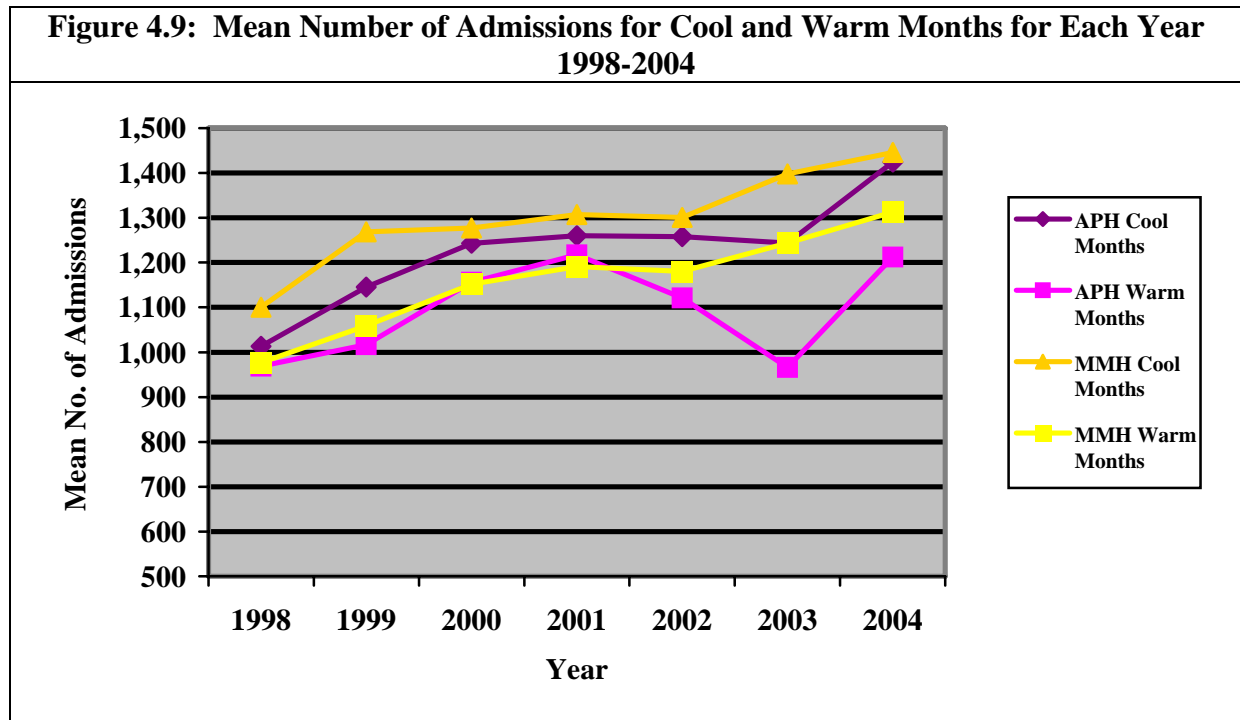
Managers, physicians and nurse specialists of both hospitals were asked for their opinions on the major reasons for the variations in warmer and colder month admission trends. All agreed that these variations were because of the impact of the winter season. And they used phrases such as, ‘*very cold month*’ and/or ‘*cold and prolonged winter*’. Another physician from APH, who supported the above statement by stating that, ‘*yes, I remember late last year [2004] we had a flu epidemic which resulted in a large number of admissions*’. This statement was borne out by the highest number of patients admitted during September 2004 at APH.

While, a nurse specialist from MMH, who works in the community as well as at the hospital, also raised issues around poor quality of housing and overcrowding, especially among the Pacific and Maori ethnic groups.

Figure 4.8: Seasonal Variations in the Crude Number of Acute Admissions by Month 1997-2004



The mean number of cool month admissions remained approximately 10%-13% higher than the warm months for MMH for most of the study period. Similarly, the mean number of cool month admissions for APH was also higher (approximately 4%-29%) than the warm month admissions but experienced greater variability. Overall, the crude numbers of admissions for cool and warm months increased for both hospitals. However, MMH had higher mean number of cool month admissions than APH.



As discussed previously in this chapter, APH experienced a significant decline in admissions during 2003. This was also the year, when APH had the lowest number ($n = 847$ in November 2003) of patients admitted for any month over the whole study period, coinciding with the hospital's move from Auckland Public Hospital to the newly opened hospital known as 'Auckland City Hospital'. This decline also went against MMH's 2003 admission trend, where the admissions either went up or remained the same compared to the previous years. Overall, January, February, March and April may be classed as the quietest months of the year, with June, July, August and September classed as the peak months. According to one of the APH managers, winter admissions used to generally peak in June, July and August, which however has now extended to Septembers too. Almost all of the physicians attributed the September 2004 winter peak to the colder weather and the changing weather pattern. Another nurse specialist from APH tried to explain the seasonal admission trends in the following way, 'lots of it is cyclical, and for example in winter 2003 a virus appeared which has

affected younger people rather than the older. Depends on weather, we also had a very mild winter and I know that the admissions from my patients are definitely down this year [2005]’.

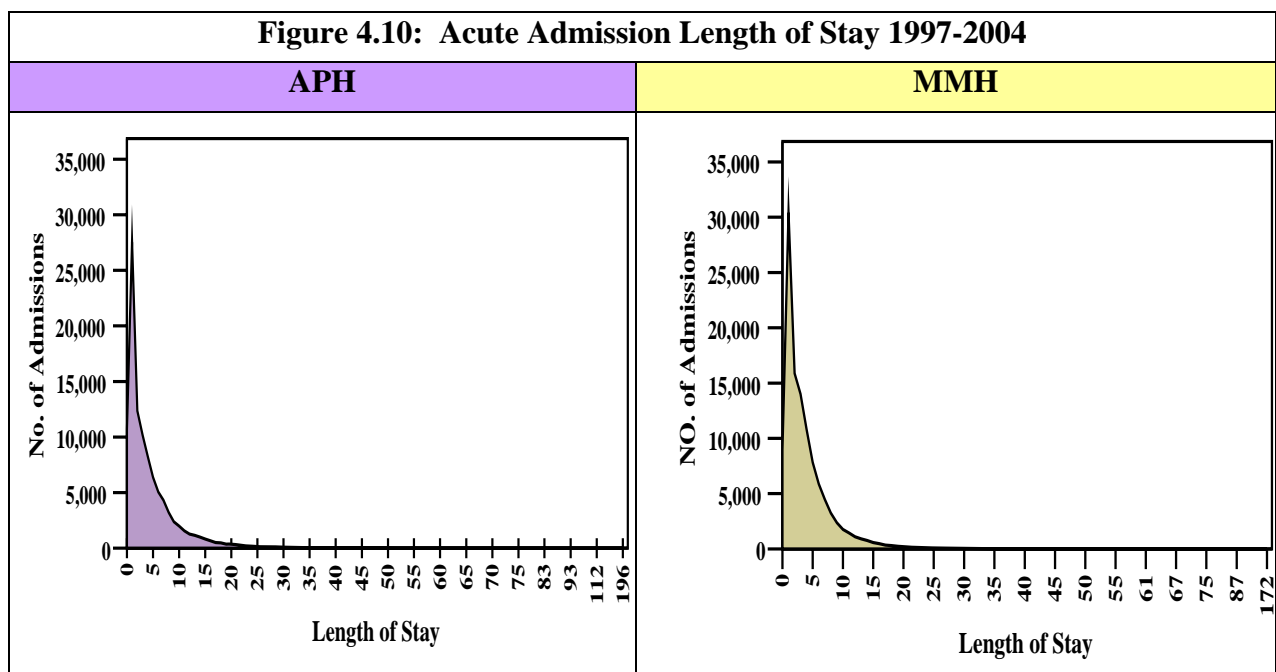
Both of the hospitals follow specific processes in order to better cope with the winter and summer fluctuations in admissions. MMH usually opens an extra ward to accommodate winter peaks. According to one of the managers, APH uses some of the surgical beds for medical patients, often at the cost of cancelling planned surgical admissions. Most of the managers, physicians and nurse specialists of both hospitals agreed, that generally there is a lot of pressure on hospital beds during winter and the bed occupancy rates can exceed 100%. As a result, all of the health professionals are encouraged not to delay the discharge of patients from hospital. An APH physician gave an example of strategies applied in clinical practice to vacate beds during winter; *‘I often make special visits to wards to speed up the discharge process... [in order]... to vacate beds for the newly arriving patients’.*

However Meng Cheong, General Manager Medical, Surgical and Cardiac services, who analysed bed management data at Auckland City Hospital, noted a pattern of slow inpatient discharges at weekends, and believed that the hospital had enough beds but that they were not being used as well as they could be (Saunders & Daley, 2004). This showed the differences of opinion on the efficiency of patient discharges and availability of beds. Both of the hospitals also provide transition lounge arrangements for patients waiting to be discharged or waiting for transport to take them home.

Overall, the cooler months of the year had higher crude and mean number of admissions than the warmer months of each year of the study period. Increased admissions in cool months were associated with cold winter weather according to the expert panellists. Generally, both hospitals experienced similar admission trends, except for 2003, when APH experienced a large decline due to the amalgamation of three hospitals to a new site.

(4.7) Length of Stay (LOS) Trends

Patient length of stay (LOS) has been used as a performance indicator and a benchmarking tool to measure performance at public hospitals in NZ. As a result, there has been significant emphasis on hospitals and health professionals to reduce patient LOS to as low a level as practical. Therefore the acute admission data (including out of zone patients) related to LOS at the hospitals is presented in the plots of Figure 4.11. The data has a very skewed distribution. Whereas the range of LOS values varied between 0 and 196 days for APH and between 0 and 172 days for MMH over the study period, the median LOS was only 3 days for each of the hospitals.



Due to the skewing of the data the mean and median values of the LOS data vary considerably. The mean LOS was 4.51 days for APH and 3.90 days for MMH. The patient LOS data was further explored and results are presented in Table 4.10.

Overall, APH's patient LOS ranged from 0 days (less than 1 day) to 196 days. The low median values highlighted that a significantly large number of patients (approximately 75%) were being discharged within the first 6 days of their hospital stay. The median LOS for APH stayed at 3 days for the first six years of the study, and then fell to 2 days for 2003 and 2004. An attempt was made to classify the data into quartiles by dividing the admissions into 4 equal groups. The interquartile range (IQR) for the first six years was 1-6 days, and then fell

to 1-5 days for 2003 and 2004. The 95th centile LOS value gradually declined from 17 days to 14 days over the study period.

Age Group	APH			MMH		
	Median LOS	IQR Days	95 th Centile	Median LOS	IQR Days	95 th Centile
1997	3	1-6	17	3	1-6	13
1998	3	1-6	16	3	1-6	12
1999	3	1-6	16	2	1-5	12
2000	3	1-6	16	2	1-5	11
2001	3	1-6	15	3	1-5	12
2002	3	1-6	14	3	1-5	12
2003	2	1-5	14	3	1-5	12
2004	2	1-5	14	2	1-5	12

MMH's length of stay ranged from 0 to 172 days for the 8 year study period. MMH's median LOS for 1997/98 was 3 days (IQR of 1-6 days). The median LOS then declined to 2, rose again to 3, and then fell again to 2 days in 2004. The IQR remained at 1-5 days from 1999 through to 2004. The 95th centile LOS value which was 13 days in 1997 had fallen to 12 days by 2004. Overall, MMH had slightly lower LOS values than APH. The expert panel was asked what they or their organisation had done to reduce the LOS as highlighted in Table 4.10. Their responses are discussed and analysed in the following section.

The expert panel members of both hospitals appeared to measure their hospital's performance against the LOS. Physicians (n = 7) particularly made statements noting that their LOS has further declined during 2005 for various reasons. A number of physicians also raised their concerns related to the impact on doctors, nurses and allied health professionals of reduced LOS periods when combined with an increased actual number of admissions. According to the expert panel both hospitals have taken very similar measures to reduce the LOS. For example an APH physician stated, *'we have taken numerous measures starting from a purpose designed and built hospital to the establishment of clinical pathways and processes, to rapidly discharge the patients from hospital'*. MMH expert panel members gave very similar examples such as stated by a physician *'we have a well developed discharge planning process in place to discharge patients without delay'*. According to the managers, physicians and nurse specialists both hospitals rigorously screen patients to identify who could be discharged within less than 24-36 hours of hospital admission, and the patients who fall into this category tend to stay in short stay units rather than be admitted to a traditional ward

setting. These short stay units tend to have more frequent doctor visits to review the patients' health status, and are better equipped with more rapid access to diagnostics tests and treatment than other medical wards.

The opening of APH's assessment and planning unit (APU) appeared to have positively influenced the LOS as shown (Table 4.10), with the median LOS stay declining from 3 days to 2 days during 2003. In contrast MMH's move to the new ED building which has a Short Stay Unit attached and the closure of Medical Services' assessment and discharge unit (ADU) during 2000, appeared to have had a negative impact on the LOS for medical admissions. As a result, the median LOS increased from 2 days in 2000 to 3 days in 2001 and remained at that level until 2003. Further analysis of the data related to LOS of 0 days (same day discharge) and of 1 day (one night's stay at hospital and up to 47 hours) was carried out to examine the impact of these new services developed by both hospitals (see Figure 4.11).

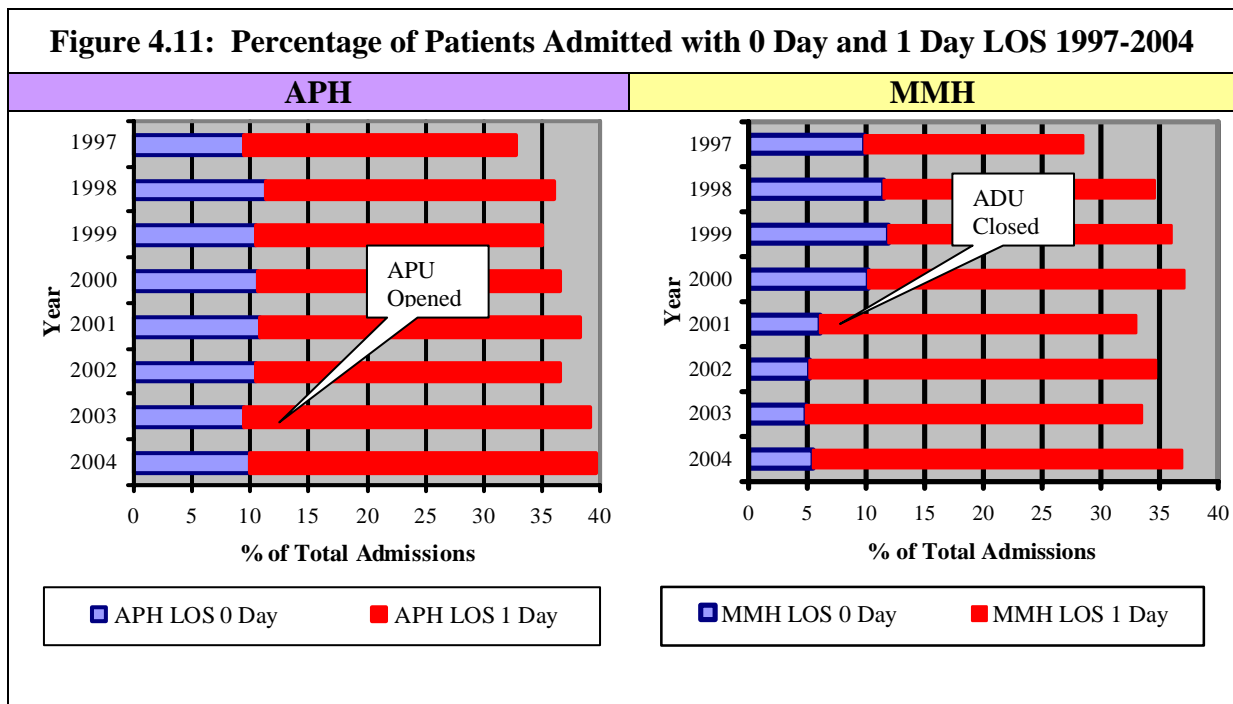


Figure 4.11 shows that MMH used to admit approximately 10%-12% of its total admissions for 0 days during 1997-2000. This was also the time when the ADU was operating. During this same period the percentage of patients staying for 1 day increased from approximately 18% to 27%. During 2001 the 0 day admissions declined to approximately 6%, and stayed around 5% up to 2004, while the 1 day admissions increased by 3% during 2001 and then a further 1.5% over the next 3 years. The decrease in 0 day stays was fairly closely matched by the increase in 1 day stays over the 2000-2002 period. Although the decline in 0 day

admissions in 2001 may be coincidental, it is interesting that the move to the new ED and the closure of the ADU occurred in 2000.

APH's 0 day LOS have remained approximately 10% throughout the study period and have not shown any significant variation. The percentage of 1 day LOS discharges have increased from approximately 23%-30% during 1997-2004. This may be related to the opening of the Assessment and Planning Unit, which has the capacity to admit and keep patients up to 36 hours in the unit.

It may be concluded that opening and closing of the assessment units has a strong influence on the overall LOS of medical admissions. Also it is of interest to note that there were some significant variations in the way in which these units were managed by both hospitals. For example APH's Assessment and Planning Unit had significant input into its administration from both Medical and Emergency Services. Whereas MMH's Short Stay Unit is largely managed and run by the Emergency Department, which has remained a point of contention between the ED and Medical Services. Most of the MMH panellist physicians want a separate assessment unit to manage the medical patients. For example a physician said, '*we would like to have a new facility similar to ADU, managed by the Medical Services for the medical patients*'.

(4.7.1) Relationship between Age and Length of Stay

The examination of relationship between patient age and LOS indicated increase in the LOS with age for both hospitals (Table 4.11). There were variations in the LOS between the age groups of each of the hospitals and also between hospitals. The median LOS and IQR values were shorter for the 15-24 and 25-34 age groups than for the 35-44 and 45-54 age groups of both hospitals. The MMH 35-44 age group had higher median LOS and lower IQR values than APH's equivalent group.

The 55-64 and 65-74 age groups had higher median LOS than the younger age groups, and lower median LOS than the older age groups. The oldest groups (75-84 and 85+) had the highest LOS and larger IQRs for both hospitals. The 95th centile values also increased with age, reflecting that older people stayed much longer at the hospitals. All APH 55+ age groups had a higher IQR range than did the comparable MMH groups.

Age Group	APH			MMH		
	Median LOS	IQR Days	95 th Centile	Median LOS	IQR Days	95 th Centile
15-24	1	1-3	8	1	1-3	8
25-34	1	1-3	9	1	1-3	8
35-44	1	1-4	10	2	1-3	9
45-54	2	1-4	12	2	1-4	10
55-64	3	1-6	15	3	1-5	12
65-74	3	1-7	16	3	1-6	13
75-84	4	1-8	18	4	1-7	14
85+	5	1-9	19	4	1-7	14

One of the APH physicians noted that the influence of the ageing population is evident, and impacts on the way in which health services are being managed. While one of the APH managers thought that there was a *'strong relationship between the availability of beds and the LOS'*. For example higher bed occupancy rates encourage health professionals to discharge patients efficiently to vacate beds for the incoming patients. At MMH physicians related the LOS to working practices such as clinical rosters and patient workload, with for example, one of the physicians commenting that *'the LOS has come down further due to changes in the physicians' roster at MMH in 2005'* which led to a more even workload throughout the week and improvement in the quality of care.

Two APH physicians thought that the high IQR for the 55+ age groups was possibly related to APH's tertiary service care role such as the neurological specialty. However, there is clearly a direct relationship between age and LOS according to Table 4.11. Some of the reasons for the longer or shorter LOS of different age groups and the two hospitals will be explored further in Chapter 5.

However one of the MMH managers, presenting an alternative view on the shorter LOS, thought it might not be related to the hospital's performance as claimed by some health professionals, but rather that, *'there is a lot of anecdotal evidence supporting that there are a lot of patients being admitted who should not be admitted in the first place, as a result the LOS has gone down'*.

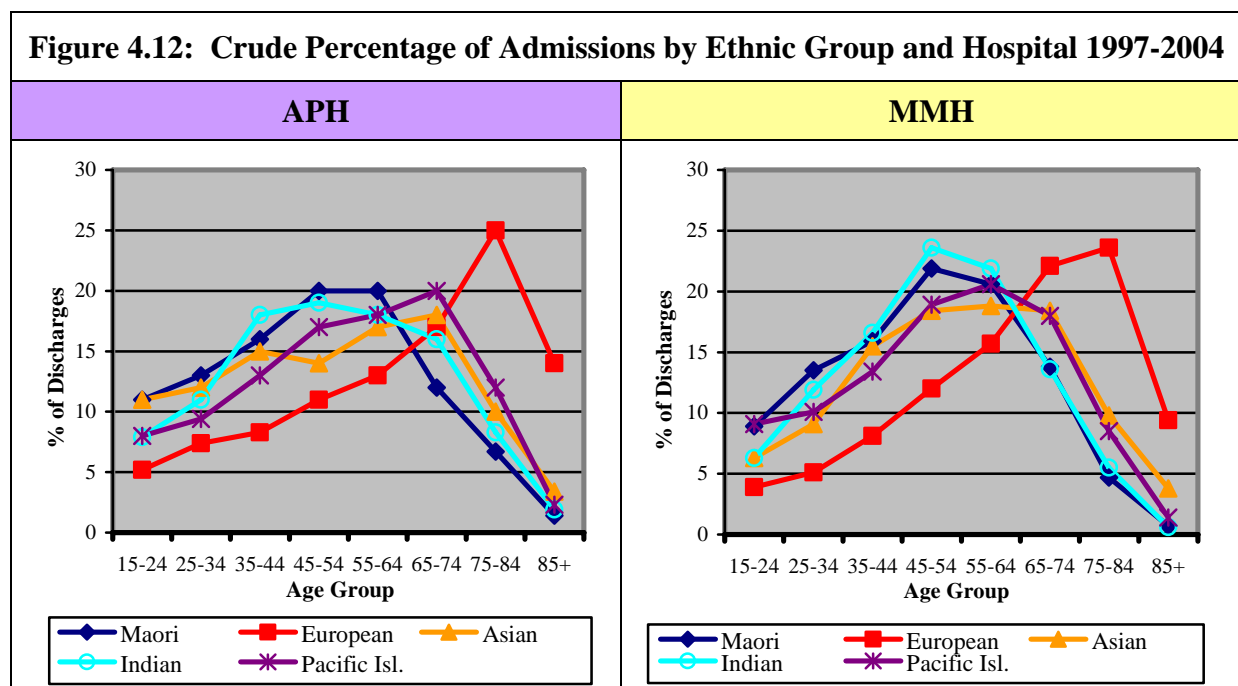
Overall, patient LOS has declined over the study period and was relatively similar at both hospitals. A large percentage of patients were discharged within 6 days of being admitted. However, the 95 centile LOS was higher at APH than at MMH, which is thought by panellists to have been related to the specialty services provided by APH to the Northern Region. Trends in reductions in LOS were related to the opening of the assessment units under the management of Medical Services. There was also a direct correlation between age and LOS. While reduced LOS is generally regarded positively, indicating an efficient use of resources, it was suggested it might also indicate inappropriate admissions.

(4.8) Ethnicity and Age at Admission

Analysis of data carried out to examine the similarities and differences in age at admission indicated that most of the ethnic groups had a relatively similar median age at admission to either hospital, except the European group, which had a markedly higher median age at admission (Table 4.12).

Ethnic Group	APH			MMH		
	Median	Mean	(95% CI)	Median	Mean	(95% CI)
Maori	50.0	49.2	(48.8-49.6)	50.0	49.0	(48.7-49.2)
European	68.0	63.2	(63.0-63.3)	69.0	64.3	(64.1-64.4)
Asian	53.0	52.2	(51.6-52.8)	59.0	56.4	(55.7-57.1)
Indian	51.5	51.4	(51.0-52.0)	52.0	51.2	(51.0-51.7)
Pacific Isl.	56.0	54.2	(53.9-54.6)	55.0	53.2	(53.0-53.4)

There was an approximate 18-19 years gap between the lowest median age (of the Maori group) and the highest median age (of the European/Other group). MMH's Asian ethnic group had a much higher median age (59 years) than APH's Asian group (53 years). Also noticeable was a 5 year difference between median and mean ages for the European group at each of the hospitals, highlighting the larger number of older age admissions in this ethnic group. Further differences in age between the ethnic groups are shown in Figure 4.12.



Further analysis of the data revealed that all of the ethnic groups have shown some increase in their median age over the 7 year period of the study (Table 4.13).

Ethnic Group	APH Median Age		MMH Median Age	
	1998	2004	1998	2004
Maori	48	53	50	52
European	67	69	67	70
Asian	47	55	53	61
Indian	50	54	53	53
Pacific Islander	56	58	54	55

However this increase has not been consistent in both of the hospitals and across all of the ethnic groups. The Asian group's median age has increased by 8 years for both of the hospitals. At the same time, the Maori ethnic group's median age at admission increased by only 5 years at APH and 2 years at MMH.

The expert panel was asked to comment on the median and mean ages of the different ethnic groups. One of the APH physicians commenting on these age variations said, *'the difference in the age is dramatic, which is just astounding'*. A MMH physician supported the above by stating: *'Still there was a striking difference between the Europeans and other ethnic groups, but not unexpected'*. The Pacific Islanders' higher median age, compared to that of Maori and Indian groups at both hospitals, surprised most of the study participants, as it went against their expectations. One of the APH physicians summed-up the differences between the Maori and Pacific Islander groups in the following manner, *'I think without being rude the Pacific people look after themselves better compared to the Maori. They also have a strong input from their families and religion which is being helpful'*. While, a number of physicians (n = 4) from both hospitals suggested that the main reason for the younger age admissions for the Indian and Asian groups was likely to be related to, *'the young immigrant population'*.

(4.9) Chapter Conclusions

Results show a dramatic increase in total medical admissions in both hospitals over an 8 year period, with the largest proportion by far being acute medical admissions. Over the study period the increases in crude AMAs at both hospitals were significantly higher than the corresponding population increases. However MMH's AMA increase was considerably higher (approximately 51% over the 8 year period), than APH's increase (approximately 32% over the 7 year period). The ASRs also showed significant differences in the admission rates of the two hospitals. The increase in the crude percentage of 75+ age group admissions and the decline in the <55 age group admissions highlighted the impact of an ageing population on AMAs. The expert panellists identified the ageing population as one of the key reasons for the increase in admissions.

Findings highlighted large variations in the self-referral rates of the two hospitals. On average approximately 50% of MMHs total admissions came from self-referrals to hospital ED, compared to only 20%-25% at APH. The differences were related by panellists to what GP services were offered in the community, to socioeconomic status of the population, and to patient preference for using hospital services or dissatisfaction with GP services. Triage 2 and 3 were the leading and growing categories of admissions at both hospitals, indicating an increasing severity of disease. Continuing increases in triage 4 admissions at MMH, in contrast to declining numbers at APH, highlighted the inadequacy of primary care in the MMH region. A very small variation between hospitals and in trends may be explained by coding practices, however.

Although the crude number of admissions increased for each month of the year during the study period, the seasonal variations highlighted that cool months have a higher number of admissions compared with warm months. Expert panel members also highlighted the relationship between admission peaks and cool months.

Hospital LOS has declined and the trends were similar at both hospitals. The reasons for the decline in LOS were related to the development of purpose designed buildings, the implementation of patient management processes specifically targeting LOS, and the reduction in hospital beds. The development of short stay units managed by Medical Services was also related to a decline in LOS. Ageing was related to longer LOS, with the 55+ age

groups at APH having slightly longer LOS than the equivalent MMH groups. However all of the age groups at both hospitals experienced decreases in LOS over the study period.

One of the major reasons for the increase in AMAs was the ageing of the population. Other reasons for the increase and the variations in the admission rates of the hospitals and their ethnic groups were related to socioeconomic variations between the two hospital populations; access to community and GP services, especially after hours in the community; and the higher prevalence of disease among some ethnic groups. The expert panellists also identified issues related to the quality of gate keeping service provided by hospital EDs, differences in the purposely built EDs of the hospitals, and the management of short stay units. A reduction in hospital beds, a campaign to encourage the public to use GP services in the community, and an aggressive front door policy at APH, were strongly associated with reductions in admissions, while the opening of a large ED at MMH encouraged more admissions.

Finally, it is concluded that MMH and all of its ethnic groups had significantly higher admission rates than equivalent APH groups. There was an 18-19 year gap between the median age at admission of the Maori patients and the higher median age of the European/Other patients, highlighting significant differences between the morbidity patterns of the ethnic groups. These differences were striking, and variations between the two hospitals, with the marked differences in socioeconomic and demographic characteristics of their respective populations, highlight the importance of such factors on acute admissions.

The findings presented in this chapter are discussed in Chapter 7. The following two chapters further analyze acute medical admission data by examining first the impact of morbidity, and then of socioeconomic and ethnic characteristics.

Chapter 5

Findings: Acute Admission Trends by Morbidity 1998-2004

(5.0) Introduction

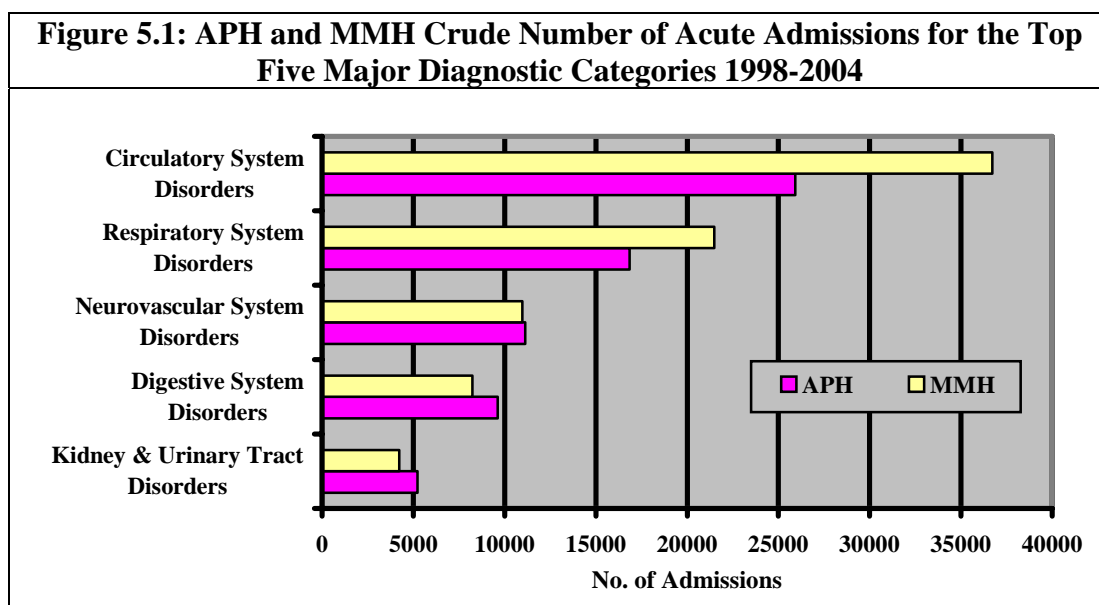
Having established total and acute medical admission (AMA) trends to APH and MMH over the study period in the previous chapter, the focus of this chapter is on identifying and evaluating some of the specific major diagnostic categories (MDCs) and related diagnostic group (DRG) categories contributing significantly to the rise in AMAs.

In the first part (5.1) of this chapter on acute admission trends by morbidity, the top five MDCs contributing significantly to admissions are identified. Then each of these MDCs and its leading DRG categories (disorders/conditions) are further analysed in relation to hospitals and their ethnic and age groups. The issues raised by these findings are further explored and discussed at the end of each section, in relation to the qualitative data of the expert panel opinions. Finally in 5.7 the chapter ends with a summary of the chapter's key findings.

The admission rates of the two hospitals and the ethnic groups were compared for each MDC using age-standardised rates (ASRs) and age-specific rates per 1000 population. The patients not residing in the hospitals' catchment areas were excluded to make true comparisons and remove their confounding effects on the outcomes. Patients admitted under arranged and waiting list categories were also excluded as the main focus of this chapter was related to trends in AMAs. Due to the incomplete APH data for 1997, only findings based on the 1998-2004 data are presented in this chapter.

(5.1) Acute Admission Trends by Morbidity

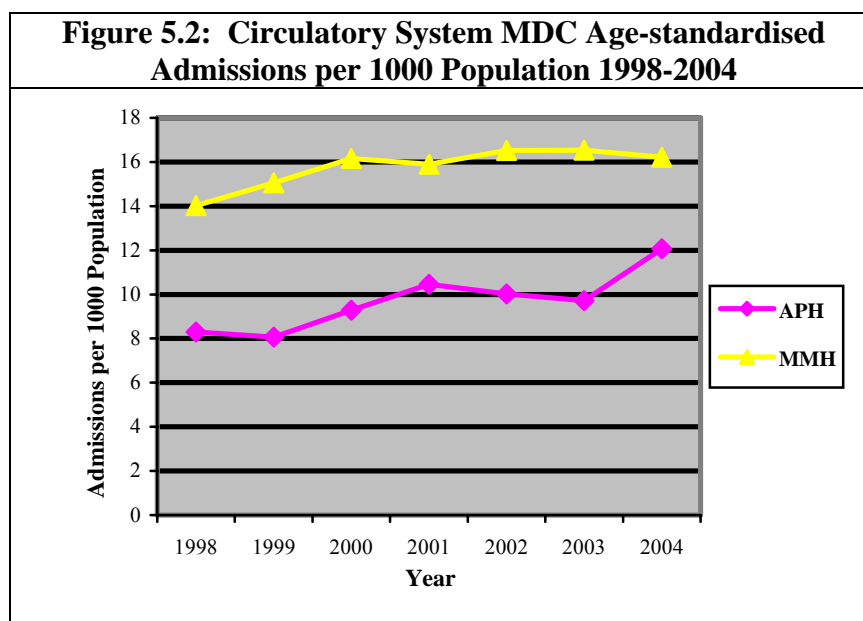
The principal diagnosis data for the crude AMAs, were categorised into MDCs in phase 1 of the project (as discussed in the Methodology, Chapter 3). Analysis of this data identified the following top five MDCs, contributing between 70% and 80% of the total number of AMAs each year for APH and MMH respectively (Figure 5.1).



Circulatory system disorders were the leading cause of admissions to both of the hospitals and accounted for 36% of MMH's and 27% of APH's AMAs during 1998-2004. Similarly, respiratory system disorders were the second leading cause of admissions for both of the hospitals. The other three top MDCs were the neurovascular system disorders, the digestive system disorders and the kidney & urinary tract related disorders. Thus results related to each of the top five MDCs, and the leading DRG categories associated with each, are presented in the following five sections.

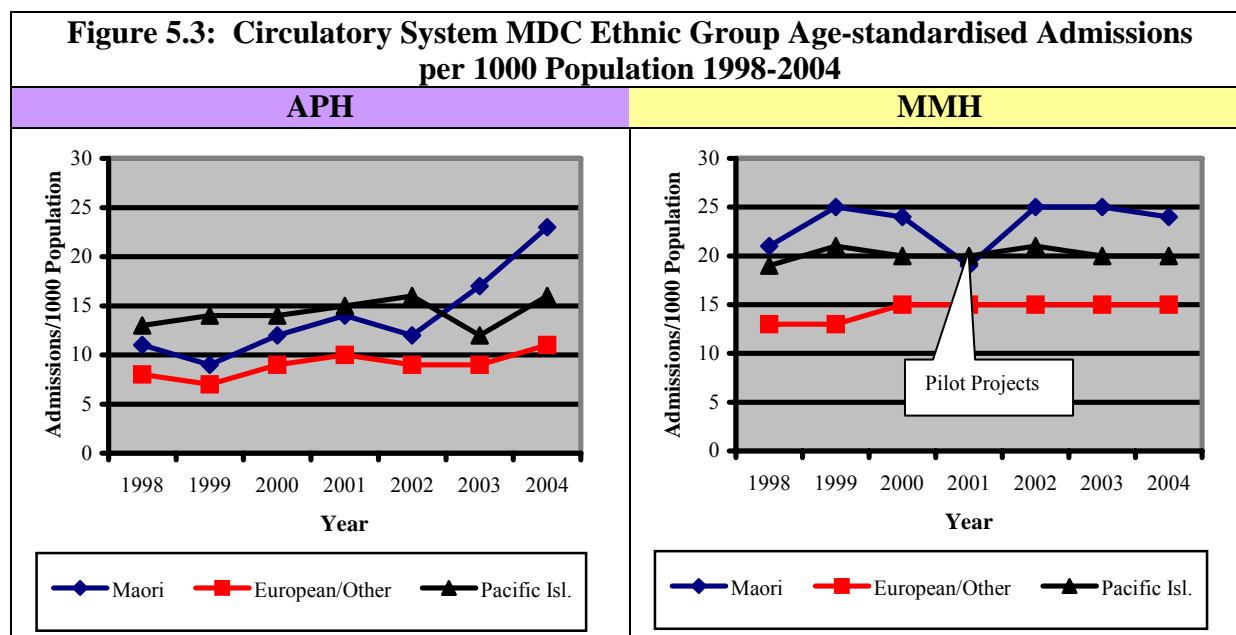
(5.2) Circulatory System MDC Admission Trends

Overall, circulatory disorders were the leading cause of hospital admissions for both of the hospitals, constituting approximately 34%-37% and 25%-32% of the AMAs over the study period at MMH and APH respectively. The age-standardised rates (ASRs) showed a steady increase in the circulatory system MDC admissions/1000 population during 1998-2004 for each hospital (Figure 5.2). The crude number of admissions has increased from approximately 37% (n = 2,500) to over n = 4,000 per year for APH and approximately 40% (n = 3,700) to over n = 5,200 for MMH during the study period. The MMH population had significantly higher age-standardised circulatory admission rates ranging from 14.02/1000 to 16.54/1000 (95% CI 13.97-14.08 to 16.48-16.59) during 1998-2004 than the APH population, which had rates of 8.06/1000 to 12.07/1000 (95% CI 8.03-8.08 to 12.03-12.11) over the same period.



The age-specific trends analysis indicates that the circulatory system disorder admission rates increased rapidly for the 65+ year age groups of both hospitals. MMH had much higher age-specific rates than APH, and the rates increased significantly from younger to older age groups. For example, in the 65-74 age groups, MMH's age-specific rates ranged from 43-49/1000 compared to APH's rates of 26-34/1000 each year. Similarly, the 75-84 age groups' admission rates were 74-91/1000 for MMH and only 48-75/1000 for APH. The oldest age group accounted for even higher admission rates (79-134/1000 and 60-99/1000 for MMH and APH respectively).

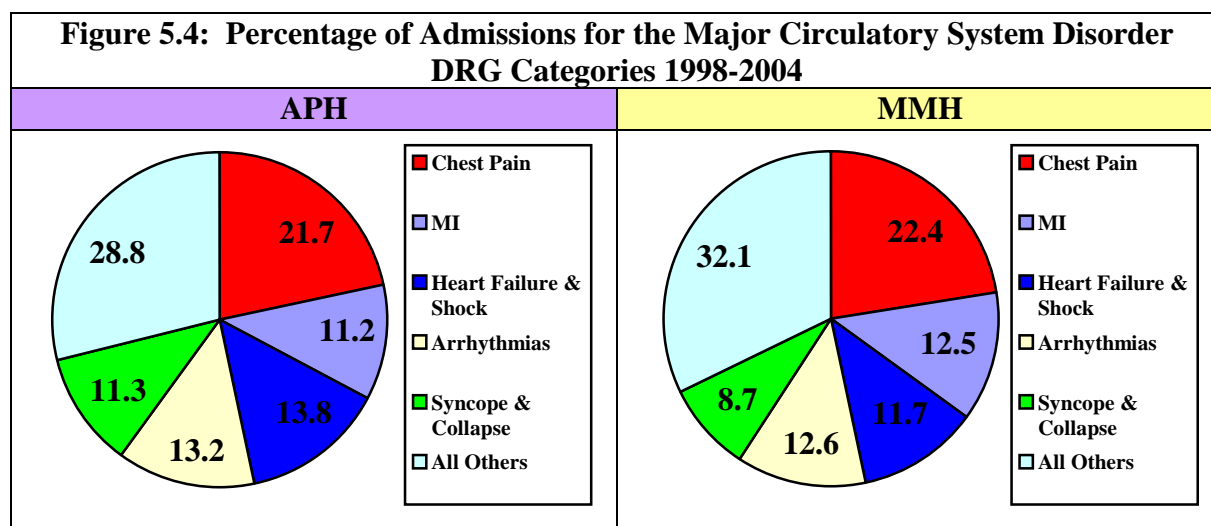
Further, ethnic group circulatory ASRs per 1000 showed that MMH had relatively stable and statistically higher admission rates/1000 for all of the ethnic groups compared to APH (Figure 5.3). MMH's Maori ethnic group admissions have remained 21.15-25.13/1000 (95% CI 20.94-31.36 to 24.89-25.37) during 1998-2004, except for the year 2001 when the admission rate declined to 19/1000. In contrast APH's Maori group admission rates have increased from 9.09/1000 to 23.30/1000 (95% CI 8.97-9.20 to 23.01-23.60) during 1999-2004.



MMH's Pacific Islander group had the second highest ASRs 19.09/1000 to 20.95/1000 (95% CI 18.91-19.28 to 20.77-21.13) over the study period, which were 4-8/1000 age-standardised admissions higher than for APH's Pacific Islander group. Similarly, MMH's European/Other group also had stable and much higher ASRs 12.55-14.91/1000 (95% CI 12.50-12.61 to 14.84-14.97) during 1998-2004, than APH's European/Other group 7.49-11.22/1000 (95% CI 7.46-7.52 to 11.18-11.26). MMH's European/Other group ASRs were also higher during 1998-2002 than for APH's Maori group. There was no overlap between the 95% CIs of MMH's ethnic groups as compared to APH's equivalent ethnic groups, which indicated that MMH's admission rates were statistically higher than APH's.

Data were also analysed to investigate whether circulatory admissions had any significant differences in median age at admission compared to the total admission trends. Overall, for all ethnic groups at both hospitals, the median age for circulatory admissions was higher by 2 to 4 years than the median age for AMAs. Exceptions were MMH's Pacific Islander group for which the two median age values remained the same, and MMH's Asian group for which the circulatory admission median age was higher by 8 years.

Further analysis of the circulatory system DRGs revealed that there were five specific DRG categories that played a significant role in circulatory admissions (Figure 5.4). These specific DRG categories were chest pain (CP), myocardial infarction (MI), heart failure (HF) & shock, arrhythmias, and syncope & collapse. (Refer to Appendix 6 for information on specific DRGs).

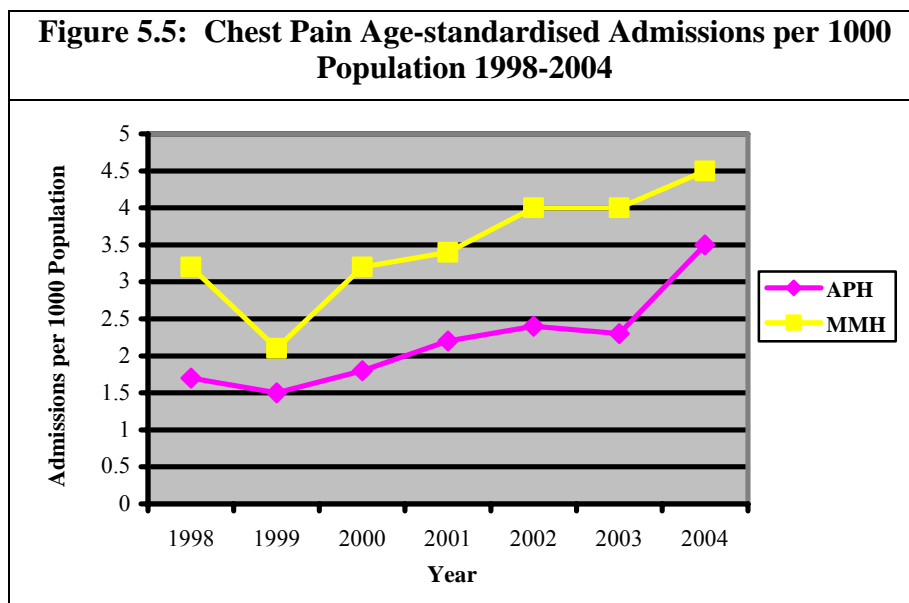


Chest pain was the leading cause of circulatory admissions to both hospitals. For APH heart failure & shock was the second leading cause of admissions, closely followed by arrhythmias. On the other hand, arrhythmias and myocardial infarction admissions were the 2nd and 3rd causes of admissions for MMH. For APH myocardial infarction and syncope & collapse DRG category rates were relatively similar and both contributed significantly to the overall number of circulatory system disorder admissions. Whereas for MMH heart failure & shock, and syncope & collapse were the 4th and 5th leading causes of the circulatory admissions. Further trend analysis of each of the DRG admissions categories was carried out and the results are presented in the following section.

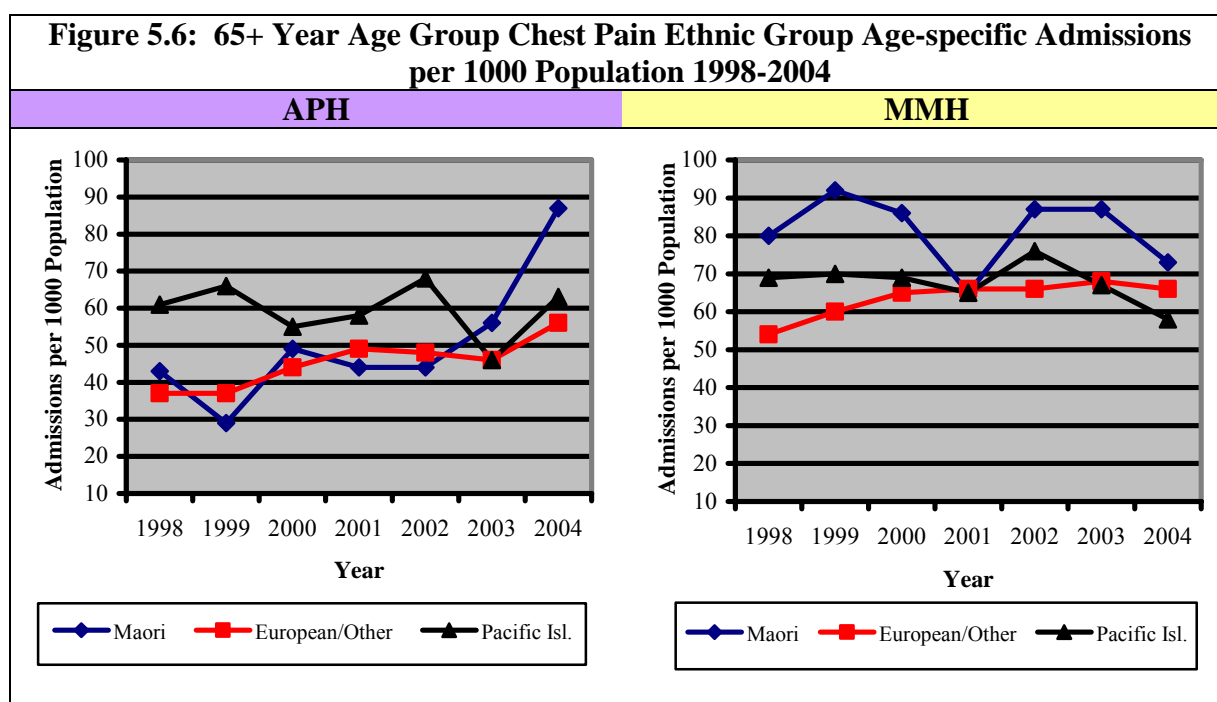
(5.2.1) Chest Pain (CP)

As highlighted in Figure 5.5, the CP admissions have continued to grow each year from 1999 to 2004, although the 1999 figure was lower than 1998 at both hospitals. MMH's age-standardised admission rates increased from 2.08/1000 to 4.47/1000 (95% CI 2.07-2.09 to 4.45-4.49) during 1999-2004. Similarly, APH's admission rates also increased from 1.53/1000 to 3.48/1000 (95% CI 1.52-1.54 to 3.47-3.49), but remained lower than MMH's

rates. APH's rate grew rapidly between 2003 and 2004. The mean length of stay (LOS) in hospital for the APH admissions was 1.4 days (95% CI 1.35-1.43). MMH also had a very similar mean LOS of 1.5 days (95% CI 1.42-1.61).



The CP admission trends indicated that the majority of admissions came from the 65+ age groups of both hospitals. MMH had higher 65+ age-specific admission rates/1000 population for all of the ethnic groups than APH, except for the age-specific admission rates in 2004, when both the Maori and Pacific Islander groups of APH were higher than for MMH (Figure 5.6).



MMH's Maori group had the highest age-specific admission rates of any other ethnic group. The APH CP DRG category admissions remained below 70/1000 throughout the study period except for the Maori ethnic group, which exceeded this for 2004. APH's European/Other groups of both hospitals have also shown a steady increase in admissions/1000 population. Despite the steady increase in APH's CP category admissions, MMH's age-specific admission rates/1000 population have remained considerably higher. MMH's Maori group experienced a significant but temporary decline in CP admissions during 2001.

(5.2.2) Myocardial Infarction (MI)

Myocardial infarction was also one of the top five DRG categories contributing to overall circulatory admissions. ASRs/1000 population related to MI are presented in Table 5.1.

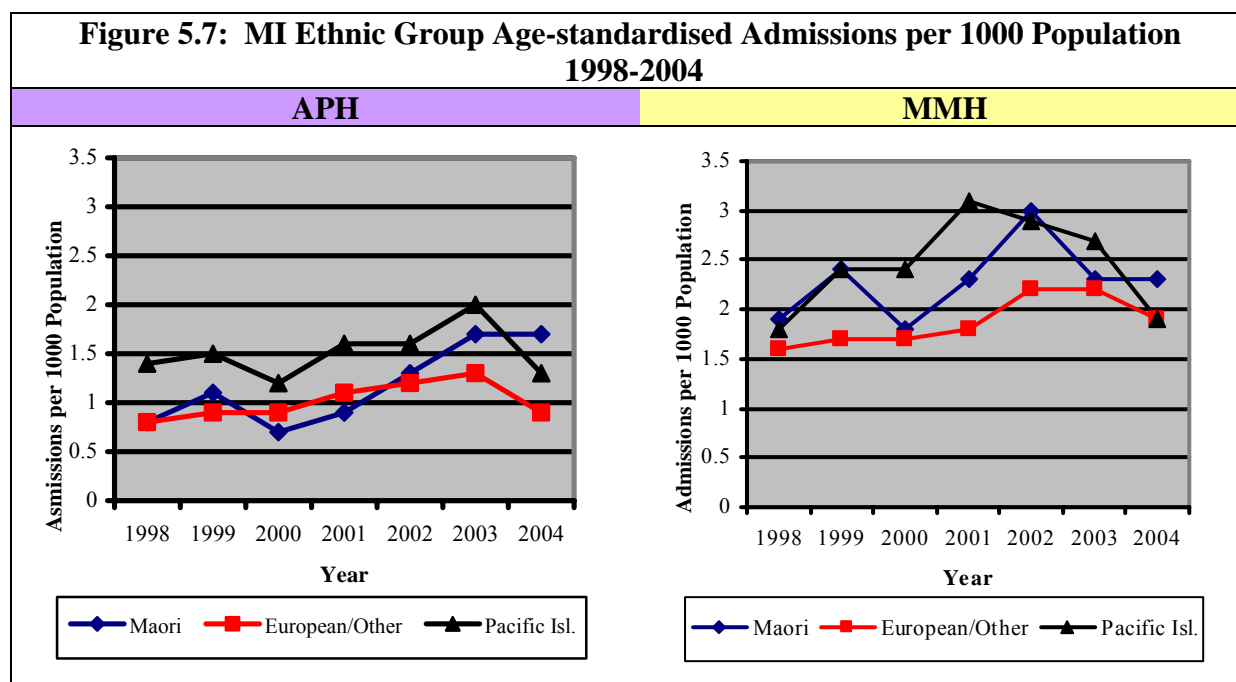
Hospital		1998	1999	2000	2001	2002	2003	2004
APH	ASR (95% CI)	0.83 (0.83-0.84)	0.98 (0.98-0.98)	0.89 (0.89-0.90)	1.14 (1.14-1.15)	1.29 (1.29-1.30)	1.40 (1.39-1.40)	0.96 (0.96-0.97)
MMH	ASR (95% CI)	1.62 (1.62-1.63)	1.86 (1.85-1.86)	1.80 (1.79-1.81)	1.95 (1.94-1.96)	2.40 (2.39-2.41)	2.26 (2.25-2.26)	1.97 (1.96-1.98)

APH's MI results illustrated a steady increase in ASRs during 1998-2003 followed by a decline in 2004. The MI admission trends for MMH may have peaked during 2002 and have started to decline. The results also exhibit MMH's relatively higher ASRs/1000 population compared to APH's.

As shown in Figure 5.7 all of the ethnic groups of MMH have higher age-standardised admissions than the APH groups. All of the ethnic groups of APH experienced some increase in admission rates during 1998-2003 followed by a decline in 2004. In both hospitals, MI ASRs declined during the last 1-2 years of the study.

MMH's European/Other group showed significant age-specific increases in MI admissions per 1000 population. For example the 75-84 age group admissions increased from 12/1000 in 1998 to 17/1000 population in 2002 and then declined to 13/1000 over 2003/04, while the 85+ group had even higher age-specific admission rates, peaking to 27/1000 in 2003. Similarly, the age-specific admissions for APH's 75-84 European/Other age group only increased from

3/1000 to 10/1000 during 1998-2003, while the rate for the European/Other 85+ age group increased from 4/1000 to 18/1000 population during 1998-2004.



The median age for MI admissions showed significant differences between the ethnic groups. Overall, the Maori patients had the lowest median ages (55 years at APH and 57 years at MMH), the Pacific Islander ethnic groups' median age was 61-62 years for both of the hospitals, and the European/Other group had the highest median ages (76 at APH and 72 at MMH) over the study period. This highlighted a 15 to 21 year median age gap between the Maori and the European/Other ethnic groups. Overall, the Pacific Islander and Maori ethnic groups of MMH had higher age-standardised rates per 1000 population than the other ethnic groups but it was not possible to derive meaningful results related to specific age groups due to the small sample size for each age group.

(5.2.3) Heart Failure (HF) & Shock

The HF & shock DRGs were other significant contributors to the major circulatory disorders category, with relatively similar admission trends to the MI and CP ones. Again, MMH had much higher HF & shock ASRs 1.56-2.13/1000 (95% CI 1.55-1.56 to 2.13-2.14) population compared to APH 1.04-1.26/1000 (95% CI 1.04-1.04 to 1.25-1.26). Table 5.2 further highlights the significant differences between the ethnic groups and hospitals.

The MMH Maori ethnic group's ASRs per 1000 population were higher than for the other groups. Admissions have also continued to increase for APH's Maori group to match that of MMH in 2004. The Pacific Islander group ASRs of both hospitals were also relatively high, in some years even exceeding those of the Maori groups.

Hospital Ethnic Group	1998	1999	2000	2001	2002	2003	2004
APH Maori ASR (95% CI)	3.18 (3.14-3.22)	2.61 (2.58-2.65)	2.42 (2.39-2.45)	2.98 (2.94-3.02)	3.52 (3.48-3.57)	3.69 (3.64-3.74)	5.47 (5.40-5.54)
MMH Maori ASR (95% CI)	5.36 (5.30-5.41)	6.24 (6.18-6.30)	5.45 (5.40-5.50)	3.29 (3.26-3.32)	4.78 (4.74-4.83)	5.45 (5.40-5.50)	5.54 (5.49-5.59)
APH European /Other ASR (95% CI)	1.05 (1.04-1.05)	0.98 (0.98-0.99)	0.99 (0.98-0.99)	1.08 (1.08-1.09)	1.06 (1.06-1.07)	0.97 (0.97-0.98)	1.12 (1.11-1.12)
MMH European /Other ASR (95% CI)	1.28 (1.28-1.29)	1.29 (1.28-1.29)	1.14 (1.14-1.15)	1.24 (1.23-1.24)	1.17 (1.16-1.17)	1.56 (1.55-1.56)	1.41 (1.40-1.41)
APH Pacific Isl. ASR (95% CI)	2.82 (2.79-2.85)	3.76 (3.72-3.80)	2.94 (2.91-2.97)	2.67 (2.64-2.70)	3.14 (3.10-3.17)	2.01 (1.99-2.03)	2.69 (2.66-2.72)
MMH Pacific Isl. ASR (95% CI)	4.57 (4.53-4.61)	4.72 (4.68-4.77)	2.53 (2.50-2.55)	3.64 (3.61-3.68)	4.07 (4.03-4.10)	3.73 (3.70-3.77)	3.34 (3.31-3.37)

The European/Other groups' HF & shock ASRs per 1000 population have remained stable, but MMH's European/Other group had slightly higher rates than APH's. For the older age groups the rates increased significantly. At MMH the annual age-specific admission rates for the 85+ European/Other group ranged from 19-36/1000, and at APH the corresponding group had slightly lower (but still high) rates in the 12-25/1000 range.

The data analysis related to age-specific admission rates/1000 population revealed that the MMH Maori ethnic group's HF & shock admission rates peaked at a much younger age, with the age-specific rates per year for the 55-64 age group ranging 6-13/1000, and 9-31/1000 for the 65-74 age group. In comparison, the European/Other ethnic groups' admissions peaked in older age groups (9-14/1000 for the 75-84 age group, and 19-36/1000 for the 85+ age group) over the study period. For the Pacific Islander admissions the age groups with peak admissions were in-between the age groups of the other two ethnic groups, and age-specific rates ranged from 8-19/1000 for the 65-74 age group, and from 13-41/1000 for the 75-84 age group. Overall all of the MMH ethnic groups had slightly higher age-specific rates/1000 population than the corresponding APH ethnic groups.

(5.2.4) Heart Arrhythmias

The major diagnostic category of heart arrhythmias included both major and non-major heart arrhythmia DRGs. Overall, the data analysis indicated that the heart arrhythmia patients were younger compared to the MI patients, with very few admissions in the 85+ age group category for either of these groups. Again the ASRs revealed that MMH had stable but higher rates of admission per 1000 population than APH (Table 5.3).

Hospital		1998	1999	2000	2001	2002	2003	2004
APH	ASR (95% CI)	1.07 (1.06-1.07)	0.90 (0.90-0.90)	1.40 (1.40-1.41)	1.42 (1.41-1.42)	1.39 (1.38-1.39)	1.26 (1.26-1.27)	1.54 (1.54-1.55)
MMH	ASR (95% CI)	1.70 (1.69-1.71)	2.09 (2.08-2.10)	2.06 (2.05-2.07)	1.91 (1.90-1.92)	1.97 (1.96-1.98)	2.03 (2.02-2.04)	2.10 (2.09-2.11)

The ASRs for MMH's Maori group increased from 2.86/1000 (95% CI 2.83-2.88) to 4.46/1000 (95% CI 4.42-4.51) during 1998-1999 and then declined to 2.60/1000 (95% CI 2.57-2.62) in 2004. The ASRs for the Maori group of APH were much lower, starting at 0.80/1000 (95% CI 0.79-0.81) at the beginning of the study and increasing to 3.31/1000 (95% CI 3.27-3.36) by 2004. Examination of the age-specific rates demonstrated that the 35-74 year Maori ethnic groups of both hospitals had the highest number of admissions for the heart arrhythmia DRG category (6-9/1000 for APH and 8-13/1000 for MMH).

Similarly, for the Pacific Islander groups of both hospitals the 65-74 age groups again had the highest number of admissions for the heart arrhythmia DRG category each year from 1998 to 2004. And the age-specific range was higher (5-13/1000) for the MMH group than for the APH group (5-10/1000). MMH's Pacific Islander group had the second highest ASRs (range 1.9-3.1/1000) after the Maori groups of both hospitals. The age-specific rates for 75-84 age groups have increased significantly and were higher (range 5-24/1000) than those for the 65-74 age groups, but as the sample size was relatively small it was not possible to draw reliable conclusions.

The peak admission numbers for the European/Other ethnic groups of both hospitals were for the 75-84 age groups. However their ranges of age-specific admission rates varied

significantly, from MMH's range of 9-13/1000, to APH's of 6-9/1000 admissions. The 85+ age groups at both hospitals had even higher age-specific rates ranging from 8-15/1000.

(5.2.5) Syncope & Collapse

The crude number of admissions has continued to increase for the syncope & collapse with or without catastrophic or severe continuing care DRGs. The syncope & collapse admissions increased by 70% for APH and 63% for MMH between 1998 and 2004. Overall MMH groups had slightly higher ASRs than APH groups (Table 5.4).

Hospital		1998	1999	2000	2001	2002	2003	2004
APH	ASR (95% CI)	0.83 (0.83-0.83)	0.79 (0.79-0.80)	1.14 (1.13-1.14)	1.17 (1.16-1.17)	1.16 (1.16-1.17)	1.17 (1.17-1.17)	1.23 (1.23-1.23)
MMH	ASR (95% CI)	1.05 (1.05-1.05)	1.09 (1.09-1.09)	1.43 (1.42-1.44)	1.67 (1.66-1.68)	1.59 (1.58-1.60)	1.66 (1.65-1.67)	1.49 (1.48-1.50)

The MMH age-specific admission rates have increased from 8-13/1000 and 13-22/1000 for the 75-84 and 85+ age groups respectively over the study period. The equivalent APH groups' age-specific rates were slightly lower (7-11/1000 and 10-15/1000 for the 75-84 and 85+ age groups respectively). The age-specific rates for the different ethnic groups have not been calculated due to the small sample sizes.

Other DRGs such as hypertension, unstable angina, valvular disorders, and vein thrombosis have also continued to contribute to overall circulatory system admissions. These DRGs have not been analysed further due to the small number of admissions involved, but they were included in the general discussion on circulatory disorders.

(5.2.6) Expert Panel Opinions Related to Circulatory System Disorder Trends

In order to interpret the above trends in the context of delivering health services to populations, the circulatory system disorder findings were explained to the expert panel who were asked to comment on the overall identified trends. The panel was also asked to comment on the trends related to the ethnic groups of their hospital.

Overall, all panel members indicated that the statistical data agreed with their impressions that circulatory system disorders were the leading cause of medical admissions to their hospital. The increase in the CP DRGs received most attention by them. The common themes raised by the panel were related to changes in the admission threshold, medical management, public expectations and ageing population of patients with CP over the past 10 years. For example, one of the APH physicians suggested that, *‘the rise in chest pain admissions was probably a good thing, but from the service provision point of view may not be ideal. However we should have a low threshold for admitting people who might have ischemic heart disease. Of course it would be even better to have a low threshold for assessing people and not to admit them, but we have to admit patients otherwise the hospital does not get much money – its true, there are perverse incentives’*. As the hospitals were being funded by DRG and number of admissions, it was in their financial interest to admit patients seen at the hospital, even if they did not really require a hospital admission. While, in the case of non-DRG funding or bulk funding, emphasis is on meeting the contractual requirements, rather than attracting funding through the number of admissions.

A number of physicians (n= 7) from both hospitals were astonished by the CP admission findings (Figure 5.5), but suggested a number of possible reasons for the ongoing increase in the number of CP admissions. For example one of the APH physicians commented, *‘Yes, we argue that the threshold for admitting has changed for CP for some ethnic groups. We are also admitting more people due to enhanced access to hospital services’*. A MMH manager supported the above explanations for the rise in CP admissions, and further added, *‘it might be that more people and health professionals are more aware of CP and its implications. Therefore more people are coming in with CPs and as a result experiencing less number of MIs. This could be called better management and screening, or ”worried well” ’*.

The low mean length of stay (LOS) of 1.4-1.5 days also indicated that most of the CP admissions were likely to have negative cardiac diagnostic tests. Managers from both hospitals (n =2 from MMH and n = 1 from APH) and physicians (n = 2) from MMH supported this explanation. An APH manager responded, *‘CP was the leading DRG which also included patients with non-cardiac chest pain. Partly, this might be considered defensive medicine as a large number of non-cardiac chest pain patients are also screened for cardiac chest pain’*. However an APH physician believed that, *‘they might be doing more negative cardiac diagnostic tests, but it was still nice to say to someone that some cardiac tests had*

been done and it was not cardiac pain, which would be considered therapeutic from a patient's point of view'.

Another APH manager, whose view was supported by a nurse specialist, expressed great concern at the increase in CP admissions and raised some questions about the CP admission increase from 2003 to 2004, *'It showed up in all 20 top DRGs in Medical Services including infectious diseases, which is very interesting, however our Clinical Directors don't believe it. It is likely that patients admitted for non-cardiac chest pain are getting wrapped-up into the cardiac chest pain admissions. Another explanation could be more Emergency Room type of television programmes heightening an awareness of CP dangers, and as a result more people are coming to hospital'.* The above views were also shared by one of the MMH managers, who further explained that, *'there are a lot of patients who have non-cardiac CP but do get admitted under the low-risk chest pain pathway to medical wards for further screening and assessment.'*

Finally, almost all of the expert panel physicians and nurse specialists felt that the demand created by the ageing population, especially the 75+ age group, was having a major impact on the health services. Some MMH physicians (n = 4) wanted to have the CP patients managed by nurse specialists in the community, while others thought patients with chronic and multiple co-morbidities would be better managed by general physicians, not multiple specialists. One of the APH physicians summed up the present situation in the following way, *'there are only 30% general physicians in the hospital at present and 70% specialists. Most of the patients have multiple co-morbidities, and the specialists tend to have a narrow focus. Therefore more hands have to be involved in caring for a patient, which becomes time consuming'.* While a MMH physician believes that, *'if we are to re-design the health service then we must design a service that meets the needs of the elderly population, rather than meeting the needs of health professionals and service providers'.*

Myocardial infarction and heart failure & shock admission trends also received comments from expert panel members of both hospitals. Almost all agreed that from a practitioner's perspective the admission rates for these disorders appeared to have peaked and stabilised over the study period. One of the issues commonly raised was the importance of the role of heart failure specialist nurses in addressing the problem of multiple admissions. For example, one of the APH physicians stated, *'we have a nurse specialist, whose role is to case manage*

the high-risk heart failure patients both in hospital and in the community'. A MMH physician supported the above views by highlighting that, *'most of these patients have multiple co-morbidities, therefore are better managed by nurse specialists through case management supported by cardiologists (physicians) as not many GPs have the skills to manage these patients'*.

According to the expert panel physicians (n = 7) from both hospitals, MI admissions have largely remained stable with some minor fluctuations. The main reason for the stability of the MI admissions trends was best described by one of the APH physician; *'We admit more people with CP, and as a result the number of MIs have stabilised or even dropped – and this although the diagnostic criteria for MIs has been made much stricter, and we code more people with MIs than we did in the past. Then we used to call it unstable angina, but we now call it non-STEMI (non ST elevation MI)'*.

(5.2.7) Circulatory System Disorders – Conclusions

Overall, the crude number of circulatory admissions has increased over the study period for both hospitals. The ASRs at APH have also continued to increase, while in contrast the MMH ASRs appear to have stabilised, but at levels significantly higher than the APH ones. The MMH population had significantly higher ASRs for circulatory system disorders, ranging from 14.02/1000 to 16.21/1000 (95% CI 13.97-14.08 to 16.16-16.27), with APH population rates ranging only from 8.29/1000 to 12.07/1000 (95% CI 8.26-8.32 to 12.03-12.11) during 1998-2004. Similarly, MMH had much higher age-specific rates than APH and the rates increased significantly from younger to older age groups. Further analysis of the circulatory MDC indicated that there were five main DRG categories, which accounted for approximately 67% and 71% of the total MDC admissions for MMH and APH respectively. CP was one of the leading DRG categories of the circulatory system that alone accounted for approximately 22% of the total admissions to both hospitals. Overall MMH had significantly higher ASRs for all top five DRG categories compared to APH. The ethnic groups ASRs analysis indicated that Pacific Islander and Maori groups of MMH had the highest rates for almost all of the DRG categories. The European/Other group of MMH and Pacific Islander group of APH had the second highest ASRs for the circulatory system disorders during 1998-2002, (except for the HF & shock DRG category, where the Maori group of APH had higher ASRs than the European/Other group of MMH). The Maori and European/Other groups of

APH had the lowest ASRs. But the Maori circulatory system rates increased rapidly during 2003 and 2004, and as a result became comparable to MMH's Pacific Islander and Maori group rates.

Overall, the expert panel members agreed with the circulatory system findings of the study. Change in the admission threshold for CP admissions was identified as one of the key themes influencing the CP admission trends, while some of the panel members also raised the possibility of non-ischemic CP admissions influencing the findings. Some of the physicians related lowering of the CP threshold to possible reduction in MIs. The increase in CP admissions was also related to other factors, such as ageing population, and public and professional expectations. The expert panel further raised the role of specialists in the management of patients with multiple co-morbidities, such as using nursing case management in conjunction with hospital specialists to better manage patients with complex needs in the community.

(5.3) Respiratory System MDC Admission Trends

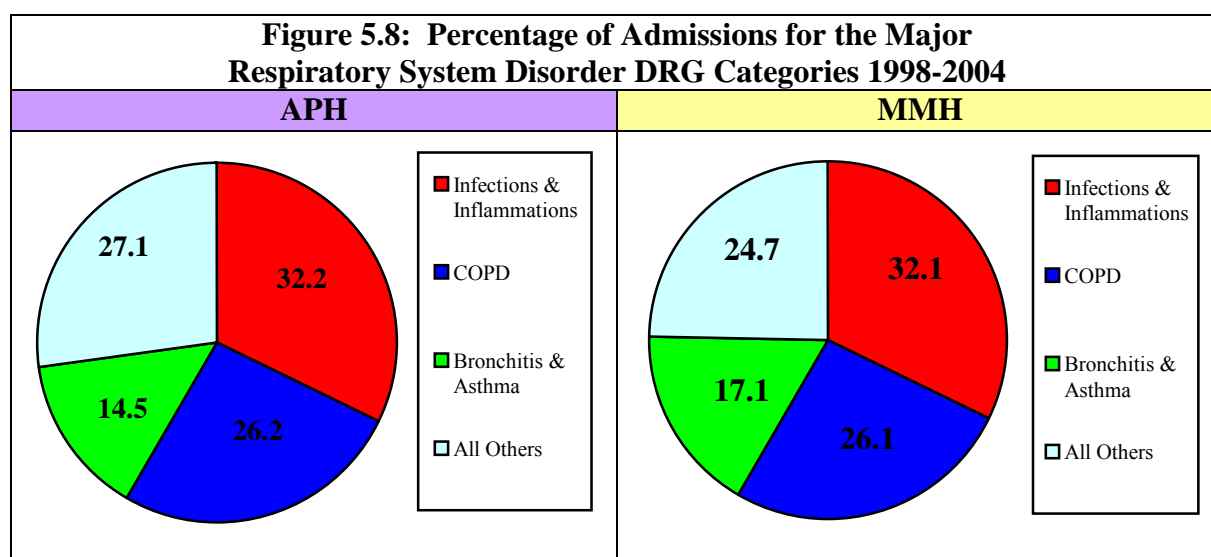
Respiratory disorders were the second major cause of patient admissions for both of the hospitals and accounted for 21% (n = 21,138) of MMH's and 19% (n = 15,755) of APH's total AMAs. The crude number of admissions has continued to increase for both of the hospitals. For example, the respiratory disorder admissions increased by 48% (n = 1,008) at MMH and 51.5% (n = 833) at APH from 1998-2004. However, the ASRs have remained relatively stable with some fluctuations since the 1999 peaks at both hospitals, while MMH consistently had statistically higher ASRs than APH (Table 5.5).

Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	5.20 (5.19-5.21)	7.02 (6.99-7.04)	6.45 (6.43-6.47)	6.95 (6.93-6.98)	5.87 (6.85-6.89)	6.19 (6.17-6.21)	7.14 (7.12-7.17)
MMH ASR (95% CI)	7.71 (7.69-7.74)	10.23 (10.19-10.27)	9.12 (9.09-9.16)	9.22 (9.18-9.25)	8.85 (8.82-8.89)	9.59 (9.56-9.63)	9.65 (9.62-9.68)

But, if 1998 is taken as the base year, then the ASRs have increased significantly. For example in 1998 APH had an ASR of 5.20/1000 compared to MMH's rate of 7.71/1000. Likewise, during 2004, APH's ASR was 7.14/1000 compared to MMH's of 9.65/1000. Similar differences remained between the two hospitals throughout the study period. Crude admission rates/1000 population were almost identical to the ASRs, highlighting that the two hospital populations with respiratory disorders were relatively similar in their age make-ups.

Analysis of the age-specific admission rates highlighted that overall respiratory disorder related admissions have either remained the same or declined for the <65 age groups and have increased for the 65+ age groups, and especially for the 85+ age groups. The age-specific admission rates between the two hospitals varied significantly. MMH's 75-84 and 85+ age group rates were 33-54/1000 and 34-68/1000 respectively. APH's age-specific rates for the same two age groups were much lower at 26-45/1000 and 32-49/1000 respectively.

There were three DRG categories identified in the analysis that contributed most significantly to overall respiratory admissions, namely respiratory infections & inflammations, chronic obstructive pulmonary disease (COPD), and bronchitis & asthma. (Refer to Appendix 6 for information on specific DRGs).



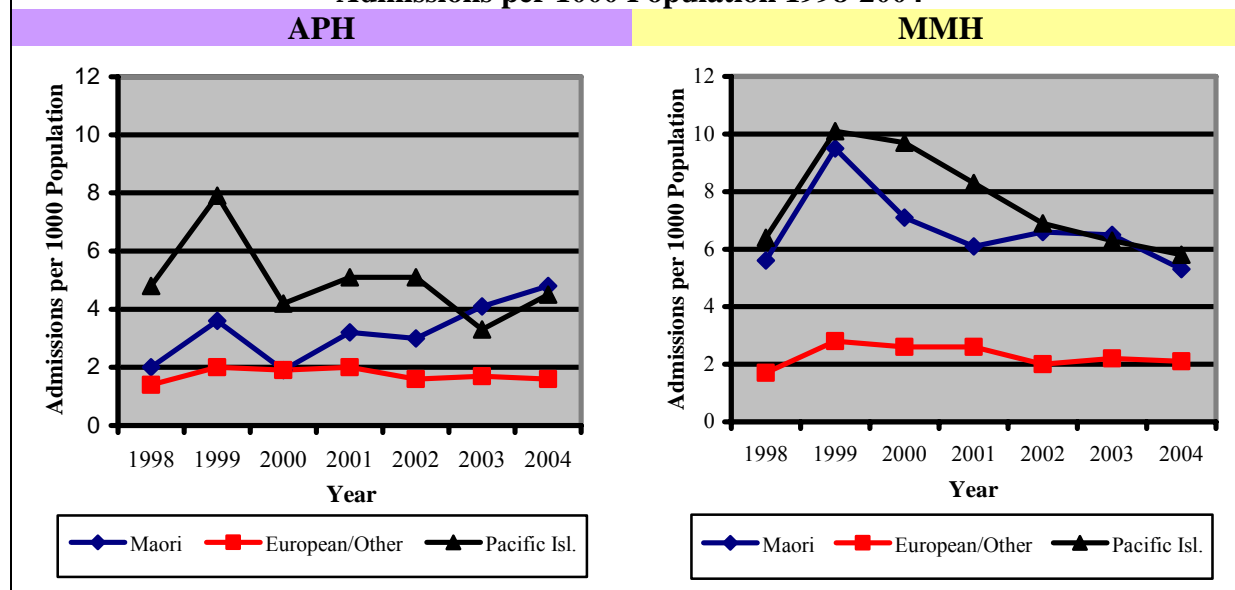
As shown in Figure 5.8 the top three respiratory DRG categories were responsible for causing >72% of the respiratory admissions. The infections & inflammations DRG category was the leading cause of respiratory related hospital admissions. Both hospitals had an almost identical percentage of admissions for the COPD DRG category, and also for the respiratory infections & inflammations DRG category. Results related to each of the three identified DRG categories are presented in the following sub-sections.

(5.3.1) Infections & Inflammations

Table 5.6: Infections & Inflammations Age-standardised Admissions per 1000 Population 1998-2004							
Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	1.65 (1.64-1.66)	2.45 (2.44-2.46)	2.06 (2.05-2.06)	2.32 (2.31-2.32)	1.91 (1.90-1.92)	1.89 (1.88-1.90)	1.93 (1.92-1.94)
MMH ASR (95% CI)	2.25 (2.24-2.26)	3.61 (3.60-3.62)	3.38 (3.37-3.39)	3.15 (3.14-3.16)	2.76 (2.75-2.77)	2.86 (2.85-2.87)	2.62 (2.61-2.63)

Respiratory infections & inflammations was the leading cause of respiratory admissions. Their ASRs peaked at both hospitals during 1999 (APH 2.45/1000, MMH 3.61/1000 population), and then declined to 1.93/1000 population for APH and 2.62/1000 for MMH by 2004. Overall MMH had higher ASRs than APH each year. The ASRs for each hospital's ethnic groups showed that between 1998 and 2004 the MMH Maori and Pacific Islander groups had significantly higher rates than the equivalent APH groups (Figure 5.9).

Figure 5.9: Respiratory Infections & Inflammations Ethnic Group Age-standardised Admissions per 1000 Population 1998-2004



At each hospital the Pacific Islander group had the highest ASRs for most of the study period. The MMH Pacific Islander group had the highest ASRs, followed closely by MMH's Maori group. The MMH Maori and Pacific Islander groups' ASRs have continued to decline after peaking to around 10/1000 in 1999. The APH Pacific Islander and Maori groups experienced a sharp decline in admissions after the 1999 peak. However APH's Maori admissions then rose again, and have continued to increase, which went against the trend experienced by other ethnic groups at either hospital. Overall, the European/Other groups of both hospitals had very similar admission trends with significantly lower ASRs compared to the Maori and Pacific Islander groups from their hospital as well as the other hospital.

The age-specific admission rates related to each hospital's ethnic groups showed some variations between the ethnic groups and hospitals. Generally, MMH had a higher rate of age-specific admissions compared to APH for each of the ethnic groups. The APH Maori ethnic group's age-specific rates for the 15-44 age groups remained 0.5-2/1000, whereas the corresponding MMH group had slightly higher age-specific admission rates ranging between 1/1000 and 4/1000 during 1998-2004. The age-specific admission rates/1000 population increased significantly for the 65+ year and older groups for both of the hospitals, with MMH's Maori group again having higher age-specific admission rates than APH. For example, the age-specific admission rates ranged from 13-30/1000 for MMH and from 3-15 for APH's Maori 65-74 age groups. The Maori 75-84 age groups' age-specific admissions

experienced major fluctuations (between 13-73/1000 for MMH and 7-50/1000 for APH), with some of these fluctuations are due to the small sample sizes.

The Pacific Islander group had very similar trends but much higher admission rates than the Maori group. The MMH Pacific Islander group had slightly higher age-specific admission rates than the APH group. For example, the 65-74 age group at MMH had an age-specific rate between 14-31/1000 as compared to APH between 8-23/1000. Similarly, MMH's 75-84 age group rate was 40-70/1000 compared to APH's of 24-43/1000. Pacific Islander 85+ age group admissions appeared to be growing rapidly over the study period and the age-specific admission rates increased from 23/1000 to more than 100/1000 for both of the hospitals. These figures should be interpreted with caution due to the very small sample sizes.

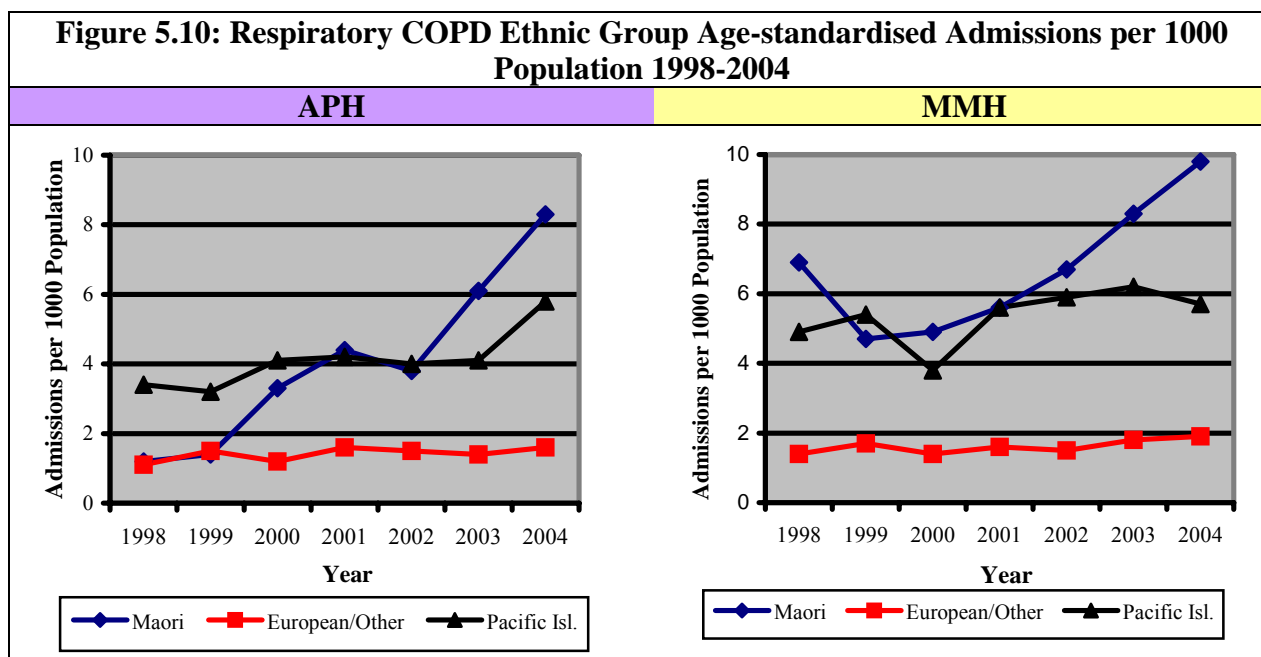
Overall the European/Other group's ASRs peaked during 1999-2001, and the admission rates slightly declined and stabilised between 2002 and 2004 for both of the hospitals. The European/Other ethnic groups at both hospitals had the lowest age-standardised and age-specific admission rates of all the ethnic groups for the infections & inflammations DRG category. The 15-54 age groups' age-specific admission rates remained around 1/1000 for both hospitals. The APH European/Other group had slightly lower age-specific rates than MMH's (1-2/1000 for the 55-64 age group and 4-8/1000 for the 65-74 age group). The age-specific rates for the 75-84 age groups remained largely between 10-15/1000 and 8-13/1000 for MMH and APH respectively. The 85+ age group had the highest age-specific admission rates of all the European/Other age groups. Age-specific rates were lower at APH, remaining mostly around 20-25/1000, compared to MMH's of 30-35/1000.

(5.3.2) Chronic Obstructive Pulmonary Disease (COPD)

The analysis of specific respiratory system disorder DRGs revealed that COPD was the second leading cause of respiratory related admissions for both of the hospitals (Table 5.7). Overall, the ASRs indicated that MMH had slightly higher rates than APH, with both hospitals continuing to experience increases in the COPD ASRs.

Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	1.27 (1.27-1.26)	1.59 (1.58-1.59)	1.46 (1.46-1.47)	1.85 (1.85-1.86)	1.75 (1.75-1.76)	1.71 (1.71-1.72)	2.10 (2.09-2.10)
MMH ASR (95% CI)	1.99 (1.98-2.00)	2.15 (2.15-2.16)	1.94 (1.93-1.95)	2.30 (2.29-2.31)	2.36 (2.36-2.37)	2.76 (2.75-2.77)	2.83 (2.82-2.83)

Findings related to ethnic groups indicated that the MMH Maori group had the highest ASRs ranging from 4.67/1000 (95% CI 4.62-4.72) to 9.82/1000 (95% CI 9.73-9.91) (Figure 5.10). This was closely followed by APH's Maori group, which showed a rapid increase in ASRs from 1.22/1000 to 8.26/1000 (95% CI 1.22-1.24 to 8.15-8.37) over the 7 year period.



Similarly the APH Pacific Islander group also experienced an increase in admissions 3.39/1000 to 5.81/1000 (95% CI 3.35-3.43 to 5.75-5.87). However MMH's Pacific Islander group had the second highest ASRs, which appear to have stabilised around 6/1000.

The MMH European/Other group had slightly higher ASRs than the APH group's, which ranged from 1.36/1000 to 1.88/1000 (95% CI 1.35-1.37 to 1.87-1.89), but these rates were significantly lower than those for the other ethnic groups at either hospital. The APH rates have largely remained stable while the MMH ASRs have shown some increase over the study period.

Age-specific admission trend analysis related to each ethnic group showed that the MMH Maori ethnic group admissions remained higher than the APH group's. The MMH 55-64 age group age-specific admissions increased from 11/1000 to 20/1000 during 1998-2004. However the equivalent APH group experienced a significant rise in admissions from 1/1000 to 17/1000 over the study period. The MMH Maori 65-74 age group admissions remained between 21-43/1000 with no definite up or downward trend. In contrast the APH 65-74 age

group's age-specific admission rate more than doubled from 8/1000 to 22/1000. When it comes to presenting the results related to the 75-84 age Maori groups, it appeared that the fluctuations due to the small sample size, the age-specific admission rates have continued to grow. The MMH group admission rates increased from 46/1000 to 91/1000 and the APH ones from 11/1000 to 79/1000 over the study period.

Generally the MMH Pacific Islander groups have higher rates of age-specific admissions than APH's Pacific Islander groups. For example, MMH's Pacific Islander 55-64 age group age-specific admission rates were between 5/1000 and 13/1000 compared to the APH equivalent group's whose rates increased only from 2 to 8/1000. On the other hand, MMH's Pacific Islander 65-74 age group experienced a decline in admission rates from 30-21/1000 as compared to the APH group whose rates either remained stable or increased from 19-30/1000 over the study period. APH's Pacific Islander 75-84 age group experienced a significant rise from 22 to 56/1000 in age-specific admissions, which was similar to the MMH group's of 32 to 58/1000. Overall, APH's Pacific Islander group admissions increased by 116% over the study period in comparison to 82% for the MMH group. There were very few or no admissions in the Maori and Pacific Islander 85+ age groups, possibly due to their shorter life expectancy.

At both hospitals the European/Other 55-64 groups' age-specific admission rates remained largely stable between 1-3/1000 and their younger age groups had less than one admission per 1000 population. The European/Other 65-74 age groups of both hospitals showed no significant change in admission rates, which remained around 8/1000. But for APH's 75-84 group the admission rate doubled from 8 to 16/1000 over the 7 year period. MMH's European/Other 75-84 age group remained at a slightly higher age-specific admission rate level (10 to 18/1000) for the same period. The MMH European/Other 85+ age group's age-specific admissions increased significantly from 6 to 14/1000 during 1998-2004. APH's 85+ age group also experienced a moderate increase from 5 to 10/1000. Finally MMH's European/Other group's admissions increased by 60% over the study period as compared to 49% for the APH group. The APH European/Other group showed the smallest increase in admissions.

Overall the COPD admissions have continued to increase especially for the Maori and Pacific Islander groups, and the crude numbers of admissions have also increased for all of the ethnic groups of both hospitals.

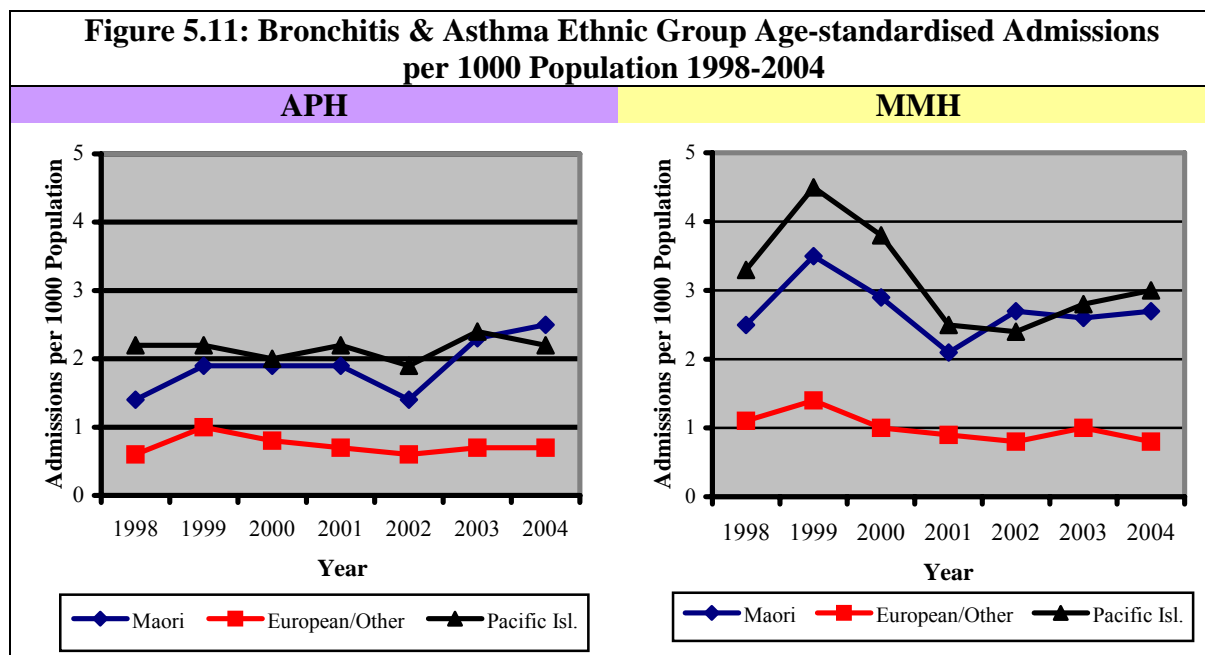
(5.3.3) Bronchitis & Asthma

The third major cause of respiratory admissions was bronchitis & asthma. Overall, the ASRs for bronchitis & asthma conditions have remained relatively stable for both hospitals (Table 5.8).

Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	0.80 (0.79-0.80)	1.14 (1.14-1.15)	0.97 (0.97-0.97)	0.93 (0.93-0.93)	0.78 (0.78-0.78)	0.92 (0.91-0.92)	0.93 (0.93-0.93)
MMH ASR (95% CI)	1.54 (1.53-1.55)	1.97 (1.96-1.98)	1.57 (1.57-1.583)	1.30 (1.30-1.31)	1.30 (1.29-1.30)	1.47 (1.46-1.47)	1.35 (1.34-1.35)

MMH experienced a rapid rise in bronchitis & asthma admissions during 1999. Since then the age-standardised rates have declined and stabilised. The crude number of admissions for all of MMH's ethnic groups has declined by $n = 123$ from the 1999 peak to 2004. APH also experienced a decline in crude admissions ($n = 27$) over the same period, however this decline was only related to the European/Other group, while the actual number of admissions increased for the Maori and Pacific Islander groups of APH over the study period.

MMH's Maori ethnic group had much higher age-standardised admission rates/1000 population than the Maori group of APH during 1998-2002 (Figure 5.11). However the MMH Maori group bronchitis & asthma admissions have continued to decline slowly. The APH Maori group ASRs increased to 2.51/1000 (95% CI 2.47-2.54) during 2004, which was relatively close to that for the MMH group at 2.68/1000 (95% CI 2.66-2.70).



MMH's Pacific Islander group had the highest ASRs compared to any other ethnic group, including the APH Pacific Islander group. The APH Pacific Islander group bronchitis & asthma admission rates have remained between 1.94 to 2.36/1000 (95% CI 1.92-1.96 to 2.34-2.38), whereas the MMH group admission rates continued to fluctuate and declined from 4.51/1000 (95% CI 4.47-4.55) in 1999 to 2.40/1000 (95% CI 2.38-2.42) during 2002 and then again increased to 2.96/1000 (95% CI 2.94-2.98) during 2004. Both of the hospitals' European/Other admission groups had relatively low, similar and stable ASRs of around 1/1000.

The analysis of age-specific admissions by ethnicity and hospital indicated that higher number of crude admissions occurred for patients under the age of 65 irrespective of ethnicity or hospital. While the crude admissions fell rapidly above 65 years of age. In fact, there were hardly any admissions from the Maori and Pacific Islander 74-84 and 85+ age groups. These had higher age-specific admission rates for younger age groups as compared to the European/Other groups.

(5.3.4) Expert Panel Opinions Related to Respiratory System Disorder Trends

Based on the above findings, the expert panel was asked to respond to the findings. For example; to explain the reasons for the COPD and infections & inflammations admission trends, and to describe the reasons for differences between the ethnic groups.

The common themes identified from the expert panel data analysis may be divided into two broad categories; those related to the health service and those related to patients, and most responses dealt mainly with COPD admission trends. For example, one of the APH physicians explained the reasons for the increasing number of COPD and infections & inflammations DRG category admissions as follows; *'if you further break it down into pneumonia patients with a COPD history and non-COPD pneumonia patients, the answer may be 50:50. There are a lot of people coming with pneumococcal pneumonia and half of those would be with a history of COPD'*. There appeared to be a move towards admitting lower DRG patients, such as respiratory infections & inflammations patients, to higher or more complex DRGs, such as the COPD DRG. The main reason for doing it related to financial incentives in coding the infections & inflammations diagnosis patients with a history of COPD or respiratory infections & inflammations secondary to COPD. For example, *'the hospital gets more funding for the COPD admissions as compared to infections & inflammations admission'*. An APH manager supported the above views related to the coding practice change by stating, *'the increase in COPD admissions might partly be caused by coding practice changes. For example, patients with a history of COPD presenting with infections & inflammations are being coded under the COPD DRG'*. However, this coding practice was not likely to impact on the overall admission trends or the crude number of patients being admitted to hospitals.

Another factor related to the health service, which possibly led to increased COPD admissions, was the inappropriate referrals from the hospital ED to the Medical Service, as highlighted by the MMH physicians (n = 4). One of the physicians summed up the increase in the following *'approximately 90% of the patients seen by the Emergency Care staff are passed on to the medical specialty. None of the COPD patients are discharged from EC. Similarly, the non-cardiac chest pain patients also come to the Medical Services'*.

On the other hand, two nurse specialist (n = 1 from each hospital), thought the increase was definitely real. One of these nurse specialists summed up the situation as, *'the trend that is seen here in the results, I am seeing out there in the community. If you look at the Thoracic Society of Australia and New Zealand's internet website, there will be another 34% COPD patients by 2007/2008'*. In contrast, one of the MMH managers was astonished by the increase in COPD: *'This is despite the implementation of the chronic disease management*

initiatives with all that investment and I truly question the effectiveness of the projects implemented’.

When commenting on the increased number of Maori and Pacific Islander respiratory admissions, one of the APH physicians thought they were possibly related to, *‘better access, more friendly staff etc, which is encouraging more of them to access the services. Would be very nice if we could interpret it further, actually we are more accessible now’.* In contrast, the MMH physicians (n = 3), nurse specialist (n = 2) and one manager felt the higher number of Maori and Pacific Islander respiratory admissions was possibly related to high smoking rates among these ethnic groups, and to their possible genetic predisposition to these disorders.

Bronchitis & asthma DRG category admissions have declined at both hospitals. Consequently an APH nurse specialist suggested that the main reason for the decline was related to, *‘better management in the community by GPs, nurses and better asthma drugs’.* On the other hand, the same nurse specialist said, *‘there appear to be lot of GPs who needs to be better educated to effectively manage the respiratory patients with conditions such as COPD’.*

Both hospitals have introduced nurse specialist roles to effectively case manage the high-risk patients with complex healthcare needs. An APH physician supports the value added by the COPD nurse role to the service in the following, *‘once I made a referral of a COPD patient, who looked quite unwell to me and I did not know the patient. The COPD nurse was there in no time. The nurse assessed the patient in a few minutes and immediately the oxygen tubes and other monitoring gear was taken down. The nurse informed me and the other team members that the patient’s condition was no worse than usual. Therefore the patient was taken to his/her home by the nurse’.*

However, the effectiveness of the COPD nurse might be limited by weaknesses in the referral mechanisms. Issues related to communication between ED and the Medical Service professionals were raised by one of the APH manager, who stated that *‘if you are known to the COPD nurse a flag should come up. By and large we may or may not get a referral from ED, and we tend to get more referrals from wards once they [COPD patients] are already*

admitted. In ED, if a patient was discharged, then the COPD nurse might not know about it either'.

(5.3.5) Respiratory System Disorders – Conclusions

Overall, the respiratory system MDCs account for 19%-21% of the total acute admissions for both hospitals. The crude number of admissions increased 48% for MMH and 50% for APH during 1998-2004. On the other hand, the ASRs per 1000 population appeared to have peaked in 1999 for both hospitals and remained stable with some fluctuations since. Overall the age-specific rates indicated that admission rates for the 65+ age groups have continued to increase while the younger age groups experienced a decline in admissions.

There were 3 respiratory system disorder related DRG categories that largely (>72%) contributed to the overall respiratory admissions. Respiratory infections & inflammations DRG category admission rates appeared to have peaked during 1999-2001 for both hospitals and have since declined for all ethnic groups. MMH's Maori and Pacific Islander groups had significantly higher ASRs compared to the equivalent groups of APH. APH's Maori group was the only group that showed an overall increase in the ASRs for the respiratory infections & inflammations DRG category.

Chronic obstructive pulmonary disorders were the second leading DRG category. According to the ASRs, APH's COPD rates appeared to have peaked at 2.4/1000 in 1999, and have since declined moderately to stabilise at 1.9/1000, whereas, the MMH rates have continued to increase over the study period and were significantly higher than APH's rates. The ethnic group analysis indicated that all three groups of MMH experienced increased admissions, although there were significant variations in the rates for these groups. At APH the Maori and Pacific Islander groups experienced increased admissions, while the European/Other group's rates remained relatively stable. The MMH Maori group had the highest COPD ASRs of any other group. Pacific Islander groups of both hospitals had the second highest rates for most of the study period. On the other hand, APH's Maori ethnic group ASRs increased at a faster rate than for other groups.

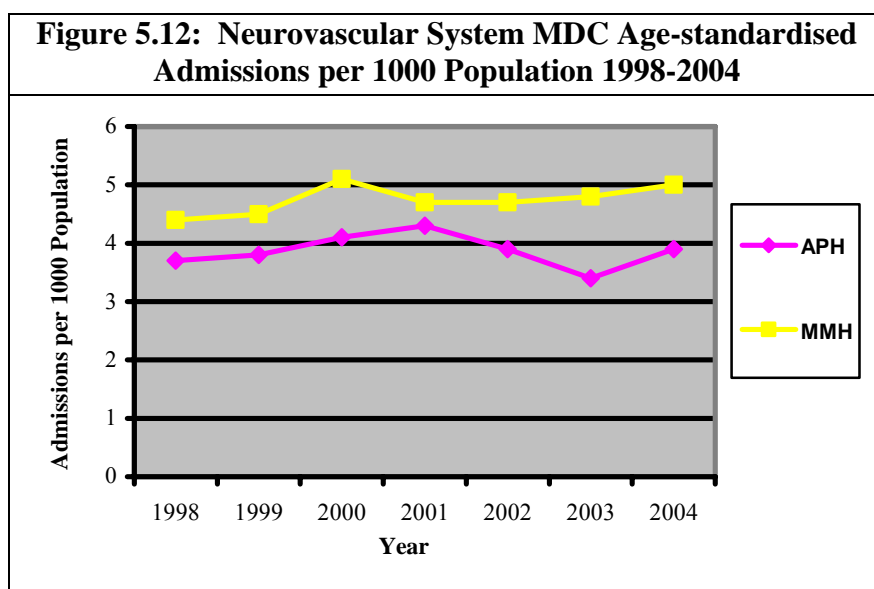
Overall, the bronchitis & asthma DRG category admissions have remained relatively stable for APH, and MMH ASRs peaked in 1999 and then declined over the study period. Again

MMH's Maori and Pacific Islander groups had higher ASRs closely followed by the equivalent APH groups. The European/Other groups of both hospitals showed a moderate decline in the admission rates. Ethnic group and overall findings indicated that age-specific rates declined sharply for the 65+ age groups of both hospitals.

It may be concluded from the expert panel analysis that both hospitals appeared to manipulate the infections & inflammations DRG data to maximise hospital revenue. This practice may have contributed to some of the rise in COPD admissions, but without having any effect on the overall respiratory admission trends. Other causes identified for increased COPD admissions ranged from better access to hospital services, to higher prevalence of disease, risk behaviour and genetic predisposition. New initiatives appeared to have had more positive effects at APH than at MMH. Improved management of certain disorders in the community has reduced the number of patients admitted to hospital.

(5.4) Neurovascular System MDC Admission Trends

Neurovascular system disorders were the third major cause of AMAs in the study, and contributed 10.7% ($n = 10,639$) to MMH's and 11.5% ($n = 9,463$) to APH's total admissions. Overall, the crude number of neurovascular admissions for APH experienced fluctuations. For example, the number of admissions increased from $n = 1,160$ in 1998 to $n = 1,406$ by 2001, declined to $n = 1,138$ in 2003 and then again increased to $n = 1,359$ during 2004. At the same time, MMH also experienced moderate fluctuations in admission numbers and the overall crude number of admissions increased from $n = 1,192$ during 1998 to $n = 1,604$ in 2004. MMH's neurovascular age-standardised admissions remained statistically higher than at APH during 1998-2004 (Figure 5.12).



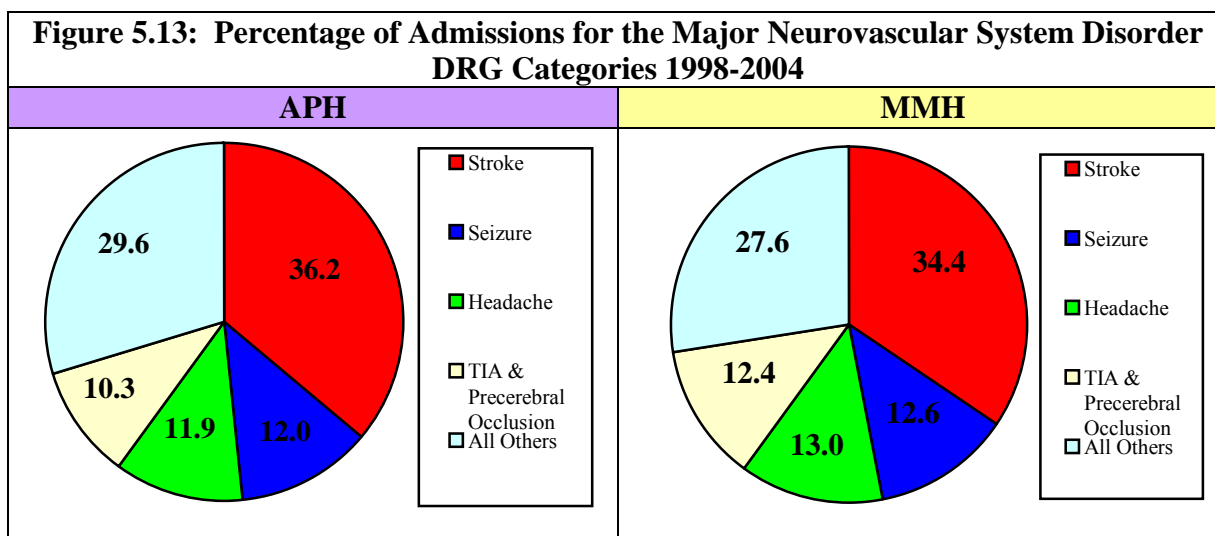
Over the study period APH's neurovascular ASRs varied between 3.35/1000 (95% CI 3.34-3.36) and 4.35/1000 (95% CI 4.33-4.36), while MMH's ASRs were somewhat higher varying between 4.45/1000 and 5.12/1000 (95% CI 4.43-4.47 and 5.10-5.14) respectively.

The age-specific rates indicated lower admission rates for the <55 age groups at both of the hospitals. Then the age-specific admission rates/1000 population increased rapidly for the 55+ age groups of both hospitals. APH's <55 age groups had slightly lower age-specific admission rates/1000 population than did MMH's ones. The age-specific admission rates for the 55-64 age groups of both hospitals (5-6/1000 for APH and 5-8/1000 for MMH) were almost double those of the 45-54 age groups. The age group differences between the two

hospital populations are also shown in the median ages at admission for the neurovascular MDC, which were 63 and 69 years at MMH and APH respectively.

Again, the age-specific admissions for the 65-74 age groups of both hospitals (ranging from 10-12/1000 for MMH and 12-14/1000 for APH) were around double those of the next younger age group. The APH admissions showed some decline during the last two years of the study. For the 75-84 age group MMH's age-specific admissions were again almost double (range 24-28/1000), while the APH group also showed an increase but only to rates in the range 20-26/1000.

The age-specific admissions again further increased for the 85+ age groups of both hospitals. MMH's admission rate range (30-39/1000) was relatively comparable to APH's (31-37/1000). Overall the two hospitals had similar age-specific admission trends, although APH admitted more patients for the 75+ age groups and MMH admitted more 55-74 age group patients.



The leading four DRG categories contributing significantly to overall neurovascular MDC admissions were neurovascular stroke, seizure, headache, and transient ischemic attack (TIA) & precerebral occlusion. (Refer to Appendix 6 for information on specific DRGs). The remainder of the neurovascular disorder DRGs have been combined in the category “all others” in Figure 5.13. In the following sections the data related to the top four neurovascular DRG categories are examined more closely, although the ethnic group ASRs for these DRG categories were not calculated due to the small sample sizes.

(5.4.1) Stroke Diagnosis

The stroke (with or without continuing care) DRG category was the leading category of neurovascular disorders. Overall, the age-standardised admission rates varied slightly between the hospitals (Table 5.9). MMH's age-standardised stroke admission rates have remained reasonably stable ranging from 1.55/1000 to 1.73/1000, with APH's slightly lower ranging from 1.21/1000 to 1.57/1000. At APH the ASRs peaked in the year 2001 and then experienced some decline during 2002-2004.

Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	1.26 (1.26-1.27)	1.35 (1.34-1.35)	1.40 (1.40-1.41)	1.57 (1.57-1.58)	1.48 (1.48-1.49)	1.21 (1.21-1.22)	1.32 (1.32-1.33)
MMH ASR (95% CI)	1.57 (1.57-1.58)	1.73 (1.73-1.74)	1.62 (1.62-1.63)	1.55 (1.55-1.56)	1.70 (1.69-1.70)	1.66 (1.65-1.67)	1.56 (1.55-1.56)

There were very few age-specific admissions for the <65 age groups. The APH age-specific admissions/1000 population doubled from 4-6/1000 for the 65-74 age groups to 10-14/1000 for the 75-84 groups, and further increased (14-21/1000) for the 85+ age groups. The MMH age-specific admission rates were slightly higher for the 65-74 and 75-84 age groups, and slightly lower for the 85+ age group than APH's.

(5.4.2) Seizure Diagnosis

The seizure (with or without continuing care) DRG category was another category that contributed significantly to the neurovascular system disorder admissions. According to the age-standardised admission trends APH's admission rate was around 0.5/1000 during 1998-2002, which was relatively similar to MMH's rate of 0.5-0.6/1000. During 2003-2004, APH's seizure DRG category ASRs declined to 0.4/1000 whereas the MMH admissions rates did not change during the same period.

When it came to analysing the age-specific admission rates, there were no specific trends identified. There was almost the same number of crude admissions for all the age groups for both hospitals with age-specific admission rates less than 1/1000.

(5.4.3) Headache Diagnosis

Headache as a diagnosis also made a substantial contribution to the overall neurovascular admissions. According to the headache data analysis MMH's ASRs have increased from 0.50/1000 to 0.75/1000 (95% CI 0.50-0.50 to 0.75-0.75) during 1998-2004, and for APH have remained between 0.42 to 0.56/1000 (95% CI 0.42-0.42 to 0.56-0.56) over the study period. The age-specific admission trends analysis indicated that most of the admissions were from the <65 age groups.

(5.4.4) Transient Ischaemic Attack (TIA) & Precerebral Occlusion Diagnosis

The TIA & precerebral occlusion diagnosis DRG category age-standardised admission rates appeared to be stable for both hospitals. MMH had slightly higher ASRs at 0.53-0.65/1000 (95% CI 0.53-0.54 to 0.65-0.65) compared to APH's of 0.44-0.61/1000 (95% CI 0.44-0.44 to 0.61-0.61).

There were very few admissions for the <65 age groups for either hospital. The age-specific admission rates for the 65+ age groups varied between 2-7/1000 at both hospitals. The 65-74 age groups had lower admission rates (2-3/1000) compared to the 85+ age groups (4-6/1000). Again APH Admissions were somewhat lower than MMH's age-specific admissions/1000 population.

(5.4.5) Expert Panel Opinions Related to Neurovascular System Disorder Trends

The expert panel members were asked to comment on the reasons for the neurovascular admissions trends. Most of the panel members of both hospitals agreed that most of these admissions were related to the 65+ age groups. One of the APH physicians stated that, *'the impact of the ageing population is quite obvious in my service area. We definitely have more patients coming with strokes and transient ischaemic attacks'*. Another physician from MMH noted that, *'the main reason for declining or stabilising stroke admission rates was possibly related to better management of hypertension in the community'*.

Generally, the panellists agreed unanimously that while ASRs for strokes may have remained stable, the crude number of admissions has increased in their hospitals.

(5.4.6) Neurovascular System Disorders – Conclusions

Neurovascular system disorders constitute the 3rd major diagnostic category, contributing approximately 11% acute admissions to both hospitals. Although the crude number of admissions has increased at both hospitals over the study period, overall, the ASRs per 1000 population have remained relatively stable, with higher ASRs at MMH than at APH. Both hospitals experienced very similar age-specific admission trends. The younger <55 year age groups had relatively lower admission rates for both hospitals. The age-specific admission rates increased, particularly for the older age groups. The 85+ age groups of both hospitals had the highest number of admissions followed by the 75-84 age groups and so on. APH's age-specific rates were slightly lower than MMH's. APH appeared to admit more patients for the 75+ age groups while MMH admitted more 55-74 age group patients.

According to the data analysis there were 4 DRG categories that accounted for approximately 70% of the total neurovascular admissions, with the stroke DRG category alone, accounting for approximately 36% and 34% of the total neurovascular admissions for APH and MMH respectively. MMH's admission rates were slightly higher than APH's over the study period.

The TIA & pre-cerebral occlusion DRG category admissions trends were relatively similar apart from MMH's slightly higher ASRs than APH. The majority of the admissions came from the 65+ age groups for both of the hospitals.

The seizure DRG category had admission trends relatively similar and relatively stable for both hospitals. There were no age-specific trends identified for either hospital.

The headache DRG category trends indicated that MMH had slightly higher ASRs and that they have continued to increase moderately for MMH, while the rates for APH have largely remained stable over the study period.

Overall the expert panel findings indicated that ageing population was the major cause for the increase in stroke and TIA admissions, while the better medical management of hypertension in the community was helping in reducing or stabilising the number of admissions.

(5.5) Digestive System MDC Admission Trends

The digestive system disorders were the fourth major cause of AMAs. These disorders accounted for approximately 8% (n = 8,058) of MMH's and 10% (n = 8,001) of APH's total admissions. The crude number of APH admissions per year, increased from approximately n = 912 to 1172 during 1998-2000 and then declined to n = 1154 in 2004. Despite these fluctuations the overall number of crude admissions increased approximately by 26% (n = 240) over the 7 year period. MMH also experienced a similar trend in the crude number of admissions for each year increasing from n = 892 to n = 1067 during 1998-2001 followed by a small decline in 2002 and then again further increasing to n = 1228 during 2004, showing an overall gain of approximately 38% (n = 336) admissions during the study period. Overall MMH's ASRs were slightly higher than APH's admission rates except for the year 2001, when APH's ASR was higher (Table 5.10).

Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	2.94 (2.93-2.95)	3.19 (3.18-3.20)	3.64 (3.63-3.66)	3.69 (3.68-3.70)	3.38 (3.37-3.39)	3.32 (3.31-3.33)	3.35 (3.34-3.37)
MMH ASR (95% CI)	3.31 (3.30-3.32)	3.35 (3.34-3.37)	3.74 (3.73-3.76)	3.45 (3.44-3.46)	3.61 (3.59-3.62)	3.63 (3.62-3.64)	3.84 (3.83-3.85)

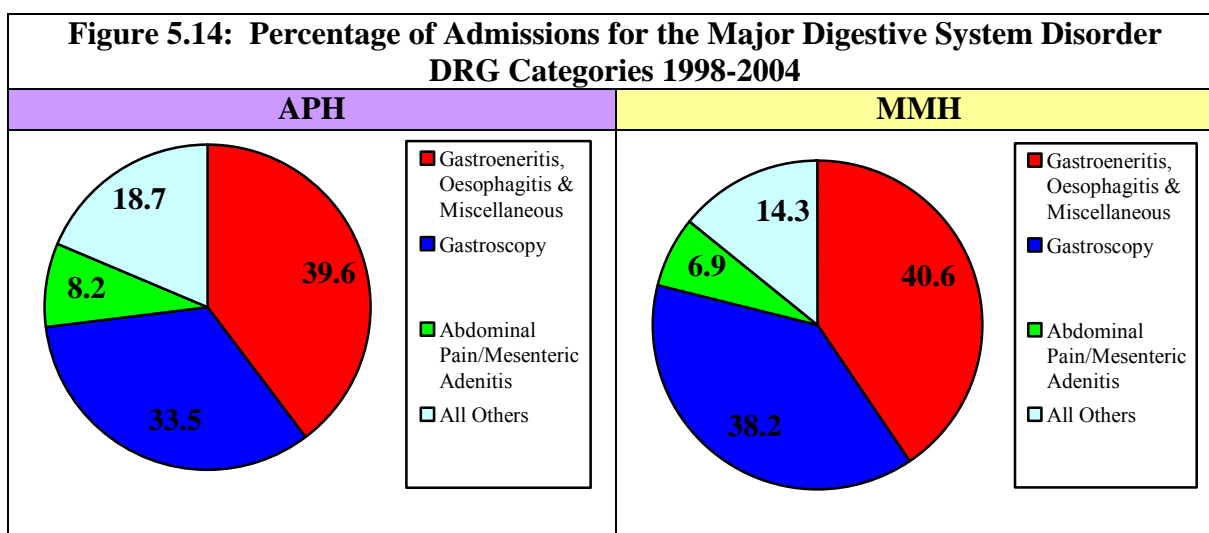
The ASRs appeared to be relatively stable for both of the hospitals. APH's digestive system admission rates increased from 2.94/1000 to 3.69/1000 during 1998-2001 and have stabilised at about 3.35/1000 by 2004. MMH also showed a slight increase in the ASRs from 3.31/1000 in 1998 to 3.84/1000 by 2004.

Age-specific digestive system disorder rates for the <44 years age groups of both hospitals were relatively similar (1-2/1000) for the study period. The age-specific rates increased rapidly for the 45+ age groups of both hospitals. The 45-54 age groups' age-specific rates ranged from 2- 4/1000, which was higher than for the younger age groups of both hospitals.

The 55-64 age groups showed some variations between the hospitals; the APH group had slightly higher rates (4-6/1000) compared to 4-5/1000 for MMH. There were also higher age-specific increases between MMH's 65+ age groups compared to those at APH. For example, APH's age-specific admissions increased from 8-10/1000 for the 65-74 age group to 12-

19/1000 for the 75-84 age group over the study period, while MMH's corresponding age-specific admission rate ranges were 8-9/1000 and 15-19/1000 respectively, highlighting some of the differences between the two hospitals. The 85+ age groups had the highest age-specific admission rates at 19-21/1000 for APH and 20-26/1000 for MMH. The ethnic group analysis for each of the groups has not been carried out due to the small sample sizes (especially for the Maori and Pacific Islander groups).

Further analysis of data revealed that there were three main DRG categories contributing more than 80% to the digestive system admissions (Figure 5.14). These were the gastroenteritis, oesophagitis & miscellaneous digestive system disorder DRG category, the gastroscopy (including complex gastroscopy) for major and non-major digestive disease DRG category, and the abdominal pain & mesenteric adenitis with or without continuing care DRG category. (Refer to Appendix 6 for information on specific DRGs).



Gastroenteritis, oesophagitis & miscellaneous digestive system disorders was the leading DRG category contributing 39.6% and 40.6% of the total digestive system admissions for APH and MMH respectively. The second DRG category was related to gastroscopy, which contributed 33.5% and 38.2% of the total admissions for APH and MMH respectively. The abdominal pain & mesenteric adenitis DRG category was the third leading category, but with far fewer admissions.

There were a number of other DRGs that contributed to the digestive system disorder admissions, for example, gastric haemorrhage, colonoscopy, peptic ulcers, gastrointestinal obstruction, gastrointestinal cancers and so on, which all contribute to the overall admission

trends for digestive system disorders. These DRGs were analysed as a part of the overall trends above, but were not analysed separately in the following sections due to the small sample sizes for each.

(5.5.1) Gastroenteritis, Oesophagitis & Miscellaneous Disorders

The ASRs for gastroenteritis, oesophagitis & miscellaneous disorders have increased gradually over the study period for both of the hospitals. The admission trends were very similar for both of the hospitals but the ASRs were slightly higher at 1.12-1.77/1000 for MMH than the 1.00-1.64/1000 for APH (Table 5.11). The crude admissions increase at MMH was higher at 88.7% (n = 267) than the 82.5% (n = 255) at APH between 1998 and 2004.

Hospital	1998	1999	2000	2001	2002	2003	2004
APH ASR (95% CI)	1.00 (1.00-1.01)	1.01 (1.00-1.01)	1.21 (1.20-1.21)	1.55 (1.54-1.55)	1.46 (1.46-1.47)	1.52 (1.52-1.53)	1.64 (1.64-1.65)
MMH ASR (95% CI)	1.12 (1.11-1.12)	1.28 (1.27-1.28)	1.57 (1.57-1.58)	1.44 (1.44-1.45)	1.59 (1.59-1.60)	1.53 (1.52-1.53)	1.77 (1.76-1.77)

The age-specific admission trends indicated that the 15-54 age groups had relatively similar admission rates (0-1/1000) for both hospitals. The APH 55-74 age group had slightly higher age-specific admission rates than MMH's one, ranging from 1-4/1000. On the other hand MMH's 75+ age groups had slightly higher rates than those of APH's corresponding age groups, ranging between 4/1000 to 11/1000.

(5.5.2) Gastroscopy

The analysis of the gastroscopy (including complex gastroscopy) DRG category admissions indicated that overall the crude number of admissions has declined approximately 5% and 11% for MMH and APH respectively over the study period. This is also supported by the falling ASRs from 1.55-1.23/1000 during 1998-2004 for MMH and 1.27-0.91/1000 during 2000-2004 for APH (Table 5.12).

Hospital		1998	1999	2000	2001	2002	2003	2004
APH	ASR (95% CI)	1.13 (1.13-1.14)	1.20 (1.20-1.21)	1.27 (1.26-1.27)	1.23 (1.22-1.23)	1.09 (1.08-1.09)	0.96 (0.96-0.96)	0.91 (0.91-0.91)
MMH	ASR (95% CI)	1.55 (1.54-1.55)	1.39 (1.39-1.40)	1.45 (1.44-1.45)	1.26 (1.25-1.26)	1.16 (1.16-1.16)	1.27 (1.27-1.28)	1.23 (1.22-1.23)

The age-specific admission rates were similar for both hospitals. The age-specific rates for the 15-24 and 25-34 age groups were zero, the 35-64 age groups' rates remained between 1-2/1000 for the study period, and the age-specific rates ranged from 3 to 4/1000 for the 65-74 age groups. However there were some differences in the age-specific rates of the 75+ age groups, with MMH's rates (6-8/1000) for the 75-84 groups higher than the 5-7/1000 of APH. Similarly, MMH's 85+ age group's 10-12/1000 ASRs were higher than the 7-9/1000 for the equivalent APH group. Overall, the age-specific rates have not increased for any age-specific group over the study period.

(5.5.3) Abdominal Pain & Mesenteric Adenitis

The data analysis related to the abdominal pain & mesenteric adenitis DRG category indicated a number of similarities between the two hospital populations. Overall, the ASRs for both hospitals were stable (0.2-0.4/1000) over the study period, although APH's ASRs were slightly higher during 1998-2000 than MMH's.

Age-specific admission rates remained 0-1/1000 for all of the age groups for APH and MMH, except for the MMH 85+ age group which had slightly higher admission rates ranging from 0-2/1000.

(5.5.4) Expert Panel Opinions Related to Digestive System Disorder Trends

Based on the above digestive system trends, the expert panel members were asked to explain what caused the decline in gastroscopy admissions and describe the reasons for the increase in gastroenteritis & oesophagitis admissions. According to the expert panel the main reason for the decline in gastroscopy admissions was possibly related to the advent of day clinics and different funding arrangements between the hospitals and DHBs. According to one of the APH managers, *'most of our gastroscopy patients go through the non-DRG funded day clinic*

stream. As a result they have not appeared in the hospital inpatient data'. Similarly, MMH gastroscopy patients are also being treated through the outpatient clinics as arranged admissions, and have therefore been excluded from the present acute admissions analysis.

There were virtually no responses related to gastroenteritis & oesophagitis, or to abdominal pain & mesenteric adenitis admissions. Obviously, these disorders did not rank very highly on the panel members' list.

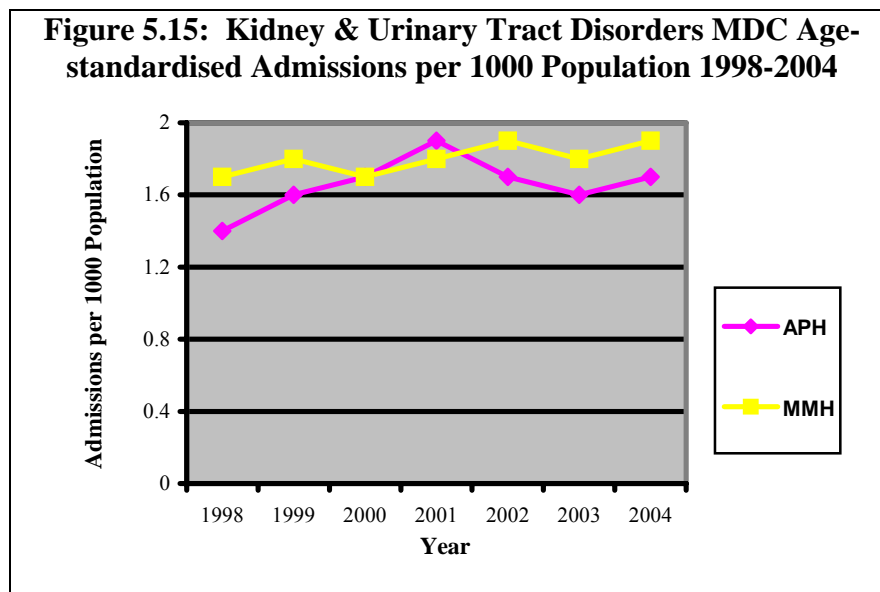
(5.5.5) Digestive System Disorders – Conclusions

Digestive system MDC disorders were the 4th major cause of admissions for both hospitals, contributing between 8%-10% of the total admissions. The crude number of admissions has continued to increase while the ASRs have remained relatively stable over the study period. MMH had slightly higher admission ASRs compared to APH. The age-specific admission rates tend to increase with age. For example the 65+ year age groups had much higher ASRs than the younger groups. MMH's 75-84 and 85+ age groups had higher age-specific rates than APH's equivalent groups.

Among the major digestive system disorder DRG categories, admissions for gastroscopy have continued to decline over the study period, admissions for gastroenteritis & oesophagitis have constantly increased, and admissions for abdominal pain & mesenteric adenitis have remained relatively stable. Overall, the expert panel findings highlighted the influence of day clinics and different funding mechanisms on admission trends.

(5.6) Kidney & Urinary Tract MDC Admission Trends

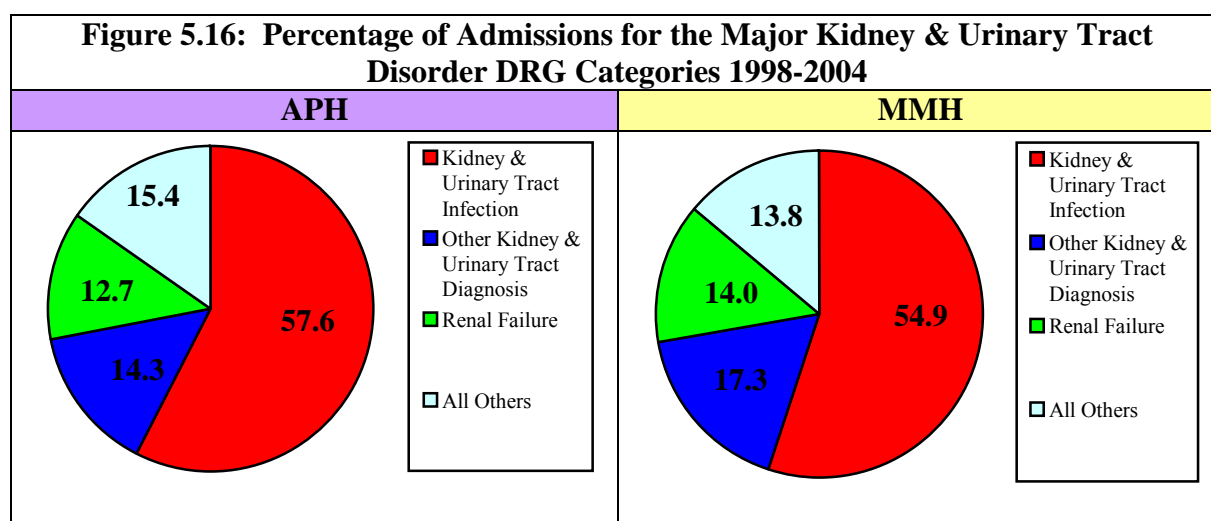
Kidney & urinary tract disorders were the 5th largest MDC, accounting for 4.1% (n = 4,069) of MMH's and 4.8% (n = 3,930) of APH's overall acute admissions.



The age-standardised admission trends indicated that MMH's admissions have remained reasonably stable between 1.66/1000 to 1.92/1000 (95% CI 1.65-1.66 to 1.92-1.93) during the study period (Figure 5.15). APH's ASRs have remained slightly lower than MMH's rates except for the year 2001, when APH's rate was slightly higher. Despite the stable ASRs for both hospitals, the crude number of admissions increased from n = 437 to n = 604 (approximately 38%) for APH and n = 451 to n = 582 (approximately 29%) for MMH over the period of 7 years.

When examining the age-specific admission rates related to kidney & urinary tract disorders, the younger age groups had lower admission rates than the older age groups at both hospitals. For instance the 15-44 age groups admission rates remained around 1/1000 over the study period. In contrast, the admission rates increased to between 1-3/1000 for the 45-64 age groups, 3-10/1000 for the 65-84 age groups, and even higher at 6-18/1000 for the 85+ age, with MMH having slightly higher age-specific admission rates for this group than APH.

According to the data analysis, there were three major DRG categories that accounted for approximately 86% and 85% of the total kidney & urinary tract disorders admissions at MMH and APH respectively (Figure 5.16).



Both hospitals had the same leading DRGs. The kidney & urinary tract infection DRG category had by far the largest number of admissions (more than 50%) for both hospitals, with around a third of the remainder of the admissions being in the other kidney & urinary tract diagnosis DRG category, the renal failure DRG category, and the “all others” kidney & urinary tract disorder DRGs combined. Trends related to the top three identified DRG categories have been further explored in the following section. (Refer to Appendix 6 for information on specific DRGs).

(5.6.1) Kidney & Urinary Tract Infections

Kidney & urinary tract infections DRGs (L63A, B, C and 575-77) are the major cause for admissions in this MDC. The actual number of admissions has continued to increase for both APH (n = 249 to 398) and for MMH (n = 239 to 349) over the study period. The ASR rates were calculated and are presented in the Table 5.13.

Table 5.13: Kidney & Urinary Tract Infection Age-standardised Admissions per 1000 Population 1998-2004								
Hospital		1998	1999	2000	2001	2002	2003	2004
APH	ASR (95% CI)	0.81 (0.80-0.81)	0.81 (0.81-0.81)	0.88 (0.88-0.88)	0.97 (0.97-0.98)	0.97 (0.97-0.97)	0.99 (0.99-0.99)	1.13 (1.13-1.13)
MMH	ASR (95% CI)	0.88 (0.88-0.88)	0.94 (0.93-0.94)	0.94 (0.93-0.94)	1.00 (1.00-1.01)	1.16 (1.15-1.16)	1.00 (1.00-1.00)	1.12 (1.12-1.13)

MMH’s kidney & urinary tract infection ASRs were slightly higher than APH’s rates during 1998-1999. Otherwise the rates and admission trends of the two hospitals were similar.

Age-specific rates were also analysed, and again the 85+ age groups had the highest age-specific admission rates (APH 4-10/1000 and MMH 5-13/1000). MMH's 85+ age group appeared to have comparatively higher rates than APH's, with the 75-84 age groups having the second highest age-specific rates, in the range 2-5/1000. The rates for all of the other age groups were fairly low (1-2/1000), and there were no apparent differences between the two hospitals.

(5.6.2) Other Kidney & Urinary Tract Diagnosis

The second major cause of admissions for the kidney & urinary tract disorders were those covered by the other kidney & urinary tract diagnosis DRGs 10AM (L67A, B and C) and DRGs 9AM (585,586 and 589). The ASRs were relatively similar for both of the hospitals. The APH ASRs remained fairly low at 0.2/1000 for the study period, except for the year 2001 when the ASRs increased to 0.4/1000. In contrast, MMH's ASRs remained constant at 0.3/1000 throughout the study period. The crude number of admissions for APH fluctuated considerably between $n = 60-79$ during the study period, apart from one year (2001), when crude admissions reached $n = 111$. Similarly, the crude number of admissions for MMH remained between $n = 73$ to $n = 105$ for the duration of the study.

The age-specific admissions remained between 0-1/1000 for all of the APH and MMH age groups. The sample size was too small to carry out further sub-group analysis.

(5.6.3) Renal Failure

Renal failure DRGs were the third most common cause of kidney & urinary tract disorders at both of the hospitals. Both of the hospitals have experienced similar renal failure ASR trends. The age-specific admission rates remained steady between 0.18/1000 to 0.27/1000 (95% CI 0.18-0.18 to 0.27-0.27) for the study period. MMH had slightly higher admission rates (approximately 0.3/1000) during 1998-2000, and then the rates declined to 0.2/1000 for 2002-2004. Overall, both hospitals had comparable ASRs and showed no significant differences between the hospitals.

When it comes to analysing the age-specific admission rates both hospitals had between 0-1/1000 for the 15-74 age groups. MMH's 75+ age groups had slightly higher age-specific

admission rates (1-2/1000) compared to APH's (1/1000). Similarly, MMH's 85+ age group had slightly higher age-specific rates (1-3/1000) compared to APH's (1-2/1000).

(5.6.4) Expert Panel Opinions Related to Kidney & Urinary Tract Disorder Trends

Again, the expert panel members were asked to comment on the findings discussed in the conclusion. Again most of the panel members did not have much to contribute to this section except for making general statements, which largely come under the morbidity and prevalence of disease, and ageing of population themes. For example one of the APH physicians stated that, *'yes, the renal admissions have continued to increase – this may possibly be related to the higher prevalence of diabetes'*. And a MMH nurse specialist supported the above by stating, *'our renal service is admitting a lot more patients with renal failure than it did in the past'*.

Another MMH physician suggested that *'the higher number of kidney & urinary tract infections was largely related to the older age groups and also to the prevalence of diabetes'*. The panel members also agreed unanimously that there was a lack of services to meet the health care needs of renal failure patients in the community, and that as a result some of these patients were being admitted to medical wards.

(5.6.5) Kidney & Urinary Tract Disorders – Conclusions

Overall the kidney & urinary tract disorder MDC ASRs have remained relatively stable and comparable for both hospitals while the crude number of admissions has continued to increase for both hospitals. The older age groups' age-specific rates were higher than the younger age groups'.

The kidney & urinary tract infection DRG category alone accounted for more than 50% of the total admissions for kidney & urinary tract disorders. Both the ASRs and the crude number of admissions increased slightly over the study period. The age-specific admission rates also increased for the older age groups (particularly for the 75-84 and 85+ age groups) of both hospitals.

The other kidney & urinary tract diagnosis ASRs have also remained relatively stable, while the crude number of admissions increased over the study period for both hospitals. The age-specific rates also remained very low and showed no specific trend.

The expert panel identified a number of issues related to kidney & urinary tract disorder admissions, such as the higher prevalence of diabetes leading to renal disease, the effect of the ageing population, and the lack of adequate community services to support the renal failure patients.

(5.7) Chapter Conclusions

The findings related to the top five MDCs and corresponding DRGs illustrated that the crude number of AMAs has increased progressively for both hospitals during the study period. Overall, MMH's ASRs were significantly higher for circulatory, respiratory and neurovascular DRGs than APH's rates, while both hospitals had relatively similar ASRs for digestive system disorders, and kidney & urinary tract infections.

The circulatory system disorder MDC, which included DRGs such as CP, MI, heart failure & shock, arrhythmias, and syncope & collapse, had the highest number of admissions. It accounted for approximately 27% and 36% of the total admissions at APH and MMH respectively. The respiratory system disorder MDC had the second highest number of admissions and accounted for 19% of APH's and 21% of MMH's total admissions. The respiratory MDC included DRGs such as infections & inflammations, COPD, bronchitis & asthma, and other respiratory diagnosis. The neurovascular system disorder MDC that included DRGs such as stroke, seizures, headache, and TIA & precerebral occlusion was the third leading cause and accounted for approximately 10%-11% of the total admissions for each hospital. Digestive system and kidney & urinary tract disorders were the 4th and 5th leading causes of admissions. It is summarised from the above conclusions that a number of identified MDCs and their DRGs are related to common pathologies such as CP, MI, Heart failure & shock, stroke, TIA & precerebral occlusion, and renal failure.

Almost all of the expert panel members (n = 16) of both hospitals agreed that the number of acute admissions have increased as indicated by findings derived for these MDCs from data of phase 1 of this study. The members also raised some issues related to the differences in the admission rates of the two hospitals and also highlighted the possible causes for the trends for each identified MDC and their corresponding DRG categories. Improved access to hospitals and a lowered admission threshold were major causes of increased admissions for some DRG categories, e.g. chest pain. Issues related to poor access to primary care and lack of diagnostic services in the community, combined with an ED open admission policy, was also leading to growing admissions. On the other hand, the improvements in the medical management of certain conditions in community by GPs were leading to reductions in hospital admissions. In order to reduce the growing impact of AMAs, both hospitals implemented new models of

care, such as creating nurse specialist roles, which appeared to have been successful according to the expert panellists.

Age-specific rates findings indicated that admissions for <65 year age groups have remained relatively stable or even declined for most of the disorders. On the contrary, the age-specific admission rates for ≥65 age groups have increased significantly, highlighting a strong association between ageing and growing morbidity. However the impact of ageing appeared to affect both Maori and Pacific Islander patients at younger age bands than European/Other group patients.

Diabetes as a disease does not feature in the top five identified MDCs and related DRGs. However its complications such as circulatory, neurovascular, and kidney failure do.

Overall, the findings indicated that MMH had higher ASRs compared to APH for almost all of the leading MDCs and related DRG categories over the study period. When comparing the ethnic groups, again MMHs Maori and Pacific Islander groups had the highest ASRs and age-specific rates, followed by the equivalent groups of APH. The European/Other group of APH had the lowest ASRs. These differences were likely to be related to the higher prevalence of disease among Maori and Pacific Islanders. Additional analysis revealed a pattern of frequent admissions and complex co-morbidities among a sub-set of the population admitted acutely in the period of the study. This sub-set alone accounted for a high proportion of admissions, as further explained in the following chapter. This sub-set alone accounted for a high proportion of admissions, as further explained in the following chapter. Further discussion on the above findings in relation to national and international literature is provided in Chapters 7, 8 and 9.

Chapter 6

Findings: Acute Admission Trends by Frequency, Ethnicity and Socioeconomic Status, and Admission Themes 1998-2004

(6.0) Introduction

In the previous two chapters findings related to total and acute medical admissions, and morbidity trends were explored. The aim of this chapter is to explore the influence of readmissions or frequency of admissions on admission trends and to identify key characteristics of high users of medical hospital services. The effect ethnicity has on admissions is investigated, and the relationship between deprivation by domicile, ethnicity and acute admission trends is examined.

In the first part of this chapter (6.1), analysis related to the trends in the frequency of AMAs is presented. This part also includes examination of some specific patients with 8 or more admissions during the 8 year period. In 6.2 admission trends of the various ethnic groups are presented. In 6.3 admission trends related to low and high deprivation domicile patients have been discussed, and 6.4 provides some further analysis of the expert panel responses related to the overall findings of the study. Finally the chapter is concluded with a summary of the key findings.

(6.1) Acute Admission Frequency Trends

In order to further explore and examine the acute admission trends, analysis of the frequency of admissions or readmissions was carried out. The patient National Health Index (NHI) numbers were used to identify and analyse the frequency of admissions. The NHI number system was established in 1993, replacing the existing National Master Patient Index implemented in 1977 (New Zealand Health Information Service, 2003). Each individual coming in contact with the NZ health system gets assigned a unique NHI number.

In order to calculate the readmission rates all admissions based on the patient NHI were sorted and matched to identify single or multiple admissions. Then all admissions were coded

based on the number of times each NHI appeared over the study time. This revealed whether a patient was admitted once or multiple times over the study period. For example, if an NHI only appeared once it was coded as '1', whereas an NHI appearing 50 times over the study period was coded as '50'. The results related to this data are presented in the following.

As shown in Table 6.1, there were $n = 113,226$ and $n = 103,010$ acute admission episodes at MMH and APH respectively during 1997-2004. This analysis includes data for all of the study years for both hospitals, as it is likely to help in understanding the overall readmission trends. 69.4% ($n = 41,712$) and 66.3% ($n = 40,068$) of the patients had one admission each at APH and MMH respectively over the 8 years. These patients were responsible for 40.5% and 35.4% of the total admissions at APH and MMH respectively.

Admission Frequency	APH		MMH	
	Percentage of Patients (n)	Percentage of Admissions (n)	Percentage of Patients (n)	Percentage of Admissions (n)
1	69.4% (41,712)	40.5% (41,712)	66.3% (40,068)	35.4% (40,068)
2	15.9% (9,581)	18.6% (19,162)	16.6% (10,028)	17.7% (20,056)
3	6.5% (3,882)	11.3% (11,646)	7.1% (4,279)	11.3% (12,837)
4	3.2% (1,943)	7.5% (7,772)	3.5% (2,138)	7.6% (8,552)
5-9	4.1% (2,482)	14.8% (15,230)	5.2% (3,134)	17.1% (19,369)
10 +	0.9% (535)	7.3% (7,488)	1.4% (821)	10.9% (12,344)
Total	100.0% (60,135)	100.0% (103,010)	100.0% (60,464)	100.0% (113,226)

Thus at APH the 30.6% ($n = 18,423$) of patients who had ≥ 2 admissions accounted for 59.5% ($n = 61,298$) of APH's total acute admissions, with an average frequency of 3.3 admissions/patient. Similarly, at MMH 33.7% ($n = 20,400$) of the patients had ≥ 2 admissions over the study period, accounting for 64.6% ($n = 73,158$) of MMH's total acute admissions, giving an average frequency of 3.6 admissions/patient. In other words, give or take a few percentage points, at each hospital about a third of patients accounted for about two thirds of admissions, with this finding more pronounced at MMH.

Excluding those patients with 10+ admissions, further analysis of data related to patients with 2-9 admissions per patient revealed that at APH 29.7% of the patients accounted for 52.2% of the acute admissions (with on average 3.0 admissions/patient). Similarly, for the equivalent MMH group 32.3% of the patients accounted for 53.7% of the acute admissions, again giving

an average of 3.0 admissions/patient. Thus it was those few patients with 10+ admissions that drove up both the total number of admissions and the average admissions per patient. At APH there were only n = 535 (0.9%) patients with 10+ admissions, accounting for 7.3% (n = 7,488) of the acute admissions (with on average 13.9 admissions/patient). Similarly, at MMH the n = 821 (1.4%) patients in this category accounted for 10.9% (n = 12,344) of the total acute admissions (with on average 15.0 admissions/patient) - slightly higher than for APH.

Overall, it may be concluded that a very small number of patients, here termed 'high users', caused a disproportionately large number of admissions at both hospitals. For example, at APH the n = 535 patients with ≥ 10 acute admissions each, who accounted for n = 7,488 acute admissions would have used approximately 22,464 hospital bed days (number of admissions multiplied by the median LOS of 3 days per admission). Similarly, MMH's patients with ≥ 10 admission per patient (n = 821), who accounted for n = 12,344 acute admissions, would have used 37,032 bed days over the study period. Based on the above scenario, this small group of patients would have been using approximately 8.2 and 12.7 hospital beds per day at APH and MMH respectively averaged over the study period.

(6.1.1) High User Characteristics

As highlighted above a small group of patients have significantly utilised the hospital services more than the rest of the patient population. In order to further understand the trends and some characteristics related to the high service users' admission trends, 10 cases with 8 or more acute admissions from each hospital's database were randomly selected and analysed. The aim of this analysis was to identify specific differences that the high service users may have compared to the overall results. Specific issues looked at and discussed in the following sub-sections were, self-referral trends, self-referral Emergency Department (ED) presentation times, and ED triage trends for these high user admissions.

High User Self-referral Patterns

An analysis of self-referral trends was carried out for both hospitals, and the findings have previously been presented (4.4). It was found that MMH had much higher self-referral rates than APH. This identified trend is also apparent for the randomly selected high users groups.

The randomly selected APH high user group had self-referral rates ranging from 25%-75% for each patient's multi-admissions, with an average of 30%. For the APH group high user admissions came largely from external referrals. In comparison, MMH's self-referral rates for the selected high users ranged from 55%-100% for each patient's multi-admissions, with an average of 70%. There were two cases from MMH where all of these admissions came from self-referrals (n = 50 and n = 13 admissions respectively). However at both hospitals the high user self-referral rates were higher than the hospital's overall self-referral rates.

Age Profile

Seven of the ten selected APH high users were ≥ 65 years old and only two patients were younger than 45. The MMH sample only had n = 5 patients who were ≥ 65 years old, and had the youngest selected high user patient, (in the 19-23 year age range, with 47 admissions over a period of four years).

Diagnostic Characteristics

The admission trends analysis related to principal diagnoses of the high users indicated that there were multiple causes of admissions. There was no patient, who only had one type of principal diagnosis accounting for all multiple admissions. There were no differences between the two hospital high users' admission diagnostic trends. Approximately 50% of the twenty randomly selected high users' admissions were related to respiratory system disorders, predominantly chronic obstructive pulmonary disorders. Most of these patients admitted with respiratory problems also had a large number of admissions related to circulatory system disorders, the second leading cause of multiple admissions (chest pain, heart failure & shock, and arrhythmias). Most of these circulatory patients also had admissions related to respiratory, neurovascular and metabolic disorders. There were a few cases of patients with multiple admissions where it was difficult to decide whether the primary problem was related to circulatory or respiratory system disorders. The renal, neurovascular and metabolic disorders were also contributors to multiple admissions. Overall this analysis highlighted that there were virtually no high user patients who were admitted again and again with the same principal diagnosis. In fact, the high users' multiple admissions were often related to a number of major diagnostic categories. This finding highlights the complex co-morbidities the sub-population of high users suffered from.

Self-referral ED Presentation Time

The arrival times at the Emergency Department (ED) for the self-referral patients among the selected high user patients were also obtained and manually calculated. The aim of this exercise was to examine whether the arrival time could explain the reasons for the self-referrals. Therefore all of the high user referrals were divided into “office hours” (0800-1700) and “outside office hours” (1701-0759). According to the analysis approximately 40% of high users presented themselves at the ED during office hours and approximately 60% presented outside office hours. However, there were some cases where all of the self-referral presentations were either within the office hours or were outside the office hours. It was also noted that a large number of the outside office hour self-referral presentations fell into the 1701-2100 and 0500-0759 time periods.

High User Triage Trends

For each of the selected high user cases the Emergency Departments triage codes on admission were reviewed to examine the patient acuity on arrival to hospital. Triage analysis indicated that there were no marked differences between the patient populations of the two hospitals. Triage 1 and 5 had virtually no patients. Triage 3 had the highest number of admissions (approximately half), which was closely followed by triage 2 (approximately a third). Almost all of the chest pain admissions had been coded as triage 2. On the other hand, a significantly large number of the COPD and heart failure & shock admissions had been coded as triage 3. The remaining sixth of the selected patients were triaged as category 4.

(6.1.2) Expert Panel Analysis Related to Frequency of Admissions

The expert panel members were asked if they were aware of the long-term readmission rates and the characteristics of the high users. They were specifically asked to explain the possible causes of readmissions. Most of the physicians from the expert panel mentioned readmissions within the first 6 to 12 weeks after the hospital discharge of a patient, and commonly mentioned figures such as, ‘yes, eight percent’. However they did not know the long term readmission rates as there was no information available on the long term readmission rates as explored above.

When exploring the reasons associated to readmissions a MMH nurse specialist stated that, ‘I am aware of a number of patients who have been visiting the hospital frequently. Most of the

time these patients don't have the resources to see a doctor in the community'. While affordability may be a barrier for some patients, a MMH manager questioned the adequacy of the primary health services provided in the community in the CMDHB region by stating that, 'we are still getting a lot of people after 8pm who have nowhere to go to get medical advice. I am not sure if the PHOs [Primary Health Organisations] are fully making an impact yet'.

Issues related to the lack of, or the limited nature of, services provided in the community, were also raised by physicians (n =2) from MMH and nurse specialists (n = 2) one from each hospital. Perhaps it was best described by the nurse specialist, who said, *'recognising that these patients can live 4-5 years with end stage COPD or renal failure or heart failure, which is not like cancer. These patients can also live in a semi-palliative state for a number of years. When these patients are unwell, not many GP's are equipped to manage these patients or know what else to do for them. So they often come to the hospital even for such tests as arterial blood gasses. Certainly they can be managed at home. [On the other hand] if they need treatment like intravenous antibiotics or oxygen therapy, then they do need to come to the hospital, as such services are not provided in the community'.*

It is not just the inadequacy of or the inability to afford primary healthcare that lead to readmissions, but also the inadequacy or lack of support services in the community for high-risk patients. One of the APH nurse specialists, who is experienced in the case management of high health needs patients in the community, said, *'there are issues around failed discharges. A proportion of the problem is the lack of support once they go home. It may be the lack of community healthcare workers. Home help can be approved but it does not guarantee that they are actually getting it. I know of one lady who is getting help through one agency that has the contract but they don't have enough healthcare workers to go around. This type of situation often leads to multiple discharges'.*

Other factors possibly related to readmissions were the overspecialisation of the health professionals. A MMH nurse specialist highlighted a number of cases of difficulty in accessing subspecialty services for patients at the hospital. For example, *'I had a patient who needed to be seen by another specialty service. I made a number of referrals to that specialty. The reply I got was that my patient's condition was largely related to my clinical specialty, which was not the case. As a result, it took nearly a year to have this patient seen by the*

other specialty. In the meantime this patient was being admitted to the hospital on a regular basis with the same health problem again and again’.

In order to meet the growing demand for healthcare of the ageing population as highlighted by the study findings, the hospitals are required to have health professionals, who are able to look after patients with multi-system disorders. One of the APH physicians also raised some issues related to general medicine and subspecialty services. According to the physician, *‘integrating the subspecialty services into general medicine is very important. At present, there is a very nasty imbalance between speciality services and general medicine. Only 37% of the [physicians] workforce looks after general medicine and 63% after the subspecialties at APH. So a lot of the stuff is looked after differently. What we really need is more general medicine. Multi-system disease requires multi-system involvement. What happens is that the specialists have a tendency to only focus on their speciality, whereas general medicine physicians can take up the whole lot and meet the patient needs more comprehensively’.*

Both hospitals have implemented some new initiatives to reduce the high user admission rates. As a part of these initiatives APH has created nurse specialist roles such as the COPD, heart failure and gerontology nurses. One of these nurse specialists presented the situation as follows, *‘I know the nurse specialist roles do have some impact in reducing the readmission rates. On the other hand, I know my patients, the ones with end stage disease, and I can’t stop them coming to the hospital because by that stage they are so brittle, that they do not have much reserve, so they come in. However, the ones I do put on case management, once we improve their disease management, this immediately decreases their hospital admission rate. The patients generally don’t go to see their GP, nor do they understand their disease or recognise the early warning signs and I do make an impact with those particular admissions’.* Similarly after examining the results of this study most of the MMH physicians proposed a special system to manage the higher users of the hospital to reduce admissions. For example one of these physicians stated, *‘it may be a good idea to manage the top 2000 users of the service differently to reduce the overall admissions’.*

(6.1.3) Trends in the Frequency of Admissions – Conclusions

Overall, the frequency of admission findings highlighted that a relatively small proportion of patients was responsible for a large number of admissions. Approximately 60% and 65%

acute admissions for APH and MMH respectively came from patients admitted ≥ 2 times. The patients who had ≥ 10 admissions (n = 535 for APH and n = 821 for MMH) accounted for approximately 7% and 10.9% of the total acute admissions, and occupied on average 8 and 13 beds daily at APH and MMH respectively.

The analysis of randomly selected high user patients indicated that self-referral rates were higher for the high user patients than the overall average for the hospitals. Most of the selected high user patients admitted at APH were ≥ 65 years of age, while 50% of the MMH ones were ≤ 65 years old. All of the selected patients had multiple co-morbidities and there was none of these patients with multiple admissions who only had one type of principal diagnosis. Most of these patients were admitted under triage 3, and approximately 60% presented themselves at the ED outside office hours.

The expert panel findings indicated that some of the patients did not have the resources to visit a doctor in the community, while others found poor access to the primary health services especially after hours. Issues related to the lack of general medicine physicians and the limitations of the over specialisation of medical specialists were also raised. New initiatives such as case management of patients with complex needs have been implemented and appear to have shown some success.

(6.2) Acute Admission Trends by Ethnicity

As discussed in the Methodology (Chapter 3), both MMH and APH provide hospital services to a culturally diverse population. Therefore the relationship between ethnicity and admission trends was examined in the following section. The variations in the ethnic makeup of the two hospital populations, with APH having a considerably higher percentage of admissions for the European group than MMH and lower percentages for the Maori and Pacific Islander groups, has previously been discussed in Section 4.1.

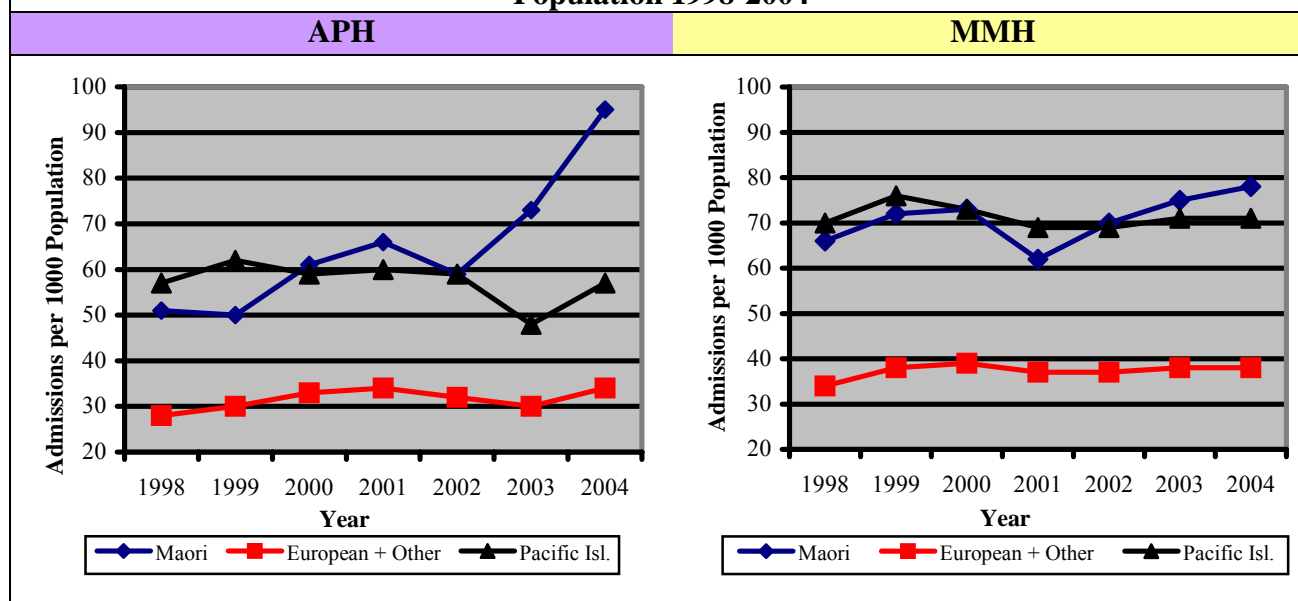
In order to analyse acute admission trends by ethnicity, patients, whose domicile fell into other DHB regions than those of the study hospitals' own catchments, were excluded from further analysis, to remove their confounding effect on the findings and particularly on the age-standardised rates used to compare the two DHB populations. Consequently, the percentages of the European population admissions further increased slightly for both hospitals (Table 6.2). In contrast, admissions of the Maori ethnic groups at APH declined approximately 0.8% after excluding the other DHB patient admissions, while MMH's Maori group showed no real change. The Pacific Islander group's percentage of admissions for APH increased slightly and MMH's group experienced some decline in admissions percentage. Overall, it might be argued that there was very little or no change in the percentage of admissions whether the other DHBs patients were included or excluded.

Ethnic Group	APH		MMH	
	APH Acute Admissions		MMH Acute Admissions	
	Percentage	Number	Percentage	Number
Maori	6.8	5,671	14.4	14,344
European	68.2	56,655	55.4	55,240
Asian	4.4	3,689	2.7	2,681
Indian	3.9	3,200	3.3	3,305
Pacific Is.	12.1	10,062	18.1	18,015
Other	4.5	3,740	6.2	6,212
Overall	99.9	83,017	100.1	99,797

There appeared to be a number of similarities and variations in the ethnic groups' age-standardised admission rates/1000 within each of the DHBs' ethnic groups and between the

hospital groups (Figure 6.1). The analysis of data was limited to the major ethnic groups, Maori, Pacific Islander and European/Other, due to the limitations of the estimates and projections population data as discussed in the Methodology chapter. Overall both hospitals have relatively similar admission trends.

Figure 6.1: Overall Acute Admission Ethnic Group Trends Age-standardised Rates per 1000 Population 1998-2004



All of APH's ethnic groups have lower admission rates compared to MMH's ethnic groups except for the year 2004, when the ASR of APH's Maori group exceeded the rate of MMH's Maori group. APH's European/Other group was the group at both hospitals with the lowest admission rates ranging between 27.6/1000 and 34.4/1000 (95% CI 27.5-27.7 and 34.2-34.5). The crude number of admissions for the APH European/Other group increased by approximately 38% (n = 2,916). In contrast, the APH Maori ethnic group showed a rapid increase in ASR of 50.7/1000 in 1999 to 95.2/1000 (95% CI 50.0-51.4 to 94.0-96.4) during 2004. The crude number of admissions almost doubled from n = 582 to n = 1149 (approximately 97%) over the 7 year study period. The APH Pacific Islander group's ASRs per 1000 remained higher 56.6 to 62.3/1000 (95% CI 56.0-57.2 to 61.6-63.0) except year 2003, than for the European/Other ethnic groups during 1998-2004. Despite the higher ASRs, the Pacific Islander groups admissions only increased by approximately 30% (n = 338) as compared to the European/Other groups (approximately 38%) over the study period.

Overall, MMH's ethnic groups have higher ASRs per 1000 population compared to the equivalent APH ethnic groups. The Pacific Islander group of MMH had slightly higher or

relatively similar rates to the Maori ethnic group during 1998-2002, until the Maori group's admission rates exceeded theirs during 2003-2004. Despite some fluctuations in the admission rates the ASRs have remained stable and close to 70/1000 for the Pacific Islander Groups of MMH over the study period. The crude number of acute admissions also increased by $n = 1080$ (58%) over the same period. The MMH Maori group showed an increase in ASR from 66.3/1000 to 78.3/1000 (95% CI 65.7-67.0 to 77.5-79.0) during 1998-2004, except for the year 2001 when their ASR declined to 62.2/1000 (95% CI 61.6-62.8). And the actual number of acute admissions also only increased by $n = 715$ (48%). These findings highlighted that despite standardising for age and ethnicity, there are some other factors contributing to the variations in admission rates of these groups.

MMH's European/Other group also had slightly higher ASRs compared to those of the APH group, and ASRs increased from 34.0/1000 (95% CI 33.8-34.1) and stabilised at about 38/1000 during 1998-2000, and then remained relatively stable for the rest of the study period. The crude number of admissions increased approximately 29% ($n = 2,173$) for the MMH European/Other group.

In order to further explore and explain the overall acute admission trends of ethnic groups and hospitals, the expert panel was asked to respond to the questions raised by the above findings, such as: explain the reasons for the lower admission rates at APH compared to MMH; describe the causes that may have contributed to the rapid increase in the APH Maori group's admissions during 2003-2004; and describe the reasons for the decline in admissions for the MMH Maori group in 2001.

As noted above, overall the age-standardised admission rates were higher for each of the ethnic groups at MMH compared to APH. Most of the panellists interviewed from MMH thought that this was possibly related to inadequate primary healthcare services and the poor socioeconomic status of the CMDHB population. Other issues raised unanimously by the MMH physicians were related to the capacity and ease of access created by the opening of the new Emergency Care. For example one of the physicians stated; *'since the opening of the new EC in 1999 we have experienced a large increase in GP referrals and self-referral patients'*. The above views were also supported by a senior manager, who summed up the situation by stating, *'in many ways, we built a much bigger EC [Emergency Care or*

Emergency Department], *than required at that time. As a result, when we moved to the new EC in 2000 there was an increase of approximately 15% in EC throughput*'.

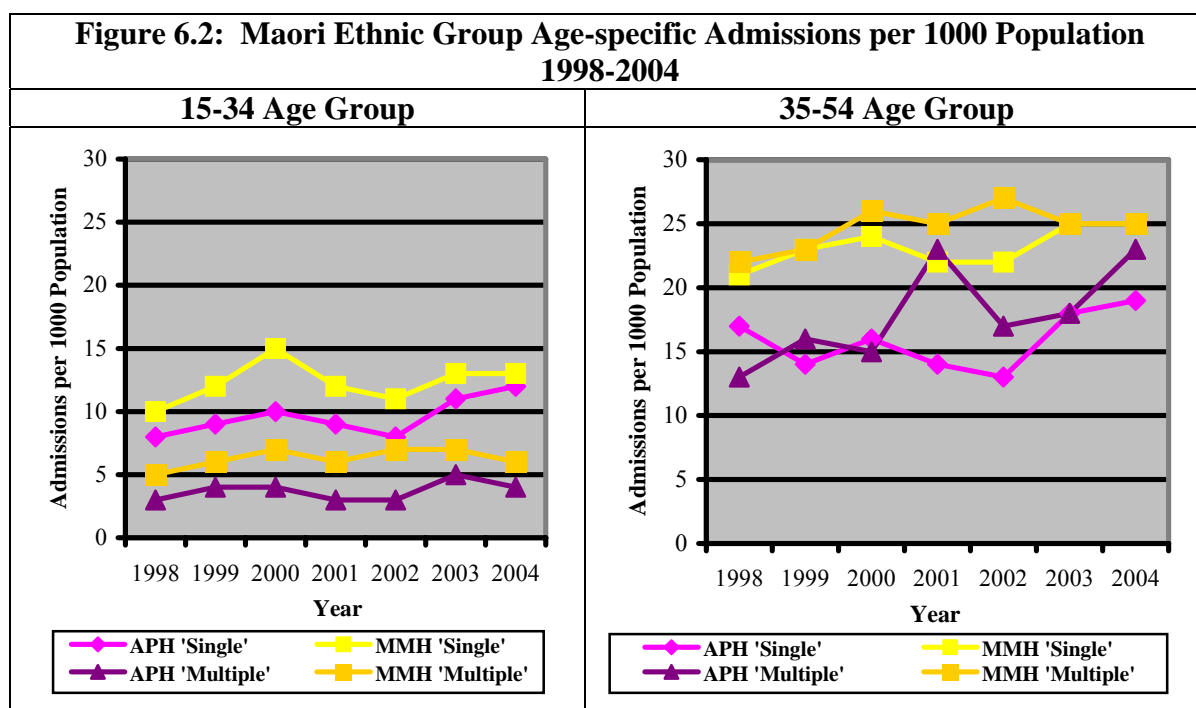
On the other hand, one of the APH managers explained that the main reason for the lower admission rates for APH was that, *'Auckland Central has comprehensive GP and private accident and emergency services'* and a nurse specialist further added that *'the ADHB population has a culture of using primary health services'*. Both of the panellists acknowledged that there were some areas of high deprivation in Auckland Central, such as Mt Roskill and Otahuhu, but as this population was relatively small this would only have a small impact on the overall admission rates of APH. The APH physicians and managers were asked to comment on the Maori ethnic group rise in admissions during 2003-2004. One of the physicians stated, *'it could be related to the ease of access created by the new hospital service development'*.

(6.2.1) Ethnic Group 'Single' versus 'Multiple' Acute Admission Trends

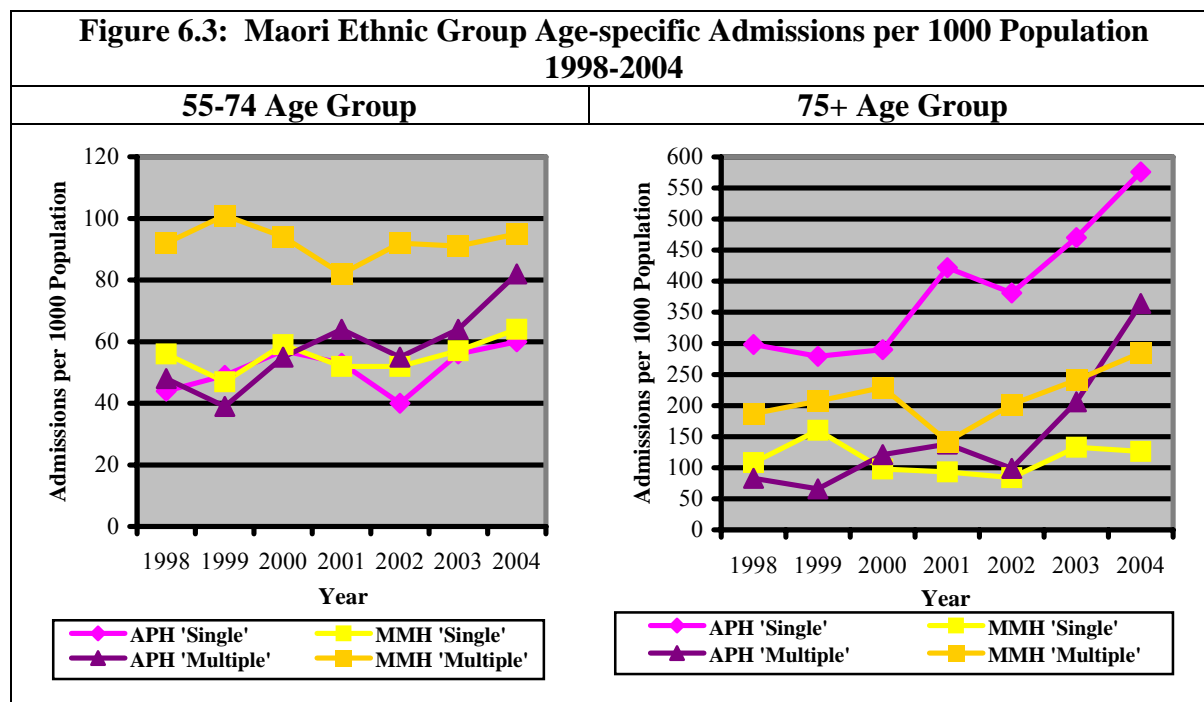
To further examine the similarities and differences in the ethnic group admission rates, age-specific admission rates/1000 were calculated for 4 major age groups (15-34, 35-54, 55-74 and 75+ years) for both hospitals. In addition, based on the patient National Health Index (NHI) number, one admission per patient was extracted for each patient, and allocated to the 'single' admission, while all other admissions were categorised into the 'multiple' admission category to explore their influence on the overall admission trends for each year of the study. One of the weaknesses of accounting for each year is that some 'multiple' admission NHI's, where some of the admissions fell into the subsequent calendar year, could have been categorised into the 'single' category, therefore increasing the overall number of 'single' admissions, to a certain extent. Overall, MMH had 53.7% (n = 52,621) 'single' and 47.3% (n = 47,176) 'multiple' admissions, while APH had 56.9% (n = 47,255) 'single' and 43.1% (n = 35,762) 'multiple' admissions. Thus APH had a higher percentage of 'single' admissions, and MMH a higher percentage of 'multiple' admissions. The following section includes results related to age-specific 'single' and 'multiple' admission trends per 1000 population for each of the ethnic group categories of both hospitals.

(6.2.2) Maori Admission Trends

When examining the Maori groups' age-specific admission trends per 1000 population, there appeared to be similar 'single' and 'multiple' admission trends over time between the two hospital groups. The MMH Maori group had higher age-specific admission rates (both 'single' and 'multiple') for all of the age groups than the APH group over the study period except for year 2004. Each of the older age groups' age-specific admission rates were significantly higher than their younger groups' rates (Figure 6.2).



The 'single' age-specific admission rate for the Maori 15-34 age groups of both hospitals ranged between 8-15/1000 and 'multiple' admission rates/1000 were also much lower than for the older age groups. For the 35-54 age groups the 'single' age-specific admission rates had almost doubled, while 'multiple' admission rates were 3 to 4 times higher compared to the younger 15-34 age groups' admission rates at both hospitals. The 'multiple' admissions were generally higher or similar to the 'single' admission rates/1000. The MMH Maori (35-54) age group had higher 'multiple' and 'single' admission rates than APH's equivalent group.



Similarly, the 55-74 age groups' rates showed a further significant increase for both categories of admissions (see Figure 6.3). (Due to the large differences in the age-specific rates of the 55-74 and 75+ age groups, different y-axis scales were used). In contrast to the rates of the Maori 35-54 age groups, the 'single' rates for the 55-74 Maori age groups were more than double and the 'multiple' rates grew at an even faster rate. The MMH Maori 55-74 age group's 'multiple' admission rates remained between 80-100/1000 and were much higher than those of the similar APH group. However the APH group's 'multiple' admissions also increased from 40/1000 in 1999 to 80/1000 during 2004. The 'single' admission trends for the 55-74 age groups were relatively similar for both hospitals and remained between 40-60/1000 over the study period. For each of the years 1998 to 2004 APH's 75+ age group had the highest 'single' age-specific admission rates of any other ethnic or age groups in the study (ranging in value from 279/1000 to 576/1000 population).

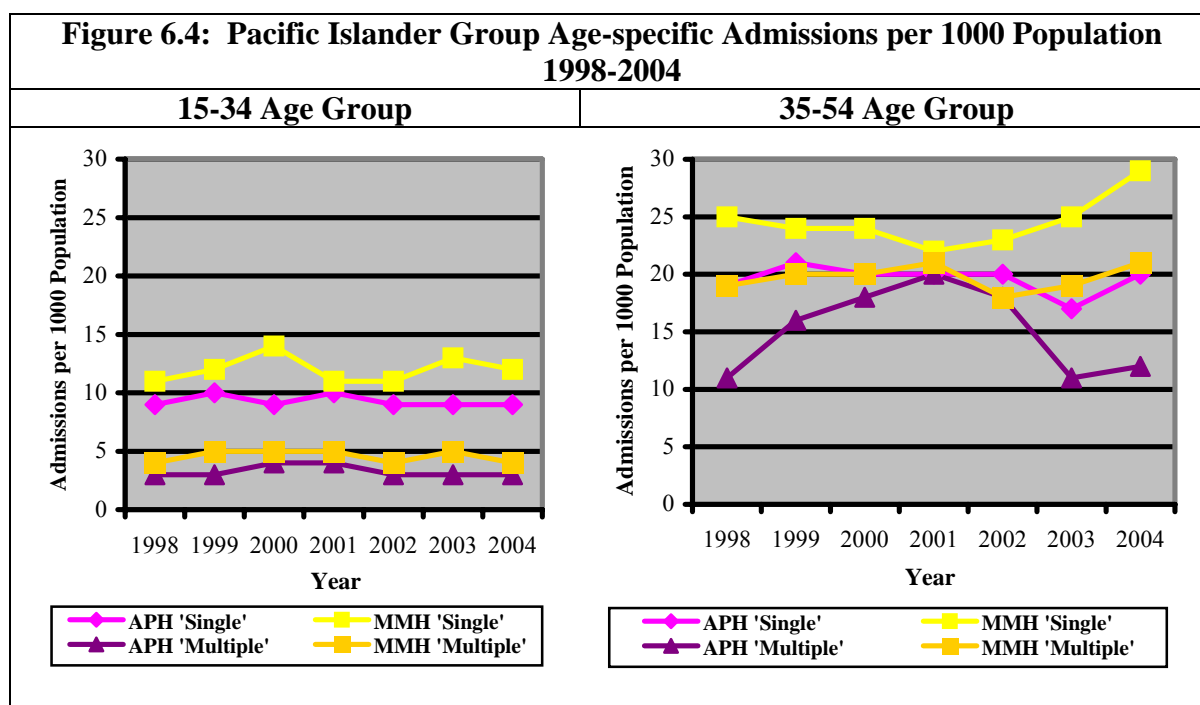
The 'single' age-specified admission rate for MMH's 75+ Maori age group almost doubled again and their 'multiple' admission rates were also 2 to 3 times the values of the 'single' rates (range 187-285/1000) with some significant fluctuation in the rates. In contrast the 'single' admission rates appeared to have peaked at 160/1000 in 1999 and then stabilised at approximately 130/1000 by 2004. The APH 75+ Maori group 'single' admissions showed very significant increases from 279/1000 during 2000 to 576/1000 during 2004. The crude number of admissions increased from $n = 100$ to $n = 190$ (approximately 90%) between 1998 and 2004. The 'multiple' admissions also increased from 66/1000 to 364/1000 during the

period 2000 to 2004. Both of these rates were higher than for the equivalent MMH group. The ‘multiple’ admission rates were higher than the ‘single’ rates at both hospitals for the 55-74 and 75+ Maori age groups. When combined (‘single’ plus ‘multiple’) the Maori 75+ group’s age-specific admissions at MMH also increased from 242/1000 during 1997 to 354/1000 during 2004. In contrast, the equivalent APH group experienced a substantial increase from about 345/1000 in 1999 to nearly 940/1000 in 2004.

Consequently, the expert panel members were asked to discuss the reasons for the above trends. Particularly, what were the major causes of the increase in the APH Maori 75+ age group admissions? Key themes highlighted by the panellists were related to the prevalence of disease and improved access to hospital services for Maori. For example, the most common response of a number of physicians (n = 6) and managers (n = 3) of both hospitals, best expressed by a MMH physician, was that *‘Maori people get sick in younger age, die young as well and are overrepresented in health services’*. And an APH physician thought the possible reasons for growth in admission rates was related to, *‘providing better services for the Maori, such as better access, more friendly staff etc, which is encouraging more of them to access the services’*.

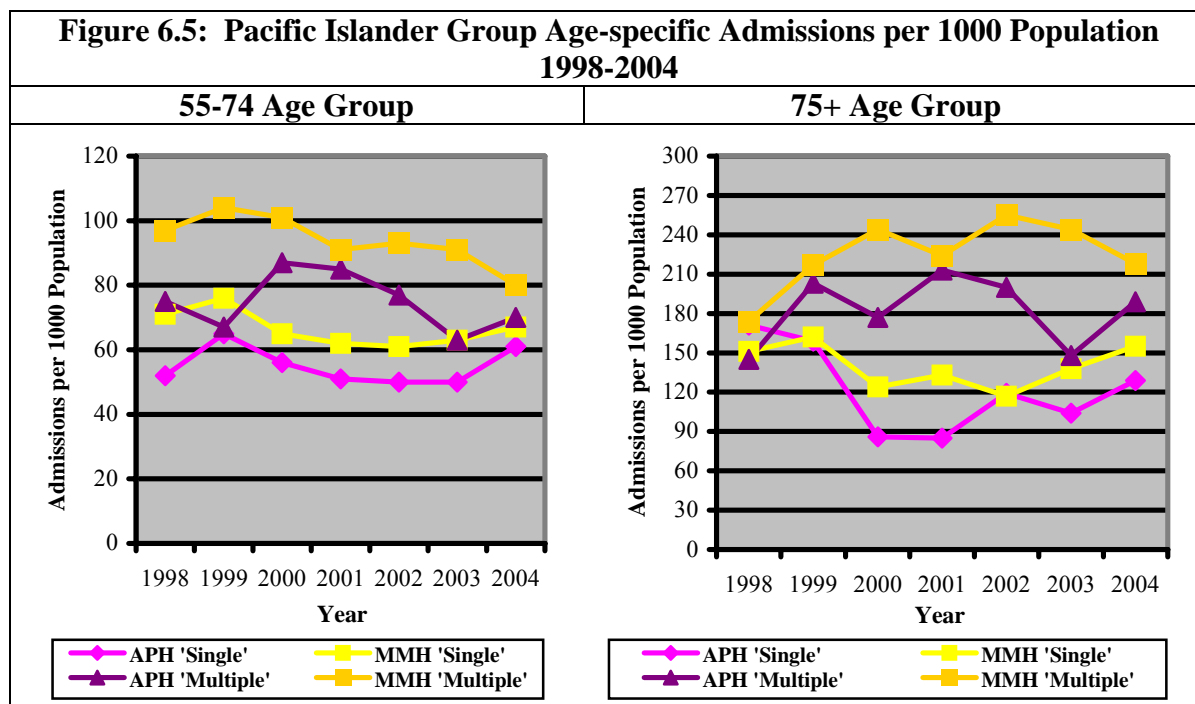
(6.2.3) Pacific Islander Admission Trends

The data analysis indicated that ‘single’ and ‘multiple’ age-specific admission trends for Pacific Islander 15-34 age groups were relatively similar to those of the Maori groups. MMH’s Pacific Islander group appeared to have similar ‘single’ and ‘multiple’ admission rates to APH’s Pacific Islander group during 1998-2004 (see Figure 6.4). Although MMH had slightly higher ‘single’ and ‘multiple’ admission rates as compared to APH, the crude rates have remained relatively stable for the 15-34 age groups. Overall, the 35-54 age groups’ ‘single’ and ‘multiple’ age-specific admission rates/1000 almost doubled compared to the 15-34 age groups’.



APH's 'single' age-specific admissions for the Pacific Islander 35-54 age group remained relatively steady around about 20/1000 during the study period, while the MMH 35-54 age group's 'single' age-specific admissions declined from 25/1000 to 22/1000 during 1998-2001 and again increased to 29/1000 by 2004. The MMH Pacific Islander group's 'multiple' age-specific admissions remained stable close to 20/1000 for the study period. The APH equivalent group's 'multiple' admissions increased from 12-20/1000 in 1998-2001 and then declined and appeared to have stabilised at 11-12/1000 during 2003-2004. Overall, there were some significant variations in the trends of age-specific admissions of the two hospital populations.

The age-specific admissions for the 55-74 and 75+ age groups were significantly higher than those of the younger age groups (Figure 6.5). (Different y-axis scales were again used for the two graphs). The 'multiple' admission age-specific rates for the MMH Pacific Islander 55-74 and 75+ age groups were higher for most of the study period than those of APH's equivalent groups. The MMH 'single' age-specific admission rates declined from 76/1000 to 61/1000 during 1999-2002 and then increased to 67/1000 in 2004 for the 55-74 age group. APH's 'single' category admissions experienced a very similar trend to MMH's group.



The MMH Pacific Islander 55-74 age group also experienced a decline in ‘multiple’ category age-specific admission rates from 104-80/1000 during 1999-2004. Although the APH Pacific Islander 55-74 age group admission rates were much lower to the MMH group’s, these went through a number of fluctuations as shown in Figure 6.5. Differences between the two hospital groups remained even after combining (‘single’ and ‘multiple’) categories. Combined the Pacific Islander 55-74 age groups’ age-specific admissions were lower for APH (112-143/1000) than for MMH (134-179/1000).

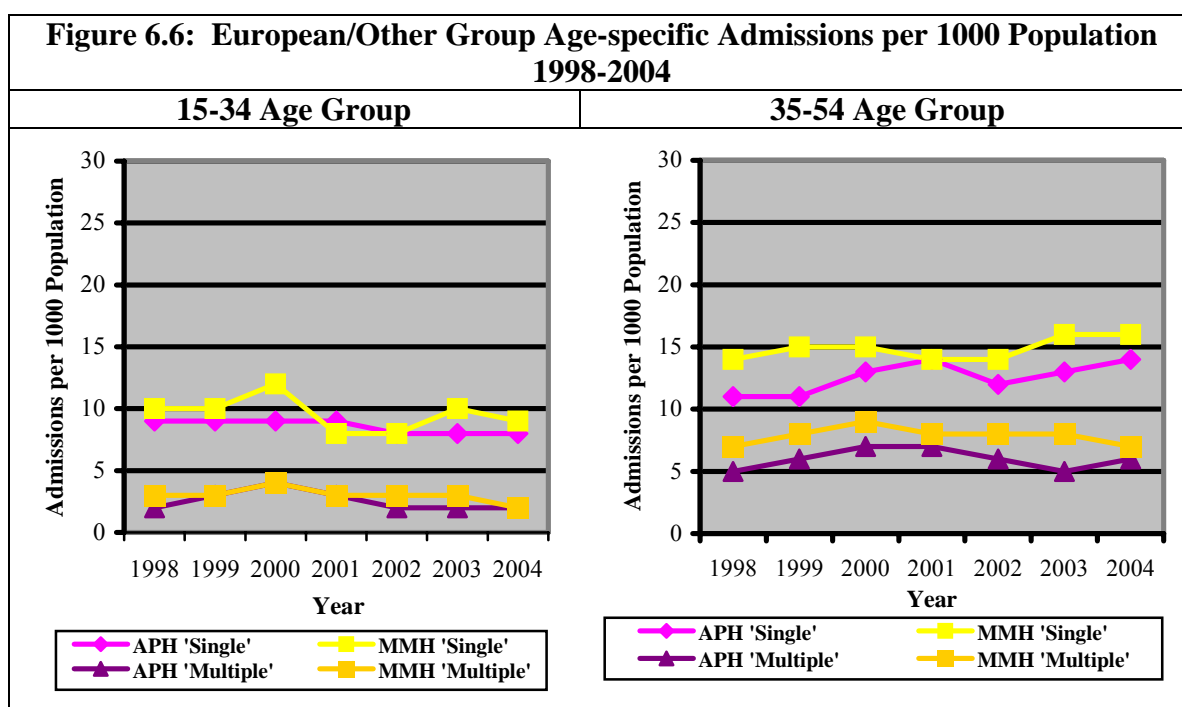
The analysis of data related to Pacific Islander 75+ age groups indicated that ‘single’ and ‘multiple’ admission rates for both hospitals were greater than for the 55-74 age groups. The APH Pacific Islander group showed an overall decline in ‘single’ age-specific admissions over the study period. The APH admissions declined from 174-85/1000 during 1998-2001 and then increased to 129/1000 in 2004. The MMH equivalent group had relatively similar ‘single’ category age-specific admission rates. Initially, the MMH group’s ‘single’ admission rates increased from 150-162/1000 during 1998-1999, then following some fluctuations declined to 117/1000 in 2003 and again increased to 155/1000 during 2004. The APH Pacific Islander 75+ age group admissions also experienced a number of trend variations in ‘multiple’ admissions. Overall the APH group’s ‘multiple’ admissions increased from an age-specific rate of approximately 150/1000 to 180-200/1000 over the study period. The MMH Pacific Islander group’s ‘multiple’ age-specific admissions also increased from 180/1000 in 1998 to approximately 215/1000-250/1000 during 1999-2004. Therefore at MMH the combined

(‘single’ and ‘multiple’) age-specific admissions increased during 1997-1999 (289-379/1000) and then remained stable for the study period. In contrast, the APH Pacific Islander group’s age-specific combined admission rates peaked to 311/1000 in 1999 and then declined to 284/1000 during 2004.

The study participants were asked for reasons for the significantly higher admission rates for this ethnic group. One of the APH physicians suggested that this was because of *‘a lack of infrastructure in the hospital and community to deal with the Pacific health issues adequately, despite having a much bigger population base than the Maori ethnic group at the ADHB’*. The MMH physicians (n = 4) thought that age and ethnic admission trends matched their experience in their clinical areas and causes were multidimensional starting from access to primary health services to socioeconomic status and genetic predisposition to chronic disease etc. While an APH nurse specialist, who manages chronic disease patients both at hospital and in the community, expressed concerns in the following, *‘one of my frustrations with the Pacific people is the language. It certainly makes it very difficult for me if there was a Pacific Island patient [for whom] I knew we could improve the medical management. It makes it very difficult if the family members can’t speak and understand English either. Although there are some Pacific Island community organisations available, it is difficult to find who the key people are,... and hoping that they are following it up’*. This situation often leads to multiple admissions to the hospital. Overall both hospital groups experienced many fluctuations in their admission trends for each age group. Some of these fluctuations might be related to the small sample and population sizes.

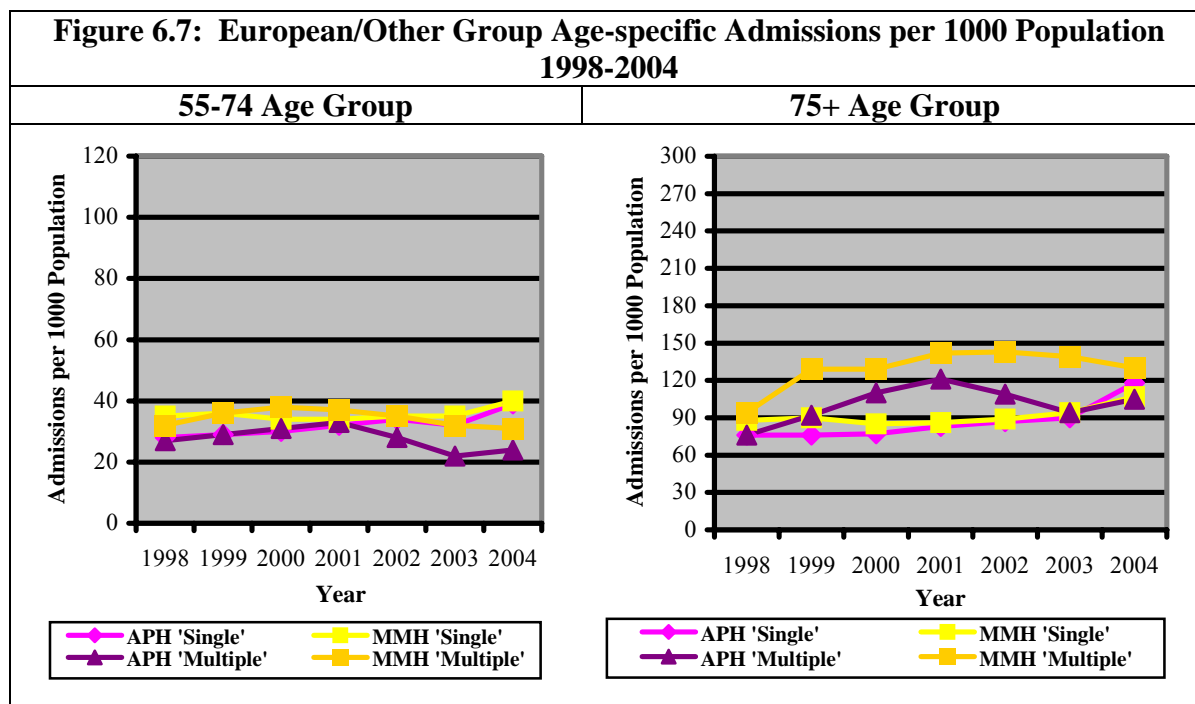
(6.2.4) European/Other Admission Trends

The European/Other ethnic groups have much lower age-specific ‘single’ and ‘multiple’ admission rates as compared to the Maori and Pacific groups of their hospital and the other hospital’s admission rates for the 15-34, 35-54 and 55-74 age groups (Figures 6.6 and 6.7). The age-specific admission trends for the 15-34 and 35-54 age groups remained relatively similar for the ‘single’ and ‘multiple’ admission categories of both hospitals. The age-specific ‘single’ admission rates for the 15-34 age groups remained largely between 8-10/1000 for both hospitals. While the ‘single’ admission rates increased steadily for the 35-54 age groups of both hospitals, the MMH group had slightly higher age-specific admission rates than the APH.



The 'multiple' category age-specific admissions have also remained relatively stable (range 2-4/1000) for the 15-34 age groups at both hospitals, as have the rates for the 35-54 age groups (range 5-9/1000). Overall the MMH European/Other 35-54 age group had slightly higher age-specific rates for both 'single' and 'multiple' admission categories. The age-specific admission rates increased rapidly from the 35-54 age groups' to the 55-74 age groups.

The APH 55-74 age group's 'single' and 'multiple' category admission rates were relatively similar and ranged from 27 to 34/1000 during 1998-2001. The 'multiple' admissions then declined to 22/1000 in 2003, whereas the 'single' category admissions increased to 39/1000, which created a large gap between the two admission categories for the same population group. The MMH European/Other 55-74 age group rates also showed some increase, with some fluctuations in 'single' category admissions from 35/1000 in 1998 to 40/1000 during 2004. MMH's 'multiple' category age-specific admissions increased from 32/1000 to 36/1000 during 1998-2000 and then declined to 31/1000 over the following 4 year period. Overall the 'single' and 'multiple' admissions for the 55-74 age groups of both hospitals were almost double those of the 35-54 age groups of their respective hospitals. (Note the different y-axis scales for the two graphs of Figure 6.7).



MMH has a higher rate of 75+ age-specific admissions compared to APH. 'Multiple' age-specific admissions for the 55-74 and 75+ age groups were higher for MMH's European/Other group compared to the same APH group. Again the age-specific admission rates doubled from the 55-74 groups' to the 75+ groups' of both hospitals. Both hospitals 'single' and 'multiple' admission categories have shown an overall increase in age-specific admissions. For example, the APH European/Other 75+ age group's 'single' admissions increased from 76-118/1000. And the 'multiple' age-specific admissions for the APH group first also increased from 76/1000 to 120/1000 during 1998-2001 then declined to 105/1000 during 2002-2004. Similarly the equivalent MMH group's 'single' admissions also increased from 88-107/1000 for the study period, which was however lower than the APH rates. And the 'multiple' age-specific European/Other admissions for MMH increased from 94-143/1000 during 1998-2002, then declined to 130/1000 during 2004. Overall, both hospitals have shown a significant increase in admissions for the 75+ age groups. Age-specific admissions for the European/Other 85+ age groups were even higher and have continued to increase faster than their respective younger age groups. For example the MMH 85+ group's age-specific rates increased from 210/1000 to 320/1000 and APH's from approximately 188/1000 to 286/1000, during 1998-2004.

One of the APH managers believed that *'European admission rates were relatively stable'*. Whereas a physician from the same organisation claimed that, *'this increase in the 75+ age group reflects our clinical experience'*. Another physician from MMH supported the above

views by stating that *'the impact of the ageing population was quite obvious'*. Overall the physicians from both hospitals further emphasized that Europeans were healthier compared to the Maori and Pacific Islander groups, resulting in much lower age-specific admission rates than for the other ethnic groups.

Overall, the ethnicity admission findings indicated that APH has a much higher proportion of European and lower proportion of Maori and Pacific Islander admissions than MMH. All three ethnic groups of MMH had higher ASRs than their counterparts at APH except for 2004 when the APH Maori group's rates were higher. The APH European group had the lowest ASRs. The main reasons for these variations were related to capacity and improved access to hospital care and access to healthcare services in the community.

Both 'single' and 'multiple' admissions were much higher for the 55-74 and 75+ year age groups compared to the younger groups, highlighting a strong relationship between ageing of the population and admission rates. This finding was also well supported by the expert panel. Major differences were also found in admission rates of different ethnic groups. MMH's Maori and the Pacific Islander groups have higher age-specific 'single' and 'multiple' admission rates than APH's equivalent groups. APH's European/Other group has the lowest 'single' and 'multiple' admission rates. The main reasons identified for these differences were related to the higher burden of disease among the Maori, and lack of infrastructure to meet the healthcare needs of the Pacific Islander groups. Significant variations in age-specific rates from year to year, especially for the Maori and Pacific Islander groups, might be related to the small sample size and population sizes. However, the overall number of admissions for these groups has continued to increase significantly over the study period.

Finally, one of the APH physicians summed up the growing admission rates as follows, *'I am increasingly distressed by people saying how unhealthy a population we have got. In fact this is the healthiest the population has ever been. The life expectancy for people born in this region is the highest for the people born in Auckland including the Maori population. We have a healthy population, actually this is superbly healthy by historical standards, this is not to say there is nothing needs to be done, but we should not be filling out the negative image'*. This may be true, but a majority of the other panellists of both hospitals, found large variations in the ethnic admission rates unacceptable. The rise in admissions for the 75+ age groups was considered unsustainable by all MMH panel physicians.

(6.3) Acute Admission Trends by Deprivation

In looking at what influence socioeconomic deprivation levels have on acute hospital admissions, the main focus of the present analysis was to examine whether patients living in low deprivation areas have similar or different admission trends to patients in high deprivation areas.

Hospital data collected contained information related to the domicile of each patient admitted. Similarly, population estimates data obtained from the New Zealand Health Information Service (2005) also contained information related to the domicile code and deprivation score code for each domicile, each different age group and each ethnic group (Maori, Pacific and European/Other). Therefore, the domicile code for each admission in the hospital data was matched to the domicile code from the population projections data provided. The projections statistics also provided data on the approximate number of people living in each domicile according to age and ethnic group in each of the hospital areas.

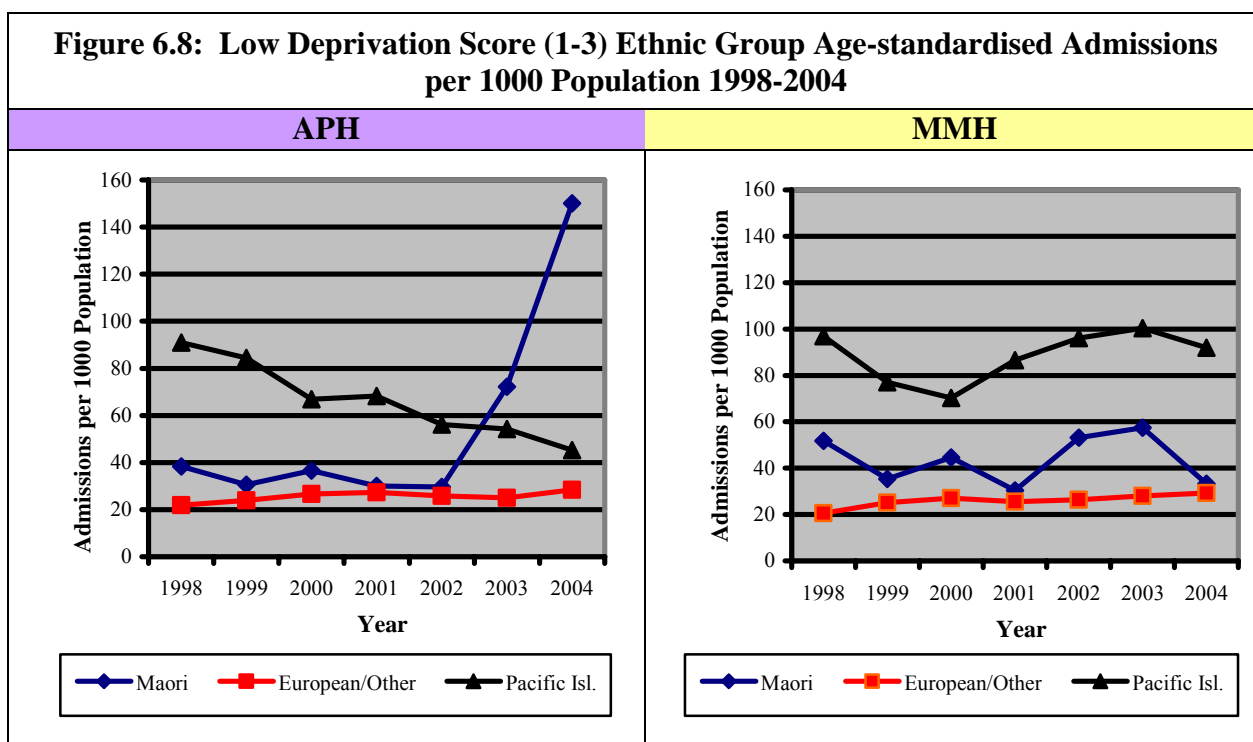
Data related to deprivation scores 1-3 (low deprivation) and 8-10 (high deprivation) were analysed, to examine the influence of socioeconomic deprivation AMAs (Figures 6.8 and 6.9 respectively). Data related to patients in the 4-7 deprivation score categories were excluded from the analysis as the focus of this analysis was to identify admission variations between the low and high deprivation domicile patients.

(6.3.1) Low Deprivation Admission Trends

According to the analysis of the low deprivation area admission data, the European/Other groups of both hospitals had the lowest and relatively similar number of admissions compared to the other ethnic groups (Figure 6.8). For example, the ASRs increased from 21.9/1000 (95% CI 21.0-22.8) to 28.4/1000 (95% CI 27.4-29.4) for APH during 1998-2004. Similarly, the ASRs also increased for MMH from 20.6/1000 (95% CI 19.5-21.7) to 29.3/1000 (95% CI 28.1-30.5) over the study period.

APH's Maori ethnic group ASRs were slightly higher than the European/Other groups' admission rates during 1999-2002. However the admission rates increased rapidly from 29.6/1000 (95% CI 22.4-36.8) to 150.1/1000 (95% CI 122.2-178.0) during 2002-2004, with

the large confidence intervals reflecting the small sample sizes. MMH's Maori group's ASRs were slightly higher than the APH group's during 1998-2002. Overall, the admission rates for MMH's Maori group increased from 30.4/1000 (95% CI 23.6-37.2) in 2001 to 57.4/1000 (95% CI 47.6-67.2) in 2003.

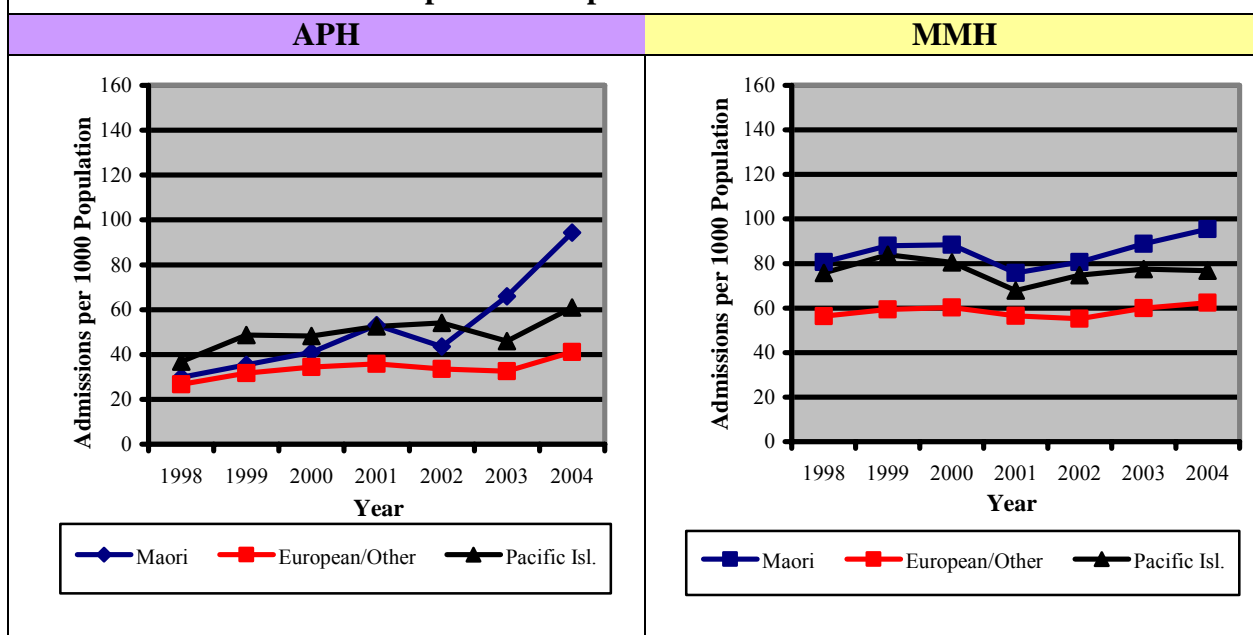


Overall, the Pacific Islander groups from the lowest deprivation areas of both hospitals had significantly higher admission rates than other ethnic groups during 1998-2001. Both of these groups also experienced a decline in admission rates during 1998-2000. However, MMH's Pacific Islander group admissions increased again from 70.2/1000 (95% CI 49.9-90.5) in 2001 to 100.4/1000 (95% CI 79.4-121.4) in 2003. In contrast APH's equivalent group admissions decreased throughout the study period from 91.0/1000 (95% CI 76.0-106.0) to 45.2/1000 (95% CI 36.5-53.9). Again, the wider confidence intervals are indicative of the small sample sizes, and the results should therefore be interpreted with caution.

(6.3.2) High Deprivation Admission Trends

The analysis of data related to high deprivation domicile (decile 8-10) patients indicated that MMH's Maori group had the highest ARSs ranging between 75.8/1000 (95% CI 71.8-79.6) and 95.4/1000 (95% CI 91.1-99.7) (Figure 6.9).

Figure 6.9: High Deprivation Score (8-10) Ethnic Group Age-standardised Admissions per 1000 Population 1998-2004



The Maori group of APH had the second lowest admission rates during 1998-2002, which then however increased rapidly to 94.3/1000 (95% CI 87.4-101.2) during 2003-2004. In the first year (1998) and the last two years (2003/04) of the study, the least deprived APH Maori ethnic group patients had higher ASRs than did the high deprivation patients. On the other hand, MMH's high deprivation group consistently had significantly higher ASRs than the least deprived group.

The high deprivation Pacific Islander group of MMH had the second highest admission rates with a relatively similar trend to the Maori group's. The admission rates appeared to have peaked (84.0/1000, 95% CI 80.2-87.8) in 1999 followed by a decline and then settled at about 77/1000 during 2003-2004. These admission rates remained consistently lower (during 2001-2004) than the rates for the low deprivation area (decile 1-3) of the Pacific Islander group of the same hospital. The Pacific Islander group patients admitted from the high deprivation (decile 8-10) areas of APH had the highest ASRs during 1998-2002, of all the APH ethnic groups. The admission rates increased from 36.7/1000 (95% CI 33.6-39.9) to 60.9/1000 (95% CI 57.1-64.7) over the study period. However, these rates were much lower than for the low deprivation (decile 1-3) area Pacific Islander group of the hospital during 1998-2003.

The high deprivation European/Other ethnic groups of MMH had the third highest ASRs compared with the other ethnic groups at MMH. The admission rates appeared to have remained relatively stable, ranging from 56.4/1000 (95% CI: 54.4-58.2) to 62.4/1000 (95%

CI: 60.6-64.2). These rates were more than double those of the least deprived (decile 1-3) group of the hospital. APH's European/Other group had the lowest ASRs per 1000 population, ranging from 26.7/1000 (95% CI 25.5-27.9) to 41.0/1000 (95% CI 39.6-42.4) over the study period. The most deprived group's admissions were higher by 5-13/1000 compared to the least deprived group's admissions of the hospital. There were also significant differences in the admission rates of the two European/Other ethnic groups living in the most deprived areas of either hospital.

(6.3.3) High User Deprivation Trends

The relationship between socioeconomic deprivation and the high users of hospital services was also explored. Among the randomly selected high users there were no admissions from the low deprivation deciles 1-3. Approximately 25% of the selected high user patients lived in areas of neither high nor low deprivation. All of the other selected high users came from the high deprivation areas. The relationship between ethnicity and high users was also explored but no significant trends were found, possibly related to the small sample size.

(6.3.4) Expert Panel Analysis on Deprivation and Admissions

The expert panel was also asked to reflect, from their own experience of working with patients coming from different deprivation areas, whether they observed a relationship between the levels of deprivation and number of admissions. The relationship between high deprivation and the inability to afford access to primary care, was one of the key issues raised by most of the MMH expert panel members. A number of expert panel members gave examples from their personal clinical experience, for example, a MMH nurse specialist: *'According to my clinical experience and research more than 50% of the MMH population lives in high deprivation score areas with no disposable income. I feel, unless primary healthcare becomes affordable the patients will continue to use the hospital. I know personally some patients who are happy to wait at the hospital but would not use GP services due to the financial constraints'*.

A MMH manager supported the above views: *'Yes, there are people who prefer to come to the hospital rather than to go to a GP, most of it to do with money. If you were on a minimum wage, would you take your child or yourself to a doctor and pay 70 dollarsit's that*

craziness. Some cultures in the community also prefer to come to the hospital, rather than to go to their GP'.

Another nurse specialist, who is used to working with patients in the community, raised another issue which again related to the socioeconomic situation of some of the patients admitted to MMH: *'GP hopping is a relatively common problem in high deprivation areas, as many patients owe money to their first GP, and then start going to a second GP and so on. At the end, hospital is the only choice left for these patients'*. Similarly, one of the APH managers also raised the issue of higher admission rates from the high deprivation areas. For example: *'There are some areas of high deprivation in the APH catchment, such as Mt Roskill, Otahuhu and Orakei, which possibly do have higher admission rates than the affluent areas. We do have some PHOs funded to provide some specific services to these local communities. There is no evidence whether or not these PHOs are meeting their targets, etc'*.

A number of physicians (n = 3) and nurse specialists (n = 2) and a manager from MMH supported the above views. These panel members agreed strongly that the introduction of subsidised GP visits in South Auckland has possibly encouraged the public to visit their GP. Summed up by one of the nurse specialists: *'The fact is that CMDHB has made it more accessible in the last eighteen months through the Primary Health Care Strategy for people to attend their GP. I have definitely seen an increasing number of people going to see their GP. But for some of them even \$10 a visit can be a barrier'*. A MMH physician, who also works in the community, supported the above views by stating: *'I have seen a definite increase in the number of patients going to see their GP'*.

A nurse specialist and a manager from APH attempted to highlight the issues related to a patient's level of deprivation and self-referral trends, to the community culture of using or not using GP services. For example, according to an APH manager: *'Self-referral rates were possibly related to the catchments area and the community culture. As a general rule people from the APH region go to their GP first'*. This view is validated by the quantitative finding of the much lower self-referral rates at APH compared to MMH. Another APH physician further supported it by commenting: *'Despite the high deprivation you don't get the increase in European, Asian and Indian admissions but in the Maori and Polynesian populations you do. So it's not just the degree of deprivation causing the increased demand but there are a multitude of other factors'*.

(6.3.5) Admission Trends by Deprivation – Conclusions

According to the findings related to admissions of patients from low deprivation areas versus ones from high deprivation areas, the European/Other groups had significantly higher ASRs for the high deprivation area patients compared to the low deprivation area patients for both hospitals. The low deprivation European/Other groups of both hospitals had relatively low and similar rates. However, there were significant differences between the ASRs of the European/Other high deprivation patients of the two hospitals, with the MMH group having consistently higher rates than the APH group.

Overall, the high deprivation MMH Maori group had the highest ASRs, while the high deprivation APH group had the second lowest ASRs. These rates were significantly higher for both groups when compared with the rates for their hospital's low deprivation domicile area Maori patients.

The ASRs of the Pacific Islander groups with low deprivation scores also had overall higher admission rates compared with the Pacific Islander patients from high deprivation areas. Although the ASRs for APH's low deprivation Pacific Islander group have continued to decline, both of these hospital groups had the highest ASRs for the low deprivation area patients.

The expert panel findings strongly supported the relationship between high deprivation and the inability to afford access to primary care or GP services. A number of APH panellists, suggested that some cultures prefer to go to hospital than use the primary care services in the community.

Overall, it may be concluded that for the European/Other and Maori ethnic groups of both hospitals there was a direct relationship between the level of deprivation of the area the patients lived in, and their admission rates to hospital. For the Pacific Islander groups the inverse relationship applied. The high user deprivation trends also indicated that patients living in high deprivation areas were more likely to have multiple hospital admissions than patients living in low deprivation areas.

(6.4) Expert Panel Analysis on Overall Study Findings

Finally, expert panel members were invited to comment on overall findings of the study, rather than to a specific area of the study. Therefore most of the identified themes were related to the overall rise in admissions. These responses are discussed and presented in this section.

Due to the increased number of admissions at APH, some physicians (n = 2), nurse specialist (n = 2), and a manager, defended the rise in the overall number of AMAs and were more concerned with the availability of patient beds at the hospital. One of the physicians said: *'We will argue that our new hospital and new outpatient services have improved the accessibility to healthcare without needing admissions. Yes, we can do even more things to prevent admissions, but I am worried that the hospital remains not demand driven but supply limited. We work at very high bed occupancy rates - it's almost as if you don't have enough beds. All the stuff about what is the best efficient bed occupancy rate whether it should be 88 or 90% - our hospital is in excess of that'*. The above views were also well supported by an APH manager, who stated: *'We could possibly keep down the numbers of our very short stays, [for example] 4 hour ones, the types of patients who hit the APU [short stay unit] and don't get to the wards. But my feeling still is that over time the patient acuity actually is rising, not dropping. There are very few people in hospital beds, who don't need to be in a hospital bed. If anything, because of the pressure on beds, we are pushing people out earlier [discharging from hospital]'*.

Another APH manager, added a different dimension to the reasons for the growing number of admission at hospitals: *'It is scary - the significant increase in the number of admissions over the study period. Maybe we have not got as good preventative strategies as we should have at the moment. Maybe our reliance on PHOs to manage their population is not as robust as we would anticipate'*.

An APH nurse specialist highlighted that the lack of appropriate medical and diagnostic services in the community was another likely reason for the increased number of medical admissions. Some of these reasons are explained in the following: *'Most of the people we are seeing in the Assessment Planning Unit do need to come in. It [the diagnostic services provided by the hospital] would not be something that a GP can do, often due to the lack of*

access to diagnostic services such as an exercise test [for chest pain patients] to get the definitive diagnosis. There are very few GP practices that have access to that kind of immediacy’.

While others expressed concern at the growing number of admissions and the limited availability of beds. For example, a MMH nurse specialist responded that: *‘There are not sufficient hospital beds in the hospital at present and MMH is already thinking of building another two floors for patients - just two years after completing the new hospital building. If this growth trend continues then MMH will require another hospital in the next few years’.*

The increased numbers of admissions were not just related to the opening of a larger ED at MMH. Another MMH manager suggested the unprecedented rise in admissions at MMH was also related to the ineffectiveness of ED, the professional culture of health professionals and the hospital processes. This manager highlighted some of the issues that require addressing to prevent inappropriate admissions to the hospital: *‘The decision making at the front door [Emergency Department] needs to improve. For this you could look at different models of care. We need to have good gate keeping services. Patients are still largely being admitted by the junior medical staff. We need to have the consultants from each specialty supporting the staff in diagnosing at the front end of the hospital’.* While another manager further expanded on this, by stating: *‘I think the junior doctors often get snowed under and overwhelmed with the workload and they often admit patients for medico-legal reasons. Therefore senior medical staff needs to be present in ED as required’.* Another MMH nurse specialist, appeared to agree with the above comments: *‘If patients do come to hospital they should be seen by the professionals who are good decision makers [consultants], at least on admission, but not by the professionals who are learning to make decisions’.*

Lack of appropriate health services in the community and health funding were also issues identified as encouraging admissions to hospitals. For example, one of the APH managers said: *‘Overall, what the findings indicate is that different ethnic groups have different needs. Funding models are not supportive of the younger people with chronic disorders and there is a generalised lack of community service’.* Nurse specialists of both hospitals who case manage the chronic disease patients also raised issues around the adequacy, or otherwise, of community support services. For example one of them said: *‘Generally, there is a lot of sickness around, especially during the winter months [when also some of] the healthcare*

workers can't come to work. Or it may be Christmas and the New Year holiday period and the agencies don't have enough workers to go around. Sometimes some of these patients crumble due to the lack of support'

Some of the expert panel physicians (n = 4) from both hospitals, were more focused on reducing the number of patients coming to hospitals by exploring alternative models of care in the community. For example one of the MMH physicians proposed that: *'patients with low acuity, such as triage categories 4 and 5, especially the elderly, could be managed elsewhere in the community by other health professionals, such as nurse specialists in conjunction with GP services'*. In contrast, an APH manager stated: *'When it comes to elderly care, I think GPs are not really that good. We take a lot of acute admissions to Older People's Health from the community. . [The patients we are admitting are not healthy, they tend to be] more complex, they are older and frailer'*.

Most of other expert panel members from both hospitals referred to strategies to reduce the burden of disease. One of the MMH managers best described it by stating: *'I think the DHB and the Ministry of Health concept of trying to keep the population healthy long term, through the diabetes campaign, the healthy eating, quit smoking and exercise programmes for the Maori and Pacific Islander, or at-risk groups, is possibly the best strategy'*.

Some identified issues impacting on admission rates were outside the control of hospitals and DHBs. Hospitals can only do so much, according to one of the MMH managers, who stated: *'Issues outside the hospital, such as the social aspects of housing, overcrowding, diet, influence of culture on health, including primary health professional culture, need to be examined. Primary care also needs to be accessible 24 hours a day and 7 days a week, and affordable, if we seriously want to reduce the number of admissions'*.

On the topic of better meeting the healthcare needs of the population, a number of managers (n = 3), physicians (n = 4) and nurse specialists (n = 2) of both hospitals, raised issues that urgently need to be addressed. Summarised by an APH physician, what is required, are: *'Changes in medical education; focus on patient centred hospital health services, rather than doctor centred health services; appropriate workforce planning and retention of staff; and a comprehensive review of the changing demographics and their impact on health services in NZ'*.

Finally, all the expert panel members unanimously agreed that that the public expects a lot more from the public health system than what is being offered, and that as a result more people are using the hospitals.

(6.4.1) Summary

It is concluded from the panel findings that the patient acuity has increased with the increase in admissions, and that there is a perceived lack of hospital beds. At MMH, apart from the large ED capacity, lack of physician involvement in admissions in ED was seen as a contributing factor to rise in admissions.

The panellists of both hospitals related the rise in admissions to lack of adequate community support services, inability of GP services to look after older patients with multiple morbidities, and lack of rapid diagnostic services in the community. New population health based strategies and models of care to raise the health status of at-risk groups were proposed. Finally a large-scale fundamental inter-sectoral change was proposed in the areas of medical education, funding of the health sector, and coupled with appropriate workforce planning to match the changing population demographics.

(6.5) Chapter Conclusions

The frequency of admissions findings showed that a small proportion of the population was responsible for a large number of admissions. For example, each patient, who had ≥ 2 acute admissions accounted for an average of 3.32 and 3.59 admissions per patient at APH and MMH respectively. Approximately 60% of acute admissions at APH came from patients with more than one admission over the study period. This figure was even higher (approximately 65%) for MMH. Findings related to randomly selected cases indicated most of the high user admissions were self-referrals to the hospitals. Approximately 60% of the selected high users were admitted outside office hours. Most of the high user admissions came from the 65+ age groups and from high deprivation domiciles.

Ethnic group analysis indicated large differences in admissions from the ethnic groups of the two hospitals, with APH having a considerably higher percentage of admissions from the European/Other groups. The acute admission findings indicated that all three ethnic groups of MMH had higher admission ASRs compared to the equivalent APH groups for most of the study period, except for the APH Maori group in 2004. MMH's Maori and Pacific Islander groups had the highest ASRs and APH's equivalent groups the second highest. The crude number of acute admissions increased at both hospitals, but there were large differences in the increases for different ethnic groups. The ASRs and crude number of admissions almost doubled (97% increase) between 1999 and 2004 for the Maori group of APH, while in contrast the European/Other group of MMH only showed a 29% crude increase, highlighting the differences in trends for the ethnic groups.

The 'single' and 'multiple' admission findings indicated that APH had a higher proportion (57%) of 'single' admissions than MMH (54%). It also highlighted that there was a large group of patients with 'multiple' admissions, particularly for the 55-74 and 75+ age groups, who had much higher age-specific admission rates than the younger age groups. Again the Maori and Pacific Islander groups of MMH had the highest age-specific 'single' and 'multiple' admission rates, while the APH European/Other group had the lowest rates.

Domicile deprivation analysis produced expected results. Among high deprivation domicile patients MMH had higher admission rates than APH for each of the ethnic groups. For the low deprivation domicile patients MMH and APH had comparable rates for the Maori and

European/Other groups, while the Pacific Islander groups were comparable in 1998-2000, after which the rate for MMH increased while APH's decreased. When looking at an individual hospital, patients from low deprivation domicile areas tend to have lower admission rates than patients from high deprivation areas of the same ethnic group. However there were some exceptions to this general trend. The most obvious was the Pacific Islander population at APH, which had higher admissions for the low deprivation domicile patients.

The expert panellists raised a number of issues that they believe have continued to contribute to the increase in admissions. These included factors related to health professional practice, the size of the hospital ED at MMH, the lack of beds at APH, and the lack of or inadequate or poor access to community and primary care services to effectively meet the complex health needs of the ageing population. The panellist findings indicated therefore that a large scale fundamental structural change was required to meet the future healthcare needs of the population.

Chapter 7

Discussion: Acute Admission Trends

(7.0) Introduction

As stated the purpose of this study was to explore the trends, nature and causes of the rise in adult medical admissions at two Auckland Hospitals (APH and MMH). Discussion on the findings of this study is presented in three separate chapters. This chapter focuses on the admission trends reported in Chapter 4 and the admission frequency trends reported in 6.1, Chapter 8 discusses the admission trends related to morbidity (major diseases and disorders) reported in Chapter 5, and Chapter 9 provides discussion on the influence on admission trends of deprivation, population and the health service factors that were reported in Chapter 6.

In this chapter, acute medical admission trends are discussed in relation to admission management practices, initiatives intended to enhance quality of care and to reduce medical admissions, and other identified key themes. The chapter begins by briefly discussing the study sample characteristics including total admission trends, acute admission trends and related themes. These include patient management processes such as patient referral trends, ED triage trends and the influence of seasonal variations and ageing population on acute admission trends. The chapter further discusses the length of stay (LOS) trends, the influence of short stay units on acute admission and LOS trends, and finally readmission trends.

(7.1) Total Admissions

Auckland Public Hospital (APH) and Middlemore Public Hospital (MMH) between them had N = 277,416 adult medical admissions over the 8 year study period. The ethnic makeup of the two hospital populations showed some significant differences. In particular, MMH had a higher proportion of admissions for Maori and Pacific Islanders at 14% and 17% compared with 8% and 12% respectively at APH. On the contrary, the European/Other group's proportion of admissions was lower at 54% as compared to 67% at APH. Both hospitals had slightly higher female admissions (by approximately 1%). This reflects the 51%:49%

female:male ratio found in the NZ population as reported in the 2001 Census (Ministry of Health, 2005).

When comparing total admission rates, MMH had a higher crude admission rate at 64/1000 than APH at 54/1000 (there were $n = 150,120$ total admissions to MMH between January 1997 to December 2004, and $n = 127,295$ to APH between July 1997 to December 2004¹. This difference was further highlighted by findings related to trends in the crude number of all admission categories (acute, arranged and waitlist) for each hospital (see Table 4.2). MMH admissions increased rapidly from $n = 12,149$ in 1997 to $n = 21,791$ in 2004, although it experienced a slight decline in admissions in 2002. In contrast, APH's overall number of admissions experienced significant fluctuations with an overall increase from $n = 16,134$ in 1998 to $n = 18,795$ in 2001. This was followed by a slight decline during 2002, and a greater decline of 24% ($n = 13,917$) during 2003. During 2004 the admissions began to rise again, but remained lower than the 2001 admission numbers. As a result the gap between the crude admission rates of the two hospitals further widened.

Overall the admission trends of both hospitals were very similar. Only in 2003 did trends differ markedly, when there was a significant decline at APH while MMH admissions increased. This decrease in admissions at APH coincided with the opening of the purpose built hospital. Three hospitals (Auckland Public Hospital, Greenlane Hospital and National Women's Hospital) located on different sites, were amalgamated into a new purpose built hospital on a single site. The new Auckland City Hospital provided less hospital beds than had been provided by the three hospitals. According to some estimates by APH administrators the hospital has lost approximately 5% to 8% of total beds, although the actual number of beds lost is unclear, and APH expert panel managers and physicians could not agree on the actual number of beds lost.

In addition, APH implemented some temporary measures to better cope with the disruptions caused by the hospitals' transfer to, and amalgamation into, the new hospital building, which involved a temporary large-scale reduction in available beds. It is likely that the reduced number of beds may have discouraged the admitting doctors from admitting patients. Other measures included a request to general practitioners to send only essential referrals to hospital, coupled with ongoing advertisements in the local newspapers and local radio stations

¹ The two hospitals had different data collection time periods.

to encourage potential patients to use primary healthcare services in the community rather than self-referring to the hospital. All these measures were specifically designed to reduce admissions to the hospital while the hospital staff were busy with hospital amalgamation and transfer issues. These measures proved successful. For example, there were only $n = 847$ patient admissions in November 2003, compared to the average of $n = 1,098$ APH admissions for the month of November month over the 8 year study period (Figure 4.8). This finding raises issues related to supply and demand, and whether demand could be managed on the supply side by restricting the number of hospital beds.

According to 'Roemer's Law' there is a strong link between the number of hospital beds in a given community and the hospitalisation rate of that community (Roemer, 1961). It is argued that the significant decline in admissions at APH during 2003 was related to the severe reduction in hospital beds associated with hospital amalgamation, closure of three hospitals and replacement by a single new hospital. This is further supported by a report on the care of patients with severe chronic illness, that more than half of the variability in rates of hospitalisations for medical conditions can be attributed to differences in local supply of acute care hospital beds (Dartmouth Medical School Center for Evaluative Clinical Sciences, 2006).

These findings demonstrated that the demand for hospital beds could be better managed if required. Further evidence was found in 2006 (post the period of this present study) when there was a 20% decline in the hospital ED presentations at MMH during the junior doctors' strike of June 2006 (McKernan, 2006). During the same strike, APH used clinical nurse advisors to support senior medical officers during the strike period and senior medical officers reviewed patients in ED early in their episode of care, measures that proved very successful in reducing the number of inappropriate admissions and enhancing the overall quality of patient treatment. As a result of the experience APH was considering such a medical team structure on a regular basis (NOVA, 2006).

In addition to hospital redevelopment, some of the fluctuations in the data were directly caused by changes in coding of patients to different admission categories. All of the patients were admitted into one of three major patient admission categories. The acute admission category accounted for most of the admissions for both hospitals. The combined arranged and waitlist category admissions remained between 23%-29% for MMH for the 8 years of the study period. Both hospitals' combined arranged and arranged admission rates were lower

than the NZ total medical public hospital rates of 32%-35% during 1997/98-2002/03 (Ministry of Health, 1999 & 2004a). APH's combined arranged and waitlist admissions were between 21%-26% during 1998-2002. However these rates declined rapidly to 2.8% due to the non-DRG funding initiated by the DHB during 2003-2004². MMH's acute admissions remained between 71%-77% of the total admissions over the study period. In contrast, APH's acute admissions were relatively steady (73%-79%) during 1998-2002 but then increased rapidly to 97% in 2004. These rates were higher than the overall NZ public hospital acute admission rates which ranged between 65%-68% during 1997/98-2002/03 (Ministry of Health, 1999 & 2004a). The rapid increase in acute medical admissions at APH during 2004 was directly related to the removal of waitlist and arranged admission categories from the inpatient database (refer 4.2.2). APH was being funded under a different contract on a non-DRG basis to provide health services for waiting list and arranged admission category patients.

Consequently, waitlist and arranged admissions no longer appear in the inpatient hospital data. As a result, the percentage of acute admissions increased to 97% absorbing what was formerly reported as waitlist and arranged admissions in 2004. Therefore a large part of the decline in total admissions at APH between 2003 and 2004 was related to data coding changes. Another reason for the decline had to do with hospital transfer management issues such as the large-scale temporary closure of hospital beds. The above discussion demonstrates that approximately 75% of the total medical patients were acute (unplanned) admissions, which has significant implications for the administration of the hospitals. The remainder of the discussion is only on acute (unplanned) admissions.

² Arranged and waitlist same day procedures such as gastroscopy and bronchoscopy cases are excluded from the casemix purchasing and are funded through independent contracts at APH as advised by the DHBNZ SFG Cost Weight Project (2003), while MMH's DHB has continued to fund these cases through the DRG based casemix payment system.

(7.2) Acute Admission Trends

Both hospitals experienced statistically significant increases in the acute admission age-standardised rates (ASRs) per 1000 population during 1998-2004. APH acute admission ASRs peaked to 37.5/1000 (95% CI 37.4-37.6) in 2001, declined to 32.8/1000 (95% CI 32.7-32.9) between 2002 and 2003, and increased to 37.9/1000 (95% CI 37.8-38.0) in 2004. Acute admission ASRs at MMH were statistically and consistently higher than at APH. The acute admission ASRs peaked to 45.0/1000 (95% CI 44.8-45.2) in 2000, declined by 3% (n = 396) in 2001 and then increased steadily to 45.8/1000 (95% CI 45.6-45.9) by 2004.

Acute admissions increased by approximately 54% (n = 5,163) during 1997-2004, at MMH, and 41% (n = 3,821) between 1998 and 2004 at APH. These rises in acute admissions were significantly higher compared to the overall NZ public hospital acute medical admissions, which grew only about 14% between 1996/97 and 2002/03 (Ministry of Health, 1998 & 2004b). However, the national figure also included data related to the <15 year age groups as well as medical maternity patients, who largely have arranged or waitlist admissions, limiting comparability.

Admission rates have increased at a faster rate than the actual projected population growths for both hospitals. The increase of approximately 41% at APH was considerably higher than the projected population growth for the APH region of approximately 11% (1.6% per year during 1998-2004), as was the 54% increase at MMH, where the population only increased approximately 18% (2.3% each year during 1997-2004). This finding that acute admission rates have increased over and above the population growth rates for both hospitals, was also supported by increases in the ASRs over the study period. There was a high degree of agreement among the expert panel members of both organisations that this rise in acute admissions was real, and was reflected in their clinical practice. Therefore, both national and international literature were analysed to examine trends in acute adult hospital admissions.

According to NZ research on the inpatient volume changes in Auckland's public hospitals, acute adult medical admissions accounted for approximately 60% of the total medical admissions (Jackson, 1996; Medical and Surgical Services, 1997), a figure significantly lower than the 71% to 79% acute admissions found in the present study for both hospitals. A reason for the difference might be incomplete data records prior to 1997, evident to the researcher

who was unable to use data prior to 1997 for the present study, as both hospitals had incomplete and fairly poor quality data records for earlier years. It was also noted that both hospitals have invested in the development of outpatient and day patient services during the study period to reduce the number of acute admissions. Had this not occurred admission rates might have been even higher. Even so AMAs accounted for a very high proportion of the public hospitals' total admissions throughput, and will have put high pressure on available hospital beds as well as other hospital resources. As highlighted by an APH physician the hospital did not have a sufficient number of beds to provide adequate care. As a result AMAs impact on other services provided by the hospitals, such as for example elective surgery. It is interesting that media and political attention remain focused on the surgical waiting lists and waiting times, with hardly any mention of the growing number of AMAs.

The former Northern Regional Health Authority also carried out a study on admission trends at all Auckland public hospitals during 1995/96-1996/97, and found that acute admissions had increased by 8.2% (Corkill, 1997), strengthening evidence that there has been a significant rise in acute medical admissions at least since 1995 in Auckland. In support of this conclusion, the New Zealand Health Technology Assessment Group (NZHTA, 1998) carried out a large-scale systematic review of literature on the trends in acute medical admissions and concluded that there was significant growth in medical admissions both in NZ and other countries such as in Australia, the UK and the USA. According to the Patient Management Task Force (2001) the public health system of Victoria was also facing increasing pressure to meet the growing demand for acute medical inpatient care in Australia, further supporting findings of the present study.

Reasons for the decline in the ASR of acute medical admissions at MMH during 2001 were explored with MMH's expert panel members. There were 11 distinct projects trialled in conjunction with primary healthcare and the hospital Medical Services during 2000-2002. Most of these projects were disease specific, such as for heart failure, chronic obstructive pulmonary disease and diabetes, while some were more focused on preventing readmissions to hospitals (Clarke, Howells, Wellingham & Gribben, 2003). For example, one of these trials was the 'Primary Options for Acute Care' (POAC) trial, which ran from February to December 2001, with the aim of enrolling 600 primary care "avoidable admission" patients in a programme. General practitioners (GPs) managed the enrolled patients in the community and were allowed to use any healthcare resources required up to a cost of approximately \$266

per patient per episode (Aish, Didsbury, Cressey, Grigor & Gribben, 2003). According to the authors, $n = 707$ patients were enrolled in the POAC by 100 GPs and only 104 patients (15%) were eventually admitted to hospital. As a result, approximately 85% of these patients, who would otherwise have been admitted to hospital, were managed by the GPs in the community. In contrast, the evaluation of some of these projects indicated that the utilisation of hospital outpatient clinics and even admissions to hospital increased due to some of these projects (Gribben, 2001a, b, c, d & e). Overall, it is likely that most of these projects, would have contributed to the decline in acute admissions during 2001 as highlighted by the expert panel. After 2001 most of these projects were discontinued, and acute admissions began to rise again. The decline in acute admissions at MMH also reflected national NZ trends for the financial year 2001/02, with the NZ public hospital throughput reports demonstrating a national decline of 2.4% in 2001/02 and a further 4.7% in 2002/03 for acute medical admissions (Ministry of Health, 2004a & 2004b). In contrast, the APH admissions peaked during 2001, against both the national and MMH admission trends.

A number of studies have examined trends in emergency, unplanned or acute presentations to hospital EDs in different countries. For example, emergency (acute) hospital admissions account for 40% of the National Health Service's total bed usage in England, and have increased by 2–3% each year (Capewell, 1996; Pettinger, 2001). Equally, Shactman and Altman (2002) investigating utilisation and overcrowding of hospital Emergency Departments (ED) in the USA, found ED utilisation increased from 345/1000 in 1997 to 365/1000 during 1999, with the majority of the increase related to medical admissions. NSW Health Services Research Group (1998) also reported similar trends in acute inpatient services in New South Wales, Australia

It is concluded that acute admissions to the Auckland hospitals have increased well above the population growth and higher than overall trends in NZ. This finding reflects similar trends in other developed countries and is supported by both NZ and international literature. MMH had significantly higher ASRs compared to APH, though the overall trends were similar. One of the reasons for the decline in AMAs at MMH in 2001 was likely to be related to the trial projects, which however produced mixed results, while APH's decline in 2003 was associated with the large-scale temporary bed closures and the media campaign to manage the amalgamation of the hospitals. The reasons for this variation are to be explored in the remainder of this chapter and the further discussion chapters. These two variations point to

possible future strategies to manage acute medical admissions: one, to target avoidable admissions and strengthen alternative ways of managing that population; and two, to target the supply side combined with clear protocols for use of acute beds. Finally, this increase in AMAs has a direct impact on surgical waiting list/time, yet has not received any media attention, while surgical waiting lists have remained the centre of attention both politically and in the news media.

(7.2.1) Patient Referral Sources

The study found that self-referral and external referral by external health professionals accounted for most AMAs. However, there were some differences in the referral patterns of the two hospitals. For example, at MMH the number of self-referrals and external referrals during 2002-2004 were similar (50:50), while in the preceding years (1998-1999) the ratio between self- and external referrals fluctuated dramatically. In comparison, at APH only 16%-21% of admissions were self-referred, and 79%-84% externally referred during 1998-2001, but from 2002 self-referrals increased and the external professional referrals declined, and by 2004 self-referrals even exceeded external. According to APH expert panel members, this dramatic apparent shift in ratio was related to miscoding. In their experience the ratio of self- to external referrals has not in fact changed at the hospital (refer 4.4, p97). Further investigations revealed that all patients arriving by ambulance service to the hospital ED were being coded as self-referrals, while in the past ambulance referrals were treated as external referrals.

Similarly, MMH expert panel members also acknowledged that the 1998-1999 fluctuation in the referral trend was most likely to be due to miscoding during the implementation of a new patient information management system at the hospital. An acute demand project study, carried out at North Shore Hospital, Auckland, found that 67% of the ED presentations were self-referrals and 31% external in 2002/03 (Whittaker & Peters, 2003). These results highlight the differences between the self- and external referral rates of the three Auckland DHBs.

The ASRs related to ethnic and hospital referral sources indicated that the Maori and European/Other groups of MMH had significantly higher self-referral rates (44%-50%) than APH's equivalent groups (21%-23%) during 1999-2004. The Pacific Islander group at MMH

had the highest self-referral ASRs at 42.1-44.8/1000 (or 52%-60%). In contrast to MMH's experience, external health professionals referred approximately 70% of APH's Pacific Islander patients during 1998-2001. The referral data pre 1999 and post 2001 were considered unreliable for MMH and APH respectively. Due to the high number of self-referrals at MMH, a research project which included advertising campaigns with messages such as 'have and use a family doctor' and 'save Middlemore ED for emergencies', and general practitioner liaison roles, were also being trialled (Clarke, Howells, Wellingham & Gribben, 2003). This project appeared to have had no obvious effect on the self-referral rates.

Further discussion focuses on the reasons for differences in the referral trends of the two hospitals and their ethnic groups. The differences were possibly related to the access to primary health services in each hospital's catchment. The MMH expert panel agreed with the above findings and believed inadequate primary medical care to be a reason for higher self-referral rates at MMH (refer 4.4, p98).

In contrast APH panel experts indicated that the ratio of GPs per population was higher in their area and that patients have better access to them. The findings of the present study support that opinion. The population living in the APH area, where self-referral rates were lower, had much better access to primary healthcare than the population in the MMH area. An analysis of the New Zealand general practitioner workforce by the New Zealand Medical Association (2004) highlighted that the total ratio of active GPs was 1:1230 population in NZ, but the ratios varied by region and DHB. The West Coast had the lowest ratio (1:1780) followed by Counties Manukau District Health Board at 1:1570, while Auckland District Health Board had the highest ratio at 1:940 of GPs per population in NZ. Patients living in the MMH area, therefore, used MMH instead of primary healthcare services, suggesting a lack of GPs in the community contributing to the increased number of self-referral admissions at MMH. In contrast the primary healthcare needs of the APH population were better met by the GP and private accident and emergency community services, as claimed by the APH expert panel.

It is not just the number of general practitioners available per population but also the variations and inequities that exist between the regions that affect self-referrals and admissions to hospital. Malcolm (2000) analysed data on capita expenditure on general medical, pharmaceutical and laboratory services between primary care organisations (PCOs)

in the four Auckland sub-regions. ProCare Central serving mainly well-off patients in Central Auckland, had a GP consultation rate of 5.9 per population and year, and also had a higher per capita expenditure than expected. In contrast, Mangere Health Resources Trust, which served South Auckland, with one of the most disadvantaged population groups in NZ, had a GP consultation rate of less than 4.6 per population and year, and a much lower per capita expenditure. Variations between district health boards (DHBs) in primary and community healthcare expenditure on pharmaceutical and laboratory services were compared. When the gap between budgets as determined by the primary care funding formula and actual expenditure on these services were compared, expenditure for the Auckland District Health Board (APH region) was approximately 25% above, and for the Counties Manukau District Health Board (MMH region) approximately 10% below, the budgeted funding. Overall, Malcolm (2000) concluded there were major inequities in the funding distribution and utilisation based on expenditure on primary care services in the greater Auckland region. These inequities in primary healthcare utilisation expenditure are likely to be related to the variations in the admission rates of the two hospitals and between the hospital ethnic groups. Indeed, MMH expert panel members were emphatic that poor access to primary medical services has led to high self-referrals to the hospital. The above patterns of referral can be summed up as the inverse care law, i.e. that the availability of good medical care tends to vary inversely with the need of the population (Hart, 1971).

Auckland findings reflect similar findings overseas. Weinick, Billings and Burstin (2002) carried out a comprehensive literature review to examine the role of primary care in the overcrowding of the USA hospital EDs. Their findings showed that first contact with a primary care provider can reduce subsequent use of specialists and EDs. Longer travel times to primary care offices and lack of extended after hour primary care may lead to less first contact with primary care and increased ED service utilisation as an alternative. Also in the USA, Bindman et al. (1995) found that the lack of access to a primary healthcare physician was related to higher hospital admission rates for chronic disorders such as asthma, chronic obstructive pulmonary disease, hypertension, congestive heart failure and diabetes, adding support to the premise that poor access to primary care services leads to higher hospital admissions.

A number of MMH expert panel members also commented on the poor socioeconomic status of MMH's population, attracted by free care to the hospital. The Health Funding Authority

(2000) found South Auckland had a high deprivation rating and poor health status, with approximately 72% of Maori and 90% of Pacific Islander people in Counties Manukau living in the highest deprivation (decile 8-10) areas (p11). In contrast, the APH population was more affluent and made much better use of the primary health services. The results of a telephone survey in Melbourne, Australia, concluded that financial disadvantage was associated with episodes of not seeking after hours care (Kelaher, Dunt, Day & Feldman, 2006). According to the National Health Committee (1998) income was the most important determinant of health, and there was persistent correlation between low income and poor health status in NZ and elsewhere. The influence of socioeconomic status on hospital admissions is further discussed in Chapter 9.

An alternative explanation for variations in self-referral and external referral rates might be the physical location and ease of access to the ED of the hospital itself. According to the expert panel, APH has an *'aggressive front end policy'* which discourages access to the hospital and encourages use of community based services. For example, the physical entrance to the ED is well off the main road and specifically built for ambulances only. Vehicle parking for the general public is limited and closely monitored, and the main entrance to the ED is also monitored by hospital security. Patient referrals from health professionals are also monitored and inappropriate referrals actively discouraged by administrators. MMH, in contrast, has an open plan ED with the main entrance on the main road, and there is an adjacent visitor car park. Most MMH expert panel physicians were unanimous that there was a strong relationship between the large accessible ED facility and increased admissions. *'The hospital has the biggest ED facility in the Southern Hemisphere'*. ED is regarded as a welcoming place and as a result it attracts more patients through external and self-referrals. In support of the above view another panellist stated, *'There was a significant increase in the external and self-referrals to the new hospital ED as soon as it was opened'*.

Other factors, such as the outside-NZ healthcare use practices of the large Pacific Islander population in the MMH region, also had an influence on the self-referral rates according to the MMH expert panel (refer 4.4, p98).

In conclusion a reason for MMH's higher admission rates appeared to be related to higher patient self-referral rates that in turn, were influenced by factors including the availability of

primary health services in the community, the socioeconomic status of patients, and the ease of access to the ED of a hospital.

(7.2.2) Triage Trends and Severity of Disease

The expert panel members of both hospitals noted that the severity of disease was increasing along with the ageing of the population and that a large number of older patients had multi-system and complex problems and could not be looked after by community primary healthcare services. Some panellist pointed out that primary care did not have access to the rapid diagnostic services required to meet the healthcare needs of this population. This section discusses triage trends in relation to severity of disease.

All patients acutely admitted to the hospitals were admitted through ED and were triaged by the nursing staff. The Australasian Triage Scale (ATS) is a 5-level triage urgency scale with each level having an associated time goal to initiate medical evaluation. The ATS mainly focuses on the urgency of the patient to be seen by a physician (immediately/10/30/60/120 minutes for triage categories 1-5 respectively) in ED (Fernandas et al., 2005). As described in 4.5 there were significant similarities and differences in the triage trends of the two hospitals. Triage 2 and 3 admissions have increased, indicating an increase in the severity of disease of patients coming to hospital. Triage 1 ranked 4th in frequency, declined somewhat in the crude rate for MMH while that for APH remained stable and was higher than MMH's. The main reason for higher crude rates at APH reflected the fact that APH provides some of the sub-specialty medical services not provided by other public hospitals in the Northern Region. As a result, it would have received high acuity patients, who needed to be seen immediately on their arrival to the ED. Lee et al. (2003) carried out a retrospective study to quantify trends in emergency presentations to the five public hospitals in Australia's Northern Territory in relation to demand and access during 1996-2001. Unlike the present study, findings related to triage 1 indicated a 121% increase over the five year period. The authors did not highlight any specific reason/s for this, except to note the high proportion of the indigenous Australian population served by the hospitals.

Triage 2 was the 2nd largest admission category after triage 3 and increased at both hospitals during 1997-2004. APH's crude triage 2 admissions increased steadily from 8-15/1000 over the study period, with a rapid rise in 2003/04 coinciding with the hospital amalgamation

period. At MMH the triage 2 crude admission rate increased from 7-16/1000 between 1997-2000, fell sharply to approximately 7/1000 in 2001, and again increased to 13-14/1000 during 2002-2004.

The primary contributor to the increase in triage 2 volumes was the chest pain DRG category. According to the expert panels, both hospitals used relatively similar clinical policies to manage chest pain patients, and all chest pain patients were automatically triaged as category 2 patients and screened for heart disease. This management of patients in ED reflects the guidelines for acute coronary syndromes of the National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand (Aroney, Aylward, Kelly, Chew & Clune, 2006). As the study found that circulatory system disorders were the leading cause of medical admissions for both hospitals, high and rising volumes of triage 2 were not surprising. Of many circulatory disorders, the chest pain DRG category was the leading cause of admissions and also showed a significant increase in admissions (Figure 5.5). As far as MMH expert panel members were concerned, most of these patients could be looked after in the community by nurse specialists supported by general practice. However, some members of the expert panels of both hospitals expressed their reservations as to whether general practice was adequately equipped to meet the needs of these patients.

Triage 3 was the leading admission category, with the highest crude number of acute admissions, and the crude rates were relatively similar for both hospitals, ranging from 14-22/1000. The expert panel analysis indicated that most of the patients admitted under this category were coming in with significant illness, such as older patients with chronic multi-system problems. Overall the triage 3 admissions related to the population aged <55 years appeared to have declined, while they have increased for the ≥ 55 years population at both hospitals. The major diagnostic category and specific DRG category findings also indicated that most of the disorders were age related (Chapter 5).

There appeared to be a direct link between the rapid decline in the MMH triage 2 crude rates during 2001, and again in 2002, and concurrent increase in the triage 3 crude rates for each of the same two years. Changes in triage 2 and 3 were related to, and likely to have been caused by, a change in triage coding practice after MMH opened its new ED in late 2000, and implemented new clinical processes and installed a new information technology system. Lee

et al. (2003) also found the numbers of triage 2 and 3 patients presenting in the Northern Territories, Australia, increasing substantially, similar to the findings of the present study.

Triage 4 admissions were significantly different for both hospitals. At MMH triage 4 crude admission rates increased from 4-10/1000 over the study period, while APH's crude admission rates declined significantly from 2001 onwards. According to the APH expert panel most of the triage category 4 patients were being handled by community services, while the MMH expert panellists believed that because primary healthcare was insufficient in the MMH region, many of these patients showed up at ED.

Primary healthcare services appeared to be handling the triage 5 admissions in the community, in both hospital regions. A MMH manager noted that a fair number of triage 5 patients were assessed at the hospital ED, but were not admitted, unsurprisingly given the lower number of GPs in the community.

The findings related to triage categories further support the conclusion that the MMH population, which is poorer economically and is poorly served by primary medical services, is more likely to self-refer to hospital. Patients who are not critically ill turn up at ED, where they are seen by junior doctors. Having junior and relatively inexperienced doctors assess these patients contributes to high acute admission rates. A finding of the present study supported by previous research investigating the influence of GPs on hospital admissions (Reid, Cook & Majeed, 1999; Giuffrida, Gravelle & Roland, 1999), concluded that admitting doctors at the hospital have a much greater influence on hospital admissions, than do GPs. MMH managers highlighted that junior medical doctors were admitting most of the medical patients and that there was little senior medical officer involvement in the ED. Wanklyn, Hosker, Pearson & Belfield (1997) investigated whether early assessment of GP referrals by senior registrars in a hospital medical receiving room would result in lower admission rates, and in increased use of specialist ambulatory services, specialty beds and early outpatient appointments. The authors found that, the same-day discharge rate increased from 3.6% to 15% and 29% when senior house officers and senior registrars respectively assessed patients. Senior registrars also directed more patients to the relevant specialty, therefore improving patient care and effective use of available beds. In another study, a retrospective analysis of the ED database was carried out to compare two groups of ED attendances at Tamworth Base Hospital, Australia (Donald, Smith, Doherty & Sundararajan, 2005). Group one presented at

the hospital when an emergency physician was in the ED and group two patients were seen when the emergency physician was not on site. The results demonstrated that the presence of an on-site physician resulted in a significantly shorter LOS, reduced number of admissions and fewer pathology tests, and concluded that having dedicated senior medical staff assess medical patients could reduce the number of admissions and discharge more patients in under 24 hours.

In contrast, APH has a '*very aggressive front end policy*' to manage patients seeking healthcare at the hospital. Unless classed as triage 1 and 2, all medical GP referrals go through to an Assessment and Planning Unit (APU), a 45 bed unit which is administered by the Medical Services physicians. Therefore, all these patients are assessed and screened by senior Medical Services personnel. Triage 1 and 2 as well as the self-referred medical patients, continue to be managed by the ED, but supported by the Medical Services. ED patients, requiring further medical care are referred to the Medical Services, i.e. as inpatients. The APU provides a number of options from not admitting, to admitting in a short stay bed (up to 36 hours), or admitting a patient to a hospital ward. The clinical protocols governing admissions mean that only patients who require hospital care are admitted, which is reflected in the decline of triage 4 and 5 patients. By comparing the two hospitals, it is clear that administration of patients on arrival to hospital influences the overall number of admissions.

There was a possibility of patients of less urgent triage categories being admitted to hospital, when a general practitioner in the community should really have treated them. Gribben (2003) carried out a study in which 12 GPs retrospectively reviewed 300 randomly selected ED discharge summaries of patients, to estimate the proportion of MMH ED attendances the GPs thought could have been handled by primary care services. The 12 GPs concluded that an average of 56% (range 38–81%) of the cases they reviewed could have been handled in their surgeries with no extra resources. This review highlighted the finding that hospital's Medical Services were being used to provide primary healthcare services. Sheerin, Allen, Henare and Craig (2006) also investigated the extent of potentially avoidable admissions at Christchurch Hospital in the Canterbury District Health Board area during 2000-2004. The authors concluded that 31% of all hospital admissions were avoidable admissions. These studies highlighted that a large number of patients were being admitted and treated by the hospital, who should really have been looked after by the primary and community healthcare services.

Some of the expert panel members at MMH questioned the adequacy of the triage system used by the hospitals ED. The panellists proposed that a triage tool should also support clinicians in deciding whether that patient should be seen by a hospital ED practitioner or a general practitioner in the community. This concept is also supported by Fernandes et al. (2005).

It is concluded from the above discussion, that admissions related to triage 2 and 3 have increased at both hospitals. The triage 2 increase was likely to be related to increased numbers of chest pain patients, while the triage 3 increase was more related to the ageing of the population and with its increasing multi-system chronic disorders. The significant variations in triage 4 admissions to hospitals were related to the effectiveness and availability of primary care in the community and the degree of involvement of physicians in the admission processes at the two hospitals. Triage 5 patients have almost stopped coming to APH, while MMH ED still assesses a fair number of these patients without admitting them, highlighting the lack of GP services in the community and/or consumers' preferences to use the hospital services.

(7.2.3) Seasonal Variations

By examining crude admissions on a monthly basis, it was seen that admissions increased between 19%-47% for each month of the year between 1998 and 2004. The expert panel suggested that there was a strong relationship between cold weather and higher admissions during winter months. In order to validate the identified seasonal admission trends, data related to mean monthly air temperature based on high and low temperatures for 24 hour days were obtained for Auckland City for 1997-2004 from the National Institute of Water and Atmospheric Research - NIWA (2006). NIWA data showed that the mean Auckland City monthly temperatures varied from 10°C to 22.5°C over the study period.

Seasonal admission trends showed that 'cool months' (May, June, July, August, and September) had a higher mean number of admissions than 'warm months' (January, February, March, April, October, November and December). The 'cool month' temperatures were lower and ranged from 10°C to 15°C compared to the 'warm month' range between 14°C to 22°C. There was a large difference in the crude number of admissions in cool and warm

seasons (approximately 10%-13% for MMH and 4%-29% for APH). Overall, the analysis supported the expert panellists views that lower temperatures in cool months were related to higher admissions and vice versa. An APH physician gave the winter of 2004 as an example: *'Yes, I remember late last year (2004) we had a flu epidemic which resulted in a large number of admissions'*.

The highest crude number of patients admitted to both of the hospitals during the June, July, August and September months were for the year 2004. There were approximately 17% and 10% increases respectively in the mean number of admissions during 2004 at APH and MMH. The monthly crude admission rates also increased rapidly for these months. According to NIWA (2006) data related to mean monthly temperatures, the months of August and September 2004 had the lowest mean temperatures over the 8 year study period. However, the relationship was not consistent, as there were many individual cool months in the study period when lower temperatures did not lead to the expected increase in admissions. For example, during October 2002 MMH's crude admissions declined by $n = 111$ compared to the previous year, while the mean monthly temperature was 2.8°C lower than the previous year. Similarly, during the winter of 2004, September crude admissions were higher by $n = 100$ than in the month of August, although the mean monthly temperature for August was 1.8°C lower than for September.

It is also important to note that other factors can influence expected seasonal relationships. In 2003, which also had a relatively cold winter, and for which MMH experienced significant peaks in some winter months, no direct relationship between the lower mean temperature for winter months and the crude number of admissions was evident for APH. Due to the disruptions caused through the amalgamation of the hospitals in that year, APH's admissions did not follow the expected similar trend to that at MMH. This raises the issue that even in winter there are mechanisms for managing patients as an alternative to hospital admissions.

Overall, MMH had a slightly higher mean number of winter admissions compared to APH over the study period. Both hospitals had relatively similar admission trends for each month of the study period except for the 2003 winter months, when the mean temperature for July 2003 was only 10°C , the lowest temperature for all of the July months since 1998 (NIWA, 2006). MMH experienced an approximately 20% increase in July 2003 admissions, while

APH's increase (some three months before amalgamation) was only around 6% when compared to the 2002 July admissions (Figure 4.9).

The winter high volume admission months were historically July and August. However towards the end of the study period September had become the highest volume admission month, exceeding July and August. A number of expert panellists (physicians, managers and nurse specialists) commented on the shift: *'We used to have peaks in July and August. [These] have now extended to September months. And winters have been milder and more evenly spread over the winter period'*.

The free influenza vaccination programme offered to people aged 65+ from 1997 by the Ministry of Health through the DHBs might explain the trend partly. This programme was extended in 1999 to those <65 years with one or more chronic medical conditions, and a target of 75% coverage of eligible groups was also established (Baker, 2001). One of the effects of the free vaccination programme could be the delayed onset of pneumonia and influenza resulting in an increased number of admissions in September and October. The duration of protection after vaccination has not been clearly established: some trials have documented effectiveness for up to two, or even three years (Baker, 2001). An evaluation of the influenza vaccination programme in NZ concluded that it had no statistically significant impact on the number of hospital admissions related to pneumonia and influenza in NZ (Baker, 2001). In fact, the number of admissions has continued to increase in winter, as evidenced in Figure 4.9. The lack of impact might be because of overall low coverage, as according to Laing, Slater and Coles (2001), influenza immunisation was relatively uncommon in NZ, despite the availability of the free influenza vaccination to people at-risk. The poor immunisation rates are likely to be related to the unavailability of free vaccination to the general public. Consequently, due to low population immunity, there was very little or no effect on total admissions but the vaccine has affected the peak period.

According to the physicians the high numbers of patients with respiratory infections & inflammations, chronic obstructive pulmonary disease (COPD), and chest pain accounted for the winter peaks. Indeed, data shows that admissions related to these disorders increased significantly during 2004 for both hospitals (Figures 5.5, 5.9 & 5.10). A study to determine the relative contribution of seasonal effects and other factors to bed occupancy in a large teaching hospital in Belfast over one year, found that there was a significant seasonal effect on specialities such as general medicine, geriatric medicine and orthopaedics, which

respectively explained 55%, 24% and 32% of the variability in bed occupancy (Fullerton & Crawford, 1999). Anderson et al. (2004) investigated seasonal variations in the occurrence of stroke in a large population based study in Auckland. The authors found that strokes were less likely to occur during summer and spring than in winter, the increased risk of stroke in winter was considered statistically insignificant.

Research carried out in other developed countries also supports a relationship between winter and increased admissions for specific disorders. Afza and Bridgman (2001) investigated the contribution of respiratory disease to the excess burden of winter hospital admissions in the North Staffordshire district, UK, by months from April 1995 to March 2000, and found two- to three-fold increases in respiratory admissions during the winter peak months compared to the non-winter months. Kendrick, Frame and Povey (1997) highlighted that winter peaks were principally reflected in the respiratory and cardiovascular DRG admissions. A study of seasonal variations was conducted in Quebec, Canada, in 1990-1998 to identify differences in mortality and hospitalisation rates related to heart failure associated with seasonal variations. It was found that heart failure mortality and hospitalisations were the highest during the winter period and declined in summer (Feldman et al., 2004).

Other researchers felt that poor quality of housing was a major factor in the winter admission peaks in NZ. Howden-Chapman, Signal and Crane (1999) carried out an extensive literature review (both national and international) to analyse the impact of housing on older people's health in NZ. The researchers concluded that the indoor environment in older people's houses was likely to be colder than recommended for the maintenance of good health, putting older people at greater risk of respiratory disease, coronary events and accidental hypothermia. Further, the researchers highlighted that despite the milder climate, New Zealand had a high rate of excess winter mortality in older people, possibly related to the poor thermal performance of houses - especially of houses constructed prior to 1960. Isaacs and Donn's (1993) analysis of the seasonality of mortality suggested NZ had a greater seasonality of mortality than the UK, the USA, Australia, Japan or Sweden, which experience more extreme climates. The issue of quality of housing is related to socioeconomic factors, further discussed in chapter 9.

Overall, it is concluded that there were clear seasonal variations in AMAs, with similar trends for both hospitals (except 2003 at APH). It was possible that the targeted free influenza

vaccination programme offered by DHBs might have contributed to a more even spread of admissions and delayed peaking over the winter months. There was very little or no evidence of a resulting overall reduction in acute hospital admissions during the winter months, which is likely to be a reflection of the low total immunisation coverage of the population. Finally, the crude number of acute admissions has increased for each month, in almost every successive year, reflected in an overall increase in acute medical admissions. The winter months had a higher number of admissions each month in comparison to the summer months over the study period. Although there is a definite relationship between admission peaks and winter weather, the causes of winter admission peaks appeared to be intertwined with other issues, such as the morbidity and socioeconomic factors discussed further in this study.

(7.2.4) Ageing Population

A major contribution to the increase in the admissions was the ageing of the population. In summary, the crude percentage of acute and total admissions declined for the youngest age group (15-34), remained relatively constant for the middle (35-54) and older (55-74) age groups, and rose consistently for the oldest age groups (75+) percentage for both hospitals during 1998-2004 (Table 4.1). Overall, the absolute number of admissions increased for all of the age groups. As shown in Table 4.5, the 75+ age groups experienced the highest admission increase 62% and 52% at MMH and APH respectively. Further sub-group analysis of the very old 85+ age groups highlighted 84% and 60% increases for MMH and APH respectively during 1998-2004. The crude admission rate for the same groups was 321/1000 and 289/1000 for MMH and APH in 2004. This discussion highlights that ageing contributes to higher admission rates, but this contribution is largely from the very old, not merely from the old population. This is also reflected in the overall proportion of AMAs for the 55+ age groups combined, which has increased from 59.7% to 63.1% for MMH, and 63.7% to 66.3% for APH.

When comparing admission rates with population growth between 1998 and 2004, there were significant differences between the two hospital populations and their age groups. In the MMH region crude admissions for the 75+ age group increased approximately 62% (n = 1,537) while the population for the same age group increased by only 23% (from n = 12,983 to 15,980). Similarly, for APH crude admissions of 75+ increased by 53% (n = 1,597), while the equivalent population increased by approximately 3% (from n = 19,411 to 19,916)

(Appendix 4). This further highlights, that the effect the ageing population has on acute medical inpatient services far exceeds the growth rates of the population. The Patient Management Taskforce (2001a) showed similar age related admission trends and proposed possible strategies to improve health care for the older Victorians in Australia.

When the 75+ age groups were further divided into the old (75-84) and the very old (85+) age sub-groups, the population increase for MMH was spread evenly over both age sub-groups. In contrast APH's population showed no increase for the 75-84 age sub-group between 2000 and 2004, while there was a 12% increase in population for the 85+ age sub-group. Based on 2001 Census data (Walker, 2001) ADHB experienced a loss of 1,500 older people (aged 65+) from its region between 1996 and 2001, the likely reason for no growth in the 75-84 age group admissions. However, admissions of the 85+ age sub-groups grew at a much faster rate between 1998 and 2004 (approximately 84% and 60% for MMH and APH respectively), than for any of the younger age groups, regardless of the rate of the population increase. According to Cornwall and Davey (2004) the highest crude rate increase in acute admissions in NZ was for the 85+ age group. According to Ministry of Health (2002b) data on medical and surgical hospital admissions (recorded on discharge, and not including outpatients or maternity services), 32% of admissions were related to people aged 65+ during 2000/01. Further, the admission rates were much higher for the 85+ age group than for those aged between 65 and 74 (534/1000 and 260/1000 respectively). These findings highlight that health service utilisation increases with age.

There were some significant differences between the two hospitals in relation to the admission of their 55-74 and 75+ age groups, which could be explained by the demographic variations between the populations of the two regions. For example, MMH had 14.4% Maori, 18.1% Pacific Islander and 55.4% European ethnic group acute admissions (Table 6.2). In contrast, APH had lower Maori and Pacific Islander admissions (6.8% and 12.1% respectively) and higher European admissions (68.2%). There was an approximately 12-19 year gap in the median age at admission of the Maori and Pacific Islander ethnic groups compared to the European one (Table 4.12). The median admission age of Europeans was 68 years, 50 for Maori and 56 for Pacific Islanders. As a result, a significantly large number of MMH's admissions fall into the 55-74 age group, whereas at APH with its larger proportion of European ethnicity admissions, it is the 75+ group that had the highest number of admissions. In addition the lower median age of admissions of the Maori and Pacific Islander

groups, reflects higher morbidity and mortality rates at a younger age; Maori and Pacific Islanders' life expectancy was 8 to 9 years less for both males and females than for the non-Maori population (Ministry of Health, 2001b). The next section further discusses the differences in the admission trends of the ethnic groups.

(7.2.5) Age and Ethnic Group Admission Trends

The findings related to both 'single' and 'multiple' AMAs indicated that single admissions were 6.7% and 13.9% higher than multiple admissions at MMH and APH respectively, highlighting the influence of multiple admissions on hospitals. Further analysis of 15-34, 35-54, 55-74 and 75+ age groups indicated a strong relationship between the ageing of population and single and multiple age-specific acute admissions (Figure 6.2 – Figure 6.7). Again, all ethnic groups (Maori, Pacific Islander and European/Other) of MMH had higher ASRs than their counterparts at APH except for the year 2004 when the APH Maori group rates were higher. The European/Other groups of APH had the lowest ASRs and the MMH groups the second lowest.

As expected, the youngest age group (15-34 years) had the lowest and relatively similar age-specific admission rates for all ethnic groups of both hospitals, and 'single' admission rates were higher than 'multiple' admission rates. On the other hand, both 'single' and 'multiple' age-specific admission rates were much higher for the 55-74 and 75+ age groups compared to the younger groups, highlighting a strong relationship between ageing of the population and admission rates, which is supported by the expert panellists of both hospitals. The younger age groups (15-34 and 35-54) generally had higher rates of 'single' and slightly lower rates of 'multiple' age-specific rates at both hospitals. While for the older age groups' (55-74 and 75+) a majority of the admissions were 'multiple' age-specific admissions, with the exception of the Maori APH 75+ age group. Overall, the admission trends indicated that both Maori and Pacific Islander groups had higher admission rates, including the younger age groups, than the European/Other groups. This finding is supported by the NZ literature on ethnic group inequalities in health (CMDHB, 2005; Ministry of Health, 2001b & 2002c; Ministry of Health and University of Otago, 2006).

According to Te Puni Kokiri (2000 & 2000a), Maori health status levels were considerably lower than those of non-Maori across a range of health indicators including hospital admissions. Another report calculated disability adjusted life years and concluded that total

annual loss in 1996 was estimated to be the highest among Maori and second highest among Pacific Islander groups, and lowest among European/Others (Ministry of Health, 2001). According to the expert panellists, both Maori and Pacific Islander groups have a higher prevalence of chronic disease at a much younger age, indicated by the higher utilisation of hospital services and lower life expectancy of these groups compared to the European groups, and this finding is well supported by the Ministry of Health reports (1999a; 2000c; & 2001a).

Another factor likely to be contributing to the higher AMA rates for the Pacific Islander groups, was the lack of adequate infrastructure to meet the healthcare needs of this group, which is also reflected in the limited published literature related to health issues of the Pacific Islander groups (Ministry of Health, 2001a). Other issues such as lack of access to primary care have already been discussed in the previous section of this chapter and are further discussed in Chapter 9.

The above finding with respect to the influence of ageing of the population was supported by the New Zealand Health Information Service (2001) report on public hospital data. The report indicated that the percentage of publicly funded admissions increased steadily from 24.3% in 1995 to 27.2% during 1998/99 for the 65+ age groups in NZ, while the younger age groups (15-44 years) showed no increase in the percentage of publicly funded admission. According to NZIER (2004) ageing was associated with multiple medical conditions and higher support needs, resulting in more and longer periods of hospitalisation for very old people aged 80+ compared to those in the 65-79 age group. The authors further emphasized that older people (65+) were more likely to have been admitted to hospital in the previous months than the adult population as a whole.

The international literature on the relationship of population ageing and hospital admissions also supports the findings of the present study. In an analysis of health and disability demands in the Australian Capital Territory, Gilbert (1997) found that while people over the age of 60 constituted 9.8% of the total population, they accounted for 24.6% of all acute-care hospital admissions. Wanless (2001) reported that the majority of the burden of disease in the UK was related to old age and over a third of health expenditure was for people over the age of 65. The study further concluded that on average, an individual uses about 25% of lifetime health services in the last year of life. Wanless (2001) suggested that population ageing postpones health services use to the end of life rather than producing an overall increase in

costs and demand. Another study from the UK produced similar results. According to Health Promotion England (2001) people aged 65 and over accounted for 33% of all completed consultant sessions in National Health Service hospitals. Overall, the volume of health care provided for older people in the UK increased significantly between 1986/87 and 1996/97.

Oxley and Jacobzone (2001) examined the impact of ageing of population on health spending in the OECD nations. The authors reported that the 65+ age group accounted for 40% to 50% of the total healthcare expenditure, and that this group's per capita health care costs were 3 to 5 times higher than for the <65 year groups. These findings reflect the conclusion of the present study in relation to hospital admissions. In the USA, adults aged 65+, while comprising only 12% of the population, made 24% of all physician office visits in 1999 (Merck Institute of Ageing and Health, 2002). A comprehensive literature review on the causes of the increase in acute medical admissions (NZHTA, 1998) also concluded that the increasing number and proportion of elderly (65+) in the community has been found by most (but not all) studies to be an important explanation for the increase in acute medical admissions in New Zealand and several other Western countries over the last decade.

Overall, it is concluded that the ageing population has significantly influenced the admission rates of both hospitals, and this finding is well supported by the literature on this topic. The crude number of admissions has increased for all of the age groups; however proportionally admissions of younger age groups have declined as the percentage of older age groups have risen. At APH the 75+ age group had a much higher percentage of admissions than the equivalent group at MMH, while for the 55-74 age groups MMH had a higher percentage of admissions than APH. These differences are likely to be related to demographic characteristics and the ethnic makeup of the two hospital populations. There is a strong relationship between ethnicity and admission rates. The differences between the ethnic groups were related to socioeconomic deprivation, affordability and access to primary care, improved access to hospitals, and lack of overall infrastructure to adequately meet the healthcare needs of these ethnic groups. Further issues related to ethnic group morbidity trends are discussed in Chapter 8.

(7.3) Length of Stay

Literature related to length of stay (LOS) of medical patients indicated that in most of the developed countries over the last decade there has been a trend towards LOS declining while patient acuity has commensurately increased (NZHTA, 1998). Reductions in LOS were thought to be related to increased demand for hospital beds, better medical management, technological advances and financial constraints. The relationship between LOS and admissions is discussed in this section.

Overall, the findings showed that the median LOS for acute medical admissions declined from 3 to 2 days for both hospitals over the study period. The findings also demonstrated that the mean LOS stayed significantly higher (between 4.0-4.7 and 3.7-4.0 at APH and MMH respectively) than the median LOS, because of the much longer LOS of some patients. The 95th centile LOS values (at 14 days and 12 days for APH and MMH respectively) reflect the extent of LOS of some patients. The main reason for the higher APH value is the tertiary sub-specialty services such as neuro-medicine that APH provides to the Northern Region. One of the APH physicians observed, *'Some of our tertiary care sub-specialty patients have a much higher LOS due to the nature of their disorder than our general medical patients'*.

The above statement was supported by the analysis of admissions to the APH neurology specialty, which showed significantly higher LOS (median 3 days, mean 5 days) compared to the overall LOS for all acute medical admissions. APH also attracted a much higher proportion (approximately 20%) of admissions from out of the hospital's catchment, than did MMH. Some of these patients were admitted only for the sub-specialty services provided by APH.

The mean LOS for both APH and MMH combined was higher than the national means but the declining trend was similar to that shown by the Ministry of Health (1999 & 2004a). These reports showed that national average LOS declined from 5.0 to 3.3 days between 1997/98 and 2002/03 for all medical admissions. In fact in 2003, the national average LOS was significantly lower at 3.3 days than 4.1 and 3.9 days for APH and MMH respectively (refer 4.7). The main reason for the lower national average LOS is probably related to the inclusion of arranged and waitlist medical admissions that tend to have a much shorter LOS stay, and the admissions of younger ages (<15 years), in that analysis. For NZ overall approximately

20% of the total discharges were day cases, whereas MMH and APH had only discharged between 10% and 12% of their total patients within 24 hours of their acute admission time.

Literature related to LOS from developed countries produced similar results (e.g. NZHTA Group, 1998; Baker, Einstadter, Husak & Cebul, 2004). Similarly, the Canadian Institute for Health Information (2005) concluded that though medical patients accounted for the largest percent of total hospital days (56%), the overall average LOS has declined between 2003-2004 and 2004-2005 in most of the provinces and territories in Canada. Popovic and Hall (2001) carried out the '1999 National Hospital Discharge Survey' for the Centres for Disease Control and Prevention in the USA, and concluded that the average LOS peaked in hospitals in the early 1980s and has been steadily decreasing since.

It is concluded that for NZ generally, and internationally, the LOS declined over the study period. There were variations between the two hospitals, most likely due to specialty services provided by each hospital. There were some major initiatives implemented by both hospitals in response to the increasing demand for medical care. These initiatives appeared to have influenced the LOS significantly and are discussed below.

(7.3.1) Age and Length of Stay

The study found a strong correlation between patient age and average LOS. For example, the median LOS increased from 1 day for the 15-24 age groups to 4-5 days for the 75+ age groups of both hospitals (Table 4.11). This was supported by the increase in interquartile range (IQR) LOS values from younger to older age groups of both hospitals, though MMH IQR and 95th centile LOS values were slightly lower for most of the age groups compared to those of APH. Again these differences between the two hospitals reflected the neurology and transplant services provided only by APH (Jackson, Palmer, Lindsay & Peace, 2001).

A number of studies exploring the association between older age (65+) and average LOS have attempted to explain reasons for the longer LOS. For example, an investigation was conducted into the effects of patient-related variables, in-hospital progress and complications on LOS of congestive heart failure (CHF) patients admitted at APH (Wright et al., 2003). The mean age at admission was 73 years. The median LOS for the HF patients was 6 days, comparable to the NZ national rates. For patients who stayed more than 6 days, major

reasons for their longer LOS were more severe CHF, multi-system involvement, other acute problems at admission, treatment complications and social issues requiring intervention. Similarly, Health Promotion England (2001), also demonstrated a positive relationship in the UK between ageing in the population and longer LOS.

A prospective observational study investigated patient demographic characteristics and organisational factors that influenced LOS among medical emergency admissions of a teaching hospital in Belfast, Ireland (McMullan, Silke, Bennett & Callachand, 2004). The study concluded that there was a significant positive correlation between patient age and LOS, and highlighted that the single most useful patient characteristic for predicting LOS was patient age. This might be related to a greater need for pre-discharge social care planning in elderly patients, together with the older people having a greater number of complex health problems that prolong the LOS. Similarly Black and Pearson (2002) found that the main reasons for prolonged LOS were the initiation of community support services or pending social care placement. Other factors influencing the LOS stay were waiting for a specialty physician review, or for laboratory or radiology results. Panis, Verheggen and Pop (2002) reviewed the appropriateness of hospital stay in a cross-sectional survey at the University Hospital of Maastricht, Holland and found over 20% of the hospital stays were inappropriate i.e. staying much longer at hospital than required. Therefore, LOS might be influenced by a number of variables.

It is concluded therefore, that the ageing population was showing its influence on the LOS as well as on AMA trends. Assuming international research applies, the older patients were staying significantly longer at the hospital due to multi-system chronic disorders and their growing need for social and supportive care post discharge.

(7.3.2) Short Stay Units

Both hospitals have implemented new service development initiatives to better meet the growing demand for medical care. MMH was the first public hospital in NZ to open an Assessment and Discharge Unit (ADU) during 1997 (Benipal, 1998). As a result, MMH showed a significant decline in the median LOS from 3 days in 1998 to 2 days in 1999. One of the functions of ADU was to offer free advisory service to GPs in the community, and as a result during May to October 1997, there were 5,145 calls received by physicians in ADU

from GPs, but only 4,305 patients were seen in ADU. The other 840 patients (16%) were treated by the GPs in the community on the advice given by the ADU physicians (Benipal, 1998). ADU was administered by the Medical Services Department and one of its roles was to provide a gate-keeping service to Medical Services. Staffed by dedicated medical senior registrars and physicians, the unit discharged between 29%-36% of patients within less than 24 hours of admission time (Benipal, 1998). However, in 2000 ADU was replaced by a short stay unit developed for all adult hospital specialties, managed by the Emergency Department of the hospital. The main focus of the short stay unit was to admit patients who were likely to be discharged within 24 hours of admission time, but other ADU functions appeared to have been lost, including the loss of the advisory service provided to GPs by physicians, a service now largely provided by junior doctors (registrars). As a result, MMH's median LOS increased from 2 to 3 days during 2001 and it stayed at that level to the end of 2003. A decline in the number of same day discharge patients was also experienced, together with an increased number of discharges within one night's and up to 47 hours' stay at hospital (Figure 4.11). Consequently, at least 5% (n = 600 to 700) of the total admitted patients each year, stayed up to 24 hours longer at the hospital. At \$1,000 per day and patient, it would have cost the organisation between \$600,000 and \$700,000 each year, and this figure did not include associated opportunity costs or loss in hospital funding. According to the Director of Medical Services at MMH, the main reason for the decline in discharges from the short stay unit was the loss of physical space to adequately assess and evaluate patients (Garrett, 2005). Because of this, patients who could have been discharged within 24 hours were instead being admitted to the medical wards. According to the MMH expert panel the closure of the ADU has resulted in a higher number of admissions to Medical Services at MMH.

APH also opened an Assessment and Planning Unit (APU) in 2003 based on similar principles to MMH's ADU, and able to admit patients up to 36 hours. As a result the LOS declined immediately from 3 to 2 days. The APU has a shared management structure between the Emergency Department and Medical Services, and its opening resulted in an increase by 4% in the number of patients being discharged within one night's and up to 47 hours' stay at hospital. This finding highlighted the importance of a purpose built facility enabling eligible short-term medical patients to be directly managed by general medicine and its sub-specialities right from admission to discharge. The findings also highlighted the impact of changes or restructuring of services on the LOS.

Daly, Campbell and Cameron (2003) carried out a systematic review of literature related to short stay and observation units and concluded that these units have the potential to reduce LOS. According to the NZHTA (1998) literature review on ED observation wards, these wards/units can offer appropriate surveillance of patients who require a period of observation to exclude serious disease and then discharge those patients from hospital. Such units therefore provide a gate-keeping role to the hospital wards and reduce inappropriate admissions and longer stays.

These assessment units provide an excellent environment for physicians to further assess and diagnose patients to decide whether to discharge a patient without admitting, or admit a patient to a ward, or discharge after a short stay in the unit. An increased number of short stay patient discharges have led to a decline in overall LOS. However these units do not appear to reduce the number of patients coming to hospital, unless they also provide an advisory service to GPs in the community.

(7.4) Frequency and Trends in Readmissions

An important finding of this study was that readmission rates have a very significant influence on the overall trends in admissions. By determining 'single' patient admissions it was clear, that there were more patient admissions per year than episodes of care per year. The majority of the patients 69% (n = 41,712) at APH and 66% (n = 40,068) at MMH, had only one admission (Table 6.1). The balance of the patients (31% and 34% respectively) had more than one admission per year. These smaller groups of patients, almost one third overall, accounted for 60% (n = 61,298) of the total admissions at APH, and 65% (n = 73,158) at MMH.

These groups were further divided into two sub-groups based on the number of readmissions. About a third of all patients 30% (n = 17,888) at APH and 32% (n = 19,579) at MMH had between 2 and 9 readmissions inclusive per patient, and accounted for more than half (52% and 54% at APH and MMH respectively) of the total admissions over the entire study period (Table 6.1). The other sub-group of patients, 0.9% (n = 535) at APH and 1.4% (n = 821) at MMH, comprising those with ≥ 10 readmissions, was responsible for 7% (n = 7,488) and 11% (n = 12,344) of the admissions respectively – an average of 14-15 readmissions per patient. When translated into hospital bed utilisation, this sub-group occupied an average of 8.2 and 12.7 hospital beds (at APH and MMH respectively) on a daily basis. This finding, demonstrating that a small number of patients accounted for a large number of admissions and high bed utilisation, highlights the impact of readmissions on hospital services and health resources and the gap in the clinical management of high users of hospital services. On questioning, the expert panel estimated that approximately 8% of patients discharged from hospital were being readmitted between 4-12 weeks later. This figure appears to considerably underestimate the impact of high users on admission rates and beds occupied. A similar pattern was found in the USA, where a national, population-based data source was analysed to investigate frequent hospital emergency department use (Hunt, Weber, Showstack, Colby & Collaham, 2006). That analysis found that 8% of users with 4 or more presentations were responsible for 28% of the total emergency visits.

Further commenting on the results of this study, expert panel members acknowledged the readmission problem, but highlighted that there was a problem of access to primary healthcare services and a lack of adequate community support services. Consequently, some patients

had to be readmitted to hospital. Calver et al. (2006) noted that in order to effectively manage high cost hospital service users and reduce readmissions, more focus is required on the onset and progression of chronic disease.

(7.4.1) High User Characteristics

The randomly selected high hospital services users (with ≥ 8 admissions in a year) analysed in this study had characteristics highlighting a number of similarities and differences between the hospitals. At MMH approximately 70% of the high user admissions were self-referred – a rate much higher than the overall self-referral rates at MMH. In contrast, the majority of the high user admissions at APH came from external health professional referrals. However, even at APH the high users' self-referral rates were higher than the overall APH self-referral rates.

The findings highlighted that most of these patients presented 'outside office hours', reflecting the limited availability of primary health services in the community, especially after hours. This finding supports the analysis of MMH's expert panel, that the primary health organisations were not meeting their contractual requirement of providing adequate after hours services in the community. It is likely to be related to the much lower proportion of GPs per population in the MMH region compared to the APH region or most of the other District Health Board regions in NZ (New Zealand Medical Association, 2004). There appear to be not enough general practitioners to provide the required primary care services in the CMDHB area. However, it may also be that this group of patients prefer to use the hospital services, and therefore present to hospital after hours, and then they can't be referred back to the GP services. A number of the panellists from MMH suggested socioeconomic status was one of the likely factors, that the hospital was possibly providing better quality of care and the GPs were not adequately trained or set up to effectively treat the patients with multiple co-morbidities.

The findings related to age at admission revealed that a large number of the high user APH patients were ≥ 65 years, in comparison to only 50% at MMH. The characteristics related to the principal diagnoses indicated that most of the high user admissions were related to chronic disorders involving multi-system problems such as respiratory, circulatory, neurovascular and metabolic disorders. Among the randomly selected high user cases, no patient was found

with only one chronic disorder. These findings are supported by Reid et al. (2003), who analysed the characteristics of high users of physician services in Canada. An analysis of the top 5% of high cost users of hospital beds was carried out in Western Australia (Calver et al., 2006). The study concluded that older high cost users (≥ 65 years) were not more expensive to treat than younger high cost users but that they had a disproportionately higher representation. An ageing population was strongly associated with a growing proportion of high cost users. A NZ study by Madhan (2004) also found a rapidly growing number of patients with age related end-stage renal failure. A similar study of emergency medical admissions in Glasgow, also found emergency admission rates were higher among the elderly (Blatchford & Capewell, 1997; Blatchford, Capewell, Murray & Blatchford, 1999).

The ED high user triage code findings indicated that triage 3 had most of the admissions, closely followed by triage 2, at both hospitals. This highlighted that high users did not have a life threatening presenting problem, but the patients' condition was serious enough to be admitted, likely an exacerbation of a chronic condition. According to Calver et al. (2006) chronic stable and unstable conditions were a key characteristic of high cost users, which supports the above findings.

Overall, discussion on the frequency of admissions illustrated a strong influence of readmissions on the admission trends. The discussion related to high user (8 or more admissions) characteristics showed that most of these patients were 65+ years old and seriously ill with chronic multi-system disorders at both hospitals. However, the large majority (70%) of high users from MMH referred themselves to hospital, compared to only 30% at APH. This finding highlights the lack of effective healthcare management for this group of patients.

(7.5) Chapter Conclusions

Overall, it is concluded that medical admissions have increased at both hospitals during the study period. The increase in admissions was much higher than the actual population growth, and reflects similar trends in other developed countries as reported in international literature. The increase in medical admissions has received very little or no attention from the media despite having a significant influence on the surgical waiting lists or waiting times - an issue that has remained under media scrutiny.

Both crude number of total admissions and acute admission ASRs were consistently much higher at MMH compared to APH. These differences were likely to be related to differences in the socioeconomic status of the two hospital populations, access to primary care, and access to hospitals.

The admission trends were relatively similar at both hospitals except for some fluctuations. MMH's decline in admissions during 2001 was likely to be related to the enhanced primary care access to low socioeconomic communities, and high-risk multiple morbidity patient management trials. While the significant decline in admissions at APH in 2003 was strongly associated with the reduction in hospital beds and the media campaign encouraging the public to use primary care services rather than hospital during the amalgamation period of the hospitals.

The referral trends indicated major differences in the referral pattern of the two hospitals. Self-referral and external referral were the two major sources of patient referral to both hospitals, with MMH having a significantly higher proportion of patients with self-referrals than APH, and vice versa. All three ethnic groups of MMH had significantly higher self-referral rates than the APH equivalent groups. The reasons for these differences were again related to access to primary care services, access to and capacity of the hospital ED, involvement of physicians in the admission processes, and socioeconomic status of the community.

Increases in triage 2 and 3 admissions highlighted the increasing severity of disease at both hospitals. Access to adequate, or otherwise, primary care was again reflected in the declining rates of triage 4 admissions at APH, and increasing rates at MMH.

There were variations in the mean number of monthly admissions between warm and cool months, and between the hospitals, and generally the mean number of admissions increased for cool months and declined in warm months each year. There was a strong link between cool winter months and admission peaks but this relationship was not consistent or predictable. The introduction of influenza vaccinations did not reduce the hospital admissions, but appeared to have contributed to a more even spread of admissions over the winter months.

The ageing of the population was one of the major factors contributing to the increase in AMAs. Overall, the crude number of admissions increased for all age groups, but the proportion of admissions for the 55+ group has continued to increase. The admissions for the 85+ age group grew at a much higher rate than for any other younger age group, highlighting the association between health service utilisation and ageing population. Again this finding is strongly supported by literature on the topic.

Overall, the median LOS declined over the study period for both hospitals, related in part to the opening of short stay units at both hospitals, which provide an excellent venue for physicians to further assess and diagnose the patients. The changes in the short stay unit at MMH led to increased LOS. Similar LOS trends have been found both in NZ and international literature. The findings also highlighted that APH had higher mean LOS for some patients than MMH, possibly related to admissions of tertiary care services provided by the APH to the North Island population. The study also found that on average older people had longer LOS than younger adults due to multiple co-morbidities and their requiring more social support. This association has also been supported by a number of studies.

The frequency of admission trends indicated that most of the patients (>65%) had one admission each year during the study period at both hospitals, and that approximately 1/3 of the patients were responsible for nearly 2/3 of the total admissions for both hospitals. A very small number of patients had 10 or more admissions over the study period, but yet between them continuously occupied on average 8.2 and 12.7 beds at APH and MMH respectively.

Due to coding practice changes, major fluctuations were evident in admission numbers between the acute, arranged and waiting list admissions categories, particularly at APH.

However these fluctuations were not related to real increases in the acute admissions over and above normal expected trends. The acute admission category was the leading admission category, showing increases in admissions at both hospitals greater than the population increase. MMH had significantly higher acute admission ASRs than APH.

Overall, the findings indicate that there are some factors (e.g. ageing of the population) that contribute to an increase in admissions, others (e.g. hospital gate keeping) contribute to the decrease in admissions, and some (e.g. influenza vaccinations) moderate the admissions. Further discussion on the conclusions of this chapter is provided in Chapter 9.

Chapter 8

Discussion: Morbidity Admission Trends

(8.0) Introduction

The analysis of acute medical admission (AMA) trends in Chapter 7 allowed the identification of factors contributing to both admission increases and decreases. Factors related to health services policy and management do influence AMAs and can be manipulated. Further analysis showed that 70%-80% of all acute admissions were accounted for by five major diagnostic categories (MDCs). It follows, then, that how these diseases are treated will affect medical admission trends. The aim of this chapter is to discuss the morbidity trends related to the five most significantly contributing major diagnostic categories (MDCs), and their leading diagnostic related group (DRG) categories. The relationship between ethnicity and specific DRG categories is also discussed.

In Chapter 5, the five MDCs that between them contributed 70% and 80% (for APH and MMH respectively) to the total number of acute medical admissions each year were presented. These are:

Circulatory system disorders; including DRG categories such as chest pain, myocardial infarction, heart failure & shock, arrhythmias, and syncope & collapse.

Respiratory system disorders; including DRG categories such as infections & inflammations, chronic obstructive pulmonary disease, and bronchitis & asthma.

Neurovascular system disorders; including DRG categories such as stroke disorders, seizure disorders, headache diagnosis, and transient ischaemic attack & precerebral occlusion.

Digestive system disorders; including DRG categories such as gastroenteritis, oesophagitis & miscellaneous disorders, gastroscopy, and abdominal pain & mesenteric adenitis.

Kidney & urinary tract disorders; including DRG categories such as kidney & urinary tract infections, other kidney & urinary tract diagnosis, and renal failure.

The above MDCs and their related DRG categories also figure prominently when looking at the NZ national admission trends. For example, the largest proportion of public hospital day and inpatient admissions was for chronic diseases such as, cardiovascular diseases (including

ischemic heart disease and stroke), respiratory diseases, digestive diseases and cancers (Ministry of Health, 1999). Diabetes did not appear as one of the leading DRGs because it rarely leads to hospital admission as a principal diagnosis, but rather is associated with other disorders such as cardiovascular, renal, and neurovascular system disorders.

(8.1) Circulatory System MDC and DRG Categories

The study found that circulatory system disorders were the leading cause of admissions for both of the hospitals (refer 5.2). The circulatory system MDC hospitalisations accounted for approximately 34%-37% and 25%-32% of the total annual acute admission for MMH and APH respectively during 1998-2004. Cardiovascular disease was also the most frequent chronic disease group leading to hospitalisation in NZ (Ministry of Health, 2004a).

Both hospitals experienced an increase in the overall number of circulatory system admissions during 1998-2004. The increase in the crude percentage of circulatory admissions was much higher at APH than at MMH between 1998-04 (62% (n = 1,595) at APH and 40% (n = 1,468) at MMH). However for APH the age-standardised rates (ASRs) only increased (with fluctuations) from 8.29/1000 to 12.07/1000 (Figure 5.2), significantly lower than MMH's ASR admission rates of 14.02/1000 to 16.21/1000. It is also likely that APH historically had much lower admission rates for circulatory system admissions than MMH. This gap between the two hospitals has remained and reasons related to this difference are now discussed in the following.

In contrast to APH and MMH, circulatory system admissions nationally only increased approximately 21% over the 6 year period from July 1997 to June 2003 (Ministry of Health, 1999 & 2004a), a much lower increase than that experienced at APH and MMH. However analysis of hospital throughput data related to medical admissions also indicated major differences between the NZ DHB admission trends over time (Ministry of Health, 1999 & 2004a). For example, while Taranaki DHB's admissions declined 11.7% from 2001/02 to 2002/03, Hawkes Bay DHB's admissions increased by 15% during the same period (Ministry of Health, 2004a).

Findings related to age and the circulatory system MDC showed that the median age for circulatory system disorders was higher (2-4 years) than for medical admissions overall, and that the age-specific admission rates increased rapidly with increasing age. In addition, rates at MMH were generally higher than those at APH. For example, age-specific rates for the 65-74 age group were 43-49/1000 and 26-34/1000 for MMH and APH respectively over the study period. The 75-84 age group admission rates were even higher at 74-91/1000 for MMH compared to 48-75/1000 for APH, and the 85+ age group age-specific rates were the highest at 79-134/1000 and 60-99/1000 for MMH and APH respectively. Between 1998 and 2004 the 85+ age groups also experienced large increases in crude admissions, (91% and 85% respectively). These findings once again demonstrate a strong association between age and admission rates, and also the significant differences in the admission rates of the two hospitals.

The Ministry of Health (2004c) NZ Health Survey 2002/03, that randomly surveyed the health status of the NZ population, reported that a large number of older people had been diagnosed with coronary artery disease, and 40% of those aged 75+ and 30% aged 65-74 had symptoms of the disease. Therefore, the above increase in circulatory admissions will have been due to the higher prevalence of the disease among the growing older population.

Findings related to the ethnic groups at the hospitals demonstrated that all three of MMH's ethnic groups (Maori, Pacific Islander and European/Others) had statistically higher circulatory system disorder admissions than their counterparts at APH. An unexpected finding was that despite the European/Other group at MMH having lower ASRs than the other MMH ethnic groups, their ASRs were similar or slightly higher than the ASRs of the APH Maori and Pacific Islander groups for most of the study period. It was also noteworthy that while the Maori ethnic group had the highest admission rates for MMH, at APH the Pacific Islander group had the highest ASRs from 1998-2002, highlighting the differences between the two hospitals and their ethnic groups.

One of the reasons for the differences in admission rates among the ethnic groups is the difference in the burden of disease experienced by each of the groups. In a Ministry of Health (2001a) report on the burden of disease experienced by Maori and Pacific groups in NZ, the authors calculated disability adjusted life years (DALYs), which calculated life years lost through both fatal and non-fatal outcomes. Cardiovascular diseases accounted for the highest

DALYs loss due to any single disease group, with prevalence rates of 197/1000 for the Maori, 169/1000 for the Pacific and 113/1000 for the European/Other populations. These differences in the DALYs are reflected in the significant variations of admission rates of these ethnic groups.

In the present study five specific DRG categories (chest pain; myocardial infarction; heart failure & shock; arrhythmias; and syncope & collapse) were identified as contributing 68%-71% of the total admissions for the circulatory system disorder MDC. Admission trends related to each of these DRG categories are discussed below.

(8.1.1) Chest Pain (CP)

CP was the leading cause of circulatory admissions for both hospitals. The CP admission ASRs increased from 2.1/1000 to 4.5/1000 for MMH and from 1.5/1000 to 3.5/1000 for APH from 1999-2004 (Figure 5.5), with ASRs significantly higher at MMH than at APH. Overall, the CP crude admissions increased by approximately 70% and 135% for MMH and APH respectively between 1998 and 2004. This finding is supported by the Ministry of Health (1999 & 2004b) hospital throughput report, which showed a 68% increase in CP admissions in NZ between 1997/98 and 2002/03 over the 5 year period. While this is comparable to MMH's increase, APH's chest pain admissions increase was much higher than the overall national rise. Most of this rise occurred during 2004, when its ASRs also increased significantly from 2.33/1000 in 2003 to 3.48/1000 in 2004, and the admissions increased by approximately 54%. In contrast, the CP admissions at MMH only increased approximately 3.5% over the same period.

This is a significant difference in the CP admission growth trends for these two hospitals located in the same city and only 15 kilometres apart. It is likely that APH's large increase in admissions during 2003-2004 was related to the opening of the newly built hospital with its new Emergency Department and its newly established Assessment and Planning Unit (APU). This unit provides rapid access to diagnostics and monitoring and has a short stay admission facility. As a result, many of these CP patients were being admitted for a short stay in APU, while prior to the opening of the APU most of these patients were likely to have been discharged from the hospital ED without having been admitted, as indicated by an APH

expert panel physician: *'The access to the hospital has improved and all of the chest pain patients are being screened for acute coronary syndrome'*.

When it comes to explaining the much smaller increase in CP admissions at MMH, it can be argued that MMH has had a short stay type of facility available since 1997. Therefore, it is likely that the gap between the two hospitals' CP admission rates will close further if APH continues to admit more CP patients to APU. More discussion on the possible changes in the threshold for admission and specific protocols is provided in Chapter 9.

One of the reasons for the increase in CP admissions is related to the difficulty in diagnosing and deciding which patient has an acute coronary syndrome and needs admission, and which haven't and can be sent home. MMH expert panel physicians noted that the hospital ED referred almost all of the chest pain presentations to the Medical Service for further investigation and monitoring. Blatchford and Capewell (1999) similarly found that most patients with CP were being routinely admitted to the UK hospitals, despite knowing that fewer than half of these patients were likely to have acute coronary syndrome. Another MMH physician raised the question of whether missing one MI patient per 100 CP discharges from the ED is an acceptable level of risk? Some studies carried out both in the UK and USA have identified that 2%-6% of the patients who were discharged from an emergency department had prognostically significant myocardial damage (Collison, Premachandran & Heshemi, 2000; Pope et al., 2000). Both of the Auckland hospitals appear to find admitting the CP patients for further investigations to be the better option, rather than taking the risk. In fact, APH's Assessment and Planning Unit processes were specifically developed to meet the healthcare needs of CP patients.

Some of the reduction in the LOS overall might be partly explained by the significantly shorter (1.4-1.5 days) mean length of stay (LOS) for CP compared to other disorders noted at both hospitals (refer 5.2.1). This decrease is comparable to the decrease in the national mean LOS for CP (from 1.9 to 1.5 days between July 1997 and June 2003) reported by the Ministry of Health (1999 & 2004a). Expert panel members from both hospitals felt that the reason for the shorter LOS, was the large number of CP patients with negative diagnostic results and no acute coronary syndrome, resulting in many patients being admitted as there were no appropriate services in the community to rule out serious pathology. Further, MMH's expert

panel raised possibilities around alternative models of care to better meet the needs of these patients in the community rather than through the hospital services.

There were also significant differences in the admission rates of the ethnic groups. For example, APH's Maori group showed the largest increase (160%) in admissions and the European/Other group the second largest increase (142%), while the Pacific Islander group only experienced an 82% increase during 1998-2004. Similarly, the increase in admissions for MMH's Maori group was much higher (approximately 131%) in contrast to the Pacific Islander (100%) and European/Other (55%) groups. The national admission rates increased by approximately 85%, 131% and 63% for the Maori, Pacific Islander, and European/Other groups between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a), which highlighted ethnic variations at the national level. The Maori rates at both hospitals were considerably higher, and the Pacific Islander rates were considerably lower, than the national rates. The APH European/Other group CP admissions rise was more than double the national and MMH rise. It may be speculated that the differences were related to better or worse access to health services such as primary health care services and ethnic group specific hospital infrastructure. For example, the low rate for the Pacific Islander group may in part be related to the lack of infrastructure for the Pacific Islanders, as noted by an APH physician.

The literature related to chest pain diagnosis considers a large number of CP hospital admissions inappropriate. For example, a number of studies from the UK found that 20%-30% of the emergency medical admissions were related to acute central chest pain, and less than half of these had a final diagnosis of myocardial infarction, unstable angina or acute coronary syndrome (Kendrick, Frame & Povey, 1997; Blatchford & Capewell, 1999; Goodacre et al., 2005). Overall, it is concluded that the CP rates have grown rapidly over the study period both in Auckland and New Zealand. As a result, the national ranking of the chest pain principal diagnosis has gone up from 11th place in 1997/98 to 3rd in 2002/03 out of the top-20 high volume hospital throughput DRGs (Ministry of Health, 1999 & 2004a). The expert panellists suggested that this increase is likely to be related to the raised awareness of CP in the community and among health professionals, to changes in administration and medical management and to financial incentives to admit CP patients. Further discussion on these issues is provided in Chapter 9.

(8.1.2) Myocardial Infarction (MI)

The number of MI cases more than doubled at both hospitals between 1998 and 2004. For example, the MMH ASRs increased to 2.40/1000 in 2002, a 78% increase from 1998. The APH rates also increased 85% from 1998 to 2003, peaking at a much lower 1.40/1000 in 2003 (Table 5.1). The main reason for this apparent rapid rise in the number of MIs was related to changes in the definition of acute myocardial infarction and the development of more sensitive diagnostic tests such as the use of troponins. Guidelines for the diagnosis of AMI (anterior MI) have been changed in NZ to incorporate the use of troponins in differentiating between AMI and unstable angina. As a result, the number of AMI cases diagnosed in NZ has increased by 17% per year from 1999/00 to 2002/03 (Elliot & Richards, 2005), an increase similar to that for the present study. The guidelines also resulted in declining crude numbers of admissions related to unstable angina, as more were being coded as AMIs.

However, both hospitals also experienced some decline in MI ASRs in the last 1-2 years of the study period. For example, between 2003 and 2004 MI admissions at MMH declined by approximately 11%, while APH experienced an even larger decline of approximately 27%. The national MI data were not available for the 2003/04 period to ascertain whether this trend was present at the national level in NZ. However, according to the expert panellists, this decline was possibly related to better access to the hospitals and early medical management of acute coronary syndromes or chest pain admissions. Therefore, this decline may be associated with the increased number of CP admissions, resulting in a reduced number of MI cases. Graff, Dallara & Ross (1997) in the USA similarly found that a specifically structured chest pain assessment service showed a reduction in the discharge rate of patients with 'a missed infarction' from 4.5 to 0.4 percent, and also a reduction in hospital admissions from 57% to 47%.

All of the MMH ethnic groups had significantly higher MI ASRs per 1000 population than the comparable APH groups. Overall, the MMH Pacific Islander and Maori groups had the highest MI ASRs, followed by the MMH European/Other group. The APH Pacific Islander group ASRs were lower than those for the MMH Pacific Islander group, but higher than the ASRs for the APH Maori and European/Other groups. Elliot and Richards (2005) found that Maori ethnic group discharges after treatment for AMI increased by 14% each year nationally, compared to 4% for other ethnic groups, between 1995/96 and 2000/01. The

overall proportion of AMI admissions for the Maori also increased from 5.5% in 1995/96 to 6.7% in 2000/01. They also found that the Pacific Islanders had the second highest admission rates for acute coronary syndrome (including AMI and unstable angina). Therefore, the findings of this study were relatively matched to the NZ national data and literature on MI trends.

(8.1.3) Heart Failure & Shock

Heart failure & shock DRG category admission trends were relatively stable for most of the study period, except for the years 2003 and 2004 when admissions increased at both MMH and APH. MMH has a significantly higher admission rate than APH as a whole, due largely to the significantly higher rates of the Maori and Pacific Islander groups. Overall, the MMH ASRs were significantly higher than the APH rates, with all MMH ethnic groups showing higher ASRs than the equivalent APH ethnic groups (Table 5.2). For example, the MMH Maori ethnic group had the highest and the Pacific Islander group the second highest ASRs for most of the study period from 1998 to 2004. Nevertheless, the admission rates have declined significantly for both of the groups, compared to the 1999 peak. The MMH European/Other group also had slightly higher admission rates than the equivalent APH group. In contrast at APH, the Maori group showed a significant increase in ASRs between 2001 and 2004, while the Pacific Islander group admissions showed a downward trend since 1999 with some significant fluctuations, and the European/Other group admissions have remained largely stable and were slightly lower than for the equivalent MMH group. According to an APH physician, the significant increase in the Maori ethnic group admissions was related to enhanced access to the hospital services. This raises similar issues to those discussed in the MI DRG category discussion above. The NZ public hospital throughput data on heart failure & shock indicated that admissions have declined by approximately 4% (n = 270) between 1997/98 and 2002/03 (Ministry of Health 1999 & 2004a). In contrast, the crude number of HF & shock admissions increased at both hospitals. The above findings of the present study were also supported by Jackson, Palmer, Lindsay and Peace (2001), who concluded that Maori had the highest rate of heart failure admissions in NZ during 1999. The heart failure rates for the European/Other groups were similar to national NZ heart failure rates.

The higher rates for the Maori and Pacific Islander groups were possibly related to their relatively poor socioeconomic status. According to Jackson, Kelsall, Parr and Papa (1998) who explored the relationship between higher congestive heart failure admissions and socioeconomic status, the admission rates for the lowest socioeconomic group were six times higher than for the highest group. Riddell and North (2003) also related these inequalities to socioeconomic variations in the ethnic groups. Therefore, an individual's inability to pay for the primary care consultations and the ongoing prescriptions required to stay in good health, was more likely to account for higher admission rates. As discussed in the literature review, the Maori and Pacific Islander groups, and especially those in the MMH population, largely lived in the lowest socioeconomic areas in Auckland City. The relationship between deprivation and admission trends is discussed in Chapter 9.

(8.1.4) Heart Arrhythmias

Overall, the heart arrhythmia DRG category admission trends were relatively similar to the MI, and heart failure & shock DRG category trends. MMH again had higher ASRs of admissions each year than APH. However, while MMH's rates remained stable, the APH ASRs showed a small increase from 1998 to 2004. The crude percentage of admissions increased by 7% and 8% each year for MMH and APH respectively from 1998 to 2004, a much greater increase than the NZ national arrhythmia admission increase of 3.5% per year between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a). The ethnic arrhythmia trends were relatively similar to those for the other circulatory system DRG categories.

(8.1.5) Syncope & Collapse

Despite the small number of crude admissions, the syncope & collapse DRG category admissions increased by 10% for APH and 9% for MMH each year from 1998 to 2004. The findings also demonstrated that the ASRs have remained relatively stable for both hospitals, but that MMH had higher ASRs than APH. The NZ national syncope & collapse crude admission increase was lower than for APH and MMH, only increasing by approximately 6.5% per year between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a).

(8.1.6) Age-specific Circulatory DRG Category Admissions

The discussion on overall circulatory disorder age-specific admissions highlighted a strong association between the ageing population and admission rates. The findings showed that most of the admissions came from the 65+ age groups for both hospitals. Nationally the admissions related to the 65+ age groups were growing at a much faster rate than the admissions for younger age groups (Ministry of Health, 2004b). However the present study found some differences between the specific DRG categories and age-specific trends. For example, for all of the circulatory system disorders Maori were admitted at much younger ages, European/Other were older, and Pacific Islanders in-between. Some of the differences in the age-specific trends in the DRG categories are discussed below.

The CP admissions findings highlighted that the CP patients were younger than those with MI, heart failure & shock, and syncope & collapse. The age-specific findings showed that most of the European/Other CP admissions came from the middle age groups (45-64 years) of both hospitals, while the Maori and Pacific Islander group patients came from the younger 35-64 age groups, with a relatively even spread in the crude number of admissions. Overall, the findings indicated that heart arrhythmia patients were relatively younger than MI and slightly older than the chest pain patients.

Overall the MI patients were older compared to CP patients. The European/Other group MI admissions largely came from the 65+ age groups and there was a 3-4 fold higher crude number of admissions for the 85+ age groups compared with the 65-74 age groups. The Maori group MI admissions were mostly from the 45-74 age groups, and the Pacific Islander group admissions were again mainly from the in-between age groups.

The heart failure & shock, and syncope & collapse DRG categories demonstrated relatively similar age-specific trends. Overall, these patients were older than the CP and MI patients. The heart failure & shock age-specific rates indicated that the Maori ethnic group admissions largely came from the much younger 55-64 and 65-74 age groups, compared to the European/Other ethnic group's much older 75-84 and 85+ year age groups. The Pacific Islanders age-specific admissions were more related to the 65-74 and 75-84 age groups. The European/Other groups results further showed the influence of age on crude admissions; for

patients >85 years old these rates increased by 65% and 100% for APH and MMH respectively from 1998 to 2004.

The increase in younger age CP admissions possibly reflected the development of short stay and specific CP observation and monitoring facilities at both hospitals, an example of service use being influenced by factors other than the incidence or prevalence of disease. According to the Ministry of Health (1999a) the types of patients and conditions treated in a hospital can, to some extent, be shaped by the kinds of services available and the degree to which the demand for certain medical or surgical interventions is met. The present study further highlighted that due to the raised awareness of both patients and GPs more patients with CP were being referred to hospitals, taking advantage of the processes set up to specifically meet the needs of CP patients.

As discussed above, Maori and Pacific Islander patients were much younger than their European/Other counterparts for all of the circulatory disorder DRG categories. Hay (2004) found that in the Maori population 56% male and 34% female coronary heart disease deaths occur in those <65 years old, with the Pacific Islander group having relatively similar rates to the Maori. In contrast, the European/Other population only experienced 16% male and 5% female coronary heart disease deaths in those <65 years (Hay, 2004), again highlighting the differences in the ethnic groups. The above age-specific findings emphasise the relationship between an ageing population and the prevalence of MI.

Another reason for the younger age admissions for the Maori and Pacific Islander groups was the appearance of heart disease at a younger age. According to the Ministry of Health (2001) the age-specific comparisons between the Maori and European/Other ethnic groups showed that the Maori rates of disability adjusted life years loss (DALYs) exceeded those of the European/Others in each age group. The excess rates for Maori peaked in the 45–64 age groups at approximately 119% higher than the European/Other group rates. For the Pacific Islanders the peak rate of DALYs loss also occurred in the 45–64 age group, at values 67%-77%, higher than for the European/Others.

The above discussion highlighted that most of the heart failure & shock, and syncope & collapse admissions were related to the older (65+) population. This sector of the population is also known to have co-morbidities. Chin and Goldman (1997) carried out a cross-sectional

patient chart review of $n = 435$ patients admitted acutely with heart failure to an urban university hospital in the USA, to identify precipitating factors for hospitalisation. The authors concluded that the most commonly identifiable factors associated with admissions were acute angina, chest pain, respiratory infection, uncontrolled hypertension, atrial arrhythmia, and patient non-compliance with medication or diet.

A retrospective study to examine the age related trends in clinical characteristics of patients, analysed 800 patient charts per state in the USA of Medicare patients hospitalised between April 1998 and March 1999 with a principal diagnosis of heart failure, and found that heart failure was the leading diagnosis at hospital discharge for patients ≥ 65 years old (Edward et al., 2002). The authors further concluded that heart failure was not only a disease of the elderly, but in fact a disease of the very elderly, as there were twice as many patients >85 years old in the sample, compared for example, to those 65-69 years old. Both of these findings supported the results of the present study. Another study supporting the above finding analysed cross-sectional data related to approximately 300,000 patients from 53 primary care practices participating in a Scottish continuous morbidity recording scheme between 1 April 1999 and 31 March 2000, to examine the epidemiology and primary care burden and treatment of heart failure (Murphy et al., 2004). The incidence of heart failure in the overall population was 2/1000, which increased with age to 22/1000 among patients >85 years old, a rate similar to the APH European/Other 85+ age group's age-specific rates of 17-25/1000. The rates for the equivalent group at MMH were however higher at 19-36/1000. The Maori and Pacific Islander groups virtually had no admissions for the 85+ age groups highlighting their lower life expectancy and higher mortality at a younger age as highlighted by Hay (2004).

Finally, the Ministry of Health (2004c), which carried out the NZ Health Survey 2002/03, reported that 1 in 10 adults (10.4%; 95% CI 9.7-11.1) has been diagnosed with heart disease (heart attack, angina, heart arrhythmia or heart failure), and that the prevalence was highest for the Maori followed by the European/Other and Pacific Islander groups (Ministry of Health, 2004c). According to the findings of the present study the Pacific Islander groups had the second highest admission rates for most of the DRG categories discussed above, and the European/Other groups the lowest. The reason for the higher admission rates for the Pacific Islanders found in this study, is probably related to their higher use of hospital services compared to the European/Other group, so that despite having similar prevalence rates, the

Pacific Islanders' higher usage of hospital services, leads to higher admission rates for them. The survey results concluded that in NZ the prevalence of heart disease increased with age, peaking in the 75+ years age groups (Ministry of Health, 2004c).

(8.1.7) Summary

Overall, it was found that circulatory system admissions have increased significantly at both hospitals. The MMH and its ethnic groups had higher ASRs per 1000 population than APH and its equivalent ethnic groups. CP admissions were the leading cause of admissions, with CP admission rates increasing significantly for both hospitals. All of the other DRG categories experienced increases both in ASRs and the crude number of admissions, except for MI admissions, which declined during 2003-2004. The findings demonstrated a strong association between age and admission rates, which is well supported by both national and international literature. Maori were younger in age to the Pacific Islanders, who in turn were younger than the European/Other group, and the CP patients were younger than other DRG category patients.

(8.2) Respiratory System MDC and DRG Categories

Respiratory system disorders were the second major cause of admissions, and accounted for 21% and 19% at MMH and APH respectively, with both hospitals experiencing relatively similar increases for these disorders.

The crude number of admissions increased approximately 48% (n = 1,008) and 50% (n = 834) for the two hospitals respectively between 1998 and 2004. Despite the slightly higher crude rate increase for APH, the ASRs remained statistically higher for MMH for each year of the study (Table 5.5). The admission ASRs appeared to have peaked in 1999 and have then remained lower or equal from 2000 to 2004. Findings related to overall age-specific admission rates indicated increases for the 65+ age groups only, although the crude number of admissions increased for all age groups.

In the present study four specific DRG categories (infections & inflammations; COPD; bronchitis & asthma; and other respiratory system diagnoses) were identified as contributing 80% of the total admissions for the respiratory system disorders MDC, and these DRG categories are now discussed.

(8.2.1) Infections & Inflammations

The crude and age-standardised admission rates for the infections & inflammations DRG category peaked for both hospitals and their ethnic groups in 1999, and then declined 14.3% and 15.5% for APH and MMH respectively by 2004 (Table 5.6). The decline in the crude number of admissions went against the overall increasing trend in the crude number of respiratory admissions.

One of the likely reasons supported by the expert panellists for the increase in 1999, was the lower than usual temperatures during the colder months (June, July, and August) of that year (NIWA, 2006). The infections & inflammations DRG category data for the NZ public hospitals also showed a 12% increase during 1998/99-2001/02 (Ministry of Health, 2000 & 2004b), while admissions declined by 10.4% between 2001/02 and 2002/03 (Ministry of

Health, 2004a & 2004b). In fact, the admission trends identified in the present study almost matched the NZ national trends, both agreeing that infections & inflammations DRG category admissions have either declined or remained stable since 2001.

Overall, the MMH ASRs for infections & inflammations admissions remained significantly higher than the APH ones over the study period, with the MMH Pacific Islander and Maori groups having the highest ASRs. This is thought to be largely due to the larger proportion of Maori and Pacific Islanders, with their predisposition to respiratory infections, living in the MMH region. For example, a population-based survey in Auckland found that Maori and Pacific Islander adults had higher rates of acquiring respiratory infections & inflammations than the European population (Drinkovic, Wong, Taylor, Roberts & Morris, 2001). On the other hand, the MMH European/Other groups also had moderately and statistically higher admission rates than the equivalent groups at APH. Reasons put forward by the expert panellists to explain these variations included factors such as access to primary and hospital care, and prevalence of disease, which are both further discussed in Chapter 9.

Post the admission peak in 1999, the ASRs for all the ethnic groups of both hospitals (except the Maori groups of APH) had declined to the 1998 rates by the year 2004. One of the reasons for this decline could be attributed to the free influenza vaccination programme introduced in 1997 for people aged 65+, and then extended in 1999 to those with one or more medical co-morbidity (Baker, 2001; Ministry of Health, 2002b). This vaccination programme was possibly effective in reducing some admissions in 2001, as discussed in Chapter 7. In the winter of 2001, MMH launched a special influenza campaign to increase the level of immunisation of individuals at risk of hospitalisations for selected South Auckland suburbs (Clarke, Howells, Wellingham & Gribben, 2003). The campaign also appeared to have had some influence on the Pacific Islander and Maori ethnic group ASRs at MMH, leading to consistently declining admissions (Figure 5.9). However the COPD admissions have continued to increase despite the vaccination campaigns, while infections and inflammations admissions have declined (Figure 5.10). Part of this decline could be related to changes in the coding practice, rather than to the influenza vaccination programme alone.

In contrast, the same was not observed for the APH Maori group, whose ASRs increased from 1.9/1000 to 4.8/1000 from 2000-2004. Possibly the uptake of the free nationally available vaccination for those aged 65+ years was poor among this group, and APH did not introduce

any special programme to increase the vaccination uptake during the study period. A comprehensive literature review related to respiratory admissions was carried out by NZHTA (1998), which concluded that the vaccine appeared to be less effective in the older population. According to the findings of the present study the majority of respiratory admissions at APH were from the ≥ 65 year population. Therefore it is likely that the vaccination has not been as successful as predicted, and there might be other factors affecting the admissions rates.

Another reason contributing to the decline in the number of infections & inflammations cases was probably related to a change in the coding practice. Historically, patients admitted with infections & inflammations with a history of chronic obstructive pulmonary disease (COPD) were given a principal diagnosis of infections & inflammations. The study findings indicated the principal diagnosis of these patients now tended to be COPD, due mainly to the higher level of funding attracted by the COPD DRG. The expert panel physicians emphasized that a high percentage of pneumonia patients admitted would have had a history of COPD, which is supported by Chambers et al. (2006), who examined 474 pneumonia related hospitalisations and concluded that 26% had a history of COPD and 58% had multiple co-morbidities. This change in coding practice has resulted in a reduction in the number of admissions coded as infections & inflammations and an increase in COPD admissions. Another physician reflected that: *‘There were a lot of people coming with pneumococcal pneumonia and half of those would be with a history of COPD’*.

From the above discussion it is concluded that the Maori and Pacific Islander groups have higher respiratory infections & inflammations admission rates due to their higher prevalence rates. Younger Maori and Pacific Islander groups have higher age-specific rates than the older Maori and Pacific Islander groups. The findings also emphasize the impact of the ageing population.

(8.2.2) Chronic Obstructive Pulmonary Disease (COPD)

Overall, the COPD DRG category findings indicated that crude admissions increased by 78% (n = 313) at APH, and 52% (n = 315) at MMH between 1998 and 2004. The ASRs also increased steadily at both hospitals, but the ASRs were significantly higher at MMH than at APH. The national trends on COPD admissions indicated a 17.3% (approximately 3% each year) increase between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a), which was

considerably lower than the increases found for this study. Jackson, Palmer, Lindsay and Peace (2001) also concluded that MMH's COPD hospitalisation ASRs were higher than the NZ national rates.

The expert panel members highlighted that one of the reasons for higher admission rates among the Maori and Pacific Islanders was their higher prevalence rates for COPD. Based on the World Health Organization's estimates for this region, Broad and Jackson (2003) measured the burden of COPD in NZ, and concluded that COPD affected approximately 15% of the adult population ≥ 45 years of age (at least 200,000 New Zealanders). According to projections of mortality and disability by cause, COPD was one of the leading causes of disability and mortality in the world, and was expected to become the 3rd cause of death and the 5th cause of disability by the year 2020 (Murray & Lopez, 1997). According to the Ministry of Health (1999) COPD alone as a disease was ranked third overall due to its significant contribution to both mortality and disability.

The findings also highlighted significant differences between admission rates of the different ethnic groups at the two hospitals. The ASRs were the highest among the Maori and have increased for both hospitals (Figure 5.10). The MMH Pacific Islander group had the 2nd highest admission rates, and the European/Other groups at both hospitals had the lowest ASRs for COPD.

The main reason for the higher hospitalisation rates among the Maori and Pacific Islander groups was related to the prevalence of high levels of smoking (Broad & Jackson, 2003). Lundback et al. (2003) who carried out a survey to measure the prevalence of COPD in a Swedish cohort study in 1996/97 concluded that COPD was strongly smoking dependent and increased considerably with increasing age. Among smokers, the prevalence of COPD based on the British Thoracic Society's criteria was; 5% in those aged 46-47 years, 24% in those aged 61-62 years and 45% among the oldest age groups. According to the NZ Health Survey 1999, the Maori population has the highest smoking rates (45% Female, 35% male) with lower rates for Pacific Islanders (25% female, 35% male), and even lower ones for the European/Other population (19% female, 25% male) (Ministry of Health, 1999a).

MMH's Maori and Pacific Islander groups experienced a rapid decline in ASRs between 1999 and 2000. A likely explanation for this decline was the COPD trial carried out by the

hospital's DHB, which commenced in 1999 and finished in 2000 (Clarke, Howells, Wellingham, & Gribben, 2003). The aim of this trial was to prove that enhanced primary care level support for patients with COPD would result in lower usage of hospital resources and improved quality of life for patients. When this trial was closed, the ASRs again increased in 2001. Given the higher prevalence of COPD among the Maori and Pacific Islander populations, this trial only had a minor effect on the admission rates of the European/Other group of MMH. More detailed discussion on some of these initiatives has been provided in Chapter 9.

In order to manage the growth in COPD admissions, both hospitals have invested in the development of new models of care, such as establishing COPD nurse specialist roles. These roles appear to have been successful in reducing the readmission rates, average length of stay and improving quality of care. Further discussion on these roles is provided in Chapter 9.

(8.2.3) Bronchitis & Asthma

As with the other respiratory conditions, the bronchitis & asthma DRG category admissions also peaked during 1999. Since 1999, the admission rates have declined by approximately 8% and 22% for APH and MMH respectively. The NZ public hospital asthma and bronchitis hospitalisation rates have declined by approximately 22% from 1998/99 to 2002/03 (Ministry of Health, 2000 & 2004a). Therefore, the NZ national decline was very similar to that of MMH but much higher than APH's. The bronchitis & asthma findings further indicated that the crude number of hospitalisations declined for all of the MMH ethnic groups from 1999 to 2004. In contrast at APH the European/Other group was the only group that experienced a decline in the crude number of admissions. According to the findings of this study the major reason for the decline in bronchitis & asthma admissions was probably related to better management in the community and availability of better medications. This is supported by the similar results of a Swiss prospective observational study (Bollag, Capkun, Caesar, & Low, 2005).

Although MMH ethnic groups experienced a decline in the crude number of admissions, their ASRs have remained higher than those of the equivalent APH ethnic groups, probably related to the higher proportions of Maori and Pacific Islander people living in the MMH region. The

Maori and Pacific Islander groups appeared to have higher admission rates for bronchitis & asthma compared to the NZ national rates (Jackson, Palmer, Lindsay & Peace, 2001).

The NZHTA (1998a) Group also found similar variations in the bronchitis & asthma hospitalisation rates between non-Maori and Maori (275/100,000 and 507/100,000 respectively) in 1996, (these rates also include hospitalisations of <15 year olds). These variations have also existed historically. For example, in 1989 Garrett, Mulder and Wong-Toi reported that Pacific Islanders had significantly lower self-management skills, asthma knowledge, preventive medications, access to medical care and use of urgent medical services, than Europeans. The Maori participants in the study had significantly lower access to medical care and lower utilisation of urgent medical services. These issues appear to be still relevant in this study.

Another reason for the higher rates of admissions for the Maori and Pacific Islander groups is the higher prevalence of bronchitis & asthma in those of poor socioeconomic status. The expert panel findings indicated that there were some population groups who could not afford to visit a doctor due to financial constraints. For example, the MMH nurse specialist who stated: *'Even \$10 is too much for some families. They often have to choose between visiting a doctor and putting food on the family table'*.

According to Kolbe, Vamos and Fergusson (1997) there was a positive association between low socioeconomic status and either hospital admission or emergency department attendance in those aged between 15 and 50 years. Other associated factors included unemployment and being unable to fill a prescription due to cost. There was a strong association between high deprivation domicile and asthma admissions (Jackson, Palmer, Lindsay & Peace, 2001). Further discussion on the influence of low and high deprivation domiciles on admissions is provided in Chapter 9.

(8.2.4) Age-specific Respiratory DRG Category Admissions

Overall, respiratory system MDC findings indicated that admissions increased for the 65+ age groups. The age-specific admission trends for the DRG categories are presented below.

Age-specific rates related to respiratory infections & inflammations showed that the Maori and Pacific Islander groups' admission rates for the 65+ age groups were growing rapidly, however the admissions were spread across all of the age groups of both hospitals. In contrast, most of the European/Other group infections & inflammations admissions of both hospitals came from the 65+ year age groups.

The COPD age-specific admission trends differed in that most of the Maori group admissions for both hospitals came from the 55-64 and 65-74 age groups, the Pacific Islander group admissions from the 65-74 and 75-84 age groups, and the European/Other group admissions largely from the 75+ age group, highlighting a strong relationship between age, ethnicity and admissions.

The bronchitis & asthma age-specific admission trends were different again, though similar to those for the other respiratory system diagnosis DRG category. The majority of the bronchitis & asthma admissions for the Maori and Pacific Islander groups came from the ≤ 64 age groups and were relatively evenly spread over these age groups. In contrast, the European/Other group admissions had a much wider spread over the 15-84 age groups, with some admissions in the 85+ age groups of both hospitals.

Another feature of the findings was that the MMH Maori and Pacific Islander groups had much higher age-specific rates, than the equivalent APH groups for all four of the DRG categories, despite the availability of the special flu vaccination project for the at-risk age groups at MMH, highlighting that there are differences between the populations of the two hospitals. An observational study conducted in Christchurch and Hamilton in NZ, found that the community acquired pneumonia rate for the 45-54, 55-64 and 65-74 age groups was 3.03 times higher among Maori than non-Maori in the whole population (Chambers et al., 2006). The authors further concluded that compared with non-Maori, the Maori population was significantly younger (mean age of 50 versus 66 years) and that they had a significantly

higher rate of smoking (35% versus 19%). The main reason for the fewer admissions for the 85+ age groups was probably related to the lower life expectancy of these ethnic groups.

The expert panellists emphasized that most of the European/Other group admissions were related to the older age groups, which highlighted the impact of the ageing population. In the USA, National Hospital Discharge Survey data from 1988 to 2002 was analysed to examine the pneumonia hospitalisation trends in adults aged 65+ years (Fry, Shay, Holman, Curns & Anderson, 2005). According to the authors, the hospitalisation rates by discharge codes for pneumonia increased by 20% from 1988-1990 to 2000-2002 for patients aged 65 to 74 and 75 to 84 years. The hospitalisation rates were 2-fold higher for patients aged 85+. These increases were very similar to the European/Other group results found in this study.

The age-specific differences highlighted that the Maori and Pacific Islander patients with COPD required hospital care at a much younger age than European/Other group COPD patients. According to the Ministry of Health (2001a), the peak DALYs loss for the Maori and Pacific groups occurred for the 45-64 age groups, which highlighted their shorter life expectancy as opposed to the European/Other groups. The above finding was also supported by Garcia-Aymerich et al. (2003), who noted that respiratory exacerbations were associated with poor quality of life, reduced life expectancy and a high healthcare expenditure.

The large age variations between the Maori and Pacific Islander groups, and the European/Other group are well supported by the Ministry of Health (1999a), which reported that some of the highest asthma hospitalisation rates were in the younger age groups, especially for the Maori and Pacific Islander groups. This study further emphasized that there was sufficient evidence that the prevalence of asthma had increased over the 15 years, not only in NZ but also throughout the industrialised world (Ministry of Health 1999a), and further concluded that asthma trends might have already peaked, and that the incidence of asthma was possibly stabilising or even decreasing. The present study findings also showed that bronchitis & asthma rates had relatively stabilized and were possibly declining, especially for the European/Other groups, possibly related to more effective primary care in the community and reduction in smoking rates.

(8.2.5) Summary

Overall, respiratory admissions peaked during 1999 at both hospitals, and MMH consistently had higher admission rates than APH. COPD admission rates have continued to increase well above the national rates, while infections & inflammations showed a definite downward trend, which appears to be related to a diagnostic coding change and the introduction of influenza vaccination. The continuing decline of bronchitis & asthma admissions since 1999 for both hospitals appeared to be associated to better management of asthma in the community. Discussion on the overall respiratory and specific DRG categories demonstrated that MMH Maori and Pacific Islander groups consistently had higher admission rates and higher age-specific rates than the equivalent APH groups. Maori and Pacific Islander admissions were also at a much younger age than for the European/Other groups.

(8.3) Neurovascular System MDC and DRG Categories

Neurovascular disorders were the 3rd leading cause of admissions. The crude number of admissions has increased at both hospitals while the ASRs have largely remained stable during 1998-2004, and again MMH had higher admission rates than APH.

At MMH neurovascular MDC ASRs peaked to 5.12/1000 during 2000, then remained below this peak for the remainder of the study period. A similar pattern was observed for APH, except that the ASR peak (4.35/1000) occurred a year later in 2001 (Figure 5.12). The expert panel findings indicated no specific reasons for the peaks experienced at either hospital.

Around 57% and 48% of the age-specific admissions for APH and MMH respectively came from the 65+ age groups during 1998-2004. At APH the 75+ age groups had a higher percentage of crude admissions, while at MMH the 55 to 74 age groups had the higher percentage, again highlighting the demographic differences in the two DHB populations. When comparing the age-specific admission rates of the 65-74, 75-84 and 85+ age groups for neurovascular MDC admissions, these were 2, 4 and 6 times higher respectively than the rates for the 55-64 age groups of both hospitals, highlighting a strong relationship between patient age and admission rates.

According to the findings of the present study there were four specific DRG categories (stroke; seizure; headache; and transient ischemic attack & precerebral occlusion) that contributed 70%-72% of the total neurovascular disorder MDC admissions. Admission trends related to each of these DRG categories are discussed below.

(8.3.1) Stroke

The stroke ASRs were stable for both hospitals, but MMH had statistically slightly higher rates than APH for most of the 1998-2004 study period (Table 5.9). Despite the stable ASRs the crude number of admissions increased by 13% (n = 53) and 21% (n = 86) admissions for APH and MMH respectively between 1998 and 2004. This increase in crude admissions at both hospitals was much greater than the national increase of only 4.1% between 1997/98 and 2002/03, based on NZ hospital throughput data on stroke admissions (Ministry of Health,

1999 & 2004a). These findings were also supported by the NZ Health Survey 2002/03, which highlighted that one in 48 adults has been diagnosed with stroke (Ministry of Health, 2004c). The prevalence of stroke was much higher among Maori compared to other ethnic groups. However, the stroke rates were slightly higher at MMH than the national rate in 1999 (Jackson, Palmer, Lindsay & Peace, 2001). According to the Ministry of Health (1999) stroke ranked second at an individual disease level due to its high burden overall. And it was the 2nd cause of mortality after ischaemic heart disease in NZ (Ministry of Health, 2004).

Due to the increased number of admissions, a stroke unit was opened at MMH in 2001, the effectiveness of which was evaluated by Matteo, Anderson, Ratnasabapathy, Green and Tryson (2004). The DRG data showed an increase of 14% in admissions to the unit from 1999 to 2001/2002, while the average length of stay, readmission rates, and referral for rehabilitation declined significantly. Similarly, APH has also made a number of administrative changes including establishment of a stroke unit, through the older people's health services, to better manage stroke patients. These services provide more rehabilitative and multidisciplinary care to people aged 65+ years.

(8.3.2) Seizure

Findings related to the seizure DRG category indicated that ASRs have largely remained stable at between 0.4-0.7/1000 for both hospitals. The crude number of admissions at APH declined in the last two years of the study while at MMH they increased in 2004. This finding was different to the NZ data on hospital throughput, which showed a 16.1% (n = 574) increase between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a). Further investigations at both hospitals revealed that most of these patients were being managed through hospital outpatient and primary health services in Auckland, rather than being admitted at the hospitals.

(8.3.3) Headache

Although, the crude number of admissions for the headache DRG category increased at both hospitals from 1998 to 2004, the ASRs have remained relatively stable with minor fluctuations. The APH crude number of admissions peaked in 2000 and then remained close to the peak for the rest of the study period. MMH also experienced a rapid rise (23%) in admissions during 2000, and then another increase of 22% during 2003-2004, which differed

from APH and NZ national trends. NZ hospital throughput data also saw the crude number of admissions increasing by 22% (n = 528) between 1997/98 and 2000/01 (Ministry of Health, 1999 & 2002b), but this was then followed by a decline (3%) during 2001/02-2002/03 (Ministry of Health, 2002b & 2004a).

The prevalence of headache in the population was highlighted by the Ministry of Health (2004c) finding, that one in 17 (5.8%) adults has been diagnosed with migraine headache. In the present study some of the expert panel physicians suggested that the main reason for many headache hospitalisations was to exclude meningitis cases. Therefore, some of the rise in admissions was attributed to the fear caused by meningitis, and the growing awareness of meningitis among both the general population and health professionals.

(8.3.4) Transient Ischemic Attack (TIA) & Precerebral Occlusion

The TIA & precerebral occlusion DRG category ASRs have remained relatively stable with a slightly declining trend for both hospitals. MMH again had slightly higher admission rates than APH. The crude numbers of admissions for both hospitals have fluctuated somewhat, but have remained relatively similar to the 1998 figures. In comparison, national TIA & precerebral occlusion admissions declined by 6.4% (n = 132) between 1997/98 and 2004 (Ministry of Health, 1999 & 2004a). Overall, the age-specific rates were relatively similar to the stroke DRG category findings.

(8.3.5) Age-specific Neurovascular DRG Category Admissions

Findings related to the stroke DRG category showed that the rates of age-specific admissions for the 75-84 age groups were double those for the 65-74 groups, and were even higher for the 85+ age groups. The MMH age groups had slightly higher admission rates than the equivalent APH groups. The rates for the TIA & precerebral occlusion DRG category were relatively similar.

The seizure DRG category showed no age-specific trends, and had the lowest average crude number of admissions, while, the headache age-specific rates for both hospitals indicated that there were more admissions related to the ≤ 54 age groups than the 55+ age groups. Therefore

age-specific trends of both of these DRG categories were different to those of the stroke and TIA & precerebral occlusion categories.

The relationship between ageing population and the stroke and TIA DRG categories is well documented. Bridges, Spilsbury, Meyer & Crouch (1999) found that stroke was one of the common diagnoses among older (65+ year) patients presenting at hospital accident and EDs in the UK and the USA. According to the Ministry of Health (1999), hospitalisations for stroke were more common among the 45+ age groups, with those aged 75+ having the highest rate at 19 per 1000. The Ministry of Health (2004c) survey found a strong association between age and stroke rates

Age-specific rates for the different ethnic groups have not been calculated for the present study, because of the small sample sizes. However according to the Ministry of Health (2004a), compared to the European/Others group, Maori had higher rates of hospitalisation for stroke in the 45–64 and 65–74 year age groups, but lower rates in the 75+ age group, and Pacific people had the highest rates of hospitalisation for stroke in all three of the older age groups. The growth in the older age group admissions reflect the higher life expectancy and the fact that incidence of stroke increases with age (White, 2004). Overall the stroke and TIA & precerebral occlusion age-standardised admissions have remained stable but the crude number of admissions has continued to increase.

The panellists indicated that both stroke and TIA & precerebral occlusion disorders were strongly associated with the ageing population, however overall, the neurovascular admissions have remained relatively stable over the study period.

(8.3.6) Summary

Overall, the neurovascular admissions have remained a major contributor to admissions and relatively stable over the study period. Admissions increased 2, 4, and 6 times for the 65-74, 75-84, and 85+ age groups respectively compared to the 55-64 age groups. For the stroke and TIA & precerebral occlusion admissions, ASRs remained stable, the crude number of admissions increased, and there was a strong association with the ageing population with admissions largely coming from the 65+ age groups.

Headache admission ASRs were stable with admission trends relatively similar to those for stroke and TIA & precerbral occlusion, and age-specific trends highlighted that most of the headache admissions came from the younger (<55 years) age groups.

(8.4) Digestive System MDC and DRG Categories

Digestive system disorders were the fourth major cause of medical admissions and accounted for 8%-10% of the total admissions. Overall, the ASRs at both hospitals have experienced a small increase with some fluctuations between 1998-2004 (Table 5.10). Again, the ASRs were slightly higher for MMH than APH. According to the findings, and despite some fluctuations in admissions, the crude number of admissions increased approximately 26% and 38% for APH and MMH respectively between 1998 and 2004. These rates were much higher for both hospitals than the projected population increase over the study period. According to the Ministry of Health (2004a) digestive disorders (including hepatic) led to a significant number of total hospitalisations in NZ.

Age-specific analysis of digestive system disorders showed that the admission rates increased rapidly from younger to older age groups. For example, the 45-54 age groups' age-specific rates ranged from 2 to 4/1000, while the rates for the 85+ groups increased to 19-21/1000 for APH and 20-26/1000 for MMH over the study period, highlighting the influence of the ageing population on the digestive system admissions.

In the present study there were three main digestive system disorders DRG categories that contributed more than 80% of the total digestive system disorder MDC admissions. The findings related to each of these DRG categories (gastroenteritis, oesophagitis & miscellaneous disorders; gastrocopy; and abdominal pain & mesenteric adenitis) are now discussed.

(8.4.1) Gastroenteritis, Oesophagitis & Miscellaneous Disorder

The gastroenteritis, oesophagitis & miscellaneous disorder DRG category accounted for approximately 40% of the total admissions for the digestive system MDC at each hospital. ASRs showed increases for both hospitals, and the crude number of admissions increased 82.5% (n = 255) and 88.7% (n = 267) at APH and MMH respectively between 1998 and 2004. NZ hospital throughput data only showed a 40% increase in admissions between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a). According to a comprehensive literature review carried out to identify the characteristics of older patients presenting to

hospital accident and emergency departments, gastrointestinal disorders were some of the common diagnoses (Bridges, Spilsbury, Meyer & Crouch, 1999).

(8.4.2) Gastroscopy

The second largest DRG category in this group was related to gastroscopy, which contributed approximately 33% and 38% of the total admissions at APH and MMH respectively. Overall, the ASR findings indicated that the admission rates have declined slightly (0.1-0.2/1000) for both hospitals (Table 5.12). The crude number of admissions also showed a decline of 5.5% and 11.3% for MMH and APH respectively between 1998 and 2004. In contrast, NZ hospital throughput data showed a much smaller decline of only 2.1% between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a). Decline in admissions at APH was possibly related to the non-DRG funding contract. According to an APH expert panel manager, gastroscopy procedures were bulk funded under a separate contract, rather than being DRG funded, as at MMH. Therefore most of these cases were no longer included in the hospital case-mix data.

(8.4.3) Abdominal Pain & Mesenteric Adenitis

For the abdominal pain & mesenteric adenitis DRG category, the ASRs are relatively similar for both hospitals. Those at MMH have remained relatively stable, while those for APH showed some decline during 1999-2000. The crude number of admissions declined by 34.4% (n = 32) for APH from 1999 to 2004, while at MMH they increased by 35.8% (n = 24) from 1998 to 2004. These fluctuations in results are possibly related to the small sample size. In comparison the NZ national rates for abdominal pain & mesenteric adenitis increased by 7.4% between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a).

(8.4.4) Age-specific Digestive DRG Category Admissions

The gastroenteritis, oesophagitis & miscellaneous disorder DRG category and the gastroscopy DRG category age-specific findings showed that the 15-54 age groups had much lower rates than the 55+ age groups, indicating an increased number of admissions with older age. Gastroscopy DRG age-specific rates were highest for the 85+ age group. Again MMH had slightly higher age-specific rates than APH. The expert panel physicians also explained that

most of the patients admitted for gastroscopies were from older age groups, requiring further investigations to diagnose digestive system disorders.

The abdominal pain & mesenteric adenitis DRG category age-specific rates were evenly spread over the 15-84 age groups for both hospitals, except for the 85+ age group, which had the lowest number of admissions. This finding was contrary to the literature review carried out by Bridges, Spilsbury, Meyer & Crouch (1999), which concluded that abdominal pain & mesenteric adenitis was one of the common final diagnoses related to older patients.

(8.4.5) Summary

It is concluded that overall digestive system MDC admissions increased at both hospitals over the study period. As for the other MDCs, the ageing population also had some influence on the admission rates, and MMH had slightly higher rates than APH. The gastroenteritis & oesophagitis DRG category admissions steadily increased during 1998-2004 (82%-89%), gastroscopy admissions declined for both hospitals, and abdominal pain & mesenteric adenitis admissions remained relatively stable for both hospitals.

(8.5) Kidney & Urinary Tract MDC and DRG Categories

Kidney & urinary tract MDC admissions were the 5th major cause of medical admissions and accounted for approximately 4%-5% of the admissions. The findings indicated that MMH had slightly higher ASRs than APH, except for the year 2001 when APH's rate exceeded MMH's rate (Figure 5.15). Both ASRs and the crude number of admissions have increased for both hospitals, but the crude admission increases were considerably higher at APH (46%) than at MMH (29%) between 1998 and 2004.

The age-specific admission rates were higher for the 65+ age groups of both hospitals, than for the younger age groups, and the 85+ age groups' age-specific rates have continued to increase and were higher than for any of the other age groups.

In the present study three main DRG categories (kidney & urinary tract infection; other kidney & urinary tract diagnosis; and renal failure) were identified as contributing more than 85% of the total admissions for the kidney & urinary tract disorders MDC. Admission trends related to each of these DRG categories are discussed in the following.

(8.5.1) Kidney & Urinary Tract Infection

Kidney & urinary tract infection DRG category age-standardised admissions have increased slightly between 1998 and 2004 (Table 5.13). The crude number for kidney & urinary tract admissions has continued to increase and accounted for $\geq 55\%$ of the total kidney & urinary tract MDC admissions. The increase in the crude number of admissions was higher at APH than at MMH (60% (n = 149) and 46% (n = 110) respectively) from 1998 to 2004. The national increase in crude admissions from 1997/98 to 2002/03 was much lower at 23% (Ministry of Health, 1999 & 2004a). Foxman (2002) reviewed the literature to explore the epidemiology of urinary tract infections (UTIs) and concluded that UTIs were considered to be the most common bacterial infection. In the USA they accounted for nearly 7 million primary care office visits and 1 million ED visits resulting in 100,000 hospitalisations in 1997.

(8.5.2) Other Kidney & Urinary Tract Diagnosis

APH ASRs were slightly lower than for MMH. Despite the lower ASRs at APH, the increase in the crude number of admissions was much higher at APH than at MMH (34% compared to 10%). Overall the admission trends have remained relatively stable. In contrast, the national data on hospital throughput indicated a decline of 10% between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a).

(8.5.3) Renal Failure

Admission rates for renal failure have remained relatively stable for both hospitals. MMH had slightly higher rates during 1998-2000, which declined to almost match APH's rates for the rest of the study period. In contrast, NZ public hospital funded admissions increased by 32% between 1997/98 and 2002/03 (Ministry of Health, 1999 & 2004a). Madhan (2004) analysed Australia and New Zealand dialysis and transplant data from 1991 to 2001 to identify incidence and prevalence of elderly end-stage renal disease trends, and found that the total number of patients with end-stage renal disease went up from n = 215 in 1991 to n = 458 in 2001 (an increase of 113%). For patients aged 65+ the number went up from n = 28 patients in 1991 to n = 139 patients in 2001, demonstrating a 396% increase compared to the 70% for those aged less than 65 years. The author further found that the growth in those aged above ≥ 75 years was even greater (483%), and occurred mostly between 1996 and 2001.

(8.5.4) Age-specific Kidney & Urinary Tract DRG Category Admissions

The kidney and urinary tract infection age-specific findings indicated that 15% to 17% of the total admissions were related to the 15-24, 25-34, and 75-84 age groups. The rest of the admissions were evenly spread among the other age groups of both hospitals. However the ASRs were the highest for the 85+ age groups and second highest for 75-84 age groups of both hospitals. Foxman (2002) identified some population groups at risk of urinary tract infections, including young sexually active adults, especially females, pregnant women, older people, patients with spinal cord injuries and/or catheters, patients with diabetes and patients with underlying urologic abnormalities.

The renal failure age-specific admission rates showed that the 75+ age groups had higher admission rates than other age groups and that MMH's rates were slightly higher than APH's. However, the crude percentage of admissions indicated that most of the admission came from the 45-84 age groups and that the 75-84 age groups accounted for 23%-25% of the total admissions for both hospitals, again showing the impact of the ageing population between 1998 and 2004. According to Madhan (2004) the prevalence of renal failure was increasing among the older age groups, supporting the above findings.

Other kidney & urinary tract diagnosis DRG category findings showed no age-specific trends, with admissions relatively evenly spread over most of the age groups.

(8.5.5) Summary

Overall, kidney & urinary tract admissions have remained relatively stable, both hospitals had relatively similar ASRs, and older age groups had a higher percentage of admissions than younger age groups. Kidney & urinary tract infection admissions have increased steadily, while renal failure and other kidney & urinary tract diagnosis showed no significant increase in admissions at either hospital.

(8.6) Chapter Conclusions

Discussion related to MDCs and DRGs highlighted a number of morbidity based themes contributing to admission increases. Out of the five identified MDCs, the circulatory and respiratory system disorders accounted for more than 50% of the total AMAs at both hospitals. A significant increase in CP admissions at APH during 2003-2004, was most likely to be related to the opening of a new facility equipped to diagnose, assess and even admit patients for shorter LOS. Therefore, changes in medical practice, introduced in the form of diagnostic tests with strong emphasis on excluding potential life threatening risk, posed by certain conditions such as meningitis and chest pain, have led to increased admissions.

Some of the endemic and epidemic diseases such as COPD, diabetes, and other chronic disorders have contributed to the rise of admissions directly or indirectly. Diabetes did not emerge as a principal cause of growing admissions, however it has been identified as a major risk factor for circulatory, neurovascular and kidney & urinary tract disorders that do account for admissions.

Demographic makeup of population and some ethnic group predispositions to certain disorders also contributed to the increased number of admissions. Both Maori and Pacific Islander groups consistently had higher admission rates compared to European/Other ethnic groups. There was also a positive correlation between poor socioeconomic status, higher smoking rates, poor housing, over crowding and leading morbidities for the Maori and Pacific Islander groups at both hospitals, lending support to the theory that differences between major ethnicities is largely explained by socioeconomic differences. These issues are discussed further in Chapter 9.

Hospital admission rates increased with age for most of the identified MDCs and their associated DRG categories, regardless of ethnicity and hospital. These DRGs were CP, MI, heart failure & shock, stroke, TIA & precerebral occlusion, syncope & collapse, renal failure, gastroscopy, and gastroenteritis, oesophagitis & miscellaneous digestive system disorders. Therefore, ageing of the population was one of the significant factors that contributed to the growing number of admissions. Maori and Pacific Islander patients were younger in age, but with similar morbidity trends to older European/Other groups. As supported by the literature,

both Maori and Pacific Islander groups have a much higher prevalence of chronic disease at a much younger age than the European/Other groups.

At both hospitals, there were a few DRG categories whose admissions were not associated with ageing or socioeconomic factors such as bronchitis & asthma, kidney & urinary tract infections, and abdominal pain & mesenteric adenitis.

Both the Ministry of Health and the hospitals in this study implemented a number of new initiatives to reduce and stabilise the growing demand for hospital care. One of these initiatives, which had a moderating effect on admissions, was the introduction of the influenza vaccinations, which appears to have stabilised the winter admission peaks to a certain extent. The introduction of community based disease management and specialist nursing management was helpful in preventing some of the admissions. Introduction of ambulatory clinics for gastroscopy patients reduced the need for inpatient hospital care, and short stay units appeared to influence the LOS and prevent inappropriate admissions to hospitals.

Finally, there were some influencing ‘artefacts’, which although not affecting total admissions, did affect certain DRG categories, such as for example: the shift of respiratory infections & inflammations admissions to COPD admissions; some coding changes; and changes in funding contracts for the arranged and waitlist admission categories under the gastroscopy DRG.

Chapter 9

Discussion: Socioeconomic, Population and Health Service Issues

(9.0) Introduction

Chapters 7 and 8 discussed findings related to acute admission trends and leading major diagnostic categories and related disorders. The focus in this chapter now shifts to discuss and examine common themes related to population and its socioeconomic status, and health services issues.

This chapter comprises three main sections. The first section focuses on the trends in admissions in relation to low and high deprivation and the related differences in admission between the hospitals and between ethnic groups. The second and third sections identify and discuss common issues raised in Chapters 7 and 8 and the first section of this chapter, regarding admissions. These are divided into two broad categories; those related to patients and population (9.2) and those related to hospital and health service factors (9.3). Although these factors, (including ethnicity, socioeconomic, lifestyle, burden of disease, patterns of health service use, among others), which influence admission trends, are discussed in separate broad categories, there is significant overlap and interrelatedness between them.

(9.1) Ethnicity, Admission Trends and Socioeconomic Issues

The study findings have highlighted significant differences in the admission rates between the ethnic groups and the hospitals. Most of the NZ literature which supports these findings has also highlighted significant inequalities in health between the Maori, Pacific Islander and European/Other groups (National Health Committee, 2005; Ajwani, Blakely, Robson, Tobias & Bonne, 2003; Ministry of Health, 2000a & 2001c; Howden-Chapman & Tobias, 2000). As reported in the findings, the age-standardised acute admission rates/1000 for all of APH's ethnic groups were lower compared to MMH's groups except for the years 2001 and 2004, when APH's Maori group had higher ASRs than the MMH Maori group (Figure 6.1). Both Maori and Pacific Islander groups of MMH had the highest ASRs around 70/1000 per year during 1998-2004. The ASRs for the Pacific Islander group of APH remained close to

60/1000 except for the year 2001 decline, while the Maori groups of APH experienced large fluctuations in admissions and the ASRs increase to 95/1000 in 2004. The ASRs for the European/Other groups remained relatively stable at both hospitals but the MMH's rates were higher than APH's. The above findings highlight the key differences in the admission rates of the two hospitals and their ethnic groups.

The themes identified in this study and in the literature on the rise in AMAs indicated a strong relationship between socioeconomic status and hospital utilisation. According to the study findings, one of the possible reasons for higher admissions at MMH was the poor socioeconomic status of the population it serves. Discussion on the findings related to the low deprivation (1-3) or better off domicile patients, and high deprivation (8-10) or poorer domicile patients, in relation to ASRs by ethnicity and hospital is presented below. Overall, low and high deprivation admission ASRs, when compared by ethnic group and hospital, have followed a number of regular trends. However a few significant exceptions to these trends were also found.

When comparing the admission findings for different ethnic groups of the same deprivation level and at the same hospital, the admission rates for the European/Other groups were consistently lower than for the other ethnic groups. For the high deprivation groups, Maori and Pacific Islander groups had generally similar rates to each other, and for the low deprivation groups the Pacific Islanders had significantly higher rates than the Maori (Figures 6.8 and 6.9). The main exception to this occurred in 2003 and 2004 when the APH low deprivation Maori group had considerably higher ASRs than the equivalent Pacific Islander group.

The admission ASRs for APH's low deprivation domicile Maori ethnic group were close to its European/Other group rates during 1998-2002, however then jumped from 30/1000 to 150/1000 during 2003-2004 (Figure 6.8). The possible causes of this rapid rise have already been discussed in the previous section, and were probably related to the opening of the new hospital building and associated services, and the development of the Tamaki Healthcare PHO with a specific focus on Maori health needs (Tamaki Healthcare PHO, 2006). The admission rates for MMH's low deprivation domicile Maori group also remained moderately higher than for its European/Other group.

(9.1.1) Deprivation and Hospital Admission Trends

When comparing the admission findings for equivalent groups of the two hospitals (of the same deprivation level and of the same ethnic group), MMH generally had higher ASRs than APH for Maori and Pacific Islander groups for low and high deprivation domicile. For the low deprivation domicile European/Other groups MMH rates were similar to APH's. The major exception to this trend occurred for the low deprivation Maori group at APH in 2003 and 2004, whose ASRs were considerably higher than for the equivalent group at MMH, again due to the new hospital and the Tamaki Healthcare PHO initiatives. According to APH expert panel, the access to hospital has improved with the opening of the new hospital, which is attracting more patients. It is likely that by opening of the low cost Tamaki Healthcare PHO, with a specific focus on Maori healthcare needs, more Maori are going to GPs in the community, and are then getting referred to hospital due to their higher prevalence of chronic disease and previously unmet healthcare needs. According to Gribben (2001a, b & c) who evaluated a number of primary care projects trialled by the MMH's DHB, hospital service utilisation increased with the improved access to primary care service in South Auckland due to the past unmet healthcare needs.

Each of the MMH high deprivation ethnic groups had significantly higher ASRs in comparison to the equivalent high deprivation ethnic group at APH. For example, Maori living in a high deprivation area of the MMH region had a significantly higher risk of being hospitalised than Maori living in a high deprivation area of the APH region. The same pattern was found for the other ethnic groups also. This is an unexpected finding of this study. An explanation for this variation is likely to be related to the availability of primary care and the hospital admitting practices.

According to study findings and other literature, a large proportion (approximately 34%) of the population in the MMH catchment live in high deprivation districts especially Maori and Pacific Islander groups (Jackson, Palmer, Lindsay & Peace, 2001). Similarly, the Health Funding Authority (2000) found that South Auckland had a high deprivation rating and poor health status. When further divided into ethnic groups, approximately 72% of Maori and 90% of Pacific Islander people in Counties Manukau lived in the highest deprived deciles 8-10 (p11). In contrast APH has a wealthier population, with pockets of high deprivation in some areas of Orakei, Mount Roskill and Glen Innes (ADHB, 2005). In order to reduce

inequalities in health, the District Health Boards associated with hospitals have provided funding for the development of the PHOs. According to the expert panel findings this has made attending a GP more accessible in the MMH's high deprivation regions. As a result, the number of people going to see their GP has possibly increased. In a NZ study comparing the GP utilisation rates of two low-income patient groups, Group 1 paid no charge and Group 2 patients were charged a co-payment for consultation (Barnett, Coyle & Kearns, 2000). The authors reported that a large proportion of patients who were charged a co-payment reported delaying seeking care because of cost. In contrast, the free of charge patients did not delay attending a GP. An expert panel nurse specialist from MMH who often works with patients in the community highlighted the problems associated with the low cost DHB funded initiatives, for example: *'For some people even a small co-payment can be a barrier to access primary care'*.

However, the findings of the present study showed no reduction in the number of self-referrals or admission rates at either hospital during 2004, the period when most of these PHOs were fully functioning in their respective regions. In fact some of the expert panel members have questioned whether the PHOs were in fact delivering the primary services contracted for by the DHBs. Another issue raised in the literature is that general practice has continued to provide episodic medical primary care (illness focused), rather than primary healthcare (Coster & Gribben, 1999).

On the other hand, it could be argued that it will take some time for the PHOs to be more effective in delivering the primary health care to meet the health needs of the high deprivation domicile population. Similarly, Billings, Parikh and Mijanovich (2000), who analysed 6 million patient records of New York ED presentations, concluded that only 23% of the presentations required ED care and further emphasized that due to the economic barriers to accessing primary care, many people were using the hospitals as a first and last resort of care. The relationship between high deprivation and high hospital service utilisation is well established in the literature. A NZ report, which analysed mortality and hospitalisation data concluded that populations living in high deprivation areas were more likely to have higher rates of hospital admissions and outpatient attendances than low deprivation populations (Tobias & Howden-Chapman, 2000). Another large cohort study from Glasgow analysed hospital medical admission data and found that patients from disadvantaged areas had more

than twice the admission rates of patients belonging to affluent areas (Blatchford, Capewell, Murray & Blatchford, 1999).

(9.1.2) Low and High Deprivation Admission Trends

When comparing the admission findings for low and high deprivation groups (of the same ethnic group and at the same hospital), the high deprivation group ASRs were generally higher than the low deprivation group ASRs, which is an expected outcome. The major exception to this trend occurred for the Pacific Islander groups. At MMH the Pacific Islander ASRs for the high and low deprivation groups were similar to each other. At APH the ASRs for the low deprivation Pacific Islander groups considerably exceeded those for the high deprivation groups from 1998 to 2001, from 2002 to 2003 the rates were about the same, and for 2004 the findings followed the general trend, with the rates being higher for the high deprivation group.

Therefore, generally socioeconomic deprivation appeared to be directly related to the increased number of admissions, which is consistent with studies carried out here in NZ and in other developed countries (National Health Committee, 1998; Bernard & Smith, 1998; Blatchford, Capewell, Murray & Blatchford, 1999; Harris et al., 2006). The above finding was supported by the randomly selected high user case analysis, which also indicated a strong relationship between high readmission rates and high deprivation domicile.

Overall, the high deprivation domicile findings indicated that the MMH Maori groups had the highest, Pacific Islander group the 2nd highest and the European/Other groups the lowest admission rates. In contrast at APH all three high deprivation domicile groups had significantly lower ASRs, than their counterparts at MMH, but higher than low deprivation counterparts at APH. The relationship between higher hospital admissions and higher deprivation has also been highlighted in the 'Counties Manukau Health Indicators' report 2005 (CMDHB, 2005). According to the report, which included Census 2001 figures on population deprivation, the MMH region had a greater proportion of the population in higher NZ deprivation deciles 9 and 10 than the APH region or the total NZ population. It was possible that a large number of patients were seeking free care at point of service at public hospitals, rather than having to pay for primary healthcare services in the community. Having self-referred to the hospital, they were then more likely to be admitted.

All of the expert panel members of both hospitals pointed out that high deprivation of the Maori and Pacific Islander groups were directly related to higher admission rates at both hospitals. Some of the expert panel members attempted to highlight the financial constraints faced by the high deprivation groups by giving examples. One of the MMH the expert panel managers highlighted the socioeconomic hardship faced by these patients: *'If you were on a minimum wage, would you take your child or yourself to a doctor and pay 70 dollars?'*

Income has been reported to be the single most important modifiable determinant of health (National Health Committee, 1998). Malcolm (2000) found gross under utilisation of and expenditure on primary health care and related services by Maori, Pacific Islanders and other New Zealanders in poor circumstances. The author further concluded that the poor access to primary health services was likely to be one of the factors of high hospitalisation rates of these groups. This highlighted the lack of, or poor access to, primary services for the high deprivation domicile population. In contrast, according to the NZ Health Survey 2002/03, there was no significant difference in the use of GP services between the least deprived and the most deprived domicile populations (Ministry of Health, 2004c). On the other hand, the morbidities of high deprivation groups are statistically much higher, therefore use should be commensurately higher. This is an example of the 'inverse care law' of Hart's article (1971), which noted that the people who need the healthcare services the most get the least and vice versa. This is further supported by small studies carried out based on specific provider groups, which have demonstrated low rates of general practitioner use by the high deprivation groups in both South Auckland (Gribben, 1999) and Christchurch (Barnett, Coyle & Kearns, 2000). According to Quam, Smith and Yach (2006) chronic disease is a bigger problem among poor people because they do not have the resources to pursue healthy lifestyles.

One of the noteworthy findings of this study, and an exception to the above, was that the low deprivation domicile Pacific Islander group's admission ASRs were higher or similar to those of the high deprivation domicile group during most of the study period and at both hospitals (Figures 6.8 & 6.9). These ASRs had relatively large 95% confidence intervals, indicating small sample size. This was an unexpected outcome of the study. The likely reason for this finding was this population's known poor health status and higher burden of disease compared to Europeans in NZ (Ministry of Health, 2001a & 2004c).

Finally, the above findings have also raised a very serious question that despite standardisation for age, ethnicity and socioeconomic deprivation, significant differences in admission rates have remained between the ethnic groups and the hospitals. This variation in the hospital admission rates of hospitals and ethnic groups has not been well understood in literature, but the study found differences in the admission rates are likely to be the result of such factors as hospital admitting practices and the availability of primary health services in the community, rather than purely because of the poor socioeconomic status and ethnic predisposition to disease (on burden of disease by ethnicity) of the Maori and Pacific Islander groups.

(9.2) Acute Admissions: Patient and Population Factors

There were a number of issues/themes related to population identified in the study findings, which had a significant influence on the overall AMA trends, as well as on the admission trends of the related major diagnostic categories (MDCs) and diagnostic related groups (DRGs). These are discussed below.

(9.2.1) Ageing of the Population

The influence of the ageing population on acute admissions has already been partly discussed in 7.2.4. Ageing of the population was also one of the issues raised by almost all of the expert panel members of both hospitals. A strong relationship between ageing population and admission trends has been found throughout this study, whether examining overall admissions, the top five MDCs, most of the related DRG categories, or the randomly selected high user cases. Both hospitals' admission rates clearly show that the proportion of admissions related to the older age groups has been consistently rising in contrast to the younger population, while the crude number of admissions for both groups continued to rise. These findings were well supported by the literature review on the relationship between older populations and the proportion of admissions (NZHTA, 1998; Hider, O'Hagan, Bidwell & Kirk, 2000).

The findings and discussion on MDCs and DRGs demonstrated that most of the identified health conditions or problems were chronic in nature and related to ageing of the population. The expert panel physicians and nurse specialists also indicated that a large number of patients presented with chronic and multi-system disorders. According to the Ministry of Health (1999) between 58% and 66% of all hospitalisations in the 45–64, 65–74 and 75+ age groups were for chronic diseases, and age was a key determinant of hospitalisation for chronic diseases. The report also documented that in the case of Maori and Pacific Islanders age related chronic conditions appeared at a younger age. This is also supported by a comprehensive literature review related to the characteristics of older people (60+ years) presenting to an accident and emergency department, which concluded that these patients were more likely to arrive by ambulance, be acutely ill, have a medical condition, present with co-morbidities, require more diagnostic tests than younger age groups, and be admitted to hospital (Bridges, Spilsbury, Meyer & Crouch, 1999). Expert panel physicians and nurse specialists reported that this is what they were experiencing in their daily clinical practice.

The impact of the ageing population was further highlighted by Goulding, Rogers and Smith (2003) who found that in 1999 in the USA, approximately 80% of all persons aged 65+ years had at least one chronic condition, and 50% had at least two. One of the earlier studies related to the increase in emergency admissions in Scotland, also concluded that the admission rate of patients aged over 65 years was more than twice that of younger patients (Kendrick, 1996).

Overall, the NZ literature related to the ageing population and medical admissions has consistently concluded that the increased proportion of the older population in the community has largely contributed to the rise in acute medical admissions over the past 15-20 years (NZHTA, 1998; NZIER, 2004). Different conclusions were reached by Grey, Yeo and Duckett (2004) who analysed hospital data from the Australian Institute of Health and Welfare in the period 1993/94 to 2001/02, to determine trends in use of Australian acute hospital inpatient services by older patients. The authors concluded that the proportion of beds occupied by the older population (65+ years) remained stable at 47%, despite their numbers in the general population increasing by 18%. One of the main reasons for the stable bed utilisation by this group was attributable to a reduction in LOS. However the authors acknowledged the limitations of the data itself and results were only descriptive in nature. On the other hand in UK studies, the majority of the burden of disease in the UK was related to old age and over a third of health expenditure was for people over the age of 65 (Wanless, 2001; Shaw, 2002). Shaw (2002) further emphasized that, on average, about a quarter of health service use by individuals was taken up in the last year of their lives. Therefore, as life expectancy has increased, the demand for healthcare has increased for the older age groups. According to NZIER (2004) in the European (developed) countries, per capita health expenditure on the 65+ age groups was three to five times greater than on the younger age groups. The findings of the present study also showed rising admissions were driven by ageing, with older age groups contributing to the increasing admission rates.

In order to reduce or stabilise the growing impact of the ageing population on hospital services, MMH trialled a number of projects both in the community and at hospital. One of these projects was 'EastHealth Eldercare' during December 2000 to November 2001. The main aim of this project was to provide a coordination of services to improve the care and delivery of services to elderly people aged 75+ in the EastHealth area, through improved communication, education and support (Clarke, Howells, Wellingham & Gribben, 2003). Patients, who lived at home but were identified as 'at-risk' of readmission to hospital, or who

had recently been discharged from hospital, were referred by their GPs to a Coordination Service for the Elderly. In particular the evaluation of the project showed no reduction in admissions or readmissions to MMH from EastHealth doctors for patients aged 75+ in the ten months after the project commenced (Gribben, 2001e). The major issues that needed addressing for these patients related to review of their home situation or their inability to cope at home. On the other hand it may be argued that a 10 months time span was too short for the project to prove its effectiveness.

(9.2.2) Prevalence of Chronic Disease

The high user sub-group analysis highlighted that most of all of the randomly selected high users had multiple co-morbidities. The expert panels also raised issues related to the increase in co-morbidities and in the prevalence of disease among the populations that they serve. The Ministry of Health population based health survey (2004c), attempted to determine the prevalence of chronic diseases by asking participants, whether a doctor had ever told them they had any of the listed chronic diseases. The results of this survey may have underestimated the true prevalence of some chronic diseases, as not all people with the disease will have been diagnosed. According to the survey results 1 in 10 (10%) adults had been diagnosed with heart disease. The prevalence of the disease was higher among Maori and increased significantly with age, peaking in the 75+ year age group. Cardiovascular disease was the leading cause of mortality in NZ (Ministry of Health, 2003). The Maori ethnic group had much higher prevalence rates than the European/Other group. Stroke was also one of the leading causes of mortality in NZ, which accounted for 10% of all deaths in 1999 (Ministry of Health, 2004c). During 1998-1999 the Australian Institute of Health and Welfare carried out a national study of the burden of disease and injury in Australia, which showed that the leading causes for the total burden of disease were ischemic heart disease (IHD) and stroke, which together accounted for 18% of the burden, and chronic obstructive pulmonary disease (COPD) which ranked third (Mathers, Vos, Stevenson & Begg, 2000). These results support the findings of the present study.

The Ministry of Health (2004c) survey found that 1 in 23 (4.3%) adults of the population had been diagnosed with diabetes. The Pacific Islander and Maori ethnic groups had significantly higher prevalence of diabetes, and the European/Others the lowest. The prevalence of diabetes increased with age, peaking in the 65–74 year age group. Diabetes was not identified as one of the leading causes of admissions to hospitals in this study, as it did not show up in

the principal diagnosis on admission categories. However diagnostic groups that did lead to acute admissions are associated with diabetes. These include circulatory and neurovascular system disorders, and kidney & urinary tract disorders.

Looking at the prevalence of respiratory disorders, approximately 20% of the 15-44 year old survey population had been diagnosed with asthma, and 1 in 18 (5.5%) adults with COPD, with no significant differences between the ethnic groups (Ministry of Health, 2004c). These diseases were leading contributors to acute admissions in the study.

Increased admission rates related to cardiovascular, respiratory and diabetes have also been reported in other countries (Kendrick, Frame & Povey, 1997; Blatchford & Capewell, 1999). In order to explore the co-morbidity trends in the USA, Fry et al. (2005) studied 270,000 patient records from 500 hospitals in the 65+ age group focusing on pneumonia admissions. The contribution of chronic illness was examined by comparing the two study periods 1988-1990 and 2000-2002. The authors concluded that chronic heart disease increased from 47.8% to 56.9%; COPD from 34.9% to 47.2%; diabetes from 12.9% to 19.5%; and chronic renal disease from 4.6% to 6.5% from one study period to the next.

Similarly, co-morbidities were also a significant factor for renal failure patients. For example, Madhan (2004) found that among all new end-stage renal failure patients in 2001, peripheral vascular disease was present or suspected in 26% of the cases, coronary artery disease in 39%, and cerebrovascular disease in 16%. For the 65+ year age group the presence of co-morbidities was even higher with the percentages having increased to 38%, 56% and 31% of the cases respectively. Alternatively the higher prevalence of disease could also be related to the availability of more advanced diagnostic tools as a result of which more patients are being diagnosed - patients who may have been missed altogether in the past.

Taking into account NZ and international research, the continuing growth in the identified MDCs and their DRGs was most likely to be related to the underlying prevalence of disease among the older age groups as well as high prevalence at younger ages in the Maori and Pacific Islander groups. The study findings and the supporting literature have demonstrated consistently the growth in the older age groups, and that the Maori and Pacific Islander groups are generally younger than the European/Other age groups.

The leading MDCs and DRG categories identified in the study contributing to rising AMAs reflect only the principal diagnosis and not associated co-morbidities. Thus type 2 diabetes rarely leads to an acute admission, while its co-morbidities such as HF, MI, and renal failure do. The NZHTA (1998) literature review on acute admissions also raised a significant doubt in the literature about the efficacy of using hospitalisation data as an indicator of the prevalence of disease in a community.

(9.2.3) Cultural Preferences

The study findings related to high deprivation also emphasised that some cultures or ethnic groups preferred to use hospital services routinely, rather than going to see a GP in the community. The expert panel members specifically pointed out that the European/Other ethnic groups at both hospitals, whether of low or high deprivation domicile ratings had significantly lower admission rates, than the Maori and Pacific Islander groups at the same hospital and of similar deprivation ratings. At the same time, MMH's high deprivation domicile European/Other ethnic group had significantly higher ASRs than the equivalent group at APH, highlighting that cultural preferences may be an issue, but not the only issue. Indicating that other hospital and primary health service issues also have an influence on cultural preferences and admission rates, e.g. to explain why MMH has significantly higher self-referral rates for all its ethnic groups compared to APH groups. These differences appeared to be related to the degrees of gate keeping service provided by hospital EDs, support provided to junior doctors by medical service physicians in admission processes at each hospital, and access to primary care.

The findings also showed that there were differences in the way patients used hospital or primary health services. For example, MMH's population preferred hospital to primary healthcare services in the community, and as a result around 50% of MMH patient admissions were from self-referrals. In contrast, according to the APH expert panel members, their population had a culture of using primary health services. As a result the self-referral admission rates were significantly lower (by 21%-23%) at APH than at MMH. There are also large differences in the economic status of the two hospital populations. The findings indicated that the APH population was relatively affluent as compared to MMH's, which made access to primary care more affordable for some people (Ashton, 2005). A report supporting the above explanation related to the development of primary health organisations (PHOs), and highlighted that primary care was fragmented with significant financial and other

barriers to access (Malcolm, Wright & Barnett, 1999). Other issues raised for the excessive use of hospital services were related to some communities' perceptions that overall better quality of care, including specialist and diagnostic services, are provided from one site. This is further supported by a case study report by Foote, North and Houston (2004) which highlighted that most of the GP requests for radiology were assumed non-urgent or given low priority by radiologists, unless the GP arranged an urgent scan.

(9.2.4) Ethnicity and Admission Trends

The findings related to ethnic groups have consistently shown significant differences between the two hospital groups, and within the ethnic groups of each hospital. These significant differences have remained between the hospitals and the ethnic groups despite adjusting for age, and deprivation. For example, the high deprivation domicile ethnic groups of MMH had significantly higher admission ASRs as compared to APH's equivalent high deprivation domicile groups. The acute admission category findings also indicated that the Maori and Pacific Islander groups at both hospitals had significantly higher ASRs than the European/Other group. The findings related to MDCs and specific DRG categories, indicated significant differences between the ethnic groups. According to the expert panel, both Maori and Pacific Islander groups were over represented in poor health statistics. This was also supported by the ASRs for the MDC and DRG category findings demonstrating significantly higher admissions for the Maori and Pacific Islander groups, and lower for the European/Other ethnic groups. These inequalities between the Maori, Pacific Islander and European/Other groups are well documented in NZ. For example, the rates for cardiovascular mortality have decreased over the past 20 years in NZ for all ethnic groups, but the decline was more rapid among the European/Other groups than the Maori and Pacific Islander groups (Ajwani, Blakely, Robson, Tobias & Bonne, 2003). As a result the gap has further increased between the ethnic groups in NZ, which is also reflected through the higher Maori and Pacific Islander hospitalisation rates at MMH and APH.

Bramley, Hebert, Jackson and Chassin (2004) carried out a study comparing the disease-specific mortality rates of the indigenous populations of New Zealand, Australia, Canada, and the USA with the non-indigenous populations in each country. The authors found that NZ Maori, Australian Aboriginals and Torres Strait Islanders, and American Indians experienced the highest levels of disparities, when compared to their respective non-indigenous population groups. Another study compared the health statuses of the indigenous populations of New

Zealand and the USA and concluded that ethnic health disparities appear to be more pronounced in New Zealand than in the USA (Bramley, Hebert, Tuzzio, & Chassin, 2005). The epidemiological evidence also reported that the high Maori rate of potentially preventable deaths indicates that the health sector did not meet the health needs of the majority of the Maori (Reid, Robson & Jones, 2000; Sporle, Pearce & Davis, 2002; Ajwani, Blakely, Robson, Tobias & Bonne, 2003; Jeffreys et al., 2005). It is likely that the Pacific Islander groups also experience relatively similar mortality rates, but there is a lack of published research related to this group.

The study findings related to age at admission demonstrated significant differences between the ethnic groups. For example the median age for the Maori and Pacific Islander groups was 50 and 56 years respectively, compared to the median value of 68 years for the European/Other group. These differences in the median age are closely related to the life expectancy of each of the ethnic groups, and the lower life expectancy of the Maori and Pacific Islander groups is largely related to the high mortality rate of their 44-65 age groups (Ajwani, Blakely, Robson, Tobias & Bonne, 2003).

This is also validated by the peak admissions rates, which for the Maori and Pacific Islander groups occur for the 45-74 age groups, as opposed to the 65-84 age groups for the European/Others. The 12-18 year difference in the median and mean ages at admissions suggest that a large number of older patients admitted to both hospitals were from the European/Other group. The Ministry of Health (1999a) found significant ethnic differences existed in the reporting of unmet health needs in the 1996/97 NZ Health Survey. For example, 19% Maori and 18% Pacific Islanders indicated unmet needs for GP services in the preceding year, compared with only 11% of European/Others (Ministry of Health, 1999b). According to the MMH expert panel nurse specialists, who were used to working with patients at the hospital and in the community, inability to pay for the GP services was the single most important issue.

The Asian and Indian groups which have been included in the European/Other groups analysis, also had much lower median ages at admission. According to the expert panel findings, the younger median age was related to a young immigrant population. In order to migrate permanently to NZ, people have to apply through one of three residence streams (Department of Labour, 2005). These streams were skilled/business, family sponsored, and

international/humanitarian. In total, there are 50,000 immigration permanent permits issues each year, 60% of these allocated to the skilled or business category, 30% family sponsored, and 10% international/humanitarian. According to the applications approved for permanent residence during 2004/05 under the skilled/business category, 82% of skilled and 89% of business applicants were from the 25-44 year age groups (Migration Trends, 2005). The proportion of the younger age groups was also higher for the family sponsored and humanitarian immigration categories. With a large proportion of the population being young, this would be a major factor for the low median age at admission for the Asian and Indian populations.

Most of the NZ literature related to ethnic inequalities tends to agree that the Maori and Pacific Islander groups were far more likely to live in the most deprived areas of NZ than the European/Other groups (Ministry of Health, 1999a, 2001a & 2004c; Ministry of Maori Development, 2000). The above literature findings are directly applicable to this study which found that a large number of the admissions were for patients with high deprivation domicile ratings from the Maori and Pacific Islander groups. For example, at MMH the ratios of low deprivation (1-3 domicile) to high deprivation (8-10 domiciles) patients were around 1:24, 1:13 and 1:2 for the Maori, Pacific Islander and European/Other groups respectively. In contrast these ratios at APH were 1:5, 1:5 and 1:1 respectively. This clearly highlights which ethnic, hospital and socioeconomic groups the majority of the admissions are coming from. Reid, Cook and Majeed (1999), found that there were substantial variations in hospital admission rates between general practices in the UK. These variations were largely explained by factors related to patients, such as the proportion of chronically ill and unskilled population served by a practice. The authors further found that both of these factors were closely associated with high deprivation, which was in turn strongly related to emergency admissions.

(9.2.5) Genetic and Lifestyle Factors

One of the commonly quoted reasons for the ethnic disparities in health is genetic predisposition to certain diseases or conditions. For example, age-standardised cardiovascular disease mortality rates were 264.9 and 78.5 per 100,000 among Maori and non-Maori, respectively, during 1996 to 1999 (Ajwani, Blakely, Robson, Tobias & Bonne, 2003). Similarly, both Maori and Pacific Islander groups have much higher admission rates related to respiratory disorders as compared to the European/Other groups. According to Ellison-Loschmann and Pearce (2006) approximately 85% of genetic variation occurs randomly and

is not related to race or ethnicity. The authors further explained that environmental factors have contributed significantly to the Maori mortality and morbidity trends over the 20th century. Therefore the non-genetic factors such as access to healthcare, socioeconomic status, and lifestyle may help in further explaining the identified differences in admission rates of the ethnic groups.

A number of the expert panel members highlighted the influence of smoking and obesity on the admission rates. Lifestyle factors such as tobacco smoking and obesity represent one of the mechanisms, which have a direct influence on health. Tobacco smoking is a major cause of preventable death (World Health Organization, 1997). The prevalence of smoking is strongly related to heart disease, respiratory disorders and some cancers. According to the NZ Health Survey 2002/03, both Maori (46%), and Pacific Islanders (33%) were most likely to be current smokers, with rates significantly higher than for the European/Other group (21%) (Ministry of Health, 2004c). In particular, Maori aged 25–44 years were twice as likely to be current smokers as non-Maori of the same age (Ministry of Maori Development, 2000).

The prevalence of obesity is related to higher rates of such chronic conditions as diabetes, coronary heart disease, hypertension, metabolic syndrome and respiratory problems (World Health Organization, 2000). In both males and females, the prevalence of adult weight gain and obesity was the highest in the Pacific Islander and Maori ethnic groups, intermediate in the European/Other ethnic group and lowest in the Asian ethnic group (Ministry of Health, 2004c). Similarly, another research report concluded that the Pacific Islander people were also less physically active than other ethnic groups in NZ. This low physical activity rate, combined with their high intake of fatty foods and sugars, make for a group that is disproportionately overweight compared to the total population (Davis, Suaalii-Sauni, Lay-Yee, & Pearson, 2005). These studies suggest that lifestyle puts both Maori and Pacific Islanders at a greater risk for diabetes, chronic respiratory disorders and screenable cancers. When compounded with other factors previously discussed, including deprivation levels that limit adoption of healthy lifestyles, access to primary health services, and other issues outside the control of those populations, Maori and Pacific Islander people aged 0–74 years have much higher rates of avoidable deaths than European/Others (Ministry of Health, 1999a).

(9.3) Acute Admissions: Hospital and Health Service Factors

Similar to the population themes, there were some themes/issues, which were related to health services and had a significant influence on the admission trends. These are discussed below.

(9.3.1) Primary Health Care

According to the study findings, there was a rapid increase in the number of admissions during 1997-2001 at both hospitals. This increase was likely to be attributable to the market driven economic and social service restructuring of the 1990s, which led to greater deprivation and poverty and wider gaps between the rich and poor (refer 2.2 & 9.1) (Scott, 1994). Coinciding with this were the market driven health reforms, whose influence was seen in the supply of primary health services particularly and also in the supply of hospital beds in general. A NZ GP practice and population survey evaluated the extent to which financial barriers were important deterrents to the utilisation of primary care by low income groups (Barnett & Coyle, 1998). The authors concluded that despite the introduction of the Community Services Card, delays in using primary health services, because of the cost of care, remain significant for many groups of patients, including cardholders themselves. One of the influences of the health reforms was on the supply of health services, such as the reduced availability and accessibility of primary care (Dharmalingam, Pool, Baxendine & Sceats, 2004). Another effect of the market on supply is reflected in the marked differences found in the number of available general practitioners per 1000 population in each of the hospitals' regions (Malcolm, 2000), with fewer doctors setting up their business in high deprivation areas.

Both the Maori and Pacific Islander groups have much higher hospital admission rates than the European/Other group. These ethnic groups' mortality rates are also much higher than the European/Other group (Ministry of Health, 2001a). However their use of primary care services appeared to be very low in relation to their overall higher mortality rates and hospital use as discussed in the previous section (Davis, Lay Yee, Sinclair & Gribben, 1997). According to the findings of this study, one of the most noticeable reasons for not using the primary health services was a lack of general practitioner services in the more deprived areas of the MMH region. However, projects such as the Pacific and Maori Primary Care Extension projects, developed to provide enhanced primary care for the hard-to-reach

populations, had over-enrolment problems, indicating that when accessible, primary health services were well used (Gribben, 2001a & b). According to the literature there is a strong link between readmissions or avoidable hospitalisations and the underutilisation of primary care, associated with lower socioeconomic status (Bidman et al., 1995; Jackson, Kelsall, Parr & Papa, 1998; Dharmalingam, Pool, Baxendine & Sceats, 2004). The present study showed, however, that admissions increased as primary health services were developed and used, suggesting a previous unmet need for health care.

According to MMH's expert panel physicians, general practice was demoralised and fragmented in South Auckland in the MMH region. This finding has also been supported by Malcolm, Wright and Barnett (1999), who found that there were major inequalities in primary medical care and related services. Over the last 10 to 15 years general practice has been experiencing major changes, evolving from individual practices to independent practitioner associations responsible for managing a wide range of programmes. NZ general practice was, and still remains, more disease and illness focused, and to a certain extent provides episodic care somewhat similar to the secondary hospital services. In contrast the aim of the Primary Health Care Strategy is to achieve population health based objectives such as reducing the barriers, particularly the financial ones, for the groups with the greatest health needs with more focus on primary prevention and health promotion (Ministry of Health, 2001). As a result, the primary healthcare focus has shifted to a population health focus with continuing comprehensive care and integrated care (Coster & Gribben, 1999). However, medically dominated primary healthcare is likely to take longer to undergo a similar paradigm shift.

The development of the primary health organisations (PHOs) in the APH and MMH regions has been facilitated and funded by the respective District Health Boards. The main role of the PHOs is to provide primary healthcare services to high need Maori, Pacific Islander and other ethnic groups at considerably subsidised fees (Tamaki Healthcare PHO, 2003). This role of the PHOs appears to be misunderstood by the hospital health professionals. For example, most of the expert panel members of both organisations have raised issues around the effectiveness of the PHOs. They appeared to equate the effectiveness of the PHOs with reductions in hospital admissions. However, some of the specific projects trialled to provide better primary care access to the high deprivation domicile patients at MMH and also at Tamaki PHO, have demonstrated a resulting increase in the utilisation of hospital services (Gribben, 2001a, b & e). This was possibly related to the previously unmet health needs of

the targeted populations. For example, a national study of 401 low-income households highlighted common issues experienced by low-income people in accessing primary healthcare services (Waldegrave, King, and Stuart, 1999). This study illustrated that in the year prior to the study, 56% of all households had members who did not visit a doctor or fill a prescription, because of not being able to afford it, and 34% of households were not able to purchase medicines three or more times during the previous year. Scott, Marwick and Crampton (2002) carried out a study related to the variations in utilisation of general practitioner services in relation to subsidy, income, ethnicity and self-reported health. The authors concluded that a system of low-income targeted government subsidies reduces the barrier for the high deprivation people, but does not fully compensate for the barrier posed by doctors' fees.

Bindman et al. (1995) in the USA found that high hospital admission rates for chronic diseases like asthma, hypertension, congestive cardiac failure, chronic obstructive airways disease, and diabetes have been associated with lack of access to primary care physicians. In contrast a number of studies from the UK indicated that emergency admissions were a poor indicator of quality in primary care (Giuffrida, Gravelle & Roland, 1999; Reid, Cook & Majeed, 1999). Both of these studies highlighted that the variations in emergency admissions from different general practices were more related to socio-demographic differences, patient morbidity, and affected by hospital factors.

Some of the differences, such as the differing self-referral rates of the two hospitals (Tables 4.6, 4.7 & 4.8) and their ethnic groups, might be explained by the differences in the distribution of general practitioners in the two hospital regions. This is also supported by Malcolm, Wright and Barnett (1999) who concluded that these inequities in the health status of the ethnic groups were possibly related to the distribution of primary medical care and related services, reflecting the 'inverse care law', (i.e. those most in need of care are those least likely to receive it). The authors further claimed that the public hospitals in NZ have continued to encourage the overuse of hospital and specialist resources, which further impacts on the effectiveness of the primary care. A number of NZ studies have also concluded that approximately 30% of the total hospital admissions were inappropriate, and that most of these were related to medical patients (Gribben, 2003; Dharmalingam, Pool, Bexadine & Sceats, 2004; Sheerin, Allen, Henare & Craig, 2006).

(9.3.2) Admission Threshold

A reason for the increase in admissions appeared to be linked to changes in the admission thresholds of patients to hospital ED, assessment and short stay units. The development of assessment and short stay units has given physicians the option to admit patients for a shorter length of stay while investigating their condition. Therefore this option is being used frequently to reduce the rate of misdiagnosis. Misdiagnosis rates, found for example in the USA for patients with acute MI and of patients with unstable angina, were around 2.1% and 2.3% respectively, and the Canadian misdiagnosis rates were twice as high for these same disorders (Pope et al., 2000; Christenson et al., 2004).

Another reason for lowering the admission thresholds and improving the quality of care was related to the development of disease specific evidence based guidelines. The ST-Elevation Myocardial Infarction Guidelines Group and the NZ Branch of the Cardiac Society of Australia and NZ (2005) developed guidelines to be applied to the management of patients with ST-elevation myocardial infarction (STEMI). Simultaneously, the Non ST-Elevation Acute Coronary Syndrome Guidelines Group and the NZ Branch of the Cardiac Society of Australia and NZ (2005) have developed guidelines to better manage patients with non-ST elevation acute coronary syndromes (NSTEMACS) based on best practice evidence. Resulting from the guidelines the management and screening of STEMI or NSTEMACS patients has improved in hospitals. To a certain extent, the NSTEMACS guidelines have been in practice in New Zealand and Australia since 2000 (Aroney et al., 2001), and MMH had similar guidelines in place in 1997-98 for screening MI patients (Benipal, 1998). Consequently, in both hospitals, chest pain ED presentations are triaged as category 2, highlighting the priority given to these patients. According to the APH expert panel, all of these patients were being screened for acute coronary syndromes (ACSs). Increasing number of patients with NSTEMACS were being referred to the hospitals' Medical Services for further investigations and were often admitted for a short stay. The MMH expert panel physicians agreed with their APH counterparts. As summed up by one of them: *'They [ED physicians] refer almost all of the chest pain patients to us'*.

The expert panel physicians acknowledged the numerous benefits of the STEMI and NSTEMACS guidelines, but noted that this was being achieved at the expense of including very low-risk patients in extensive rule-out myocardial infarction and ACS diagnostic procedures.

For example, one of the APH expert panel physicians noted: *'CP is counted as cardiac pain even if it's not cardiac pain'*.

A national survey of emergency department CP centres in the USA also identified very similar clinical issues related to low-risk (non-cardiac) CP patient admissions (Zalenski, Rydman, Ting, Kampe & Selker, 1998). Therefore it is concluded that reducing the thresholds for high-risk disorders has also reduced the thresholds for low-risk disorders, resulting in increased admissions. For example, admitting headache ED presentations to exclude meningitis. However admissions for most low-risk disorders are short, thus do not result in excessive resource utilisation.

(9.3.3) Advancements in Technology and Medicine

Due to the advancements in technology and medicine, the medical management of circulatory system disorders has changed significantly over the last decade. The guidelines related to STEMI and NSTEMI, have made specific recommendations based on evidence to best manage the patients. These recommendations include specific suggestions for the medical management, diagnosis, investigations such as ECG, cardiac biomarkers, blood tests and cardiac echocardiography and information on pharmaceuticals (ST-Elevation Myocardial Infarction Guidelines Group and the NZ Branch of the Cardiac Society of Australia and NZ, 2005; Non-ST Elevation Acute Coronary Syndromes Guidelines Group and the NZ Branch of the Cardiac Society of Australia and NZ, 2005). The guidelines have also specified time and frequency for some of the investigations, medical management and the monitoring, requiring a 10 to 24 hour admission period. According to an APH expert panel physician: *'Most of the CPs coming in are being assessed and discharged within 36 hours, after exercise tests, and some of them only stay 10 hours'*.

Therefore, some of the advances in the medical management of circulatory system disorders have necessitated hospital admissions, as in the case of most CP patients. According to a study related to the outcomes of a rapid assessment chest pain clinic in Glasgow, one-sixth of the total medical admissions were suspected of having myocardial infarction. However two-thirds of these patients were then found not to have acute coronary syndrome (Davie, et al., 1998). Therefore, attempts to exclude myocardial infarction appear to consume significant

hospital resources. The expert panels emphasised that there were no appropriate alternative services offered in the community for this group of patients.

(9.3.4) Defensive Medicine

There appeared to be some relationship between defensive medicine with increased diagnostic testing and possibly increased admissions to hospitals. According to some of the expert panel physicians, there were definitely more complaints from patients going to Medical Council against doctors in NZ than in the past. The physicians felt that the patients were becoming more informed about their health problems and treatment options, by accessing readily available medical information on the internet and through the news media. For example, one of the physicians highlighted a situation from their experience with a patient, who asked them: *'Don't you [doctor] think, I [patient] should have these tests?'*

Therefore, due to the fear of complaints it was likely that some doctors were coming under increasing pressure not only to admit patients but also to provide more diagnostic tests such as admitting headache patients to exclude meningitis. The expert panel managers and physicians further explained that some patients wanted to be treated only by specialists and asking for referral was becoming common. According to Coates (2002) there was sufficient evidence both in NZ and overseas, that doctors were responding to the risk of potential patient complaints and litigation, by practising defensively.

Cunningham (2004) surveyed 1200 doctors working in different clinical setting in NZ. Of these, 34% indicated that they had received at least one complaint in their working life. The key finding indicated that receiving a medical complaint had a significant negative impact on the doctor, and on important components of the doctor-patient relationship. Cunningham's findings demonstrated that a culture of defensive medicine has taken hold in NZ, in which doctors act to reduce the possibility of complaints, rather than make decisions in the best interests of patients.

Another NZ study into the impact of complaints on ten general practitioners concluded that general practitioners reported long-term changes to their practice in the direction of defensive medicine, including withdrawal from providing some services and avoidance of perceived high-risk activities (Cunningham & Dovey, 2000). Similarly, a survey of 824 physicians practicing in 6 different specialty areas was carried out to determine the prevalence and

characteristics of defensive medicine they practiced during 2003 (Studdert et al., 2005). Nearly all of the physicians (93%) reported practicing defensive medicine. The results further indicated that physicians commonly ordered more tests (92%), performed additional diagnostic test procedures, and referred patients for consultation, to satisfy their clients. The study by Henderson, North and Patterson (2005) also found evidence of increasing defensive medicine.

However, it could also be argued that patient complaints have the potential to improve the quality of care. For example, if additional diagnostic testing were not harmful or even offered marginal benefits to the patient, it may be considered better from the patients' points of view. Similarly, referring a difficult patient to a specialist could again enhance the patient outcome. Henderson, North and Patterson (2005) interviewed 33 doctors and nurses working in 16 rural communities in NZ to examine the effects of formal quasi-judicial investigations on the quality of health care services. A consistent finding was that after about two years, some doctors' left rural practice, and these were then difficult to replace. The study further pointed out, that the remaining health workers responded to the investigations in a negative manner, losing confidence, enthusiasm and motivation for work, performing in a less efficient manner, working more slowly, setting up barriers to access, ordering more tests and referring more patients to secondary care. Therefore it is concluded that the issues related to defensive medicine were having some influence on the overall admissions to hospitals.

(9.3.5) Emergency Department versus Medical Services

Issues around the management of patients in the hospital ED versus Medical Services were also raised, and appeared to have some influence on admissions. For example, the findings related to COPD/chest pain ED presentations at MMH, indicated that the ED physicians referred most of these patients to Medical Services for admission. Given that in addition, around 50% of MMH's admissions are self-referrals, a significantly high number of these patients who turn up at hospital get admitted at hospital. A NZ study related to asthma patients compared the Wellington Hospital ED presentations to after hour clinic presentations and concluded that those who presented at ED were more likely to be admitted (30% in contrast to 1%) (Kljakovic & Dalziel, 1996). However, no controls were applied to the severity of disease in this study.

Also highlighted was that ED physicians were possibly not adequately trained to manage this group of patients, therefore patients were being referred to general medicine. The APH expert panel physicians raised issues related to the high number of sub-specialist services, ill equipped to deal with growing number of patients presenting with multi-system problems, which required a multi-system medical management approach. This situation often led to major time delays in the medical management of patients, often resulting in the patients having to be admitted. A comprehensive literature review related to EDs indicated a growing need for staff to develop knowledge and skills to meet the complex needs of older people, and also highlighted gaps in medical and nursing training and knowledge (Bridges, Spilsbury, Meyer & Crouch, 1999).

Compounding the issue, the MMH expert panel managers raised concerns around the lack of senior medical physician involvement in the management of their patients in the hospital ED. As a result, a majority of medical patients were being admitted to Medical Services by its junior doctors. A number of studies have compared the differences in the admission, referral and discharge rates of patients seen by junior doctors as compared to ones seen by senior registrars. They have consistently concluded that senior doctors admitted fewer patients and made a higher number of referrals to outpatient clinics and other services (Wanklyn, Hosker, Pearson & Belfield, 1997; Donald, Smith, Doherty & Sundararajan, 2005). Therefore, physician involvement in the clinical management of ED medical patients was more likely to reduce inappropriate admissions and also enhance the quality of care provided. For example, during the junior doctors strike in 2006, there was a 20% decline in the hospital ED presentations at MMH, which was linked to the physician involvement in the admission process (McKernan, 2006). Similarly, a randomised controlled trial in the UK concluded that senior surgeons and senior radiologists working together in an emergency department were able to prevent approximately 30% of admissions related to abdominal pain in the intervention group (Cochrane et al., 1998).

(9.3.6) Improved Access

In Chapter 7, issues related to the access to hospital services were raised. According to the findings, expert panel members from both hospitals have claimed that physical access to their hospital's medical services had improved. Both hospitals have opened new purpose built hospitals with the ED attached to a short stay/assessment and planning unit. Even prior to the

opening of the new hospital buildings both hospitals had a short stay/assessment planning type unit in existence. One of the aims of these units was to keep the EDs free from patient overcrowding and therefore make the access to hospital easier.

Significant differences in the way in which both hospitals' EDs operate emerged in the study. As noted in Chapter 7 in MMH a new, easy access, open plan ED, with good car parking facilities, and a welcoming of self-referrals, would have been one of the main factors leading to increased acute admission numbers in 2001.

In contrast the situation at APH was more complicated. With its 'aggressive front end policy', the ED entrance was hidden from general public view and largely designed to facilitate ambulance patients. On the other hand, APH physicians emphasized that the significant increase in admissions for the Maori population was related to enhanced access. A lower APH admission threshold for the Maori population, due to its poor health status, might explain this, but there was no evidence to support this.

One of the likely reasons for the increase in Maori ethnic group admissions was related to the development of the Tamaki Healthcare Primary Health Organisation (THPHO) funded by the Auckland District Health Board since 2003. The THPHO was established as a unique Maori-led access PHO and was expected to predominantly service high need Maori, Pacific Islander, immigrant and refugee populations (ADHB, 2002). The THPHO established three clinics in relatively high Maori population and high deprivation (8-10) geographic areas of the APH region. The cost to visit a general practitioner was reduced substantially from approximately \$45 to \$10 per visit, with a pharmaceutical prescription charge reduced from \$15 to \$3 (Tamaki Healthcare PHO, 2006). It is likely that due to the lower costs and better access to local primary health services, more Maori patients were attending the health professionals in the community. Consequently, the health professionals were referring more Maori patients to the hospital for further investigation and treatment, which would have led to some increase in hospital admissions during 2003 and 2004 (Figure 4.13). The relationship between accessing primary health service and cost was explored by the NZ Health Survey 1996/97, which found that for 49% of the Maori, cost was the main reason for not seeing a general practitioner (Ministry of Health, 1999b).

In contrast, the increase in admissions experienced by all three ethnic groups at APH in 2004, was most likely to have been related to the opening of the new hospital including the Assessment and Planning Unit. A similar situation had been observed at MMH in 2000. That was the year when the new hospital ED was opened and the acute admission ASRs increased to 45/1000. According to their panel of experts, there had been a significant increase in patient referrals from general practitioners and self-referrals to the hospital's newly opened ED during 2000. Therefore, it was likely that the increase in admissions at APH was related to the opening of the new ED.

(9.3.7) Perverse Financial Incentives to Code and to Admit Patients

Another likely reason for increased admissions was the practice of admitting patients inappropriately for financial gain. The expert panel physicians of both hospitals commented that there was a wide gap in funding received for a patient seen but not admitted to hospital, compared to a patient admitted to hospital and discharged more than 3 hours after first being seen. One of the MMH physicians acknowledged that: *'It was a common practice to admit all GP referrals coming to the Assessment and Discharge Unit before being seen by a doctor'*. On the other hand, an APH physician stated: *'Of course it would be even better to have a low threshold for assessing people [with CP] and not to admit them, but we have to admit them otherwise we don't get much money – its true'*.

The above situation was also identified by audits carried out by the New Zealand Health Information Service, which found a number of providers (public hospitals) have been including accident and emergency events as day cases if the total treatment time was greater than three hours. The audits further revealed that 'some of those providers have erroneously been using the three-hour rule so that treatment time includes waiting time' (Ministry of Health, 2004a, p234). In addition, some providers admitted patients in the short stay observation unit, while other providers did not admit these patients.

A reason for admitting more patients was likely related to changes made in the hospital funding structure. In NZ, from 1 July 1993 to 30 June 1997, four Regional Health Authorities were responsible for purchasing health services on a contractual basis within their regions from the Crown Health Enterprises (Ministry of Health, 1999). These four authorities were subsequently amalgamated into a single Health Funding Authority and Crown Health

Enterprises were renamed Hospital and Health Services in 1998 (Gribben & Coster, 1999). The Health Funding Authority funded hospitals through a fixed DRG based payment scheme from January 1998, instead of contracting health services to the Hospital and Health Services (Ministry of Health, 1999; Cumming & Scott, 1998). With the DRG based funding scheme, admitting more patients attracted more funding, and as a result acute admissions increased significantly. At MMH and APH acute admissions peaked during the years 2000 and 2001 respectively (Figure 4.4). On the other hand, some of this rise in admissions was also likely to have been due to the attempts made by hospitals through information systems to capture complete patient episode data.

Due to the fixed DRG based funding, the hospitals could also maximise funding by admitting patients to higher or more complex DRGs, which attracted higher levels of funding. For example, the expert panel physicians have acknowledged that respiratory inflammations & infections patients with a history of COPD were being coded under COPD as the principal DRG, which affect apparent admission trends at individual DRG level.

The funding structure was once again changed in 2003/04, from being DRG based to Population Based Funding (PBF). For the year 2003/04 DHBs were funded based on the expenditure on their population. The population based funding implementation structure is slowly being phased-in. There appeared to be a risk that DHBs such as Counties Manukau District Health Board, the DHB that operates MMH and was being under funded, would run deficits in anticipation of increased funding. And that Auckland District Health Board, the DHB that operates APH, which historically had higher funding, would run deficits as a solution to reduced revenue increases. In fact during 2004, APH admissions increased significantly. Some of this increase may have been related to protecting the previously existing level of funding.

(9.3.8) Chronic Disease Management

Due to the growing demand for secondary hospital services by the respective hospitals' populations, both hospitals invested heavily in new initiatives to control the growing demand, reduce health inequalities, as well as to provide health services more efficiently and cost effectively. Some of these initiatives have had a significant effect on admission numbers and trends, as discussed below.

Maori/Pacific Primary Care Extension Projects

Two projects were trialled during 2001-2002, to provide more comprehensive primary health care to the Maori and Pacific Islander groups in the MMH region. The primary focus of these projects was to provide services to those hard to reach, or care for those who posed a risk of high-cost interventions, with a view to improving the overall health status of Maori and Pacific Islanders in the MMH region. Identification of at-risk individuals included hospital referrals for those with unmanaged chronic illness for case management (Gribben, 2001). Three Maori and two Pacific Islander primary care clinics were established in high deprivation (8-10) areas. These services were staffed largely by Maori and Pacific Islander health professionals. Both of the services were able to enrol more patients than required well before the target date. The initiatives were then evaluated.

According to the evaluation there was a significant increase in secondary care costs, largely due to an increase in the number of outpatient events. This finding highlighted the previously unmet healthcare needs of these groups. For example, approximately 7% (n = 245) of the enrolled population at Clendon (Maori) clinic in South Auckland, were identified with a chronic illness and 45% of these patients had more than one chronic illness (Maniapoto & Gribben, 2003). Overall, the patients reported very high levels of satisfaction with the service. Examination of data on hospital services utilisation demonstrated increases of approximately 18% for inpatient, 40% for outpatient, and 25% for emergency care events at the Clendon clinic over 9 months in 2001. The Pacific Seas (Pacific Islander clinic) patients experienced even higher increases of approximately 65% for inpatient, 117% for outpatient, and 16% for emergency care events in the utilisation of secondary health services (Gribben, 2001b). According to the author this was likely to have been related to the previously unmet healthcare needs of that population group.

APH did not invest in such trials but contributed to the establishment of the Tamaki Healthcare Public Health Organisation (THPHO) in 2003. THPHO was expected to predominantly service high needs Maori, Pacific Islander and other high deprivation populations (Tamaki Healthcare PHO, 2006). No evaluation of the THPHO had been carried out, however the overall number of acute admissions increased significantly for all ethnic groups during 2004 at APH (Figure 6.1). APH Maori groups experienced significantly higher increases in the age-standardised acute admissions rates (from 60/1000 to 95/1000

during 2003-2004) compared to the other groups of the hospital (Figure 6.1). Therefore, it is likely that hospital service utilisation increased due to improved access to the primary care services, in a similar manner to that experienced at MMH.

COPD Trial

Due to the increased number of COPD admissions, MMH trialled the 'FirstHealth Airways Disease Management' project (January 2000 to September 2001), aimed at reducing avoidable admissions and inappropriate ED attendances for asthma and COPD (Gribben, 2001c). The project attempted to motivate participants through patient education to better manage their chronic disease. However, this project appeared to have had significant issues right from recruitment through to retention and with follow-up of the participants. According to Gribben (2001c) who evaluated the project, secondary health service utilisation increased during the project. In contrast, COPD admissions showed some decline in 2000. According to MMH physicians this decline was related to the project.

Congestive Heart Failure

An integrated care one year heart failure project trial was carried out by MMH. The aim of this project was to implement HF disease management with 15 South Auckland GPs in SouthMed and Procure South, and it recruited 149 patients with heart failure in the intervention cohort. This project demonstrated significant improvements in the area of heart failure disease management consistent with the heart failure guidelines. The number of inpatient events declined from 130 to 38 compared to the year previous to the study (Gribben, 2001d). It is likely that the outcomes of this project would also have influenced the medical management of other HF patients managed by the GPs not enrolled in the study.

New Models of Care

In order to provide better quality healthcare, both hospitals have introduced disease specific nurse specialist roles such as the heart failure nurse, the COPD nurse, the asthma nurse, the diabetes nurse, the heart failure nurse, the discharge planning role, and so on. The main aim of these dedicated roles was to better manage the high-risk users of hospital health services, and required a collaborative multidisciplinary approach. In the literature these roles were more generally described as hospital based case management. According to Kim and Soeken (2005) who carried out a meta-analysis of literature relating to nurse specialist roles, the core components of these roles were assessment, education, collaboration, discharge planning,

linkage, and monitoring. In order to be effective in these roles, clinical expertise with management abilities and knowledge of the healthcare system are considered essential (Kim & Soeken, 2005).

According to the APH expert panel these roles have been highly successful. For example a physician gave an example of a COPD nurse specialist, who was able to take a patient to their home from the hospital ED without admitting them. In the absence of the COPD nurse such patients would have been hospitalised. These findings are also supported by Rae (1998), who evaluated the impact of care co-ordination for patients with recurrent hospital presentations for COPD. The results of the study showed that clinical specialist nurses who co-ordinated the care of COPD patients, were effective in preventing multiple admissions, facilitating early discharge, improving patient quality of care and saving on costs related to hospital admissions. However the number of COPD admissions has continued to grow despite these initiatives. According to the meta-analysis, the overall effect of hospital-based case management (nurse specialist roles) was not significant in reducing hospitalisation days and readmission rates (Kim & Soeken, 2005).

Another new nurse coordinator role was being trialled by MMH to implement the acute demand management (ADM) program. ADM is about preventing the need for inappropriate secondary care, by identifying individuals requiring avoidable and costly hospital care (Heavens & Reedy, 2004). MMH implemented the ADM programme by ensuring that high-risk patients (frequent hospital users) were connected with an appropriate primary healthcare provider and that they have an ongoing care plan on discharge that was well communicated to the patient, relevant family, their general practitioner and other community services, as appropriate. In order to implement it, MMH employed some ADM nurse coordinators, who were responsible for ensuring that these patients had appropriate discharge plans. As this project has not been evaluated, it is not known whether this program has been successful in achieving its goals.

The effectiveness of these roles was also dependent on how well they were being utilised in the integrated environment. The findings related to nurse specialist roles indicated that generally emergency departments did not refer patients, who were already known to nurse specialists, but admitted them to hospital wards. This occurred despite most of the patients' case managed by the nurse specialists having an indicator code, which comes up at each

admission time. This may be the result of a lack of professional awareness on the part of the ED staff, and resulted in inappropriate admissions.

There were also issues related to communication difficulties with Pacific Islander patients, making nurse specialist interventions ineffective. The expert panel nurse specialists also found difficulties in locating appropriate community services to support their patients in the community. In NZ the Health Workforce Advisory Committee (2003) found a lack of adequately trained staff and services in the community to meet the population health needs. McKinney (2006), who interviewed patients found that some patients did not receive appropriate education regarding their illness management due to cultural and language barriers.

Public Expectations

The expert panel findings also raised issues around the public's desire to be treated at hospital rather than by a general practitioner in the community. For example, one of the panel members recounted one of their patient's comments: *'At present I have a number of specialists involved with me and I don't really use my GP for much, and I would like to be treated by a specialist'*.

This example is supported by the comprehensive literature review related to ageing populations carried out by Cornwall and Davey (2004), which concluded that in many European countries healthcare users were becoming more vocal in terms of their choice of service providers and clinical regimes, and were even taking part in policy development. The expert panel members also raised issues around the growing expectations of patients to be treated regardless of their age and health status. This is highlighted by Madhan (2004), who studied end-stage renal failure trends in NZ and found that the 75+ years age groups, requiring and demanding renal dialysis for end-stage renal failure, had grown rapidly in the past five years.

Wanless (2001) undertook a review of the long-term trends affecting the health service in the United Kingdom and concluded that changing patient and public expectations will have a significant influence on health services. The author further concluded that the future health service user is likely to be better educated, more informed, more affluent, less deferential to authority and professionals, and would demand more tailored health services. Some of this

has already been experienced by the expert panel members in this study, who explained that they were being asked by patients to provide individualised medical management.

Another reason for the growing demand for hospital care was the lack of immediacy and adequacy of diagnostic services offered in the community. In general practice, it takes a lot longer to make a definitive diagnosis. Expert panel managers of both hospitals noted that people like to come to hospitals because they know that everything will be sorted out in a short space of time, rather than having to wait a few days for a resolution. For example, the results of a NZ study related to the behaviour of patients prior to admission to hospital with symptoms of acute coronary syndromes, indicated considerable delays in presentation to hospital (Tanner, Larsen, Lever & Galletly, 2006). Results of the study indicated that most of the patients related chest pain to coronary syndromes. The study further concluded that patients who presented directly to hospital arrived significantly faster (median 72 minutes) than those who first called an ambulance (180 minutes) or contacted a general practitioner (485 minutes). This study reinforces that in some situations going directly to a hospital was the best decision from a patient's point of view. However, a report prepared by Whittaker and Peters (2003) for the Waitemata District Health Board, demonstrated that only 32% of the self-referral patients (versus 87% of the health professional referral patients) were admitted to North Shore Hospital, Auckland. This finding showed to what extent self-referral patients make inappropriate use of hospital resources.

(9.4) Chapter Conclusions

Comparison of the ethnic groups' admission rates related to socioeconomic deprivation showed that at both hospitals European/Other groups had significantly lower admission rates than Maori and Pacific Islander groups. On the other hand, when comparing the two hospitals, generally all three ethnic groups at MMH had higher admission rates than the equivalent groups at APH within each of the deprivation categories.

The discussion highlighted that the high deprivation domicile Maori group at MMH had the highest, the Pacific Islander group the 2nd highest, and the European/Other groups the lowest admission rates, in contrast to all three high deprivation domicile groups at APH, who had significantly lower ASRs. This variation existed despite standardising for ethnicity and deprivation domicile, highlighting other factors influencing the admission rates. This variation between the groups was most likely to be related to differences in access to primary care and hospital medical services in the two hospital regions.

When comparing the high and low deprivation groups, the high deprivation groups had generally higher admission ASRs with the exception of the Pacific Islander group, whose ASRs were high for both low and high deprivation, possibly signifying high prevalence of disease among this group.

These differences in admission rates between high and low deprivation groups followed ethnic lines, but were not explained by ethnicity. Socioeconomic factors (deprivation) influences lifestyle, which leads to growing burden of disease and vice versa. In turn both of these factors affect patterns of health service use.

Of the patient and population factors responsible directly or indirectly for affecting the admission rates either negatively or positively, the ageing population was the single most important factor contributing to the rise in AMAs, whether examining overall admissions, the top five MDCs and related DRG categories, or the randomly selected high user cases. The majority of these patients were admitted due to chronic and multi-system disorders. This finding validates previous research carried out in NZ and overseas.

According to this study's findings, another patient and population factor affecting admissions was the growing prevalence of disease resulting in higher admission rates. One of the reasons for the higher admission rates for Maori and Pacific Islander groups was related to their higher prevalence of disease at a younger age than the European/Other groups. Because of this, the significant differences between the admission rates of ethnic groups and hospitals remained despite adjusting for age, and deprivation. Genetic and lifestyle factors also contribute to higher rates of prevalence of disease among the Maori and Pacific Islanders, which in turn led to higher rates of admissions.

Some of the variations in admissions rates found in this study between equivalent ethnic groups of the two hospitals, were however more likely to have been due to hospital and health service factors such as access to hospital ED, junior or senior doctor involvement in admission processes, availability and access to primary care, etc.

One of the hospital and health service factors that led to the significant increase in admissions related to circulatory disorders found in this study, was the lowering of the admission threshold for acute coronary syndromes, and increased awareness of the management of chest pain patients. Admission threshold is strongly interrelated to advancements in technology and medical management.

Other hospital and health service factors found to influence admission trends were patient management and admission processes followed in ED or a short stay unit, such as the involvement of junior doctors in admission processes, and general physician versus sub-specialist doctors managing patients with chronic disease multi-system problems. According to the study findings defensive medicine also had some influence on the overall admissions. Improved access to hospital ED and primary care services through the PHOs led to higher numbers of admissions, possibly reflecting previously unmet health needs. Perverse incentives, such as hospital funding based on per admission by DRG basis led to more patients being admitted. There was some evidence of changes in DRG coding practice, from simple DRGs to more complex DRGs, which attracted more funding.

According to the present study's findings, there was a growing desire by patients to be treated at hospital rather than in the community, largely due to the comprehensive nature of the health services offered by hospitals in comparison to the fragmentation of primary care.

There were a number of chronic disease management projects trialled by MMH's DHB in conjunction with primary care and MMH. The projects largely produced mixed results. In fact hospital admissions increased due to some of these projects, due to the previously unmet health needs. Almost all of these projects ran for periods ranging from 10 to 24 months, which is considered too short a time to evaluate the effectiveness of such projects, and probably was the reason for the mixed results.

Overall, there is a dynamic and complex interaction of the factors influencing admission rates, such as deprivation, patient and population factors, and hospital and health service factors. Further discussion on the study's overall conclusions follows in Chapter 10.

Chapter 10

Conclusions and Recommendations

(10.0) Introduction

Following on from the study's findings and the subsequent discussion presented over the preceding six chapters, this final chapter summarises the key themes, which have influenced the admission trends. In the first part of this chapter, the factors that contribute to or moderate the number of admissions to hospitals are summarised, and then key conclusions of the study, highlighted. Based on these conclusions, recommendations on measures to reduce the number of admissions to hospital, while enhancing the quality of care provided to the population, are made to public hospitals and DHBs, the Ministry of Health, and to educational institutions that prepare health professionals. These intervention points are also summarised in a model giving a whole system perspective on the 'medical patient pathway from home to hospital to home'. Finally, the chapter concludes with suggestions for future areas of research.

The main purpose of this study was to establish empirically the nature of and contributing factors to the rise in adult medical admissions in Auckland. Based on a detailed analysis of all AMA data (N = 277,416) of the two largest NZ public hospitals during 1997-2004 and covering around one third of NZ's population, the study found that AMAs increased significantly at both hospitals at rates well above the population growth. Admission trends were largely similar at both hospitals except for some fluctuations, however MMH consistently had significantly higher admission rates per 1000 population than APH. The findings of the present study are consistent with the findings of previous small studies carried out in NZ, and international research literature on the topic.

(10.1) Summary of Main Findings and Limitations of the Study

10.1.1 Summary of main findings

The previous six chapters have reported and discussed in detail the finding of the study. The present discussion will now focus on highlighting those factors that appear to most strongly contribute to rising AMAs, and how these interact. The aim of this study was primarily to analyse data from a health management perspective, and the comparison of AMAs in two hospitals allowed illumination of differences in health services management accounting for differences in AMAs. This section will not repeat findings reported in previous chapters, but highlight the key differences in health services management that emerged.

Patient factors contributing to AMAs

Four patient-related factors were highlighted as contributing to AMAs: morbidities, ageing, ethnicity and deprivation. Further, these factors interacted with each other, compounding the impact on AMAs. Hospitals and health services have little ability to influence ageing, ethnicity and deprivation, and only limited ability to reduce morbidities related to patient behaviour.

An objective of this study was to identify major diagnostic categories contributing to the rise in admissions. Morbidity related trends highlighted that overall the crude number of admissions has generally increased for most of the MDCs and related DRG categories. There were five major diagnostic categories which accounted for 70%-80% of the total AMAs at both hospitals during the study period. As per the overall AMA trends the MDC and associated DRG trends were relatively similar for both of the hospitals. However MMH's AMA ASRs were significantly higher for most of the MDCs and associated DRGs than APH's. Overall, these differences in the AMA ASRs were again most likely to be related to hospital and primary care related issues.

Circulatory and respiratory system disorders accounted for more than half of the total admissions at both hospitals, with some DRG categories, such as CP and COPD, having shown consistent increases in admissions. A number of morbidity based themes contributing to admission increases have been identified such as changes in medical practice introduced in the form of diagnostic tests with strong emphasis on excluding potential life threatening risk posed by certain conditions such as MI and meningitis. The relationship between the

availability of diagnostic services, short stay beds and increased hospital admissions was apparent for CP. Due to the better disease management of asthma and bronchitis in the community, however, these DRG admissions have declined at both hospitals in spite of their high prevalence. Diabetes did not emerge as a principal cause of growing admissions, however it has been identified as a major risk factor to those MDCs that did account for high proportions of admissions; circulatory, neurovascular, and kidney and urinary disorders.

The severity of disease on admission to hospital appeared to have increased as indicated by the increase in admissions related to triage 2 and 3 and the decline in triage 5 at both hospitals. The decline in admissions at APH and increase in admissions at MMH for triage 4 (the least urgent), again highlighted the differences in the access to primary care and hospital services management. While this finding suggests increase in seriously ill people in the community, it is limited by the subjective nature of triage assessment combined with changes to coding practices.

The study findings highlighted that multiple admissions have a dramatic influence on the AMA trends, with a 1/3 of the patients having ≥ 2 admissions during the eight year study period, and being responsible for 2/3 of the AMAs over that time. The study findings further highlighted that the very small number of patients who each had 10 or more admissions over the study period, between them continuously occupied on average 8 and 13 beds at APH and MMH respectively. A large majority of these patients were 65+ years old and had multiple chronic co-morbidities as indicated by the high user hospital service analysis. Such data has not been available in NZ previously, but is similar to the research findings published in international literature (e.g. Kendrick, 1996; Patient Management Taskforce, 2001a; Oxley and Jacobzone, 2001; Wanless, 2001).

Both Maori and Pacific Islander groups of both hospitals consistently had higher admission rates than the European/Other group, which indicated their higher predisposition to most of the leading morbidities. Maori and Pacific Islander groups were younger compared to the European groups but presented with similar morbidities, highlighting the prevalence of chronic disease at a younger age in these ethnic groups. Factors related to poor socioeconomic status, in the form of having higher smoking rates, poor housing, overcrowding and poor diet, all lead to poor health status, but were not reflected in higher community health services use, thus contributed to leading morbidity admissions. This

finding validates previously published research in NZ. As expected, all the high deprivation groups had higher admission rates than the equivalent low deprivation groups at both hospitals, except for the APH Pacific Islander group, which had relatively similar admission rates for both high and low deprivation domicile patients. The findings of the present study were consistent with the results of research carried out in NZ and other countries demonstrating the impact on health of socioeconomic factors (National Health Committee, 2005; Ajwani, Blakely, Robson, Tobias & Bonne, 2003; Ministry of Health, 2000a & 2001c; Howden-Chapman & Tobias, 2000).

Although hospitals cannot change such patient related factors as ageing and ethnicity that are associated with increased AMAs, the study found important differences between the two hospitals in admission rates, discussed in 10.1.2 below.

Health service related factors influencing AMAs

Unlike patient related factors over which health services have little or no ability to influence, these are factors that are directly in the power of hospitals and health services to influence. For example, average patient length of stay (LOS) at both hospitals was similar and declined over the study period. This finding is consistent with the previously published research findings in NZ (REF). Another contribution of the present study was to demonstrate empirically a strong link between older age and longer LOS, and between severity of disease and longer LOS.

Short stay units appear to influence the LOS and prevent inappropriate admissions to hospitals. The present study contributed to research by highlighting the impact on AMAs of the implementation of such units (1997 at MMH and 2003 at APH), and the disestablished of one at MMH in 2001.

The study found variations in the self-referral rates of the two hospitals. For example approximately half of the total MMH admissions resulted from self-referrals, while APH had a much higher proportion of external referrals by health professionals. When comparing self-referral rates in relation to ethnicity, all three ethnic groups of MMH had higher self-referral rates compared to the equivalent APH groups, and these rates showed only minor differences between the ethnic groups. Further analysis related to self-referral rates to hospital for high deprivation groups at MMH showed that at MMH there were very small or no differences in

rates between the ethnic groups, but there were significant differences between the two hospitals in the self-referral rates among the two hospitals' high deprivation ethnic groups. This suggests that the explanation is found not in ethnic and cultural groups' preferences of hospital services over primary care services as some key informants suggested, but to health systems differences and management practices: availability of and access to primary care; ease of access to hospital services; hospital gate keeping practices; and senior physician active involvement in admission processes.

According to the finding of the present study cool months had the higher number of admissions and the warm months had lower numbers of admissions. But this relationship between cool temperature and higher admissions was not consistent or predictable. The introduction of the influenza vaccination did not reduce total hospital admissions, possibly due to poor uptake of the vaccination, but appeared to have contributed to a more even spread of admissions over the winter months.

According to the study findings, the introduction of community based disease management and specialist nursing management was helpful in preventing some inappropriate admissions for conditions such as heart failure and COPD. Introduction of ambulatory clinics for gastroscopy patients also reduced the need for inpatient hospital care.

Financially, it was beneficial to organisations to admit a patient to ED or a short stay ward after assessment, rather than discharging them without admission, because of the ways hospitals could claim funding. There were also some financial incentives influencing the admission trends for some DRGs but that had no effect on the total number of admissions or overall trends. For example, the shift from respiratory infection and inflammation to COPD DRGs reflected the higher funding available to the latter and was applied to COPD patients for whom respiratory infection and inflammation precipitated their admission.

In summary, the AMAs have increased substantially at both hospitals. The factors associated with the increase were related to patient and population factors including ethnicity and ageing coupled with deprivation, and equally importantly the factors related to hospital admission and patient management processes and the availability of and access to primary and community care services. The relationships among these factors are dynamic and complex. Therefore based on the overall conclusions of the present study, and the factors found to have

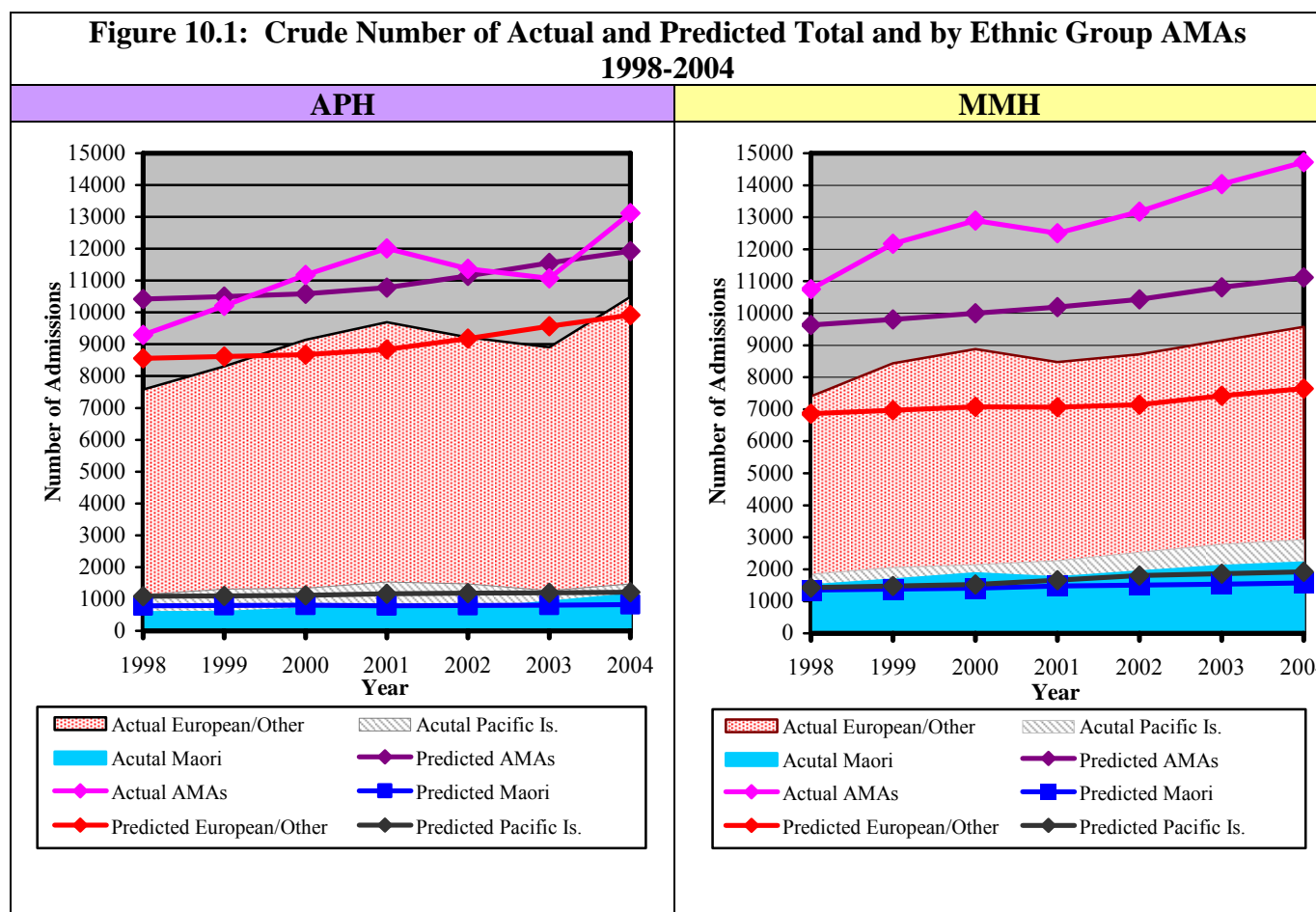
increased, moderated and prevented acute medical admissions at APH and MMH from 1997 to 2004, a summary of factors affecting the number of acute medical admissions to these hospitals is presented in conclusion (Figure 10.3).

10.1.2 Towards an explanation of excess AMAs

As stated above, the study found that AMAs increased substantially over the period covered by the study. Some increase would be expected in line with growth of populations in the regions the hospitals served. In addition, based on a large body of international and New Zealand research (reviewed in Chapter 2) increased AMAs would be expected to follow demographic changes and differences in regional populations, including population ageing and the ethnic mix. An objective of this study was to identify ethnic and age groups significantly contributing to the rise in AMAs. The technique of micro-analysis of the large hospital admissions data bases allowed the important finding to emerge that the MMH population had significantly higher AMA ASRs for all three ethnic groups than their equivalent groups at APH for most of the study period. In addition, an unexpected result was the persistent and significant difference in the age-standardised admissions rates between equivalent groups of the two hospitals, despite adjusting for age, ethnicity and deprivation of the two hospital populations who, after all, live in the same city. These differences remained despite controlling for possible confounding variables such as age, deprivation and morbidities of the large data set. These findings are further validated and highlighted by the analysis of the crude data presented in Figures 10.1 and 10.2.

In Figure 10.1, the crude actual AMA data were standardised to 1998 admissions per 1000 population for both hospitals, and the crude predicted rates were calculated according to the population increase for each hospitals' population for each year. The findings illustrated that the overall crude number of actual AMAs for MMH had increased above the predicted admissions from 9% to 28.5% during 1998-2004, while APH's predicted and actual crude AMAs were relatively similar to each other except for the years 2001 and 2004. The crude analysis further highlighted that all three ethnic groups of MMH (Pacific Islander 29% to 44%; Maori 11% to 41%; and European/Other 8% to 26%) experienced large increases well above the predicted AMAs for each of the ethnic groups. In comparison the APH groups showed no consistent variation between the predicted and actual AMAs. These differences between the hospitals suggest that factors unrelated to ethnicity and associated socioeconomic and cultural factors (such as deprivation and health service use patterns) account for

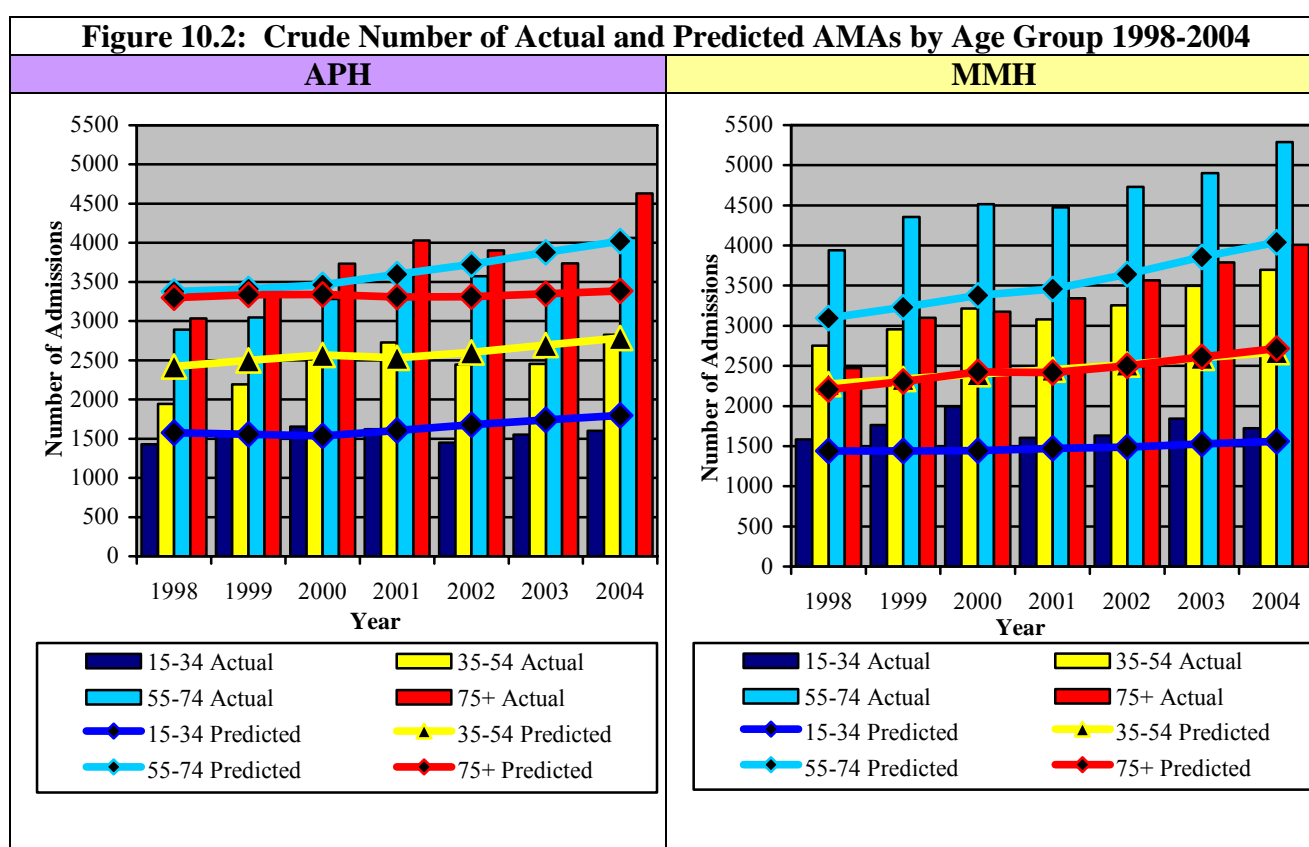
differences in AMAs, and these factors are most likely to be differences in health services and health management practices.



The detailed analysis of data showed a strong influence of the ageing population on AMA rates. Overall, the crude number of admissions has increased for all age groups, but the proportion of admissions has declined for the <55 age groups as admission rates of the 55+ age group has increased at both hospitals. In particular the admission rates grew at a much faster rate for the 75-84 and 85+ age groups than for the 55-64 and 65-74 age groups, highlighting the association between health service utilisation and the ageing population. However, the Maori and Pacific Islander groups' admission rates peaked at a much younger age than for the European groups of both hospitals.

Adding weight to the above conclusion that hospital management practices contribute to AMAs, additional analysis was conducted on predicted versus actual crude AMAs based on the 1998 age-specific rates adjusted for population increase for each year (Figure 10.2). This further validated the strong influence of an ageing population on the AMA trends. For

example, the gap between the predicted and actual AMAs for the 75+ age groups has increased from -8% to 37% at APH and 12% to 48% at MMH during 1998-2004. More importantly, however, the analysis highlighted differences between the hospitals. While AMAs for younger age groups (15-34 and 35-54) were less than or equal to predicted AMAs at APH, at MMH AMAs exceeded predictions. And crude AMAs substantially exceeded predicted rates at MMH compared with a more modest excess at APH. Like differences related to ethnic group differences, these findings are highly likely to reflect differences in health management practices.



10.1.3 Limitations of the study

The aim of this study was primarily to analyse data from a health management perspective, rather than from biological or epidemiological points of view, which poses certain limitations on the interpretation of results as well as on the research methods applied to analyse the data.

The study results drawn were based on patient admission data bases of two large public hospitals in Auckland, an urban population that has some specific demographic characteristics. In addition the health systems of the two regions served by the hospitals in the study have particular characteristics, particular in relation to the development and

distribution of health services outside hospitals. Therefore some of the study findings may only be generalized to similar populations.

New Zealand relies on throughput data submitted by hospitals, but this study has demonstrated variations in coding practices between the two hospitals. These variations raise concerns about the reliability and comparability of the data.

The data related to Phase 2 of the study was limited to hospital physicians, nurse specialists and managers. Outside the scope of the study were expert advice from GPs, community based nurses, PHOs, communities and the patients themselves and their families and whanau, though of high importance, are not reflected. The lack of voices and perspectives outside those represented by hospitals are limitations of the study.

(10.2) Conclusions and Principal Contributions of the Study

This study set out to describe trends in adult AMAs in New Zealand public hospitals, based on a microanalysis of 7 years' data from two large urban hospitals that together cover about a third of New Zealand's population. Findings are consistent with international research, and results of several small New Zealand studies are confirmed. The summary of the main findings of the study in 10.1.1 make several contributions:

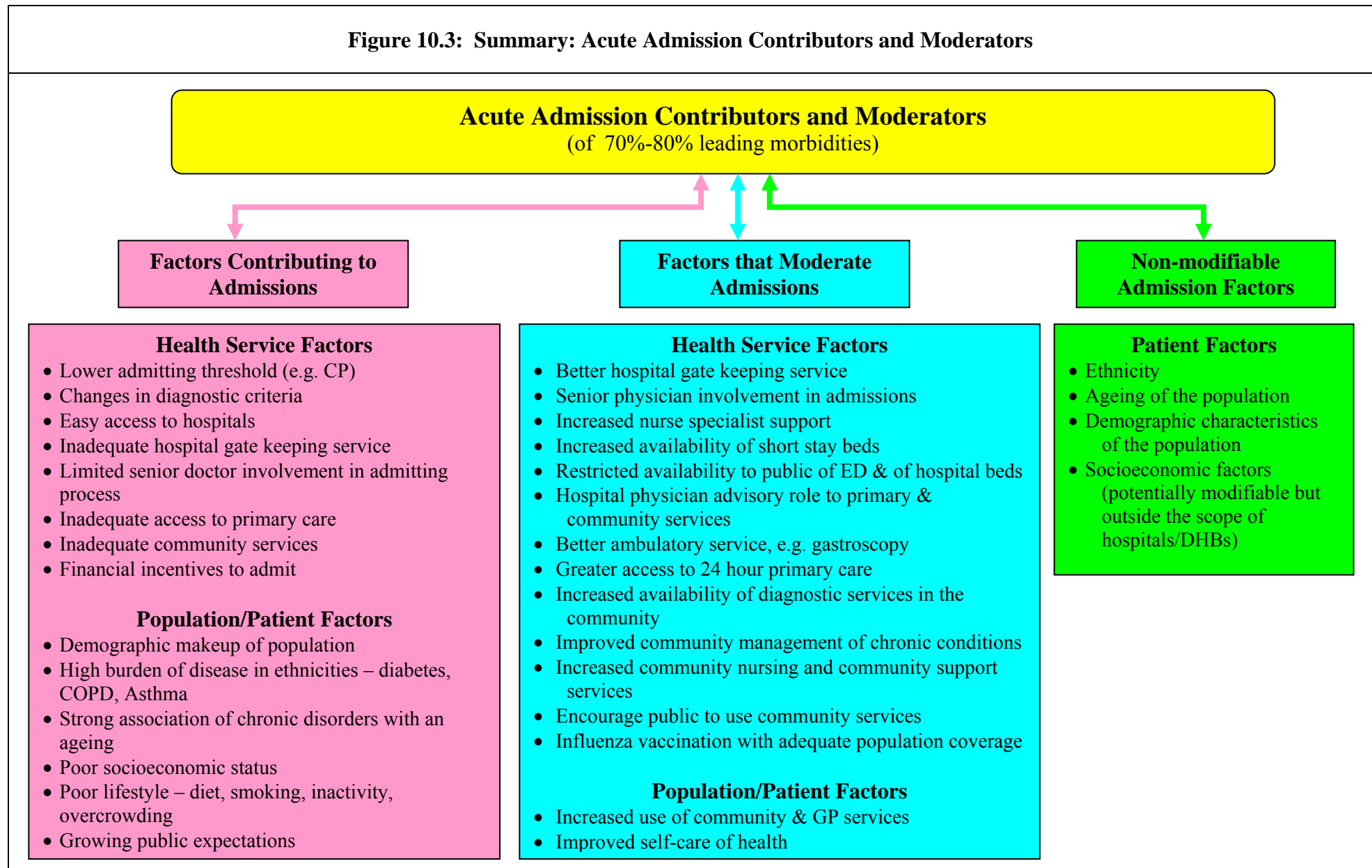
- Clear evidence is provided of the trend toward increased AMAs in excess of population growth in New Zealand;
- Provided clear evidence of the impact on health services in relation to ageing of the population not previously empirically measured in NZ;
- Demonstrated empirically a strong link between older age and longer LOS, and between severity of disease and longer LOS;
- Provided evidence that, reflecting the burden of disease, Maori and Pacific Islander admission rates peaked at a much younger age than for the European groups;
- Expanded on our understanding on health inequalities between ethnic groups by showing that factors unrelated to ethnicity and associated socioeconomic and cultural factors (such as deprivation and health service use patterns) account for differences in AMAs;
- Provided evidence on the impact of short stay units that influenced both LOS and prevent inappropriate admissions to hospitals; and
- Demonstrated that the ease of access of the hospital services to self-referring patients is associated with differences in AMAs.

In addition was the particular contribution through using the analytical technique of micro-analysis of the large hospital admissions data bases and comparison between hospitals. This led to the unexpected and important finding that the MMH population had significantly higher AMA ASRs for all three ethnic groups than their equivalent groups at APH for most of the study period. These differences remained despite controlling for possible confounding variables such as age, deprivation and morbidities of the large data set. The study thus contributed to the existing literature on small area or regional variations in AMAs, by filling the identified gap in the literature which has largely focused on disease or procedure specific differences between different regions.

This variation between the AMA rates of both hospitals could only be attributed to differences in access to and availability of primary care, access to hospitals, and hospital admitting, management and discharge practices. Therefore the inter-hospital variations found in the present study made a significant contribution to the literature on ethnic inequalities in health by showing that in addition to ethnicity and deprivation, and health utilisation practices, other factors such as access to primary care, ED and hospital admitting practices also play a major role in admission trends. The inter-hospital variations also enhanced our understanding of the relationship between ageing and chronic disease burden and association with AMAs, highlighting again that access to hospitals, and hospital admitting, management and discharge practices explain some excess in AMAs.

In summary, the AMAs have increased substantially at both hospitals. Acute medical admissions almost doubled during the study period. This increase in medical admissions will have had a significant direct impact on the amount of elective surgery carried out, and yet although much political and public focus has remained on waiting times or lists for elective surgery, AMAs have been almost ignored. The factors associated with the increase were related to patient and population factors including ethnicity and ageing coupled with deprivation, and equally importantly the factors related to hospital admission and patient management processes and the availability of and access to primary and community care services. The relationships among these factors are dynamic and complex. Therefore based on the overall conclusions of the present study, and the factors found to have increased, moderated and prevented acute medical admissions at APH and MMH from 1997 to 2004, a summary of factors affecting the number of acute medical admissions to these hospitals is presented in conclusion (Figure 10.3).

Figure 10.3: Summary: Acute Admission Contributors and Moderators



(10.3) Recommendations

Having better understood the admission trends and their causes, the ultimate goal of this study was to then propose some recommendations to reduce the need and demand for hospital healthcare by implementing strategies that better serve the changing characteristics of the patient population, strengthening community-based services and promoting health of populations over-represented in AMA trends. Therefore the following recommendations are made to the DHBs and their public hospitals, the Ministry of Health, and educational institutions that prepare health professionals.

Recommendations to District Health Boards

Unlike hospitals whose focus is on delivering services to the seriously ill, DHBs are responsible for the health of their populations. As DHBs own and operate the hospitals, it is in their interests to best manage pressure on hospitals by considering alternative ways of managing the health of ageing populations with chronic morbidities. It is also in their interests to pursue ways of reducing the burden of disease in high user populations through health promotion and health development strategies. Both hospitals of the DHBs in the study experienced significant increases in AMAs. This increase in AMAs was the consequence of the many and complex factors as discussed in this study. The ageing of the population coupled with a rise in chronic disease, ethnic, cultural and socioeconomic variations, differences in access and availability of primary care, ease of access to hospital and hospital admitting practices and processes, *all* influenced AMAs. The proportion of the older age population is expected to increase rapidly in future, therefore the demand for chronic and multiple co-morbidities care will also increase. A health system characterised by a focus largely on acute care management is unlikely to be sustainable in terms of effectively meeting the healthcare needs of this older population economically. Implications of the differences found between the two hospitals highlighted the risks to hospitals' AMAs of uncontrolled or poorly controlled access by patients to hospital services; the first step to intervening between a patient and the hospital is to ensure availability of and access to community-based services. Therefore, the following recommendations are made to the DHBs to reduce the impact of AMAs and enhance the health status of their populations:

- Investigate and establish a profile of high users of hospital services (top 5%) to reduce long-term readmission rates by: developing a database; developing strategies to reduce

readmission rates; and instituting appropriate health service measures in the community.

- Develop adequate primary health services, especially after hours, in high deprivation areas, with the specific goals of primary prevention, health promotion and chronic disease management of at-risk populations and high users of hospital services.
- Investigate and invest in a telephone triage and advisory service, in consultation with primary and secondary care services.
- Investigate and invest in rapid diagnostic services (similar to hospitals) in the community, to support primary and community health service providers.
- Investigate those hospital services that are currently provided by and in hospitals, such as specialist consultation services, which could be provided in the primary healthcare setting without compromising safety and quality of care, to reduce admissions to hospitals.
- Invest in and encourage the development of community health services and community support services to adequately meet healthcare needs of patients living with multiple co-morbidities in the community. For example, offering treatment interventions such as intravenous antibiotics, nebuliser and oxygen therapy to patients in the community, to reduce the need for hospital admissions, or a walk-in acute care or emergency unit attached to an Accident and Emergency Clinic in the community.
- Introduce guidelines for hospitals and general practice to establish a common understanding of patients with certain morbidities and their management in the community with back-up by the hospital.
- Introduce a community health service clinic on or near the hospital site, particularly in such hospitals as MMH, to encourage self-referral patients to use GP clinic service as an alternative to hospital care.

- Invest in a large-scale media campaign to encourage the public to use primary health services in the community, especially as community-based services become available.
- DHBs should work with the educational institutions that provide pre-registration and postgraduate education to health professionals to develop courses and internships, such as generalist medical specialist courses for doctors and nurses that better meet the needs of the DHB's populations and effectively meet the needs of the ageing population and those with multiple co-morbidities.
- Innovative chronic disease management projects should be allowed to run over a period of at least 5 years (not 2 years or less as previously) to evaluate their effectiveness. These projects should not be dominated by any one professional interests, but involve a range of health professionals including nurse specialists and nurse practitioners to physicians and general practitioners, and have a broader focus to reduce the number of admissions related to high deprivation, complex co-morbidity, and older populations, instead of being single disease focused.
- DHBs to provide a PHO centred development away from traditional GP led practices to interdisciplinary team delivered services that in the community manage target populations accounting for increases in AMAs. The PHOs and other community services should be encouraged to use nurse specialists and nurse practitioners to manage top MDC/DRG patients with complex morbidities and older people.
- Especially, the DHBs to encourage and invest in the development of alternative models of care of high user populations (complex co-morbidities, ageing, Maori, Pacific Islander, and high deprivation) that take into account the key findings of the present study related to the pathway between home and acute hospital bed.

Recommendations to Public Hospitals

Recommendations for hospitals focus on the pathway for patients from the front door to a hospital bed. The findings of the study provided clear evidence that a hospital's front door policy influences AMAs: open access to a hospital's ED, tolerance of self-referral practices, weak gate-keeping practices between ambulatory and in-patient hospital services, and no short-stay medical unit are all associated with increased AMAs. The following

recommendations are made to public hospitals to reduce AMAs by instituting measures targeted at different points that are expected to potentially reduce unnecessary AMAs:

- Discourage self-referrals to hospital by instituting rigorous measures and processes in the hospital ED to prevent inappropriate admissions and to provide appropriate gate keeping services to the hospital ED.
- Move towards active involvement of experienced physicians in admission processes in the hospital ED and/or short stay unit.
- Both hospitals to encourage their ED to involve nurse specialists/case managers to prevent and reduce inappropriate admissions.
- Where there is no short stay medical assessment unit, to introduce a dedicated assessment area with short stay facility for Medical Services to assess, diagnose, treat and discharge or admit patients to medical wards.
- Provide a reliable and accessible telephone medical physician advisory service to primary and community health service providers, especially during the peak admission times of the day (10:00-21:00 hours).
- Hospitals could also actively review the appropriateness of admissions with a view to identifying avoidable admissions. Those patients and families could then participate in nurse led programmes to self-manage chronic illness and their symptoms.

Recommendations to the Ministry of Health

Despite the substantial increases in demand for medical care, there has been very little or no microanalysis of hospital data in NZ. The following recommendations are made to the Ministry of Health to reduce avoidable AMAs, reduce their impact and raise the health status of the population on the whole:

- Base health policy on evidence related to both macro and micro analysis of the hospital admission data.

- Investment in and evaluation of evidence-based initiatives to better manage the target populations responsible for high AMAs to promote health and reduce hospitalisation rates. Also prevention of and screening for conditions leading to the morbidities accounting for AMAs (diabetes etc).
- Investigate financial incentives for admitting patients and invest in initiatives that financially reward hospitals for discharging patients from ED or short stay wards without admitting patients to hospital.
- Address health inequalities, especially for at-risk populations, through social and economic policies, such as introduction of free community general and specialist care for high deprivation and high-risk population groups, and working with other Ministries and agencies to enhance environmental and lifestyle factors (e.g. healthy homes, clean air, healthy diet, etc).
- Provide targeted funding for programme development and courses offered by education providers that better meet the population's changing health needs. For example, offering more scholarships to doctors and nurses enrolling in generic specialist courses and support the development of advanced community based health practitioners.
- Fund research on how hospital inpatient data can be used to gain further understanding of admission trends and their relationship to hospital and community services as well as to socioeconomic deprivation.
- In view of researcher experiences of variations in coding practices and data quality between the two hospitals, the Ministry of Health should enforce and closely monitor the data collection requirements.

Recommendations to Educational Institutes in Preparing Health Professionals

Academic institutions providing education to health professionals at pre-registration and postgraduate levels play a significant role in preparing the workforce to meet the health needs of the population. It can be argued that present educational programmes, that have been developed historically and reflect health needs and populations of earlier times, should be

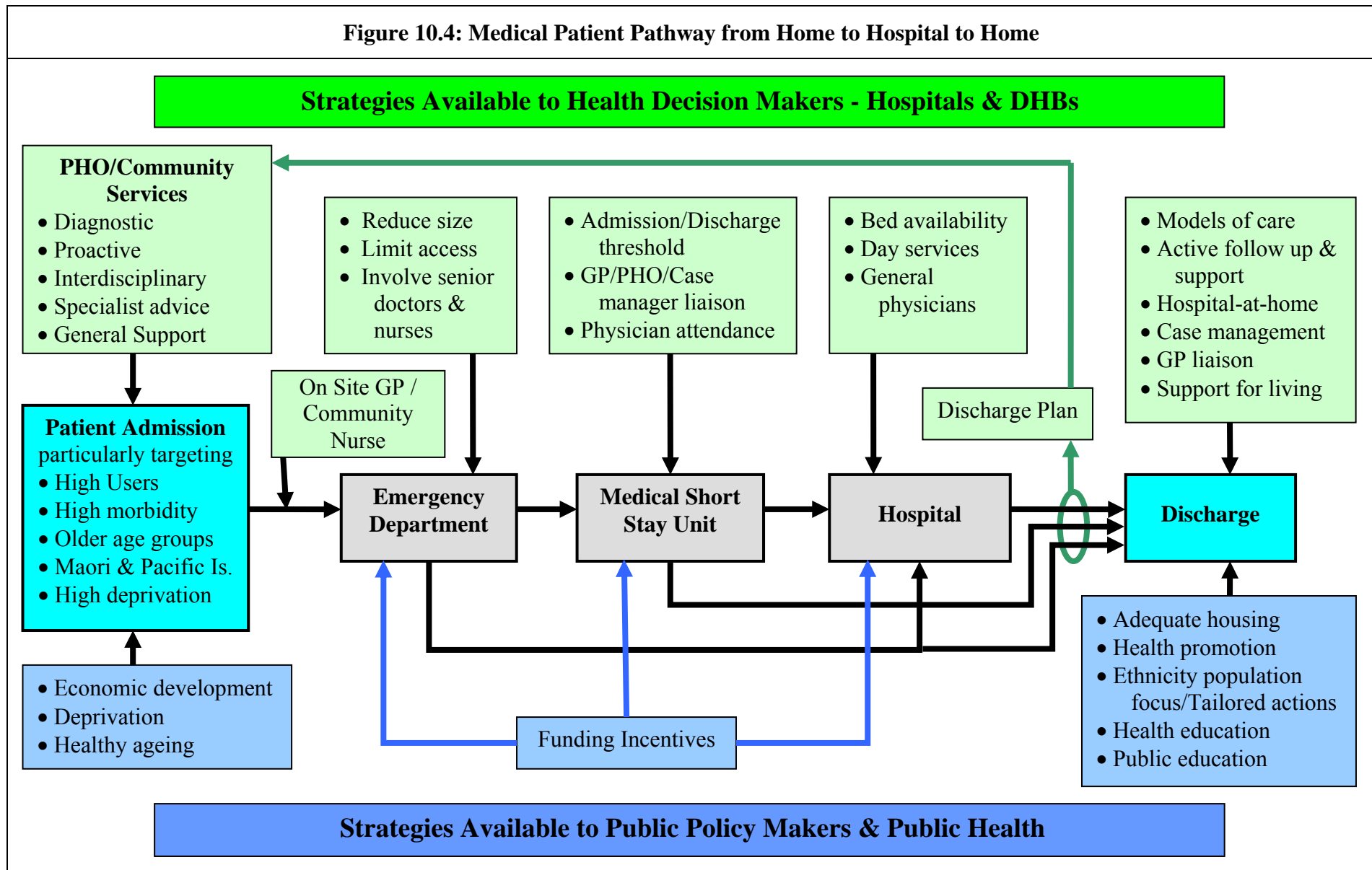
reviewed and redeveloped to better meet the needs of today's populations. Therefore, the following recommendations are made to these institutions:

- Academic institutions urgently need to increase the focus on out of hospital services in curricula and clinical experience, in both undergraduate and post-registration education, and replace their current hospital, single system, and specialist focus with a population and primary health care focus. The health professional specialisation courses must be based on current and future needs of the population as a whole, as well as of individual ethnic groups.
- Health professional academic institutions could make a valuable contribution by actively promoting research into alternative ways of delivering health services and robust evaluation of innovations.

Summarising recommendations

Based on the detailed microanalysis of hospital data carried out in this study and the resultant discussion and conclusions, the above recommendations are offered as possible areas to be considered in an attempt to effectively and efficiently deal with the continuing increase in acute medical admissions and rapidly changing health needs particularly of the ageing population. They also aim at addressing regional and ethnic health inequalities, and enhancing the effectiveness of services provided by hospitals, primary health care and community health services. Present increases in AMAs are not sustainable, and the status quo no longer an option. Literature on effective alternatives and this study's findings indicate that a whole system perspective is needed with multiple intervention points, to reduce the impact of AMAs and better meet the population's health needs, incorporating possible actions from both a health service management perspective and a public policy and public health perspective. These recommendations are further summarised in the flowchart of Figure 10.4. Running through the middle of the flowchart is the patient pathway from the community, through admission at a hospital, to discharge. Possible interventions to reduce the avoidable AMAs to hospitals are noted at the different stages of the patient pathway on the flowchart. Educational institutions providing education to health professionals (which are not shown on Figure 10.4), would need to be reviewed to better prepare health professionals to work in a re-orientated health service.

Figure 10.4: Medical Patient Pathway from Home to Hospital to Home



(10.4) Future Areas of Research

Several directions of potential research have emerged from the analysis:

- Arising from Limitations (10.1.3), admission trends could be further investigated from the points of view of primary and community service providers, as well as of patients and communities.
- A large cohort study to investigate health service utilisation of the 55+ age groups would help in addressing issues related to new health service development and workforce planning related to population ageing.
- Research related to the characteristics of high users of hospital services would be advantageous, to better meet the healthcare needs and to prevent admissions of this group.
- Further research into the causes of differences in self-referral rates to different hospitals of patients with similar ethnic and deprivation background would help determine reasons for differences. Similarly, examining the reasons behind the increased self-referral rates of high users of hospital services after hours, would help in understanding this specific group's experience.
- Finally, interventions based on the findings of the present study could be developed, implemented, and evaluated to determine the effectiveness of alternative models of care and their impacts on acute medical admission trends. Such interventions should be evidence based, well conceptualised and developed, and after implementation given sufficient opportunity for results to emerge. Examples are suggested in the recommendations for hospitals and DHBs above.

Appendix 1 - Ethical Approvals – Phase 1 & 2

**Auckland
Ethics Committees**

Please include the reference no. and study title in all correspondence/telephone calls.

Private Bag 92522
Wellesley Street
Auckland
Delivery Address:
C/O Ministry of Health
3rd Floor, Unisys Building
650 Great South Road, Penrose
Phone (09) 580 9105
Fax (09) 580 9001
Email: pat_chainey@moh.govt.nz

27 June 2002

Mr J.S. Benipal
Division of Nursing
Faculty of Medical & Health Sciences
PB 92 019
Auckland

Dear Jagpal,

AKY/02/00/077 Phase 1: Is the number of acute adult medical admissions rising in Auckland ?

Thank you for your amendments, received 25 June 2002.

We are pleased to inform you that this study has received ethical approval until 3 July 2003, subject to the Committee being advised when the study is completed and an End of Study report is received in a timely manner.

Please note that the Committee grants ethical approval only. If management approval from the institution/organisation is required, it is your responsibility to obtain this.

Should the study extend, a progress report will be required in June 2003 and a blank form should come off our data base for you to complete and return.

The Committee wishes you well with your research.

Yours sincerely,



**Pat Chainey
Administrator**

Cc: Auckland DHB
Cc: J Rouse, Sth Auck Health



NORTHERN X ETHICS COMMITTEE

Pat Chainey
Administrator

Phone: (09) 580 9105
e-mail: pat_Chainey@moh.govt.nz
website: <http://www.newhealth.govt.nz/ethicscommittees>

650 Great South Road
Penrose
Private Bag 92522
Wellesley Street
Auckland
New Zealand
Phone (09) 580 9000
Fax (09) 580 9001

28 January 2005.

Mr Jagpal Singh Benipal
School of Nursing
Faculty of Medical & Health Sciences
University of Auckland
PB 92 019
Auckland.

Dear Jagpal,

AKY/02/00/077

Is the number of acute adult medical admissions rising in Auckland (phase 1) ?

Thank you for your letter dated 25 January 2005.

The chairperson of Northern X Ethics Committee considered the following amendment and has given ethical approval for :

- The collection of similar data for a further 2 year period (January 2003 – December 2004)

Your reasons as listed 1 to 3 in your letter are noted.

Yours sincerely,

Pat Chainey
Administrator, Northern X Ethics Committee

Cc: Auckland Research Office
Cc: South Auckland Health



Northern X Regional Ethics Committee

Ministry of Health
3rd Floor, Unisys Building
650 Great South Road, Penrose
Private Bag 92 522
Wellesley Street, Auckland
Phone (09) 580 9105
Fax (09) 580 9001

e-mail: pat_Chainey@moh.govt.nz
website: <http://www.newhealth.govt.nz/ethicscommittees>

3 May 2005.

Mr Jagpal Singh Benipal
Lecturer
School of Nursing
Faculty of Medical & Health Sciences
PB 92 019
Auckland.

Dear Jagpal,

**NTX/05/04/027 Changes in the burden of medical admissions/discharges in Auckland:
Phase 2: PIS/Cons V 26/4/05.**

Thank you for your amendments, received 29 April 2005

The above study has been given ethical approval by Northern X Ethics Committee for the Northern Region.

It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider, within whose facility the research is to be carried out. Where applicable, authority for this must be obtained separately from the appropriate manager within the organisation.

Certification

It is certified as not being conducted principally for the benefit of the manufacturer or distributor and may be considered for coverage under ACC.

Accreditation

This Committee is accredited by the Health Research Council and is constituted and operates in accordance with the Operational Standard for Ethics Committees, March 2002.

Documents Approved:

- Information Sheet/Consent Form V# 26 April 2005.

Progress Reports

The study is approved until 30 September 2006 but is subject to annual review. A progress report is required for this study on 3 May 2006.

.../2

A form should come off our database requesting this information two months prior to the review date but if a form is not received, it is still your responsibility to provide a progress report and this may be obtained from the website above. Please note that failure to complete and return this form may result in the withdrawal of ethical approval.

Please advise the Committee when the study is completed and under the ethical approval process, final report is also required at the conclusion of the study.

Requirements for SAE Reporting

Please advise the Committee as soon as possible if there are any serious adverse events which may relate to this study.

General:

All amendments to the study must be advised to the Committee prior to their implementation, except in the case where immediate implementation is required for reasons of safety. In such cases the Committee must be notified as soon as possible of the change.

Yours sincerely,



Pat Chainey
Administrator, Northern X Committee

Cc: Auckland Research Office

Cc: South Auckland Health

Appendix 2 - Participant Information Sheet

SCHOOL OF NURSING
Faculty of Medical & Health Sciences



THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

Private Bag 92019
Auckland
Tel: 64-9-373 7599 x 85139
Fax: 64-9-367 7158
Email: j.benipal@auckland.ac.nz

PARTICIPANT INFORMATION SHEET

Study Title: Reasons for the continuing increase in medical admissions/discharges in Auckland

Jagpal Benipal (Researcher)
School of Nursing
Faculty of Medical and Health Sciences
The University of Auckland
85 Park Road
Grafton
Private bag 92019
Auckland

Phone no. (09) 373 7599 x 85139

Dear Participant

You are being invited to participate (maximum 20 participants) in phase 2 of this study by taking part in an individual interview or a focused group interview depending on your personal preference. You have been selected based on your professional, clinical, management or research involvement directly or indirectly with adult medical hospital patients. Attached to this project information sheet is the key findings derived from the analysis of the hospital medical inpatient data collected during phase 1 of the study. If you agree to participate, you will be asked to comment on these identified trends during the interview. Your participation is voluntary. You will be asked to complete a consent form agreeing to take part in the study at the beginning of your interview. Also, you have the right to withdraw or correct the information provided by you within 7 days after receiving a draft copy of the interview transcript for review.

My name is Jagpal Benipal and am presently studying towards a Doctorate of Philosophy at the University of Auckland. I am a registered nurse and have worked in a number of different clinical areas as a staff nurse and a charge nurse manager. I am currently employed as a lecturer in the School of Nursing, Faculty of Medical and Health Sciences, The University of Auckland.

As part of my PhD research I am conducting a two phase study to examine trends in adult medical admissions/discharges in Auckland. Phase 1 of the project, now

completed, focused on the analysis of the inpatient medical data (1997-2004) of Middlemore and Auckland Hospitals, and identified major trends. The aim of phase 2 of this project is to explore and explain trends in adult medical inpatient hospital admissions/discharges from the position of key informants by giving them the opportunity to comment on the results of hospital inpatient data analysis carried out in phase 1 of the project.

The information collected in phase 2 of the project would be used to further explain and explore medical discharge trends identified in phase 1 of the project. Any report or paper written for the study will be done in a way that does not identify you as its source. A copy of the final report will be placed in your Hospital's library. An oral presentation will also be given at your institution to communicate the findings of this project. The report will be submitted for publication approval in health professional and/or management journals to share the findings with a wider audience. This study is to be completed by September 2006. You may be able to use the information provided by this project for improving the present and future health services plans.

The interview will take approximately 30 minutes of your time. With your consent, an audio tape will be used to record your comments. You may choose to have the recorder turned off at any time during the interview. The audio tapes will be transcribed by the researcher. A copy of your individual transcript will be sent to you by mail for review. And appropriate changes will be made to individual transcripts if required. The interview transcripts will be stored on a password protected computer and the audio tapes will be kept in a locked cupboard in the researcher's office, School of Nursing, The University of Auckland, while the study is analysed. The audio tapes will be destroyed by the researcher at the completion of the project. The data collected may also be used for future research in the same field by the researcher, for which ethical approval will be sought by a NZ accredited ethics committee.

The project is being supervised by Associate Professor Dr Nicola North (School of Nursing, The University of Auckland, who may be contacted at (09) 373 7599 X 82931) and Emeritus Professor Dr Norman Sharpe (Medical Director, New Zealand Heart Foundation, Auckland, who may be contacted at (09) 571 9196).

If you have any queries or concerns regarding your rights as a participant in this study, you may wish to contact a Health & Disability Advocate, telephone number 0800 555 050 Northland to Franklin.

This study has received ethical approval from the Northern X Ethics Committee.

I will contact you within the next 10 days, to enquire whether you are interested in being a participant in this phase of the study. If you require further information or have any questions, please feel free to contact me. Thank you.

Yours sincerely

Jagpal Benipal (Researcher)

Appendix 3 - Consent Form

SCHOOL OF NURSING
Faculty of Medical & Health Sciences



THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

Private Bag 92019
Auckland
Tel: 64-9-373 7599 x 85139
Fax: 64-9-367 7158
Email: j.benipal@auckland.ac.nz

Consent Form

Study Title: Reasons for the continuing increase in medical admissions/discharges in Auckland

Researcher: Jagpal Singh Benipal, Lecturer, School of Nursing, Faculty of Medical and Health Sciences, The University of Auckland.

I have read and I understand the information sheet dated 10th March 2005 for volunteers taking part in the study designed to explore and explain trends in adult medical inpatient hospital admissions/discharges. I have had the opportunity to discuss this study. I am satisfied with the answers I have been given.

I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time and this will not affect my employment in anyway. I have had sufficient time to consider whether to take part. I also know whom to contact if I have any questions about the study. I also understand that:

- My interview will be audio taped, but I may choose to have the recorder turned off at any time during the interview,
- The audio tapes will be kept in a locked cupboard in the researcher’s office and these tapes will be destroyed at the completion of the research,
- I have the right to withdraw my information up to 7 days after the interview,
- I understand that my participation in this study is confidential and that no material which could identify me will be used in any report on this study, and
- My consent form will be kept for ten years in the School of Nursing, Faculty of Medical and Health Sciences, The University of Auckland.

I (full name) hereby consent to take part in this study.

Participant’s Name: _____

Participant’s Signature: _____

Date: _____

Appendix 4 - Population Estimates Data

Table A4.1: APH & MMH Region Population Estimates Data by Age Groups 1997-2004

Age Group	Hospital	1997	1998	1999	2000	2001	2002	2003	2004
15-24	APH	55,970	55,850	55,586	55,873	59,297	62,812	65,498	68,005
	MMH	57,831	58,066	58,254	58,827	62,320	63,504	65,910	67,860
25-34	APH	72,330	71,788	70,339	68,666	70,725	73,182	75,649	77,626
	MMH	58,409	58,683	58,410	58,188	56,950	57,200	58,007	58,587
35-44	APH	60,299	62,490	64,277	65,867	63,832	65,825	68,297	70,571
	MMH	53,750	55,834	57,298	58,599	60,280	61,980	64,060	65,430
45-54	APH	42,957	44,950	46,615	48,129	48,503	49,548	51,229	53,070
	MMH	43,419	45,076	46,465	47,795	48,620	49,630	51,280	53,130
55-64	APH	25,909	26,486	27,344	28,408	30,316	31,966	33,826	35,297
	MMH	27,548	28,750	30,034	31,439	32,420	34,360	36,490	38,290
65-74	APH	20,796	20,352	19,935	19,631	19,582	19,671	19,959	20,507
	MMH	18,705	19,157	19,607	20,125	19,915	20,537	21,450	22,360
75-84	APH	14,333	14,345	14,370	14,238	13,950	13,911	14,080	14,230
	MMH	9759	10054	10458	10912	10920	11290	11850.	12390
85+	APH	4,895	5,066	5,253	5,424	5,497	5,577	5,617	5,686
	MMH	2691	2929	3102	3345	3300	3420	3510	3590
Sum Age Groups	APH	297,489	301,328	303,719	306,236	311,702	322,492	334,155	344,992
	MMH	272,113	278,549	283,628	289,230	294,725	301,921	312,557	321,637

(New Zealand Health Information Service, 2005)

Appendix 5 - Standard Population

Table A5.1: ADHB + CMDHB Age Groups Population Estimates Data for 2004 Used as the Standard Population to Calculate Age-standardised Rates per 1000 Population

Population by Age Group	Standard Population
15-24	135,865
25-34	136,213
35-44	136,001
45-54	106,200
55-64	73,587
65-74	42,867
75-84	26,620
85+	9,277
Total Standard Population	666,629

(New Zealand Health Information Service, 2005)

Appendix 6 - Diagnostic Related Groups

Table A6.1: Specific Diagnostic Related Group (DRG) Categories Analysed for the Five Significantly Contributing Major Diagnostic Categories (MDCs)

DRG Category	DRG Version ICD-9AM	DRG Version ICD-10AM
Circulatory System Disorders MDC		
Chest Pain	261	F74Z
Myocardial Infarction	245, 246, 247, 248 and 249	F41A/B and F60A/B/C
Heart Failure & Shock	252	F62A/B
Heart Arrhythmias	266, 267, 268, 279, 280 and 281	F70A/B and F71A/B
Syncope & Collapse	259 and 260	F73A/B
Respiratory System Disorders MDC		
Infections & Inflammations	170, 171 and 172	E62 A/B/C
Chronic Obstructive Pulmonary Disease	177	E65 A/B
Bronchitis & Asthma	185,186 and 187	E69A/B/C
Neurovascular Disorders MDC		
Stroke Disorders	037 and 038	B70A/B/C/D
Seizure Disorders	045,046 and 047	B76A/B
Headache Diagnosis	048	B77Z
Transient Ischemic Attack & Precerebral Occlusion	067,068 and 069	B69A/B
Digestive System Disorders MDC		
Gastroenteritis, Oesophagitis & Miscellaneous Digestive System Disorders	348 and 349	G67A/B
Gastroscopy – complex and other gastroscopy for major and non-major digestive disease	325, 326, 327, 328, 329, 330, 331 and 332	G40A/B, G41A/B, G43Z, G42A/B and G45A/B
Abdominal Pain & Mesenteric Adenitis - with or without continuing care	346 and 347	G66A/B
Kidney & Urinary Tract Disorders MDC		
Kidney & Urinary Tract Infections	575, 576 and 577	L63A/B/C
Other Kidney & Urinary Tract Diagnosis	585, 586 and 587	L67A/B/C
Renal Failure	570 and 571	L60A/B/C

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Glossary

Acute admission is an unplanned admission on the day of presentation at the admitting healthcare facility.

Admission is a documentation process that may include entry to the National Health Index, by which a person becomes resident in a healthcare facility. It is recommended by the Ministry of Health, New Zealand that healthcare users who are likely to attend for more than three hours should be admitted.

Arranged admission is a planned admission where the admission date is less than seven days after the date the decision was made by the specialist that this admission was necessary.

Daypatient is a patient who is admitted and discharged on the same day.

Diagnosis related group (DRG) is a classification system established to assist categorising cases and assessing their cost. Each DRG includes a series of similar diagnoses and/or procedures, but is limited to those with similar resource needs.

Discharge is a documentation process that changes the status of an admitted healthcare user.

Domicile code refers to Statistics New Zealand Area Unit Code representing a patient's usual residential address at the time of this event.

Elective admission is a booked admission on a date more than seven days after a specialist decision to admit or a patient who was placed on a waiting list without a specific date being given.

Ethnicity/ethnic group may be defined as a social group, whose members have one or more of the following four characteristics: share a sense of common origins; claim a common and distinctive history and destiny; possess one or more dimensions of collective cultural individuality; and feel a sense of unique collective solidarity. Generally, the patients' self-

identify their ethnicity and completed at the start of each health event. This definition is adopted by the Ministry of Health, New Zealand.

Length of stay is the time in days between admission to hospital 'X' and discharge.

Major diagnostic categories (MDCs) are 0-25 mutually exclusive categories into which cover all possible principal diagnoses. The diagnoses in each category correspond to a single body system or aetiology, broadly reflecting the speciality providing the care.

Outpatient is a patient, who receives a pre-admission assessment, or a diagnostic procedure or treatment at a healthcare facility, and who is not admitted, and the specialist's intent is that they will leave that facility within 3 hours from the start of the consultation.

Outpatient clinic is a scheduled administrative arrangement enabling outpatients to receive the attention of a healthcare provider. The holding of a clinic provides the opportunity for consultation, investigation and minor treatment, and patients normally attend by prior arrangement. The clinic may be held on or off the hospital site.

Patient is a healthcare user.

Principal Diagnosis is a condition established (disease/disorder) after study to be chiefly responsible for occasioning the patient's episode of care in hospital.