North West Adelaide Health Study

RISK FACTORS AND ASSOCIATED CHRONIC CONDITIONS

MAY 2002

human services

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Government of South Australia

University of South Australia

LYELL McEWIN HEALTH SERVICE

RISK FACTORS AND ASSOCIATED CHRONIC CONDITIONS

MAY 2002

David Wilson

Sarah Appleton

Anne Taylor

Eleonora Dal Grande

Catherine Chittleborough

Richard Ruffin

Centre for Population Studies in Epidemiology
Department of Human Services, South Australia

in conjunction with

Department of Medicine
The University of Adelaide

Published May 2002 by the South Australian Department of Human Services
PO Box 287, Rundle Mall
Adelaide 5000
South Australia, Australia.

National Library of Australia Cataloguing-in-Publication:

ISBN 0 7308 9191 7.

1. Health surveys – South Australia – Adelaide. 2. Health behaviour – South Australia – Adelaide – Statistics. 3. Diabetes – South Australia – Adelaide – Statistics. 4. Asthma – South Australia – Adelaide – Statistics. 5. Lungs – Diseases, Obstructive – South Australia – Adelaide – Statistics. 6. Adelaide (S. Aust.) – Statistics, Medical. I. Wilson, David H, 1942- . II. University of Adelaide. Dept. of Medicine. III. Centre for Population Studies in Epidemiology (S. Aust.).

614.4294231

Further copies of this publication may be purchased from the Centre for Population Studies in Epidemiology (CPSE) or may be downloaded from the CPSE web site:
http://www.health.sa.gov.au/pehs/cpse.html

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The North West Adelaide Health Study is South Australia's first biomedical population study of chronic disease since the National Heart Foundation studies of the 1980's. It is therefore an important current information source providing validated estimates of chronic disease and related risk factors that can contribute to health policy decisions. This report is focussed on the chronic disease risk factors and their relationship with diabetes, asthma and chronic obstructive pulmonary disease (COPD). The following summary conclusions are made from the data:

- In the north west region of Adelaide the prevalence of diabetes was 6.7%, asthma was 11.6% and COPD was 21.3%.
- The burden of risk factors associated with chronic disease conditions showed that single risk factors in chronic disease is the exception rather than the rule.
- In north west Adelaide, 74% of people with diabetes, 57% of people with COPD and 52% of people with asthma had two or more risk factors. This underscores the complex morbidity and the difficult management situations of these chronic disease conditions.
- The SEIFA index of disadvantage declines with increasing number of risk factors and is lower in the northern region than the western region.
- Smoking is the most important risk factor for COPD yet 40% of those with this chronic condition are current smokers.
- Within chronic disease categories there are some risk factor combinations that have their own associations for example: obesity and high blood pressure; alcohol and smoking; activity and obesity. In these cases single risk factor health promotion programs may be ineffective.
- The northern region compared to the western region of Adelaide has the higher burden of risk factors both in terms of number of risk factors and combinations of risk factors.
- As the number of risk factors increases there is a related deterioration in quality-of-life.

Some important similarities and differences are apparent in the combinations of risk factors across the chronic conditions. The prevalence of people who are obese and smoke is fairly constant across all the disease conditions. On the other hand, the prevalence of smokers who are also obese is almost three times higher among people with diabetes than among those with asthma or COPD. These data again point to different targeting needs when addressing the risk factors and combinations of risk factors for each of the chronic disease conditions.

These data identify the complexity of risk factor associations within the chronic disease conditions and the need to differentially target each chronic condition. In management and secondary prevention initiatives there will be several related risk factor conditions that need to be dealt with (for example, obesity/high blood pressure, smoking/high blood pressure). In these cases dealing with simply one risk factor may have little effect.

The additional burden of combinations of risk factors increases the probability of developing chronic disease or impairs the ability to stabilise and manage chronic conditions. Guidelines for primary care need to acknowledge this management complexity and the fact that combinations of risk factors are very common.

Overall, these analyses identify the need to consider different combinations of risk factors for interventions in each region. The data obtained in the North West Adelaide Health Study can be used for more detailed analyses than are presented in this report, thus contributing further to policy and strategy development.

CHAPTER 1: THE NORTH WEST ADELAIDE HEALTH STUDY

1.1 Introduction

The North West Adelaide Health Study is a representative biomedical population sample of people aged eighteen years or older living in the north west area of Adelaide.

The aims of the study were to provide estimates of diabetes, asthma and chronic obstructive airways disease (COPD) and associated risk factors and quality-of-life for the north and west regions of Adelaide. A further basic aim of the study was to provide an estimation of previously undiagnosed rates of these diseases and a demographic description and risk factor profile of the groups of concern.

In this report we identify the prevalence of the chronic diseases, risk factors and various combinations of risk factors for the region as a whole and the sub-divisions of the north and west. The associations of the risk factors with disease groups and their impact on quality-of-life are also identified together with descriptions of the groups at risk.

1.2 The Study Region

The study region was selected as the focus of an Adelaide University Foundation Grant. The north west region of Adelaide stretches geographically from Glenelg to Elizabeth and was considered a priority study area because of previous self-report evidence concerning the levels of chronic disease and risk factors in the region. One previous study has pointed to high self-reported rates of respiratory disease and smoking prevalence in this area[1]. South Australian Health Omnibus[2] data on diabetes for the region over the last decade also point to high prevalence rates. A further reason for selection was because measures of social disadvantage identify parts of this region having greater relative social disadvantage compared with many other areas of South Australia.

1.3 Methodology

People selected at random from the electronic white pages telephone directory were then interviewed by telephone and recruited to a clinical assessment at The Queen Elizabeth Hospital or Lyell McEwin Health Service. Telephone interviews investigated self-reported health status, mental health, smoking status, demographic variables and, if appropriate, reasons for no further participation in the study at this stage. Of the n=3422 people who were interviewed, n=2523 agreed to participate in the clinical assessment. An information folder was then sent to each participant clarifying times and procedures for the medical assessment. The folder included a second self-completion questionnaire, which comprised the Short Form (SF-36) Quality-of-Life questions[3]; the General Health Questionnaire (GHQ-28)[4]; further questions on exercise patterns; family history of disease; prevalence of diabetes, asthma and chronic lung disease; frequency of alcohol consumption; and further demographic information.

Medical assessment comprised fasting plasma glucose levels; blood pressure measurement; height, weight, waist and hip measurements; allergy skin tests (rye grass, cat, house dust mite, alternaria, feather and cockroach), and lung function tests.

The full methodology and design of the North West Adelaide Health Study including rationale, aims, sample assessment, weighting of data, recruitment, response rates, and clinical procedures has been described comprehensively elsewhere[5,6].

1.4 The Context and Determinants of Health Status

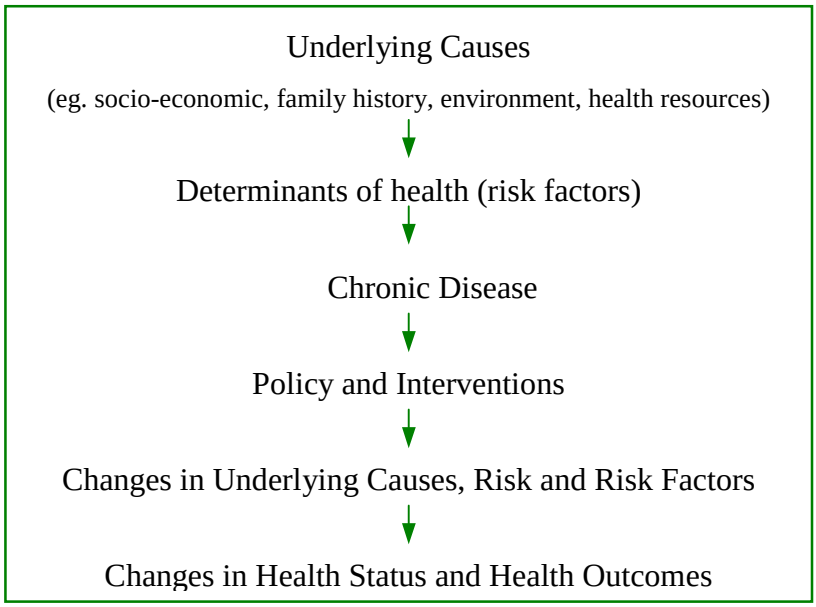
The risk factors examined in this report in relation to chronic disease status provide the basis of a health impact statement for the north west region of Adelaide and the subdivisions of the north and west. The risk factors of concern in this report are: smoking, physical activity, body mass index, blood pressure levels, cholesterol levels and alcohol consumption.

Risk factors for health status also have their own context and determinants. In the case of risk factors examined in this study we also examine their demographic context and level of relative disadvantage through the Socio-Economic Indexes for Areas (SEIFA)[7], an index of disadvantage for geographic areas that allows us to make

comparisons of disadvantage across the north west region. These data together with environmental and genetic risk are considered to be part of the determinant context of risk factors i.e. the determinants of the determinants[8].

Figure 1.1 provides an overall explanatory context of health status with health policy and interventions included as part of the context of health status. The purpose of this report is to better inform health policy and target interventions that will affect each stage in the figure and subsequently lead to changes in underlying causes of risk factors, risk factors themselves and ultimately health status.

Figure 1.1: Context and determinants of health status.



adapted from Joffe et al[8]

CHAPTER 2: PUBLIC HEALTH & CHRONIC DISEASE

2.1 Introduction

The discipline of public health is concerned with the patterns of disease in human populations and the factors that influence these patterns. During the 20th century, following the control of many infectious diseases in western society, the average lifespan of people lengthened by more than thirty years and in a recent Centers for Disease Control report most of this increase is attributable to advances in public health[9]. Major health improvements and increased life expectancy resulted from public health initiatives such as vaccination, healthier mothers and babies, safer and healthier foods, family planning, safer workplaces and economic and social improvements. In the latter part of the century public health gains were also made from motor vehicle safety, fluoridation of water, and recognition of tobacco as a health hazard.

The present challenges to public health in north west Adelaide, and future improvements in health, life expectancy and well-being, relate to chronic diseases and in minimising the conditions and risk factors that produce them. In Australia during the last decade chronic disease targets, frameworks and programs have become important components of contemporary health care. This has resulted in priorities for action[10,11,12] and the development of chronic disease frameworks and proposals[13,14]. These have contributed to the design of the North West Adelaide Health Study, which will provide data, and intelligence for evidence based policy and interventions.

There are two approaches to chronic disease intervention defined as primary and secondary prevention. These terms can be confusing and they are often used inconsistently. The World Health Organisation defines primary prevention as the prevention of the onset of the initial episode of disease[15]. Secondary prevention involves the detection and treatment of disease that already exists and where possible the prevention of further episodes or complications of disease. Secondary prevention is based primarily on a biomedical model that involves one or more of diagnosis, surgery or the use of medications and education. Primary prevention is based on behavioural, social or environmental models and in modifying the factors that produce ill health. Secondary prevention is also likely to concentrate mainly on health services policy whereas primary prevention will focus more on public policy that may go beyond health services (pollution, sanitation, community development, education) and require cross portfolio cooperation for improved health outcomes. Given these two pathways to prevention, primary prevention is still in its infancy yet Kaplan and others argue that primary prevention pathways may offer most health at the lowest

cost[16,17]. The extent of chronic disease and associated risk factors that are identified in this report will require a public health approach that effectively uses both primary and secondary prevention methods. Primary prevention programs should aim to lower the prevalence of the key risk factors for disease and with this reduce the prevalence of asthma, chronic obstructive pulmonary disease, hypertension and diabetes in the future. Secondary prevention must aim to reduce the impact of disease by minimising the rate of progression and development of complications as well as optimising quality-of-life in those already diagnosed.

2.2 The Importance of Population Surveillance

Only by studying the health of populations can we understand, target and modify the most pressing threats to life and well-being. Population surveillance has been an important tool in identifying groups at risk and the differentials between groups in north west Adelaide. The data gained by population surveillance becomes the intelligence for policy and strategy. In this study important differences are identified across the north west Adelaide health region in disease and risk factors that will require a varied response by communities. The data obtained in the study has been analysed using advanced statistical methods to help in the process of targeting groups most at risk. The value of surveillance does not stop here and ongoing monitoring will be required to further explain the heterogeneity of health status and health risk and to identify the health outcomes and cost effectiveness of any new policy, strategy or health investment. Future surveillance initiatives should monitor the social and psychological context of risk factors in greater depth if we are to specify the mechanisms that are linked to the burden of problems that produce risk and disease.

2.3 Risk Factors and Lifestyle

Lifestyle is a major contributor to chronic disease in north west Adelaide. The impact of smoking, inactivity, obesity, elevated cholesterol and elevated blood pressure on chronic disease is unequivocal. A recent Australian study by Magnus et al argues that the established risk factors of cholesterol, blood pressure and smoking explain 75% of the variation in heart disease rates and a great deal more than was historically attributed[18]. Risk factors for chronic disease are established early and should be the focus of public health policy aimed at the young. Risk factors develop not simply

through individual choices of behaviours but through the conditions under which people live, work and play. It follows that solutions to the conditions that develop from risk factors must also come from the communities themselves. McGinnis argues that health is a function of opportunities and choices provided to people and the actions and behaviours that are made in response to these choices[19]. This is most effectively illustrated in the influence of the peer group in smoking uptake. Health behaviour is motivated not only by knowledge but also by the supportive social environments and services that underpin and support the right choices. "Unhealthy" behaviour will occur in communities where these do not exist. A healthy community will provide the opportunities for healthy choices and behaviours and help its members achieve their potential. Public health is therefore what we as a society do to assure the conditions in which people can be healthy.

Every community is unique and contains its own resources and leadership for change. This has sometimes been described as social capital and is found in the organisations, businesses, government, institutions, clubs, societies and services that have a vested interest in the productivity and sustainability of the community. These are the resources that must be enlisted in the development and implementation of policies and strategies that improve the health and quality-of-life of people who live there. The key to improving health in north west Adelaide is therefore to identify the assets, to bring them together, and to develop their own plan for changing risk factors and chronic disease patterns. In all of this, central health authorities have a key-facilitating role to play. When communities do come together in this way it has been shown that this leads to ownership of programs, improved networks, seeking and finding resources and even improvements in the local economy[19]. This means that local health promotion initiatives are best placed to identify and influence harmful physical conditions and consumer products, harmful social structures and local policies, and media and cultural messages that influence health. Local communities and initiatives also have the best chance of achieving long term sustainability of successful policies and interventions. This approach to improving the health of communities has often been described as the ecological approach and works on the principle that influencing situational, environmental, organisational and social influences are more important than focussing on individual behaviour per se[17].

CHAPTER 3: THE IMPORTANCE OF THE RISK FACTORS INCLUDED IN THE NORTH WEST ADELAIDE HEALTH STUDY

3.1 Introduction

Chronic disease is currently overwhelming the capacity of the Australian health system and a more balanced and effective approach to dealing with the problem is required. As already identified, this must involve primary and secondary prevention approaches. Primary prevention must modify the development of risk factors and disease and promote the value of lifestyle modification for health and quality-of-life. Secondary prevention must identify chronic disease at the earliest possible stage and prevent or slow further deterioration and the development of complications. Together these approaches have to deal with an existing burden of risk factors and disease at the same time as changing these patterns in future generations.

3.2 Alcohol Consumption

Both protective and harmful effects of alcohol consumption have been shown in public health studies. Alcohol has been associated as a risk factor for heart disease, stroke, cancer, cirrhosis, mental health, accidents, violence and crime[20]. It has also been cited as having a protective health effect for ischaemic heart disease. For some time in Australia there has been a trend to identify a safe level of consumption[21] but this implies that there is a threshold below which ethanol is harmless. In one of the largest studies of alcohol consumption ever undertaken total mortality increased remorselessly with intake per day[22]. However, two units (standard drinks) of alcohol per day were associated with lower all cause mortality than the consumption of no alcohol. Above three units per day, progressively increasing levels of consumption were associated with higher all-cause mortality. It should also be pointed out that the relationship between dose and blood concentration depends on rates of absorption and elimination and the effects of a given blood alcohol concentration can vary considerably on an individual basis.

More recently alcohol has been implicated in hypertension and renal disease. It has been shown that the regular consumption of more than two drinks per day is associated with both hypertension and renal disease although the mechanism by which this occurs still needs to be explained[23]. The finding also demonstrates the interconnected nature of some risk factors.

For the purposes of the North West Adelaide Health Study a risk level of alcohol consumption determined by the National Heart Foundation was used to determine risk levels of alcohol consumption[21]. The prevalence of alcohol consumption was calculated using data obtained from the questionnaire. To ascertain their personal alcohol risk, respondents were asked the number of standard drinks they usually have on a weekly and daily basis. Alcohol risk was then calculated using this information to categorise respondents into non-drinkers, no risk drinkers, low risk drinkers, intermediate risk drinkers, high risk drinkers and very high risk drinkers. The information was divided into non drinkers, no risk; low risk; intermediate to very high risk.

The classification formulae classified people into alcohol risk categories as shown in Table 3.1.

Table 3.1: Categories of Risk Levels

	Number of drinks					
Frequency of drinking	**1-2**	**3-4**	**5-8**	**9-12**	**13-20**	**>20**
Less than once a week	B	B	B	C	D	E
1 or 2 days	B	B	B	C	D	E
3 or 4 days	B	B	C	D	E	F
5 or 6 days	B	C	D	E	F	F
Every day	B	C	D	E	F	F

The risk factor levels have been defined as follows:

Table 3.2: Alcohol risk levels

		Risk	
Category	**Description**	**Men**	**Women**
A	Non-drinkers	None	None
B	Average daily intake of less than 3 drinks	None	Low
C	Average daily intake of 4 drinks or 9-12 drinks in any day	Low	Intermediate
D	Average daily intake of 5-8 drinks or occasional excess	Intermediate	High
E	Average daily intake of 9-12 drinks or frequent or great occasional excessive intake	High	Very high
F	Average daily intake of over 12 drinks	Very high	Very high

Overall, 6.6% (95% CI: 5.7 - 7.6) of study participants had an intermediate to very high alcohol risk. This level of risk is referred to as medium to high alcohol use or consumption throughout the report.

3.3 Hypertension

The National Heart Lung and Blood Institute (NHLBI) has described hypertension as a chronic disease rather than a risk factor, although it is a risk factor for many other diseases (stroke, heart disease, and diabetes complications). Many prospective epidemiological studies have shown that high blood pressure is a major independent risk factor for common adult cardiovascular-renal diseases, cerebral vascular diseases, aortic aneurysm and peripheral vascular disease[32]. In this last respect it is also a major risk factor for complications in diabetes. It is also the most common disease for which treatment is available[33].

The NHLBI in collaboration with other authorities have developed a Stepped Care program that has proved to be effective in reducing all-cause mortality even for people with mild hypertension[33]. In Stepped Care, medication is increased stepwise to bring patients to their diastolic blood pressure (DBP) goal; defined as 90mmHg for those with a diagnosed level of 100mmHg or greater or already receiving antihypertensive therapy and a 10mmHg decrease for those entering with a DBP between 90mmHg and 99mmHg.

The NHLBI Program has emphasised vigorous drug treatment for many years for those with DBP 105mmHg or over but there is now evidence that this should also occur for the mild hypertension group. Given most people with hypertension are in this mild category this is an important finding.

In this study, blood pressure was measured in the clinic using a standard, calibrated blood pressure sphygmomanometer. Two blood pressure measurements were recorded, five to ten minutes apart, while the participant was relaxed and seated. The average of these two recorded measures was used in the analyses.

High blood pressure was defined as systolic blood pressure greater than or equal to 140mmHg and/or diastolic blood pressure greater than or equal to 90 mmHg [18,24]. Overall, 27.7% (95% CI: 26.0 - 29.5) of study participants had high blood pressure.

3.4 Cholesterol

It is well established that high blood cholesterol is a major reversible risk factor for coronary heart disease (CHD). There is a close linear relationship between cholesterol levels and long term mortality, which extends across the range of cholesterol levels[25].

For the majority of people, dietary saturated fat is the main factor that raises blood cholesterol levels. However, genetics plays a role and regardless of dietary intake some people have high cholesterol levels due to a deficiency in high density lipoprotein (HDL) cholesterol, which is thought to mediate the uptake and return of peripheral cholesterol to the liver for bile acid secretion[26].

In Australia, high cholesterol levels pose a significant risk burden. Recent data from the AusDiab study has demonstrated that the average total blood cholesterol (TBC) levels for male and female adults were 5.50 mmol/L and 5.41 mmol/L, respectively[27]. For the same period, 50% of Australian adults aged 25 years and over were determined to be at increased risk of developing CHD, with TBC levels higher than 5.5 mmol/L[27].

Cholesterol lowering drugs or statins are prescribed widely in Australia because these agents, which reduce low density lipoprotein (LDL) cholesterol, reduce CHD mortality. A recent Australian study of the effects of pravastatin, a cholesterol lowering therapy in people with a broad range of cholesterol levels has demonstrated reduced mortality from CHD and overall mortality as well as reduced incidences of cardiovascular outcomes (including heart attack and stroke). The relative risk reduction was in the order of at least 20% for people on therapy compared to those receiving placebo[28]. Cholesterol lowering therapy and its associated benefits has a considerable cost burden however to both the government and patients. In the year ending September 2001, statin therapy accounted for the highest government drug cost ($592 million) and 15% of total government drug costs. This represented a 20% increase on the spending for the previous year[29]. The benefits of strategies to reduce this risk factor burden in terms of health care resource allocation and optimal patient management in high risk primary prevention is clear.

Cholesterol levels in the North West Adelaide Health Study were assessed with a fasting blood sample. For this report, high cholesterol was defined as TBC greater than or equal to 5.5 mmol/L[30]. Overall, 36.5% (95% CI: 34.7 – 38.5) of study participants had high TBC.

3.5 Smoking

The association of smoking with elevated risk of mortality from all causes is well established[31] and includes several cardiovascular diseases, cancer, chronic obstructive pulmonary disease, peripheral vascular disease and others. Adjusted hazard ratios for all causes of mortality show that the risk of death increases with number of cigarettes smoked[31]. The health benefits of cessation are clearly positive regardless of the age of smoking initiation, the age of cessation or daily number of cigarettes smoked[32]. It has also been shown that former smokers had a 24% reduction in cardiovascular disease mortality within two years of quitting[32].

Despite the general population decrease in smoking in Australia in recent decades there are some disturbing trends among young smokers and high rates were found for younger age groups in the present study. Efforts to prevent uptake or continuation of smoking are faced with the countervailing influence of tobacco promotion at point of sale in Australia. Reviews of the literature suggest that many of the strategies used in smoking cessation initiatives have demonstrated some effectiveness and include: educational strategies, pharmacological approaches, regulation, community programs, clean air programs, excise and environmental bans[33,34].

Smoking prevalence was calculated using data obtained from the questionnaire. The information was then divided into non-smokers, ex-smokers and current smokers.

Overall, 26.6% (95% CI: 24.9 - 28.4) of study participants were current smokers.

3.6 Obesity

Obesity is now being identified as reaching epidemic proportions in developed countries and has largely been ignored as a public health intervention issue[35]. There is also a disturbing growth of obesity in children that may lead to chronic disease in adults in the future[36]. Obesity is also related to nutrition and exercise. The human body obeys the laws of thermodynamics and an excess of energy intake over expenditure leads to storage in the form of fat[35]. It has been shown that calorie intake in the United States has increased over the last two decades[37]. Public health and

clinical strategies to address the obesity epidemic must begin with weight maintenance for the adult population, weight loss for those who are obese and a general increase in physical activity for all. Modest weight loss improves glucose tolerance and blood pressure in obese people and gains in these factors will have an impact on chronic diseases.

The decline in tobacco use over recent decades reflects a broad public health strategy and it is reasonable to suggest that declines in obesity will not occur without a similar prevention initiative. Given that obesity continues to rise, failure to invoke public health action will mean a continuing increase in chronic diseases. Because obesity has not been the focus of public health efforts, research will be required to identify effective policies and programs to prevent and reduce obesity on a population basis.

For this report, obesity was determined by using body mass index (BMI). BMI was calculated using height and weight measurements. Measurements were taken in the clinic using calibrated instruments and standard methods. The formula for calculation of BMI is as follows [21]:

$$\text{weight (kg)} / \text{height (m)}^2$$

The criteria for classifying BMI are as follows:

Table 3.3: BMI Criteria

Descriptive term	BMI
Underweight	Less than than 20
Acceptable weight	20 to 25 inclusive
Overweight	greater than 25 and up to and including 30
Obese	greater than 30

Overall, 28.5% (95% CI: 26.8 - 30.4) of study participants were obese.

3.7 Physical Inactivity

Physical inactivity is related to a number of chronic diseases and it has been shown that people who exercised for less than 30 minutes per week had an increased all cause mortality ratio of 2.8 compared to those who exercised for 30 minutes or more per week[38]. Increased mortality risk persisted after adjustment for age, sex, current smoking, functional impairment and co-morbidity score. The relationship between physical inactivity and general adverse health outcomes has been well established and a graded inverse relationship has been demonstrated between measures of physical inactivity and all cause mortality[38]. Inactivity is also a significant predictor of disability in midlife and older populations.

There is a need for public health recognition of the value of maintaining at least minimal levels of physical activity. The Lipids Research Clinics Mortality follow up demonstrates this is true even for older adults with pre-existing cardiovascular disease[39]. As in the case of obesity, organised public health policy is required to increase exercise on a population basis.

Prevalence of physical activity was calculated using data obtained from the self-reported questionnaire. Sufficient physical activity was defined as at least 150 minutes per week of walking, moderate activity or vigorous activity [240].

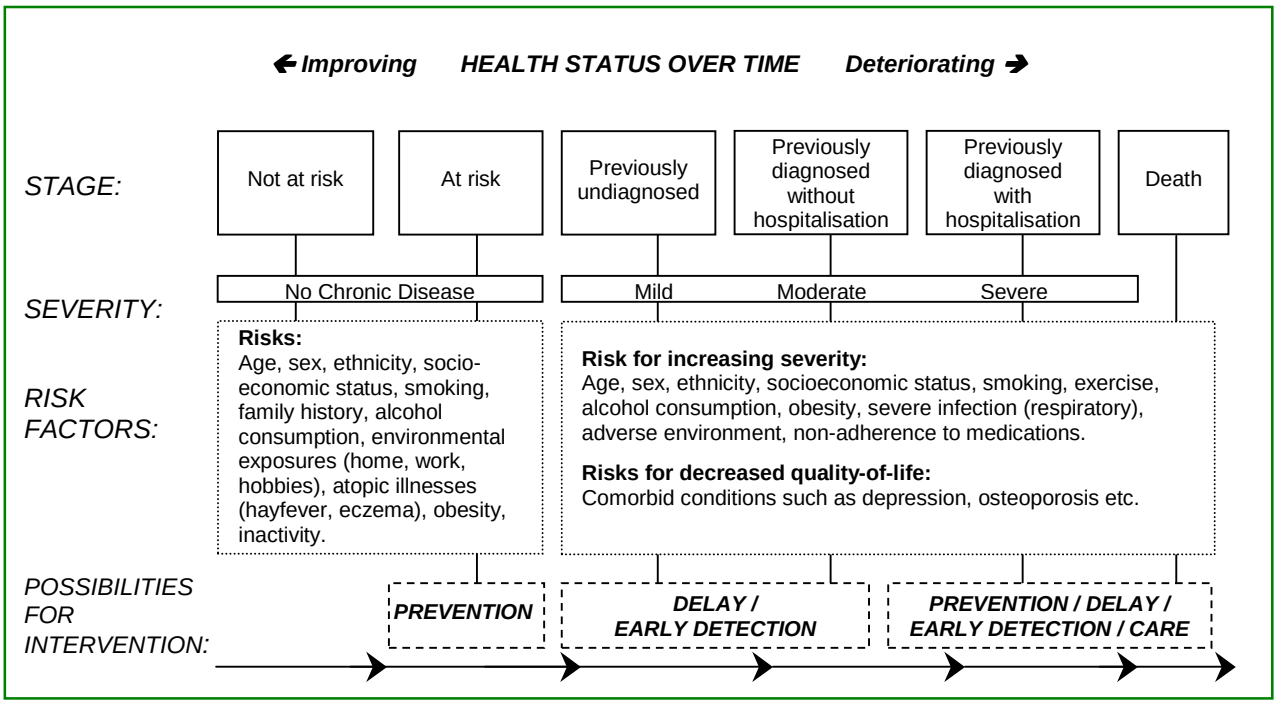
The prevalence of insufficient or no physical activity in North West Adelaide was 48.5% (95% CI: 46.6 - 50.5).

CHAPTER 4: THE IMPORTANCE OF THE CHRONIC DISEASES INCLUDED IN THE NORTH WEST ADELAIDE HEALTH STUDY

4.1 Introduction

The three chronic diseases included in this biomedical study explain a great deal of the overall burden of chronic disease and rank high as national priorities[11,12,41]. They are also diseases where considerable progress can still be made through primary and secondary prevention strategies especially if these are coordinated as part of a public health response to the conditions. Each of the chronic conditions has stages of development when patients have different prevention, management and treatment needs. The North West Adelaide Study Planning Group has described this as the chronic disease continuum. A simplified version of the continuum is shown in Figure 4.1. From this it is apparent that both the management and education needs of someone with, for example, impaired glucose tolerance would be quite different from someone who had been diagnosed with substantive diabetes and had developed complications. The fine line between primary and secondary prevention is also apparent in the continuum. Opportunities for primary prevention exist at both of the first two stages of the continuum for diabetes, COPD and asthma but beyond these stages secondary prevention takes over. There will also be occasions when this demarcation is artificial, for example when someone is diagnosed with impaired glucose tolerance and clearly needs ongoing medical surveillance. The importance of the concept is that an effective public health plan will attempt to minimise transition of people with diabetes, COPD and asthma along the continuum.

Figure 4.1: The Chronic Disease Continuum



Unfortunately much detection does not occur until complications are apparent[43] and people have progressed along the continuum in Figure 4.1. Several studies in recent years have stressed the need for strict control of glycaemia to minimise the progression to micro and macro vascular disease. It is the development of these complications and movement along the continuum that seriously affect quality and quantity-of-life.

In South Australia the Diabetes Clearing House[44] has established a population approach to improve health outcomes in diabetes and has begun the work of establishing performance measures within and across health regions. This will provide vital information of diabetes management and associated health outcomes at a population level and provide further intelligence for health policy. This work is at an early stage of development.

In this study, people with diabetes were defined as those who had a fasting plasma glucose (FPG) level of at least 7.0mmol/L or those who self-reported having been told by a doctor that they have diabetes. The prevalence of diabetes was found to be 6.7% (95% CI: 5.6 – 7.8).

4.3 Chronic Obstructive Airways Disease (COPD)

COPD is characterised by a single physiological feature: the limitation of expiratory airflow. It is, however, a constellation of diseases embracing emphysema and bronchitis. Cigarette smoking is the main cause of COPD resulting in an 80–90% risk of the disease developing at some level[45]. Other factors that increase the risk of COPD include exposure to occupational dust, environmental air pollution or tobacco smoke. Clinical manifestations of COPD include dyspnea, wheeze, cough and sputum production. These symptoms are less common and less severe in the early stages of the disease. As the disease progresses it produces extremely disabling effects on physical and mental health[46].

Early and aggressive management of COPD has not yet reached the levels obtained with some other chronic diseases and it is important that the awareness of the disease is promoted more widely to develop a population understanding of the symptoms, causes and risks. Many people at an early stage of the disease are unaware of their condition and fail to consult their doctor for respiratory symptoms. Consequently they do not receive appropriate counselling and treatment, which will prevent or slow transition along the continuum. The airflow obstruction in COPD is generally progressive over a period of years and is largely irreversible. Early identification and treatment of COPD can lead to substantial declines in mortality and morbidity and improvements in quality-of-life. Identification of mild but clinically significant airflow obstruction is possible using simple spirometry and it is therefore important for doctors to screen patients who fit the risk categories. This can lead to early diagnosis long before symptoms worsen and complications develop. Smoking cessation is an important step in treatment as are rehabilitation programs involving exercise training in established disease.

Differences in COPD have been observed in different ethnic groups and regional differences have also been observed[47]. This may also reflect genetic and/or environmental factors in the disease. Of concern with COPD is the fact that prevalence and disease mortality rates seem to be increasing[47]. Given that COPD is hailed as the fifth leading cause of chronic morbidity and mortality worldwide it fails to receive adequate public health attention.

People with COPD were defined as those with a measured FEV1:FVC ratio less than the result of the formula (87.21 - (0.18 x age)) for males, and (89.10 - (0.19 x age)) for females [48]. In addition, the definition of COPD required that people had not been

diagnosed with asthma[a]. According to the results of the FEV1:FVC ratio formulae and no asthma diagnosis, 21.3% (95% CI 19.7 - 22.9) of participants had COPD.

4.4 Asthma

Asthma is a complex respiratory disorder characterised by chronic inflammation of the airways, recurrent episodes of wheezing, breathlessness, tightness of the chest and reversible airways obstruction. Asthma causes many emergency department visits and hospitalisations. Asthma has been increasing in recent years but the reasons for this are not clear and could be explained by lifestyle, environment, diet, genetics, or combinations of these. The diagnosis of asthma is based on measurement of reversibility of airflow obstruction in addition to an appropriate clinical history. In some patients, particularly the elderly, it can be difficult to discriminate between asthma and COPD. The reversible airway obstruction component in these patients may be difficult to diagnose.

Asthma is a variable disease with fluctuations influenced by exposure to trigger factors and medication. Exacerbations of asthma that may manifest as slow or rapid onset attacks can mean extremely rapid transition along the chronic disease continuum. Effective medication is now available to treat asthma but a considerable component of successful health outcomes are dependent on patient self-management using a written asthma management plan. A minority of the asthma population currently have written management plans despite this having been a major platform of asthma education over the past decade[49].

People with current asthma were defined as those who reported having been told by a doctor that they have asthma or those who had a 15% increase in FEV1 (forced expiratory volume in one second) from pre-Ventolin to post-Ventolin, or those who had a 12% increase in FEV1 from pre-Ventolin to post-Ventolin if their absolute difference in FEV1 was greater than 200ml[b]. From this definition, 11.6% (95% CI: 10.3 - 12.8) of the study participants had current asthma.

[a] Self-reported, current asthma; 15% increase in FEV1 from pre-Ventolin to post-Ventolin; or those who had a 12% increase or FEV1 from pre-Ventolin to post-Ventolin if their absolute difference in FEV1 was greater than 200ml.

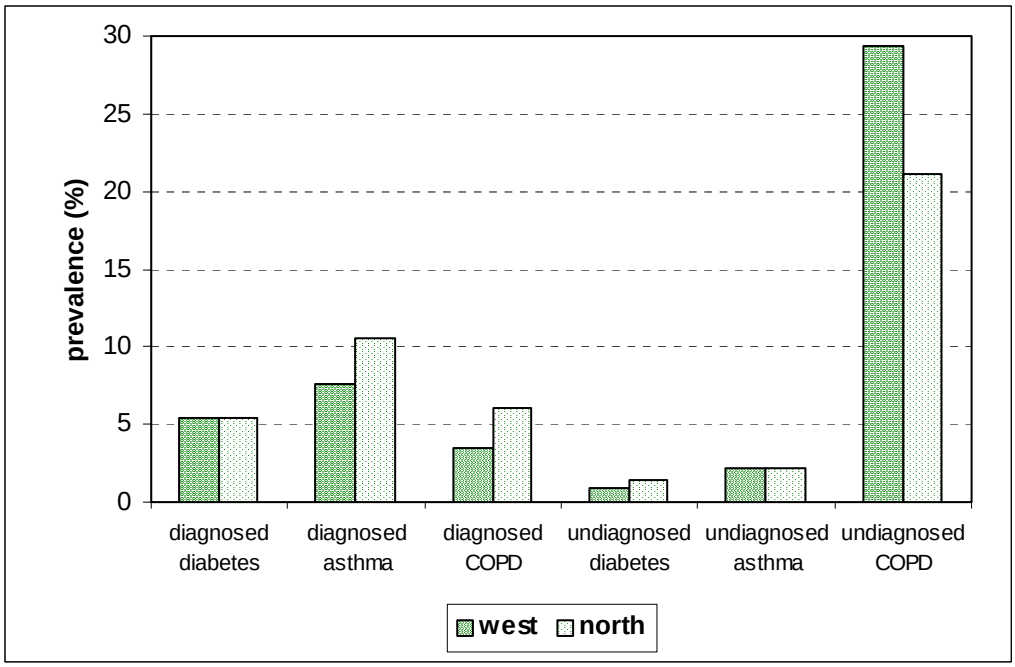
[b] It is recognised that the above criteria may miss some people with undiagnosed asthma who may be detected by measurement of airway hyper responsiveness.

4.5 Undiagnosed disease in North West Adelaide

Undiagnosed chronic disease is an important phenomenon in disease planning. It is this group who may not appear at a health service until they have developed complications associated with the primary condition. They may also represent a group of people with whom cost-effective secondary prevention could occur.

In north west Adelaide the prevalence of undiagnosed diabetes was 1.2%. Of those people with diabetes, 18.3% were undiagnosed. The prevalence of undiagnosed asthma was 2.2%. Of those people with asthma, 19.1% were undiagnosed. The prevalence of undiagnosed COPD was 19.7%. Of those people with COPD, 92.8% were undiagnosed. The overall proportion of undiagnosed disease for all conditions was 61%. These proportions are shown graphically in Figure 3. It should also be pointed out that the prevalence estimates for asthma are likely to be an underestimate because the diagnosis requires a measure of airway hyper responsiveness, which was not possible in this study. These measures will increase the asthma prevalence estimate further. Undiagnosed disease was more prevalent in the west. The largest proportions of undiagnosed COPD patients suffer mild COPD, but this is the group, as mentioned earlier, who would benefit from early detection and intervention. It is possible to stop further deterioration by good management at an early stage of COPD symptom detection. Similar gains may be possible with diabetes especially if the undiagnosed have not yet developed complications. A further 5.5% of the north west study group overall have elevated blood glucose levels (6.1 to 7.0mmol/L) and may be another important prevention group. Further work is required with the undiagnosed group to determine the reasons for non-diagnosis.

Figure 4.2: Prevalence of diagnosed and undiagnosed chronic disease conditions in the northern and western regions of Adelaide

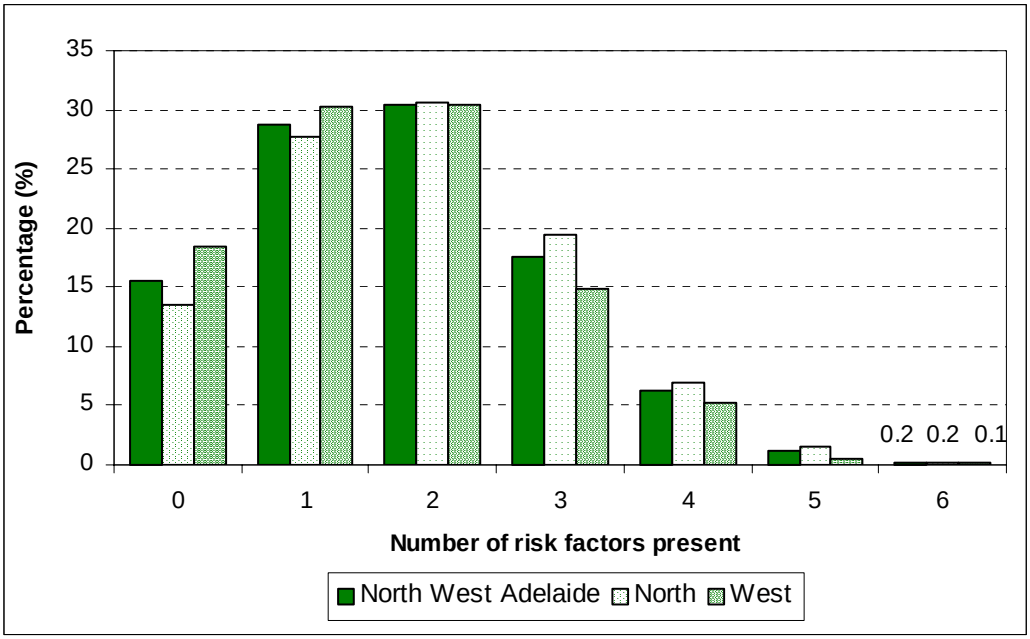


CHAPTER 5: RESULTS

5.1 Introduction

The risk factors included in the following analyses are medium to high alcohol consumption, high blood pressure, high cholesterol, smoking, obesity, and physical inactivity. The proportion of people who had none or one to six of these risk factors is shown in Figure 5.1. Overall, 15.6% of people living in North West Adelaide had no risk factors, 28.8% had one risk factor, 30.5% had two risk factors and 25.1% had three or more risk factors.

Figure 5.1: Number of risk factors by region



5.2 Prevalence of One or More Risk Factors in North West Adelaide

Figure 5.2, Figure 5.3 and Figure 5.4 show the number of risk factors associated with diagnosed chronic disease conditions in north west Adelaide. It can be seen from Figure 5.2 that having one or more risk factors is very common for all three chronic disease conditions studied. In the north west area over 85% of people with COPD have at least one risk factor, over 57% have two risk factors and almost 25% have three or more risk factors. This pattern is even more pronounced for diabetes, which has the greatest burden of risk factors with 74% of this chronic disease group having two or more risk factors and over 45% with three.

Figure 5.3 and Figure 5.4 show that there is some variation in risk factor prevalence between the north and west regions with the northern region having the greatest prevalence of two or more risk factors for all three chronic diseases. There are also a smaller proportion of people in the northern region who do not have any risk factors associated with each of the chronic conditions.

The management of chronic disease conditions with multiple risk factors points to a complex treatment and education problem for health services. Failure to deal effectively with the risk factors will lead to disease complications. The data also point to the need for the regions to deal effectively with risk factors from both a primary and secondary prevention perspective. Given the varying burden and, as we will see varying combinations of risk factors, the evidence also argues for individualising regional strategies and interventions that will modify each regional risk factor profile over time.

Figure 5.2: Prevalence of risk factors associated with chronic disease conditions in north west Adelaide (n=2523)

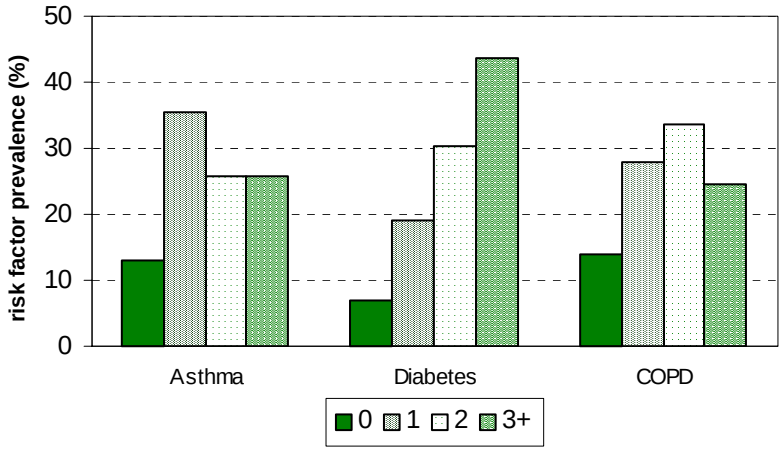


Figure 5.3: Prevalence of risk factors associated with chronic disease conditions in the western region (n=1410)

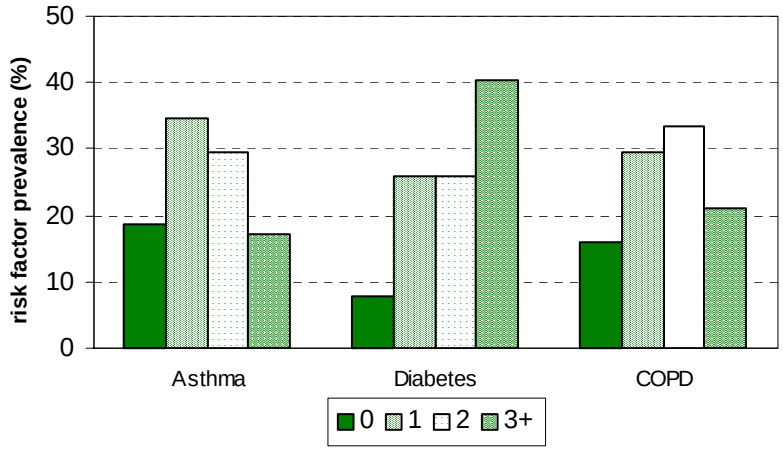
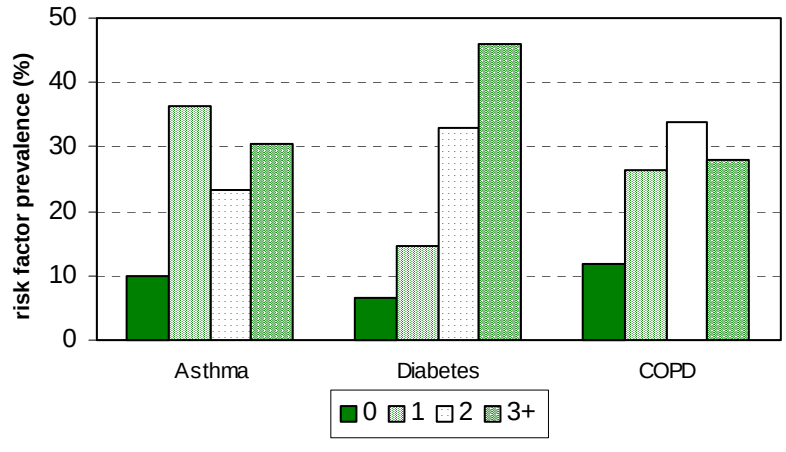


Figure 5.4: Prevalence of risk factors associated with chronic disease conditions in the northern region (n=1113)



5.3 Demographic variables Associated with One or More Risk Factors in North West Adelaide

Table 5.1, Table 5.2 and Table 5.3 show the variables associated with one or more risk factors in north west Adelaide and the north and west regions separately. The odds ratios in the tables denote the increased or decreased probability of having the risk factor in a specific variable category compared to the probability of having no risk factors. For example, if the odds ratio for females having one risk factor is 1.25 compared to males, as is shown in Table 5.1, then the probability of females having the risk factor is increased by 25% over males.

Table 5.1 shows that the odds of having one, two or three or more risk factors in north west Adelaide is elevated for most categories of the demographic variables with the exception of employment and country of birth. The data in the table show increased probability of having one, two or three or more risk factors for increasing age, lower income, receiving a DSS pension, married or living with a partner and lower education levels. There is a trend for the odds ratios to increase (denoting greater risk) as the number of risk factors increase for age, income and education. Of particular interest are the high proportions of European migrants with two or more risk factors, people over fifty years and those with apprenticeship or only secondary education. These groups with multiple risk factors are those most likely to have a chronic condition or be at risk for developing one and are priority target groups for action.

For the western region and northern regions there is some variation in the risk factor patterns but increasing age, lower income, in receipt of a DSS pension, married or living with a partner and lower education level is common to both regions.

Table 5.1: Demographic variables associated with having one or more risk factors, compared to having no risk factors, in the North West Adelaide region (n=2523)

	No risk factors	1 risk factor			2 risk factors			≥ 3 risk factors		
Demographic	**n**	**n**	**%**	**OR**	**n**	**%**	**OR**	**n**	**%**	**OR**
Gender										
Female	177	367	67.5	***1.25***	415	70.1	***1.43***	328	64.9	***1.31***
Male	216	359	62.4	1.00	355	62.2	1.00	305	58.5	1.00
Age										
≤ 39 years	252	353	58.3	1.00	328	56.6	1.00	197	43.8	1.00
40-49 years	60	130	68.4	***1.55****	138	69.7	***1.77****	128	68.1	***2.73****
50-59 years	33	81	71.1	***1.75****	121	78.5	***2.82****	161	83.0	***6.24****
≥ 60 years	49	163	76.8	***2.37****	183	78.8	***2.87****	193	79.8	***5.04****
Marital status										
Married, partner, not stated	199	488	71.0	***1.99****	479	70.6	***1.72****	414	67.5	***1.84****
Divorced, widowed, never married	194	239	55.2	1.00	271	58.3	1.00	219	53.0	1.00
Income										
≤ $20,000	60	162	73.0	***2.24****	200	76.9	***2.69****	169	73.8	***3.99****
$20,001 - $40,0000	74	192	72.1	***2.15****	205	73.5	***2.20****	182	71.6	***3.02****
$40,001 - $60,0000	98	178	64.4	***1.51****	162	62.3	1.31	138	58.4	***1.47****
≥ $60,001	161	194	53.5	1.00	203	55.8	1.00	145	45.8	1.00
Employment Status										
Full-time	165	262	61.4	1.00	288	63.6	1.00	219	57.0	1.00
Part-time	68	137	66.8	***1.27***	127	65.1	1.07	87	56.1	1.00
Unemployed	18	30	62.5	***1.05***	41	69.5	1.30	35	66.0	1.52
Home duties, retired, student, other	141	297	67.8	***1.33***	314	69.2	1.28	292	67.4	***1.62****
Receive a DSS pension										
Yes	71	229	76.3	***2.09****	258	78.4	***2.29****	252	78.0	***3.00****
No	322	497	93.9	1.00	512	94.1	1.00	381	92.2	1.00
Highest Education Level										
Secondary, other, not stated	160	323	66.8	***1.76****	386	70.1	***2.79****	346	68.4	***6.56****
Apprenticeship, certificate, diploma	145	302	67.6	***1.82****	308	67.9	***2.46****	259	64.1	***5.42****
Bachelor degree or higher	88	101	53.4	1.00	76	46.3	1.00	29	24.8	1.00
Country of Birth										
Australia	286	516	64.3	1.00	521	64.5	1.00	445	60.9	1.00
United Kingdom, Ireland	60	125	67.6	1.15	138	69.7	1.26	113	65.3	***1.21***
Europe	22	51	69.9	1.28	69	75.8	***1.72***	69	75.8	***2.02****
Asia, other	24	35	59.3	0.81	42	63.6	0.96	7	22.6	***0.19****

Figures in ***bold, italic*** p<0.05; ***bold*, *italic*** p<0.001

Table 5.2: Demographic variables associated with having one or more risk factors, compared to having no risk factors, in the northern region (n=1113)

	No risk factors	1 risk factor			2 risk factors			≥ 3 risk factors		
Demographic	**n**	**n**	**%**	**OR**	**n**	**%**	**OR**	**n**	**%**	**OR**
Gender										
Female	64	161	71.6	***1.49***	187	74.5	***1.66****	151	70.2	1.27
Male	87	147	62.8	1.00	153	63.8	1.00	162	65.1	1.00
Age										
≤ 39 years	101	169	62.6	1.00	147	59.3	1.00	109	51.9	1.00
40-49 years	23	49	68.1	1.27	67	74.4	***2.00****	66	74.2	***2.66****
50-59 years	12	31	72.1	1.54	57	82.6	***3.26****	60	83.3	***4.63****
≥ 60 years	17	60	77.9	***2.11****	69	80.2	***2.79****	78	82.1	***4.25****
Marital status										
Married, partner, not stated	76	214	73.8	***2.25****	223	74.6	***1.88****	210	73.4	***2.03****
Divorced, widowed, never married	75	94	55.6	1.00	117	60.9	1.00	102	57.6	1.00
Income										
≤ $20,000	21	65	75.6	***2.21****	87	80.6	***2.78****	73	77.7	***2.79****
$20,001 - $40,0000	29	85	74.6	***2.09****	96	76.8	***2.22****	91	75.8	***2.52****
$40,001 - $60,0000	44	79	64.2	1.28	73	62.4	1.11	78	63.9	1.42
≥ $60,001	57	80	58.4	1.00	85	59.9	1.00	71	55.5	1.00
Employment Status										
Full-time	52	110	67.9	1.00	126	70.8	1.00	115	68.9	1.00
Part-time	31	61	66.3	0.93	55	64.0	0.73	47	60.3	0.69
Unemployed	10	10	50.0	0.47	23	69.7	0.95	20	66.7	0.90
Home duties, retired, student, other	58	127	68.6	1.04	137	70.3	0.97	130	69.1	1.01
Receive a DSS pension										
Yes	23	92	80.0	***2.37****	109	82.6	***2.63****	120	83.9	***3.48****
No	128	216	62.8	1.00	231	64.3	1.00	192	60.0	1.00
Highest Education Level										
Secondary, other, not stated	74	154	67.5	1.43	184	71.3	***2.60****	177	70.5	***5.85****
Apprenticeship, certificate, diploma	56	123	68.7	1.51	136	70.8	***2.54****	126	69.2	***5.50****
Bachelor degree or higher	22	32	59.3	1.00	21	48.8	1.00	9	29.0	1.00
Country of Birth										
Australia	108	212	66.3	1.00	217	66.8	1.00	210	66.0	1.00
United Kingdom, Ireland	33	73	68.9	1.13	86	72.3	1.30	67	67.0	1.04
Europe	10	16	61.5	0.82	21	67.7	1.05	33	76.7	1.70
Asia, other	1	8	88.9	4.08	17	94.4	***8.46****	4	80.0	2.06

Figures in ***bold, italic*** p<0.05; ***bold*, *italic*** p<0.001

Table 5.3: Demographic variables associated with having one or more risk factors, compared to having no risk factors, in the western region (n=1410)

	No risk factors	1 risk factor			2 risk factors			≥ 3 risk factors		
Demographic	**n**	**n**	**%**	**OR**	**n**	**%**	**OR**	**n**	**%**	**OR**
Gender										
Female	124	207	62.5	1.03	225	64.5	1.21	172	58.1	***1.56****
Male	136	221	61.9	1.00	204	60.0	1.00	121	47.1	1.00
Age										
≤ 39 years	159	173	52.1	1.00	178	52.8	1.00	69	30.3	1.00
40-49 years	40	88	68.8	***2.02****	66	62.3	1.47	54	57.4	***3.11****
50-59 years	23	54	70.1	***2.16****	61	72.6	***2.37****	50	68.5	***5.01****
≥ 60 years	37	114	75.5	***2.83****	124	77.0	***2.99****	121	76.6	***7.54****
Marital status										
Married, partner, not stated	133	274	67.3	***1.70****	246	64.9	1.28	180	57.5	***1.52***
Divorced, widowed, never married	127	154	54.8	1.00	183	59.0	1.00	113	47.1	1.00
Income										
≤ $20,000	43	103	70.5	***2.32****	114	72.6	***2.50****	99	69.7	***3.99****
$20,001 - $40,0000	47	105	69.1	***2.16****	104	68.9	***2.09****	82	63.6	***3.02****
$40,001 - $60,0000	54	100	64.9	***1.79****	89	62.2	***1.55***	46	46.0	1.47
≥ $60,001	116	120	50.8	1.00	123	51.5	1.00	67	36.6	1.00
Employment Status										
Full-time	132	158	54.5	1.00	164	55.4	1.00	88	40.0	1.00
Part-time	36	75	67.6	***1.74***	74	67.3	***1.65***	32	47.1	1.33
Unemployed	6	22	78.6	***3.06****	13	68.4	1.74	12	66.7	***3.00***
Home duties, retired, student, other	86	173	66.8	***1.68***	179	67.5	***1.68****	160	65.0	***2.79****
Receive a DSS pension										
Yes	55	145	72.5	***1.92****	153	73.6	***2.08****	124	69.3	***2.75****
No	206	283	57.9	1.00	276	57.3	1.00	169	45.1	1.00
Highest Education Level										
Secondary, other, not stated	83	160	65.8	***1.93****	190	69.6	***2.81****	147	63.9	***5.98****
Apprenticeship, certificate, diploma	96	187	66.1	***1.95****	173	64.3	***2.21****	122	56.0	***4.29****
Bachelor degree or higher	81	81	50.0	1.00	66	44.9	1.00	24	22.9	1.00
Country of Birth										
Australia	194	316	62.0	1.00	316	62.0	***1.00***	224	53.6	1.00
United Kingdom, Ireland	21	36	63.2	1.05	30	58.8	0.88	32	60.4	1.32
Europe	13	41	75.9	***1.94***	57	81.4	***2.69****	34	72.3	***2.27***
Asia, other	31	34	52.3	0.67	26	45.6	***0.51***	3	8.8	***0.08****

Figures in ***bold, italic*** p<0.05; ***bold*, *italic*** p<0.001

5.4 Logistic Regression Analyses of Variables Associated with One or More Risk Factors in North-West Adelaide

When the variables that are related significantly at a bivariate level ($p<0.25$) are entered into logistic regression analyses the explanatory nature of the variables is modified. The variables that were statistically significant in the previous analyses and were associated with one or more risk factors in north-west Adelaide and the north and west regions separately were entered into logistic regression analyses to determine the best set of descriptive variables associated with having one, two or three or more risk factors. These analyses are shown in Table 5.4.

It can be seen that the variables that provide the best overall description for having one risk factor are: married or living with a partner, a household income between $20,001 and $60,000, receiving a DSS pension and secondary education level only.

The variables that best describe those with two risk factors are: female, increasing age, married or living with a partner, a household income between $20,001 and $60,000, in receipt of a DSS pension, and lower educational status. The variables that best describe those with three or more risk factors are: increasing age, a household income between $20,001 and $60,000, in receipt of a DSS pension and lower educational status.

For the western and northern regions separately there was some variation in the variables associated with one, two or three risk factors. Age, education and income level are fairly consistent variables across the two regions for three or more risk factors but the associations of these with other factors reflect the different ecological footprints and varying socio-economic context of the regions and within which constellations of risk factors have developed. It should be remembered that these data identify associations with numbers of risk factors but not the combination of risk factors and as will be shown these also vary across regions.

Table 5.4: Logistic regression analyses of the demographic variables associated with one or more risk factors in north west Adelaide and for each region

	1 risk factor		2 risk factors		3 risk factors	
Region	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**
NORTH WEST	**Marital status:** Married, living with a partner, not stated	1.89	**Age:** 40-49 years	1.59	**Age:** 40-49 years	2.85
			50-59 years	2.43	50-59 years	4.37
			≥ 60 years	1.99	≥60 years	3.85
	Income:		**Income:**		**Income:**	
	$20-$40K	1.95	$20-$40K	1.60	$20-$40K	2.21
	$40-$60K	1.51	$40-$60K	2.14	$40K-$60K	1.88
	DSS pension:	1.96	**DSS pension:**	1.82	**DSS pension:**	2.27
	Education:		**Education:**		**Education:**	
	Secondary	1.52	Secondary	2.29	Secondary	5.67
			Apprentice, certificate, diploma	1.91	Apprentice, certificate, diploma	4.31
			Marital status:		**Country of birth:**	
			Married, living with a partner, not stated	1.34	UK, Ireland	0.62
					Asia, other	0.18
			Female:	1.54		
NORTH	**Marital status:** Married, living with a partner, not stated	2.17	**Age:** 40-49 years	1.91	**Age:** 40-49 yrs	3.10
			50-59 years	2.93	50-59 yrs	5.05
					≥60 yrs	3.09
	Income:		**Marital status:**		**Income:**	
	$20-$40K	1.79	Married, living with a partner, not stated	1.65	$20-$40K	1.90
					$40K-$60K	1.92
	DSS pension:	3.09	**Country of birth:**		**DSS pension:**	3.05
			Asia, other	7.88		
			Education:		**Education:**	
			Secondary	2.25	Secondary	5.26
					Apprentice, certificate, diploma	4.91
WEST	**Age:**		**Age:**		**Age:**	
	40-49 years:	1.83	50-59 years	2.03	40-49 yrs	3.23
			≥ 60 plus years	2.20	50-59 yrs	4.29
					≥60 yrs	4.71
	Income:		**Income:**		**Income:**	
	$20-$40K	1.94	$20-$40K	1.93	$20K-$40K	1.95
	$40-$60K	2.36	$40-$60K	1.79		
	Marital status:		**Education:**		**Education:**	
	Married, living with a partner, not stated	1.67	Secondary	1.82	Secondary	4.61
			Apprentice, certificate, diploma	1.77	Apprentice, certificate, diploma	3.79
	Unemployment:	3.28	**Country of birth:**		**Country of birth:**	
			European	2.00	Asia	0.08
					Unemployment:	5.06

Note: To ascertain reference category for each variable, please refer to Table 5.1, Table 5.2 & Table 5.3

5.5 Prevalence of Specific Risk Factors and Combinations of Risk Factors in North West Adelaide

Table 5.5, Table 5.6 and Table 5.7 show the prevalence for each type of risk factor and for pairs of risk factor combinations in north west Adelaide. In the tables the overall prevalence of each risk factor is shown on the bold diagonal line. Table 5.5 shows the overall prevalence of risk factors in the north west of Adelaide ranges from 6.6% of people with medium to high alcohol consumption, to 48.2% who do not undertake sufficient activity.

Table 5.6 and Table 5.7 show the regional variations in risk factor prevalence and it can be seen that the northern region has a higher risk factor burden for all risk factors, with the exception of total cholesterol, when compared to the overall profile for north west Adelaide. The risk factor burden for the western region is lower than the overall north west burden, again with the exception of total cholesterol.

There are some notable differences between the western and northern regions. Obesity is eleven percentage points higher in the north compared to the west. Physical inactivity, blood pressure and smoking are all in the region of five percentage points higher in the north.

The prevalence of risk factor combinations can be seen to the left and right of the bold diagonal. If, for example, smoking is considered as the first risk factor of a combination then the prevalence of smokers who are obese is 23% (Table 5.5). If obesity is considered as the first risk factor then 22% of those who are obese also smoke. The population prevalence of those who are both obese and smoke is the figure in brackets (6.1%). Of concern is the fact that more than half the smoking and obese populations are involved in insufficient activity. Some of the associated effects of obesity are also reflected in the high rates of blood pressure and blood cholesterol in this group. Overall, these analyses identify the need to consider different combinations of risk factors for interventions in each region.

The additional burden of combinations of risk factors increases the probability of developing chronic disease or impairs the ability to stabilise and manage chronic conditions. Guidelines for primary care need to acknowledge this management complexity and the fact that combinations of risk factors are very common.

Table 5.5: Prevalence of Risk Factor Combination in north west Adelaide (n=2523)

Risk Factors		Second risk factor					
		Obese n= 720	Smoking n= 671	Med-high alcohol n= 166	High BP n= 699	High TBC n= 922	Insufficient activity n= 1215
First risk factor	Obese	**28.5**	21.6 (6.1)	5.1 (1.5)	43.5 (12.4)	39.4 (11.2)	53.8 (15.3)
	Smoking	23.1 (6.1)	**26.6**	15.0 (4.0)	18.6 (5.0)	36.5 (9.7)	53.7 (14.3)
	Med-high alcohol	22.3 (1.5)	60.8 (4.0)	**6.6**	24.7 (1.6)	43.4 (2.9)	53.0 (3.5)
	High BP	44.8 (12.4)	17.9 (5.0)	5.9 (1.6)	**27.7**	47.4 (13.1)	54.9 (15.2)
	High TBC	30.7 (11.2)	26.6 (9.7)	7.8 (2.9)	35.9 (13.1)	**36.5**	50.9 (18.6)
	Insufficient activity	31.9 (15.3)	29.7 (14.3)	7.2 (3.5)	31.6 (15.2)	38.6 (18.6)	**48.5**

Note:
- BP: blood pressure; TBC: total blood cholesterol.
- Data represent the Percentage of population with first risk factor having second factor (Percentage of region population with both risk factors).
- Data in **bold** represent the Percentage of region population with the risk factor

Table 5.6: Prevalence of Risk Factor Combinations in the northern region (n=1113)

Risk Factors		Second risk factor					
		Obese n= 367	Smoking n= 317	Med-high alcohol n= 80	High BP n= 331	High TBC n= 390	Insufficient activity n= 559
First risk factor	Obese	**33.0**	22.6 (7.5)	4.9 (1.6)	43.6 (14.4)	39.5 (13.0)	55.0 (18.1)
	Smoking	26.3 (7.5)	**28.5**	15.8 (4.5)	22.2 (6.3)	32.9 (9.4)	54.3 (15.4)
	Med-high alcohol	22.5 (1.6)	62.5 (4.5)	**7.2**	22.5 (1.6)	40.0 (2.9)	58.0 (4.2)
	High BP	48.3 (14.4)	21.1 (6.3)	5.4 (1.6)	**29.8**	46.8 (13.9)	58.1 (17.3)
	High TBC	37.2 (13.0)	26.7 (9.4)	8.2 (2.9)	39.7 (13.9)	**35.0**	52.9 (18.6)
	Insufficient activity	36.1 (18.1)	30.7 (15.4)	8.4 (4.2)	34.5 (17.3)	37.0 (18.6)	**50.3**

Note:
- BP: blood pressure; TBC: total blood cholesterol.
- Data represent the Percentage of population with first risk factor having second factor (Percentage of region population with both risk factors).
- Data in **bold** represent the Percentage of region population with the risk factor

Table 5.7: Prevalence of Risk Factor Combinations in the western region (n=1410)

Risk Factors		Second risk factor					
		Obese n= 310	Smoking n= 337	Med-high alcohol n= 80	High BP n= 348	High TBC n= 546	Insufficient activity n= 636
First risk factor	Obese	**22.0**	19.0 (4.2)	5.5 (1.2)	43.1 (9.5)	39.0 (8.6)	51.1 (11.3)
	Smoking	17.5 (4.2)	**23.9**	13.9 (3.3)	12.2 (2.9)	42.7 (10.2)	52.8 (12.6)
	Med-high alcohol	21.3 (1.2)	58.8 (3.3)	**5.7**	28.8 (1.6)	50.0 (2.8)	42.5 (2.4)
	High BP	38.4 (9.5)	11.8 (2.9)	6.6 (1.6)	**24.7**	48.3 (11.9)	49.3 (12.2)
	High TBC	22.2 (8.6)	26.4 (10.2)	7.3 (2.8)	30.8 (11.9)	**38.7**	48.2 (18.7)
	Insufficient activity	25.0 (11.3)	28.0 (12.6)	5.3 (2.4)	27.0 (12.2)	41.4 (18.7)	**45.1**

Note:
- BP: blood pressure; TBC: total blood cholesterol.
- Data represent the Percentage of population with first risk factor having second factor (Percentage of region population with both risk factors).
- Data in **bold** represent the Percentage of region population with the risk factor

5.6 Prevalence of Specific Risk Factors and Combinations of Risk Factors by Chronic Disease Condition

Table 5.8, Table 5.9 and Table 5.10 show the risk factor prevalence and combinations for each type of risk factor in north west Adelaide for people with asthma, COPD and diabetes. Again the prevalence of each risk factor is shown on the bold diagonal line. It should be remembered that these prevalence rates are for risk factors within each disease condition and not for the population as a whole.

Table 5.8 shows that for people with asthma the prevalence of risk factors range from 6.5% for medium/high alcohol consumption to 49.3% for insufficient activity. For those with COPD risk factors range from 9.8% for medium/high alcohol consumption to 48.8% for insufficient activity (Table 5.9). For people with diabetes the prevalence of risk factors range from 4.5% for medium/high alcohol consumption to 54.7% for insufficient activity (Table 5.10).

Of concern in these analyses is the high prevalence of smoking at 40.3% of the COPD population and obesity (56.2%) and high blood pressure (59.6%) in the diabetes population.

In terms of risk factor combinations it is important to identify the high blood pressure and insufficient activity combination (62%) in the asthmatic population; the high smoking and insufficient activity combination in those with COPD, and; the high blood pressure (65%) and cholesterol rates (42%) in the diabetes population for those who are obese.

Some important similarities and differences are apparent in the combinations of risk factors across the chronic conditions. The prevalence of people who are obese and smoke is fairly constant across all the disease conditions. On the other hand among people with diabetes, the prevalence of smokers who are obese is almost three times the prevalence of this combination for the other two conditions. These data again point to different targeting needs when addressing the risk factors and combinations of risk factors for each of the chronic disease conditions.

Table 5.8: Prevalence of risk factor combinations associated with asthma (n=292)

Risk Factors		Second risk factor					
		Obese n= 96	Smoking n= 68	Med-high alcohol n= 19	High BP n= 87	High TBC n= 93	Insufficient activity n= 144
First risk factor	Obese	**33.0**	14.6 (4.8)	1.0 (0.3)	37.5 (12.3)	42.7 (14.1)	47.9 (15.8)
	Smoking	20.6 (4.8)	**23.4**	20.3 (4.8)	29.4 (6.8)	33.8 (7.9)	59.4 (14.0)
	Med-high alcohol	5.0 (0.3)	70.0 (4.8)	**6.5**	15.0 (1.0)	15.0 (1.0)	73.7 (4.8)
	High BP	41.4 (12.3)	23.0 (6.8)	3.4 (1.0)	**29.8**	41.4 (12.3)	62.1 (18.5)
	High TBC	44.1 (14.1)	24.7 (7.9)	3.2 (1.0)	38.7 (12.3)	**31.8**	51.6 (16.4)
	Insufficient activity	31.9 (15.8)	28.5 (14.0)	9.7 (4.8)	37.5 (18.5)	33.3 (16.4)	**49.3**

Note:

- BP: blood pressure; TBC: total blood cholesterol.
- Data represents the Percentage of asthma/ COPD/ diabetes population with first risk factor having second factor.
- Data in parentheses represents the Percentage of asthma/ COPD/ diabetes population with both risk factors.
- Data in **bold** represents the Percentage of asthma/ COPD/ diabetes population with the risk factor.

Table 5.9: Prevalence of risk factor combinations associated with COPD (n=533)

Risk Factors		Second risk factor					
		Obese n= 115	Smoking n= 215	Med-high alcohol n= 52	High BP n= 124	High TBC n= 195	Insufficient activity n= 260
First risk factor	Obese	**21.6**	37.4 (8.1)	10.4 (2.2)	40.9 (8.8)	39.1 (8.4)	44.7 (9.6)
	Smoking	20.0 (8.1)	**40.3**	12.6 (5.1)	18.1 (7.3)	33.0 (13.3)	58.1 (23.5)
	Med-high alcohol	22.6 (2.2)	50.9 (5.18)	**9.8**	38.5 (3.8)	66.0 (6.6)	59.6 (5.8)
	High BP	37.9 (8.8)	31.5 (7.3)	16.1 (3.8)	**23.3**	52.4 (12.2)	45.2 (10.5)
	High TBC	23.1 (8.4)	36.6 (13.3)	17.9 (6.6)	33.5 (12.2)	**36.5**	51.5 (18.8)
	Insufficient activity	19.7 (9.6)	48.3 (23.5)	11.9 (5.8)	21.5 (10.5)	38.6 (18.8)	**48.8**

Note: BP: blood pressure; TBC: total blood cholesterol.
Data represents the Percentage of asthma/ COPD/ diabetes population with first risk factor having second factor.
Data in parentheses represents the Percentage of asthma/ COPD/ diabetes population with both risk factors.
Data in **bold** represents the Percentage of asthma/ COPD/ diabetes population with the risk factor.

Table 5.10: Prevalence of risk factor combinations associated with diabetes (n=168)

Risk Factors		Second risk factor					
		Obese n= 94	Smoking n= 29	Med-high alcohol n= 8	High BP n= 100	High TBC n= 59	Insufficient activity n= 92
First risk factor	Obese	**56.2**	18.1 (10.2)	5.3 (3.0)	64.9 (36.3)	41.5 (23.4)	58.8 (32.9)
	Smoking	58.6 (10.2)	**17.5**	10.3 (1.8)	48.3 (8.3)	44.8 (7.7)	58.6 (10.2)
	Med-high alcohol	71.4 (3.0)	42.9 (1.8)	**4.5**	57.1 (2.4)	57.1 (6.8)	25.0 (1.2)
	High BP	61.0 (36.3)	14.0 (8.3)	4.0 (2.4)	**59.6**	39.0 (23.2)	58.0 (34.5)
	High TBC	67.2 (23.4)	22.0 (7.7)	6.8 (2.4)	66.1 (23.2)	**35.0**	49.2 (17.3)
	Insufficient activity	60.4 (32.9)	18.7 (10.2)	2.2 (1.2)	63.0 (34.5)	31.5 (17.3)	**54.7**

Note: BP: blood pressure; TBC: total blood cholesterol.
Data represents the Percentage of asthma/ COPD/ diabetes population with first risk factor having second factor.
Data in parentheses represents the Percentage of asthma/ COPD/ diabetes population with both risk factors.
Data in **bold** represents the Percentage of asthma/ COPD/ diabetes population with the risk factor.

5.7 Prevalence of Chronic Disease Within Various Risk Factor Combinations

Another way to assess the importance of risk factors is to look at the proportion of chronic disease that exists within each risk factor combination. Figure 5.5, Figure 5.6 and Figure 5.7 show the prevalence rates for chronic conditions within each of the risk factor combinations. Within each of the disease conditions there is a strong trend for risk factor combinations to be extremely common.

For asthma there is a fairly even spread of risk factor combinations with the smoking/high blood pressure and medium high alcohol/insufficient activity combinations dominating the profile. For diabetes a number of combinations associated with obesity and high blood pressure predominate. For COPD all smoking combinations are associated with high disease prevalence, indicating that there are important additional risk factors in combination with smoking.

These data identify again the complexity of risk factor associations within the chronic disease conditions and the need to differentially target each chronic condition. In management and secondary prevention initiatives, there will be several related risk factor conditions that need to be dealt with (eg obesity/high blood pressure, smoking/high blood pressure) and within these combinations there may be a causal relationship. In these cases dealing with simply one risk factor may have little effect.

Figure 5.5: Prevalence of COPD in people in the north west with combinations of risk factors

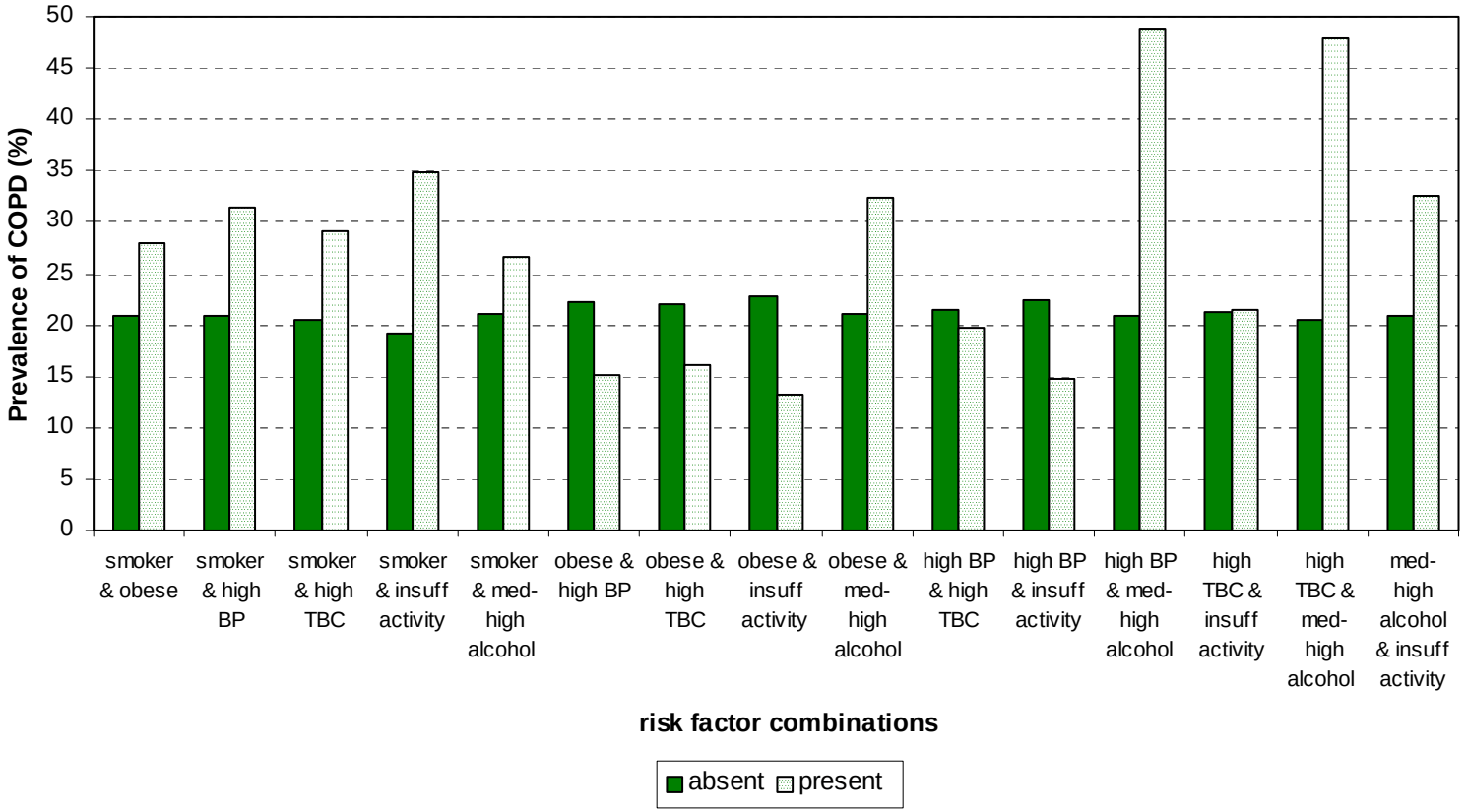


Figure 5.6: Prevalence of asthma in people in the north west with combinations of risk factors

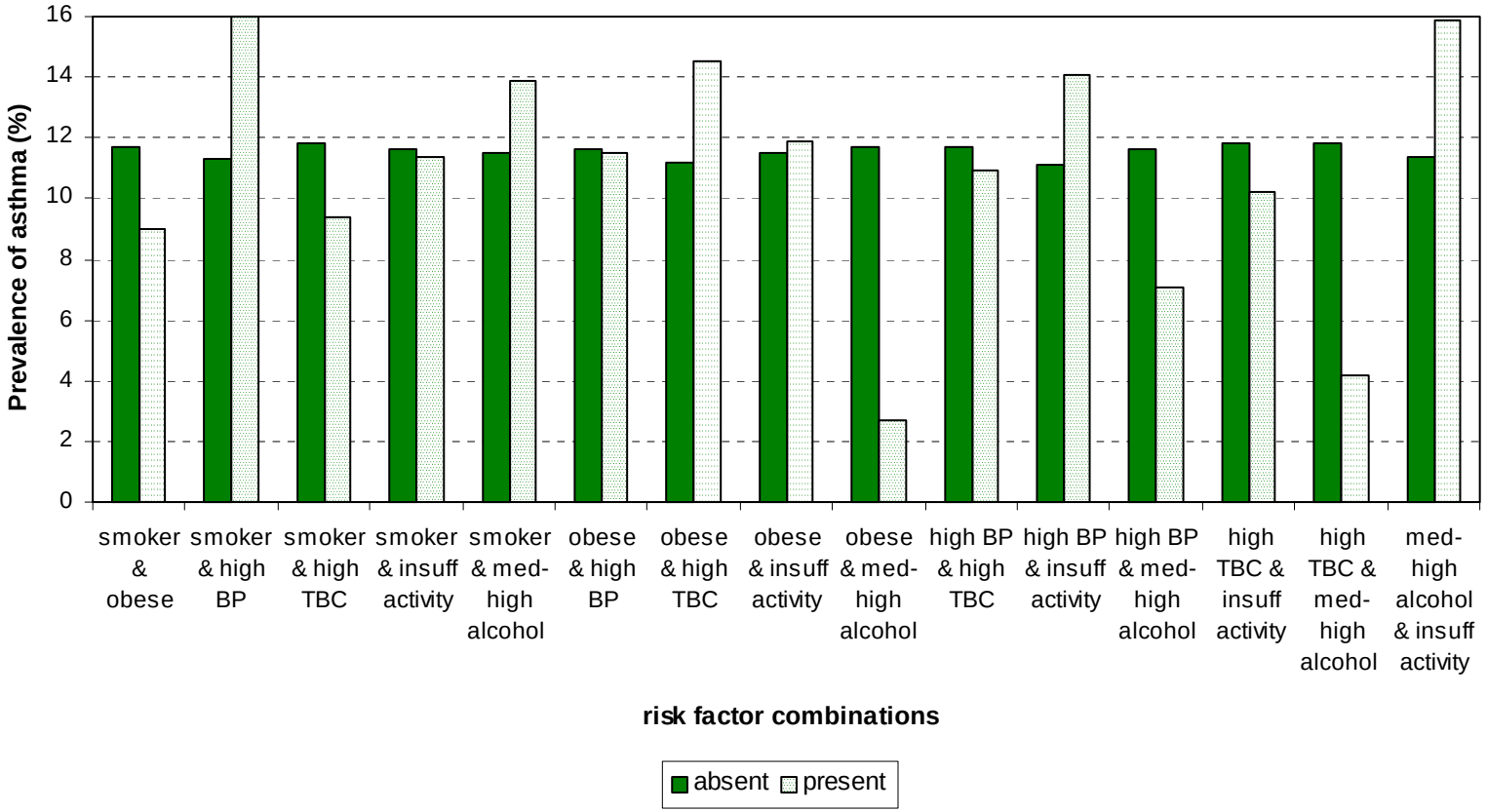
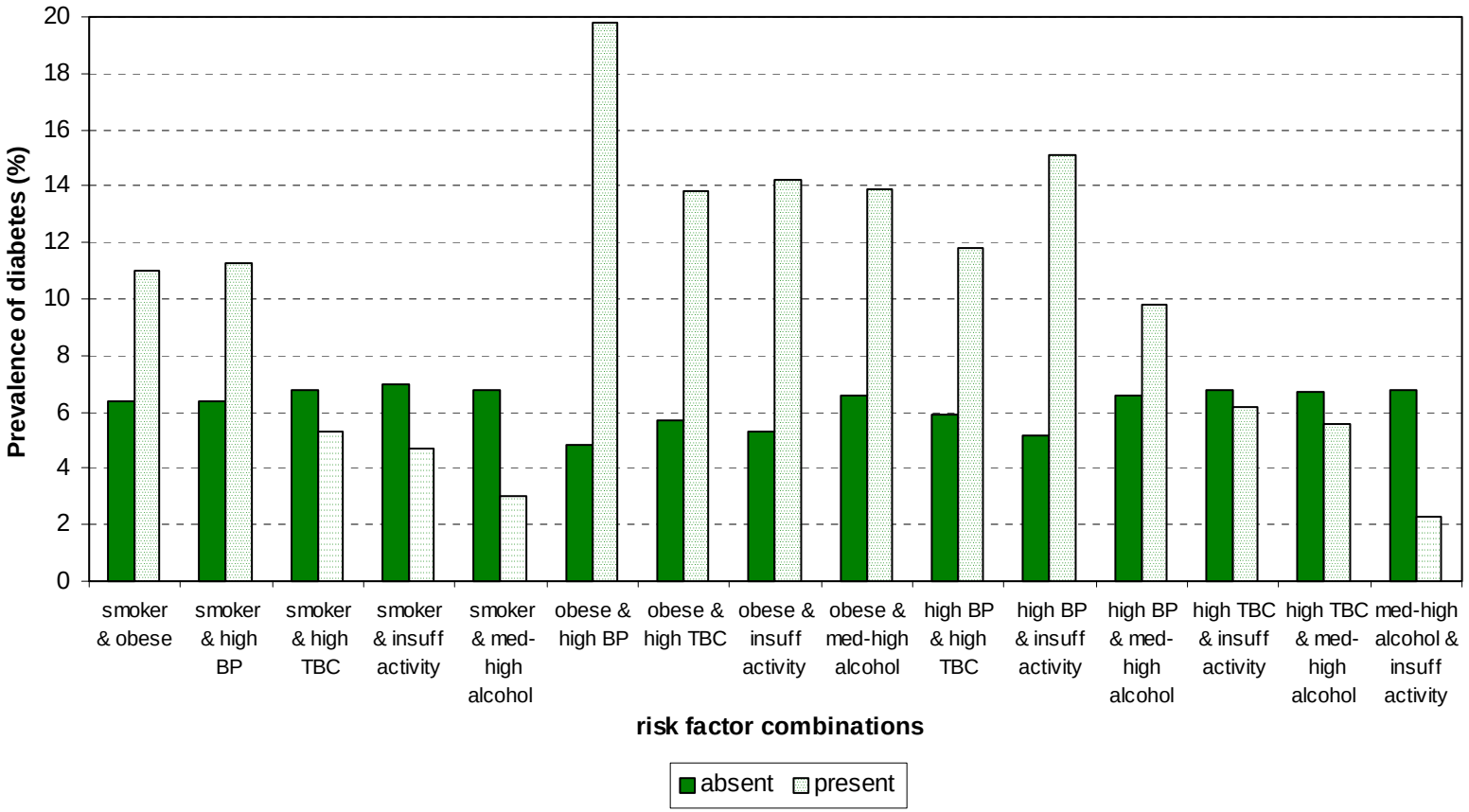


Figure 5.7: Prevalence of diabetes in people in the north west with combinations of risk factors



5.8 Distribution of Risk Factors According to Demographic Variables

Table 5.11, Table 5.12 and Table 5.13 show the distribution of risk factors according to demographic variables at the bivariate level. Odds ratios identify the relative probability of having a risk factor in any one of the demographic categories. For example, in north west Adelaide the odds of being a smoker if you are male is increased by 25% (OR=1.25, p=0.05). It should be pointed out that these relationships of the risk factors with the demographic variables apply only at a bivariate level.

There are a number of important observations that can be made from Table 5.11 given statistically significant relationships between the risk factors and some demographic variables. In addition to higher male smoking prevalence, smoking prevalence is increased with younger age, unemployment, part and full-time employment, people who were divorced, separated, widowed or never married, income between $20,000 and $60,000, not in receipt of a DSS pension, educational status below degree level.

Obesity is more prevalent among females, older age, being in a relationship, in receipt of a social security pension, married or living with a partner, home duties, retired or student status, educational status below degree level, annual household income of less than $20,000 or between $40,001 and $60,000 per annum, and born in the United Kingdom or Ireland.

High blood pressure is more prevalent in males, increases with age, married or living with a partner, lower income or being in receipt of a DSS pension, home duties, retired or student status, for educational status below degree level, and United Kingdom, Ireland or European born.

High blood cholesterol is more prevalent with age, married or living with a partner, lower income or in receipt of a DSS pension, home duties, retired or student status, and born in Europe.

Medium/high alcohol use is more prevalent among males, younger age groups, people who were divorced, separated, widowed or never married, higher income levels, unemployed, part and full-time employed, not in receipt of a social security pension and secondary education only.

Insufficient activity is more prevalent among females, age over 60 years, being in a relationship, a household income less than $40,000 or in receipt of a social security pension and education below degree level.

When the same analyses are conducted for the north and west regions separately some differences in the associations of the risk factors with the demographic variables are apparent. Comparisons of Table 5.12 and Table 5.13 show these differences. This points to the need to consider different strategies when targeting risk factors in each of the regions or in setting priorities for intervention. For example the priority smoking group is males for north west Adelaide as a whole but this is largely explained by the high prevalence of smoking in males in the northern region. The priority target group for smoking would therefore be males in the northern region. A second target group, not shown in the Figure, is females under 40 years of age in the west.

Table 5.11: Demographic variables associated with each risk factor in north west Adelaide (n=2523)

		Smoking		Obesity		High Blood Pressure		High Total Blood Cholesterol		Medium-High Alcohol Use		Insufficient Activity	
Demographic	n	%	OR	%	OR	%	OR	%	OR	%	OR	%	OR
Gender													
Female	1287	24.4	1.00	31.3	***1.32***	30.2	1.00	37.8	1.12	5.3	1.00	52.5	***1.43****
Male	1235	28.9	***1.25***	25.6	1.00	25.3	***1.28***	35.2	1.00	7.9	***1.55***	43.6	1.00
Age													
≤ 39 years	1129	36.2	***5.52****	23.1	1.00	10.3	1.00	24.9	1.00	8.1	***2.18****	45.9	1.00
40-49 years	455	29.7	***4.10****	31.9	***1.56****	25.1	***2.92****	41.3	***2.12****	7.7	***2.05***	49.5	1.15
50-59 years	351	20.5	***2.60****	37.6	***2.00****	37.9	***5.33****	53.6	***3.45****	4.6	1.18	49.3	1.15
≥ 60 years	589	9.4	1.00	30.9	***1.49****	57.1	***11.60****	45.2	***2.49****	3.9	1.00	50.9	***1.22***
Marital status													
Married, partner, not stated	1580	22.5	1.00	32.0	***1.60****	30.6	***1.50****	39.5	***1.40****	4.9	1.00	50.5	***1.29***
Divorced, widowed, never married	943	33.5	***1.73****	22.7	1.00	22.8	1.00	31.7	1.00	9.4	***2.03****	44.2	1.00
Income													
≤ $20,000	591	21.3	1.00	33.0	***1.58****	42.0	***2.73****	39.1	***1.29***	3.9	1.00	50.4	***1.31***
$20,001 - $40,000	652	32.5	***2.30****	26.7	1.14	28.1	***1.48***	40.0	***1.34***	7.7	***2.05***	53.4	***1.48****
$40,001 - $60,000	577	28.8	***1.49***	31.9	***1.50****	21.0	1.00	33.5	1.01	7.5	***1.99***	45.4	1.07
≥ $60,001	703	23.9	1.16	23.8	1.00	20.9	1.00	33.7	1.00	7.1	***1.89***	43.7	1.00
Employment Status													
Full-time	934	29.4	***2.52****	26.7	1.00	21.0	1.00	34.8	1.00	7.3	***1.60***	48.4	1.00
Part-time	420	20.0	***3.40****	24.0	0.87	17.1	0.78	31.4	0.86	8.6	***1.90***	45.1	0.87
Unemployed	124	22.3	***6.84****	32.3	1.31	15.2	0.68	33.1	0.93	11.2	***2.59***	42.7	0.79
Home duties, retired, student, other	1054	16.5	1.00	31.5	***1.27***	39.5	***2.46****	40.6	***1.20***	4.7	1.00	49.8	1.05
Receive a DSS pension													
Yes	811	21.2	1.00	34.9	***1.57****	41.6	***2.65****	41.9	***1.39****	4.7	1.00	51.3	***1.20***
No	1712	29.2	***1.53****	25.5	1.00	21.1	1.00	34.0	1.00	7.5	***1.64***	46.7	1.00
Highest Education Level													
Secondary, other, not stated	1215	26.8	***1.93****	30.9	***1.71****	30.5	***3.60****	37.1	1.19	7.7	***1.95***	52.9	***2.25****
Apprenticeship, certificate, diploma	1014	29.4	***2.19****	27.9	***1.48***	29.2	***3.38****	36.9	1.19	6.0	1.50	46.7	***1.76****
Bachelor degree or higher	294	16.0	1.00	20.7	1.00	10.9	1.00	33.0	1.00	4.1	1.00	33.3	1.00
Country of Birth													
Australia	1768	29.4	1.00	28.6	1.00	25.2	1.00	35.6	1.00	7.6	1.00	46.9	1.00
United Kingdom, Ireland	435	20.0	***0.60****	28.5	1.00	35.6	***1.57****	38.2	1.12	5.5	0.71	49.2	1.09
Europe	211	22.3	***0.69***	35.2	***1.35***	39.5	***1.84****	44.5	***1.45***	1.9	***0.23****	52.4	1.23
Asia, other	109	16.5	***0.47****	13.9	***0.40****	13.8	***0.45****	29.6	0.75	1.8	***0.23***	56.9	1.49

Figures in ***bold, italic*** p <0.05; ***bold*, *italic*** p <0.001

Table 5.12: Demographic variables associated with each risk factor in the northern region (n= 1113)

		Smoking		Obesity		High Blood Pressure		High Total Blood Cholesterol		Medium-High Alcohol Use		Insufficient Activity	
Demographic	n	%	OR	%	OR	%	OR	%	OR	%	OR	%	OR
Gender													
Female	563	24.7	1.00	37.2	1.19	26.6	1.00	35.9	1.03	5.2	1.00	52.9	***1.28***
Male	550	32.4	***1.46***	28.6	1.00	33.1	***1.36***	34.2	1.00	9.3	***2.03***	47.5	1.00
Age													
≤ 39 years	526	36.9	***5.62****	28.0	1.00	12.6	1.00	23.6	1.00	9.0	***3.03***	48.7	1.00
40-49 years	204	32.4	***2.67****	36.8	***1.50***	29.9	***2.33****	41.2	***2.83****	8.8	***2.99***	51.5	1.12
50-59 years	160	21.9	***2.69****	40.3	***1.72***	42.1	***5.02****	55.0	***3.96****	5.0	1.62	52.2	1.14
≥ 60 years	223	9.4	1.00	35.9	***1.44***	61.2	***11.00****	42.0	***2.30****	3.1	1.00	51.3	1.12
Marital status													
Married, partner, not stated	724	24.2	1.00	37.2	***1.76****	32.9	***1.56***	38.0	1.46	5.2	1.00	52.9	***1.37***
Divorced, widowed, never married	390	36.4	***1.80****	25.1	1.00	23.9	1.00	29.6	1.00	10.8	***2.12****	45.2	1.00
Income													
≤ $20,000	246	22.4	1.00	39.0	***1.61***	42.7	***2.28****	34.3	1.01	3.3	1.00	53.3	1.25
$20,001 - $40,000	302	35.1	***1.86****	29.8	1.07	30.1	1.32	39.1	1.25	8.6	***2.80***	55.1	1.25
$40,001 - $60,000	273	32.6	***1.66****	36.6	***1.43***	23.7	***1.84***	32.8	0.96	8.8	***2.87***	45.1	0.90
≥ $60,001	703	22.9	1.02	28.4	1.00	24.6	1.00	33.9	1.00	7.5	***2.42***	47.6	1.00
Employment Status													
Full-time	402	33.1	***2.45****	31.8	1.00	25.1	1.00	34.6	1.00	8.7	***2.06***	52.7	1.13
Part-time	195	38.5	***3.10****	27.3	0.80	18.6	0.67	30.8	0.84	9.2	***2.20***	46.2	0.87
Unemployed	64	51.6	***5.28****	39.1	1.37	17.2	0.62	31.3	0.86	10.9	***2.66***	50.0	1.01
Home duties, retired, student, other	453	16.8	1.00	35.5	1.18	40.4	***2.02****	37.8	1.15	4.4	1.00	49.8	1.00
Receive a DSS pension													
Yes	345	23.2	1.00	41.4	***1.76***	42.6	***2.36****	41.4	***1.49***	4.3	1.00	53.6	1.22
No	768	30.9	***1.48***	29.2	1.00	24.0	1.00	32.2	1.00	8.5	***2.03***	48.7	1.00
Highest Education Level													
Secondary, other, not stated	589	30.6	***2.17***	33.2	1.67	30.8	***4.83****	34.2	1.07	8.7	***3.84***	53.4	***1.92***
Apprenticeship, certificate, diploma	442	27.8	***1.90***	34.6	***1.72***	31.9	***3.85****	36.7	1.20	6.1	2.63	48.4	1.57
Bachelor degree or higher	83	16.9	1.00	23.2	1.00	10.8	1.00	32.5	1.00	2.4	1.00	37.3	1.00
Country of Birth													
Australia	747	31.7	1.00	33.5	1.00	26.2	1.00	33.3	1.00	8.4	1.00	49.2	1.00
United Kingdom, Ireland	258	19.4	***0.52****	30.6	***0.64****	36.4	1.32	37.2	1.19	5.8	0.55	49.8	1.04
Europe	78	26.9	0.79	40.5	1.33	46.2	***2.75****	44.9	***1.63***	2.6	0.26	49.4	1.04
Asia, other	29	27.6	0.82	23.3	***0.33***	17.2	***0.33***	33.3	1.05	0.0		83.8	***6.47****

Figures in ***bold, italic*** p <0.05; ***bold*, italic*** p <0.001

Table 5.13: Demographic variables associated with each risk factor in the western region (n=1410)

		Smoking		Obesity		High Blood Pressure		High Total Blood Cholesterol		Medium-High Alcohol Use		Insufficient Activity	
Demographic	n	%	OR	%	OR	%	OR	%	OR	%	OR	%	OR
Gender													
Female	728	24.0	1.02	22.8	1.10	23.5	1.00	40.6	1.10	5.4	1.00	52.1	***1.37***
Male	682	23.8	1.00	21.1	1.00	26.0	1.14	36.7	1.00	5.9	1.03	37.7	1.00
Age													
≤ 39 years	580	35.0	***5.37****	14.8	***0.51****	6.4	1.00	26.9	1.00	6.6	1.47	41.1	1.00
40-49 years	247	25.5	***3.41****	24.3	0.93	17.7	***3.81****	41.5	***1.94****	6.1	1.36	46.4	1.25
50-59 years	188	18.7	***2.28****	33.5	***1.47***	30.5	***6.39****	51.1	***2.84****	4.3	0.93	44.7	1.16
≥ 60 years	395	9.1	1.00	25.6	1.00	53.2	***16.66****	48.4	***2.54****	4.6	1.00	50.4	***1.46***
Marital status													
Married, partner, not stated	834	19.8	1.00	23.6	1.26	27.0	***1.36***	41.8	***1.37***	4.3	1.00	46.7	1.17
Divorced, widowed, never married	577	29.8	***1.72****	19.8	1.00	21.3	1.00	34.3	1.00	7.6	**2.25***	42.8	1.00
Income													
≤ $20,000	358	20.1	1.00	25.4	1.57	41.1	***3.54****	45.3	***1.64****	4.5	1.00	46.8	***1.38***
$20,001 - $40,000	338	28.1	***1.55***	21.6	1.27	24.9	***1.68***	41.7	***1.42***	6.5	1.49	50.6	***1.60****
$40,001 - $60,000	287	22.0	1.12	24.4	***1.49***	16.4	1.00	34.8	1.06	5.2	1.18	46.0	1.33
≥ $60,001	426	25.1	***2.77***	17.8	1.00	16.4	1.00	33.6	1.00	6.6	1.50	38.9	1.00
Employment Status													
Full-time	541	26.2	***2.01****	19.6	1.00	15.3	1.00	35.1	1.00	5.2	1.00	42.5	1.00
Part-time	217	34.6	***2.99****	18.4	0.93	14.3	0.92	32.7	0.90	7.8	1.56	43.3	1.03
Unemployed	54	58.5	***7.62****	18.5	0.93	9.4	1.56	38.9	1.18	11.1	2.29	26.4	***0.47***
Home duties, retired, student, other	599	15.0	1.00	25.9	***1.45***	38.2	***3.42****	44.2	***1.47****	4.8	0.93	49.8	***1.34***
Receive a DSS pension													
Yes	476	18.5	1.00	26.3	***5.50***	40.1	***3.31****	42.6	***1.28***	5.0	1.00	48.1	1.20
No	933	26.7	***1.61****	19.8	1.00	16.8	1.00	36.8	1.00	6.0	1.20	43.6	1.00
Highest Education Level													
Secondary, other, not stated	582	20.0	1.36	26.8	***1.56***	30.1	***3.44****	42.5	***1.47***	5.8	1.24	52.2	***2.39****
Apprenticeship, certificate, diploma	577	31.5	***2.52****	18.5	0.97	25.3	***3.76****	37.3	1.19	5.9	1.25	44.4	***1.76****
Bachelor degree or higher	252	15.5	1.00	19.0	1.00	11.1	1.00	33.3	1.00	4.8	1.00	31.0	1.00
Country of Birth													
Australia	1051	26.4	1.00	22.2	1.00	23.9	1.00	38.5	1.00	6.6	1.00	43.9	1.00
United Kingdom, Ireland	119	21.7	0.78	20.2	0.89	32.5	***1.55***	42.5	1.20	5.0	0.76	46.7	1.14
Europe	145	17.4	***0.58***	30.3	***1.53***	33.1	***1.58***	44.1	1.26	1.4	0.20*	55.2	***1.58****
Asia, other	95	10.5	***0.33****	9.5	***0.37****	11.6	***0.42****	28.4	***0.63***	3.2	0.46	41.1	0.89

Figures in ***bold, italic*** p <0.05; ***bold*, *italic*** p <0.001

5.9 Logistic Regression Analyses of Risk Factors According to Demographic Variables

When the variables that are related significantly at a bivariate level are entered into logistic regression analyses the explanatory nature of the variables is modified. The demographic variables that were significantly associated with the risk factors at a bivariate level were then entered into logistic regression analyses to determine which set of variables comprised the best joint predictors for each risk factor. Table 5.14, Table 5.15 and Table 5.16 show the logistic regression analyses for north west Adelaide overall and the northern and western areas separately.

Table 5.14 shows the best set of joint explanatory variables for smoking were represented by the demographic categories: younger age group, unemployed part or full-time employment, lower education levels. For obesity female, age groups between 40 and 60 years, in receipt of a DSS pension and secondary level education remained significant. The best set of explanatory variables for high blood pressure were: male, age over 40 years, and education below degree level. For elevated cholesterol age was the only significant variable while controlling for the effects of other variables.

Explanatory variables for medium to high alcohol consumption were: male, divorced, separated, widowed or never married, earning between $20,000 and $40,000 per annum and secondary education level. The best explanatory variables for insufficient activity were: female, married or living with a partner, earning between $20,000 and $40,000 per annum, secondary or apprenticeship education level, and Asia born.

Table 5.15 and Table 5.16 show the best sets of explanatory variables for the northern and western regions separately. While there is some minor agreement in the associations between the demographic variables and the risk factors across the regions (eg cholesterol) there are many differences. This again points to the importance of place and the need to carefully consider locality and the nature of the local population in targeting programs that will reduce the prevalence of important risk factors on a population basis. The data also identify that the combination of variables that make up the socio-economic context within which risk factors occur is dynamic and will vary considerably as explanatory factors in chronic disease risk factors.

Table 5.14: Logistic regression analyses of the demographic variables associated with each risk factor in north west Adelaide

Smoking		Obesity		High Blood Pressure		High Total Blood Cholesterol		Medium-High Alcohol Use		Insufficient Activity	
Variable	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**
		Female:	1.37	**Male:**	1.56			**Male:**	1.55	**Female:**	1.58
Age:		**Age:**		**Age:**		**Age:**		**Marital status:**		**Marital status:**	
<40 yrs	5.10	40-49 yrs	1.41	40-49 yrs	3.04	40-49 yrs	2.14	Divorced, widowed, never married	2.01	Married, living with a partner, not stated	1.30
40-49 yrs	3.98	50-59 yrs	1.63	50-59 yrs	5.33	50-59 yrs	3.54				
50-59 yrs	2.36			≥ 60 yrs	11.05	≥ 60 yrs	2.59				
Education:		**Education:**		**Education:**				**Education:**		**Education:**	
Secondary	2.45	Secondary	1.30	Secondary	2.46			Secondary	2.39	Secondary	2.10
Apprentice, certificate, diploma	2.56			Apprentice, certificate, diploma	2.24					Apprentice, certificate, diploma	1.69
Income:		**Country of Birth:**						**Income:**		**Income:**	
>$60K	0.57	Australia	1.90					$20-40K	1.88	$20-40K	1.38
		UK/Ireland	1.59								
		Europe	2.16								
Employment:		**DSS pension:**	1.55					**Country of Birth:**		**Country of Birth:**	
Full time	1.58							Europe	0.30	Asia, other	1.70
Part time	1.99							Asia, other	0.23		
Unemployment	3.25										
Country of Birth:											
Asia, other	0.39										

Note: To ascertain reference category for each variable, please refer to Table 5.11

Table 5.15: Logistic regression analyses of the demographic variables associated with each risk factor in the northern region

Smoking		Obesity		High Blood Pressure		High Total Blood Cholesterol		Medium-High Alcohol Use		Insufficient Activity	
Variable	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**
Male:	1.38	**Female:**	1.68	**Male:**	1.68			**Male:**	1.75		
Age:		**DSS pension:**	2.18	**Age:**		**Age:**		**Education:**		**Education:**	
<40 yrs	4.76			40-49 yrs	3.21	40-49 yrs	2.25	Secondary	4.30	Secondary	1.77
40-49 yrs	4.26			50-59 yrs	5.71	50-59 yrs	3.85				
50-60 yrs	2.42			≥ 60 yrs	13.36	≥ 60 yrs	2.18				
Marital status:		**Marital status:**		**Education:**				**Marital status:**		**Marital status:**	
Divorced, widowed, never married	1.42	Married, living with a partner, not stated	1.82	Secondary	3.29			Divorced, widowed, never married	2.17	Married, living with a partner, not stated	1.43
				Apprentice, certificate, diploma	3.17						
Employment:		**Country of birth:**									
Full time	1.80	UK/Ireland	0.70								
Part time	2.18										
Unemployed	2.78										
Education:											
Secondary	2.69										
Apprentice, certificate, diploma	2.11										

Note: To ascertain reference category for each variable, please refer to Table 5.12

Table 5.16: Logistic regression analyses of the demographic variables associated with each risk factor in the western region

Smoking		Obesity		High Blood Pressure		High Total Blood Cholesterol		Medium-High Alcohol Use		Insufficient Activity	
Variable	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**	**Variable**	**OR**
Age:		**Age:**		**Age:**		**Age:**		**Marital status:**		**Female:**	
< 40 yrs	6.60	< 39 yrs	0.54	40-49 yrs	1.90	40-49 yrs	3.32	Divorced, widowed, never married	1.77		1.86
40-49 yrs	4.01			50-59 yrs	2.77	50-59 yrs	6.74				
50-59 yrs	2.41			≥ 60 yrs	2.50	≥ 60 yrs	15.78				
Income:		**Income:**				**No DSS pension:**	1.46	**Country of Birth:**		**Income:**	
$40-60K	0.58	$40-60K	1.62					Europe	0.19	$20-40K	1.52
										$40-60K	1.44
Country of Birth:		**Country of Birth:**								**Unemployed:**	0.43
Asia, other	0.17	Asia, other	0.39								
Unemployed:	4.26									**Country of Birth:**	
										Europe	1.54
										Education:	
										Secondary	2.27
										Apprentice, certificate, diploma	1.89

Note: To ascertain reference category for each variable, please refer to Table 5.13

5.10 Distribution of Risk Factors in Chronic Disease

Table 5.17 shows the risk factors associated with each chronic condition in north west Adelaide at the bivariate level. No regional analyses were conducted on the north and west regions because of the small sample size in some cells and the probability of unstable estimates.

Table 5.17 shows that the variables associated with diabetes are non-smoker status, high blood pressure, and obesity. This analysis is confirmed by considerable literature support. Obesity and high blood pressure are micro and macro-vascular risk factors and put the diabetes population at risk for diabetes complications. When the variables that were significant were entered into a logistic regression analyses, high blood pressure and obesity were significant and remain the best risk factor predictor variables for diabetes in this analysis. It should be noted that other factors, such as age, family history, and ethnicity, are also associated with diabetes[50] but were not examined in this analysis.

None of the risk factor variables were significantly associated with asthma, although normal/low cholesterol, obesity, and non- and ex-smoking status did approach significance.

For COPD, smoker status, medium/high alcohol consumption, normal/low blood pressure and non-obese status were associated with the condition. When the significant variables were entered into a logistic regression analyses smoker and non-obese status were the best joint descriptors.

As expected different risk factor combinations explain each of the chronic disease conditions with little commonality across the disease conditions.

Table 5.17: Risk factors associated with diabetes, asthma and COPD in north west Adelaide

	Diabetes			Asthma			COPD		
Risk Factor	**n/N**	**%**	**Odds Ratio**	**n/N**	**%**	**Odds Ratio**	**n/N**	**%**	**Odds Ratio**
Current smoker									
No	138/1845	7.5	***1.79***	223/1851	12.0	1.21	318/1835	17.3	1.00
Yes	29/671	4.3	1.00	68/671	10.1	1.00	215/666	32.3	***2.27****
Alcohol consumption									
No drinker, no-low	160/2351	6.8	1.45	272/2357	11.5	1.01	481/2335	20.6	1.00
Intermediate-high	8/167	4.8	1.00	19/166	11.4	1.00	52/166	31.3	***1.76****
Activity Level									
Sufficient	76/1302	5.8	1.00	148/1308	11.3	1.00	273/1292	21.1	1.00
Insufficient	92/1216	7.6	1.32	144/1216	11.8	1.05	260/1209	21.5	1.02
Blood Pressure									
No	68/1823	3.7	1.00	205/1824	11.2	1.00	409/1806	22.6	1.35
Yes	100/694	14.4	***4.34****	87/700	12.4	1.12	124/694	17.9	1.00
Obese									
No	73/1803	4.0	1.00	195/1803	10.8	1.00	418/1787	23.4	***1.59****
Yes	94/714	13.2	***3.59****	96/719	13.4	1.27	115/713	16.1	1.00
Total blood cholesterol									
No	109/1595	6.8	1.07	199/1601	12.4	1.27	339/1587	21.4	1.00
Yes	59/922	6.4	1.00	93/922	10.1	1.00	195/915	21.3	1.00

Diabetes: n/N = 167/2517; Asthma: n/N = 292/2523; COPD: n/N = 533/2501.

Figures in ***bold, italic*** p <0.05; ***bold*, *italic*** p <0.001

5.11 Distribution of Chronic Disease According to Demographic Variables

Table 5.18 shows the risk factors associated with each chronic condition in north west Adelaide at the bivariate level. No regional sub analyses were conducted on the north and west regions because of the small sample size in some cells and the probability of unstable estimates.

Table 5.18 shows that the variables associated with diabetes are over 40 years of age, not living in a relationship, lower income, unemployed or in receipt of a DSS pension, secondary education level and born overseas. Asthma was associated with female, lower income and unemployed or in receipt of a DSS pension. The variables associated with COPD were male, age under 40 years and not in receipt of a DSS pension.

Table 5.18: Demographic variables associated with diabetes, asthma and COPD in north west Adelaide

	Diabetes			Asthma			COPD		
Risk Factor	**n/N**	**%**	**Odds Ratio**	**n/N**	**%**	**Odds Ratio**	**n/N**	**%**	**Odds Ratio**
Gender									
Male	78/1282	6.1	1.00	178/1287	13.8	***1.59****	243/1278	19.0	***1.32***
Female	90/1235	7.3	1.21	113/1235	9.1	1.00	290/1223	23.7	1.00
Age									
< 40 years	13/1123	1.2	1.00	135/1129	12.0	1.00	261/1119	23.3	***1.24***
≥ 40 years	155/1394	11.1	***10.68****	155/1394	11.3	1.09	273/1382	19.7	1.00
Marital status									
Married, partner, not stated	124/1574	7.9	1.00	193/1580	12.2	1.19	332/1571	21.1	1.00
Divorced, widowed, never married	174/943	18.5	***2.65****	99/943	10.5	1.00	202/931	21.7	1.03
Income									
< $40,000	123/1243	9.9	***3.07****	167/1243	13.4	***1.43***	268/1225	21.9	1.19
≥ $40,000	44/1274	3.5	1.00	125/1280	9.8	1.00	265/1275	20.8	1.00
Employment Status									
Employed: full or part time	39/1354	2.9	1.00	127/1354	9.4	1.00	305/1344	22.7	1.00
Not working: unemployed, home duties, retired, student, other	129/1164	11.1	***4.02****	164/1169	14.0	***1.58****	229/1158	19.8	1.00
Receive a DSS pension									
Yes	109/811	13.4	***4.31****	120/811	14.8	***1.56****	170/796	21.4	1.00
No	59/1706	3.5	1.00	171/1712	10.0	1.00	363/1705	21.3	***1.26***
Highest Education Level									
Secondary, other, not stated	95/1209	7.9	***1.46***	153/1215	12.6	1.21	232/1203	19.3	1.21
Qualification: apprenticeship, certificate, diploma, degree or higher	72/1308	5.5	1.00	139/1309	10.6	1.00	301/1297	23.2	1.00
Country of Birth									
Australia	88/1763	5.0	1.00	223/1769	12.6	1.00	390/1752	22.3	1.00
Immigrant: UK, Ireland, Europe, Asia, other	80/754	10.6	***2.26****	69/755	9.1	0.80	143/749	19.1	0.82

Diabetes: n/N = 167/2517; Asthma: n/N = 292/2523; COPD: n/N = 533/2501.

Figures in ***bold, italic*** p <0.05; ***bold*, *italic*** p <0.001

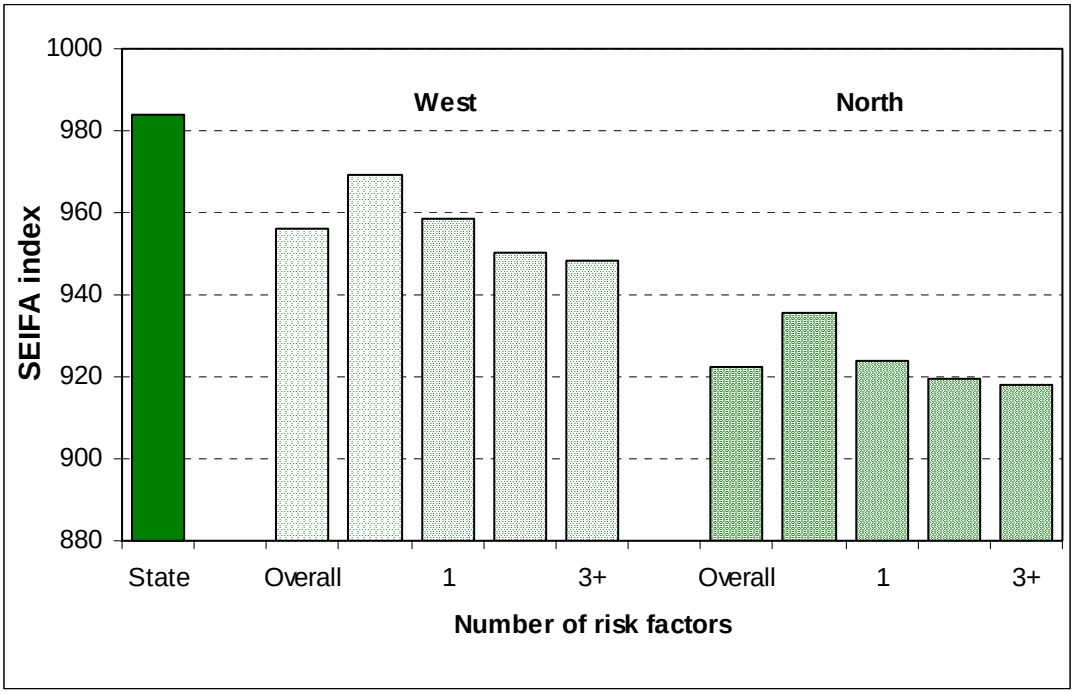
5.12 SEIFA (Socio-Economic Indexes for Areas) Indicators and Risk Factor Groups

The Socio Economic Indexes for Areas 96[7] are measures social advantage or disadvantage and are therefore of vital importance in association with both risk factors and chronic disease. SEIFA indicators give an indication of the resource capacity of a community to deal with chronic disease and related phenomena. The lower the SEIFA indicator, the lower the capacity to achieve improved health outcomes.

In the North West Adelaide Health Study SEIFA indicators were used to compare the associated disadvantage of each risk factor group across areas. The SEIFA indicators were produced by the Australian Bureau of Statistics in 1996 to provide an indication of the relative socio-economic status across urban and non-urban areas at the Census Collection District (CD) level or greater applied at postcode level. The index used here is the Index of Relative Socio-economic Disadvantage (IRSED).

Figure 5.8 shows the SEIFA index for each risk factor group in the north and west of Adelaide compared to the state and national index (set at 1000 with a standard deviation of 100). It can be seen there is a steady decline in the SEIFA index for each of risk factor group and as the number of risk factors increases. It must be noted that the SEIFA index is already lower than that for the state in both the north and west of Adelaide for people without any risk factors, but this declines further with increasing numbers of risk factors. There is a clear relationship of risk factors with social disadvantage as measured by the IRSED, which derives its score from census variables such as low income, low educational attainment, high unemployment and a range of occupations. It should be noted that there is also a substantial difference in the IRSED index between the people in the west and the north for those without any risk factors in the study.

Figure 5.8: SEIFA index of disadvantage for each risk factor group in the northern and western regions



5.13 Effect of the Risk Factors on Quality-of-Life

Improved quality-of-life is one positive outcome of changes in health status and reflects the capacity of the individual and the community to function in terms of the activities of daily living. In the North West Adelaide Health Study it was considered to be a fundamental comparative measure across the communities of interest.

Figure 5.9, Figure 5.10 and Figure 5.11 show the effect of the number of risk factors on the physical and mental health summary scores as measured by the SF-36 quality-of-life questionnaire. Dimension scores are also included in Appendix 2. Standard scores were calculated for each risk factor and compared to the South Australian population norms. The mean of the South Australian population is set at zero for each dimension allowing comparisons to be made in terms of standard deviations for each comparison group. An effect size of -0.2 to less than -0.4 is described as mild, an effect of -0.4 to less than -0.6 as moderate and -0.6 or greater as severe.

Figure 5.9, Figure 5.10 and Figure 5.11 show the impact on physical and mental health in north west Adelaide for increasing numbers of risk factors. The differences experienced for one, two or three or more risk factors for the physical health

dimension is described as mild for one or two risk factors and approaching moderate for three or more risk factors. Given that the mental health dimension score is above zero for north west Adelaide the difference between this and one risk factor is moderate and two or more risk factors approaches a severe effect. It can be seen from Figure 5.10 and Figure 5.11 that there is a slightly greater impact on the physical and mental health dimensions for the northern region compared to the west.

Figure 5.12, Figure 5.13 and Figure 5.14 show the effect of each risk factor on physical and mental health. Most of the effect sizes of the risk factors in north west Adelaide on the physical and mental health summary scale are lower than the comparative statewide score and are described as mild. The impact of smoking on mental health lies between a moderate and severe effect. For the north and west regions separately the impact on quality-of-life is similar to that for the north west overall.

The data in the summary scores mask the impact on some of the specific health dimensions assessed by the SF-36 and these effects can be seen in the figures of Appendix 2. Substantial differences are seen in the impact on quality-of-life with increasing numbers of risk factors across dimensions in each region. Compared to not having the risk factor, differences on dimension scores are observed for smoking, obesity, blood pressure and insufficient activity in the western region. In the northern region differences are observed for obesity and insufficient activity. For the northern region it should be pointed out that the dimension scores for not having the risk factor are generally lower than in the west.

Figure 5.9: Effect of one or more risk factors on SF-36 HRQL summary scores in north west Adelaide (n=2523)

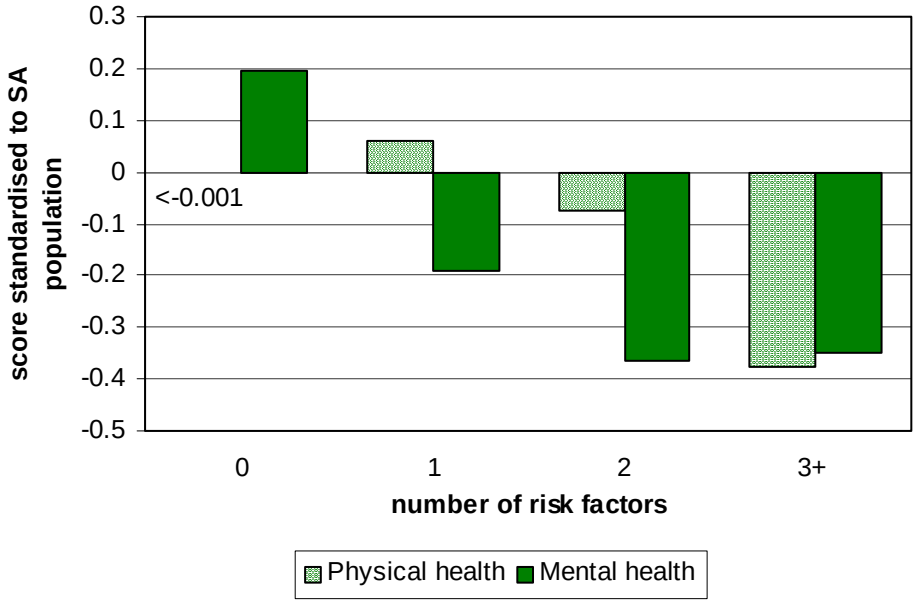


Figure 5.10: Effect of one or more risk factors on SF-36 HRQL summary scores in the northern region (n=1113)

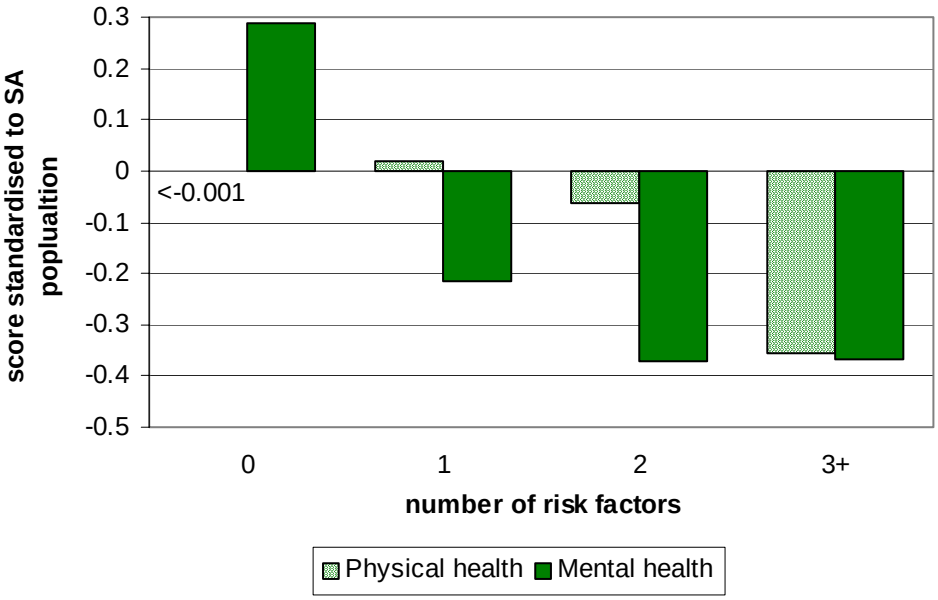


Figure 5.11: Effect of one or more risk factors on SF-36 HRQL summary scores in the western region (n=1410)

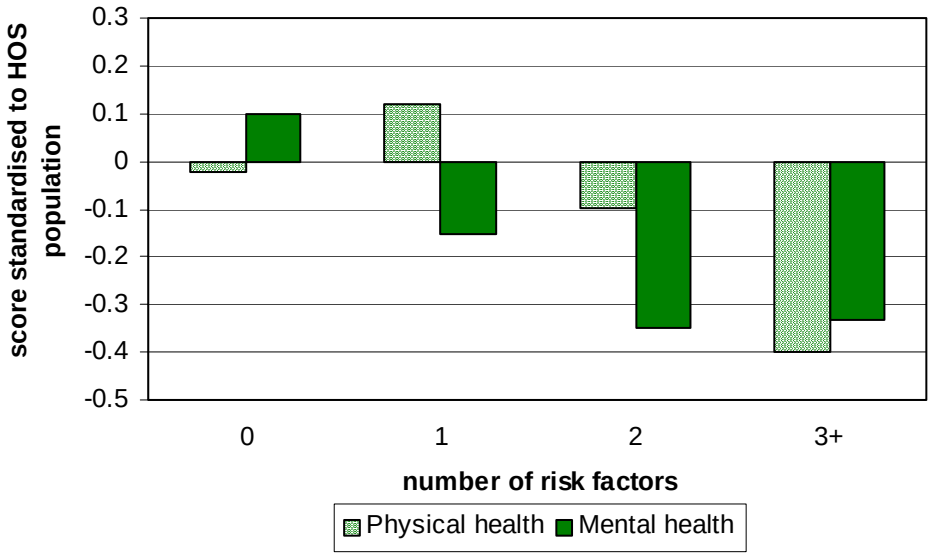


Figure 5.12: Effect of risk factors on SF-36 Physical and Mental Health summary scores in north west Adelaide (n=2523)

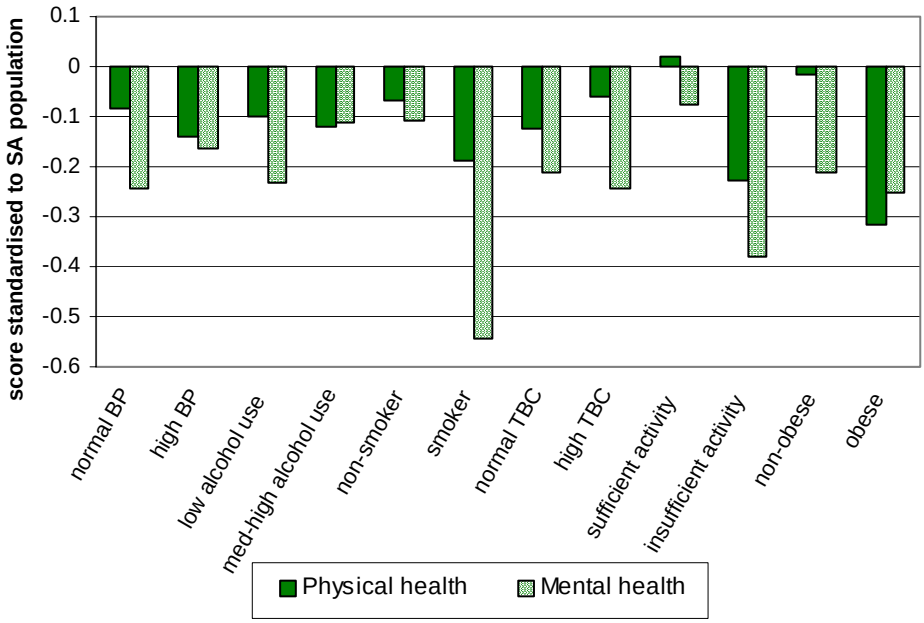


Figure 5.13: Effect of risk factors on SF-36 Physical and Mental Health summary scores in the northern region (n=1113)

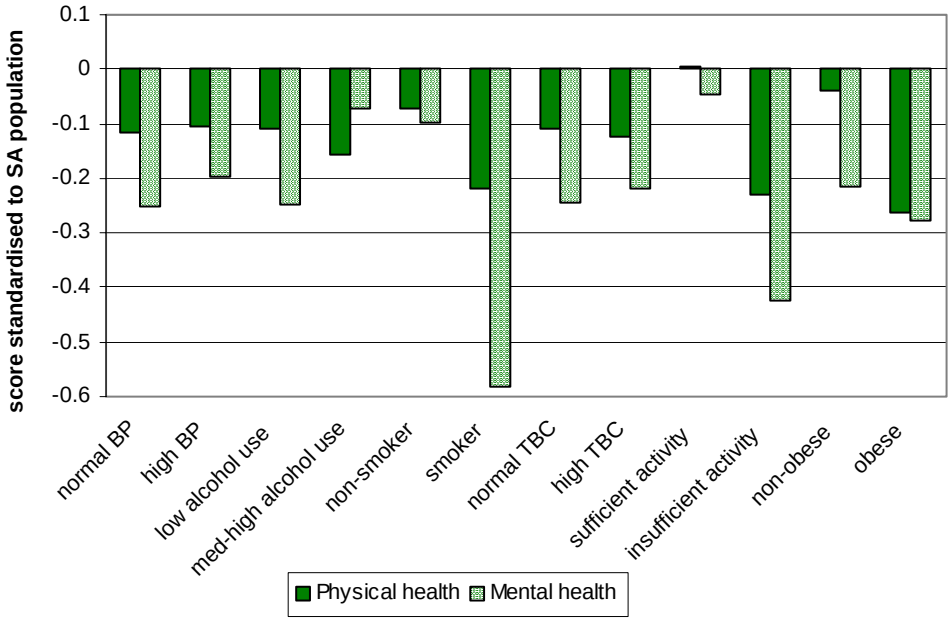
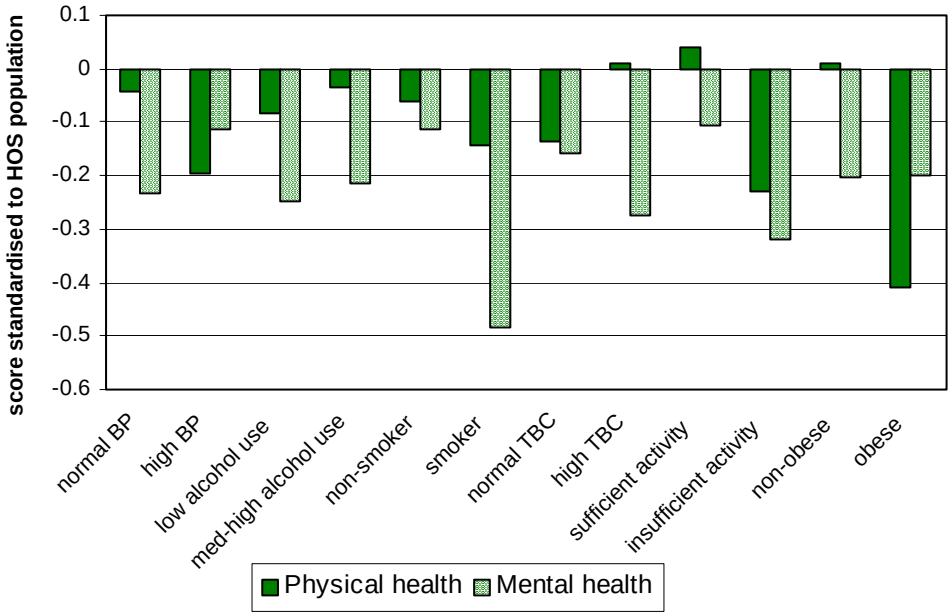


Figure 5.14: Effect of risk factors on SF-36 Physical and Mental Health summary scores in the western region (n=1410)



APPENDIX 1: STUDY TEAM

CHIEF INVESTIGATORS

Professor Richard Ruffin
Department of Medicine, The University of Adelaide

Dr Patrick Phillips
Endocrine and Diabetes Service, The Queen Elizabeth Hospital

Professor Julianne Cheek
Division of Health Sciences, University of South Australia

Assoc Professor David Wilson
Department of Medicine, The University of Adelaide

Ms Anne Taylor
Centre for Population Studies in Epidemiology, South Australian Department of Human Services

ANALYSIS TEAM

Centre for Population Studies in Epidemiology, South Australian Department of Human Services

Ms Eleonora Dal Grande
Epidemiologist

Ms Catherine Chittleborough
Epidemiologist

Ms Tiffany Gill
Senior Epidemiologist

Ms Janet Grant
Epidemiological Research Officer

Division of Health Sciences, University of South Australia.

Ms Candice Oster
Research Assistant

CLINIC TEAM

Ms Ingerid Meagher, Study Coordinator

Ms Else Jansen

Ms Sandy Pickering

Ms Megan Taylor

Ms Ruth Battersby

Ms Nardina Labiszewski

Ms Angelique Scardigno

Ms Mandy O'Grady

RECRUITING STAFF

Ms Jan Dibble

Ms Shirley Ogilvy

Ms Brenda Webb

Ms Kay Smith

ADMINISTRATIVE SUPPORT

Ms Jacqueline Hickling
Project Officer
Centre for Population Studies in Epidemiology, South Australian Department of Human Services

REPORTS

1. Cheek J, Oster C. A qualitative investigation of the experiences, perceptions and understandings of people with a chronic condition: Part of the North West Adelaide Health Study. November 2000. University of South Australia. ISBN 0 7308 9193 3
2. Taylor A, Dal Grande E, Chittleborough C, Ruffin D, Wilson D, Phillips P. The North West Adelaide Health Study – Key biomedical findings, policy implications and research recommendations. May 2002. SA Department of Human Services. ISBN 0 7308 9189 5
3. Taylor A, Dal Grande E, Chittleborough C, Ruffin D, Wilson D, Phillips P. The North West Adelaide Health Study – Summary of key findings, policy implications and research recommendations. May 2002. SA Department of Human Services. ISBN 0 7308 9190 9
4. Wilson D, Appleton S, Taylor A, Dal Grande E, Chittleborough C, Ruffin D. The North West Adelaide Health Study – Risk factors and associated chronic diseases. June 2002. SA Department of Human Services. ISBN 0 7308 9191 7
5. Chittleborough C, Cheek J, Grant J, Phillips P, Taylor A. Education and information issues among people with diabetes. May 2002. SA Department of Human Services. ISBN 0 7308 9185 2

INTERNAL REPORTS

Report 1	North West Adelaide Health Study – General overview of data collected in 2000
Report 2	Demographic characteristics of participants in the North West Adelaide Health Study compared with 1996 Census data
Report3	Community responses to the notion of taking part in the North West Adelaide Health Study
Report 4	Community responses to the notion of having participated in the North West Adelaide Health Study
Report 5	Interviews with subjects unwilling to participate in the North West Adelaide Health Study Report 8 Report to the Commonwealth Department of Health and Aged Care on the process of conducting a biomedical study in SA
Report 6	Exit survey of people taking part in the North West Adelaide Health Study
Report 7	The North West Adelaide Health Study - Initial Results

APPENDIX 2: RISK FACTORS ON QUALITY-OF-LIFE

Figure A. 1: Effect of one or more risk factors on SF-36 health related quality of life in *North West Adelaide*

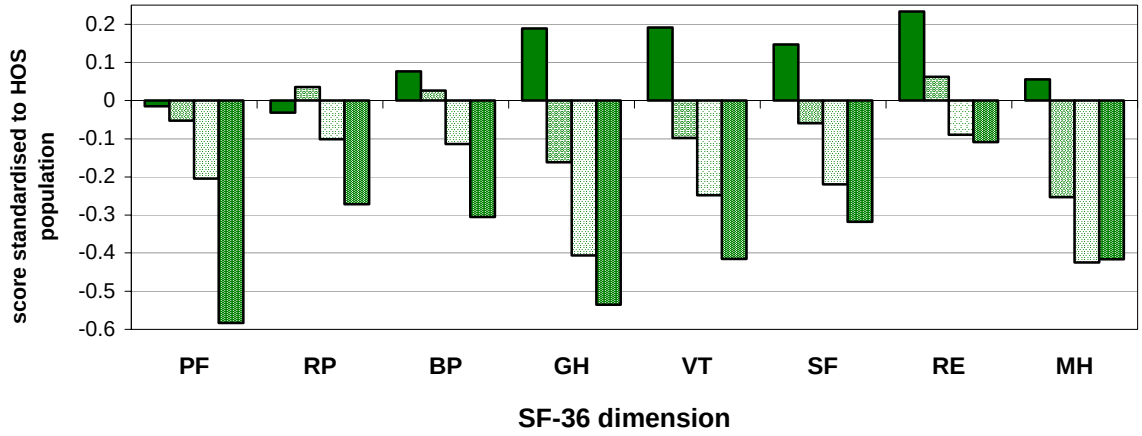


Figure A. 2: Effect of one or more risk factors on SF-36 health related quality of life in the *Northern Region*

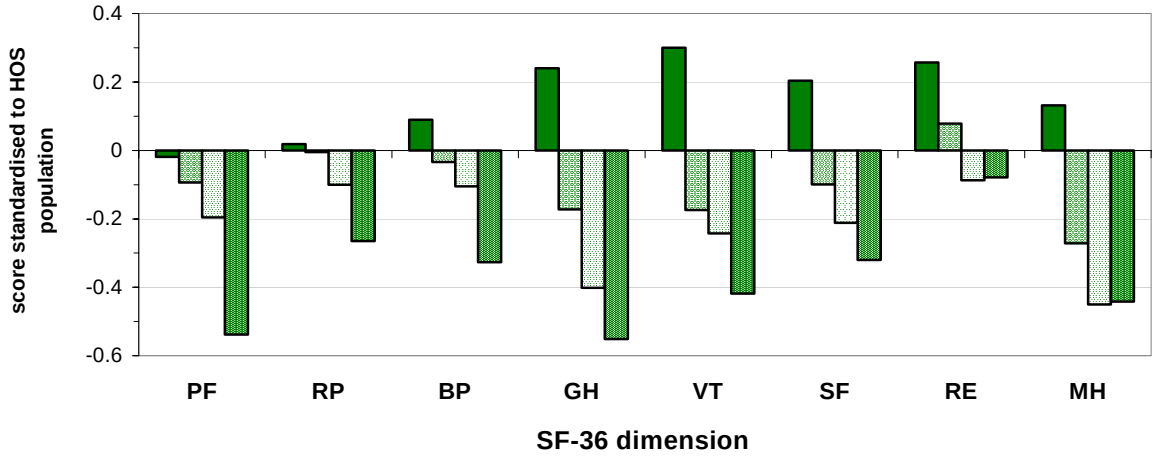


Figure A. 3: Effect of one or more risk factors on SF-36 health related quality of life in the *Western Region*

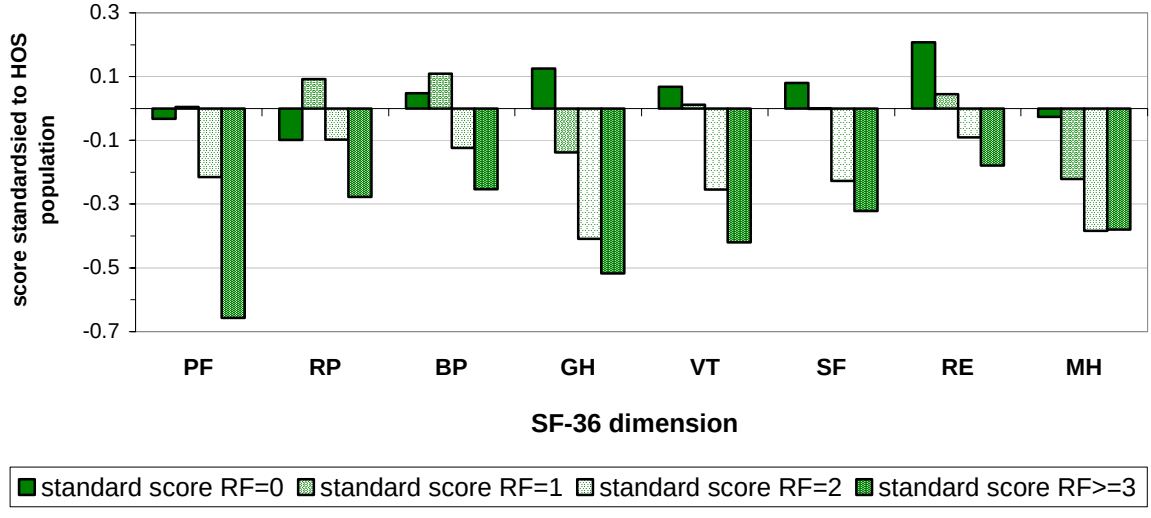


Figure A. 4: Effect of smoking on SF-36 health-related quality of life in *North West Adelaide* (n=2523)

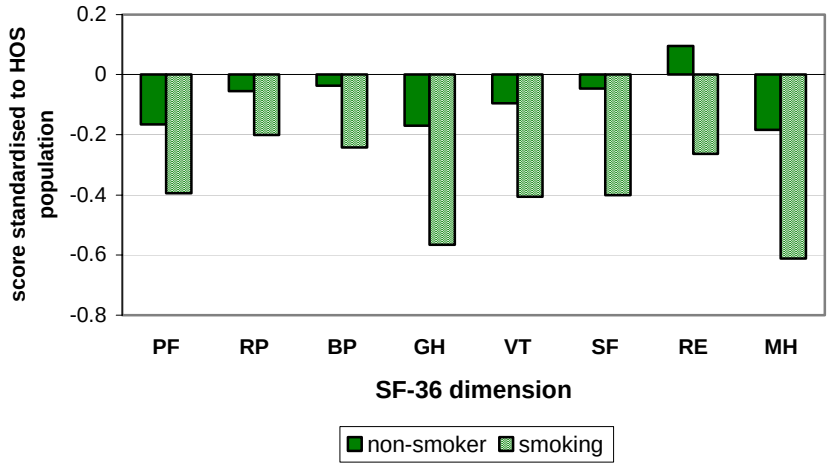


Figure A. 5: Effect of obesity on SF-36 health-related quality of life in *North West Adelaide* (n=2523)

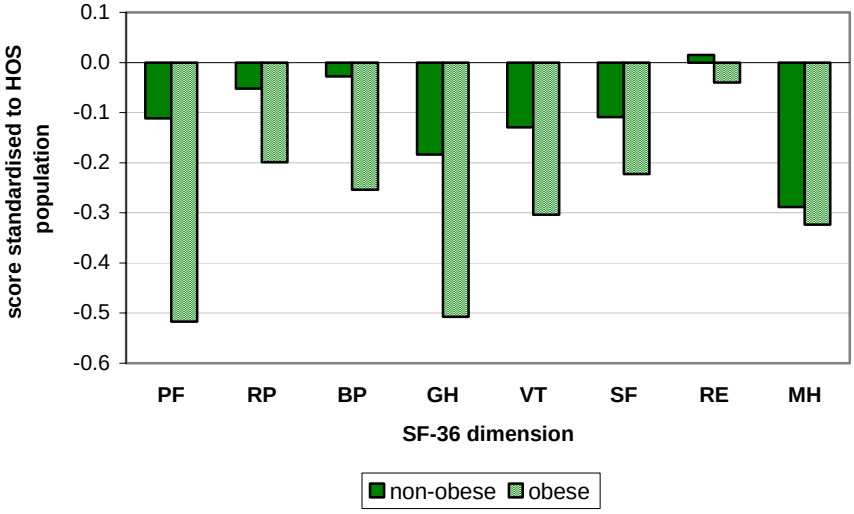


Figure A. 6: Effect of high blood pressure on SF-36 health-related quality of life in *North West Adelaide* (n=2523)

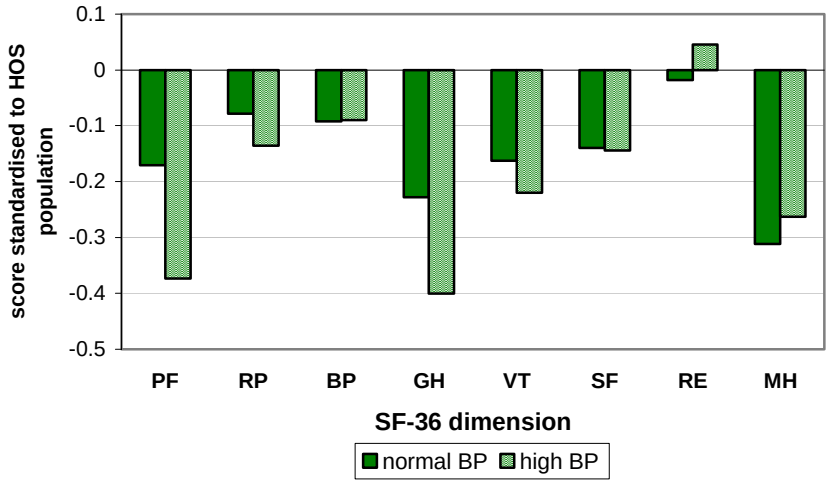


Figure A. 7: Effect of high total cholesterol on SF-36 health-related quality of life in *North West Adelaide* (n=2523)

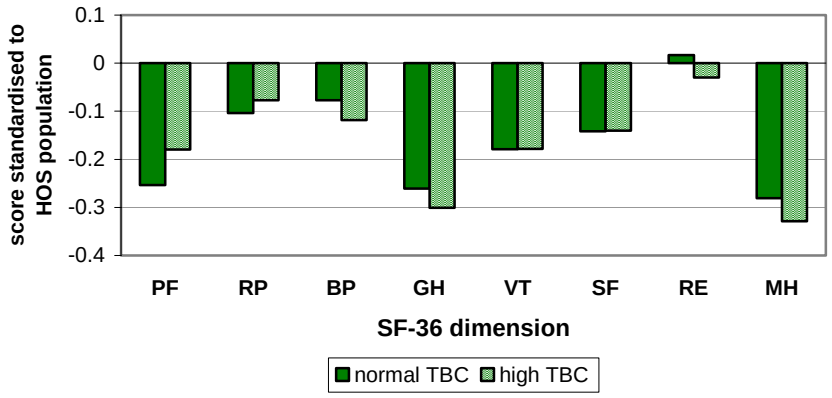


Figure A. 8: Effect of medium to high alcohol use on SF-36 health-related quality of life in *North West Adelaide* (n=2523)

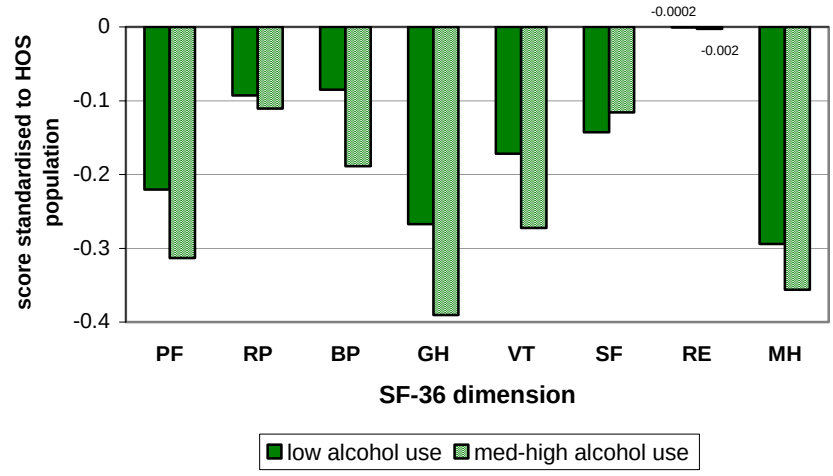


Figure A. 9: Effect of insufficient activity on SF-36 health-related quality of life in *North West Adelaide* (n=2523)

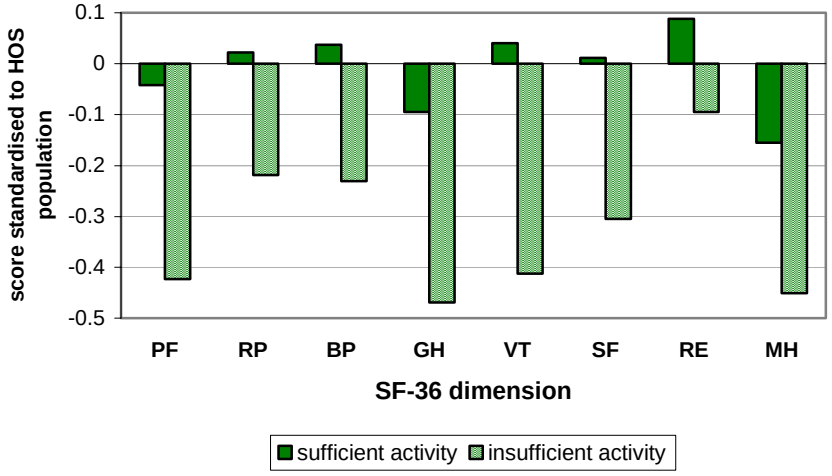


Figure A. 10: Effect of smoking on SF-36 health-related quality of life in the *Northern Region* (n=1113)

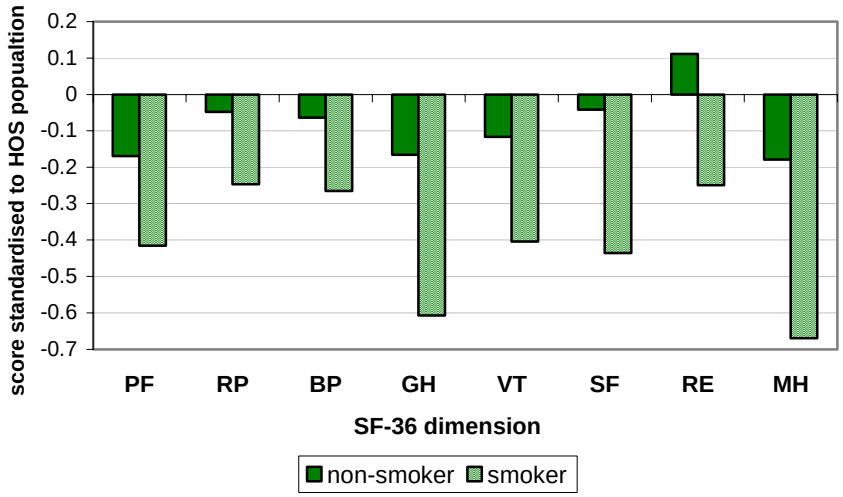


Figure A. 11: Effect of obesity on SF-36 health-related quality of life in the *Northern Region* (n=1113)

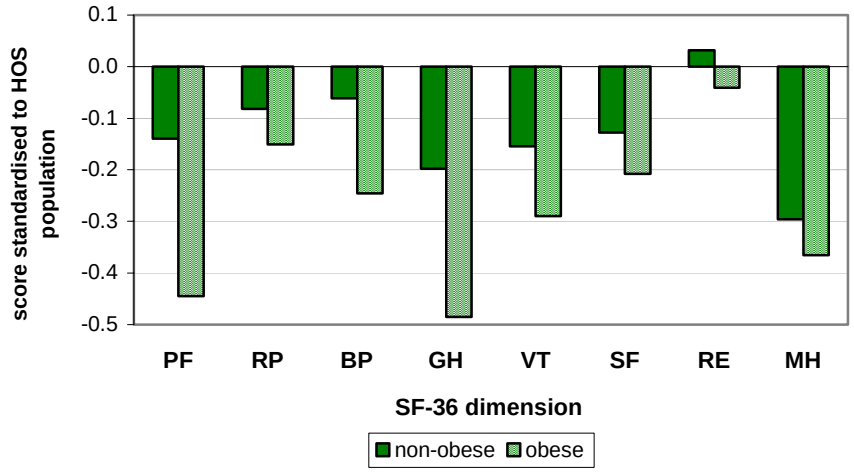


Figure A. 12: Effect of high blood pressure on SF-36 health-related quality of life in the *Northern Region* (n=1113)

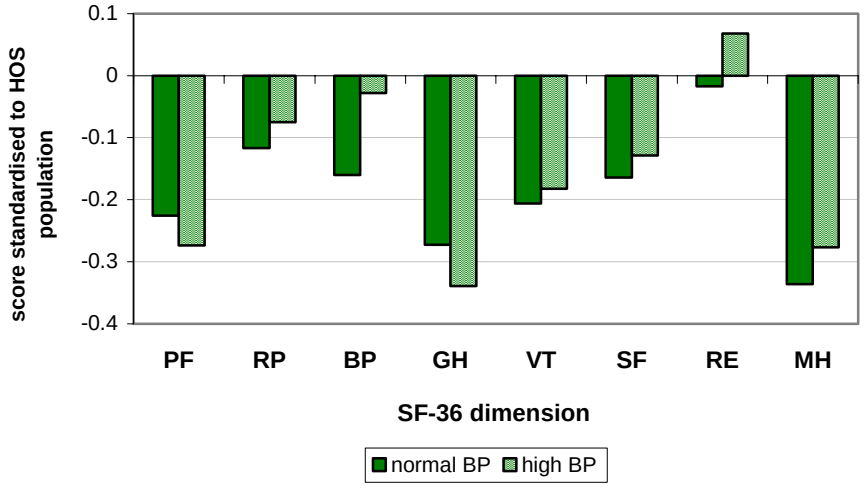


Figure A. 13: Effect of high total cholesterol on SF-36 health-related quality of life in the *Northern Region* (n=1113)

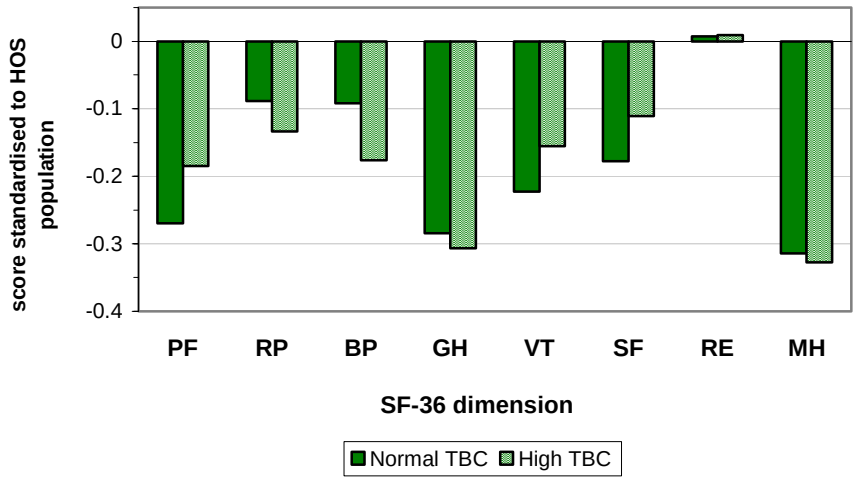


Figure A. 14: Effect of medium to high alcohol use on SF-36 health-related quality of life in the *Northern Region* (n=1113)

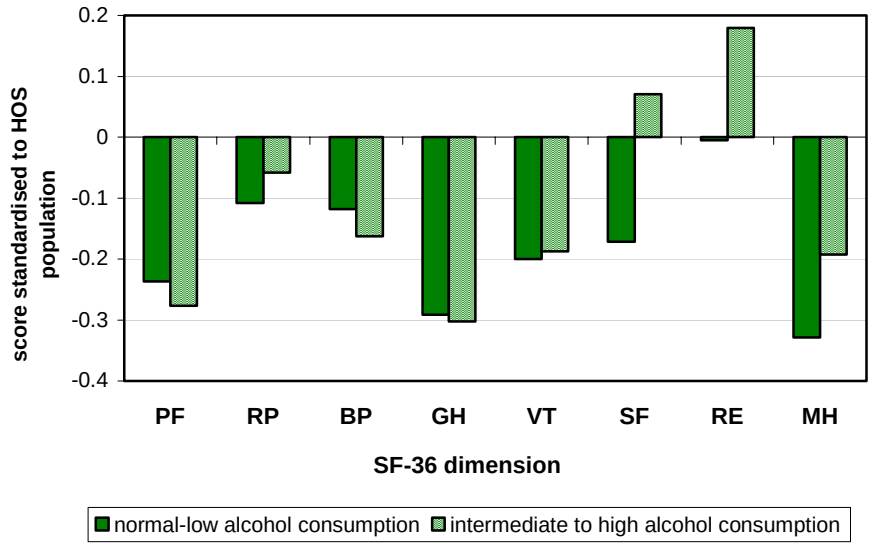


Figure A. 15: Effect of insufficient activity on SF-36 health-related quality of life in the *Northern Region* (n=1113)

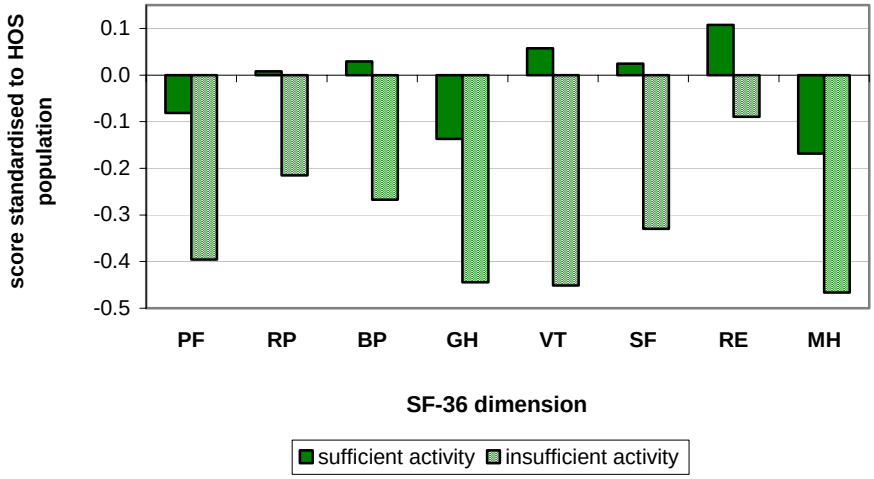


Figure A. 16: Effect of smoking on SF-36 health-related quality of life in the *Western Region* (n=1411)

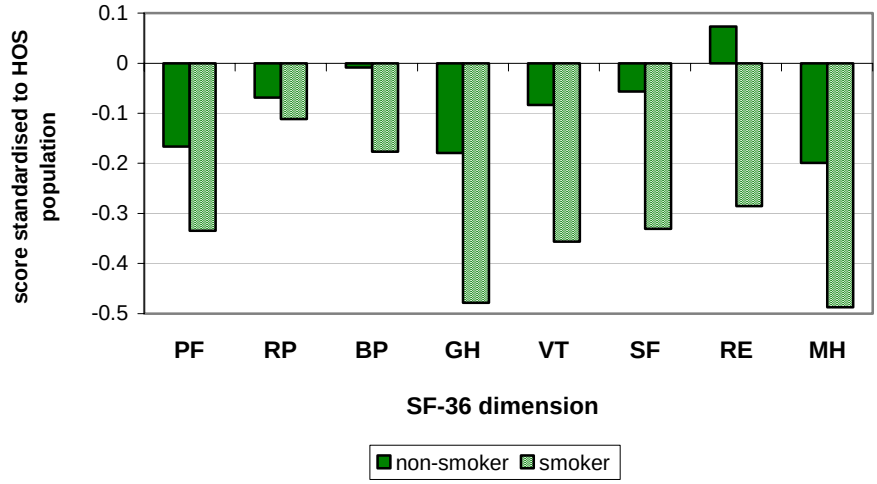


Figure A. 17: Effect of obesity on SF-36 health-related quality of life in the *Western Region* (n=1411)

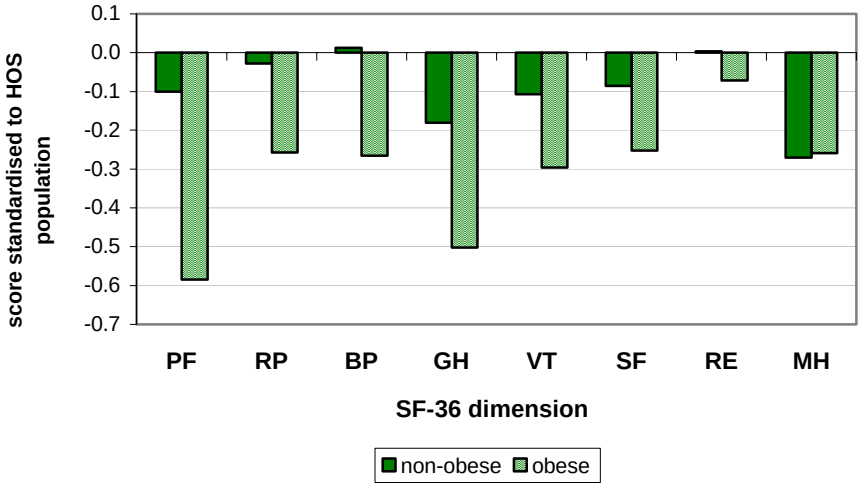


Figure A. 18: Effect of high blood pressure on SF-36 health-related quality of life in the *Western Region* (n=1411)

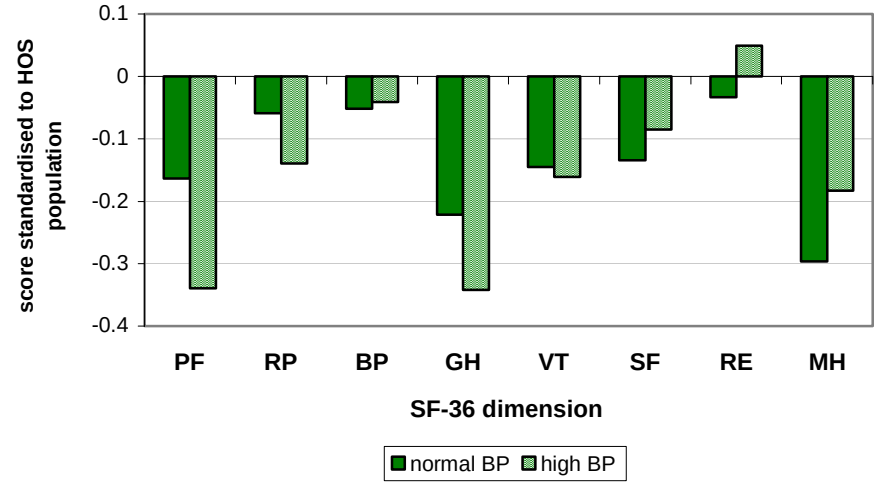


Figure A. 19: Effect of high total cholesterol on SF-36 health-related quality of life in the *Western Region* (n=1411)

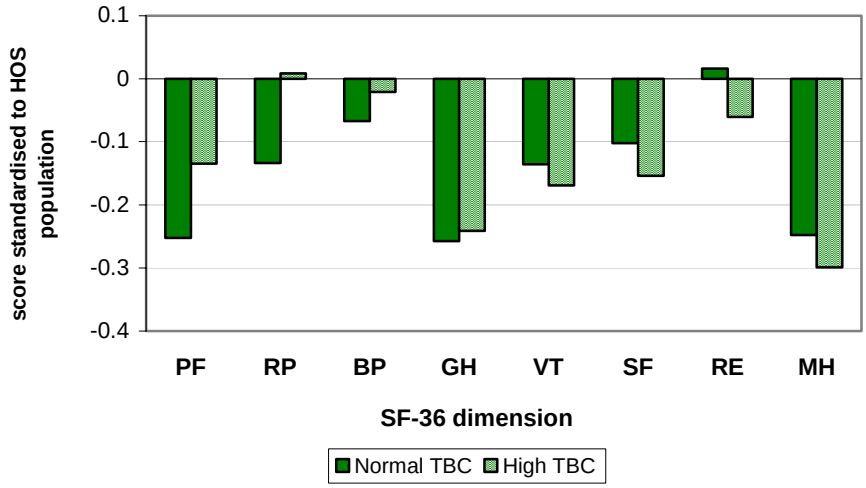


Figure A. 20: Effect of medium to high alcohol use on SF-36 health-related quality of life in the *Western Region* (n=1411)

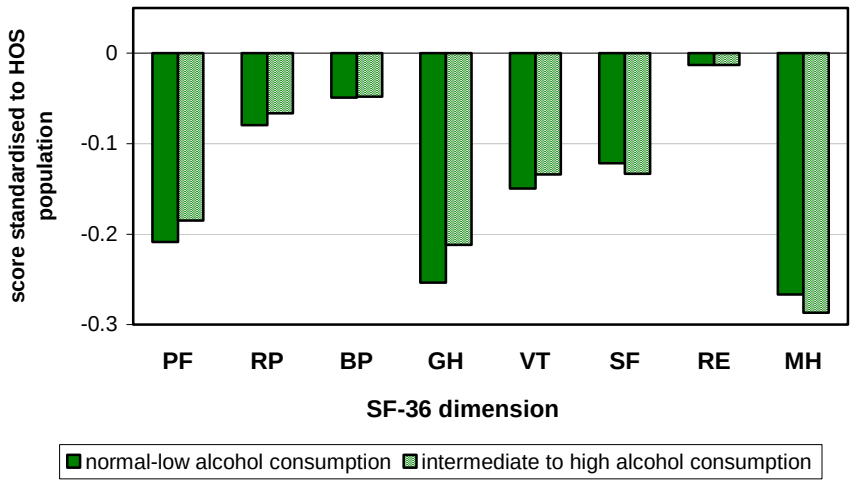
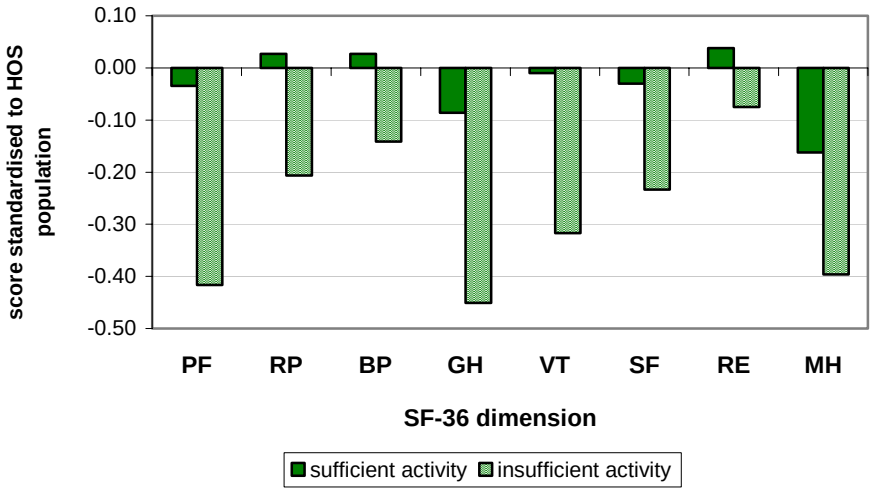


Figure A. 21: Effect of insufficient activity on SF-36 health-related quality of life in the *Western Region* (n=1411)



REFERENCES

[1] Pilotto LS, Smith B, Nitschke M, Ruffin R, Mitchell R. Industry, air quality, cigarette smoke and rates of respiratory illness in Port Adelaide. *Australian and New Zealand Journal of Public Health* 1999; 23: 657-660

[2] Wilson D, Wakefield MA, Taylor A. The South Australian Health Omnibus Survey. *Health Promotion Journal of Australia.* 1992; 2:47-49.

[3] Ware JE, Snow KK. Kosinski M, Gandek B. *SF-36 health survey: manual and interpretation guide.* The Health Institute, New England Medical Center. Boston, Massachussetts, 1993.

[4] Goldberg D, Williams P. *A user's Guide to the General Health Questionnaire.* Windsor: NFER-Nelson Publishing Company LTD, 1998.

[5] Centre for Population Studies in Epidemiology. *The North West Adelaide Health Study. Initial Results.* Department of Human Services, South Australia, October 2001.

[6] Taylor A, Dal Grande E, Chittleborough C, Phillips P, Cheek J, Wilson D, Ruffin R. *The North West Adelaide Health Study – Key findings, policy implications and research recommendations.* SA Department of Human Services, Adelaide, 2002.

[7] Australian Bureau of Statistics. *Socio-Economic Indexes for Areas 96.* Canberra: Australian Bureau of Statistics. http://abs.sagen.sa.gov.au/abs/abs@nsf/5e3ac7411e37881aca2568b0007afd16/b8186d. Accessed 13th May 2002.

[8] Joffe M, Mindell J. A framework for the evidence base to support Health Impact Assessment. *Journal of Epidemiology and Community Health* 2002; 56: 132-138.

[9] Morbidity and Mortality Weekly Reports. Ten great public health advances. *MMWR* 1999; 48: 241-43.

[10] Australian Institute of Health and Welfare and Commonwealth Department of Health and Family Services. *First report on National Health Priority Areas 1996*. AIHW Cat No. PHE 1. Canberra: AIHW and DHFS, 1997.

[11] Commonwealth Department of Health and Aged Care and Australian Institute of Health and Welfare. *National Health Priority Areas Report: Diabetes Mellitus 1998.* AIHW Cat. No. PHE 10. HEALTH and AIHW, Canberra, 1999.

[12] Commonwealth Department of Health and Aged Care. *National Health Priority Areas. Asthma*. Canberra 1999. Accessed at http://www.health.gov.au/hsdd/nhpq/asthma/

[13] National Public Health Partnership. *Preventing Chronic Disease: A Strategic Framework.* A Background Paper. Melbourne: NPHP, 2001.

[14] National Health Performance Committee. *National Health Performance Framework Report*. Brisbane: Queensland Health, 2001.

[15] Pan American Health Organisation. *Health Promotion: an Anthology* (PAHO Scientific Publication 557). Washington, DC: 1996.

[16] Kaplan RM. Two pathways to prevention. *American Psychologist* 2000; 55; 382-96.

[17] Kreiger N. Theories for social epidemiology in the 21st century: an ecosocial perspective. *International Journal of Epidemiology* 2001; 30: 668-677.

[18] Magnus P, Beaglehole R. The real contribution of the major risk factors to the coronary epidemics: time to end the "only-50%" myth. *Archives of Internal Medicine* 2001; 161: 2657-60.

[19] McGinnis JM. Health Objectives for the nation. *American Psychologist* 1991; 46: 520-24.

[20] Murray RP, Connett JE, Tyas SL, Bond R, Ekuma O, Silversides C, Barnes GE. Alcohol volume, drinking pattern, and cardiac disease morbidity and mortality. Is there a U shaped function? *American Journal of Epidemiology* 2002; 155: 242-48.

[21] National Heart Foundation of Australia. *Risk Factor Prevalence Study. Survey Number 3 1989.* Canberra: Australian Institute of Health, 1990.

[22] Doll R, Peto R, Hall E, Wheatley K, Gray R. Mortality in relation to consumption of alcohol: 13 years' observations on male British doctors. *British Medical Journal* 1994; 309: 911-918.

[23] Parekh RS, Klag MJ. Alcohol: role in the development of hypertension and end-stage renal disease. *Current Opinion in Nephrology & Hypertension* 2001; 10: 385-90.

[24] Chalmers J et al. *Guidelines for the management of hypertension*. WHO-ISH Hypertension Guidelines Committee. World Health Organisation. Geneva. 1999. Accessed at http://www.who.int/ncd/cvd/ht_guide [30/8/01].

[25] Stamler J, Wentworth D, Neaton JD, for the MRFIT Research Group. Is the relationship between serum cholesterol and risk of premature death from coronary heart disease continuous and graded? Findings in 356,222 primary screenees of the Multiple Risk Factor Intervention Trial (MRFIT) *JAMA* 1986; 256: 2823-8.

[26] Genest J Jr. Genetics and prevention: A new look at high-density lipoprotein cholesterol. *Cardiology in Review* 2002; 10: 61-71.

[27] Dunstan D, Zimmet P, Welborn T, Sicree R, Armstrong, Atkins R, Cameron A, Shaw J, Chadban S. *Diabesity and Associated Disorders in Australia – 2000: The Accelerating Epidemic. The Australian Diabetes, Obesity and Lifestyle Study (AusDiab) Report*. International Diabetes Institute, Melbourne, 2001.

[28] Long-Term Intervention with Pravastatin in Ischaemic Disease (LIPID) Study Group. Prevention of cardiovascular events and death with pravastatin in patients with coronary heart disease and a broad range of cholesterol levels. *New England Journal of Medicine* 1998; 339: 1349-57.

[29] Commonwealth Department of Health and Ageing. *PBS Expenditure and Prescriptions. October 2000 to September 2001*. Canberra, 2002. Accessed: www.health.gov.au/pbs/pubs/pbbexp/pbsept

[30] Australian Institute of Health and Welfare and National Stroke Foundation of Australia. *Heart, Stroke and Vascular Diseases Australian Facts 2001*. Canberra. AIHW. 2001.

[31] Jacobs DR, Adachi H, Mulder I, Kromhout D, Menotti A, Nissinen A, Blackburn H. Cigarette smoking and mortality risk: twenty five year follow up of the seven countries study. *Archives of Internal Medicine* 1999; 159: 733-40.

[32] Kawachi I, Colditz GA, Stamfer MJ. Smoking cessation and time course of decreased risks of coronary heart disease in middle-aged women. *Archives of Internal Medicine* 1994; 154: 169-75.

[33] US Department of Health and Human Services. *Reducing tobacco use. A report of the Surgeon General*. Atlanta Georgia: US Department of Health and Human Services, 2000.

[34] Lantz PM, Jacobson PD, Warner KE, Wasserman J, Pollack HA, Berson J, Ahlstrom A. Investing in youth tobacco control: a review of smoking prevention and control strategies. *Tobacco Control* 2000; 9: 47-63.

[35] Koplan JP, Dietz WH. Caloric imbalance and public health policy. *Journal of the American Medical Association* 1999; 282: 1579-81.

[36] Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity in the United States. *Journal of the American Medical Association* 1999; 282; 1523-29.

[37] Frazao E. Americas eating habits: changes and consequences. Washington DC: US Dept. of Agriculture; 1999. *Information Bulletin* AIB-750.

[38] Martinson BC, O'Connor PJ, Pronk NP. Physical inactivity and short term all cause mortality in adults with chronic disease. *Archives of Internal Medicine* 2001; 161: 1173-80.

[39] Ekelund L, Haskel W, Johnson J, Whaely F, Criqui M, Sheps D. Physical fitness as a predictor of cardiovascular mortality in asymptomatic North American men: the Lipids Research Clinics Mortality follow up study. *New England Journal of Medicine* 1988; 319: 1379-84.

[40] Armstrong T, Bauman A, Davies J. *Physical activity patterns of Australian adults*. Results of the 1999 National Physical Activity Survey. Canberra. AIHW. 2000.

[41] Mathers C, Vos T, Stevenson C. *The Burden of Disease and Injury in Australia*. Canberra: Australian Institute of Health and Welfare, 1999.

[42] Zimmet P, Alberti KGMM, Shaw J. Global and societal implications of the disease epidemic. *Nature* 2001; 414: 782-87.

[43] Phillips P, Wilson D, Beilby J, Taylor A, Rosenfeld E, Hill W, Parsons J. Diabetes complications and risk factors in an Australian population. How well-managed are they. *International Journal of Epidemiology* 1998; 27: 853-859.

[44] Centre for Population Studies in Epidemiology. *Diabetes Clearing House (Brief Report).* Adelaide Department of Human Services 2002.

[45] Ryu J, Scanlon PD. Obstructive lung diseases: COPD, asthma and many imitators. *Mayo Clinic Proceedings* 2001; 414: 782-87.

[46] Ruffin R, Wilson D, Chittleborough C, Southcott A, Smith B, Christopher D. Multiple respiratory symptoms predict quality-of-life in chronic lung disease: A population based study of Australian adults. *Quality-of-life Research* 2000; 9: 1031-39.

[47] Pena VS, Miravitlles M, Gabriel M, Jimenez-RuizCA, Villasante C, Masa JF, Viejo L, Fernandez-Fau L. Geographic variations in Prevalence and underdiagnosis of COPD. Results of the IBERPOC Multicentre Epidemiological Study. *Chest* 2000; 118(4): 981-989.

[48] Quanjer GJ, Tammeling JE, Cotes OF, Pederson RP, Yernault J-C. Lung volumes and forced ventilatory flows. *European Respiratory Journal* 1993; 6 (Suppl. 16): 5-40.

[49] Ruffin RE, Wilson D, Southcott A, Smith B, Adams RJ. A South Australian population survey of the ownership of asthma action plans. *Medical Journal of Australia* 1999;171:348-51.

[50] Parsons J, Wilson D, Scardigno A. *The Impact of Diabetes in South Australia. The Evidence*. On behalf of the South Australian Diabetes Health Priority Area Advisory Group. South Australian Department of Human Services, Adelaide, 2000.