

**The Accessibility of Phase 2 Cardiac Rehabilitation Programs in Rural and Remote Australia.**

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Thesis submitted for the degree of  
Doctor of Philosophy  
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June 2013

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## **Abstract**

Cardiovascular disease (CVD) continues to impose a heavy burden in terms of cost, disability and death in Australia. In 2011 cardiovascular disease was the largest single cause of mortality in Australia. CVD also contributes significantly to morbidity and impaired quality of life, as more than one million Australians live with long-term illness and disability, from conditions associated with CVD. With increases in life expectancy and an ageing population the future impact of the disease in Australia is alarming with one quarter of Australians predicted to have CVD by 2051.

Structured Phase 2 Cardiac Rehabilitation provides an opportunity for the development of a life-long approach to prevention and management of coronary heart disease for patients. Benefits include reduced mortality and reduced risk of further cardiac events; improvements in physical and social functioning, risk factor profiles and quality of life; and reduced prevalence of depression. The impact of CVD in Australia is not uniform as there is clear evidence to suggest that inequities in health outcomes, access and delivery of healthcare services exist between socio-economically advantaged and disadvantaged groups. Many rural populations in Australia do not have access to structured cardiac rehabilitation (CR) programs, and the level of support available to them in the form of unstructured CR through local general practitioners (GP's) is unclear. Despite the evidence to support cardiac rehabilitation, existing services remain underutilised (National Heart Foundation 2004, p. 11).

Accessibility is a major factor in the underutilisation of Phase 2 Cardiac Rehabilitation Programs. Previous studies on accessibility to cardiac services have been based on travel time, cost or distance only, and provide only a partial view of access to services. In reality, people trade off geographical and non-geographical factors in making decisions about health service use.

This study defines what aspects of accessibility should be studied to determine the accessibility of Phase 2 Cardiac Rehabilitation Programs in Australia. Through applying Penchansky and Thomas' (1981) dimensions of accessibility: availability, accommodation, affordability, and



acceptability and creating a spatial model of the accessibility, of Phase 2 Cardiac Rehabilitation Programs it was possible to define how accessible the programs are to rural and remote population centres. Therefore identifying areas where accessibility to these programs could be improved and where new programs or models of delivery should be established to enhance accessibility in areas that are currently poorly served.

## **Declaration**

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Deborah Anne van Gaans and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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## **Acknowledgements**

This study was undertaken on an Australian Postgraduate Award (Australian Research Council), with support from the Department of Geographical and Environmental Studies.

This research project was supported by Cardiac-ARIA: An Australian Research Council Funded Linkage Project with collaborating partners Alphapharm Pty. Ltd., The University of Adelaide, University of South Australia, University of Queensland, Monash University and The Baker Heart Research Institute. I would like to thank all members of the Cardiac-ARIA project team for their support. I would particularly like to thank Dr. Robyn Clark, Professor Andrew Tonkin, and Dr. Kerena Eckert for their advice and support.

I would like to thank my principal supervisor Professor Graeme Hugo for his guidance and encouragement throughout my candidature. I would also like to thank Neil Coffee, for getting me started on my PhD journey and Dr. Kym Nicolson for his advice and assistance.

Special thanks to Dr. John Biggins from the Department of Health who not only provided data to the project but valuable knowledge on the health system.

This study could not have been done without the support of the Co-ordinators that run Phase 2 Cardiac Rehabilitation Programs around Australia. In particular I would like to thank Sanchia Shute from the Flinders Medical Centre, Dianne Littlechild from the Centre for Physical Activity in Ageing, Claudine Clark from the Royal Adelaide Hospital, Susan Sierp from the Lyell McEwin Hospital, and Renee Hawthorn from the Queen Elizabeth Hospital.

I would also like to thank Wendy Keech and Vanessa Poulson from the Heart Foundation, who provided me with valuable feedback and information to include in my research.

Thanks to my family; Greg, Teagan and Matt for all of your love and support while I “wrote the book” and my best friend Simone Gawel for her constant encouragement.

## List of Abbreviations and Acronyms

ABS	Australian Bureau of Statistics
ACRA	Australian Cardiac Rehabilitation Association
ACS	Acute Coronary Syndromes
AMI	Acute Myocardial Infarction
ARIA	Accessibility and Remoteness Index of Australia
CABG	Coronary Artery Bypass Grafting
CHD	Coronary Heart Disease
CHF	Chronic Heart Failure
CR	Cardiac Rehabilitation
CVD	Cardiovascular Disease
FCA	Floating Catchment Area
GIS	Geographic Information System
GP	General Practitioner
IHWs	Indigenous Health Workers
MI	Myocardial Infarction
NCR	Not Accessing Cardiac Rehabilitation
PBAC	Pharmaceutical Benefits Advisory Committee
PTCA	Percutaneous Transluminal Coronary Angioplasty
QALY	Quality Adjusted Life Year
QOL	Quality of Life
SAMSS	South Australian Monitoring and Surveillance System
SCR	Standard Cardiac Rehabilitation
SES	Socioeconomic Status
WHO	World Health Organisation
WWT	Willingness to Travel

## **Chapter 1: Introduction**

### **1.1 The Research Problem**

Over the past century, average Australian mortality rates have fallen significantly, with life expectancies rising for both men and women (Swan 2010, p. 6). The fall in mortality rates have added to population growth and the proportion of older people in the Australian population. The impending rapid growth of Australia's older population has important implications for provision of services which are particularly needed by older people (Hugo 2010, p. 96). This challenge is not only because there are many more Australians surviving to old age than was the case for previous generations, but it may well be that on average they are sicker than earlier generations (Hugo 2010, p. 67). This age-associated shift is evident within the burden of cardiovascular disease within Australia.

Although mortality rates from acute events (heart attack and stroke) have been declining, the burden of cardiovascular disease (CVD) remains enormous and is becoming more associated with periods of chronic disabling illness (notably heart failure) (Access Economics 2005, p.i). There were an estimated 3.4 million people living with the disease in 2007–08 (Australian Institute of Health and Welfare 2012, p.265). CVD occurred more commonly among the elderly, with 62% of those aged 75 and older having a cardiovascular condition compared with 5% of those aged under 45 (Australian Institute of Health and Welfare 2012, p.265). The Australian Institute of Health and Welfare (2012) believe that due to improved treatment and management of risk factors for cardiovascular disease the burden of death and disability will shift to older age groups within the Australian population. This age-associated shift combined with the growing number of older Australians, is likely to add considerably to health care costs in the future.

Cost-effective investment in research, prevention and management has been shown in Australia in the past decade to reduce cardiovascular disease events and mortality rates and to arrest growth in health costs over the medium term (Access Economics 2005, p.54). Cardiac rehabilitation

provides an opportunity for the development of a life-long approach to prevention and management of coronary heart disease for patients. Cardiac rehabilitation is an important part of secondary prevention of coronary heart disease, aiming to give people the confidence, motivation and skills to make a lifelong commitment to a healthy lifestyle and greater well-being (National Health and Medical Research Council 2007, p.v). Defined benefits include reduced mortality and reduced risk of further cardiac events; improvements in physical and social functioning, risk factor profiles and quality of life; and reduced prevalence of depression (Bunker and Goble 2003, p.332). The National Heart Foundation's Recommended Framework for Cardiac Rehabilitation (2004) emphasises that the long-term benefits from cardiac rehabilitation come from continuing behavioural change beyond the period of inpatient and outpatient treatment, and that establishing ongoing community-based approaches is essential.

Despite the evidence to support cardiac rehabilitation, existing services remain underutilised (National Heart Foundation 2004, p .11). Bunker and Goble (2003) have identified that access to cardiac rehabilitation is one of the major factors affecting the utilization of Phase 2 Cardiac Rehabilitation programs, especially in rural and remote areas within Australia. This is despite the World Health Organisation (1993) and the National Heart Foundation of Australia (2004) recommending that cardiac rehabilitation, incorporating secondary prevention programs, should be available to all patients with cardiovascular disease. Improving access to Phase 2 Cardiac Rehabilitation will be necessary to cope with an ageing population and falling cardiovascular death rates. Currently Australia is under invested in infrastructure, and infrastructure and services are unequally distributed so that some areas are significantly under provided – outer metropolitan and remote areas are of particular significance (Hugo 2010, p.43). As stated by Hugo (2010) it is not simply a matter of a need to invest more in infrastructure but carefully targeting where it is most needed and where it will create improved access to services.

## **1.2 Aims and Objectives**

This study is part of the overarching Cardiac-ARIA: Measuring the Accessibility to Cardiovascular Services in Rural and Remote Australia via Applied Geographical Spatial Technology (GIS) project, which is supported by the Australian Research Council Linkage Project (LP0775217). The specific

aims of Cardiac-ARIA are to: map the type and location of cardiovascular services currently available in Australia, relative to the distribution of individuals who currently have symptomatic CVD; determine by expert panel, what are the minimal requirements for comprehensive cardiovascular health support in metropolitan and rural communities; derive a rating classification based on the Accessibility and Remoteness Index of Australia (ARIA) for each of Australia's 11,338 rural and remote population centres. These project aims serve as a framework to define the aims and objectives of this thesis, which is supported by the Cardiac-ARIA project.

This study is designed to further the Cardiac-ARIA project by exploring the concept of accessibility and how it should be defined and modelled to assess the accessibility of cardiac rehabilitation services in rural and remote Australia. This study focuses on answering one broad research question of how accessible are cardiac rehabilitation services in rural and remote Australia?

To answer this research question the study aims to:

- Investigate the concept of accessibility as it relates to health services
- Identify where in the continuum of aftercare for patients with coronary heart disease issues of accessibility have the greatest impact
- Identify the factors which affect the accessibility of patients to cardiac rehabilitation programs
- Develop a spatial model of accessibility to outpatient cardiac rehabilitation services
- Identify and describe the accessibility of cardiac rehabilitation within rural and remote Australia

The first aim will be achieved through reviewing current published literature on accessibility and how accessibility to health services has been measured previously. Then the current continuum of care used for patients with coronary heart disease within Australia will be analysed to determine where patients face barriers to accessing cardiac rehabilitation services. The third aim of identifying the factors which affect the accessibility of patients to cardiac rehabilitation programs will be achieved by reviewing current published literature. The factors that affect the accessibility of patients to cardiac rehabilitation services will then form the basis of a series of questions which will be developed into a survey and given to each cardiac rehabilitation program within Australia. The fourth aim of developing a spatial model of accessibility to outpatient cardiac rehabilitation services will be achieved using the methods and technology of Spatial Information Science. The

spatial model will then use the information obtained through the survey on the accessibility of each cardiac rehabilitation program to describe the accessibility of outpatient cardiac rehabilitation within rural and remote Australia.

This research project will provide health service planners with new information on the accessibility of outpatient cardiac rehabilitation within rural and remote Australia. Output from this research will identify areas of low accessibility to cardiac rehabilitation services and therefore highlight where new programs or models of delivery should be established to enhance accessibility in areas that are currently poorly served.

### **1.3 Rural Health**

In recent years, population growth has been concentrated mostly around the largest cities and coastal communities, with population decline the hallmark of many small inland settlements and farming regions (Healy and McKee, 2004, p.90). Compounding the general ageing process resulting from fertility decline over than last fifty years, internal migration is contributing to a shift in age structure in both metropolitan and non-metropolitan Australia – and most notably to ageing in rural regions (Healy and McKee, 2004, p.90). Of all older Australians (65 years and older), approximately one-third (36%) reside in rural locations (Davis and Bartlett 2008, p.56). In fact, many rural and remote communities have higher proportions of older people than metropolitan centres (Davis and Bartlett 2008, p.56). At the same time that younger and higher income individuals migrate to major centres for education and lifestyle opportunities, many low-income households migrate to rural towns where costs are lower (Healy and McKee, 2004, p.90). Glover (1999) found that rural areas had higher proportions of single parent families and disabled people, together with a significant percentage of the population on very low incomes from paid employment. Increasingly, many small communities cannot sustain traditional health services at the local level, so consumers are required to travel to larger regional centres or depend on visiting services (Humphreys 2009, p.35). The rate of growth, patterns of migration, higher levels of health risk factors and of social and economic disadvantage all impact on rural healthy ageing (Davis and Bartlett 2008, p.56).



Rural communities are characterised by older populations which also affects the community's health status. The Australian Institute of Health and Welfare (2010) reported that people in rural and remote areas of Australia suffer a health differential that is skewed toward higher mortality and morbidity rates for some diseases, and increased incidence of certain diseases and rates of hospitalisation. Compared with their urban counterparts, rural and remote people experience poorer health as evidenced by higher mortality, lower life expectancy and an increase in incidence of some diseases (Eckert, Taylor, and Wilkinson 2004, p.426). As can be seen in figure 1.1 overall mortality rates increase with remoteness, for example, in 2004-2006, death rates in inner and outer regional areas were 1.1 times as high as in major cities, while the rates in very remote areas were 1.8 times as high. However, these differences are not consistent across rural and remote Australia, with higher rates in areas with a higher proportion of residents who are Indigenous or who have lower incomes, education and socioeconomic status (Bourke et al. 2010 p. 3). The greatest contributors to differences in mortality between remote areas and the capital cities are coronary heart disease, other circulatory disease and motor vehicle accidents (Gregory 2009, p.50).

For people who usually resided outside major cities, the cause of death with the highest death rate was ischaemic heart disease, with 144 deaths per 100,000 people (ABS 4102.0 - Australian Social Trends, Mar 2011). As table 1.1 shows although ischaemic heart disease was also the most common cause of death for people who resided in major cities, people outside major cities were 44% more likely to have died from this disease than those in major cities (ABS 4102.0 - Australian Social Trends, Mar 2011).

The Australian Institute of Health and Welfare (2008) highlighted that there are many reasons for generally poorer health in rural and remote areas, including the lower economic advantages of many rural communities (lower levels of education, income and employment), occupational risks from farming or mining work, greater levels of smoking and alcohol abuse, less access to health services and staff, and the hazards of driving over long road distances. Indigenous Australians are known to suffer many health disadvantages and they make up a considerably larger part of some

rural populations, especially the more remote communities (26%), than they do in the cities (1%) (Australian Institute of Health and Welfare 2010, p.246).

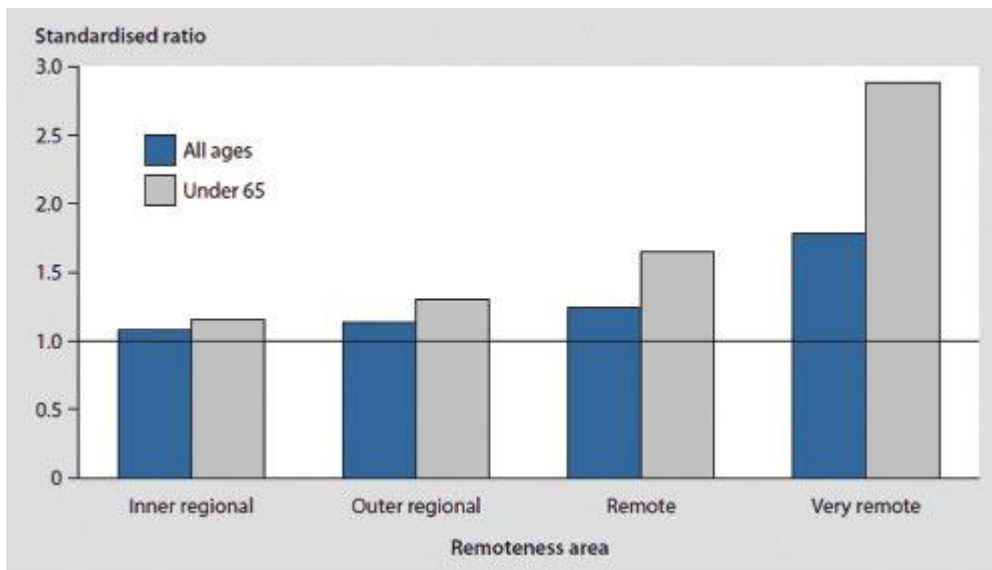


Figure 1.1 Mortality Ratios Compared with Major Cities, by Remoteness Area, 2004-06

Source: AIHW (2010), Australia's health 2010

As the need for health care services in the rural remote communities in Australia increases, many of these communities are experiencing a loss or rationalisation of health services. There are mining and resource towns growing at such a rate that development of the physical infrastructure has fallen behind: houses are in short supply and health services cannot cope and, at the other extreme is the long-term population loss in smaller towns in pastoral areas, exacerbated over the last several years by serious drought (Gregory 2009, p.51). Increasingly, many small communities cannot sustain traditional health services at the local level, so consumers are required to travel to larger regional centres, depend on visiting services, or alternatively, consumers forego care or present late, thereby contributing to their poorer health status (Humphreys 2009, p.35).

The centralisation of many health services within major regional centres has resulted in longer journeys for patients, together with increased costs in accessing health services, increased reliance on private and community transport providers for residents without private transport, and often major disruption to home life (Humphreys 2009, p.36). Transport disadvantage prevents

adequate or timely access to health services and can contribute to worsening health outcomes, particularly for groups such as the elderly, people with disabilities, low incomes and those living in isolated areas, including Aboriginal communities (Humphreys 2009, p.36). The cost of providing health services also increases with remoteness, while the availability of existing infrastructure and workforce become more limited (Hugo 2002, p.29). As Hugo (2002) states this has important implications for health, since not only does the demand for health services increase with age but also there is a change in the types of services required, with more emphasis on the treatment of chronic diseases.

<b>Cause of Death and ICD-10 Code</b>	<b>Death rate(c) per 100,000</b>	<b>Ratio to Major Cities (d)</b>
Ischaemic heart diseases (I20-I25)	143.6	1.44
Strokes (I60-I69)	68.2	1.31
Trachea and lung cancer (C33-C34)	48.7	1.36
Dementia and Alzheimer disease (F01-F03)	43.6	1.20
Chronic lower respiratory diseases (J40-J47)	40.8	1.59
Diabetes mellitus (E10-E14)	27.5	1.61
Heart failure (I50-I51)	22.2	1.70
Suicide (X60-X84, Y87.0)	13.6	1.66
Hypertensive diseases(e) (I10-I15)	12.8	1.90
Transport accidents (V01-V99, Y85)	11.7	3.08
<b>Total deaths</b>	<b>870.5</b>	<b>1.42</b>

(a) Top six leading causes of death for those usually residing outside Major Cities, plus other causes which were also a leading cause at the Australian population level and had a high outside Major Cities/Major Cities ratio. 'Transport accidents' is not a leading cause of death at the Australian population level but has been included due to the high outside Major Cities/Major Cities ratio.

(b) Causes of death data for 2008 are preliminary and subject to a revisions process.

(c) Crude death rate.

(d) Based on age standardised death rates. This ratio shows how many times more likely it was to have had a particular cause of death when living outside Major Cities compared with in Major Cities e.g. 1.44 times (44%) more likely.

(e) High blood pressure.

Table 1.1 Selected Causes of Death (a) Outside Major Cities - 2008(b) (Source: ABS 4102.0 Australian Social Trends March 2011)

## 1.4 Equity

Within Australia, all levels of government provide a range of health services which aim to meet a variety of purposes, covering the full spectrum from prevention to reduce the onset of disease to managing ill health within the community (ABS 4102.0 - Australian Social Trends, Mar 2011). The Australian healthcare system is complex, consisting of service providers of varying types that operate under a range of funding and regulatory mechanisms at the local, state and federal level. Service provision is often fragmented, with many services operating vertically or within "silos" (Savage et. al 2005, p.11).

Despite the billions of dollars that are spent on health services each year by all levels of government and non-government sources, many people report that they are unable to access the care they require (ABS 4102.0 - Australian Social Trends, Mar 2011). The recognition that health status and utilization of health services varied significantly depending upon one's income, race, and geographic location was an important factor in support for national health policies to expand health care programs for the poor and other vulnerable population groups in the 1960's and 1970's (Davis 1991, p.253). Health service use was seen as a function of the community and personal factors that enabled or impeded use of health services and need for care (Eckert, Taylor and Wilkinson 2004, p.426). During the 1990s, 'rural health' emerged as a significant concern warranting special attention by developed world governments (Smith et. al. 2008, p.56). Since then, models have focused on principles of social justice and equity of access whereby providing similar treatment for comparable levels of need (regardless of where one lives) is expected (Eckert, Taylor and Wilkinson 2004, p.426).

Aday and Anderson (1981) identified three assumptions that serve as a starting point for examining the ethics of equity: 1) Health care is a right; 2) The resources for allocating health care are finite; 3) Health policy should be concerned with the design of "just" mechanisms for allocating scarce health care resources. The "right to health" includes the constitutional and moral bases for this right in terms of equal protection, minimum welfare, and other "justice" criteria (Blackstone 1976, p.391). Equity of access to care is said to exist "when services are distributed on the basis of people's need for them... Inequity is suggested, however, if services are distributed on the basis of demographic variables, such as race, family income, or place of residence, rather than need"

(Aday and Anderson 1981, p.6). Mechanic (1976), states that in general "the right to health care" is concerned with ensuring that everyone has a right of access to services and that this right is an important normative goal of the health care system. In order to ensure equity of access to medical services, and to ensure that resources are used in the most cost effective manner, it is increasingly important to understand the influences affecting the utilization of health care services (Parker and Campbell 1998, p.192).

In countries with universal health care coverage, services are generally free at the point of delivery which is intended to provide equitable access to care for all residents regardless of their individual situations (Wellstood, Wilson and Eyles 2006, p.121). It is clear that access is most frequently viewed as a concept that somehow relates to consumers' ability or willingness to enter into the health care system (Penchansky and Thomas 1981, p.128). The need for such a concept derives from the repeated observation that entry into (or use of) the health care system cannot be fully explained by analyzing the health state of clients or even their general concerns with health care (Penchansky and Thomas 1981, p.128). Access to health care continues to be an important issue for health policy makers, researchers, service providers and consumers alike (Wellstood, Wilson and Eyles 2006, p.121).

'Patient choice' policies form part of a wider debate about the access to health care and the interaction between providers (including information, provision, performance and reputation) and patients (including knowledge, resources and willingness to travel) (Exworthy and Peckham 2006, p.267). Aday and Anderson (1981) state that the supply and demand principle of resource allocation emphasizes the consumer's free choice of preference among alternatives and the distribution of services on the basis of the unrestricted (*laissez faire*) operation of these forces. Exworthy and Peckham (2006) take this concept further by highlighting that the health service of 'choice' for patients might not necessarily be the 'local' provider, and that some patients will be willing to travel further which in turn, affect patients' access to services. In general, use of services decreases with distance but this is dependent on accessibility to services, the organization of those services, the socio-economic characteristics of the patient, perceptions of the provider and the condition for which they are to be treated (Exworthy and Peckham 2006, p.267). The exercise of choice by patients is mediated by knowledge, resources, family circumstances, residential location and the accessibility of alternative providers (Exworthy and Peckham, 2006, p.268). Exworthy and

Peckham (2006), noted that patient choice poses challenges in terms of balancing the quality and efficiency within a publicly funded health service, committed to equity. Patient choice raises, therefore, important questions about the way health care is accessed and delivered (Exworthy and Peckham 2006, p.270).

Medical economists argue that some "basic minimum" care should be assured by society; however, market forces should be freer to operate in allocating services beyond this minimum (Aday and Anderson 1981, p.8). However, the "science" of medicine has not been able to establish universally accepted criteria for what is the most appropriate care for any particular illness. Standards of the appropriateness of access for a given level of need are still in large measure judgmental (Aday and Anderson 1981, p.11). However, the National Healthcare Agreement has stated that all Australians should have timely access to quality health services based on their needs, not ability to pay, regardless of where they live in the country (ABS 4102.0, Mar 2011).

The vast distances separating small communities throughout rural Australia provide enormous challenges for authorities responsible for servicing population health needs as there are conflicts between ensuring operational efficiency and cost-minimisation, whilst maintaining effective and equitable delivery of accessible health services (Tham et. al. 2011, p.57). Australian governments responded to findings of poorer rural health status and evidence that mainstream health programs were failing to meet the needs of rural Australians by implementing a number of specifically 'rural' health policies and programs (Smith et. al. 2008, p.56). Undoubtedly, there is no "one-size-fits-all" solution to meeting the diverse health needs of rural Australian residents and the range of service models needed is likely to vary between communities (Tham et. al. 2011, p.57). As Field and Briggs (2001) suggest, the ability to identify and measure spatial variations in need, access and provision, and determine their effect on utilization is therefore vital to inform the decisions of individual service providers and to help plan a national service that reduces inequalities in health outcome. Accordingly, interventions need to be carefully targeted, based on a sound understanding of demographic, social, and economic trends, so that their impact on people and areas most in need can be maximized (Hugo 2002, p. 41). Hence it is necessary to investigate models of health service delivery to ensure equitable access to care and reduce the health differential between rural and metropolitan people (Tham et. al. 2011, p.57).

## 1.5 The Study Area

Australia has a large land area - approximately 7,692,030 km<sup>2</sup> and a population of 22,905,671 (ABS population clock accessed 1/1/2013). As can be seen in figure 1.2, population density varies greatly across Australia, ranging from very low in remote areas to very high in inner-city areas. As at June 2010, 68.7% of the population resided in Australia's major cities (ABS 3218.0 - Regional Population Growth, Australia, 2009-10). Many people in Australia live outside major cities for a variety of reasons, such as commercial opportunities, a preference for living in smaller communities, and because of the different lifestyle which may be found there.

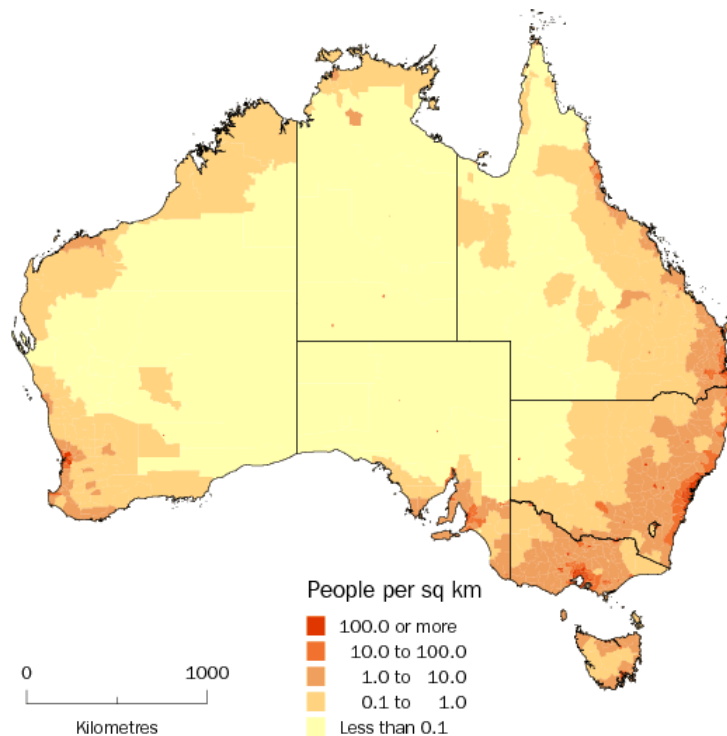


Figure 1.2 Population Densities by Statistical Local Area, June 2010.

(Source: ABS 3218.0 - Regional Population Growth, Australia, 2009-10)

Of particular importance to this research are the rural and remote regions of Australia as classified by the Australian Remoteness Index of Australia (ARIA) (please refer to figure 1.3). ARIA calculates remoteness as accessibility to some 201 service centres based on road distances and the values are grouped into five categories using 'natural breaks' in the 0 -12 continuous variable, where:

- Highly Accessible (ARIA score 0 - 1.84) -relatively unrestricted accessibility to a wide range of goods and services and opportunities for social interaction,
- Accessible (ARIA score >1.84 - 3.51) - some restrictions to accessibility of some goods, services and opportunities for social interaction,
- Moderately Accessible (ARIA score >3.51 -5.80) - significantly restricted accessibility of goods, services and opportunities for social interaction,
- Remote (ARIA score >5.80 - 9.08) - very restricted accessibility of goods, services and opportunities for social interaction,
- Very Remote (ARIA score >9.08 - 12) - very little accessibility of goods, services and opportunities for social interaction (Commonwealth Department of Health and Aged Care 2001, p. 3).

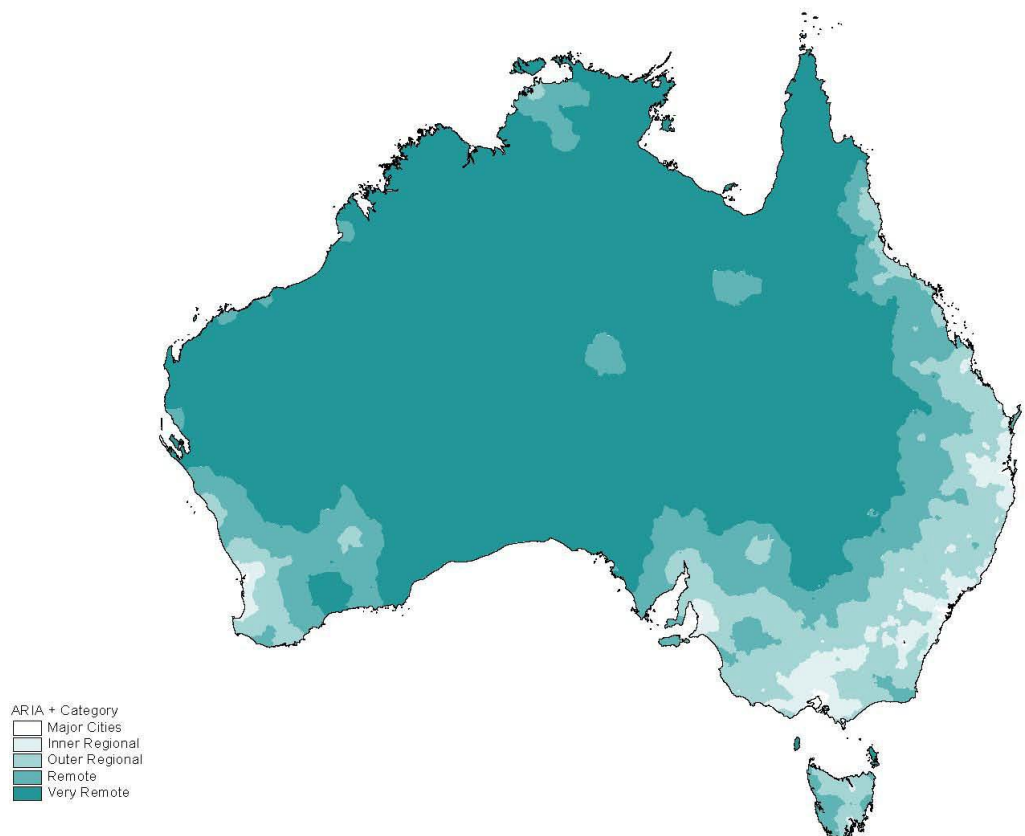


Figure 1.3 Accessibility Remoteness Index of Australia (ARIA +) (source: Glover and Tennant 2003, p.5).



The rural and remote regions of Australia are the focus for this research as the population live large distances away from major cities and services, and are generally not as healthy as their city counterparts. The Australian Institute of Health and Welfare (2010) state that there are many reasons for their generally poorer health, including the lower economic advantages of many rural communities (level of education, income and employment), occupational risks from farm or mining work, greater levels of smoking and alcohol abuse, less access to health services and staff, and the hazards of driving over long road distances.

The age structure of those living outside and in major cities within Australia is different. Figure 1.4 clearly shows that there are substantially less 20 to 44 year olds but significantly more 45 to 84 year olds outside of major cities in Australia. It has been estimated that life expectancy is up to four years lower outside major cities than it is in major cities (ABS 4102.0 - Australian Social Trends, Mar 2011). In 2008 it was calculated that the number of deaths for every 100,000 people who usually resided outside Major Cities was 42% higher than those who lived in Major Cities (ABS 4102.0 - Australian Social Trends, Mar 2011).

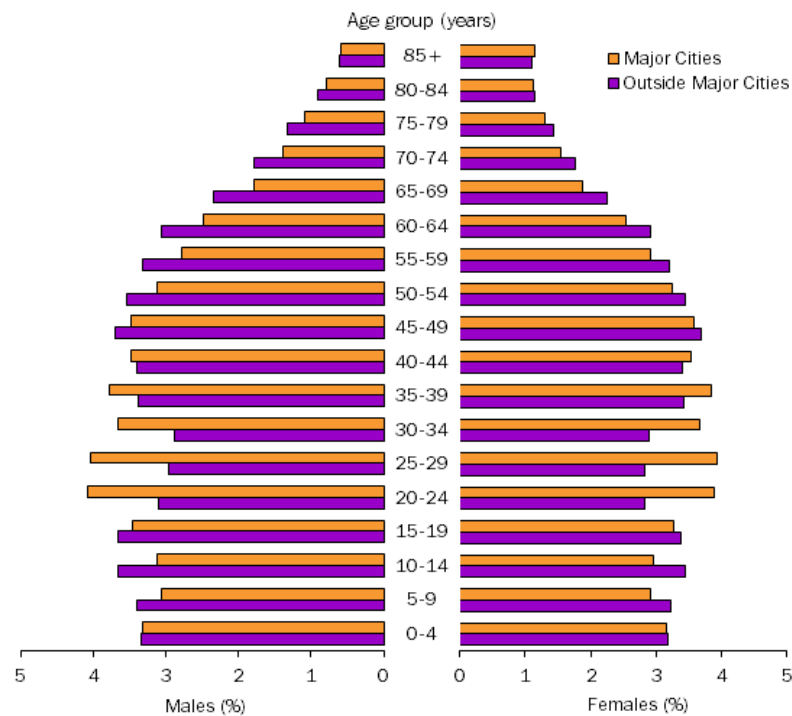


Figure 1.4 Age Distribution Outside and In Major Cities - 30 June 2009

(Source: ABS preliminary 2009 estimated resident population)

The rural and remote regions of Australia have also been selected for this research as the health care system in these regions can be influenced by common factors such as larger client capture areas, smaller population, fewer general and specialist medical professionals, and fewer health services overall (AIHW 2010, p. 251). People in these regions also have different patterns of service use as they make greater use of hospital emergency departments as a source of primary care than people in major cities which complicates the interpretation of data on health resources use and access to services in regional and remote areas (AIHW 2010, p. 251).

## **1.6 The Structure of the Thesis**

The dimensions of accessibility as characterised by Penchansky and Thomas (1981) underpin this thesis. Penchansky and Thomas's dimensions have been used to guide the exploration of the concept of accessibility and the development of the methodology that was undertaken to create a spatial model of accessibility to Phase 2 Cardiac Rehabilitation Programs. The spatial model along with data from individual Australian cardiac rehabilitation programs on their service delivery has then been interpreted through the spatial model to describe the accessibility of Phase 2 Cardiac Rehabilitation Programs within Australia.

Chapter 1 of this thesis has introduced the background to the research project and presented the aims and objectives of this research. This chapter has also introduced the rural and remote regions of Australia as the study area and highlighted why these regions are important to this research. The issue of health in the rural community within Australia and equity in relation to fair access for all to health services has also been discussed.

Chapter 2 investigates how accessibility is defined and highlights that accessibility is composed of inter-related geographic and socio-economic components. This chapter also discusses the use of Geographic Information Systems (GIS) in measuring access to health services has been introduced and more specifically, previous approaches to measuring accessibility to Cardiac Rehabilitation Services in Australia using GIS have been identified. The role of geographic distance in measuring accessibility to Phase 2 Cardiac Rehabilitation Programs is investigated. Data on patient attendance to South Australian Phase 2 Cardiac Rehabilitation Programs is

analysed to determine if accessibility can be measured using just geographic distance. This chapter highlights the need to further investigate the concept of accessibility beyond distance.

Chapter 3 presents the significance of cardiovascular disease in Australia and the heavy cost it imposes upon Australia's health system. Highlighted in this chapter is the effect of the aging population and the shifting burden of disease from an acute event (heart attack and stroke) to becoming more associated with periods of chronic disabling illness (notably heart failure).

Chapter 4 defines cardiac rehabilitation and the role it plays in reducing morbidity and mortality associated with coronary heart disease, as well as reducing the risk of recurrent cardiac events. This chapter also highlights the underutilization of cardiac rehabilitation programs within Australia due to issues of accessibility. The three phases of cardiac rehabilitation are defined, so that the point along the continuum of care for patients with coronary heart disease where accessibility becomes an issue can be identified.

Chapter 5 discusses the factors that affect accessibility to cardiac rehabilitation programs. Data obtained from the Cardiac Rehabilitation Accessibility Survey and from published literature highlight the need for incorporating both geographical and socio-economic aspects of accessibility when measuring accessibility to phase 2 cardiac rehabilitation programs.

Chapter 6 documents the development of the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs including its content, form, and the principles which guided its construction. Each of the model components are defined in this chapter and the model methodology is explained. This chapter also includes how the model was validated.

The accessibility of Phase 2 Cardiac Rehabilitation Programs to rural and remote population centres and to patients with coronary heart disease generally throughout Australia is discussed in the chapter 7. Results from the Cardiac ARIA model highlight the geographic accessibility to cardiac rehabilitation services within Australia. This chapter then discusses the geographic and

socio-economic accessibility of Phase 2 Cardiac Rehabilitation programs as shown through the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation.

Chapter 8 summarises the findings of this study and revisits the original aims and objectives. This chapter provides an overview of the research project and discusses the limitations of the study, and implications for policy and further research.

## **1.7 Conclusion**

The combined impact of fewer resources, poorer access to services, and limited availability of key health professionals, poorer health status, lower socioeconomic status, distance and travel mean that rural and remote communities and the health challenges they face are significantly different from those that confront metropolitan Australia. Health care planning, programs and service delivery models must be adapted to meet the widely differing health needs of rural communities and overcome the challenges of geographic spread, low population density, limited infrastructure and the significantly higher costs of rural and remote health care delivery.

The development of this spatial model of accessibility to cardiac rehabilitation will require an understanding of the continuum of care provided to patients with coronary heart disease, to identify where accessibility becomes an issue. The synthesis of published cardiac rehabilitation literature on the barriers to accessing cardiac rehabilitation, and the dimensions of accessibility is key to the development of the spatial model. Geographic Information Systems (GIS) is used to combine the theoretical framework of accessibility and knowledge of patient accessibility to cardiac rehabilitation into a practical methodology which can be applied in a real world.

Through the development of the spatial model of accessibility to Phase 2 Cardiac Rehabilitation Programs it will be possible to contribute to the global understanding of measuring accessibility, which has implications not only for decreasing the burden of coronary heart disease in Australia but

Internationally. The methodology developed to create the spatial model also has the potential to be applied to a range of other diseases such as diabetes, cancer, and mental illness to name but a few.

## Chapter 2: Defining Accessibility

### 2.1 Introduction

Accessibility is one of the most important concepts in regional science; it frequently comes into play in the evaluation and analysis of facility distributions, transport networks, travel behaviour, and so forth (Sadahiro 2005, p.63). The increasing utilization of Geographical Information Systems (GIS) in health research, together with the proliferation of spatially disaggregate data, has led to a number of studies that have been concerned with developing measures of access to health care services. Spatial accessibility measures are an important policy tool for managing health care provision and reducing health inequality (Langford and Higgs 2006, p.294).

While many think immediately of access in terms of geographical proximity and the ease with which distance can be transcended, access must be viewed more broadly to encompass that bundle of factors contributing directly or indirectly to meeting health needs (Healy and McKee, 2009, p.95). Access to care is often viewed simplistically as distance and availability, however, access masks quality of care, cultural security and the appropriateness of the model of care, type of service and needs of the local community (Bourke et al. 2010 p.3). Focusing solely on 'area-based' explanations and responses to rural health problems runs the risk of diverting attention from more fundamental social and structural processes operating in the broader context and misdirecting policy formulation and remedial effort (Smith, et. al., 2008 p.56). In reality, people trade off geographical and nongeographical factors in making decisions about health service use (Cromley and McLafferty 2002, p.243).

The health status of any place is a product of more than just location, as poorer outcomes for certain health conditions in many rural and remote populations are largely attributable to higher levels of socioeconomic disadvantage, ethnicity and poorer access to health services, compounded by higher levels of personal risk and more difficult environmental, occupational and transportation conditions (Smith et. al., 2008, p.59). Therefore to be able to build a spatial model of accessibility to Phase 2 Cardiac Rehabilitation Programs it is necessary to define what accessibility

is beyond measuring distance to services. This chapter discusses the inter-related geographic and socio-economic components of accessibility using health related examples from literature to highlight their importance to measuring accessibility comprehensively.

This chapter reviews different techniques for measuring accessibility to health services using Geographic Information Systems and examines previous approaches to measuring accessibility to cardiac rehabilitation services in Australia. This chapter also investigates the use of geographic distance in measuring accessibility to Phase 2 Cardiac Rehabilitation Programs. Patient attendance records for 5 closely located, Phase 2 Cardiac Rehabilitation Programs were analysed spatially to determine if accessibility can be measured using just geographic distance.

## **2.2 Defining Accessibility**

Access is an important concept in health policy and health services research. There have been a number of different definitions of accessibility proposed in the health services literature. To some authors "access" refers to entry into or use of the health care system, while to others it characterizes factors influencing entry or use (Penchansky and Thomas 1981, p.127). However the most commonly used definition is that described by Aday and Anderson (1981), who define access to health care as the interplay between providers of health care and patients, denoting the availability of services rather than their use. It describes the relationship between attributes of service need and the characteristics of service delivery systems (Cromley and Mc Lafferty 2002, p.239.). Any factor that limits his or her appropriate use of a service is an access-limiting factor (Rushton 1999, p.93).

Nasser, Benwell and Holt (2005) identify that there are two major dimensions of access, potential and realized, where potential accessibility is seen when a resident lives in place with a capable health care system, and realized access when all barriers and impediments to health care are removed. Gulliford et al. (2002) draw a distinction between "having access" to health care and "gaining access", the former may result from the availability of services, the latter refers to whether

individuals have the resources to overcome financial, organisational and socio-cultural barriers and utilise that service. Khan (1992, p. 275) refers to the “availability of that service moderated by space, or the distance variable”. This assumes that “given a maximum range for the service being offered at a facility and assuming that every member of the population is a potential user of the service, the pattern of physical accessibility will depend only on the relative location of the population and the service facilities” and therefore could be represented as travel time, road or map distance. However utilisation of services, or the actual entry into the system, is dependent on barriers and facilitators of both the service system and the potential users.

Penchansky and Thomas (1981) take the concept of accessibility as representing the degree of “fit” between the clients and the system, and break it into a series of dimensions—availability, accessibility, accommodation, affordability and acceptability. Aday and Andersen (1981) also have a wider definition of accessibility that goes beyond geographical or spatial accessibility as they also consider financial, informational and behavioural influences on accessibility. The World Health Organisation and UNICEF (1978) identified accessibility as being contingent on four interrelated components: geographic, financial, cultural, and functional accessibility. Where geographic accessibility examines the physical separation of population from a desired location, financial accessibility analyses the ability of a population to pay for the desired service, cultural accessibility as an appraisal of locations not only with respect to exclusion, but also in terms of personal perceptions of how to access the desired service, and functional accessibility as care being available on a continuing basis to those who need it whenever they need it, and is provided by the health team required for its proper delivery (Brabyn and Gower 2004, p.41). Health status and outcomes reflect a wide range of interrelated household, community, health system and government policy-related determinants operating at a variety of scales (Figure 2.1) (Smith et. al., 2008, p.60). Smith et. al.’s Conceptual Framework for Understanding Health Inequalities highlights that health system and related sectors are influenced by health system policies at macro and micro levels, health finance through public and private insurance, financing and coverage as well as community factors such as cultural norms and expectations, community organisations and social capital. Therefore access can be defined, as a collective of health care system and user-related aspatial (need for services, socio-cultural, psychological, financial and attitudinal) and spatial characteristics such as distance, architecture and transportation (Eckert, Taylor and Wilkinson, 2004 p.426).



Access is often categorized according to social and cultural factors, denoting the association between the socio-demographic characteristics of patients and of providers (Exworthy and Peckham 2006, p.269). Higgs (2004) feels that any study that investigates variations in

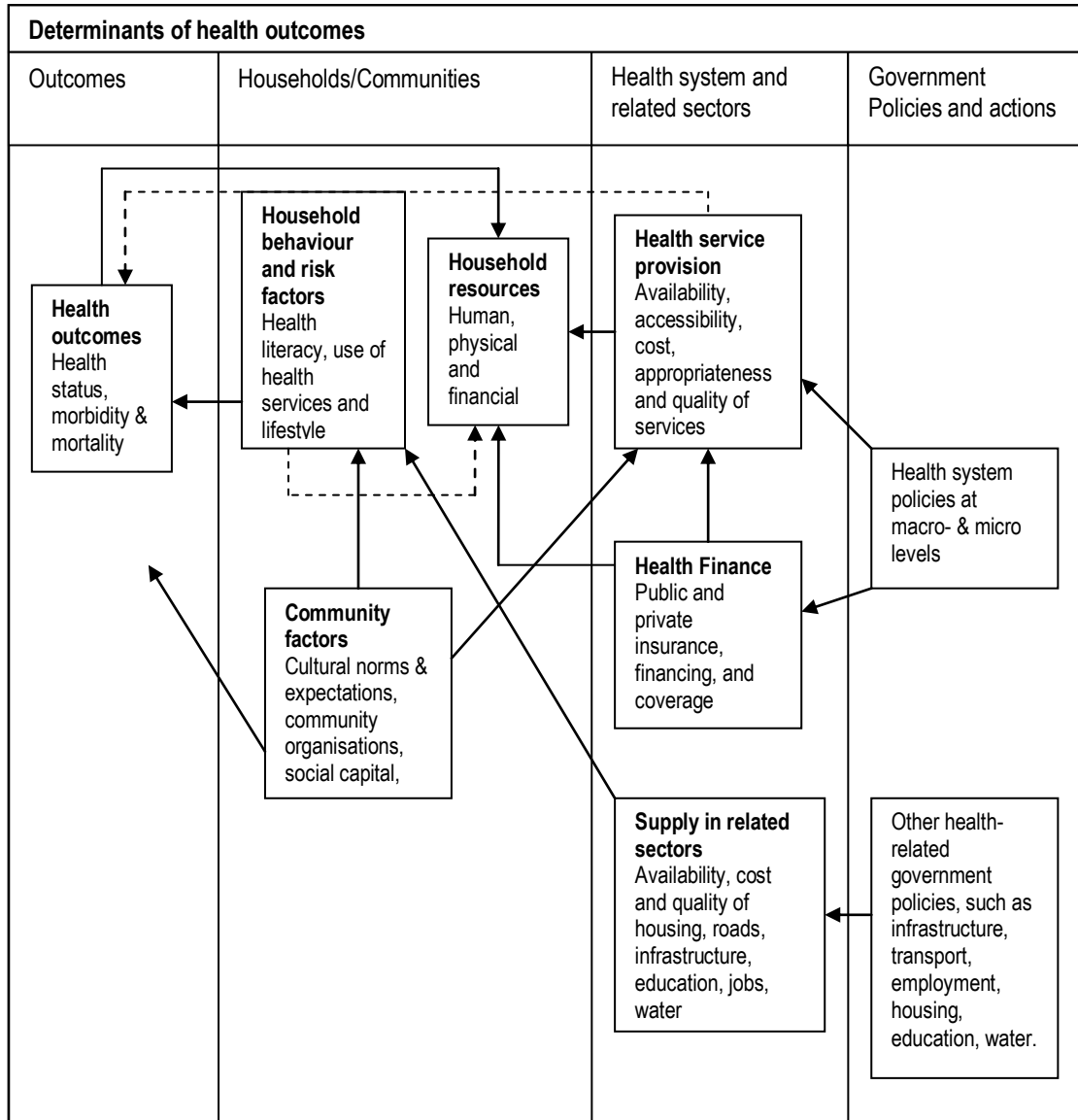


Figure 2.1 A Conceptual Framework for Understanding Health Inequalities (Smith et. al., 2008, p.60)

accessibility needs to examine issues surrounding ‘affordability’, ‘physical accessibility’, and ‘acceptability’ as “the availability of services, and barriers to access, have to be considered in the context of the differing perspectives, health needs and material and cultural settings of diverse groups in society”. As patient choice needs to be seen within a web of factors that influence

access to and use of health care services. Beliefs and expectations of different groups in different geographical and cultural settings will also influence such trends (Higgs 2004, p.121). The provision of choice and the likely increase in travel will influence access to health care, and patients (and their families and carers) will need to make trade-offs between these dimensions of access (Exworthy and Peckham 2006, p.270).

People's access to health services is rooted in their daily activity patterns in time and space (Cromley and Mc Lafferty 2002, p.234). Accessibility encompasses barriers linked to gender, culture, ethnicity, and sexual orientation that affect an individual's willingness to use particular health services and his or her sense of comfort and satisfaction in receiving services (Cromley and Mc Lafferty 2002, p.234). Services are acceptable if clients are well treated and satisfied, if providers and clients communicate openly, and if providers are confident about the quality of care delivered (Cromley and Mc Lafferty 2002, p.234). The dimensions of accessibility are not easily separated. In some settings accessibility may be closely tied to availability, however various service areas having equivalent availability may have different accessibility (Penchansky and Thomas 1981, p.129). Given the complexity and multi-dimensional nature of defining and measuring access, it is of no surprise that the concept remains unclear and yet access to appropriate health care is central to most health policy (Eckert, Taylor, and Wilkinson 2004, p.426).

### **2.3 Dimensions of Accessibility**

Rosenberg and Hanlon (1966) argue that the existence of health care within a geographic location is not enough to ensure access. Accessibility to health services is a social and economic issue that has many dimensions (Brabyn, and Gower 2004, p.41). People differ in their ability to overcome distance and in how locational constraints affect their service use (Cromley and McLafferty 2002, p.236). Travel for health care is strongly affected by demographic and socioeconomic characteristics such as income, occupation, age, and gender (Cromley and McLafferty 2002, p.236). Bashshur, Shannon, & Metzner (1971) found that people whose mobility is limited by low incomes, age, or poor access to transportation are more sensitive to distance, and thus more likely to use the nearest health care provider. Perceptions of place and location, and the meanings attached to them, vary through time and space (Kearns 1993, p.140). Therefore the

social and geographical dimensions of accessibility are closely intertwined. Location and distance have significant effects on people's willingness and ability to use services but these geographical effects vary in importance and meaning among places, populations, times and individuals (Cromley and Mc Lafferty 2002, p.237).

A range of factors interact to influence a patient's ability to access health care at any point in time. Therefore, a focus on distance or the simple provision of transport may reveal little about how patients view travelling for health care as one element of their decisions about the choices offered (Exworthy and Peckham 2006, p.277). Accessibility measures based on travel time, cost, or distance offer only a partial view of access to services, as in reality, people trade off geographical and nongeographical factors in making decisions about health service use (Cromley and McLafferty 2002, p.243). Cromley and McLafferty (2002) found that people are willing to travel further to obtain better (more "attractive") health care services. Attractiveness depends on price, quality of services, accommodation, cultural appropriateness, and a host of service-related factors (Cromley and McLafferty 2002, p.244). Different population groups typically evaluate service attractiveness differently, depending on the service characteristics and qualities that are most relevant to their own needs (Cromley and McLafferty 2002, p.244).

Thomas and Penchansky (1981) have defined the following 5 dimensions to describe accessibility:

1. Availability: the relationship between the volume and type of existing services (and resources) and the clients' volume and types of needs. It refers to the adequacy of the supply of physicians, dentists, and other providers or facilities, such as clinics and hospitals, and of specialized programs and services, such as mental health and emergency care.
2. Accessibility: the relationship between the location of supply and the location of clients, taking account of client transportation resources and travel time, distance and cost.
3. Accommodation: the relationship between the manner in which the supply resources are organized to accept clients (including appointment systems, hours of

operation, walk-in facilities, telephone services) and the clients' ability to accommodate these factors.

4. **Affordability:** the relationship between prices of services and providers' insurance or deposit requirements and the clients income, ability to pay, and existing health insurance. Client perception of worth relative to total cost may be a concern, as many clients' knowledge of prices, total cost, and possible credit arrangements.

5. **Acceptability:** the relationship, between clients' attitudes about personal and practice characteristics of existing providers including age, sex, location and type of facility or religious affiliation of provider or facility, as well as provider attitudes about acceptable personal characteristics of clients, including ethnicity and patient payment source.

The dimensions of accessibility described by Thomas and Penchansky (1984) are closely related and are not easily separated. The dimensions of availability and accessibility are spatial in nature, with availability referring to the number of local service points from which clients can choose and accessibility as travel impedance (distance or time) between patient location and service points (Guagliardo 2004, p.4). While the distinction between availability and accessibility can be useful, in the context of urban areas, where multiple service locations are common, the two dimensions should be considered simultaneously (Guagliardo 2004, p.4). The fusion of these two dimensions is often referred to as, 'spatial accessibility', a term that is common in the geography and social sciences literature and is gaining some favour in the health care geography literature (Guagliardo 2004, p.4).

### **2.3.1 Availability**

Penchansky and Thomas (1981) refer to availability as the relationship of the volume and type of existing services (and resources) to the clients' volume and types of needs. Availability can be seen as simply as a deficit in a residents' knowledge of what services are available and how to access them (Savage et. al 2005, p.11). However, Penchansky and Thomas (1984) found that the

doctor-to-population ratio, which should represent a clear measure of availability is not significant in predicting utilization.

Accessibility is an attribute of individuals, who create it through their daily activities and movements, with time, space, and individual activity patterns, being integral elements of these measures (Kwan and Weber 2003, p.350). They can also incorporate certain interpersonal differences that cannot be captured by conventional measures, even among those living in the same household (Kwan and Weber 2003, p.350). Space-time measures are built upon a conceptual foundation that corresponds more closely with theoretical expectations about urban form and human spatial behaviour in contemporary cities (Kwan and Weber 2003, p.350). Rather than being proximity-based, they can be thought of as context-based measures that incorporate both, the individuals' own activities and constraints as well as characteristics of the individual's urban environment (Kwan and Weber 2003, p.350).

Age and gender have been demonstrated to be important determinants of access to health care services, with women and older persons being associated with higher rates of health care utilization than males and younger age cohorts (Rosenberg and Hanlon 1996, p.981). Wellstood, Wilson and Eyles (2006) found that there are different barriers for men and women to accessing healthcare, with men most often discussing work responsibilities and females identifying family responsibilities as barriers. Overall, females appeared to experience more barriers (both system and individual) to accessing care (as measured by total number of mentions) (Wellstood, Wilson and Eyles 2006, p.126). Although women are more likely to have higher utilization rates than men for general practitioners, specialists and hospitals, Green and Pope (1999) revealed that higher utilization rates do not necessarily translate into greater access to health care services for women. Due to their lower levels of access to resources and greater demands placed on their time, especially for those who combine employment with domestic responsibilities, women may have a lower level of access to health care than men (Wellstood, Wilson, and Eyles 2006, p.122). Time availability has been found to be a key factor in accessing health care. Young (1999), found that both men and women, but in particular women, face increased time-constraints due to their responsibilities within the household such as taking care of dependent children, partners and elderly relatives, in addition to paid employment responsibilities which impacts an individual's ability to access care (Wellstood, Wilson and Eyles 2006, p.127).

While accessibility is often measured as space-time and is often measured as individuals' continuous trajectories or paths, in reality they are not random in space-time but are subject to a range of personal and social constraints, including the limits on mobility resulting from the available transport technology and the biological need for resting time (Kwan and Weber 2003, p.347). Kwan and Weber (2003) noted that facility opening hours and variable travel speeds at different times of the day and parts of the city are important to individual accessibility. Forer and Huisman (2000) found that time is an integral element of individual accessibility, both in terms of the amount of time available to individuals for carrying out travel and activities, and also to the scheduling of activities throughout the day.

Long waiting times were thought to act as a disincentive for positive health management for some residents (Savage 2005, p13). In an Isle of Wight study, Ryan, McIntosh, Dean and Old (2000) found that 22 per cent of respondents (mainly older people) had a 'dominant preference' for being treated on the island and for not incurring significant costs. Nearly half (48 per cent) preferred treatment on the mainland and shorter waiting times and 30 per cent were willing to trade between the island and mainland depending on waiting time and travel costs (Ryan, McIntosh, Dean and Old 2000, p.205). However, accessibility is often represented as a static, timeless view of mobility and accessibility, which denies the ways in which behaviour, activity patterns, and even population compositions varies by time of day (Kwan and Weber 2003, p.346). Factors such as business hours, traffic congestion, or changes in transit schedules at different hours of the day, can affect the availability of a service. By not taking these factors in to consideration it is possible to overestimate mobility and accessibility.

### **2.3.2 Acceptability**

The relationship between clients and providers is important in accessing health care. Acceptability is often used to refer to specific consumer reaction to such provider attributes as age, sex, ethnicity, type of facility, neighbourhood of facility, or religious affiliation of facility or provider

(Penchansky and Thomas 1981, p.129). In turn, providers have attitudes about the preferred attributes of clients or their financing mechanisms (Penchansky and Thomas 1981, p.129).

Some segments of the population travel further than others to obtain a site of care that they find acceptable. This behaviour is particularly observable with certain ethnic minorities and is related to income and education as well (Thomas and Penchansky 1984, p.). Le Maistre et al (2004) in the evaluation of a pilot programme for coronary heart disease (CHD) choice, found that 57 per cent of patients offered a choice of provider opted to go to an alternative (non-local) hospital. They found the main influences on making choices were the speed of treatment, reputation of the hospital and specialist, and convenience for family and friends (Le Maistre et al 2004, p.3) Given a limited local choice, more distant providers offer (a greater range of) 'more acceptable' services (Exworthy and Peckham 2006, p.272 ). Starmans, Leidl and Rhodes (1997) found that acceptability is a prerequisite to service utilization in more distant locations.

It is often assumed that patients prefer using the nearest health care facility, but service use is also influenced by historical patterns (such as familial links), work connections and perceived quality of care (including waiting times) (Jones and Moon 1987, p.236). Patient preferences are also influenced by the anticipated and actual impact upon social and familial networks. Payne et al. (2000) considered a trade-off between less favourable clinical outcomes in cancer care (associated with a 'local' provider) and the lower level of social support (if the patient travelled further to the provider). Payne et al (2000) found that family and social support had a protective effect for women but not for men, and travel and distance were potential stressors in terms of psychological adjustment or as a barrier to seeking appropriate care. Payne et al (2001) also compared cancer patients who travelled from Guernsey to Southampton with those patients who lived in Southampton. They found that 'counter-intuitively' Guernsey patients perceived themselves to have better social support' because of the denser social networks and/or 'the disruption of leaving the island might have elicited more explicit expression of social support (Payne et al 2001, p.201). They found that absolute distance was not the sole determining factor; the mode of travel (in terms of public or private transport and comfort, flexibility and cost) was also important (Payne et al 2001, p.203). Stewart and Donaldson (1991) tested the 'feasibility' and acceptability of offering the opportunity to travel further afield in order to receive earlier treatment for routine surgical operations and found that 74 per cent of patients accepted the offer to undergo earlier treatments

outside their local health district. Burge et al. (2005) found that for every additional hour of travel, on average, patients would require a reduction in waiting time of 2.1 months to take up the offer of an alternative hospital. The provision of choice and the likely increase in travel will influence access to health care as patients (and their families and carers) will need to make trade-offs between these dimensions of access (Exworthy and Peckham 2006, p.270).

Patient satisfaction with a health service has been viewed by Penchansky and Thomas (1984) as influencing the accessibility of a health service. Ware et al. (1978) have defined eight dimensions of patient satisfaction: art of care (encompassing personal qualities), technical quality of care (relating to provider professional competence), accessibility / convenience, finances, physical environment, availability, continuity and efficacy / outcomes of care. These dimensions of patient satisfaction highlight that patient acceptability, is a function of attitudes, beliefs, and experiences, and that these in turn are likely to be influenced by patient age, employment status, and other demographic characteristics (Thomas and Penchansky 1984, p.130). More frequently, however, satisfaction is treated as a factor in patients' decisions to use services, with dissatisfied patients expected to utilize less (Thomas and Penchansky 1984, p.130). "Actual" access characteristics, such as availability of services, travel distance to care, and costs of care, are considered to relate to patient utilization behaviour through the medium of satisfaction (Thomas and Penchansky 1984, p.130). Dissatisfied patients are assumed to use fewer services, and the degree to which dissatisfaction influences behaviour is assumed to depend upon the salience or importance of that dimension to the patient (Thomas and Penchansky 1984, p.130).

Acceptability of a service does not occur in isolation from other factors of accessibility.

Penchansky and Thomas (1981) found that the following factors influence satisfaction: travel time is a strong predictor of satisfaction with accessibility; time to get an appointment is predictive of satisfaction with accommodation; and a longer relationship with the physician implies greater satisfaction with availability and acceptability. They also found that having to wait longer in the physician's office negatively influences satisfaction with availability and accommodation, while travel time and waiting time in the physician's office, together representing opportunity cost of a visit, were shown to influence satisfaction with affordability (Penchansky and Thomas 1981, p.138). People with high health concerns, those who think about their health more than most other people, are shown to be less satisfied than other respondents with the accommodation dimension of



access. Therefore, accommodation relates to the "customer service" aspect of access - getting appointments, waiting in the office, telephone consultations - and persons with high health concerns are likely to be more sensitive than others to these factors (Penchansky and Thomas 1981, p.139).

### **2.3.3 Affordability**

Affordability has a major impact on the ability of people to access services. Affordability can be seen as, the relationship of prices of services and providers' insurance or deposit requirements to the clients' income, ability to pay, and existing health insurance (Penchansky and Thomas 1981, p.128) This includes the client's perception of worth relative to total cost and the clients' knowledge of prices, total cost and possible credit arrangements. Savage (2005) also identified that in addition to the actual cost of the service, the cost of transport may prevent some residents from accessing services. Many rural and remote communities lack sufficient people to sustain a local service, so residents are required to seek health care from other major towns and cities. The distances they must travel to access and obtain health care places heavy cost burdens on consumers of health care services and for many people the time and costs involved in such travel are a major barriers to health care (Humphreys and Dixon 2004, p. 97).

Income is often identified as the main determinant of access with the link between access and income being most strong in countries that lack universal health coverage and those that rely more on private insurance (Wellstood, Wilson and Eyles 2006, p.122). Higher affordability, from higher income, more health insurance, or lower prices, has consistently been shown to be related to higher use of services, specialists, dental care and drugs. The increased use of medical services by the poor since the passage of Medicaid seems a clear reflection of improved affordability (Thomas and Penchansky 1984, p.129).

### **2.3.4 Physical Accessibility**

Penchansky and Thomas (1981) describe physical accessibility as the relationship between the location of supply and the location of clients, taking account of client transportation resources and

travel time, distance and cost. However, physical accessibility can also be the lack of a physical presence of some services (Savage 2005, p.13).

A common measure of geographic access is the distance from a client to a facility (Rushton 1999, p.95). Inherent in any assessment of geographical access is a measure of distance that represents the geographical separation, in distance, time or cost, between people and services (Cromley and Mc Lafferty 2002, p.241). Phibbs and Luft (1995) argue that studies of hospital demand and choice of hospital have often adopted a 'straight line distance' from the patient's home to hospitals in order to measure access but this may not reflect travel time. However, Damiani et. al. (2005) found that 'very high' correlations allowed the inference that straight line distance was indeed a reasonable proxy for travel time in most hospital demand or choice models but that travel time is only one measure of accessibility. Although distance is a fundamental indicator of geographical access, travel time, cost, transportation access, and perceived distance are often much more relevant to health care utilization (Cromley and Mc Lafferty 2002, p.242).

Bashshur et al. (1971) suggests that distance to a source of care affects frequency of use, with increased distance usually reducing use of services. Starman et al. (1997) summarized this 'distance-decay' model: An increase in the travel distance between the hospital and a patient's residence is expected to lower hospital utilization. The distance-decay model varies according to patient characteristics (including age, gender, ethnicity, socio-economic status), service organisation (notably existing provision) and disease/illness condition (both the condition and its severity) (Exworthy and Peckham 2006, p.275).

The relationship between distance and use is complex. Lovett et. al. (2000) state that it is not distance per se, but rather time and cost of travel and access to reliable (private or public) transport that are more likely to be critical factors in shaping "willingness to travel". Travel time is often used as a proxy for distance as costs can be inferred from both and 'because this perspective is more relevant for patients' (Damiani et al. 2005, p.284). Travel times provide a better indication of geographical barriers to health services than does travel distance, since by definition travel times incorporate access to transportation (Cromley and Mc Lafferty 2002, p.242).

Measuring physical accessibility as a single distance between the client home and the service is not always appropriate, as it denies the existence of considerable amounts of multi-stop trips over the course of the day, and a person may spend considerable time away from home or the workplace (Kwan and Weber 2003, p.344). Therefore the length of the commute is not just the distance between home and the service because of these multi-purpose trip chains. By not taking into account the trip (trip chaining), conventional accessibility measures may be underestimating an individual's accessibility (Kwan and Weber 2003, p. 344).

There are also a number of factors which prompt individuals to shun local providers and/or which attract them to more distant ones. Exworthy and Peckham (2006) have identified the following factors that shape a persons willingness to travel (WTT):

- Type of care (with specialist care associated with greater WTT);
- Reputation of hospital/surgeon (a good reputation increases WTT especially among higher-income groups);
- Urgent or serious condition (more urgent cases associated with greater WTT);
- Frequency (frequent users of services may exhibit lower WTT);
- Gender (men exhibit greater WTT than women);
- Age (older people, especially over 60 years of age, are associated with lower WTT);
- Socio-economic status (high status, especially income, is associated with greater WTT);
- Responsibilities (parents or guardians of an under-18-year-old are associated with lower WTT);
- Ethnicity (the association is weak, but lower WTT is associated with some minority ethnic groups);
- Geography (there is limited comparative evidence regarding WTT in rural and urban areas evidence is mainly drawn from urban areas)

(Exworthy and Peckham 2006, p.279)

Therefore patients must overcome difficulties in travel and the friction of distance to access acceptable services. It is not simply travel distance but travel time, costs, social dislocation and spatial perceptions which influence accessibility.

### **2.3.5 Accommodation**

Penchansky and Thomas (1981) describe accommodation as the relationship between the manner in which the supply resources are organized to accept clients (including appointment systems, hours of operation, walk-in facilities, and telephone services) and the clients' ability to accommodate to these factors and the clients' perception of their appropriateness. Variations in access are presumed to influence not only patient satisfaction, but service utilization and provider practice patterns as well (Penchansky and Thomas 1981, p. 139). Service utilization and patient satisfaction are interrelated; system characteristics that affect patient satisfaction negatively may also reduce utilization, either directly or through the mechanism of satisfaction (Penchansky and Thomas 1981, p. 139). The balance between 'push' (repelling patients from using local services) and 'pull' (attracting them to distant ones) factors might include the quality of premises and of provision (in terms of waiting time, reputation, performance indicators, etc.) (Exworthy and Peckham 2006, p.276).

System barriers have just as much effect on accessibility to health care services as individual barriers. Wellstood et. al. (2006) state that there is limited research to identify other key system barriers that play a role in shaping access to primary health care services, such as waiting times, geographic location and hours of operation. However research has identified characteristics of individuals as being important determinants of access to health care services, such as age, gender, and health status (i.e., need) and the inconclusive role that income plays (Wellstood et. al. 2006, p.123). Wellstood et. al. (2006) noted that the most frequently mentioned system barrier to primary care was waiting times in the doctor's office followed by the geographic location of doctors' offices, in particular the location of doctors' offices relative to respondents' residences which makes it difficult to travel for appointments, especially for those who lack private transportation. They found that, the third most frequently mentioned barrier to receiving care was limited hours of operation at family doctors' offices (Wellstood, Wilson, and Eyles 2006, p.125).

A range of factors interact to influence patient's willingness to travel at any point in time (Exworthy and Peckham 2006, p.277). Therefore a focus on distance or the simple provision of transport may

reveal little about how patients view travelling for health care as one element of their decisions about the choices offered (Exworthy and Peckham 2006, p.277).

## **2.4 The Use of Geographic Information Systems in Measuring Access to Health Services**

A number of different methods exist to evaluate access, each potentially providing a somewhat different perspective (Rushton 1999, p.93). Traditional approaches to measuring geographical barriers to health services have been based on potential and realized accessibility measures (Langford and Higgs 2006, p.294). In the former, health provision measures are examined in relation to demand among those potentially accessing the service; that is, they are primarily concerned with opportunities available to residents within administrative areas generally (Langford and Higgs 2006, p.294). In the latter approach, researchers draw on utilization data (e.g., postcoded patient lists, referral and/or attendance records, actual travel behaviour) that permit measures of accessibility to be directly calculated (Langford and Higgs 2006, p.294). Khan (1992) has reviewed the approaches taken to calculating potential access measures in a health context, and acknowledges the dichotomy between potential and realised (revealed) and spatial and aspatial measures. The most basic measures compare the supply of facilities (e.g., numbers of general practitioners, dentists, pharmacists, etc.) with the potential demand for such services (based on aggregates of population) in a defined area (Higgs 2004, p.123).

Accessibility has traditionally been conceptualized as the proximity of one location (whether zone or point) to other specified locations (Kwan and Weber 2003, p.341). Analytical methods for evaluating accessibility have been based on a spatial logic through which the impedance of distance shapes mobility and urban form through processes of locational and travel decision making (Kwan and Weber 2003, p.341). As a result, traditional models of urban form and accessibility are based upon a similar conceptual foundation and spatial logic, and the relationships between models of urban form and conceptualizations of accessibility are inextricably intertwined (Kwan and Weber 2003, p.341). There is inherently a spatial component, which should be considered when analyzing health needs and patient behaviour (Parker and Campbell 1998, p.183).

Geographic Information Systems (GIS) have been used extensively in the health sector for a couple of decades to examine spatial patterns of disease. Changes in GIS-based accessibility measures can also be used to monitor the impacts of health sector reforms, as GIS has great potential to identify those communities that have inadequate access to health care and where such interventions could be targeted to improve access (Higgs 2004, p.128). It has also been used to examine spatial patterns of health services and in planning the location of new health facilities (Higgs 2004, p.125). Typically these studies involve the use of standard GIS functionality such as buffering (e.g., generating catchments at physical or travel time distances away from doctors surgeries or hospitals), overlay analysis (e.g., examining the location of patients in relation to such areas) and network analysis (using characteristics of a network such as travel speeds or public transport availability to gauge how long it takes patients to access a facility) (Higgs 2004, p.125). GIS can be used to integrate spatial and nonspatial attribute information in one system and examine the relationship between them (Wang and Luo 2005, p.145). Through user-defined criteria spatial data can be manipulated, to analyse the spatial relationship and conduct complex computational tasks related to spatial data (Wang and Luo 2005, p.145).

Health provision is often examined in relation to demand from those potentially trying to access the service; that is, they are primarily concerned with opportunities available to residents within administrative areas generally (Langford and Higgs 2006, p.294). In the absence of detailed patient-level information potential measures of access based on either straight-line or travel-time distances between health services and demand points have been utilised, to identify areas where provision is poor and where additional health facilities are needed to improve levels of access (Langford and Higgs 2006, p.295).

There are two basic steps involved in measuring an individual's actual accessibility and availability to health care services using a GIS: the first step (geocoding) involves determining the spatial locations of subjects and all relevant health care providers from their physical addresses; the second step (cost of space) involves determining the distance or time individuals must travel to visit relevant health care providers (Fortney, Rost and Warren 2000, p.174). Different methods can be used to both geocode locations and to calculate the cost of space (Fortney, Rost and Warren 2000, p.175). Distance computations always are estimates and vary greatly in their accuracy whether

they are sufficiently accurate always will depend on their fitness for the purpose for which they are used (Rushton 1999, p.99). A limitation of such studies is that measures tend to be calculated from demand points based on where patients reside (typically derived from their residential postcode) and not from where they work (Higgs 2004, p.125). However, the use of GIS network analysis functions and the availability of national data sets is making it possible to model physical accessibility more accurately than was practically possible in the past (Brabyn and Gower 2004, p.48).

The most primitive form of accessibility is given as a function of an origin, a destination, a departure time, a transport mode, and an individual (Sadahiro 2005, p.63). Using these variables, it is possible to define accessibility by the time required for the individual who starts at the departure time from the origin - to the destination (Sadahiro 2005, p.63). Many other representations of accessibility are defined as simplified or aggregated forms of this primitive definition. Distances are often known as network distances or shortest path distances and are generally computed between nodes on a network (Rushton 1999, p.95). The mean travel time between two locations (a definition of accessibility in an aggregated form) is calculated by averaging travel time over a certain time period for all the available modes (Sadahiro 2005, p.63). Given a location (origin), we sum up the utility of choosing a destination across all the possible alternatives in order to obtain the logsum measure, which is often used in transportation and location planning to evaluate accessibility as a function of location (Sadahiro 2005, p.63). For instance, if we choose only the origin and destination as variables, we may define accessibility by the Euclidean distance between two locations (Sadahiro 2005, p.63).

While the representation of distance using euclidean distance is straightforward, it is also not very accurate for most intra-urban applications in which movement is confined to street networks (Kwan and Weber 2003, p.345). Further, few studies have considered the multi-modal characteristics of actual travel and trip making (e.g. one needs to walk to the car or to a transit stations); while variations of travel speed among various parts of a city, road segments and times of the day are only beginning to be addressed in recent research (Kwan and Weber 2003, p.345).

In the health services research literature, rural-urban residence and provider-to-population ratios have been the most commonly used proxies for geographic access (Fortney, Rost and Warren 2000, p.174). The use of density or ratio mapping to represent accessibility is based on simple mathematical ratios of population divided by the number of services and is helpful for indentifying baselines for analysis of inter-regional differences (Brabyn and Gower 2004, p.43). Personnel and facility-to-population ratios, are useful in exploring the operation of supply and demand factors (Aday and Anderson 1981, p.9). However, such measures are limited because they assume that there is no cross boundary flow of people accessing facilities in adjoining areas (Higgs 2004, p.123).

The density or ratio mapping technique fails to describe patterns of variance found within the regional boundary and, consequently, has a smoothing and generalizing effect (Brabyn and Gower 2004, p.43). In other words, because people live in different locations within the area of aggregation (e.g., county), there will necessarily be unmeasured variation in geographic access to providers that will attenuate the strength of the observed relationship between geographic access and service utilization (Fortney, Rost and Warren 2000, p.174). One way to overcome the unmeasured spatial variation within the area of aggregation is to use smaller geographic units, however this increases the problem of border crossing. The border crossing problem occurs when individuals have poor access to services within their geographic area, but have excellent geographic access to services in adjacent areas (Fortney, Rost and Warren 2000, p.174). Therefore at different levels of spatial aggregation (e.g., census tract, zip code, county or state), there is a trade-off between the degree of unmeasured variation in geographic access within the area of aggregation and the amount of travel across the boundaries of the areal unit (Fortney, Rost and Warren 2000, p.174).

The use of allocation models enables elements of functional accessibility to be considered by using a capacity constraint (Brabyn and Gower 2004, p.46). The allocation model has advantages over the ratio method and straight least-cost-path analysis and should be the preferred approach (Brabyn and Gower 2004, p.47). One such advantage is that of including supply and demand factors that can have major impacts on the functional accessibility (Brabyn and Gower 2004, p.47). A disadvantage of the allocation model is the added complexity of the process and the consequent increase in computation time (Brabyn and Gower 2004, p.47). Area based measures are also



dependent on the exact nature of the areal unit which, in the case of relatively coarse administrative areas, may hide significant intra-zonal variations in accessibility (Higgs 2004, p.126). Nevertheless, such measures can provide a useful exploratory tool to identify areas where there are gaps in provision prior to more detailed qualitative studies (Higgs 2004, p.126).

The least-cost path algorithm can be used to determine the shortest distance, via a road network, from an origin point to a destination service (Brabyn and Gower 2004, p.44). If the road network also contains travel time information, then the travel time to the closest service can also be determined (Brabyn and Gower 2004, p.44). Results from least-cost path methods are advantageous because they are easy for a general audience to understand and interpret, as values can be expressed as time or distance impedance values to access (Brabyn and Gower 2004, p.44). The average travel time can also be misleading because it does not consider the population affected by this time, as a region may have a high average travel time but a low population (Brabyn and Gower 2004, p.45).

The allocation model is a variation on least-cost path but includes the capacity of the service (supply) and the number people to be served (demand). The model allocates potential patients to the closest service until the service reaches a specified capacity; it then finds the next closest service. Once a patient population has been allocated a service, the network travel time and distance are calculated. The allocation model is an improvement on the least-cost-path analysis model because it considers both the supply capacity of services and the demand of the population. The allocation method adds an extra degree of complexity to the model compared to just the least-cost-path analysis, but this complexity may misrepresent human choice in particular circumstances (Brabyn and Gower 2004, p.47). The sensitivity of these measures to the spatial resolution of the unit under consideration, and the implications of varying such service area boundaries when examining the potential availability of health care, has long been recognised (Higgs 2004, p.123). Another limitation of physician- to- population measures is that they assume all consumers have equal access to such facilities independent of where they live in the census tract or their personal circumstances (Higgs 2004, p.123). Thus they do not account for the role of distance for example or of a 'distance-decay' effect on utilisation patterns (Higgs 2004, p.123). This has led others to propose measures that use probabilistic techniques which take into account overlapping areal units in order to 'allocate' the supply of health services in relation to the time patients spend travelling to

access such services (Higgs 2004, p.123). GIS can be used to measure travel times under different transport or network scenarios and are therefore increasingly being used in more advanced applications, where suitable data sources are available, in order to examine spatial and temporal variations in accessibility (Higgs 2004, p.123).

A number of recent studies have proposed alternatives to area-based physician-to-population measures to try to overcome the limitations of this method to measure accessibility. For example, the use of circles of varying radii (calculated by using GIS to buffer an arbitrary distance or travel time based on assumed utilisation behaviour) placed at the (population-weighted) centroid of a census tract and counts the number of physicians within the circles in order to calculate a physician-to-population ratio for each tract (Higgs 2004, p.123). These floating catchment area (FCA) methods, it is argued, overcome the assumption regarding cross-boundary flows by extending the radius of the circle outside the immediate census zone but, in the absence of detailed information on individual addresses (or the socio-economic characteristics of people accessing such services), are still limited by assuming equal access within the catchment (Higgs 2004, p.124).

Gravity models belong to a more general class of spatial interaction models, tools for modelling interactions between places (Cromley and Mc Lafferty 2002, p.244). The widely used gravity model and potential model offer a method for modelling these trade-offs in defining service access (Cromley and Mc Lafferty 2002, p.243). The gravity model is based on an analogy with Newtonian physics in which the interaction between places is directly related to their relative sizes or attractiveness, and inversely proportional to the distance between them (Cromley and Mc Lafferty 2002, p.243). Gravity-based and cumulative-opportunity measures, are helpful for identifying changes in the accessibility of different locations (place accessibility) and the effect of competition on access to urban opportunities (Kwan and Weber, 2003, p.342).

Modelling accessibility applied to health care has been an area of on-going research. The majority of studies to date have used GIS to measure potential accessibility to both primary and secondary health services in order to examine spatial inequalities in health care delivery (Higgs 2004, p.125). There have also been a number of studies that have taken an area-based approach to measuring

accessibility using GIS including some that have incorporated access to health services as a key domain in an overall index summarised for areas, usually census or administrative tracts (Higgs 2004, p.125). Analytical methods for evaluating accessibility have been based on a single logic through which the impedance of distance shapes mobility and urban form through processes of locational and travel decision making (Kwan and Weber 2003, p.341). Previous studies on the role of spatial factors have examined the impacts of 3 broad sets of factors on overall accessibility; (a) the spatial configuration and characteristics of the health delivery system along with a broad range of quality measures associated with particular services; (b) the role of the transport system in getting individuals to these destinations, including the respective importance of private and public transport in different socio-cultural contexts and (c) the characteristics of individuals utilising health services or, more commonly, the characteristics of the areas in which they reside based on relevant census data (Higgs 2004, p.122).

## **2.5 Previous Approaches to Measuring Accessibility to Cardiac Rehabilitation Services in Australia using Geographic Information Systems.**

In 2007 the National Health and Medical Research Council produced a report on the accessibility of cardiac rehabilitation programs for Aboriginal and Torres Strait Islanders. Each Cardiac Rehabilitation Program was given a score in terms of remoteness using the Accessibility and Remoteness Index of Australia (ARIA++) and information on each program was collected via a survey. The report was published with a practical guide which provides advice and tools for each stage of cardiac rehabilitation, from diagnosis of heart disease to secondary prevention and self-management, and an interactive geographic information system that can help to locate the best services for Indigenous patients with heart disease. The interactive GIS was designed as a resource for primary health care providers and cardiac rehabilitation services by, providing a tool to locate services and understand the distribution of cardiac illness in local areas (National Health and Medical Research Council, 2007 p.1). The information was also intended to be used by those involved in planning and developing cardiac rehabilitation service systems as it offers a means of considering the spatial distribution of services (cardiac rehabilitation and primary / community health) in the context of population distribution.

The National Health and Medical Research Council 's Cardiac Rehabilitation Geographic Information System for Aboriginal and Torres Strait Islander Peoples revealed that the number of cardiac rehabilitation programs declines as areas become more remote (National Health and Medical Research Council 2007, p. 13). Further, the number of services per 100,000 Aboriginal and Torres Strait Islander population's declines quite rapidly outside major regional centres (Health and Medical Research Council 2007, p. 13). The Health and Medical Research Council (2007) also found that 21% of the Aboriginal and Torres Strait Islander population lived in postal areas that are more than 100 kilometres from the nearest cardiac rehabilitation service. However, while the National Health and Medical Research Council's Cardiac Rehabilitation Geographic Information System is a useful tool for locating a cardiac rehabilitation service and calculating its remoteness through the use of ARIA++ it does not include the socio-economic aspects of accessibility that can greatly affect a patient's access to such a service.

More recently an accessibility model to cardiac services in Australia was developed by Clark et. al. (2010). The Cardiac ARIA Index contains a return to community (aftercare) component which is based on the translation of the guidelines for secondary prevention to health services and resources. The aftercare index includes the minimal services required for a patient after a cardiac event (access to a general practitioner for monitoring and on-going management; a pharmacy for supply and to support the routine cardiac medication regime, access to a cardiac rehabilitation and secondary prevention program with cardiologist follow-up). The index is based on a 60 minute road travel time with urban road speeds at 40kph, non-urban road speeds at 80kph, and off-road speeds at 50kph to:

- Aftercare medical facilities (hospital, remote area clinic or GP)
- Cardiac rehabilitation programs
- Pathology laboratories
- Retail pharmacies

As can be seen in figure 2.2 different orders of priority were set for each of the facilities in the model. The output from the four calculations (time to community based services) were used to produce the Aftercare Cardiac ARIA Index (Table 2.1).

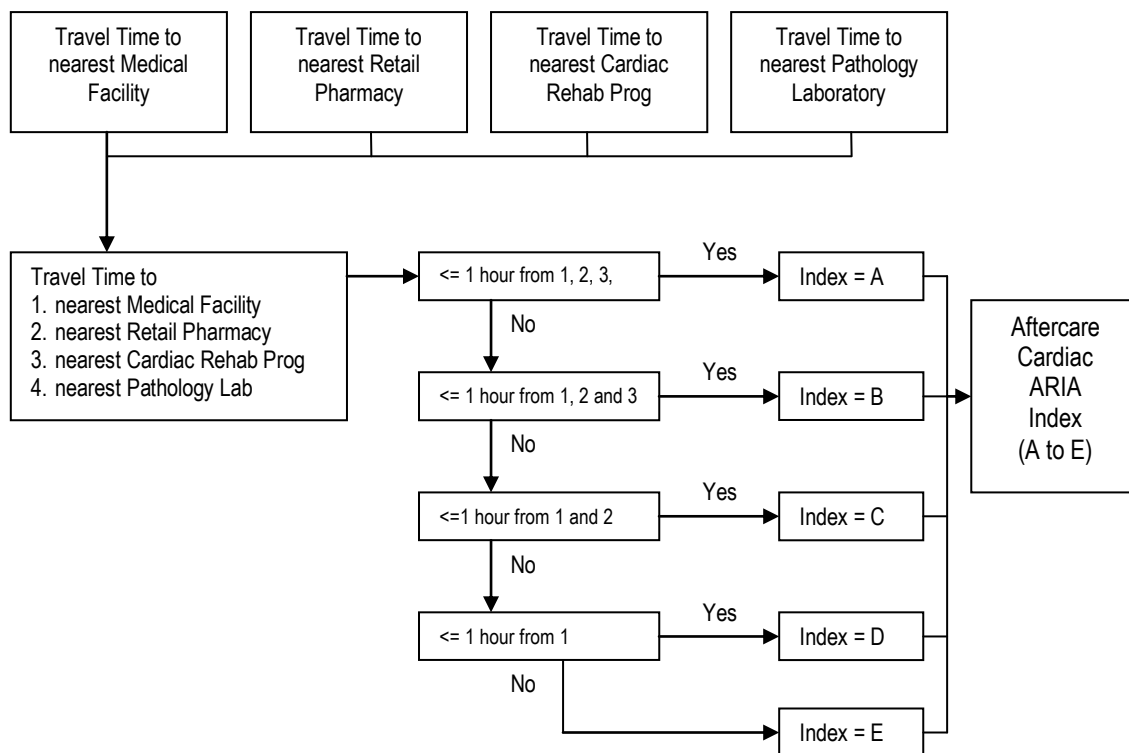


Figure 2.2 Aftercare Cardiac ARIA Flowchart (source: Clark et. al., 2011, p. 75)

Field	Value
Medical	Travel time to nearest medical facility – hospital, GP or remote clinic
Pharmacy	Travel time to nearest retail pharmacy
Rehabilitation	Travel time to nearest cardiac rehabilitation facility
Pathology	Travel time to nearest pathology laboratory
A	Medical, Pharmacy, Rehabilitation and Pathology <= 60 minutes
B	Medical, Pharmacy and Rehabilitation <= 60 minutes
C	Medical and Pharmacy <= 60 minutes
D	Medical only <= 60 minutes
E	No services <= 60 minutes

Table 2.1 Cardiac ARIA Time to Community Based Services Methodology (source: Clark et.al. 2011, p.79).

Results from the Cardiac ARIA Aftercare Index (figure 2.3) clearly show that Australians have excellent geographic access to cardiac aftercare services, with approximately 96% or 19 million

people living within one hour of the four cardiac aftercare services, and 96% of older Australians lived within one hour of the four cardiac aftercare services, 75% of indigenous people lived within one hour of the four cardiac aftercare services. It also highlights the lack of accessibility to cardiac after care services by indigenous people. However, like the National Health and Medical Research Councils Geographic Information System of Cardiac Rehabilitation Services for Aboriginal and Torres Strait Islander Peoples the index does not include socio-economic aspects of accessibility.

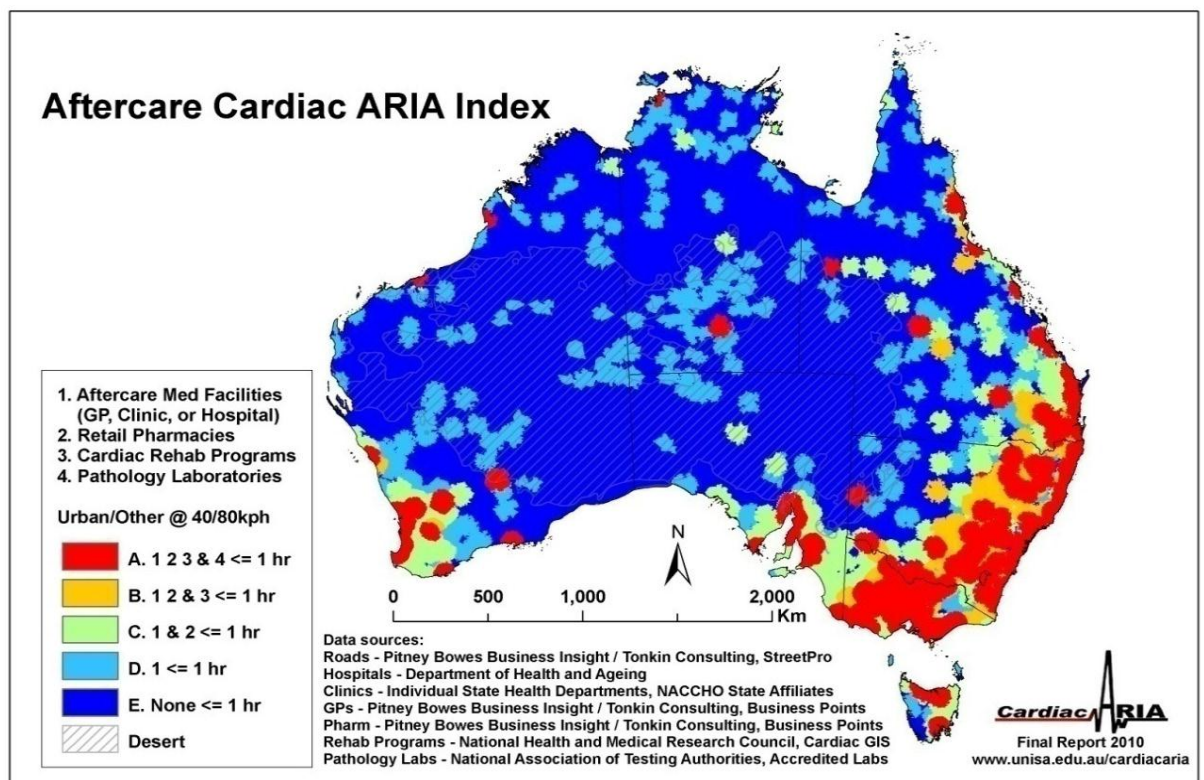


Figure 2.3 Aftercare Cardiac ARIA Categories (Clark, et. al., 2011, p.79).

## **2.6 Can the Accessibility of Cardiac Rehabilitation Services be Assessed by Measuring just Geographic Accessibility?**

To determine if the accessibility of cardiac rehabilitation programs can be assessed by measuring just geographic distance, patient location data was gathered and analysed to determine if patients attended their nearest cardiac rehabilitation program. Patient locations (n=857) for 2007/2008 were gathered from five Phase 2 Cardiac Rehabilitation Programs in Adelaide, South Australia. Street name and suburb only were collected to protect patient confidentiality. The patient location data was geolocated using Aus-emaps.com Online Maps of Australia, Manual Geocoder Service. Patients were assigned a random point along their street within their suburb to represent their true address.

Initial observations of the map of patient locations and the Phase 2 Cardiac Rehabilitation Programs that they attended, revealed no distinct zones of patients attending a particular Phase 2 Cardiac Rehabilitation Program (figure 2.4). The map revealed that within the Adelaide metropolitan area patients were often located closer to other rehabilitation programs than the program that they attended. In some cases patients were located only a few streets away from a Phase 2 Cardiac Rehabilitation Program but they attended one that was further away.

Using the road network for South Australia from the Department of Transport, Energy and Infrastructure, distances were calculated along the road network between each patient location and each of the Phase 2 Cardiac Rehabilitation Programs using ArcGIS 9.3 (figure 2.5). Distances between patient locations and each of the Phase 2 Cardiac Rehabilitation Programs were then analysed to assess if the program that they attend was the nearest program. A map was produced which identified the patients which did not attend their nearest Phase 2 Cardiac Rehabilitation Program (figure 2.6). Figure 2.5 clearly shows that 33.37% of patients did not attend their nearest Phase 2 Cardiac Rehabilitation Program. This data clearly shows that for a large percentage of patients, distance to Phase 2 Cardiac Rehabilitation is not the only factor that is considered when accessing these services. Therefore accessibility to Phase 2 Cardiac Rehabilitation Programs cannot be assessed based on geographic accessibility alone.

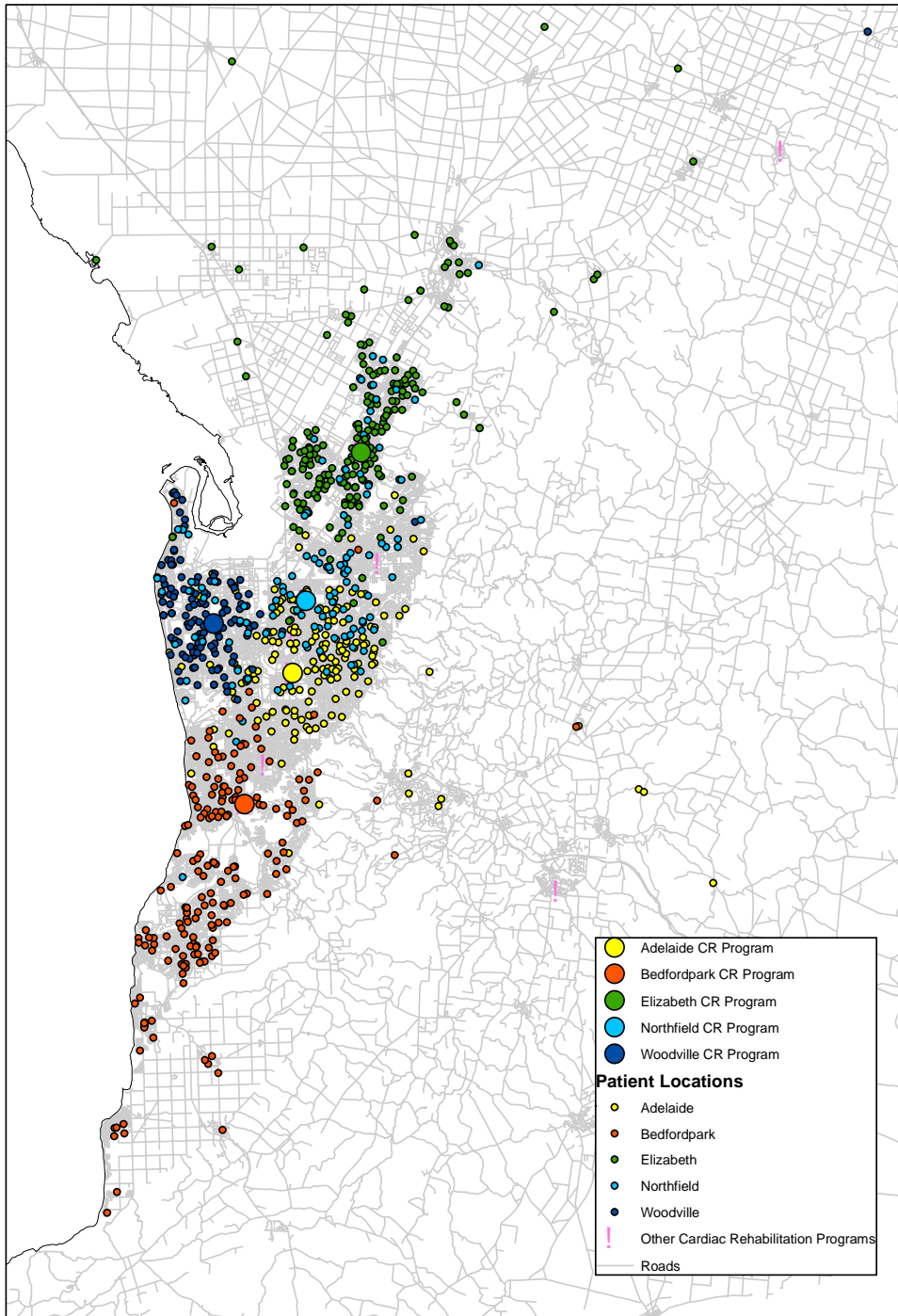


Figure 2.4 The Spatial Distribution of Patients that Accessed Phase 2 Cardiac Rehabilitation Programs.



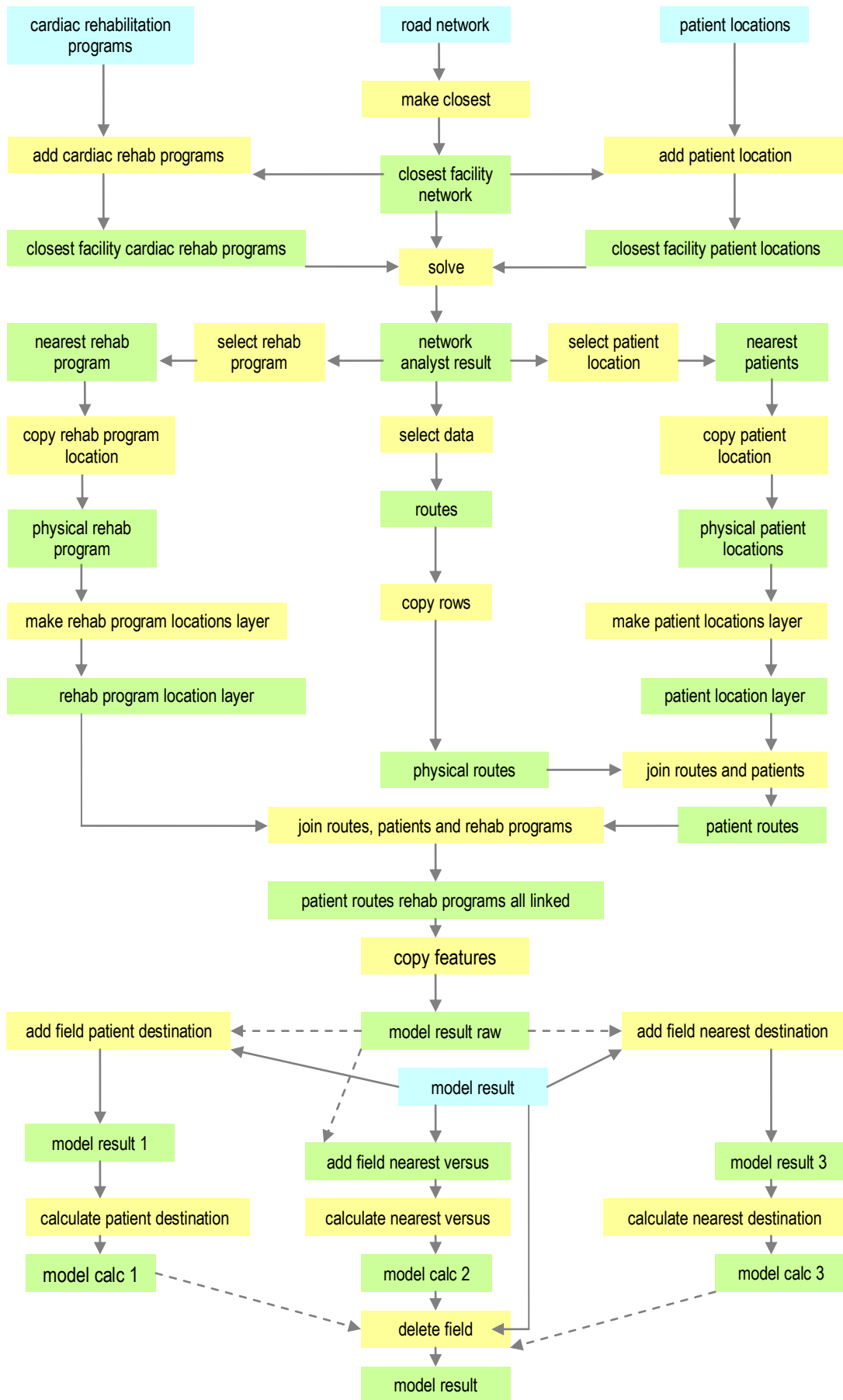


Figure 2.5 Spatial Analysis to Determine Closest Phase 2 Cardiac Rehabilitation Program.

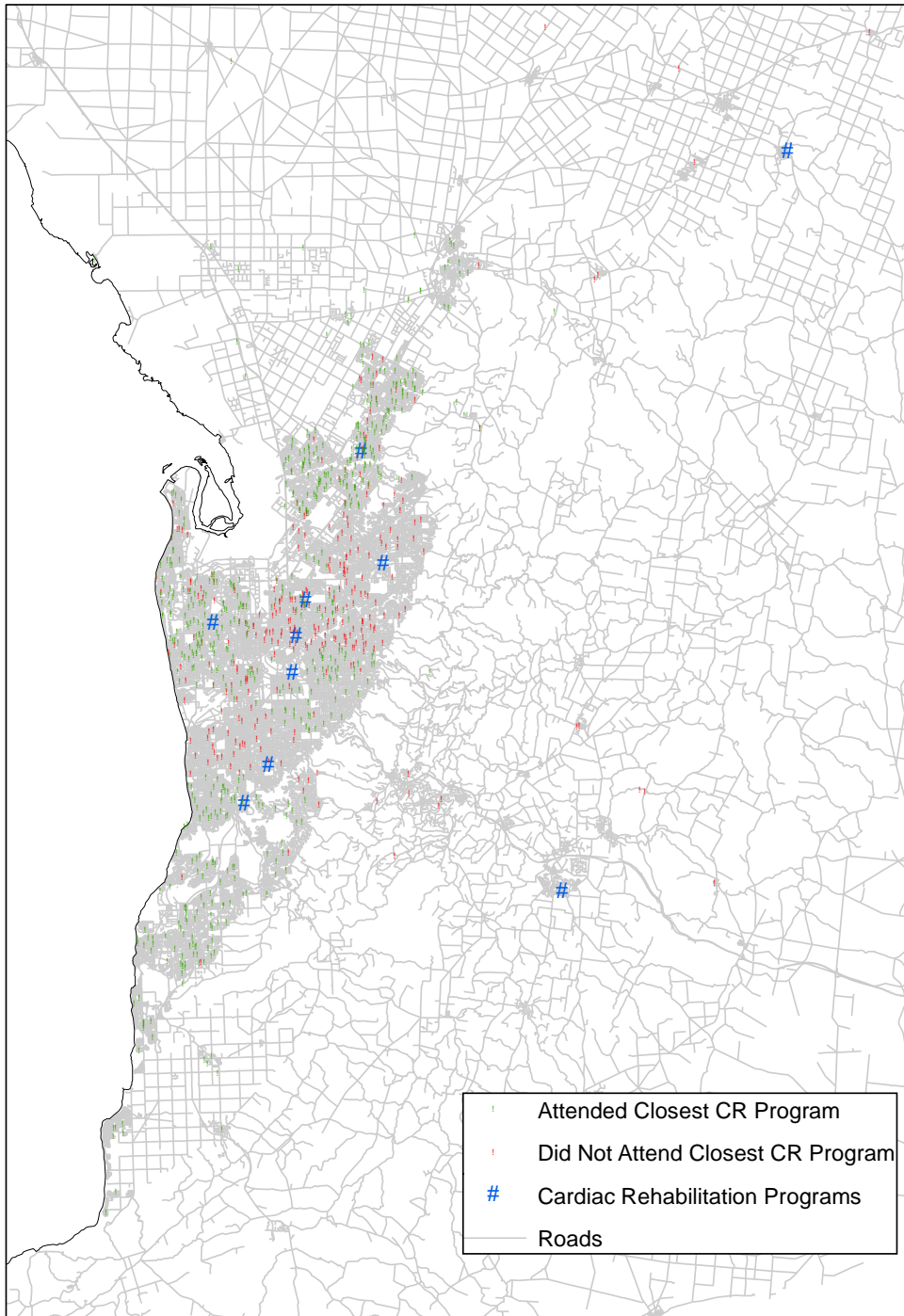


Figure 2.6 The Patients That Did Not Attend Their Closest Phase 2 Cardiac Rehabilitation Program.

## 2.7 Conclusion

Although distance is a fundamental indicator of geographical access, travel time, cost, transportation access, and perceived distance are often much more relevant to health care utilization (Cromley and Mc Lafferty 2002, p.242). Therefore a focus on distance or the simple provision of transport may reveal little about how patients view travelling for health care as one element of their decisions about the choices offered (Exworthy and Peckham 2006, p.277).

While studies like Clark (2007) highlight the inequitable distribution of cardiovascular services in Australia. Rosenberg and Hanlon (1966) argue that the existence of health care within a geographic location is not enough to ensure access. Barriers to accessing cardiac rehabilitation services are not just related to physical distance, and the availability of reliable transport (National Health and Medical Research Council 2007, p.37). This chapter highlights the need to further investigate the concept of accessibility beyond distance as accessibility based on travel time, cost or distance only provides a partial view of access to services. In reality, people trade off geographical and nongeographical factors in making decisions about health service use (Cromley and McLafferty 2002, p.243).

This chapter has highlighted the complexity and multi-dimensional nature of defining and measuring accessibility to health services. The concept of accessibility is more than a measure of distance from a health service to a population. As Penchansky and Thomas (1981), state access is “a concept representing the degree of ‘fit’ between the clients and the system”. Parker and Campbell (1998) highlight that accessibility can be judged in both socio-organizational and geographical terms with patterns of utilization of health services generally being viewed as a manifestation of accessibility.

Barriers to access exist in many forms but are generally categorized into individual and system barriers as, in addition to personal barriers, associated with individuals’ needs, attitudes, beliefs and experiences, access impediments are associated with financial, geographic or organisational factors, such as levels of insurance, out of pocket costs, location and waiting times ( Stewart Williams et. al 2010, p.1). Penchansky and Thomas (1981) have identified 5

dimensions of access: accessibility, availability, accommodation, affordability, and acceptability. Through their definition of the dimensions of accessibility it is possible to see that accessibility is more than the geographic distance between two locations as socio-economic factors are included among the predisposing variables influencing health service use. Demographic factors, may affect use directly, with some individuals having a propensity toward more use and, indirectly through health and illness status, life style and attitudes and beliefs about medical care (Thomas and Penchansky 1984, p.556). As patient accessibility to health services is dependent on a number of factors which are related to the service they are accessing and the illness that the patient has it will be necessary to investigate the factors which affect the accessibility to Phase 2 Cardiac Rehabilitation in depth.

## **Chapter 3: Cardiovascular Disease in Australia**

### **3.1 Introduction**

Cardiovascular disease continues to dominate the Australian health profile and the burden of the disease in Australia is a major issue. This chapter discusses the impact of cardiovascular disease within Australia and identifies which of all the cardiovascular diseases is the most significant.

Although mortality rates from acute events (heart attack and stroke) have been declining, the burden of cardiovascular disease remains enormous and is becoming more associated with periods of chronic disabling illness (notably heart failure) (Access Economics 2005, p.i). The health system and quality of life impacts are thus shifting towards more effectively managing risks and disease burden, as much as reducing mortality (Access Economics 2005, p.i). The direct health care system and indirect costs of CVD are substantial. This chapter highlights the increasing cost of cardiovascular disease upon the health system and on society within Australia.

The associated economic burden is projected to increase markedly with ageing of the population and decrease in case-fatality rates with acute events such as myocardial infarction (Tonkin and Chen 2009, p.108). Cost-effective investment in research, prevention and management has been shown in Australia in the past decade to reduce cardiovascular disease events and mortality rates and to arrest growth in health costs over the medium term (Access Economics 2005, p.54). The future impact of the disease due to the effect of the aging population and the shifting burden of disease from an acute event (heart attack and stroke) to becoming more associated with periods of chronic disabling illness (notably heart failure) is discussed in this chapter.

### 3.2 The Impact of Cardiovascular Disease

The impact of cardiovascular disease in Australia is significant. In 2008 cardiovascular disease was the largest single cause of mortality in Australia, and accounted for 31% of male and 28% of female deaths (refer to figure 3.1).

Coronary heart disease (CHD) or as it is sometimes known as ischaemic heart disease, is the largest single cause of death and the most common cause of sudden death in Australian of all the cardiovascular diseases. Ischaemic heart disease and stroke are the leading cause of cardiovascular disease burden at all ages for both sexes (National Heart Foundation of Australia 2006, p.18). In 2002, CHD claimed 26,063 lives which was over half of all deaths from heart, stroke and vascular diseases, and it is the leading cause of premature death and disability (Australian Institute Health and Welfare 2004, p.26). It was by far the greatest epidemic in Australia during the twentieth century and it is predicted that by 2020 it will become the single leading health problem for the world (Australian Institute and Welfare 2004, p.26).

Over the last three decades CHD death rates have declined substantially, by over 60%, compared to falls of around 20% in deaths from non-cardiovascular diseases (Mathur 2002, p.12). Mathur (2002) noted that over the last decade age-adjusted incidence, mortality rates, and case-fatalities have been gradually declining. The reasons for this include:

- reduced occurrence of heart attacks may be due to reduced overall levels of CHD risk factors, improved medical care for those at higher risk of heart attack, or both;
- reduced mortality from CHD may be due to the reduced occurrence of heart attacks, better survival of those who do have a heart attack, or both; and
- improved survival after a heart attack may be due to a change in the natural history of the disease, protective effects of drugs already being taken at the time of the event, better
- emergency care, better care after the emergency stage, or some combination of these factors (Mathur 2002, p.19).

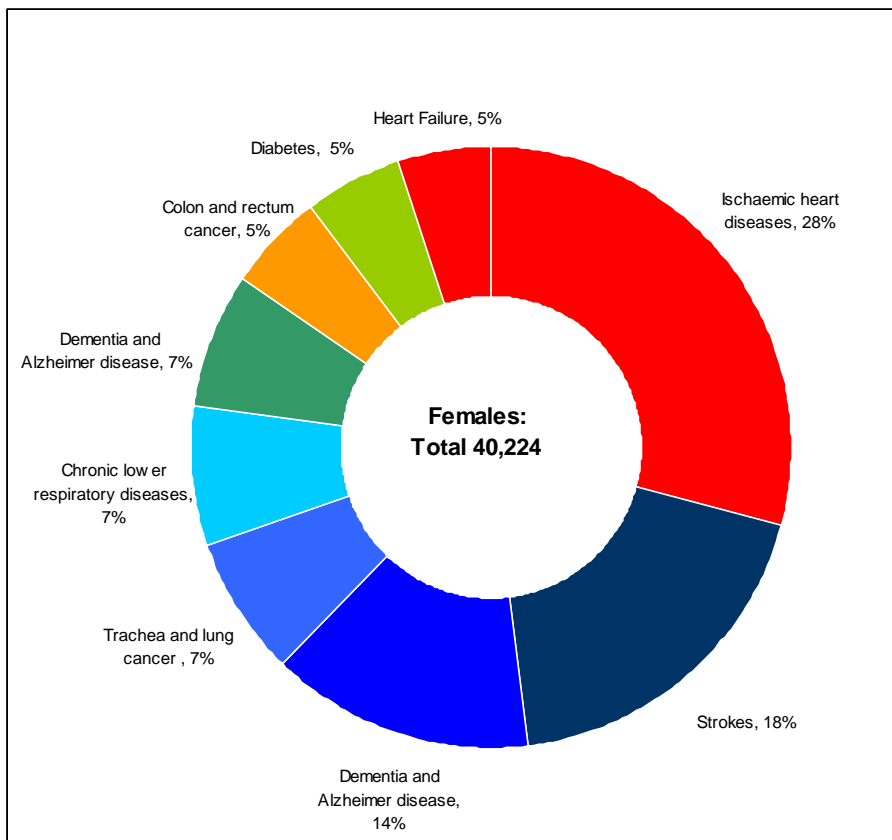
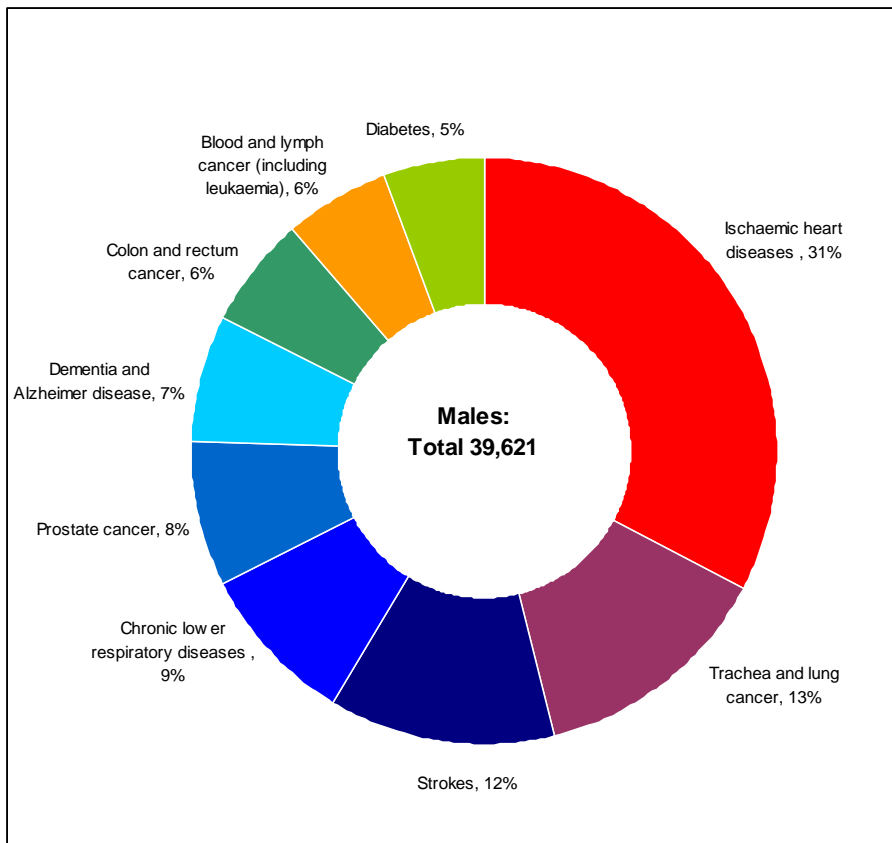


Figure 3.1 Death by Major Cause, Group and Sex, 2008 (ABS 3303.0 - Causes of Death, Australia, 2008).

While there has been continuous decline in CHD mortality in Australia since the late 1960s, certain Australians continue to experience considerably higher death rates from CHD than other Australians, in particular Aboriginal and Torres Strait Islander peoples and people who are at a socioeconomic disadvantage (Mathur 2002, p.14). There is a clear disparity between metropolitan and rural Australia as can be clearly seen in Figure 3.2, which shows the average annual rate per 100,000 population for avoidable mortality from cardiovascular diseases which could have been avoided through either incidence reduction (prevention) or case fatality reduction (treatment) or a combination of both (The Public Health Information Development Unit, The University of Adelaide, 2011).

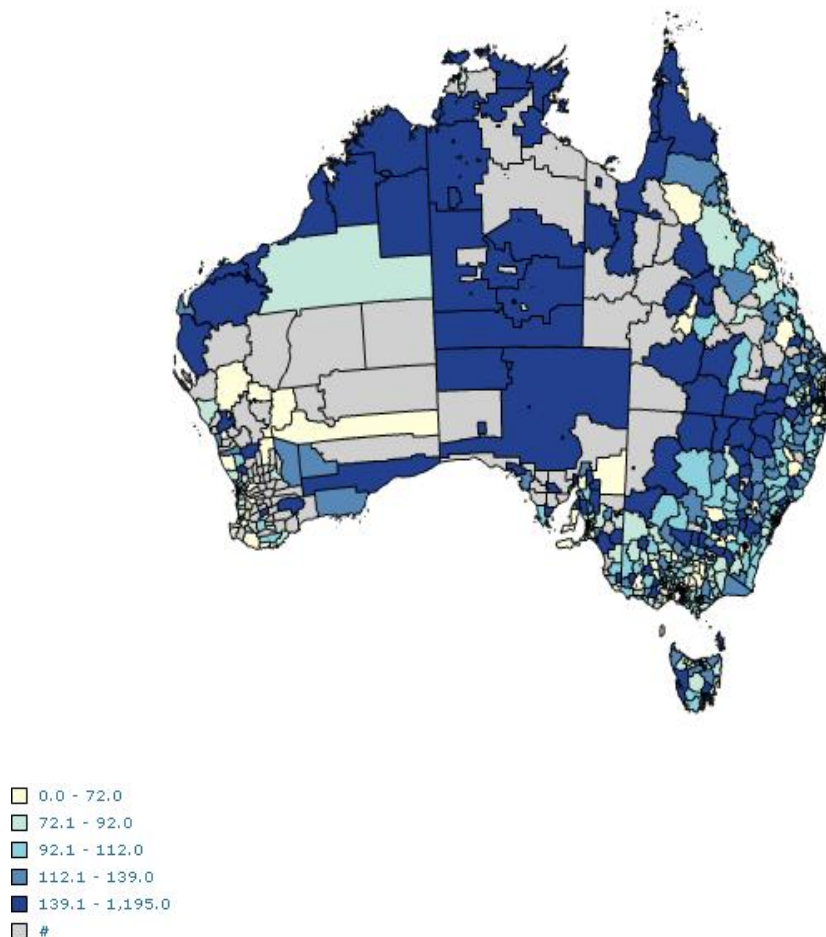


Figure 3.2 The Average Annual Death Rate per 100,000 Population from Potentially Avoidable Cause, for Cardiovascular Diseases for Ages 0 to 74 years, 2002 to 2006.

(Source: A Social Health Atlas of Australia, 2011 by local Government and Statistical Local Area, Accessed through, The Public Health Information Development Unit (PHIDU), The University of Adelaide <http://www.publichealth.gov.au/> on 20/05/11).



### 3.3 Cost of Cardiovascular Disease

Heart, stroke and vascular diseases continue to impose a heavy burden on Australians in terms of illness, disability and death, and the associated direct health care expenditure exceeds that of any other disease group (National Centre for Monitoring Cardiovascular Disease 2004, p.2). Direct healthcare costs for cardiovascular disease were estimated at \$3.7 billion in 1993-94, which was 12% of total direct healthcare costs in Australia that year (Tonkin et. al. 1999, p.183). Figure 3.3 shows that by 2004 the total costs of CVD had increased substantially to \$6,563.7 million (Access Economics 2005, p.20). In 2004-05, just over half (\$3,009 million) of CVD expenditure was for hospital-admitted patients, another 28% (\$1,636 million) was spent on prescription pharmaceuticals (including both prescribed medicines subsidised through PBS/RPBS arrangements and prescribed medicines that patients paid for directly (Australian Institute of Health and Welfare 2011, p. 168). The remainder was spent on out-of-hospital medical services, (\$1,133 million) and research (\$164 million) (19% and 3% respectively) (Australian Institute of Health and Welfare 2011. p.168). While the costs associated with CVD are heaviest in the inpatient sector of the health system, costs can be seen across the whole of the health care system.

While cardiovascular disease as a whole continues to impose a heavy financial burden on the health care system, it is coronary heart disease that creates the most costs. The total direct cost of cardiovascular disease in Australia during 1993-94 was \$3,719 million, with coronary heart disease accounting for 24% of total cardiovascular disease costs, stroke 17% and heart failure 11% (Mathur 2002, p.51). In 1993-94 the direct healthcare expenditure on coronary heart disease in Australia was \$894 million or 2.8% of total recurrent health expenditure (Mathur 2002, p.51). Coronary heart disease was responsible for 2.8% of total recurrent health expenditure in 1993-94 (\$894 million) with two-thirds of these costs coming from hospital in-patients and 10% from medical services (Mathur 2002, p.51). The cost of coronary heart disease has been increasing over time. Access Economics (2009) estimated that in total heart attacks were expected to cost around \$15.5 billion in 2009. The majority of these costs are associated with the loss in the value of health, accounting for around 78%, which is

representative of the large amount of premature deaths associated with heart attacks (Access Economics 2009, p.5). Mathur (2002) found that the length of stay in hospital has a large impact on the health system costs for coronary heart disease.

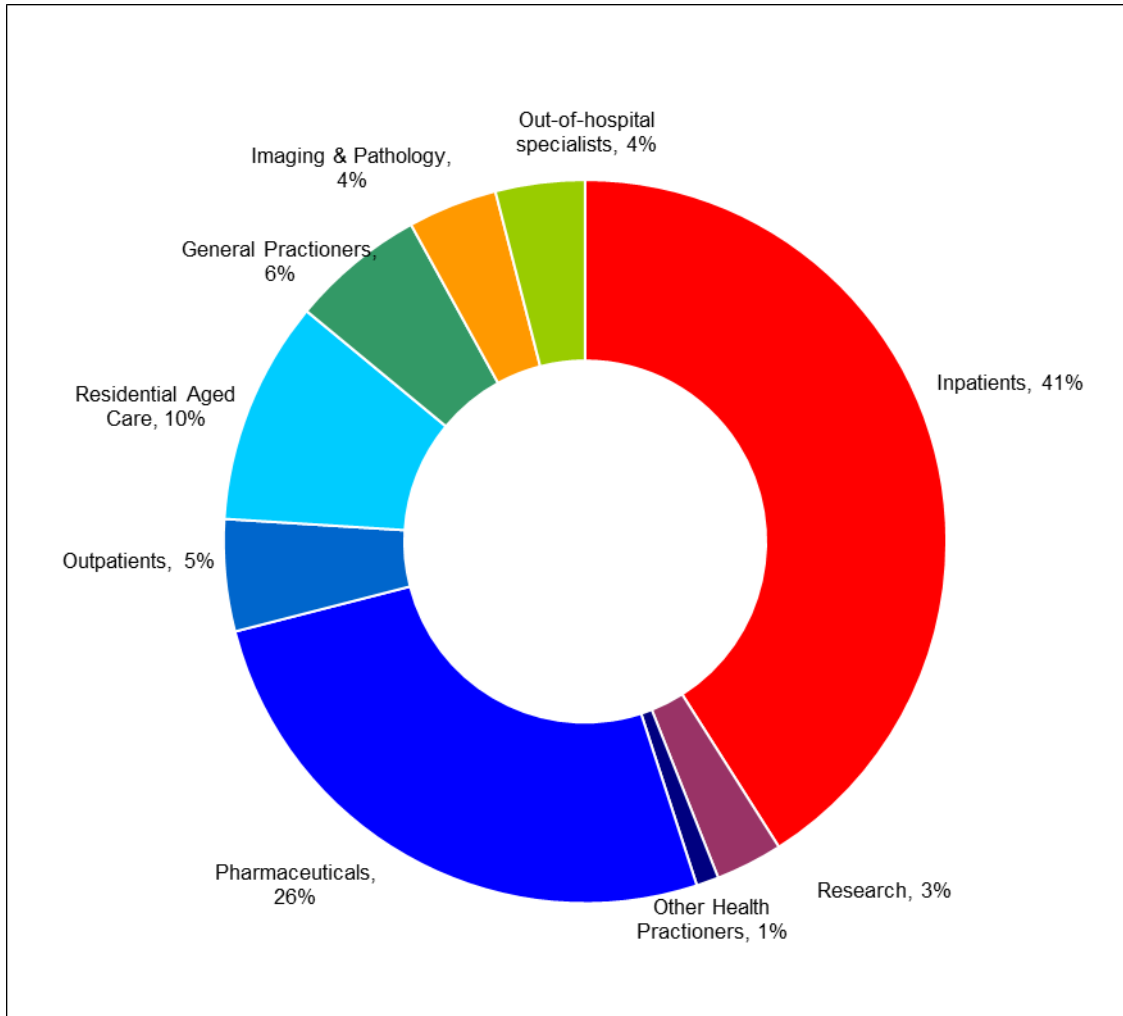


Figure 3.3 Health Costs of CVD, 2004, \$M by Cost Type (Access Economics 2005, p.20)

The costs associated with cardiovascular disease (CVD) are not just limited to the health system. Access Economics (2009) investigated the indirect costs that are associated with acute coronary syndromes (ACS). They list the following as costs indirectly associated with ACS rather than costs associated with treatment:

- Productivity losses from reduced labour market participation through lower employment, greater absenteeism, and premature mortality associated with ACS;

- Costs to informal carers from providing care to someone who has experienced an ACS event;
- Private costs associated with rehabilitation; and
- Deadweight loss associated with raising additional tax revenue to publicly fund health care services associated with ACS (Access Economics 2009, p.47)

With Australia's ageing population it is important to note, that expenditure on CVD in 2004–05 was low among young people but increased sharply from about age 45 years and was highest among those aged 85 years and over (Australian Institute of Health and Welfare 2011. p.169 . For those in the 85 years and over age group, the average annual per person expenditure on CVD was \$1,858, compared to \$229 for people aged 45-54 years (Australian Institute of Health and Welfare 2011. p.169).

Cost-effective investment in research, prevention and management has been shown in Australia in the past decade to reduce cardiovascular disease events and mortality rates and to arrest growth in health costs over the medium term (Access Economics 2005, p.54).

### **3.4 Shifting Burden of Cardiovascular Disease**

Significant progress has been made in recent years in improving the cardiovascular health of Australians (National Centre for Monitoring Cardiovascular Disease 2004, p.2). There has been a continuous decline in mortality from coronary heart disease in Australia since the late 1960s (McElduff et. al. 2001, p.24). Between 1993–94 and 1999–00 the age-adjusted total case-fatality rate significantly declined 12% for men and 16% for women aged 40–90 years (Mathur 2002, p.15). The level of case-fatality for patients aged 40–90 years who reached hospital alive also fell over this period (19–20% decline in age-standardised rates) (Mathur 2002, p.15). Most of the decline in total case-fatality among 40–90 year-olds was due to declines in coronary deaths, with age-standardised coronary heart disease death rates declining by 28–30% between 1993–94 and 1999–00 (Mathur 2002, p.15). In summary, the evidence suggests that the declines in death rates from coronary heart disease and stroke have been influenced by changes in some risk factors, drug use, emergency care, medical and surgical treatment,

rehabilitation and follow-up care (Australian Institute of Health and Welfare 2004, p.4). Despite major falls in death rates over the past 30 years and advances in treatment and care, heart, stroke and vascular diseases collectively are still Australia's leading cause of premature death and disability (Australian Institute of Health and Welfare 2004, p.v).

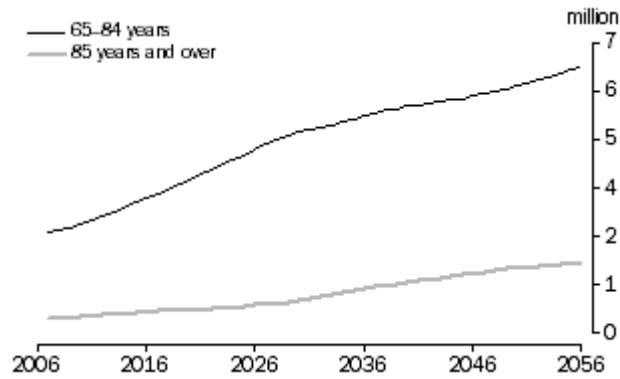
The burden of cardiovascular disease remains enormous and is becoming more associated with significant illness, disability and poor quality of life for many Australians. 1.10 million Australians are disabled long-term by heart, stroke and vascular diseases (Australian Institute of Health and Welfare 2004, p.x). Coronary heart disease (angina and myocardial infarction) is one of the major causes of disability in Australia (Australian Institute and Welfare 2004, p.28). Therefore the management of cardiovascular disease is a major issue in Australia. The health system and quality of life impacts are thus shifting towards more effectively managing risks and disease burden, as much as reducing mortality (Access Economics 2005, p.i).

### **3.5 Effect of Ageing Population**

Heart disease prevalence, and coronary heart disease incidence and mortality rates, are substantially higher among older Australians (Mathur 2002, p.19). Coronary heart disease predominantly affects middle-aged and older Australians, with the majority of hospital admissions for heart attack and cardiac procedures occurring among the population aged 60 years and over—70% of AMI hospital admissions, 73% of CABG procedures and 61% of PCI procedures (Mathur 2002, p.3). In 2011, the first of the baby boomers will reach the age of 65 years. The total burden of heart, stroke and vascular diseases is expected to increase over the coming decades due to the growing number of elderly Australians, which can be seen clearly in figures 3.4 and 3.5.

Figures 3.4 and 3.5 show that Australia's ageing population is expected to continue. This is a result of sustained low levels of fertility combined with increasing life expectancy at birth (ABS, 2008). The median age of Australia's population (36.8 years at 30 June 2007) is projected to increase to between 38.7 years and 40.7 years in 2026, and to between 41.9 years and 45.2

years in 2056 (ABS, 2008). The Australian Bureau of Statistics (2008) predict that by 2056 the proportion of people in Australia aged 65 years and over, will increase to between 23% and 25%, and people aged 85 years and over will also increase significantly to between 4.9% and 7.3%.



Note: Data for 2007 is estimated, all other years are projections

Figure 3.4 Projected Aged Populations: 2007 – 2056.

(Source: Population Projections, Australia 2006 to 2101 (ABS cat. no. 3222.0))

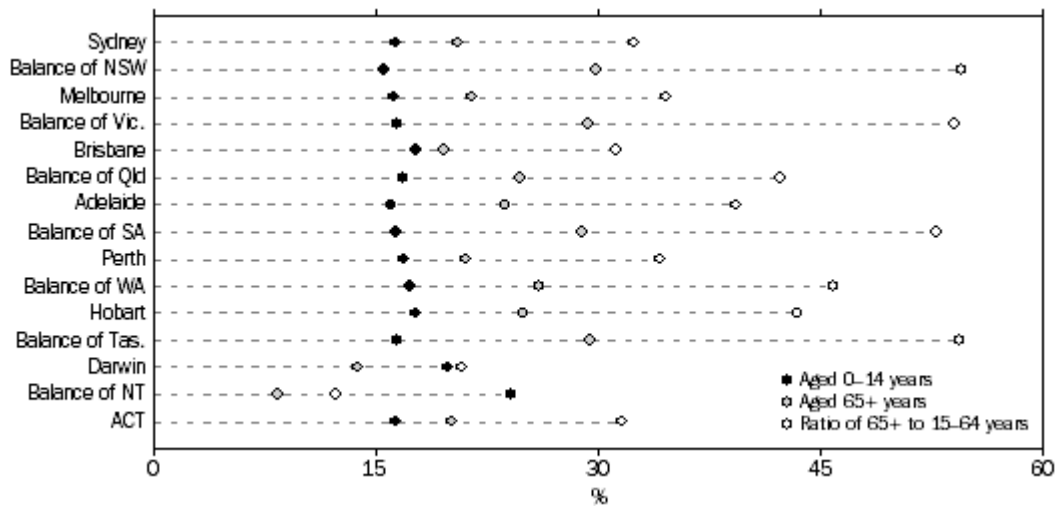


Figure 3.5 Indicators of Age Structure: Capital Cities and State Balances, 2056

(Source: Population Projections, Australia 2006 to 2101 (ABS cat. no. 3222.0))

Over the next 30 years, the ageing of the population is expected to lead to an approximate 2-fold increase in the prevalence of conditions such as coronary heart disease, stroke, heart failure and hypertension and their treatment with drugs and other medical interventions will place increasing pressure on the healthcare system (Tonkin 1999, p.185). It is expected that the proportion of the Australian population that is 65 years and older (and therefore at higher risk of an ACS event will increase from around 14% in 2009 to around 23% in 2050 (Access Economics 2009, p.7). This, coupled with the expected increase in risk factors associated with acute coronary syndromes (ACS) such as obesity and diabetes, means public and private health care resources to prevent and treat ACS are expected to come under significant pressure in the near future (Access Economics 2009, p.7). In the context of demographic ageing in Australia, given the increasing age standardisation rates among the older population and the link between health, health care resource utilisation, and quality of life, more emphasis will be needed on preventing and reducing disability and improving quality of life in this age group (Access Economics 2009, p.7).

### **3.6 Conclusion**

The impact of cardiovascular disease on Australians and the Australian health system is substantial and with Australia's population becoming older increased pressure on cardiovascular services is predicted.

A National Strategy for Heart, Stroke and Vascular Health in Australia has been developed 'to improve the health status of the Australian population. The strategy identifies the following seven 'arenas for national action' where there is most potential for improvement, and identifies goals and priorities for national action against each arena:

- heart, stroke and vascular diseases in Aboriginal and Torres Strait Islander peoples
- consumer engagement and information
- prevention of heart, stroke and vascular diseases
- cardiac emergency and acute care
- stroke emergency and acute care

- chronic heart failure
- rehabilitation after an acute heart, stroke or vascular event (National Centre for Monitoring Cardiovascular Disease 2004, p.1)

Cardiac rehabilitation post hospital discharge has the potential to lessen the burden of cardiovascular disease upon the health system. Briffa et al (2005) estimated that post discharge rehabilitation (including an exercise regime to improve function capacity, education on lifestyle changes and pharmacological treatment) compared to conventional care had an incremental cost-effectiveness ratio of \$42,535 per quality-adjusted life year (QALY) saved, assuming that rehabilitation increased survival rates.

## **Chapter 4: Cardiac Rehabilitation**

### **4.1 Introduction**

Cardiac rehabilitation has been identified as a means of decreasing the burden of cardiovascular disease. Cardiac rehabilitation programs were originally introduced to facilitate recovery from acute cardiac events (Goble and Worcester 1999, p. xviii). In 1961 the National Heart Foundation introduced cardiac rehabilitation into Australia. The focus was on restoration of a sense of wellbeing and encouraging return to work for survivors of acute myocardial infarction and other cardiac illness (Bunker 2003, p.332). By 1986, cardiac rehabilitation had advanced sufficiently for it to be seen as an important component of cardiac care (Bunker 2003, p.332). Since 1961 the number of cardiac rehabilitation programs has grown significantly and programs can be found in metropolitan and rural hospitals, and community settings throughout Australia.

Cardiac rehabilitation is defined in this chapter, and details on the different phases of cardiac rehabilitation are discussed. The National Heart Foundation's Recommended Framework for Cardiac Rehabilitation (2004) emphasises that the long-term benefits from cardiac rehabilitation come from continuing behavioural change beyond the period of inpatient and outpatient treatment, and that establishing ongoing community-based approaches is essential. Despite the evidence to support cardiac rehabilitation, existing services remain underutilised (National Heart Foundation 2004, p .11). The accessibility of cardiac rehabilitation is one of the major factors affecting the utilization of phase 2 cardiac rehabilitation programs.

For those experiencing coronary heart disease, admission to an acute hospital presents the opportunity to access specialist cardiac rehabilitation programs. This chapter defines the individual phases of cardiac rehabilitation, so that it is possible to identify at which point along the continuum of care for patients with coronary heart disease, accessibility to services is an issue.



The potential benefits to patients and cost benefits to the Australian health system is also discussed in this chapter to highlight the importance of increasing accessibility to cardiac rehabilitation. International and Australian studies show the cost effectiveness of new models of coordinated multidisciplinary care, that provide individualised management by specialist nursing staff and promotion of self-care activities, as well as appropriate pharmacotherapy (i.e. at effective dosages) (Access Economics 2005, p.ii). Cardiac rehabilitation is an important part of secondary prevention of coronary heart disease, aiming to give people the confidence, motivation and skills to make a lifelong commitment to a healthy lifestyle and greater well-being (National Health and Medical Research Council 2007, p.V).

Patients with a history of acute coronary syndrome are particularly susceptible to further vascular or ischemic events (Rockson, deGoma, and Fonarow 2007 p.375). Secondary prevention programs improve processes of care, coronary risk factor profiles, and functional status or quality of life. Although the optimal mix of interventions, including frequency and duration, is unclear, secondary prevention programs also reduce subsequent MI and mortality in patients with coronary disease (Clark, Hartling, Van der Meer et. al. 2005 P. 669). Structured outpatient cardiac rehabilitation is a recognised focal point for the development of a life-long approach to prevention. Most of the evidence for improved prognosis is derived from combined ambulatory and maintenance programs which have been hospital-based (Goble and Worcester 1999, p.12). Cardiac rehabilitation programs have been shown to reduced mortality, recurrent events and readmissions. However, despite the evidence to support cardiac rehabilitation, existing services remain underutilised.

## **4.2 Defining Cardiac Rehabilitation**

The term cardiac rehabilitation is defined in a number of different ways. Cardiac rehabilitation can refer to an exercise program after a cardiac event to an integrated program involving assessment, review, diet, behaviour modification, education, counselling and exercise. The aim of this section is to define cardiac rehabilitation for the development of the spatial model of accessibility.

The first definition of cardiac rehabilitation was stated by the World Health Organisation (WHO) in 1969, and has been updated to being 'the sum of activities required to influence favourably the underlying cause of the disease, as well as to ensure the patients the best possible physical mental and social conditions, so that they may, by their own efforts, preserve, or resume when lost, a place as normal as possible in the life of the community' (World Health Organisation 1992, p.5).

Cardiac rehabilitation (CR) aims to 'maximise physical, psychological and social functioning to enable patients to live productively and with confidence' and 'assist and encourage behaviours that may minimise the risk of further cardiac events and conditions' (Dollard, Thompson, and Stewart 2004, p.27). As well as facilitating recovery, cardiac rehabilitation programs function as launching pads for secondary prevention of cardiovascular disease (Goble and Worcester 1999, p. xviii).

Cardiac rehabilitation is an organised approach to achieving the following aims:

The broad aims of cardiac rehabilitation are to:

- Maximise physical, psychological and social functioning to enable people with cardiac disease to lead fulfilling lives with confidence,
- Introduce and encourage behaviours that may minimise the risk of further cardiac events and conditions (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.1).

The specific aims of cardiac rehabilitation are to:

- Facilitate and shorten the period of recovery after an acute cardiac event,
- Promote strategies for achieving mutually agreed goals of ongoing prevention,
- Develop and maintain skills for long-term behaviour change and self-management,

- Promote appropriate use of health and community services, including concordance with prescribed medications and professional advice (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.1).

Cardiac rehabilitation is the co-ordinated use of medical, social, educational and vocational measures to ensure patients regain the highest possible level of function following an adverse cardiac event (Shepherd, Battye and Chalmers 2003, p.632). The traditional ingredients of formal cardiac rehabilitation programs in Australia include exercise, education, and psychological and social support (Goble and Worcester 1999, p.9).

While cardiac rehabilitation is primarily focused on patients who have had a cardiac event, it may also be appropriate for patients awaiting cardiac investigation or intervention to attend inpatient or outpatient cardiac rehabilitation programs (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.2). It is now recognised that cardiac rehabilitation programs, in certain circumstances, may also be delivered to those at high risk of coronary heart disease, including those with other evidence of vascular disease or who are at high risk of vascular disease, or indeed any other form of cardiac disease (Goble and Worcester 1999, p.10). In some cases, separate programs will be provided for people with different diagnoses; however, in many instances the approach adopted will address the differing needs of these groups (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.2).

### **4.3 Phases of Cardiac Rehabilitation**

Rehabilitation begins in hospital and consists of early mobilisation and education (Goble and Worcester 1999, p.11). Cardiac rehabilitation is divided into three phases: Phase 1 and 2 involve exercise, education, discussion, and counselling, and Phase 3 a maintenance phase. Phase 1 occurs on an inpatient basis and Phase 2 is provided on an outpatient basis. Some centres provide phase 3 rehabilitation, which is an unstructured maintenance program, which usually begins on the conclusion of phase 2. However, participation in cardiac rehabilitation is

not necessarily sequential, as people may access services at different stages and entry points. Progression through these phases should be coordinated, with the patient as the focus of care (Queensland Health 2000, p.7). This section discusses the individual phases of cardiac rehabilitation and identifies the phase in the cardiac patient's continuum of care where accessibility issues arise.

### **3.3.1 Phase 1 – Inpatient**

Inpatient cardiac rehabilitation usually begins as soon as possible after admission to hospital and is referred to as Phase 1. It is delivered on an individual basis and, additionally, in some hospitals, to groups of patients (Goble and Worcester 1999, p.11). The structure of inpatient programs varies from one hospital to another. During Phase 1, a full evaluation of the patient should take place, including consideration of risk factors and the patients' level of knowledge about his or her condition (Barrett, Gretton, and Quinn 2006, p.27). Patients are educated about the practical changes to their lifestyle that may need to be made, including understanding the implications of the illness, and the future direction of treatment and rehabilitation.

Multidisciplinary education and support is also usually provided to allow early steps to be taken in the modification of risk factors. Phase 1 also includes an assessment of psychosocial factors, through either interviews or the use of a formal assessment tool (Barrett, Gretton, and Quinn, 2006, p.27).

Due to the short length of stay in hospital by some patients and the limited availability of a specialised cardiac rehabilitation nurse / co-ordinator, Phase 1 Cardiac Rehabilitation programs are often not completely delivered to every patient. The National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association (2004) recommends that where there is insufficient time available for completing the recommended inpatient mobilisation and education program, the emphasis should be on providing:

- Basic information and reassurance
- Supportive counselling
- Guidelines for mobilisation

- Appropriate discharge planning, including the involvement of the general practitioner / primary care provider and follow-up
- Referral to outpatient cardiac rehabilitation (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.4).

On conclusion of Phase 1 cardiac rehabilitation patients are given a discharge plan which usually incorporates a discharge letter to the general practitioner and/or cardiologist or cardiac surgeon and assurance that the patient is aware of the need for continued medication. Appointments are usually made for follow-up review and, ideally, referral to a formal outpatient cardiac rehabilitation program (Goble and Worcester 1999, p.11).

The shorter hospital stay (now commonly four to six days after acute myocardial infarction, five to seven days after coronary bypass surgery, and one day after coronary angioplasty) makes it extremely difficult to conduct formal inpatient education programs (Goble and Worcester 1999, p.11). Inpatients commonly undergo time consuming comprehensive investigations, therefore inpatient cardiac rehabilitation programs are now much more limited in scope than in the past (Goble and Worcester 1999, p.11). It is also, recognised that inpatient education may be ineffective because of the psychological state and concerns of patients soon after their acute event (Goble and Worcester, p.11). Therefore, outpatient rehabilitation is particularly important because hospital stays are becoming shorter, thereby limiting the opportunities for inpatient education about risk reduction and lifestyle changes.

#### **4.3.2 Phase 2 – Outpatient**

Usually people with coronary heart disease are referred to outpatient cardiac rehabilitation from inpatient settings following a hospital admission for an acute event or revascularisation procedure. Attendance begins soon after discharge from hospital, ideally within the first few days (Goble and Worcester 1999, p.12). However, referrals are increasingly being encouraged for people with coronary heart disease, and for those at high risk of developing coronary heart disease (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association

2004, p.6). These referrals come from a wide variety of other sources including general practitioners, cardiologists, other medical specialists, community health centres, diabetes educators and other hospital outpatient clinics (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.6).

The length, content and type of program vary according to the specific needs of the individual and the available resources. Formal outpatient cardiac rehabilitation programs vary widely in content (Goble and Worcester 1999, p. 12). However there are a number of common elements to all phase 2 cardiac rehabilitation programs. The main components of phase 2 cardiac rehabilitation as recognised by the National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association (2004) are as follows, regardless of the type of program being provided:

1. Assessment, review and follow-up
  - Individual assessment and regular review, which includes attention to physical, psychological and social parameters.
  - Referral to appropriate health professionals and services as required.
  - Discharge or summary letters sent to the GP, cardiologist and other primary care provider as nominated by the patient.
  
2. Low or moderate intensity physical activity
  - Can include a supervised group or individual program, including a warm-up and cool-down period, and catering for the individual needs and capacities of each patient.
  - Resistance training as appropriate
  - Written guidelines for resumption of daily activities, including a home walking program, and aiming to accumulate a minimum of 30 minutes of light to moderate intensity physical activity on most or all, days of the week.
  - Individual review of a physical activity program on a regular basis (at least three times during participation in the program).
  - Instruction in self-monitoring during physical activity.

### 3. Education, discussion and counselling

- Basic anatomy and physiology of the heart.
- Effects of heart disease, the healing process, recovery and prognosis.
- Risk factors for heart disease and their modification for on-going prevention (e.g. smoking cessation, physical activity, healthy eating, control of blood lipids, weight, blood pressure and diabetes).
- Supporting skill development to enable behaviour change and maintenance.
- Resumption of physical, sexual and daily living activities including driving and return to work.
- Psychological issues e.g. mood (depression), emotions, sleep disturbance.
- Social factors e.g. family and personal relationships, social support / isolation.
- Management of symptoms e.g. chest pain, breathlessness, palpitations.
- Development of an action plan by patient and carer to ensure response to symptoms of a possible heart attack.
- Medications e.g. indications, side effects, importance of concordance.
- Investigations and procedures.
- Cardiac health beliefs and misconceptions.
- The importance of follow-up by specialist, GP or other primary care provider.

Services are provided for a period of between 4 and 12 weeks and are predominantly based in outpatient hospital settings (Dollard, Thompson, and Stewart 2004, p.27). However phase 2 cardiac rehabilitation may also be provided in community health centres, general medical practices, or at the patients home or a combination of these. Home-based cardiac rehabilitation may include a combination of home visits, telephone support, telemedicine or specifically developed self-education materials. Sessions may be offered once, twice or occasionally three times per week in Australia (Goble and Worcester 1999, p.12). Once patients have completed a Phase 2 cardiac rehabilitation program they may be offered a Phase 3 cardiac maintenance program, if one is available.

#### 4.3.3 Phase 3 – Maintenance

A maintenance phase follows Phase 2 cardiac rehabilitation. Phase 3 or maintenance cardiac rehabilitation is centred on ongoing prevention beyond the inpatient and outpatient phases. Phase 3 programs are even more varied in content and structure than Phase 2 programs. Services offered in this period have an emphasis on supporting behaviours that decrease the risk of future cardiovascular events. This involves sustained activities and behaviours to reduce cardiovascular disease risk factors, including healthy nutrition, active lifestyle, measured alcohol intake and being a non-smoker (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.10).

National Heart Foundation of Australia and the Australian Cardiac Rehabilitation Association (2004) recognises the following main elements of phase 3 cardiac rehabilitation:

- Smoking, nutrition, alcohol, physical activity and weight management including identification of individual goals.
- Biomedical risk factors (lipids, blood pressure, and diabetes).
- Pharmacology (e.g. Antiplatelets, ACE inhibitors, Beta-blockers, statins, anticoagulants).
- Psychosocial risk factors.

A range of structured ongoing prevention programs is now being offered to support the ongoing prevention and management that general practitioners and specialists provide (National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association 2004, p.10). However, relatively few maintenance programs have been established or adequately evaluated (Goble and Worcester 1999, p. 12).

#### **4.4 Benefits of Cardiac Rehabilitation**

Cardiac rehabilitation increases the likelihood of participation and long-term compliance beyond the hospital setting. Cardiac rehabilitation with supervised exercise training positively affects the basic pathophysiology of CAD and the underlying disease process, the extent of disability and level of quality of life (QOL), and has the ability to potentially impact events of both morbidity and mortality (Williams, Ades, Hamm, Keteyian, LaFontaine, Roitman, and Squires 2006,



p.839). Sundararajan et. al. (2004) found that attendees of cardiac rehabilitation had a 35% improvement in 5-year survival (hazard ratio for death associated with rehabilitation attendance, 0.65 [95% CI, 0.56–0.75]).

Cardiac rehabilitation has been shown to improve exercise tolerance and symptomatology in patients experiencing angina or heart failure and reduce long term mortality after myocardial infarction, with good cost-effectiveness ratio (Monpere 1998, p.143). Eshah and Bond (2009) found significant improvement in participants' quality of life, exercise capacity, lipid profile, body mass index, body weight, blood pressure, resting heart rate, survival rate, mortality rate and decreased myocardial infarction (MI) risk factors, after patients had participated in cardiac rehabilitation. Optimal care (at least 80-90% uptake of an intervention) was seen with antiplatelet and statin treatments and with smoking cessation (Dalal, and Evans 2003, p.481). These results support the notion that early exercise-based rehabilitation counters functional cardiac impairment (Briffa, et. al. 2005, p.454).

Redfern et. al. (2007) quantified the CHD risk profile and risk-factor knowledge of patients not accessing cardiac rehabilitation (NCR group) after hospital admission for an ACS. They found that, patients had a more adverse risk-factor profile and poorer knowledge of cardiac risk factors than those about to commence standard cardiac rehabilitation (SCR group) (Redfern, et. al. 2007, p.24). The NCR group had higher mean ( $\pm$  SEM) low density lipoprotein (LDL) cholesterol levels ( $2.6 \pm 0.1$ ;  $P=0.02$ ), and were more likely than the SCR group to have a total cholesterol level of  $>4.0\text{mmol/L}$  (78% v 53%;  $P<0.001$ ) and an LDL cholesterol level  $>2.5\text{mmol/L}$  (47% v 25%;  $P=0.01$ ) (Redfern, et. al. 2007, p.21). They were more likely than the SCR group to be physically inactive (77% v 22%;  $P<0.001$ ); obese (46% v 33%;  $P=0.04$ ); depressed (21% v 5%;  $P<0.001$ ); or current smokers (21% v 1%;  $P<0.001$ ) (Redfern, et. al. 2007, p.21). Compared with the SCR group, the NCR group also had higher risk scores (LIPID risk score) ( $4.5$  v  $2.1$ ;  $P<0.001$ ); lower quality of life (Medical Outcome Short Form [SF-36] Health Survey); and significantly poorer knowledge of risk factors (Redfern, et. al. 2007, p.21). The benefits of CR programs can clearly be seen in their research, as patients not participating in cardiac participation after an ACS have more adverse risk profiles and poorer knowledge of risk factors compared (Redfern, et. al. 2007, p.21).

While cardiac rehabilitation programs facilitate recovery after a cardiac event they also function as launching pads for secondary prevention of cardiovascular disease (Goble and Worcester 1999, p. xviii). Linkage of West Australian administrative datasets has shown that almost 50% of CHD deaths and non-fatal myocardial infarctions occur in those (possibly 4-5% of the population) who have already been diagnosed with CHD after a hospital admission (Tonkin and Chen 2009, p.110). Cardiac rehabilitation programs following an ACS event can reduce morbidity and mortality associated with an event, and the risk of recurrent ACS events. In 2004, the Australian Institute and Welfare, undertook a state-wide survey that showed that people who attended cardiac rehabilitation programs had better survival after five years than non-attendees. This study, involving 1,570 patients from 15 cardiac rehabilitation programs, also showed significant improvements in physical and mental health-related quality of life scales (Australian Institute and Welfare 2004, p.126). Dalal and Evans (2003) also found that the number of myocardial patients achieving secondary prevention targets improved significantly: those with serum cholesterol < 5.0 mmol/l at discharge increased from 28% at baseline to 75% at 12 months. Cooper et. al. (2007) found that there was a reduction in all-cause mortality that is persist over time, with a risk ratio of 0.53 (95% confidence interval (CI) 0.35 to 0.81) at 24 months and 0.77 (95% CI 0.74 to 0.94) over 5 years (Cooper et. al. 2007, p.53). These studies clearly show that the benefits of cardiac rehabilitation go beyond the initial cardiac rehabilitation program timeframe.

The potential for people with cardiovascular disease to benefit from cardiac rehabilitation is substantial. Patients with symptomatic CHD form an important target group in terms both of changing lifestyles and systematic application of proven medical and surgical interventions (McElduff, Dobson, Jamrozik, and Hobb, 2001, p.28). Preventing recurrences of heart attack or stroke can be a powerful way of reducing the burden of heart, stroke and vascular diseases (Australian Institute and Welfare 2004, p.127). Without preventive treatment, the average death rate from heart disease in people who have had a heart attack is about 5% per year for the rest of their life (Australian Institute and Welfare 2004, p.127).

#### 4.5 Cost Benefits of Cardiac Rehabilitation

The design of programs varies from low-cost home training programs to costly institutional rehabilitation in specialised centres offering continuous exercise monitoring combined with lifestyle modification and occupational counselling (Perk 1996, p.167). However, there is now evidence that significant cost saving may be achieved through cardiac rehabilitation and secondary prevention programs, largely from reduced subsequent hospital admissions and reduced costs of medical care (Goble and Worcester 1999, p. xxv). Cardiac rehabilitation programs can reduce hospital readmissions for heart failure and avoidance of transplantation amongst patients with congestive heart, and the removal of patients with stable angina pectoris from waiting lists for coronary artery bypass surgery (Heart Research Centre 1999, p.188). There are additional savings that arise through pension, retirement and sickness benefits, provided that work resumption and remaining in work is achieved (Goble and Worcester 1999, p. xxv). Not all patients need to wait 2-3 months before returning to work (Perk 1996, p.169).

Briffa et. al. (2005) estimated that postdischarge rehabilitation (including an exercise regime to improve function capacity, education on lifestyle changes and pharmacological treatment) compared to conventional care had an incremental cost-effectiveness ratio of \$42,535 per quality-adjusted life year (QALY) saved, assuming that rehabilitation increased survival rates. This is within the acceptable range of the cost effectiveness threshold set by the World Health Organisation (WHO) and the Pharmaceutical Benefits Advisory Committee (PBAC) (Access Economics 2009, p.62). While cost benefit and effectiveness studies are so far not widely reported, it is apparent that cardiac rehabilitation programs have benefits and effectiveness similar to other successful interventions in the treatment of cardiac and vascular disease (Goble and Worcester 1999, p.xxv).

The biggest cost savings associated with coronary heart disease are to be made from rehospitalisations. Ades, Weaver and Burlington (1992) found that participation in a 3-month outpatient cardiac rehabilitation program was associated with a significantly decreased cost for cardiac rehospitalisations in post-coronary event patients over a fairly short mean follow-up period of 21 months. As over a 1 to 46 - month follow-up period (mean 21 months), per capita

hospitalization charges for participants in cardiac rehabilitation were \$739 lower than charges for nonparticipants (\$1197 +- 3911 vs \$1936 +- 5459,  $p = 0.022$ ) (Ades, Weaver and Burlington 1992, p.916). This was due to both a lower incidence of hospitalization and lower charges per hospitalization (Ades, Weaver and Burlington 1992, p.916). Although the results from this study are for the costs associated with coronary disease in 1992, they do show that there is a relationship between participation in comprehensive cardiac rehabilitation and lowered cardiac rehospitalisation costs in the years after an acute coronary event. However, despite evidence pointing towards the cost effectiveness of cardiac rehabilitation, outpatient care is still underutilised in Australia (Access Economics 2009, p.62).

#### **4.6 Utilisation of Cardiac Rehabilitation Programs**

Despite evidence for effectiveness and patient referral to cardiac rehabilitation programmes by their doctors, suboptimal attendance at cardiac rehabilitation is an international problem (Cooper et. al. 2007, p.53). In New Zealand, an audit of a cardiac rehabilitation centre showed that, 56% of eligible patients did not attend the Phase 2 Cardiac Rehabilitation Program (Parks et. al., 2000, p. 160). Australian research suggests 24% to 39% of eligible patients participate in structured CR programs (Watchel, Kucia and Greenhill 2008, p.196). Sundararajan et. al. (2004) found the rates of participation in rehabilitation were 15% for acute myocardial infarction (AMI), 37% for coronary artery bypass grafting (CABG), and 14% for percutaneous transluminal coronary angioplasty (PTCA). Rehabilitation attendance rates drop sharply after 70 years of age (Sundararajan et. al. 2004, p.268). Existing services remain underutilised, due to a number of geographic and socio-economic barriers. For patients who did not attend cardiac rehabilitation programs, lack of knowledge regarding the existence of such programs, problems with access to them and the belief that they were unnecessary were the most frequently identified factors discouraging attendance King et al. 2001, p.294). Limited availability of program places, failure of clinicians to refer patients and patient related barriers to attendance are cited as reasons for low participation rates both in Australia and Internationally.

The significant underutilisation of cardiovascular rehabilitation services can be seen in the work of Clark et al. (2007) who mapped the location of general practices and the known Chronic

Heart Failure (CHF) Management Programs operating in Australia. The study showed that, of the probable 63 000 individuals admitted to hospital with CHF during 2004–2005, only 8% (5000 patients) were enrolled in a CHF Management Program and therefore that most Australian CHF patients did not receive recommended evidence-based care (Clark 2007, p.172). The study also found that there is an inequity in the provision of CHF management programs to rural Australians as the mean distance from any Australian population centre to the nearest CHF management program was 332 km (median, 163 km; range, 0.15–3246 km) (Clark 200, p.169). This study highlights the fact that the distribution of these services is primarily in urban centres or larger regional centres which limits access to ongoing support and follow-up especially for those from rural and remote communities. Access is an important mediator of health resources use and has been shown to be particularly problematic for elderly and rural-living patients (King et. al. 2001, p.295).

It is clear that a majority of eligible Australians are failing to achieve the potential gains available from our network of outpatient cardiac rehabilitation programs (Bunker and Goble 2003, p.332). Key factors contributing to these deficiencies include the following:

- Data have not been collected to establish cardiovascular health indicators for monitoring the proportion of patients entering and completing a cardiac rehabilitation program;
- Routine referral, although recommended in Australia, is not standard practice;
- Cardiac rehabilitation programs are not available or accessible to all patients, especially those in rural and remote areas; and
- Cardiac rehabilitation programs are not sufficiently accessible and attractive to certain population groups, such as Indigenous people, older women, those unable to speak English, and the indigent (Bunker and Goble 2003, p.332).

The underutilisation of cardiac rehabilitation programs reflects both a lack of initial referral and a failure of patients to attend despite having been referred. Referrals should be offered to all patients and the individual needs of each patient, and their family and community, need to be considered (Heart Foundation, 2004). Accessibility to cardiac rehabilitation is one of the major factors affecting the utilization of phase 2 cardiac rehabilitation programs. Bruhal et. al.( 2010 ) found that the barriers of particular importance are geospatial in nature, such as CR site location, distribution, distance and travel time. King et. al. (2001) found that access is an

important mediator of health resources use and has been shown to be particularly problematic for the elderly and rural-living patients. The World Health Organisation (1993) and the National Heart Foundation of Australia (2004) recommend that cardiac rehabilitation, incorporating secondary prevention programs, should be available to all patients with cardiovascular disease.

#### **4.7 Conclusion**

This chapter has defined cardiac rehabilitation for this thesis as an integrated program that incorporates assessment, review and follow-up, low or moderate intensity physical activity, education, discussion, and counselling. This definition from the National Heart Foundation is well recognised and accepted within Australia and will be used within this thesis.

Due to the aging population, and the shift of cardiovascular disease from an acutely fatal event to a chronic disease, there is a marked and growing need for medical services that help patients improve their quality of life (QOL), lessen symptoms, increase functional capacity, decrease disability, and reduce the risk of subsequent morbidity and mortality (Williams, et. al. 2006, p.838). This chapter has identified that cardiac rehabilitation is one way of decreasing the burden of heart disease in Australia, through the benefits patients receive and through cost savings within the health system.

Despite the World Health Organisation (1993) and the National Heart Foundation of Australia (2004), recommending that, unless contraindicated, all patients who have had a heart attack, heart surgery, coronary angioplasty or other heart or blood vessel disease, are to be routinely offered the opportunity to be referred to, and participate in, a cardiac rehabilitation and prevention program that is appropriate to individual need, cardiac rehabilitation is underutilised. Access and availability are key factors in health care utilization (Johnson, Weinert, and Richardson 2001, p.288). Accessibility to services has been highlighted as a barrier to cardiac patients utilizing cardiac rehabilitation services. The 3 phases of cardiac rehabilitation were discussed in this chapter and Phase 2 was identified as a point within the cardiac patient's continuum of care where accessibility becomes an issue for cardiac patients. This is the point

within the patient's journey that they are able to decide if they participate or not in their health care, as Phase 1 cardiac rehabilitation is often routinely provide in hospital as part of their inpatient care. Therefore the spatial model of accessibility which forms the basis of this thesis will be developed specifically for measuring the accessibility to Phase 2 cardiac rehabilitation programs.

## **Chapter 5: Data: Factors Affecting Accessibility to Cardiac Rehabilitation Programs**

### **5.1 Introduction**

In the previous chapter the complexities of defining accessibility were discussed and the different dimensions of accessibility were also explored. Barriers to patients accessing cardiac rehabilitation generally fall into two categories: patient barriers and health service barriers. Cooper et. al. (2002) for example found that patients that did not attend were likely to be older, have lower income/greater deprivation, downplay the seriousness of their illness, are less likely to believe they can influence the course and outcome of their illness and are less likely to perceive that their physician recommends cardiac rehabilitation. Stewart, Williams, Lowe, and Candlish (2005) ran focus groups and identified the following issues which would improve the accessibility of cardiac rehabilitation services to patients: rescheduling more clinic visits in the last 12 weeks of the program; holding exercise classes with fewer participants; improving the venue for the education sessions; revisiting the clinical pathways to identify patients for referral to the program; actively recruiting subjects through specialists; ensuring all subjects received a home visit; providing a transportation service for subjects to attend the program; and providing accessible parking for those who preferred to use private transport. Understanding the barriers to accessing cardiac rehabilitation programs is necessary for determining which factors should be included in the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs.

To identify the barriers to patients accessing Phase 2 Cardiac Rehabilitation programs a literature review was undertaken. From the literature review, a series of questions were developed to capture individual Phase 2 Cardiac Rehabilitation Programs accessibility. The questions were then developed into a questionnaire and a survey of the accessibility of Phase 2 Cardiac Rehabilitation Programs within Australia was then undertaken and the results from that survey are presented in this chapter with supporting material from the literature review. The results from the Cardiac Rehabilitation Accessibility Survey highlight the most significant barriers Phase 2 Cardiac Rehabilitation Programs possess which limit patient accessibility to these services.



## **5.2 Cardiac Rehabilitation Accessibility Survey Methodology**

A review of available literature on barriers to the uptake of cardiac rehabilitation services within Australia was undertaken. Using Penchansky and Thomas' (1981) five dimensions of accessibility as a structural framework the information obtained from the literature review was used to form a series of questions (see table 5.1). The questions were both open-ended and closed. These questions were then organised into a formal questionnaire which was sent to each of the Cardiac Rehabilitation Programs within Australia (n=401) (see appendix 1).

The names and addresses of cardiac rehabilitation centres were obtained from the National Heart Foundation of Australia (NHF) and the Australian Government National Health and Medical Research Council's report "Geographic Information System of Cardiac Rehabilitation Services for Aboriginal and Torres Strait Islander Peoples" (2007). The address lists were combined and duplicates were removed.

An initial pilot survey was undertaken in July 2008, using a subsample of 20 cardiac rehabilitation services from the total population (n=401). The cardiac rehabilitation services were chosen at random and were used to test the suitability of the Cardiac Rehabilitation Accessibility Survey questionnaire. The questionnaires were sent to the rehabilitation coordinators for each cardiac rehabilitation service via email. Feedback from the pilot testing was used to modify the questionnaire to make it easier for the cardiac rehabilitation centres to complete. Only 3 questionnaires were returned and 12 of the emails that were sent no longer had valid email addresses. As a result of the poor response rate from the pilot testing, traditional post was seen as the preferred method of survey delivery.

Table 5.1 Methodology for Developing the Cardiac Rehabilitation Accessibility Survey.

Penchansky and Thomas (1981) dimensions of access:	Reference	Cardiac Rehabilitation Accessibility Survey Question
<p><b>Accessibility</b> - Describes geographical barriers, including distance, transportation, travel time, and cost.</p>	<p>"Living an average of 27 km away compared to an average of 47 km". Schulz, D.L., McBurney, H. (2000). Compared with non-attendees, patients who attended CR had a significantly shorter travel time (mean difference, 5.31 min [95% CI, 0.81–9.81 min]; F1159 = 5.42; P = 0.021), lived closer to the program venue (mean difference, 5.53 km [95% CI, -0.22 to 11.27 km]. Higgins et al (2008).</p> <p>"Patients were less likely to attend CR as travel time increased: 1 min of extra travel time was associated with a 14% reduction in the likelihood of attendance, and 10min of extra travel time corresponded to a 77% reduction." Higgins et al (2008).</p> <p>"This is highlighted by the fact that attendees lived an average of 15.4 km from the facility providing the CR program whereas non-attenders lived an average of 40.4 km from the facility. Easy access to transport is a principal enabler to CR attendance." De Angelis et. al. (2008).</p> <p>Aikman et al. (1996) found the patient characteristics that influenced attendance were 'wanting to attend', 'partner wanting to attend' and 'living less than 15 km from the program'.</p>	<p>Program location (where do patients go to access your program): Street: Suburb: Town/city: Postcode:</p>
<p><b>Availability</b> – Defines the supply of services in relation to needs – are the types of services adequate to meet health care needs?</p>	<p>"Many CR programs have an age limit on attendance" Schulz and McBurney (2000), Pell et al. (1996), and McGee et al. (1992).</p> <p>"Exclusions were on the basis of age, a positive exercise tolerance test, postinfarct angina or heart failure, despite the fact they may have benefited the most from exercise cardiac rehabilitation". Tod, Lacey, and McNeill (2002).</p> <p>"The most significant factor in the prediction of CR attendance was referral to the program" Schulz and McBurney (2000).</p>	<p>Which of the following age groups do you allow to use your cardiac rehabilitation program? All ages, &lt;15, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, 85+</p> <p>According to discharge diagnosis, what type of patients do you allow into your cardiac rehabilitation program? (please tick all of those that apply).</p> <p>Do the people that utilise your cardiac rehabilitation program require a referral? (please circle) Yes / No If "Yes" where do people usually get referred from?</p>
<p><b>Accommodation</b> – Identifies the degree to which services are organised to meet clients' needs, including hours of operation, application procedures, and waiting times.</p>	<p>"Some patients interpreted cardiac rehabilitation as exercise only. This was a barrier when people did not see exercise for them". Tod, Lacey, and McNeill (2002).</p> <p>"the provision of home as well as hospital-based CR may be an important means of addressing the suboptimal uptake of CR after MI" Wingham, Dalal, Sweeney, and Evans(2006).</p> <p>Some participants advocated the delivery of education and exercise in a group setting. Others found it inappropriate and unappealing. Tod, Lacey, and McNeill (2002).</p> <p>"Home-based, CR models have the most substantive evidence base and, therefore the greatest potential to be developed and made accessible to eligible people living in rural and remote areas." Dollard, Thompson, and Stewart (2004).</p>	<p>Which of the following are included in your cardiac rehabilitation program (please tick all that apply)? Health education, physical activity, counselling, behaviour modification strategies, support for self-management, cultural understanding</p> <p>Within what type of setting is the cardiac rehabilitation program run (tick all that apply): within an acute public hospital, within an acute private hospital, within an Aboriginal medical service, within a non-acute/community hospital, within a public community health centre/service, within a private outpatient service, as part of an outreach service to communities, telephone service, home visits, internet.</p> <p>What type of sessions do you provide? Group only, individual only, group and individual</p> <p>When is your cardiac rehabilitation program available to patients (please indicate operating hours):</p>
<p><b>Affordability</b> – Refers to the price of services in regard to people's ability to pay.</p>	<p>"Reasons for not participating include lack of time, lack of referral or physician support, financial reasons, lack of motivation, perceptions of the benefits, distance and transportation, family composition, nature of the program and work commitments." Shepherd, Battye, and Chalmers (2003).</p> <p>"Patients on a low income or who are socially deprived are less likely to attend but as with the elderly or female patients, may have the most to gain from secondary prevention because there is a linear relationship between socioeconomic status and cardiac outcome" Cooper, Jackson, Weinman, and Horne (2002).</p>	<p>Is there a cost associated with attending your cardiac rehabilitation program that is not covered by medicare? yes/no If yes, what is the cost?</p>
<p><b>Acceptability</b> – Describes client's views of health services and how service providers interact with clients.</p>	<p>"While the evidence underpinning cardiac rehabilitation suggests that it can be of benefit, poor attendance rates mean that services often fail to help those in need." Clark, Barbour, White, and MacIntyre (2004).</p>	<p>How many patients participated in your cardiac rehabilitation program in the last financial year (2007/2008)?</p> <p>How many patients completed your cardiac rehabilitation program in the last financial year (2007/2008)?</p>

In October 2008 a postal survey of all cardiac rehabilitation services (n=401) in Australia was undertaken to collect information on the accessibility of their Phase 2 Cardiac Rehabilitation Programs for the 2007/2008 financial year. Every Cardiac Rehabilitation Program was mailed a questionnaire (refer to Appendix 1) and given 3 weeks to return it in a pre-paid envelope. Incentive for the return of the questionnaire was provided by "The Heart Shop" in the form of a heart rate monitor. This was given at random to one of the cardiac rehabilitation services that returned their questionnaire.

The return rate for the questionnaire was 84% with 362 responses being returned, however 158 of the questionnaires that were returned stated that they did not run a Phase 2 Cardiac Rehabilitation Program. This has resulted in a total of 204 questionnaires being completed. This highlights the a limitation of the survey which was that it was not possible to distinguish between the different types of cardiac rehabilitation prior to the survey being posted, to target Phase 2 Programs only. However it has had no impact upon the survey results as the letter that accompanied the questionnaire clearly stated that it was targeting Phase 2 Cardiac Rehabilitation Programs only, and many of the Co-ordinators that were running other types of Cardiac Rehabilitation Programs returned the questionnaire with it clearly marked with the other type of program that they were running.

From the total number of surveys that there sent out, 39 cardiac rehabilitation services did not reply to the questionnaire. These services were given a follow-up phone call requesting information but they were still unable to provide information. Many of the Cardiac Rehabilitation Coordinators for these services stated that they did not have the time to fill out the questionnaire (n= 28), that they did not run a Phase 2 Cardiac Rehabilitation Program (n=9), or could just not be contacted (n= 2). While the data that these programs could have provided in the most part would have been valuable, it was not seen to have a significant impact upon the survey results due to their spatial distribution as shown in figure 5.1 as those programs that did not provide data are fairly evenly distributed across Australia. Therefore no single area would be severely underrated due to a lack of information. Also by knowing their spatial location the cardiac rehabilitation services that did not provide information on their Phase 2 Cardiac Rehabilitation programs can still be geo-located and the lack of information for that spatial area can be clearly identified.

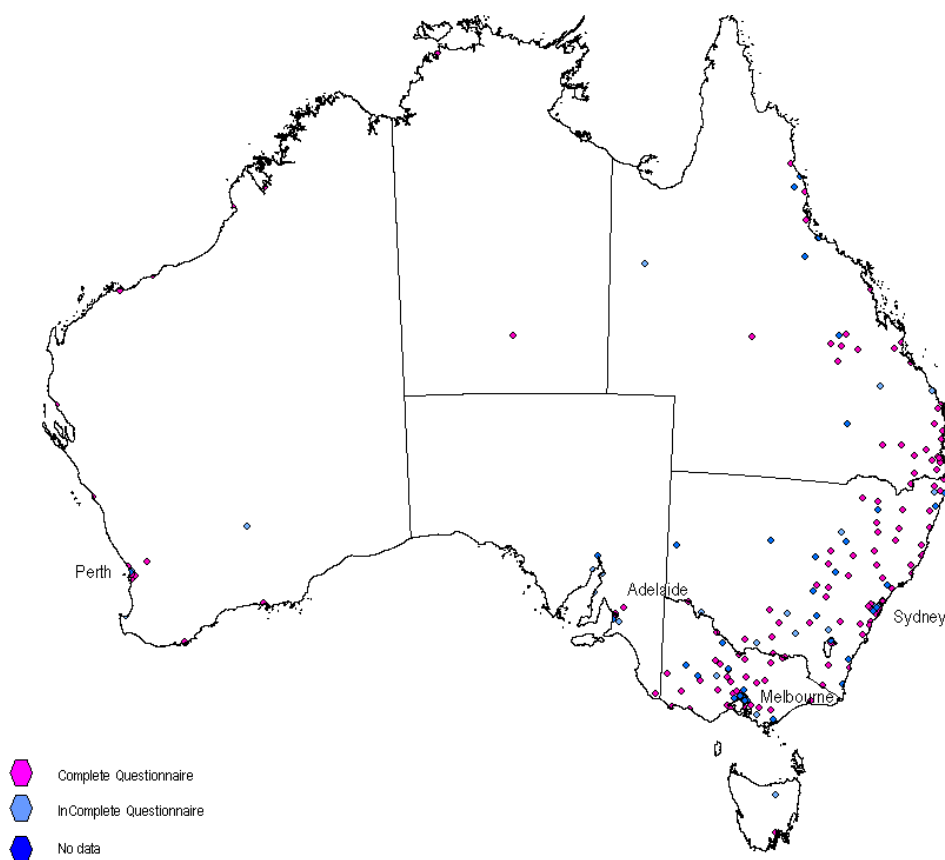


Figure 5.1 Cardiac Rehabilitation Accessibility Survey Coverage. (Source: Cardiac Rehabilitation Accessibility Survey)

### 5.3 Referral

A letter of referral from either a General Practitioner or Cardiologist is in some cases necessary for a patient to gain access to individual Phase 2 Cardiac Rehabilitation Programs, however it is not a mandatory requirement for all Phase 2 Cardiac Rehabilitation Programs. Bunker and Goble (2003) note that the lack of referral to a phase 2 cardiac rehabilitation program can be seen as a major barrier to patients accessing cardiac rehabilitation. In New Zealand, Doolan-Noble et. al. (2004) found that of the people who were referred to inpatient rehabilitation, only 83% were referred on to an outpatient program. Scott, Lindsay and Harden (2003) reported that one of the barriers to patients accessing outpatient coronary rehabilitation was the failure of attendant doctors to consider referring eligible patients (32%), lack of clinician awareness of program availability (26%),

and insufficient time to arrange referrals (35%). Lack of referral by the General Practitioner or Cardiologist can result from a number of factors.

Doolan-Noble et. al. (2004) found that referral to Phase 2 Cardiac Rehabilitation Programs was negatively associated with increasing age and no access to transport (either private or programme) and those patients that were post-revascularization and post-myocardial infarction were more likely to receive referral to Phase 2 Cardiac Rehabilitation (Doolan-Noble et. al 2004, p.6). Those who had previously attended a cardiac rehabilitation program were significantly more likely to attend, and compared to those aged 65 to 74 years, those older or younger were less likely to complete the programme (Doolan-Noble et. al. 2004, p.1). Some associations with deprivation were found, but none with ethnicity (Doolan-Noble et. al. 2004, p.1). The strongest predictors of ongoing participation were physician's endorsement, ease of physical access, and transportation and high self-efficacy, high social support, high socioeconomic status, and high education (Jackson, Erskine, Linden 2005, p.12).

One clear predictor of referral is the physician's endorsement and attitude towards the effectiveness of cardiac rehabilitation (Jackson, Erskine and Linden 2005, p.10). Furthermore, Jackson, Erskine and Linden (2005) found that patients with a primary diagnosis of either percutaneous transluminal coronary angioplasty, angina, coronary artery bypass grafting, or hypercholesterolemia were referred more often to cardiac rehabilitation programs as were co-morbid patients. Women and patients lacking medical insurance coverage were less likely to be referred (Jackson, Erskine, Linden 2005, p.11). Jackson, Erskine and Linden (2005) state that women were referred less often and adhered less often to cardiac rehabilitation programs due to lower fitness levels, older age and greater disease severity at first morbidity, greater social isolation and depression. Lack of awareness by clinicians of outpatient cardiac programs, inadequate hospital referral procedures, and poor program organisation (such as no designated in hospital cardiac rehabilitation coordinator) are contributory factors to referral failure (Scott, Lindsay and Harden 2003, p.344). Failure of hospital referral procedures is of concern given that patients react more positively to specialist recommendations to attend outpatient cardiac rehabilitation than to recommendations by other health professionals (Scott, Lindsay and Harden 2003, p.344).

The lack of referral to an outpatient (phase 2 cardiac rehabilitation program) can be a barrier to accessing phase 2 cardiac rehabilitation programs. The Cardiac Rehabilitation Accessibility Survey found that 73% (n = 228) Phase 2 Cardiac Rehabilitation Programs in Australia needed a referral prior to patients accessing their program. Therefore without a referral from a General Practitioner or Cardiologist results from the Cardiac Rehabilitation Accessibility Survey show that a large percentage of Australian Phase 2 Cardiac Rehabilitation Programs would not be accessible to patients.

#### **5.4 Hours of Operation**

Thornbill and Stevens (1998) found that of the patients that attended cardiac rehabilitation, all agreed that being given a choice about the time for attendance made a great difference to their commitment to the program. According to Young (1999), both men and women, but in particular women, face increased time-constraints due to their responsibilities within the household such as taking care of dependent children, partners and elderly relatives, in addition to paid employment responsibilities. As such, an individual's ability to access care is affected by their daily schedules and routines (Wellstood, Wilson, and Eyles 2006, p.127). Dollard, Thompson, and Stewart (2004) found that, people are more likely to participate in cardiac rehabilitation when access is convenient. The Cardiac Rehabilitation Accessibility Survey found that all Phase 2 Cardiac Rehabilitation Programs in Australia were each run with very limited and specific hours of operation, with some programs operating as little as 2 hours a week. With very little choice in times available to attend programs patients would find this a major barrier to them accessing the service. The survey also found that only 2% (n=4.56) of the Phase 2 Cardiac Rehabilitation Programs ran out of hours sessions for patients. The lack of out of hours sessions would greatly affect the accessibility of the service for those patients that have returned to work.

#### **5.5 Patient Perceptions**

Patients' perceptions of the program can act as a barrier to them accessing cardiac rehabilitation. Tod, Lacey and McNeill (2002) found that while some participants advocated the delivery of education and exercise in a group setting, others found it inappropriate and unappealing. They

also found that, people were deterred from attending groups because they found them stressful socially, lacked privacy or were put off by dominant members in the group (Tod, Lacey and McNeill 2002, p.428). Therefore for some patients having their cardiac rehabilitation program delivered in a group setting can be seen as a real barrier to them accessing the service. Therefore having both group and individual settings available would improve the accessibility of the service.

The Cardiac Rehabilitation Accessibility Survey found that more than half (56%, n=228) of the Phase 2 Cardiac Rehabilitation Programs Surveyed conducted both group and individual sessions. Group only sessions were conducted by 36.8% of the total number of Phase 2 Cardiac Rehabilitation Programs in Australia. Individual only sessions were run by only 6.6% of the Phase 2 Cardiac Rehabilitation Programs surveyed.

Cardiac patients' accessibility to the Phase 2 Cardiac Rehabilitation Program may also be influenced by their perception of the quality of the program. The Cardiac Rehabilitation Accessibility Survey used the National Heart Foundations' Recommended Framework (2004) to determine what components would be best practice to include in a Phase 2 Cardiac Rehabilitation Program. The National Heart Foundation recommended that health education, physical activity, self-management, behaviour modification strategies, counselling, and cultural understanding were necessary components of a Phase 2 Cardiac Rehabilitation Program. As can be seen in table 5.2, The Cardiac Rehabilitation Accessibility Survey found that a large percentage of the Phase 2 Cardiac Rehabilitation Programs had each of these components recommended as best practice within their program. However the Cardiac Rehabilitation Accessibility Survey also found that only 49% (n=228) of Phase 2 Cardiac Rehabilitation Programs had all 6 recommended components. Therefore most Phase 2 Cardiac Rehabilitation Programs within Australia failed to meet the National Heart Foundations' recommendation of what a Phase 2 Cardiac Rehabilitation Program should comprise of. Patients may have found that some Phase 2 Cardiac Rehabilitation Programs were not suitable due to the program not offering components that the patient required. If the Phase 2 Cardiac Rehabilitation program only offered a very limited service (such as physical activity and or counselling only) then the patient might have preferred to access these components of the service elsewhere in a more non-specific setting such as through their General Practitioner (GP) or local gymnasium.

<b>Phase 2 Cardiac Rehabilitation Program Component</b>	<b>% of Phase 2 Cardiac Rehabilitation Programs</b>	<b>No. of Phase 2 Cardiac Rehabilitation Programs n= 228</b>
Health education	96%	220
Physical activity	96%	220
Counselling	80%	183
Behaviour modification strategies	84%	190
Support for self-management	90%	207
Cultural understanding	62%	141

Table 5.2 The Percentage of Phase 2 Cardiac Rehabilitation Programs with Components Recommended by the National Heart Foundation (National Heart Foundation, 2004, p.1.). (Source: Cardiac Rehabilitation Accessibility Survey).

## 5.6 Patient Age and Gender

Despite often having greater needs, women, older people and those from lower socio-economic groups are identified consistently as being less likely to be invited or attend cardiac rehabilitation (Cooper et al. 2002, p.541). Wellstood, Wilson, and Eyles (2006) found many system-related barriers to receiving healthcare (e.g., waiting times, geographic inaccessibility and quality of care) and some individual-related barriers (e.g., work or family responsibilities). In terms of individual barriers, differences emerged between men and women with males most often discussing work responsibilities and females identifying family responsibilities as barriers to receiving health care (Wellstood, Wilson, and Eyles 2006, p.126).

Female gender and increasing age are independently associated with decreasing cardiac rehabilitation uptake (McGee and Horgan 1992, p.284). Women were less often referred and participated less often even after referral (Jackson, Erskine, Linden 2005, p.10). Women with a diagnosis of angina or Myocardial infarction (MI) were less likely to attend than men at 12% versus



28% and 36% versus 52% ( $p < 0.01$ ) respectively and in the other 34% of women versus 49% of men attended (Cooper et. al. 2002, p.543). Women are less likely to own and drive a car thereby rendering access to a rehabilitation program more difficult (Ades, Waldman, McCann and Weaver 1992, p.1035). Lower fitness levels, older age, and greater disease severity at first morbidity, as well as greater social isolation and depression in women, make it harder for women to access cardiac rehabilitation (Jackson, Erskine, Linden 2005, p.10). Tod and McNeill (2002) found that women often don't attend cardiac rehabilitation due to other commitments including childcare, paid employment, housework and family responsibilities. Delay in service availability places an additional barrier upon women because of the speed with which they resume responsibilities in the home and family (Tod, Lacey and McNeill 2002, p.428). Cardiac Rehabilitation needs to be flexible enough to meet individual and group needs (Day and Batten 2006, p.24).

Older age is commonly associated with nonattendance with the exception of patients from a rural setting (Cooper et. al. 2002, p.542). Worcester et. al. (2004) found that there was poorer attendance amongst older patients (both men and women) despite evidence that older patients can improve significantly by attending cardiac rehabilitation. Worcester et. al. (2004) felt this was due to transport difficulties, since many were non-drivers and the slower recovery and a higher incidence of complications among older patients following acute cardiac illness. Bunker et. al. (1999) found that different patients were more likely than others to attend cardiac rehabilitation. They found that, CABG patients are more likely to participate in outpatient CR programs than AMI or PTCA patients (Bunker et. al. 1999, p. 337). Bunker et. al. (1999) thought that this was due to improved initial referral rates for CABG patients and that the experience of cardiac surgery may provide a greater incentive for those patients to participate in CR programs than for those who had experienced an AMI. Rehabilitation attendance rates peak in the 50–59-year age group at 29% and decline after the age of 70 years (Sundararajan, Bunker, Begg, Marshall, and McBurney 2004, p.269). Frailty because of age or co-morbidity may exacerbate problems with travel, transport and distance to services (Tod, Lacey and McNeill 2002, p.428). In the United Kingdom, Day and Batten (2006) found that overall health and the ability to travel to cardiac rehabilitation venues does affect older people's use of services. It is also possible that these two factors are related, with people with more severe health-problems having more difficulty with travelling (Harrison and Wardle 2005, p.1021).

Results from the Cardiac Rehabilitation Accessibility Survey show that 68% (n=228) of Phase 2 Cardiac Rehabilitation Programs in Australia accept all age groups into their programs. Of the 32% that did not accept all age groups into their programs almost all accepted patients from 35 to 85 years and more into their programs. Therefore age is a barrier for the patient and not a barrier imposed by the Phase 2 Cardiac Rehabilitation Program to access cardiac rehabilitation.

## **5.7 Support**

Thornbill and Stevens (1998) found that spouses often provided motivation to attend cardiac rehabilitation programs. Compliance with cardiac rehabilitation attendance has been shown to increase from 67% to 90% when the spouse was included in the cardiac rehabilitation program (Oldridge et al. 1993, p.156). While the degree of support provided by the spouse varies from individual patient, Thornbill and Stevens (1998) found that partners that participated in the exercises, assisted in the changing of diet and were great motivators of change, in general to cardiac patients. Phase 2 Cardiac Rehabilitation Programs within Australia accept social support for their patients and do not exclude patients on this basis. Therefore while social support acts as a driver for the patient to attend Phase 2 Cardiac Rehabilitation it is not viewed as a barrier imposed by the program to access cardiac rehabilitation.

## **5.8 Acceptability**

Patients' reasons for not adhering to their cardiac rehabilitation program are multifactorial and very individualized (Jones et al. 2007, p.355). Cooper et al. (2007) found that patients' beliefs regarding the necessity of cardiac rehabilitation, concerns about attending the program as well as not understanding the benefits of cardiac rehabilitation were common reasons for patient non-attendance. Their concerns about cardiac rehabilitation include those about undertaking exercise or physical activity, and practical barriers – namely, availability and cost of transport and financial implications of taking time off work (Cooper et al. 2007, p.57). Patients are also concerned about the suitability of the cardiac rehabilitation program, as some feel, that cardiac rehabilitation is more suitable for younger, previously active people (Cooper et al. 2007, p.59).

Patient beliefs are a strong driving force for the attendance or non-attendance at cardiac rehabilitation programs. Thornbill and Stevens (1998) asked patients who had attended cardiac rehabilitation, what made them return week after week to finish the program and each participant provided a number of responses which generally could be categorised under four themes: (i) the encouragement provided by the cardiac rehabilitation program nurse; (ii) the camaraderie generated by the group they attended; (iii) the positive reinforcement gained from the exercise undertaken in the program; and (iv) the empowerment gained by the education received as part of the program.

Results from the Cardiac Rehabilitation Accessibility Survey, reveal that completion rates of Phase 2 Cardiac Rehabilitation Programs are low. Figure 5.2 shows that only 14% (n=228) of Phase 2 Cardiac Rehabilitation Programs had 100% of patients complete their program. The survey also revealed that 18% of Phase 2 Cardiac Programs had half or less of their patients complete the program.

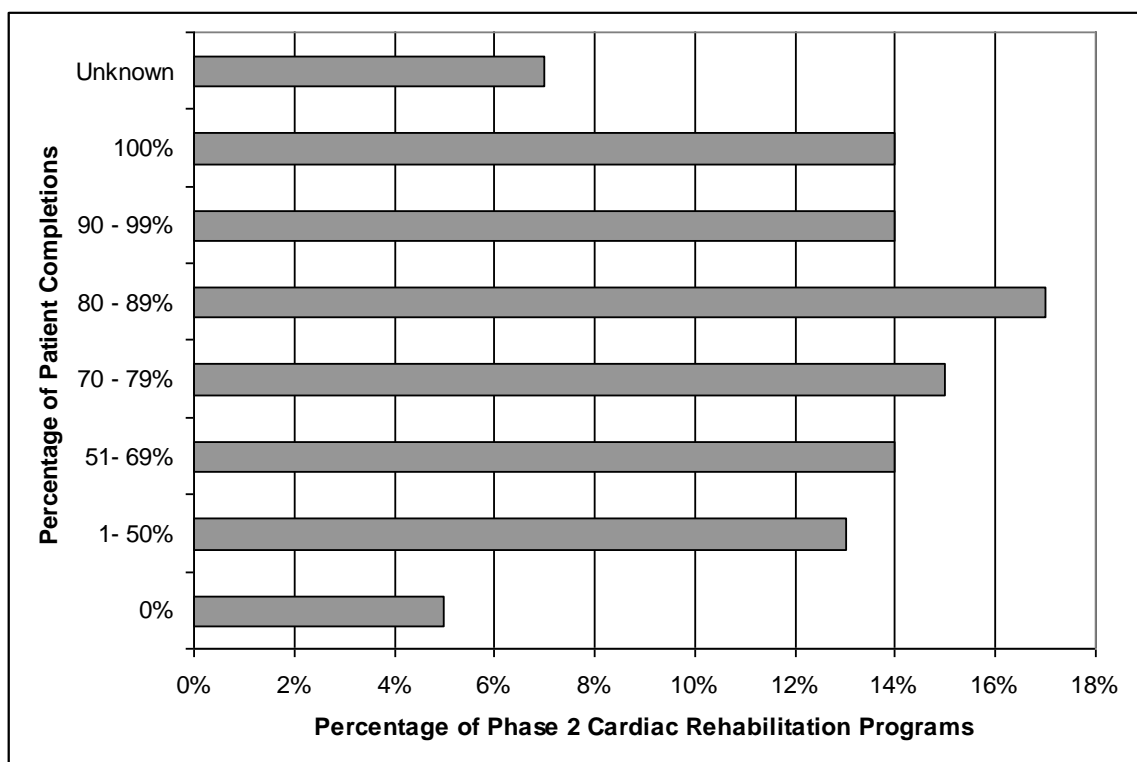


Figure 5.2 The Percentage of Patients Completing Phase 2 Cardiac Rehabilitation Programs (n=228). (Source: Cardiac Rehabilitation Accessibility Survey).

Patients' reasons for not attending or not completing their cardiac rehabilitation program are varied. Jones et. al. (2007) has grouped the reasons for non-attendance into four main categories: many patients were undertaking alternative exercise programmes or activities, some had other health problems which interfered with exercise, others had personal reasons making participation in cardiac rehabilitation difficult or undesirable and there were factors associated with the individual programs. Jones et. al. (2007) found that for many patients their other health problems were a greater barrier to exercising than their heart condition, particularly emphysema, arthritis and back pain. Ramm et. al. (2001) found that after initially commencing cardiac rehabilitation patients may later withdraw, (which is commonly high, around 50%). Reasons for withdrawing included post infarction angina, continued smoking and uncontrolled hypertension, lack of interest or motivation, logistical reasons and work commitments (Ramm et. al. 2001, p.227).

Tod and McNeill (2002) identified that, patients' understanding of coronary heart disease and their heart attack appeared to influence whether they accessed cardiac rehabilitation. Research shows that participants' needs after a cardiac event are oriented towards accepting their condition and knowing their limits, rather than modifying health habits (Wiles and Kinmonth 2001, p.123). Viewing their heart attack as an acute event rather than a symptom of a chronic condition has been proposed as an explanation for patients' low levels of motivation for long-term life changes (Paquet et. al. 2005, p.573). Similarly, a perception of moderate versus mild physical impairment independently predicted attendance with mildly impaired patients 42% more likely to participate than moderately impaired patients (Cooper et. al 2002, p.543). Research undertaken by Bunker and Goble (2003) supports this idea, as he found that, patient "denial" of severity of illness and a history of depression have both been found to be significant predictors of non-participation, and may also account for the varying participation rates by diagnosis or procedure. Cooper et. al. (1999) found that patient illness perceptions measured during hospital admission are associated with future cardiac rehabilitation attendance and that those with a stronger belief that their condition is controllable will subsequently take appropriate action such as attendance at cardiac rehabilitation. Similarly, individuals who attributed their heart condition to their lifestyle showed a higher rate of cardiac rehabilitation attendance indicating that this particular causal belief is associated with a commitment to further behaviour change (Cooper et. al. 1999, p.236).

The World Health Organisation (1993) recommends that cardiac rehabilitation services be available, and routinely offered, to everyone with cardiovascular disease. The National Heart Foundation (2004), state that the core group of people eligible for cardiac rehabilitation are those who have had: myocardial infarction (ST elevation MI, non-ST elevation MI), re-vascularisation procedures, stable or unstable angina, controlled heart failure, other vascular or heart disease. Figure 5.4 lists the coronary heart disease codes which were translated from The National Heart Foundations' 2004 guidelines into disease codes by Professor Andrew Tonkin, Head of Cardiovascular Research Unit, Department of Epidemiology and Preventative Medicine, Monash University, Melbourne, Australia. Results from the Cardiac Rehabilitation Accessibility Survey reveal that patient accessibility to Phase 2 Cardiac Rehabilitation Programs in Australia is restricted by the patient's type of cardiovascular disease (refer to Figure 6.3). Figure 6.3 shows that less than half of the Phase 2 Cardiac Rehabilitation Programs in Australia accept patients with the following coronary heart disease conditions: Dressler's Syndrome, Atrial Thrombosis Auricle Append Ventricular with Acute Myocardial Infarction, Ruptured Papillary Muscle Complications Following Acute Myocardial Infarction, Ruptured Chordae Tendineae Complications Following Acute Myocardial Infarction, Ruptured Cardiac Wall without Hemopericrd Following Acute Myocardial Infarction, and Haemopericardium Current Complications Following Acute Myocardial Infarction. The survey results also reveal that heart failure patients are not accepted at all Phase 2 Cardiac Rehabilitation Programs. However the National Heart Foundation (National Heart Foundation of Australia and Australian Cardiac Rehabilitation Association 2004, p.1) recommend that cardiac rehabilitation services should be available, and routinely offered, to everyone with cardiovascular disease.

Tod and McNeill (2002) found that exclusions on the basis of age, a positive exercise tolerance test, postinfarct angina or heart failure created a barrier to accessing cardiac rehabilitation. This is primarily due to the clinical pathway that patients undertake. Some participants are temporarily excluded until they have had an interventional cardiology or revascularization procedure (Tod, Lacey and McNeill 2002, p.427). This creates two waiting periods, first for the procedure, then for accessing cardiac rehabilitation (Tod, Lacey and McNeill 2002, p.427). Patients with co-morbidities often have difficulty participating in cardiac rehabilitation programs. Older patients with various co-morbidities now comprise up to 50% of patients hospitalised with cardiac conditions (Scott, Lindsay and Harden 2003, p.344). However, often these patients have the most to gain from cardiac rehabilitation.

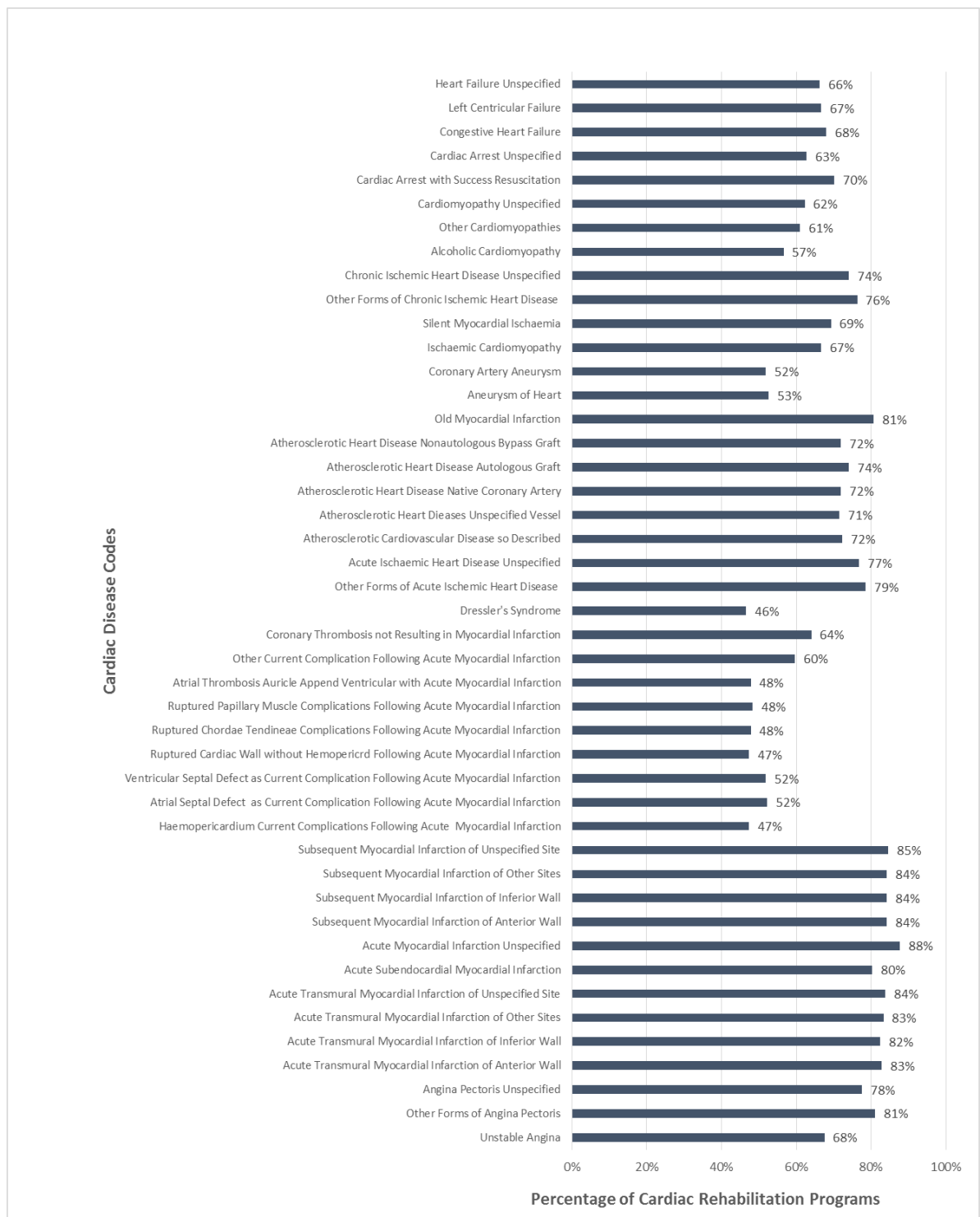


Figure 5.3 Discharge Diagnosis Accepted into Phase 2 Cardiac Rehabilitation Programs (n=228) (Source: Cardiac Rehabilitation Accessibility Survey).

Exercise is a vital component of cardiac rehabilitation. Most patients attending cardiac rehabilitation find that the controlled exercise readjusted their belief in what their physical limitations were (Thornbill and Stevens 1998, p.108). Unfortunately some patients interpret cardiac rehabilitation as exercise only and therefore can be seen as being a barrier when people did not see exercise for them (Tod, Lacey and McNeill 2002, p.427). Therefore the method of program delivery can be seen as a barrier to some patients. Conventional cardiac rehabilitation programs involving both education and exercise in a group setting are the most common method of program delivery in Australia. Conventional cardiac rehabilitation models are preferred for several reasons, two of which are social support and exercise supervision (Dollard, Thompson and Stewart 2004, p.28). However, Tod, Lacey, and McNeil (2002) found that some participants advocated the delivery of education and exercise in a group setting, while others found it inappropriate and unappealing. While group work provides social support for the client, it is indeed an individual preference and if it is not preferred, it could act as a barrier to participation (Dollard, Thompson and Stewart 2004, p.28).

Due to patient preferences for different program models offering a range of program deliver modes is important for improving access to cardiac rehabilitation. De Angelis et. al. (2008) found that 38% of patients were receptive to alternative cardiac rehabilitation methods such as programs in outlying communities, evening facility-based programs, home and general practioner based programs, telephone support and a patient manual/workbook. Understanding the factors which influence people in choosing cardiac rehabilitation may help health professionals guide patients to the most appropriate cardiac rehabilitation method for them (Wingham et. al. 2006, p.294). Wingham et. al. (2006) found that by giving patients the choice of cardiac rehabilitation, it increased the patient's feelings of control and increased their motivation to complete the program. Therefore, the provision of home as well as hospital-based cardiac rehabilitation may be an important means of addressing the suboptimal uptake of cardiac rehabilitation. Referrals should be offered to all patients, and the individual needs of each patient considered (Bunker and Goble 2003, p.332). Medical practitioners and healthcare authorities need to understand and accept that not all patients' needs can be met by so-called "usual" medical care (Bunker and Goble 2003, p.332).

The results from the Cardiac Rehabilitation Accessibility Survey reveal that a majority of Phase 2 Cardiac Rehabilitation Programs operate out of an acute public hospital (51% n=228). Figure 5.4 shows that Phase 2 Cardiac Rehabilitation Programs offering alternative modes of delivery such as: telephone service (27%), home visits (25%), postal (12%) and internet (2%), are limited. The survey also showed that only 2% (n=4.56) of Phase 2 Cardiac Rehabilitation Programs ran an after-hours service. However more importantly to each Phase 2 Cardiac Rehabilitation Programs accessibility is the range of options available to patients to access their services. Results from The Cardiac Rehabilitation Accessibility Survey reveal that 54% of Phase 2 Cardiac Rehabilitation Programs only offer their service through one delivery setting. Only 3% of Phase 2 Cardiac Rehabilitation Programs were found through the survey to offer their service through 5 settings. Therefore it can be seen that Phase 2 Cardiac Rehabilitation Programs within Australia are predominantly run within acute public hospital settings with very few alternative delivery options. Limited flexibility in how each Phase 2 Cardiac Rehabilitation Program is delivered is a barrier to many patients wanting to access the service.

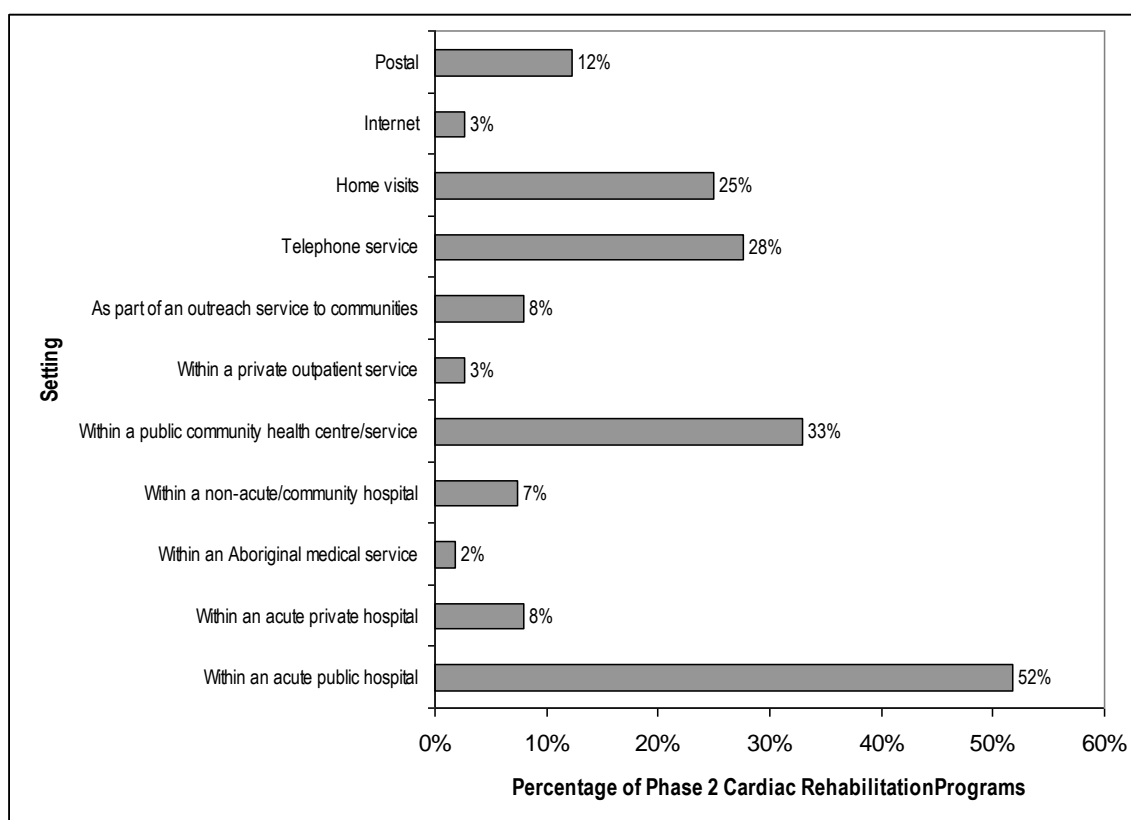


Figure 5.4 The Number of Phase 2 Cardiac Rehabilitation Programs for Each Setting (n=228). (Source: Cardiac Rehabilitation Accessibility Survey).



The characteristics of organizations providing cardiac rehabilitation services are also likely to influence attendance opportunities and support for patients (Clark 2004, p.7). In a study by Tod, Lacey and McNeil (2002), scarce resources were seen specifically by staff as limiting access by generating an overwhelming workload; thereby providing little time to meet the needs of users with different needs, and fostering longer waiting times to start on a program. Such limitations may result in groups seeing the programs as being poorly tailored to their needs.

Social characteristics, individual patient needs and preferences and the location of cardiac rehabilitation programs need to be taken into account in program design to maximize participation (Jones et. al. 2007, p.357). Unless the beliefs underpinning decisions about attendance are understood, interventions designed to promote attendance are unlikely to succeed.

## **5.9 Affordability**

The cost of cardiac rehabilitation programs varies considerably across Australia. The Cardiac Rehabilitation Accessibility Survey revealed that only 23% (n=52.44) of Phase 2 Cardiac Rehabilitation Programs in Australia are provided to the patient as a free service. The survey also revealed that schemes to make the Phase 2 Cardiac Rehabilitation Programs accessible to poorer patients such as Medicare (59%), Centrelink (56%), Health Card (57%) and Department of Veteran Affairs Cards (70%) were not accepted at all programs. Extra costs were also identified through the survey which ranged from a gold coin donation per session to \$60 per session.

The cost of cardiac rehabilitation can be seen as a barrier to many patients. Cooper et. al. (2002) found that non-attendees had spent significantly less years in full-time education and experienced greater social deprivation. A lack of insurance coverage is also a strong predictor of non-participation (Jackson et. al. 2005, p.12). A higher income was found to be a significant predictor of attendance in spite of the cost of the course being waived (Cooper et. al. 2002, p.543). Tod, Lacey and McNeill, (2002) found that professional and more affluent patients were better able to negotiate their way around the system by seeking out advice or 'going private'. Patients on a low income or who are socially deprived are less likely to attend but as with the elderly or female

patients, they may have the most to gain from secondary prevention because there is a linear relationship between socioeconomic status and cardiac outcome (Cooper et. al. 2002, p.550).

Being employed however does not always predict non-attendance. Hagan et. al. (2007) reports that important financial considerations, namely, employment and program scheduling, directly influenced participants prioritizing their work over attending phase 2 cardiac rehabilitation. In contrast, participants who were working for an employer before hospitalization frequently referred to employment issues as barriers to attending cardiac rehabilitation (Hagan et. al. 2007, p.109). Hagan et. al. (2007) also identified that financial barriers which influenced whether cardiac rehabilitation was perceived as a relevant goal also exist for some retired participants. Many patients who return to work but are not self-employed voiced the opinion that there needed to be more “after hours” programs as program scheduling was largely considered to be incongruent with maintaining a job (Hagan et. al. 2007, p.110)

## **5.10 Distance**

A well-documented barrier to accessing cardiac rehabilitation programs is the distance patient’s travel, with those who have further to travel not attending (Johnson et. al. 2001, p.294). The distance required to travel is a deterrent for urban populations, and is even more problematic for rural and remote dwelling people (Dollard et. al. 2004, p.28). Cooper et. al. (2002) found that distance to program location influences attendance, with rural residents and those with a longer journey less likely to attend. Schulz and McBurney (2000) also recorded fewer attendances at nonmetropolitan compared with metropolitan cardiac rehabilitation programs. Therefore people living in rural and remote areas are at a disadvantage in accessing cardiac rehabilitation.

The reasons why some patients consider a cardiac rehabilitation program to be too far away to justify attendance involves a plethora of other underlying beliefs and judgements. While distance to the program is a barrier, other factors associated with travel are also real barriers faced by patients. Transportation is often a problem. The Cardiac Rehabilitation Accessibility Survey revealed that while other options of transportation were available such as a bus stop nearby (53%

n=228), or a taxi station (32%), or a community bus stop (19%) most patients chose to take private transport to access their Phase 2 Cardiac Rehabilitation Program as 105 programs reported 91-100% of their patients travelling via private car (refer to Table 5.3). Other modes of patient transport reported in the survey included between 0-10% using taxis, train, bus, community bus or other which mainly included walking or the use of volunteer drivers. The data from the survey highlights that patients utilize road networks to access Phase 2 Cardiac Rehabilitation Programs regardless of their mode of transportation.

Percentage of Patients	No. of Phase 2 Cardiac Rehabilitation Programs					
	Private Car	Taxi	Train	Bus	Community Bus	Other
0-10%	22	216	227	221	221	210
11-20%	2	6	1	6	0	6
21-30%	4	3	0	1	3	5
31-40%	1	0	0	0	1	3
41-50%	8	2	0	0	0	1
51-60%	1	0	0	0	0	0
61-70%	7	0	0	0	1	0
71-80%	26	1	0	0	1	1
81-90%	52	0	0	0	0	1
91-100%	105	0	0	0	0	1

Table 5.3 The Percentage of Patients That Use Each Mode of Transport to Travel to Each of the Phase 2 Cardiac Rehabilitation Programs (n=228). (Source: Cardiac Rehabilitation Accessibility Survey).

Many people, especially caregivers (usually women) do not drive and people with a recent cardiac event have restrictions (Paquet et. al. 2005, p.572). Patients following acute myocardial infarction are discouraged from driving for 6 weeks, therefore someone is required to drive them to cardiac rehabilitation (Thornbill and Stevens 1998, p.107). Being reliant on someone else to drive is a real barrier for some patients. Other transport barriers include, travelling during the winter and/or at night is more difficult, parking availability, walking distance and parking fees (Paquet et. al. 2005,

p.572). The Cardiac Rehabilitation Accessibility Survey revealed that 95% (n=228) of Phase 2 Cardiac Rehabilitation Programs had a car park. However this can still be seen as a barrier to accessing cardiac rehabilitation, as some patient's beliefs such as the perceived safety of the local area or availability and cost of safe and reliable public or private transport can also affect attendance.

Schultz and McBurney (2000) have shown that being older, living further away, living alone and not having access to private transport were significantly associated with cardiac rehabilitation nonattendance. The factors that predicted cardiac rehabilitation attendance in 93.6% of cases were being referred to the program, living an average of 27 km away compared to an average of 47 km, living with a partner and being male (Schultz and McBurney 2000, p.135). Aikman et al. (1996) also found that the patient characteristics that influenced attendance were 'wanting to attend', 'partner wanting to attend' and 'living less than 15 km from the program'. Schultz and McBurney (2000) also found that male attendees travelled further to attend cardiac rehabilitation.

Through the research of Higgins et. al. (2008) it is possible to see the impact that travel time has upon patient attendance at cardiac rehabilitation. Patients were less likely to attend cardiac rehabilitation as travel time increased as 1 minute of extra travel time was associated with a 14% reduction in the likelihood of attendance, and 10 minutes of extra travel time corresponded to a 77% reduction (Higgins et. al. 2008, p.714). Their model explained more than 10% of the variance in cardiac rehabilitation attendance (Nagelkerke's  $R^2 = 0.124$ ) (Higgins et. al. 2008, p.714). Compared with non-attendees, patients who attended CR had a significantly shorter travel time (mean difference, 5.31 min [95% CI, 0.81- 9.8 min];  $F_{1,159} = 5.42$ ;  $P = 0.021$ ), and lived closer to the program venue (mean difference, 5.53km [95% CI, -0.22 to 11.27km];  $F_{1,159} = 3.61$ ;  $P = 0.059$ ) (Higgins et. al. 2008, p.713). Travel time and or distance, is an important factor in planning service planning provision for patients with coronary heart disease. There is a need to ensure that travel times are minimised so that access can be maximised.

## 5.11 Indigenous

Aboriginal Australians have high rates of morbidity and mortality related to cardiovascular disease (DiGiacomo et. al 2010, p.18). Aboriginal Australians have low rates of participation in cardiac rehabilitation (CR), despite having high rates of cardiovascular disease (DiGiacomo et. al 2010, p.17). Possible barriers to Indigenous people seeking health care include cultural constructions of health and access (distance) to and acceptability of health services (especially staffing) (Shepherd, Battye and Chalmers 2003, p.632). Research by Shepard, Battye and Chalmers (2003) show that more than 15% of indigenous people have no access to a doctor, 17% have no access to a nurse and 22% have no access to an Aboriginal health worker within 25 kilometres of where they live. The Cardiac Rehabilitation Accessibility Survey found that 68% (n=228) of Phase 2 Cardiac Rehabilitation Programs within Australia had reported cultural understanding as part of their program. The lack of cultural understanding poses a real barrier to indigenous patients in access Phase 2 Cardiac Rehabilitation Programs.

Like other healthcare sectors, accessing cardiac rehabilitation poses real barriers for Aboriginal people. Shepard, Battye and Chalmers (2003) identified the following reasons why Aboriginal people did not participate in cardiac rehabilitation: lack of knowledge about rehabilitation, low income making dietary changes difficult, and having a large extended family with issues of family support and understanding making the lifestyle changes difficult. The major barrier patients identified to changing diet was family, mostly to do with the large family size, while difficulty and pain were cited as barriers to starting exercise (Shepherd, Battye and Chalmers 2003, p.635). The barriers to making diet and exercise changes need consideration in designing interventions for primary prevention of cardiovascular disease, as does the importance of promoting heart health in a culturally relevant way (Aitken et. al. 2007, p.15).

Health for Aboriginal people "cannot be dissociated from self-determination, land rights and 'cultural vitality'; it cannot be divided neatly into 'wellness' and 'illness' or mental and physical aspects" (Shepherd, Battye and Chalmers 2003, p.632). Indigenous health workers (IHWs) form an essential link between Aboriginal communities and medical services. They link Western health beliefs to Aboriginal health and cultural practices. When studying patient's perceptions about the role of IHW's, Shepard, Battye and Chalmers (2003) found that there was a common perception that IHW's could better explain health issues to patients and make them feel more comfortable.

Shepard, Battye and Chalmers (2003) found that 37% of the patients in their study thought they would be more likely to participate in cardiac rehabilitation if an IHW was involved.

## **5.12 Service Capacity**

The concept of a healthcare recipient has evolved from, what in the past was, the doctors' and nurses' patient, to that of the recipient as a customer buying a service (Thornbill and Steven 1998, p.106). Therefore more attention on what the patients have to say is needed when developing new services and directions for existing cardiac rehabilitation services.

There are a number of barriers to accessing cardiac rehabilitation programs that relate to service capacity. The complexity of healthcare provision is frequently acknowledged as a problem in addressing a population's health status. Issues identified include limited collaboration across sectors; vertical funding and organisation of health services; multiple program evaluation criteria; and short term and inadequate funding (Allan, Ball and Alston 2007, p.2).

In the United Kingdom, Tod, Lacey, and McNeil (2002) found cardiac rehabilitation to have a limited service capacity with big gaps existing between patches of service activity that most patients appeared to slip through. They were able to categorize the problems in accessing the service into five themes: absence, waiting, communication, understanding, and appropriateness (Tod, Lacey, and McNeil 2002, p.421). The same has been found here in Australia with the results of a needs analysis that was undertaken by Allan, Ball and Alston (2007). They found a poorly resourced, limited service, patching up the health of their community as best they could (Allan, Ball and Alston 2007, p.12). Complex policies and processes are differentially applied across the nation and there exists a lack of understanding of community context and culture (Allan, Ball and Alston 2007, p.2).

Tod, Lacey and McNeill (2002) found that the level of service required by patients and families varied but limited capacity and inflexibility prevented staff offering an appropriate range of services

to ensure access. Alternative strategies for the delivery of cardiac rehabilitation, with more explicit cooperation and agreed processes between the rehabilitation team and doctors providing conventional care, may achieve better health outcomes and further enhance its cost-effectiveness (Briffa et. al. 2005, p.455).

### **5.13 Conclusion**

Accessibility to cardiac rehabilitation is one of the major factors affecting the utilization of phase 2 cardiac rehabilitation programs. Many rural populations in Australia do not have access to structured cardiac rehabilitation programs, and the level of support available to them in the form of unstructured cardiac rehabilitation is unclear (Watchel et. al. 2008, p.195). Rural Australia has a significantly higher incidence of cardiac mortality and morbidity compared to metropolitan areas (Access Economics, 2005), yet these populations have poorer access to CR programs (Dollard et al. 2004, p.28). The World Health Organisation (1993) and the National Heart Foundation of Australia (2004) recommend that cardiac rehabilitation, incorporating secondary prevention programs, should be available to all patients with cardiovascular disease.

Through a literature review this chapter has identified the factors that affect accessibility to cardiac rehabilitation programs. It has highlighted that accessibility to cardiac rehabilitation is affected by geographic distance and socio-economic factors. As Wang and Luo (2005) state, spatial access emphasizes the importance of the geographic barrier between consumer and provider, and non-spatial factors which include nongeographic barriers or facilitators.

Results from the Cardiac Rehabilitation Accessibility Survey show that patient accessibility to Phase 2 Cardiac Rehabilitation Programs extends beyond service availability and includes various impediments that can prevent or limit service use. This chapter has identified a number of socio-economic barriers that need to be included when measuring accessibility to Phase 2 Cardiac Rehabilitation Programs. The Cardiac Rehabilitation Accessibility Survey highlighted that the need for a referral, the specific type of coronary heart disease the patient has, the provision of group and individual sessions, flexibility in service delivery setting, hours of operation, cost, and

range of program components as significant barriers imposed by Phase 2 Cardiac Rehabilitation Programs that limit patient accessibility. Completion rates were low for most programs and this can be seen as a measure of acceptability by the patient of the service. Geographic barriers have also been highlighted with the distance the patient travels to a service being a significant barrier to patients accessing Phase 2 Cardiac Rehabilitation Programs. The Cardiac Rehabilitation Accessibility Survey has highlighted the significant use of the road network for patient access to Phase 2 Cardiac Rehabilitation. This chapter has therefore identified the geographic and socio-economic elements that need to be included in a spatial model of accessibility to Phase 2 Cardiac Rehabilitation Programs within Australia.



## **Chapter 6: Methods: Building a Spatial Accessibility Model for Phase 2 Cardiac Rehabilitation**

### **6.1 Introduction**

The factors that influence a patient's accessibility to Phase 2 Cardiac Rehabilitation Programs are complex. The previous chapter identified the barriers patients encounter when trying to access cardiac rehabilitation and through the Cardiac Rehabilitation Accessibility Survey it was possible to identify the socio-economic and geographic barriers that each of the Phase 2 Cardiac Rehabilitation Programs in Australia possess.

This chapter focuses on the measurement of accessibility. There has been a variety of approaches to defining and measuring access to medical services in the past. Some researchers have emphasized the overall availability (supply) of services; others have focused on the characteristics of the people who may potentially avail themselves of these services, considering factors such as their income levels or insurance coverage (Aday and Anderson 1981, p.5). More recently the focus of access studies has shifted to intermediate outcome measures, such as the rates at which services are actually used or how satisfactory consumers perceive their care to be (Aday and Anderson 1981, p.5). It is therefore necessary within this thesis to investigate how accessibility can be measured and discuss past attempts to measure the accessibility to cardiac rehabilitation in Australia so that the potential accessibility to Phase 2 Cardiac Rehabilitation Programs can be measured appropriately.

This chapter describes the development of the spatial model to assess the accessibility of Phase 2 Cardiac Rehabilitation Programs in Australia. The model has been developed based on published literature on the barriers to accessing cardiac rehabilitation and the Penchansky and Thomas (1981) dimensions of accessibility.

## 6.2 Defining the Spatial Accessibility Model Components

The Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs Model was developed using Geographic Information System (GIS) to combine both geographic and socio-economic aspect of accessibility to Phase 2 Cardiac Rehabilitation Programs in Australia. The model was developed by creating a potential gravity model that utilised the information gathered via the Cardiac Rehabilitation Accessibility Survey. The model produced a rating of access to the minimal requirements for comprehensive cardiovascular health support in a community. A spatial model such as the potential model uses gravity concepts to describe patterns of accessibility to services as higher values reflect higher levels of potential accessibility, which occurs when people live close to high quality service facilities (Cromley and McLafferty 2002, p.245). When distance has no impact on service utilization or access – access depends only on the attractiveness of service providers (Cromley and McLafferty 2002, p.245).

In October 2008 a postal survey of all 401 cardiac rehabilitation services in Australia was undertaken to collect information on the accessibility of their Phase 2 Cardiac Rehabilitation Programs for the 2007/2008 financial year. Of the 204 cardiac rehabilitation services that did complete a survey, 228 individual Phase 2 Cardiac Rehabilitation Programs were identified and information on their accessibility was obtained through the questionnaire. Using the data from the Cardiac Rehabilitation Accessibility Survey (as discussed in the previous chapter) each program was assessed based on the theory of accessibility developed by Penchansky and Thomas (1981) which included the following five dimensions of access:

Accessibility -	Describes geographical barriers, including distance, transportation, travel time, and cost.
Availability –	Defines the supply of services in relation to needs – are the types of services adequate to meet health care needs?
Accommodation –	Identifies the degree to which services are organised to meet clients' needs, including hours of operation, application procedures, and waiting times.
Affordability –	Refers to the price of services in regard to people's ability to pay.

Acceptability – Describes client's views of health services and how service providers interact with clients.

### **6.2.1 Accessibility**

Individuals are likely to travel increasingly long distances to find appropriate care for rare or serious health problems as compared to more minor problems that are treatable at a local clinic (Hare and Barcus 2007, p.183). It is unrealistic to assume that patients will always attend their nearest surgery, however it is also unrealistic to assume that proximity plays no part in patient decisions, particularly for patients from disadvantaged areas who may not have the resources to travel longer distances (Hyndman and Holman 2001, p.1607). Perceptions of proximity, however, are strongly interrelated with socioeconomic factors and subjective choices (Hare and Barcus 2007 p.183). Distance in many cases can act as a deterrent to accessing services. A fundamental aspect of health care utilization patterns is distance decay, or the tendency for interaction with service facilities to decrease with increasing distance (Cromley and McLafferty 2002, p.235). Cromley and McLafferty (2002) found that for a wide range of services, including many types of health services utilization decreases as distance increases.

Distance decay is a consequence of the added time, cost, and effort of travelling long distances (Cromley and McLafferty 2002, p.235). Studies in a variety of contexts, for different types of health services, confirm that significant effect of distance on utilization and its persistence after controlling for age, illness, and other known risk factors (Joseph and Phillips 1984: Bashshur, Shannon, and Metzner 1971). As an individual's costs increase, his or her ability and willingness to travel decrease (Cromley and McLafferty 2002, p.235). People's knowledge of and familiarity with service opportunities also decline with distance, exacerbating the pattern of distance decay (Cromley and McLafferty 2002, p.235).

The inclusion of distance decay as a central feature of a regional accessibility measure brings with it an important practical requirement: the specification of the distance decay function (Joseph and Phillips 1984, p.102). Standard distance decay spatial interaction models usually specify either a

power or an exponential function to transform the distance measure, depending on the spatial scale of the investigation (ArcInfo, 1994). Joseph and Phillips (1984) state that due to the variety of social and economic circumstances of users and the multiplicity of health care delivery systems there is no universally accepted distance decay model. Hyndman et. al. (2003) found that the transformations could not be considered as 'one size fits all', and all except two of the modelled transformations: poor access/least disadvantaged, and good access/more disadvantaged, provided a significant improvement in model fit. The frictional effect of distance varies among health services (Cromley and McLafferty 2002, p.235). Cromley and McLafferty (2002) found a decline in utilization with distance for hospital-based elective and psychiatric procedures but acute emergency procedures showed little or no distance decay. Similarly, Goodman, Fisher, Stuckel, and Chang (1997) found no decrease in utilization with increasing travel time for conditions in which there is strong medical consensus on the need for hospitalization, but significant decreases with distance for conditions where outpatient treatment is a reasonable alternative. Thus the severity and urgency of the health episode and medical practice decisions about how and where such episodes should be treated all play a role in distance decay (Cromley and McLafferty 2002, p.235).

A well-documented barrier to accessing cardiac rehabilitation programs is the distance patients are required to travel to obtain the service, with those who have further to travel not attending (Johnson et. al. 2001, p.294). Aikman et al. (1996) found the patient characteristics that influenced attendance were, 'wanting to attend', 'partner wanting to attend' and 'living less than 15 km from the program'. Similar findings were found by Schulz and McBurney (2000) who identified that the factors that predicted cardiac rehabilitation attendance in 93.6% of cases were being referred to the program, living an average of 27 km away compared to an average of 47 km, living with a partner and being male. Higgins et. al. (2008) found that patients were less likely to attend CR as travel time increased: 1 min of extra travel time was associated with a 14% reduction in the likelihood of attendance, and 10min of extra travel time corresponded to a 77% reduction. Higgins et. al. (2008) found that travel time significantly predicted CR attendance (OR, 0.86;  $P=0.039$ ). Research by Brual et. al. (2010) revealed that patients are significantly less likely to enrol in cardiac rehabilitation programs with drive times greater than 60 minutes. Higgins et. al. (2008) found similar results, with patients who attended CR had a significantly shorter travel time (mean difference, 5.31 min [95% CI, 0.81– 9.81 min];  $F_{1,159} = 5.42$ ;  $P = 0.021$ ), lived closer to the

program venue (mean difference, 5.53 km [95% CI, -0.22 to 11.27 km];  $F_{1,159} = 3.61$ ;  $P = 0.059$ ). Therefore geographic accessibility to cardiac rehabilitation is greatly affected by distance / time.

Geographic accessibility (which Penchansky and Thomas (1981) refer to as “accessibility”) for the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation was derived by constructing a distance decay model. The distances that patients would travel to cardiac rehabilitation were obtained from literature. If travel times only, were published then they were converted using 60km/hour, to a distance. The distances fitted to a curve within Microsoft Excel and XLfit and an exponential curve representing the distance decay of patients attending cardiac rehabilitation was created (refer to figure 6.1).

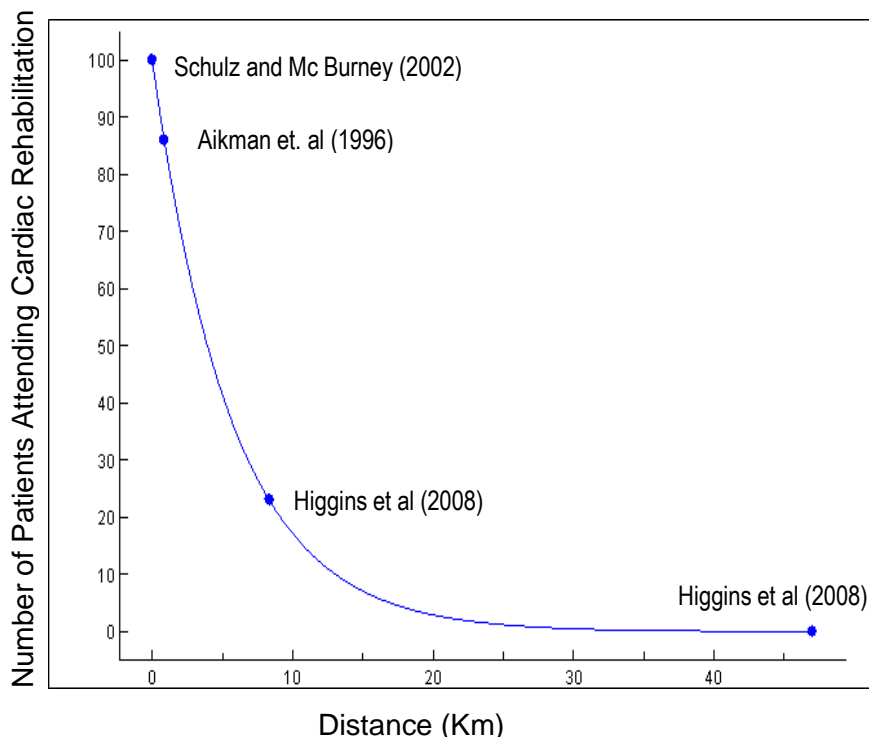


Figure 6.1 The Distance Decay of Patients Attending Cardiac Rehabilitation.

The street addresses for each Phase 2 Cardiac Rehabilitation Programs were obtained through the Cardiac Rehabilitation Accessibility Survey. Using Aus-emaps.com Manual Geocoder each Phase 2 Cardiac Rehabilitation Program was given a spatial reference.

## 6.2.2 Availability

Availability as defined by PENCHANSKY and THOMAS (1981) is the supply of services in relation to needs. Therefore the availability rating component of each Phase 2 Cardiac Rehabilitation Program within the spatial model was calculated using the following formula:

$$a = (b + c + d) / e$$

where:

a = availability rating of the Phase 2 Cardiac Rehabilitation Program,

b = referral required to enter the program,

c = the percentage of diseases accepted into the program,

d = all ages accepted into the program,

e = the total number of availability components

Referral to the Phase 2 Cardiac Rehabilitation Program was seen by Schulz and McBurney (2000) as the most significant factor in the prediction of cardiac rehabilitation attendance. Using the results from the Cardiac Rehabilitation Accessibility, Phase 2 cardiac rehabilitation programs that answered yes to “Do the people that utilise your cardiac rehabilitation program require a referral to access your program?” were given a score of 1.

Availability of cardiac rehabilitation is also affected by the type of coronary heart disease that patients have. Tod, Lacey and McNeil (2002) found that exclusions were often based on age, a positive exercise tolerance test, postinfarct angina or heart failure. Defining which of the numerous coronary heart diseases should be accessing Phase 2 Cardiac Rehabilitation Programs was determined by Professor Andrew Tonkin using the National Heart Foundation of Australia and the Australian Cardiac Rehabilitation Association’s, “Recommended Framework for Cardiac Rehabilitation ‘04”. They recommended that the care group of people eligible for cardiac rehabilitation are those who have had: Myocardial infarction (ST elevation MI, non-ST elevation MI), re-vascularisation procedures, stable or unstable angina, controlled heart failure, other vascular or heart disease (National Heart Foundation and ACRA 2004, p.2). Disease codes and

their associated descriptions were obtained from the Department of Health in South Australia and codes which matched the National Heart Foundation and the Australian Cardiac Rehabilitation Associations recommendations were used in the Cardiac Rehabilitation Accessibility Survey (n= 45). Responses from the Cardiac Rehabilitation Accessibility Survey question: “According to discharge diagnosis, what types of patients do you allow into your cardiac rehabilitation program? (please tick all of those that apply)” were represented as a percentage within the spatial model.

The age of patients able to access cardiac rehabilitation programs was also included in the availability component of the spatial model. Pell et. al. (1996), McGee et. al. (1992) and Schulz and McBurney (2000) found that many cardiac rehabilitation programs have an age limit on attendance. Results from the Cardiac Rehabilitation Accessibility Survey revealed that 67% of the Phase 2 Cardiac Rehabilitation Programs accepted patients of all ages. The Phase 2 Cardiac Rehabilitation Programs that all allowed only specific age groups into their programs were represented as a percentage of the total age allowed into the program in the spatial model.

### **6.2.3 Accommodation**

Accommodation is defined by Penchansky and Thomas (1981) as the degree to which services are organised to meet clients’ needs. Therefore the accommodation rating component of each Phase 2 Cardiac Rehabilitation Program within the spatial model was calculated using the following formula:

$$a = (b + c + d + e + f + g + h + i + j + k + l + m) / n$$

where:

a = accommodation rating of the Phase 2 Cardiac Rehabilitation Program,

b = program contained health education,

c = program contained physical activity,

d = program contained counselling,

e = program contained behaviour modification,

f = program contained self-support management,

g = program contained cultural understanding,  
h = program is delivered in a group and individual setting,  
i = program is delivered via a telephone service,  
j = program is delivered via home visits,  
k = program is delivered via internet,  
l = program is run after hours,  
m = program is delivered via post,  
n = the total number of accommodation components

Tod, Lacey and McNeill (2002) found that some patients interpreted cardiac rehabilitation as exercise only, which created a barrier when people did not see exercise for them. The National Heart Foundation of Australia and the Australian Cardiac Rehabilitation Association's, "Recommended Framework for Cardiac Rehabilitation '04" recommends that a Phase 2 Cardiac Rehabilitation Program should consist of: health education, physical activity, counselling, behaviour modification, support of self-management, and cultural understanding. These components of Phase 2 Cardiac Rehabilitation Programs were included in the Cardiac Rehabilitation Accessibility Survey, and respondents were asked to tick all of the components that applied to their program. The responses were scored as one for a positive response, and were included in the spatial model.

The setting in which the Phase 2 Cardiac Rehabilitation Program is delivered can also be considered an accommodation component of the spatial model. Home-based, CR models have the most substantive evidence base and, therefore the greatest potential to be developed and made accessible to eligible people living in rural and remote areas (Dollard, Smith, Thompson and Stewart 2004, p.27). Wingham et. al. (2006) highlighted that the provision of home as well as hospital-based cardiac rehabilitation may be an important means of addressing the suboptimal uptake of cardiac rehabilitation after Myocardial Infarction. Results from the Cardiac Rehabilitation Accessibility Survey for the question: "Within what type of setting is the cardiac rehabilitation program run: (tick all that apply)", were used in the spatial model. The Phase 2 Cardiac Rehabilitation Program Coordinators were asked to select from the following settings: acute public hospital, acute private hospital, Aboriginal Medical Service, non-acute/community health centre/service, private outpatient service, outreach service to communities, telephone service,



home visits, internet, postal, or other. Most of the Phase 2 Cardiac Rehabilitation Programs chose a number of the settings.

Tod, Lacey and McNeill (2002) found that some participants advocated the delivery of education and exercise in a group setting, others found it inappropriate and unappealing. They found that, people were deterred from attending groups because they found them stressful socially, lacked privacy or were put off by dominant members in the group (Tod, Lacey and McNeill 2002, p.428). The Cardiac Rehabilitation Accessibility Survey gathered information on whether the Phase 2 Cardiac Rehabilitation Programs ran group only, individual only, women only, and group and individual sessions. Information from the survey was included in the spatial model.

#### **6.2.4 Affordability**

The cost of cardiac rehabilitation can be seen as a barrier to many patients. Shepherd, Battye, and Chalmers (2003) found that the reasons for not participating in cardiac rehabilitation included lack of time, lack of referral of physician support, financial reasons, lack of motivation, perceptions of the benefits, distance and transportation, family composition, nature of the program and work commitments. Patients on a low income or who are socially deprived are less likely to attend but as with elderly or female patients, may have the most to gain from secondary prevention because there is a linear relationship between socioeconomic status and cardiac outcome (Cooper et. al. 2002, p.550).

Affordability for the spatial model was derived from the data obtained from the Cardiac Rehabilitation Accessibility Survey from the following question: "Is there a cost associated with attending your cardiac rehabilitation program that is not covered by medicare? (please circle) Yes / No If yes, what is the cost?". Therefore the affordability rating component of each Phase 2 Cardiac Rehabilitation Program within the spatial model was calculated using the following formula:

$$a = (b - c)$$

where:

a = affordability rating of the Phase 2 Cardiac Rehabilitation Program,  
b = free service,  
c = extra cost,

$$\text{Affordability} = (\text{free service} - \text{extra cost})$$

The extra costs that were identified through the survey ranged from a gold coin donation per session to \$60 per session. Gold coin donations were not seen as an extra cost in the spatial model.

### **6.2.5 Acceptability**

Penchansky and Thomas (1981) describe acceptability as the client's views of health services and how service providers interact with clients. Clark, Barbour, White and MacIntyre (2004) state that while the evidence underpinning cardiac rehabilitation suggests that it can be of benefit, poor attendance rates mean that services often fail to help those in need. Therefore the completion rate of patients participating in a Phase 2 Cardiac Rehabilitation Program would provide a view of the acceptance of the program by the patients. In the spatial model the acceptability rating component was derived by calculating the percentage of patients that enrolled and completed the Phase 2 Cardiac Rehabilitation Program.

### **6.3 Spatial Modelling**

The spatial accessibility model for Phase 2 Cardiac Rehabilitation was created using ESRI ArcGIS version 9.3.1, ESRI Network Analyst. The results from the Cardiac Accessibility Survey for the socio-economic dimensions of accessibility as defined by Penchansky and Thomas (1981) were combined to give an overall rating of accessibility for each of the Phase 2 Cardiac Rehabilitation Programs across Australia that responded to the survey. This included a rating for the programs; availability, accommodation, affordability and acceptability. The overall accessibility rating for each of the Phase 2 Cardiac Rehabilitation Programs were then combined with the road network from Geoscience Australia, and the distance decay curve of patients attending cardiac rehabilitation to

construct accessibility raster cost distance surfaces along the road network from each of the Phase 2 Cardiac Rehabilitation Programs. Rasters for each of the Phase 2 Cardiac Rehabilitation Programs were then overlaid and ESRI's Spatial Analyst was used to show the maximum accessibility value for each cell.

#### **6.4 Determining the Accessibility of Rural and Remote Population Centres to Phase 2 Cardiac Rehabilitation Programs.**

Since its release in 1991 the Accessibility / Remoteness Index for Australia (ARIA) was designed to be an unambiguously geographical approach to defining remoteness. Socio-economic, urban/rural and population size factors are not incorporated into the measure. ARIA measures remoteness in terms of access along the road network from 11,340 populated localities to four categories of service centres. Localities that are most remote have least access to service centres; those that are least remote have most access to service centres. ARIA values are calculated initially for populated localities and these values are then interpolated to a 1 km grid spanning the whole of Australia, and averages calculated for larger areas - so that each areal unit (populated locality, grid cell, CCD, SLA and postcode) has an ARIA value (Commonwealth Department of Health and Aged Care, 2001).

Rural and remote localities were defined using ARIA+ scores. ARIA+ scores > 5.92 – 10.53 were used to represent remote Australia where very restricted accessibility of goods, services and opportunities for social interaction exist. ARIA+ scores > 10.53 were used to represent very remote Australia where localities are locationally disadvantaged as there is very little accessibility of goods, services and opportunities for social interaction. A surface of accessibility to Phase 2 Cardiac Rehabilitation Programs was created and overlaid with the rural and remote population centres. Each rural and remote population centre was then assigned a rating of accessibility to Phase 2 Cardiac Rehabilitation.

## **6.5 Model Validation**

The patient attendance data was obtained from The Heart Research Centre, Melbourne, Australia. The patient attendance data comprised of 118 coronary artery bypass graft surgery (CABGS) patients from the Royal Melbourne Hospital between July 2001 and April 2004 (Higgins et. al. 2008, p. 712). Patients were excluded from the dataset if they were over 85 years of age, were subsequently assigned to a non-CABS procedure, or failed to return the questionnaire before surgery. Cardiac rehabilitation attendance was defined as having attended at least one cardiac rehabilitation session and was confirmed by contacting the relevant cardiac rehabilitation program coordinators (Higgins et. al. 2008, p. 712).

The results from the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs were overlaid with the locations of patients that attended and those that did not attend Phase 2 Cardiac Rehabilitation and accessibility values were obtained for each of the patient locations. Patients with higher accessibility ratings from the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation were found to have been more likely to have attended cardiac rehabilitation (Pearson Correlation 0.308 ( $P > 0.0001$ , 95% CI 0.1350 to 0.4632)). The correlation between patient attendance at cardiac rehabilitation and the accessibility rating from the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation can also be seen spatially in figure 6.2. This figure clearly shows that as accessibility to the cardiac rehabilitation program decreases patient non-attendance occurs.

## **6.6 Conclusion**

The choice of measure selected to examine spatial patterns in accessibility has to be considered in the light of the particular service under consideration and differing assumptions concerning travel behaviour to that service (Higgs 2004, p.124). In this chapter The Cardiac Rehabilitation Accessibility Survey with supporting literature has provided valuable information on the accessibility of Phase 2 Cardiac Rehabilitation Programs within Australia.

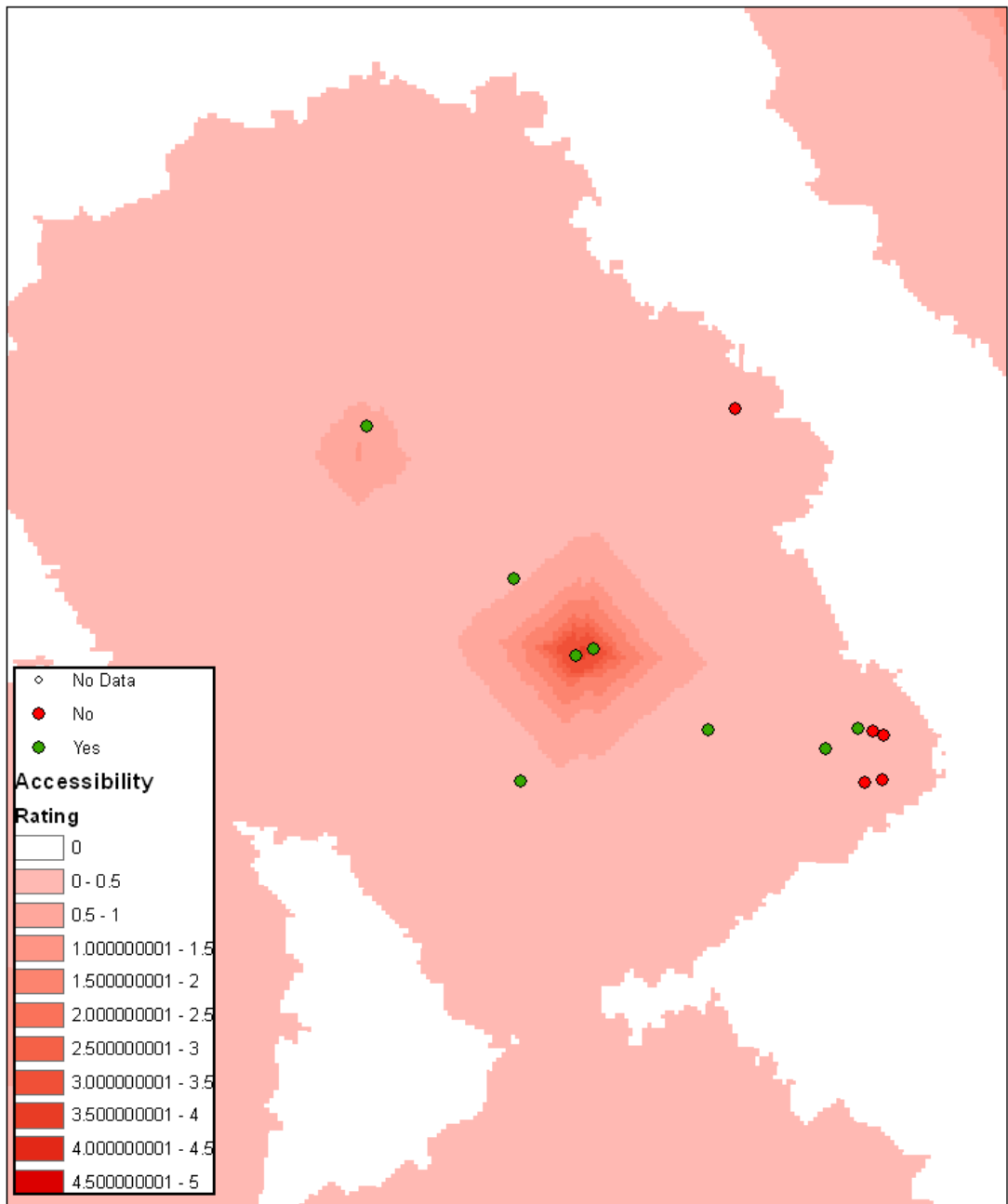


Figure 6.2 Results from the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs Overlaid with Patient Attendance and Non-attendance to Cardiac Rehabilitation.

Access to healthcare varies across space because of uneven distributions of healthcare providers and consumers (spatial factors), and also varies among population groups because of their different socioeconomic and demographic characteristics (nonspatial factors) (Wang and Luo 2005, p.131). Spatial access emphasizes the importance of geographic barriers (distance or time) between consumer and provider, whereas aspatial access stresses nongeographic barriers or facilitators such as social class, income, ethnicity, age, sex, etc. (Wang and Luo 2005, p.131). The Penchansky and Thomas (1981) dimensions of accessibility have provided a framework for the development of the spatial model of accessibility to Phase 2 Cardiac Rehabilitation Programs in Australia. As noted by Brabyn and Gower (2004) within an analysis model, different aggregated statistics, such as average travel time, total travel time, and population more than 30 minutes from a GP, will provide varying insights into accessibility. The Penchansky and Thomas (1981) dimensions of accessibility have ensured that all aspects of accessibility to Phase 2 Cardiac Rehabilitation have been incorporated into the model.

This chapter has highlighted that it is possible to apply the theoretical concepts of accessibility to create, a practical spatial model of accessibility to Phase 2 Cardiac Rehabilitation Programs within Australia. By spatially modelling the accessibility, availability, accommodation, affordability, and acceptability to each Phase 2 Cardiac Rehabilitation Program, it is possible to identify areas where accessibility to cardiac rehabilitation could be improved. It also highlights where new programs or models of delivery should be established to enhance accessibility in areas that are currently poorly served. These two aspects of accessibility to Phase 2 Cardiac Rehabilitation Programs in Australia will be discussed in detail in the next chapter.

## **Chapter 7: Accessibility to Phase 2 Cardiac Rehabilitation Services**

### **7.1 Introduction**

This chapter begins by identifying the need for Phase 2 Cardiac Rehabilitation Programs in rural and remote areas of South Australia. Data on hospital separations from the South Australian hospital system highlights the need for the continuation of care beyond the emergency hospital for patients with coronary heart disease. While there is clearly a need for more after care facilities for patients with coronary heart disease within South Australia, data from the South Australian Monitoring and Surveillance System (SAMSS) reveals the underutilisation of hospital clinics by respondents with cardiovascular disease in rural and remote regions. This picture of the need and underutilisation of aftercare cardiac services within South Australia is representative of what is occurring across Australia as a whole.

Accessibility to after care services for patients with coronary heart disease is a major factor in the underutilization of these services. This chapter discusses the Cardiac ARIA (Accessibility Remoteness Index of Australia) model of accessibility developed by Clark et. al (2010). This index shows the geographic accessibility to four basic services (general practitioner, pharmacy, cardiac rehabilitation, pathology) within a 1 hour drive-time from each of Australia's 20,387 population locations. This index shows that the majority (96%) of Australian cardiac patients had excellent (less than one hour) "geographic" access to after care services. Therefore highlighting that distance alone does not affect cardiac patient attendance to after care health services.

This chapter then discusses specifically the accessibility to Phase 2 Cardiac Rehabilitation Programs within Australia, beyond geographic distance to incorporate: affordability, accommodation, availability, and acceptability as defined by Penchansky and Thomas (1981). Results from the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitations programs highlight the accessibility of Phase 2 Cardiac Rehabilitation Programs across Australia.

## 7.2 The Need for Greater Accessibility to After Care for Patients with Coronary Heart Disease in Rural and Remote Australia.

Significant differences in health status exist between rural and urban populations (Eckert et. al. 2004, p.426). Data on the number of hospital separations from the South Australian Hospital system highlights the severity of cardiovascular disease in rural and remote South Australia. Figure 7.1 shows the spatial spread, beyond the state border of South Australian hospital separations for patients with cardiovascular disease (refer to Appendix 2 for a list of included ICD codes) for the 2007/2008 financial year. South Australian hospital separations for patients with cardiovascular disease are particularly high in many rural and remote regions in South Australia, in particular: Port Lincoln, Whyalla, Port Pirie, the upper regions of the Fleurieu Peninsula, the Barossa Valley and Millicent. Although this data is for South Australia, it is representative of most rural and remote regions within Australia.

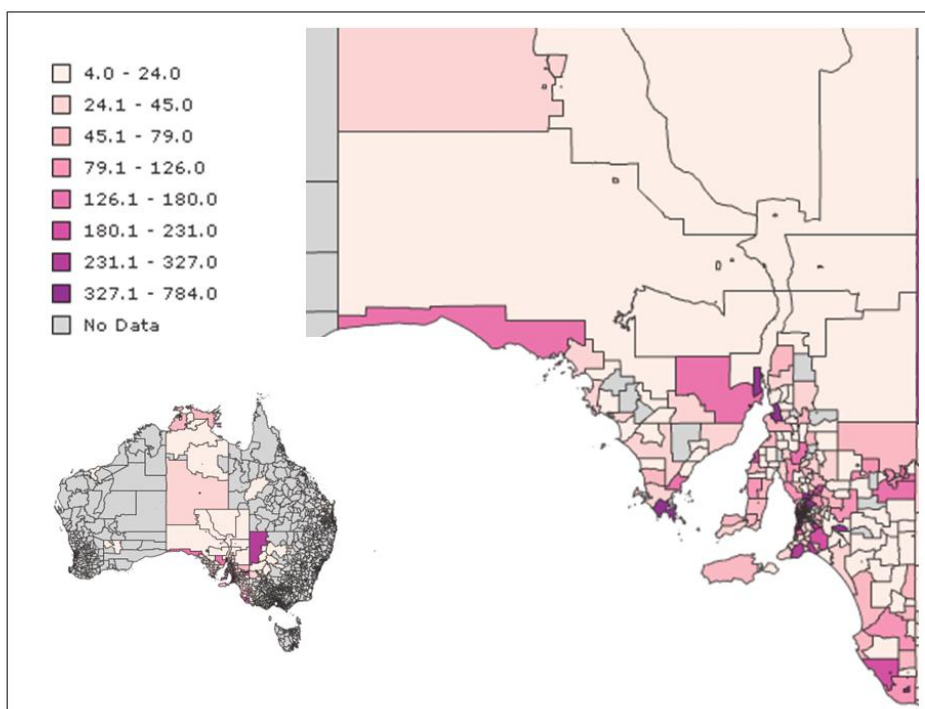


Figure 7.1 The Number of South Australian Hospital Separations for the 2007/2008 Financial Year, per Post Code (Source: SA Health).

Compared with their urban counterparts, rural and remote people experience poorer health as evidenced by higher mortality, lower life expectancy and an increase in incidence of some diseases



(Eckert et. al. 2004, p.426). Therefore optimal provision of health and human services to residents of low socioeconomic status (SES) suburbs is particularly important, given the substantial evidence of the relationship between low SES and poor health in Australia (Savage et. al. 2005, p.11). The major issues for remote populations relate to access to services rather than health differentials (Tonkin et. al, 1999, p.185). Key findings by Savage et. al. (2005) indicate that successful navigation of health care services by residents within these low socioeconomic status (SES) environments is being impeded by issues of access, a lack of appropriate early intervention options or measures, and general resident disempowerment. Rowland, Lyons, and Edwards (1988) found that residents in rural areas were more likely to be poor and uninsured. Coupled with the reduced availability of health services in rural areas, rural residents receive fewer physician and hospital services than urban residents (Davis 1991, p.263). However, access to health care is perceived to be an important factor that contributes to improved health status (Eckert et. al. 2004, p.426).

Data from the South Australian Monitoring and Surveillance System (SAMSS) (appendix 3) that was gathered from South Australian Households between January 2007 and December 2008 for respondents with cardiovascular disease highlights the underutilisation of cardiac rehabilitation services in the State. Cardiovascular patients were defined as having been told by their doctor that they have any of the following conditions: heart attack, angina, heart disease or stroke. Table 7.1 shows that country South Australian patients with cardiovascular disease had the highest percentage of respondents that did not attend a hospital clinic in the last four weeks.

Without appropriate resources and support to ensure their health care activities are effectively maintained, some families and communities are being placed unnecessarily at risk (Humphreys 2000, p.179). The provision of cardiac rehabilitation services to people living in rural and remote areas is often limited to the nearest large hospital situated in urban coastal centres, leaving a gap in the rehabilitation of cardiac patients (Parker et. al 2002, p.15).

<i>Region</i>	<i>Attended clinic</i>		<i>Did not attend clinic</i>	
	<i>n</i>	<i>% (95% CI)</i>	<i>n</i>	<i>% (95% CI)</i>
Eastern Adelaide	14	13.2 (8.0 - 21.0)	92	86.8 (79.0 - 92.0)
Northern Adelaide	31	18.5 (13.3 - 25.0)	137	81.5 (75.0 - 86.7)
Southern Adelaide	35	15.0 (11.0 - 20.1)	199	85.0 (79.9 - 89.0)
Western Adelaide	28	24.1 (17.3 - 32.7)	88	75.9 (67.3 - 82.7)
Country SA	31	12.4 (8.9 - 17.1)	218	87.6 (82.9 - 91.1)
<b>Overall</b>	<b>139</b>	<b>15.9 (13.6 - 18.5)</b>	<b>734</b>	<b>84.1 (81.5 - 86.4)</b>

Data Source: SAMSS January 2007 to December 2008

Note: The weighting of data can result in rounding discrepancies or totals not adding

Table 7.1 The Proportion of Respondents with Cardiovascular Disease that had visited a Hospital Clinic in the Last Four Weeks, Age 16 Years and over, 2007.

### 7.3 Geographic Accessibility to After Care Services for Cardiac Patients in Australia.

Access problems are particularly acute for families living in those small rural communities which have borne the brunt of recent withdrawal and rationalisation of many local health care services undertaken by State Government health authorities (Humphreys 2000, p.168). The impact of economic and social changes is creating additional pressures for many rural families (Humphreys 2000, p.179). Such pressures exacerbate the existing problems resulting from lack of locally available health care services and difficulties associated with accessing them from distant locations (Humphreys 2000, p.179). Eckert et. al. (2004) found that there is higher use of primary care services among residents of highly accessible areas, and as remoteness increases the levels of use of public hospitals decreases significantly. The reported higher use of allied health services in moderately accessible areas may be in response to the increasing reliance on complementary and alternative health provider care that has occurred in Australia over the past decade (Eckert et. al. 2004, p.431).

Measuring accessibility to cardiac after care services is critical to identifying gaps in the continuum of care for patients with coronary heart disease. With the focus of identifying where access to

basic services for secondary prevention is limited in the community Clark et. al. (2011) developed the Cardiac Accessibility and Remoteness Index of Australia (Cardiac ARIA). Clark et. al (2011) used Geographic information systems (GIS) technology to model the access to four basic services (general practitioner/nurse clinic, pharmacy, cardiac rehabilitation, pathology) within a one hour drive-time from each of Australia's 20,387 population locations. The Cardiac ARIA aftercare phase was modelled into five alphabetic categories, A (all four services = 1 h) to E (no services available within 1 h) (refer to table 7.2). Time to each of the facilities was calculated based on urban road speeds of 40kph, non-urban road speeds at 80kph, and off-road speeds at 50kph.

Field	Value
Medical	Travel time to nearest medical facility – hospital, GP or remote clinic
Pharmacy	Travel time to nearest retail pharmacy
Rehabilitation	Travel time to nearest cardiac rehabilitation facility
Pathology	Travel time to nearest pathology laboratory
A	Medical, Pharmacy, Rehabilitation and Pathology <= 60 minutes
B	Medical, Pharmacy and Rehabilitation <= 60 minutes
C	Medical, and Pharmacy <= 60 minutes
D	Medical only <= 60 minutes
E	No services <= 60 minutes)

Table 7.2 Cardiac ARIA After Care Categories (Source: Clark et. al. 2010 p.79)

Clark et. al (2011) found that eighteen percent of the population locations were within category “A” zones with the remaining 82% located in zones with some limitation to recommended services. From the location data Clark et. al (2011) estimated that 96% or 19 million Australians lived within one hour of the four basic services to support cardiac rehabilitation and secondary prevention, including 96% > 65 years and 75% of the Indigenous population. Therefore as can be seen in figure 7.2 the majority of Australians had excellent “geographic” access to services after a cardiac event. This research by Clark et. al. highlights that further research is needed to identify which aspects of accessibility other than geographic distance to cardiac rehabilitation affect utilisation of services.

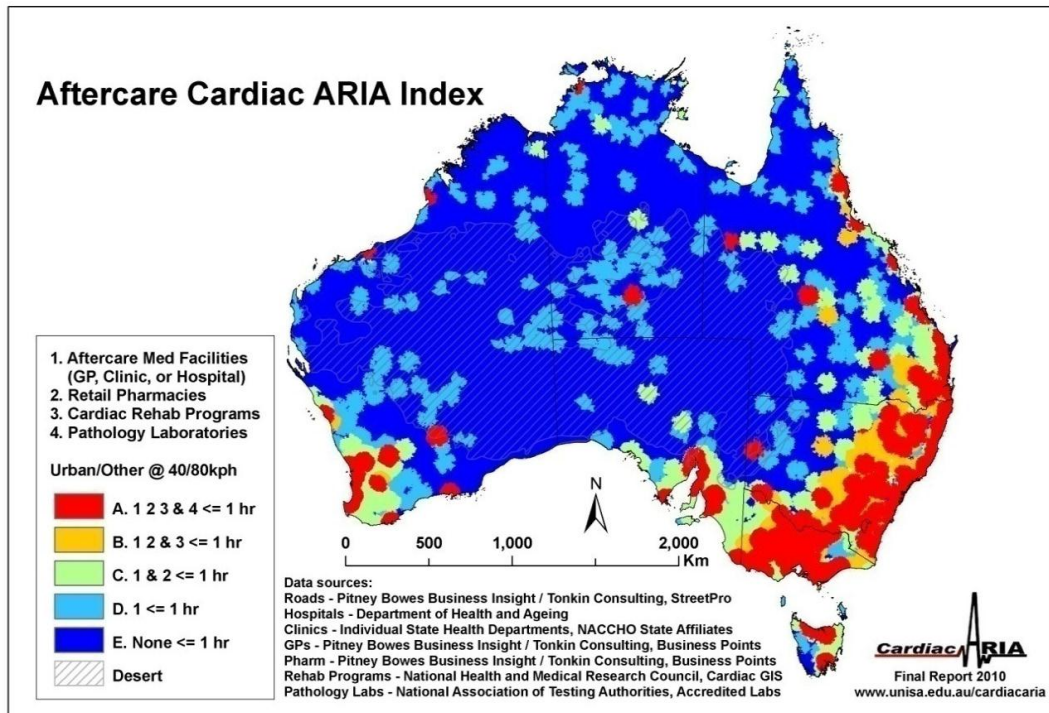


Figure 7.2 Cardiac ARIA Index of After Care for Australia (source: Clark et. al. 2010, p.81).

#### 7.4 The Accessibility of Phase 2 Cardiac Rehabilitation Programs in Rural and Remote Australia.

Thornbill and Stevens (1998) found that attendance at cardiac rehabilitation programs in rural and remote areas is greatly affected by geographical position. Ensuring appropriate access to health services in rural and remote areas is more difficult because long-distance travel is often required. Distance is one important factor that has been shown to affect access to, and utilisation of, health services (Eckert et. al. 2004, p.426). People from rural and remote areas commonly need to attend large rural towns and metropolitan cities for specialist care (Veitch et. al. 1996, p.104). Their decision to make such trips "away" involves a number of non-medical considerations that include economic, emotional and social factors (Veitch et. al. 1996, p.104). Thornbill and Stevens (1998) found that those who lived close to the cardiac rehabilitation program were more likely to attend compared with those who lived further away. The availability of transport and the cost and time of transport were the leading reasons for non-attendance of a cardiac rehabilitation program (Thornbill and Stevens 1998, p.110). Research by Veich et. al. (1996) revealed that rural and remote patients made important considerations when planning their trip to an urban facility; they

were predominantly related to urgency, household organisation and the costs likely to be incurred while away. Generally, remote area respondents saw these impediments as more serious barriers to seeking care than did rural area respondents (Veitch et. al. 1996, p.104). The provision of cardiac rehabilitation services to people living in rural and remote areas is often limited to the nearest large hospital situated in urban coastal centres, leaving a gap in the rehabilitation of cardiac patients (Parker 2002, p.15). Veitch et. al. (1996) found that rural people encounter problems at urban facilities particularly problems directly related to the lack of understanding of the transport and distance needs of rural people.

Structured Phase 2 Cardiac Rehabilitation provides an opportunity for the development of a life-long approach to prevention and management of coronary heart disease for patients. Within the continuum of care for patients with coronary heart disease within Australia, the entry into a Phase 2 Cardiac Rehabilitation Program after a hospital stay is determined by the patient. Accessibility has been identified as a major factor in the underutilisation of Phase 2 Cardiac Rehabilitation Programs both within Australia and internationally. As identified by Clark et. al (2011) the majority of Australians have good (less than one hour ) geographic accessibility to cardiac rehabilitation, however these services still remain underutilised. Like the research undertaken by Clark et. al. (2011) previous studies on accessibility to cardiac services have been based on travel time, cost or distance only, and they therefore provide only a partial view of access to services.

In reality, people trade off geographical and nongeographical factors in making decisions about health service use (Cromley and McLafferty 2002, p.243). To gain a better understanding of the accessibility of Phase 2 Cardiac Rehabilitation Programs the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation was developed using Geographic Information Systems (GIS) to combine both geographic and socio-economic dimensions of accessibility. The model was based on published literature on the barriers to accessing cardiac rehabilitation and the Penchansky and Thomas (1981) dimensions of accessibility which include: accessibility, availability, accommodation, affordability, and acceptability. Maps showing the output from the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Model against the rural and remote localities, as determined by the Australian Remoteness Index for Australia (ARIA) highlight that the accessibility of Phase 2 Cardiac Rehabilitation Programs in 2007/08 was extremely variable across Australia. As can be seen in figure 7.3 most rural and remote localities in Australia had no access to Phase 2

Cardiac Rehabilitation Programs and access to programs in metropolitan areas in some areas is also low despite services being available.

While results from the Cardiac ARIA model highlight that cardiac rehabilitation is geographically accessible to the majority of rural and remote Australians the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation highlights that the broader dimensions of accessibility greatly affect the patient's accessibility to these services. This is significant, given that people living in rural or remote areas are more in need of services because although population mortality rates attributable to coronary heart disease have decreased in Australia, this has not occurred to the same extent in those populations living outside of the capital cities (Dollard, Thompson, and Stewart 2004, p.28).

The way rural and remote patient's access health information needs to be considered when planning to improve their access to cardiac rehabilitation. Parker et. al. (2002) states that people living in rural communities seek out 'curative medical care' more often as opposed to 'preventive care' or health education information. Rural and remote patients preferred method for the delivery of a health service is important to understand if patient accessibility is to be improved. Humphreys et. al. (1994) found that the most important sources of health information for residents in rural areas were the general practitioner and chemist. However remote and very remote areas, are under-served by GPs and residents of these areas often travel long distances to attend the closest practice (Turrell et. al. 2004, p.157). GPs in rural and remote areas tend to charge more for their services and are less likely to bulk bill, resulting in higher out-of-pocket costs (Turrell et. al. 2004, p157.). Turrell et. al. (2004) found that people in socio-economically disadvantaged metropolitan areas have higher rates of GP utilisation than people living in disadvantaged remote/very remote areas who are most in need of GP services but are least likely to receive them. Among the general population in remote and very remote regions, these factors are likely to deter patients from using GP services for all but the more serious conditions (Turrell et. al. 2004, p.157). Therefore while GP's are the preferred option for rural and remote patients to access cardiac rehabilitation they only provide limited access to cardiac rehabilitation services.

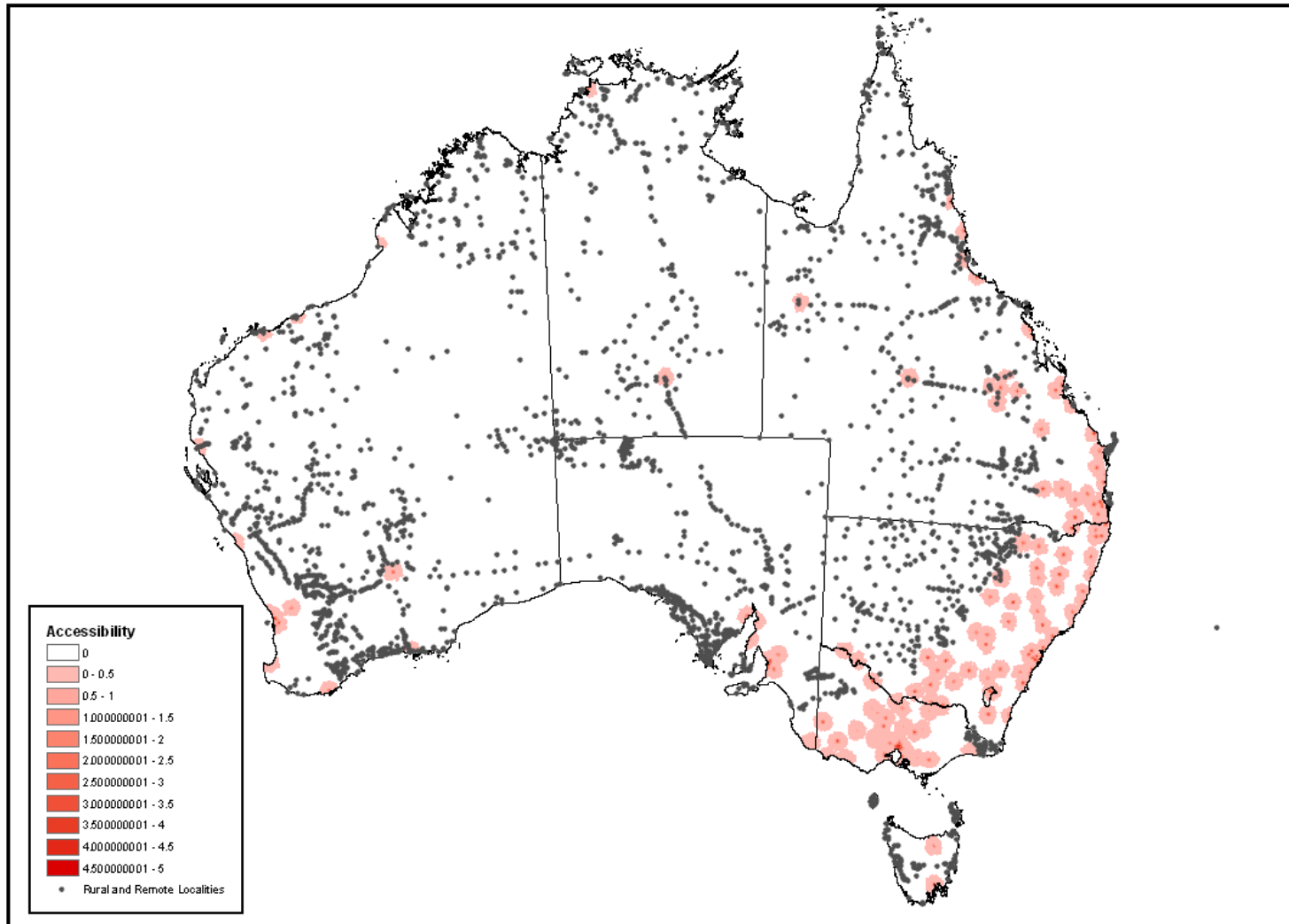


Figure 7.3 The Accessibility of Phase 2 Cardiac Rehabilitation Programs in Australia 2007/2008.

## 7.5 Conclusion

Barriers to comprehensive cardiac rehabilitation and secondary prevention services in Australia must be addressed, particularly in high risk rural and remote populations (Watchel et. al. 2008, p.195). Chronic and complex care in rural and remote settings must be flexible and take into account the context of the settings (Shepard, Batty, and Chalmers 2003, p.635). As the participation in outpatient CR is poor, access to conventional CR is difficult for people living in rural and remote areas, and there is a need to reduce mortality from cardiovascular disease in rural areas, it is proposed that non-conventional and comprehensive models of CR need to be developed to improve access for eligible rural and remote people (Dollard, Thompson, and Stewart 2004, p.28). For cardiac rehabilitation to be effective, an appropriate method of information provision and patient education is required (Parker 2002, p.16). Dollard, Thompson and Stewart (2004) recommend telephone contact, and home visits as ways of patients conveniently accessing cardiac rehabilitation services. Humphreys et. al. (1994) identified that within rural and remote populations, printed materials were valued more highly than television, radio, health workshops and family/friends as sources of health information because they could be kept and referred to later. Similarly the role of family and friends was also significant in these small close-knit communities (Humphreys 2000, p.174). Being able to access health care services at times of need is critical for families, particularly in rural areas where the problems of distance and accessibility are paramount (Humphreys 2000, p.174). Choosing the most appropriate method of cardiac rehabilitation will depend on, geographical location, population and health service capacity, but providing different sub-populations with a preferred model will enhance adherence (Dollard, Thompson, and Stewart, 2004, p.40). Central to the improvement of service provision is the need for services to become economically, geographically and culturally accessible (Savage et. al. 2005, p.11).



## **Chapter 8: Conclusion and Implication**

### **8.1 Introduction**

This examination of accessibility to Cardiac Rehabilitation within Australia has identified that attendance at Phase 2 Cardiac Rehabilitation Programs is the first point along the continuum of care for Australian patients with coronary heart disease where accessibility impacts the utilization of services. Accessibility to Cardiac Rehabilitation services is more than the existence of a service within a geographic location and the availability of reliable transport. Geographic and socio-economic variables impact upon the accessibility of rural and remote population centres to Phase 2 Cardiac Rehabilitation Programs across Australia.

The development of a Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs has been based on the five dimensions of accessibility defined by Penchansky and Thomas (1981) and the known barriers patients with coronary heart disease face when accessing cardiac rehabilitation services. This thesis contributes to the increasing knowledge base by describing a method for incorporating the geographic and socio-economic dimensions of accessibility into a single measure and using it to describe the current accessibility of Phase 2 Cardiac Rehabilitation Programs within rural and remote Australia. Importantly the current work stresses the significance of measuring accessibility beyond measuring purely distance to services.

This final chapter summarises the findings from the study with reference to the original aims and objectives. From this discussion, a number of issues have emerged which impact future policy formulation and when conducting further research into measuring the accessibility to Phase 2 Cardiac Rehabilitation within Australia. In a climate where the increasing burden of coronary heart disease continues to put strain on the governments limited funds for health care services and policy makers demand empirical evidence to support decision making, this type of spatial modelling provides an opportunity to better understand where future investment in existing services is needed.

## 8.2 Objectives

The first objective of this research was to identify where in the continuum of care for patients with coronary heart disease, issues of accessibility impact service utilization. This was achieved by reviewing the current literature on the care of coronary heart disease patients from an emergency event leading to hospitalization, and then the patients return back into the community. Phase 2 Cardiac Rehabilitation was identified as the point along the continuum of care where the uptake of medical services by the patient is affected by issues of accessibility.

The second objective of this research was to investigate the role of geographic distance for measuring accessibility to cardiac rehabilitation. Patient attendance records for five closely located, Phase 2 Cardiac Rehabilitation Programs in Adelaide, South Australia were analysed spatially to determine if accessibility can be measured using just geographic distance. Results from this analysis revealed that distance alone is not enough to measure accessibility to Phase 2 Cardiac Rehabilitation Programs as patients did not always utilize their nearest Phase 2 Cardiac Rehabilitation Program.

Through a review of current literature it was possible to meet the third objective of the research which was to identify the factors which affect the accessibility of patients to cardiac rehabilitation programs. The knowledge gained on the known barriers to cardiac rehabilitation was used to develop the Cardiac Rehabilitation Accessibility Survey which was sent to each of the Phase 2 Cardiac Rehabilitation Programs within Australia. This survey provided valuable data on individual Phase 2 Cardiac Rehabilitation Programs which had previously not been collected. This data has provided insight into the current accessibility of Phase 2 Cardiac Rehabilitation Programs across Australia.

The development of the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs has aided in the achievement of the fourth objective of this research, which was to contribute to the

understanding of measuring accessibility to cardiac rehabilitation services. The spatial model incorporates the five dimensions of accessibility as defined by Penchansky and Thomas (1981) to cardiac rehabilitation. While there have been a number of methodologies developed for measuring the geographical accessibility of cardiac services, there have been no methodologies that have incorporated socio-economic and geographic aspects of accessibility for cardiac rehabilitation services. This research has therefore provided a new perspective to measuring accessibility to Phase 2 Cardiac Rehabilitation.

Objective number five was achieved by assigning an accessibility rating for each of Australia's rural and remote population centres according to their level of access to the minimal requirements for comprehensive cardiac rehabilitation health support in a community. Data from the Cardiac Rehabilitation Accessibility Survey was incorporated into the Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs and overlaid with the rural and remote population centres for Australia as defined by the Accessibility and Remoteness Index for Australia (ARIA). Maps showing rural and remote population centres accessibility to Phase 2 Cardiac Rehabilitation Programs across Australia were created.

Maps showing the accessibility to Phase 2 Cardiac Rehabilitation Programs across Australia reveal that the majority of rural and remote population centres do not have access to these services. This has aided in the fulfilment of the final objective of the research which was to inform policy by identifying and describing the accessibility of cardiac rehabilitation to rural and remote population centres within Australia. From these maps it is possible for policy makers and planners to clearly see how accessible Phase 2 Cardiac Rehabilitation Programs are to coronary heart disease patients, and where services need to be enhanced or new services created to improve accessibility.

Together, the exploration of these objectives has achieved the overarching aim of answering the major question: "How accessible are cardiac rehabilitation services in Australia?" These results and, more importantly, the synthesis of these findings have built up a unique picture of measuring accessibility to cardiac rehabilitation services in Australia. This research has demonstrated that Geographic Information System (GIS) technology is a useful tool for providing insight into key

social issues such as access to secondary health care, and can aid in the equitable distribution of these services to where they are most needed.

### **8.3 Study Limitations**

While this research has identified a number of aspects which are of importance to the further study of measuring accessibility to cardiac rehabilitation services, it has also been subject to limitations of both data and method. While these do not undermine the strengths of the study, they must be acknowledged and their impact evaluated.

While every effort was made to gather data from every Phase 2 Cardiac Rehabilitation Program in Australia through the Cardiac Rehabilitation Accessibility Survey it was not possible to gather data from all of the programs. The return rate for the questionnaire was 84% with 362 responses being returned. 204 questionnaires were returned completed and 158 cardiac services sent replies stating that they did not run a Phase 2 Cardiac Rehabilitation Program. This highlights the main limitation of the survey which was that it was not possible to distinguish between the different types of cardiac rehabilitation prior to the survey being posted, to target Phase 2 Programs only. However it has had no impact upon the survey results as the letter that accompanied the questionnaire clearly stated that it was targeting Phase 2 Cardiac Rehabilitation Programs only, and many of the Co-ordinators that were running other types of Cardiac Rehabilitation Programs returned the questionnaire with it clearly marked with the other type of program that they were running. However 39 cardiac rehabilitation services did not reply to the questionnaire. These services were given a follow-up phone call requesting information but they were still unable to provide information. While the data that these programs could have provided would have been valuable, it was not seen to have a significant impact due to their spatial distribution which was fairly uniform across the whole of Australia. The even spread of these non-responding cardiac rehabilitation programs therefore does not significantly underestimate the accessibility of one particular area.

While the response rate of the Cardiac Rehabilitation Accessibility Survey was high a small number of the questionnaires were incomplete with 5.8% not completing one question and 13.2% not completing two questions on the survey. The survey consisted of twenty one questions in total and a number of the dimensions of accessibility were constructed using the responses from a number of questions. The individual dimensions of accessibility were then combined to give an overall accessibility rating for each of the programs, so the incomplete questionnaires would only have a minor effect upon the overall accessibility rating given to each Phase 2 Cardiac Rehabilitation Program.

#### **8.4 Synthesis of Findings**

Cardiovascular disease is the largest cause of premature death and the overall death rate in Australia, accounting for 42% of all deaths in 1996 (Tonkin et. al. 1999, p.183 ). Cardiovascular disease continues to dominate the national health profile in terms of cost, disability and death in Australia (Access Economics 2005, p.i). Because of the aging population, and the shift of cardiovascular disease from an acutely fatal event to a chronic disease, there is a marked and growing need for medical services that help patients improve their quality of life, lessen symptoms, increase functional capacity, decrease disability, and reduce the risk of subsequent morbidity and mortality (Williams, et. al. 2006, p.838).

This examination of accessibility to Cardiac Rehabilitation has identified that attendance at Phase 2 Cardiac Rehabilitation Programs is the first point along the continuum of care for Australian cardiac patients where accessibility impacts the utilization of services. Phase 2 Cardiac Rehabilitation Programs provide a significant opportunity for the development of a life-long approach to the prevention of further cardiac events and aid in the management of the disease for patients. Cardiac rehabilitation is an important part of secondary prevention of coronary heart disease, aiming to give people the confidence, motivation and skills to make a lifelong commitment to a healthy lifestyle and greater well-being (National Health and Medical Research Council 2007, p.v). Participation in comprehensive cardiac rehabilitation is also associated with lowered cardiac rehospitalisation costs in the years after an acute coronary event (Ades et. al. 1992, p.919). Despite the evidence to support cardiac rehabilitation, existing services remain underutilised

(National Heart Foundation 2004, p. 11). This is primarily due to a lack of initial referrals and a failure of patients to attend, despite being referred (Bunker and Goble 2003, p.332). One of the key factors contributing to these deficiencies is that cardiac rehabilitation programs are not available or accessible to all patients, especially those in rural and remote areas, as well as certain population groups, such as indigenous people, older women and those unable to speak English (Bunker and Goble 2003, p.332). Scott et. al. (2003) highlighted suboptimal rates of referral to and utilisation of outpatient rehabilitation programs with only 29% of patients with a cardiac discharge diagnosis being referred to an outpatient cardiac rehabilitation program, while 49% of discharged patients were eligible for such a referral. More importantly, less than a third of the referred patients completed the program (Scott et. al. 2003, p.341). Therefore accessibility is a major factor in the underutilisation of these services, despite The World Health Organisation (1993) recommending that Cardiac Rehabilitation be available to all persons with coronary heart disease.

This research has shown that while studies like Clark et. al. (2007) highlight the inequitable distribution of cardiovascular services in Australia, barriers to accessing cardiac rehabilitation services are not just related to physical distance, and the availability of reliable transport (National Health and Medical Research Council 2007, p.37). Distances between patient locations and each of the Phase 2 Cardiac Rehabilitation Programs in Adelaide South Australia, showed that 33.37% (n=857) of patients did not attend their nearest Phase 2 Cardiac Rehabilitation Program. Therefore highlighting that accessibility to Phase 2 Cardiac Rehabilitation Programs cannot be assessed based on geographic accessibility alone. Results from this study support the idea developed by Cromely and McLafferty (2002) who state that in reality, people trade off geographical and nongeographical factors in making decisions about health service use.

A review of published literature on the barriers patients encounter while accessing cardiac rehabilitation shows that patient accessibility to cardiac rehabilitation is a mix of geographic and socio-economic variables that can prevent or limit service use such as those described by Penchansky and Thomas (1981). Penchansky and Thomas (1981) identified the following five important dimensions of access:

*“Availability*, the relationship of the volume and type of existing services (and resources) to the clients’ volume and types of needs. It refers to the adequacy of the supply of physicians, dentists

and other providers; of facilities such as clinics and hospitals; and of specialized programs and services such as mental health and emergency care.

*Accessibility*, the relationship between the location of supply and the location of clients, taking account of client transportation resources and travel time, distance and cost.

*Accommodation*, the relationship between the manner in which the supply resources are organized to accept clients (including appointment systems, hours of operation, walk-in facilities, telephone services) and the clients' ability to accommodate to these factors and the clients' perception of their appropriateness.

*Affordability*, the relationship of prices of services and providers' insurance or deposit requirements to the clients' income, ability to pay, and existing health insurance. Client perception of worth relative to total cost is a concern here, as is clients' knowledge of prices, total cost and possible credit arrangements.

*Acceptability*, the relationship of clients' attitudes about personal and practice characteristics of providers to the actual characteristics of existing providers, as well as to provider attitudes about acceptable personal characteristics of clients."

The Penchansky and Thomas (1981) dimensions of accessibility and the known barriers to accessing cardiac rehabilitation were used to develop the Cardiac Rehabilitation Accessibility Survey that was sent to every Phase 2 Cardiac Rehabilitation Program in Australia. The Cardiac Rehabilitation Accessibility Survey revealed that the need for a referral, the disease the patient with coronary heart disease has, the provision of group and individual sessions, flexibility in service delivery setting, hours of operation, cost, and range of program components are significant barriers imposed by Phase 2 Cardiac Rehabilitation Programs that limit patient accessibility. Completion rates for the majority of Phase 2 Cardiac Rehabilitation Programs were low and this can be seen as a measure of acceptability by the patient of the service.

A well-documented barrier to accessing cardiac rehabilitation programs is the distance patient's travel, with those who have further to travel not attending (Johnson et. al. 2001, p.294). This coupled with the findings of the Cardiac Rehabilitation Accessibility Survey which reported that a

large majority of patients chose to take private transport to access their Phase 2 Cardiac Rehabilitation Program highlights the significant use of the road network for patient access to Phase 2 Cardiac Rehabilitation within Australia. This research also combined the results of Higgins et. al. (2008), Brual et. al. (2010) and Schulz and McBurney (2002) on the relationship between distance from the Cardiac Rehabilitation Program and patient attendance / non-attendance at Phase 2 Cardiac Rehabilitation Programs to create a Distance Decay Model for Cardiac Rehabilitation within Australia.

This research then synthesised the findings from the Cardiac Rehabilitation Accessibility Survey and the Distance Decay Model for Cardiac Rehabilitation within ArcGIS 9.3 to create The Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs for the whole of Australia. Output from this spatial model is capable of identifying areas where accessibility to Phase 2 Cardiac Rehabilitation Programs is low and could be improved and where new programs or models of delivery should be established to enhance accessibility in areas that are currently poorly served.

## **8.5 Policy Implications**

This research has identified that there is a need for better service planning aimed at increasing the accessibility to Phase 2 Cardiac Rehabilitation Programs within Australia. The factors affecting the accessibility of at-risk populations should be considered and the current services should be improved to meet the specific needs of the population that they could service. This study has shown that accessibility to cardiac rehabilitation is a multifaceted phenomenon with both geographic and socio-economic factors influencing the accessibility of the service. As such, service planning for aftercare for coronary heart disease patients should take into account the complexities of accessibility beyond patient proximity to services to improve the uptake of these services and lessen the burden of coronary heart disease. In particular policy should address the need for referral to access Phase 2 Cardiac Rehabilitation Programs.

The benefits of improving the accessibility to cardiac rehabilitation are many. Patients would directly benefit through improved health outcomes by increased participation in recommended



cardiac rehabilitation programs (that are known to improve health outcomes and wellbeing). Service providers would benefit through improved return on investments in cardiac rehabilitation programs as a result of increased uptake and utilisation of services that are “customised” to meet the needs of clients with specific requirements. Service providers would also benefit through the identification of priority area for future investment in the capacity building of existing and new cardiac rehabilitation services to increase the utilisation of the services, improve public health outcomes and reduce health inequalities.

Better service planning aimed at increasing participation in cardiac rehabilitation programmes by at-risk populations through improved access by service planners and managers to information for determining the barriers that hinder access these services, whereby they are able to design and deliver more “personalised” services that are customised to meet the specific needs of targeted at-risk populations. The benefits to the Australian health system are to provide better access to information that will support the adoption of more informed decision-making and evidence-based practices in service planning, funding and performance monitoring. Therefore reducing the demand on hospital services, by reducing the likelihood of avoidable hospital re-admissions through improving access to and utilisation of allied health services within the out-of-hospital sector. Providing improved quality and safety of care, throughout the complete duration of the patient’s journey through the system, as a result of improved integration and coordination in the delivery of services to support the transition from hospital to community sectors. Greater equity in access to cardiac rehabilitation services in the future could be achieved through the identification of the mismatch between cardiac rehabilitation service provision and patient needs now and in the future. This is significant given the impact of cardiovascular disease on Australians and the Australian health system is substantial and with Australia’s population becoming older and the increased pressure on cardiovascular services currently predicted.

## **8.6 Future Directions**

Through the exploration of the dimensions of accessibility to cardiac rehabilitation, this study has identified that geographic proximity of patients to a Phase 2 Cardiac Rehabilitation Program does not equate to the equitable provision of these services. The relationship between service and

patient should be integrated into the planning of Phase 2 Cardiac Rehabilitation Programs. Patient preferences for different program models and methods of delivery should be investigated and more services should be developed to improve patient accessibility to Phase 2 Cardiac Rehabilitation within Australia.

This research has highlighted that there is a need to build a flexible model for determining the accessibility of current Phase 2 Cardiac Rehabilitation Programs that uses differing combinations and weightings for the factors that act as barriers and hinder access to cardiac rehabilitation services for different at-risk populations based upon their specific circumstances and service requirements. Through defining the set of parameters that represent the relative weightings of the known accessibility barriers for individual at-risk population types and spatially modelling these barriers against the characteristics of the Phase 2 Cardiac Rehabilitation Programs it would be possible to produce a spatial model that would map of the distribution of current cardiac rehabilitation services that meet the specific accessibility criteria for the targeted population of interest. Therefore also highlighting where there is a mismatch between Phase 2 Cardiac Rehabilitation Programs and the communities that they intend to service. This would build on from this current research by providing a less generic model of accessibility to Phase 2 Cardiac Rehabilitation Programs and provide service managers and planners with specific information on the ‘type’ of service that is needed to meet the at-risk population that the program has been established to service.

## **8.7 Conclusion**

The impact of cardiovascular disease within Australia continues to increase as a result of an ageing population and higher survival rates following a cardiac event. Phase 2 Cardiac Rehabilitation Programs provide an opportunity to lessen the impact of the disease upon individuals and the healthcare system. However issues of accessibility to Phase 2 Cardiac Rehabilitation Programs mean that these services are greatly underutilised.

This study has successfully explored the socio-economic and geographic dimensions of accessibility, and gathered data via the Cardiac Rehabilitation Accessibility Survey to further the knowledge of accessibility to Phase 2 Cardiac Rehabilitation Programs within Australia. The development of The Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs has created a practical tool for measuring accessibility that is based on published accessibility theories. The results from utilising The Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs with data obtained from the Cardiac Rehabilitation Accessibility Survey has measured the accessibility of Phase 2 Cardiac Rehabilitation Programs within Australia highlighting a number of areas which should be considered for immediate policy consideration. The approach demonstrated here has practical implications for health service clinicians, managers and other providers. This research shows that system factors can and do influence equity of access to healthcare.

Results from this study also highlight the need for further research into the issues between service users and providers within the field of health service provision. The Spatial Model of Accessibility to Phase 2 Cardiac Rehabilitation Programs that was developed as part of this study is currently only a general model. Further refinements to the model could be made so that the accessibility to Phase 2 Cardiac Rehabilitation Programs could be measured depending on the characteristics of the individual users. For example pensioners and professionals that will want to access a Phase 2 Cardiac Rehabilitation Program will consider different issues as barriers to accessing the service, therefore enhancing the existing model to incorporate a number of different user types would provide an even better measure of the accessibility of the service to the users that they are attempting to support.

While this study has focused on measuring the accessibility to Phase 2 Cardiac Rehabilitation Programs within Australia, the methodology behind the model, could be utilised to develop similar spatial models to measure accessibility to Phase 2 Cardiac Rehabilitation in other countries. The methodology developed in this study could also be applied to other health services where accessibility is an issue.

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## Appendix 1: Survey Questionnaire

### Cardiac Rehabilitation Accessibility Survey

Contact for Survey:

Name:  
Title:  
Phone:  
Service name:  
Postal Address:  
Suburb:  
Town/city:  
Postcode:

Telephone:  
Facsimile:  
Email:  
Website:

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**Please fill out the following questionnaire for each phase 2 cardiac rehabilitation program that your service provides.**

1. Program Name:
2. Contact person:
3. Program location (where do people go to access your program):  
Street:  
Suburb:  
Town/city:  
Postcode:
4. Which of the following are included in your cardiac rehabilitation program (please tick all that apply)?

Health education	
Physical activity	
Counselling	
Behaviour modification strategies	
Support for self-management	
Cultural understanding	

5. Do the people that utilise your cardiac rehabilitation program require a referral to access your program? (please circle) Yes / No

If "Yes" where do people usually get referred from?

6. Which of the following are located directly outside your cardiac rehabilitation programs location (please tick all that apply)

Bus stop	
Taxi station	
Train station	
Community bus stop	
Car Park	

7. What percentage of your patients use the following forms of transport to travel to your program?

Mode of transport	Percentage
Private car	
Taxi	
Train	
Bus	
Community bus	
Other (please specify)	

8. Within what type of setting is the cardiac rehabilitation program run: (tick all that apply)

Within an acute public hospital	
Within an acute private hospital	
Within an Aboriginal Medical Service	
Within a non-acute/community hospital	
Within a public community health centre/service	
Within a private outpatient service	
As part of an outreach service to communities	
Telephone service	
Home visits	
Internet	
Postal	
Other (please name)	

9. What type of sessions do you provide?

Group only	
Individual only	
Group and individual	
Women only	

10. Does your service accept the following?  
(please circle)

DVA	Yes	No
Medicare	Yes	No
Centrelink	Yes	No
Healthcard	Yes	No
Other concessions (please specify)		

11. Is there a cost associated with attending your cardiac rehabilitation program that is not covered by medicare? (please circle) Yes / No

If yes, what is the cost?

12. When is the cardiac rehabilitation program available to patients: (please indicate operating hours)

Days	Times available
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	

13. Which of the following age groups do you allow to use your cardiac rehabilitation program? (please tick those that apply)

Age	Accepted
All ages	
<15	
15-24	
25-34	
35-44	
45-54	
55-64	
65-74	
75-84	
85+	

14. According to discharge diagnosis, what type of patients do you allow into your cardiac rehabilitation program? (Please tick all of those that apply).

I200	Unstable angina	
I208	Other forms of angina pectoris	
I209	Angina pectoris unspecified	
I210	Acute transmural MI of anterior wall	
I211	Acute transmural MI of inferior wall	
I212	Acute transmural MI of other sites	
I213	Acute transmural MI of unspecified site	
I214	Acute subendocardial MI	
I219	Acute myocardial infarction unspecified	
I220	Subsequent MI of anterior wall	
I221	Subsequent MI of inferior wall	
I228	Subsequent MI of other sites	
I229	Subsequent MI of unspecified site	
I230	Haemopericardium current comp foll ac MI	
I231	ASD as current comp following acute MI	
I232	VSD as current comp following acute MI	
I233	Rupt card wall wo hemopericrd foll ac MI	
I234	Rupt chordae tendineae comp foll ac MI	
I235	Rupt papillary muscle comp foll ac MI	
I236	Atrl thromb auric append ventric w ac MI	
I238	Other current complication foll acute MI	
I240	Coronary thrombosis not resulting in MI	
I241	Dressler's syndrome	
I248	Other forms of acute IHD	
I249	Acute ischaemic heart disease unsp	
I250	Atherosclerotic C-V disease so described	
I2510	Atherosclerotic heart dis unsp vessel	
I2511	Atheroscl heart dis native coron artery	
I2512	Atheroscl heart dis autologs graft	
I2513	Atheroscl heart dis nonautologs byps gft	
I252	Old myocardial infarction	
I253	Aneurysm of heart	
I254	Coronary artery aneurysm	
I255	Ischaemic cardiomyopathy	
I256	Silent myocardial ischaemia	
I258	Other forms of chronic IHD	
I259	Chronic IHD unspecified	
I426	Alcoholic cardiomyopathy	
I428	Other cardiomyopathies	
I429	Cardiomyopathy unspecified	
I460	Cardiac arrest w success resuscitation	
I469	Cardiac arrest unspecified	
I500	Congestive heart failure	
I501	Left ventricular failure	
I509	Heart failure unspecified	

15. What is the maximum number of patients your cardiac rehabilitation program can service in a month?



16. How many patients participated in your cardiac rehabilitation program in the last financial year (2007/2008)?

17. How many patients completed your cardiac rehabilitation program in the last financial year (2007/2008)?

18. Please list the postcodes that your patients come from? (please attach a separate sheet if necessary)

19. Does your cardiac rehabilitation program adhere to the “Recommended Framework for Cardiac Rehabilitation ‘04” guidelines established by the National Heart Foundation of Australia & Australian Cardiac Rehabilitation Association? (please circle) Yes / No

20. Do you have any comments that you would like to make about improving patient accessibility to cardiac rehabilitation programs?

21. Would you like to receive information on the results of this research project? (please circle) Yes/ No

\*If yes please make sure you have provided your email address.

**Thank you for your time.**

**Please return completed questionnaire to:**

Deborah van Gaans

The Department of Geographical and Environmental Studies, Level 8, Napier Building,

The University of Adelaide, S.A. 5005

**Appendix 2: Disease codes ICD-10-AM 5th/6th edition codes as Principal or Secondary Diagnosis**

I200	Unstable angina
I208	Other forms of angina pectoris
I209	Angina pectoris unspecified
I210	Acute transmural MI of anterior wall
I211	Acute transmural MI of inferior wall
I212	Acute transmural MI of other sites
I213	Acute transmural MI of unspecified site
I214	Acute subendocardial MI
I219	Acute myocardial infarction unspecified
I220	Subsequent MI of anterior wall
I221	Subsequent MI of inferior wall
I228	Subsequent MI of other sites
I229	Subsequent MI of unspecified site
I240	Coronary thrombosis not resulting in MI
I248	Other forms of acute IHD
I249	Acute ischaemic heart disease unsp
I250	Atherosclerotic C-V disease so described
I2510	Atherosclerotic heart dis unsp vessel
I2511	Atheroscl heart dis native coron artery
I2512	Atheroscl heart dis autolgs graft
I2513	Atheroscl heart dis nonautolgs byps gft
I252	Old myocardial infarction
I255	Ischaemic cardiomyopathy
I256	Silent myocardial ischaemia
I258	Other forms of chronic IHD
I259	Chronic IHD unspecified
I426	Alcoholic cardiomyopathy
I428	Other cardiomyopathies
I429	Cardiomyopathy unspecified
I460	Cardiac arrest w success resuscitation
I469	Cardiac arrest unspecified
I500	Congestive heart failure
I501	Left ventricular failure
I509	Heart failure unspecified

# Hospital clinic usage among SAMSS respondents with cardiovascular disease

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**September 2009**

**Prepared for:**

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**By:**

Population Research and Outcome Studies Unit  
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**Request ID: 20099852**



## Introduction

This report presents data from the South Australian Monitoring and Surveillance System (SAMSS). The data presented here report on the hospital clinic usage of SAMSS respondents with cardiovascular disease (CVD), and were gathered between January 2007 and December 2008 from South Australian households.

## Background

The South Australian Monitoring and Surveillance System (SAMSS) is conducted by the Population Research & Outcome Studies (PROS) Unit within SA Health. SAMSS is an epidemiological monitoring system that aims to detect and facilitate understanding of trends in the prevalence of chronic conditions, risk and protective factors, and other determinants of health. These data monitor departmental, state and national priority areas and are linked to key indicators.

## Methodology

Each month since July 2002, a sample of South Australians was randomly selected from the Electronic Whites Pages (EWP). Introductory letters were sent out to each household selected to inform them of the upcoming telephone survey, inviting the person who had the last birthday in the household to participate in a telephone interview. In the case of a child under 16 years of age being the person with the last birthday, the interview was conducted by proxy (i.e. a parent or guardian). The survey was conducted by professional interviewers, using Computer Assisted Telephone Interview (CATI) technology. Approximately 600 respondents participate in each SAMSS survey.

The data presented in these analyses are weighted by sex, age, area and probability of selection of the household.

For further information on SAMSS, please see <http://www.health.sa.gov.au/pros>.

## Hospital clinic usage

Respondents were asked the question “Have you ever been told by a doctor that you have any of the following conditions?” and were given the following options to choose from:

- Heart attack
- Angina
- Heart disease
- Stroke

Those that answered yes for any of these conditions were classified as having CVD.

Respondents were also asked if they had visited a hospital clinic (outpatient, specialist or other clinic) in the last four weeks.

Table 1 presents the proportion of respondents with CVD that had visited a hospital clinic in the last four weeks.

**Table 1: Proportion of SAMSS respondents with CVD that attended a hospital clinic in the last four weeks, age 16 years and over**

	<i>Attended clinic</i>		<i>Did not attend clinic</i>	
	<i>n</i>	<i>% (95% CI)</i>	<i>n</i>	<i>% (95% CI)</i>
Eastern Adelaide	14	13.2 (8.0 - 21.0)	92	86.8 (79.0 - 92.0)
Northern Adelaide	31	18.5 (13.3 - 25.0)	137	81.5 (75.0 - 86.7)
Southern Adelaide	35	15.0 (11.0 - 20.1)	199	85.0 (79.9 - 89.0)
Western Adelaide	28	24.1 (17.3 - 32.7)	88	75.9 (67.3 - 82.7)
Country SA	31	12.4 (8.9 - 17.1)	218	87.6 (82.9 - 91.1)
<b>Overall</b>	<b>139</b>	<b>15.9 (13.6 - 18.5)</b>	<b>734</b>	<b>84.1 (81.5 - 86.4)</b>

Data Source: SAMSS January 2007 to December 2008

Note: The weighting of data can result in rounding discrepancies or totals not adding

## Glossary

### % 95% CI

This means the proportion and the 95% confidence intervals of the proportion. The confidence intervals for the proportion give a range of values around the proportion where we expect the "true" (population) proportion is located (with a given level of certainty). For example, if the proportion is 23%, and the lower and upper limits of the confidence interval are 19% and 27% respectively, then you can conclude that there is a 95% probability that the population proportion is greater than 19% and lower than 27%. Note that the width of the confidence interval depends on the sample size and on the variation of data values. This means the larger the sample size, the more reliable its proportion.