

**Whose *place* is it?  
Examining the socio-spatial geography  
of obesity in young adults for an  
Australian context**

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## ABSTRACT

This thesis was written in a climate of rising obesity rates within our population. In recent times, an inundation of media, marketing and health stories have focused on the „increasing waistlines“ of both adults and children. The research aligns itself with the „geographies of health“ perspective, utilising knowledge from geography, sociology, epidemiology and population health. Extensive literature has shown that those living in the developed world, who are locationally and socially disadvantaged, are more likely to experience the highest prevalence of obesity. This thesis contributes to a broader knowledge base on how socio-spatial factors impose barriers to achieving and maintaining a healthy weight within a young adult cohort (18 to 34 years).

The research design consists of both theory and data triangulation. The theoretical underpinning utilises Giddens' *Theory of Structuration* exploring the structure and agency debate along with a number of geographical theories on space and place. The overarching socio-spatial conceptual framework for the research captures four main theme areas; the social environment, socio-cultural factors, residential perceptions of local areas, and lay perceptions of weight status and health in the context of place. Data were obtained from a biomedical and socio-demographic cohort study (n=4056), the North West Adelaide Health Study (NWAHS) and longitudinal survey information from the South Australian Health Omnibus Survey (SA HOS) between 1994 and 2004. A follow-up telephone interview to NWAHS participants (n=2996) provides additional unique primary data around social environments, housing, residential migration, lifecourse and perceptions of health. Additionally, semi-structured interviews were undertaken with young women from the NWAHS cohort which addressed socio-demographic, geographical and lifecourse themes. Other secondary social environmental data were utilised on accessibility to services, Australian Bureau of Statistics (ABS) Population and Housing Censuses and property valuations data providing additional insight into the complexities of the macro or global level influences.

The thesis discusses the themes from the socio-spatial framework highlighting the social, cultural, historical and geographical aspects that are important for understanding the current increasing prevalence of obesity within young adults. The findings highlight the importance of space and place when thinking about health. Obesity is a complex and multifaceted issue and there is the need for contemporary research methodologies to guide future policy development and interventions.

# DECLARATION

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Natasha Jayne Howard 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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Natasha Jayne Howard

Date

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Over time I have learnt from many good friends and colleagues and the journey of the PhD is certainly much more than what is contained within these pages. I am extremely grateful to a number of wonderful friends. In particular, Donna Sundberg and Kate White who have been there from the beginning of the PhD and encouraged me through it all. Katherine Baldock who was a great support to me professionally and personally, and I am glad that we get to work together again in this research area. Dr Julie Franzon who was a great friend to have on the journey and I loved our travels and discussions along the way and Dr Kelly Parker who was an amazing friend to share this experience with and I think over the years we have deliberated every aspect of our work and life. I am glad that this experience has introduced some tremendous people into my life.

I am particularly indebted to the people who contributed to the final drafts of this thesis; Dr Kelly Parker, Dr Catherine Paquet and to my mum Jenny Howard.

*Thank you lastly to my family, Mum, Dad, James and Sara.  
For your love and belief in me always.*



## THE NOBLE STUDY

This research was a component of the overarching Nutrition Obesity Lifestyle and Environment (NOBLE) study, an Australian Research Council (ARC) linkage project (LP0455737), 2005-2009. The South Australian Government Department of Health was the major industry linkage partner and the primary aim of the relationship was to use population research intelligence to inform effective policy and interventions surrounding obesity. Other study collaborators included the Children, Youth and Women's Health Service (CYWHS), Central Northern Adelaide Health Service (CNAHS), Australian Commonwealth Scientific and Research Organisation (CSIRO), The National Centre for Social Applications of Geographic Information Systems (GISCA), The University of Adelaide and the University of South Australia (UniSA).

The CYWHS contributed a population level, measured data set of four-year old children within South Australia. There were also other social and physical environmental data sources made available through research partners, such as, accessibility, transport, education, health services and property capital valuations. A partnership existed to explore the use of the Australian Bureau of Statistics (ABS) Population and Housing Censuses and other social surveys.

The NOBLE study worked within the areas of psychology, medicine, public health, geography and economics to explore the many aspects of the obesity epidemic. Further research was recognised as a necessity to improve understanding into the social, economic, environmental and biomedical processes related to obesity. This thesis will specifically address NOBLE study aims associated with the socioeconomic factors relating to obesity and the environment (Hugo *et al.*, 2004:68).

### Chief Investigators

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## ABBREVIATIONS

ABS	Australian Bureau of Statistics
ABS NHS	Australian Bureau of Statistics National Health Survey
AIHW	Australian Institute of Health and Welfare
ADPT	Australasian Digital Theses Program
ARC	Australian Research Council
ARIA	Accessibility and Remoteness Index of Australia
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ASGC	Australian Standard Geographical Classification
ATSI	Aboriginal and Torres Strait Islander
BMI	Body Mass Index
BRFSS	Behavioural Risk Factor Surveillance System
CATI	Computer Assisted Telephone Interview
CBD	Central Business District
CD	Collection District
CDC	Centers for Disease Control
CNAHS	Central Northern Adelaide Health Service (South Australian Government)
COPD	Chronic Obstructive Pulmonary Disease
CSIRO	Australian Commonwealth Scientific and Research Organisation
CYWHS	Children, Youth and Women's Health Service (South Australian Government)
DCDB	Digital Cadastral Database
DEH	Department of Environment and Heritage
DEXA	Dual Electronic X-Ray Absorption
DoHA	Department of Health and Ageing (Commonwealth of Australia)
ERP	Estimated Residential Population
EWP	Electronic White Pages
GIS	Geographic Information Systems
GISCA	The National Centre for Social Applications of Geographic Information Systems
GLM	Generalised Linear Modelling
GMH	General Motors Holden
GWR	Geographically Weighted Regression
HiAP	Health in All Policies
IMVS	Institute of Medical and Veterinary Science
IRSD	Index of Relative Socioeconomic Disadvantage
KFC	Kentucky Fried Chicken
LGA	Local Government Area
LMH	Lyell McEwin Hospital
MAUP	Modifiable Area Unit Problem
Metro ARIA	Metropolitan Accessibility and Remoteness Index of Australia
NHANES	National Health And Nutritional Examination Survey (United States)
NHIS	National Health Institute Survey (United States)
NOBLE	Nutrition Obesity Lifestyle and Environment Study
NWAHS	North West Adelaide Health Study

OCSAR	Office of Crime Statistics and Research (South Australian Government)
OECD	Organisation for Economic Co-operation and Development
OR	Odds Ratio
PROS	Population Research and Outcome Studies Unit (SA Health)
RAAF	Royal Australian Air Force
SA	South Australia
SACC	Standard Australian Classification of Countries
SA HOS	South Australian Health Omnibus Survey
SAHT	South Australian Housing Trust
SAMSS	South Australian Monitoring and Surveillance System
SASP	South Australian Strategic Plan
SaTScan™	Software for the spatial, temporal, and space time statistics
SEIFA IRSD	Socio Economic Indexes for Areas, Index of Relative Socioeconomic Disadvantage
SES	Socio Economic Status
SF-1	Short Form-1
SLA	Statistical Local Area
TAFE	Technical and Further Education
TFU	Telephone Follow-Up
TATS	Torrens Automated Titles System
TQEH	The Queen Elizabeth Hospital
UniSA	University of South Australia
UK	United Kingdom
US	United States
WHO	World Health Organisation
WHR	Waist-to-Hip Ratio



## PUBLICATIONS AND PRESENTATIONS

The following peer reviewed publications, conference presentations, posters resulted from work described in this thesis.

### PEER-REVIEWED PUBLICATIONS

Adams, R.J., **Howard, N.**, Tucker, G., Appleton, S., Taylor, A.W., Chittleborough, C., Gill, T., Ruffin, R.E. and Wilson, D.H. 2009, „Effects of area deprivation on health risks and outcomes: a multi-level, cross-sectional, Australian population study“, *International Journal of Public Health*, vol. 54, pp. 1-10.

**Howard, N.J.**, Taylor, A.W., Gill, T.K. and Chittleborough, C.R. 2008, „Severe Obesity: Investigating the sociodemographics within the extremes of body mass index“, *Obesity Research and Clinical Practice*, vol. 2, no.1, pp. 51-59.

**Howard, N.J.**, Hugo, G.J., Taylor, A.W. and Wilson, D.H. 2008, „Our perception of weight: socioeconomic and sociocultural explanations“, *Obesity Research and Clinical Practice*, vol. 2 no.2, pp. 125-131.

### PRESENTATIONS

**Howard, N.** 2007, *Investigating spatial dimensions of obesity in South Australia*. ARCNRSS Summer School, Brisbane, February 11-21 2007.

**Howard, N.** 2007, *Geographies of Obesity: The social environment and the young adult cohort*. NOBLE Conference “The Shape of Things to Come”, NOBLE Conference, Adelaide Town Hall, 5 November 2007.

**Howard, N.** and Franzon, J. 2006, *Space, Place and Health: Small area analysis of Obesity*. Space, Place and Health: Geographical Approaches to Public Health Short Course, Flinders University, 7-11 August 2006.

**Howard, N.**, Wilson, D., Taylor, A., Hugo, G. and The North West Adelaide Health Study Team. 2006, *Investigating spatial relationships and obesity: What role does area and individual level disadvantage play within the north-west region of Adelaide, South Australia*. International Congress of Obesity (ICO), Poster Presentation, Sydney, 3-8 September 2006.

**Howard, N.**, Hugo, G., Wilson, D., Taylor, A. and The North West Adelaide Health Study Team. 2006, *Individual health or area-level health effects: Investigating the socio-spatial aspects of obesity within the north west region of Adelaide, South Australia*. GeoHealth Conference, Nelson, New Zealand, November 27-30 2006.

**Howard, N.**, Hugo, G., Wilson, D., Taylor, A. and The North West Adelaide Health Study Team. 2006, “*Is my neighbourhood making me sick?: a spatial investigation into obesity and inequalities in the north-west region of Adelaide*”. Australian Population Association Population, Poster Presentation, 6-8 December 2006.

**Howard, N.J.**, Taylor, A.W., Dal Grande, E., Gill, T.K. and Carter, P. 2005, *Trends Analysis of Body Mass Index in South Australia 1994-2004: Does Socioeconomic Status make a difference?* Australasian Society for the Study of Obesity (ASSO), Adelaide, 28-30 October 2005.

**Howard, N.**, Grant, J., Montgomerie, A., Taylor, A.W. and the North West Adelaide Health Study Team. *Using a Tape Measure to Examine Chronic Disease and Risk Factors: The North West Adelaide Health Study*. Australasian Society for the Study of Obesity (ASSO), Poster Presentation, Adelaide, 28-30 October 2005.

Hugo G.J., Lienert (Franzon) J., and **Howard N.** 2005. Child Obesity in South Australia: Some Initial Findings. Presentation to Healthy Development Adelaide Thematic Evening on Obesity and Life Style, Union House, University of Adelaide, 4 August.

# CHAPTER 1

## INTRODUCTION: Examining the socio-spatial geography of obesity in young adults

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No person is an island because it is through places that their lives are lived and places are people, histories, classes, capital, and... health.

*“People and Places” (Tunstall et al., 2004:7)*

### 1.1 Introduction

Both developing and developed countries are confronted with rising rates of obesity (WHO, 2000; Mokdad *et al.*, 2001; Monteiro *et al.*, 2004; Sassi *et al.*, 2009). The study of obesity is not a new phenomenon; it was first described in Venner’s<sup>1</sup> *Via Recta* in 1620, as being derived from the Latin *obesus* meaning “one who has become plump through eating” (Barnett, 2005:1843). Throughout much of history, fat storage and weight gain were seen as a sign of health and prosperity, and people of a low socio-economic position were underweight due to sustained food shortages and inadequate levels of nutrition (WHO, 2000:1). In modern times, however, this thinking has been reversed with individuals at the lower end of the social gradient predominantly described as overweight or obese. The increasing rates of obesity across all socio-demographic groups has seen a substantial body of research focus on the underlying causes and processes (for example WHO, 2000; Stubbs & Lee, 2004; James, 2008). Obesity has traditionally been researched within the fields of medicine, population health and epidemiology<sup>2</sup>, concentrating on biomedical associations and the concept of „risk“. There is recognition from leading obesity experts (Swinburn & Egger, 2004; EurActive Network, 2006) that continued evidence is needed from interdisciplinary perspectives, as obesity is a complex and incompletely understood aspect of chronic condition research.

A ‘geographies of health’ approach is utilised here to examine the socio-spatial context of obesity for a cohort of young Australian adults, aged 18 to 34 years. The prevalence of obesity has been found to be increasing within young adults (McTigue *et al.*, 2002)

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<sup>1</sup> Tobias Venner (1577-1660) was a physician and medical writer.

<sup>2</sup> **Epidemiology** is “the study of the distribution and determinants of states of health in populations” (Susser, 1973). **Population health** is “the health outcomes of a group of individuals, including the distribution of such outcomes within the group” (Kindig & Stoddart, 2003). **Public Health** “refers to a descriptive notion of the measurable state of a population’s health. But it also refers to a historical, self-conscious social and scientific movement” (Szreter, 2002).

and along with this, there has been escalating rates of chronic conditions, such as Type 2 Diabetes (Chittleborough *et al.*, 2007; Lipscombe & Hux, 2007). Obesity in childhood increases the probability of obesity in young adulthood (Whitaker *et al.*, 1997:871) and will, therefore, have an impact on future obesity prevalence within this age cohort. It has been argued that late adolescence and young adulthood may represent a critical period in the development of lifelong obesity (McTigue *et al.*, 2002; Ferraro *et al.*, 2003; Magarey *et al.*, 2003; Venn *et al.*, 2007). Despite the increased knowledge about childhood obesity and obesity in general, there is limited literature that concentrates on young adults. From a social environmental perspective, young adulthood is a critical period of the lifecycle to study and intervene on health issues and is a life stage where family patterns and lifestyles are not only created but also concreted. Young adults develop their own family unit and „social environments“ both within and outside the home. There are transitions from school to further studies, such as vocational education or university, and movement into the workforce (Raffe, 2009). Lifecycle events for young adults may present opportunities to explore social processes relating to obesity to better facilitate policy and practice, particularly of a social and physical environmental nature.

In recent times, health research has undergone expansion into spatial methodologies and techniques, and obesity has become an important focus (Cutchin, 2007; Drewnowski *et al.*, 2007). Space is a central concept in geography and can be used in the form of absolute and relational space (Holt-Jensen, 1999). Health research predominantly defines absolute space using geographically discrete units, for example aggregated census boundaries (Gatrell *et al.*, 2004), although growing interest has emerged on the broader conceptualisation and construction of space, such as, how socio-spatial relations may contribute to poor health outcomes (Cummins *et al.*, 2007). „Socio-spatial“ refers to the relationship between space and society, where society is the structures of a given mode of production (Peet, 1998) and incorporates both absolute and relational thinking about space. Socio-spatial processes vary across different places, and *how* the social environment influences the health status of the individual for the Australian context is yet to be determined, although, it has been suggested that individuals living within disadvantaged areas are at greater risk of obesity regardless of their individual-level situation (King *et al.*, 2005). The incorporation of geography enhances knowledge into

obesity relationships through conceptual and theoretical perspectives on space, place and health.

## 1.2 Objectives

This study seeks to provide insights into understanding the multifaceted nature of obesity in young adults within the north-west region of metropolitan Adelaide, South Australia (SA). The major goal of describing the socio-spatial geography of obesity for this region is achieved through the following six objectives:

Objectives	
1	To develop a conceptual framework for the socio-spatial geography of obesity in an Australian young adult cohort incorporating both global and local factors;
2	To investigate attributes of the social environment and the relationship with obesity in young adults;
3	To explore obesity within young adults in relation to ethnicity, lifecourse socio-economic status and mobility;
4	To discuss the residential perceptions of young adults living in the north-west region of Adelaide in relation to understanding obesity;
5	To investigate the processes related to lay perceptions of obesity in the context of place;
6	To discuss how the geographies of health perspective can enhance theoretical approaches to address healthy weight within the population.

Health as a „human right“ is the backdrop to this research. As Marmot (2007:1153) outlines on behalf of the World Health Organisation (WHO) Commission on the Social Determinants of Health:

Health is a universal human aspiration and a basic human need. The development of society, rich or poor, can be judged by the quality of its population’s health, how fairly health is distributed across the social spectrum, and the degree of protection provided from disadvantage as a result of ill-health.<sup>3</sup>

<sup>3</sup> “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 2009). Preamble to the Constitution of the World Health Organization (WHO) as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the WHO, no. 2, p. 100) and entered into force on 7 April 1948.

A social justice perspective, as adopted here, suggests that minimal levels of income, basic housing, employment, education and healthcare should be seen as fundamental rights (Schneider, 2000:17). Venkatapuram and Marmot (2009:87) argue that:

All liberal theories of social justice begin from the premise of the individual as the primary unit of analysis or moral agent, and that every individual has equal moral worth.

Geographers, such as Gleeson (1996:232), extend the philosophical position of social justice to a concept of „socio-spatial justice“ where “a just geography must commit itself to the realisation of social space, which guarantees both material well-being and social participation for all”. It is a well established fact that the obesity prevalence has risen dramatically over the last twenty years, and is particularly high within the individually and locationally disadvantaged (Ball & Crawford, 2005; McLaren, 2007). There is a need then to understand obesity in disadvantaged spaces using interdisciplinary approaches, such as the geographies of health, and this requires “a scientific and moral concern for human health at the centre of social justice theory and practice” (Venkatapuram & Marmot, 2009:89).

It is important to note that the perspective of „geographies of health“ is different to that of „medical geography“. Traditionally, medical geography was the application of geographic perspectives and methods to the study of health. Jones and Moon (1989) claim that the medical geography approach is dominated by the biomedical viewpoint that is both flawed and limited. The „post-medical“ geography of health develops an alternative social and environmental perspective on health (Kearns, 1993). The field of health deals with issues broader than the healthcare of individuals and populations. Addressing the health of populations to fully appreciate the complexities of relationships across space will require research to adopt a social justice framework with supporting theoretical explanations. A move to the „geographies of health“ perspective and a focus on the geography of place, space and time plays an important role in understanding health concepts and in developing directed policy and intervention.

It is clear that part of that debate focuses on the inelegantly titled „spatial turn“ and it is important that geographers emphasize [sic] the value of a spatial perspective to other disciplines rather than allowing them to reinvent the wheel for themselves.

(Ogden, 2000:628)

This study utilises the North West Adelaide Health Study (NWAHS) which is unique for Australia in assessing, through a range of biomedical and self-reported surveys, a representative sample of an adult community. Although the north-west region is traditionally reported as a low socio-economic sector of metropolitan Adelaide (Baum, 2005; Spoehr *et al.*, 2007), there are both high and low socio-economic clusters and the region includes the full spectrum of metropolitan ecological contexts found in Australia. The nature of the NWAHS sample allows a wider extrapolation to the Australian population with policy implications at a regional, state and national level.

### 1.3 The obesity context

In responding to the 2005 WHO report *Preventing Chronic Disease: A Vital Assessment*<sup>4</sup>, the Director of Non-Communicable Diseases and Health Promotion, Robert Beaglehole, said:

The real tragedy is that overweight and obesity, and their related chronic diseases, are largely preventable. Approximately 80 percent of heart disease, stroke, and type 2 diabetes, and 40 percent of cancer could be avoided through healthy diet, regular physical activity and avoidance of tobacco use.

More recently, there has been the release of the *2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-Communicable Diseases*<sup>5</sup>, which recognises obesity as an important contributing component to global health. Obesity is a risk factor for many chronic conditions including: diabetes, asthma, chronic obstructive pulmonary disease (COPD), osteoporosis and musculoskeletal disease (Must *et al.*, 1994; AIHW, 2003a; Brown & Siahpush, 2007). The increasing prevalence of obesity within the population inevitably is a driver to the growth of risk factors, chronic conditions and the burden of disease (Mathers *et al.*, 2001).

A rapidly ageing population and associated demographic changes will have a considerable effect on future health resources, and the increasing prevalence of obesity places even greater demand on these systems (Adams *et al.*, 2008). For example, in 2000, the average cost of diabetes in SA has been estimated at \$4059 per person with diabetes; the total direct costs were \$218 million and indirect costs (i.e. cost of carers and loss of labour) were around \$246 million (Burke *et al.*, 2007:24). A report from

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<sup>4</sup> Media statement on release of the WHO report, Found at: [http://www.who.int/chp/chronic\\_disease\\_report/media/quotes/en/index.html](http://www.who.int/chp/chronic_disease_report/media/quotes/en/index.html)

<sup>5</sup> WHO Action Plan, Found at: <http://www.who.int/chp/en/>

2005 estimated the total financial costs of obesity in Australia at around \$3.8 billion (Access Economics, 2006:98). Nonetheless, these figures do not include associated psycho-social consequences, such as loss of self-esteem, motivation and barriers to participating in society and, consequently, may be underestimating the total cost of obesity within the population.

In 2008, the increasing prevalence of obesity was recognised by the Australian Health Minister's Conference as a National Health Priority Area aiming to:

- help drive collaborative efforts aimed at tackling obesity at national, local, state and territory levels and;
- ensure that obesity receives the attention it deserves as a matter of urgency (DoHA, 2008).

The *National Preventative Health Taskforce*<sup>6</sup> in the release of the report, *Australia: The Healthiest Country by 2020*, focuses on obesity, tobacco and alcohol as contributing to the rising level of chronic conditions within Australia. The recommendations from this report suggest “the prevention of half a million premature deaths if we stabilise obesity at current levels between now and 2050” (National Preventative Health Taskforce, 2009:10). As with the increasing interest in obesity at the national level, SA has seen heightened attention towards the issue. The SA Government, particularly through the South Australian Strategic Plan<sup>7</sup> (SASP), addresses overweight and obesity as part of *Objective 2: Improving Wellbeing Preventative Health* and “Target 2.2 Healthy Weight: Increase the proportion of South Australians 18 and over with healthy weight by 10 percentage points by 2014”. A number of other SASP targets relate to surrounding issues of healthy weight, including participation in sport and recreation (T2.3), use of public transport (T3.6), psychological well-being (T2.7) and chronic diseases (T2.6).

### 1.3.1 Defining obesity

In simple terms, obesity is defined by the WHO (2000:6) as “a condition of abnormal or excessive fat accumulation in adipose tissue<sup>8</sup>, to the extent that health may be

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<sup>6</sup> The Preventative Health Taskforce was established in 2008 by the Commonwealth Government of Australia. The Taskforce will provide the Government with advice on the framework for the Preventative Health Partnerships between the Commonwealth and the State and Territories and to develop a National Preventative Health Strategy. Found at: <http://www.preventativehealth.org.au/>

<sup>7</sup> The South Australian State Strategic Plan (SASP) was launched in 2004 with six objectives; Growing Prosperity, Improving Wellbeing, Attaining Sustainability, Fostering Creativity and Innovation, Building Communities and Expanding Opportunity and 98 targets as priorities for SA.

<sup>8</sup> **Adipose tissue** is defined by the Merriam-Webster's Medical Dictionary (Pease, 1995) as “Connective tissue in which fat is stored and which has the cells distended by droplets of fat (p.12)”. **Adiposity** is defined as “the quality or state of being fat; obesity”.

impaired". The most commonly described measure of obesity or adiposity in the literature is the body mass index (BMI) where obesity is defined as a BMI of 30 or more. The BMI can be self-reported using height and weight calculations or biomedically measured. A number of other biomedical measures including waist-to-hip ratio (WHR), waist circumference and Dual Electronic X-ray Absorption (DEXA) scanning are also utilised in describing the prevalence of obesity within populations.

The molecular mechanisms in the origin of fat mass storage and maintenance are still not completely understood (Clement, 2004). Continuing research investigates explanations of differences in biological regulatory systems and the balance of energy consumed from food and beverages with the energy expended through metabolism and physical activity (Astrup *et al.*, 2004). Currently, around 430 genes relating to obesity have been described and it is estimated that the total genetic makeup can explain up to 50 percent of the variation in the obese phenotype (ibid, 2004:125). However, around half of the obesity cases are not explained by a genetic origin and global increases of obesity have been argued as too rapid to be associated with major genetic changes in the population (Poston & Foreyt, 1999:202). The „fat gene“ discourse still holds obesity as a problem against which action must be taken by the individual themselves and has significant social currency in accounting for „disease“ (Throsby, 2007:1564). The genetic approach may allow identification of those susceptible to early weight gain and therefore at „risk“ of weight problems later in life; it does not, however, explain the rapid international trends.

### 1.3.2 Obesity trends internationally and within Australia

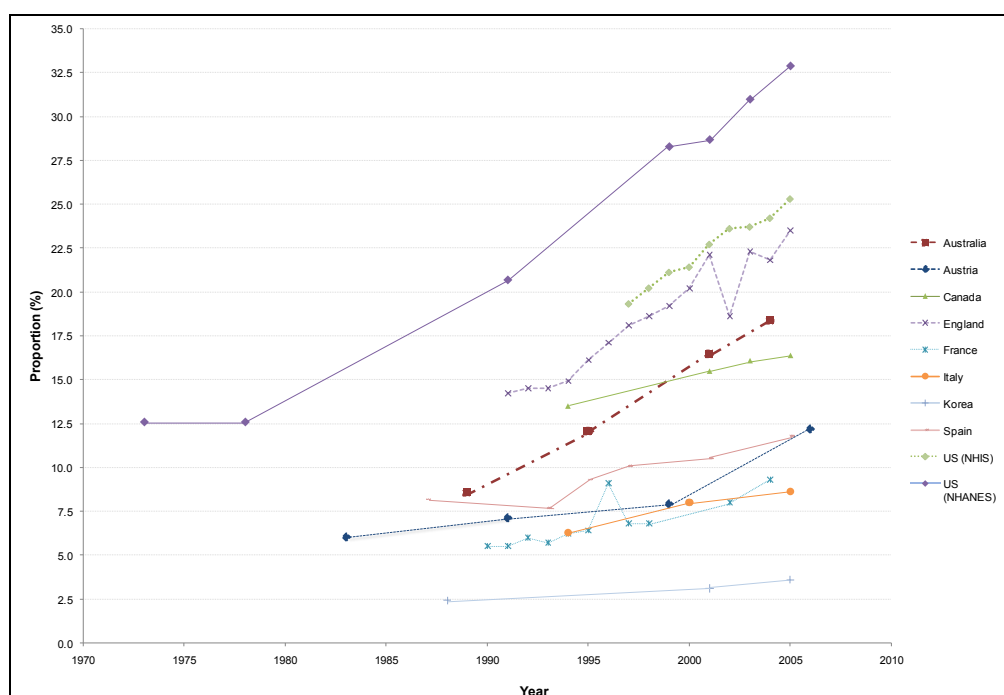
Over the last two decades, the prevalence of overweight and obesity among Australian adults has increased two and half times (Thorburn, 2005:187) and in developing nations, such as China, the prevalence has increased more than fourfold (Du *et al.*, 2002:172). A comparison of data from Organisation for Economic Co-operation and Development (OECD) countries between 1970 and 2006 indicates that Australia has experienced prevalent increases in line with countries such as the United States (US), England and Canada (Figure 1.1).<sup>9</sup> There appears to be something beyond a biological explanation occurring to observe these prevalence changes over a short period.

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<sup>9</sup> There are issues in comparison of data between countries due to collection methods and study design (sampling, biomedical examination, self-reported survey and time period of collection), and the structural characteristics of the population.



**Figure 1.1: Prevalence of obesity (BMI ≥30) in adults aged 15 to 64 years by OECD nation, various data sources, 1973 to 2006**



SOURCE: Compiled from Sassi *et al.*, (2009)<sup>10</sup>

Table 1.1 outlines the fold increase in obesity prevalence for OECD nations, including Australia.

**Table 1.1: Fold increase in obesity (BMI ≥30) prevalence, OECD nations and South Australia, various data sources and dates**

Country	Fold increase	Time period**
Austria	1.72	1991-2006
United States (NHANES)	1.59	1991-2005
Australia (NHS)	1.52	1995-2004
Korea	1.50	1988-2005
England	1.46	1995-2005
France	1.45	1995-2004
Italy	1.37	1994-2005
United States (NHIS)	1.31	1997-2005
Spain	1.27	1995-2005
Canada	1.21	1994-2005
South Australia (SA HOS) Males	1.80	1994-2004
South Australia (SA HOS) Females	1.50	1994-2004

\*Fold increase calculated as (last year prevalence/first year prevalence). \*\*Note discrepancy in data collection periods which may influence the fold increase.

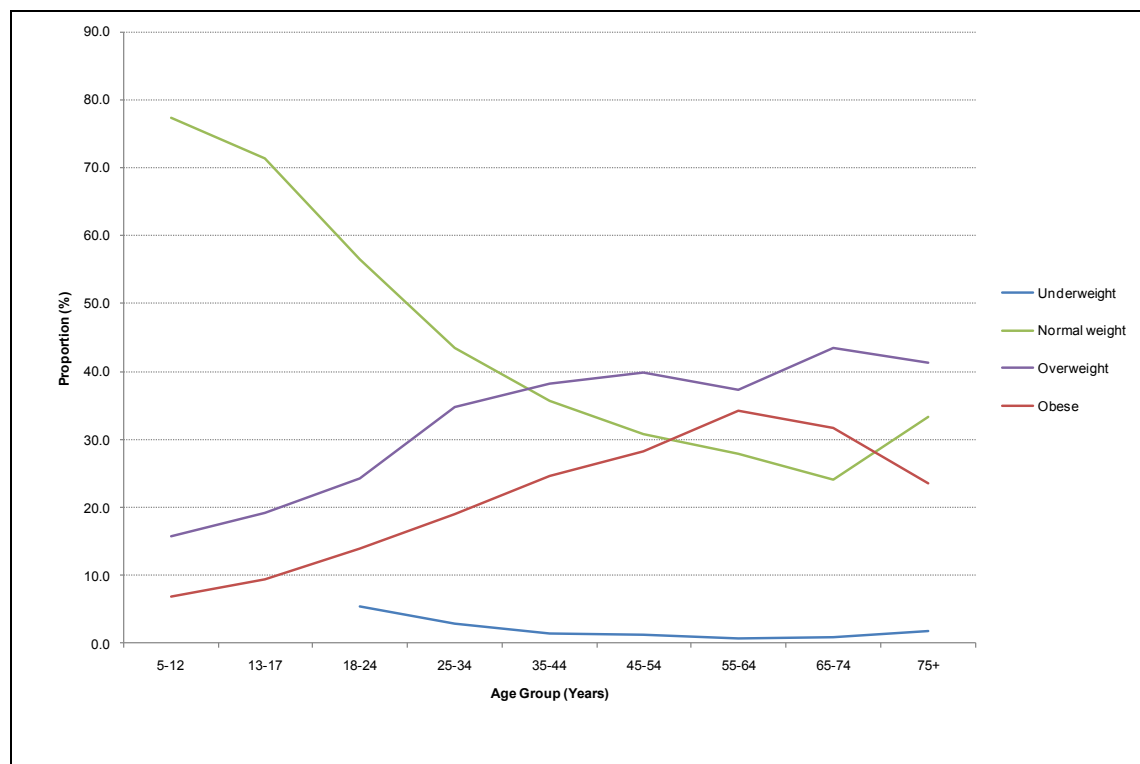
SOURCE: Compiled from Sassi *et al.*, (2009) and SA HOS, metropolitan Adelaide (1994 to 2004)

<sup>10</sup> **AUSTRALIA** National Health Survey, ABS; **AUSTRIA** Mikrozensus and Health Interview Survey Statistics, Austria Health; **CANADA** National Population Health Survey + Canadian Community Health Survey, Statistics Canada Health; **ENGLAND** Health Survey for England, Office for Population Censuses and Surveys (1991-1993), then the Joint Survey Unit of the National Centre of Social Research and the Department of Epidemiology and Public Health at University College London (since 1994); **FRANCE** Enquête Santé et Protection Sociale Institute for Research and Information in Health Economics; **ITALY** Condizioni di Salute Istituto, Nazionale di Statistica Health; **KOREA** Korean National Health and Nutrition Examination Survey jointly carried out by the Korea Institute for Health and Social Affairs and the Korea Health Industry Development Institute (Health examination survey); **SPAIN** Encuesta Nacional de Salud de Espana Ministry of Health and Consumers in collaboration with the Centre of Sociological Investigations **US-NHIS** National Health Interview Survey National Center for Health Statistics; **US-NHANES** National Health and Nutrition Examination Survey.

According to these data sources, Australia has the second most rapid increase in obesity behind Austria. There have been extensive studies investigating these trends of obesity within Australia (Mathers *et al.*, 2001; AIHW, 2003b; Stubbs & Lee, 2004; Ball & Crawford, 2005; Venn *et al.*, 2007). Between 1995 and 2004, the Australian Bureau of Statistics National Health Survey (ABS NHS) reported a 1.52 fold increase in the prevalence of obesity for the Australian population. The South Australian Health Omnibus Survey (SA HOS) display a fold increase of 1.8 for males and 1.5 for females.<sup>11</sup>

Figure 1.2 outlines the 2007-08 prevalence for each of the BMI classifications (underweight, normal, overweight and obesity) by age cohort in Australia.

**Figure 1.2: Prevalence of body mass index (BMI) classifications, by age cohort (5 years and over), Australian Bureau of Statistics National Health Survey (ABS NHS), Australia, 2007-08**



\*Definition for 18 years and over using World Health Organisation (WHO) BMI Classifications. \*\*Definitions for 5 to 17 years using Cole *et al.*, (2000)

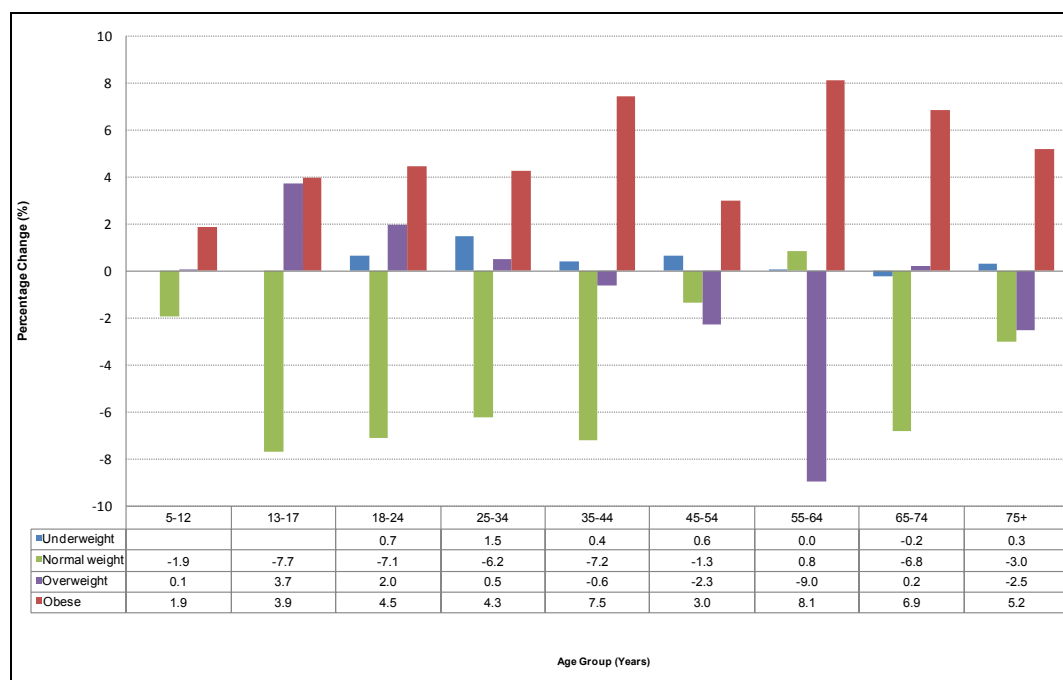
SOURCE: Compiled from Australian Bureau Statistics National Health Survey (ABS NHS) 2007-08 (ABS, 2009)

The highest prevalence of obesity was found in those aged 55 to 64 years (34.2 percent), followed by 65 to 74 years (31.6 percent) and 45 to 54 years (24.6 percent). During this period, there were an estimated 2.8 million Australian adults who were classified as

<sup>11</sup> This analysis was undertaken by author using the South Australian Health Omnibus Survey (SA HOS) metropolitan Adelaide (1994 to 2004).

obese, an increase from 1995 of over 350,000 persons (ABS, 2009).<sup>12</sup> Among young Australian adults, there are reported to be 30.3 percent overweight and 16.3 percent obese (ABS, 2009). An additional aspect to consider is those classified as underweight (BMI <18.5), which includes 3.9 percent of Australians aged 18 to 34. There are issues including body image, self-esteem and increasing eating disorders that exist concurrently with the rising obesity prevalence (Mission Australia, 2007). According to the ABS NHS, the absolute percentage change of BMI between 1995 to 2007-08 (Figure 1.3) indicates a growth for all age groups classified as „obese“ with the highest rate of change seen in those aged 55 to 64 years (8.1 percent) followed by 35 to 44 years (7.5 percent). Young adults aged 18 to 24 years and 25 to 34 years saw percentage increases of 4.5 percent and 4.3 percent respectively.

**Figure 1.3: Absolute percentage change by body mass index (BMI) classifications and age cohort (5 years and over), Australian Bureau of Statistics National Health Survey (ABS NHS), Australia, 1995 to 2007-08**



SOURCE: Compiled from Australian Bureau Statistics National Health Survey (ABS NHS) 1995 and 2007-08 (ABS, 2009)

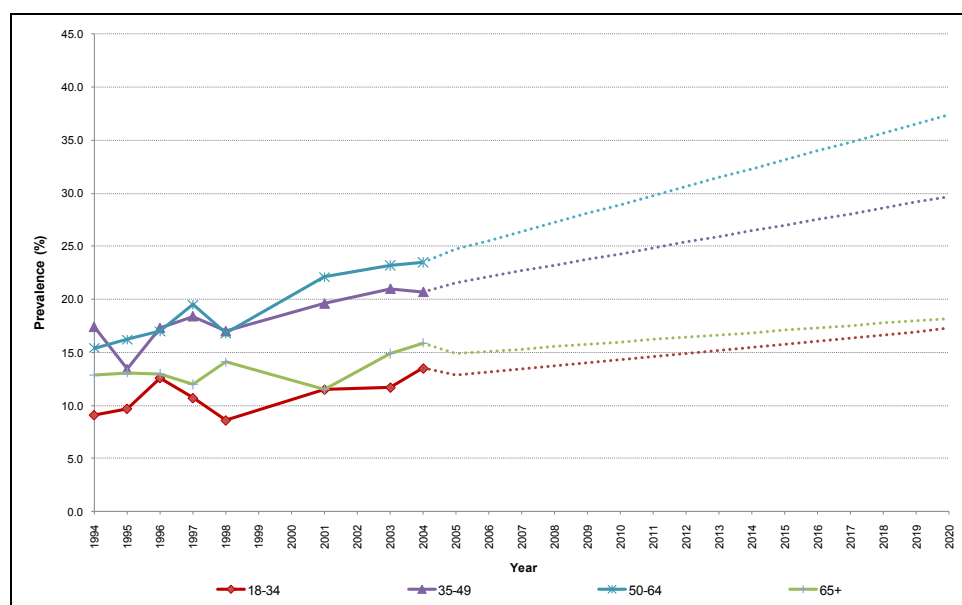
The SA HOS data has previously described obesity for the SA population in relation to a range of chronic conditions including asthma (Wilson *et al.*, 2006), diabetes (Chittleborough *et al.*, 2007) and mental health (Taylor *et al.*, 2000) and the findings are consistent with Australia as a whole (Dal Grande *et al.*, 2005). Analysis undertaken between 1994 and 2004 for metropolitan Adelaide (Appendix 1) found that females

<sup>12</sup> In 1995 according to the Australian Bureau of Statistics National Health Survey there were 2,440,200 persons classified as obese (BMI ≥30), increasing to 2,791,000 persons in 2007-08 (ABS, 2009).

have a statistically significantly higher prevalence of obesity (19.0 percent) compared to males (17.0 percent). There are a number of age cohorts found to be important in relation to obesity within this context, including those born between 1946 and 1964 or the „Baby Boomer“ cohort (Buckley, 2008; Hugo *et al.*, 2008) and four-year old children (Vaska & Volkmer, 2004; Hugo & Franzon, 2006). The 18 to 34 year age group has a significantly lower (19.1 percent) prevalence of obesity when compared to the older age cohorts. However, young adults experience the greatest percentage change increase (44.2 percent) (Appendix 1). In particular, young women have experienced the largest percentage increase (63.1 percent) in the SA population. These findings are consistent with the extensive literature that currently exists relating to the trends in obesity, such as McLaren’s (2007) review on socio-economic status and obesity.

The prevalent increases in obesity have occurred over a longer period than the more recent heightened awareness, knowledge and education. The Framingham Heart Study used longitudinal biomedically measured height and weight data to demonstrate that obesity prevalence increased over the entire 50 years of the cohort study (Parikh *et al.*, 2007). Although there is current heightened awareness of increased obesity prevalence, these trends are set to continue (Dal Grande *et al.*, 2005; Chittleborough *et al.*, 2007; Wang *et al.*, 2008), and are shown for the SA context in Figure 1.4.

**Figure 1.4: Prevalence and projections of obesity (BMI  $\geq 30$ ) by age cohort, South Australian Health Omnibus Survey (SA HOS), metropolitan Adelaide, South Australia, 1994 to 2020**



\*Calculated using weighted data (Wt)

SOURCE: Compiled from South Australian Health Omnibus Survey (SA HOS), Metropolitan Adelaide (1994 to 2004)

To date, there have been limited studies on the effectiveness of interventions and policies tackling obesity (WHO Regional Office for Europe, 2007:159). A Cochrane Review on childhood obesity stated that there was limited quality data on prevention programs to be able to draw any substantial conclusions (Campbell *et al.*, 2002:12). Astrup *et al.* (2004) outlined that there were no comprehensive strategies to address obesity, pointing out that this was not surprising given that obesity has only recently been acknowledged as a health issue. The current increased investment in a range of activities and interventions potentially will impact on the future prevalence of obesity in both children and adults. It has been argued that interventions to prevent obesity should begin in early life and target the socio-economically disadvantaged (Baltrus *et al.*, 2005). It is necessary for future interventions to be developed from the individual to neighbourhood-level focusing on local area improvements that facilitate the elimination of „obesogenic environments“ (Booth *et al.*, 2005). There have been few comprehensive literature reviews (for example, Raine *et al.*, 2008) conducted on the influence of the social environment, again not surprising with the rapidity of the research field and rising rates of obesity.

### 1.3.3 Thinking spatially to address health issues

A number of spatial and health discourses are a result of the mounting interest in concepts such as area, space and place; ranging from the traditional fields of geography and sociology and more recently to population health and in particular, epidemiology. Research into chronic conditions has seen the introduction of spatial concepts, variables and analysis techniques. A historical perspective on population health reveals that many early origins in research and intervention were geographical or „spatial“ in their own right (Figure 1.5).

**Figure 1.5: Three eras in the evolution of modern epidemiology**

NOTE:  
This figure is included on page 12  
of the print copy of the thesis held in  
the University of Adelaide Library.

Taken from Susser and Susser (1996:669)

One of the earliest paradigms in health saw the notion of miasma theory, where the assumption was that diseases were caused when the soil, air or water was „bad“ due to decay of organic matter (Susser & Susser, 1996:669). The sanitary conditions of populations were studied and related to disease outcomes with the aim of preventing the spread of disease. The era of sanitary statistics focused on analysing the association of disease with the social and physical environment prior to the formulation of the biological and pathological basis of disease.

The development of microbiology in the 19<sup>th</sup> century observed a move from the miasma to germ theory. The now famous epidemiological research of John Snow in the early 1850<sup>s</sup> is seen as a classic example of how mapping methodology was used to identify a link between the water supply of London and cholera cases (Elliott *et al.*, 2000). Charles Booth<sup>s</sup> research in the late 1800<sup>s</sup>, *Inquiry into the Life and Labour of the People in London*, was some of the first work to investigate the location and clustering of disadvantaged populations (Shaw *et al.*, 2001). Booth attempted to understand the lives of Londoners investigating places of work and working conditions, homes and urban environments. Dorling and colleagues (2000:1551) have shown that predictors of health in London made over 100 years ago continue to be useful in analysing current health inequalities.

During the 19<sup>th</sup> century improvements in health were seen to be a result of changes in nutrition and the places in which people lived and worked (Marmot, 1998). Much of the research from this period onwards focuses on discovering disease causing agents and less on the environment and area-level studies (Susser & Susser, 1996). The era following the germ theory was that of chronic disease epidemiology with its paradigm of the „black box“ or a move to focusing on individual-level variables, risk and study designs. The attention on non-communicable diseases in the 1960<sup>s</sup> saw deliberation in the causation of disease that ranged from individual behaviour modification to broader social interventions<sup>13</sup> (Kickbusch, 2007) and, inadvertently, resulted in decreased acknowledgement of spatial viewpoints of health.

The field of epidemiology and population health were looking for new paradigm shifts with the addition of conceptual models and post-positivist theory building.

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<sup>13</sup> This epidemiologic transition from infectious to non-communicable disease has in recent times seen a shift to infectious disease in combination with chronic conditions (Pearce, 1996; Barrett *et al.*, 1998; Cohen *et al.*, 2007).

As Stanley (2002:40) states:

The need to move away from a focus at the proximal end of causal pathways and from single risk factors in individuals to looking at populations and the social and environmental contexts in which risk factors arise, points us more towards the social antecedents of diseases and poor outcomes.

There have been advances in thinking about social epidemiology that have brought theory to their applications of society, risk and the causation of disease (Berkman & Kawachi, 2000; Krieger, 2001). Thinking beyond an individual behavioural model is necessary to explain the increases in chronic conditions and to draw relevant conclusions for policies and interventions. Krieger and others (2005:352) have suggested that explanations of population health issues will be incomplete with a focus on only one level in research and outlined the following ecosocial premise:

Clues to current and changing population patterns of health, including social disparities in health, are to be found chiefly in the dynamic social, material, and ecological contexts into which we are born, develop, interact, and endeavour to live meaningful lives.

Ecological models of health explore how the social environment, including individual factors, families and communities both supports and maintains chronic conditions and unhealthy lifestyles. An example from health literature recognising the broader social context is the Health Promotion „Ottawa Charter“<sup>14</sup> defining health as being; “created and lived by people within the settings of their everyday life; where they learn, work, play and love” (Kickbusch, 2007:1). As seen in Figure 1.6, there are a number of ecological perspectives over history that have influenced the current state of population health (McMichael, 2007). Obesity is a modern day epidemic whereby ecological perspectives could provide valuable input into policies and interventions to create communities that support health. Egger and Swinburn (1997) were pivotal in the shift to an ecological paradigm to explain the underlying causes of overweight and obesity.<sup>15</sup>

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<sup>14</sup> The Ottawa Charter was adopted by the international WHO conference in Ottawa, Ontario, Canada, in November 1986. The areas of action include supportive environments, healthy public policy, personal skills, community action and reorientation of health services (Kickbusch, 2007).

<sup>15</sup> The epidemiological triad is presented as a potential intervention strategy for obesity. The „host“ is the biological, behavioural and physiological aspect of the epidemiological triad. The „agent“ (vehicle) represents energy intake and energy output and the „environment“ is constructed of the physical, economic and socio-cultural factors.

**Figure 1.6: The rise and fall of major urban health penalties in developed countries over the past two centuries**

NOTE:  
This figure is included on page 15  
of the print copy of the thesis held in  
the University of Adelaide Library.

SOURCE: McMichael (2007:42)

Historically, ecological analyses have been seen to be a second rate way of approaching individual risks for disease. One reason was the potential of the researcher to fall in the trap of the ecological fallacy, which results when a cause-effect relationship is inferred between area-based spatial variables and human behaviour (Golledge & Stimson, 1997:6). With the acknowledgement of the importance of the environment through ecological approaches, these methodologies are now increasingly seen as a useful way to examine the effect of the social environment on health (Marmot, 1998) and area-level ecological bias can be overcome with inclusion of individual-level data (Wakefield, 2007).

There are two main explanations for area based outcomes within social epidemiology; one being compositional and the other contextual (Berkman & Kawachi, 2000). Individuals vary from place to place and these differences provide a compositional explanation for the spatial variation of areas. Compositional perspectives assess whether or not such variation reflects the social characteristics and material circumstances of people living in a particular place. A contextual explanation would be that there are features of the social and physical environment, which influence the health of those individuals within these environments, and this is in addition to, or in interaction with, individual characteristics. It is argued that the health behaviours of individuals cannot be fully understood unless the characteristics and processes of the



immediate and broader environment are considered (Berkman & Kawachi, 2000). The social and physical characteristics are not independent of each other due to the way that social processes operate.

With the renewed interest in ecological studies and area-level variables there has been an increase in the sophistication of statistical methodologies and techniques. Multi-level analysis<sup>16</sup> is one such statistical methodology that has been advanced through the inclusion of spatially referenced data and allows for inclusion of environmental variables in statistical models. Multi-level modelling has been used extensively in the fields of education, demography and sociology (Lawson *et al.*, 2003). Social data has an inherent hierarchal structure where individuals (level one) are nested within their social space, and operationalised through small areas or administratively defined geographic units (level two). There has been extensive epidemiological research on these methodologies and techniques (such as, Diez-Roux, 2000). In 2001, Pickett and Pearl (2001) reviewed multi-level studies from a number of contexts and sources of information. There have more recently been a range of research topics utilising multi-level methodologies among other things *inter alia*, low birth weight (Morenoff, 2003), tobacco and alcohol use (Chaix & Chauvin, 2003) and asthma (Blanc *et al.*, 2006). For the Australian context, although there have been interest in these types of research to date, there has been only a few studies that have resourced both individual and area-level characteristics. Of particular note for this context are studies on area-level association and health outcomes, including obesity, conducted by Kavanagh and colleagues (Kavanagh *et al.*, 2005; King *et al.*, 2005; Turrell *et al.*, 2006).

The renewed interest in ecological approaches, advances in technology, and the availability of environmental data sources has facilitated the development of spatial epidemiology.<sup>17</sup> This particular area of study is concerned both with describing and understanding spatial variation in disease risk, particularly at the small area-level (Elliott *et al.*, 2000; Elliott & Wartenberg, 2004). Spatial epidemiology has traditionally been used as an analysis technique for communicable disease and cancer research, and more recently, it has been applied to current health issues such as obesity. The accessibility to additional social data sets, geographically indexed population data,

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<sup>16</sup> Multi-level analysis is an analytical approach that is appropriate for data with nested sources of variability, involving units at a lower level or micro units (for example, individuals) nested within units at a higher or macro units (or example, schools or neighbourhoods) (Diez Roux, 2002b).

<sup>17</sup> Spatial epidemiology is the description and analysis of geographically indexed health data with respect to demographic, environmental, behavioural, socioeconomic, genetic and infectious risk factors (Elliott & Wartenberg, 2004).

and computer technology known as Geographic Information Systems (GIS)<sup>18</sup> have allowed this research field to be recognised as a useful tool in social applications and health.

Geographical perspectives attempt to provide further understanding of socio-economic factors through exploring locational disadvantage, whereby people experience disadvantage due to the area in which they live, its social characteristics and their ability to access services and facilities. Research by Cutchin (2007) has made commentary on how the new health geography can inform epidemiology through an improved understanding of „context“ and the theorisation of space. With the interest from other fields in undertaking geographic analyses and the use of the language of „space“, it is critical also to understand the complexities at play (Picheral, 1994). Buchanan (2003) provides a review of Berkman and Kawachi’s book *Social Epidemiology* highlighting the scant attention to the „social“, thus disregarding the complex, problematic nature of the relationship between structure and agency.

There has been limited exploration of the broader social and spatial processes that are related to obesity and particularly in different cohorts of the population. Pearce (2007:3) has argued that there was the need for more research from the Australasian perspective, specifically with reference to understanding scale effects, places that matter to different social and demographic groups, and the role of place histories in poor health outcomes. As Stanley (2002) indicates there are many under-utilised databases which are available in Australia that could be linked together to provide a rich national resource. Research within Australia is moving towards an appreciation of the geographical and social sciences contributing to health within interdisciplinary frameworks. The development of this research area has been facilitated by advances in the use of computer systems and their applications, in conjunction with an increase in the availability of spatially referenced population health and administrative data (O’Dwyer & Burton, 1998; Dunn *et al.*, 2007). There is growing interest in examining the relationship between place and health (Diez Roux, 2002a; Chaix *et al.*, 2005a), nevertheless, there is still less attention to be found on the broader socio-spatial context and space as a continuum rather than fragmented into disconnected areas (Cummins *et al.*, 2007).

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<sup>18</sup> Geographic Information Systems (GIS) are “a powerful set of tools for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes” (Burrough & McDonnell, 2000:11).

This study aims to broaden the knowledge base on how different social environments contribute to a healthy weight. It draws upon the agent and structure theories of Giddens to provide a theoretical rationale on the underlying processes of individual health outcomes and the social environment (Giddens, 1984). A number of geographical theories are employed, most particularly around space and temporality, in relevance to rising rates of obesity. There are gaps in the existing knowledge base with respect to the spatial variations of obesity and, as a result, methodologies have not been fully developed for interdisciplinary frameworks. Within SA, there have been a number of resources that have allowed for the development of area-level studies, and it is with this platform that this thesis takes the path of an exploratory and descriptive analysis of the key components to consider in socio-spatial research. A deeper understanding of both compositional and contextual processes operating across and between geographic areas may shed light into the socio-economic forces contributing to the increasing prevalence of obesity in young adults; in particular within those that are disadvantaged individually and locationally.

#### 1.4 Thesis structure

Chapter 2 examines the contextual and theoretical explanations of the wider socio-spatial perspective and how this approach can address the geographies of obesity. This chapter will detail the conceptual framework for obesity within a young adult cohort through four theme areas; the social environment, socio-cultural attributes, residential perceptions of local areas, and lay perspectives of health and weight status in the context of place.

The data sources and research design are detailed in Chapter 3. This thesis will utilise mixed methodologies and interdisciplinary perspectives from epidemiology, population health and geography, using a combination of quantitative analyses and semi-structured qualitative interviews to meet the research objectives. A range of existing data sources are described including; the North West Adelaide Health Study (NWAHS), the ABS Census of Population and Housing, the Metropolitan Accessibility and Remoteness Index of Australia (Metro ARIA) and Digital Cadastral Database (DCDB) and property valuations. Further analysis of the NWAHS data will allow the research to utilise multiple sources of information on a cohort population, including biomedical

information, which will enable the research to explore in more detail the associations between the social environment and obesity.

Chapter 4 discusses the geography, history and culture of the study region, the north-west region of Adelaide. The chapter also develops a rationale for spatial research within this region by commenting on the NWAHS cohort spatial distribution in comparison to Census information. Aspects of the social environment are explored in Chapter 5 introducing contextual analyses of population health surveys and a range of other social data sources. These analyses include aggregated Census information, housing and mobility of the NWAHS cohort in relation to obesity rates within young adults. Chapter 6 explores socio-cultural themes of the study population including aspects of the lifecourse such as parents' occupation and country of birth. The chapter introduces the notion of social reproduction of environments by way of residential migration and childhood place of residence.

Chapter 7 examines the residential perceptions of local areas including residential choice, socio-spatial differentiation and sense of „place“. The perceptions of health and weight status in the context of place are explored in Chapter 8, discussing global influences such as media and social norms. Additionally, outlined are psycho-social factors, coping mechanisms and lifestyle stressors in relation to a socio-spatial identity. Finally, the concluding chapter of the thesis (Chapter 9) presents a synopsis of research findings and implications for further research, policy and practice.

## 1.5 Conclusion

This chapter has outlined the six research objectives and provided the study rationale through a description of international and local obesity trends, historical perspectives of health, and previous social and spatial obesity research. It is argued that a multi-dimensional and holistic approach incorporating knowledge on the socio-spatial context will enhance perspectives into obesity outcomes and intervention in Australia. The following chapter will explore the contextual and theoretical explanations for socio-spatial research into obesity within young adults.

## CHAPTER 2

# INCORPORATING SPACE AND PLACE WITHIN OBESITY RESEARCH: A conceptual framework

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Modern public health sees the environment as social and psychological, not merely as physical. In this sense, then, „environment“ and „place“ converge to provide a spatial context for health that transcends the individual's own behavior [sic] and health outcomes.

(Gatrell, 2002:13)

### 2.1 Introduction

There have been numerous studies that focus on the relationship between individual measures of socio-economic disadvantage and obesity (Stubbs & Lee, 2004; Ball & Crawford, 2005; McLaren, 2007). Geographical research surrounding obesity has conventionally been reliant on defined or „absolute“ spaces that focus on the differences in obesity rates between large geographic areas (Davies-Cole *et al.*, 2003; Moon *et al.*, 2007). Additionally, obesity has been described within multi-level studies of individual and area-level socio-economic factors (King *et al.*, 2005; Stafford *et al.*, 2010). There has been less emphasis within health literature on understanding relational spaces such as examining how people experience „place“ in association with health behaviours and outcomes (Popay *et al.*, 2003; Cummins *et al.*, 2007). An exploration of sociological perspectives and the theorisation of space will shed important insight into the apparent relationship between obesity and socio-economic factors. Based on these discussions, this chapter outlines the research conceptual framework that incorporates both global and local factors to address obesity within young adults.

### 2.2 The importance of space

Space is one of the key concepts of geography and the discipline enhances perspectives on health outcomes through clearly defining „objects“ within and across these spaces. Tunstall *et al.*, (2004:6) define the difference between space and place; “A „space“ describes where a location is while a „place“ describes what a location is”. It is through spatial concepts and analysis that one seeks to gain knowledge on how health data reveals the modes of organisation and existing variations. In *The Production of Space* (1974), Lefebvre contends that there are different levels of space, from very abstract, or

'absolute space', to space that is meaningful to people, or 'relational space'. The proceeding sections discuss the geographical and sociological theories of space to provide a background to researching the socio-spatial geography of obesity in the north-west region of Adelaide, South Australia (SA).

### 2.2.1 Absolute spaces

Early geographical discussions on space range from the field of regional geography through to the emergence of the spatial sciences in the early 1950's (Lefebvre, 2001:131-132). Spatial science has a focus on positivist methodologies that incorporate defining spatial laws and examining spatial analytical techniques. A number of research areas, including population health, encompass the concept of space to address issues of health inequalities across place. The use of Geographic Information Systems (GIS) as a novel methodology to explore health was critiqued in an early review, indicating that there was a need for more research (Moore & Carpenter, 1999), and there has since been a vast and rapidly growing literature exploring the use of spatial analytic tools for use in health studies. Traditional modes of research focused on absolute spatial units defined by census geographies to understand variations of health across these geographic units of space. Absolute views indicate that space has an existence of its own, independent of matter (Peet, 1998:29), with a philosophy of space as "the container projected by the mind as an organizing framework for objects and events" (ibid, 1998:299). There are a range of discrete geographies in which absolute space can be described and these geographies vary in composition and size across international contexts.

Studies have resourced spatially referenced information from censuses and administrative social data to assist in describing socio-economic factors including, area-level education, employment and household income. Obesity rates have typically been presented by SA regional profile for a large statistical area (i.e. Australia Post® Postcode<sup>19</sup>), primarily due to the deficiency of data at a smaller spatial scale. Local research in SA has compared geographic areas highlighting inequalities in health (Hetzl *et al.*, 2004) and a number of Social Health Atlases of SA (for example, Glover *et al.*, 2005; Glover *et al.*, 2006) produced over ten years have consolidated local data sources on injury, general health and well-being, cancer, and more recently, obesity.

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<sup>19</sup> Australia Post® is the mail and parcel service to all Australians. Further information on spatial units is found in Chapter 3.

These publications have been a cornerstone in acknowledging areas in need of services, facilities and resources at a local government level. Additionally, the health status of the population has been described by geographic areas, such as the Divisions of General Practice, indicating variation in obesity between areas (PROS Unit SA Health, 2003; SA Department of Health, 2005; Jury *et al.*, 2007).

Early studies on the use of census information as a proxy of socio-economic measures discusses level of aggregation and interpretation of these ecological analyses (Geronimus & Bound, 1998). Krieger and colleagues (2002) questioned whether the choice of area geography mattered for application in epidemiological research, highlighting the importance of both statistically and conceptually appropriate area-level measures for the health issue of interest. Geographical and health literature with defined units of space have provided, and continue to provide, valuable insight into health issues. Aggregated data are restrained by census geographies and suggestions have been made to expand methodologies removing defined boundaries to fully account for spatial variation within health analyses (Chaix *et al.*, 2005b).

A geographical perspective argues that the small-area inequalities in health are potentially underestimated due to the scales used for analysis (Stafford *et al.*, 2008), and this concept is described as the modifiable areal unit (MAUP) problem. Golledge and Stimson (1997) have challenged spatial scientists to think more critically about the behaviours produced and created within these spaces. Absolute space has been described by Soja (1980:209-210) as a container of human life and argued this theorisation of space as:

a misleading foundation upon which to analyze [sic] the concrete and subjective meaning of human spatiality. Space itself may be primordially given but the organisation, use, and meaning of space is a product of social translation, transformation and experience.

The first spatial law of geography, Tobler's Law, which states "everything is related to everything else, but near things are more related than distant things", was critiqued by Miller (2004:284) suggesting that "relations among near entities do not imply a simple, sterile geography; complex geographic processes and structures can emerge from local interactions". With these critiques in mind, of particular interest to analysing both people and place is the notion of relational space.

### 2.2.2 Relational spaces

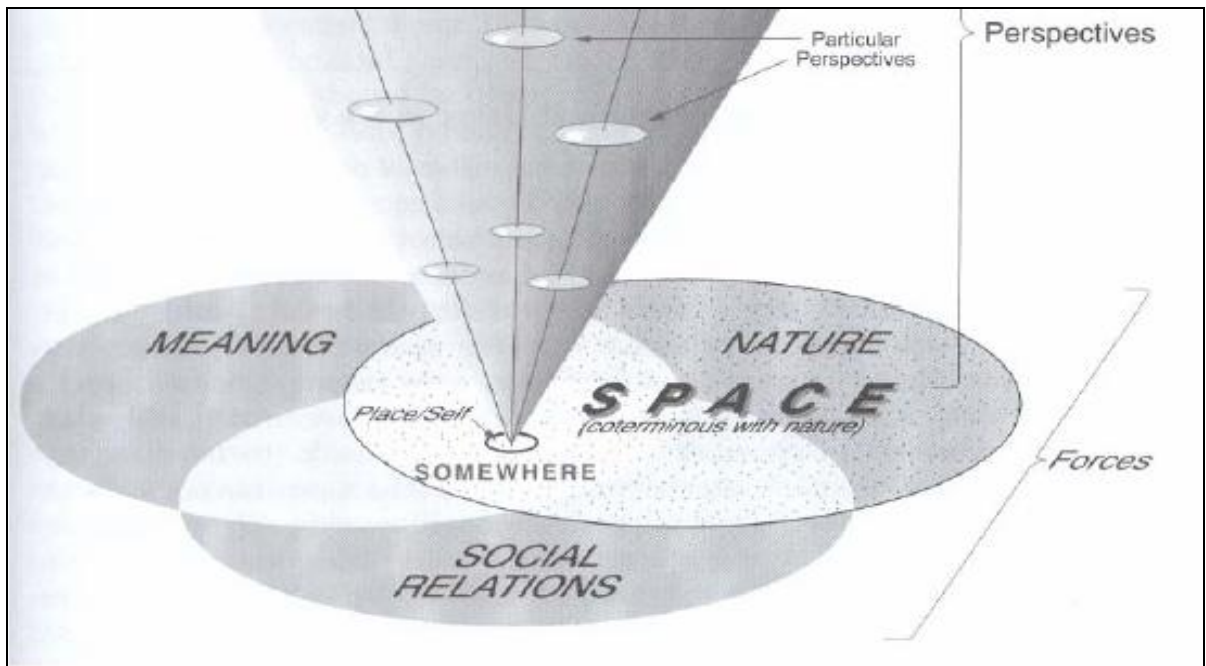
There has been a rich literature on the theorisation of space and the concept of social space was developed by two French scholars, Maximilien Sorre and Paul-Henri Chombart de Lauwe (Buttimer, 1969). Since this time within the fields of sociology and geography, numerous debates on social space have been presented resulting in variations in definitions and theoretical applications.

(Social) space is a (social) product. This proposition might appear to border on the tautologous, and hence on the obvious. There is good reason, however, to examine it carefully, to consider its implications and consequences before accepting it.

(Lefebvre, 2001:136)

Lefebvre's notion of social space closely aligns with the discourse on „place“ being described as lived and embodied space (Elden, 2009:266). Relational space is depicted in Figure 2.1 incorporating the location (place) of self within a „social space“ that is provided by the structures for these locations. The individual perspectives of place therefore comprise of a combination of forces such as social relations, meaning and the nature of space.

**Figure 2.1:** A diagrammatic representation of the concept of relational space



SOURCE: Taken from Holt-Jensen (1999:152)



Space and place are intrinsic parts of our being in the world and are consciously or unconsciously embedded in our intentions and actions (Holt-Jensen, 1999). It has been suggested by Gatrell and others (2004) that there is a need for more relational thinking in understanding the complexities of place. As with arguments that space comes in different shapes and sizes (i.e. spatial scale), there has been a renewed focus on the theoretical construction of „neighbourhoods“, although limited work has been done for particular contexts (Bernard *et al.*, 2007). Cummins and colleagues (2007) have utilised the concepts of relational space to gain a richer understanding into the geography and health nexus. The experiences of people living in disadvantaged communities has emerged within recent health literature (Stead *et al.*, 2001; Popay *et al.*, 2003; Warr *et al.*, 2007; Davidson *et al.*, 2008).

Peripheral to the concept of space within sociology is the notion that the design of places shape the social relations of those people living and interacting within these local areas (Tickamyer, 2000). From a geographical perspective there has been acknowledgement that space has been incorporated within social theory, for example, Pred (1984) indicated that *Structuration* provided an important theory in the construction of place. Traditionally, sociological theorists thought in one of two ways, structure or agency, and Anthony Giddens broadened understanding on the relationship between structure and agency through the *Theory of Structuration*. For Giddens, central to this theory is the idea, “that social reality is being continually (re)produced and structured in space and time by competent actors in their everyday praxis” (Lippuner & Werlen, 2009:39).

Of singular importance to Structurationist approaches is the concept of „duality“ between structure and agency. Human behaviour is not only structured by the social world in which humans live (social structure) but by the way the actors (human agency) behave within these structures (Giddens, 1984). According to Giddens, the actors draw on a set of rules and these rules can be seen to structure and give shape to the practices that they help to organise (Cassell, 1993). Additionally, the actors move through space and time influencing the landscapes in which the actor is involved.

Harvey (1990) was of the opinion that there are still more challenges to face with a need to explore the difficult terrain of the interface between society and the social construction of space and time. As Curtis and Jones (1998) have argued, there is a

place for geography in the study of health inequalities, not only through defining space and place but also in applying sociological theories that shed light into the observations of health inequalities across different geographies. The convergence of disciplines, such as geography and sociology, provide a greater theoretical viewpoint on the concepts of nearness or sharing of „spaces“ and the features that produce and reproduce behaviour and lifestyles, particularly in relation to health. Del Casino and Jones (2007:247) argued that geographers and sociologists would benefit from increased dialogue about social and spatial relations:

Put simply, no single theoretical approach can resolve all the answers to our questions about socio-spatial inequality. Thus, it is necessary to think beyond the boundaries of paradigmatic approaches, space and place, generalizability [sic] and particularity, and discrete [absolute] and relational space, and examine social inequality and its inherent spatialities from multiple perspectives simultaneously.

A „geographies of health“ approach as a result requires the development of sociological insights and theoretical perspectives on space and place to further enhance interdisciplinary health debates, particularly with respect to obesity.

### 2.2.3 The socio-spatial dialectic

Smith and Easterlow (2005:186) suggested that geography “when talking about health, remains caught in the paradigm of how places affect people”. There are few studies that explore the interdisciplinary nature of the methodologies, theories and the practicalities of incorporating both absolute and relational space. As Soja (1980:208) outlines:

The structure of organized [sic] space is not a separate structure with its own autonomous laws of construction and transformation, nor is it simply an expression of the class structure emerging from the social (i.e. aspatial) relations of production. It represents, instead, a dialectally defined component of the general relations of production, relations which are simultaneously social and spatial.

Theories about the social-spatial dialectic seek to understand the underlying social, cultural, political and economic processes that relate to space. Much geographical work on social issues have explored the complexity of socio-spatial relations (such as, Takahashi & Magalong, 2008) and early research on the urban neighbourhood „socio-spatial schema“ implied that there was an interest in the broader structure of the relationship of space and the construction of area (Lee, 1968). There is an apparent

research gap for the Australian context in considering the socio-spatial context to explain variations in health outcomes.

It has been argued that current approaches to epidemiology are atheoretical in their study design, providing a potential limitation to the conceptualisation of social issues such as obesity (Carpiano & Daley, 2006). The inclusion of socio-spatial frameworks will attempt to address these gaps within health research with a range of scholars suggesting the incorporation of geographical perspectives to enhance current debates in population health (Curtis & Jones, 1998; Smith & Easterlow, 2005). Hugo (2001) has argued that addressing community issues with spatial information provides an important evidence base across government sectors. Post-modern geographical perspectives on health and the incorporation of structurationist approaches (Pred, 1984) have further informed knowledge on spatial relationships with health. Tickamyer (2000:810) incorporates space into sociological perspectives, suggesting an agenda for exploring spatial inequality with a “socio-spatial dialectic that constrains and shapes social and spatial relations and activity simultaneously and reciprocally”. This move beyond „places“ conceptualised as a physical entity, such as accessibility to services and the built environment, to the social construction of these environments may influence understandings on the increasing rates of obesity.

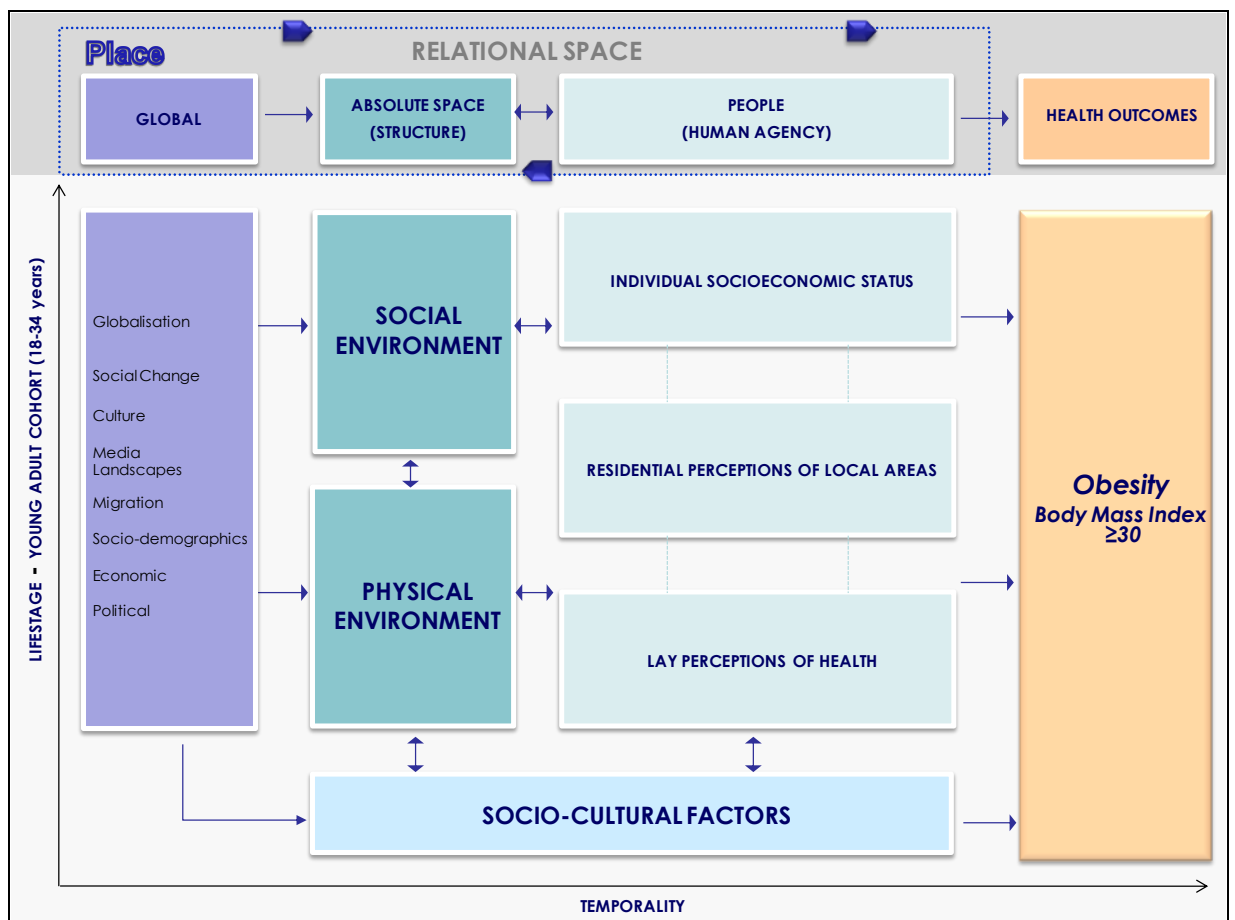
### 2.3 Conceptual framework for the research

The development of a conceptual framework to address the „socio-spatial dialectic“ is a central point to understanding the importance of a „geographies of health“ approach to this research. A number of theoretical and conceptual frameworks have emerged within the literature to understand the complexities of these relationships, such as seen with the examples of coronary heart disease (Chaix, 2009) and cardio-metabolic disease (Daniel *et al.*, 2008). These types of frameworks have centralised less on the macro influences and broader components of the socio-spatial context, and to date no Australian obesity research has been framed within a „geographies of health“ model. The conceptual framework for this thesis is presented in Figure 2.2.

The framework outlines a number of key components. Firstly, several global factors are outlined that are potential contributing components to both structure (absolute and relational space) and human agency (people). Structural features are presented incorporating the social and physical environment. Both absolute and relational spaces

are conceptualised to encompass the socio-spatial context within the following themes; (1) individual-level socio-economic status; (2) perceptions of residential areas; and (3) lay perceptions of health in the context of place. The final component displayed along the bottom of the framework incorporates socio-cultural factors being represented in this fashion to indicate the temporal nature of these processes across space. Finally the conceptual framework displays obesity as measured by a body mass index (BMI) of greater than or equal to 30 as described for a young adult cohort. Along the x-axis indicates the temporality of obesity along the age continuum.

**Figure 2.2: Conceptual framework to explore the socio-spatial geography of obesity in young adults for an Australian context**



SOURCE: Created by Author (2010)

### 2.3.1 Global influences on health and space

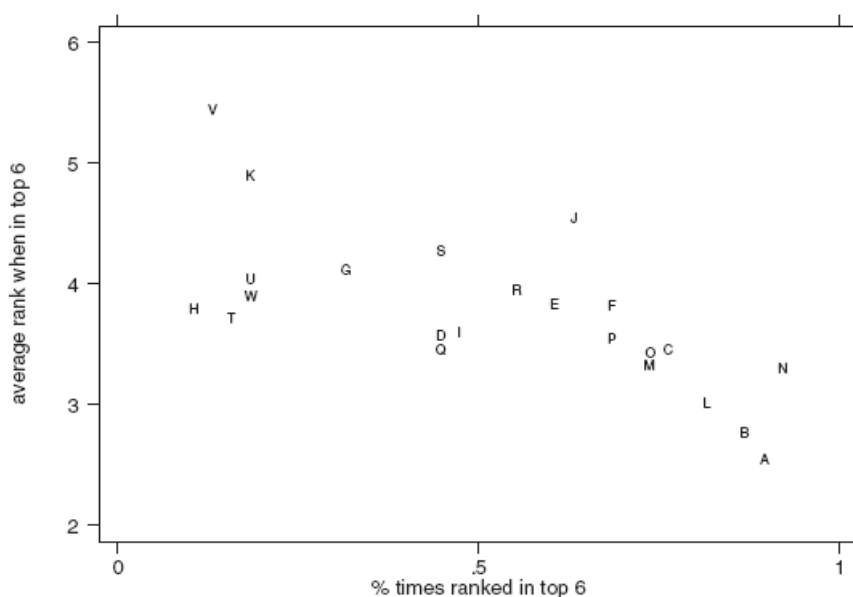
Globalisation began in the 16<sup>th</sup> century with the expansion and intensification of linkages and flows of capital, people, goods, ideas and cultures across national borders (Knox & Marston, 2004). There are ranging global factors that influence both

structures and the people living, working and „being“ within these spaces. An obesity research focus has been on the macro factors that influence the increasing international trends of obesity. There has been emerging translation of these global factors into health literature (Popkin, 2005; Faith *et al.*, 2007). More recently within the United Kingdom (UK), systems mapping work has highlighted the complexity of the obesity problem from a macro, meso and micro level and across policy, government and researcher perspectives. The recent *Foresight Report* highlights a number of important global factors in relation to obesity including; media, social, economic, food and activity processes (Vandenbroeck *et al.*, 2007). Putnam and Galea (2008:283) suggest that “macrosocial factors are warranted and necessary to improve overall population health”, commenting on numerous studies that encouraged the study of „socio-political“, „socio-economic“, „societal“, „global“, „upstream“, „ultimate“, „structural“, or „macro“ factors and their effect on health (ibid, 2008:278).

Banwell and colleagues (2005) identified through interviews with 50 Australian „experts“ from a range of fields<sup>20</sup> the major social trends that have led to Australia-wide changes in physical activity and food consumption over the past 50 years. The Delphi method was utilised as a way to delineate the complexities of the global issues contested to influence the current rising rates of obesity within the Australian population. The theme areas presented in Figure 2.3 outline changes in work and family, media landscapes, technological change, political and economic landscapes, and new spaces influencing the „local“. The global factors contributing to the changes in the socio-spatial landscape and resulting behaviour and lifestyle include and, in turn, affect the social and spatial distribution of health. Limited research has focused on *how* these global forces influence local areas as a component of socio-spatial relations and health. Understanding the influences of the global factors on structures and local areas may provide important insight into how health varies across international contexts.

<sup>20</sup> **Public policy** (Obesity, health promotion, food policy, indigenous health, town planning, sport); **Non-government organisations** (Disease prevention, health education, indigenous health, schools, rural health, home economics, community service); **Health practitioners and public health advisors** (General Practitioner, dietetics, children’s specialists, population health, women’s health); **Researchers** (Obesity, epidemiology, nutrition, health sociology, leisure sociology, physical activity, women’s health, child health, indigenous health, urban planning); **Industry** (Processed food, livestock, fast food, fitness, weight loss/management); **Consumer advocates and social experts** (Food regulation, cycling, sustainable transport, slow food, size acceptance, nutrition history, gastronomy).

**Figure 2.3: Major social trends relating to obesity epidemic by theme area (adapted from Australian Delphi study Banwell *et al.*, 2005)**



<b>Family</b>		
B and L	Physical Activity and Food Consumption	Increasing busy-ness and lack of time
I	Physical Activity	Growth of work
O	Food Consumption	Changes in families
N	Food Consumption	Rising use of convenience and pre-prepared foods
P	Food Consumption	Changing patterns of food consumption
R	Food Consumption	Decline in cooking
<b>Technological Change</b>		
A	Physical Activity	Escalating car reliance
C	Physical Activity	Sedentarisation of leisure activities
F	Physical Activity	Substitution of physical activity by machines
V	Food Consumption	Population level metabolic trends
<b>Media Landscapes</b>		
M	Food Consumption	Aggressive marketing of food
<b>Economic landscapes</b>		
H and T	Physical Activity and Food Consumption	Growing wealth and inequality
<b>Political landscapes</b>		
E	Physical Activity	Reduced emphasis on physical activity in schools
W	Food Consumption	The impact of government policy
<b>A 'confusing' world</b>		
D	Physical Activity	Changing knowledge exercise and physical activity
S	Food Consumption	Confusing information about food and nutrition
G	Food Consumption	Changing psycho-social factors
<b>A 'changing' world</b>		
J	Physical Activity	Mounting concerns over public safety
K	Physical Activity	Urbanisation
Q	Food Consumption	Growing availability, and access to, foods
U	Food Consumption	Increasing variety of food

Adapted from Banwell *et al.*, (2005)

### 2.3.2 Structural and individual factors

Earlier work on the geographic variation particularly focused on the physical aspect of the environment and there is a vast and growing literature across a number of research topics including; local area greenness (Nielsen & Hansen, 2007; Bell *et al.*, 2008), the built environment and ethnicity (Casagrande *et al.*, 2009) and restaurant availability (Mehta & Chang, 2008). The built environment and urban design impacts the access and opportunities for physical activity through services such as parks and footpaths (Frank *et al.*, 2005), and the healthy food environment is created by the availability of fresh food as opposed to fast or convenience options (Burns & Inglis, 2007; Macdonald *et al.*, 2007; Pearce *et al.*, 2007). Research into urban design and walkability of metropolitan Adelaide found that walkability<sup>21</sup> was associated with transport for those who chose to live in that area for access to services (Owen *et al.*, 2007:391). Other studies into obesity have provided a spatial dimension for children within metropolitan Adelaide (Franzon, 2010).

Individual socio-economic status can be measured through a number of variables such as marital status, family structure, education, household income, housing tenure and property value. The social environment is formed through the behaviour and interaction of people and local communities and research has considered the social environment in relation to obesity (Reidpath *et al.*, 2001; Mobley *et al.*, 2006). These studies on area-level outcomes have expanded the individual-level socio-economic profiles in relation to health across topics, such as social connectedness (Walker & Hiller, 2007), social capital (Mohan *et al.*, 2005; Ziersch *et al.*, 2005), perceptions of local area (Kavanagh *et al.*, 2006; Poortinga, 2006), and values and beliefs about their community (Lebel *et al.*, 2007). Place identity is an emerging concept in relation to health and has been described for an older population in Adelaide (Walker & Hiller, 2007). There is growing interest in gaining these perspectives and understanding the experiences that people have of place (such as described by, Townley *et al.*, 2009). Within southern metropolitan Adelaide, there has been research into people, place and health with a strong focus on social capital and area-level outcomes (Baum & Palmer, 2002; Baum *et al.*, 2007).

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<sup>21</sup> "Traditional neighborhoods purported to be highly walkable and bikable are characterized [sic] by high population density, a good mixture of land use, high connectivity, and adequate walk/bike design (e.g., continuous sidewalks)" (Saelens *et al.*, 2003:83).

### 2.3.3 Temporality of space

Another reason to explore space is the temporal nature of its construction and reproduction, as space is a changing and moving reality over time. As Gatrell (2002:3) outlines, “We occupy locations and, in the course of our lives, move from place to place. We all have our own „geographies“ as well as our own biographies”. Understanding the absolute and relational spaces also acknowledges with a greater emphasis the temporality of space and the mobility of people within and across space. Lefebvre indicates that:

space is never „innocent“ It always contains traces of the processes that produced it, and subsequently is acted upon by a variety of material and mental processes to provide the context through which we know things. Space in this sense, is constitutive of our ontologies and epistemologies; and, space itself is a social product.

(Lefebvre, 2001:131)

The increasing migratory patterns and population mobility has seen movement from one place to another, permanently, temporarily and at both a global and local scale. The movement of people internationally could help to explain socio-cultural patterns across geographies, and at the local level residential mobility and daily mobility patterns shape these landscapes. Studies have indicated that „the same people in the same place“ creates socio-spatial identities for these places (Jones, 1999) and population mobility is a critical component of understanding the construction and production of spaces and, therefore, the „reproduction“ of disadvantaged spaces over time.

There have been few studies that have investigated place and space across the lifecourse, partly due to accessibility to information and the technologies to explore these relationships. Current studies that have incorporated space across the lifecourse include the place of residence (Curtis *et al.*, 2004) and the relationships of socio-economic status and birthplace (Sanchez-Vaznaugh *et al.*, 2009). The academic literature incorporating the subjects of place, space and obesity continue to expand rapidly as methodologies are enhanced and at the same time obesity remains a pertinent public health issue.



## 2.4 Conclusion

Thinking geographically develops a broader socio-spatial explanation to investigate how people, places and spaces are constructed as unhealthy landscapes. The theorisation of space and sociological perspectives presented provide a backdrop to operationalise these spatial attributes across absolute and relational space and further unravel the role that the social environment has in the increasing rates of obesity. A socio-spatial framework is supportive of Rose's (1992) viewpoint that the behaviour and health of individual members is influenced by the collective characteristics and social norms. The dialectical nature of social and spatial processes is an emerging literature base and may provide additional insights into the complexities of obesity across different geographies, as outlined within the conceptual framework. Chapter 3 outlines the methodological approaches for the research, bringing together people and places.

## CHAPTER 3

# METHODOLOGY: Bringing together people and places to explore obesity

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The most significant contribution made by geographers to quantitative health research has been to demonstrate that data for both places and individuals can be brought together in order to shed light on health outcomes.

*(Gatrell, 2002:67)*

### 3.1 Introduction

The methodology adopted within this research utilises mixed methods and interdisciplinary perspectives to provide further knowledge into the complexities of obesity and the social environment. At the outset the chapter discusses the crossing of research paradigms to address the socio-spatial context and outlines the use of data, method and theory triangulation. The chapter outlines the secondary and primary data sources utilised as part of this research. The North West Adelaide Health Study (NWAHS) provides a unique opportunity to explore the spatial location and biomedical attributes of a population based cohort in conjunction with additional social information. Additionally, primary data were collected through a follow-up telephone interview and semi-structured interviews of a sub-sample of NWAHS participants. In concluding, this chapter will detail how the conceptual framework for this research informs the methodological and analytical approaches undertaken.

### 3.2 Research into the socio-spatial geography of obesity

Geographers, in their need to understand the real world, cross paradigms, theories and methods to gain a better grasp of social processes (Holt-Jensen, 1999). This thesis intersects positivist approaches of spatial science and methodologies from population health and the critical social sciences to gain insight into the associations between space, place and health. Del Casino and Jones (2007:246) discussed the major epistemological and ontological binaries for structuring such geographic theory (as indicated in Component A of Figure 3.1). The authors commented that:

Spatial scientific approaches provide valuable insights into the generalities of various socio-spatial relations, while critical realist approaches point to the importance of studying on the ground spatial arrangements and connections.

The theories, methodologies and data sources utilised for this research within the spatial scientific and critical realist paradigms are shown in Figure 3.1. Component A of the figure incorporates the epistemological and ontological binaries incorporating both objective and subjective investigative methodologies to explore obesity within young adults. This research adapted Del Casino and Jones’ framework (Component B) to include the theoretical, data sources and methodological approach utilised. In association with Component A, this addition highlights the importance of crossing disciplinary boundaries and paradigms for research into obesity and as a result is guided by multiple theoretical underpinnings, data sources and methodologies.

**Figure 3.1: Major epistemological and ontological binaries structuring geographic theory (A) and theoretical, data sources and methods (B) used within this research**

A		Spatial Scientific	Critical Realist
Epistemology	Objectivity General Explanation	Subjectivity Particular Interpretation	
Ontology	Order Society Discrete	Chaos Individual Relational	
B			
Theoretical	Structure Absolute Space Area	Human Agency Relative Space Individual	
Data sources and methods	NWAHS Stage 1 and 2 (1999-2006) NWAHS telephone follow-up (TFU 2) 2007 Social and Physical Environmental data sources	Semi-structured interviews NWAHS Participant comments Observational research	

SOURCE: Adapted from Del Casino and Jones (2007:235)

The nature of socio-spatial analysis requires a methodological perspective combining data sources and techniques, and Webb *et al.* (1966) coined the term „triangulation“ in their treatise on non-reactive measures in the social sciences. In discussing triangulation, Golledge and Stimson (1997:12) stipulate that “no single method ever adequately solves the problem of rival factors”. Denzin (1989) outlines four types of triangulation; theory, data, methodological and investigator triangulation.<sup>22</sup> As Thurmond (2001:253) argues, the use of two or more aspects of research strengthens the research design and the ability to interpret the findings.

Theory triangulation is a complex process which uses multiple perspectives to interpret a single set of data (Mathison, 1988). The methods in this research build upon the theoretical perspectives outlined in the previous chapter including Giddens’ *Theory of Structuration* and other geographical theories on space, place and health. As discussed

<sup>22</sup> Investigator triangulation refers to research which involves a number of different researchers; this was not undertaken in this research.

in Chapter 2, more research into the theoretical position of socio-spatial research is needed and, thereby, the incorporation of theory triangulation.

Methodological triangulation refers to the use of mixed methods (Mathison, 1988), and there has been an increasing combination of both quantitative and qualitative methods in empirical research (Punch, 2005). Denzin (1978:302) states:

The rationale for this strategy is that the flaws of one method are often the strengths of another: and by combining methods, observers can achieve the best of each while overcoming their unique deficiencies.

Mathison (1988:14) discusses the approach of Denzin incorporating both time and space “based on the assumption that understanding a social phenomenon requires its examination under a variety of conditions”. Geographical analyses incorporate at least one spatial variable which is crucial to the analyses; these have a reference that is a spatial location and analysis can be undertaken using space as the common identifier (Anselin & Getis, 1992:23). Spatial analysis brings together both social and spatial information and provides a new dimension of understanding the local and global social contexts, especially in relation to how these contexts relate to health outcomes. This research undertakes data triangulation sourcing key population and social data available within the study region. The data sources utilised are shown in Figure 3.2.

**Figure 3.2: Summary table of data sources, spatial scale and time frame utilised within research**

Data source name	Source	Spatial scale	Time frame
South Australian Health Omnibus Survey (SA HOS)	Government of SA, SA Health	Australia Post® Postcode	1994 to 2004
National Health Survey (NHS)	Australian Bureau of Statistics (ABS)	SA and Australia	1995, 2001, 2004-05, 2007-08
Population and Housing Census	Australian Bureau of Statistics (ABS), CData 2001	CD, SLA	2001
Socio Economic Indexes for Areas (SEIFA) Index of Relative Socioeconomic Disadvantage (IRSD)	Australian Bureau of Statistics (ABS)	CD, SLA, Postal Area	2001
North West Adelaide Health Study (NWAHS)	Government of SA, SA Health (including the Central Northern Adelaide Health Service), The University of Adelaide and University of South Australia	Spatially referenced residential location at Stage 1 and 2	Stage 1 (1999-2003) Stage 2 (2004-2006) Telephone follow-up (TFU 2), 2007* Semi-structured interviews*
Metropolitan Accessibility and Remoteness Index of Australia (Metro ARIA)	The University of Adelaide, The National Centre for the Social Applications of GIS (GISCA)	Parcel	2003
Digital Cadastral Database (DCDB and Valuations Data)	Government of SA, Department of Environment and Heritage (DEH)	Parcel	2005

\*Denotes primary data source (discussed in Section 3.4).  
Abbreviations; CD – Collection District, SLA – Statistical Local Area, SA – South Australia.

### 3.3 Secondary data sources

As indicated in Figure 3.2, a number of data sources with varying spatial scales within the north-west region of Adelaide were obtained. The metropolitan region of Adelaide was chosen for this research as there were a number of resources available to undertake this type of research and Chapter 1 highlighted the differences in the prevalence of obesity across Australia and specifically for this study region. Chapter 4 further outlines the rationale for utilising this study region. The discussions below highlight the methodological techniques for the forthcoming analysis based on a common spatial identifier.

#### 3.3.1 The South Australian Health Omnibus Survey (SA HOS)

SA HOS is a face-to-face self report, representative survey of health, well-being and related issues in the South Australian (SA) adult population aged 15 years and older.<sup>23</sup> The survey involves a multi-stage, systematic, clustered area sample of people living in metropolitan Adelaide and country centres with more than 1,000 people. Response rates for the survey each year are on average about 70 percent.<sup>24</sup> These face-to-face household interview surveys (around n=3,000 people each year) have provided reliable estimates of self-reported height and weight since 1991 (Starr *et al.*, 1999b). SA HOS data are some of the only available in Australia that have continuously monitored the prevalence of obesity over this period with repeated methodologies across the survey years. Data were weighted by age, geographic location, sex and probability of selection in the household to the estimated resident population (ERP) to produce results that were representative of the SA population.

Between 1994 and 2004, there were 14,818 SA HOS participants living in the metropolitan region of Adelaide aged 18 years and over.<sup>25,26</sup> The rural and remote regions were excluded from analysis as this study is focusing on metropolitan Adelaide. Analysis was undertaken of SA HOS self-reported height and weight data and was interpolated for periods when data were not collected (1999, 2000 and 2003). More

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<sup>23</sup> SA HOS is a user-pays survey administered by the Population Research and Outcome Studies (PROS) Unit, Operations Division, SA Health, in conjunction with Harrison Health Research. Access was obtained for use in this research from the PROS Unit, SA Health. Ethics for the SA HOS was previously obtained from the SA Health, Human Research Ethics Committee.

<sup>24</sup> The person whose birthday was next in the selected household was interviewed in their home by trained health interviewers. Up to six call-backs were made in an attempt to interview the selected person, resulting in approximately 3,000 annual interviews conducted in October/November. There was no replacement for non-response, and hotels, motels, hospitals, nursing homes and other institutions were excluded. Further information on SA HOS sampling and methods have been reported previously (Wilson *et al.*, 1992; Population Research and Outcome Studies Unit, 2002; Taylor *et al.*, 2006b).

<sup>25</sup> Those aged 18 years and over within SA HOS were selected to make use of the WHO BMI classifications.

<sup>26</sup> These data describe the obesity situation up to the time when Stage 1 of NWAHS (1999-2003) was undertaken. Data prior to 1994 did not have a spatial unit for analysis (i.e. Postcode).

recent emphasis has been placed on the importance of comprehensive monitoring and surveillance of height and weight information to inform policy and targets for obesity within populations (Wilkinson *et al.*, 2007).

### 3.3.2 The North West Adelaide Health Study (NWAHS)

Population health surveys in SA have observed an increase in self-reported prevalence of a range of chronic conditions (for example, Taylor *et al.*, 1998; Starr *et al.*, 1999a; Ruffin *et al.*, 2000; Taylor *et al.*, 2000) but the absence of biomedical data to support the development of chronic conditions, such as asthma and diabetes, inhibited the establishment of the causal pathways of disease. Population health surveys and surveillance systems were unable to monitor how individuals within certain populations move along a chronic disease continuum (Grant *et al.*, 2009). These initial findings within SA saw the establishment of the North West Adelaide Health Study (NWAHS), a biomedical cohort of people aged 18 years and over living in the north-west region of Adelaide. As Penman and Johnson (2006:2) argue:

Data from cohort studies, in which data from the same individuals are collected over time, would help shed light on this issue by not only showing changes in the distribution of BMIs [body mass indexes] but also by allowing researchers to determine which individuals are gaining weight.

NWAHS is a collaboration between the Central Northern Area Health Service (CNAHS), SA Department of Health, The University of Adelaide, University of South Australia (UniSA) and the Institute of Medical and Veterinary Science (IMVS) (Grant *et al.*, 2005a).<sup>27</sup> The selection of the cohort study region was initially due to a number of linkages within CNAHS<sup>28</sup> and this provided the basis for study management. A number of studies have described the north-west region as experiencing an increased prevalence of a range of chronic conditions compared to other areas of metropolitan Adelaide (Glover *et al.*, 2006; Jury *et al.*, 2007). Chapter 4 discusses the socio-demographic profile of the study area, a predominantly disadvantaged region; notwithstanding, this study does provide a spectrum of both advantage and disadvantage. This unique Australian study assesses a representative adult population

<sup>27</sup> Ethics for the NWAHS Stage 1 and 2 was obtained from The Queen Elizabeth Hospital Human Research and Ethics Committee.

<sup>28</sup> The Queen Elizabeth Hospital (TQEH) and the Lyell McEwin Hospital (LMH); were formerly known as the North West Adelaide Health Service.

through a range of biomedical and self-reported surveys. The overall aims of the NWAHS are to:

1. Assess the measured clinical prevalence of priority health problems: diabetes and chronic lung diseases, and the clinical prevalence of the key risk factors for these diseases and their demographic distributions;
2. Segment each of the diseases to investigate the specific health issues and needs of different sub-groups so that more effective policy can be developed and more precise targeting of these diseases can occur;
3. Following segmentation of the diseases, qualitatively assess the differential understanding, management and contextual difficulties associated with positive and negative health outcomes; and
4. Track the cohort over time to identify the incidence of new cases of disease and the rate at which complications develop in these and existing cases of disease.

(Taylor *et al.*, 2002:10)

The longitudinal nature of NWAHS is valuable in researching people who are developing chronic conditions over time, and the factors that increase their risk. Furthermore, NWAHS offers the opportunity to utilise Geographic Information Systems (GIS) as a tool for spatial analysis at the fine spatial scale of individual-level information. As part of recruitment to the NWAHS, participants provided their residential address and consented to social and health analysis based on where they live. The NWAHS participants were able to be linked on the spatial identifier of their residential location to other environmental attributes using GIS. The cohort tracking over the study period, regardless of the participants' location within the north-west region, allows socio-spatial research to explore residential mobility patterns, intra-state, inter-state and internationally. Additionally, there is opportunity to seek further information on the study participants (as explained in section 3.4).

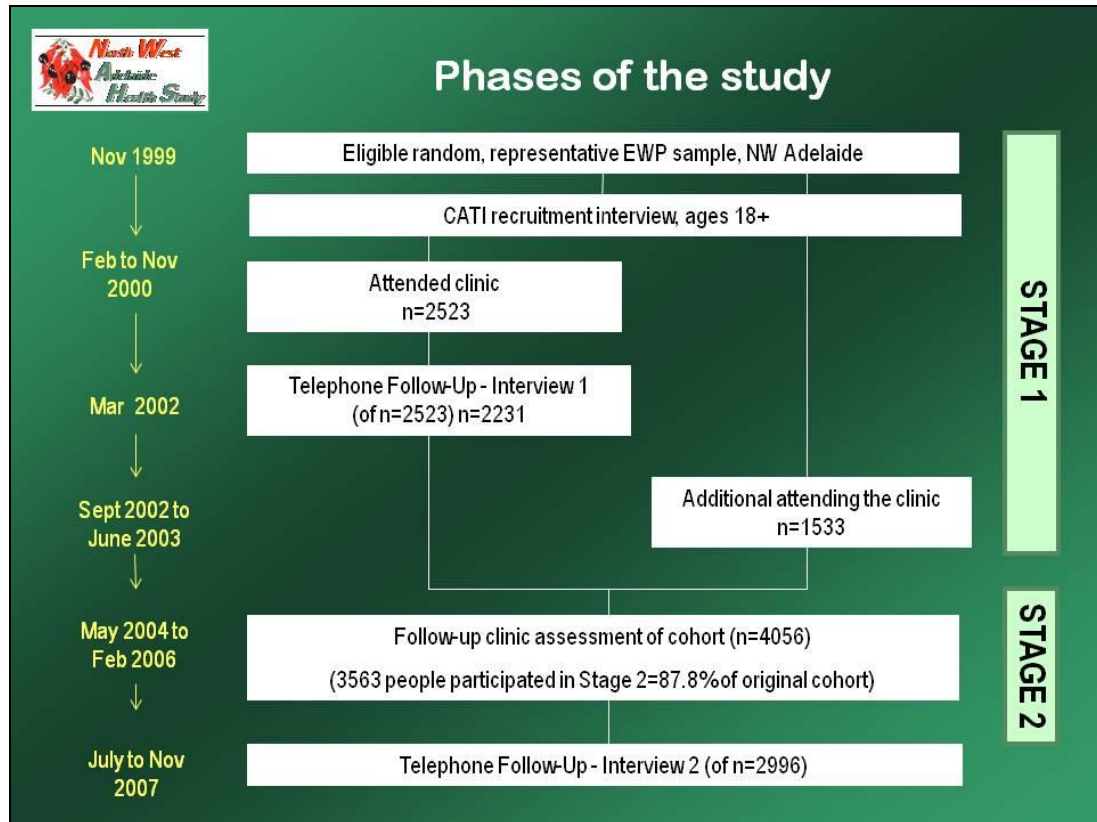
Stage 1 of NWAHS saw recruitment of participants between 1999 and 2003, returning for Stage 2 biomedical appointments over the 2004 and 2006 period. A telephone follow-up interview was conducted in July and August 2007<sup>29</sup> (Grant *et al.*, 2007) and

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<sup>29</sup> Further description of the TFU 2 can be found in primary data (Section 3.4). NWAHS third wave of biomedical and self-report data collection began on June 2008 and is expected to be completed by late 2010 (per comm., Grant, J, 2009).

this doctoral research contributed themes and questions to NWAHS participants. Figure 3.3 outlines the phases of the NWAHS between 1999 and 2007. Further information on the study design, sampling and procedures of the study has previously been published elsewhere (Grant *et al.*, 2005b; Grant *et al.*, 2009).

**Figure 3.3: Phases of the North West Adelaide Health Study (NWAHS), 1999 to 2007**



Abbreviations: CATI – Computer Assisted Telephone Interview, EWP – Electronic White Pages

SOURCE: personal communication, Grant, J. (2008)

Previous cohort studies have been primarily based on volunteers, clinical or convenience samples and the follow-up is sought through self-report data or record linkages (Taylor *et al.*, 2006a). In Stage 1 (1999-2003) of NWAHS, all households in the north-west region of Adelaide with a telephone connected and listed in the Electronic White Pages (EWP) were eligible for selection in the study.<sup>30</sup> The Stage 1 participants were recruited in two phases; Phase 1A (n=2,523) between November 1999 and December 2000 and Phase 1B (n=1,533) between September 2002 and June 2003. During both a Computer Assisted Telephone Interview (CATI) and a paper-based questionnaire, all participants were asked a range of questions regarding self-reported physical and mental health conditions and socio-demographic information. The

<sup>30</sup> An introductory letter was sent out to those eligible for selection in the study and up to ten call-backs were made to each selected household to obtain an interview. There was no replacement for refusal or non-response.



respondents were invited to attend a clinic for a 45 minute biomedical appointment<sup>31</sup> at either The Queen Elizabeth Hospital (TQEH) or The Lyell McEwin Hospital (LMH). The free medical check was used as an incentive for participation in the study and reimbursements were made for travel expenses to some participants. Overall, 4,056 participants attended the Stage 1 clinic representing 49.4 percent of the eligible sample, and 69.3 percent of those who completed the CATI.

Between May 2004 and February 2006, in Stage 2 of the NWAHS, all participants were recalled for their second biomedical clinic appointment and self-reported socio-demographic and health surveys. During Stage 2, 87.8 percent (n=3,563) provided information and 79.0 percent (n=3,206) attended the clinic. For those participants who completed an interview, the response rate for attendance at the Stage 2 clinic was 69.0 percent. Appendix 2 outlines the socio-demographic characteristics of non-respondents to Stage 2 NWAHS.

*Weighting of NWAHS data*

The NWAHS data utilised within this research were weighted to the Australian Bureau of Statistics (ABS) 1999 ERP (ABS, 1999b) by north-west region, age group, sex and probability of selection in the household to ensure that the sample was representative of the north-west region of Adelaide. The formula for calculating a Stage 1 study participant weight (variable: *wtclnc*) is shown in Figure 3.4.

**Figure 3.4: Weighting formula applied to the North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

NOTE:  
This figure is included on page 40 of the print copy of the thesis held in the University of Adelaide Library.

SOURCE: Dal Grande (2005)

A number of weights were assigned for NWAHS Stage 2 that considers Stage 1 weighting and includes the mode of Stage 2 completion.<sup>32</sup>

<sup>31</sup> Biomedical tests at Stage 1 included measurements of: blood pressure; height and weight; waist and hip; fasting blood sample (for glucose, lipid profile, and glycated haemoglobin); allergy skin test (to rye grass, cat, house dust mite, alternaria (mould), feather, and cockroach); lung function tests (spirometry followed by Ventolin inhalation and retesting). Additional biomedical tests at Stage 2 included: DEXA scan for those aged 50 years and over.

<sup>32</sup> The following weights were assigned for Stage 2 NWAHS data: *wtclncS2* – Stage 2 Weighting of Clinic participants; *wtqubS2*– Stage 2 Weighting of Self-Report Questionnaire participants; *wtcatiS2* - Stage 2 Weighting of CATI participants.

### Defining obesity within NWAHS

This research utilises measured height and weight to calculate body mass index (BMI) as a continuous measure and additionally the separated classes based on the World Health Organisation (WHO) definition (shown in Table 3.1). A particular focus within this thesis was those persons classified as obese, defined as a BMI of 30 or more. BMI was calculated using height in centimetres (measured to the nearest 0.5 cm using a calibrated stadiometer) and weight in kilograms (measured to the nearest 0.1 kg in light clothing and without shoes using standard digital scales). The formula used to calculate BMI was the following:

$$\text{Body Mass Index (BMI)} = \text{weight (kilograms)} / (\text{height (metres)} * \text{height (metres)}).$$

**Table 3.1: World Health Organisation (WHO) classification of body mass index (BMI) criteria**

NOTE:  
This table is included on page 41  
of the print copy of the thesis held in  
the University of Adelaide Library.

SOURCE: World Health Organisation (2000)

There are other measures of obesity or „adiposity“ such as Dual Electronic X-ray Absorption (DEXA) scanning, waist-to-hip ratio and waist circumference that have been found to be accurate in the examination of obesity and associated chronic conditions (Kamel *et al.*, 1999). DEXA measures were only available for those aged 50 years and over and, consequently, were not available for this research into young adults. During the clinic visit, three measurements of the waist and hip<sup>33</sup> were recorded and the mean was calculated from these measurements. A high waist-to-hip ratio was defined as greater than 1.0 for males and greater than 0.85 for females, using Evidence Guidelines for Type 2 Diabetes (Holmwood *et al.*, 2002).

### Geocoding of NWAHS

Geographic data are locations that are assigned a specific location in space (Aronoff, 1995:162), and this research utilises the latitude and longitude of NWAHS participant

<sup>33</sup> "Waist circumference was measured to the nearest 0.1 centimetre using an inelastic tape maintained in a horizontal plane, with the subject standing comfortably with weight distributed evenly on both feet. The measurement was taken at the level of the narrowest part of the waist. Hip circumference was also measured using an inelastic tape, at the level of the maximum posterior extension of the buttocks." (Grant *et al.*, 2005b:7).

residential locations corresponding to the stage of data collection. Data for Stage 1 were geocoded in two phases using ArcView Version 3.3 (ESRI, 2002); Phase 1A n=2,523 (collected in 1999-2000 and geocoded in April 2003) and Phase 1B n=1,537 (collected in 2002-2003 and geocoded February 2006). The National Centre for the Social Applications of GIS (GISCA) at The University of Adelaide was commissioned to undertake the geocoding for Phase 1A by the NWAHS team and for Phase 1B as part of this research within the Nutrition Obesity Lifestyle and Environment (NOBLE) project.<sup>34</sup> The process for geocoding was based on the residential address of the NWAHS participant at the original clinic appointment and this was linked to the corresponding land parcel using a base file of addresses.<sup>35</sup> Table 3.2 outlines the geocoded participant information for each stage of NWAHS data collection.

**Table 3.2: Participant information geocoded at Stage 1, Stage 2 and telephone follow-up, North West Adelaide Health Study (NWAHS), 1999 to 2007**

	Stage 1 (1999-2003)	Stage 2 (2006-08)	TFU 2 (2007)
Participation in Clinic	4,056	3,145	2,996
Information on Participant	4,056	3,683	3,621
Refused/Died/No information	N/A	374	621
Geocoded	4,050	3,596	3,596#
Geocoded (clinic/survey)	4,050 (99.9%)	3,129 (99.5%)	2,912# (97.2%)

# Telephone follow-up (TFU 2) 2007 data were matched to location at Stage 2

At all times the privacy and anonymity of each of the participants was preserved. The results of the study, under no circumstances, are disclosed in any form that would enable deductive or explicit identification of individual participants. All information was de-identified, and a unique identifier used for data linkage.

Every attempt was made to ensure a complete spatially referenced NWAHS data set by means of referring to hard copy files, contacting participants directly, and utilising the SA Electoral Roll. As NWAHS data were almost completely geocoded (99.9 percent) there was no need to provide a comparison of data not available with a spatial attribute. Chapter 4 provides further information on the study population and socio-demographics with a comparison of the Census population, weighted and unweighted NWAHS variables.

<sup>34</sup> An Australian Research Council (ARC) Linkage Project resulting from the North West Adelaide Health Study (NWAHS).

<sup>35</sup> The Digital Cadastral Database (DCDB) and valuation data was the most recent version held by GISCA at the two time points of geocoding (2003 and 2006). Further explanation of DCDB and valuation data is in Section 3.3.5.

### 3.3.3 Australian Bureau of Statistics (ABS) sources

The Australian Bureau of Statistics (ABS) is a national service of statistics for Australia and this research utilises the following sources: the National Health Survey (NHS), 2001 Population and Housing Census and Socio Economic Indexes for Areas (SEIFA). A background to these ABS sources is outlined in the subsequent sections.

#### *National Health Survey (NHS)*

The ABS NHS collected information about health status, socio-demographics and socio-economic characteristics through face-to-face interviews with selected residents in sampled dwellings<sup>36</sup> across Australia, approximately 15,800 private dwellings. Both urban and rural areas in all states of Australia were included in the survey and very remote areas were excluded. Within each selected dwelling, one adult aged 18 years and over and one child were randomly selected for inclusion in the survey. Data were weighted to the total population to account for probability of being selected in the survey and to reduce non-response bias. Further information on the study design has been published by the ABS (2009). The NHS was utilised in this research for the periods 1995, 2001, 2004-05 and 2007-08.

#### *2001 ABS Population and Housing Census*

The Census of Population and Housing is a snapshot of the Australian population that is undertaken every five years in August. Census data were obtained from CData 2001 (Release 2) using the software MapInfo Professional Version 7.0 (CData, 2001). The Census data were aggregated to areal geographic units protecting the confidentiality of each individual and small numbers of respondents within an area are assigned error to ensure that no individual can ever be identified (ABS, 2001b:3).<sup>37</sup>

#### *Australian Census Geography*

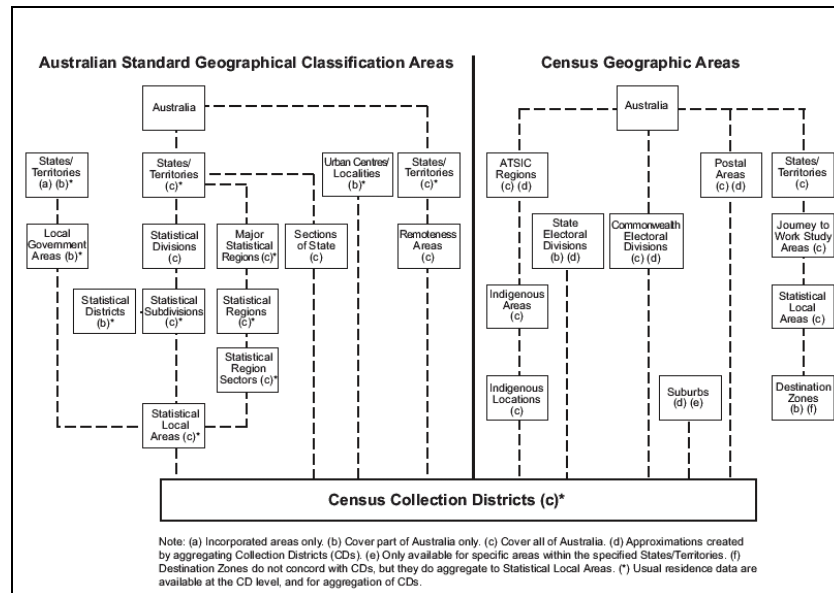
Scale is important when undertaking analysis of space, whether it is thinking about spatial science or critical social science. The scale at which a phenomenon is examined can affect the observations made and must be considered when analysing any information of a spatial nature. Figure 3.5 shows the hierarchical structure of the Australian Standard Geographical Classification (ASGC) and Census Geographic

<sup>36</sup> Dwellings were selected at random using a multi-stage area sample of private dwellings.

<sup>37</sup> For use of the ABS data at the lowest aggregated level, the CD, those that contain 1 or 2 respondents are randomly assigned either 0 or 3 respondents for the corresponding census geography.

Areas. The ABS defines the statistical geography into a number of spatial units according to the ASGC.

**Figure 3.5: Diagram of Australian Standard Geographical Classification (AGSC) Areas and Census Geographic Areas, Australian Bureau of Statistics (ABS), 2001**



SOURCE: Australian Bureau of Statistics (2001e)

A Collection District (CD) is the smallest spatial unit containing on average 220 households in urban areas (ABS, 2006a:16). A Statistical Local Area (SLA) is a general purpose spatial unit and CD's aggregate to form an SLA. A Postcode is the four digit number assigned by Australia Post® that is commonly used by researchers and businesses as a makeshift geographic region (ABS, 2001a). Census geography is based on the unit of a CD and Postcodes are not compatible with these geographies. In response to this, the ABS has created Postal Areas that are the approximate area of the Postcode. The selection of the SA HOS study region sample was based on Australia Post® Postcodes that were located within the metropolitan region of Adelaide.<sup>38</sup>

Census data at the CD and SLA level were assigned to the individual-level NWAHS participant for further analysis of aggregated data using ArcView 9.2 (Esri, 2008) for data management. The ABS Census 2001 is the closest match Australian Census information that was available at the time of initial analyses and is most compatible with the timing of Stage 1 NWAHS data collection. At all times, consideration was given to the time period of additional secondary data, thus aligning with the Stage 1

<sup>38</sup> The Postcode variable within SA HOS is not a useful spatial unit for analysis and the sampling frame (clustered and multi-staged) also makes for an unreliable representation of spatial processes occurring over time and space.

NWAHS population to further explain the NWAHS participants' social space. A key limitation of ABS data is that variables are only available at the CD level and these aggregated units have boundaries that are not necessarily based on a unit that is appropriate for analysis.

*Socio Economic Indexes for Areas (SEIFA)*

SEIFA Index of Relative Social Disadvantage (IRSD) is a measure of area-level socio-economic status created by the ABS and the index attempts to explore at a basic level the social environment (ABS, 2001c). The SEIFA IRSD values at the spatial unit of a CD were calculated for the NWAHS participants based on their residential address at Stage 1 and 2. The ABS recommends the use of the deciles rather than ranks or scores and conventionally SEIFA IRSD values have been reported by quintile distribution (ABS,2001c:15). As a result, for this research, SEIFA IRSD continuous scores were assigned to a quintile distribution ranging from Lowest (most disadvantaged or Quintile 1) to Highest (least disadvantaged or Quintile 5) Quintile.<sup>39</sup>

**3.3.4 Measure of accessibility**

The University of Adelaide, GISCA has previously developed an Accessibility and Remoteness Index for Australia (ARIA) based on road network systems to determine access to services and resources for urban, rural and remote regions of Australia (ABS, 2001d). Metropolitan ARIA (Metro ARIA) is a geographic accessibility index created in 2001, designed to quantify service accessibility within metropolitan areas as shown in Table 3.3 (GISCA, 2003). Metro ARIA is a composite index that aims to reflect the ease or difficulty people face accessing basic services through quantifying accessibility in the metropolitan area based on the road distances individuals travel from their place of residence to reach different types of services.

**Table 3.3: Themes of the Metropolitan Accessibility and Remoteness Index for Australia (Metro ARIA), metropolitan Adelaide, 2001**

NOTE:  
This table is included on page 45 of the print copy of the thesis held in the University of Adelaide Library.

SOURCE: Metro ARIA (GISCA, 2003)

<sup>39</sup> SEIFA values were recoded to include three categories; 1 „Low/Lowest Quintiles“ 2 „Middle Quintile“ and 3 „High/Highest Quintiles“.

The spatial distribution of Metro ARIA is indicated in Figure 3.6. Metro ARIA provides valuable information to assist service planning and geographic access equity (GISCA, 2003).

**Figure 3.6: Spatial distribution of the Metropolitan Accessibility and Remoteness Index for Australia (Metro ARIA), metropolitan Adelaide, 2001**

NOTE:  
This figure is included on page 46  
of the print copy of the thesis held in  
the University of Adelaide Library.

SOURCE: Metro ARIA (GISCA, 2003)

### 3.3.5 Property and valuations data

The Digital Cadastral Database (DCDB) is a spatial representation of the legal land parcel boundaries in SA and has been available since 2000. The DCDB integrates computer based valuation and title based valuation, stored in the Torrens Automated Title System (TATS), with computer based mapping and provides a spatial view of all properties within the state. A property is defined as a unit of land that is separately assessed by the Valuer-General pursuant to the Valuation of Land Act of SA (DEH, 2005).

The 2005 DCDB land parcel data were obtained for this research from the SA Government Department of Environment and Heritage (DEH) for the Adelaide metropolitan region.<sup>40</sup> Data of this quality and fine spatial scale is limited throughout the world, and allows exploration of housing features, such as property capital value and building quality, to be explored with health outcomes. The DCDB was used to match property capital value and condition of housing to individual-level NWAHS data. Information was not available for those houses that incorporate more than one land parcel, for example an apartment or unit block that represents multiple valuations for a land parcel. Therefore, 80.3 percent (n=3,145) of NWAHS participants were able to be assigned a property capital valuation and characteristic. The resulting individual-level variable provides further information on the socio-economic status of the individual living within that household.

## 3.4 Primary data sources

There were two primary data sources for this research; the telephone follow-up interview and semi-structured face-to-face interviews using a sample of the NWAHS cohort. This section will outline the ethics submission, sampling frame, mode of collection and survey response rates, along with qualitative methodologies for the face-to-face interviews.

### 3.4.1 Telephone follow-up interview of NWAHS cohort

The telephone follow-up (TFU 2) interview was an additional questionnaire given to the NWAHS cohort participants and was funded as part of the ARC Linkage Project, the NOBLE study. All current NWAHS participants were contacted to take part in the self-

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<sup>40</sup> Permission for the use of the Digital Cadastral Database (DCDB) and valuations data was obtained from the South Australian Department of Environment and Heritage (DEH), 16 March 2005, via letter correspondence.



reported CATI questionnaire. The survey was undertaken with the aim of further exploring the participants' past and current social environment. The questions for inclusion were developed through initial analyses of the study population and a review of the relevant literature for the development of the conceptual framework presented in this research. The list of additional survey questions can be found in Appendix 3 and included information across a range of theme areas (Figure 3.7).

**Figure 3.7: Themes included in the telephone follow-up (TFU 2) interview, North West Adelaide Health Study (NWAHS), 2007**

Theme	Theme Components
Residential Mobility	Times moved location Times moved since first clinic visit
Lifecourse	Parents' Country of Birth Parents' Occupational Status as a child Where they grew up as a child
Lifestyle	Ability to fit in physical activity in day Frequency of prepared meals in the home Perceptions of level of stress
Socio-demographics	Current Occupation Family Unit demographics
Lay perspectives on health	Perception of weight status General Health and well-being Short Form (SF)-1

The additional questions included within the telephone follow-up interview that did not directly relate to health provided further insight into issues associated with the social and spatial landscape. During the survey, participants made comment on the relevance of such questions, for example:

Can't see where father and mother details are relevant.

*(Comments section, telephone follow-up interview, 2007)*

Although there were no intentions to ask controversial questions, additional ethics clearance was sought for the qualitative aspects of the research. The ethics approval was obtained from the North West Adelaide Health Service Ethics of Human Research Committee (See Appendix 4) and also from The University of Adelaide Human Ethics Committee.<sup>41</sup>

The survey was pilot tested in June 2007 on a sample of 50 people randomly selected from the eastern and southern suburbs of Adelaide, after being cross checked with the

<sup>41</sup> Verbal permission was granted from The University of Adelaide, Human Ethics Committee (18 March 2008).

NWAHS cohort to ensure no participants were included.<sup>42</sup> Data for the survey were collected between July and November 2007. The participants of the additional interview were given the option to refuse participation, as in all stages of NWAHS. The second telephone follow-up of the NWAHS had a response rate of 93.4 percent (n=2,996) of those that had completed a clinic appointment at Stage 2 (2004-06). Of the original cohort (n=4,056), 73.8 percent participated in this interview, equating to 79.8 percent when excluding original sample loss (Table 3.4).

**Table 3.4: Response rates of telephone follow-up (TFU 2) interview, North West Adelaide Health Study (NWAHS), 2007**

Response Rates TFU 2		
	n	%
<b>Original Sample</b>	<b>4056</b>	
Sample Loss	300	7.4
<i>Died</i>	167	
<i>Double ID</i>	4	
<i>Too ill</i>	19	
<i>Complete withdrawal</i>	108	
<i>Overseas</i>	2	
<b>Tracking</b>	<b>139</b>	
<b>Sample minus original sample</b>	<b>3760</b>	
Sample for TFU 2	3621	
Sample Loss	45	1.1
<i>Deceased</i>	11	
<i>Foreign language</i>	18	
<i>Hearing Impaired</i>	9	
<i>Incapable/Too ill</i>	7	
Non-contactable	34	0.9
Tracking	306	8.1
Refused TFU2 2007	237	6.3
Terminated Interview	3	0.1
<b>Completed Interviews</b>	<b>2996</b>	<b>79.8</b>

SOURCE: Personal comm., (Montgomerie, 2008)

The ongoing maintenance of the NWAHS cohort within the Department of Health has ensured a good response rate and this has been through extensive tracking of participants, including checks using the SA Electoral Roll, electronic telephone directory and letters sent to secondary contacts.

### 3.4.2 Semi-structured interviews

Indeed, for some researchers, the mixing of both quantitative and qualitative methods has proved singularly useful, with insights from in-depth interviews adding color [sic] and explanatory power to quantitative studies.

(Gatrell, 2002:87)

<sup>42</sup> The telephone follow-up (TFU) interview was undertaken in collaboration with the South Australian Department of Health.

Semi-structured interviews were undertaken with selected NWAHS participants to explore dimensions of the socio-spatial context, social disadvantage and obesity within the study population. These interview themes provide additional insight into socio-spatial processes that are not available through current spatial data sources, such as Census data and NWAHS information. The spatial patterning may shed some light on the disease causation, although these approaches do not explore the feelings, experiences, beliefs, and the attitudes that the individuals have (Gatrell, 2002). An initial descriptive analysis of both primary and secondary data was completed before undertaking semi-structured interviews, and enabled discussion of the themes generated from the initial analyses to allow for clarification on issues. Qualitative research provides insight by observing and analysing „real life“ actions and provides a deeper understanding into the diversity of opinion and experiences of space and place.

The semi-structured interviewees were initially selected as an indicative or purposeful sample and those eligible for an interview included the following criteria:

- participants aged between 18 and 34 years at Stage 1 clinic appointment;
- current records state they are living in the north-west region of Adelaide;
- took part in the 2007 NWAHS telephone follow-up interview;
- were included in the spatial sample selected for this research; and
- gave their informed consent to participate in the sub-study (Appendix 5).

It was the initial intention to sample both females and males for the semi-structured interviews. However, when contacting the NWAHS male participants there were a number that dropped out, did not wish to participate and were not available for interview. As a result, the qualitative component of this research had a focus on young women, providing an interesting foundation for discussions into the relational components of space, place and obesity within the north-west region of Adelaide.

According to the above criteria, NWAHS participants were then randomly selected<sup>43</sup> from a range of BMI classifications (normal, overweight, obese) and locational advantage and disadvantage. All participants were contacted via an approach letter (Appendix 6) and provided with an information sheet (Appendix 7) by the NWAHS

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<sup>43</sup> A random number was assigned to all young adults that were eligible for selection in this sub-study.

study co-ordinator. An essential part of NWAHS is to undertake all sub-studies under the study branding as there is seen to be recognition from participants of the ongoing nature of the cohort. A batch of fifteen letters was sent to those eligible to participate in a semi-structured interview. There was the option for the participant to refuse to participate by contacting the NWAHS study co-ordinator to remove their name from the contact list for this sub-study. Around one week after the letter was sent, the researcher made contact with participants via telephone during a range of times of the day and week between April and May 2008. During the initial phone call the participant gave verbal consent to participate and an appointment time and a meeting place was confirmed.

Participants were given a broad outline of the research and the issues that would be explored during the interview. There were no direct questions to participants about the issue of obesity but instead the focus was on lay perceptions of health and lifestyle, participant's interaction with their social environment, neighbourhoods, social disadvantage, work and family life. Initial questions within the interview were deliberately of an open nature in order to put the interviewee at ease and encourage natural flow of the conversation. A technique known as funnelling was utilised in the schedule design as this is a strategy allowing for conversational development to more sensitive issues (Hay, 2000:58) and a majority of the questions allowed for an open response. In this way the participant could advise about events or opinions in their own words. The methodology of semi-structured interviews sets about to ask a set of questions but also allows the participant to shape the conversation rather than the researcher dictating the direction, and the staging of the questions are dependent on the progress of the interview. Appendix 8 outlines the themes explored as part of the interview schedule.

In total, eight participants agreed to be interviewed and the interviews took around thirty minutes each (Range: 14:43 to 50:54 minutes). The spatial setting of the interview provides other valuable researcher observation and, due to timing and the nature of this cohort, the most appropriate location for the interviewee was taken into consideration. These interviews had varying spatial settings with two interviews undertaken in a public space (i.e. a coffee shop) whereas others were undertaken within the participant's home or workplace. The semi-structured interviews provided the

researcher with an excellent insight by observation of the participant’s relationships in their natural environment.<sup>44</sup>

Interviews were recorded using an Olympus Digital Wave Player® and downloaded using the device software. The researcher directly transcribed recordings after completion of all interviews into Microsoft® Office Word. A coding framework was developed from the interview schedule and recurring themes based on the research conceptual framework. The names of interviewees were masked to ensure the anonymity of participants in presenting this research. The NWAHS interview quotes were used to illuminate results from secondary data analysis. The participant information is outlined for the semi-structured interviews in Table 3.5.

**Table 3.5: Participant information semi-structured interviews, North West Adelaide Health Study (NWAHS), 2008**

Interview No	Code name	Home suburb	Age (S2)	Interview location	Individual SES (Household Income S2)	Individual SES (Highest Education S2)	Area-level SES (SEIFA IRSD S2)
1	Melanie	QUEENSTOWN	29	PORT ADELAIDE work	\$40,000 to \$60,000	Trade/Certificate/Diploma	IRSD 1
2	Suzy	POORAKA	31	POORAKA home	\$40,000 to \$60,000	Secondary	IRSD 3
3	Laura	WYNN VALE	22	GOLDEN GROVE community	\$40,000 to \$60,000	Trade/Certificate/Diploma	IRSD 3
4	Tracey	ELIZABETH DOWNS	28	ELIZABETH DOWNS home	Up to \$20,000	Secondary	IRSD 1
5	Sarah	VALLEY VIEW	24	ADELAIDE work	Over \$60,000	Bachelor degree or higher	IRSD 1
6	Louise	EDWARDSTOWN	30	MARION community	\$40,000 to \$60,000	Secondary	IRSD 3
7	Sandra	LOCKLEYS	32	PORT ADELAIDE work	Over \$60,000	Secondary	IRSD 3
8	Gabby	NORTHFIELD	28	NORWOOD work	\$20,000 to \$40,000	Secondary	IRSD 1

IRSD 1=Most Disadvantaged, IRSD 3= Middle Quintile of disadvantage  
S2= Stage 2 North West Adelaide Health Study (NWAHS)

SOURCE: NWAHS Semi-Structured Interviews and Stage 1 and 2 NWAHS (2004-06)

Additionally, research observation of the interaction between food, leisure and perceptions of obesity were considered in the analyses. It is arguable that researchers who define their own position in relation to their research could be more objective than colleagues who do not reveal the many subjective influences which shape both the research question and the explanations that they find to be true (Hay, 2000:13). Insider observation is an important consideration in undertaking qualitative interviews. The researcher grew up in the northern region of Adelaide and had more knowledge of these suburbs compared to the west or other areas of metropolitan Adelaide. Conversely, the

<sup>44</sup> Such as one participant’s [Suzy’s] child playing in the backyard as we interviewed and her husband „popping in“ to his home office.

researcher had outsider observation of being from a middle class, semi-privileged background and education, a different social class to some of the interviewees.

### 3.5 Analytical techniques

The research will explore descriptive analyses of the secondary and primary data sources outlined within this chapter. Table 3.6 outlines the data sources, themes and analytical techniques undertaken for each corresponding research objective indicating the use of triangulation within this research. Objective 1 was addressed within Chapter 2 providing a conceptual framework for the research and Objective 6 is chiefly addressed within the conclusion (Chapter 9) outlining a number of policy implications for socio-spatial research into obesity. The conceptual framework for obesity research provided an underpinning for the methodologies utilised to meet the six research objectives. Additional data sources SA HOS and ABS NHS were addressed within contextual descriptions of obesity for state, national and study region profiles.

**Table 3.6: Addressing the research objectives, data sources, themes and analytical techniques**

	Chapter	Data sources	Theme areas	Analytical techniques
Objective 2: To investigate attributes of the social environment and the relationship with obesity	Chapter 5	<ul style="list-style-type: none"> <li>North West Adelaide Health (Cohort) Study</li> <li>ABS 2001 Population and Housing Census</li> <li>Metropolitan Accessibility and Remoteness Index of Australia (Metro ARIA)</li> <li>Digital Cadastral Database (DCDB)/Valuations Data</li> </ul>	<ul style="list-style-type: none"> <li>Aggregated Census information by socio-economic status (Education, Income, etc.)</li> <li>Accessibility to Services and Facilities</li> <li>Property Capital Value</li> <li>Movement between Stage 1 and 2 residential address</li> </ul>	<ul style="list-style-type: none"> <li>Descriptive profile</li> <li>Chi-square test</li> <li>Logistic Regression</li> <li>Spatial distribution</li> <li>Kernel density</li> <li>Distance calculations</li> <li>Semi-structured interview comments</li> </ul>
Objective 3: To explore obesity within young adults in relation to ethnicity, lifecourse socio-economic status and mobility	Chapter 6	<ul style="list-style-type: none"> <li>North West Adelaide Health (Cohort) Study</li> <li>ABS 2001 Population and Housing Census</li> </ul>	<ul style="list-style-type: none"> <li>Country of Birth and Year of Arrival in Australia</li> <li>Parents' Country of Birth</li> <li>Parents' Occupational Status as a Child</li> <li>Family History of Diabetes</li> <li>Parents' smoking status as a child</li> <li>Childhood residence</li> </ul>	<ul style="list-style-type: none"> <li>Descriptive profile</li> <li>Chi-square test</li> <li>Logistic Regression</li> <li>Generalised Linear Modelling</li> <li>Semi-structured interview comments</li> </ul>
Objective 4: To discuss the residential perceptions of young adults living in the north-west region of Adelaide in relation to understanding obesity	Chapter 7	<ul style="list-style-type: none"> <li>North West Adelaide Health (Cohort) Study</li> <li>ABS 2001 Population and Housing Census</li> </ul>	<ul style="list-style-type: none"> <li>Choice of neighbourhood</li> <li>Residential mix and segregation</li> <li>Perceptions of current environment</li> <li>Sense of community and 'place'</li> <li>Stigmatised local areas</li> </ul>	<ul style="list-style-type: none"> <li>Descriptive profile</li> <li>Chi-square test</li> <li>Logistic Regression</li> <li>Spatial distribution</li> <li>Getis-Ord (Gi) Statistic</li> <li>Semi-structured interview comments</li> </ul>
Objective 5: To investigate the processes related to lay perceptions of obesity in the context of place	Chapter 8	<ul style="list-style-type: none"> <li>SA Health Omnibus Survey (1994-2004)</li> <li>North West Adelaide Health (Cohort) Study</li> <li>ABS 2001 Population and Housing Census</li> </ul>	<ul style="list-style-type: none"> <li>Change in BMI distribution</li> <li>Media landscapes</li> <li>Perception of weight and health status</li> <li>Embodiment of health</li> <li>Lifestyle stressors</li> <li>Socio-spatial identity</li> </ul>	<ul style="list-style-type: none"> <li>Descriptive profile</li> <li>Chi-square test</li> <li>Chi-square test for trends</li> <li>Logistic Regression</li> <li>Semi-structured interview comments</li> </ul>

SOURCE: Created by Author (2010)

The analytical techniques undertaken within this research are exploratory in their nature and are utilised in combination with the theoretical and conceptual rationale of space in relationship with the increasing prevalence of obesity within this population. The research is unique for this Australian context in the bringing together of these data sources with a common spatial identifier. The disaggregation of data is important to consider and may result in the issue known as the Modifiable Areal Unit Problem (MAUP) and as Plane *et al.* (1994:365) outline:

Spatial disaggregation does not yield benefits if – the quality of the data at finer scales is unreliable or the processes at the finer scale are sufficiently unstable that we have little faith that the underlying assumptions will hold.

There is also the tendency for geographers to fall into the trap known as the ecological fallacy and infer cause-effect relationships between area-based spatial variables and human behaviour (Golledge & Stimson, 1997:6). A major component of this study was the analytical techniques used through spatial joins of NWAHS and environmental data sources based on the common spatial identifier of each NWAHS participant's residential address.

### 3.6 Conclusion

This chapter outlined the methodology, data sources and the techniques to be used in the research. Overall, the „geographies of health“ methodologies provide new insights into tackling multifaceted health problems such as obesity. The research objectives are addressed within four main theme areas; the social environment (Chapter 6); socio-cultural influences (Chapter 7); residential perceptions of local areas (Chapter 8); and lay perspectives on health in the context of place (Chapter 9). Chapter 4 will outline the study region, the north-west region of Adelaide, highlighting some of the historical, socio-cultural and geographical attributes of this area. The chapter will provide an outline of the study participants in comparison to the Census population.

## CHAPTER 4

### THE STUDY AREA: The north-west region of Adelaide, South Australia

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I'm happy to participate and help other northern suburbs [people] – I enjoy doing it, it is easy to do. If it can help lift this whole area then it's a good thing.

It [NWAHS] hopefully helps people in the northern districts who are probably at a disadvantage; it is a hard knocks area.

*Quotes from NWAHS participants, telephone follow-up interview, 2007*

#### 4.1 Introduction

The northern and western regions of Adelaide can be described as separate and distinctive spatial landscapes and this chapter presents the physical location, including the geography, history and culture of these regions. Additionally, outlined are socio-demographic, individual socio-economic and country of birth characteristics of the North West Adelaide Health Study (NWAHS) participants making comparisons to Census information from Adelaide and South Australia (SA). Furthermore, a description of obesity prevalence within the NWAHS is profiled, including the incidence of obesity for the young adult cohort over two waves of data collection.

#### 4.2 Background to the study region

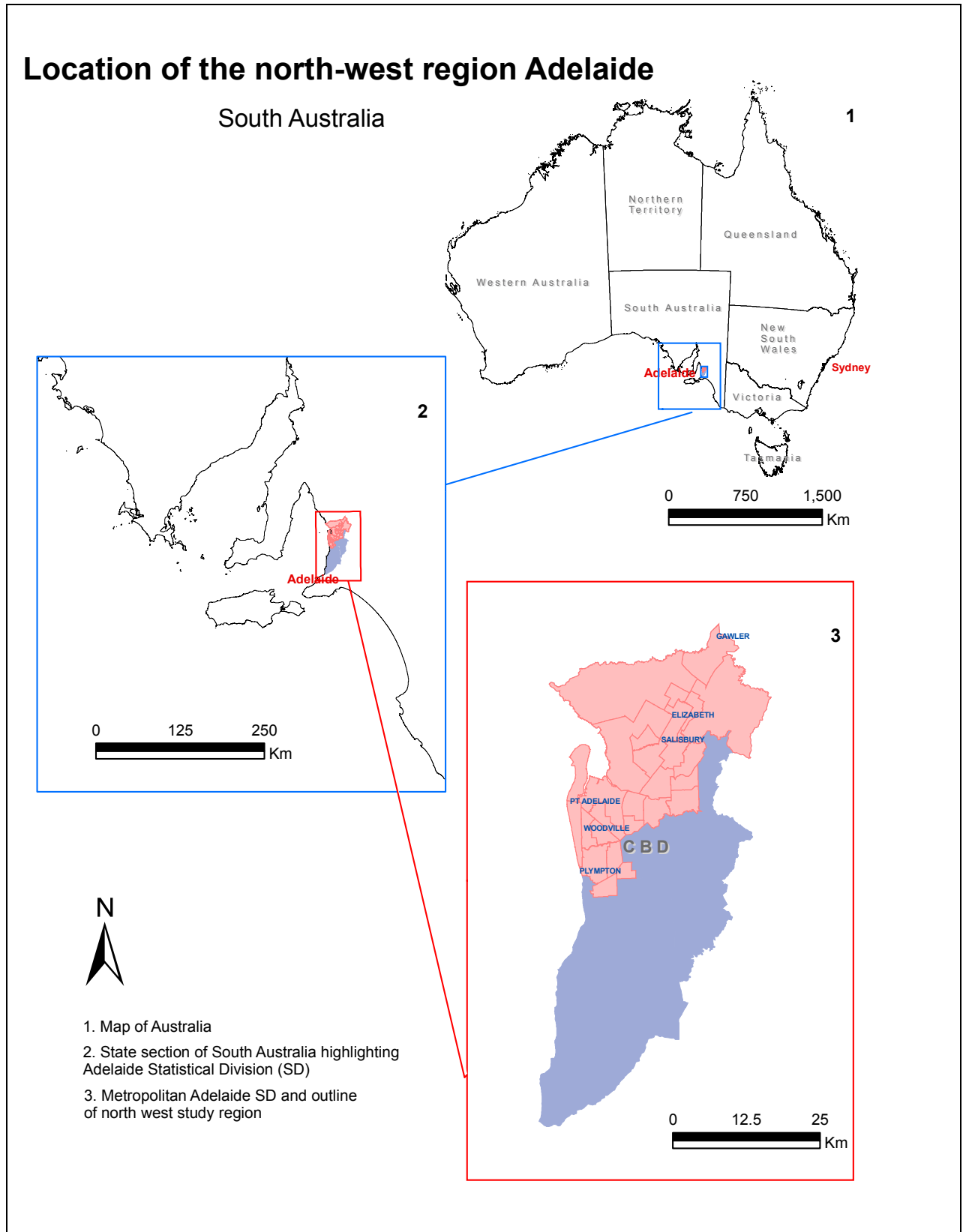
The early beginnings of Adelaide were extremely well thought out as the result of planning by Colonel William Light (Gibbs, 1990:28). The urban sprawl stretches from the north to the south nearly 100 kilometres providing a distinctive spatial layout for a population of around 1.1 million persons, equating to three quarters of the South Australian (SA) population living in the metropolitan region (ABS, 2008b). Metropolitan Adelaide is also a narrow stretch of 30 kilometres east to west with the western suburbs bounded by coastline. The geographical nature of Adelaide, that is the size and distribution of the population, provides challenges in the accessibility to services and resources. In 2001, there were 407,271 persons living in the north-west study area, around 36 percent of the total population within metropolitan region of Adelaide.<sup>45</sup> Figure 4.1 shows the location of the north-west region in relation to metropolitan Adelaide and South Australia.

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<sup>45</sup> Australian Bureau of Statistics (ABS) 2001 Census figures were utilised as a match to NWAHS information at Stage 1 (1999-2003).



**Figure 4.1: Map of the Australia, South Australia and metropolitan Adelaide highlighting the north-west study region**



\*CBD – Central Business District of Adelaide

SOURCE: Compiled from Australian Bureau of Statistics (ABS) 2001 Census Boundaries

As a state, SA has a diverse landscape due to its sheer size and much of the area experiences a Mediterranean climate with mild wet winters and hot dry summers. Adelaide has an annual rainfall of around 558 millimetres, and the state is one of the driest being comprised of 60 percent desert. Adelaide’s average maximum and minimum temperatures for January are 31.9 °C and 19.9 °C, and for July 15.3 °C and 7.5 °C (ABS, 2007). In terms of promoting healthy weight and physical activity, the climate within metropolitan Adelaide is one that favours outdoor activity with reasonable temperatures throughout the year, and only a few weeks a year that experience extreme hot and dry, or wet and cold conditions.

In the early days colonial settlements relied on agricultural and mining expansion in the areas around Adelaide. After 1914, the government realised they relied too heavily on primary production and set about encouraging greater industrialisation (Kwan, 1987). There were post-war industrialisation in a number of regions in the state with expansion into manufacturing and ammunition works. The state still has rich mineral resources particularly in the far north at Olympic Dam (Roxby Downs) and Moomba (Baker, 1998), providing a strong foundation for employment and economic benefit. The north-west region social history highlights a few important phases that were instrumental in the development of the current social environment (outlined in Figure 4.2).

**Figure 4.2: Schematic representation of important social history in the north-west region**



SOURCE: Created by Author (2010)

These phases include government policy, industrial expansion and the significant world events of The Great Depression and World Wars. The South Australian Housing Trust (SAHT) was formulated after The Depression as there was a housing and building shortage. The first public housing was completed in 1938 at Rosewater, immediately north of Woodville and at Croydon Park to the south (Marsden, 1977).

#### 4.2.1 The western suburbs

In December 1836, Colonel William Light wrote of the western suburbs plains:

Having traversed over nearly six miles of a beautiful flat, I arrived at the river [Torrens] and saw from this continuation of the same plain... to the foot of the hills under Mount Lofty, affording an immense plain of level and advantageous ground for occupation.

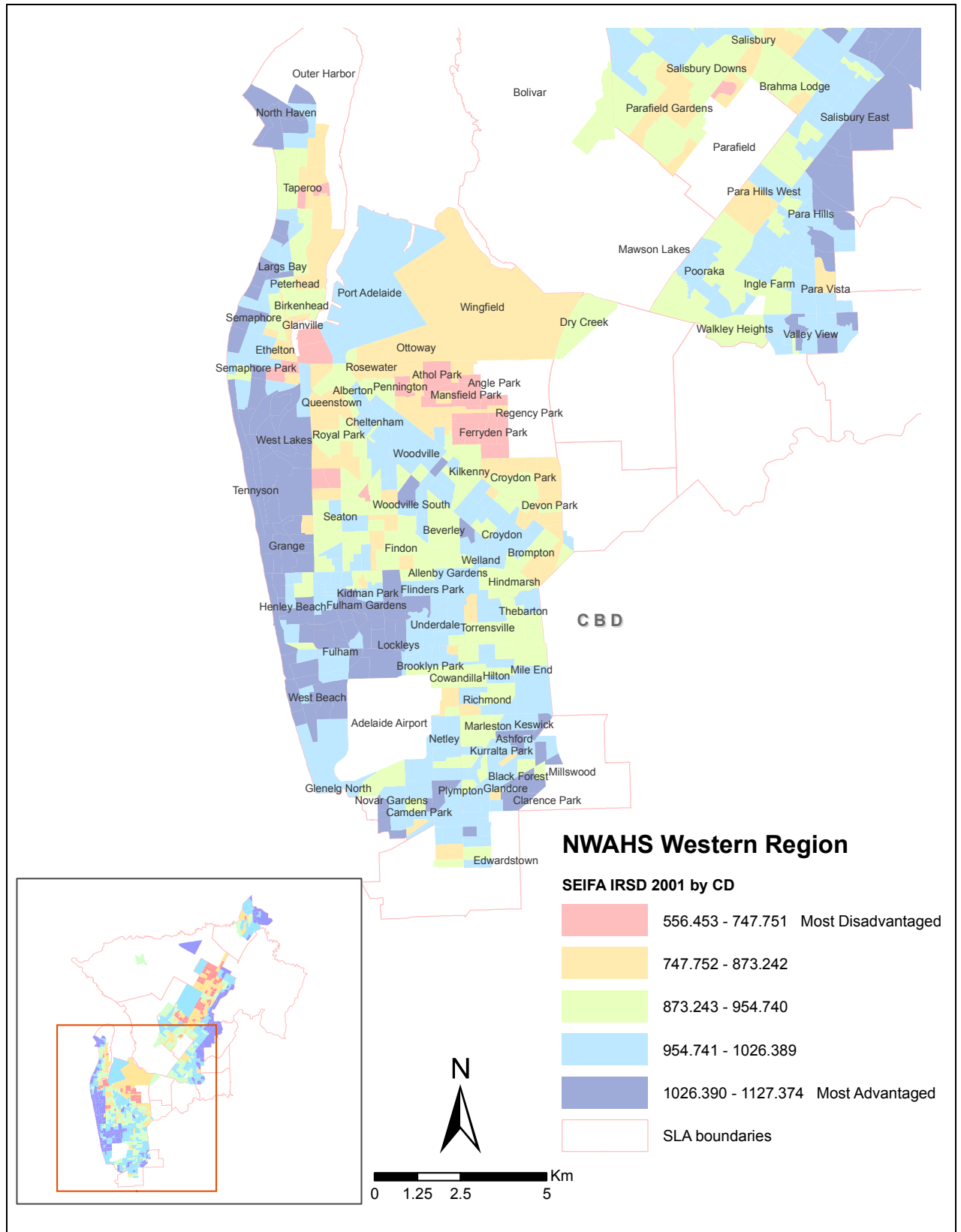
(Marsden, 1977:1)

The area of Port Adelaide dates back to the establishment of the colony and is steeped in history of „wharfies“ and the shipping industry (Lumbers, 1956). Although the Port Reach provided the best landing place for the ships entering SA, the landscape of saltwater swamp did not provide an ideal location for planning a city such as Adelaide. The western suburbs originally sprawled along the stretch between the Port where the ships landed and the original development of the City of Adelaide further along „the six miles of beautiful flat“. The first main road constructed in SA was Port Road (Marsden, 1977:1) which linked the Port and a number of small villages to Adelaide. In reference to one of the original villages Woodville, Marsden (1977:237) outlines:

It is a community based not only on family and friendship but on locality. Usually these were one and the same; people knew their neighbours well. When the war came, people moved away, including the sons and daughters of the old families.

The north-west region of Adelaide has been described as having substantial areas that are disadvantaged (Glover *et al.*, 2006; Newman *et al.*, 2007). Figure 4.3 details area-level disadvantage within the western suburbs, including Port Adelaide and Woodville. The map also highlights the variation in area-level socio-economic status across the region using the Socio Economic Index for Areas, Index of Relative Socioeconomic Disadvantage (SEIFA IRSD). The areas highlighted in red are more disadvantaged and those in blue are more advantaged.

**Figure 4.3: Map of the western area of the north-west study region by suburb and area-level disadvantage (SEIFA IRSD), 2001 Australian Census**



SOURCE: Compiled from Australian Bureau of Statistics (ABS) 2001 Census and SEIFA IRSD by Collection District (CD) level

There was expansion of industry to the west of Adelaide with the founding of the Woodville plant of General Motors Holden (GMH) (Marsden, 1977:156) and after World War Two, major munitions works were built in the Woodville region at Hendon and Finsbury. By 1954 the areas of Hindmarsh, Woodville and Port Adelaide held 47 percent of the total industrial land in metropolitan Adelaide (Marsden, 1977:247). These early beginnings saw the settlement of blue-collar working class families and the workforce today represents around 17 percent of the population within manufacturing, industry or construction (ABS, 2006c). Although a rejuvenation project has begun within the Port district to expand housing development and local facilities, the area still maintains its historical atmosphere. The western suburbs now present a diverse range of ethnicities, cultures and socio-economic backgrounds.

#### 4.2.2 The northern suburbs

Until 1845 the Para Plains remained an empty passageway to Gawler and beyond (Lewis, 1980:17). The settlement in the northern suburbs dates back to the 1850's with the most significant expansion occurring post-Second World War with immigrants arriving mainly from the United Kingdom (UK). The SAHT, under the leadership of Premier Thomas Playford<sup>46</sup>, initiated the development of a satellite community north of Adelaide known as Elizabeth. The Playford government also gave incentive for industry to be set up within this region as there would be a growing population that was going to need a place to work. Over time, industries such as clothing, defence, the Edinburgh Royal Australian Air Force (RAAF) Base, automotive and component manufacturing, in particular GMH, have developed within the northern suburbs. As Winter and Bryson (1998:61) argue it is the construction of the "Holdenist suburbia"<sup>47</sup> that "sowed the seeds of urban poverty" and provided a basis for housing those that were disadvantaged:

Housing recent migrants and families from neighbourhoods that had fallen under the slum clearance programs, Holdenist suburbs were and have remained overwhelmingly working class.

(Winter & Bryson, 1998:65)

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<sup>46</sup> The region is now the City of Playford named after the original founder Sir Thomas Playford, Premier of South Australia 1938 to 1965.

<sup>47</sup> A Holdenist suburb is described by Winter & Bryson (1998:60) "after Australia's first locally manufactured car, the Holden. The Holden like these suburbs, was a product of the particular conjuncture of capital-state relations that prevailed during the 1950s & 1960s".

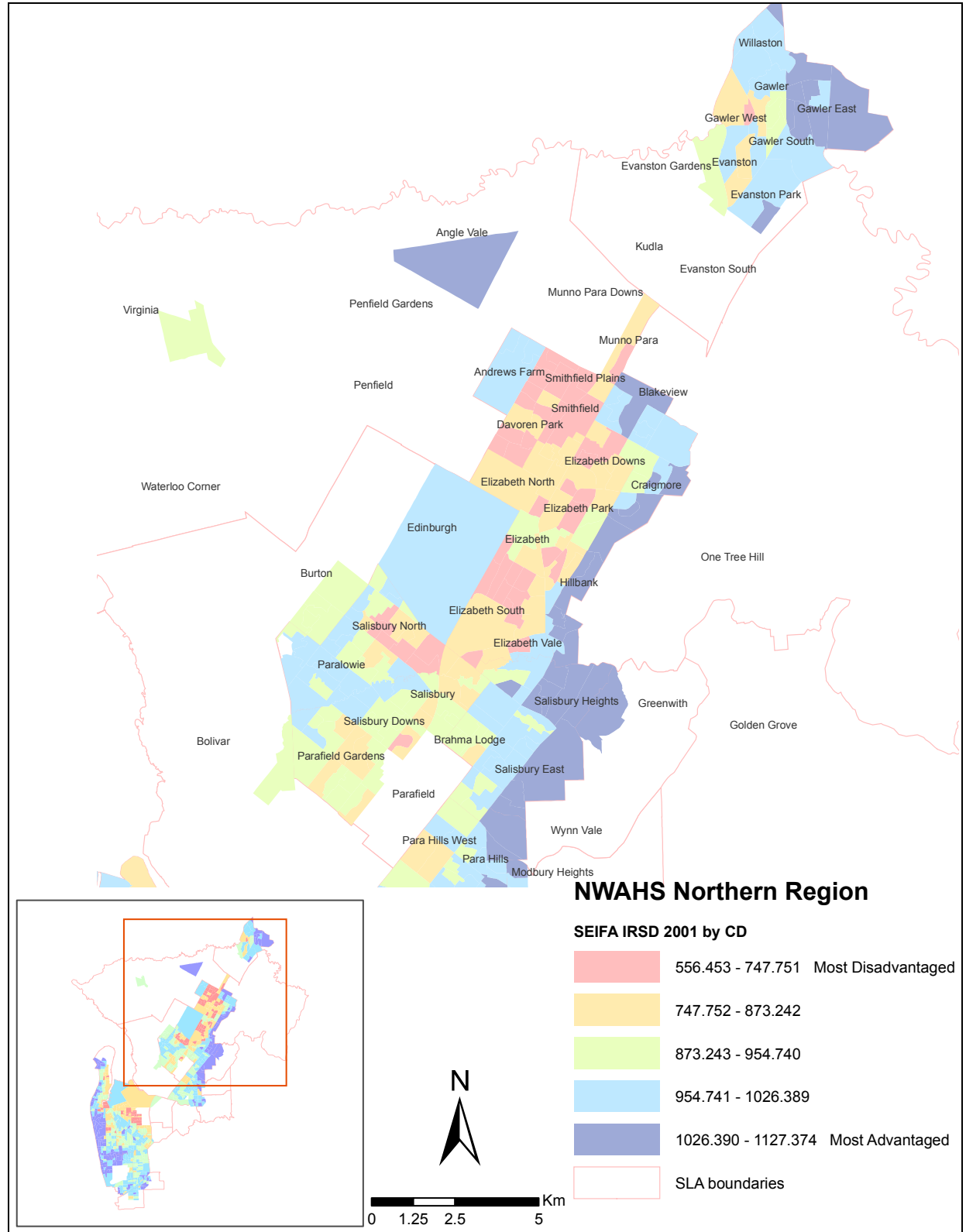
The City of Salisbury is located around 20 kilometres north of Adelaide and like the post-war settlement within Elizabeth, many of the newcomers to Salisbury originated from the UK, but there were also many displaced persons and others from European countries, notably Italy, Greece, and Poland (Lewis, 1980:261). The Second World War was a beginning of a new era for Salisbury with the development in the 1940's of a munitions programme and the start of a hive of industry at Penfield, employing locals and many of the immigrants (ibid, 1980:205). The influx of people into the area saw housing known as „cabin homes“ constructed in Salisbury North. The migrants were not prepared for the basic facilities that faced them as there were no shops, drainage, sealed roads, mail delivery, street lighting or rubbish removal for several years (Migration Museum, 1995). The planning and development of the new housing estate was entrusted to the SAHT and the region known as Salisbury North became “a legacy of neglect [and] a heartache for years to come” (Lewis, 1980:212). Today, there has been the development of housing and industry at Mawson Lakes providing a hub of defence, technology and electrical industry within the region.

The suburb of Gawler, around 40 kilometres to the north of Adelaide, was also planned by Colonel William Light as the country town to Adelaide. The town emerged as the last stop over with one day's travel left to the city on horse and buggy and Gawler fulfilled Light's vision of a town acting as the gateway to districts beyond (Gibbs, 1990:55). The current marketing motto of *The Best of Town and Country* depicts the changing nature of urban-rural sprawl within SA. The region has a growing housing market and employment opportunities exist within surrounding areas in agriculture and industry, all within commuting distance to the Central Business District (CBD) of Adelaide.

Figure 4.4 details the suburbs and geographical local areas for the northern aspect of the study region. A number of urban centres are contained within the northern region including Elizabeth, Munno Para, Salisbury and Gawler. The map also highlights the variation in SEIFA IRSD indicating a number of clusters of disadvantage located within the northern region, particularly within the suburbs of Elizabeth and Salisbury. These urban centres have been reported within Social Health Atlases of SA as experiencing area-level disadvantage across a number of factors, including a low proportion of

residents with a „Bachelor degree or higher“ and low household income (Glover *et al.*, 2006).

**Figure 4.4: Map of the northern area of the north-west study region by suburb and area-level disadvantage (SEIFA IRSD), 2001 Australian Census**



SOURCE: Compiled from Australian Bureau of Statistics (ABS) 2001 Census and SEIFA IRSD by Collection District (CD) level

### 4.3 The North West Adelaide Health Study (NWAHS)

The previous chapter discussed the NWAHS methodology and study design. Grant *et al.*, (2005a) have outlined the NWAHS cohort socio-demographic and biomedical results for Stage 1 showing that 51 percent were female, 38 percent aged over 50 years, 70.6 percent were born in Australia, and 28 percent were biomedically measured as obese. These analyses provide a platform to understanding more about the complex socio-spatial relationships that exist within the north-west study region. Taylor *et al.*, (2006a) investigated the baseline participation of this cohort reporting that people with risky behaviours are represented in the same proportions as people without these risk factors. This study investigated a range of biomedical and socio-demographic factors comparing the NWAHS population against a population based survey, the South Australian Surveillance and Monitoring System (SAMSS). This research outlined the profile of age groups, sex, area of residence and area-level disadvantage<sup>48</sup> for the NWAHS population and the study region Census population. A range of tables within this section extend the analyses of Taylor *et al.*, (2006a) to consider the entire metropolitan<sup>49</sup> region and state of SA using the NWAHS population and Census data. Furthermore, analysis includes a broader range of socio-demographic variables to include household income, work status and country of birth.

#### *Socio-demographics*

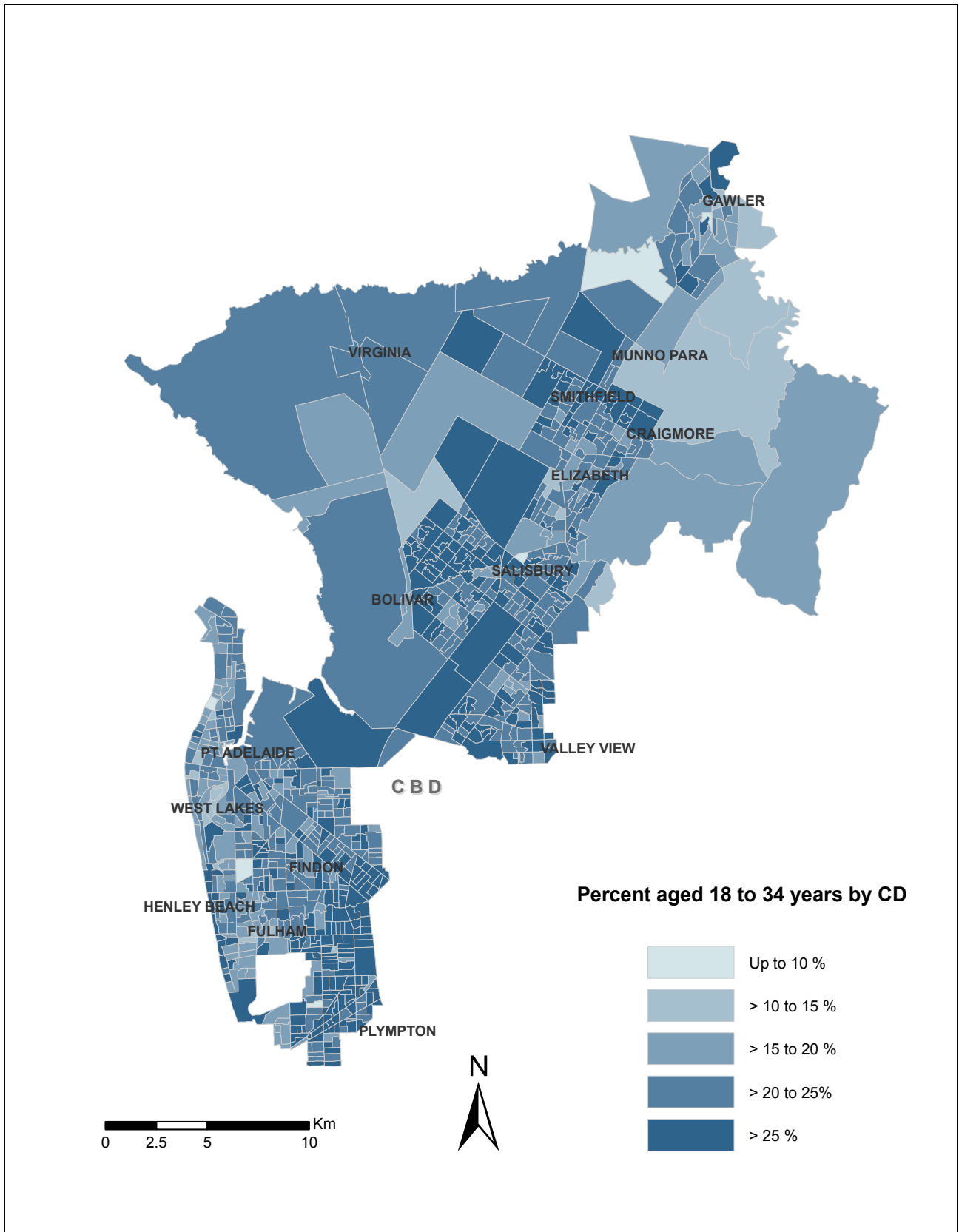
Figure 4.5 shows the distribution of young adults (18-34 years) as a percentage of the total population for the region, indicating a number of areas with a high proportion of young adults. Table 4.1 outlines gender, age groups and Indigenous status for the north-west study region. The unweighted study population recruited more people aged 35 years and older into the study compared with the younger persons (those under 35 years). The north-west region has a slightly younger population with 31.7 percent of the population within the younger cohort (18-34 years) compared to 30.8 percent for the entire metropolitan region. The study sample supports the evidence that population health surveys are more likely to sample an older population (Nelson *et al.*, 1998). The study region also has slightly more males and fewer females compared with the Census population for the entire metropolitan region.

<sup>48</sup> As measured by Socio-Economic Indexes for Areas Index of Relative Socio-Economic Disadvantage (SEIFA IRSD).

<sup>49</sup> Metropolitan region includes the north-west region of Adelaide.



**Figure 4.5: Distribution of the young adult cohort (18-34 years) as a percentage of the total population by Collection District (CD), north-west region of Adelaide, 2001 Australian Census**



SOURCE: Compiled from Australian Bureau of Statistics (ABS), 2001 Census of Population and Housing

**Table 4.1: Demographic comparison of Stage 1 North West Adelaide Health Study (NWAHS) participants to study region, metropolitan Adelaide and South Australia, 2001 Australian Census**

<i>Socio-demographics</i>	2001 Census north-west Adelaide %	2001 Census Metropolitan Adelaide %	2001 Census South Australia %	NWAHS Stage 1 (weighted*) %	NWAHS Stage 1 (unweighted) %
<i>Gender</i>					
Male	49.2	48.7	49.7	49.0	47.6
Female	50.8	51.3	50.3	51.0	52.4
<i>Age group</i>					
18-24	12.4	12.6	11.8	15.3	5.2
25-34	19.3	18.2	17.9	19.5	13.4
35-44	20.1	19.7	20.0	19.2	21.1
45-54	17.2	18.3	18.5	16.1	20.0
55-64	12.0	12.2	12.8	11.6	17.8
65-74	10.1	9.6	9.8	10.1	13.7
75+	8.9	9.4	9.2	8.3	8.8
ATSI**	1.5	1.0	2.1	0.5	0.5

\* NWAHS data calculated using weighted data (WtInc) \*\*ATSI – Aboriginal or Torres Strait Islander (total population)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

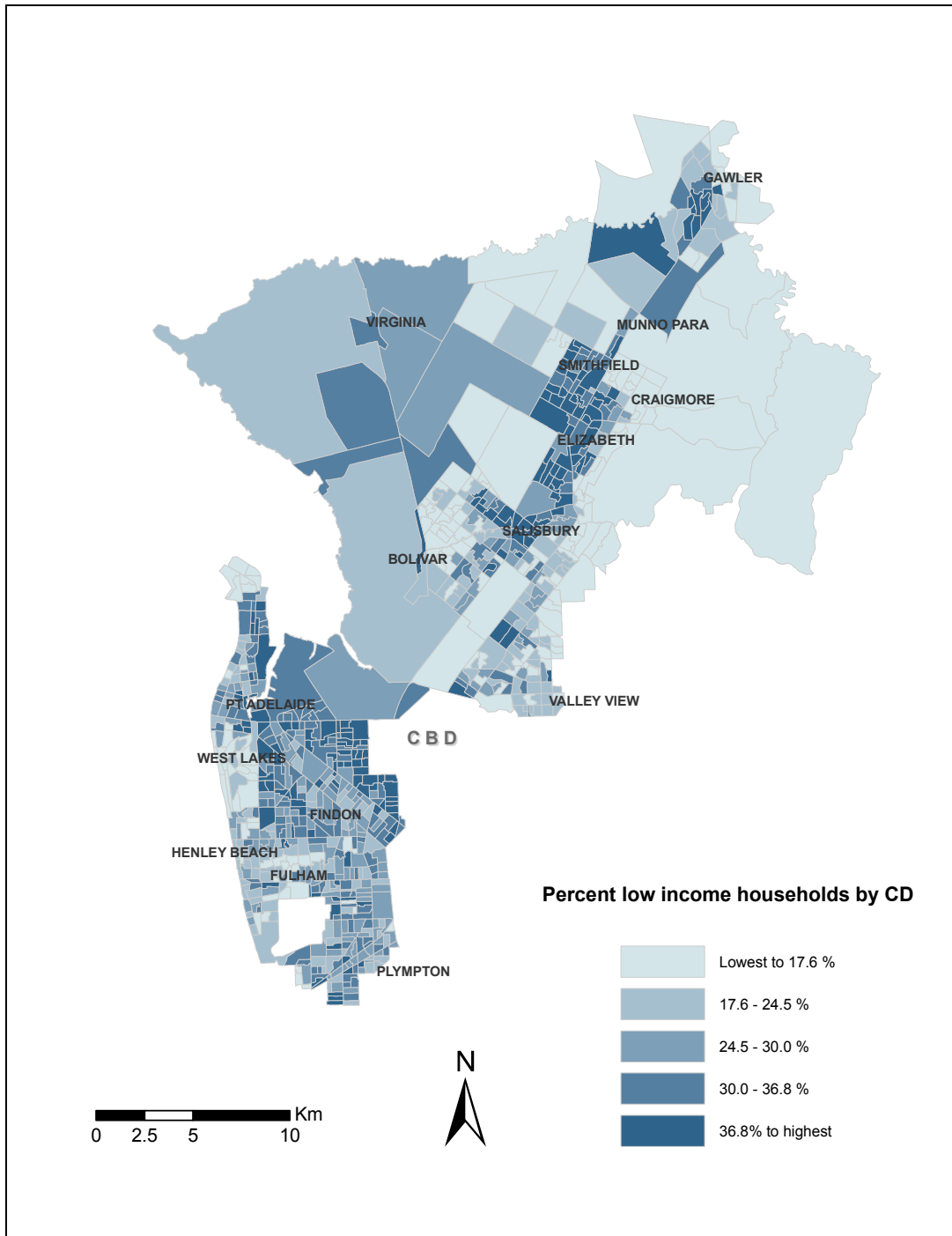
Australia has a short history with respect to European settlement; however the traditional land owners, the Aboriginal peoples, are considered one of the oldest living cultures dating back 50,000 years (Gibbs, 1990:2). A report on the health and welfare of the Australia's Aboriginal and Torres Strait Islander (ATSI) population found that Indigenous women were around one and half times more likely than non-Indigenous women to be overweight or obese (ABS & AIHW, 2003). Within the north-west region there are reported to be 8,162 persons of ATSI origin (CData, 2001).<sup>50</sup> The NWAHS ATSI population was 0.5 percent (18 years and over) of the overall sample compared to 1.5 percent for the total ATSI Census population within the north-west region. At NWAHS baseline there were 20 participants of ATSI origin and therefore, this research is unable to make any conclusions about obesity in this population. However, the author acknowledges this is an important sub-population, especially for socio-spatial research. The ATSI population is a disadvantaged minority group with a lower life expectancy at birth and also have lower education and income levels compared to the non-Indigenous population (ABS & AIHW, 2003). Land is fundamental to the existence of these peoples and they believed that they held the land in trust from *The Dreaming* that had created it - they belonged to the land as much as it belonged to them.

<sup>50</sup> The following definition, commonly known as 'The Commonwealth Definition', was given in a High Court judgement in the case of *Commonwealth v Tasmania* (1983) 46 ALR 625. "An Aboriginal or Torres Strait Islander is a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community in which he or she lives" (ABS, 1999a).

*Individual socio-economic status*

As previously indicated, the north-west region contains some of the most disadvantaged local areas in SA, although there are individuals of both high and low socio-economic status living in the region, as displayed in the spatial distribution of household income for the study region (Figure 4.6).

**Figure 4.6: Distribution of low income households by Collection District (CD), the north-west region of Adelaide, 2001 Australian Census**



\* Quintile distribution of percent low income household "Less than \$400 per week"

SOURCE: Compiled from Australian Bureau of Statistics (ABS), 2001 Census of Population and Housing

Table 4.2 shows a demographic comparison of self-reported household income for the NWAHS population and Census data. Within NWAHS, 22.4 percent (weighted) and 29.6 percent (unweighted) reported a low household income. The north-west region has a higher proportion of low income (17.4 percent) households compared to the metropolitan region (14.7 percent) and SA (15.4 percent).

**Table 4.2: Household income comparison of Stage 1 North West Adelaide Health Study (NWAHS) participants to study region, metropolitan Adelaide and South Australia, 2001 Australian Census**

Household Income	2001 Census north-west Adelaide %	2001 Census metropolitan Adelaide %	2001 Census South Australia %	NWAHS Stage 1 (weighted*) %	NWAHS Stage 1 (unweighted) %
Low income	17.3	14.7	15.4	22.4	29.6
Medium Low income	28.4	26.6	27.0	24.8	25.3
Medium High income	17.2	17.7	17.5	22.2	19.8
High income	17.8	22.5	21.1	24.4	19.7
Not stated	19.3	18.6	19.0	6.2	5.5

\*NWAHS data calculated using weighted data (wtclnc)

Low income – NWAHS: „Up to \$20,000“ and ABS Census: „Up to \$400 per week“, Medium low income – NWAHS - \$20,001 to \$40,000 per year and ABS Census: „\$401 to \$800 per week“, Medium High income – NWAHS: „\$40,001 to \$60,000 per year“ and ABS Census „\$801 to \$1200 per week“, High income – NWAHS: „More than \$60,001 per year“ and ABS Census: „More than \$1201 per week“

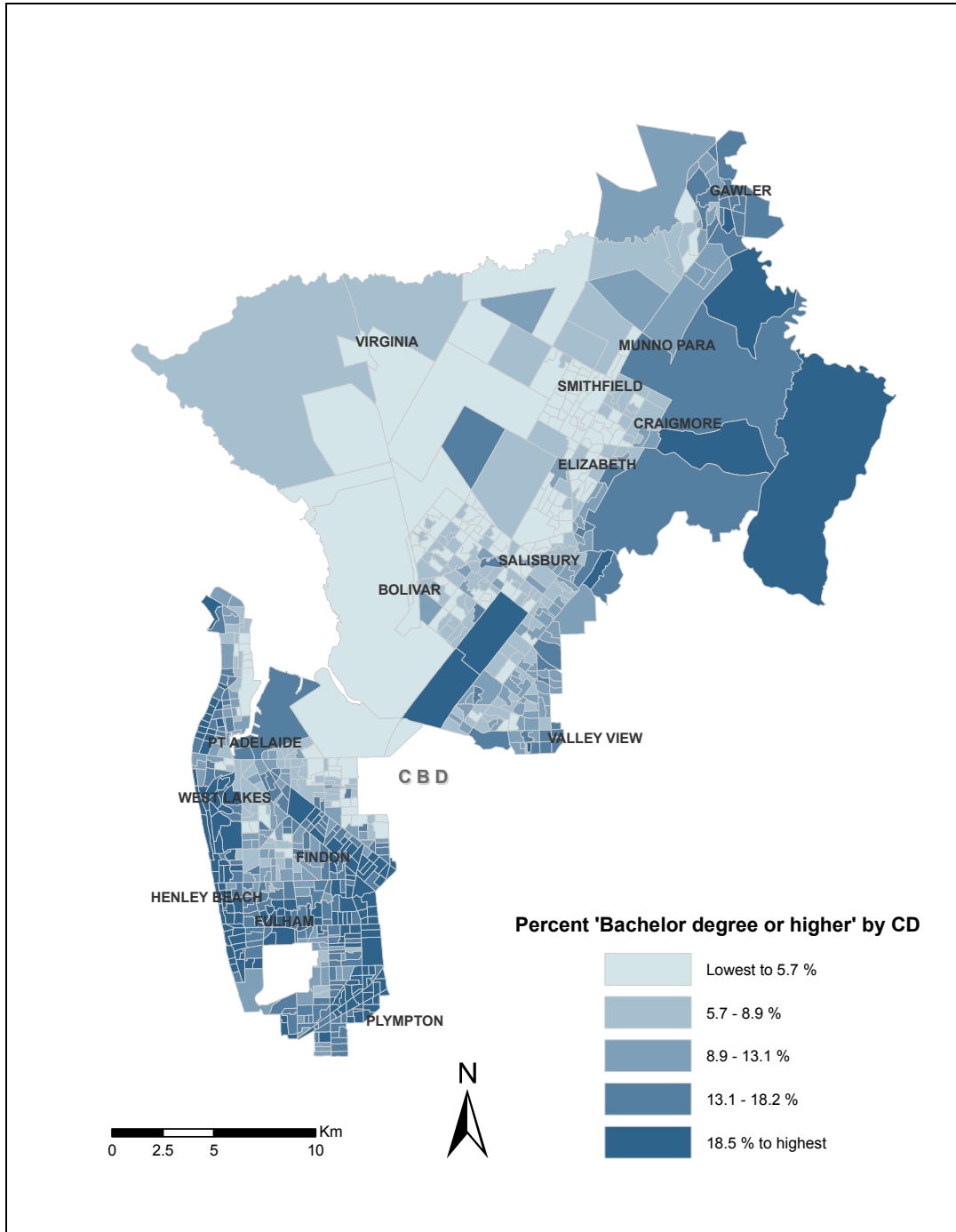
SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

The unweighted data is a closer match to the household income distribution for the NWAHS population and the gradient that exists between low and high income households for the north-west region. The adjustment for age and gender does not counter balance the socio-economic differences within this area. In a region such as the north-west of Adelaide, the socio-economic differentials are important in understanding the complexities of chronic conditions over the lifecourse. In light of these findings, Taylor *et al.* (2006a) did report that there were consistent results for those living in each of the quintiles of SEIFA IRSD. These analyses were undertaken at the Postcode level and, at a later point, a comparison will be made for area-level socio-economic status at different spatial scales (Chapter 5).

The spatial distribution of those with a „Bachelor degree or higher“ is shown in Figure 4.7, indicating low levels of tertiary education across a large sector of the north-west region of Adelaide. The main campuses of the University of South Australia (UniSA) and The University of Adelaide are found in the CBD, accessible via public transport from the northern and western suburbs. Flinders University is located south of the city and many people access this campus from the north-west region as an option for tertiary education. There are five Technical and Further Education (TAFE) SA institutions

within the study region that provide an opportunity for vocational education and practical work experience within the community.<sup>51</sup>

**Figure 4.7: Distribution of 'Bachelor degree or higher' by Collection District (CD), the north-west region of Adelaide, 2001 Australian Census**



\* Quintile distribution of percent "Bachelor degree or higher"

SOURCE: Compiled from Australian Bureau of Statistics (ABS) 2001 Population and Housing Census

<sup>51</sup> A campus of the University of South Australia with a focus on education studies was located until 1994 at Salisbury and only recently has been developed as a housing estate. The development of Mawson Lakes as a technology hub in the north has seen the relocation of a UniSA campus to major in computer and engineering studies. The University of Adelaide, Roseworthy campus, is around ten minutes north of Gawler in the northern part of the study region and has a focus on agricultural research.

The level of education is an indicator of socio-economic status and the NWAHS provides an opportunity to explore variables such as these in more depth in relation to other socio-economic factors. Table 4.3 shows a demographic comparison for the study region and NWAHS population for educational status. There were 43.2 percent (weighted) of those in the NWAHS whose highest level of education was secondary (or high school) in comparison to 62.3 percent in the north-west Census population. The study region has a low proportion (12.1 percent) of residents with a „Bachelor degree or higher“. This is 3.6 percent lower than the entire metropolitan Adelaide.

**Table 4.3: Highest level of education comparison of Stage 1 North West Adelaide Health Study (NWAHS) participants to study region, metropolitan Adelaide and South Australia, 2001 Australian Census**

Highest Level of Education	2001 Census north-west Adelaide %	2001 Census metropolitan Adelaide %	2001 Census South Australia %	NWAHS Stage 1 (weighted*) %	NWAHS Stage 1 (unweighted) %
Secondary	62.3	56.5	59.7	43.2	43.3
Trade/Apprentice	15.8	18.0	14.4	40.4	41.5
Bachelor Degree or higher	12.1	15.7	15.9	11.6	11.6
Other	9.9	9.8	10.1	4.8	3.7

\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

The employment and marital status comparison of study region and the study populations is shown in Table 4.4.

**Table 4.4: Employment and marital status comparison of Stage 1 North West Adelaide Health Study (NWAHS) participants to study region, metropolitan Adelaide and South Australia, 2001 Australian Census**

	2001 Census north-west Adelaide %	2001 Census metropolitan Adelaide %	2001 Census South Australia %	NWAHS Stage 1 (weighted*) %	NWAHS Stage 1 (unweighted) %
<b>Employment Status**</b>					
Full time employed	55.2	57.4	59.0	63.0	63.1
Part time / Casual	31.1	32.3	32.0	29.8	30.4
Unemployed	11.0	7.9	7.4	7.1	6.5
<b>Marital Status</b>					
Married or living with partner	48.3	49.7	51.3	62.1	60.6
Separated or Divorced	12.5	11.4	11.1	8.1	14.2
Widowed	7.2	7.5	6.7	5.7	9.3
Never Married	32.0	31.2	30.4	23.2	15.2

\*NWAHS data calculated using weighted data (Wtclnc)

\*\*For comparison of data sources only those currently in the labour force were utilised. NWAHS data also includes those retired, home duties and student classifications.

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

A comparison of those that were full-time employed within the study population indicated that there was a slightly higher proportion within the NWAHS sample (63.0 percent) compared to the north-west Census population (55.2 percent). There were 4.5 percent (unweighted) fewer unemployed persons in the study population and this finding could be a reflection on the characteristics of persons who undertake health studies and civic participation.

There were more people that were „married or living with a partner“ that participated within NWAHS and lower proportions of „separated or divorced“. There are higher proportions of those „separated or divorced“ living in the study region (12.5 percent) in comparison to metropolitan region (11.4 percent) and SA (11.1 percent). The occupational status of NWAHS participants at Stage 1 saw the highest proportion classified as „Intermediate Clerical, Sales and Service Workers“ (21.4 percent) followed by „Tradespersons and Related Workers“ (14.4 percent). The proportions of occupation groups for the Australian labour force indicated a slightly different profile for the entire population with fewer „Managers and Administrators“ and „Professional“ persons. Future research would need to consider sampling based on workforce, employment and occupational sub-populations to fully capture the socio-spatial landscape.

#### *Country of Birth*

Table 4.5 shows a comparison of the study region and NWAHS population for the origin countries of birth.

**Table 4.5: Country of birth comparison of Stage 1 North West Adelaide Health Study (NWAHS) participants to study region, metropolitan Adelaide and South Australia, 2001 Australian Census**

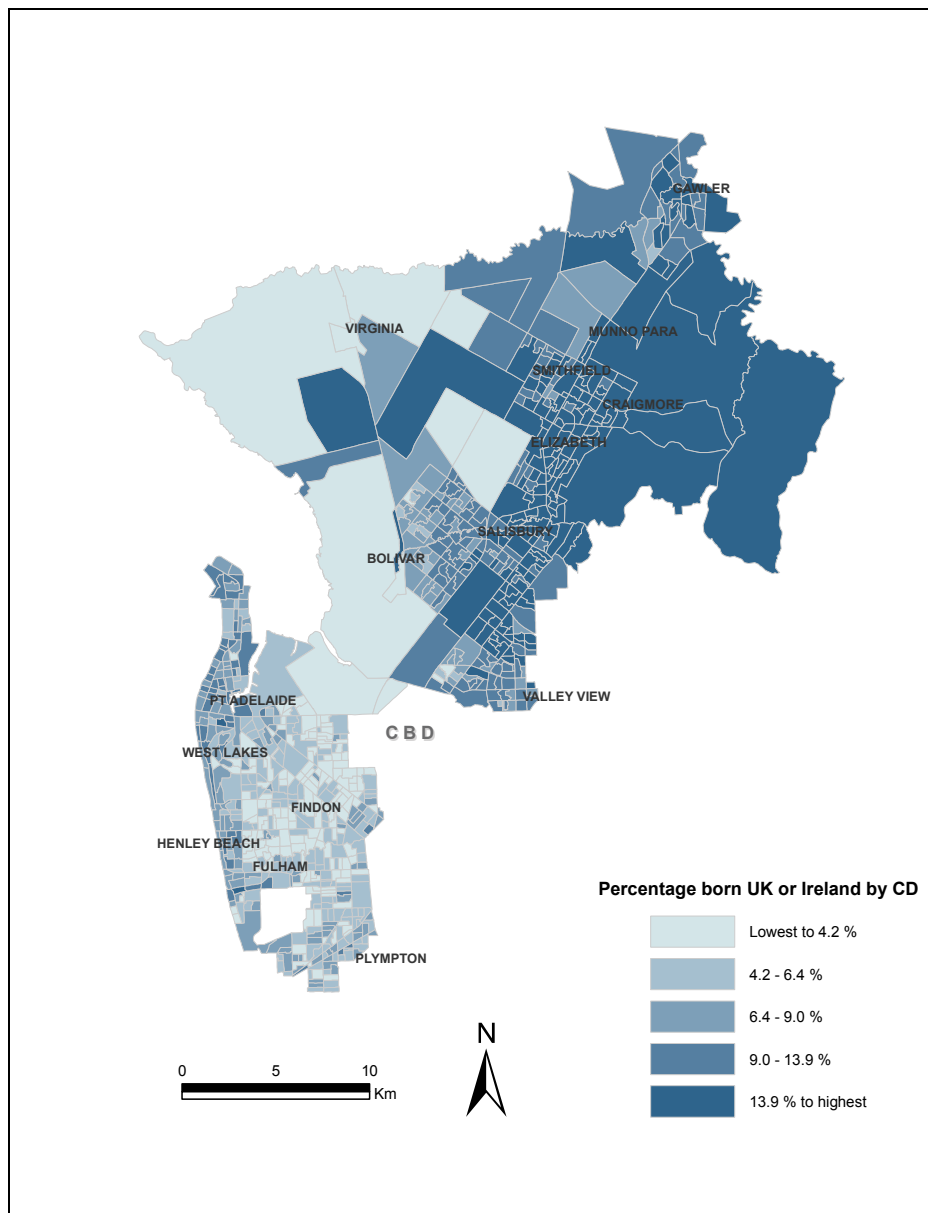
<i>Country of Birth</i>	2001 Census north-west Adelaide %	2001 Census metropolitan Adelaide %	2001 Census South Australia %	NWAHS Stage 1 (weighted*) %	NWAHS Stage 1 (unweighted) %
Australia	69.8	71.7	77.7	70.7	68.5
UK or Ireland	9.1	9.6	7.9	15.8	17.2
SE Europe	4.4	1.9	1.7	6.0	6.8
NW Europe	1.7	5.9	3.7	2.4	3.1
Asia	4.4	3.5	2.1	2.9	2.1
Other	2.2	2.6	2.0	1.7	1.8
Not Stated	4.5	4.2	4.4	0.6	0.5

\*Calculated using weighted data (WtCinc)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

The NWAHS cohort profile (using weighted data) underestimates the „Asia“ (2 percent) and „Other“ (0.5 percent) populations using Census data for the same study region. There is an over representation of those born in Australia (0.9 percent), „UK or Ireland“ (6.7 percent) and „Europe“ (2.3 percent). The NWAHS cohort is a mainly „Anglo-Australian“ population; however, in the case of this research the population provides a suitable initial sub-group to explore socio-cultural factors in relation to health outcomes. The unique migration history and the satellite settlement of Elizabeth within the northern region displays a spatial cluster of high proportions of persons born in the „UK or Ireland“ and low levels of minority populations (Figure 4.8).

**Figure 4.8: Distribution of ‘United Kingdom or Ireland’ born by Collection District (CD), the north-west region of Adelaide, 2001 Australian Census**

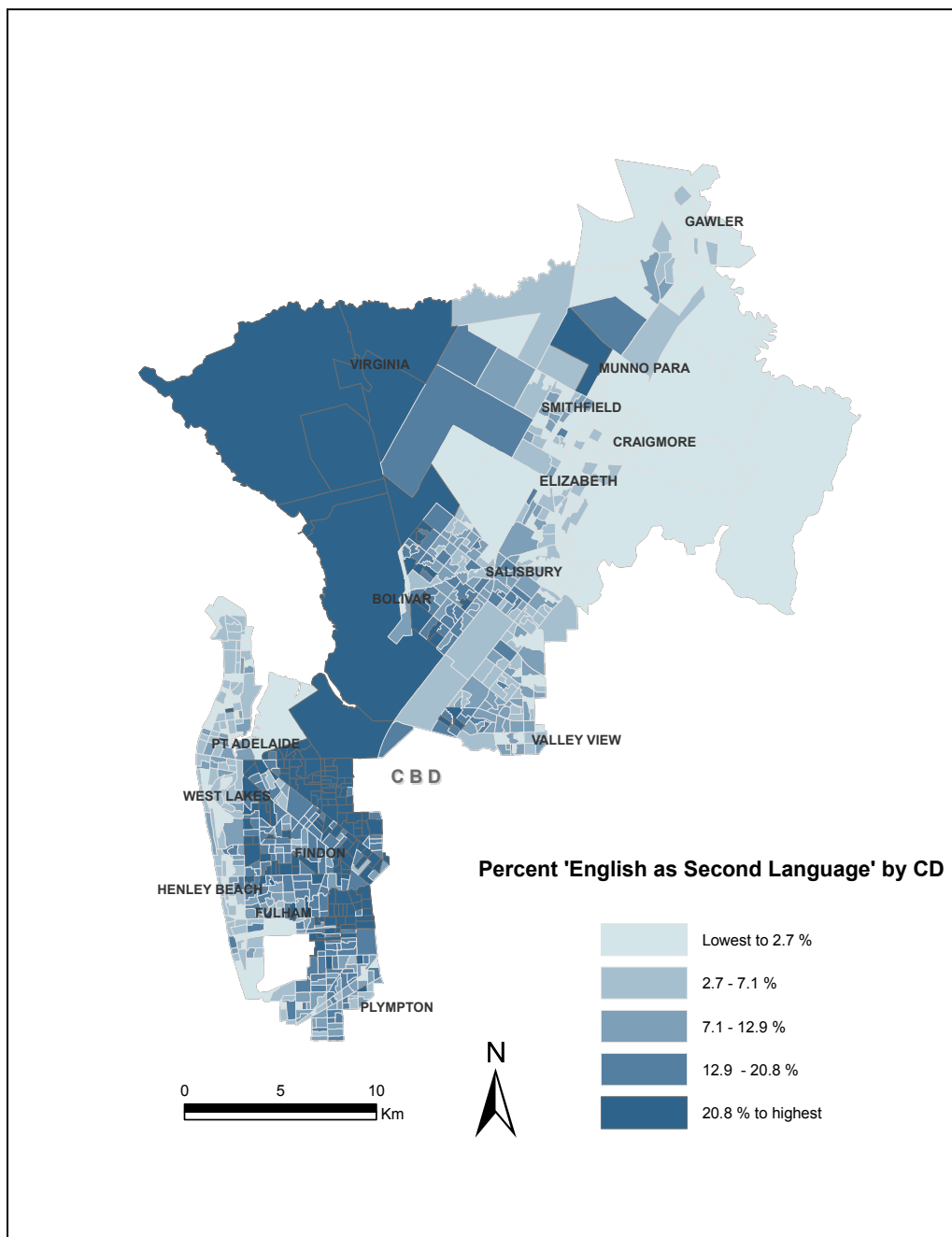


SOURCE: Compiled from Australian Bureau of Statistics (ABS) 2001 Population and Housing Census



Conversely, Figure 4.9 shows that there are differing patterns of those persons with poor English proficiency, as defined by speaking English „not well“ or „not at all“. The settlement patterns of different migration groups are apparent in SA and in particular in the north-west region there are a number of spatial clusters of multi-cultural populations. The clustering has evolved due to previous ethnic minority groups already settled within that area, more affordable housing market, rental properties or government housing for refugee and migrant populations.

**Figure 4.9: Distribution of English proficiency described as 'not well' or 'not at all' by Collection District (CD), the north-west region of Adelaide 2001 Australian Census**



SOURCE: Compiled from Australian Bureau of Statistics (ABS) 2001 Population and Housing Census

The findings within this section have highlighted the socio-demographic and socio-economic comparisons for the study population and Census population for the study region, metropolitan Adelaide and SA. There are a number of key differences in the population and it is thought that many of these are counteracted in the weighting of the study population sample. These findings on the distribution of the population and socio-demographic representation of the NWAHS cohort may potentially influence any interpretation of biomedical and self-reported health findings.

#### 4.3.1 Spatial sampling for the North West Adelaide Health Study

The spatial distribution of the NWAHS population is important in the interpretation of analysis for certain sub-populations. The original sampling of the NWAHS did not incorporate a truly spatial methodology with Australia Post® Postcodes and suburb names being the basis of selection into the north-west region (Figure 4.10).<sup>52</sup>

**Figure 4.10: Baseline sampling for the North West Adelaide Health Study (NWAHS) by Postcode and suburb name, Stage 1 1999-2003**

Australia Post® Postcodes that were originally sampled in the north-west population:
5007-5025
5031-5033
5037
5040
5088-5093
5095-5098
5106-5117
5120-5121
5125-5127
Within both Australia Post® Postcodes and suburb for inclusion within baseline sample:
5035
5037
5038
5082
5094
5118
Ashford
Camden Park
Cavan
Dry Creek
Gawler
Gawler East
Gawler South
Gawler West
Glandore
Keswick
Keswick Terminal
Kurralta Park
Netley
North Plympton
Ovingham
Plympton
Plympton North
Willaston

SOURCE: NWAHS Stage 1 Sampling (1999-2003)

<sup>52</sup> The Tea Tree Gully Local Government Area (LGA) was not included within the final sample as the individuals approached did not associate themselves as part of the north-western area of Adelaide or the Lyell McEwin Hospital (Dal Grande, 2005). Chapter 3 further discusses the NWAHS sampling frame.

The NWAHS cohort was not originally intended to allow for these types of spatial analyses and the sampling was a random spatial representation. The statistics for NWAHS participants at the spatial scales of Collection District (CD) and Statistical Local Area (SLA) are found in Table 4.6. There were 823 CD's within this study population with an average of 5.2 persons per CD, ranging from 1 to 16 participants. There were 27 SLA's that were included within the NWAHS spatial study region. The study population is a 1.3 percent sample of the 2001 Census population residing within the study region (measured at the CD level). The clustering of NWAHS participants in comparison to the Census population is critical in undertaking any form of hierarchical analysis.

**Table 4.6: Summary statistics for the North West Adelaide Health Study (NWAHS) by Collection District (CD) and Statistical Local Area (SLA) level, 2001 Australian Census**

	NWAHS population n	Census CD population n	Proportion of NWAHS to Census %	Census SLA population n
Average number of persons per CD	5.2	404	1.3	146.7
Minimum number of persons per CD	1	101	0.2	1
Maximum number of persons per CD	16	879	5.0	442
Standard Deviation	2.9	149	0.7	131
Median number of persons per CD	5	395	1.2	170

\*Abbreviations: CD – Collection District; SLA – Statistical Local Area.

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

The study used the Australian Standard Geographical Classification (ASGC) based on the ABS 2001 Census. The structure of the ASGC is current at the time of the Census and, therefore, these selections are only valid for the spatial references of the NWAHS population at Stage 1 (1999-2003). The NWAHS baseline participants located within an urban centre<sup>53</sup> were selected to create a new spatial study region. The final spatial sample was chosen based on the original NWAHS sampling and ABS 2001 Census boundaries. As a result, this saw the creation of a unique database for this research, referred to as the „NWAHS Spatial Sample“. Analyses of the spatial distribution of the NWAHS cohort in comparison to the 2001 ABS Census population range from 2.9 percent to 5 percent of study participants, compared to the number of persons within a CD.

<sup>53</sup> The Urban Centres and Localities (UC/L) group CD's together based on population size criteria, where an urban centre is a population cluster of 1,000 or more people (ABS, 2006a).

Table 4.7 indicates that more young adults (29.9 percent) are living in the „Lowest Quintiles“ of SEIFA IRSD compared to those aged 35 and over (26.4 percent). This is potentially a reflection of the housing market and affordability for this age cohort.

**Table 4.7: Area-level disadvantage (SEIFA IRSD) by age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

SEIFA IRSD	Young adults		Aged 35 and over	
	n	%	n	%
Lowest Quintile	375	29.9 <sup>^</sup>	743	26.4 <sup>^</sup>
Low Quintile	477	27.4 <sup>^</sup>	681	33.5 <sup>^</sup>
Middle Quintile	357	21.2 <sup>^</sup>	528	25.1 <sup>^</sup>
High Quintile	187	17.3 <sup>^</sup>	430	13.1 <sup>^</sup>
Highest Quintile	27	4.1 <sup>^</sup>	103	1.9 <sup>^</sup>
<b>Overall</b>	<b>1423</b>	<b>100.0</b>	<b>2485</b>	<b>100.0</b>

\*Calculated using weighted data (Wtclnc), SEIFA IRSD – Socio Economic Indexes for Areas, Index of Relative Socioeconomic Disadvantage by CD level  
<sup>^</sup> Statistically significantly different (p<0.05) than „young adults“ or „aged 35 years and over“

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

#### 4.4 Obesity in the north-west region of Adelaide

A social atlas of the central northern region of Adelaide has reported the rate of obesity cases for males as 138.3 cases per 1,000 persons and for females 204.3 cases per 1,000 persons (Glover *et al.*, 2005:172-175). Previous literature describing the monitoring and surveillance of chronic conditions has provided strong evidence of increasing obesity within this SA population. In particular, research undertaken describing self-reported weight and height found there was an underestimation of weight and overestimation of height, resulting in a lower prevalence of self-reported obesity as measured by BMI (Taylor *et al.*, 2006d).

The prevalence of obesity within metropolitan Adelaide is slightly lower (0.3 percent) than what has previously been reported for the whole of SA using the same data source (Gill *et al.*, 2004a:34). Between 1994 and 2004, South Australian Health Omnibus Survey (SA HOS) participants classified as underweight, normal, overweight and obese was 3.0 percent, 48.9 percent, 33.0 percent and 15.1 percent respectively. The trends in longitudinal data sources potentially fluctuate due to the sampling methodology and response to the survey over time. However, the important point is the overall significant trend upwards (Flegal & Troiano, 2000; Ogden *et al.*, 2004).

There have been a number of studies at SA state level that have reported differences in obesity by region. Obesity research has already reported important regional and spatial differences in the prevalence of obesity within four-year old children (Vaska &

Volkmer, 2004; Hugo & Franzon, 2006). The prevalence of obesity in those 18 years and older has been reported to be significantly higher for those living within „Adelaide Northern“ region, as defined by Division of General Practice catchments (Jury *et al.*, 2007:78). The north-west region and other metropolitan areas have seen interesting changes in obesity prevalence between 1994 and 2004 (Table 4.8). In what is a relatively short period of time, percentage increases in obesity prevalence have been noted within the rest of metropolitan Adelaide.

**Table 4.8: Comparison in the prevalence of obesity between the north-west region and the rest of metropolitan Adelaide, South Australian Health Omnibus Survey (SA HOS), 1994 to 2004**

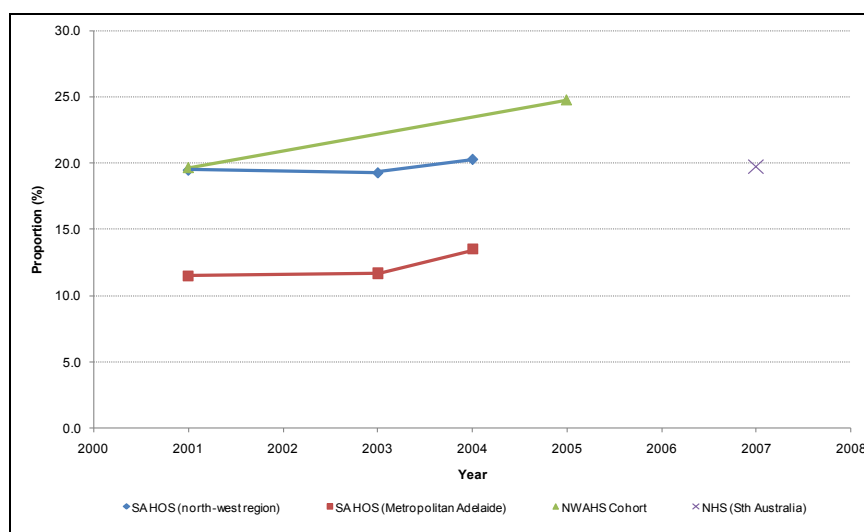
Year	North-west region Adelaide**		Rest of metropolitan Adelaide	
	n	% (CI 95%)	n	% (CI 95%)
1994	156/920	17.0 (14.7 - 19.5)	90/945	9.5 (7.8 - 11.6)
1995	119/860	13.8 (11.7 - 16.3)	111/968	11.5 (9.6 - 13.6)
1996	166/952	17.4 (15.2 - 20.0)	113/933	12.1 (10.2 - 14.4)
1997	150/898	16.7 (14.4 - 19.3)	121/927	13.1 (11.0 - 15.4)
1998	125/874	14.3 (12.1 - 16.8)	126/966	13.0 (11.1 - 15.3)
2001	172/880	19.5 (17.1 - 22.3)	127/974	13.0 (11.1 - 15.3)
2003	170/883	19.3 (16.8 - 22.0)	150/939	16.0 (13.8 - 18.5)
2004	176/866	20.3 (17.8 - 23.1)	164/994	16.5 (14.3 - 18.9)
<b>Overall</b>	<b>1234/7133</b>	<b>17.3 (16.4 - 18.2)</b>	<b>1002/7646</b>	<b>13.1 (12.4 - 13.9)</b>

\*SA HOS data calculated using weighted data (Wt), North-West Region of Adelaide ( $\chi^2$  for trends=26.864,  $p \leq 0.001$ ) Rest of metropolitan Adelaide ( $\chi^2$  for trends=13.340,  $p \leq 0.001$ ). \*\*The north-west region was selected based on ABS postal codes that match the north-west study region.

SOURCE: Compiled from South Australian Health Omnibus Survey (SA HOS), metropolitan Adelaide (1994 to 2004)

Initial observations on obesity within the north-west region reported a higher prevalence compared to the rest of metropolitan Adelaide (Figure 4.11).

**Figure 4.11: Prevalence of obesity (BMI  $\geq 30$ ) across a number of data sources, north-west region and metropolitan Adelaide, total population, South Australia, 2001 to 2007**



North West Adelaide Health Study (NWAHS) calculated using weighted data (Wt) and wtlncS2). South Australia Health Omnibus Survey (SA HOS) calculated using weighted data (Wt) to the entire SA population, north-west region HOS sample selected based on the baseline selection criteria of the north-west study area. Australian Bureau of Statistics (ABS) National Health Survey (NHS) taken from 2007-08 age cohort and state data.

SOURCE: Compiled from NWAHS Spatial, Stage 1 (1999-2003) and Stage 2 (2005-2006), SA HOS (2001-2004) and SA NHS (2007-08)

The prevalence of biomedically measured BMI within the NWAHS is slightly higher (19.7 percent) compared to other self-reported surveys within this South Australian population, such as seen in the SA HOS (19.5 percent).

Table 4.9 outlines the prevalence of obesity (BMI  $\geq 30$ ), waist-to-hip ratio (WHR) and waist circumference (WC) within Stage 1 NWAHS by gender and age groups. Within NWAHS, there was a reported higher prevalence for females with a BMI greater than 30 (28.4 percent), high waist-to-hip ratio (24.4 percent) and high waist circumference (61.8 percent). Again, those aged 50 to 64 years had a higher prevalence of obesity (35.7 percent) when compared to young adults (19.1 percent). These findings also support the preliminary comments (Chapter 1) on the prevalence of obesity within this population and for young adults.

**Table 4.9: Gender and Age groups by obesity, high waist-to-hip ratio and high waist circumference, North West Adelaide Health Study (NWAHS), Stage 1 2000-2003**

	Obesity (BMI $\geq 30$ )			High Waist-to-hip ratio			High Waist Circumference <sup>#</sup>		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
<b>Sex</b>									
Male	489	25.4 <sub>v</sub>	(23.5 - 27.4)	157	8.1 <sub>v</sub>	(7.0 - 9.4)	1042	54.0 <sub>v</sub>	(51.8 - 56.3)
Female	571	28.4 <sub>^</sub>	(26.5 - 30.4)	490	24.4 <sub>^</sub>	(22.6 - 26.3)	1241	61.8 <sub>^</sub>	(59.6 - 63.9)
<b>Age Groups</b>									
18 to 34 years	264	19.1 <sub>v</sub>	(17.1 - 21.3)	77	5.6 <sub>v</sub>	(4.5 - 6.9)	489	35.4 <sub>v</sub>	(33.0 - 38.0)
35 to 49 years	320	30.1 <sub>^</sub>	(27.4 - 32.9)	154	14.5 <sub>v</sub>	(12.5 - 16.7)	655	61.6 <sub>^</sub>	(58.6 - 64.4)
50 to 64 years	276	35.7 <sub>^</sub>	(32.4 - 39.1)	180	23.3 <sub>^</sub>	(20.4 - 26.4)	582	75.3 <sub>^</sub>	(72.1 - 78.2)
65+ years	200	27.7	(24.6 - 31.1)	236	32.8 <sub>^</sub>	(29.5 - 36.3)	557	77.4 <sub>^</sub>	(74.2 - 80.3)
<b>Overall</b>	<b>1060</b>	<b>26.9</b>		<b>647</b>	<b>16.4</b>		<b>2283</b>	<b>58.0</b>	

\*NWAHS data calculated using weighted data (WtdInc) # Waist circumference: men at least 95cm, women at least 80cm.

<sub>v</sub> Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

The most severe aspect of the obesity epidemic, those with class II and III obesity<sup>54</sup>, has remained relatively hidden despite increases within these classes reported to be twice as fast as all classes of obesity (Sturm, 2003). A majority of the literature regarding severe obesity concentrates on treatment and medical interventions; to date there have been few investigations focusing on those with a BMI of class II and III. Between 1990 and 2000, the prevalence of class III obesity in the United States (US) has increased from 0.78 percent to 2.2 percent. The largest relative increase was found in those persons aged 18 to 29 years (0.4 percent to 1.2 percent). The prevalence increased among all categories of educational achievement, with the highest prevalence among persons who did not complete high school (Freedman *et al.*, 2002). Howard *et al.*, (2008b)<sup>55</sup> shows

<sup>54</sup> The World Health Organisation (WHO) further defines BMI into separate classes; class I (BMI 30.0-34.9), class II or severe (BMI 35.0-39.9) and class III or morbid (BMI  $\geq 40$ ).

<sup>55</sup> Research from Author, refer to Appendix 9.

from multi-variate analysis that among those who were obese, women were more than two and half times more likely than men to be class II and III obese. In addition, those living in the „Low/Lowest Quintiles“ of SEIFA IRSD were more likely to be class II and III obese compared to the more advantaged areas.

The NWAHS cohort provides an opportunity to investigate *who* is gaining weight over time instead of simply trends observed in cross-sectional surveys. The distribution of the mean BMI raw scores for NWAHS Stage 1 (27.4) and Stage 2 (27.9) indicates an increase between the two data collections of 0.5 BMI points (Table 4.10).

**Table 4.10: Continuous body mass index (BMI) and weight gain observed between Stage 1 and 2 North West Adelaide Health Study (NWAHS), 1999 to 2006**

Continuous BMI	n	Mean	Median	Range	Standard Deviation	Standard Error
<b>Young Adults</b>						
Stage 1	1440	25.8 (25.5 – 26.1)	24.6	14.7 thru 55.4	5.42	0.142
Stage 2	1148	27.0 (26.6 – 27.3)	25.4	14.7 thru 60.1	6.14	0.181
<b>Aged 35 and over</b>						
Stage 1	2496	28.3 (28.1 – 28.5)	27.6	14.4 thru 62.9	5.28	0.106
Stage 2	1951	28.4 (28.2 – 28.6)	27.7	14.6 thru 59.9	5.38	0.122
<b>Total Population</b>						
Stage 1	3936	27.4 (27.2 – 27.5)	26.6	14.4 thru 62.9	5.46	0.087
Stage 2	3100	27.9 (27.7 – 28.1)	27.0	14.6 thru 60.1	5.71	0.103
<b>Weight gain Stage 1 to 2 (kilograms)</b>						
Young Adults	1148	3.48 (3.05 – 3.90)	2.65	-20.8 thru 35.6	7.36	0.217
Aged 35 and over	1949	0.59 (0.36 – 0.83)	0.55	-39 thru 45.0	5.21	0.118
Total Population	3097	1.66 (1.44 – 1.88)	1.10	-39 thru 45.0	6.25	0.112

\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS Stage 1 and 2 Spatial Sample (1999 to 2006)

In comparison, the young adult cohort saw an increase in mean BMI between Stage 1 (25.8) and Stage 2 (27.0) of 1.2 BMI points. On average young adults gained 3.48 kilograms between data collection points compared to 0.59 kilograms for those aged over 35 years. Table 4.11 outlines obesity incidence between Stage 1 and 2 NWAHS.

**Table 4.11: Incidence of obesity between Stage 1 and Stage 2 by age cohort, North West Adelaide Health Study (NWAHS), 1999 to 2006**

Incidence	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
S1 non-obese S2 non-obese	842	73.4	1246	64.0	2088	67.4
S1 obese S2 obese	204	17.8	513	26.3	717	23.1
S1 obese S2 non-obese	21	1.9	83	4.2	104	3.4
S1 non-obese S2 obese	80	7.0	108	5.5	188	3.1
<b>Overall</b>	<b>1148</b>	<b>100.0</b>	<b>1949</b>	<b>100.0</b>	<b>3097</b>	<b>100.0</b>

\*Calculated using weighted data (Wtclnc). Definitions: Non-obese (BMI <30) and Obese (BMI ≥30), biomedically Note: The rudimentary nature of this analysis does not explore the complexities of movement within the overweight definition; i.e. those who are non-obese maybe classified as „overweight“ or „normal“.

SOURCE: Compiled from NWAHS Stage 1 and 2 Spatial Sample (1999 to 2006)

Young adults were experiencing a higher incidence of movement from „non-obese“ to „obese“ (7.0 percent) compared to those aged over 35 years (5.5 percent). The knowledge of increasing weight gain within young adults suggests targeting of this cohort at a time point before weight gain and understanding the complexities of these relationships (as supported by, McTigue *et al.*, 2002).

## 4.5 Conclusion

This chapter has outlined a profile of the north-west region of Adelaide, SA. The region has a rich history and cultural composition that is apparent in the current landscapes of the local environment. It provides both high and low socio-economic areas, but also clusters of disadvantage and residential mix for this research to explore in greater depth. The distribution of those born in „UK or Ireland“ and those persons with poor English proficiency indicate particular spatial patterns that are depicted in the settlement and cultural history of the study region. The weighted data for NWAHS is comparable in gender and age structure for the north-west study region based on ABS 2001 Census data. Understanding how the historical perspective influences the current social landscape of the north-west region may shed light on how the social reproduction of lifestyle, behaviour and disadvantage may influence rates of obesity across different geographies. This chapter also presented obesity rates by age, gender, cohort and alternative biomedical measures. The next chapter will outline several components in relation to obesity prevalence within young adults and the social environment, including area-level disadvantage, accessibility to services and housing features.



## CHAPTER 5

# THE SOCIAL ENVIRONMENT: Area-level attributes, housing profiles and residential mobility

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The social forces affecting health are expressed in class structure. This division into classes encompasses economic, political, and cultural differences, all of which may have an impact on health. At the very least, differences in health and disease by social class point to the importance of the social environment.

*(Marmot et al., 1987:112)*

### 5.1 Introduction

Obesity research into the increasing rates within the population has extended from conventional measures of individual-level socio-economic factors to explore relations with the social environment. The inclusion of new attributes, such as the use of aggregated area-level census information, has been previously described for the Australian context by an index at a large spatial scale, for instance, the Postcode or Local Government Area (LGA). The consideration within obesity analyses of spatial scale provides insight into methodological gaps, both theoretically and statistically, in exploring the multi-level relationships of place and health. This chapter provides a descriptive profile of the social environment and obesity status among young adults. The findings utilise a number of data sources and uniquely describes socio-economic features alongside biomedical and self-reported information drawn from the North West Adelaide Health Study (NWAHS). Obesity status within young adults is detailed through new avenues such as physical accessibility, housing tenure, property capital valuations and aggregated area-level housing characteristics. Exploratory spatial analyses outline the distribution of obesity and existing variations across the north-west region of Adelaide. Additionally, the temporal nature of residential location is observed through mobility patterns between Stage 1 and Stage 2 NWAHS and these movements are examined in relation to area-level socio-economic status.

### 5.2 Examining the social environment

Traditionally, obesity studies have utilised a range of individual-level socio-economic measures to indicate positive relationships with disadvantage (such as reviews from Ball & Crawford, 2005; McLaren, 2007). For instance, observations of the hierarchy of

income suggest that the rates of ill-health subsequently increase from those persons who are advantaged to those who are disadvantaged (Berkman & Kawachi, 2000; Wilkinson & Pickett, 2006) and this has been reported for obesity rates within developed countries (Pickett *et al.*, 2005). For the Australian context, there is less understanding about the complexities of individual-level socio-economic status and obesity for young adults.

### 5.2.1 Individual-level socio-economic status

Table 5.1 presents the prevalence of measured body mass index (BMI  $\geq 30$ ) and high waist-to-hip ratio (WHR) within the NWAHS population by gender and age cohort for the following individual-level attributes; household income, work status, highest level of education and current marital status. The results indicate different patterns between individual-level socio-economic status and obesity for young adults and those aged over 35 years.

**Table 5.1: Prevalence of obesity and high waist-to-hip ratio (WHR), by individual socio-economic indicators (household income, work status, education and marital status), gender and age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Males				Females			
	Young Adults		Aged 35 and over		Young Adults		Aged 35 and over	
	BMI $\geq 30$ %	WHR %	BMI $\geq 30$ %	WHR %	BMI $\geq 30$ %	WHR %	BMI $\geq 30$ %	WHR %
<b>Household Income</b>								
Up to \$20,000	12.9	-	30.2	16.6 <sup>^</sup>	26.3	8.9	35.8	41.1 <sup>^</sup>
\$20,001 to \$40,000	14.7	3.1	26.7	13.4	23.5	7.6	34.4	34.8
\$40,001 to \$60,000	23.7	3.2	28.8	10.0	24.0	13.8	34.7	22.0 <sup>v</sup>
\$60,001 +	18.4	0.8	28.8	7.6 <sup>v</sup>	15.0 <sup>v</sup>	8.5	26.0	19.4 <sup>v</sup>
Not stated	24.2	-	38.4	8.2	12.2	2.0	32.0	42.7 <sup>^</sup>
<b>Work Status</b>								
Full Time employed	20.9	2.5	30.3	9.2 <sup>v</sup>	18.4	9.0	26.2 <sup>v</sup>	22.5 <sup>v</sup>
Part Time/Casual employed	11.3	1.6	25.9	15.3	18.2	9.9	30.1	20.6 <sup>v</sup>
Unemployed	17.3	-	35.2	9.3	27.5	9.2	25.0	25.9
Home duties	-	-	-	-	27.6	8.5	39.0 <sup>^</sup>	39.5 <sup>^</sup>
Retired	-	-	26.4	14.7	-	-	34.8	41.8 <sup>^</sup>
Student	15.9	-	20.0	40.0	15.2	6.6	21.4	28.6
<b>Highest Level of Education</b>								
Secondary	18.9	1.7	30.6	13.6	22.8	9.3	34.5	37.3 <sup>^</sup>
Trade/Apprenticeship	14.6	1.9	27.8	10.6	34.5	34.5 <sup>^</sup>	4.7	33.9
Certificate/Diploma	20.4	3.4	30.8	12.7	20.2	10.1	31.5	23.7 <sup>v</sup>
Bachelor degree or higher	19.8	2.7	23.8	7.9	14.8	5.5	20.8	20.7 <sup>v</sup>
<b>Marital Status</b>								
Married/De facto	28.1 <sup>^</sup>	4.0	29.2	11.7	21.6	10.8	33.4	30.0 <sup>v</sup>
Separated/Divorced	-	-	30.1	13.3	32.4	16.2	32.9	31.4
Widowed	-	-	20.8	14.9	-	-	27.8	46.1
Never married	13.6 <sup>v</sup>	1.1	31.9	12.3	17.2	7.2	48.4	33.9 <sup>^</sup>

\*Calculated using weighted data (WtInc), Abbreviations: WHR – high waist-to-hip ratio (Defined as greater than 1.0 for males and greater than 0.85 for females), BMI – Body Mass Index, <sup>^</sup> Statistically significantly different ( $p < 0.05$ ) than the other categories combined

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

The NWAHS young women within the highest household income category were more likely to have a lower prevalence of obesity (15.0 percent) compared to those with a household income of „Up to \$20,000 per year“ (26.3 percent). Alternatively, young

males did not display a gradient for obesity prevalence between low and high household income. Matthews *et al.*, (2002:776) suggests that individual-level socio-economic status could be difficult to report within the young adult cohort:

For the importance of measuring socioeconomic trajectories, especially in populations like young adults or minority groups where a single static measurement of SES [socio-economic status] is not likely to represent the future SES trajectory.

It is important to consider time in analysing income and disadvantaged communities (Benzeval & Judge, 2001), and within this NWAHS population differences in obesity prevalence were observed by income category and age cohort. Household structure and the accumulation of wealth over time could potentially explain these observations. Liberatos and colleagues (1988:115) discussed the measurement of income and education as a measure of social class:

Although income as a single indicator appears to measure unique aspects of social class, it is subject to reporting error, varies over time, and requires standardization [sic] by family size and region.

Young adulthood is a life stage where attributes such as household income are possibly more reflective of progression within the workforce and current housing tenure, for example, individuals living in group households or still living with their parents. Within the NWAHS, 6.1 percent of participants did not state their income and non-reporting of this category was highest amongst the young adult cohort. Education level is reported to be a good predictor of health and reviews have shown an inverse relationship between highest level of education and obesity (Sobal & Stunkard, 1989; Molarius *et al.*, 2000). Within NWAHS young adults, there were no apparent differences by reported highest level of education. An explanation for these findings could be that persons in this age cohort have not necessarily completed their highest level of education and, as a result, the observed relationships usually seen within the total population will accumulate over time.

Obesity prevalence was higher among young adult males who were „married or in a de facto relationship“ (28.1 percent) and lower among those males „never married“ (13.6 percent). The highest prevalence of obesity for females, although not significant, was among those individuals classified as „separated or divorced“ (32.4 percent). These

findings may highlight the extent to which obesity is potentially influenced by negative psycho-social factors, such as self-esteem, motivation and social isolation. With respect to marital status, the progression into marriage or a long-term relationship is within early stages due to the age of this sub-population. Further examination is required within the young adult cohort specifically with reference to individual-level socio-economic status and changing perspectives on this life stage. Heinz (2009:3) argues that:

The instabilities of the life course stem from the tension between uncertain life chances and the culture of individualism which expects that people actively shape their biographies.

There is still much to be described about the prevalence of obesity among young adults and new associations with socio-economic factors potentially will provide insight into the future health status of this cohort.

Modern societies differ in the institutional arrangements concerning life transitions: education and training provisions, labour market regulations, exclusion mechanisms, social assistance rules, and to the extent to which there is an explicit youth policy. Consequently, the focus of youth issues differs between societies.

(Heinz, 2009:6)

It is yet to be determined whether similar characteristics will be displayed in terms of behaviour, lifestyle and consumption as this cohort shifts along the age continuum. Furthermore, it is unknown as to whether there will be a relationship between social environments and the future prevalence of obesity within the population.

### 5.2.2 Area-level index of disadvantage

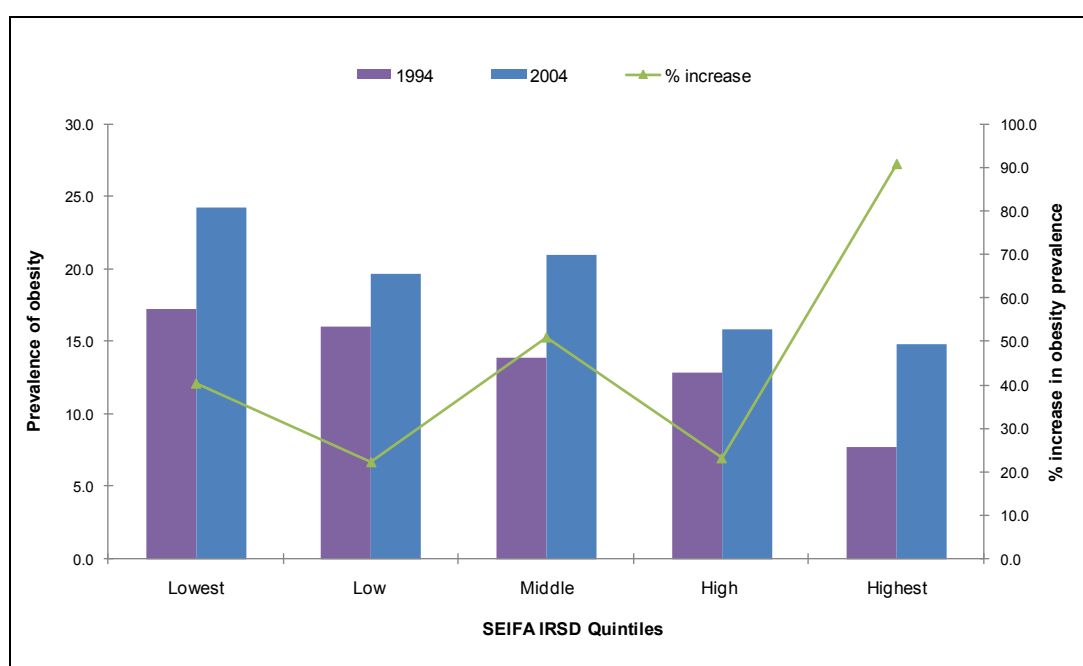
The development of small area indexes to describe health outcomes and area-level disadvantage have been seen in France (Havard *et al.*, 2008), England (Phillimore *et al.*, 1994) and New Zealand (Salmond & Crampton, 2002). Within Australia, area-level factors are commonly measured for health and social research using the composite index constructed by the Australian Bureau of Statistics (ABS), the Socio Economic Indexes for Areas, Index of Relative Socioeconomic Disadvantage (SEIFA IRSD) (ABS, 2001c).<sup>56</sup> For example, *A Weighty Issue* reported obesity rates in South Australia

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<sup>56</sup> Refer to methodology (Chapter 3) for further discussions on SEIFA IRSD.

(SA) by individual-level socio-economic status and included the use of the SEIFA IRSD to describe area-level disadvantage and obesity (Gill *et al.*, 2004a). Figure 5.1 displays obesity prevalence by area-level disadvantage between 1994 and 2004 in conjunction with increases in the percentage over time for the total population. The most disadvantaged areas, or those living in the „Lowest Quintile“ of SEIFA IRSD, experienced the highest prevalence of obesity.

**Figure 5.1: Prevalence of obesity and percentage increases by SEIFA IRSD quintile, total population, metropolitan Adelaide, South Australia, 1994 to 2004**



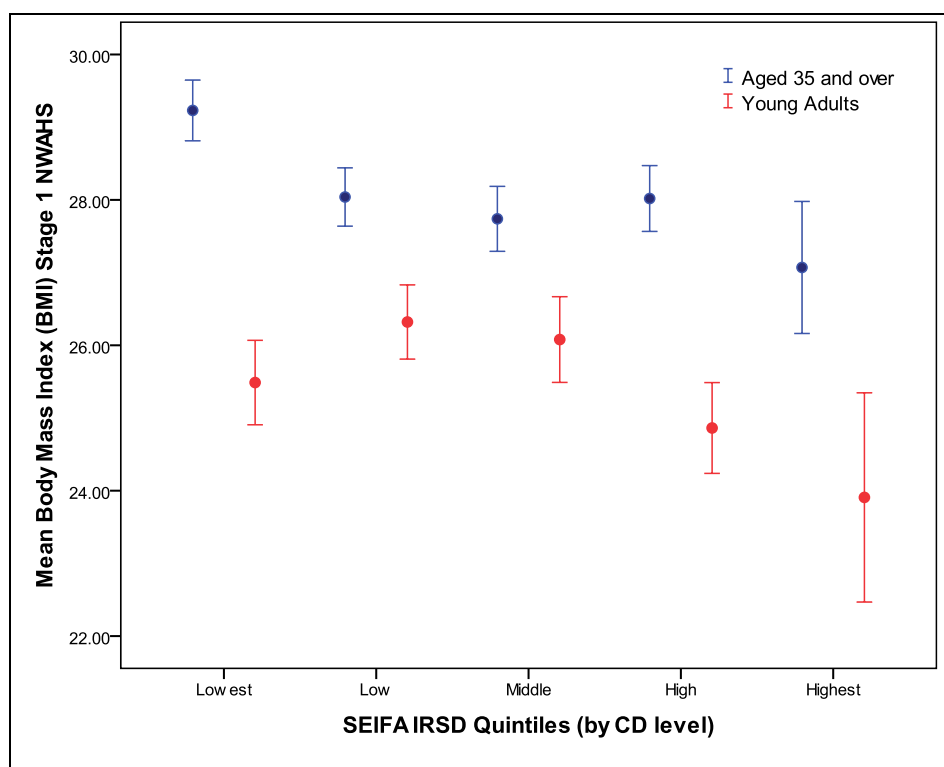
\*SA HOS calculated using weighted data (Wt) \*\*SEIFA IRSD was calculated at the Postcode level using 2001 data

SOURCE: Compiled from South Australian Health Omnibus Survey (SA HOS), metropolitan Adelaide (1994 to 2004)

According to the SA HOS, the gap between the advantaged and disadvantaged populations has narrowed slightly between 1994 and 2004, with individuals living within the „Middle“ and „High“ quintiles of SEIFA IRSD experiencing the greatest percentage change in the prevalence of obesity. These findings do not necessarily equate to the inequalities of obesity as „narrowing“ over time but could possibly indicate changing social environments. There is a need to enhance methodologies for socio-spatial research, particularly with reference to measuring area-level influences.

Within NWAHS, the distribution of mean body mass index (BMI) raw scores by SEIFA IRSD quintile are outlined in Figure 5.2 for young adults and those aged over 35 years. The trend line for these observations indicates an inverse gradient for obesity rates between the most disadvantaged and advantaged areas.

**Figure 5.2: Box-plot distribution of body mass index (BMI) raw scores by area-level index of disadvantage (SEIFA IRSD quintiles) and age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**



\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

For NWAHS participants aged over 35, there was an inverse gradient of BMI raw scores from „Lowest“ to „Highest“ quintile, or those individuals living in the most disadvantaged to advantaged areas. On the other hand, the NWAHS young adults displayed a different pattern for those individuals living within the „Low“ and „Middle“ quintiles experiencing a higher mean BMI raw score compared to those in the „Lowest Quintile“ of SEIFA IRSD.

Table 5.2 outlines an alternative to this approach with exploratory logistic regression analysis of area-level disadvantage and obesity status by age cohort.

**Table 5.2: Sex-adjusted odds ratio of obesity (BMI ≥30) for area-level index of disadvantage (SEIFA IRSD) and age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

SEIFA IRSD	Young Adults		Aged 35 and over		Total Population	
	Odds Ratio (CI 95%)	p	Odds Ratio (CI 95%)	p	Odds Ratio (CI 95%)	p
High/Highest quintile	1.00		1.00		1.00	
Middle quintile	2.20 (1.30 – 3.74)	<b>0.003</b>	0.91 (0.70 – 1.19)	0.490	1.02 (0.81 – 1.28)	0.874
Low/Lowest quintile	2.89 (1.78 – 4.70)	<b>≤0.001</b>	1.34 (1.08 – 1.66)	<b>0.008</b>	1.46 (1.20 – 1.76)	<b>≤0.001</b>

\*Calculated using weighted data (Wtclnc)

\*\*SEIFA IRSD measured at the Collection District (CD) level 2001.

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

Overall, the total NWAHS population display significantly higher odds of being obese (BMI  $\geq 30$ ) for those individuals living within the „Low/Lowest Quintiles“ of SEIFA IRSD (OR 1.46 CI 95% 1.20 – 1.76  $p \leq 0.001$ ) compared to those living in the more advantaged areas („High/Highest Quintiles“). Interestingly, those young adults living within the disadvantaged areas have higher odds of obesity (OR 2.89 CI 95% 1.78 – 4.70  $p \leq 0.001$ ), compared to the reference category of advantaged areas according to SEIFA IRSD („High/Highest Quintiles“). For those persons aged over 35, a lower odds ratio was reported for obesity in the disadvantaged areas (OR 1.34 CI 95% 1.08 – 1.66  $p = 0.008$ ). These findings question the differences that exist across social environments for young adults and whether the socio-spatial inequalities between advantage and disadvantage exist from this early stage of the lifecycle.

### 5.3 Using spatial information to explore the social environment

Spatially referenced data sources were made available within this research to investigate the social environment and obesity within the north-west region of metropolitan Adelaide. The secondary data sources utilised to describe area-level features included information from aggregated ABS Census, residential housing tenure, property capital valuations and accessibility to local services and facilities.

#### 5.3.1 Aggregation of Australian Bureau of Statistics (ABS) Census data

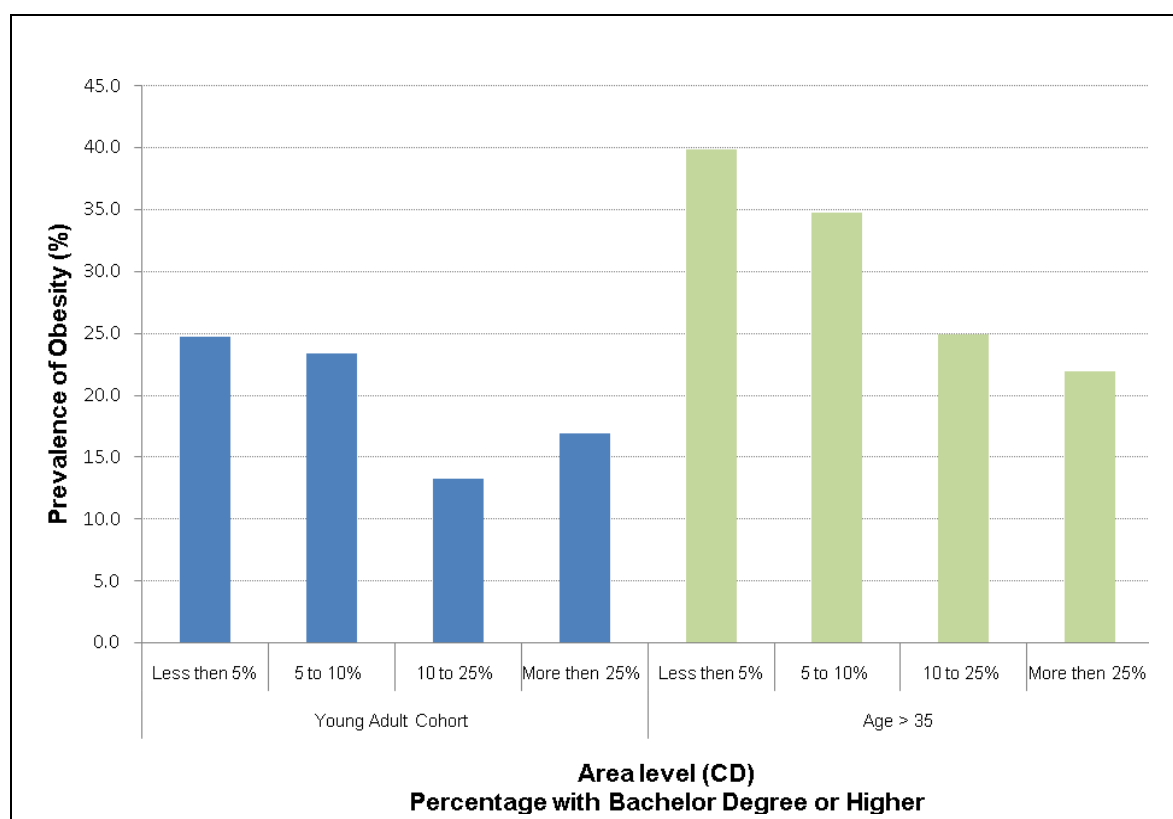
To date, a majority of research utilising area-level attributes has concentrated on incorporating area-level indexes and describing other aggregated measures such as Census data by regional profiles, as seen in the South Australian Social Health Atlases (Glover *et al.*, 2006). There has been no research to date within this study region that has combined aggregated area-level data and biomedically measured individual outcomes. Census information at the Collection District (CD) level<sup>57</sup> was disaggregated to the individual participant based on the spatially referenced NWAHS residential location and spatially joined to ABS Census geographies using the software ArcView Version 9.2 (Esri, 2008). After assignment of area-level characteristics at the CD level to each of the NWAHS participants, analysis of ABS 2001 Census information was undertaken at the individual-level to describe obesity prevalence within this population.

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<sup>57</sup> Refer to methodology (Chapter 3) for description of Australian Bureau of Statistics (ABS) Census geographies.

The following section provides a profile of obesity by the area-level characteristics of unemployment, proportion unmarried, proportion of the area that is „separated or divorced“, living within low income areas and those with a „Bachelor degree or higher“. Figure 5.3 outlines by age cohort the prevalence of obesity by aggregated ABS 2001 Census information and the proportion of persons living within the area with a „Bachelor degree or higher“ as their highest level of education.

**Figure 5.3: Prevalence of obesity (BMI  $\geq 30$ ) by aggregated proportion of persons with a 'Bachelor degree or higher' by age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**



\*Calculated using weighted data (Wtclnc) Australian Bureau of Statistics (ABS) Census Data aggregated to the Collection District (CD) level

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

As can be seen from results utilising NWAHS, both age cohorts experience an inverse gradient of obesity from those individuals living in areas with a low proportion of a „Bachelor degree or higher“ through to areas with a higher proportion of the population with higher education qualifications. Table 5.3 outlines the prevalence of obesity by area-level information for young adults, those aged over 35 years and the total NWAHS population. These results indicate significant relationships between disadvantaged area-level characteristics, such as high unemployment and low household income. The quintiles represent low to high proportion of residents within that area relating to the social environmental characteristic.



**Table 5.3: Prevalence of obesity (BMI ≥30) for Australian 2001 Census information aggregated to Collection District (CD) level by age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (BMI ≥30)					
	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Unemployment (CD level)</b>						
Quintile 1 (low %)	32	11.9 <sub>√</sub>	127	24.7 <sub>√</sub>	119	19.6 <sub>√</sub>
Quintile 2	43	15.1 <sub>√</sub>	381	26.0 <sub>√</sub>	125	20.2 <sub>√</sub>
Quintile 3	75	23.8 <sup>^</sup>	326	31.8	159	27.7
Quintile 4	62	21.7	300	35.2 <sup>^</sup>	152	27.4
Quintile 5 (high %)	70	24.6 <sup>^</sup>	328	38.1 <sup>^</sup>	180	33.0 <sup>^</sup>
<b>Not Married (CD level)</b>						
Quintile 1 (low %)	33	13.5 <sub>√</sub>	132	24.9 <sub>√</sub>	130	21.8 <sub>√</sub>
Quintile 2	36	12.0 <sub>√</sub>	170	31.8	146	22.6
Quintile 3	80	26.7 <sup>^</sup>	168	32.2	164	27.1
Quintile 4	82	29.3 <sup>^</sup>	169	34.6	164	30.7 <sup>^</sup>
Quintile 5 (high %)	53	16.8	138	32.6	131	25.4
<b>Separated or Divorced (CD level)</b>						
Quintile 1 (low %)	38	14.9	136	25.0 <sub>√</sub>	130	20.6 <sub>√</sub>
Quintile 2	65	20.6	147	29.2	146	24.3
Quintile 3	68	22.7	155	32.0	158	27.2
Quintile 4	60	18.5	177	36.4	166	27.9
Quintile 5 (high %)	52	21.3	162	33.8	135	27.6
<b>Low income (CD level)</b>						
Quintile 1 (low %)	68	18.3	136	25.0 <sub>√</sub>	175	23.3
Quintile 2	72	21.9	147	29.2	159	24.7
Quintile 3	42	16.5	155	32.0	127	24.2
Quintile 4	57	23.3	177	36.4 <sup>^</sup>	129	26.5
Quintile 5 (high %)	44	18.3	162	33.8	145	29.7
<b>Overall</b>	<b>283</b>	<b>19.7</b>	<b>777</b>	<b>31.1</b>	<b>735</b>	<b>25.4</b>

\*Calculated using weighted data (Wtclnc), Australian Bureau of Statistics (ABS) Census Data aggregated to the Collection District (CD) level  
<sub>√</sub> Statistically significantly different (p<0.05) than the other quintiles for social characteristic combined

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

For instance, a higher prevalence of obesity was found among young adults who were living in areas with a high proportion of persons „unemployed“ (24.6 percent) compared to aged 35 and over (33.0 percent). Moreover, there exists a difference of 12.7 percent between areas with low levels of unemployment and areas of high unemployment. For other measures of the social environment, there are varying results across the quintile range for attributes such as proportion „not married“ or „separated or divorced“. Apparent prevalent differences were observed between high and low proportions of low income households, although these findings were not statistically significant. Further exploration of these variables would need to include the multi-level relationships of individual and area-level socio-economic status. Initial analyses were undertaken as part of this research but it was concluded that more investigation is needed into the validity and reliability of the area-level aggregated measures for this Australian context. Furthermore, an understanding on the conceptual constructs of socio-cultural and residential influences related to this context is required.

### 5.3.2 Place of residence

Literature on „place of residence“ and health has surrounded physical components of housing such as residential location and „neighbourhood“ environments. Dunn (2000:361), in a review of housing and health inequalities, outlined the need for more research between housing, socio-economic status and health. In the case of obesity prevalence in Australia, research on socio-economic factors and obesity indicated that housing features, such as nature of occupancy and number of bedrooms, explained less of the relationship with obesity than traditional measures of the family unit and employment status (Ball *et al.*, 2002). With increased availability of data to measure residential features the statistical relationships with health outcomes could potentially be improved.

Within the NWAHS, housing tenure by age cohort displays a pattern as expected related to age, as shown in Table 5.4.

**Table 5.4: Proportion of participants by housing tenure and age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up, 2007**

Housing Tenure	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
Paying off a mortgage	713	58.2 <sup>^</sup>	500	30.0 <sup>v</sup>	1213	42.0
The outright owner/joint owner	109	8.9 <sup>v</sup>	934	56.2 <sup>^</sup>	1043	36.1
Renting (or paying board)	306	25.0 <sup>^</sup>	176	10.6 <sup>v</sup>	482	16.7
Using a rent to buy scheme	-	-	1	0.1	1	0.0
Living as a dependent child with parents	54	4.4 <sup>^</sup>	3	0.2 <sup>v</sup>	57	2.0
Living rent free	26	2.1	10	0.6	36	1.2
Able to live there for the remainder of your life	-	-	18	1.1	18	0.6
Living in work-provided accommodation	-	-	1	0.1	1	0.0
Other	18	1.5	19	1.3	37	1.3
<b>Overall</b>	<b>1226</b>	<b>100.0</b>	<b>1662</b>	<b>100.0</b>	<b>2888</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2)

<sup>^v</sup> Statistically significantly higher or lower than comparison group, young adult cohort and aged 35 years and over (p<0.05)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

There were higher proportions of NWAHS young adults „paying off a mortgage“ (58.2 percent) and „renting or paying board“ (25.0 percent) compared to those aged over 35 years. In the case of the young adult cohort, many individuals decide to live within the family home for a longer period allowing them to save for a house deposit and make other lifestyle choices. Macintyre and colleagues (1998) outlined that housing tenure may not only be related to health because they are markers for income or psychological traits, but they may also have some direct health promoting or damaging effects. Additionally, recent social housing reform within Australia was seen by Baker (2007) to

provide an opportunity to monitor these policy changes alongside development of health outcomes over time.

Australia has seen recent changes in the nature of the housing market and of particular relevance is the rise in interest rates by major banking institutions. According to a recent report on housing affordability in SA, “housing purchase and rental options are simply out of the reach of most low income households” (Vas Dev & Spoehr, 2009:3). These changes in the housing situation in Australia occurred concurrently with the timing of interviews with NWAHS participants. There was heightened attention within the media associated with these interest rate rises, as indicated by Sandra:

Trying to live, trying to have a mortgage, or save enough money for a mortgage. Like nowadays especially in the last five years, the average housing price has risen so much and wages haven't really increased that much, to start off it is really tough.

*Sandra (Current mortgage holder, married)*

The global factors of housing affordability potentially act as an important driver to the local-level spatial relationships observed between the social environment and health. This research was unable to establish whether housing market changes had an impact on the responses to questions on housing and socio-economic circumstances. Within the NWAHS young adult cohort, there was a higher prevalence of obesity within those individuals „paying off a mortgage“ (25.4 percent) compared to „renting or paying board“ (15.0 percent), as seen in Table 5.5.

**Table 5.5: Prevalence of obesity status (BMI  $\geq$ 30) by housing tenure, young adult cohort, North West Adelaide Health Study (NWAHS), telephone follow-up, 2007**

In this residence, are you....	BMI $\geq$ 30	
	n	%
Paying off a mortgage	142	25.4 <sup>^</sup>
The outright owner/Joint owner	19	22.9
Renting or Paying board	30	15.0 <sup>v</sup>
Living as a dependent child with parents	4	11.8 <sup>#</sup>
Living rent free	3	15.0 <sup>#</sup>
Other	3	37.5 <sup>#</sup>
<b>Overall</b>	<b>201</b>	<b>22.2</b>

\*Calculated using weighted data (Wttfu2) # Indicates small cell size

<sup>^v</sup> Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

There are potential processes related to housing tenure at young adulthood, although, for the NWAHS young adults the sample was too small to explore the relationship of obesity further for „renters“ and those participants „paying off a mortgage“.

As previously indicated, there are issues in the reporting of individual-level or household income as a measure of the social environment and, therefore, the inclusion of other measures may provide more insight into relationships with obesity. One such socio-economic measurement to consider is property capital valuations for NWAHS residential locations. There has been limited research that has explored this type of information in relation to health outcomes. For example within the United States (US), Drewnowski and colleagues (2007) investigated obesity rates at the zip code level, or equivalent to Postcode for the Australian context, to determine if there was a relationship with area-level measures of income, poverty and property values. The findings from this research indicated a need for property values at a finer spatial scale to determine the relationship with obesity. Table 5.6 outlines the prevalence of obesity within NWAHS by age cohort and quartile distribution of property capital valuations.

**Table 5.6: Prevalence of obesity (BMI  $\geq$ 30) by distribution of property capital valuations (total population and home owner) by age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (Biomedical BMI $\geq$ 30)					
	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Property capital values (Total Population)</b>						
Up to \$150,000	83	24.1 <sup>^</sup>	240	40.8 <sup>^</sup>	324	34.7 <sup>^</sup>
\$150,001 to \$210,000	90	23.7 <sup>^</sup>	146	26.5 <sup>v</sup>	236	25.3
\$210,001 to \$290,000	44	16.3	143	30.7	188	25.5
Over \$290,000	26	12.1 <sup>v</sup>	127	25.7 <sup>v</sup>	153	21.6 <sup>v</sup>
<b>Overall</b>	<b>243</b>	<b>20.1</b>	<b>656</b>	<b>31.3</b>	<b>901</b>	<b>27.2</b>
<b>Property capital values (Purchasing or own home)</b>						
Up to \$150,000	40	20.5	142	44.9 <sup>^</sup>	195	38.2 <sup>^</sup>
\$150,001 to \$210,000	49	20.4	93	26.7 <sup>v</sup>	147	25.4 <sup>v</sup>
\$210,001 to \$290,000	34	22.1	87	31.2	126	28.6
Over \$290,000	14	11.4	86	24.8 <sup>v</sup>	110	22.6 <sup>v</sup>
<b>Overall</b>	<b>137</b>	<b>19.2</b>	<b>408</b>	<b>31.6</b>	<b>578</b>	<b>28.7</b>

\*Calculated using weighted data (Wtclnc)

<sup>^v</sup> Statistically significantly higher or lower than comparison group

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007) and DCDB Valuations and Property Data (2005)

Individuals living in properties with a capital value of „Up to \$150,000“ were more likely to be obese, as seen for young adults (24.1 percent), those aged over 35 (40.8 percent) and the overall population (34.7 percent). Further analysis of obesity and housing tenure indicated no significant findings by property capital valuation quartiles for those young adults purchasing the property or a current home owner. For those aged over 35, there was a gradient between the property valuation data and obesity prevalence among individuals that were a „homeowner“ or „paying of a mortgage“, from lowest (44.9 percent) to highest property valuation range (24.8 percent). Interestingly,

analysis of the property capital values<sup>58</sup> of NWAHS participants who „owned or were paying off a mortgage“ as opposed to all NWAHS properties showed higher levels of obesity for all the age cohorts. Again consistent with discussion regarding the use of household income as an individual-level socio-economic measure, property valuation may present an issue for analysis within young adults. As a standalone, this attribute does not indicate wealth of the individual as there are socio-economic factors relating to housing affordability or the cohort entering the housing market for the first time.

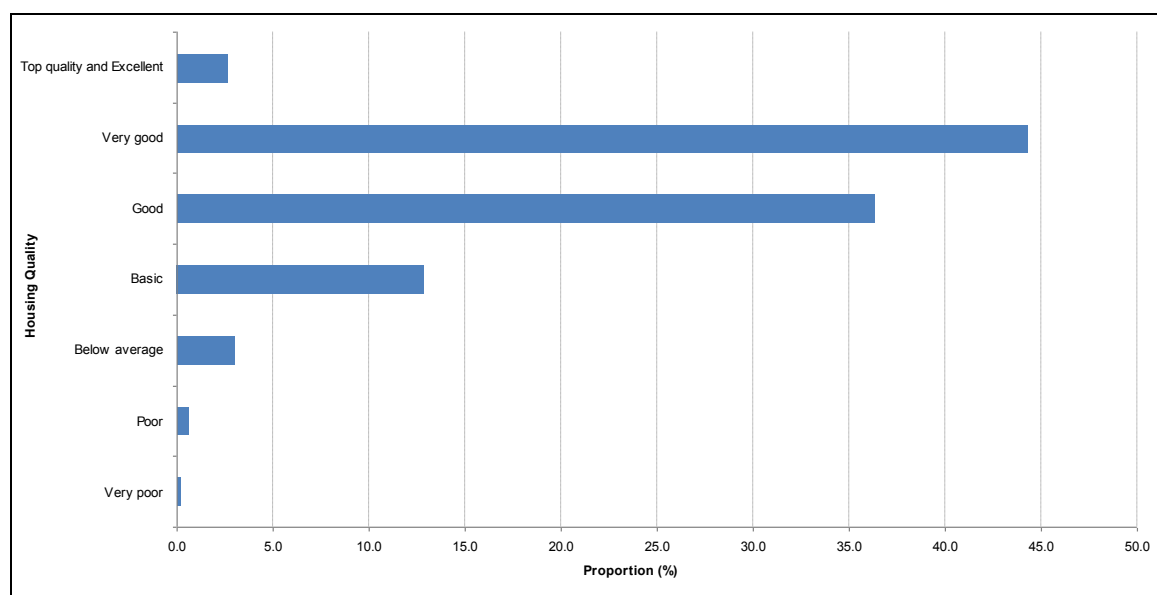
In addition to the property capital valuations, the Valuer-General provides a description of the building condition, ranging from „Very Poor“ to „Top Quality or Excellent“, at the time of valuation.<sup>59</sup> Melanie describes her experience on the quality of residences within her area:

Even rental affordability at the moment, like it is ridiculous for what you are getting, you are paying a huge amount for the most disgusting places.

*Melanie (Current housing tenure, Renter)*

As indicated in Figure 5.4, a majority of the NWAHS population were living within a building condition that is described as „Good“ (36.4 percent) to „Very Good“ (44.3 percent).

**Figure 5.4: Proportion of North West Adelaide Health Study (NWAHS) participants by building condition, total population, valuation data, 2005**



SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007) and Valuations Data (2005)

<sup>58</sup> Property capital value quartiles were determined by natural breaks within the NWAHS population distribution.

<sup>59</sup> Assignment of land use codes are by the Office of the Valuer-General, Land Services Group, Department for Administrative and Information Services, South Australian Government. There is the potential for variation in the assignment of this variable due to the nature of data collection.

The commonly used socio-economic indicator of housing tenure was outlined by Davey-Smith (2000) as an inadequate marker for housing quality within health research. Therefore, the ability to use Government administrative data sources as opposed to self-reported information on the condition and quality of a property provides additional insight into social environments. Australian property conditions are reported to be exceptionally different in comparison to other contexts. For example, Macintyre *et al.*, (1998:658) on housing in Scotland, commented that “dampness, mould, and overcrowding, which are related to respiratory and chronic illness and psychological distress, are more common in public sector homes”, all issues that are potentially irrelevant within the SA context.

The building condition was also found to be related to the obesity status within the NWAHS population. Those participants who live in „Below average“ to „Very Poor“ housing were around two times more likely (OR 2.32 CI 95% 1.12 – 4.79  $p=0.023$ ) to be obese compared to participants living in „Top Quality/Excellent“ housing. Housing quality described as „Good“ also indicated a higher prevalence of obesity status (Table 5.7).

**Table 5.7: Odds of obesity (BMI  $\geq 30$ ) by building condition, total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003 and valuation data, 2005**

Housing condition	Obesity (BMI $\geq 30$ )		
	Odds Ratio	CI 95%	P
Top Quality and Excellent	1.00	Reference	
Very good	1.65	(0.91 – 3.02)	0.101
Good	2.16	(1.18 – 3.96)	<b>0.012</b>
Basic	1.64	(0.87 – 3.10)	0.128
Below Average to Very poor	2.32	(1.12 – 4.79)	<b>0.023</b>

\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007) and Valuations Data (2005)

Table 5.8 outlines aggregated housing information based on the ABS 2001 Census by young adults, those aged over 35 years and the total NWAHS population. There are apparent relationships between obesity prevalence and high and low proportions of housing trust (social housing) residences for both young adults and the entire NWAHS population. The relationship for proportion of the area with social housing is bi-model with increases in the „Quintile 3“ and again in „Quintile 5“. There are different patterns observed in obesity prevalence and the proportion of rental properties within a local area, and this could possibly reflect the nature of residential patterns by housing tenure across socio-economic groups.

**Table 5.8: Prevalence of obesity (BMI ≥30) for Australian 2001 Census information (social housing and rental properties) aggregated to Collection District (CD) level by age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (BMI ≥30)					
	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Social Housing (CD level)</b>						
Quintile 1 (low %)	85	19.4	209	26.4 <sup>√</sup>	208	22.0 <sup>√</sup>
Quintile 2	22	13.1	88	34.0	79	23.9
Quintile 3	61	20.1	149	30.7	143	25.6
Quintile 4	52	20.1	140	30.1	139	25.1
Quintile 5 (high %)	64	23.4	191	38.5 <sup>^</sup>	166	32.4
<b>Renting Property (Private) (CD level)</b>						
Quintile 1 (low %)	52	16.0	140	24.7 <sup>√</sup>	142	20.2 <sup>√</sup>
Quintile 2	78	26.8 <sup>^</sup>	171	32.0	184	30.0 <sup>^</sup>
Quintile 3	54	19.9	149	30.3	132	23.9
Quintile 4	37	12.8 <sup>√</sup>	143	32.3	122	22.6
Quintile 5 (high %)	63	24.0	173	37.4 <sup>^</sup>	155	31.8
<b>Overall</b>	<b>284</b>	<b>19.7</b>	<b>776</b>	<b>31.1</b>	<b>735</b>	<b>25.4</b>

\*Calculated using weighted data (Wttfu2)

^√ Statistically significantly higher or lower (p&lt;0.05) than the other categories combined

SOURCE: Compiled from NWAHS Spatial Sample TFU 2 (2007) and ABS 2001 Census

Relationships between housing and health are multifaceted; Chapter 7 will extend these discussions to the residential perceptions and decision processes driving the socio-spatial differentiation in local areas.

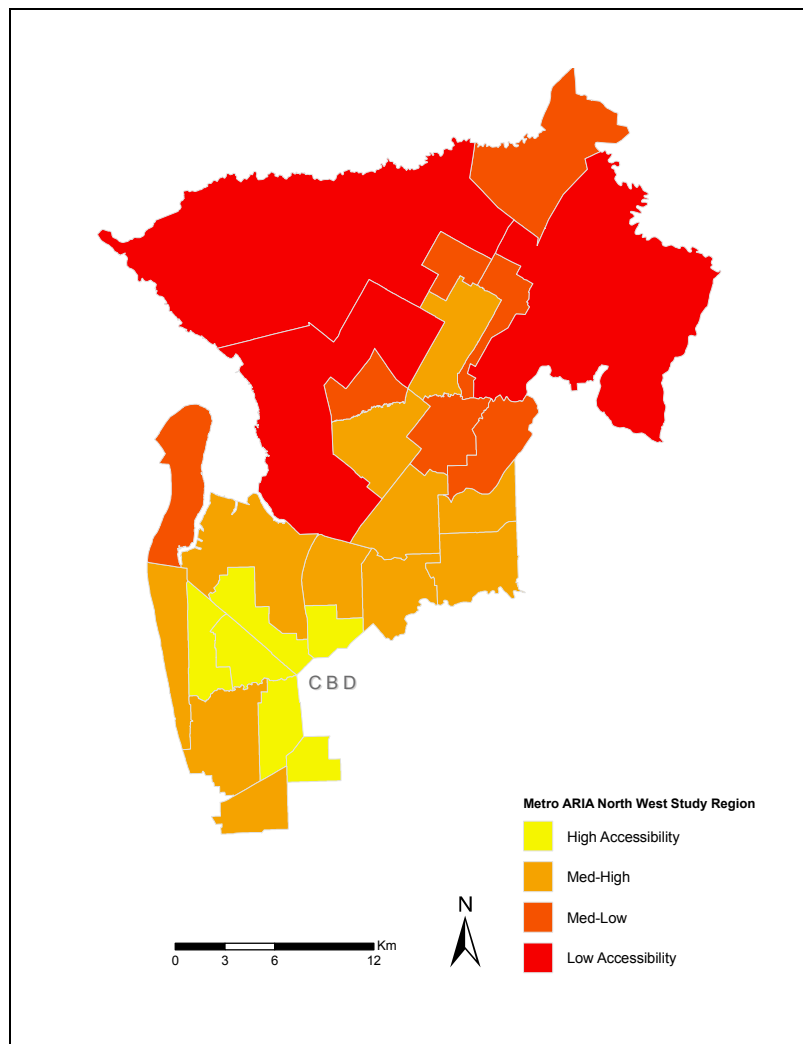
### 5.3.3 Accessibility to services and facilities

Another component of the social environment to explore is the accessibility of NWAHS residents to services and/or facilities. There is growing research exploring issues of area-level information and how accessibility to services and facilities may enhance healthful environments. This area of research has remained limited despite the sophistication of Geographic Information Systems (GIS) to calculate Euclidean distance, for example, the distance between residential location and shopping facilities. A major focus up until present has been on the spatial accessibility of food supplies such as distance to supermarkets (Zenk *et al.*, 2005) and fast food restaurants (Pearce *et al.*, 2007) and, additionally, the availability of healthy food across different social environments (Coveney & O'Dwyer, 2009). Within the Adelaide context, Franzon (2010) explored the location of three major fast food restaurant chains, McDonalds<sup>®</sup>, Hungry Jacks<sup>®60</sup> and Kentucky Fried Chicken (KFC)<sup>®</sup>, indicating a higher density of fast food outlets within disadvantaged areas, supporting other research within Melbourne, Australia (Thornton *et al.*, 2009).

<sup>60</sup> Hungry Jacks<sup>®</sup> is the franchise of Burger King<sup>®</sup> within Australia.

In New Zealand, a strong geographical variation was reported between accessibility to community resources across the domains of recreation, shopping, education and health facilities (Pearce *et al.*, 2006). Studies using the Accessibility and Remoteness Index of Australia (ARIA) have shown a higher use of primary care health services among highly accessible areas according to this index (Eckert *et al.*, 2007). The Metropolitan ARIA (Metro ARIA) is a geographic accessibility index designed to quantify service accessibility within metropolitan areas and has been defined for the metropolitan region of Adelaide. In Figure 5.5, the Metro ARIA average score by Statistical Local Area (SLA) is outlined for the north-west region.

**Figure 5.5: Spatial representation of mean score of accessibility (Metro ARIA) by Statistical Local Area (SLA), north-west region of Adelaide, 2001**



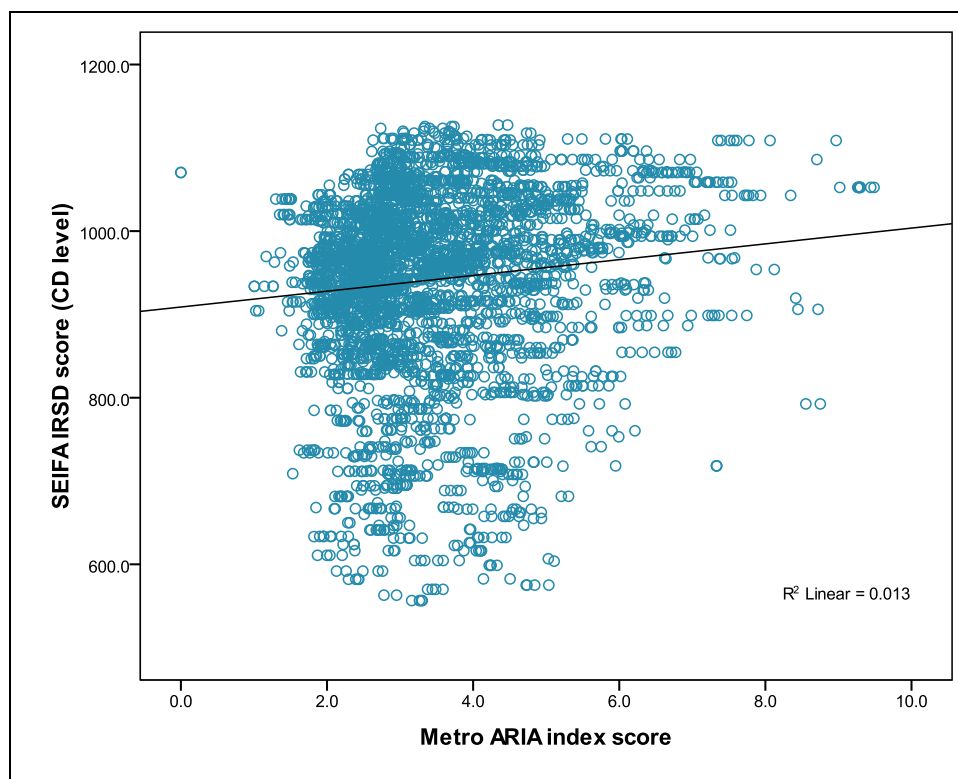
SOURCE: Compiled from Metro ARIA Adelaide, GISCA, The University of Adelaide (2001)

This distribution indicates that there are ranging levels of accessibility for this study region, particularly considering the spatial layout of the region in comparison to the



central business district (CBD) of Adelaide. As seen in a detailed description of the study region (Chapter 4), metropolitan Adelaide has undergone urban fringe developments and the residential population are dispersed over a large metropolitan area. There was found to be a significant relationship within the NWAHS population between Metro ARIA raw scores and continuous SEIFA IRSD (Pearson's Correlation  $0.113$   $p < 0.001$ ). Furthermore, Figure 5.6 displays a scatterplot of continuous SEIFA IRSD by Metro ARIA raw scores for NWAHS participants. There is a positive relationship between area-level disadvantage (high SEIFA IRSD raw score) and the Metro ARIA Index (a low score).

**Figure 5.6:** Scatterplot of area-level disadvantage (SEIFA IRSD) and Metro ARIA raw scores, total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003



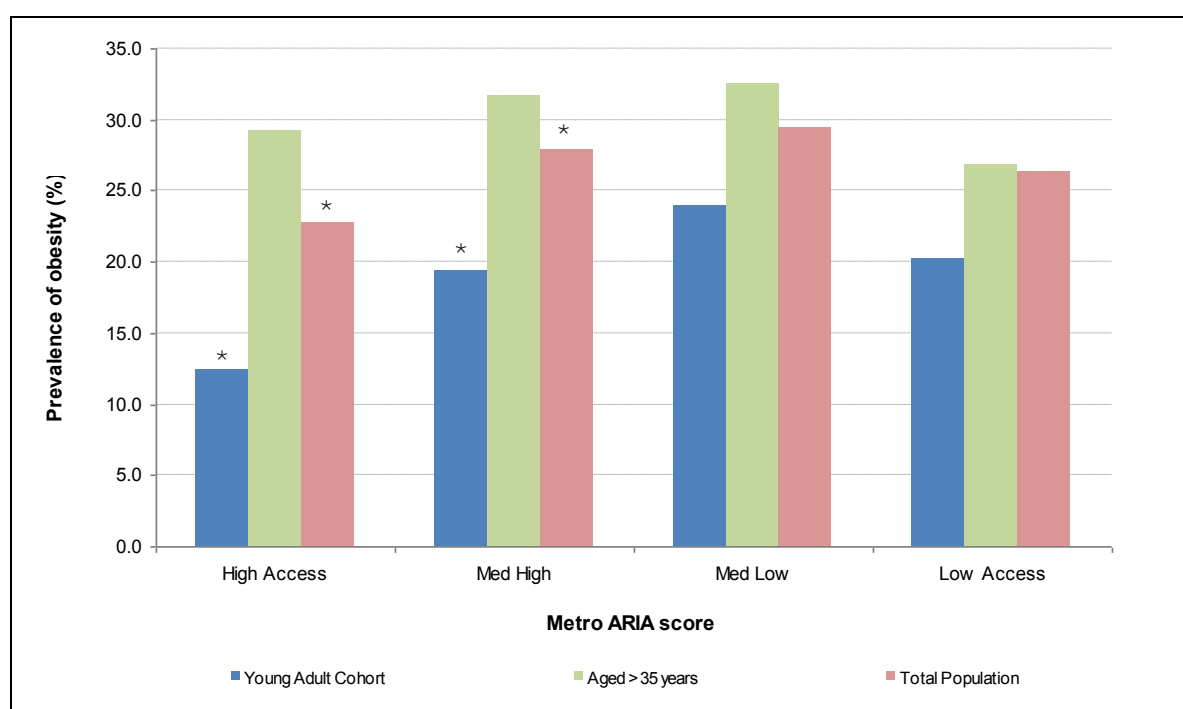
SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and Metro ARIA Adelaide (2001)

NWAHS participants living within the „Low/Lowest Quintiles“ of SEIFA IRSD saw 32.7 percent living in the „High Access“ areas of Metro ARIA. The „Low Access“ areas within the north-west region were highest amongst the „High/Highest Quintile“ of SEIFA (13.9 percent).

A study has found that there is no evidence to support that access to services explains neighbourhood variations in the case of depressive symptoms (Kubzansky *et al.*, 2005).

This is despite the hypothesis that services promote social engagement and residents of disadvantaged neighbourhoods are thought more likely to be exposed to poorer physical infrastructure, fewer health and community services, and higher levels of crime. There is little evidence in the SA context on the relationship between health outcomes and the geographic distribution of services and facilities. In Figure 5.7, a comparison is made between Metro ARIA index (high to low access) and the prevalence of obesity for the young adult cohort, those aged over 35 and the total NWAHS population.

**Figure 5.7: Prevalence of obesity (BMI  $\geq 30$ ) by Metro ARIA quintiles (high to low access), young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**



Calculated using weighted data (WtInc)

\*Denotes a statistically significant finding ( $p < 0.05$ ) between quintiles of Metro ARIA score

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and Metro ARIA Adelaide (2001)

The NWAHS participants living in high access areas saw increasing obesity with a decrease in accessibility, although there was a slight decrease of obesity for those NWAHS participants living within „Low Access“ areas compared to „Medium Low“. There is a higher percentage difference between „Low“ and „High“ access for the young adult cohort (difference of 7.8 percent) compared to those aged 35 years and over (difference of 2.4 percent) and the total population (difference of 3.6 percent). The Metro ARIA index can be further broken into four categories of access; public transport, shopping services, health services and educational facilities. The four major index categories are summarised by obesity status, gender and age cohort within Table 5.9. A lower prevalence of obesity was found for young females that had „High Access“

to education (14.4 percent), shops (14.1 percent) and health facilities (11.8 percent) as measured by Metro ARIA sub-categories.

**Table 5.9: Prevalence of obesity (BMI  $\geq$ 30) for metropolitan Adelaide accessibility index (Metro ARIA) components (public transport, education, shops and health), by age cohort and gender, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Males				Females			
	Young Adults		Aged 35 and over		Young Adults		Aged 35 and over	
	n	%	n	%	n	%	n	%
<b>Public Transport Index</b>								
High Access	34	20.7	106	29.9	31	15.7	132	35.5
Med High Access	27	13.6	85	29.8	25	15.3	105	32.5
Med Low Access	38	19.5	93	32.4	40	24.5	101	33.6
Low Access	42	24.0	64	23.6	46	24.9	90	29.5
<b>Education Index</b>								
High Access	51	17.6	166	29.6	45	14.4 <sub>v</sub>	208	34.8
Med High Access	27	17.3	71	32.3	35	28.9 <sub>^</sub>	84	31.8
Med Low Access	27	18.9	60	28.6	27	22.3	74	34.1
Low Access	36	25.2	51	24.8	36	23.2	62	27.9
<b>Shops Index</b>								
High Access	35	16.9	75	26.0	25	14.1 <sub>v</sub>	92	29.5
Med High Access	29	17.0	96	29.9	27	16.8	110	33.2
Med Low Access	31	19.4	99	31.8	49	28.0 <sub>^</sub>	109	31.8
Low Access	46	23.7	78	28.3	42	21.4	118	37.3
<b>Health Index</b>								
High Access	30	15.8	71	25.0	20	11.8 <sub>v</sub>	108	33.0
Med High Access	27	15.5	97	28.4	37	19.1	118	32.4
Med Low Access	30	16.9	110	32.2	42	24.1	98	28.2 <sub>v</sub>
Low Access	53	28.2 <sub>^</sub>	70	30.4	43	25.1	104	39.5 <sub>^</sub>

\*Calculated using weighted data (Wtclnc)

<sub>v</sub> Statistically significantly different ( $p < 0.05$ ) than the other quintiles of Metro ARIA combined

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and Metro ARIA Adelaide (2001)

In metropolitan Adelaide, suburban areas have become super-regional centres with multi-million dollar expansions of shopping facilities, such as seen within Marion in the south-west of Adelaide (Allen, 1998). Similar re-developments have occurred in the north at Elizabeth and Munno Para. To date, limited research has concentrated on the impact these shopping facilities have on local areas and behaviour of residents. These urban centres are important in the day-to-day mobility patterns observed within communities, as well as, the use and/or access to services providing a rich cultural and geographical importance to the local residents. Research for this context has not determined the extent to which different communities make use of their local environments. The analysis of these temporary social spaces requires detailed data for individuals' day-to-day mobility patterns. As indicated in the interviews with NWAHS participants, there was no perceived need to travel or utilise the CBD:

Well you know now at Elizabeth it has every shop there. I can't even remember the last time that I went to the city. I have driven through...

**Researcher:** So you don't go to the city much?

Not at all, not the cinemas, not the restaurants, everything is here and even if I did want to go to different ones.

*Tracey (Elizabeth Downs, 2 children, home duties)*

The local environment provided Tracey with all the facilities and services that she deemed necessary for day-to-day life and she indicated she “wouldn’t have a clue” where public transport was within her local area. Within Australian capital cities, 75 percent of adults travel to their usual place of work or study using private motor vehicles as their main form of transport (ABS, 2008a). Despite a slight increase in public transport use in the last decade, Australian cities are one of the most vehicle dependent in the world (Kenworthy & Laube, 1999). Australian 2006 Census information indicates that only one-quarter (26 percent) of young adults used public transport as their main method of travel to work or study, although, interestingly this is high compared to 11 percent of persons aged 55 years and over who use public transport (ABS, 2008d:3). The spatial layout of a city such as Adelaide, with a large metropolitan sprawl and low population density, provides numerous challenges to transport geography and urban planning. More insight is needed into the spatiality of networks within disadvantaged spaces and the influence on unhealthful behaviour.

Further breakdown of accessibility to facilities and services by obesity status in disadvantaged areas is shown in Table 5.10. NWAHS participants living in „High“ access areas are less likely to be obese compared to those that are living in „Medium Low“ and „Medium High“ access areas according to quintiles of Metro ARIA. These results indicate a relationship within disadvantaged areas between obesity and the distribution of accessibility to services according Metro ARIA index.

**Table 5.10: Prevalence of obesity (BMI  $\geq$ 30) for participants living within the most disadvantaged areas by Metro ARIA Index, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Low/Lowest SEIFA IRSD Obesity (BMI $\geq$ 30)	
	Odds Ratio (CI 95 %)	p
<b>Metro ARIA access</b>		
High access	1.00	
Med high access	1.48 (1.19 – 1.84)	$\leq$ 0.001
Med low access	1.65 (1.28 – 2.12)	$\leq$ 0.001
Low access	1.17 (0.75 – 1.85)	0.489

Calculated using weighted data (WtdInc)

SEIFA IRSD – Socio Economic Indexes For Areas, Index of Relative Socioeconomic Disadvantage measured at the Collection District (CD) level

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and Metro ARIA Adelaide (2001)

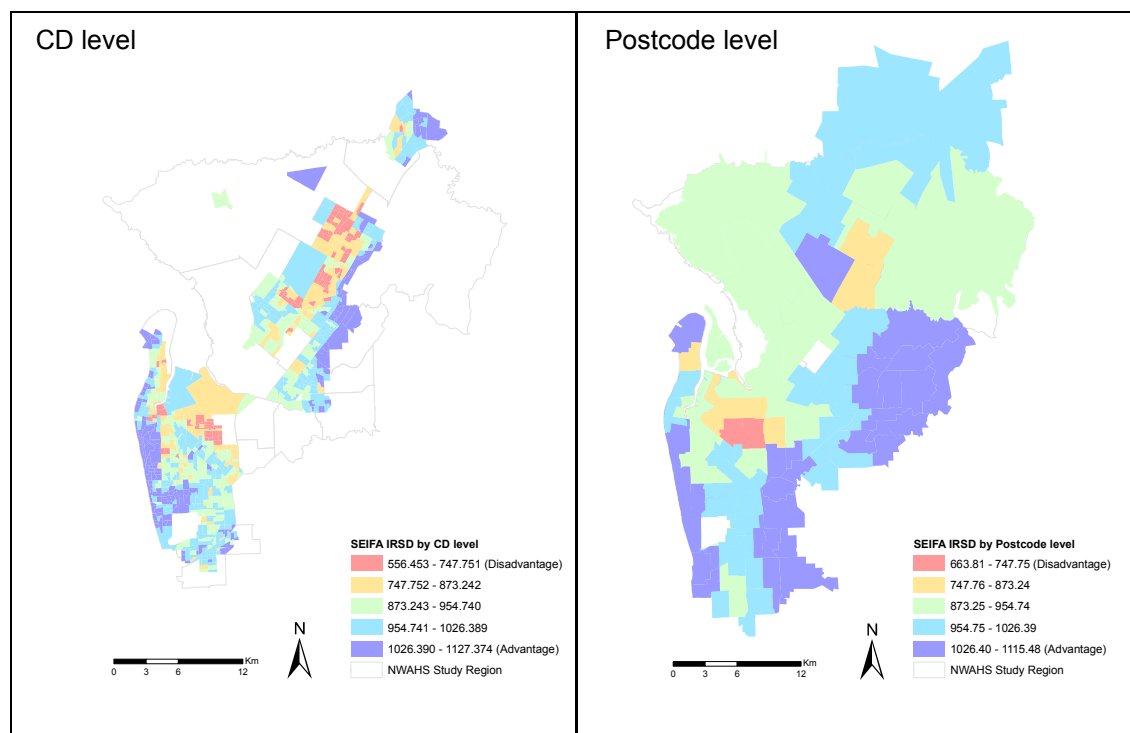
The social processes surrounding accessibility are extremely complex and the use of the Metro ARIA index does not capture an understanding on the frequency of use or quality

of a facility or service. Therefore, low accessibility to services and facilities is not merely a lack of physical resources but also the ability to use, understand and manoeuvre around these systems.

### 5.4 Comparison of spatial scale

There are varying spatial scales in which research can be undertaken, and these units vary in terminology and size cross-nationally. For example, research from the United States (US) context typically utilises census geographic units known as „Census Tracts“ (Krieger *et al.*, 2002) which are large in geographic size, although, the nature of US urban landscape formation allows for high concentrations of persons living within a local area. Figure 5.8 outlines a comparison of Australian Census geographies, Postcode and CD level information, by SEIFA IRSD. The findings indicate greater socio-economic heterogeneity at the smallest spatial scale.

**Figure 5.8: Comparison of spatial scale (Postcode and Collection District (CD) level) by area-level index of disadvantage (SEIFA IRSD), north-west study region, 2001 Australian Census**



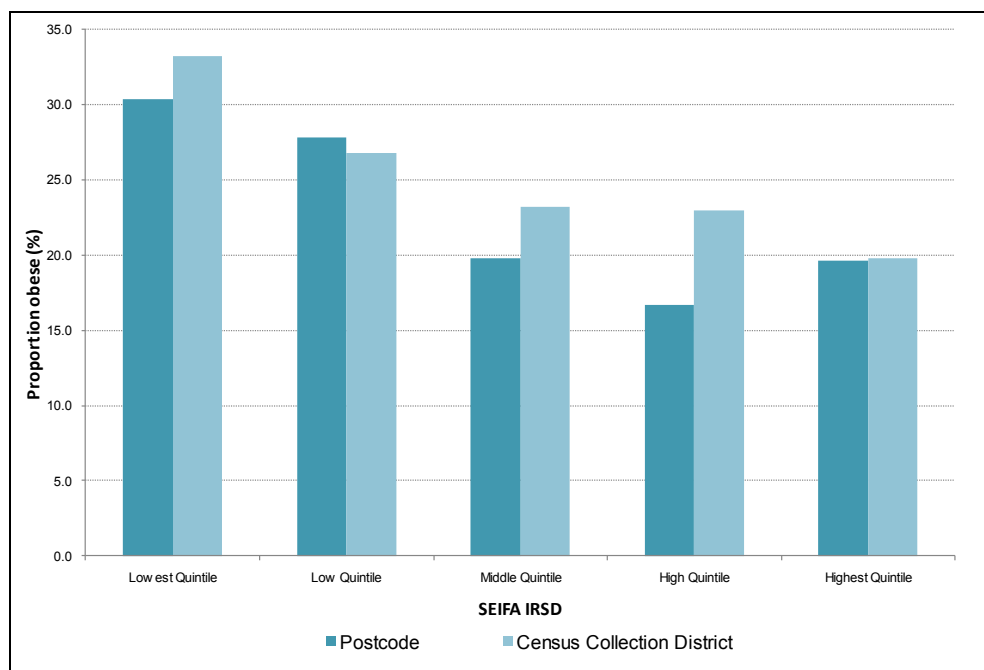
SEIFA IRSD - Socio Economic Indexes for Areas, Index for Relative Socioeconomic Disadvantage, \*\*Boundaries of CD level represent the „NWAHS Spatial Sample“ chosen for this research.

SOURCE: Compiled from the ABS 2001 Census

Figure 5.9 outlines a comparison of Postcode and CD level prevalence of obesity for each of the quintiles of SEIFA IRSD. There was found to be a slight difference

between the prevalence of obesity by this area-level socio-economic measure at the Postcode level (30.4 percent) and at the CD level (33.2 percent).

**Figure 5.9: Prevalence of obesity (BMI  $\geq 30$ ) by area-level disadvantage (SEIFA IRSD 2001) quintiles and spatial scale (Postcode and Collection District (CD) level), total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**



\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and the ABS 2001 Census

Additionally, Table 5.11 compares highest level of education „Bachelor degree or higher“ at the Statistical Local Area (SLA) and CD level.

**Table 5.11: Prevalence of obesity (BMI  $\geq 30$ ) by area-level disadvantage quintiles (Bachelor degree or higher) by age cohorts, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Young Adults		Aged 35 and over		Total population	
	n	%	n	%	n	%
<b>Bachelor degree (CD level)</b>						
Quintile 1 (low)	272	22.1	347	20.8	619	21.4
Quintile 2	286	23.3	342	20.5	628	21.7
Quintile 3	265	21.5	358	21.5	623	21.5
Quintile 4	194	15.8	340	20.4 <sup>^</sup>	534	18.4
Quintile 5 (high)	213	17.3	281	16.8	494	17.0
<b>Overall</b>	<b>1230</b>	<b>100.0</b>	<b>1668</b>	<b>100.0</b>	<b>2898</b>	<b>100.0</b>
<b>Bachelor degree (SLA level)</b>						
Quintile 1 (low)	259	21.1 <sup>v</sup>	418	25.1 <sup>^</sup>	677	23.4
Quintile 2	385	31.3 <sup>^</sup>	376	22.6 <sup>v</sup>	761	26.3
Quintile 3	284	23.1	390	23.4	674	23.3
Quintile 4	143	11.6 <sup>v</sup>	250	15.0 <sup>^</sup>	393	13.6
Quintile 5 (high)	159	12.9	233	14.0	392	13.5
<b>Overall</b>	<b>1230</b>	<b>100.0</b>	<b>1667</b>	<b>100.0</b>	<b>2897</b>	<b>100.0</b>

\*Calculated using weighted data (Wtffu2) <sup>^v</sup> Statistically significantly different ( $p < 0.05$ ) than the other quintiles of „Bachelor degree or higher“ combined

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census

There is an indication of variation in obesity prevalence by spatial scale for young adults, those aged over 35 years and the total population. These findings on spatial scale question previous research reporting area-level associations and obesity, possibly suggesting a misrepresentation of these relationships across advantaged and disadvantaged areas. There is a consistent reporting of an increasing prevalence of obesity across different populations and this is the key issue, not necessarily the difference in percentage points between groups. Notwithstanding, an investigation of obesity longitudinally does require an understanding of the variation in obesity rates across space.

The larger spatial unit definitions are too large to capture the area-level influences on individual health outcomes, as discussed in relation to spatial scale within the Australian setting. Area effects research has predominantly addressed analytical techniques of multi-level modelling (Diez-Roux, 2000), and these methodologies are one option for analysis of the NWAHS population. Adams *et al.*,<sup>61</sup> (2009) examined the effect of area-level socio-economic disadvantage in the north-west region accounting for individual socio-economic status. Initial multi-level analyses utilised SEIFA IRSD continuous scores based on Australia Post<sup>®</sup> Postcodes. Only slightly significant results were found for obesity at this larger spatial scale and there was a reported variance of 0.1 percent explained at level two of the statistical model (or the Postcode). The results at the CD level saw a reported higher variance partition coefficient of six percent attributable to the area-level influences.

Understanding the consequences of scale is critical to analysing the modes and patterns that exist in relation to obesity across and within local areas. Plane and Rogerson (1994:363) reaffirm that:

Since different questions can be asked if the scale of analysis is shifted, since the choice of technique is often scale-dependent, and since statistical results may be a function of the spatial scale of the units of analysis, we might think that analyses at a given scale should always be interpreted completely independently of analyses at other scales. There is often an important, positive interaction between phenomena studied at alternative scales of analysis.

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<sup>61</sup> Research includes author, see Appendix 10.

These initial analyses make comparison of different levels of spatial scale and the influence on the prevalence of obesity. Geographies of health research requires future studies to consider definitions of the local social environment, that is spatial scale, and also to capture area-level influences at the local-level of people living and „being“ within these spaces. As noted in the study region profile (Chapter 4) there were small numbers of NWAHS participants within each of the CD's and, therefore, further investigation is required into the hierarchal nature of these data and area-level measures. Methodological debates have deliberated whether multi-level methods are truly spatial as these statistical techniques potentially underestimate the influence of the variance of an outcome across space (Fotheringham, 1997). These global statistical models do not account for the differences that may occur across the study region and, therefore, may not fully explain the relationships that exist with health outcomes such as obesity.

## 5.5 Investigating variations of obesity across space

Cartographic work can be used to make a certain point (Dorling, 2007), such as seen in the case of obesity prevalence within the United States (Figure 5.10). The changes in the colour sequentially with the changes in the maps provide a lay perspective of the trends in obesity prevalence. In this case, the work has been an excellent tool in reaching audiences outside of the discipline of population health, such as the general public, without displaying statistics or the „numbers“.

**Figure 5.10: Trends in the prevalence of obesity among United States adults (18 years and over), Behavioural Risk Factor Surveillance System (BRFSS), 1990 to 2006**

NOTE:  
This figure is included on page 103  
of the print copy of the thesis held in  
the University of Adelaide Library.

SOURCE: CDC Behavioural Risk Factor Surveillance System (BRFSS) (2006)



In recent years there has been reporting in the media of SA HOS data using cartographic methods like those shown in Figure 5.11 (Phillips, 2006:4).

**Figure 5.11: South Australian obesity trends reported in media using the South Australian Health Omnibus Survey (SA HOS), 1993 to 2005 ('The Advertiser', 2006)**

NOTE:  
This figure is included on page 104  
of the print copy of the thesis held in  
the University of Adelaide Library.

SOURCE: „Obesity rates trigger health alarm“, *The Advertiser* (Phillips, 2006)

However, the simple visualisation using individual data in epidemiology is often not very informative and the distribution could be perceived by the reader in different ways (Gatrell, 2002). One such difficulty is the display of spatial units within areas comprising of varying physical attributes and population size, such as found in rural SA. The result is a map that represents too much visual weight for extensively sized areas that are sparsely populated.

The geographic variation in obesity rates has been an important component in understanding spatial variation of obesity and how across regions there is a differing prevalence in obesity. However, what is less understood is a consideration of *what* it is about these places that inadvertently produces variation across space. In attempting to understand the variation of obesity cases across space and within the north-west region of Adelaide, alternative spatial analytical techniques were investigated. One such method, the kernel density function, has been used to investigate health issues such as

clusters of cancer (Rushton *et al.*, 2004) and low birth weight (Reader, 2001). A kernel density “calculates a magnitude per unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline” (Esri, 2008). There is limited health research that has employed the techniques of a kernel density calculation to explore the distribution of chronic conditions in relation to the underlying population.

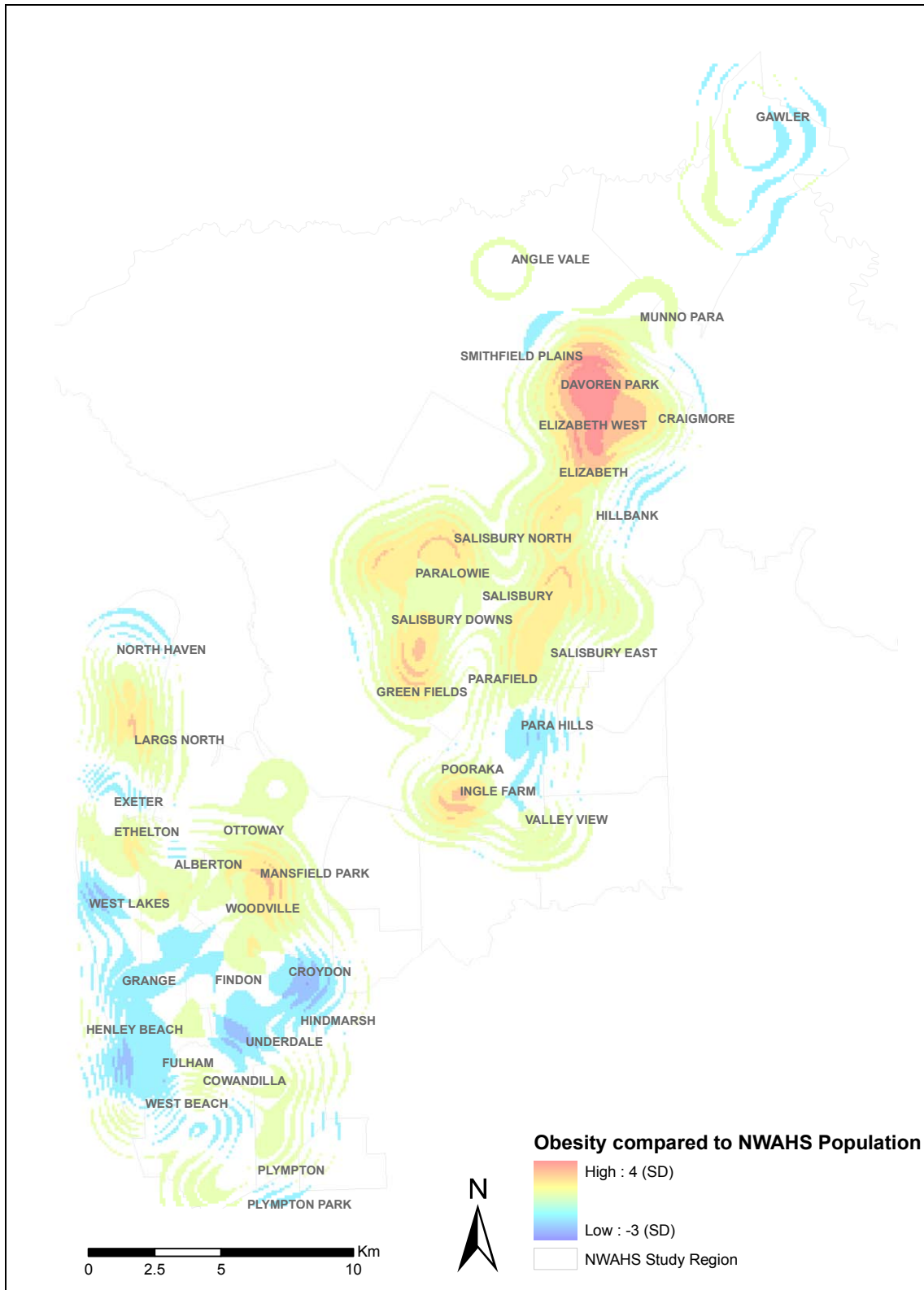
The calculations of a kernel density spreads point values, or in this case the residential location of NWAHS participants, over a surface (Figure 5.12). A circular search was applied and, in this example, a bandwidth of a two kilometre radius around each of the NWAHS participant’s residential location. The selection of a bandwidth has been described by De Smith *et al.*, (2007:131) as “often more of an art than a science”, and a number of alternative bandwidths were employed in these exploratory analyses of obesity. The kernel density surface of NWAHS obesity cases<sup>62</sup> for the north-west region was calculated using the binary variable of obesity (where 0 „non-obese“ or 1 „obese“). The density of obesity cases was subtracted from a density surface of the total NWAHS participants to provide standard deviations of higher than expected (red) and lower than expected (blue) obesity cases across the north-west study region. The total NWAHS population was utilised for this exploratory spatial analysis as a result of the spatial distribution of young adults. Therefore, these findings do not articulate obesity occurrences specifically for young adults. Nevertheless, this spatial display does provide insight into the spatial distribution of obesity within the entire NWAHS population.

Within the north of the study region there is a concentration of higher than expected cases of obesity within the NWAHS population, as indicated in the „hot“ spot shown in Figure 5.13. Additional, smaller „hot“ spots were also apparent in other suburbs within the study region. Results for the total NWAHS population display similar „hot“ spots to what has been shown in preliminary findings from Franzon (2010) on obesity rates within four-year old children in metropolitan Adelaide.

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<sup>62</sup> Calculated using binary variable (0 and 1) for the density of cases (obesity = 1) at 2 kilometre radius around NWAHS residential address for a 100m cell grid.

**Figure 5.12: A kernel density of obesity prevalence (BMI  $\geq 30$ ) and underlying population for the north-west region, total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

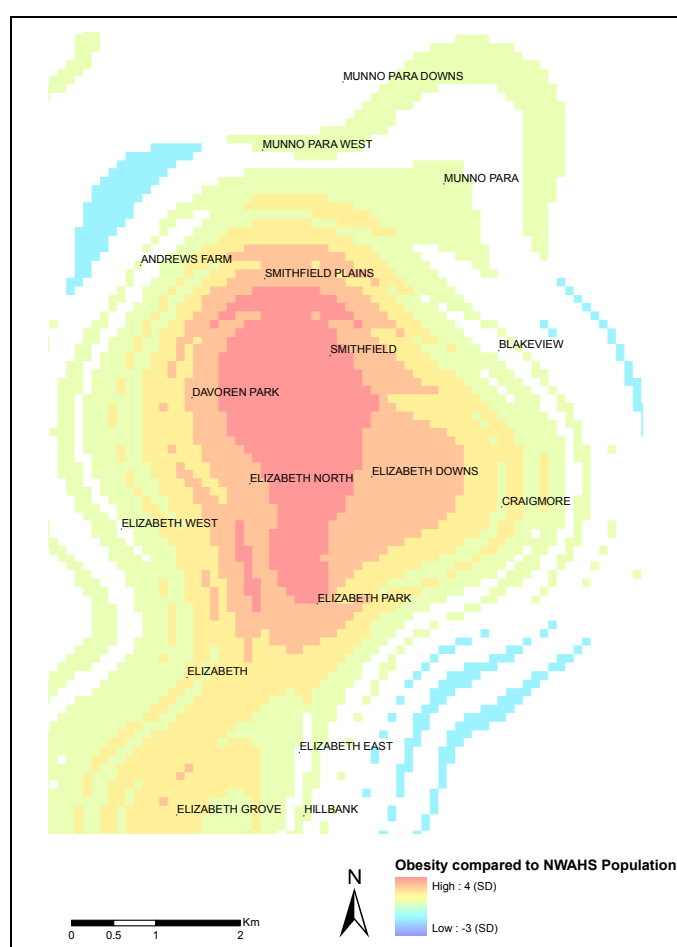


\*Calculated by subtracting kernel density of NWAHS obesity cases from a kernel density of the total NWAHS population, using ArcGIS Version 9.2 Kernel density function.

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

When analysing these „hot“ and „cold“ spots, from a researcher observation perspective, it appears that these areas are related to the area-level index of disadvantage (SEIFA IRSD) as shown previously in Figure 5.8. Further discussion on socio-spatial clustering of disadvantage and obesity is outlined in Chapter 7.

**Figure 5.13: Higher than expected cases (‘hot’ spots) of obesity within the north-west region, total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**



SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

In this case, it cannot be determined whether the results visually displayed on the map arise by chance, or from the sample from which it is drawn. The question is whether these areas of higher than expected cases of obesity actually „cluster“ together or whether the spatial arrangement of obesity rates are essentially random. In examining these results, careful interpretation is needed taking into consideration the sampling methodology and underlying population characteristics. The subtraction of kernel density maps, does provide exploratory analysis to further understand the complex phenomenon of the spatial distribution of obesity rates across a study region such as the

north-west of Adelaide. These results do not explain, however, what features attribute to these „hot“ and „cold“ spots.

Further examination is required through investigation of census information and qualitative field work to determine the variation in characteristics that exist between these areas. Additionally, an understanding of the construction of place is important in determining what features of these areas may result in a higher than expected number of obesity cases within this region. Individuals from the same area may be similar to each other in relation to their health status and may have different degrees of health depending on where they live within the area and because of differing cultural, economic, political, climatic, historical or geographical contexts (Merlo *et al.*, 2005). Therefore, consideration is required of local level social and health policy and socio-cultural features across the lifecourse to understand the similarities and differences within and across these spaces.

Chaix and colleagues (2005a) have examined whether investigating variations across continuous space provides more relevant information than the multi-level approach in the social epidemiological field of contextual analysis. More recently, spatial models have expanded to include continuous space and local measures such as spatial regression (Wakefield, 2007), and Geographically Weighted Regression (GWR). Fotheringham *et al.*, (2006:202) have indicated that in its usual form the kernel density estimates are an aspatial method of estimating the probability of density function. GWR considers geographically weighted kernels through regression points that are calculated across an entire surface on each individual point to consider the importance of variations that exist over space. There have been studies more recently that have utilised this statistical technique to investigate property price structure in Adelaide (Lockwood, 2007) and employment rates in South-East Queensland (Li *et al.*, 2009). These applications are some of the first for the Australian context to investigate the variations of a phenomenon across continuous space, although there has been less of a focus on investigating health outcomes from these methodologies.

## 5.6 Mobility within and between social environments

The conceptual framework for this research (outlined in Chapter 2) indicated:

Space is a moving and changing reality and its characteristics result from the development overtime by a population or a society. A population manages a space – its own space – where it lives, works, moves and generates fluxes.

(Picheral, 1994:1589)

Therefore, in considering the social environment, it is important to also incorporate the nature of residential movement within the study region. Residential migration is the term used to describe the process where an individual changes their usual residence and intends to remain in that location for the foreseeable future (Pooley *et al.*, 2005:2). Australia is large in geographical area but, in spite of this, most people move short distances, a median distance of approximately 16 kilometres (Bell & Hugo, 2000:33). Between 1991 and 1996, Census data indicated that mobility was highest among young adults, the separated and divorced, the unemployed, those living in rental housing, professionals and people working in public administration and in the hospitality sector (Bell & Hugo, 2000).

In the past, Australian studies investigating residential migration utilised the ABS Census data collected every five years, that are aggregated to the SLA or larger local area (Bell & Ward, 1998). Analysis of residential mobility at a large spatial scale does not provide detailed information of individual movements and there currently exists limited opportunities within Australian context to explore these patterns over time. Also, there have been few studies conducted for recent Census years (e.g. 2001 and 2006) and global changes may influence internal migration processes within this study region. Therefore, it is a unique opportunity to explore the NWAHS cohort between two stages of data collection, in conjunction with individual and area-level socio-economic attributes, and additionally incorporating biomedical information such as obesity status.

### 5.6.1 Patterns of movement within the north-west region

Figure 5.12 outlines the socio-demographic characteristics of NWAHS participants for „movers“ and „non-movers“ between Stage 1 and Stage 2 of data collection. Young adults moved residential location more times (32.8 percent) than those aged 35 years and over (14.6 percent), and there was no difference reported by gender for movement patterns.

**Table 5.12: Socio-demographic characteristics of 'movers' and 'non-movers', total population, North West Adelaide Health Study (NWAHS), Stage 1 to Stage 2 1999 to 2006**

	Movers		Non-movers	
	n	%	n	%
<b>Gender</b>				
Male	330	21.8	1186	78.2
Female	332	21.0	1252	79.0
<b>Age Cohort</b>				
Young Adults	378	32.8 <sup>^</sup>	747	67.2 <sup>v</sup>
Aged 35 years and over	284	14.6 <sup>v</sup>	1664	85.4 <sup>^</sup>
<b>Income</b>				
Up to \$20,000	98	16.8 <sup>v</sup>	484	83.2 <sup>^</sup>
\$20,001 to \$40,000	150	21.5	549	78.5
\$40,001 to \$60,000	160	24.1	503	75.9
\$60,001 +	342	23.2	773	76.8
<b>Marital Status</b>				
Married/de facto	447	21.7	1613	78.3
Separated/divorced	69	26.7 <sup>^</sup>	189	73.3 <sup>v</sup>
Widowed	27	12.9 <sup>v</sup>	182	87.1 <sup>^</sup>
Never married	114	21.0	429	79.0
<b>SEIFA IRSD (CD level)</b>				
Low/Lowest Quintiles	276	16.7 <sup>v</sup>	1379	83.3 <sup>^</sup>
Middle Quintile	155	22.4 <sup>^</sup>	537	77.6 <sup>v</sup>
High/Highest Quintiles	160	24.0 <sup>^</sup>	506	76.0 <sup>v</sup>

\*Calculated using weighted data (WtclncS2). All socio demographic variables are measured at Stage 1

<sup>^v</sup> Statistically significantly higher or lower (p<0.05) „movers“ compared to „non-movers“

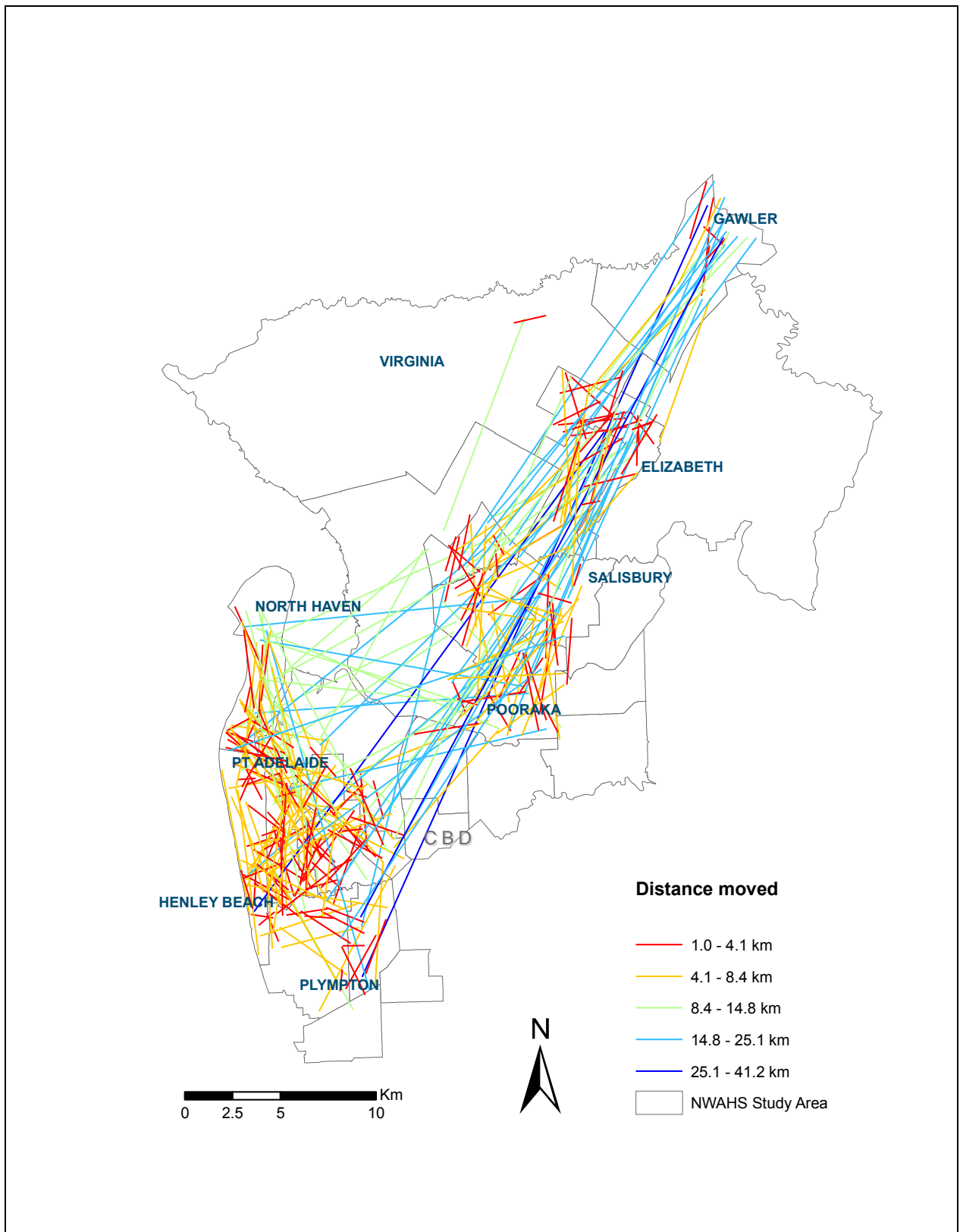
SOURCE: Compiled from Stage 1 and 2 NWAHS Spatial Sample (1999 to 2006)

NWAHS participants within the lowest household income (16.8 percent), widowed (12.9 percent) and living within the „Low/Lowest Quintiles“ of SEIFA IRSD (16.7 percent) were less likely to move residence during the two stages of NWAHS data collection. Alternatively, the participants who were „separated or divorced“ (26.7 percent) or living within the „High/Highest Quintiles“ of SEIFA IRSD (24.0 percent) were more likely to have moved residence.

The movement patterns and the relationship with health are complex in their nature and consideration of distance moved may provide insight into changing social environments for individuals.<sup>63</sup> Figure 5.14 outlines the spatial distribution of the distance that NWAHS participants moved between Stage 1 and 2 within the north-west region. The corresponding line represents the residential movement of each NWAHS participant. The movement patterns have been distributed into quintiles, from low (red) to high (blue) distance moved.

<sup>63</sup> Data were available for the north-west region for both Stage 1 and 2 coordinates indicating the participants' residential location for these two time points. The spatial references for the telephone follow-up survey (TFU2) 2007 were assigned based on the location at the Stage 2. The distance moved between the two stages of data collection was calculated using the spatially referenced coordinate for both points of time, utilising ArcView 9.2 extension application Point Distance (Version 9.02) for this analysis. This extension takes pairs of coordinates from records (Stage 1 and 2) and converts the pair into polylines adding a 2d distance to each polyline record. The result is a continuous variable for each participant with a distance in kilometres and was exported and matched to other NWAHS data for analysis in SPSS Version 15.0.

**Figure 5.14: Spatial distribution of distance moved residential address within the north-west region metropolitan Adelaide, total population, North West Adelaide Health Study (NWAHS), Stage 1 to 2 1999 to 2006**



SOURCE: Compiled from NWAHS Stage 1 and 2 Spatial Sample (1999 to 2006)



Between Stage 1 and 2, the NWAHS cohort moved an average distance of 5.8 kilometres, 1 through to 41.2 kilometres, within the north-west region. As can be seen from this graphical display, there appears to be more movement within the western suburbs over a short distance, equating to up to 8.4 kilometres. There are apparent movement patterns within local areas, with individuals moving within a similar social environment. These spatial processes could be influencing the reproduction of lifestyle and behaviour at the local level.

### 5.6.2 Understanding disadvantaged spaces through mobility

Residential mobility across the life stages has seen an increase in movement of the population due to changes in work and lifestyle. It is hypothesised that increased residential sorting through internal population mobility accounts for the increasing segregation of disadvantage at the small scale. Mare and Bruch (2003:23) have provided a methodological and conceptual contribution, showing that aggregated neighbourhood characteristics influence mobility decisions in the following way:

The accumulated impact of individual moves, however, is to change the characteristics of neighbourhoods [sic], thereby altering the relative attractiveness of neighbourhoods to future potential movers.

There is a small but articulate literature base for the movement of the population within the local context of Adelaide. For example, early work from Stimson (1978) investigated residential location behaviour and social space in Adelaide, demonstrating that the majority of moves took place within the same or an adjacent suburb and that there was little upward social space mobility. There are possibly a number of socio-economic forces at play in residential mobility. In the US, it was found that wealthier and better educated families were more mobile (Henderson & Ioannides, 1989), indicating „advantage“ due the accumulation of capital and wealth across the lifecycle. Conversely, other individuals who move are „disadvantaged“ and undertaking mobility due to the instabilities that exist in housing, such as social housing or renting, and occupational insecurity.

Figure 5.13 shows the proportion of NWAHS „movers“ living within each of the quintiles of SEIFA IRSD between Stage 1 and 2 (1999 to 2006).

**Table 5.13: Change in area-level disadvantage (SEIFA IRSD) for 'movers', total population, North West Adelaide Health Study (NWAHS), Stage 1 to 2 1999 to 2006**

	Total Population				Changed Location Stage 1 to 2			
	Stage 1		Stage 2		Stage 1		Stage 2	
	n	%	n	%	n	%	n	%
<b>SEIFA IRSD</b>								
Lowest Quintile	1119	28.6	1157	34.9	197	30.0	136	24.5
Low Quintile	1159	29.6	683	20.6	170	25.9	136	24.5
Middle Quintile	885	22.6	932	28.1	148	22.5	121	21.8
High Quintile	617	15.8	414	12.5	114	17.4	115	20.7
Highest Quintile	131	3.3	131	3.9	28	4.3	47	8.5
<b>Overall</b>	<b>3910</b>	<b>100.0</b>	<b>3317</b>	<b>100.0</b>	<b>657</b>	<b>100.0</b>	<b>555</b>	<b>100.0</b>

\*Calculated using weighted data (Wtclnc and WtcatiS2)

\*\*SEIFA IRSD measured at the CD Level for 2001

SOURCE: Compiled from NWAHS Stage 1 and 2 Spatial Sample (1999 to 2006)

Analysis of the total Stage 1 NWAHS population indicated that there were 28.6 percent of participants living within the „Lowest Quintile“ of SEIFA IRSD and at Stage 2 there were 34.9 percent. Those who had „moved“ reported a higher proportion within the „Lowest Quintile“ at Stage 1 (30.0 percent) compared with at Stage 2 (24.5 percent). These findings suggest that there is some degree of area-level social mobility occurring within this population. Some 34 percent of those who did not participate at Stage 2 NWAHS were living within the „Lowest Quintile“ of SEIFA IRSD at Stage 1 (Appendix 2). The observations in the distribution of area-level disadvantage and residential mobility, therefore, are unable to consider non-participation within the NWAHS cohort.<sup>64</sup> Table 5.14 reports the percentage of NWAHS participants moving more than one SEIFA IRSD quintile between data collection periods.

**Table 5.14: Movement of area-level disadvantage index categories (number of SEIFA IRSD categories), total population, North West Adelaide Health Study (NWAHS), Stage 1 to 2 1999 to 2006**

	SEIFA IRSD Movement		
	Quintile change	n	%
<b>MOVED UP</b>	4	7	1.3
	3	19	3.5
	2	39	7.1
	1	88	16.0
<b>Stayed same</b>		<b>179</b>	<b>32.5</b>
<b>MOVED DOWN</b>	1	111	20.2
	2	65	11.8
	3	34	6.2
	4	8	1.5
<b>Overall</b>		<b>550</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2)

SOURCE: Compiled from NWAHS Stage 1 and 2 Spatial Sample (1999 to 2006)

<sup>64</sup> To fully capture the extent to which people move within and between social environments there would be the need to follow up the locations of individuals who did not participate in Stage 2 NWAHS.

There were 27.8 percent of the population moving to a more advantaged area, compared with 39.6 percent moving to a more disadvantaged area and 32.5 percent staying within the same quintile of SEIFA IRSD. „Movers“ within the NWAHS population are more likely to rent rather than own a home (OR 1.32 95% CI 1.02 – 1.71  $p=0.036$ ). Analysis of the age cohorts show that young adults were less likely to be „home owners“ (OR 0.60 95% CI 0.42 – 0.86  $p=0.005$ ), whereas, the older age cohorts were more likely to be „renters“ (OR 2.22 95% CI 1.52 – 3.26  $p\leq 0.001$ ).

### 5.6.3 Short-term mobility patterns and obesity

It has been argued by O'Reilly and Stevenson (2003) that many studies have ignored the movement of people between areas when researching the growing inequalities in health. Researchers into space, place and health have highlighted that the processes involved in movement are complex and need a greater theoretical understanding (Bernard *et al.*, 2007). International studies have found mobility to be more strongly associated with poor health and the spatial process of migration have shown that healthier people come to be living in the most affluent areas (Shaw *et al.*, 2001). Previous research in Australia indicated an association with indicators of poor health and residential moves for two waves of a middle-aged cohort of women aged between 45 and 50 years (Larson *et al.*, 2004). The study provides a basis to researching health and mobility patterns, however, it is limited to this female age cohort and the sampling methodology covered the whole of Australia. There is little known about how movement patterns influence an individual's socio-spatial relations, for example social capital and a „sense of community“, and these themes are further discussed in Chapter 7.

Between Stage 1 and 2 NWAHS is a relatively short period of time to notice any difference in the relationship between environmental exposures and obesity status. A higher prevalence of obesity was found for those individuals that did not move between Stage 1 and 2 NWAHS, although these results were not significant. Moreover, no differences were observed between those that had moved „up“ or „down“ area-level socio-economic status and those individuals who stayed living within the same SEIFA IRSD quintile between data collections. Internal migration as an explanatory variable needs to be considered in future modelling of health data, especially for longitudinal studies and future research should collect information regarding movement patterns.

## 5.7 Conclusion

Traditionally within this population, socio-economic status has been measured at the area-level utilising the ABS SEIFA index at the spatial scale of the Postcode. The previous chapter has outlined aspects of the social environment, both from an individual and area-level perspective, through the analysis of ABS 2001 Census and property capital valuation data. There were apparent gradients with obesity for young adults across these social characteristics. The combination of property capital value and individual-level wealth determines the quality and type of housing, and also potentially the building condition. Additionally, relationships exist with where a property is located based on the spatial distribution of the housing market, and this influences the accessibility to services and facilities within different regions. There are innovative ways of investigating the social environment that extend analysis opportunities to explore individual or area-level measures of disadvantage. An understanding of the social, cultural and residential processes will provide additional insight into obesity rates within and across these spaces. The NWAHS young adult cohort were more likely to have moved residential location between waves of data collection compared to the older age groups and mobility is an important factor to include within socio-spatial frameworks to address health. Chapter 6 will investigate the socio-cultural influences of obesity including the ethnicity, lifecourse socio-economic status and childhood residence.

## CHAPTER 6

# SOCIO-CULTURAL ATTRIBUTES: Ethnicity, lifecourse and social environments

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In geography England and her Antipodes [Australian and New Zealander's] were far apart, but the Antipodes developed the kind of community one would expect to find within a few miles of the Lands End. Nearly all their people spoke English, conformed to British political and social customs, obeyed or disobeyed most of the laws which Britons obeyed and were subjects of the British monarch.

*The Tyranny of Distance, (Blainey, 1966:314)*

### 6.1 Introduction

This chapter aims to outline a number of socio-cultural processes relating to obesity and health within the young adult cohort. The socio-spatial global forces of globalisation, migration, social change, media landscapes, and the economic and socio-political climate, all contribute to the local social environment and the north-west region „culture“. The obesity patterns in relation to individual and parents“ country of birth emphasise the diverse intergenerational nature of this region. Building on discussions around ethnicity, the second section introduces obesity status and the lifecourse indicators of parents“ socio-economic position, family history of disease and residence during childhood.

### 6.2 The north-west region socio-cultural landscape

The migration history of Australia depicts a number of noteworthy periods to consider in addressing socio-cultural themes, in particular it is a unique „British“<sup>65</sup> settlement. The colonisation of South Australia (SA) as the first settlement absent of convicts occurred in 1834, with migrants landing on the shores from Britain in 1836 (Migration Museum, 1995). The history of Australia as a British colony has been shaped in the early beginnings by the remarkable distance from Britain in itself creating a cultural and spatial landscape that is distinct to these parts of the world. From the 1880's this form of Immigration control became known as the „White“ Australia policy, and the subsequent Commonwealth Government formation in 1901 saw the introduction of the „Immigration Restriction Act“.<sup>66</sup> The „White“ Australia policies saw a domination of

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<sup>65</sup> As Jupp (2002:3) indicates "Australia was not settled by „Europeans“ but by the „British“, partly to keep „Europeans“ out. Its subsequent history was determined by that fact“.

<sup>66</sup> Although nowhere in this Act does it mention race or the White Australia policy (Jupp, 2002).

immigration mainly from Britain. It was only around thirty years ago that Australia abandoned its policy of excluding those immigrants that were not „white“. From 1947, the post-World War II expansion in SA saw immigration play a crucial role in the state’s economic growth and was a measure to curb substantial labour shortages. The assisted passage scheme saw migrants from the United Kingdom (UK) for as little as ten pounds for an adult and five pounds a child migrating to Australia, becoming commonly referred to as the „10 pound Poms“. At the time immigration policies were centralised on a 'populate or perish' mentality. Furthermore, in later years, these policies moved to ones of 'economic rationalism' where there was an emphasis on the quality of migrants instead of purely on numbers (Jupp, 2002:2).

Since these changes in policy, Australia has become a more multi-cultural country instead of one of the „most British“ countries in the world. There are increasing rates of international migration to Australia and in particular to SA (Hugo, 2004). One explanation for these increases is the current SA population policy and regional classification of visas to enter the state (Jupp, 2002; Hugo, 2008). Adelaide presents an emerging opportunity for overseas students to study abroad at the three internationally recognised universities. Today, the history and culture of South Australian people details a diverse set of origin countries, including South East Asia, Africa and Western Europe, and continuing changing profiles due to refugee and humanitarian populations settling within the region (Migration Museum, 1995).<sup>67</sup> SA has prospered through the addition of these migrants as part of the community. These changing profiles will influence the cultural composition of the region and the demands placed on resources and services within metropolitan Adelaide.

### 6.3 „Ethnicity“ shapes place

„Landscape shapes culture“<sup>68</sup> not only in terms of the physical environment but in addition *ethnicity* contributes to socially shaping the places in which people live. The global and local processes attributing to socio-demographic and socio-economic characteristics are determined spatially by population migration and depict changing socio-cultural geographies. The spatial patterns observed in this study region indicate spatial clustering of those persons with poor English proficiency in the western suburbs

<sup>67</sup> Refer to study region profile (Chapter 4).

<sup>68</sup> Quote from Terry Tempest Williams, Author and environmental activist (1955 - ).

and „UK or Ireland“ born in the northern suburbs (Chapter 4). The concept of ethnicity for the following analyses was based on self-reporting of „country of birth“ and does not fully capture the extent of what it means to be „from“ one country or another, and the reporting is dependent on how individuals view their cultural and ethnic identities. „Ethnicity“ implies cultural similarities among individuals whereas „race“ implies biological traits indicative of meaningful genetic similarities (Tremblay *et al.*, 2005:25). A profile of ethnicity and „country of birth“ provides an interesting descriptive profile attributing to the socio-spatial geography of obesity within this population.

Australia and other Western countries experience some of the highest rates of obesity in the world. Furthermore, as indicated in Chapter 1, there is wide variation in obesity prevalence between countries (Sassi *et al.*, 2009). Many of these Western countries have a rich migrant history with varying ethnic minority groups and, therefore, it is not new to think about the patterns associated with health for these sub-populations. It is, however, more common for research to report prevalence of obesity status for those who are born overseas or from a specific country of origin. For example, Baltrus and colleagues (2005) provide a cultural perspective indicating differences in weight gain over time by race and socio-economic status.

Traditionally, literature on migration and health surrounds the „healthy migrant“ debate – that is that international migrants are usually healthier than the rest of the population. The migration process is highly selective towards positive health status and immigrants are usually reported to be of better health due to the nature of mandatory health checks for migration (McDonald & Kennedy, 2004). Migrants to Australia are required to meet certain health and character requirements (DIAC, 2009), therefore, this is a selective group. As the Western world experiences increases of chronic conditions, there are changing patterns in migrants“ health status as they move to countries with a higher prevalence of these conditions. Literature in recent years has begun to explore how the population movement between countries to „new“ social environments relate to health outcomes across the lifecourse. There are a number of international studies that have investigated the impact of international migration and ethnicity on obesity and related disorders (Landman & Cruickshank, 2001; Tremblay *et al.*, 2005; Argeseanu Cunningham *et al.*, 2007; Misra & Ganda, 2007).

Research in the United States (US) focuses on examining race, particularly within the Latino and Black populations. Obesity among US immigrant groups found even after adjusting for age, socio-demographic and lifestyle factors that living in the US for 15 years was associated with a 1.39 BMI increase (Goel *et al.*, 2004). Another US study found foreign-born adults had a lower BMI than US-born adults and increasing BMI was associated with the length of time since arrival. The effect of birthplace and length of US residence on BMI differed by education level, gender and race/ethnicity (Sanchez-Vaznaugh *et al.*, 2008). Immigrants to North America are less likely than the host population to be overweight but within two or three generations the prevalence of overweight among these groups exceeds the non-immigrants (Perez, 2002). It has also been found that the health of foreign-born people in the UK moving from „more to less deprived“ locations are healthier than migrants who move from „less to more deprived“ locations (Norman *et al.*, 2005). The complexities of these relationships have not been fully articulated to explain why movement to a new country promotes the characteristics or „culture“ of the new social environment.

### 6.3.1 Country of birth

Within the North West Adelaide Health Study (NWAHS), there were significantly higher proportions (68.8 percent) of those within „Other Country“<sup>69</sup> origins that were living in disadvantaged areas („Low/Lowest Quintiles“ of SEIFA IRSD at Stage 1) (Table 6.1). In addition, more Australian born people were living in the „High/Highest Quintiles“ (20.1 percent) compared to those who were born overseas.

**Table 6.1: Current area-level disadvantage status (SEIFA IRSD) by country of birth, total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	SEIFA IRSD Quintiles					
	Low/Lowest		Middle		High/Highest	
Country of birth	n	%	n	%	n	%
Australia	1588	57.3	625	22.6	557	20.1 <sup>^</sup>
UK or Ireland	347	56.6	136	22.2	130	21.2
Europe	197	62.1	73	23.0	47	14.8 <sup>v</sup>
Other	128	68.8 <sup>^</sup>	47	25.3	11	5.9 <sup>v</sup>
<b>Overall</b>	<b>2260</b>	<b>58.2</b>	<b>881</b>	<b>22.7</b>	<b>745</b>	<b>19.2</b>

\*Calculated using weighted data (WtInc) <sup>^</sup> Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS Stage1 Spatial Sample (1999-2003)

For the total NWAHS population, the prevalence of obesity was found to be significantly higher for the Australian born (20.3 percent) compared to persons born

<sup>69</sup> Other country represents those person born overseas but not within „United Kingdom/Ireland“ or „Europe“.



overseas (11.2 percent). Table 6.2 presents the origin country of birth by gender and obesity status for the entire NWAHS population.

**Table 6.2: Prevalence of obesity (BMI  $\geq$ 30) by country of birth and gender, total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

Country of Birth	Obese (Biomedical BMI $\geq$ 30)			
	Males		Females	
	n	%	n	%
Australia	367	27.2 <sup>^</sup>	387	26.9 <sup>v</sup>
UK or Ireland	63	20.7 <sup>v</sup>	101	32.1
Southern Europe	26	29.5	32	47.8 <sup>^</sup>
Northern and Western Europe	14	35.9	14	25.9
Other Europe and Former USSR*	7	16.7	12	44.4
Asia and other	2	3.1 <sup>v</sup>	2	4.1 <sup>v</sup>
<b>Overall</b>	<b>479</b>	<b>25.4</b>	<b>548</b>	<b>28.1</b>

\*Calculated using weighted data (WtInc) <sup>^</sup><sup>v</sup> Statistically significantly higher or lower ( $p < 0.05$ ) „Males“ compared to „Females“

\*Formally Eastern Europe, The USSR and the Baltic States, ABS Standard Australian Classification of Countries (SACC) 1998, Cat. No. 1269.0, originally coded for Stage 1 (1999-2003)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

Higher proportions of obesity were found in those females born in „Southern Europe“ and „Eastern Europe“, 47.8 percent and 44.4 percent respectively. In addition for males, higher levels were found in „Northern and Western Europe“ (35.9 percent) and „Southern Europe“ (29.5 percent). The NWAHS cohort provides small numbers for some minority groups within the north-west region, as shown in NWAHS „country of birth“ comparisons with aggregated ABS 2001 Census information (Chapter 4). The original Computer Assisted Telephone Interview (CATI) allowed for the option of a translator. There was no option for a translator during the clinic appointment, although the participant could bring someone along to assist with translation.

The patterns observed for the total NWAHS population are potentially explained by increasing BMI with age, in conjunction with immigration patterns during these periods. In light of the previous findings, age adjusted odds ratios are reported in Table 6.3, indicating males born in the „UK or Ireland“ (OR 0.64 95% CI 0.47 – 0.87  $p=0.050$ ) and „Asia and Other“ (OR 0.37 95% CI 0.20 – 0.69  $p=0.002$ ) were less likely to be obese compared to those born in Australia. For females, European born persons were 57 percent more likely (OR 1.57 95% CI 1.10 – 2.24  $p=0.014$ ) to be obese compared to those born in Australia.

**Table 6.3: Age adjusted odds ratio of obesity (BMI ≥30) by gender and country of birth, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

Country of Birth	Obese (BMI ≥30) Age adjusted			
	Males		Females	
	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p
Australia	1.00		1.00	
UK and Ireland	0.64 (0.47 – 0.87)	<b>0.050</b>	1.18 (0.90 – 1.54)	0.245
Europe	0.96 (0.66 – 1.37)	0.803	1.57 (1.10 – 2.24)	<b>0.014</b>
Asia and other	0.37 (0.20 – 0.69)	<b>0.002</b>	0.56 (0.31 – 0.99)	<b>0.046</b>

\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

The year of arrival in Australia observed for NWAHS data is consistent with Australian immigration policies with more migrants from UK and Europe pre-1972 compared to other origin countries (Table 6.4). The number of years of residence is important in the analysis of socio-cultural themes and has been shown to be related to increasing BMI within immigrant populations (Goel *et al.*, 2004).

**Table 6.4: Year arrived in Australia (pre and post 1972) by country of birth, total population, North West Adelaide Health Study (NWAHS)**

Country of Birth	Year of Arrival in Australia			
	Pre 1972		Post 1972	
	n	%	n	%
UK or Ireland	442	71.8	174	28.2
Europe	229	73.9	81	26.1
Asia and other	36	19.3	151	80.7
<b>Overall</b>	<b>707</b>	<b>63.5</b>	<b>406</b>	<b>36.5</b>

\*Calculated using weighted data (Wtclnc)

\*\*Pre and Post 1972 utilised to be consistent with immigration policies for Australia.

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

For those participants born overseas there were significantly higher odds of obesity for those born in the „UK or Ireland“ (OR 1.85 CI 95% 1.14 – 2.30  $p=0.012$ ) and „Europe“ (OR 2.54 CI 95% 1.53 – 4.24  $p\leq 0.001$ ) compared with those in „Asia and Other“, even after adjusting for age, sex and year of arrival in Australia (Table 6.5).

**Table 6.5: Age, sex and year arrived in Australia adjusted odds ratio of obesity (BMI ≥30), total persons born overseas, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

Country of Birth	Obese (BMI ≥30)			
	Age and Sex adjusted		Age, Sex and Year Arrived in Australia (Pre/Post 1972) adjusted	
	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p
Asia and Other	1.00		1.00	
UK and Ireland	1.96 (1.23 – 3.13)	<b>0.004</b>	1.85 (1.14 – 2.30)	<b>0.012</b>
Europe	2.80 (1.72 – 4.56)	<b>≤0.001</b>	2.54 (1.53 – 4.24)	<b>≤0.001</b>

\*Calculated using weighted data (Wtclnc)

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003)

These results are slightly lower compared to those adjusted for age and sex, suggesting that the length of time in the social environment, when accounting additionally for immigration period, may be related to obesity status.

International migration drives the changes in the cultural landscapes within the north-west region and future generations are impacted by these movements, specifically in relation to food and lifestyle. The effect of these cultural patterns is apparent across the lifecourse in how people undertake their day-to-day life. Immigrants to Australia have had a considerable influence on the type of food and cooking techniques available and this diversification has intensified in more recent times. For example, Asian migration to Australia has introduced a variety of new food crops including rice, green vegetables, tropical fruits, herbs and spices, all resulting in an increased variation in diets and benefits to the general population (Wahlqvist, 2002).

A study of first generation Greek Australians suggests that their Greek culture is still apparent because they have brought their food, religion, culture and lifestyles when migrating to Australia (Kouris-Blazos, 2002). Amongst the total NWAHS population, European born women saw the highest levels of obesity with nearly half (47.8 percent) biomedically measured as obese. Even after adjusting for age and time since arrival in Australia, those NWAHS participants with European heritage experienced higher proportions of obesity compared to other ethnic groups. There were many examples of the influence of European culture on food and lifestyle choices for this Australian context. Sarah discusses the observations of her partner's Italian heritage being centred on the concepts of entertaining, socialising and food:

From their point of view everything revolves around eating and drinking, well not drinking but having a good time... The volume of food that goes on the table at that time, he has got a sister and two brothers and they are all very very close so that is their time that they come together and it is around food [...] [In] his immediate family there are no grandparents but they did grow up with the grandparents. They only just died a few years ago and they had a huge influence over that family unit.

*Sarah (partner Italian heritage)*

Along with the previous knowledge that BMI increases for those that have migrated, another study reports that migrants tend to adopt food consumption patterns of their host or general population (Landman & Cruickshank, 2001). Previous findings within this research have indicated the importance of variations in the social environment for understanding the complexities of health in different populations. The socio-spatial

segregation of those born outside of Australia (Hugo, Forthcoming) and these descriptive findings on country of birth warrant further exploration in relation to social exclusion of these minority populations and health outcomes, such as obesity. Most research utilises country of birth of parents to examine childhood health and obesity outcomes rather than examining the relationship with health in later life (Williams *et al.*, 2005). With this in mind, parental country of birth provides additional insight into ethnicity and health and a further opportunity to explore cultural influences on increasing prevalence of obesity.<sup>70</sup>

### 6.3.2 Parents' country of birth

A majority (86.5 percent) of NWAHS young adults were born in Australia. Australian Bureau of Statistics (ABS) 2001 Census data for the north-west region shows an average of 47.6 percent of households had at least one parent born overseas (CData, 2001).<sup>71</sup> A study into immigrants' health in Canada found that second-generation male immigrants living in communities with high unemployment reported poorer health and had higher BMI's compared to non-immigrants (Zunzunegui *et al.*, 2006:493). Table 6.6 outlines the ethnicity of NWAHS participants through investigating mothers' and fathers' country of birth by age cohort.

**Table 6.6: Parents' country of birth by age cohort, North West Adelaide Health Study (NWAHS)**

	Young Adults		Aged 35 and over		Total population	
	n	%	n	%	n	%
<b>Mothers' country of birth</b>						
Australia	763	64.9 <sup>^</sup>	926	58.3 <sup>^</sup>	1689	61.1
UK or Ireland	177	15.1 <sup>^</sup>	419	26.4 <sup>^</sup>	595	21.5
Europe	167	14.2	218	13.7	384	13.9
Other	68	5.8 <sup>^</sup>	26	1.6 <sup>^</sup>	94	3.4
<b>Overall</b>	<b>1175</b>	<b>100.0</b>	<b>1589</b>	<b>100.0</b>	<b>2763</b>	<b>100.0</b>
<b>Fathers' country of birth</b>						
Australia	649	53.2	880	53.8	1528	53.6
UK or Ireland	223	18.3 <sup>^</sup>	426	26.1 <sup>^</sup>	649	22.7
Europe	267	21.9 <sup>^</sup>	274	16.8 <sup>^</sup>	540	18.9
Other	81	6.6 <sup>^</sup>	55	3.4 <sup>^</sup>	136	4.8
<b>Overall</b>	<b>1220</b>	<b>100.0</b>	<b>1635</b>	<b>100.0</b>	<b>2854</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2)

<sup>^</sup> Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „Young adults" compared to „Aged 35 and over"

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

The young adult cohort saw more mothers born in „Australia" (64.9 percent) and „Other Country" (5.8 percent) compared to „UK/Ireland" than those aged 35 years and over, and

<sup>70</sup> For many of the minority origin countries there are insufficient numbers in the sample to undertake analysis of sub-populations. NWAHS participants were asked their mother's and father's country of birth and recoded into the major origin countries.

<sup>71</sup> The spatial distribution of those with both parents born overseas by Collection District (CD) level within the north-west region ranged from 0 to 77.3 percent.

more fathers born in „Europe“ (21.9 percent) or „Other Country“ (6.6 percent). The increases seen within the „Other Country“ category is in line with international migration patterns, with a growing number of migrants arriving from Asia and other regions compared to traditional European areas (ABS, 2003:12).

In Table 6.7, obesity status for the young adult cohort is outlined by gender and parents' country of birth. For males, obesity rates for those individuals whose mother was born in Australia was significantly lower compared to those whose mother was born overseas (13.9 percent). For those who had mothers born in Europe, there was a significantly higher obesity prevalence for both males (34.8 percent) and females (27.3 percent). There was also a higher obesity prevalence for both males (25.9 percent) and females (26.9 percent) whose fathers were of European decent.

**Table 6.7: Prevalence of obesity (BMI  $\geq$ 30) by parents' country of birth by gender, young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (BMI $\geq$ 30)			
	Males		Females	
	n	%	n	%
<b>Mothers country of birth</b>				
Australia	51	13.9 $\checkmark$	74	18.7
UK or Ireland	16	15.5	7	9.5 $\checkmark$
Europe	31	34.8 $\wedge$	21	27.3 $\wedge$
Asia/Other	4	11.8 $\#$	-	-
<b>Overall</b>	<b>102</b>	<b>17.2</b>	<b>94</b>	<b>24.2</b>
<b>Fathers country of birth</b>				
Australia	45	14.6	68	20.1
UK or Ireland	13	10.8	9	8.7 $\checkmark$
Europe	38	25.9 $\wedge$	32	26.9 $\wedge$
Asia/Other	4	12.1 $\#$	-	-
<b>Overall</b>	<b>100</b>	<b>16.4</b>	<b>109</b>	<b>17.9</b>

\*Calculated using weighted data (Wttfu2) #Insufficient numbers for statistical analysis

$\wedge$  Statistically significantly different ( $p < 0.05$ ) than the other „country of birth“ combined

SOURCE: Compiled from NWAHS Stage 1 and TFU 2 Spatial Sample (2007)

The temporal nature of social environments and the influence that population movements have on health in later life are under-researched. One reason for this is the difficulty in capturing the lag period and the influence of the social and physical environment over time on individuals living within these changing environments. Complex patterns exist between gender, age cohorts and origin countries and it is not determined what influence this has on culture, food and lifestyle within the population. Within the north-west context closer examination is required through cultural geographical research to examine the impact of food and lifestyle in relation to obesity outcomes.

## 6.4 Influence of the social environment across the lifecourse

### 6.4.1 Individual socio-economic status during childhood

Early life socio-economic circumstances are an indicator for chronic disease in adulthood (Davey-Smith *et al.*, 1998; Claussen *et al.*, 2003; Galobardes *et al.*, 2004). Research is yet to understand the nature of social environments over the lifecourse and how these have influenced individual health outcomes (Rose *et al.*, 2004), and more importantly how these vary across different spaces. There has been limited lifecourse research that has concentrated on the young adult cohort, obesity and health. To further understand the temporal nature of obesity this section discusses lifecourse influences within the socio-spatial conceptual framework for the north-west region of Adelaide.

A study of seven population based surveys investigating the contribution of childhood and adult socio-economic position found obesity was higher for women in adulthood if during childhood their parents were undertaking manual work. For obesity, blue collar worker origins, based on father's occupation, increased the risk for women (adjusted ORs 0.96-2.50) and these effects were weaker among men but mostly in the same direction (adjusted ORs 0.79-1.42) (Power *et al.*, 2005:339). Within lifecourse research, it is noted that carefully collected retrospective data can offer a valuable complement to birth cohort studies, or in this case a population biomedical cohort study.<sup>72</sup> Parents' occupational status were coded into „Managers and Professionals“, „White Collar Employees“, „Blue Collar Employees“ and „Home Duties“.<sup>73</sup> As can be seen in Table 6.8, both parents will tend to have a similar classification of occupation status. For example, a higher proportion (33.1 percent) of mothers and fathers were both classified as „Managers and Professionals“ and a higher proportion of mothers whose classification was „Blue-collar Employee“ (76.1 percent) and fathers whose status was also „Blue Collar Employee“.

<sup>72</sup> In discussing the importance of retrospective data collection, 3.7 percent of the population did not report their fathers' occupation and 1.4 percent for mothers' occupation. These results are relatively low in comparison to other retrospective studies and research in South Australia has compared self-report face-to-face and telephone interviews for lifecourse questions (Chittleborough *et al.*, 2008a).

<sup>73</sup> Parents' occupational status coded originally using Australian Bureau of Statistics Australian and New Zealand Standard Classifications of Occupation (ANZSCO) Coding (ABS, 2006b) and recoded into the following: **Managers and Professional** (Managers, Professionals, Community and Personal Services Workers), **White Collar Employees** (Clerical and Administrative Workers, Sales Workers), **Blue Collar Employees** (Technicians and Trades Workers, Machinery Operators and Drivers, Labourers).

**Table 6.8: Parents' occupational status by employment classification, young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Fathers' occupation					
	Managers and Professionals		White Collar Employees		Blue Collar Employees	
	n	%	n	%	n	%
<b>Mothers' occupation</b>						
Managers and Professionals	92	33.1 <sup>^</sup>	47	16.9	139	50.0 <sup>∨</sup>
White Collar Employees	81	29.5 <sup>^</sup>	71	25.8 <sup>^</sup>	123	44.7 <sup>∨</sup>
Blue Collar Employees	43	16.0 <sup>∨</sup>	21	7.8 <sup>∨</sup>	204	76.1 <sup>^</sup>
Home Duties	67	19.9 <sup>∨</sup>	39	11.6 <sup>∨</sup>	229	68.2 <sup>^</sup>

\*Calculated using weighted data (Wttfu2) \*\*1 father coded as home duties

<sup>^</sup><sup>∨</sup> Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Table 6.9 presents the obesity status for the young adult cohort by gender according to parents' occupational status. The results indicate a higher proportion of obese females whose mothers' occupational status was „Blue Collar Employee“ (24.8 percent) and lower amongst „White Collar Employees“ (10.3 percent). For males, obesity was found to be significantly higher for fathers' whose occupational status was „Blue Collar“ (20.2 percent) and lower for „White Collar“ (7.6 percent) employees.

**Table 6.9: Parents' occupational status by obesity status and gender, young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (Biomedical BMI ≥30)					
	Males		Females		Total Young Adults	
	n	%	n	%	n	%
<b>Mothers' occupation</b>						
Managers and Professionals	19/137	13.9 (9.1 - 20.6)	23/162	14.2 (9.7 - 20.4)	42/299	14.0 (10.6 - 18.4)
White Collar employees	27/138	19.6 (13.8 - 27.0)	15/145	10.3 (6.4 - 16.4) <sup>∨</sup>	41/283	14.5 (10.9 - 19.1)
Blue Collar employees	27/151	17.9 (12.6 - 24.8)	32/129	24.8 (18.2 - 32.9) <sup>^</sup>	59/280	21.1 (16.7 - 26.2)
Home duties	26/185	14.1 (9.8 - 19.8)	37/170	21.8 (16.2 - 28.6)	63/355	17.7 (14.1 - 22.1)
<b>Overall</b>	<b>99/611</b>	<b>16.2 (13.5 - 19.3)</b>	<b>107/606</b>	<b>17.7 (14.8 - 20.9)</b>	<b>205/1217</b>	<b>16.8 (14.8 - 19.1)</b>
<b>Fathers' occupation</b>						
Managers and Professionals	19/140	13.6 (8.9 - 20.2)	18/144	12.5 (8.1 - 18.9)	37/284	13.0 (9.6 - 17.4) <sup>∨</sup>
White Collar employees	8/105	7.6 (3.9 - 14.3) <sup>∨</sup>	12/72	16.7 (9.8 - 26.9)	20/178	11.2 (7.4 - 16.7) <sup>∨</sup>
Blue Collar employees	71/352	20.2 (16.3 - 24.7) <sup>^</sup>	70/348	20.1 (16.2 - 24.6)	141/700	20.1 (17.3 - 23.3) <sup>^</sup>
<b>Overall</b>	<b>98/597</b>	<b>16.4 (13.7 - 19.6)</b>	<b>100/565</b>	<b>17.7 (14.8 - 21.1)</b>	<b>198/1163</b>	<b>17.0 (15.0 - 19.3)</b>

\*Calculated using weighted data (Wtclnc) \*\*1 father coded as home duties

<sup>^</sup><sup>∨</sup> Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 and Stage 1 Spatial Sample (2007)

These findings suggest that there are socio-cultural processes occurring whereby gender roles influence the health of future generations. Investigation into parents' occupational status may suggest that males are influenced by the status of their fathers and females by their mothers. There are complex gender influences that occur within the family unit and this could be possibly explained through the influence parents have on their children with respect to values, ideals and general lifestyles.

### 6.4.2 Family history of disease

My dad was a big man and my mother's mother, my grandmother, and my mother's sisters were big. My great grand... on my mother's side, my mother was probably the one that didn't get the big gene. On my father's side, he got it, and my aunty... she grew up a pretty normal size. But my sister and I got it in the very big, seriously kind of OTT [over the top] kind of way...

(Throsby, 2007:1564)

Throsby (2007:1564) details Fiona's experience of a family history of obesity and the thought that it made her "a loser in the genetic lottery and mitigates against the easy attribution of individual moral failure for having become fat". The „fat gene“ discourse still places fatness as a problem against which action must be taken by the individual themselves, giving an account of why they are fat, therefore placing the „blame“ in their genes and family history. Previous research has suggested that there is a link between family history and the onset of disease in individuals (Pierce *et al.*, 1995; van der Sande *et al.*, 2001; Yoon *et al.*, 2003; Annis *et al.*, 2005; Valdez *et al.*, 2007). Within these discussions, there is limited research that has focused on family history of disease and the influence of social environments in which they live and interact across the lifecourse. A Gambian study found a positive family history of diabetes resulted in an increase in BMI. Among the study participants, 70.6 percent of those with a positive family history were living in the urban areas (van der Sande *et al.*, 2001:325).

Results of logistic regression analysis showed increased risk of overweight in Iranian children and adolescents (OR = 2.02 CI 95% 1.50 - 2.60) if either parent had diabetes, even after adjusting for socio-economic status (Maddah, 2009). The conclusions from the author (2009:2) suggested that "this implicates that children from diabetic parents may be metabolically more predisposed to obesity than children from non-diabetic families". The genes associated with the patho-physiology of obesity predict a small percentage of body weight and body composition variability (Yiannakouris *et al.*, 2001). This is seen in the distribution of weight as either an „apple“ (increased weight around the waist) or „pear“ (more around the buttock) shape. The distribution of weight displays variation in the risk of chronic conditions and excess weight around the waist has been shown to be related to an increased risk of cardiovascular disease (Lee *et al.*, 2008). Aspects of genetic make-up will determine metabolic functioning among individuals and it is important to understand the genetics of human physiology and how



the body regulates weight. The genetics associated with adiposity helps to understand who is at risk of obesity and only partially explains the changes in prevalence over time (Astrup *et al.*, 2004). Genetics, nevertheless, does not provide an avenue to curb the rising levels of obesity in the way that societal action does and the changes in the prevalence over time are only explained partially by genetic composition.

An ecological model for Health Promotion recommends family as an important avenue to reach the population for individual behaviour change, through both interpersonal and intrapersonal relationships (McLeroy *et al.*, 1988). In general, people are likely to learn the behaviours from those that are close to them, adopting the attitudes, behaviours and opinions about health, as seen in Laura's comments on her family history of health and how this relates to her future health status.

I think it will be really good, my mum's really healthy. She didn't used to be as healthy. She has had a lot of joint problems and she has been more or less forced to adjust her health side of things. She has had disadvantages in not being able to do exercises. So that has kind of rubbed off on me. If I turn out like my mum, my mum is 62 and she looks about 50. If I turn out like that I won't be too disappointed.

*Laura (22 years, Medium household income)*

An interesting aspect of the family history of disease is the influence that this knowledge has in one's perception of his or her current and future health. This is seen through discussions with NWAHS participants on their perceived „risk“ of future chronic conditions:

No I don't think I will get heart disease or diabetes as they are family history stuff and we haven't got that. I feel pretty comfortable with that.

*Tracey (28 years, biomedical results indicate the presence of at least one familial risk factor, current smoker, low exercise level, living in disadvantaged area)*

Fairly slim actually, because usually as I said I eat well, I usually sleep well, I exercise regularly, don't smoke and don't drink a large amount. I have some hereditary things in my family, that if you are going to get them you are going to get them. But other than that... there is a fairly slim chance.

*Melanie (29 years, biomedical results indicate the presence of at least one familial risk factor, ex-smoker, moderate exercise level, shift worker and recently divorced)*

There is more research needed into the relationship with family history of disease and genetic susceptibility, and how this relates to the influence of the social environment.

The NWAHS cohort does not currently have access to genetic information or family records for analysis<sup>74</sup> and, as a result, the examination of self-reported family history of disease is one way to begin to explore this theme. The NWAHS collects information on family history of diabetes, heart disease, stroke and osteoporosis.<sup>75</sup> Obesity is known to be a risk factor for future diabetes and the following analysis explores the family history of diabetes in a first degree relative (parent or sibling). Table 6.10 outlines obesity status for those young adults with a family history of diabetes by area-level disadvantage. Those NWAHS participants living in the most disadvantaged areas with a family history of diabetes have significantly higher proportions of obesity (26.4 percent) compared to those that did not have a family history (18.6 percent).

**Table 6.10: Prevalence of obesity (BMI  $\geq$ 30) by area-level disadvantage (SEIFA IRSD) and family history of diabetes (first degree relative), young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (BMI $\geq$ 30)	
	n	%
<b>Low/Lowest Quintiles (SEIFA IRSD)</b>		
Family History	96	26.4 <sup>^</sup>
No Family History	75	18.6 <sup>v</sup>
<b>Middle Quintile (SEIFA IRSD)</b>		
Family History	27	17.9
No Family History	35	20.6
<b>High/Highest Quintiles (SEIFA IRSD)</b>		
Family History	10	8.7
No Family History	8	9.0

\*Calculated using weighted data (WtInc)

<sup>^v</sup> Statistically significantly different ( $p < 0.05$ ) than the other categories combined

SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (2007)

Within Table 6.11, parents' smoking status when participant was a four-year old child is outlined for each of the age cohorts.

**Table 6.11: Parents' smoking status by age cohort, North West Adelaide Health Study (NWAHS)**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Either parent or guardian smoked at 4 years of age</b>						
Yes	706	38.5 <sup>v</sup>	1127	61.5 <sup>^</sup>	1833	64.7
No	515	51.6 <sup>^</sup>	484	48.4 <sup>v</sup>	999	35.3
<b>Overall</b>	<b>1221</b>	<b>100.0</b>	<b>1611</b>	<b>100.0</b>	<b>2832</b>	<b>100.0</b>

\*Calculated using weighted data (WtTFU2)

<sup>^v</sup> Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „young adults“ compared to „aged 35 and over“

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

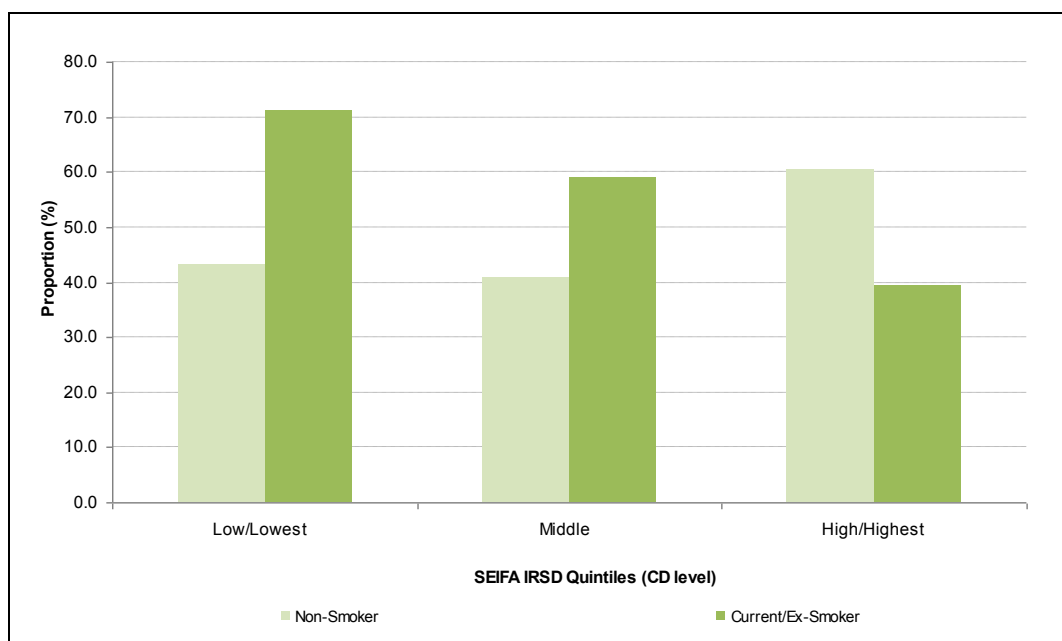
<sup>74</sup> Stage 3 NWAHS has collected genetic information.

<sup>75</sup> Question asked as follows: "Do, or did, any of your relatives have [diabetes, heart disease, stroke or osteoporosis]?" Response categories were: Mother, Father, Sister, Brother, Grandmother, Grandfather or Other.

The young adult cohort has a significantly lower proportion (38.5 percent) of parents who smoked when they were a child. This is consistent with the anti-smoking campaigns and recent decreases in the prevalence of smoking (White *et al.*, 2003). The current prevalence of smoking provides a positive outlook for younger generations and they are set to benefit from the decreased amounts of smoking during pregnancy, smoking in the home or car and reduced exposure to passive smoke, all as a result of years of anti-tobacco campaigning. However, there is debate as to whether the smoking rates have actually decreased within the most disadvantaged populations over time (Najman *et al.*, 2006). With this in mind, public health research and policy must continue to focus on the socio-economic gradient that still exists with those who are smoking and, in relation to emerging consequences of rising levels of obesity.

Of those within the young adult cohort who were „current or ex-smokers“, 67.6 percent (OR 1.93 CI 95% 1.48 – 2.52) had a parent or guardian that smoked as a child. Figure 6.1 displays how these relationships change in different social environments. For those people living in the most disadvantaged areas, 71.2 percent were a „current or ex-smoker“ and had a parent who smoked when they were a child. In comparison, within the more advantaged areas, 39.4 percent were a „current or ex-smoker“.

**Figure 6.1: Parents smoking status and current participant smoking status by area-level disadvantage (SEIFA IRSD), young adults, North West Adelaide Health Study (NWAHS), telephone follow-up, 2007**



\*Calculated using weighted data (Wtifu2)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Within this research, there is not the ability to look at obesity outcomes across generations but this finding on smoking behaviours does shed important insight into behaviour by area-level disadvantage. The complexities of these associations are not fully understood, but this merits further investigation and the possibility to consider the wider family context, such as whether parents and offspring were overweight or obese. The NWAHS cohort will potentially enable these types of analyses to be undertaken with the recruitment of children in the current stages, as seen in studies such as the Framingham Heart Study in Boston (US). Research needs to consider the degree to which current health is influenced by genetics or the social environment and explore the causal pathways of family history of disease and, within particular social environments.

## 6.5 Childhood residence

The place of residence during childhood provides a key concept to determining area-level socio-economic status at this lifestage and will further aid understanding into the complexities of early life influences on socio-economic conditions. There is a relationship between socio-economic area-level influences and health (Pickett & Pearl, 2001). One would assume that childhood socio-economic area is related to current area-level socio-economic status - that is, those who have grown up in disadvantaged circumstances are likely to still live in a similar environment. Evidence has shown that disadvantaged socio-economic position accumulates over the lifecourse and is fundamental to causing intergenerational inequality (Holland *et al.*, 2000).

Local research into childhood residence at age four has recently found a relationship between various measures of area-level disadvantage and overweight (Franzon, 2010). In spite of this, it cannot be established with current data sources the link between child and adult health within the north-west region of Adelaide. Much of the research into lifecourse factors and current obesity status has been centralised around measurement of individual socio-economic status. There has been limited literature investigating the area-level influences during childhood and the relationship between place and health for these two time points of the lifecycle. The lack of research is mainly due to limited area-level data available at childhood for current adult population studies.

Curtis *et al.* (2004) investigated the area-level effects on health variation over the lifecourse in relation to childhood residence during the 1930's. The findings suggested that in Britain, early life factors, including the area in which the child lived, may help to

explain health outcomes in disadvantaged communities. Child and adult socio-economic environments in the Netherlands were found to be related to both smoking and obesity, establishing links between childhood socio-economic position and adult social environments (Monden *et al.*, 2006:397). A study among British adults indicated that regional variation in BMI, blood pressure and respiratory factors was related to region of residence in middle age, independent of birth place (Strachan *et al.*, 2007).

The lifecourse influences of place were investigated by exploring where the participant mostly grew up as a child and the following analyses examined the change between the two time points of the NWAHS cohort.<sup>76</sup> There is limited literature to date that has the capability to look at these relationships as there are few longitudinal studies of this nature, especially within Australia. Therefore, the ability to ask retrospective questions of the NWAHS cohort provided further insight into aspects of their childhood. Additionally, with the incorporation of methodological techniques, such as Geographic Information Systems (GIS), these data will be able to be geocoded and analysed in new ways. The issues related to participant recall of residential address as a child was investigated by Rose and colleagues (2004), with these methodologies in mind, NWAHS participants were asked to reflect on the suburb or town they mostly lived as a child (up to the age of fifteen years). The young adults in the NWAHS cohort were on average born between the years 1967 and 1984.

### 6.5.1 Growing up in north-west Adelaide

A comparison between those living in the „north-west region“ and „other region“ during most of their childhood years (Table 6.12) indicated a higher proportion of young adults (59.3 percent) living within the „north-west region“ as a child.

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<sup>76</sup> A proxy question was used to increase the response rate using the primary school that they attended as a child. This was coded to the suburb level to match with the data from the suburb/town that they mostly grew up in (up to the age of 15 years). The data were further coded to match with those suburbs that were part of the original sampling methodology for the NWAHS. Records were checked to confirm that those individuals were attending a primary school within the same or surrounding suburb. A SEIFA IRSD code was given to the suburb and proxy postal code (POA) for regional areas using CData SEIFA 2001. The population base of this cohort does not account for change in environments over time and utilises a fixed SEIFA IRSD score at 2001. On a whole, it is hypothesised that the disadvantage scores of suburbs have not changed dramatically over time. A comparison was made with the SEIFA IRSD score of the suburb that they mostly grew up in and the suburb that they lived in at Stage 1 of NWAHS. There have been geographical boundary changes over time and in investigating the young adult cohort there is less likely to be large changes in the residential make up of the residence as a child.

**Table 6.12: Childhood residence by region or 'Postcode' by age cohort, North West Adelaide Health Study (NWAHS)**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Where grew up as a child...</b>						
North West Region	807	59.3 <sup>^</sup>	555	40.7 <sup>∨</sup>	1362	59.6
Other Region	319	34.6 <sup>∨</sup>	604	65.4 <sup>^</sup>	923	40.4
<b>Overall</b>	<b>1126</b>	<b>100.0</b>	<b>1159</b>	<b>100.0</b>	<b>2285</b>	<b>100.0</b>
<b>Living in the same Postcode...</b>						
No	641	61.3 <sup>∨</sup>	887	89.5 <sup>^</sup>	1528	75.0
Yes	405	38.7 <sup>^</sup>	104	10.5 <sup>∨</sup>	509	25.0
<b>Overall</b>	<b>1046</b>	<b>100.0</b>	<b>991</b>	<b>100.0</b>	<b>2037</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2)

<sup>^</sup>∨ Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „young adults“ compared to „aged 35 and over“

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Young adults were more likely (61.3 percent) to be living in the same „Postcode“ as they did during their childhood compared to those NWAHS participants aged over 35 years.

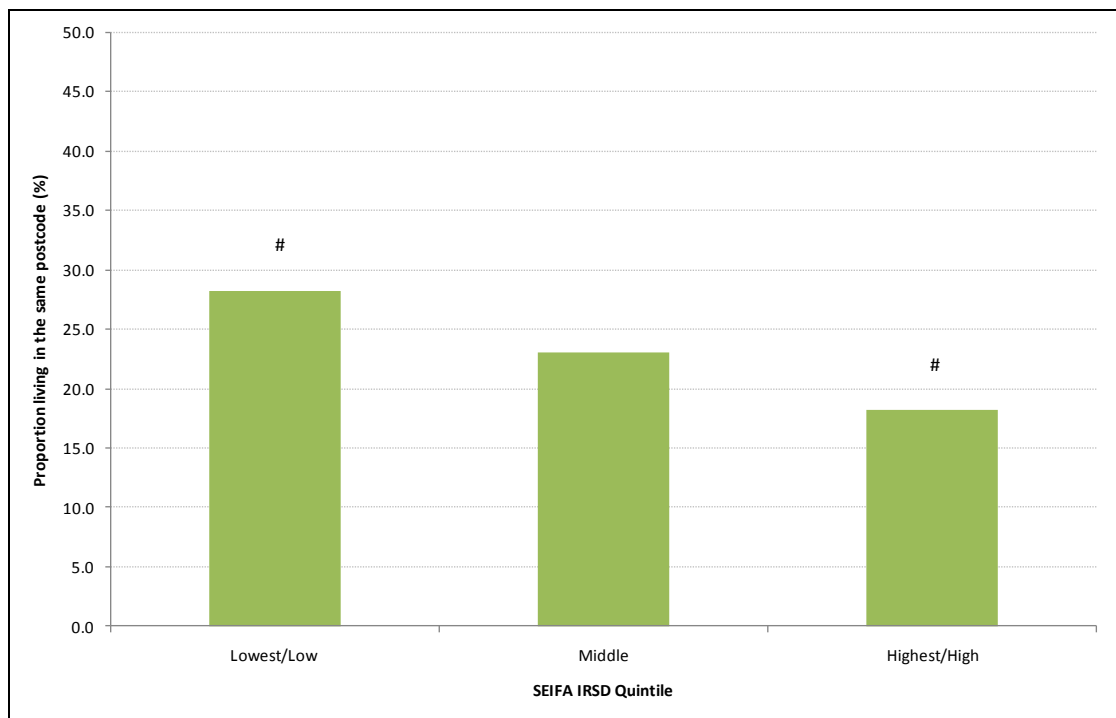
NWAHS young adults whose childhood residence was „other region“ included 12 percent who lived within rural SA as a child. On the other hand, those within the older age cohorts were more likely (22.2 percent) to have grown up in smaller rural or remote areas. These observations in the rural SA population support the work of Hugo and Smailes (1985) who investigated the turnaround of urban-rural migration, indicating that there had been a population deconcentration in Australia at the macro and meso (national and state) level. Analysis of longitudinal South Australian Health Omnibus Survey (SA HOS) data indicated that there have been changing patterns of obesity in rural areas, particularly for young women (SA Dept Health, 2005). Initial analyses within this research of young adults did not show any significant results for those growing up in country region of SA, even after adjusting for childhood socio-economic status (father's occupational status). The rural and city nexus needs to be explored in greater detail with respect to the mobility patterns of the population and consequential health outcomes.

Figure 6.2 outlines analysis for the young adult cohort by area-level socio-economic status and for those participants living within the same „Postcode“.<sup>77</sup> Young adults living in the most disadvantaged areas were more likely to be living in the same „Postcode“ (28.2 percent). Findings such as this are also a reflection of the residential mobility

<sup>77</sup> Interpreting this analysis needs to consider the nature of „Postcode“ data. The participants could have moved to an area that is in a neighbouring Postcode and, hence, same „social environment“ but are still described as living elsewhere.

patterns found for this cohort, and though young adults tend to move more compared to older cohorts, it suggests these movements are to a similar environment. Research such as this begins to explore social reproduction of behaviour and lifestyle associated with area-level disadvantage and movement to social environments across the lifecourse possibly creating an accumulation of disadvantage.

**Figure 6.2: Proportion of participants living within same ‘Postcode’ as an adult and during childhood by area-level socio-economic status (SEIFA IRSD 2001), young adults, North West Adelaide Health Study (NWAHS)**



\*Calculated using weighted data (Wttfu2) \*\*SEIFA IRSD measured at CD level using 2001 data  
 # Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

### 6.5.2 Perspectives on disadvantage

Table 6.13 presents the child and adult area-level socio-economic status for the young adult cohort and the total population. There were more people found to be living in the „Low/Lowest Quintiles“ (58.2 percent) and „Middle Quintile“ (22.6 percent) of SEIFA IRSD as an adult compared to when they were a child (50.0 percent and 16.8 percent, respectively). For the young adult cohort, there were more people living in the „Low/Lowest Quintiles“ as an adult compared to where they grew up as a child. Moreover, there were more young adults living in disadvantaged areas compared to the total population.

**Table 6.13: Area level disadvantage (SEIFA IRSD) during childhood and adulthood, total population and young adults, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

SEIFA IRSD Quintile	Childhood Residence		Adult Residence (Stage 1 NWAHS)	
	n	%	n	%
<b>Total population</b>				
Lowest/Low	1215	50.0	2278	58.2
Middle	408	16.8	885	22.6
Highest/High	806	33.2	748	19.1
<b>Overall</b>	<b>2429</b>	<b>100.0</b>	<b>3910</b>	<b>100.0</b>
<b>Young Adults</b>				
Lowest/Low	545	46.8	853	59.9
Middle	218	18.7	357	25.1
Highest/High	402	34.5	215	15.1
<b>Overall</b>	<b>1165</b>	<b>100.0</b>	<b>1424</b>	<b>100.0</b>

\*Calculated using weighted data (Wtifu2) and (Wtinc)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

The nature of the housing market and the young adult cohort establishing residences within affordable areas could begin to unravel the socio-economic distribution of these populations at different points of the lifecycle.

### 6.5.3 Obesity status and mobility over the lifecourse

Research on residential mobility has investigated a range of health conditions (Larson *et al.*, 2004) and overall health status (Oishi & Schimmack, 2010) but no studies in Australia have examined the impact on obesity status. Table 6.14 outlines obesity rates by age cohort for aspects of residential mobility over the lifecourse.

**Table 6.14: Childhood residence by region or 'Postcode' and obesity (BMI ≥30) status by age cohort, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (BMI ≥30)					
	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Same Postcode</b>						
No	133	20.7 <sup>^</sup>	278	31.3	411	26.9 <sup>^</sup>
Yes	35	8.6 <sup>∨</sup>	36	34.6	71	13.9 <sup>∨</sup>
<b>Overall</b>	<b>168</b>	<b>16.0</b>	<b>314</b>	<b>31.7</b>	<b>482</b>	<b>23.7</b>
<b>Region</b>						
Other Region	70	21.9 <sup>^</sup>	186	30.8	256	27.8 <sup>^</sup>
North West Region	112	13.9 <sup>∨</sup>	180	32.5	292	21.5 <sup>∨</sup>
<b>Overall</b>	<b>182</b>	<b>16.2</b>	<b>366</b>	<b>31.5</b>	<b>548</b>	<b>24.0</b>

\*Calculated using weighted data (Wtifu2)

<sup>^</sup> Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „Young adults“ compared to „Aged 35 and over“

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

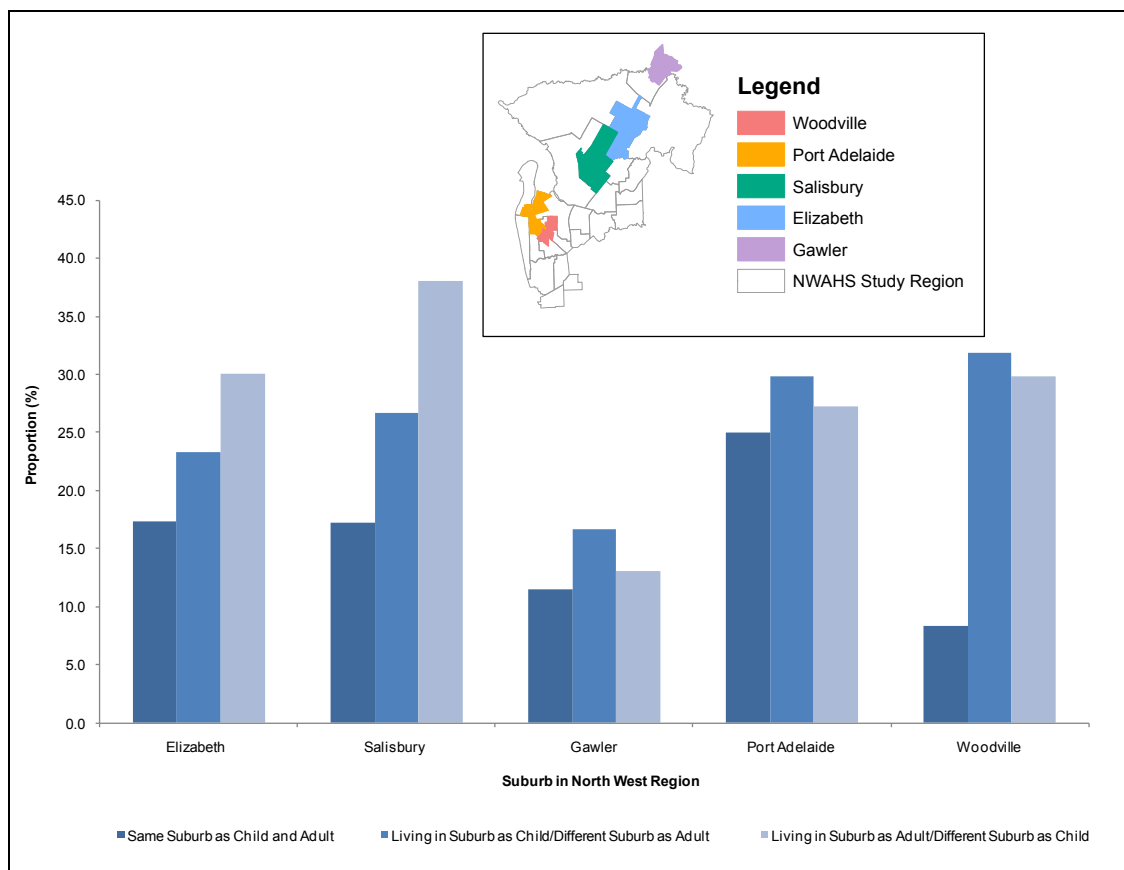
There were seen to be higher proportions of obesity in those young adults that as a child were not living in the same „Postcode“ (20.7 percent) or in a region other than the north-



west (21.9 percent). For the total population, there were higher levels of obesity for those who were living within a different region or „Postcode“ and for those aged over 35 years there were no significant differences reported. The multifaceted nature of movement patterns by age cohort is critical to understanding the relationships with health and obesity status.

There are a number of mediating factors that influence these outcomes. Firstly, there is the link with social capital and the networks that are kept within a similar region. People who are *not* moving their place of residence long distances have family, friends and networks, such as services and facilities that they have always utilised. It is not known whether these observed phenomena of movement are because of the nature of the move or due to other social processes. The obesity status by suburb is shown for those who are living in the same or different suburb as a child and adult for select suburbs (background to these regions was described in Chapter 4) (Figure 6.3).

**Figure 6.3: Obesity status by suburb for those people in the same or different suburbs during childhood and adulthood, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**



\*Calculated using weighted data (Wtffu2)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

For individuals living within the same suburb at both time points obesity saw the highest proportions in Port Adelaide (25.0 percent), Elizabeth (17.3 percent) and Gawler (11.5 percent). There were higher proportions of obesity found for those living in all these suburbs as an adult but not during childhood; Port Adelaide (27.3 percent), Elizabeth (30.1 percent) and Gawler (13.1 percent). Additionally, there was also seen to be higher proportions for those who lived in those suburbs as a child but not during adulthood. There are many complexities to these relationships such as length of time in the suburb, age, gender and individual socio-economic status.

Table 6.15 outlines the obesity status for the young adult cohort for those living in the same „Postcode“ as a child and still residing within the north-west study region. Obesity was found to be lower in the young adults who are still living in the north-west region in comparison to living in another region. These findings indicate that there is a relationship between residence in childhood and current health status in conjunction with socio-economic factors. A gradient exists between those most and least disadvantaged, even within those who had moved „Postcode“ and region between childhood and adulthood.

**Table 6.15: Prevalence of obesity (BMI  $\geq$ 30) for participants living within the same Postcode and north-west region, young adults, North West Adelaide Health Study (NWAHS), Stage 2 2004-06**

	Obesity (BMI $\geq$ 30)			
	Grew up in same Postcode			
	No		Yes	
	n	%	n	%
<b>SEIFA IRSD Quintile</b>				
Low/Lowest	87/372	23.4	29/251	11.6
Middle	29/159	18.2	5/88	5.7
High/Highest	15/101	14.9	1/63	1.6
	Grew up in the north-west region			
	No		Yes	
	n	%	n	%
<b>SEIFA IRSD Quintile</b>				
Low/Lowest	56/183	30.6	65/466	13.9
Middle	11/93	11.8	32/191	16.8
High/Highest	3/34	8.8	13/141	9.2

\*Calculated using weighted data (Wttfu2)

SOURCE: Compiled from NWAHS Stage 2 Spatial Sample (2004-06)

Generalised Linear Modelling (GLM) showed that disadvantaged area-level socio-economic status during childhood significantly increased the likelihood of obesity status in later life, even if parents' occupational status (blue collar, white collar and professional status) and current area-level disadvantage (SEIFA IRSD at Stage 1) were controlled within the analysis (Table 6.16).

**Table 6.16: Obesity status for childhood socio-economic area-level disadvantage (SEIFA IRSD) for young adults that had moved SEIFA IRSD between childhood and adulthood, North West Adelaide Health Study (NWAHS), Stage 2 2004-06**

	Obesity (BMI $\geq$ 30)		
	OR	(95% CI)	p
<b>Childhood residence</b>			
High/Highest SEIFA	1.00	Reference	
Middle SEIFA	1.04	(0.97 – 1.12)	0.293
Low/Lowest SEIFA	1.11	(1.04 – 1.18)	<b>0.002</b>

\*Calculated using weighted data (Wttfu2)

^v Statistically significantly different ( $p > 0.05$ ) than the other categories combined

Generalised Linear Modelling (GLM) analysis adjusted for parents' occupational status as child (Professional, White Collar and Blue Collar) and Stage 1 area-level SEIFA IRSD measured at Collection District (CD) level.

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Participants living as a child in the „Low/Lowest Quintiles“ of SEIFA IRSD were ten percent more likely to be currently obese (OR 1.10; 95% CI 1.04 – 1.18  $p=0.002$ ) compared to those in the least disadvantaged areas. Analysis was undertaken for only those who had moved SEIFA IRSD status between childhood and adulthood, which included 73.5 percent of all young adults. This selection was due to the collinearity between SEIFA IRSD at childhood and adulthood for those who were within the same areas at the two points of data collection.

Other research has indicated that the lifecourse perspective provides a deeper understanding of the accumulation of disadvantage and advantage. All of the above aforementioned attributes interact and relate with the social reproduction of lifestyle and behaviours in the community. There is still little known about the nature of the family environment and the role this has as a mediating variable for area-level health outcomes. These findings highlight a need for future research to compare age cohorts and Census and spatial information associated with current residence and individual-level information.<sup>78</sup> Findings within this chapter need further qualifying to discuss the complexities of these movement patterns for the young adult cohort.

## 6.6 Conclusion

This chapter has outlined a number of socio-cultural processes for young adults within this study region. The chapter discussed the range of attributes associated with disadvantage indicating these as an important consideration in the reproduction of behaviour and lifestyle from the early origins of life. Embedded within our society are the cultural landscapes that reproduce and recreate over time. Obesity was found to be higher among males and females born in European countries as well as among those

<sup>78</sup> For this to take place there is a need for a sample size that is adequate for one particular time period.

with European heritage. Parents' occupational status saw a relationship with obesity for those with a „Blue Collar“ background, further reiterating the influence of the lifecourse and social reproduction of disadvantage, behaviour and lifestyle. Those participants living within different environments as a child were more likely to be obese, suggesting that movement across the lifecourse is an interesting phenomenon for future research. Chapter 7 discusses residential factors such as length of time in an area, perceptions of the environment and perceived sense of community.

## CHAPTER 7

# RESIDENTIAL FACTORS: Perceptions of local areas and sense of „place“

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As we try to scale down the walls to our western ideals, look through the holes in our thoughts and wonder how it feels to know your neighbours, to know their family, to be a part of a greater community.

Song Lyrics, „Community“ (Loren, 2005)

### 7.1 Introduction

This chapter investigates the socio-spatial processes relating to residents' perceptions of their local area. At the outset, the chapter discusses the term „neighbourhood“ as conceptualised by North West Adelaide Health Study (NWAHS) participants and explores individual decisions on residential choice. A number of drivers, such as financial affordability and family contact, influence the socio-spatial differentiation of local areas and these processes result in the segregation of disadvantaged and advantaged populations. The reporting of a „sense of community“ provides an insight into the connections that young adults have with the „places“ in which they live. In closing, the chapter discusses the concept of a „sense of place“ in relation to the prevalence of obesity and the influence that changing socio-cultural landscapes have on attitudes to these places.

### 7.2 What is a neighbourhood? Defining the broader context

Socio-spatial research commonly refers to *neighbourhoods* as the contextualising unit for area-level analysis and the appropriate context in which to frame residents' perception of their local area or wider social context. With the assumption that the neighbourhood encapsulates an individual's broader social space, the role of these neighbourhoods in both individual and area-level health outcomes have been considered within discussions. Previous research has shown the importance of neighbourhood in the prevalence of overweight and obesity<sup>79</sup> (Diez Roux, 2001; Glass *et al.*, 2006; Adams *et al.*, 2009; Harrington & Elliott, 2009). Many studies presuppose that the neighbourhood is a clearly defined area-level unit for analysis of health outcomes. Guo

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<sup>79</sup> This includes analysis from author utilising the NWAHS (Adams *et al.*, 2009).

and Bhat (2007) identify that there is limited attention given to the spatial definition of neighbourhood. Furthermore, researchers have argued that in understanding the relationships between place and health the field remains limited by how spatial concepts such as „the neighbourhood“ or „the built environment“ are operationalised (Spielman & Yoo, 2009:1098).

There are varying definitions of „neighbourhood“ within place and health literature (Caughy *et al.*, 2001; Macintyre *et al.*, 2002; Cummins *et al.*, 2005; Lebel *et al.*, 2007). Moreover, the composition of „local areas“ vary in geographic size cross-nationally. Burnley and Murphy (1995 p.246) make a case that “while Australian and United States (US) cities are similar in many ways, there are important differences in the factors driving growth and change”. United Kingdom (UK) researchers“ Kearns and Parkinson (2001) suggest that the neighbourhood exists at three different scales those being the „home area“, „locality“ and „urban district or region“ (Figure 7.1).

**Figure 7.1: Kearns and Parkinson's (2001) interpretation of the scales of neighbourhood**

Scale	Predominant function	Mechanism(s)
Home area	Psycho-social benefits (for example, identity; belonging)	Familiarity Community
Locality	Residential activities Social status and position	Planning Service Provision Housing market
Urban district or region	Landscape of social and economic opportunities	Employment connections Leisure interests Social networks

Borrowed from (Kearns & Parkinson, 2001:2104)

On the other hand, Galster (2001:2112) defines neighbourhood for the US context as “a bundle of spatially based attributes associated with clusters of residences, sometimes in conjunction with other land uses”. Research in Canada has attempted to broaden the definition of neighbourhood to incorporate socio-economic situation, history and residents“ perceptions of the local area (Lebel *et al.*, 2007).

NWAHS participants discussed how they defined a neighbourhood providing further understanding into the formulation of „place“:

I don't know, I haven't really thought about it. I suppose it would be the people in your street.

*Melanie (29 years, Queenstown)*

Neighbourhood? People around my place, living in your street.

*Gabby (28 years, Northfield)*

Yeah I don't know. You would think that a neighbourhood would be a block or so. But because this is a fairly main road and we don't know the people at the end as you can't walk on the road. As I said we only know the ones just around.

*Tracey (28 years, Elizabeth Downs)*

Well.. see to be perfectly honest it is not like we are close to our neighbours, we know our neighbours. We know our neighbours to the extent to saying hello for five minutes in the drive way and that is about it.... I think that the people in your street and the ones that surround you and we don't have a lot to do with those people.

*Suzy (31 years, Pooraka)*

When asked to discuss „their neighbourhood“, these young adults hesitated as to what the term meant to them and a „neighbourhood“ was seen as the area around their house, or even just the street. The smallest unit of neighbourhood, the „home area“, is typically defined as an area of 5 to 10 minutes walk from one's home and it has been suggested that the psycho-social purposes of the neighbourhood are strongest within this scale (Kearns & Parkinson, 2001:2103). The sociological insight of *Structuration Theory* provides “a conceptualisation of structure which includes and goes beyond the notion of resources” (Bernard *et al.*, 2007:1841). The definition of a neighbourhood according to Giddens does not constitute just the immediate local area but considers a more complex and wider social space.

I don't know, I just think of community. What's kind of just around my little neck of the woods I guess.

**Researcher:** Does this include the things that you do?

Yeah I guess sometimes, I suppose you can make community and whatever you are involved in can be your neighbourhood. But I mean in a literal sense I suppose it is the street that I live on or you know that little part of Wynn Vale [suburb].

*Laura (22 years, Wynn Vale)*

The phrase „community“ was used by Laura when discussing her neighbourhood and she indicated that „you can make a community“. As Galster (2001:2116) states “what that neighbourhood will **be** – will be shaped by the decisions of current and prospective consumers”. Bernard *et al.*, (2007) outline a theoretical conception of neighbourhood demonstrating that there are five domains; the physical, economic, institutional, local sociability and community organisation which cut across neighbourhood environments. Other NWAHS participants observed the neighbourhood as something much broader in terms of facilities and services, thus supporting Kearns and Parkinson's „local and urban region“ scale of neighbourhood to provide a landscape of social and economic opportunities. However, initial insights into those participants who considered the

locality as part of their „neighbourhood“ tended to be of a higher individual socio-economic status.

I would hope that a neighbourhood is a cohort of people, it might not be within a suburb it might just be in an area related whether it is just a street or what not. Hopefully they would respect each other and to an extent look after each other.

*Sarah (24 years, Valley View, Bachelor degree or higher)*

A tricky one... community. [pause] Friendly neighbours, get to know your neighbours. Um... also the local shops and facilities that are available. I think a lot has to do with the councils and how they keep that area.

*Sandra (32 years, Lockleys, high income)*

Another interesting aspect of the discussion was the impact that popular culture had in influencing the participants' formation of the term „neighbourhood“. The interaction with television possibly creates a sense of connectedness to the characters or program, and Russell and Puto (1999:397) argue that this connectedness “extends beyond the television watching experience into individuals' personal and social lives”. Popular culture influences the way that people perceive their environments and define their social space. The Australian television soap opera, *Neighbours*<sup>80</sup> was discussed by participants in relation to defining their neighbourhood:

I have never thought about it. [Pause] I know it is difficult because we are not all in each others houses and things like that. So it is not like “Neighbours” street or something.

*Louise (30 years, Edwardstown)*

[hesitates] I guess people have in their mind and going back to popular culture and you know you think of the television show [Neighbours] and you think of those communities that exist.

*Sarah (24 years, Valley View)*

In Australia, the suburb<sup>81</sup> was the term that people tended to associate as their local environment, aligning with Kearns and Parkinsons' scale of neighbourhood at the „local region“. This has also been confirmed by Australian researchers Ball and colleagues (2006:628) where through informed pilot work “women typically referred to their suburb when questioned about their local neighbourhood food environment”. In addition, Walker and Hiller (2007:1157) found that older women in metropolitan Adelaide varied in responses from immediate residential street to a wider area.

<sup>80</sup> „Neighbours“ is a popular culture Australian soap opera (1985-present) that has been aired overseas and in particular within the United Kingdom.

<sup>81</sup> A suburb (or State Suburb SSC) is defined by the Australian Bureau of Statistics (ABS) as a Census Geographical Area and relates to the Australian Statistical Geographical Classification (ASGC) by allocating CD's to localities gazetted by the Geographic Place Name authority in each State/Territory (ABS, 2006e).



People within these places are not restricted to geographically defined boundaries and the movement patterns and flows of the population do not confine to these boundaries. Spielman and Yoo (2009:1100) demonstrate that there is a need for a shift away from the concept of a fixed neighbourhood:

This idea, that different people have different neighborhoods [sic], is not without problems, the principle one being the lack of theory, methods, or data necessary to define effective neighborhoods.

The lay perspectives from this research on the local environment support the notion that the concept of a „local area“ is yet to be fully formulated for the Australian context. From these discussions, it appears neighbourhood might not be the correct terminology to utilise for this context. The construction of a local area differs across geographies, both subjectively and by scale, and this could potentially impact on the relevance of spatial analysis. One such study that mapped residents“ perceptions of neighbourhood boundaries has shown that there are differences between researcher and resident defined neighbourhoods and argue that it is a source of bias in neighbourhood effects research (Coulton *et al.*, 2001). Further research would need to integrate historical, socio-economic and residential perceptions of the local area, such as recognized by Lebel and colleagues (2007) and explore options for constructing boundaries that are appropriate in size and conceptually, for both the researcher and the community.

### 7.3 Socio-spatial differentiation driving local area formation

The socio-spatial differentiation of the population across local areas is driven by both active and passive filtering systems. At different stages of the lifecycle, there are ranging preferences in residential choice and these processes vary by socio-economic status. In reference to residential choice, Louise was of the opinion that the location of her house was irrelevant:

It’s just where my house is. I don’t have any absolute love for the area or anything like that. It is where we bought our house.

*Louise (Edwardstown, Medium household income)*

Even though Louise was of the opinion that it „was just where her house was“ there would have been some driving force behind the decision to purchase that house. Kearns and Parkinson (2001:2105) discuss the concept of a neighbourhood having an element of „choicefulness“ where:

the crucial aspects of choice which affect the fortunes of a neighbourhood are that the residents feel that they have some choice of location – they opted into the neighbourhood and can opt to remain or depart, rather than simply ending up there; and secondly, that the residents perceive that others might also choose to live in their neighbourhood.

Table 7.1 details by age cohort the reported reasons for current residential choice.<sup>82</sup> The results indicate that young adults were choosing to live in their current residence due to „financial reasons/affordability“ (25.1 percent), „the area“ (22.4 percent), „closeness to family“ (19.8 percent), „other reasons“ (18.9 percent) and „family always lived in the area“ (16.2 percent).

**Table 7.1: Reported choice of neighbourhood by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up, 2007**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Why chose to live in current neighbourhood...</b>						
Closeness to family	244	19.8	296	17.7	541	18.7
Closeness to shops or services	90	7.3	123	7.4	212	7.3
Closeness to friends	73	5.9 <sup>^</sup>	67	4.0 <sup>v</sup>	140	4.8
Closeness to work	184	15.0	239	14.3	423	14.6
Closeness to school	46	3.7	60	3.6	106	3.7
Family always lived in area	199	16.2 <sup>^</sup>	176	10.6 <sup>v</sup>	375	13.0
Access to public transport	30	2.4	51	3.1	82	2.8
Financial reasons/affordability	309	25.1 <sup>^</sup>	365	21.9 <sup>v</sup>	675	23.3
Safety	16	1.3	25	1.5	40	1.4
The area	276	22.4 <sup>v</sup>	451	27.0 <sup>^</sup>	727	25.1
The house/Unit (residence)	58	4.7 <sup>v</sup>	149	8.9 <sup>^</sup>	207	7.1
Close to the beach	91	7.4 <sup>v</sup>	167	10.0 <sup>^</sup>	258	8.9
Close to the city	110	8.9 <sup>^</sup>	85	5.1 <sup>v</sup>	195	6.7
Other	233	18.9	291	17.4	523	18.1

\*Calculated using weighted data (Wttfu2) \*\*Multiple response question

<sup>^v</sup> Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) young adult cohort compared to aged 35 years and over

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

### 7.3.1 Financial drivers

Individual- and household-level socio-economic status and housing affordability are key drivers as to why someone resides in a certain residence or „local area“. Segregation is driven by a number of residential factors as indicated by Mare and Bruch (2003:1-2):

The rationale for these studies is that segregation is, at root, the result of individual choices about where to live which are determined in part by individuals“ attitudes and preferences about the characteristics of neighborhoods [sic].

<sup>82</sup> In light of the previous section, it would appear that the wording of the NWAHS telephone follow-up question “Why did you choose to live in your current neighbourhood?” might have been more suitable within a „suburb“ or „local area“. The timeline for this study was that the follow up data collection were undertaken before the semi-structured interviews. In hindsight, it might have been appropriate to undertake focus groups before administering the quantitative questionnaire to establish the term „neighbourhood“ for this context. In interpreting these findings, it would appear the choice of current neighbourhood would be why they chose the current residence and street area within a limited local proximity.

There are a range of financial drivers that determine residential choice including the attitudes and preferences around housing tenure, property value, location and the type or quality of housing (Ioannides, 1987). Moreover, processes of labour market sorting occur at the local level with persons seeking employment that is relevant to their skills and qualifications (Weller, 2008). Financial reasons and housing affordability were seen to be the main reason for current residential choice within young adults (25.1 percent) and the area was the second highest reason (22.4 percent). Housing affordability saw a higher proportion amongst the younger cohort as many transition out of the family home into the rental or housing market. In contrast, the reason of „the area“ was significantly lower compared to those aged over 35 and this may be related to housing affordability and the available funds for mortgage and rent payments.

Active filtering systems of the population are driven by individual socio-economic status and, as a consequence, produce segregated areas that are concentrated with high and low disadvantage. Fundamentally, exclusion is geographical and, historically, geographical research has investigated aspects of the social and spatial distribution of populations (Shevky & Bell, 1955). Much research has investigated individual inequality and residential segregation (Kawachi, 2002; Boyd Hamilton, 2003) and there is evidence of social polarisation in Australia with an increase in spatial clusters of both advantaged and disadvantaged populations (Badcock, 1997; Fincher & Nieuwenhuysen, 1998). The resulting concentrated areas of both a high and low socio-economic status create disparities in health and well-being across space.

Both overseas and in Australia governments have pursued policies of social mix<sup>83</sup> “in anticipation of assisting to create more stable and vigorous neighbourhoods than when disadvantaged residents are concentrated in one place” (Arthurson, 2008:486). Within the north-west region, there are a number of areas with social housing integrated within the region creating an area of social mix. Suzy discusses her perception of the integration of social housing within her suburb:

I know that there are Housing Trust [social housing] throughout this Estate here, which is good because it is all mixed in. There are not streets upon streets of that sort of type of lifestyle. Not that every one that lives within the Housing Commission is an unemployed bum, don't get me wrong.

*Suzy (Middle quintile SEIFA IRSD, Pooraka)*

<sup>83</sup> “A balanced social mix generally refers to the idea of creating neighborhoods with a blend of residents with a range of income levels and age groups from across different housing tenures types, including social housing, private rental, and owner-occupied housing” (Arthurson, 2002:247).

Responses also indicated that this was the housing option „given“ to them, with participants articulating that they “had no choice the housing trust [social housing] gave us this one”.<sup>84</sup> The area in which someone lives has been framed as one of „choicefulness“ and these discussions are indicative that there is not necessarily an element of „choice“ in the case of social housing or rental properties. Research within Adelaide investigated the use of a spatial decision support system to aid in the relocation of public housing tenants during an urban regeneration project (Baker, 2008). The nature of public housing allocation removes the element of „choice“ in the area in which people live and in turn may have subsequent negative effects on individuals and families. There is a need for public housing allocations to be socially inclusive and consider the importance of social capital, networks, and negative psycho-social factors which may relate to health and social well-being.

Social mix policies were established under the premise that “a balanced social mix is a prerequisite for the development of „inclusive“, „sustainable“ and „cohesive“ communities” (Arthurson, 2002:245). International research has indicated that social mix policies do not produce better health and social outcomes, suggesting that there are “inadvertent negative consequences of implementing social mix policies” (Graham *et al.*, 2009). This has also been supported within the Australian context where Arthurson (2002) argues that there is no evidence for varied social mix for the development of cohesive communities and strong support networks existed prior to regeneration commencing. The mixing of housing tenures does not necessarily mean that there is increased social contact with the more affluent residents and, therefore, not achieving the intended policy outcomes.

Brown and Chang (2006) investigated the use of both global and local segregation indices for geographical research into ethnic and racial segregation. The research suggested that global measures, such as the index of dissimilarity, are aspatial and do not consider the local variation in the same way as the local measure, Local Moran’s I. Omer and Benenson’s (2002) research in Tel Aviv, attempted to utilise local measures of segregation such as the Getis Index. Figure 7.2 utilises the Getis-Ord  $G_i^*$  statistic to investigate clusters within metropolitan Adelaide of both low and high area-level disadvantage using the Socio Economic Indexes for Areas, Index of Relative Socio-

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<sup>84</sup> NWAHS telephone follow-up (TFU 2) other responses for “Why choose to live in your current neighbourhood?”

economic Disadvantage (SEIFA IRSD). A large proportion of metropolitan Adelaide is heterogeneous and displays spatial diversity, although, areas of significant clustering of high disadvantage (shaded in orange) do exist within the study region. Table 7.2 also utilises this local measure within the north-west region to investigate classifications of disadvantage/advantage clustering and social mix in relation to obesity.

**Table 7.2: Logistic regression of obesity and Gertis-Ord  $G_i$  statistic clustering of area-level index of disadvantage (at a one kilometre radius around residential location), total population, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

	Obesity (BMI $\geq 30$ )		
	Odds Ratio	(CI 95%)	p
<b><math>G_i</math> Statistic at 1km</b>			
Significant clustering of high SEIFA values	1.00		
Social mix - med high	2.07	(0.86 – 5.02)	0.106
Social mix - med low	2.58	(1.07 – 6.21)	<b>0.035</b>
Significant clustering of low SEIFA values	3.62	(1.49 – 8.76)	<b>0.004</b>
<b><math>G_i</math> Statistic at 1km</b>			
Social mix	1.00		
Significant clustering of high SEIFA values	0.42	(0.18 – 1.01)	0.053
Significant clustering of low SEIFA values	1.52	(1.29 – 1.79)	<b><math>\leq 0.001</math></b>

\*Calculated using weighted data (Wtclnc)

The analysis was undertaken for the total NWAHS population at Stage 1 (1999-2003). Getis-Ord  $G_i$  Statistic calculated at a one kilometre radius around NWAHS residential location at Stage 1.

SEIFA IRSD – Socio Economic Indexes for Areas, Index of Relative Socioeconomic Disadvantage. SEIFA IRSD calculated at the Collection District (CD) level.

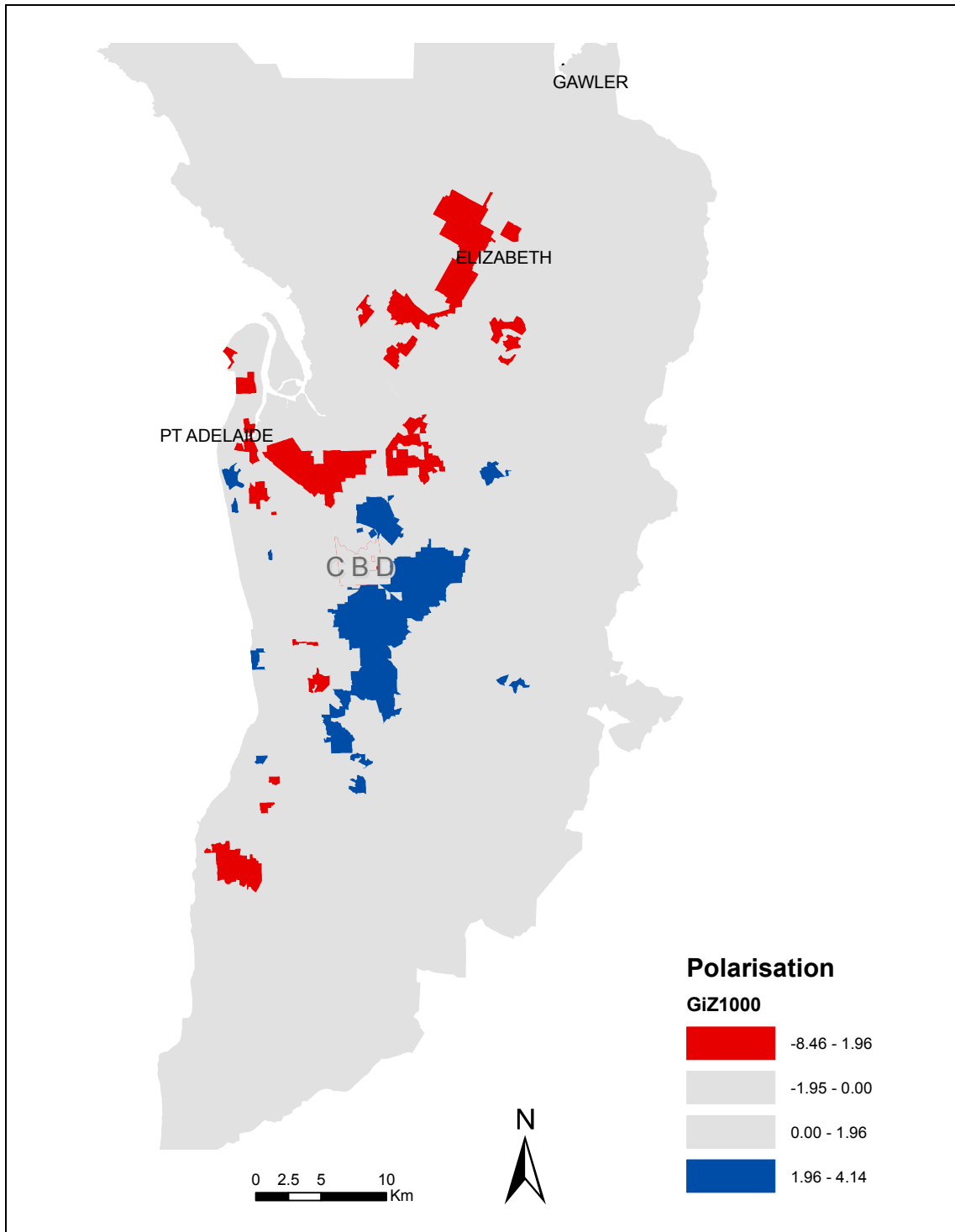
SOURCE: Compiled from NWAHS Stage 1 Spatial (1999-2003) and ABS 2001 Census

The values within this section were calculated by the Getis-Ord ( $G_i$ ) statistic using the spatial analyst tool box in ArcView 9.2 (Esri, 2008). A high  $z$  score for a feature indicates its neighbours have high attribute values, and vice versa. The  $z$  score is statistically significant at 0.05 when a  $z$  score is less than -1.96 or greater than 1.96. The index is calculated at location  $i$  regarding the neighbours within  $i$ 's neighbourhood  $U(i)$ , is based on a weighted average of characteristic  $f$  over locations  $j$  within  $U(i)$ , normalised for the average and variance of  $f$  over the entire north-west region (Esri, 2008). The calculation for the  $G_i$  statistic is as follows:

$$G^*_i = \frac{\sum_{j \in U(i)} (w_{ij} f_j - \langle f \rangle)}{(W_i s)}$$

This calculation was applied to the NWAHS population utilising the distance band of one kilometre.

**Figure 7.2: Local measure of clustering (Getis-Ord Gi statistic) of significant low and high values of area-level disadvantage (SEIFA IRSD), metropolitan Adelaide, 2001**



SOURCE: Compiled from NWAHS Stage 1 Spatial Sample (1999-2003) and ABS 2001 Census SEIFA IRSD

Individuals living within areas of significant disadvantage clustering were around 3.6 times (CI 95% 1.49 – 8.76  $p=0.004$ ) more likely to be obese when compared to advantaged areas. An additional perspective indicates that the odds of obesity within the clusters of disadvantage were around one and a half times more (OR 1.52 CI 95%

1.29 – 1.79  $p \leq 0.001$ ) when compared to areas of social class mix. There were no significant results found for the young adult cohort, obesity and clustering of the population, due to the study sample size. These results need to be interpreted with caution due to the low proportion of clustering at a high SEIFA IRSD score within the north-west study region and large confidence intervals for the odds of living within an area with disadvantage clustering or residential mix. These preliminary results indicate that a possible relationship exists between clusters of disadvantage and odds of obesity. The capability of technology and availability of data sources allows the multi-level interactions to be explored and include perceptions of the local area, socio-spatial patterning and health outcomes. Additionally, the local  $G_i$  statistic has potential to be explored using alternative area-level measures, for example, the clustering of social housing and proportion of those with low education living within a local area.

These types of analyses need to be studied in line with the social policies around housing and urban planning. In light of the comments on social mix of housing tenure, it would suggest that in terms of health outcomes, such as obesity, there is a need to investigate the impact of socio-spatial segregation of the population. As indicated previously, it is thought that housing mix does not necessarily produce cohesive communities and strong support networks. Notwithstanding, the segregation of communities compared to areas of social mix in this case does appear to have a positive relationship with declining health, given the higher rates of obesity. These discussions point towards potential relationships within areas that have a concentration of social disadvantage. It has not been determined within the literature what social factors drive the increased prevalence of obesity within clusters of disadvantage compared to areas of residential mix, and additionally, how the processes related to these social factors are interacting across space.

### 7.3.2 Additional factors attributing to the socio-spatial patterning of populations

The processes driving the socio-spatial patterning of the population are far more complex than „living where you do just because that is where you can afford to live“. There are socio-demographic factors that influence the spatial decisions made during a housing career and these include the deferral of marriage and children, growth in single person households and the change in home ownership. Many young adults still live with their parents, in line with a gradual rise in the age at which they are leaving the

parental home (Flatau *et al.*, 2003). Also contributing to the sorting processes are changes such as de-facto relationships and separation or divorce. Examples were given where one partner had purchased the house already before the relationship and therefore it was not necessarily a choice but “[I] moved in with [my] partner”.<sup>85</sup>

It has been shown that the family context is important in all aspects of residential choice (Mulder, 2007) and Rogerson *et al.*, (1997:133) indicated that the “proximity to children and intergenerational interaction are interdependent and ever changing”. Kearns and Parkinson (2001:2104) argue that places are about 'dwelling in nearness' to others. The concept of „nearness“ detailed by German philosopher Heidegger entails both face-to-face contact and a reciprocal relationship. The geographical proximity of networks and the relationships in which these are maintained bring about the construction of a „neighbourhood“. There were many examples from discussions with NWAHS participants on their choice of living close to family networks:

They actually live around the corner. However, I might speak to them on the phone once a week or maybe once a fortnight. Even though I am close I am not really really close. I might see them once a fortnight or once every three weeks.

*Sandra (Married, local networks in Western Suburbs, medium contact)*

Yeah I have always been in the west but it was more so being close with my family and networks. I had met other friends that live in other areas and my friends had gradually moved out of the western suburbs. It was not as hard a decision to make based on my networks.

*Sarah (Married, local networks within north and west of Adelaide, frequent contact)*

The literature around this topic focuses on profiling residential mobility histories and the motivations of older adults to live near children and family (for example Warnes, 1986). There are a number of reasons to explain why people live near family, for instance, to act as intergenerational family support. On one hand, there is the need to care for ageing family members and, on the other, there has been increasing numbers of grandparents that provide care for their grandchildren. In 2008, 24 percent of all South Australian children (0 to 12 years) in couple families had informal care given by a grandparent (ABS, 2008c). This is in line with a rise in maternal employment and financial burden of childcare. The young adult cohort presents a point in the lifecycle where family, career and/or workforce are important in the spatial relationships of the household and the community. Within the NWAHS population, young adults were

<sup>85</sup>NWAHS telephone follow-up (TFU 2) 2007 comments section.



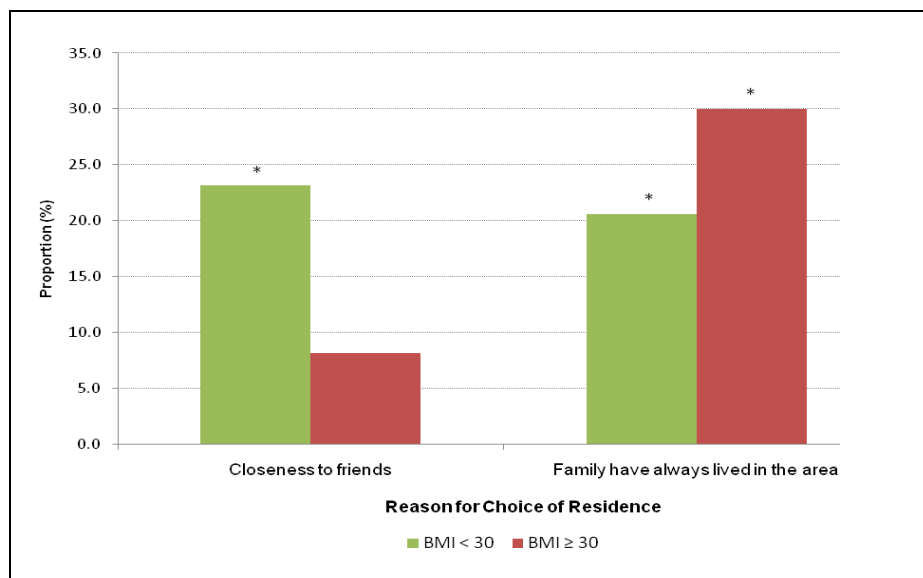
choosing to live close to friends (5.9 percent) when compared to the rest of the population (4.0 percent). If participants were to move they would like to be nearer to family and friends, such as this comment from Suzy on where else she would choose to live in the future:

I would like to not go any further north, rather go in, for convenience, close to everyone still that we know. That is important to me.

*Suzy (Currently living in Pooraka, middle quintile SEIFA IRSD)*

Another option that was found to be higher in the younger cohort was that „family always lived in the area“. Figure 7.3 shows that there were lower levels of obesity for NWAHS participants who chose to live in the area to be close to friends (8.2 percent) and higher levels of obesity if they chose to live at that location because their „family had always lived in the area“ (30 percent).

**Figure 7.3: Prevalence of obesity (BMI  $\geq 30$ ) by reason for choice of residence, total population, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**



Calculated using weighted data (Wttfu2)

\*Indicates statistically significantly different ( $p < 0.05$ ) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

The reciprocity of „nearness“ can vary for different people from regular, low-level acquaintance to strong interpersonal intimacy and commitment (Kearns & Parkinson, 2001:2104). Everyone lives within „home areas“, the question is whether they are considered to be a „home“ or have particular qualities of „dwelling in nearness“. The complexities of these relationships are yet to be fully established, although considering a socio-spatial framework will aid in unravelling the processes and future consequences for health and obesity outcomes.

Within this population, access to public transport was not rated as a reason for living in certain areas and is aligned with discussion of Australian cities being exceptionally vehicle dependent (Kenworthy & Laube, 1999). The spatial layout of metropolitan Adelaide potentially influences the decisions of residential choice:

It's just too far away, even though it's just half an hour or forty-five minutes. You just get spoilt.

*Sandra (in reference to living down South compared to Western suburbs of Adelaide)*

As indicated earlier in this chapter, Galster (2001:2116) states that neighbourhoods “will be shaped by the decisions of current and prospective consumers”. There are important features that surround the decision making processes of residential location and these are thought to have long term consequences on social and psychological well-being. In turn, it is known that psycho-social processes influence the rising prevalence of health outcomes (Martikainen *et al.*, 2002). These decisions on residential choice drive the formation of local areas and are influenced by social reproduction and changing socio-demographic patterns across the lifecourse. Social environments are not static and there is a need to further understand the complexities of these individual-level factors that influence the formation of *places* for different contexts over time.

#### 7.4 Perceptions of one's social space

The development of social space and the cognitive perceptions of these places are aided by the decision processes around residential location, sense of community and connectedness within the local area. The „perception“ of environments is a developing literature base investigating the notion of how one acquires knowledge through thought, experience and the senses about their environment and how this is related to health and social well-being. In particular, perceptions research has developed links with the formation of social capital within Adelaide (Baum & Palmer, 2002; Taylor *et al.*, 2006c), and the proceeding chapter will explore associations with psycho-social factors. Kearns and Parkinson (2001:2105) indicated that at the local area-level “policies need to be based upon a better understanding of people's residential expectations and experiences”.

A research focus has previously been on an individual's perception of their local environment and how this relates to levels of physical activity and obesity status across a range of age groups (Boslaugh *et al.*, 2004; Poortinga, 2006; Panter & Jones, 2008;

Nelson & Woods, 2009). Aspects such as residents’ perceptions on the walkability of the neighbourhood are considered to be a driving force to the physical activity levels within certain communities (Leslie *et al.*, 2005). Much literature within this field has focused on variables that can be measured or quantitatively described, such as physical attributes concerned with a particular „neighbourhood“ or environment. The experience people have of a neighbourhood can be quite different depending on the individual (Wen *et al.*, 2006:2585). Macintyre *et al.*, (2005) suggest that self-report of neighbourhood environment is less revealing than objective measures. On the other hand, it is thought that perceived neighbourhood environment is more telling for individual health (Caughy *et al.*, 2003) and can explain more about neighbourhood pleasantness or physical features. Reiterating previous comments, the connectedness experienced within a local area is something that is created and not just a given. Individuals sharing a common „space“ does not necessarily result in the residential factors that constitute a „place“.

There are different experiences for people across the lifecycle and in particular by age cohort, for instance older people may experience their local area differently to a younger person. Some research concentrates on older populations and the extent that belonging to a neighbourhood correlates with health and well-being (Young *et al.*, 2004). Older persons have needs and expectations in housing and require both trusting and reciprocal relationships that include broader social networks. These relationships and expectations have the potential to be established within their local home environment, for example neighbours helping out with general day-to-day tasks whilst remaining independent in their own home or „ageing in place“. There are limited studies that have utilised multiple methodologies to investigate perceptions of local areas and research has not fully explained perspectives for young adults within changing geographies of health.

#### 7.4.1 Belonging to a local area

Community is an interesting word. I would probably define community as people getting along in my specific precinct. Possibly I don’t know it is a really tricky word.

*Sarah (Bachelor degree, works within Adelaide Central Business District)*

This section will investigate aspects of the residential environment that are related to belonging to a local area. It is important to understand the individual connections that people have with these local areas that may extend beyond the decisions of residential choice. Table 7.3 outlines by age cohort the reported „sense of community“ and

indicated that young adults within the NWAHS population were less likely to „strongly agree“ with the statement „I feel a sense of community with others in my local neighbourhood“ (14.7 percent). Although, 46.9 percent of the young adults did agree that there was a „sense of community“ within their local area. This is indicative of similar findings, such as Baum and Palmer (2002), whereby older persons were more likely to experience positive perceptions associated with social connectedness in their neighbourhood.

**Table 7.3: Reported sense of community in the local area by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>I feel a sense of community with others in my local neighbourhood...</b>						
Strongly disagree	36	2.9	49	3.0	85	2.9
Disagree	252	20.5	283	17.1 <sup>∨</sup>	536	18.5
Neither agree or disagree	183	14.9	224	13.5	406	14.1
Agree	576	46.9	800	48.3	1376	47.7
Strongly agree	181	14.7 <sup>∨</sup>	301	18.2 <sup>∧</sup>	482	16.7
<b>Overall</b>	<b>1228</b>	<b>100.0</b>	<b>1657</b>	<b>100.0</b>	<b>2885</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2)

∧∨ Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) young adult cohort compared to aged 35 years and over

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Tracey comments on her experience of a „sense of community“ relating to „her“ spatiality of what constitutes a neighbourhood:

The neighbours are good, I don't know much who lives past the three or four around us. These ones are good.

*Tracey (Local interaction and networks within Elizabeth Downs)*

And again, Louise only knows a few people in her „neighbourhood“ which she defined as her street.

On our street itself we know probably most of the people to say hello but not come in and have a cup of coffee or that sort of thing, everyone says hello as you walk past or whatever.

*Louise (Family and friend networks but not connected to suburb of Edwardstown)*

Table 7.4 indicates that those NWAHS participants living within more disadvantaged areas experienced higher levels of obesity for those that „strongly agree or agree“ there was a „sense of community“ within their local area. These findings suggest a higher prevalence of measured obesity despite the positive subjective reporting of a „sense of community“.

**Table 7.4: Prevalence of obesity (BMI ≥30) for participants living within disadvantaged areas (Low/Lowest Quintiles SEIFA) by ‘sense of community’, young adults, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

Young Adults living within Low/Lowest Quintiles of SEIFA IRSD	Obesity (BMI ≥30)	
	n	%
<b>Sense of community</b>		
Strongly Disagree/Disagree	19/115	16.5 <sup>v</sup>
Neither Agree or Disagree	24/92	26.1
Strongly Agree/Agree	83/291	28.5 <sup>^</sup>
<b>Overall</b>	<b>126/498</b>	<b>25.3</b>

\*Calculated using weighted data (Wttfu2). Obesity measured at Stage 2 (2005-06) and SEIFA IRSD measured at the CD level 2001

<sup>^v</sup> Statistically significantly different (p<0.05) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Table 7.5 outlines the self-reported „sense of community“ for a number of suburbs within the north-west region.

**Table 7.5: Reported ‘sense of community’ by suburbs within the north-west region of Adelaide by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Sense of Community by local area					
	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Elizabeth</b>						
Strongly disagree/disagree	36	20.7	68	25.2	104	23.4
Neither agree or disagree	36	20.7	43	15.9	79	17.8
Strongly agree/agree	102	58.6	159	58.9	261	58.8
<b>Salisbury</b>						
Strongly disagree/disagree	48	21.5	48	23.0	96	22.2
Neither agree or disagree	29	13.0	31	14.8	60	13.9
Strongly agree/agree	146	65.5	130	62.2	276	63.9
<b>Gawler</b>						
Strongly disagree/disagree	6	8.6	16	18.4	22	14.0
Neither agree or disagree	0	-	8	9.2	8	5.1
Strongly agree/agree	64	91.4	63	72.4	127	80.9
<b>Port Adelaide</b>						
Strongly disagree/disagree	2	3.8	16	14.4	18	11.0
Neither agree or disagree	13	24.5	8	16.2	31	18.9
Strongly agree/agree	38	71.7	77	69.4	115	70.1
<b>Woodville</b>						
Strongly disagree/disagree	14	35.9	22	25.6	36	28.8
Neither agree or disagree	9	23.1	11	12.8	20	16.0
Strongly agree/agree	16	41.0	53	61.6	69	55.2

\*Calculated using weighted data (Wttfu2) <sup>^v</sup> Statistically significantly higher or lower ( $\chi^2$  test p<0.05) young adult cohort compared to aged 35 years and over.

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

There were higher levels of „strongly agree or agree“ for young adults living within Gawler (91.1 percent), followed by Port Adelaide (71.7 percent) and Salisbury (65.5 percent). Whether a high level of community actually exists within these areas is not determined by these analyses and the findings do not ascertain what factors about living in communities with a reported „sense of community“ promote excess weight gain. One possible explanation is the maintenance of social networks within these social environments resulting in unhealthy behaviour and lifestyles. These findings indicate apparent differences between local areas in the „sense of community“ and what this

means to be from a certain suburb within the broader region of the north-west of Adelaide. The perceptions of the importance of these local areas vary across space, as indicated within the observations by suburb within the north-west region.

Cultural geography has studied the social phenomenon of a „sense of place“ to understand the formation of spaces and places. The concept extends beyond just a person’s perception and experience of the place in which they live and creates a social landscape that encapsulates what it means to be „from“ a place. Building on earlier discussions within this chapter on the conceptualisation of neighbourhood, Kearns and Parkinson (2001:2104) state that there is patchy evidence on the levels of attachment to neighbourhood and behaviour. The sense of attachment to place is familiar to ageing research and studies have found that the „sense of belonging“ allows for identity construction and well-being in older people, hence facilitating successful adjustments in old age (Wiles *et al.*, 2009). Only a few Australian studies have explored the concept of a „sense of place“. Walker and Hiller (2007) researched older women within metropolitan Adelaide highlighting a sense of pride and attachment to their physical environment, regardless of the location of their home. Proshansky (1978:155) outlines the concept of „place identity“ as:

those dimensions of self that define the individual's personal identity in relation to the physical environment by means of a complex pattern of conscious and unconscious ideas, beliefs, preferences, feelings, values, goals and behavioural tendencies and skills relevant to this environment.

The geographical concept of „place identity“ is rarely associated in relation to health outcomes such as obesity, yet it would appear to be an important aspect of understanding the place and health nexus.

Previous studies have found that those individuals living within disadvantaged areas, such as the western suburbs of Adelaide, report a degree of dissatisfaction of physical features within the urban environment (Baum & Palmer, 2002). There has been limited concentration on the social and cultural identity that living in a certain „place“ or suburb has for an individual and the family unit. Within the north-west region, there was apparent perceived stigma to living within certain suburbs, although, NWAHS participants identified with „belonging“ to that area.

I think it is more the people. I like Elizabeth and the northern suburbs more than say your eastern suburbs, I find it more down to earth.

**Researcher:** When you say more down to earth...?

More approachable you can talk to them without being judged and that sort of thing. In the eastern suburbs... well I accidentally went and picked my kids up from school yesterday in my bed socks. But in the eastern suburbs I bet I would be driving back home to get changed. You feel as though there are appearances to be kept up. As here everyone just takes you for who you are and that sort of stuff.

*Tracey (Elizabeth Downs, 3 children)*

I do believe that... Everyone bags Elizabeth and being from Elizabeth and I have heard it all. And you know what I don't care. Because you know for me it is the way that your parents bring you up is what you will be. [...] Definitely, people judge you. As soon as you say Elizabeth you get judged and that is without a doubt. If people know me they will understand me. But you know I am proud of being from Elizabeth and being successful. I don't care what people think.

*Gabby (Living in Northfield, Childhood residence in Elizabeth and Salisbury)*

The perceptions were portrayed with strong emotion and there was the opinion that „there is bad everywhere so why do these places cop it“ - resulting in a feeling of „them“ and „us“. The attachment to the region brought about a sense of pride in „belonging“ to these areas and this was associated with being „from“ a certain suburb, despite the perceived or actual socio-economic status of the region. Tracey discusses how the perceived stigma of where she lives impacts on her:

A little bit peeved. A lot of people when I say that I live at Elizabeth. „Oh Elizabeth“ and I say „When was the last time you came to Elizabeth? You know when was the last time you came here. Is all you hear about is the news reports the stabbings and stuff do ya?“

A lot of people might get pissed off at what I just said about them. You know what I mean. I am sure there is people but everyone thinks that a 100 percent of the people are like that and it is probably only 30.

*Tracey (Married, two children, local spatiality within Elizabeth Downs)*

The previous chapter discussed the length of time in a neighbourhood and childhood residence indicating that living in the same environment provided possibly positive outcomes for individuals. Living in the same „Postcode“ as an adult and during childhood was found to be associated with current obesity status. There is still much to understand as to how a „sense of place“ and identity act temporally, at different stages of the lifecycle and in conjunction with other social and health indicators. Massey (1991:1) describes a global sense of place that is “increasing uncertainty about what we mean by 'places' and how we relate to them”. Limited attention has focused on young adults and what these changing global spaces mean for this age cohort in conjunction with the importance of local areas. Place and the relationship with cultural identity

needs to be further qualified within this context and also the development of „sense of place“ measures to explore the multi-level complexities.

According to Mare and Bruch (2003), the neighbourhood in terms of the „home area“ and „locality“ ought to be an arena of predictable, comfortable and secure encounter. It is not known what causes the segregation of local areas for young adults but potentially one influence is the preference for the comforting benefits of one’s familiar neighbourhood, or simply the result of a sense of „knowing one’s place“. At the start of this chapter discussions indicated that individuals living in the most disadvantaged areas are more likely to be in their current residence due to social networks, such as family currently living within the area. Those NWAHS participants living within low income households were also more likely to reside in an area where their family have always lived (23.5 percent), compared to those within high income households. With this comes a sense of pride in „knowing“ where you come from and also interrelates with the previous findings of 25.0 percent living in the same „Postcode“ as an adult and during childhood.

NWAHS participants not only „always lived within the area“ but they felt comfortable in this place and „threatened“ when they went outside of this zone of „knowing“. There is a spatial dimension to their „sense of place“ such as indicated by Louise:

It does not really bother me where I live. I wouldn’t go the other side of town or anything like that. It’s really central and it’s a bit what you are used to as well. I have grown up this side of town so I am very used to it.

Yeah I feel comfortable there and I know my way around. For instance, I would feel uncomfortable going up to Salisbury and walking around their streets and things. Even though I am sure it is no more unsafe than where we are. But you know the familiarity with it.

*Louise (30 years, Edwardstown, middle individual and area-level SES)*

Both me and my husband grew up down South. So going down South was not too much of an issue as we were used to the area but we would not go down there again.

*Sandra (32 years, Lockleys, middle area-level SES)*

When asked about „where they would live if they had the opportunity“ participant’s tended to indicate that they would live in a similar area, even if posed with the question of living anywhere. For example, Tracey discusses the concept of living somewhere else, such as the country, but the reality of moving „out“ or „up“ was described as the following:



No it is a pipe dream. It's a "Oh mate that would be nice" but don't think it is ever going to happen.

*Tracey (Grew up in Elizabeth and established family home in similar area)*

Among young adults there would be a percentage of this cohort who were accumulating wealth over time and this enables them to undertake a certain degree of individual and area-level social mobility.

It would purely depend on cost because I know that houses are pretty pricey up here now. If I couldn't live in Wynn Vale or Golden Grove [suburbs] I would probably try and get something quite close as it is quite accessible to things.

*Laura (Living in Wynn Vale outside of north-west study region)*

Within socially disadvantaged communities there may be driving forces in the importance of where family have lived and a sense of „knowing where you are from“. A socio-economic lens of these observations gives an indication that certain sub-populations, such as those that are individually and locationally disadvantaged, actually do not see movement out of the social situation in the near future. There is no anticipation of being within a different financial situation and away from their current social networks.

Contrary to what a lay perspective on disadvantage would conclude, the more disadvantaged areas do not necessarily lack social cohesion and supportive social networks (Arthurson, 2002). Table 7.6 outlines the main reasons why the younger cohorts do not feel a sense of community as being „too busy/focus on family, job and friends“ (25.3 percent) and „like to keep to myself/not interested“ (21.2 percent). NWAHS young adults were more likely to report the reason as they were often new to the area (6.6 percent) relating to residential mobility of this cohort.

It is also thought that young people in particular are extremely territorial in their behaviour, where their “action spaces or wider neighbourhoods have very limited horizons” (Kearns & Parkinson, 2001:2106). In this case, local areas can be a source of closure and people maintain networks within spatially defined local areas. Therefore, the experiences are „socially isolated“ to their local environment in terms of the attitudes, lifestyles and consumption of behaviours (Stead *et al.*, 2001).

**Table 7.6: The reported reasons for not feeling a ‘sense of community’ by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Main reason why do not feel there is a sense of community....</b>						
Too busy/my focus is on my family, job, friends	119	25.3	132	23.7	251	24.4
Not my type of people/different interests, lifestyle, stage of life, nothing in common	22	4.7 <sup>√</sup>	60	10.8 <sup>^</sup>	83	8.0
Like to keep to myself/not interested	100	21.2	127	22.8	227	22.1
Rental property	-	-	2	0.4 <sup>#</sup>	2	0.2
No community events to meet people	15	3.2 <sup>√</sup>	6	1.1 <sup>^</sup>	20	2.0
People not approachable/not a friendly neighbourhood	35	7.4	52	9.3	86	8.4
Do not know neighbours	56	11.9	57	10.2	112	10.9
New to area	31	6.6 <sup>√</sup>	12	2.2 <sup>^</sup>	43	4.2
Do not spend much time in neighbourhood	8	1.7	17	3.0	26	2.5
Other	79	16.8	78	14.0	156	15.2
Do not know	6	1.3	15	2.7	21	2.1
<b>Overall</b>	<b>471</b>	<b>100.0</b>	<b>558</b>	<b>100.0</b>	<b>1029</b>	<b>100.0</b>

\*Calculated using weighted data (Wtftfu2). <sup>^</sup>√ Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „young adults“ compared to „aged 35 years and over“  
<sup>#</sup>Sample size insufficient to undertake statistical testing

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

There are a number of „closed“ communities where socially people tend to mix within what is similar. Laura lives in the suburb of Golden Grove<sup>86</sup> and she used words such as „up here“ to describe where she lives. The suburb is „up“ on the hill in the north-eastern suburbs of Adelaide and there is a sense of a „closed“ community – that is the notion that people that live here have „their“ lives here, mainly because the area has many services and facilities and there is no need to go elsewhere. Laura feels a strong connection to the area as she is involved in a number of local activities and services.

I kind of group Golden Grove and Wynn Vale into the same kind of thing because I have got everything up here. And its heaps close to friends, and I play sport up here, and do all the shopping up here, and all of that. I go to church up here and everything is kind of close by, which is kind of nice.

*Laura (22 years, Golden Grove „community“ member)*

Previous research has found that those individuals who maintain social networks that are similar in social characteristics are more likely to take on the features of the group such as in this case of obesity (Christakis & Fowler, 2007). Researchers Cohen-Cole and Fletcher (2008) have suggested that obesity is „contagious“ or, in other words, the social networks that are kept influence the obesity levels within those populations.

A feeling of belonging is an important aspect in the construction of the perceptions of local areas and the ability to feel safe within their home environment is a key component. Neighbourhood disorder or the threat of living in an environment that one

<sup>86</sup> Golden Grove was originally within the north-west region study area and was removed during the pilot as they did not associate with being apart of the northern or western area of Adelaide.

perceives to be dangerous can be psychologically distressing. There have been a number of studies that have outlined components of safety and fear of crime in local areas (Whitley & Prince, 2005; Burdette & Hill, 2008), although few studies have been reported for the South Australian context. The highest level of property offences outside the city centre of Adelaide were found within Port Adelaide/Enfield Statistical Local Area (SLA) with 147.5 offences per 1,000 population (OCSAR, 2006). NWAHS participant comments related to not feeling a „sense of community“ due to crime and safety are presented within Box 1.

**Box 1: Comments from North West Adelaide Health Study (NWAHS) participants on safety and crime within their local area, telephone follow-up, 2007**

North West Adelaide Health Study (NWAHS) comments on safety and crime within the region
Also, the area has become rough – hoons, wheelies, burnouts, people yelling late at night – makes me feel scared, especially when it's close to my house.
A lot of drug addicts have moved into the area and people with mental problems.
The crime and drugs around here, a shooting recently. The neighbourhood is changing a lot of demolition and people moving in and out.
Too much aggression on the streets, for example my impression is that some of the people in my neighbourhood are on drugs, kids out at night, throwing rocks etc. arguments, burnouts, cars getting stolen – it doesn't feel safe to go out.

Although safety was not apparent in the analysis of why people chose to live in an area, qualitative insights highlighted that it was a secondary aspect of their feeling of community and perception of their local area. Some negative themes that were highlighted in the interviews included these comments from Gabby who did not really like the suburb she was living in:

To be honest, I don't really like the suburb. [pause] It's not safe - I don't find it safe. Whereas other places where I have lived I did find it safe. I think there are a lot of other younger kids out and because we are near the main road we get a lot of hoons.

*Gabby (Moved out of childhood suburb to live closer to the „city“)*

Tracey liked the area because she did not have any troubles, yet it possibly would be seen by „outsiders“ as an area that is not as safe. Is it that Tracey has always grown up in a similar area and it was what is familiar to her, or is it more to do with her experience or perception of „trouble“?

We have got good neighbours, we have no troubles with the neighbours, its quiet and there are no hoons and stuff like that.

*Tracey (High crime rate area, lived in area entire life)*

Research investigating the perceptions of neighbourhood environment for physical activity found that enhancing the safety or aesthetics were just as important as the

accessibility to venues for physical activity (Boslaugh *et al.*, 2004). The physical attributes are important as it can be a barrier to participating in exercise or mobility patterns within the local area. In areas where there is a reportedly high level of crime, it was found to be positively associated with body mass index (BMI) and cardiovascular heart disease (CHD) risk, whereas neighbourhood affluence was negatively associated with these factors (Mobley *et al.*, 2006).

The opening chapter lyrics quoted the cultural identity of „knowing one“s neighbours“ (Loren, 2005). People tended to think that they had to know people next door or hang out with people in their area in order to feel as though they „knew“ their neighbours. As Louise states, “As long as I know my direct neighbours enough to say hello that covers me for safety and everything else” and further reiterated in the following comments:

No... The only people that we know in the area are next door and we talk a lot and stuff. She has kids and her kids like to play with my dog. When I take her for a walk the kids come out. We both have got each others numbers in case anything happens or the alarm goes off and stuff like that. We will go past when we take the dog for a walk and say “Hi”. In terms of knowing them - No. It is like... “Hi, how are you going?”...

*Gabby (De facto relationship, no children, dog owner)*

There is nothing wrong with the area that we live in. I wouldn't say that.. We don't talk to our neighbours. We are not neighbourly; we don't know many people in the area. But it's not unpleasant if that makes sense. We don't have that as such yet, but we haven't really made an effort obviously to get to know anyone or talk to anyone. But would I feel really strongly if I know that the person's alarm across the road was going off, I would do something. I think they would have the decency or respect to find out what is going on and ring the police and if they heard something suspicious they would report it.

*Sarah (Married, 24 years, local networks)*

These findings are similar to what was found by Walker and Hiller (2007) where older adults did not necessarily socialise with their neighbours. It appears that older people are more in tune with needing to feel „safe“ or „connected“ in case they need physical assistance. As people age, there is a sense of vulnerability or „mortality“ that motivates older populations to stay connected. The more that people rely on these networks is found to be related to the increasing importance of these ties and remaining socially included (Walker & Hiller, 2007:1159).

#### 7.4.2 Changing places

It has been found that those areas where there is low level of trust have higher rates of violent and property crime (for example Kawachi 1999). Discussions with NWAHS

participants highlighted apparent mistrust of others and the breakdown of people that you could trust was perceived to be occurring more recently (i.e. the last 5 to 10 years). This is also interesting that the NWAHS participants put a time period on when these changes were occurring and this could be an indicator of the identification of social changes that have occurred in „trusting“ members of the community. Alternatively, this could be an element of heightened media attention or „numbness“ within the community towards crime and bad behaviour. These safety concerns were apparent in comments from Gabby and Louise in what they thought of the local area they were living in:

There are the newer houses and stuff like that. And I mean in general, I don't know I think people just keep to themselves. I guess with all the stuff that happens nowadays you are just hesitant as well. You can't be the way that you were say 5 to 10 years ago. You can't be the person you were 5 to 10 years ago. Just for the general fact that there are killings, bashings, and stabbings and over stupid stuff.

*Gabby (No sense of community within local area)*

Everything is so different. I can even just think back ten years ago and I just never felt scared. Today I wouldn't walk down to my front letter box in the dark.

*Louise (No connection to suburb or local area)*

The socio-demographic mix of the local area is an important aspect to consider in understanding the socio-spatial geographies in connection to identity and attachment to place. For the population in general there were discussions that the socio-demographic composition determines the „feel“ of the local area.

It's become a dormitory or homogenous suburb rather than a mix of ages. I rarely see people walking by where as in the past you would've spoken to them. Most of those people would've passed on. Cars drive past but there are not pedestrians.

*NWAHS participant, telephone follow-up, 2007*

I guess it was an older generation sort of thing and I was the youngest one there. So the people across the road all had kids or they were grandparents. They were easy to get along with and nice.

*Gabby (Recently moved into newer housing estate area from established suburb)*

There is an association among older adults between areas with a high concentration of elderly people and positive mental health outcomes (Kubzansky *et al.*, 2005:257). The emotional attachment and memories of an area found in older persons was more apparent if they had been within the area for a substantial period, and particularly for women (Wiles *et al.*, 2009). Despite the limited research that has been undertaken investigating the attachment, pride and identity of local area for the younger cohorts,

one would assume that there may be similar relationships associated with pride and length of time in that local area.

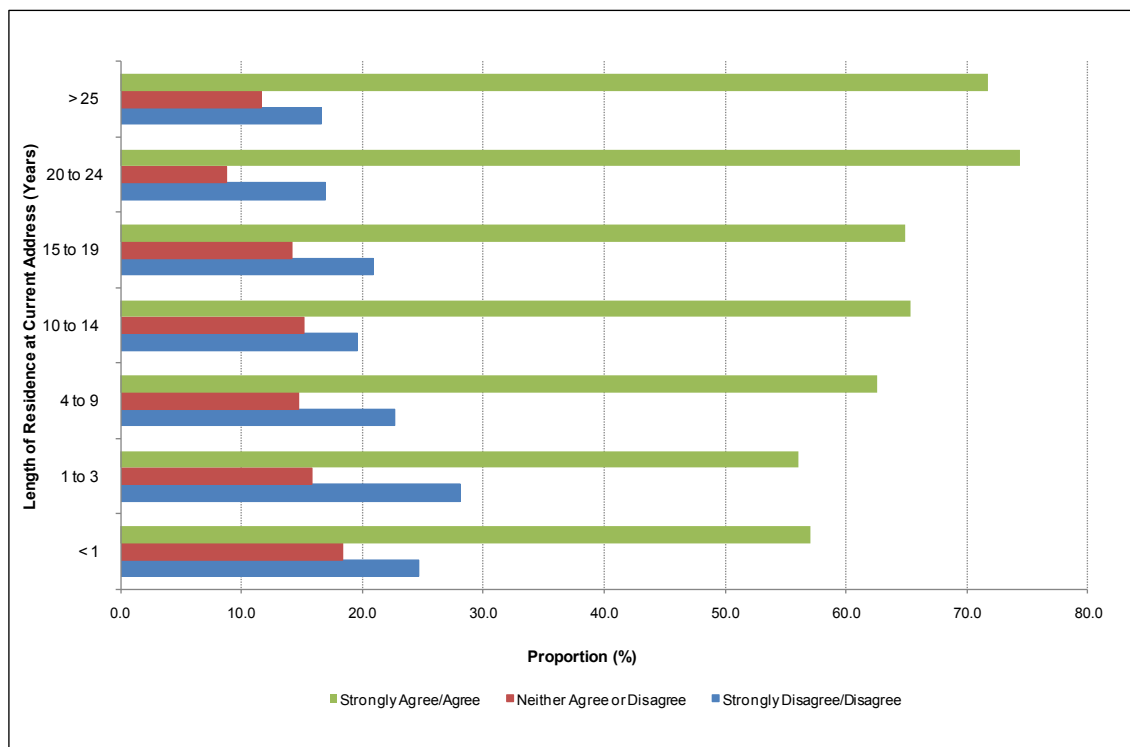
A number of comments from the NWAHS participants discussed the mobile nature of residential areas and how this changed their perspective on the local social environment and „sense of community“ (Box 2).

**Box 2: Comments on residential mobility within the north-west region, North West Adelaide Health Study (NWAHS), Telephone follow-up 2007**

North West Adelaide Health Study (NWAHS) comments on residential mobility
Neighbours constantly changing
A lot of transients in the area – just get to know someone and they move
New developments have not encouraged social interaction
No permanency – people protective of their own space
Big turnaround of different people in the neighbourhood – lots of houses are now occupied by renters. Also I work permanent nightshift.
A new wave of younger people have moved into the area – a lot of the older people have passed away or moved on. The young ones just associate with other young ones.

A positive experience in a certain local area is likely to influence decisions in residential choice in the future. Feijten and colleagues (2008) outlined that there is a chance an individual will choose to move there, live there in the future and experience return migration to an area where they have previously lived. On one hand, there are negative aspects related to the changes in residence; on the other, the alternative vision of a stable local area can offer the prospect of a stagnant „neighbourhood“. Changing landscapes present emerging challenges to understanding the local and global interactions, yet provide opportunity for the formation of dynamic local areas. Figure 7.4 indicates a positive relationship between the length of time an individual has spent within their current residence and reported „sense of community“. People living in their current residence for over 25 years were more likely to report (around 70.0 percent) that they „strongly agree or agree“ that there is a „sense of community“ in their local area. In comparison, people who had lived at their current residence for less than one year had a lower „sense of community“ (less than 60.0 percent).

**Figure 7.4: Length of time spent at current residence by reported sense of community, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**



Calculated using weighted data (Wtifu2)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

It is natural to assume that the length of time in the local area brings about a sense of connectedness and „belonging“ as people meet people and maintain these networks over time. Increased in-migration and out-migration within geographical areas weakens the social ties within (Lindstrom *et al.*, 2003), and migration out of an area is an insightful proxy for social capital. It is still unknown to what extent that movement attributes to a feeling of belonging, sense of community and connectedness within local environments. At this stage of understanding these processes, the research is unable to show causal links between residential mobility patterns and obesity rates.

Young adults within the NWAHS have previously been reported to have moved more times in the last five years compared to the rest of the population (Chapter 5). People who moved location tended to relocate to a similar social environment and there is an assumption that movers go to a less established social environment for their immediate psycho-social purpose. In this case, there were proportionate numbers by area-level socio-economic status of persons moved and those who did not between Stage 1 and Stage 2 NWAHS. There were 61.8 percent of non-participants in Stage 2 NWAHS that were originally living in the most disadvantaged regions according to area-level socio-

economic status („Low/Lowest Quintiles“ SEIFA IRSD). The attrition of the sample needs to be considered within analyses as residential mobility patterns are not determined within these types of population cohorts.

Higher civic and formal social participation has previously been associated with higher income and education (Ziersch *et al.*, 2005). Therefore, those individually of a higher socio-economic status are the movers with the capital (including cultural, financial or social) and have a degree of „choice“ around residential mobility patterns. However, housing tenures, such as social housing tenants and those within the public rental market, may have an element of movement that does not relate to choice. With this in mind, those people living within these housing tenures may have more difficulty in reforming networks and undertaking social participation in their new residential and broader local area.

As well as the socio-demographic composition of local areas, the north-west region has experienced changing landscapes in terms of cultural diversity. A case study of the Indian city of Delhi explores how the socio-spatial differentiation of residential segregation is a question of scale, a city such as this has vast cultural and religious differences that aid in the formation of landscape at a number of scales; local street level, areas and the city as a whole (Dupont, 2004). Culture is important in understanding the formation of where people live and the perception that people have on these environments. Research has argued that place explains the racial health disparities that exist in the US by quantifying the contribution of the residential context to the gap between health outcomes of black and white races (Do *et al.*, 2008). Within the US, literature is centralised around racial and ethnic issues of the decision processes for the residence and how this leads to the segregation of communities (Bruch & Mare, 2006). The „classic“ ethnic density effect predicts better health for individuals from minority ethnic groups if they live in neighbourhoods with a larger concentration of people from their own group (Fagg *et al.*, 2006:646).

There are particular spatial patterns that exist with respect to cultural minority groups within the north-west region of Adelaide (Chapter 4). With changing migration patterns in Australia and SA, there is a need to consider the implications for future health patterns based on the ethnic distribution of these populations. The population’s attitude to immigration has been a marker of cultural divide and continues to be a concern as



immigrants assimilate and integrate into local areas. The number of migrants allowed into Australia which has been perceived „gone too far and much too far“ has decreased from 56.8 percent in 1990 to fewer than 30.0 percent in 2004 (Betts, 2005:31). Betts (2005:38) found that individuals who are more cautious to their approach to immigration had a strong attachment to their country and were more likely not to have a university degree or highly skilled job. The attitudes to immigration by occupational classifications suggest an economic explanation with “workers” traditional fears about immigrants taking jobs from natives” (Evans & Kelley, 1986:188).

A number of comments by NWAHS participants indicated „xenophobic“ reasons as to why they did not perceive a „sense of community“ within their local area (Box 3). These results tended to be from participants within the older age cohort. According to Jupp (2002:2) the term „xenophobic“ is a “simpler psychological reaction to people who originate in a different homeland and who are believed to be physically or culturally different” and this may raise a sense of „fear“ as to what the newcomer brings to the community.

**Box 3: North West Adelaide Health Study (NWAHS) qualitative responses of a racial nature, telephone follow-up 2007**

North West Adelaide Health Study (NWAHS) comments on racial composition of the region
Different cultures equals different lifestyles
Different culture of the neighbourhood. Lots of foreigners. Don't speak the language
I was brought up in a much smaller community and there was a much greater feeling of community, where we live now people move, there are different nationalities, different interest groups. I think that is the general way now
Lots of Asians in my area – they keep to themselves. 23 years ago there used to be more Aussies around and it was a lot friendlier. Lots of Africans here too, the area has changed a lot.

Suzy indicated that the cultural diversity within her local area caused divide:

Mum and Dad are right near the school, they are getting very mixed, lots of Africans, Vietnamese, and Arabs and you know. Which doesn't necessarily mean crime or anything. It just means that ... well you know. It is crime in a sense as they have their own issues within their own country which they actually bring here. You know they have problems there and then they bring it here. They bring it here and they are fighting here amongst themselves in our communities you know.

*Suzy (Aged 31 years, Anglo-Australian background)*

The comment of „our“ community from Suzy is interesting in its own right, with a perception that the immigrants were coming into „her“ way of life and „her“ community. The new waves of immigrants are seen to be creating a cultural divide as people see these minority groups of the population as being „different“ to their way of living. Residents perceived increasing migrant communities as „changing the landscapes“ in

which they lived and thereby threatening one's sense of place by being „different“. Massey (1991:24) discusses a reactionary response within *A Global Sense of Place*:

An (idealized [sic]) notion of an era when places were (supposedly) inhabited by coherent and homogeneous communities is set against the current fragmentation and disruption. The counterposition is anyway dubious, of course; 'place' and 'community' have only rarely been coterminous. But the occasional longing for such coherence is none the less a sign of the geographic fragmentation, the spatial disruption, of our times. And occasionally, too, it has been part of what has given rise to defensive and reactionary responses - certain forms of nationalism, sentimentalized [sic] recovering of sanitized [sic] 'heritages', and outright antagonism to newcomers and 'outsiders'.

There are limited studies in Australia that have investigated the links between local area racial composition and health. The context for this research is different in terms of the racial composition and, hence, it is difficult to make comparison to international studies on residential factors driving health inequalities and racial segregation. It is not fully understood how social-spatial exclusion of these communities has an impact on the „xenophobic“ prejudices that exist within this community and the influence on assimilation or integration of other cultures within the north-west region.

## 7.5 Conclusion

Outlined within this chapter were several residential factors that assist in understanding the broader socio-spatial geography of obesity in young adults. The concept of the „neighbourhood“ has not been clearly defined within this population, and this context provides more understanding to the processes driving individuals' experiences within their social environment. The investigation of „sense of place“ and the socio-spatial exclusion of communities is not fully understood in relation to the reproduction of behaviour and consumption. These discussions indicate that despite a number of positive residential factors such as a sense of community, connectedness and perceptions of local area within disadvantaged communities, it is these areas that experience poor health outcomes. Even with a strong „place identity“ it would appear that residents experienced a higher prevalence of obesity and undertook unhealthful behaviours. The following chapter will unravel further the complexities of „place“ and obesity through discussion of lay perspectives of health and obesity across different social environments.

## CHAPTER 8

# THE DUALITY OF STRUCTURE: Exploring lay perspectives of obesity within the context of place

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One has to distinguish the dimension of reality-irreality within the psychological life space. The reality level of the psychological past, present, and future corresponds to the situation as they actually existed, exist, and will exist according to the individual's belief.

(Lewin, 1951:75)

### 8.1 Introduction

In the early developments of social psychology, Lewin (1997) considered a „life space“ to include aspects of the physical and social environment. However, this early work does not extend to consider the „duality“ of structure such as the sociological insights of Giddens' *Theory of Structuration*. As outlined in the conceptual framework, human behaviour is not only structured by the social world in which humans live but by the way the actors (human agency) behave within these structures (Giddens, 1984). The discussions are at both a global and local level to assist in conceptualising the socio-spatial geography of obesity within the north-west region of Adelaide. To begin with global forces for social, cultural and media landscapes are discussed to highlight influencing factors on obesity social norms. The chapter utilises perceptions from North West Adelaide Health Study (NWAHS) young adults to describe an individuals' understanding of health and obesity in the context of place.

### 8.2 Social and cultural views of the body

A social interactionist approach to health attempts to gain meaning from the interactions that people have with each other in day-to-day life. As Gatrell (2002:32) implies, human beliefs, values, meanings and intentions hold as much importance as the views of health professionals and researchers. Increasingly, literature has focused on lay perceptions<sup>87</sup> of health and this viewpoint informs the discourses of disease through understanding individual's experiences and attitudes about health (Popay *et al.*, 2003; Macintyre *et al.*, 2005, 2006). A few important studies have incorporated the variations in the perception of health that exist in disadvantaged communities (Stead *et al.*, 2001;

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<sup>87</sup> Lay perceptions is a discipline within the field of epidemiology investigating the common knowledge of individuals on health and their experience of health (Williams & Popay, 1996).

Lawlor *et al.*, 2003; Popay *et al.*, 2003). These perspectives are also considered beyond non-communicable disease research, such as Bailey and colleagues (2006), in understanding „citizen epidemiologies“ for a foot and mouth epidemic in the United Kingdom (UK). There is a need for more critical and theoretical debate to the post-medical geographies incorporating structurationist frameworks that address the geographies of health. A deeper understanding of how people view their experience of inequalities in the context of place and health has emerged within the literature (Cummins *et al.*, 2007; Davidson *et al.*, 2008). These studies have indicated the importance of individual „viewpoints“ in the context of global forces and area-level structures. Thus far, research within the Australian context has not focused on lay perspectives of health and the „duality“ of structure.

Bodies are shaped by the social contexts in which they exist and the sociology of the body provides an understanding of the social, cultural and biological factors of individuals as constituted social beings. There are numerous changes that have been experienced over time, among other things, *inter alia*, in the way we eat, prepare food, work, exercise, consume and socialise. In turn, these changes have an influence on the attitudes and beliefs about health and society.

Cultural contexts shape values and norms about body weight and change weight through modernization [sic], migration and acculturation, and historical contexts change weights and attitudes about weight over time.

(Jeffery, 2002:1)

The literature suggests that we are moving towards a more body-conscious society and people are thought to need to adhere to the standards of society to be thin (Crossley, 2004), yet it would be contested as to the degree that this is occurring socio-spatially. On one hand, society is telling us to be „thin“ like models and what the media portrays, and on the other, there has been a shift in the society norm of weight distribution. Within the NWAHS population, there were a range of lay perspectives on „other“ people“s weight which gave an insight into the cultural expectations of obesity.

I would hope that there is enough out there now that people would know how to deal with that or at least know that there is somewhere to go with that sort of issue [obesity]. I think that is a little bit self-inflicted.

**Researcher:** Where would people go?

Well if they are serious about it they might want to go and see a doctor. I am sure that if it is their local doctor they would have mentioned their problem with weight and there would be a flow on effect.

*Louise (normal weight, on the lower end of the BMI normal weight range)*

Louise was of the opinion “they should know better” and “know that they have a problem and how to deal with it”. There was also the assumption that the medical system would be able to „help“ people in understanding their health and, in particular, weight status. The „problem“ of the obese was seen to belong to the individual.

Furthermore, there are changing landscapes of consumption, such as discussed by Curtis *et al.*, (1998), in drawing on the theoretical insights of Bourdieu. In this case, consumption relates not only to „consuming“ food but also in how people uptake information that they receive about health and social issues. Contemporary landscapes present new challenges and opportunities for the entire population, yet it could be argued that the impact is different on those that are socio-spatially excluded. The previous chapter discussed how the spatial distribution of the population is socially constructed by residential factors. With this in mind, the socio-economic differences in lay understandings of health would thereby have a spatial nature. The question is how some people deal with these changing landscapes, adapting to new stimuli that promote an unhealthy lifestyle. Additionally, there is the need to find out what drivers enable some people to „cope“ better than others across social environments.

### 8.2.1 Means of body mass index: The new „normal“

Previous research from Penman and Johnson (2006:1) investigates the changing shape of the body mass index (BMI) distribution and the suitability of Geoffrey Rose’s population based prevention concept:

The aim of disease prevention is to shift the population distribution in a favourable direction by targeting the entire population and not just those at the upper tail of the distribution that are at greatest risk; the aim of this approach is to shift downward, or to the left along the X-axis, the entire population distribution of a risk factor.

Figure 8.1 outlines analysis of the South Australian Health Omnibus Survey (SA HOS) indicating a change in BMI scores between 1994 and 2004 of almost one index point. A higher BMI score has resulted in a positive skewness along the distribution. In 2004, the mean BMI raw score of 26.0 is classified as „overweight“, according to the World

Health Organisation (WHO) definition, and this means that the new „normal“ is actually „overweight“ within the population.

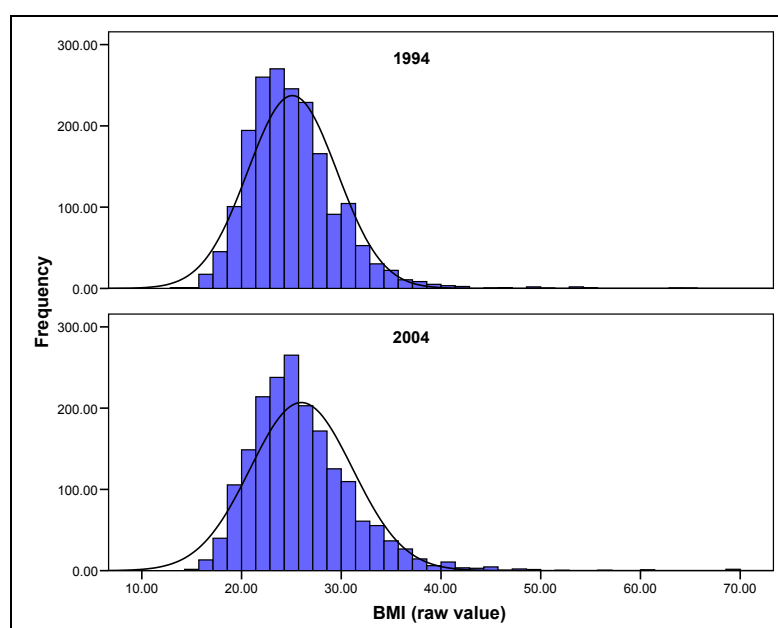
There have been increases in mean BMI for both males and females and across all age cohorts. Previously reported within this population, females have a higher prevalence of obesity, although males report a higher mean BMI score in this analysis. Even though women are more likely to be obese, men are more likely to be overweight and hence shift the mean distribution in a positive direction along the x axis.

**Figure 8.1: Description of raw BMI scores, metropolitan Adelaide, South Australian Health Omnibus Survey (SAHOS), 1994 to 2004**

Year	n	Mean (CI 95%)	Median	Range	St. Dev	St. Error				
1994	1867	25.1 (24.9 – 25.3)	24.5	13.6 thru 64.3	4.48	0.103				
2004	1866	26.0 (25.8 – 26.2)	25.3	14.4 thru 69.4	5.14	0.119				

	1994	1995	1996	1997	1998	2001	2003	2004	% change
<b>Gender</b>									
Male	25.6	25.8	25.9	25.8	25.6	26.1	26.4	26.4	0.8
Female	24.6	24.5	25.0	25.1	25.4	25.6	25.6	25.6	1.0
<b>Age Groups</b>									
18 to 29 years	23.7	23.9	24.2	23.8	23.7	23.9	24.0	24.4	0.7
30 to 49 years	25.6	25.4	25.8	25.7	25.7	26.2	26.5	26.4	0.8
50 to 69 years	25.9	26.1	26.4	26.6	26.3	27.0	27.0	27.0	1.1
70+ years	24.7	24.7	24.8	25.3	25.0	25.0	25.4	25.5	0.8
<b>SEIFA IRSD 2001</b>									
Lowest Quintile	25.8	25.5	25.5	25.5	25.7	26.0	26.7	26.7	0.9
Low Quintile	25.8	25.2	25.2	25.2	26.0	26.4	26.4	26.1	0.3
Middle Quintile	25.0	25.1	25.1	25.1	25.0	26.2	26.4	26.4	1.4
High/Highest Quintile	24.8	25.3	25.3	25.3	24.8	25.5	25.6	25.7	0.9



\*Calculated using weighted data (Wt)

SOURCE: Compiled from South Australian Health Omnibus Survey (SA HOS) metropolitan Adelaide (1994 to 2004)

The distribution of BMI by area-level socio-economic status reported that those NWAHS participants living within the most disadvantaged areas („Lowest Quintile“ of SEIFA IRSD) were more likely to display a higher mean score. It has not been fully established the role that these changing distributions have in the recognition of weight status and obesity as a health issue.

### 8.3 Media landscapes

The implications of media exposure on one’s perceptions of health and well-being are discussed in this section in the context of these changing environments and socio-cultural norms. In conversation about the most important health issue in society, the media appeared to influence the formation of the participants’ opinion, that is, it was what they „hear“ or „see“ on television:

You hear increasing amounts of cancer and everything. The amount of survivors is getting better. The cures and stuff and some of them don’t have it yet. This is what is killing everyone. There is nothing that you can do about it. Everything seems to cause cancer some way or another.

*Gabby (28 years, Secondary highest level of education)*

Traditionally, literature investigating the link between obesity and the media has focused on two key areas, the number of television viewing hours and junk food advertising. The number of hours of television viewing has been found to be negatively associated with leisure time physical activity participation (Salmon *et al.*, 2000). Additional studies have investigated aspects of the neighbourhood environment (i.e. walkability) and television consumption (Sugiyama *et al.*, 2007). These studies have concentrated particularly on sedentary lifestyle as a result of the increased number of television viewing hours, as opposed to undertaking physical activity. There has also been a focus on legislative action against the marketing of junk food to children on television and particularly within South Australia (SA) where a Parliamentary Inquiry (Parliament of South Australia, 2007) has resulted in further government action.

Limited research has focused on the heightened media attention towards obesity. This is despite the potential importance that media and television viewing have in understanding the increasing obesity prevalence within the population. Since 1992, there has been a fivefold increase of reports on obesity within United States (US) national papers and Lawrence (2004) indicates that there has been a reframing of

obesity over this period.<sup>88</sup> Additionally, an Australian study indicated that around two-thirds of television news items relating to obesity were attributed to personal responsibility (Bonfiglioli *et al.*, 2004). People are continually challenged by a range of health information that is provided in a number of media forms. The role media plays may be paramount in understanding how the general population formulates the concept of obesity. It appears that information is mixed and confusing to the lay person and there is not one clear message within the media:

Yeah... I think that they don't even know. They say that this might have something to do with it. They are just telling you „might“ in some way or another.

*Gabby (28 years, low household income)*

An example of heightened media attention towards obesity was seen on the front page of the South Australian newspaper, *The Advertiser*<sup>89</sup>, in a 2005 article about obesity rates which had the headline of “**EPIDEMIC**” (Anderson, 2005). Boero (2007:41) discusses the use of the term „epidemic“ and how it is portrayed within the media from a sociological viewpoint, where this framing of health has the effect of casting “in the shadow of a moral panic”. The way that media frames health is an important aspect of research, particularly, in relation to the impact it has on the individual in terms of psychological consequences. For example, Lupton (2004:187) articulates “the overweight body was represented as grotesque, out of control, unhealthy and unAustralian”. In addition, to reporting of obesity within traditional media avenues of news and newspaper, there has been an explosion of reality television, as discussed in the following section.

### 8.3.1 Reality television informing healthy weight within the population

I guess you see it [overweight and obesity] on the news all the time and you read about it and they've got “The „Biggest Loser” on telly. Yeah, you hear it all the time.

*Laura (22 years, medium household income)*

“The Biggest Loser”, first aired in 2006, is one of many reality shows that have been on Australian television.<sup>90</sup> An Australian study of overweight patients has investigated the influence of “The Biggest Loser” in weight loss (Thomas *et al.*, 2007). This research

<sup>88</sup> According to current obesity rate, the increases of these figures presented in 2004 would be expected to be substantial since this time.

<sup>89</sup> “The Advertiser” is the daily (Monday to Saturday) newspaper for South Australia.

<sup>90</sup> The Australian version of the Biggest Loser can be found on website: <http://www.thebiggestloser.com.au/>. On this program severely obese contestants seek to out-perform each other in losing weight. The contestants had the use of the gym, strict diets and personal trainers to help in weight loss strategies. The „biggest loser” is that contestant that lost the most weight over the competition. In considering this context for this discussion it is not determined whether the fact that “The Biggest Loser” was aired on Australian prime time television at the time of under taking these interviews and is based on the American show of the same name. “The Biggest Loser” is aired on prime time television six nights a week during the season (approximately February to May).



came out of commentary from Hill (2005) in *Obesity Management*, who argued that the program could do more harm than good. The key questions surrounding this reality program included whether it reinforced negative attitudes, provided unrealistic ideals and gave unhelpful messages. Narratives on “The Biggest Loser” arose within interviews of NWAHS participants:

I think that it is motivational, I really do... I think good on them. It just shows people that you can do it. I bet you since that show has come on, there are a lot of people out there that thought “You know I can do something and even if I can lose five kilos it is still something”. It motivates them to say “These people are doing this and I am going to try that myself and at home”. Or whatever the case they might lose a bit [of weight].

*Sandra (32 years, Secondary highest level of education, high household income)*

It probably brings it to people’s attention more and it makes them think about it more because it is on the telly. I don’t know it probably gives them some ground work to start doing it for themselves if they want to.

*Louise (30 years, Secondary highest level of education, medium household income)*

Apart from just the reality TV aspect, I find it inspires me to get out there and exercise more, and it makes me want to work out and stay fit.

Knowing that you can still lose weight even if you have a got a condition or a foot injury like Sean [2008 contestant] did. If it is educating us maybe not seven days a week five hours a day like they do. It may help to establish a healthy lifestyle.

*Laura (22 years, Diploma as highest level of education, middle household income)*

Even though the show appeared to be inspirational, it is not known whether it influenced the uptake of health information and encouraged behavioural change. The research from Thomas and colleagues (2007) would suggest that there is a mismatch between the messages on this reality program and the „real world“ and, as indicated in discussions with Laura, on whether it is actually realistic to be able to lose weight like that:

Oh na... if you work full-time of course it is not, as you would never see your family.

*Laura (Frequent viewer of “The Biggest Loser”, undertakes a high level of exercise)*

Television viewing constructs reality (Hawkins & Pingree, 1980) and promotes materialism (Shrum *et al.*, 2005). There is limited evidence of differentials between socio-economic groups and media consumption. Consumer research, such as Ger (1992), focuses on the socio-economic benefits of marketing and indicates positive effects of marketing for privileged consumers, whereas underprivileged customers seldom benefit due to a lower per capita purchasing power. Although there is not the

evidence in the case of reality television, the example of marketing studies might still hold true, that is, the more advantaged viewers benefit the greatest.

The degree to which these forms of media are able to shape opinions about health are yet to be fully contextualised. In certain environments media appears to shape and formulate concepts, values and ideas with a stronger notion as television is one of the main sources of being „informed“. As well, it is possible that media has a growing influence as television viewing consumption increases over time. The modern era presents a range of complexities in the way information is received about health and this can be extremely confusing to the general population, and especially those who are socially and spatially excluded.

In addition, media landscapes are changing and evolving with the introduction of new technologies and these potentially influence how and where people uptake information about health. New media avenues, such as mobile phones and the Internet, particularly via social networking sites, influence what Morley and Robins (1995) outlined as spaces of identity that potentially present new ways that young adults are being „influenced“. Gauntlett (2002:104) emphasises the construction of a broader identity through media:

The range of lifestyles - or lifestyle ideals - offered by the media may be limited, but at the same time it is usually broader than those we would expect to just 'bump into' in everyday life. So the media in modernity offers possibilities and celebrates diversity, but also offers narrow interpretations of certain roles or lifestyles - depending where you look.

These observations are important in considering the spatiality of networks and behaviour and how the media exposes individuals to aspects outside of their everyday life. It is also important in the way that media frames new experiences and lifestyles for children and young adults.

## 8.4 Perception of „their“ health

In light of the previous discussions surrounding the social, cultural and media landscapes driving an understanding of health, the following section explores the perceptions that individuals have of their own health and weight status.

### 8.4.1 Perception of weight status

Comparisons have been made between self-reported and biomedical measures to investigate the underestimation of overweight and obesity (Bostrom & Diderichsen, 1997; Taylor *et al.*, 2006d). Numerous studies have reported that people tend to perceive their weight to be different to their actual biomedical measurement (Chang & Christakis, 2001; Paeratakul *et al.*, 2002; Chang & Christakis, 2003). To date, much of the research on self-perception of weight has focused on parents' perceptions of their children's weight status. Recent findings in the US report that nearly two-thirds of mothers did not recognise that their children were overweight (Hackie & Bowles, 2007) and another study in Australia found a high-proportion of parents did not express concern of their children's weight (Wake *et al.*, 2002). A majority of research focuses on gender and age influences, although there have been some studies investigating the ethnic disparities associated with weight status in adults (Olvera *et al.*, 2005). The awareness of risks among rural Australians has shown a significant difference between those that considered themselves overweight and the number that were classified overweight according to BMI (Coulson *et al.*, 2006).

Already published findings (Refer to Appendix 11: Howard *et al.*, 2008a) on the perception of weight within the NWAHS indicate that nearly two-thirds (65.4 percent) of those biomedically measured as obese perceived their weight to be either „normal“ or „a little overweight“. Those people living in a low socio-economic area, or with a low household income or born in „Southern or Eastern Europe“ were more likely to underestimate their weight status when they actually were biomedically measured as obese (BMI  $\geq 30$ ) (Table 8.1).

This paper did not explore the relationships within the young adult cohort and further analysis within the NWAHS population reports significantly lower self-reported weight status as 'a little overweight' (OR 1.29  $p \leq 0.001$ ), consistent with the lower obesity prevalence within young adults. Of those young adult males biomedically measured as obese, 67.7 percent described their weight to be „a little overweight“, compared to 58.4 percent for females.

**Table 8.1: Association with self-perceived 'a little overweight' and biomedically measured obesity (BMI  $\geq 30$ ), North West Adelaide Health Study (NWAHS) (Howard *et al.*, 2008)**

'A little overweight'	Obesity (BMI $\geq 30$ )	
	Odds Ratio (95% CI)	p
<b>SEIFA IRSD (CD level)</b>		
Highest Quintile	1.00	
High Quintile	0.89 (0.46 – 1.73)	0.739
Middle Quintile	0.77 (0.51 – 1.16)	0.205
Low Quintile	1.11 (0.76 – 1.61)	0.583
Lowest Quintile	1.67 (1.14 – 2.46)	<b>0.008</b>
<b>Country of Birth</b>		
Australia	1.00	
UK or Ireland	1.17 (0.83 – 1.64)	0.369
Eastern or Western Europe	1.72 (1.07 – 2.75)	<b>0.024</b>
Asia and Other	0.68 (0.27 – 1.75)	0.428
<b>Household Income</b>		
Greater than \$60,000	1.00	
\$40,001 to \$60,000	1.32 (0.95 – 1.85)	0.099
\$20,001 to \$40,000	1.35 (0.96 – 1.89)	0.085
Up to \$20,000	1.82 (1.27 – 2.61)	<b>0.001</b>

SOURCE: (Howard *et al.*, 2008a)

Previous research has focused on norms and behaviour in relation to obesity indicating individuals are more likely to have similar characteristics to those who are within their social networks (Christakis & Fowler, 2007; Dixon & Banwell, 2009). A recent paper citing research from this thesis<sup>91</sup> utilised data from two survey periods<sup>92</sup> to highlight the generational shifts in body weight norms (Burke *et al.*, 2009). The study indicated that there had been a decline in the misperception of „overweight“ relative to BMI  $\geq 28$ , suggesting that as obesity increases within the population individuals will assess their weight status in relation to social norms. The combination of both socio-economic and socio-cultural changes temporally and across space have led to the formation of the current social spaces in which people construct their attitudes, beliefs and understanding about health.

#### 8.4.2 Self-perception of health

Self-perceived health, as measured by an individual rating their general health and well-being, has been found to have a high predictive validity to mortality outcomes (DeSalvo *et al.*, 2006). As one would tend to expect the young adult cohort reports slightly higher levels of „Excellent“ or „Good“ self-perceived health (41.4 percent) compared to the rest of the population (37.6 percent). Table 8.2 indicates young adult women classified as

<sup>91</sup> Howard, N.J., Hugo, G.J., Taylor, A.W., and Wilson, D.H. 2008, „Our perception of weight: Socioeconomic and sociocultural explanations“, *Obesity Research and Clinical Practice*, vol.2, no.2, pp.125-131.

<sup>92</sup> NHANES – National Health and Nutrition Examination Survey (1988-1994 to 1999-2004), United States.

obese were more likely to report „Good“ (OR 3.69 CI 95% 2.15 - 6.35  $p \leq 0.001$ ) or „Fair/Poor“ (OR 2.55 CI 95% 1.31 - 4.97  $p = 0.006$ ) health status. In comparison, young adult males who were obese, were more likely to report „Fair/Poor“ (OR 2.88 CI 95% 1.54 - 5.38  $p = 0.001$ ) followed by „Good“ (OR 1.70 CI 95% 1.02 - 2.84  $p = 0.042$ ) health status.

**Table 8.2: Self-perceived health status (SF-1 General Health) and odds of obesity (BMI  $\geq 30$ ) for young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

Perception of health status	Obesity (BMI $\geq 30$ )					
	Males		Females		Total Young Adults	
	OR (CI 95%)	p	OR (CI 95%)	p	OR (CI 95%)	p
Excellent/Very good	1.00		1.00		1.00	
Good	1.70 (1.02 - 2.84)	<b>0.042</b>	3.69 (2.15 - 6.35)	<b><math>\leq 0.001</math></b>	2.45 (1.69 - 3.54)	<b><math>\leq 0.001</math></b>
Fair/Poor	2.88 (1.54 - 5.38)	<b>0.001</b>	2.55 (1.31 - 4.97)	<b>0.006</b>	2.70 (1.72 - 4.26)	<b><math>\leq 0.001</math></b>

\*Calculated using weighted data (Wtffu2)

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

There has been limited research supporting the idea that health behaviours mediate the associations between the environment, obesity and self-related health (Poortinga, 2006). Among 50 year old rural women, neighborhood poverty was associated with a greater likelihood of poor self-reported health, adjusted for age, race and socio-economic status (OR=1.35, 95% CI 1.08–1.68). This effect was greatest for individuals with incomes below the median neighborhood income (Kobetz *et al.*, 2003). Previous research in SA on self-perceived health found that those living within the „Lowest Quintile“ of SEIFA (at the Postcode level) were 64 percent (95% CI 1.35–1.99  $p \leq 0.001$ ) more likely to report „fair“ health compared to the „Highest Quintile“ (PROS, SA Health 2008). Similar results were found in this study for those living within the most disadvantaged areas at a smaller spatial scale of a Collection District (CD). Those individuals who moved residential location to a more advantaged area were more likely to report health status as „Excellent“ or „Very Good“ (OR 1.71 95% CI 1.11-2.64), compared to those living in the same environment between Stage 1 and Stage 2 NWAHS (Table 8.3).

**Table 8.3: Odds of 'excellent or very good' health by movement 'up' or 'down' area-level disadvantage (SEIFA IRSD), total population, North West Adelaide Health Study (NWAHS), Stage 1 and Stage 2 1999 to 2006**

	Self-Reported Health 'Excellent or Very Good'	
	Odds Ratio (95% CI)	p
Stayed the same	1.00	
Moved up SEIFA IRSD	1.71 (1.11 - 2.64)	<b>0.015</b>
Moved down SEIFA IRSD	1.41 (0.95 - 2.11)	0.090

\*Calculated using weighted data (WtIncS2)

SOURCE: Compiled from NWAHS, Stage 1 and 2 Spatial Sample (1999-2006) and ABS 2001 Census

Interestingly, those who moved to a less advantaged area were also indicating likelihood of a positive self-reported health status compared to living in the same social environment, although these results were not significant. People who moved to a similar socio-economic area were more likely to report their health status as „Good“, „Fair“ or „Poor“. The relevance of survey questions for the self-perception of health are discussed by Lang and Delpierre (2009) citing other sociological research that indicates individuals report a similar perceived health status as their social peers. Again, these results indicate potential social reproduction within similar social environments of behaviours and lifestyles associated with excess weight.

## 8.5 Embodiment of health

There is an assumption that people were tending to refer to someone who is obese as „severe“ according to BMI classifications - or in other words „the really big“ – or „those“ that need to be on the show [“The Biggest Loser”]. Narratives surrounding important health issues in society highlighted obesity as the most apparent, as „fatness“ was something you could see „wrong“ with someone:

It is everywhere; I guess you can't see that people are having heart problems and stuff. But by people being fat, you think it is obvious but then again you would assume they would have other complications like heart problems and cholesterol.

*Laura (Self-perceived health "Very Good", Family history of heart disease/diabetes)*

Nearly two-thirds (63.2 percent) of the NWAHS population are overweight or obese and around 9.5 percent are severely obese (Howard *et al.*, 2008b). Overweight and obesity is no longer „one of them“ but a majority of the population. This questions whether there is self-realisation of obesity as an issue for „them“ or only „those people that are obese“ such as seen in the media. If this is the case, there is the possibility the experience of weight is detached from their own experience, or as Krieger (2005:351) describes as the embodiment of disease, referring to “how we, like any living organism, literally incorporate, biologically, the world in which we live, including our societal and ecological circumstances”. Sandra and Suzy highlighted their personal experience:

I think so. It's [Diabetes] like when you buy a car and then you see it everywhere. It is sort of like that. You read it more and you take more interest.

*Sandra (32 years, Type 2 Diabetic, Grandmother had Diabetes)*

Well diabetes is right up there, it is all you hear about, and obesity. I can see why it's a problem. No, to me that's the worst thing. Anything that seems to be weight related. Obesity and Diabetes – they are the two that you are forever hearing about. You have got "The Biggest Loser" in your face every night, you can't get away from it.

**Researcher:** Do you think that this is due to things that have happened to you personally, for example in terms of Diabetes?

Not particularly, it just seems to be the one and only focus. You know Oprah's weight is always up and down, It is all it is ever about.

*Suzy (31 years, Type 2 Diabetic persistent from diagnosis of Gestational Diabetes)*

Kavanagh and Broom (1998) found that the embodied risk in the case of cervical cancer diagnosis is not experienced by the individual until after they are diagnosed and this labelling then confronts them with a range of uncertainties they had not previously experienced. As Rosenberg (2002) formulates:

Diagnosis remains a ritual of disclosure: a curtain is pulled aside, and uncertainty is replaced – for better or worse – by a structured narrative.

In discussing the structured narrative, Jutel (2006:2268) suggests that the naming of diseases "legitimises concerns, explains reality, naturalises deviance and imposes status". It is not until after diagnosis that there is a development cognitively in understanding the complexities of a health condition:

I was not feeling that good for a few years before. "No, nothing wrong with you. Nothing wrong with you". I got sent to a specialist and he sort of picked it [Diabetes] up, along with some other stuff and I was like "Thank God". There is nothing worse than being told that there was nothing wrong with you.

**Researcher:** So having a „label“ helped you?

Exactly, and this is what you can do to monitor and improve. So now I have put those things in place and now I have the benefits.

*Sandra (32 years old and recently diagnosed with Type 2 Diabetes)*

Warin (2008) argues that concepts of embodiment are ignored in health promotion and policies concerning obesity. There is a need to further understand how spatial variations in embodiment of health and weight could assist in addressing the rising prevalence of obesity.

### 8.5.1 The concept of „risk“ in relation to obesity

In health sciences, in particular epidemiology, the term „risk factor“ describes the probability that members of a category will develop or contract a disease. A „risk factor“ has been defined by Rothstein (2003:2) as:

a pattern of a behaviour or physical characteristic of a group of individuals that increases the probability of the future occurrence of one or more diseases in that group relative to comparable groups without or with different levels of the behavior [sic] or characteristic.

Previously, the concept of „risk“ was discussed in relation to family history and whether people perceived that they would develop future health problems (Chapter 6), although it is still unknown as to how individuals understand this concept of „risk“. As Kavanagh and Broom (1998:441) emphasise “being told that one is „at risk“ involves a complex translation of a fact about the population into terms that are personally meaningful to oneself”. These processes are complex as each individual would experience a diagnosis differently and this perception of „risk“ could potentially vary across spaces and places.

If there are many things which place you at „risk“, then how important is weight status to an individual? During interviews with the NWAHS young adults, it appeared that weight did not matter in the long run - it was a secondary thing:

I think your weight you know, Hey, I am 35 and I am not going to be like when I was a 16 year old. But I think the energy and just being able to be productive would mean more. Feeling well means more to me than being thin. The weight thing, it is secondary.

*Sandra (Living in the middle quintile of SEIFA IRSD, Suburb of Lockleys)*

Well I think I will get overweight if I keep going. But I seem to be staying pretty level pegged at the moment so I must be eating enough of the good stuff as well. I weigh more now than when I was pregnant with the kids, yeah I am not happy, but it doesn't matter.

*Tracey (Living in most disadvantaged area, Suburb of Elizabeth Downs)*

Is there more to life than how much you weigh? It's [obesity] always caused by emotional issues, well that's what I think.

*Suzy (Living in the middle quintile of SEIFA IRSD, Suburb of Pooraka)*

Adams and White (2009) utilised a future consequences scale to measure time perspectives and found time partially mediated the relationship between an index of area-level disadvantage and BMI. It has not been established the extent to which someone at „risk“ has the self-realisation of obesity and whether it is associated with future health consequences, and additionally, how this differs to other health conditions (i.e. cancer) that may have a more „frightening“ prospect of mortality outcomes. The increasing rates of obesity within the population or increasing individual weight gain possibly will, in the short-term, not present as „risky“ due to other potential barriers,



such as financial or time constraints, that prevent weight being a priority on a day-to-day basis.

People are expected to manage their own risks, self-governance, self-care, and self-improvement (Kavanagh & Broom, 1998:438). The temporal nature of decision making is continually changing and being challenged as people move through their lifecycle. The individual perception of risk might be an influencing factor in relation to increasing rates of obesity within this population and especially within disadvantaged communities, as Leccardi (2006:9) indicates:

in contemporary modernity thinking about risks requires conceptual tools of another type. In fact, these risks do not appear governable through methods of instrumental rationality, they are risk of global reach; preventing them is arduous in the extreme.

It is not formulated how individuals respond to the „risk“ of weight into the future and the relationship with chronic conditions. For instance, do individuals who are individually and locationally disadvantaged construct differently the temporal risk of obesity and chronic conditions? Again, Leccardi (2006:15) suggests “those with meager [sic] social and cultural resources seem above all to suffer from the loss of the first modernity“s progressive future and traditional project creating”.

## 8.6 Barriers to achieving a healthy weight

The rapid effects of globalisation, social change, and technological advances, have resulted in a society where everything has become „super“ fast (Giddens, 2002). A majority of NWAHS participants suggested mild to moderate levels of stress (Table 8.4) and life is perceived to be generally more stressful now than in the past, presenting a range of complexities in day-to-day life:

The more money you have the more complicated it becomes. Life in general is more stressful and more demanding nowadays.

*Sandra (High household income, no children)*

It is a lot more complex now. Everything is faster... quicker. It used to be a lot more simplistic.

*Louise (Medium household income, 2 children)*

**Table 8.4: Self-reported rating of the stress of life commitments in general by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>Stress of life commitments</b>						
None	92	7.5 <sup>v</sup>	193	11.7 <sup>^</sup>	286	9.9
Mild	488	39.9	616	37.2	1105	38.3
Moderate	526	43.0	658	39.7	1185	41.1
Severe	84	6.9	139	8.4	223	7.7
Extreme	33	2.7	50	3.0	83	2.9
<b>Overall</b>	<b>1229</b>	<b>100.0</b>	<b>1667</b>	<b>100.0</b>	<b>2845</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2) <sup>^v</sup> Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „young adult cohort“ compared to „aged 35 years and over“

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

The NWAHS young adults were less likely to rate stress of life commitments (7.5 percent), compared to those aged over 35 years (11.7 percent). The individual perception as to what it means to be „stressed“ and what makes an individual „stressed“ are indeed subjective in their nature. There are complex pathways to investigate why some people experience different levels of stress, although, studies of mice have suggested that psycho-social stress can be a risk factor for overeating and weight gain (Moles *et al.*, 2006). Individuals are also able to cope with differing levels of stress due to biological explanations, as outlined by Kivimaki and colleagues (2006:985):

On one hand, a stress induced increase in glucocorticoid levels is assumed to increase the ingestion of comfort food, but, on the other hand, stress may inhibit appetite through activation of the sympathetic nervous system which suppresses upper gastrointestinal motility and stimulates energy substrate mobilization.

Chronic stressors are problems, challenges, and difficulties that people experience during extended periods of time in their daily lives, including poverty, long term unemployment, racism and ongoing work overload (Israel *et al.*, 2002:343). Stress could be a result of work and life imbalance, low job control, financial pressures and major life events. Early work from Marmot (1987) found that low job control, one of the most toxic elements of chronic work stress, is more prevalent among people working in lower-status jobs. Those individuals amongst the highest BMI quintiles and with high job strain and low job control have been found to be associated with weight gain at a five year follow-up (Kivimaki *et al.*, 2006). Suzy re-affirms these findings:

Being self employed sometimes stress is not the word for it, it is more than stress. It nearly takes your breath away. We are always waiting for money and we are not paid on a regular basis ever. Sometimes the work is done and we don't get paid for two or three or four weeks. Sometimes it is a real nightmare but we always pull through. We would not have it any other way. It is just the way it is...

*Suzy (Husband self-employed, low income, middle quintile of disadvantaged area)*

There have been a number of social and demographic changes that have occurred in recent times including changes to families, work and leisure time. The women's movement saw an increase in educational opportunities and a greater ability for women to participate in the workforce. The traditional roles of women and families are changing, presenting new challenges for the day-to-day stress of life. For the NWAHS population, a majority of young adults (73.8 percent) were working between 31 and 50 hours a week and an additional 7.2 percent were working over 50 hours a week. Women are facing the economic need to re-enter the workforce after having children and returning to full-time positions due to increasing financial demands and career opportunities (Pocock, 2003). The workplace provides an excellent avenue for policy and intervention and future research within this study area will extend to include the workplace as an „opportune environment“ for intervention.<sup>93</sup>

There are many demands for young people to provide care for children in combination with older family members. Table 8.5 indicates that NWAHS young adult carers were more likely to be obese (53.6 percent) compared to those participants with no caring responsibilities. Similar findings have been reported in SA for adult carers, with 55.7 percent found to be overweight or obese (PROS Unit, 2007). The additional burden of caring responsibilities for the young adult cohort have not been a focus of research and policy to date and it would appear from these findings that time responsibilities are interacting with the prevalence of obesity.

**Table 8.5: Prevalence of obesity (BMI  $\geq$ 30) by carer responsibility, young adults, North West Adelaide Health Study (NWAHS), Stage 1 1999-2003**

Carer Responsibilities	Obesity	
	n	%
Yes	15	53.6 <sup>^</sup>
No	186	21.2 <sup>v</sup>
<b>Overall</b>	<b>201</b>	<b>22.2</b>

\*Calculated using weighted data (Wtffu2)

<sup>^v</sup> Statistically significantly different ( $p < 0.05$ ) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Goal setting and future plans were additionally discussed with NWAHS participants and it appeared that many individuals tended to live within the present moment and not plan into the future. For Tracey a time frame did not seem achievable and there was not the financial freedom to make a change from her current situation:

<sup>93</sup> A further ARC Linkage Project (2009-2011) has been awarded as part of the NOBLE project research to investigate issues surrounding the workplace and increasing rates of obesity within South Australia (Hugo et al., 2008).

I suppose little goals... Like we want to fix the house but we don't set a time frame as such. We have got things that we want to get done.

**Researcher:** Why is there no time frame?

Because it never gets done on time. We will never do it and then we get upset when it is taking too long.

*Tracey (28 years old, secondary education, living within a disadvantaged area)*

Tracey describes the obstacles to living a healthy lifestyle as “just whatever I put there”, recognising the obstacles as being things that „she put there“ and almost blaming that it is „her fault“. She continues to talk about why they consume a lot of take-out food every week - even correcting the researcher: “I like how you said every month”:

„Cause I can't be stuffed cooking, most times. On the weekend we go out and about and you can't take food with you all the time. So we end up buying take-away and the kids get it. And at least one meal a week we get it because I can't be bothered or I am tired.

*Tracey (Non-employed, 2 children)*

There is a struggle to fit in everything on a day-to-day basis and as a consequence there is an issue in the frequency that food is consumed outside the home environment. Table 8.6 shows the self-reported consumption of foods prepared in the home by age cohort.

**Table 8.6: Self-reported consumption of foods prepared in the home by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>How often consume foods that are prepared at home?</b>						
All or nearly all of the time	490	39.8 <sup>√</sup>	955	57.3 <sup>^</sup>	1446	49.9
Most of the time	551	44.8 <sup>^</sup>	633	37.9 <sup>√</sup>	1184	40.9
Some of the time	148	12.0 <sup>^</sup>	58	3.5 <sup>√</sup>	206	7.1
Hardly any or none of the time	41	3.3 <sup>^</sup>	22	1.3 <sup>√</sup>	63	2.2
<b>Overall</b>	<b>1230</b>	<b>100.0</b>	<b>1668</b>	<b>100.0</b>	<b>2898</b>	<b>100.0</b>

\*Calculated using weighted data (Wttfu2) <sup>^</sup>√ Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) „young adult cohort“ compared to „aged 35 years and over“

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

Obesity was found to be statistically significantly higher (23.7 percent) in those young adults that consumed foods prepared in the home „most of the time“ to „all or nearly all the time“. This suggests that targeting those young adults as to how to prepare healthy foods within the home environment is an important aspect of reducing the prevalence of obesity within the population. There are changing landscapes with respect to the cost of low energy dense food, and it is suggested these foods are becoming more affordable during increasing economic hard times (Monsivais & Drewnowski, 2007). Additionally, perceptions may vary as to what seems to be the „easier“ or „cheaper“ option to feeding a family:

I think it has a lot to do with people being busier. These days both the mother and father have to work. Take-away is easier and cheaper in some instances. So I do think that people are lazy. A lot of families go to work all day and it is not like you can have your mum at home cooking the meal.

*Gabby (Never married, long term partner, no children)*

In addition to food preparation, it is also hard to find the time and motivation to undertake physical activity. Within NWAHS, more young adults disagreed with the statement „I did not find it easy to fit in some sort of physical activity during my usual day“. These analyses do not consider the type of employment or occupation of the participant and further exploration is required.

**Table 8.7: Self-reported ability to fit physical activity into the day by age cohort, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Young Adults		Aged 35 and over		Total Population	
	n	%	n	%	n	%
<b>I find it easy to fit in some sort of physical activity during my usual day...</b>						
Strongly disagree	95	7.7	125	7.5	220	7.6
Disagree	364	29.6 <sup>^</sup>	430	25.8 <sup>^v</sup>	794	27.4
Neither agree or disagree	76	6.2 <sup>^v</sup>	143	8.6 <sup>^</sup>	218	7.5
Agree	497	40.4	732	43.9	1229	42.4
Strongly agree	197	16.0	234	14.0	430	14.9

\*Calculated using weighted data (Wtffu2)

<sup>^v</sup> Statistically significantly higher or lower ( $\chi^2$  test  $p < 0.05$ ) for the „young adult cohort“ compared to those „aged 35 and over“

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

In particular, one study indicated that socio-economic status influenced the time available for physical activity (Cerin & Leslie, 2008). Of those NWAHS participants who „strongly disagreed“ or „disagreed“ that „I find it easy to fit in some sort of physical activity“, 80 percent did not undertake sufficient levels of activity. For those young adults living in the „Low or Lowest Quintiles“ of SEIFA IRSD this increased to 84.9 percent. The prevalence of obesity was found to be highest amongst those that „strongly disagree“ that „it is easy to fit in some sort of physical activity during my usual day“ (Table 8.8).

**Table 8.8: Prevalence of obesity (BMI  $\geq 30$ ) by self-reported ability to fit physical activity into the day, young adult participants not undertaking sufficient physical activity, North West Adelaide Health Study (NWAHS), telephone follow-up 2007**

	Obesity (BMI $\geq 30$ )	
	n	%
<b>I find it easy to fit in some sort of physical activity during my usual day...</b>		
Strongly disagree/disagree	66/257	25.7 <sup>^</sup>
Neither agree or disagree	18/40	45.0 <sup>^</sup>
Agree/strongly agree	32/252	12.7 <sup>^v</sup>
<b>Overall</b>	<b>116/549</b>	<b>21.1</b>

\*Calculated using weighted data (Wtffu2)

<sup>^v</sup> Statistically significantly different ( $p < 0.05$ ) than the other categories combined

SOURCE: Compiled from NWAHS TFU 2 Spatial Sample (2007)

NWAHS respondents also outlined factors relating to self-motivation in cooking, eating healthy food and exercising on a regular basis:

Just exhausted... you just feel unmotivated and you just have a bit of a care factor. "I don't care. I need food now. I am not going to go to the supermarket or the Fruit and Veg shop or prepare anything. I am just going to eat junk food or eat what I can get my hands on. I am just going to sit here in front of the TV and not have to think of anything. Because that will make me feel better". It doesn't though...

*Sarah (Highest level of education, full-time employed)*

It's will power, when you are dealing with food, and exercise. If you don't have that will power. I don't sometimes and I will eat that chocolate bar and I know that I am going to suffer. Sometimes you just want it, but really you should be just going "No".

*Sandra (Full-time employed, high household income)*

I have to beat myself up and make myself do it. "Get your lazy arse off the lounge and go and do it". I have scenarios in my head and I say "yes" or "no" three times before I go and do it. "Go on you should do it. But you should do it. But I don't want to." And then I get up and do it.

*Tracey (Stay at home mother, Secondary highest level of education)*

As Sarah outlines, when having „a bit of a care factor“ day the time frame changes even if an individual is motivated on most occasions and even for someone that is well educated, and „knows what the right thing do is“.

### 8.6.1 Coping mechanisms and support networks

Women have been found more likely to use healthier or adaptive coping mechanisms than men (Lindquist *et al.*, 1997), yet it is not understood how these pathways operate in the context of place. Previous work has been undertaken by Popay *et al.*, (2003) on lay perspectives of disadvantage with smoking seen as a coping mechanism to these life stressors. Within NWAHS, the relationship of obesity, smoking and the young adult cohort is complex. In lower socio-economic groups, obesity and smoking status was not significant. Those individuals that were current smokers were more likely to be obese (22.9 percent) compared to non-smokers; this is slightly lower than what is found for the whole young adult male population (24.1 percent). For women, current smokers are less likely to be obese and ex-smokers have higher levels of obesity (28.0 percent). Discussion with Sarah indicated that smoking was something that made her feel relaxed after a general work day.

Yeah, some days I don't have any, one day I might have a bad day and just have the perception that I need to do it, to smoke, and might have three, maybe three in a day.

*Sarah (Bachelor degree as highest level of education)*

As well as the demands and pressures, there is also the psychological landscape of caring and having support. The local area is also important in terms of social capital and networks that are kept in dealing with the social psychologies that are presented in these landscapes. At a larger spatial unit, the county level in the US, there has been a study investigating social capital in relation to obesity and physical inactivity (Kim *et al.*, 2006). Kavanagh *et al.*, (2006) suggested that women may benefit more from high levels of social capital as the differences between gender are attenuated when multiple aspects of the social and economic characteristics are taken into consideration.

Michelle describes not being in control at the moment as she goes through divorce and financial strain, “Not at all, not at all, no control”. Emotional support that is the provision of love, empathy, caring and trust and instrumental support is the provision of tangible assistance and services that directly help an individual (Israel *et al.*, 2002).

My husband and I are very good friends we have a really good relationship. He is my best friend and I am his best friend, the best friend that we each have ever had. It is really unusual to still have that after six years. So we rely on each other heavily.

*Suzy (Second marriage, pregnant with second child to new husband)*

These experiences would be different as people deal with stress, relationships and financial pressures. It is a contested battle as Sandra describes the role her husband played whilst she was trying to lose weight:

No one, my husband a little bit. But he is the type that says you should not be eating this and you know the next day come home and say “You want some chocolate?”. He doesn’t mean to, he just doesn’t think. So, it is all on me and I accept that because it is all on me. He can’t be with me all the time.

*Sandra (Married, no children)*

The cultural landscapes of consumption are influenced and shaped by family and social networks passing on knowledge, values and ideas about food and general lifestyle.

I am quite happy to be the stay at home wife and mother, I have worked – I have worked up until then [having children]. I am more than happy to be the cook for the family. I am not too busy to cook and cook healthy food.

It is old fashioned values from my parents. I would like to pass it on [cooking skills] and keep it going as much as I can. Because lots of people don’t do it anymore - It is a thing of the past.

*Suzy (Pregnant, mother of five-year old)*

The research presented within this chapter does not provide information on the spatiality of these networks and how it differs among social environments and further

research is needed as to the influence that these interactions have on individual behaviour. Sarah provides an example of how her networks keep her motivated to exercise:

Yep absolutely, his sister lives around the corner from us and whenever we go she comes so we have a bit of a group. Yes definitely groups motivate people more. And in summer if we don't go to the gym we try to go for walks and we have all got pets or whatever.

*Sarah (Living in Valley View, grew up in the Western suburbs)*

The modern world presents an ever changing landscape for communicating and interacting. The importance of these local area networks and social environments are considered in the context of rapid technological changes and the new ways in which young people interact. Not only has the use of mobile phones, e-mail, Skype<sup>®</sup> and the Internet in general increased, but in particular in the last five years there has been a rapid expansion in the use of social networking sites.<sup>94</sup> All of these modern technologies have changed the way that people interact, and also the way that people stay connected or have a sense of identity. In 2001, 31.2 percent (Range of 9.6 to 92.7 percent per CD) of the north-west region population had access to the Internet at home (CData, 2001), increasing to 51.5 percent at the 2006 Census (ABS, 2006c). Suzy explains that she did not keep her networks via computer technologies, since most of her friends did not use email and saw it as another expense:

Not on [Internet], no don't have it, probably could do with it. I have a small handful of people that I could contact via email. It is an unnecessary bill to me at the moment pretty much.

*Suzy (Stay at home mother, partner self-employed)*

On the other hand Sandra used the email to keep her networks with friends:

Definitely, most of mine [friends] I email. Email plays a big role. SMS not so much, I tend to email first and SMS is more for the last minute "I am running late" or whatever.

*Sandra (Full-time employed)*

It has only been in recent years that researchers have begun to study social networking sites. With the limited research that is known about these sites, Eszter (2008:290), assumes that offline networks influence access to this technology and people already constrained are not benefiting from the potential of these networks.

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<sup>94</sup> Social networking sites for example include Facebook ([www.facebook.com](http://www.facebook.com)), MySpace ([www.myspace.com](http://www.myspace.com)) and Twitter ([www.twitter.com](http://www.twitter.com)).



## 8.6.2 Social psychological landscape

At a societal level there is a need to avoid the stigmatisation that occurs with respect to obesity and avoid further marginalising individuals. Sandra was asked how this makes her feel when people talk about how much she weighs:

It makes me angry. It made me feel depressed, frustrated, and you know upset. But I think people judge and think you are eating too much. We even had friends of ours that comment, they would never say it to me but I knew that they were talking about me. Don't assume that someone is eating chips every single day. You know what I mean.

*Sandra (32 years old, biomedical measured normal weight)*

The psycho-social origins of obesity stigma have been described by Puhl and Brownell (2003) and Australian feminist Murray (2005:154) discussed the association of negative traits with the fat body as “a culture of negative collective „knowingness””. The fat body is easily labelled as lazy, self indulgent and lacking discipline (Throsby, 2007), and with this in mind, there is a need to further understand the „fat body” and the psychological consequences within ranging social environments.

Extreme obesity has been shown to be associated with increased risk for depression across gender and racial groups (Dong *et al.*, 2004). In the NWAHS population, it was found that among obese participants there was a higher prevalence of self-reported mental health conditions (Howard *et al.*, 2008b). Table 8.9 outlines that there was no difference in the prevalence of obesity and a „high or severe” disturbance of mental well-being (GHQ-12) between young adults and the older age cohorts.

**Table 8.9: Prevalence of obesity (BMI  $\geq 30$ ) by age cohort and mental well-being (GHQ-12), North West Adelaide Health Study (NWAHS), Stage 2 2004-06**

Age Cohort	Obesity (BMI $\geq 30$ ) and Mental Well-being	
	Mental Well-being (GHQ-12)- High/Severe Disturbance	
	n	%
Young Adults	42	32.5
Aged 35 Years and over	83	33.1
<b>Total Population</b>	<b>125</b>	<b>32.8</b>

\*Calculated using weighted data (WtclncS2)

SOURCE: Compiled from NWAHS Stage 2 Spatial Sample (2004-06)

Based on these findings that there was no difference by age cohort, Table 8.10 outlines for the total NWAHS population the odds of obesity and mental well-being (high disturbance according to GHQ-12) by area-level socio-economic status as measured by

SEIFA IRSD at the CD level. There were significantly higher odds of obesity (OR 1.51 CI 95% 1.22 – 1.85  $p \leq 0.001$ ) and a „high or severe“ disturbance of mental well-being (OR 1.53 CI 95% 1.14 – 2.06  $p = 0.050$ ) for those participants living within the „Low or Lowest Quintile“ of SEIFA IRSD. These relationships held true even after adjusting for individual-level household income.

**Table 8.10: Area-level disadvantage by obesity (BMI  $\geq 30$ ) and mental well-being (GHQ-12), total population, North West Adelaide Health Study (NWAHS), Stage 2 2004-06**

	Obesity (BMI $\geq 30$ )		GHQ-12 (High/Severe Disturbance)	
	Odds Ratio	p	Odds Ratio	p
<b>SEIFA IRSD (CD level)</b>				
High/Highest Quintile	1.00		1.00	
Middle Quintile	1.08 (0.84 – 1.39)	0.545	1.46 (1.04 – 2.06)	<b>0.029</b>
Low/Lowest Quintile	1.51 (1.22 – 1.85)	<b><math>\leq 0.001</math></b>	1.53 (1.14 – 2.06)	<b>0.050</b>
<b>SEIFA IRSD (CD level)/ Individual level Income</b>				
High/Highest Quintile	1.00		1.00	
Middle Quintile	1.11 (0.86 – 1.44)	0.412	1.42 (1.04 – 1.92)	<b>0.029</b>
Low/Lowest Quintile	1.46 (1.17 – 1.82)	<b>0.001</b>	1.41 (1.01 – 2.03)	<b>0.046</b>
\$60,001 and over	1.00		1.00	
\$40,001 to \$60,000	1.25 (0.99 – 1.58)	0.066	0.92 (0.66 – 1.28)	0.610
\$20,001 to \$40,000	1.28 (1.02 – 1.61)	<b>0.032</b>	1.36 (1.01 – 1.84)	<b>0.046</b>
Up to \$20,000	1.44 (1.41 – 1.82)	<b>0.002</b>	1.48 (1.09 – 2.02)	<b>0.013</b>

\*Calculated using weighted data (WtclncS2)

SOURCE: Compiled from NWAHS Stage 2 Spatial Sample (2004-06)

It is yet to be determined how these psycho-social factors interrelate with obesity, individual-level and area-level factors. There is reported hopelessness (Harper *et al.*, 2002), loneliness and low self-esteem (Sherman *et al.*, 2006) among today’s young adults. The question is how these young adults make sense of their world in what has become a very confusing and complicated „place“. The sociological influences of time perspectives may have application to chronic disease research to further identify how individuals plan for future healthful lifestyles.

In an increasingly competitive and uncertain world in which people seek to establish themselves either alongside or over and above others, the neighbourhood can play an important role in people’s personal and social identity and social position, but with highly varying outcomes.

(Kearns & Parkinson, 2001:2106)

Both individual and locational disadvantage were found to be related to obesity rates in young NWAHS adults. These aspects of residential migration and social reproduction

of environments were introduced as part of the lay perspectives on the construction and perception of local areas (Chapter 7). A „place identity“ was constructed by individuals living in similar environments over time. Proshansky (1978:154) outlined:

The organising nexus of this structure is, of course, the self-identity of the person, which is that critical component of personality structure that relates the behaviour and experience, on the one hand, and the continuing demands of his or her social and cultural setting, on the other, to an awareness of self.

At a broader level, socio-spatial identity is influenced by global forces such the influence of the political, economic, media, cultural norms and social change. Different environments experience the psycho-social context differently and, this in turn, has a different effect on one’s socio-spatial identity and understanding of health.

## 8.7 Conclusion

This chapter discussed the formation of new cultural geographies highlighting the influence of media and marketing landscapes. There was recognition that obesity was a prominent issue and media frames attitudes and opinions about health and well-being, but more broadly they frame the way that society views itself and others. Socio-economic and spatial differences in the perception of weight in the NWAHS population highlighted those who are individually and locationally disadvantaged underestimate their weight status compared to biomedical measures. Young adults also have changing views on body and there are differing pathways to adulthood in modern society (Shanahan, 2000). There is not necessarily an assumption of „risk“ in chronic conditions and time perspectives may not be projected in relation to this risk for young adults or those individuals spatially excluded. Socio-economic stressors for young adults are a barrier to undertaking a healthy lifestyle, for example whether people feel they can fit in time for exercise and prepare meals at home. These discussions on lay perspectives of health question whether the socio-spatial differentials that exist create a body „unconscious“ society. This chapter reiterates the complexities of the relationship between both the environments and the people who make up these environments. The following chapter will outline the major conclusions from this thesis including a discussion on the implications for policy and practice.

## CHAPTER 9

# CONCLUSIONS AND IMPLICATIONS: Placing health within context

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Our epidemic of obesity developed over decades and it will probably take equally as long to reverse it. We must prepare for a long war, not just a brief battle.

*(Astrup et al., 2004)*

### 9.1 Introduction

The increasing prevalence of obesity internationally has been addressed across a diverse multi-disciplinary literature and of significance is the existing social gradient for those individually and locationally disadvantaged. Between 1994 and 2004, metropolitan Adelaide saw the mean body mass index (BMI) score increase nearly one index point. A population mean BMI of 26.0 indicates that the „normal“ was actually „overweight“ according to BMI classifications and the societal „norm“ of weight status has seen a shift in the mean BMI score within the population. The north-west region displays a higher prevalence of obesity compared to the rest of metropolitan Adelaide. The North West Adelaide Health Study (NWAHS) at baseline (1999-2003) saw 19.1 percent of young adults with obesity. The investigation of change in the NWAHS participants“ weight status indicated that young adults had the highest incidence of obesity, with 7 percent of young adults moving from non-obese (BMI <30) to obese (BMI ≥30) during two waves of data collection. This is compared with 5.5 percent for those aged over 35 years. Young adulthood provides an opportune time to intervene with respect to obesity due to features of this lifecycle and this includes changes in the social, work and home environments.

With this premise, this thesis utilised a „geographies of health“ perspective to explore obesity rates within the north-west region of Adelaide, South Australia (SA), bridging the gap between geography and population health. Increasing interest in socio-spatial research and the availability of a range of social and health information, along with technologies to assess these types of data, has made this study timely. The interdisciplinary debates concerning the complexities of socio-spatial relationships, methodological techniques and conceptual thinking on space, place and health are in early beginnings. Notwithstanding, this thesis provides an exploratory platform to

further research the interactions between the social environment and obesity. Few studies within the Australian context have access to biomedical and environmental data sources which allow the use of Geographic Information Systems (GIS) and, therefore, fully appreciate the compositional and contextual factors relating to obesity. This concluding chapter summarises findings relating to each of the research objectives and outlines the theoretical and practical implications. Furthermore, the potential for future socio-spatial research is outlined in light of these conclusions.

## 9.2 Synopsis of findings by research objective

This study adopted interdisciplinary methodologies to investigate the NWAHS biomedical cohort and a range of other environmental and contextual data sources. The detail of the social geography and history of the north-west Adelaide study region provided a backdrop to describing the socio-spatial context (Chapter 4). The region provides a diverse socio-economic landscape with areas of high and low disadvantage, and there are socio-cultural and „place“ distinctions between the „western“ and „northern“ suburbs. The current information available within the north-west region of Adelaide was used to assess the social environment and obesity, and further attributes on socio-spatial relations was collected as part of this research. Within the local context of South Australia, the inclusion of spatial methodologies into health and social research have been limited, with this in mind a major research component was to assess a range of techniques utilising the NWAHS population to explore place and health relationships.

### **Objective 1: To develop a conceptual framework for the socio-spatial geography of obesity in an Australian young adult cohort incorporating both global and local factors**

A framework incorporating both global and local factors was constructed after reviewing a multi-disciplinary literature including urban planning, sociology, public health, medicine and geography. Additionally, the triangulation of theoretical principles informed this conceptualisation incorporating the „duality“ of structure and agency, as discussed by Giddens (1984), and a number of geographical theories on the construction and theorisation of space (i.e. both absolute and relational spaces). The concept of a „socio-spatial dialectic“, as outlined by Soja (1989), provided a basis to thinking about the interaction between society and the spaces in which people live, further expanding the traditional „absolute“ geographies conventionally considered within spatial health

research. The extension of this type of research to consider the multifaceted nature of theorising space and the involvement of people within and across these spaces provides valuable insight into how behaviours and lifestyles can be unhealthy within local areas.

The framework for undertaking socio-spatial research within this context focused on four key theme areas; the social environment, perceptions of residential areas, socio-cultural influences and understanding lay perceptions of health in the context of place. The components of the framework included global, area-level and individual-level influences. A Delphi study (Banwell *et al.*, 2005) of Australian „obesity related experts“ and previous literature (Butland *et al.*, 2007; McLaren, 2007) has outlined numerous global influences relating to the increasing rates of obesity within the population. The second component of the framework was „area-level“ or structural features. Despite the main research focus being on the social environment, the framework considered the importance of the physical environment, for example, green space, accessibility to parks, shops, and other features of the urban and built environment. At the individual or „local“ level there were three components of the framework: individual-level socio-economic status (e.g. household income, work status), residential perceptions of a local area and lay perceptions of health and obesity in the context of place. The conceptual framework provided the theoretical underpinning and informed the basis for the methodological approach undertaken to address the remaining research objectives.

**Objective 2: To investigate the social environment and the relationship with obesity outcomes for young adults**

At the outset of Chapter 5, findings for this NWAHS cohort, obesity and the social environment were framed in the presentation of household income, work status, and highest level of education, in line with traditional reporting of the social environment and obesity based on individual-level factors (McLaren, 2007). These types of data are routinely presented to explain the social environment, yet it would appear there has been less of a focus placed within obesity literature on this stage of the lifecycle. This is despite the knowledge that young adults have the fastest growth in the prevalence of obesity, such as suggested in findings from McTigue (2002) on increasing weight gain in young adults and, thus, indicating that this cohort is an opportune time to focus obesity research and intervention.

Further place related attributes were sought for this research through an additional questionnaire administered to NWAHS participants. Additionally, extensive environmental data sources were utilised to explore obesity rates in relation to accessibility to services, property capital values, building conditions and area-level aggregated Census information. Traditional measures of the social environment were presented to outline the context specific obesity outcomes that are most commonly reported, for example the use of the area-level index, Socio Economic Indexes for Areas, Index of Relative Socio-economic Disadvantage (SEIFA IRSD). This aggregated measure of area-level disadvantage has been previously applied to obesity research within SA (Gill *et al.*, 2004a) and similar measures have been utilised in other contexts to describe area-level disadvantage (Havard *et al.*, 2008). Results from this research indicated that NWAHS young adults living in the most disadvantaged areas had higher odds of obesity compared to those participants living in the most advantaged areas. Additionally, the odds of obesity were higher amongst young adults compared to those persons aged 35 years and over. A gradient exists between BMI raw scores and the area-level index of disadvantage (SEIFA IRSD); however, the distribution for the total population is slightly different to that of young adults. It is therefore crucial that there is an understanding of the socio-spatial context across different settings and cohorts to unravel the complexities of these relationships.

Much of the research to date relating to individual and area-level interactions has investigated whether those persons individually disadvantaged experience positive health outcomes if they are living within a more advantaged area (King *et al.*, 2005). Adams and colleagues<sup>95</sup> (2009) found obesity to be significant at the area-level using SEIFA IRSD measured at the Collection District (CD) level. Geographers are concerned with scale (Del Casino & Jones, 2007) and, therefore, in thinking about the complexities of these relationships it is important to consider the scale effects of environmental data and its application for health outcomes such as obesity. The examples of SEIFA IRSD and area-level „Bachelor degree or higher“ measured at the Postcode, Statistical Local Area (SLA) and CD level were investigated by obesity rates within the NWAHS population, highlighting differences in the distribution depending on the geographic scale used for analysis.

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<sup>95</sup> Paper includes the author of this research (refer to Appendix 10).

Methodological issues arise when interpreting the spatial display or „visualisation“ of results; this is particularly the case with population health surveys where the underlying population characteristics are to be considered. There has been less research that has focused on the variations in obesity cases across space and differences were observed for obesity by suburban areas within the north-west region of Adelaide. Exploratory spatial analysis was undertaken displaying a kernel density of NWAHS obesity cases subtracted from a density of the underlying population. These analyses represented as „hot“ spots indicated higher than expected counts of obesity compared to the actual population. Cross-sectional analyses have shown that individuals living in areas with lower levels of education (Bachelor degree or higher), „Lowest Quintile“ of SEIFA IRSD (most disadvantaged), higher proportion of unemployment, and areas with a high proportion of housing trust residents were more likely to be obese.

There was a lower prevalence of obesity found in areas that were highly accessible according to an index of accessibility and remoteness for metropolitan Adelaide. For young adults, there was a lower prevalence of obesity where education, shopping and public transport facilities were more accessible; this is despite the differences of socio-economic status and accessibility. With this in mind, for those in the most disadvantaged areas there were greater odds of obesity in areas that were less accessible, according to Metro ARIA index.

There were a higher proportion of young adult participants living in rental accommodation, share accommodation or still living with parents and a higher obesity prevalence was found within young adults who were „paying off a mortgage“ when compared to the older age cohort. A higher prevalence of obesity was observed in areas with higher proportions of low-quality housing as described by the Valuer-General's Office as „Below Average or Very Poor“. For young adults the property capital value is related to obesity, but for those purchasing the property there was no significant difference. The longitudinal nature of the NWAHS cohort provided an opportunity to investigate changing „places“ between the two stages of data collection (2000-2006). There were 18.7 percent (n=667) of NWAHS participants who had moved residential location in this time frame, an average move of just over eight kilometres for those participants within the north-west region.



**Objective 3: To explore the experiences of this young adult cohort and obesity with respect to lifecourse socio-economic status, mobility and ethnicity**

The examination of Objective 3 was mainly addressed within the socio-cultural themes presented within Chapter 6, and at the preface, this chapter investigated how ethnicity shapes the landscapes in which people live and interact. The components that were measured within this objective have seen less focus within the Australian context due to the accessibility of longitudinal socio-cultural information in conjunction with biomedical data. Additionally, the ability to further investigate NWAHS participants through retrospective questions on lifecourse socio-economic status, parents' country of birth and residence during childhood provided further information to address this objective.

The observed patterns of obesity at the local level indicated that there was a higher prevalence of obesity in males born in „Northern and Western Europe“ and for females from „Southern Europe“. After adjusting for age, NWAHS female participants born in Europe experienced the highest proportions of obesity. The migration settlement patterns observed within the north-west region relate to „country of birth“ and obesity. Nevertheless, after adjusting for age and year of arrival in Australia, European born still have higher odds of obesity for this population. As seen with individual „country of birth“ there was also a higher prevalence of obesity in those NWAHS young adults whose parents were born in Europe. Ethnicity is a difficult component to assess in terms of what it means to the individual and the influence that cultural factors have in establishing obesity and health outcomes over the lifecourse.

Investigation of NWAHS childhood socio-economic status included parental occupation, family structure and residential mobility over the lifecourse. The results were indicative of young males being influenced by the situation of their father, whereas, young women were influenced by the situation of their mother. One such example was the observation of higher obesity rates within females whose mother was a „Blue Collar Employee“, and higher in males whose father was a „Blue Collar Employee“. Individuals living within disadvantaged local areas were more likely to have a family history of diabetes compared to those living within the more advantaged areas. In addition, „current or ex-smokers“ whose parents were smokers during their childhood, measured at four-years, experienced a higher prevalence of obesity for those living in the most disadvantaged areas.

With the NWAHS population, obesity was found to be higher for those who did not live in the north-west region or the same „Postcode“ as a child. Generalised Linear Modelling (GLM) illustrated that living in disadvantaged areas during childhood significantly increased the likelihood of obesity status in later life, even after considering parents' occupational status and current area-level socio-economic status. The findings within this objective are important in unravelling the complexities of the „environmental“ debate in the progression of obesity over the lifecourse. Essentially the places in which people live are shaped by the experiences of place over the lifecourse, and these experiences will continue to influence individuals over time. Young adulthood is a stage of the lifecycle where the influence of these local level environments could potentially be an avenue for curbing the increasing prevalence of obesity that is seen with increasing age. The formation of socio-cultural patterns begins in early life, yet it is at young adulthood that new environments are created outside and within the home and the influences of food patterns, physical activity and other unhealthful behaviours could potentially be recreated at this time point.

**Objective 4: To discuss the residential experiences of young adults living in the north-west region of Adelaide**

An important relational component of the conceptual framework included the experiences that residents had within their local area, and the associated objective was addressed particularly within Chapter 7. Residential perceptions encompass the context specific construction of local areas considering political, historical and socio-economic influences. The term „neighbourhood“ has not been fully conceptualised for the local Australian context with NWAHS participants defining the local area as the people within their street or around their house. Comparisons were made to the literature on studies of a similar nature with a particular focus on the United Kingdom (UK), United States (US) and Canada. The perceptions of local areas vary across space in relation to obesity, disadvantage and ethnicity/culture.

Research was undertaken to investigate the decision making processes surrounding current residential choice and perceptions of these local areas. There are socio-spatial drivers that influence the construction of these local areas and they are important in understanding how these social environments influence unhealthful behaviours and lifestyles. Residents vary in their reasons for living in their local area, although for young adults household price and affordability was the main feature. Moreover, young

adults were more likely to reside close to family and friends and this was discussed in the context of changing caring responsibilities of both children and older persons. The spatial segregation of the population is driven by the social and financial filtering systems, resulting in the clusters of both low and high disadvantage observed within the population. Findings indicated that those NWAHS participants living in concentrated areas of disadvantage are more likely to be obese compared to those in areas of socio-economic mix. The odds of obesity were three times higher for those living in clustering of disadvantage compared to areas that are of clustered advantage.

The quality of the local environment and residential perceptions are an important element in the derivation of psycho-social benefits from the home. Those persons living in the most disadvantaged areas reported a positive „sense of community“ and a higher prevalence of obesity. A key factor of residential perceptions was a need to feel safe through „knowing“ one’s immediate neighbours. The length of time in a residence was related to whether an individual reported a „sense of place“ within the local area, and this is despite the stigmatisation or „disadvantage“ attached to that local area.

**Objective 5: To investigate the processes related to lay perceptions of obesity in the context of place**

Geographical insights for this context in understanding lay perspectives on health have not previously been considered. Features of the north-west region, including descriptions of important social, cultural and historical features of the local area, played a role in the construction of the current socio-spatial landscape. Global factors, such as media and popular culture, may influence lay perspectives of health and provides further knowledge into the formation of the social norms relating to obesity and weight issues. Theoretical implications were explored through discussions on the perception of health and obesity and the experience of the „obese“ body within society.

Published findings on the perception of weight status indicate that those participants who are individually and locationally disadvantaged are more likely to misinterpret their body size when compared to their biomedical measurements according to BMI (Howard et al., 2008). In addition, those people born in „Southern or Eastern Europe“ are more likely to underestimate their weight status. NWAHS participants who were biomedically measured as obese were more likely to report their weight status as „Good“ or „Fair/Poor“ compared to „Excellent or Very Good“. Additionally, NWAHS

participants who have moved location between Stage 1 and 2 were more likely to report that their general health was „Excellent or Very Good“ compared to those living in the same environment in this period.

In addition, this research examined the construction of the term „risk“ and what this means in understanding health and behaviour within disadvantaged communities. Those NWAHS participants biomedically measured as obese were more likely to report that they were not able to fit in physical activity in their day. The relationship of obesity and mental well-being were explored for the total NWAHS population indicating that there was a relationship with each of these health outcomes and area-level disadvantage. These relationships with the social environment still held true after adjusting for individual-level household income. It is, however, still not fully formulated how these pathways operate between individual-level social status, obesity, psycho-social factors and area-level disadvantage within the Australian context.

**Objective 6: To discuss how the geographies of health perspective can enhance theoretical approaches to address healthy weight within the population**

Obesity interventions need to consider the broader social context and how the social environment influences how people „live their lives“ and how this in turn influences healthy behaviours and lifestyles. The description of *place* is in itself complex, so whose place is it? *Place* as in a location – ranging from the disparities in health and welfare across space to how people view the *places* in which they live and relate. Furthermore, with respect to obesity where is the *place* for policy? Whose *place* is it to intervene – is it individuals, communities or governments? Examination of the broader social environment provides further evidence of where, when and how the population interacts and research intends to better inform health and social policy. The following sections outline the theoretical and practical implications for future research.

## 9.3 Theoretical implications to address healthy weight

### 9.3.1 Interdisciplinary perspectives to address obesity

Obesity is a societal problem and dealing with the issue will involve societal changes that are part of a long-term strategy that integrates the knowledge, skills and tools from a number of other disciplines such as, economics, political science, planning, sociology and psychology (Astrup et al., 2004). This thesis sits on the boundaries of traditional

disciplinary thinking and challenges current approaches to address health outcomes through the incorporation of socio-spatial perspectives. There is much value in undertaking interdisciplinary research, although, it is not without its own challenges. The social sciences perspective contributes an understanding of „places“ and the reciprocal nature of these relationships. A geographical insight into obesity suggests that the social and spatial context is valuable in understanding how people behave and consume within their immediate and global environments. It has been argued that there is a need for theory and methodologies to be refined for these interdisciplinary frameworks (Lynch, 2006), and there is also opportunity for research to facilitate more appropriate policy that is based on the influences of „place“ and the variation that exists for particular social and health outcomes.

### 9.3.2 Conceptualising the socio-spatial context for obesity

Obesity research to date has not focused on conceptualising the social and spatial variation that incorporates both global and local factors, and there is a need for these frameworks to be applied. This is particularly relevant to consider for the South Australian/Australian context and without these perspectives research has been unable to operationalise the complexities of the place and health nexus. This thesis, through the creation of a conceptual framework and discussion of the socio-spatial geography of obesity, has highlighted a number of areas that need to be addressed in future research. There is a lack of studies that incorporate these types of models that include both global, area-level and individual-level attributes to describe a health outcome such as obesity. These types of frameworks could be applied further to other chronic condition research and broader social health applications, and therefore, obesity is the example that is used in this thesis to conceptualise the interaction between society and individual social spaces.

The theorisation of space and place, as well as sociological insights into the relationship between structure and agency, provide a theoretical rationale for the development of research methodologies. Further work on the theorisation of space, such as absolute or relational spaces, and the inclusion of these types of perspectives into analytical frameworks will enhance perspectives on obesity research in the population. The „multi-level“ nature of individual and area-level research is not specifically about statistically modelling these relationships, but also requires investigation into the

theoretical position of the hierarchical nature of structure and agency. The socio-demographics, history and culture and, additionally, the lay perceptions of place need also to be considered. Del Casino and Jones (2007) discussed the incorporation of both spatial science and critical realist paradigms, suggesting to cross paradigms in methodologies and theoretical rationale to understand the complexities of issues, and this could be applied to thinking about obesity. The consideration of global factors, social geographies, theorisation of space and the socio-spatial dialectic inform the creation of an individual's socio-spatial identity.

Additionally, there is a need to consider local models for exploring health outcomes to truly account for the spatial variation of a phenomenon. The conceptualisation of local areas is important in understanding the complex relationship between individuals and the places and spaces in which they interact. Both relational and absolute space, at the local scale, will provide further insight into health inequalities. Examples include further defining „social spaces“, „neighbourhood“, and „local areas“ at the outset of health research. This would comprise of constructing boundaries that are appropriate in size and conceptually for „social environments“ and require qualification for the Australian urban, peri-urban and rural contexts.

Places will inherently change and the temporal nature of place is an important component of socio-spatial frameworks. The investigation of population mobility patterns in the context of migration theory has rarely been discussed and may provide important insight into the formation of local social environments. In particular, the potential influence that mobility patterns and processes have in social relations and the use of services and facilities. The variation across space in unhealthful behaviours could be further be explained by considering the temporal nature of place.

### 9.3.3 Appropriately framing obesity and disadvantage

There are differing opinions on the „place“ that governments have in intervening on individual behaviour and lifestyles. As Gatrell (2002:43) formulates:

Many health policies assume that people are free to make choices about lifestyle and usage of health services, and individuals get blamed when they make unhealthy lifestyle decisions (for example about diet and smoking) or when they do not make appropriate use of health services (e.g. not attending screening appointments).

Those who are already socially excluded may have a compounding of „disadvantage“ as being labelled as „obese“. Longhurst (2005) argues there is a need for the creation of a discursive space in which fat bodies are respected rather than treated with hostility and contempt. There is a need to encourage a positive attitude towards obesity and healthy weight within research, social and health policy, practice and interventions. In doing so, there is a need to reframe how we talk and act about „disadvantage“ within this context and what this does to „those“ persons who are living and being within these local areas. Potentially, there is a need to further explore how people experience the terminology and labelling of being „obese“ or „disadvantaged“.

One aspect from these results was the underlying difference between the relationship of extreme poverty and „Lowest/Low“ disadvantaged spaces. There appears to be some differences about the disadvantaged spectrum with respect to obesity and those who have enough material wealth to be „consumers“. The drivers for these social issues are all interconnected and the example of obesity should be addressed within a social inclusion agenda. The current South Australian government has recognised the importance of individuals within the community that are socially excluded through the development of a Social Inclusion initiative (Newman et al., 2007). Apparent across populations and data sources is the importance of disadvantage in addressing rising rates of obesity within the population and is crucial to future policy directions for health.

## 9.4 Practical implications

### 9.4.1 Limitations

While this thesis has contributed new knowledge on obesity and the social environment not previously detailed within Australia, there are some limitations that present opportunities for further research.

The internal validity of the study is partially addressed in the research design, incorporating both data and method triangulation. A mixed methods approach included the application of semi-structured NWAHS interviews to complement the quantitative analyses and provide further insight into the relational nature of space. Data triangulation within this research incorporated the application of various information, including the NWAHS biomedical population cohort and secondary data sources to

address aspects of the social environment. The epidemiological perspective provides strengths in study design and quantitative methodologies applicable to the use of area-level and individual-level attributes, although in this case a „geographies of health“ approach further includes the theorisation of the socio-spatial context.

The methodology for inclusion within the NWAHS was a random selection from the Electronic White Pages (EWP) within large statistical geographic units (Australia Post® Postcodes) of the north-west region of Adelaide. NWAHS participants were assigned weights to represent the age and gender profile of this study population. This methodology did not, however, represent a spatial distribution of the north-west region of Adelaide and this is highlighted in the resulting spatial distribution of participants across the study region. In attempting to discuss these limitations, the demographic, cultural and socio-economic profile of the study population from ABS 2001 Census information was compared to the NWAHS population (Chapter 4). The analyses made no comment on the NWAHS spatial population due to the availability of an almost complete compilation of spatially referenced residential addresses at baseline. There is a potential source of error from the process of geocoding residential addresses and this relies on the completeness and accuracy of the original address database. The nature of the NWAHS cohort allowed for address and personal information to be checked against the participant files maintained for study management.

The NWAHS data collection utilised within this research occurred across three collection points (1999 to 2007) using mixed modes, that is, clinical testing, self-report paper questionnaire and Computer Assisted Telephone Interview (CATI). The example of measured height and weight is reported to be a more appropriate measure of body mass index (BMI), and the NWAHS population has previously stated that these self-report measures underestimated weight and overestimated height when compared to the NWAHS biomedical information (Taylor *et al.*, 2006d). As Chittleborough (2008b) supported in SA, the accuracy of recall in retrospective data for NWAHS could be a potential source of error, such as seen in the information collected on childhood residence, parents“ country of birth and occupational status.

As Potvin (2009:127) outlined, “What we need, if we really want to describe the phenomena is longitudinal analyses”. There was the opportunity within the NWAHS to undertake longitudinal analysis between the two waves of data collection; nevertheless,



it was beyond the scope of this research to explore the longitudinal pathways that exist for features of the social environment in relation to the health outcome of obesity. There has been limited social environmental data collected as part of the NWAHS cohort and this research saw the inclusion of additional spatial attributes and exploratory cross-sectional analyses to further understand the complexities of the social environment and health for this Australian context. A „geographies of health“ approach to research will require future exploration of cohort studies, such as NWAHS, to explore these relationships. Additionally, these studies would necessitate the adoption of a spatial methodology from initial stages of sampling and enhancement of qualitative research conceptualising lay perspectives of health and well-being in the context of place.

A number of other environmental data sources were utilised as part of this research including a measure of accessibility (Metro ARIA), property capital valuations and ABS Census information. There are limitations to these types of data sources and their application to investigating health outcomes. For example, the property capital valuation information has been collected for administrative purposes and not specifically for applying to relationships between housing features and health outcomes. There are limitations in the use of area-level measures such as the SEIFA IRSD where the clustering of area-level information across census geographies may result in masking the variability that exists across these spaces. Additionally, there is a need to further expand these area-level indexes and apply more applicable measures for local areas, small spatial scales and health outcomes. The development of spatial and environmental measures has rarely been undertaken within the Australian context. Future methodological research would need to determine cut-off values and reliability and validity of these measures that are applicable to health research. There are potentially confounding variables that could explain the relationships that are described within this study region. Initial observations of the relationship between the social environment, and the individual-level health outcomes are a good justification for future collection of this type of data for analysis and interpretation within these types of frameworks.

There is limited testing of external validity within the Adelaide environmental measures and in the advancement of this research area it is essential to investigate the

generalisability beyond this context of Adelaide and the NWAHS population. It is not plausible from this research to comment on how transferable these results are from the NWAHS population. It was the objective of the research, to investigate the local level influences that may potentially be drivers to increasing rates of obesity within the north-west region of Adelaide, South Australia. The context was important in conceptualising the differences between other area-level and individual studies outlining the local level socio-spatial context in relation to obesity rates. The applicability of these findings within young adults would also need to be further explored within other age cohorts. In particular, there were some limitations on the cultural diversity of the NWAHS, as outlined in a comparison with ABS Census study region composition. Future cohort studies would need to collect cultural information that complements the evolving socio-cultural landscape of the study population.

#### 9.4.2 Expanding socio-spatial attributes and research methodologies

There is opportunity to extend the research into socio-spatial themes of health and future research could expand to include these concepts through the incorporation of spatial „thinking“ from the beginning of research proposals, policy and practice. The consideration of socio-spatial relations and health outcomes will potentially modify the traditional social and demographic research perceptions of health. This supports the comments from Matthews *et al.* (2009:S173) on the challenges for geospatial data availability, quality and standards for advancement of spatial and health research. The collection of spatial attributes allows not only for analysis by a spatially referenced location but also to undertake new sophisticated methodologies incorporating spatial attributes that are conceptualised within appropriate and applicable frameworks. In doing so, health research requires data collection to be undertaken with inclusion of accurate spatial attributes at the smallest spatial scale. This includes the collection of spatial attributes within administrative data sources and for these to be made available and encouraged for future social and health research. Additionally, there is the ability to explore other opportunities through population health surveys, surveillance systems and data linkage projects. Future spatial research is possible within the NWAHS cohort

due to the collection of geographic descriptors, allowing for future studies to exploit these initial underpinnings in developing more specific pathways of analysis.<sup>96</sup>

Spatial analytic techniques need to be further enhanced for use in obesity research. The methodological tools such as geographically weighted regression (GWR), SaTScan™ and other spatial analytical applications provide new opportunities to explore the use of spatial data sources and statistical approaches to further understand health outcomes. Local statistics need to be further investigated within these types of studies to challenge traditional global models and their application in the study of health.

There is a need to create more appropriate area-level measures, composite of different area-level features that are appropriate to health outcomes and contexts being studied. For example, the use of SEIFA IRSD may not be appropriate due to the clustering of a number of area-level characteristics. Aggregated measures of ABS Census data to explore individual variables could be further explored as a continuous measure. More research is needed into validating the assignment of variable cut-off points within the Australian context, and not just undertaken due to convenience or examples from international literature. Context specific spatial and geographic descriptors are required and this includes the consistent use of these attributes across international settings.

The experiences that people have of „place“ are potentially influential in current and future health status. Additionally, there are potential mediators in these relationships such as psycho-social well-being. Another component that is missing from current health and place frameworks is addressing how place is linked to forming a socio-spatial identity. The experience that people have of their „place“ and how this is defined could potentially be associated with health behaviours. How these pathways operate is yet to be fully determined, yet with spatial information it is possible to investigate the processes that are the multi-level interactions between actual and perceived place and the health outcome of the individual. The consideration of the socio-spatial context as a component of health promotion, policy and practice may be a potentially important factor to facilitating behaviour change at the population level.

Future work in this area would need to be more inclusive of cultural groups in the biomedical procedures. It is noted that there are important ethnic minority groups

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<sup>96</sup> There are two current National Medical Research Council Grants with study investigators and author involvement (Daniel *et al.*, 2010a; Daniel *et al.*, 2010b).

within the north-west region of Adelaide that need to be concentrated on in other studies. In particular, the Indigenous population, which is not represented within NWAHS, and increasing international migration patterns will provide new challenges to public health in the future. Future research using rural and remote communities need to be observed in comparison to urban settings for the Australian context.

#### 9.4.3 Addressing obesity within the context of place

Obesity research that incorporates a spatial perspective is needed as a matter of importance to public health, and with this there is the need to incorporate socio-spatial methodologies and conceptualisation within health policy and intervention. This thesis is applicable to the field of public health in addressing the rising rates of obesity through community health and ecological approaches to health promotion. It could be hypothesised that current interventions which target an entire population are only advantaging those with the capacity to facilitate behaviour change. Individuals who do not perceive themselves to be at „risk“ are not reached within these approaches. If this is the case, do current approaches in health promotion and intervention towards healthy weight create greater social and health inequality?

In 2004, a review to identify the existing evidence base for effective overweight and obesity interventions, at a population level, found few studies have focused on the neighbourhood (Gill et al., 2004b). Conventional approaches to obesity within the population have investigated particular settings (e.g. workplace or school) or even specific locations for targeting health promotion initiatives. An assessment of a number of approaches to health promotion leads to the conclusion that these do not incorporate the notion of „space“. Health Promotion has attempted to include multi-disciplinary perspectives within interventions, Green and colleagues (1996:271) outline the incorporation of the discipline of Geography:

Human geography and medical geography have given particular emphasis in the study of health and health behaviour to the importance of place. This has blended with health promotion concepts of setting-specificity in the planning of interventions for schools, workplaces, neighbourhoods, and clinical settings. Within the broader field of community health promotion, geography has provided critical analyses of the relation of environment and health.

Health is fundamentally more complex than a „biomedical“ approach and, therefore, there has been a push for health promotion to incorporate the macro, meso, micro influences of the environment (Swinburn et al., 1999; Egger et al., 2003). One such example has been the development of the Analysis Grid for Environments Linked to Obesity (ANGELO) framework to incorporate various scales of „environment“ into health promotion and interventions relating to obesity. The environment has been seen as a global measure, with little consideration made into the local variations that exist in terms of healthy weight policy and practice.

There has been acknowledgement of the importance of the application of GIS to a population health approach (Barnard & Hu, 2005), and the capabilities of these systems to inform about health and social issues is most likely underutilised. The complexity of health and place relationships requires the application of innovative methodologies, such as GIS, to frame the issues practically and also to identify particular variations and associations that exist across spaces and places. As a result, a population health based foundation for the planning and evaluation of health services can now move from theory to practice. The incorporation of „space“ not only allows for analysis in terms of regions and larger geographical units but also variations that exist across different spatial scales. Spatial methodologies allow for identification of sub-populations within a study area in conjunction with the underlying population characteristics. Moreover, the „spatial“ approach allows for an insight into processes that may influence the relationships found between place and obesity. Health interventions require frameworks to incorporate the socio-spatial context and evaluation of these studies for their effectiveness and appropriateness across different settings. Research and intervention to address obesity needs to be context related and consider the variations in policy and intervention at the local scale.

Our challenge is not to go backwards in time to an environment that was conducive to a healthy body weight, but to learn how to modify our current environment in ways to achieve both healthy weights for our population and a high quality of life.

(Astrup *et al.*, 2004:125)

The complex nature of the residential and „life“ environments needs to be considered as part of what Astrup (2004:125) identified as a need to learn “how to modify our current

environment”. Incorporating „spatial“ thinking within frameworks to address obesity considers broader social processes and variations across different social spaces over time. From the outset obesity research, policy and practice needs to incorporate spatial methodologies to further complement existing techniques used within traditional approaches to health research.

It is thought that policy and practice are developed within disciplines, such as health, education, welfare, employment, justice, housing and family services (Stanley, 2002). There is a need to think about „place“ and „space“ with regards to policy and not just in terms of health, but the broader social determinants of health, including housing and education. As a result there is growing recognition that governments and researchers should be addressing matters of prevention in the areas of environment and health. In recent times the South Australian government has applied a *Health in All Policies* (HiAP) framework to address a range of health issues, of which obesity is an important focus (Kickbusch *et al.*, 2008).<sup>97</sup> Thus supporting the need for engagement across all sectors, not just health related, when addressing obesity related issues.

There are possible opportunities through health literacy models that incorporate a broader social and cultural context. An individual’s behaviour is influenced by the society in which she or he lives, thereby arguing that social processes are occurring in conjunction with the shifts in the mean of the population distribution. How an individual formulates the knowledge and understanding about health and disease is important in determining their „risk“ and ability to process information on lifestyle or necessary behaviour modifications. The concept of „health literacy“ attempts to understand these broader social and cultural contexts that drive these processes, and has been defined as the following:

“The degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions”

(Institute of Medicine, 2004:32)<sup>98</sup>

<sup>97</sup> Another initiative of the State Government has been the *Thinker in Residence* program bringing to Adelaide experts in their field to add to thinking around research, policy and practice. Illona Kickbusch was brought to Adelaide as the “Thinker in Residence” during 2007/2008.

<sup>98</sup> This definition has been cited in the following articles (Kickbusch, 2001; ABS, 2006d; Nutbeam, 2008).

The socio-environmental argument places those within the most disadvantaged circumstances with the lowest health literacy (see for example Sudore et al., 2006). There are four components of health literacy outlined in the following expanded model used to analyse selected communications for an anthrax threat in the US (Figure 9.1).

**Figure 9.1: Expanded health literacy model from Zarcadoolas et al., (2005)**

<b>Fundamental literacy</b>	the skills and strategies involved in readings, speaking, writing and interpreting numbers
<b>Scientific literacy</b>	levels of competence with science and technology
<b>Civic literacy</b>	abilities that enable citizens to become aware of public issues and to become involved in the decision making processes
<b>Cultural literacy</b>	the ability to recognize and use collective beliefs, customs, world-view and social identity in order to interpret and act on health information

SOURCE: Taken from Zarcadoolas *et al.* (2005:197)

This expanded model on health literacy incorporates the broader social, physical and cultural environment. Future models need to include socio-spatial relationships to contextualise the complexities of how individuals understand and interpret the concept of obesity. There are, however, components of this „geographies of health“ approach that imply new thinking, including the relational aspects of space and conceptualisation of the socio-spatial context.

#### 9.4.4 Further understanding social reproduction of health across „place“

This research has highlighted the lack of importance that has previously been placed on the social reproduction of behaviour and lifestyle across different social environments. The temporality of spaces and places could include: movement across the lifecourse, historical perspectives of the local area and the current social and political geography. There has been insufficient biomedical and self-report health information from longitudinal studies to be able to address these research questions appropriately. The investigation of these global and local processes may shed insight into the construction and reproduction of the places in which people live. Young adults present an opportunity for health and social research, as this cohort is experiencing life stage transitions that provide further understanding into socio-spatial reproduction of health. There are potentially a number of avenues to target this sub-population whether it is as a new homeowner, private or public renting schemes.

The socio-cultural influences incorporate the temporality of space with discussions on lifecourse socio-economic status and time perspectives. If individuals do not place an importance on weight status and health into the future, there are potential consequences that have not been explained across different environments. Moreover, there is a need to define measures of embodiment for this population and, therefore, to examine the pathways between lay perspectives on health and obesity in the context of place. A combination of these factors could suggest that living within a similar environment across the lifecourse could be a multifaceted component of the environment/place and health nexus. These all need to be considered within the broader socio-spatial framework utilising mixed methodologies, such as the qualitative understandings on the formation of these interactions.

Internal migration as an explanatory variable needs to be considered in future modelling of health data and, especially for longitudinal research. Future research should collect information regarding the movement patterns or residential location. A future third wave of NWAHS data will provide an opportunity to study movement patterns over ten years within the north-west region. Further analysis could explore the length of time in the local area and take into account the distance moved, area-level socio-economic status and type of networks that are established and maintained. There is also an opportunity to investigate the psycho-social processes that exist between the „stigma of place“ and rates of obesity within these populations.

In addition to movement at the local scale, the environments in which people live are continually shaped and reshaped by global structures and forces, for example migration patterns influence the ethnic profile of a local area. The young adult cohort presents new challenges with a variety of ethnic backgrounds and origin country of birth. These factors need to be explored further in conjunction with the influence on the local level and the variations across different social spaces. As the profiles of the population ethnicity composition change there are emerging issues for health promotion and policy. Chaix (2009) within a conceptualisation of the environment and cardiovascular disease included relational aspects of space that moved beyond the incorporation of social networks to include „place identity“ and the construction and reproduction of a local „neighbourhood“. The suggestions also support the need to study the influence of



migration on local level effects, from both a historical perspective (i.e. childhood residence) and mobility over the lifecourse in conjunction with health outcomes.

There are evolving and changing global and local economic markets, as seen within the recent economic downturn during the undertaking of this research. The global financial crisis occurred after final data collection and it is not known the implications for understanding the relationships of place and area-level socio-economic variations. For example the influences may be different within the Australian context compared with the United States (US). The global economic situation will have enduring consequences on the people and places that are most affected including rising unemployment and job insecurity, and this will be interesting to consider within a framework of socio-spatial reproduction. More recently there has been a rapidly changing research and policy environment surrounding obesity. This has occurred concurrently with a surge in political interest and resulting intervention, policy and practice with respect to obesity prevention within Australia, SA and particularly in the study region. Particularly, research requires an evaluation into the effectiveness of spatial concepts for health and social policy, and this would include an examination across different political spaces.

## 9.5 Conclusion

The research contributes to the interdisciplinary literature through the application of a conceptual framework to address the socio-spatial geography of obesity within young adults in the north-west region of Adelaide, SA. More research is needed within the area to further develop the concepts and methodologies for different contexts and sub-populations. This treatise will provide a platform in which to begin the development of further socio-spatial research utilising this cohort. Further research is needed within this field to explore a multitude of potential pathways between global, area-level and individual-level factors. The modern world is rapidly changing and this „confusing“ world for young adults presents new challenges and obstacles and it is unknown what direction the affect will be on mental health, obesity and associated health outcomes in conjunction with these „places“.

The literature reiterates that „obesity is a multifaceted issue“ and there appears to be no clear answer to the growing trends of obesity and associated chronic conditions. This thesis has shown the complexities of achieving healthy weight within populations, notably, when incorporating individual, area-level and global forces such as within the

developed research conceptual framework. The research has additionally described cultural geographies that exist in forming our perceptions, attitudes and resulting environments that influence lifestyles and behaviours and potentially can be explained through differences across space.

A structurationist framework in combination with geographical perspectives on the construction of space shed insight into the „duality of structure“ in these local areas. The socially imbedded actions influence the way individuals across socio-spatial geographies conceptualise and behave. With this theoretical positioning in mind, putting the place into policy not only incorporates describing issues geographically, but also thinking spatially as to how local areas are constructed and evolve over time and, therefore, the implications for those people living, working and „being“ within their own social space. It is our place to act as a society, governments and researchers as a collective – and not just up to „individuals“ to create healthy lifestyles and environments. Astrup and colleagues (2004) indicated in the opening quote, that “we must prepare for a long war, not just a brief battle”. A change in the social psyche of general society, researchers, media and policy makers will take a cultural shift to reinvent the way that each of these populations think, talk and act about creating a healthy, productive and positive society.

## APPENDICES

## Obesity status (WHO BMI classifications) by indicators, Metropolitan Adelaide, South Australia, 1994 to 2004

Table A: Obesity status (BMI ≥30) by indicators, Metropolitan Adelaide, South Australia, 1994 to 2004

Variable	Obese (BMI ≥30 self-reported data)					
	1994			2004		
	n	%	95% CI	n	%	95% CI
<b>Gender</b>						
Male	124/929	13.3	(11.3 - 15.7)	160/920	17.4	(15.1 - 20.0) ^
Female	122/936	13.0	(11.0 - 15.3) v	179/940	19.0	(16.7 - 21.7) ^
<b>Age Groups</b>						
18 to 29 years	35/482	7.3	(5.3 - 9.9)	50/384	13.0	(10.0 - 16.8) ^
30 to 49 years	117/719	16.3	(13.8 - 19.1)	136/705	19.3	(16.5 - 22.4)
50 to 69 years	70/444	15.8	(12.7 - 19.4) v	120/505	23.8	(20.3 - 27.7) ^
70 years and over	23/220	10.5	(7.1 - 15.2)	34/266	12.8	(9.3 - 17.3)
<b>Income</b>						
Up to \$20,000	33/245	13.5	(9.8 - 18.3)	23/117	19.7	(13.5 - 27.8)
\$20,001 to \$40,000	108/753	14.3	(12.0 - 17.0)	116/576	20.1	(17.1 - 23.6) ^
\$40,001 to \$60,000	42/346	12.1	(9.1 - 16.0)	47/318	14.8	(11.3 - 19.1)
Over \$60,000	37/297	12.5	(9.2 - 16.7)	128/698	18.3	(15.6 - 21.4) ^
<b>Household Size</b>						
1	36/287	12.5	(9.2 - 16.9)	46/272	16.9	(12.9 - 21.8)
2	124/991	12.5	(10.6 - 14.7) v	178/1034	17.2	(15.0 - 19.6)
3	53/346	15.3	(11.9 - 19.5)	69/314	22.0	(17.7 - 26.9) ^
4	24/191	12.6	(8.6 - 18.0)	35/164	21.3	(15.8 - 28.2) ^
5 or more	10/51	19.6	(11.0 - 32.5)	12/75	16.0	(9.4 - 25.9)
<b>Education</b>						
Secondary	138/991	13.9	(11.9 - 16.2) v	152/835	18.2	(15.7 - 21.0)
Trade/Apprenticeship	92/649	14.2	(11.7 - 17.1)	138/683	20.2	(17.4 - 23.4) ^
Bachelor degree or higher	16/226	7.1	(4.4 - 11.2)	50/341	14.7	(11.3 - 18.8) ^
<b>Marital Status</b>						
Married/defacto	172/1174	14.7	(12.7 - 16.8) v	230/1198	19.2	(17.1 - 21.5) ^
Separated/divorced	19/158	12.0	(7.8 - 18.0)	44/172	25.6	(19.6 - 32.6) ^
Widowed	18/122	14.8	(9.5 - 22.1)	15/103	14.6	(9.0 - 22.6)
Never married	37/411	9.0	(6.6 - 12.2)	52/388	13.4	(10.4 - 17.2) ^
<b>Country of Birth</b>						
Australia	166/1305	12.7	(11.0 - 14.6) v	240/1307	18.4	(16.4 - 20.6) ^
UK & Ireland	23/236	9.7	(6.6 - 14.2)	49/245	20.0	(15.5 - 25.5) ^
Other	57/325	17.5	(13.8 - 22.0)	50/307	16.3	(10.3 - 24.7)
<b>SEIFA (IRSD)</b>						
Lowest quintile	69/394	17.5	(14.1 - 21.6)	81/354	22.9	(18.8 - 27.5)
Low quintile	51/296	17.2	(13.4 - 21.9)	61/302	20.2	(16.1 - 25.1)
Middle quintile	42/341	12.3	(9.2 - 16.2)	57/287	19.9	(15.7 - 24.9) ^
High quintile	40/337	11.9	(8.8 - 15.8)	61/411	14.8	(11.7 - 18.6)
Highest quintile	42/494	8.5	(6.4 - 11.3)	80/505	15.8	(12.9 - 19.3) ^

\*Calculated using weighted data (Wt)

^v Statistically significantly higher or lower than comparison group (p&lt;0.05)

SOURCE: Compiled from South Australian Health Omnibus Survey, Metropolitan SA, 1994 to 2004

**Table B: Percentage increases of Obesity (BMI  $\geq$ 30), Metropolitan Adelaide, South Australia, 1994 to 2004**

Variable	Absolute %	% Change	% Increase	Fold Increase
<b>Gender</b>				
Male	4.0	23.3	30.3	1.3
Female	6.0	31.6	46.1	1.5
<b>Age Groups</b>				
18 to 29 years	5.8	44.2	79.3	1.8
30 to 49 years	3.0	15.6	18.5	1.2
50 to 69 years	8.0	33.7	50.7	1.5
70 years and over	2.3	18.2	22.3	1.2
<b>Income</b>				
Up to \$20,000	6.2	31.5	45.9	1.5
\$20,001 to \$40,000	5.8	28.8	40.4	1.4
\$40,001 to \$60,000	2.6	17.9	21.8	1.2
Over \$60,000	5.9	32.1	47.2	1.5
<b>Household Size</b>				
1	4.4	25.8	34.8	1.3
2	4.7	27.3	37.6	1.4
3	6.7	30.3	43.5	1.4
4	8.8	41.1	69.8	1.7
5 or more	-3.6	-22.5	-18.4	0.8
<b>Education</b>				
Secondary	4.3	23.5	30.7	1.3
Trade/Apprenticeship	6.0	29.8	42.5	1.4
Bachelor degree or higher	7.6	51.7	107.1	2.1
<b>Marital Status</b>				
Married/defacto	4.5	23.7	31.0	1.3
Separated/divorced	13.6	53.0	112.7	2.1
Widowed	-0.2	-1.3	-1.3	1.0
Never married	4.4	32.8	48.9	1.5
<b>Country of Birth</b>				
Australia	5.6	30.7	44.4	1.4
UK & Ireland	10.3	51.3	105.2	2.1
Other	-1.3	-7.7	-7.1	0.9
<b>SEIFA (IRSD)</b>				
Lowest quintile	5.4	23.5	30.7	1.3
Low quintile	3.0	14.7	17.2	1.2
Middle quintile	7.5	38.0	61.2	1.6
High quintile	3.0	20.0	25.0	1.3
Highest quintile	7.3	46.3	86.3	1.9

\*Calculated using weighted data (Wt)

SOURCE: Compiled from South Australian Health Omnibus Survey, Metropolitan SA, 1994 to 2004

**Table C: Obesity status (BMI ≥30) by indicators for males, Metropolitan Adelaide, South Australia, 1994 to 2004**

Variable	Obese (BMI ≥30 self-reported data): Males					
	1994			2004		
	n	%	(95% CI)	n	%	(95% CI)
<b>Age Groups</b>						
18 to 29 years	23/251	9.2	(6.2 - 13.4)	23/194	11.9	(8.0 - 17.2)
30 to 49 years	64/364	17.6	(14.0 - 21.8)	69/361	19.1	(15.4 - 23.5)
50 to 69 years	31/223	13.9	(10.0 - 19.1)	55/253	21.7	(17.1 - 27.2) ^
70 years and over	6/91	6.6	(3.1 - 13.6)	14/113	12.4	(7.5 - 19.7)
<b>Income</b>						
Up to \$20,000	6/77	7.8	(3.6 - 16.0)	6/38	15.8	(7.4 - 30.4)
\$20,001 to \$40,000	51/385	13.2	(10.2 - 17.0)	40/252	15.9	(11.9 - 20.9)
\$40,001 to \$60,000	28/189	14.8	(10.5 - 20.6)	19/164	11.6	(7.5 - 17.4)
Over \$60,000	25/185	13.5	(9.3 - 19.2)	81/396	20.5	(16.8 - 24.7)
<b>Education</b>						
Secondary	54/414	13.0	(10.1 - 16.6)	56/334	16.8	(13.1 - 21.1)
Trade/Apprenticeship	61/400	15.3	(12.1 - 19.1)	74/397	18.6	(15.1 - 22.8)
Bachelor degree or higher	9/116	7.8	(4.1 - 14.1)	31/190	16.3	(11.7 - 22.2) ^
<b>Marital Status</b>						
Married/defacto	94/609	15.4	(12.8 - 18.5)	122/624	19.6	(16.6 - 22.8) ^
Separated/divorced	8/69	11.6	(6 - 21.2)	15/67	22.4	(14.1 - 33.7)
Widowed	2/22	9.1	(2.5 - 27.8)	2/18	11.1	(3.1 - 32.8)
Never married	21/230	9.1	(6 - 13.6)	22/212	10.4	(7 - 15.2)
<b>Country of Birth</b>						
Australia	89/648	13.7	(8.3 - 21.8)	103/635	16.2	(10.3 - 24.7)
UK & Ireland	9/118	7.6	(3.9 - 14.5)	24/113	21.2	(14.4 - 30.2)
Other	26/164	15.9	(10.0 - 24.3)	33/171	19.3	(12.8 - 28.1)
<b>SEIFA (IRSD)</b>						
Lowest quintile	30/209	14.4	(10.2 - 19.8)	31/178	17.4	(12.5 - 23.7)
Low quintile	24/138	17.4	(12.0 - 24.6)	25/139	18.0	(12.5 - 25.2)
Middle quintile	27/174	15.5	(10.9 - 21.6)	27/148	18.2	(12.9 - 25.2)
High quintile	20/157	12.7	(8.4 - 18.9)	36/212	17.0	(12.5 - 22.6)
Highest quintile	24/250	9.6	(6.5 - 13.9)	41/242	17.0	(12.7 - 22.2)

\*Calculated using weighted data (Wt)

^ ^ Statistically significantly higher or lower than comparison group (p&lt;0.05)

SOURCE: Compiled from South Australian Health Omnibus Survey, Metropolitan SA, 1994 to 2004

**Table D: Percentage increases for males of Obesity (BMI  $\geq 30$ ), Metropolitan Adelaide, South Australia, 1994 to 2004**

Variable	Absolute %	% Change	% Increase	Fold Increase
<b>Age Groups</b>				
18 to 29 years	2.7	22.7	29.4	1.3
30 to 49 years	1.5	8.0	8.7	1.1
50 to 69 years	7.8	36.1	56.4	1.6
70 years and over	5.8	46.8	87.9	1.9
<b>Income</b>				
Up to \$20,000	8.0	50.6	102.6	2.0
\$20,001 to \$40,000	2.6	16.5	19.8	1.2
\$40,001 to \$60,000	-3.2	-27.9	-21.8	0.8
Over \$60,000	6.9	33.9	51.4	1.5
<b>Education</b>				
Secondary	3.7	22.2	28.5	1.3
Trade/Apprenticeship	3.4	18.2	22.2	1.2
Bachelor degree or higher	8.6	52.4	110.3	2.1
<b>Marital Status</b>				
Married/defacto	4.1	21.1	26.7	1.3
Separated/divorced	10.8	48.2	93.1	1.9
Widowed	2.0	18.2	22.2	1.2
Never married	1.2	12.0	13.7	1.1
<b>Country of Birth</b>				
Australia	2.5	15.3	18.1	1.2
UK & Ireland	13.6	64.1	178.5	2.8
Other	3.4	17.8	21.7	1.2
<b>SEIFA (IRSD)</b>				
Lowest quintile	3.1	17.6	21.3	1.2
Low quintile	0.6	3.3	3.4	1.0
Middle quintile	2.7	14.9	17.6	1.2
High quintile	4.2	25.0	33.3	1.3
Highest quintile	7.3	43.3	76.5	1.8

\*Calculated using weighted data (Wt)

SOURCE: Compiled from South Australian Health Omnibus Survey, Metropolitan SA, 1994 to 2004

**Table E: Obesity status (BMI ≥30) by indicators for females, Metropolitan Adelaide, South Australia, 1994 to 2004**

Variable	Obese (BMI ≥30 self-reported data): Females					
	1994			2004		
	n	%	95% CI	n	%	95% CI
<b>Age Groups</b>						
18 to 29 years	12/230	5.2	(3.0 - 8.9) ∨	27/191	14.1	(9.9 - 19.8) ^
30 to 49 years	53/355	14.9	(11.6 - 19.0)	67/344	19.5	(15.6 - 24.0)
50 to 69 years	40/222	18.0	(13.5 - 23.6)	66/253	26.1	(21.1 - 31.8)
70 years and over	17/129	13.2	(8.4 - 20.1)	20/152	13.2	(8.7 - 19.5)
<b>Income</b>						
Up to \$20,000	27/168	16.1	(11.3 - 22.4)	17/79	21.5	(13.9 - 31.8)
\$20,001 to \$40,000	57/368	15.5	(12.2 - 19.5)	77/324	23.8	(19.5 - 28.7) ^
\$40,001 to \$60,000	15/158	9.5	(5.8 - 15.1) ∨	28/154	18.2	(12.9 - 25.0) ^
Over \$60,000	11/111	9.9	(5.6 - 16.9)	47/302	15.6	(11.9 - 20.1)
<b>Education</b>						
Secondary	84/577	14.6	(11.9 - 17.7) ∨	96/501	19.2	(16.0 - 22.8) ^
Trade/Apprenticeship	31/249	12.5	(8.9 - 17.1)	64/287	22.3	(17.9 - 27.5) ^
Bachelor degree or higher	7/110	6.4	(3.1 - 12.6)	19/151	12.6	(8.2 - 18.8)
<b>Marital Status</b>						
Married/defacto	78/566	13.8	(11.2 - 16.9) ∨	108/574	18.8	(15.8 - 22.2)
Separated/divorced	11/89	12.4	(7.0 - 20.8)	29/105	27.6	(20.0 - 36.8)
Widowed	17/100	17.0	(10.9 - 25.5)	13/85	15.3	(9.2 - 24.4)
Never married	16/181	8.8	(5.5 - 13.9)	30/176	17.0	(12.2 - 23.3) ^
<b>Country of Birth</b>						
Australia	77/657	11.7	(6.8 - 19.5) ∨	137/672	20.4	(13.7 - 29.3) ^
UK & Ireland	13/117	11.1	(6.3 - 18.8)	25/132	18.9	(12.5 - 27.7)
Other	31/162	19.1	(12.6 - 27.9)	18/136	13.2	(7.9 - 21.3)
<b>SEIFA (IRSD)</b>						
Lowest quintile	40/186	21.5	(16.2 - 28.0)	51/177	28.8	(22.6 - 35.9)
Low quintile	27/157	17.2	(12.1 - 23.9)	36/163	22.1	(16.4 - 29.1)
Middle quintile	16/167	9.6	(6 - 15.0)	30/140	21.4	(15.4 - 28.9)
High quintile	21/181	11.6	(7.7 - 17.1)	25/198	12.6	(8.7 - 18.0)
Highest quintile	19/245	7.8	(5.0 - 11.8)	38/262	14.5	(10.8 - 19.3)

\*Calculated using weighted data (Wt)

^∨ Statistically significantly higher or lower than comparison group (p&lt;0.05)

SOURCE: Compiled from South Australian Health Omnibus Survey, Metropolitan SA, 1994 to 2004



**Table F: Percentage increases for females of Obesity (BMI  $\geq$ 30), Metropolitan Adelaide, South Australia, 1994 to 2004**

Variable	Absolute %	% Change	% Increase	Fold Increase
<b>Age Groups</b>				
18 to 29 years	8.9	63.1	170.9	2.7
30 to 49 years	4.5	23.3	30.5	1.3
50 to 69 years	8.1	30.9	44.8	1.4
70 years and over	0.0	-0.2	-0.2	1.0
<b>Income</b>				
Up to \$20,000	5.4	25.3	33.9	1.3
\$20,001 to \$40,000	8.3	34.8	53.4	1.5
\$40,001 to \$60,000	8.7	47.8	91.5	1.9
Over \$60,000	5.7	36.3	57.0	1.6
<b>Education</b>				
Secondary	4.6	24.0	31.6	1.3
Trade/Apprenticeship	9.8	44.2	79.1	1.8
Bachelor degree or higher	6.2	49.4	97.7	2.0
<b>Marital Status</b>				
Married/defacto	5.0	26.8	36.5	1.4
Separated/divorced	15.3	55.2	123.5	2.2
Widowed	-1.7	-11.2	-10.0	0.9
Never married	8.2	48.1	92.8	1.9
<b>Country of Birth</b>				
Australia	8.7	42.5	74.0	1.7
UK & Ireland	7.8	41.3	70.5	1.7
Other	-5.9	-44.6	-30.8	0.7
<b>SEIFA (IRSD)</b>				
Lowest quintile	7.3	25.4	34.0	1.3
Low quintile	4.9	22.1	28.4	1.3
Middle quintile	11.8	55.3	123.7	2.2
High quintile	1.0	8.1	8.8	1.1
Highest quintile	6.7	46.5	87.0	1.9

\*Calculated using weighted data (Wt)

SOURCE: Compiled from South Australian Health Omnibus Survey, Metropolitan SA, 1994 to 2004

**Table G: Prevalence of the classes of self-reported BMI, Metropolitan Adelaide, SA, 1994 to 2004**

Year	n	Underweight	Normal	Overweight	Obese
		%	%	%	%
1994	1866	3.2	52.2	31.5	13.2
1995	1828	2.7	54.3	30.4	12.6
1996	1885	4.1	48.0	33.1	14.8
1997	1825	3.2	49.3	32.7	14.8
1998	1841	2.8	50.6	32.9	13.7
2001	1853	2.5	47.2	34.2	16.1
2003	1822	2.6	44.9	34.9	17.6
2004	1861	2.4	44.5	34.8	18.3
<b>Overall</b>	<b>14781</b>	<b>3.0</b>	<b>48.9</b>	<b>33.0</b>	<b>15.1</b>

\*Calculated using weighted data (Wt)

Chi square test for trends between the years 1994 and 2004 showed a significant increase in the prevalence of obesity ( $\chi^2=33.999$ ,  $p=0.000$ )

SOURCE: Compiled from SA HOS Metropolitan, 1994 to 2004

**Table H: NWAHS participants socio-demographics at Stage 1 for all non-participants in Stage 2**

	Non Participant NWAHS Stage 2	
	n	%
<b>Gender</b>		
Male	192	48.9
Female	201	51.1
<b>Age Groups</b>		
18 to 24 years	59	15.0
25 to 34 years	96	24.4
35 to 44 years	83	21.1
45 to 54 years	55	14.0
55 to 64 years	43	10.9
65 to 74 years	32	8.1
75 years and over	25	6.4
<b>Income</b>		
Up to \$20,000	110	28.0
\$20,001 to \$40,000	96	24.4
\$40,001 to \$60,000	78	19.8
\$60,001 +	74	18.8
Not stated	35	8.9
<b>Work Status</b>		
FT employed	137	34.9
PT or casual	73	18.6
Unemployed	22	5.6
Home duties/Retired	112	28.5
Student	41	10.4
<b>Education<sup>^</sup></b>		
Secondary	167	42.5
Trade/Apprenticeship	158	40.2
Bachelor degree or higher	51	12.9
<b>Marital Status<sup>^</sup></b>		
Married/De facto relationship	194	49.4
Separated/divorced	55	14.0
Widowed	22	5.6
Never married	119	30.3
<b>Country of Birth</b>		
Australia	276	70.2
UK and Ireland	44	11.2
Other	73	18.6
<b>SEIFA (IRSD)</b>		
Lowest Quintile	132	34.0
Low Quintile	108	27.8
Middle Quintile	82	21.1
High Quintile	57	14.7
Highest Quintile	10	2.6
<b>Overall</b>	<b>393*</b>	<b>100.0</b>

\*Not including died (n=100)

\*\*Calculated at Stage 2 using unweighted data. <sup>^</sup>Not stated not included

SOURCE: Compiled from NWAHS Spatial Sample, Stage 1 and 2 (1999 to 2006)

## North West Adelaide Health Study Telephone Follow-Up Survey 2 - July 2007

CASE: (ID number)

### A. INTRODUCTION

Good ... My name is ... from the North West Adelaide Health Study. Could I please speak with (name of study participant)?

Either

- a) Repeat introduction - go to A1.
- b) If required person not available, ask for a suitable time to call back. Record first name and make appointment to call back (End).
- c) If required person died, go to A3. If information offered re cause of death or date, record same.
- d) If required person is no longer at this telephone number, go to A4 to record details.

**A1** We recently sent your household a letter from the Professor of Medicine about your continued participation in the North West Adelaide Health Study. Did you receive the letter identifying the benefits of continuing to help us with this study?

(Single response)

1. Yes
2. No
3. Don't know

Sequence guide: If A1 = 1 (i.e. recd letter), go to A5

**A2** The letter explained that we would like you to help us by answering some questions over the phone, and possibly fill out a questionnaire which we would send to you. Would you like me to read or post the letter to you?

(Single response. Interviewer note: If yes, please read out letter now or record address to post a letter)

1. Yes, post out letter - check/enter address
2. No
3. Don't know

Sequence guide: Go to A5

**A3** (if participant has died) THEIR past involvement in the study has been most valuable in providing information that is helping to improve the health of the community.

1. Enter CAUSE of death (if volunteered)
2. Enter DATE of death (if volunteered)
3. No details give / unknown

[END/TERMINATION OF INTERVIEW - go to Q]

**A4** Record forwarding address and/or telephone number for study participant.

1. Forwarding address [specify]
2. Forwarding telephone number [specify]
3. No details give / unknown

[END/TERMINATION OF INTERVIEW- go to Q]

If A4=2 (new tel number specified), participant to be re-called. If A4=3 (no details given), disposition to be recorded as "incorrect number" and ID supplied for tracking.

**A5** We are seeking your help by answering some questions about your health and wellbeing. Would you have some time now to answer a few questions?

(Single response)

1. Yes
2. No - make appointment to call back later
3. No - refusal

Completed interviews in dispositions will include refusals - actual completed interviews of CATI survey to be calculated from A5.

I can assure you that information you give will remain confidential. The answers from all people interviewed will be gathered together and presented in a report. No individual answers will be passed on.

Sequence guide: If A5 = 1 (yes), go to B.

**A6** Your ongoing participation is vital to the success of the study in its efforts to improve the health of people both in your community and South Australia in general. Could I ask why you no longer want to be involved in the study?

(Single response. *Interviewer note: Participants who are currently pregnant can still take part as it is only a telephone interview and a questionnaire - if not convenient time, make appt to call back within 1 month [study duration]*)

1. Too old
2. Too sick
3. Health problem(s)
4. Too busy
5. Don't want to participate
6. Tired of being asked
7. Moved out of area
8. Moved interstate/overseas
9. Other (specify)
10. No
11. Currently pregnant

Sequence guide: If A6 = 7 or 8 (moved out of area), go to A8.

**A7** Try to convert for this telephone follow up. Successful? (Single response)

1. Yes
2. No - definite

Sequence guide: If A7 = 2 (definite withdrawal), go to O1

**A8** (moved out of area - locally or interstate, overseas) You are very important to us because you are still a part of the North West Adelaide Health Study. Try to convert - successful?

(Single response)

1. Yes
2. No - definite

Sequence guide: If A8 = 2 (definite withdrawal), go to O1

## B. DEMOGRAPHICS

Just to start with a few general questions ...

**B1** How would you best describe your family structure?

(Read options. Single Response)

1. A family with a child or children living with both biological or adoptive parents
2. A step or blended family
3. A sole parent family
4. Shared care parenting
5. Adult living alone
6. Adult living with partner and no children
7. Related adults living together
8. Unrelated adults living together
9. Other (specify)
10. Refused

**B2** What is your current marital status?

Are you ...?

(Read options. Single Response)

1. Married
2. Living with a partner (de facto)
3. Significant committed relationship but living apart from choice
4. Significant committed relationship but living apart because of work or family commitment in different locations
5. Separated but not divorced
6. Divorced
7. Widowed
8. Never married
9. Refused

Sequence guide: If B2 > 4 (i.e. not in a relationship), go to B4

**B3** How would you rate the quality of that relationship? Would you say ...?

(Read options. Single response)

1. Very high
2. High
3. Neutral
4. Low
5. Very low
6. Don't know
7. Refused

**B4 What is your current employment status?****Are you ...?**

(Read options. Single response. Interviewer note: if caring for someone - if being paid as a job, code as either Response 1 or 2; if caring for a relative and receiving a pension, code as unemployed or home duties if this would be their normal role)

1. Employed - Full time
2. Employed - Part time
3. Casual
4. Unemployed
5. Student - Full time
6. Student - Part time
7. Retired
8. Home duties
9. Volunteer
10. Unable to work
11. Don't know
12. Refused

Sequence guide: If B4 > 3 (i.e. no paid employment), go to B7

**B5 In the last week, how many hours did you undertake paid employment?**

(Single Response)

1. None
2. Enter hours [number - limit field to 99]
3. Don't know
4. Refused

**B6 What is your current occupation?**

(Single response. Interviewer note: the term occupation describes a particular type of job, eg plumber, nurse, teacher, clerk)

1. Accountant
2. Administration/clerical
3. Banking
4. Boilermaker
5. Bookkeeping
6. Building/construction
7. Butcher
8. Cabinet maker
9. Care worker
10. Carpenter
11. Childcare
12. Cleaner
13. Defence force
14. Dressmaker
15. Electrician
16. Electronics
17. Engineer
18. Factory work
19. Farmer
20. Fitter and turner
21. Hairdresser
22. Hospitality
23. Labourer
24. Manager
25. Mechanic
26. Nursing - registered nurse and above
27. Nursing - enrolled nurse
28. Plumber
29. Retail/sales assistant
30. School teacher
31. Truck driver
32. Other (specify)
33. Don't know
34. Refused

**B7 Since finishing school, have you ever had a period of 5 years or more outside of the paid work force?**

(Single response. Interviewer note: If self-employment (i.e. own business) is their MAIN source of income, code as Response 2; otherwise if it is a "hobby" (not main source of income), code as Response 1 B7 and include Response 1 in next question B8)

1. Yes
2. No

Sequence guide: If B7=2 (no), go to B9

**B8 What were your MAIN reasons for not working?**

(Multiple response)

1. Self employment
2. Voluntary work
3. Unemployment
4. Further education
5. Alternative lifestyle
6. Health problems
7. To raise a family
8. To look after parents or other family members
9. Travel
10. Other (please specify)
11. Don't know
12. Refused
13. Retired

**B9 Do you study at a tertiary institution such as a university or TAFE college?**(Single response. *Interviewer note: prompt for FULL time or PART time study status*)

1. Yes - FULL time Student
2. Yes - PART time Student
3. No

Sequence guide: If B8 = 3 (no), go to B11

**B10 In the last week, how many hours did you undertake study?**

(Single Response)

1. None
2. Enter hours [number - limit field to 99]
3. Don't know
4. Refused

**B11 Do you undertake any volunteer activities?**

(Single response)

1. Yes
2. No

Sequence guide: If B11 = 2 (no), go to B13

**B12 In the last week, how many hours did you undertake volunteer work?**

(Single Response)

1. None
2. Enter hours [number - limit field to 99]
3. Don't know
4. Refused

Sequence guide: If B2 &gt; 4 (i.e. not married or in a de facto or committed relationship), go to B14

**B13 What is your current spouse/partner's employment status? Are they ...?**

(Read options. Multiple response)

1. Employed - Full time
2. Employed - Part time
3. Casual
4. Unemployed
5. Student - Full time
6. Student - Part time
7. Retired
8. Home duties
9. Volunteer
10. Unable to work
11. Don't know
12. Refused

**B14 Do you provide long term care at your home or their home, for someone with a disability, or who is frail, aged, or who has a chronic mental or physical illness?**(Single response. *Interviewer note: Long term care is either a minimum of 6 months which may extend into years, or they have just started a caring role and they anticipate it will be ongoing (ie not short term say as a result of an injury). This does NOT include if this is their occupation*)

1. Yes
2. No

Sequence guide: If B14 = 2 (no), go to next section C.

**B15 Is this FULL-time care?**(Single response. *Interviewer note: Full time care is providing assistance with another person's needs every day for the majority of the day*)

1. Yes
2. No
3. Refused

Sequence guide: If B15 &gt; 1 (no or refused), go to B17

**B16 Can you please tell me who you provide FULL-time long term care for?**(Multiple response. *Interviewer note: prompt if necessary for age of person being cared for; if 65+, enter as ELDERLY*)

1. Partner
2. (Own) Child(ren)
3. Grandchild(ren)
4. Parent(s)/Parents-in-law
5. Other relative
6. Other ELDERLY relative
7. Other person(s) - not related
8. Other ELDERLY person(s) - not related
9. Refused

**B17 Do you provide PART-TIME long term care for someone?**

(Single response)

1. Yes
2. No
3. Refused

Sequence guide: If B17 &gt; 1 (no or ref), go to B20

**B18 Can you please tell me who you provide PART-TIME long term care for?**(Multiple response. *Interviewer note: prompt if necessary for age of person being cared for; if 65+, enter as ELDERLY*)

1. Partner
2. (Own) Child(ren)
3. Grandchild(ren)
4. Parent(s)/Parents-in-law
5. Other relative
6. Other ELDERLY relative
7. Other person(s) - not related
8. Other ELDERLY person(s) - not related
9. Refused

**B19 How many hours per week do you spend performing this part-time care?**

1. Enter hours [number - limit field to 99]
2. Don't know
3. Refused

**B20 In relation to your caring responsibilities, do you have support from any of the following?**

(Read options. Multiple response)

1. Siblings
2. Other family member/s
3. Friends
4. Formal services such as Meals on Wheels, and the Royal District Nursing Service
5. Other (specify)
6. Refused
7. None

**C The next few questions are about any physical activities that you may have done in the last week.****C1 In the last week, how many times have you walked continuously, for at least 10 minutes, for recreation, exercise or to get to or from places?**

(Single Response)

1. None
2. Enter number of times [number - limit field to 99]
3. Not stated/Don't know [enter 999]
4. Refused [enter 998]

Sequence guide: If C1 = 0 (none), go to C3

**C2 What do you estimate was the total time that you spent walking in this way in the last week?**

(Single Response. Enter number of hours AND/OR minutes.)

1. Enter hours [number - limit field to 168, ie max number of hrs in a week]
2. Enter minutes [number - limit field to 59]
3. Not stated/Don't know [enter 999]

**C3 This question excludes household chores or gardening. In the last week, how many times did you do any vigorous physical activity which made you breathe harder or puff and pant? (eg tennis, jogging, cycling, keep fit exercises)**

(Single Response)

1. None
2. Enter number of times [number - limit field to 99]
3. Not stated/Don't know [enter 999]
4. Refused [enter 998]

Sequence guide: If C3 = 0 (none), go to C5

**C4 What do you estimate was the total time that you spent doing this vigorous physical activity in the last week?**

(Single Response. Enter number of hours AND/OR minutes.)

1. Enter hours [number - limit field to 168, ie max number of hrs in a week]
2. Enter minutes [number - limit field to 59]
3. Not stated/Don't know [enter 999]

**C5 This question excludes household chores or gardening. In the last week, how many times did you do other more moderate physical activities that you have not already mentioned? (eg lawn bowls, golf, gentle swimming, etc)**

(Single Response)

1. None
2. Enter number of times [number - limit field to 99]
3. Not stated/Don't know [enter 999]
4. Refused [enter 998]

Sequence guide: If C5 = 0 (none), go to next section (D)

**C6 What do you estimate was the total time that you spent doing these activities in the last week?**

(Single Response. Enter number of hours AND/OR minutes.)

1. Enter hours [number - limit field to 168, ie max number of hrs in a week]
2. Enter minutes [number - limit field to 59]
3. Not stated/Don't know [enter 999]



**D2 What kind of work did your MOTHER do for MOST of her life?**

(Single Response. *Interviewer note: if adopted, then adopted mother. If have step-mother, then it is the person who they spent most of their time with when they were young. If mother has more than one type of work, enter all. The time frame is the participant's adult life - may have been home duties most of their life.*)

1. Accountant
2. Administration/clerical
3. Banking
4. Boilermaker
5. Bookkeeping
6. Building/construction
7. Butcher
8. Cabinet maker
9. Care worker
10. Carpenter
11. Childcare
12. Cleaner
13. Defence force
14. Dressmaker
15. Electrician
16. Electronics
17. Engineer
18. Factory work
19. Farmer
20. Fitter and turner
21. Hairdresser
22. Hospitality
23. Labourer
24. Manager
25. Mechanic
26. Nursing - registered nurse and above
27. Nursing - enrolled nurse
28. Plumber
29. Retail/sales assistant
30. School teacher
31. Truck driver
32. Other (specify)
33. Unemployed
34. Home duties
35. Student
36. Unable to work (disability)
37. Don't know
38. Not Applicable
39. Refused

**D. LIFECOURSE PERSPECTIVE**

Now just to change the subject ... the next few questions will help us understand how people's health is affected by their family background.

**D1 Could you please tell me ... what was your MOTHER'S country of birth?**

(Single response)

1. Australia
2. Austria
3. Bosnia-Herzegovina
4. Canada
5. China
6. Croatia
7. France
8. Germany
9. Greece
10. Holland/Netherlands
11. Hong Kong
12. Iran
13. Italy
14. Japan
15. Malaysia
16. New Zealand
17. Philippines
18. Poland
19. Slovenia
20. Spain
21. UK and Ireland
22. USA
23. Vietnam
24. Former Yugoslav
25. Republic of Macedon
26. Former Yugoslav
27. Republics of Serbia & Montenegro
28. Other (specify)
29. Don't know / refused

**D3 What was your FATHER'S country of birth?**

(Single response)

1. Australia
2. Austria
3. Bosnia-Herzegovina
4. Canada
5. China
6. Croatia
7. France
8. Germany
9. Greece
10. Holland/Netherlands
11. Hong Kong
12. Iran
13. Italy
14. Japan
15. Malaysia
16. New Zealand
17. Philippines
18. Poland
19. Slovenia
20. Spain
21. UK and Ireland
22. USA
23. Vietnam
24. Former Yugoslav
25. Republic of Macedon
26. Former Yugoslav
27. Republics of Serbia & Montenegro
28. Other (specify)
29. Don't know / refused

**D4 What kind of work did your FATHER do for MOST of his life?**

(Single Response. *Interviewer note: if adopted, then adopted father. If have step-father, then it is the person who they spent most of their time with when they were young. If father has more than one type of work, enter all.*)

1. Accountant
2. Administration/clerical
3. Banking
4. Boilermaker
5. Bookkeeping
6. Building/construction
7. Butcher
8. Cabinet maker
9. Care worker
10. Carpenter
11. Childcare
12. Cleaner
13. Defence force
14. Dressmaker
15. Electrician
16. Electronics
17. Engineer
18. Factory work
19. Farmer
20. Fitter and turner
21. Hairdresser
22. Hospitality
23. Labourer
24. Manager
25. Mechanic
26. Nursing - registered nurse and above
27. Nursing - enrolled nurse
28. Plumber
29. Retail/sales assistant
30. School teacher
31. Truck driver
32. Other (specify)
33. Unemployed
34. Home duties
35. Student
36. Unable to work (disability)
37. Don't know
38. Not Applicable
39. Refused

**D5 How would you best describe your family structure when you were 4 years old? Was it ...?**

(Read options. Single response)

1. A family with a child or children living with both biological or adoptive parents
2. A step or blended family
3. A sole parent family (lived only with mother)
4. A sole parent family (lived only with father)
5. Shared care parenting
6. Other (specify)
7. Don't know
8. Refused
9. Not applicable

**D6 Did you have any siblings when you were 4 years old?**

(Single response)

1. Yes
2. No
3. Don't know
4. Refused

Sequence guide: If D6>1 (no, dk or refused), go to D8

**D7 How many siblings did you live with when you were 4 years old?**

(Single response)

1. Enter number (number - limit field to 15)
2. Don't know
3. Refused

**D8 Thinking back to when you were 4 years old, did either or both of your parents or guardian smoke?**

(Single response)

1. Yes
2. No
3. Don't know
4. Refused

**D9 When you were a child, was either your parents or guardian unemployed WHEN THEY WANTED TO BE WORKING?**

(Single response)

1. Yes
2. No
3. Don't know
4. Refused

Sequence guide: If D9 > 2, (i.e. no, dk or refused), go to D11

**D10 How long was your parent or guardian unemployed for? Was it ...?**

(Read options. Single Response)

1. Less than 6 months
2. From 6 months to less than 1 year
3. From 1 year to less than 2 years
4. From 2 years to less than 3 years
5. More than 3 years
6. Has always been unemployed
7. Don't know
8. Refused

**D11 How many children do you have?**

(Single Response. Interviewer note: this DOES include adopted children or step-children)

1. No children
2. Enter [number - limit field to 99]
3. Refused

Sequence guide: If D11 = 1 or 3 (ie no children or refused), go to E1.

**D21 How many children (including adopted and step children) do you have living at home of the following ages?**

(Read options. Single Response)

1. 15 years of age or less [specify - enter number field]
2. Between 16 and 24 years of age [specify -enter number field]
3. 25 years and over [specify - enter number field]
4. Refused
5. None living at home

**D22 Now thinking of your BIOLOGICAL children only, how many are aged 15 years of age or less and living at home?**

(Single Response)

1. None
2. Enter number (limit field to 20)
3. Refused

**E. EARLY LEARNING**

Still thinking about when you were young ...

**E1 Did you attend kindergarten or preschool?**

(Single response. *Interviewer note: Pre-school is also known as kindergarten: they are places for learning and development, generally for 4 year old children in the 12 months before primary school starts. It is not a child care centre or child minding facility*)

1. Yes
2. No
3. Don't know
4. Refused

Sequence guide: If E1 > 1 (no, dk or refused), go to E4

**E2 How old were you when you first started kindergarten or preschool?**

(Single response)

1. 4 years old
2. 5 years old
3. Other (specify - Enter age [limit field to 1 digit])
4. Don't know/Refused

**E3 How many days a week did you attend the kindergarten or preschool?**

(Single response)

1. Less than one day
2. 1 day
3. 2 days
4. 3 days
5. 4 days
6. 5 days
7. More than 5 days
8. Don't know
9. Refused

**E4 How many different primary schools did you attend?**

(Single response)

1. 1
2. 2
3. 3
4. 4
5. 5 or more
6. Don't know
7. Refused
8. Did not attend primary school (ie did home schooling)

Sequence guide: If E4 = 8 (did not attend primary school), go to F.

**E5 What is the name of the primary school you mostly attended?**

(Single response. Interviewer note: only South Australian schools are relevant – if interstate, enter Response 2)

1. Enter primary school name [text]
2. Did not attend a primary school in South Australia
3. Don't know
4. Refused

Sequence guide: If E5 = 2 (did not attend a SA primary school), go to F.

**E6 Was this a ...**

(Read options. Single response)

1. Public school
2. Catholic school
3. Private or independent school
4. Don't know
5. Refused

## F. NEIGHBOURHOODS AND RESIDENTIAL MIGRATION

Now for some questions about where you live ...

### F1 Why did you choose to live in your current neighbourhood?

(Multiple Response. Interviewer note: PROMPT What factors were important to you in deciding where you wanted to live? )

1. Closeness to family
2. Closeness to shops or services
3. Closeness to friends
4. Closeness to work
5. Closeness to school
6. Family always lived in area
7. Access to public transport
8. Financial reasons/affordability
9. Safety
10. The area
11. The house/unit (residence)
12. Close to the beach
13. Close to the city
14. Other (specify)
15. Don't know
16. Refused

### F2 How strongly would you agree or disagree with the following statement ... I feel a sense of community with others in my local neighbourhood. Would you say you ...?

(Read options. Single response)

1. Strongly disagree
2. Disagree
3. Neither agree or disagree
4. Agree
5. Strongly agree
6. Don't know
7. Refused

Sequence guide: If F2 = 1 thru 3, go to F4

### F3 Can you please tell me why the main reason for this?

(Single response)

1. Too busy/my focus is on my family, job, friends
2. Not my type of people/different interests, lifestyle, stage of life, nothing in common
3. Like to keep to myself/not interested
4. Rental property
5. No community events to meet people
6. People not approachable/not a friendly neighbourhood
7. Don't know neighbours
8. New to area
9. Don't spend much time in neighbourhood
10. Other (specify)
11. Don't know
12. Refused

### F4 Can you please tell me about the place you live in? Is it a ...

(Read options. Single response. Interviewer note: People living in independent units attached to nursing homes OR students in university-owned apartments should be coded as Option 3 [flat, unit or apartment]. Those in a nursing home or hostel should be Option 6 (Institution or care situation. Students living in a communal university facility but with own room, would be Option 7 [Residential Hall/College].)

1. Separate house
2. Semi detached house, row or terrace house, townhouse
3. Flat, unit or apartment
4. Caravan, tent, cabin
5. House, flat attached to shop, office
6. Institution or care situation (includes nursing home)
7. Residential hall/college (ie university boarding house)
8. Living in work-provided accommodation
9. Other (specify)
10. Don't know
11. Refused

### F5 In this residence, are you ...

(Read options. Single response. Interviewer note: Life tenure is the status of holding one's position on a permanent basis without periodic contract renewals.)

1. Paying off a mortgage
2. The outright owner / joint owner
3. Renting (or pay board)
4. Using a rent to buy scheme
5. Living as a dependent child with parents
6. Living rent free
7. Able to live there for the remainder of your life (that is, you have life tenure)
8. Living in work-provided accommodation
9. Other (specify)
10. Don't know
11. Refused

**G. LIFESTYLE / NUTRITION**

Just changing the subject ...

**G1** How often do you consume foods that are prepared at home? Would you say ...?

(Read options. Single response. *Interviewer notes: includes breakfast, lunch, tea and snacks. Includes canned and frozen foods that may be just defrosted and/or heated*)

1. All or nearly all of the time
2. Most of the time
3. Some of the time
4. Hardly any or none of the time
5. Don't know
6. Refused

**G2 NUT1** How many serves of vegetables do you usually eat each day? A 'serve' is ½ cup cooked vegetables or 1 cup of salad.

(Single Response)

1. Less than one serve
2. Enter number of serves [number]
3. Don't eat vegetables
4. None
5. Don't know

**G3 NUT2** How many serves of fruit do you usually eat each day? A 'serve' is 1 medium piece or 2 small pieces of fruit or 1 cup of diced pieces.

(Single Response)

1. Less than one serve
2. Enter number of serves [number]
3. Don't eat fruit
4. None
5. Don't know

**G4 NUT3** What type of milk do you usually have?

(Single Response *Interview note: If brand of milk given, prompt for type, ie whole milk or reduced fat*)

1. Whole milk
2. Low or reduced fat
3. Skim
4. Soya
5. Evaporated/sweetened condensed
6. Other (specify)
7. None of the above
8. Don't know
9. High calcium, low fat
10. Breast milk
11. Formula
12. Rice milk
13. Doesn't drink milk

**G5 NUT4** How often do you eat chips, french fries, wedges, fried potatoes or crisps?

(Single Response. *Interview note: enter number of times per day, week or month*)

1. Enter number of times per DAY [number]
2. Enter number of times per WEEK [number]
3. Enter number of times per MONTH [number]
4. Rarely (< once / month)
5. Never
6. Don't know/can't say

**G6 NUT8** How often do you eat meat products such as sausages, frankfurters, fritz (devon), salami, meat pies, bacon or ham?

(Single Response. *Interview note: enter number of times per day, week or month*)

1. Enter number of times per DAY [number]
2. Enter number of times per WEEK [number]
3. Enter number of times per MONTH [number]
4. Rarely (< once / month)
5. Never
6. Don't know/can't say

**G7 NUT18** During the last four weeks, on average, how many glasses of water do you usually have in a day?

(Single Response. *Interviewer note: water is tap, bottled, rain. This does not include fruit juice, cordial, fizzy or energy drinks, milk, tea or coffee. A glass = 200 mls*)

1. Enter number of glasses [number]
2. Enter mls [number]
3. Enter litres [number]
4. None
5. Don't know

Sequence guide: If G7 = 4 (none), go to G9

**G8** What type of water do you usually drink?

(Single Response)

1. Tap water
2. Rain water
3. Bottled (spring) water
4. Purified water
5. Carbonated plain water
6. Don't know
7. Refused

**G9 How often on average do you drink soft drink, cordial or sports drinks (eg Powerade and Gatorade)?**

(Single Response. *Interviewer note: enter number of times per day, week, month or year. Includes artificially sweetened drinks*)

1. Enter number of times per DAY [number]
2. Enter number of times per WEEK [number]
3. Enter number of times per MONTH [number]
4. Enter number of times per YEAR [number]
5. Rarely (< twice / year)
6. Never
7. Don't know/can't say

**G10 On average, how many litres of soft drink and sports drink (eg coke, lemonade, flavoured mineral water, Powerade, Gatorade) does your household buy at the supermarket each week?**

(Single Response. *Interviewer note: Seeking info about drinks purchased as part of household shopping trips, not drinks bought during the day for a meal or snack by household members. The large supermarket bottles are 2L, the medium ones are 1.25L and the small bottles sold in delis etc are 600ml*)

1. Enter number of litres per WEEK [number]
2. Enter number of litres per FORTNIGHT [number]
3. Enter number of litres per MONTH [number]
4. Only for special occasions
5. Rarely (< once / month)
6. Don't know
7. Refused

**G11 Changing the subject once again ... On average, how many hours per day do you spend sleeping?**

(Single response. *Interviewer note: includes daytime sleeps, ie naps*)

1. Enter hours [number - limit to 2 digits]
2. Don't know
3. Refused

**G12 How strongly would you agree or disagree with the following statement ... I find it easy to fit in some sort of physical activity during my usual day. Would you say you ...?**

(Read options. Single response)

1. Strongly disagree
2. Disagree
3. Neither agree or disagree
4. Agree
5. Strongly agree
6. Don't know
7. Refused

**G13 Can you please tell me which of the following best describes you ...?**

(Read options. Single response. *Interviewer note: PROMPT if necessary regarding the majority of their friends*)

1. Most of my friends know each other well
2. Most of my friends don't know each other well
3. Most of my friends don't know each other
4. Other (specify)
5. Doesn't have any friends
6. Don't know
7. Refused

Sequence guide: If G14 = 5 (does not have any friends), go to next section (H)

**G14 How often do you spend time with friends who do not live with you: that is, you go to see them or they come to visit you or you go out to do things together? Would it be ...?**

(Read options. Single response)

1. Two or more times a week
2. Once a week
3. Once every couple of weeks
4. Once a month
5. Other (specify)
6. Don't know
7. Refused

**G15 How many close friends do you have, that is people you feel at ease with and can talk to about private matters or can call on for help?**

(Single response)

1. None
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8 or more
10. Don't know
11. Refused

Sequence guide: If G15 = 0 (none), go to next section (H).

**G16 Of these close friends, how many live locally?**

(Single response)

1. None
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8 or more
10. Don't know
11. Refused

**H. HEALTH RELATED QUESTIONS**

Just changing the subject once more ...

**H1 In general, would you say your health is ...?**

(Read Options. Single Response)

1. Excellent
2. Very Good
3. Good
4. Fair
5. Poor
6. Don't know
7. Refused

**H2 In terms of your weight, do you consider yourself to be ..?**

(Read options. Single response)

1. Too thin
2. A little thin
3. Normal weight
4. A little overweight
5. Very overweight
6. Don't know
7. Refused

**H3 So, thinking about all aspects of your life such as employment, volunteer work, care commitments, study etc ... how would you rate the stress of your life commitments in general? Would you say ...?**

(Read options. Single Response)

1. None
2. Mild
3. Moderate
4. Severe
5. Extreme
6. Don't know
7. Refused

**H4 As the next questions only relate to people of a particular age group, could you please tell me what year you were born in?****I and K SECTIONS ONLY FOR BABY BOOMERS****L. KESSLER PSYCHOLOGICAL DISTRESS SCALE (K10 - Health Status)**

These last questions are about how you have been feeling in the last 4 weeks.

**L1 In the past four weeks, about how often did you feel tired out for no good reason?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

**L2 (In the past four weeks) ... about how often did you feel nervous?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

Sequence guide: If L2 = 5 (none), go to L4

**L3 (In the past four weeks) ... about how often did you feel so nervous that nothing could calm you down?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

**L4 (In the past four weeks) ... about how often did you feel hopeless?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused



**L5 (In the past four weeks) ... about how often did you feel restless or fidgety?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

Sequence guide: If L5 = 5 (none), go to L7

**L6 (In the past four weeks) ... about how often did you feel so restless you could not sit still?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

**L7 (In the past four weeks) ... about how often did you feel depressed?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

**L8 (In the past four weeks) ... about how often did you feel everything was an effort?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

**L9 (In the past four weeks) ... about how often did you feel so sad that nothing could cheer you up?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

**L10 (In the past four weeks) ... about how often did you feel worthless?**

(Read Options. Single Response)

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time
6. Don't know
7. Refused

Sequence guide: If respondent is in not in Location 2 or 3, go to O. (END)

## O. QUESTIONNAIRE / CONTACT DETAILS

So just to finish off with some general questions ...

**O1 Would you be willing to answer a general health and well-being questionnaire that we would send out to you?**

(Single response)

1. Yes
2. No

Sequence guide: If O1 = 2 (no), go to O3

**O2 Would you rather we sent it to you by post or by email?**

(Single response)

1. Post
2. Email

**O3 We would like to keep you up to date about the study by sending you our newsletter or invite you again to participate in any other health assessment. Would you mind if we contact you at a later date?**

(Single response)

1. Yes, can contact
2. No, total withdrawal from the study

Sequence guide: If IO2 = 1 (ongoing contact), go to O5

**O4 Your involvement in the study has been most valuable in providing information that is helping to improve the health of the community. Thank you for your time today. END/TERMINATION OF INTERVIEW**

**O5 Do you have an email address so that we can send you updates about the study?**

(Multiple response)

1. Enter HOME email address [text]
2. Enter WORK email address [text]
3. No email address

**O6 Can I please confirm that your address is ...?***(HEADER - current address)*

(Multiple response)

1. Address confirmed
2. Change of address

Sequence guide: If O6 = 1 (address confirmed), go to O8

**O7 Change of address**

1. Enter address [text]
2. Enter postcode 5 \_ \_ \_

**O8 Our records show that you have a second address. Is this still ...?** *(HEADER -second address, ie if current address is postal - if address recorded, read out from header. If NO address recorded, continue) Is there another address we can record for you?*

1. Enter address (change or new) [text]
2. Enter postcode 5 \_ \_ \_

**O9 What is the length of time you have spent at your current address?**

(Single response)

1. Enter years [number - limit field to 99]
2. Enter months [number - limit field to 11]
3. Don't know
4. Refused

Sequence guide: If O9 > 7 years (ie still has same address as at recruitment), go to O14

The following questions are in relation to your address at your first clinic appointment.

*(Interviewer note: Phase 1A - in 2000; Phase 1B - in approx 2000/3). Our records show your address at that time was: (Interviewer note: HEADER - address at Stage 1 recruitment)*

**O10 What was the length of time you spent at this address?***(Interviewer note: PROMPT with year of Stage 1 appointment)*

(Single response)

1. Enter years [number - limit field to 99]
2. Enter months [number - limit field to 11]
3. Don't know
4. Refused

**O11 How many times have you moved since the time of your first clinic appointment?**

(Single response)

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7 or more
8. Don't know
9. Refused
10. None

Sequence guide: If O11 = 1, 2, 3; or 8 or 9 (small number of moves or dk/ref), go to O13

**O12 What is the address you spent most time at?**

(Single response)

1. Enter text
2. Don't know
3. Refused

**O13 Which suburb or town did you mostly live as a child (up to the age of 15 years)?**

*(Single response. Interviewer note: (If respondent moved around a lot, please specify the place where the MAJORITY of time was spent. If respondent doesn't know the suburb name, ask for the locality name)*

1. Enter suburb/town/locality [text]
2. Enter state [text]
3. Don't know
4. Refused

**O14 Is this the best phone number to contact you, or is there another number (eg work, mobile) that might be more appropriate?**

*(Multiple Response. Interviewer note: confirm number and determine if the best number is a home, work or other phone number)*

1. This is the best number
2. Home number
3. Work number
4. Mobile number
5. Other number

**O15 Additional telephone numbers** *(Multiple Response. Interviewer note: confirm number and determine if the best number is a home, work or other phone number)*

1. This is the best number
2. Home number
3. Work number
4. Mobile number
5. Other number

**P. END OF INTERVIEW (main)**

That concludes the interview. Are there any comments that you would like to make about the study?

(Single Response)

1. Yes (specify)
2. No

On behalf of the North West Adelaide Health Study Team, I would like to thank you very much for helping us once again. We very much appreciate your ongoing participation in this study which makes a very important contribution to the awareness of health issues in the north western area of Adelaide. Depending on the sections you have answered, you may be sent more than one questionnaire. Thank you again for your time.

Interviewer note: Further information, phone 1800 635 352, or Internet  
<http://www.nwadelaidehealthstudy.org>)

(IF NECESSARY) As some of the questions we have asked may have been distressing or caused some concern for some people, I would like to offer you a telephone number if you feel that you need to discuss some of these concerns with a qualified professional.

[Adult Mental Health Services - 24 hour crisis and emergency assistance - 131-465]

**Q. END OF INTERVIEW (for people speaking on behalf of those participants who have either died or moved house)**

Thank you for your time today.

**Appendices 4 – 8 are included in the print  
copy of the thesis  
held in the University of Adelaide Library.**

Howard, N.J., Taylor, A.W., Gill, T.K. and Chittleborough, C.R. (2008) Severe obesity: Investigating the socio-demographics within the extremes of body mass index.

*Obesity Research and Clinical Practice*, v. 2 (1), pp. 51-59, March 2008

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Adams, R.J., Howard, N.J., Tucker, G., Appleton, S., Taylor, A.W., Chittleborough, C.R., Gill, T.K., Ruffin, R.E. and Wilson, D.H. (2009) Effects of area deprivation on health risks and outcomes: a multilevel, cross-sectional, Australian population study. *International Journal of Public Health*, v. 54 (3), pp. 183-192, May 2009

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*Obesity Research and Clinical Practice*, v. 2 (2), pp. 125-131, July 2008

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