Department of Health

health

The Victorian Health Monitor

Revised 2013

State Government Victoria

The Victorian Health Monitor

Revised February 2013

If you would like to receive this publication in an accessible format, please phone 03 9096 0000 using the National Relay Service 13 36 77 if required.

This document is also available in PDF format on the internet at: www.health.vic.gov.au/healthstatus/survey

Suggested citation: Department of Health 2012, *The Victorian Health Monitor*, State Government of Victoria, Melbourne.

Published by the Prevention and Population Health Branch, Victorian Government Department of Health, Melbourne, Victoria.

ISBN 978-1-921801-13-6 (Online version)
978-1-921801-12-9 (Printed version)

Authorised and published by the State Government of Victoria, 50 Lonsdale Street, Melbourne.
February 2013 (1302007).

Foreword

The findings of the Victorian Health Monitor survey provide us with important information to guide and monitor prevention efforts in Victoria to help address the rising prevalence of lifestyle related chronic diseases.

Cardiovascular disease, diabetes and chronic kidney disease together account for approximately one quarter of the burden of disease in Australia. This is also true for Victoria. These three conditions share many common lifestyle-related risk factors and hence a large proportion of the disease burden associated with these conditions is potentially preventable.

This report presents, for the first time, measured baseline physical and biomedical information for Victoria on chronic disease risk factors such as poor dietary intake, obesity, elevated blood pressure and sedentary behaviour. By measuring height, weight, waist circumference, blood lipids, blood pressure and fasting blood glucose levels, the Victorian Health Monitor provides, with a high degree of accuracy, an assessment of the prevalence of obesity, hypertension, diabetes and the metabolic syndrome in the adult population. Indicators of chronic kidney disease have also been measured using specific blood and urinary markers.

The survey also included a comprehensive assessment of dietary behaviour, enabling detailed information on food and nutrition intake in the Victorian population to be reported for the first time since the *National Nutrition Survey* was conducted by the Australian Bureau of Statistics in 1995.

The food and nutrition findings of the Victorian Health Monitor are reported in a companion volume to this report entitled *The Victorian Health Monitor Food and Nutrition report*. This will help pinpoint areas in need of improvement and enable monitoring of the Victorian population against national and Victorian nutrition guidelines and recommendations.

The associations at the population level between vitamin D deficiency and skin type are also presented for the first time in this report. The prevalence of vitamin D deficiency in the population has been measured using a blood test.

The Baker IDI Heart and Diabetes Institute were commissioned by the Department of Health to manage the fieldwork and data collection components of the survey, and to report the analysis of the findings to the Department in two reports. Baker IDI is acknowledged for their work in undertaking this landmark survey.

I commend the Victorian Health Monitor reports to you. These reports provide a comprehensive examination of the health status of Victorians. The information provided will help to inform health policy directions as set out in the *Victorian Health Priorities Framework* and the *Public Health and Wellbeing Plan* and provide a baseline against which health measures can be monitored into the future.

Hon David Davis MP
Minister for Health

Contents

Index of figures

Index of tables

Abbreviations

95% CI	95 per cent confidence interval
ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index of Australia
AusDiab	Australian Diabetes, Obesity and Lifestyle study
BMI	body mass index
GFR	glomerular filtration rate
HDL cholesterol	high-density lipoprotein cholesterol
IRSD	Index of Relative Socioeconomic Disadvantage
LDL cholesterol	low-density lipoprotein cholesterol
OR	odds ratio
PBS	Pharmaceutical Benefits Scheme
WHO	World Health Organization

Definitions of risk factors and diseases

Accessibility/ Remoteness Index of Australia (ARIA)

The ARIA is an index of the accessibility of places to service centres or, conversely, of remoteness of places.

Geographical areas were given a score (continuous between 0 and 15) based on the road distance to service towns of different sizes. Scores for regions were derived by averaging scores of 1 km^2 grid. The index scores were classified into various categories as below.

Remoteness areas:

1. Major cities: relatively unrestricted accessibility to a wide range of goods and services and opportunities for social interaction.
2. Inner regional: some restrictions to accessibility of some goods, services and opportunities for social interaction.
3. Outer regional: significantly restricted accessibility of goods, services and opportunities for social interaction.
4. Remote: very restricted accessibility of goods, services and opportunities for social interaction.
5. Very remote: very little accessibility of goods, services and opportunities for social interaction.

In the Victorian Health Monitor, there were no areas classified as remote or very remote.

Adiposity

The state of being fat.

Albuminuria

Albuminuria was defined as an albumin:creatinine ratio of ≥ 2.5 mg/mmol or 3.5 mg/mmol in men and women, respectively.

Anaemia

Anaemia was defined as a haemoglobin level < 130 g/L and < 115 g/L in men and women, respectively.

Cardiovascular disease

Cardiovascular disease included angina, myocardial infarction, stroke, coronary bypass surgery and percutaneous coronary interventions.

Diabetes

Diabetes was defined on the basis of fasting plasma glucose ≥ 7.0 mmol/L or current treatment with oral hypoglycaemic medications or insulin.

Dyslipidaemia

Dyslipidaemia was defined as those who were taking lipid-lowering medication and/or had any of: total cholesterol ≥ 5.5 mmol/L, LDL cholesterol ≥ 3.5 mmol/L, HDL cholesterol < 1.0 mmol/L (men) or < 1.3 mmol/L (women) or triglycerides ≥ 2.0 mmol/L.

Elevated lead

Elevated lead was defined as a blood lead level ≥ 0.48 μmol/L.

Elevated low-density lipoprotein (LDL) cholesterol

Elevated LDL cholesterol was defined as serum LDL cholesterol ≥ 3.5 mmol/L.

Elevated total cholesterol

Elevated total cholesterol was defined as serum total cholesterol ≥ 5.5 mmol/L.

Glomerular filtration rate (GFR)	GFR is a standard measure of the filtering capacity of the kidneys. It is estimated (eGFR) from an equation using serum creatinine, age and sex.
Hypertension	Hypertension was defined on the basis of blood pressure $\geq$ 140/90 mmHg or current treatment with anti-hypertensive medications.
Hypertriglyceridaemia	Hypertriglyceridaemia was defined as serum triglycerides $\geq$ 2.0 mmol/L.
Impaired fasting glucose	Impaired fasting glucose was defined as fasting plasma glucose $\geq$ 6.1 mmol/L but $<$ 7.0 mmol/L.
Index of Relative Socioeconomic Disadvantage (IRSD)	The IRSD is a numerical index used to characterise the socioeconomic status of all postcodes in Australia, based on information concerning percentage of dwellings being rented and percentage of people unemployed, in relatively unskilled occupations, lacking fluency in English, Aboriginal or Torres Strait Islanders, and relatively low educational attainment. In the Victorian Health Monitor, participants were classified into quintiles of socioeconomic disadvantage according to their value of IRSD for their residence, with lowest quintiles corresponding to the highest socioeconomic disadvantage and highest quintiles the lowest socioeconomic disadvantage.
Insufficient physical activity	Physical activity time was calculated as the sum of the time spent walking or performing moderate physical activity per week, plus double the time spent in vigorous physical activity. Insufficient physical activity was defined as 1–149 minutes per week of physical activity.
Known diabetes	Known diabetes was defined as people who had a prior diagnosis of diabetes and who were either taking oral hypoglycaemic medications or insulin, or had a fasting plasma glucose $\geq$ 7.0 mmol/L.
Low high-density lipoprotein (HDL) cholesterol	Low HDL cholesterol was defined as HDL cholesterol $<$ 1.0 mmol/L in men and $<$ 1.3 mmol/L in women.
Metabolic syndrome	Metabolic syndrome was defined as people with any three of five risk factors: elevated waist circumference, elevated triglycerides, reduced high-density lipoprotein cholesterol, elevated blood pressure or elevated fasting glucose.
Newly diagnosed diabetes	Newly diagnosed diabetes was defined as people who did not have a prior diagnosis of diabetes but had a fasting plasma glucose $\geq$ 7.0 mmol/L.
Obesity (BMI)	Obesity (BMI) was defined as people who had a body mass index $\geq$ 30 kg/m^2.

Obesity (waist)	Obesity (waist) was defined as people who had a waist circumference ≥ 102 cm in men or ≥ 88 cm in women.
Physical inactivity	Physical activity time was calculated as the sum of the time spent walking or performing moderate physical activity per week, plus double the time spent in vigorous physical activity. Physical inactivity was defined as zero minutes per week of physical activity.
Psychological distress	Psychological distress was defined as people who scored ≥ 13 points on the Kessler 6 questionnaire.
Sedentary behaviour	Sedentary behaviour was defined as an overall sitting time ≥ eight hours per day.
Smoking status	Smoking status was defined using the following categories. • Daily smoker: people who smoked daily. • Occasional smoker: people who smoked regularly but less frequently than daily. • Ex-smoker: people who currently did not smoke but used to smoke and had smoked at least 100 cigarettes during their lifetime. • Non-smoker: people who had never smoked or those who did not smoke currently and had smoked fewer than 100 cigarettes during their lifetime. • Current smoker: people who smoked daily or occasionally, as defined above.
Sufficient physical activity	Physical activity time was calculated as the sum of the time spent walking or performing moderate physical activity per week, plus double the time spent in vigorous physical activity. Sufficient physical activity was defined as ≥ 150 mins per week of physical activity.
Vitamin B12 deficiency	Vitamin B12 deficiency was defined as a vitamin B12 level ≤ 180 pmol/L.
Vitamin D deficiency	Vitamin D deficiency categories were defined as: • severe deficiency: vitamin D level < 12.5 nmol/L • moderate deficiency: vitamin D level between 12.5 and 29.0 nmol/L • mild deficiency: vitamin D level between 30.0 and ≤ 49.0 nmol/L.

How to interpret a table

All estimates in the tables of this report have been weighted to the 2008 estimated Victorian resident population. The majority of tables contain prevalence estimates by age- and sex-specific groups, as well as an overall estimate of prevalence. Total prevalence estimates have been standardised to the 2006 Victorian population.

How to interpret odds ratios and 95 per cent confidence intervals

The odds ratio is used to compare the odds (or likelihood) of an event, or condition, occurring, or being present, in one group with the odds of the event occurring in another group. An odds ratio of 1.0 indicates that the odds were the same in both groups, while an odds ratio of 3.0 indicates that the odds of an event or condition were three times higher in one group than the other group.

The 95 per cent confidence interval helps to assess how likely it is that the odds ratio calculated in the study population will apply to the wider population by showing the likely range within which the odds ratio might really lie. For example, if we consider the question of having a full-time paid job, we might find that in a survey of 50 people, the likelihood that men had a full-time job was twice that of the women. This would give us an odds ratio of 2.0, and might have a 95 per cent confidence interval of 0.9 to 4.2. We know that if we repeated the survey on another 50 people, we would be unlikely to get an exact odds ratio of 2.0 again. The confidence interval shows us that if we conducted the survey 100 times, each in different groups of 50 people, we would expect that 95 times out of 100 the odds ratios in the study samples would lie within the range of 0.9 to 4.2. Since, in this example, 1.0 lies within the 95 per cent confidence interval, we cannot be confident that in the wider population men are really more likely than women to have full-time jobs. In general, the larger the study sample, the narrower the 95 per cent confidence interval.

All differences between estimates and trends reported in the text of this report are statistically significant differences and trends. If there is no significant difference or trend observed in the data, estimates are described in the text as being 'similar' when compared. For instance, 'the prevalence of obesity was higher in women than in men' indicates that there was a statistically significant difference between the estimates for men and women. The statement that 'the prevalence of dyslipidaemia was similar in men and women' indicates there was no statistically significant difference between the estimates for men and women in this instance.

Introduction

About this survey

The Victorian Health Monitor was conducted as a Victorian statewide cross-sectional, population-health measurement survey, with data collected between May 2009 and April 2010.

The survey aimed to measure the prevalence of diabetes, cardiovascular disease, indicators for chronic kidney disease and hypertension (and their risk factors) in a representative sample of Victorian adults aged 18–75 years.

The specific objectives of the study were to:

- estimate the prevalence of the following conditions in the Victorian metropolitan and rural population
  - diabetes and other forms of abnormal glucose tolerance
  - cardiovascular disease
  - indicators for chronic kidney disease
  - cardiovascular disease risk factors, including obesity, hypertension and lipid profile abnormalities
- assess the distribution and relationships of the cardiovascular disease risk factors indicated above
- assess the associations of the social determinants of health with risk factors and the chronic diseases included in the survey
- inform policy development and contribute to overall program planning for chronic disease prevention activities in Victoria
- inform nutrition policy at the state level and contribute to the evidence base on healthy eating.

About this report

In this report we have described the prevalence of lifestyle factors, biomedical risk factors and chronic diseases such as diabetes, cardiovascular disease and chronic kidney disease in Victorians. In each chapter we report the burden of each of these conditions and describe their burden according to age group, sex, geography and basic demographic factors. The report begins with a chapter entitled, 'Lifestyle behaviours', which contains information on the prevalence of major lifestyle behaviours associated with poor health across the Victorian population including smoking, physical inactivity and sedentary behaviour. It describes, for the first time in a research study, sedentary behaviour in terms of sitting for work, sitting watching television and overall sitting. This will be very important for targeting public health interventions.

Chapter 2 describes the biomedical risk factors that can be affected by such lifestyle factors.

Chapters 3–5 focus on chronic diseases such as diabetes, cardiovascular disease and chronic kidney disease and their relationships with various demographic and risk factors.

Chapter 6 focuses on the social determinants of health, and explores the association of both individual and area-based measures of the social determinants of health with risk factors and chronic diseases.

In chapter 7, we examine the prevalence of several other important health problems faced by Victorians. We look at self-rated health status, levels of psychological distress and deficiencies in key macronutrients such as vitamin D, vitamin B12, red cell folate and iodine. Chapter 7 also reports the prevalence of anaemia and abnormal levels of blood lead.

Methods

Methods

Sample selection and eligibility

The Victorian Health Monitor was a statewide survey of the Victorian population aged 18–75 years residing in 50 randomly selected metropolitan and rural areas (Census Collection Districts or 'CDs') of Victoria.

The sample selection was based on a stratified cluster sample of CDs within the eight Department of Health regions in Victoria. The selection of CDs was based on a random sample that was proportional to the population size (ABS 2006b) of each Department of Health region. CDs with fewer than 100 households were excluded from the sample as these CDs have a very low population density and the surveying of people within these CDs was considered logistically difficult and inefficient. The final sample comprised 25 CDs from the metropolitan area and 25 CDs from rural areas of Victoria.

Non-institutionalised adults aged 18–75 years residing in private dwellings within Victoria were eligible for participation in the survey if they had resided at their address for a minimum of six months prior to the survey. The survey did not include women who were pregnant or people with intellectual disabilities or infirmity that precluded participation.

Survey protocol and procedures

The Victorian Health Monitor was conducted over a 12-month period from May 2009 to April 2010 alongside a marketing campaign. Survey activities were conducted in three phases:

- the household interview
- the biomedical examination
- the diet recall survey.

Invitation and recruitment

A communications company was appointed to conduct the marketing strategy for the survey and an independent market research and a recruitment company was employed to conduct the household interviews and recruitment activities. All private dwellings within selected CDs were initially approached through a hand-delivered (non-addressed) letter informing them of their selection into the survey and advising them that an interviewer would visit the household to conduct an interview.

In order to minimise the potential for selection bias, one eligible person was randomly selected to participate in the survey from all eligible people within each household. At the first interview, the details of willing participants were collected and they were invited to attend a local testing site for the biomedical examination. Those eligible and willing to participate in the survey were provided with an appointment date and were given written instructions on the procedures to follow before their biomedical examination, including instructions to fast for at least 10 hours prior to testing.

Preparation of survey methods and training

The preparation of the survey methods, including both the biomedical examination equipment and questionnaires, was undertaken in accordance with the study aims and objectives.

Survey staff attended a two-day training workshop prior to collecting data. Staff were briefed on the background to the survey, objectives, methodology, privacy, confidentiality and occupational health and safety to ensure accurate and consistent data collection.

Biomedical examination

The Victorian Health Monitor biomedical examination procedures closely followed the study protocol as recommended by the World Health Organization (WHO) for the study of diabetes and other non-communicable diseases (WHO 1999b). Four teams of survey staff administered the survey, with two teams each based in metropolitan and rural Victoria. The biomedical examination was conducted from Friday to Monday over three weekends in each of four testing sites. In cases where a site was unavailable, an alternative weekday was selected. Local survey sites included community centres, scout halls, sporting venues, church halls, neighbourhood houses and schools.

All participants gave written informed consent to participate in the survey upon arrival at the testing site and were asked to remain on site until all tests were performed.

All data were collected on scannable paper forms and scanned directly into a designated database.

Blood sampling and laboratory procedures

Blood was collected by venepuncture after an overnight fast (10 hours or more). Specimens were collected to measure total cholesterol, HDL cholesterol, triglycerides, haemoglobin A1c, vitamin D, haemoglobin, red cell folate, vitamin B12, creatinine, whole blood lead and plasma glucose levels. All blood specimens were centrifuged on site to separate out the plasma and serum. All samples were transported daily to a central laboratory where analyses were conducted.

Urine collection and laboratory procedures

A morning spot urine sample was taken and transported daily to a central laboratory for the measurement of urine albumin, protein and blood, with a separate urine sample sent to Westmead Hospital in Sydney for iodine testing.

Anthropometry

Height was measured to the nearest 0.1 cm without shoes using a stadiometer. Weight was measured without shoes and excess clothing to the nearest 0.1 kg using digital weighting scales. Waist circumference was measured halfway between the inferior margin of the last rib and the iliac crest in the mid-axillary plane to the nearest 0.1 cm, using a steel measuring tape. Hip circumference was measured at the widest point over the buttocks to the nearest 0.1 cm. If the variation between the first and second measurements was greater than 0.5 cm for height, 0.5 kg for weight and 1 cm for waist and hip circumferences, a third measurement was taken and the mean of the two closest measurements was calculated. Body mass index (BMI, kg/m^2) and waist-to-hip ratio was calculated.

Blood pressure

Blood pressure measurement was performed in a seated position after resting for five minutes or more using an automated blood pressure monitor that was regularly calibrated. A cuff of suitable size was applied on the participant's exposed upper arm (the arm not used for blood collection), which was supported on a table at heart level. Three sequential measurements were taken, with a one-minute interval between them. The mean of the first two measurements were taken. However, if the difference between the first and second measurements was great than 10 mmHg and 6 mmHg for systolic and diastolic blood pressure, respectively, the third measurement was considered, and the mean of the two closest readings was used.

Questionnaires

The Food Frequency Questionnaire (FFQ) and the Modified Fitzpatrick Scale (MFS) were self-administered. The MFS is a modified version of the Fitzpatrick Skin Type Scale, which measures self-reported skin, eye and hair colour and skin sensitivity to sunlight (Fitzpatrick 1988).

An interviewer-administered questionnaire was used to ascertain a range of health and social information including demographic characteristics, lifestyle behaviours, previous history of diabetes and cardiovascular disease and socioeconomic status.

Diet recall survey

Three diet recall interviews were conducted to gather information on the diet of Victorians. The first diet recall interview was undertaken within five to seven days of participants attending the biomedical examination. Two subsequent recall interviews were conducted at two-week intervals following the first diet recall interview.

Feedback to participants

Participants were sent letters within two to three weeks following the completion of testing. They were thanked for their participation in the survey and provided with the results of their blood pressure measurement, body mass index, blood and urine tests.

Survey response

In total 14,656 households were approached across Victoria. Of the 11,353 households where contact was achieved, 6,503 (57.3 per cent) households wished to participate in the survey. Of the 6,503 households that agreed to participate, 4,922 people were identified as being eligible to participate in the survey. Of these, 3,653 eligible people attended the biomedical examination, yielding an overall response rate of 37.6 per cent.

Statistical analysis

To account for the clustering and stratification of the survey design, and to adjust for non-response, the data have been weighted to match the age and sex distribution of the 2008 estimated residential population of Victoria aged 18–75 years (Biemer & Christ 2008). The details of constructing the survey weights are supplied in the Appendix.

In order to eliminate the effect that differences in age structure may have on estimates from different populations, the prevalence of risk factors and diseases have been age-standardised to the 2006 estimated residential population of Victoria aged 18–75 years (ABS 2006b).

Differences in the prevalence of health conditions by sex were compared using Pearson's χ^2 test while accounting for survey design. Survey-weighted logistic regression models, which account for the survey design characteristics, were used to test the trends for age groups and to compare the difference in the prevalence according to major risk factors and locality. Statistical significance was determined at $p < 0.05$.

All analyses were conducted using PASW statistics version 18 (SPSS, Chicago, Illinois, USA) and Stata statistical software version 11.0 (StataCorp, College Station, Texas, USA).

Summary of findings

Summary of findings

Smoking

The prevalence of daily smoking in the population aged 18–75 years was 13.9 per cent, with an additional 4.0 per cent being occasional smokers. There was a higher prevalence of daily smokers in men compared with women. However, a similar proportion of women reported being occasional smokers (4.3 per cent), as did men (3.8 per cent). The prevalence of daily smokers decreased with age group in women, but not in men.

Physical activity

The proportion of people undertaking sufficient physical activity to meet national guidelines was 69.0 per cent. The prevalence of sufficiently active men was higher than that of women. The prevalence of sufficient levels of activity decreased with age group in men, but no clear pattern was evident in women.

Sedentary behaviour

The proportion of people sitting at least eight hours per day was 26.2 per cent. The proportions of people sitting at work and watching TV for greater than four hours per day were 31.9 per cent and 9.3 per cent, respectively.

Obesity

The proportion of Victorians categorised as overweight or obese according to measured body mass index (BMI) was 62.6 per cent (overweight: 38.1 per cent; obese: 24.5 per cent), equating to about 2.4 million people aged 18–75 years. The prevalence of obesity, which was defined using measured waist circumference, was 32.0 per cent. The prevalence of obesity was higher in women than in men and increased with age group, based on both the BMI and waist circumference definitions for obesity.

Hypertension

The proportion of people aged 18–75 years who had elevated blood pressure or who were treated for hypertension was 25.1 per cent. The prevalence of hypertension was higher in men than in women and increased with age group. It was also higher for those with fair or poor health, the obese and those with dyslipidaemia.

Among those who were on treatment for hypertension, 46.1 per cent had adequate blood pressure control.

Dyslipidaemia

The proportion of Victorians who had dyslipidaemia, defined as those who were taking lipid-lowering medication and/or had abnormal levels of either total cholesterol, LDL cholesterol, HDL cholesterol or triglycerides, was 56.8 per cent. The prevalence of dyslipidaemia was similar in men and women and increased with age group. It was higher in those who were either physically inactive or sedentary, current smokers, those with fair or poor health, the obese and those with hypertension.

Of the 8.5 per cent of the population on lipid-lowering therapy, 51.9 per cent was found to have at least one abnormality of the four lipid fractions.

Lipid-lowering therapy was being taken by about half (50.4 per cent) of all people aged 18–75 years with cardiovascular disease who were eligible for medication under the Pharmaceutical Benefits Scheme (PBS) criteria, and about half (51.1 per cent) of those with diabetes (but no cardiovascular disease).

Self-rated good/very good/excellent health

The proportion of Victorians reporting their health as excellent, very good or good was 87.9 per cent. The proportions of men and women reporting excellent, very good or good health were similar and the proportions were similar between age groups.

Psychological distress

The proportion of Victorians with elevated levels of psychological distress (Kessler 6 score 13+) was 2.8 per cent. The proportions were similar between men and women and did not increase with age group.

Diabetes

The prevalence of diabetes was 4.6 per cent for all Victorians in 2009–2010. A further 4.3 per cent had impaired fasting glucose. The prevalence of type 1 and type 2 diabetes were 0.6 per cent and 4.0 per cent, respectively. The prevalence of diabetes was similar between men and women, and increased with age group.

The prevalence of known diabetes was 3.4 per cent, which was higher than that of newly diagnosed diabetes (1.2 per cent). This would suggest that for every three diagnosed cases there is one undiagnosed case of diabetes in Victoria.

Among those with known diabetes, 91.6 per cent were receiving oral hypoglycaemic medications and/or insulin. Less than half (39.0 per cent) of those with known diabetes were meeting the haemoglobin A1c target for diabetes control.

Metabolic syndrome

Approximately one in five (20.9 per cent) Victorians aged 18–75 years met the criteria for the metabolic syndrome as defined according to a consensus statement for the clinical diagnosis of the metabolic syndrome. The prevalence of the metabolic syndrome was higher in men than in women, and increased with age group. The prevalence of the metabolic syndrome was also higher in those who were physically inactive or sedentary, current or ex-smokers, and in those with fair or poor health.

Cardiovascular disease

The prevalence of self-reported cardiovascular disease was 3.1 per cent for Victorians aged 18–75 years in 2009–2010. The prevalence of cardiovascular disease was higher in men than in women, and increased with age group. It was higher in rural areas compared with the metropolitan area, and higher in the physically inactive, the obese, in those with fair or poor health and higher in those with diabetes and the metabolic syndrome.

Chronic kidney disease

The prevalence of impaired estimated glomerular filtration was 3.5 per cent. Using albuminuria as an indicator for chronic kidney disease, the prevalence was 6.4 per cent, while 9.1 per cent of Victorians aged 18–75 years had either an impaired estimated glomerular filtration rate or albuminuria.

Social determinants of health

There was a social patterning to the prevalence of risk factors and chronic disease as assessed by individual (education and income) and area-based measures (accessibility and index of relative social economic disadvantage), though the patterns varied by disease state and risk factor.

Vitamin B12, red cell folate and anaemia

The prevalence of vitamin B12 deficiency was 7.7 per cent. Red cell folate levels were excellent, with less than one per cent of Victorians having a folate deficiency. Anaemia was present in two per cent of Victorians aged 18–75 years.

Vitamin D and iodine deficiency, and lead levels

More than two in five (42.6 per cent) Victorians aged 18–75 years were deficient in vitamin D. There was a mild level of iodine deficiency identified in the Victorian population and the average blood lead level for adult Victorians was well below the National Health Medical Research Council (NHMRC) threshold for elevated blood lead levels.

1. Lifestyle behaviours

1. Lifestyle behaviours

There are several lifestyle behaviours that are associated with the risk of diabetes, cardiovascular disease and kidney disease. Improving our understanding of these relationships is imperative to reducing the incidence of these and other chronic diseases in the future.

The various relationships between lifestyle behaviours and diabetes, cardiovascular disease and chronic kidney disease among Victorians will be explored in later chapters. This chapter provides a description of some of the relevant lifestyle behaviours and their prevalence in the Victorian population.

Smoking

Tobacco smoking is considered to be the major risk factor for a large number of respiratory, malignant and vascular diseases, and its effects on such conditions increases the risk of complications of other conditions such as diabetes, hypertension and dyslipidaemia.

The prevalence of tobacco smoking among adults in Victoria has been steadily declining for many years (McCarthy et al. 2009).

Questions on a person's smoking history were included in the interviewer-administered risk factor questionnaire using a validated instrument (Australian Institute of Health and Welfare (AIHW) 1998).

Definitions

The following criteria were used to define smoking status (Table 1.1).

Table 1.1 Classification of smoking status

Classification	Definition
Daily smoker	Smokes daily
Occasional smoker	Smokes regularly but less frequently than daily
Ex-smoker	Doesn't smoke currently but used to and has smoked ≥ 100 cigarettes during lifetime
Non-smoker	Never smoked or doesn't smoke currently and has smoked < 100 cigarettes during lifetime

Results

Overall prevalence

Table 1.2 shows the age-standardised prevalence of smoking in people aged 18–75 years. The prevalence of daily smoking in the total population was 13.9 per cent, with an additional 4.0 per cent being occasional smokers. The prevalence of non-smokers was 57.6 per cent. There was a higher prevalence of daily smokers among men (16.6 per cent) than among women (11.4 per cent), $p<0.001$. However, a similar proportion of women reported being occasional smokers (4.3 per cent) as did men (3.8 per cent) (Table 1.2).

Applying the prevalence of daily smokers to the total population of Victoria in 2008 produces an estimate of 527,000 people aged 18–75 years who smoke daily.

Prevalence by age group and sex

Table 1.2 describes the prevalence of smoking status by age group and sex. The prevalence of daily smokers decreased with age in women (p for trend = 0.001) but not for men. The age group with the highest proportion of daily smokers for both men and women was the 18–34 year age group and the age group with the highest proportion of ex-smokers for both men and women was the 65–75 year age group (Table 1.2).

Table 1.2 Prevalence of smoking status according to sex and age group

	Smoking status														
	Daily smoker			Occasional smoker			Ex-smoker			Non-smoker			Don't know/refused		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
Men															
18–34	18.6	14.0	24.4	4.2	2.3	7.6	10.1	6.8	14.7	67.1	61.6	72.2	0.0	–	–
35–44	16.9	12.1	23.0	5.1	2.9	8.9	19.6	14.3	26.3	58.2	50.3	65.7	0.2	0.0	1.5
45–54	18.0	13.4	23.7	3.8	1.7	8.0	32.7	25.6	40.6	45.6	36.8	54.7	0.0	–	–
55–64	12.8	8.4	18.8	2.4	1.0	5.6	41.1	36.0	46.4	43.8	38.8	48.8	0.0	–	–
65–75	12.5	7.2	21.1	2.1	0.3	11.6	53.5	45.9	61.1	31.8	26.2	38.1	0.0	–	–
Total	**16.6**	**14.3**	**19.1**	**3.8**	**2.7**	**5.3**	**25.8**	**22.8**	**29.0**	**53.8**	**50.4**	**57.1**	**0.0**	**0.0**	**0.3**
Women															
18–34	15.5	10.3	22.6	6.3	3.2	12.0	17.3	13.1	22.6	60.1	52.4	67.4	0.8	0.1	5.2
35–44	11.2	7.8	15.9	3.7	2.0	6.8	25.8	18.5	34.8	59.3	51.9	66.2	0.0	–	–
45–54	11.5	8.6	15.3	5.0	2.0	12.2	26.1	21.8	30.9	57.3	52.0	62.4	0.1	0.0	0.4
55–64	7.5	4.8	11.4	1.7	0.5	5.2	22.3	18.0	27.3	68.5	62.4	74.0	0.0	–	–
65–75	4.0	1.8	8.7	2.1	0.5	7.8	26.4	19.1	35.3	67.5	58.5	75.3	0.0	–	–
Total	**11.4**	**9.1**	**14.2**	**4.3**	**2.7**	**6.8**	**22.7**	**19.8**	**26.0**	**61.3**	**57.8**	**64.7**	**0.3**	**0.0**	**1.8**
Persons															
18–34	17.1	13.0	22.1	5.2	3.1	8.8	3.7	10.6	17.4	63.6	59.4	67.6	0.4	0.1	2.7
35–44	14.0	10.8	17.9	4.4	2.9	6.6	22.7	17.9	28.4	58.7	53.3	64.0	0.1	0.0	0.8
45–54	14.7	11.7	18.4	4.4	2.2	8.6	29.4	25.2	33.8	51.5	46.5	56.5	0.0	0.0	0.2
55–64	10.1	7.3	13.7	2.0	0.9	4.5	31.6	27.8	35.6	56.3	51.8	60.7	0.0	–	–
65–75	8.1	5.2	12.4	2.1	0.5	9.2	39.6	34.8	44.5	50.2	45.3	55.1	0.0	–	–
Total	**13.9**	**11.9**	**16.3**	**4.0**	**2.9**	**5.6**	**24.2**	**22.3**	**26.3**	**57.6**	**55.6**	**59.7**	**0.2**	**0.0**	**0.8**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

13/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 1.3 describes the associations of daily/occasional smoking with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of smoking was higher for people born in Australia than for those born overseas but was not related to language spoken at home or marital status. The prevalence of smoking was higher among people who were physically inactive or insufficiently active versus those who were sufficiently active. The prevalence of smoking was not related to sedentary behaviour status but was higher among those who self-rated their health as fair or poor versus those who did not. The prevalence of smoking was not related to obesity status (using either BMI or waist circumference).

Table 1.3 Prevalence of daily/occasional smoking and risk of being daily/occasional smokers, by selected risk factors

	Daily/occasional smoking %	95% CI		Age and sex-adjusted odds ratio of smoking (95% CI)
Country of birth				
Australia	19.3	16.8	22.1	1.0
Overseas	13.8	9.7	19.2	0.7 (0.5–0.9)
Language spoken at home				
English	18.3	15.9	20.9	1.0
Other than English	17.1	12.6	22.7	0.9 (0.6–1.3)
Marital status				
Married/living with a partner	18.7	15.4	22.5	1.0
Other[a]	24.2	20.7	28.1	1.3 (0.9–2.1)
Physical activity				
Sufficiently active	16.9	14.3	19.8	1.0
Insufficiently active or inactive	20.4	17.3	23.9	1.3 (1.0–1.7)
Sedentary behaviour				
< 8 hours of total sitting per day	18.3	15.4	21.6	1.0
≥ 8 hours of total sitting per day	16.6	13.5	20.2	0.8 (0.6–1.2)
Self-rated general health				
Good/very good/excellent	17.2	14.7	20.1	1.0
Fair/poor	23.5	19.6	27.9	1.5 (1.1–2.1)
Obesity (BMI)				
No	18.2	15.5	21.1	1.0
Yes	17.6	14.2	21.5	1.0 (0.7–1.4)
Obesity (waist)				
No	17.9	14.9	21.4	1.0
Yes	18.4	14.7	22.8	1.1 (0.8–1.6)

(a) Other includes people who are widowed, divorced, separated or never married.

95% CI = 95 per cent confidence interval; BMI = body mass index

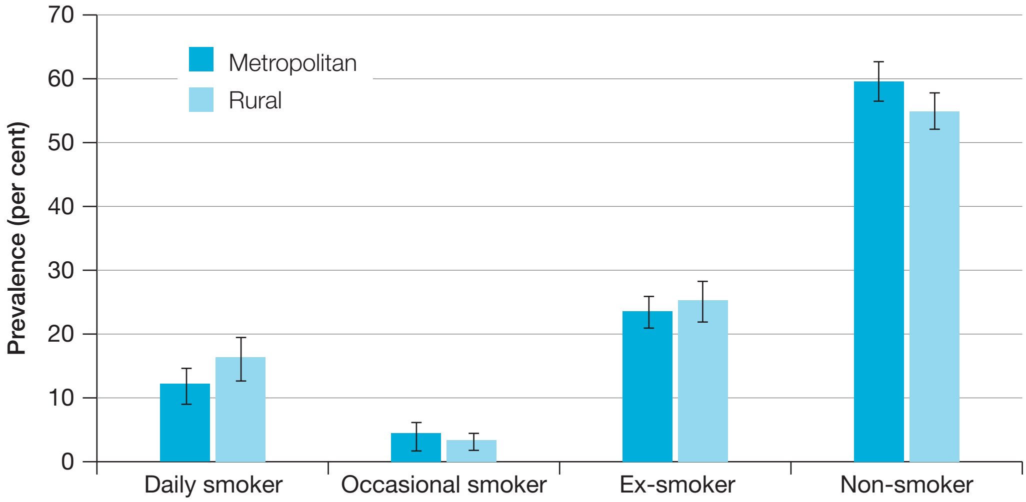
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 1.1 and Table 1.4 show the prevalence of smoking status by metropolitan and rural status. After adjusting for age and sex, rural Victorians were more likely to be daily smokers than were metropolitan Victorians ($p = 0.037$).

Figure 1.1 Prevalence and 95% CI of smoking status according to locality



The error bars represent the 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 1.4 Prevalence of smoking status according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Daily smoker	12.0	9.5	15.1	16.9	13.6	20.9
Occasional smoker	4.4	2.7	7.1	3.6	2.4	5.3
Ex-smoker	24.2	21.9	26.7	24.3	21.2	27.7
Non-smoker	59.1	56.1	62.1	55.2	52.3	58.2

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Physical activity

Regular physical activity is recognised as being an important component of a healthy lifestyle. In addition to the important health and social benefits, physical activity plays a vital role in the prevention of mortality and morbidity from cardiovascular disease, type 2 diabetes, some forms of cancer, and morbidity from some injuries and mental health conditions. The *National physical activity guidelines for adults* recommend that at least 150 minutes per week should be spent undertaking moderate to vigorous physical activity (Department of Health and Aged Care 1999).

Definitions

The following criteria were used to define each participant's level of physical activity (Table 1.5).

Table 1.5 Classification of physical activity levels

Classification	Definition
Sufficiently physically active	≥ 150 minutes of 'physical activity time' per week
Insufficiently physically active	1 –149 minutes of 'physical activity time' per week
Physically inactive	0 minutes of 'physical activity time' per week

'Physical activity time' was calculated as the sum of the time spent walking or performing moderate activity plus double the time spent in vigorous physical activity (to reflect its greater intensity) (Armstrong et al. 2000).

Results

Overall prevalence

Table 1.6 shows the age-standardised prevalence of different levels of physical activity in people aged 18–75 years. The prevalence of being sufficiently physically active among the total population was 69.0 per cent; 5.5 per cent were physically inactive. The prevalence of sufficiently active men (72.0 per cent) was higher than that of women (66.1 per cent), $p = 0.01$. However, a similar proportion of men reported being physically inactive (5.8 per cent) as did women (5.2 per cent) (Table 1.6).

Applying the prevalence of physical activity levels to the total population of Victoria in 2008 produces an estimate of 2,616,000 people aged 18–75 years who participate in sufficient levels of physical activity and 1,175,500 people who are physically inactive or insufficiently active.

Prevalence by age group and sex

Table 1.6 also describes the prevalence of different levels of physical activity by age group and sex.

The prevalence of sufficient levels of physical activity decreased with age in men (p for trend = 0.02) but no clear pattern with age was seen in women. The age group with the highest proportion of sufficiently active men was the 18–34-year age group. However, the prevalence of people being physically inactive or insufficiently active increased with age for both men (p for trend = 0.001) and women (p for trend < 0.001) (Table 1.6).

Table 1.6 Prevalence of physical activity levels according to sex and age group

	Level of physical activity								
	Sufficient			Insufficient			Inactive		
	%	95% CI		%	95% CI		%	95% CI	
Men									
18–34	79.9	69.7	87.3	17.9	11.0	27.8	2.2	0.8	6.2
35–44	70.5	63.7	76.5	24.4	18.9	30.9	5.1	3.0	8.5
45–54	69.4	62.4	75.6	23.0	16.8	30.7	7.6	4.9	11.7
55–64	64.1	56.9	70.8	26.2	20.0	33.5	9.7	6.8	13.7
65–75	67.1	60.2	73.4	24.0	18.2	31.0	8.8	5.3	14.3
Total	**72.0**	**68.3**	**75.4**	**22.3**	**19.3**	**25.5**	**5.8**	**4.4**	**7.5**
Women									
18–34	66.8	58.5	74.1	29.6	23.3	36.9	3.6	1.9	6.9
35–44	68.0	62.0	73.4	28.7	23.7	34.2	3.3	1.8	5.8
45–54	70.1	63.7	75.7	25.9	20.8	31.9	4.0	2.3	6.8
55–64	61.6	55.7	67.1	31.3	26.1	37.1	7.1	4.8	10.5
65–75	60.1	52.2	67.6	26.4	21.1	32.5	13.5	8.4	21.0
Total	**66.1**	**62.4**	**69.6**	**28.7**	**25.8**	**31.8**	**5.2**	**3.9**	**7.0**
Persons									
18–34	73.3	65.0	80.3	23.8	17.8	31.0	2.9	1.5	5.6
35–44	69.3	65.0	73.2	26.6	23.3	30.2	4.2	2.9	6.0
45–54	69.7	64.5	74.5	24.5	20.3	29.2	5.8	4.0	8.2
55–64	62.8	58.0	67.4	28.8	24.7	33.3	8.4	6.7	10.4
65–75	63.5	58.6	68.2	25.3	21.5	29.4	11.2	8.0	15.5
Total	**69.0**	**66.1**	**71.8**	**25.5**	**23.3**	**27.8**	**5.5**	**4.2**	**7.1**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

17/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 1.7 describes the associations of physical activity levels with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of being either physically inactive or insufficiently active was higher among people who were born overseas versus those born in Australia, and higher among those who did not usually speak English at home versus those who did. The prevalence of being either physically inactive or insufficiently active was not related to marital status but was higher among: people who sat for greater than or equal to eight hours per day versus those who did not; people who were current smokers versus those who were non-smokers; people who self-rated their health as fair or poor versus those who did not; and people who were obese (using either BMI or waist circumference) versus those who were not.

Table 1.7 Prevalence of being either physically inactive or insufficiently active and risk of being either physically inactive or insufficiently active, by selected risk factors

	Insufficient/inactive levels of physical activity			Age and sex-adjusted odds ratio of being either physically inactive or insufficiently active (95% CI)
	%	95% CI		
Country of birth				
Australia	30.0	27.6	32.6	1.0
Overseas	34.1	29.2	39.4	1.2 (1.0–1.5)
Language spoken at home				
English	30.0	27.4	32.7	1.0
Other than English	35.2	30.5	40.3	1.3 (1.1–1.6)
Marital status				
Married/living with a partner	33.3	28.3	38.6	1.0
Other[(a)]	31.5	28.4	34.7	1.0 (0.8–1.2)
Sedentary behaviour				
< 8 hours of total sitting per day	29.7	26.8	32.8	1.0
≥ 8 hours of total sitting per day	34.8	30.1	39.7	1.3 (1.0–1.6)
Smoking				
Non-smoker	30.3	26.8	34.1	1.0
Ex-smoker	29.0	21.8	37.5	0.9 (0.8–1.1)
Current smoker[(b)]	35.8	32.1	39.7	1.3 (1.0–1.7)
Self-rated general health				
Good/very good/excellent	29.0	26.2	32.0	1.0
Fair/poor	46.0	39.2	53.0	2.1 (1.6–2.9)
Obesity (BMI)				
No	28.6	25.6	31.7	1.0
Yes	37.8	33.1	42.8	1.5 (1.3–1.9)
Obesity (waist)				
No	28.5	25.3	31.9	1.0
Yes	34.6	30.8	38.7	1.3 (1.1–1.6)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

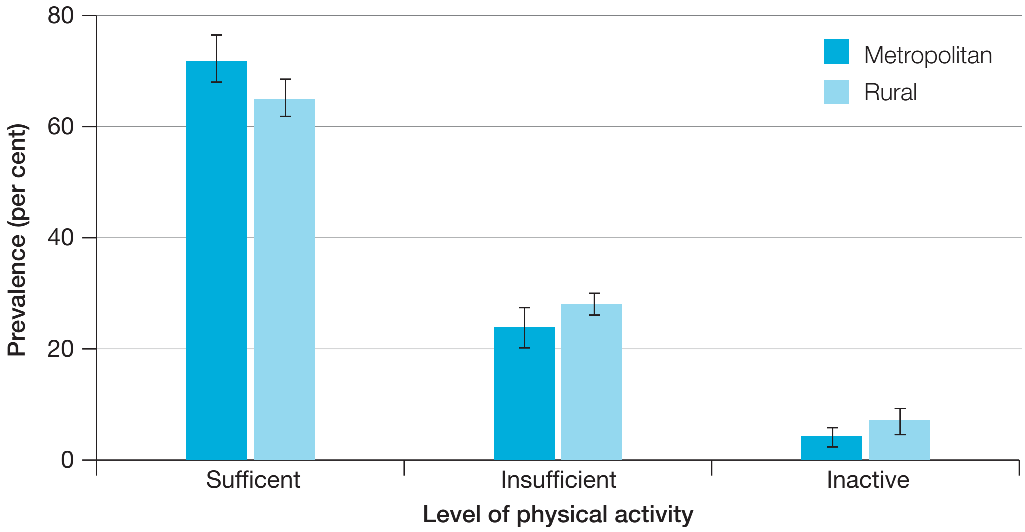
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 1.2 and Table 1.8 show the prevalence of physical activity levels by metropolitan and rural status. In age and sex-adjusted analyses, the prevalence of Victorians undertaking sufficient levels of physical activity was higher among metropolitan Victorians than in rural Victorians ($p = 0.029$).

Figure 1.2 Prevalence and 95% CI of physical activity levels according to locality



The error bars represent the 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 1.8 Prevalence of physical activity levels according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Sufficient	71.6	67.4	75.4	65.3	61.2	69.1
Insufficient	24.0	20.7	27.5	27.9	25.6	30.4
Inactive	4.4	3.0	6.4	6.9	4.8	9.6

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Sedentary behaviour

Sedentary behaviours involving prolonged sitting have become a prevalent feature of the everyday Western lifestyle. Television (TV) viewing time is the most frequently reported leisure time sedentary behaviour in adults from Australia (ABS 2008). In prospective studies, it has been found that an increase in a person's TV viewing time over five years may have negative cardio-metabolic consequences, regardless of an individual's physical activity levels (Dunstan et al. 2010; Wijndaele et al. 2010). Sedentary behaviour, however, extends further than TV viewing and also includes other activities of daily routines such as using computers, playing electronic games, desk-bound occupational tasks and automobile commuting. There is an increasing interest in the relationship between sedentary behaviour and chronic disease.

Definitions

Total sitting time was determined by asking participants to report separately for a typical weekday and weekend day on the following question: 'How many hours and/or minutes did you spend sitting down while doing things like visiting friends, driving, reading, watching TV or working at a desk or a computer?' Sitting time (hours per day) was then calculated using the following formula: [(weekday sitting × 5) + (weekend sitting × 2)]/ 7. In a separate question, TV viewing time was assessed using a different recall period to that for total sitting. Participants were asked to report separately for workdays and non-workdays during the preceding seven days via the following question: 'Please estimate the total time during the last week that you spent sitting for watching TV or DVDs or playing games on the TV. This is when it was the main activity that you were doing.' TV viewing time (hours per day) was then calculated using the following formula: (workdays TV viewing + non-workdays TV viewing)/ 7.

Sitting for work time was determined by asking participants who were currently engaged in paid employment to report separately for weekdays and the weekend on the following question: 'Please estimate the total time during the last week that you spent sitting down as part of your job while at work or working from home.' Sitting time at work (hours per day) was then calculated using the following formula [(weekday sitting / 5) + (weekend sitting / 2)]. The mean number of hours spent sitting at work was then calculated across the total population. Using data from the 2006 report *How Australians use their time* (ABS 2008), which provided a mean number of hours Australians spend at work across the total population, it was possible to estimate the proportion of time Victorians spent sitting while at work.

Table 1.9 Classification of sedentary behaviour

Classification	Low	Moderate	High
Total sitting time	< 4 hours per day	4 to < 8 hours per day	≥ 8 hours per day
TV viewing time	< 2 hours per day	2 to < 4 hours per day	≥ 4 hours per day

Results

Total sitting time

Overall prevalence

Table 1.10 shows the age-standardised prevalence of sitting time greater than or equal to eight hours per day in people aged 18–75 years. The prevalence of sitting for greater than or equal to eight hours per day in the total population was 26.2 per cent. A higher proportion of men reported sitting for greater than or equal to eight hours per day (29.5 per cent) compared with women (23.0 per cent), $p = 0.003$.

Applying these data to the total population of Victoria in 2008 produces an estimate of 993,500 people aged 18–75 years who sit for greater than or equal to eight hours each day.

Prevalence by age group and sex

Table 1.10 also describes the prevalence of total sitting time by age group and sex. The prevalence of sitting for greater than or equal to eight hours per day decreased with age for both men (p for trend = 0.002) and women (p for trend = 0.002). Among women, the percentage reporting a daily sitting time greater than or equal to eight hours fell from 30.5 per cent of those aged 18–34 years to 12.7 per cent of those aged 65–75 years (Table 1.10).

Table 1.10 Prevalence of levels of total sitting time according to sex and age group

	Total sitting time per day								
	< 4 hours			4 to < 8 hours			≥ 8 hours		
	%	95% CI		%	95% CI		%	95% CI	
Men									
18–34	22.2	14.8	32.1	43.5	31.4	56.5	34.2	28.0	41.0
35–44	27.1	21.3	33.8	42.3	35.5	49.4	30.6	24.3	37.6
45–54	21.3	15.9	28.0	48.3	41.1	55.6	30.3	24.4	37.0
55–64	20.9	15.9	26.9	52.7	45.8	59.5	26.4	20.6	33.2
65–75	26.5	21.0	32.9	57.4	47.6	66.6	16.1	9.23	26.5
Total	**23.3**	**20.1**	**26.9**	**47.2**	**41.8**	**52.6**	**29.5**	**25.9**	**33.5**
Women									
18–34	24.3	19.9	29.3	45.2	38.2	52.4	30.5	24.8	36.8
35–44	30.7	24.8	37.3	47.2	41.1	53.3	22.1	17.6	27.5
45–54	34.1	28.0	40.8	46.1	40.9	51.5	19.8	14.3	26.6
55–64	26.1	21.4	31.5	54.5	49.9	59.1	19.4	14.9	24.8
65–75	24.5	17.6	32.9	62.8	51.5	72.9	12.7	7.7	20.4
Total	**28.0**	**26.0**	**30.0**	**49.1**	**45.4**	**52.8**	**23.0**	**20.0**	**26.3**
Persons									
18–34	23.3	18.2	29.3	44.4	36.3	52.8	32.3	27.9	37.1
35–44	28.9	24.5	33.8	44.8	40.4	49.2	26.3	22.2	30.9
45–54	27.8	23.6	32.4	47.2	41.6	52.9	25.0	20.4	30.2
55–64	23.5	19.7	27.9	53.6	49.8	57.4	22.8	18.8	27.4
65–75	25.5	21.2	30.3	60.2	51.7	68.1	14.4	8.89	22.4
Total	**25.7**	**23.8**	**27.7**	**48.1**	**44.3**	**51.9**	**26.2**	**23.6**	**29.1**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

17/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 1.11 describes the associations of total sitting time with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of sitting for greater than or equal to eight hours per day was not related to country of birth, language spoken at home or marital status. The prevalence of sitting for greater than or equal to eight hours per day was higher in those who were physically inactive or insufficiently active versus those who were sufficiently physically active but was not related to smoking status. The prevalence of sitting for greater than or equal to eight hours per day was higher in those who self-rated their health as fair or poor versus those who did not, and in those who were obese (using either BMI or waist circumference) versus those who were not.

Table 1.11 Prevalence of persons who sit for ≥ eight hours per day and risk of having sitting time ≥ eight hours per day, by selected risk factors

	Total sitting time of ≥ 8 hours per day			Age and sex-adjusted odds ratio of having sitting time ≥ 8 hours (95% CI)
	%	95% CI		
Country of birth				
Australia	25.6	22.9	28.5	1.0
Overseas	29.0	23.8	34.8	1.1 (0.9–1.4)
Language spoken at home				
English	26.1	23.3	29.0	1.0
Other than English	26.8	22.2	31.9	1.0 (0.8–1.3)
Marital status				
Married/living with a partner	25.9	22.1	30.1	1.0
Other[a]	28.9	23.9	34.6	1.1 (0.8–1.6)
Physical activity				
Sufficiently active	24.8	21.8	28.0	1.0
Insufficiently active or inactive	29.3	25.3	33.6	1.3 (1.0–1.6)
Smoking				
Non-smoker	26.1	22.6	29.8	1.0
Ex-smoker	27.8	20.1	37.1	0.9 (0.6–1.2)
Current smoker[b]	24.4	20.2	29.1	1.1 (0.8–1.6)
Self-rated general health				
Good/very good/excellent	25.0	22.4	27.7	1.0
Fair/poor	34.4	29.3	39.9	1.7 (1.3–2.1)
Obesity (BMI)				
No	25.3	22.4	28.4	1.0
Yes	31.0	26.9	35.4	1.3 (1.0–1.6)
Obesity (waist)				
No	25.0	21.9	28.4	1.0
Yes	30.9	27.2	35.0	1.4 (1.0–1.8)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

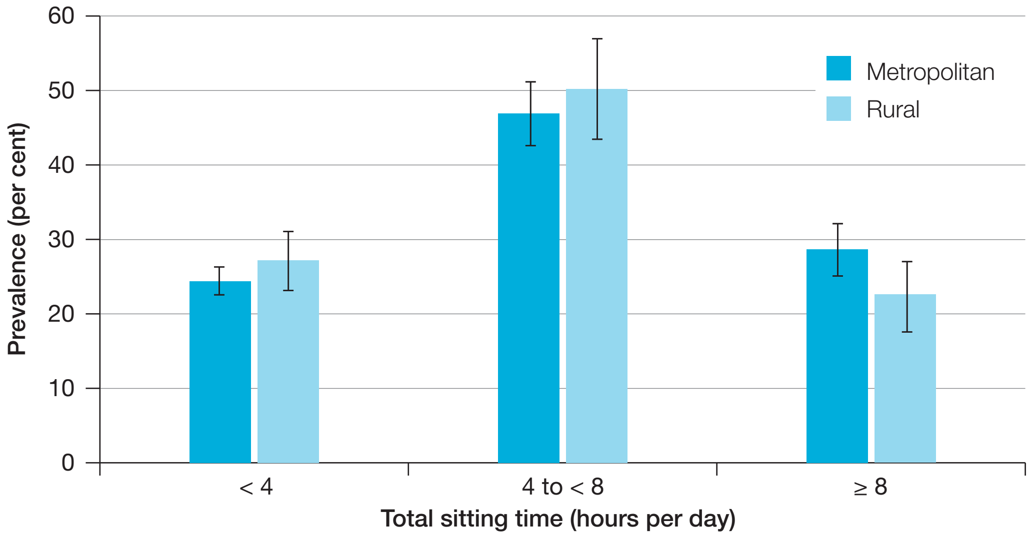
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 1.3 and Table 1.12 show the prevalence of levels of total sitting time by metropolitan and rural status. The prevalence of sitting for greater than or equal to eight hours per day was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 1.3 Prevalence and 95% CI of levels of total sitting time according to locality



The error bars represent the 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 1.12 Prevalence of levels of total sitting time according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Total sitting time (hours per day)						
< 4	24.7	22.7	26.7	27.6	23.5	32.1
4 to < 8	47.0	42.7	51.4	49.4	42.0	56.8
≥ 8	28.3	24.9	32.0	23.0	18.5	28.3

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Television viewing time

Overall prevalence

Table 1.13 shows the prevalence of watching TV for greater than or equal to four hours per day in people aged 18–75 years. The prevalence of watching TV for greater than or equal to four hours per day in the total population was 9.3 per cent. The prevalence of watching TV for greater than or equal to four hours per day was higher in men (10.6 per cent) than in women (8.0 per cent), $p = 0.05$.

Applying the prevalence of watching TV for greater than or equal to four hours per day to the total population of Victoria in 2008 produces an estimate of 352,500 people aged 18–75 years who watch TV for greater than or equal to four hours every day.

Prevalence by age group and sex

Table 1.13 also describes the prevalence of TV viewing time by age group and sex. The prevalence of people watching greater than or equal to four hours of TV per day increased with age for both men (p for trend = 0.021) and women (p for trend = 0.001). The age group reporting the highest prevalence of TV viewing time greater than or equal to four hours per day, for both men and women, was the 65–75 year age group. The lowest proportion of high TV viewing time was seen in the 35–44 year age group (Table 1.13).

Table 1.13 Prevalence of levels of TV viewing time according to sex and age group

	TV viewing time per day								
	< 2 hours			2 to < 4 hours			≥ 4 hours		
	%	95% CI		%	95% CI		%	95% CI	
Men									
18–34	63.8	56.2	70.7	25.5	18.6	33.9	10.7	7.6	14.8
35–44	50.5	43.7	57.3	43.4	37.7	49.2	6.1	3.7	10.2
45–54	46.8	39.9	53.9	43.7	35.7	52.0	9.5	6.2	14.3
55–64	44.3	38.8	50.1	41.6	36.0	47.4	14.1	10.4	18.8
65–75	31.0	24.9	37.8	50.2	44.5	55.8	18.8	14.5	24.1
Total	**51.3**	**47.4**	**55.3**	**38.0**	**34.2**	**42.0**	**10.6**	**8.8**	**12.7**
Women									
18–34	70.4	63.5	76.4	23.7	17.7	31.0	5.9	3.2	10.7
35–44	63.8	55.9	71.1	32.2	25.0	40.2	4.0	2.1	7.7
45–54	62.0	56.4	67.3	30.9	25.6	36.8	7.1	4.2	11.5
55–64	47.3	41.4	53.2	41.1	35.8	46.7	11.6	8.2	16.2
65–75	37.4	28.9	46.7	43.5	36.9	50.4	19.1	13.2	26.9
Total	**59.9**	**56.4**	**63.4**	**32.1**	**29.5**	**34.9**	**8.0**	**6.0**	**10.5**
Persons									
18–34	67.1	62.6	71.3	24.6	21.0	28.7	8.3	6.0	11.4
35–44	57.2	50.8	63.4	37.7	32.1	43.7	5.1	3.3	7.7
45–54	54.5	49.8	59.1	37.2	33.1	41.6	8.3	6.3	10.8
55–64	45.8	41.6	50.1	41.3	38.1	44.6	12.8	9.8	16.6
65–75	34.3	28.3	40.8	46.8	42.8	50.8	19.0	14.4	24.5
Total	**55.7**	**52.8**	**58.6**	**35.0**	**32.9**	**37.2**	**9.3**	**7.8**	**11.1**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

15/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 1.14 describes the associations of TV viewing time with selected risk factors and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of watching TV for greater than or equal to four hours per day was not related to country of birth or language spoken at home but was higher among: people who were widowed, divorced or never married compared with those who were not; people who were physically inactive or insufficiently active versus those who were sufficiently physically active; those who were ex-smokers or current smokers versus those who were non-smokers; those who self-rated their health as fair or poor versus those who did not; and those who were obese (using either BMI or waist circumference) versus those who were not.

Table 1.14 Prevalence of persons who watch TV for ≥ four hours per day and risk of having TV viewing time ≥ four hours per day, by selected risk factors

	TV viewing time of ≥ 4 hours per day			Age and sex-adjusted odds ratio of TV viewing ≥ 4 hours per day (95% CI)
	%	95% CI		
Country of birth				
Australia	9.7	8.2	11.3	1.0
Overseas	8.4	5.8	12.0	0.8 (0.6–1.2)
Language spoken at home				
English	9.1	7.8	10.7	1.0
Other than English	10.4	6.5	16.2	1.1 (0.7–1.9)
Marital status				
Married/living with a partner	8.3	6.6	10.4	1.0
Other[(a)]	12.5	9.8	15.6	1.9 (1.3–2.8)
Physical activity				
Sufficiently active	8.0	6.5	9.8	1.0
Insufficiently active or inactive	12.0	9.2	15.5	1.5 (1.1–2.1)
Smoking				
Non-smoker	7.3	5.8	9.1	1.0
Ex-smoker	11.1	7.7	15.8	1.4 (1.0–1.9)
Current smoker[(b)]	15.3	11.1	20.8	2.1 (1.3–3.3)
Self-rated general health				
Good/very good/excellent	8.0	6.5	9.7	1.0
Fair/poor	18.6	14.6	23.3	2.7 (1.9–3.9)
Obesity (BMI)				
No	8.4	6.7	10.6	1.0
Yes	11.8	9.2	15.0	1.5 (1.1–2.0)
Obesity (waist)				
No	8.0	6.2	10.2	1.0
Yes	12.2	9.3	15.7	1.7 (1.2–2.4)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

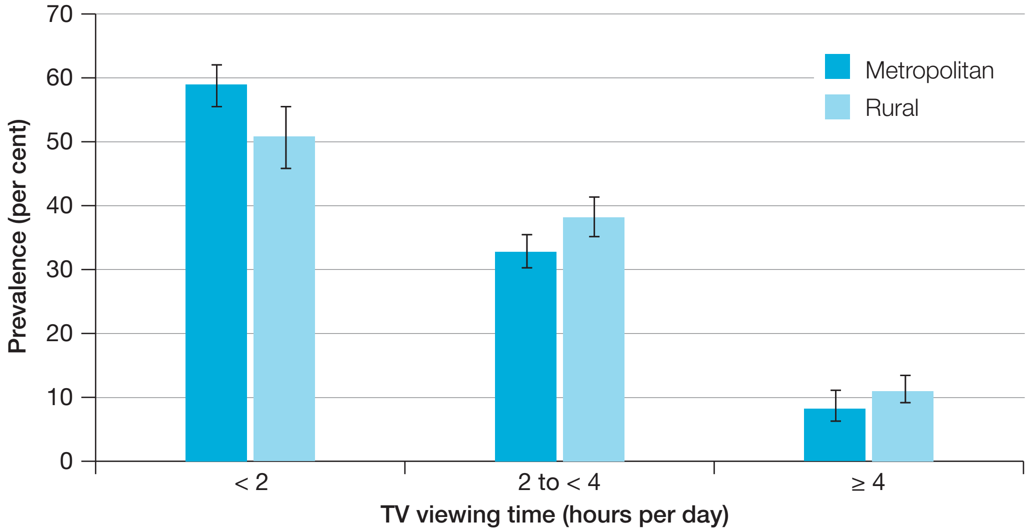
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 1.4 and Table 1.15 show the prevalence of levels of TV viewing time by metropolitan and rural status. The prevalence of watching TV for greater than or equal to four hours per day was similar among metropolitan and rural Victorians after adjustment for age and sex.

Figure 1.4 Prevalence and 95% CI of levels of TV viewing time according to locality



The error bars represent the 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 1.15 Prevalence of levels of TV viewing time according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
TV viewing time (hours per day)						
< 2	58.2	54.8	61.5	51.7	46.7	56.6
2 to < 4	33.5	30.9	36.2	37.8	34.6	41.1
≥ 4	8.3	6.2	11.0	10.6	8.6	12.9

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Sedentary work time

Overall prevalence

Table 1.16 shows the age-standardised prevalence of sitting time at work greater than or equal to four hours per day in people aged 18–75 years. The prevalence of people sitting for greater than or equal to four hours at work per day for those who were employed was 31.9 per cent. The prevalence of people with greater than or equal to four hours sitting at work was similar in men and in women.

Applying the prevalence of people sitting for greater than or equal to four hours at work per day to the total population of Victoria in 2008 produces an estimate of 1,209,500 people aged 18–75 years who sit for greater than or equal to four hours at work per day.

Prevalence by age group and sex

Table 1.16 also describes the prevalence of sitting time at work per day by age group and sex. The prevalence for women sitting for greater than or equal to four hours at work per day decreased with age (p for trend < 0.001). In men, the decrease in the prevalence of employees sitting for greater than or equal to four hours at work per day with age group was not significant.

Table 1.16 Prevalence of employees sitting for ≥ four hours at work per day according to sex and age group

	Sitting time at work per day					
	< 4 hours			≥ 4 hours		
	%	95% CI		%	95% CI	
Men						
18–34	64.0	54.5	72.5	36.0	27.5	45.5
35–44	60.3	52.4	67.8	39.7	32.2	47.6
45–54	62.8	55.3	69.7	37.2	30.3	44.7
55–64	71.0	62.0	78.7	29.0	21.4	38.0
65–75	78.9	66.5	87.5	21.2	12.5	33.5
Total	**65.6**	**61.1**	**69.8**	**34.5**	**30.2**	**38.9**
Women						
18–34	56.6	48.6	64.4	43.4	35.6	51.5
35–44	76.2	70.5	81.0	23.8	19.0	29.5
45–54	75.7	68.8	81.5	24.3	18.5	31.2
55–64	83.5	77.3	88.2	16.6	11.8	22.7
65–75	91.5	65.9	98.4	8.5	1.6	34.1
Total	**72.9**	**68.8**	**76.7**	**27.1**	**23.3**	**31.3**
Persons						
18–34	60.7	54.3	66.8	39.3	33.2	45.7
35–44	67.5	62.6	72.0	32.5	28.0	37.4
45–54	68.9	63.7	73.7	31.1	26.3	36.3
55–64	76.5	71.0	81.2	23.5	18.8	29.0
65–75	82.6	74.1	88.8	17.4	11.2	25.9
Total	**68.1**	**64.9**	**71.2**	**31.9**	**28.8**	**35.1**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

1,175/3,653 participants have no valid data.

The percentage of work time spent sitting was calculated by dividing the mean hours participants spent sitting at work by the mean hours Australians spend at work using data from the 2006 report *How Australians use their time* (ABS 2008). Women spent a higher percentage of their work time sitting compared with men ($p < 0.05$). The age group reporting the highest percentage of work time spent sitting was the 65–74-year age group. Among men, the 35–44-year age group spent the lowest percentage of their work time sitting, while for women, it was the 45–54-year age group (Table 1.17).

Table 1.17 Percentage of work time spent sitting according to sex and age group

	Men			Women		
	%[a]	95% CI		%[a]	95% CI	
25–34	47.1	45.6	48.6	78.7	76.2	81.2
35–44	46.1	44.6	47.6	62.3	60.3	64.3
45–54	46.8	45.3	48.3	56.2	54.4	58.0
55–64	52.8	51.1	54.5	58.4	56.5	60.3
65–74	64.0	61.9	66.0	81.0	78.4	83.6

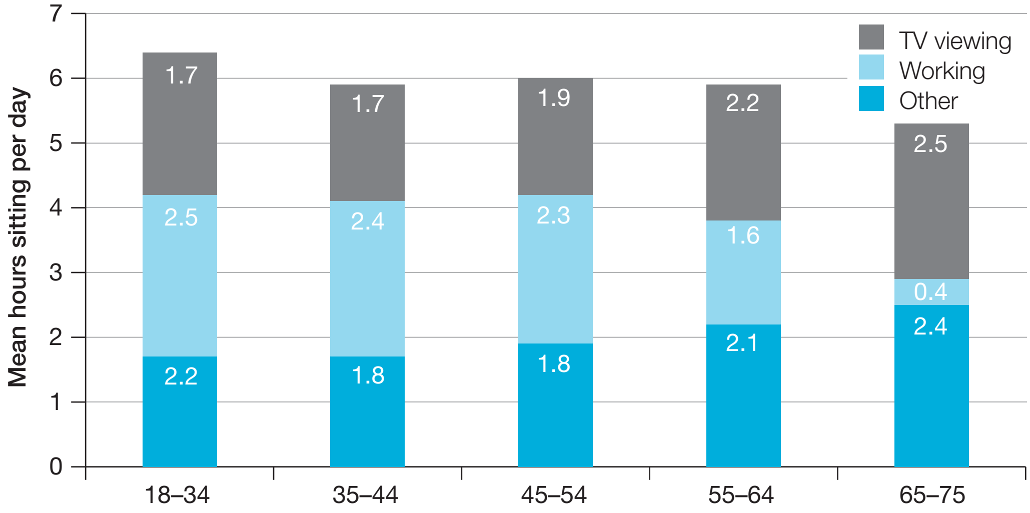
(a) Percentages were calculated by dividing mean hours participants spent sitting at work by the mean hours Australians spend at work based on the report *How Australians use their time* (ABS 2008).

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of 2008 estimated residential population of Victoria.

Figure 1.5 shows that the mean total sitting time gradually fell with increasing age (p for trend < 0.001). This was mainly due to a fall in mean working sitting time per day (p for trend < 0.001), although TV viewing per day increased with age (p for trend < 0.001). The data in Table 1.17 indicates that the fall in mean sitting hours at work with increasing age seen in Figure 1.5 was not due to a fall in the percentage of work time spent sitting (which was actually the highest in the oldest age group) but was due to a reduction in mean working sitting hours.

Figure 1.5 Mean hours sitting per day according to age group



Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Discussion

The prevalence of smoking in Victorian adults has been steadily declining (McCarthy et al. 2009). This continuing fall has the potential to contribute to a reduction in chronic disease over time. However, less encouraging is that the age group with the highest proportion of daily smokers for both men and women was the 18–34-year age group.

The Victorian Health Monitor shows that 69.0 per cent of Victorian residents aged 18–75 years undertake sufficient physical activity for good health, as defined by the *National physical activity guidelines for adults* (Department of Health and Aged Care 1999). This is higher than the national estimate from the AusDiab study in 1999–2000 (Dunstan et al. 2001), where researchers found just 50 per cent of Australians partook in sufficient levels of physical activity. Consistent with findings from the AusDiab study, the highest prevalence of sufficient physical activity among Victorians was found in the youngest age group, with the lowest prevalence in the oldest age group.

Modernisation, including increased urbanisation, increased technological innovation and societal changes, have contributed to a more sedentary lifestyle at home and at work, while TV viewing time and other physically inactive pastimes have increasingly dominated leisure time. The observation that reducing work sitting time with increasing age is not simply replaced by alternative sitting behaviours, and drives a falling total sitting time with increasing age, suggests that interventions to reduce sitting time in the workplace would be successful in reducing total sitting time. The high percentage of work time spent in sedentary activity indicates both a reliance in the traditional work environment on such activities, as well as an opportunity to make significant behaviour change.

2. Biomedical risk factors

2. Biomedical risk factors

There are several lifestyle behaviours and other risk factors that are associated with diabetes, cardiovascular disease and kidney disease. Some of these risk factors are modifiable, such as obesity, hypertension and dyslipidaemia, while others, such as age, sex and genetics, are not. Improving our understanding of the relationships between modifiable risk factors and chronic disease is imperative if the incidence and prevalence and of chronic disease is to decline.

Chronic diseases such as diabetes, cardiovascular disease and kidney disease share many modifiable risk factors. This chapter describes the prevalence of obesity, hypertension and dyslipidaemia and how they relate to other biological and lifestyle-related risk factors in Victorians aged 18–75 years.

Obesity

Obesity is linked to type 2 diabetes, and is also a major risk factor for other chronic conditions such as cardiovascular disease, hypertension, dyslipidaemia, some cancers and arthritis. The distribution of adipose tissue is important in that abdominal fat (central obesity), rather than peripheral fat, is associated with substantially higher risks for diabetes and cardiovascular disease (Alberti 1996; Hartz et al. 1983). The prevalence of overweight and obesity in Australia has been steadily increasing over the past 30 years (Cameron et al. 2003). Obesity is among the top seven preventable risk factors that influence the burden of disease, with over seven per cent of the total burden of disease being attributed to obesity (AIHW 2008a; Schultz et al. 2009). The costs of obesity and overweight are considerable, with a recent report suggesting that the annual direct costs of overweight and obesity for Australia are about $21 billion (Colagiuri et al. 2010).

Definitions

Overweight and obesity are defined using the WHO classification (WHO 2000) based on body mass index (BMI, weight/height^2) and waist circumference. WHO recommend different cut-points for overweight and obesity, depending on ethnicity (see below). While BMI is used as a measure of overall adiposity (Table 2.1), waist circumference is a more accurate measure of central adiposity (Table 2.2 and Table 2.3).

Table 2.1 Classification of adiposity by body mass index

	BMI (kg/m^2)	
	Europids[(a)]	Asian/Aboriginal and Torres Strait Islander[(b)]
Healthy weight	< 25.0	< 23.0
Overweight	25.0 to < 30.0	23.0 to < 25.0
Obese	≥ 30.0	≥ 25.0

(a) Europid cut-points apply to all ethnicities except for those listed below.

(b) Asian cut-points apply to ethnicities from South Asia, South East Asia and those of Aboriginal and Torres Strait Islander descent.

Table 2.2 Classification of adiposity by waist circumference for Europids

	Waist circumference (cm)	
	Men	Women
Healthy weight	< 94.0	< 80
Overweight	94 to < 102.0	80 to < 88.0
Obese	≥ 102.0	≥ 88.0

Table 2.3 Classification of adiposity by ethnic-specific waist circumference for Asian and for Aboriginal and Torres Strait Islander populations

	Waist circumference (cm)			
	Europids[a]		Asian/Aboriginal and Torres Strait Islander[b]	
	Men	Women	Men	Women
Normal waist	< 94.0	< 80.0	< 90.0	< 80.0
Large waist	≥ 94.0	≥ 80.0	≥ 90.0	≥ 80.0

(a) Europid cut-points apply to all ethnicities except for those listed below.

(b) Asian cut-points apply to ethnicities from South Asia, South East Asia and those of Aboriginal and Torres Strait Islander descent.

Results

Overall prevalence

Table 2.4 shows the age-standardised prevalence of obesity defined by BMI using cut-points for Europids for the whole population, as well as using ethnic-specific cut-points. It also shows the prevalence of obesity by waist circumference using cut-points for Europids. The prevalence of obesity defined by BMI using Europid cut-points in the total population was 24.5 per cent. The prevalence of obesity was similar in men and women.

Applying the prevalence of obesity (using BMI with Europid cut-points) to the total population of Victoria in 2008 produces an estimate of 929,000 people aged 18–75 years who are obese.

Table 2.4 Prevalence of adiposity categories by sex

	Adiposity status								
	Healthy weight			Overweight			Obese		
	%	95% CI		%	95% CI		%	95% CI	
BMI using cut-points for Europids									
Men	31.1	27.0	35.6	45.0	41.6	48.4	23.9	20.8	27.3
Women	43.7	39.5	47.9	31.3	27.8	35.1	25.0	21.9	28.4
Total	**37.4**	**34.1**	**40.9**	**38.1**	**35.5**	**40.8**	**24.5**	**22.1**	**27.1**
BMI using ethnic-specific cut-points									
Men	29.4	25.3	33.9	43.8	39.9	47.7	26.8	23.0	31.0
Women	41.8	37.4	46.2	31.3	27.8	34.9	27.0	23.7	30.6
Total	**35.6**	**32.2**	**39.3**	**37.4**	**34.6**	**40.4**	**26.9**	**24.1**	**30.0**
Waist circumference using cut-points for Europids									
Men	49.7	45.0	54.5	23.9	21.1	26.9	26.4	23.1	29.9
Women	41.2	36.7	45.8	21.4	18.5	24.5	37.5	32.8	42.4
Total	**45.4**	**41.2**	**49.7**	**22.6**	**20.2**	**25.2**	**32.0**	**28.3**	**35.9**

95% CI = 95 per cent confidence interval; BMI = body mass index

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and then standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

20/3,653 and 21/3,653 participants have no valid data for BMI and waist circumference, respectively.

The prevalence of obesity defined using waist circumference with cut-points for Europids in the total population was 32.0 per cent. The prevalence of obesity was higher in women (37.5 per cent) than in men (26.4 per cent), $p < 0.001$ (Table 2.4).

Using ethnic-specific cut-points for waist circumference as defined in Table 2.3, the prevalence of having a large waist in the total population was 55.0 per cent. The prevalence of having a large waist was higher in women (58.8 per cent) than in men (51.0 per cent), $p < 0.001$ (Table 2.5).

Table 2.5 Prevalence of having a large waist circumference using ethnic-specific cut-points

	Large waist		
	%	95% CI	
Men	51.0	46.2	55.8
Women	58.8	54.3	63.3
Persons	55.0	50.6	59.3

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and then standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by age group and sex

Table 2.6 and Table 2.7 describe the prevalence of obesity by sex and age group using BMI and waist circumference cut-points for Europids, respectively. There was an increase in the prevalence of obesity measured by BMI and by waist circumference with age in men and women (p for trend < 0.001).

Table 2.6 Prevalence of adiposity categories by BMI using Europid cut-points according to sex and age group

	Adiposity status								
	Healthy weight			Overweight			Obese		
	%	95% CI		%	95% CI		%	95% CI	
Men									
18–34	47.4	37.8	57.2	37.5	29.7	46.1	15.1	10.1	21.9
35–44	33.1	26.1	41.0	43.2	37.6	49.0	23.6	19.5	28.4
45–54	18.2	13.5	24.1	54.9	48.8	60.8	26.9	21.7	32.9
55–64	19.0	13.2	26.6	45.3	39.1	51.6	35.7	30.7	41.1
65–75	16.1	10.5	23.7	54.5	41.4	67.0	29.4	21.3	39.1
Women									
18–34	55.8	48.5	62.9	27.6	20.3	36.3	16.6	11.9	22.7
35–44	49.0	41.3	56.7	29.6	24.4	35.4	21.5	16.0	28.2
45–54	37.4	31.6	43.7	34.3	29.5	39.6	28.2	23.0	34.1
55–64	29.6	23.5	36.6	34.7	26.4	44.1	35.7	29.4	42.5
65–75	27.1	19.8	35.8	36.1	28.6	44.4	36.8	31.4	42.5
Persons									
18–34	51.6	44.8	58.3	32.6	26.3	39.5	15.8	12.1	20.5
35–44	41.1	35.1	47.4	36.4	32.9	40.0	22.6	18.8	26.9
45–54	27.9	23.3	33.1	44.5	40.3	48.8	27.6	23.7	31.8
55–64	24.4	20.1	29.3	39.9	34.1	46.0	35.7	31.1	40.5
65–75	21.7	16.7	27.8	45.0	36.8	53.6	33.2	28.5	38.3

95% CI = 95 per cent confidence interval; BMI = body mass index

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

18/3,653 participants have no valid data.

Table 2.7 Prevalence of adiposity categories by waist circumference using Europid cut-points according to sex and age group

	Adiposity status using waist circumference								
	Healthy weight			Overweight			Obese		
	%	95% CI		%	95% CI		%	95% CI	
Men									
18–34	68.9	58.2	77.9	18.3	12.8	25.6	12.8	8.3	19.2
35–44	53.9	45.3	62.2	22.3	16.0	30.1	23.8	18.1	30.8
45–54	40.5	33.3	48.1	26.0	20.5	32.4	33.5	27.7	39.9
55–64	27.7	21.5	34.9	32.0	27.8	36.4	40.3	34.5	46.4
65–75	28.7	22.0	36.4	30.8	21.8	41.6	40.5	32.8	48.8
Women									
18–34	53.7	44.7	62.4	22.7	15.9	31.3	23.6	17.0	31.9
35–44	45.5	37.8	53.5	21.0	17.1	25.6	33.4	26.8	40.8
45–54	35.5	29.1	42.5	21.4	17.4	26.1	43.1	35.8	50.6
55–64	25.8	21.7	30.5	23.0	18.9	27.7	51.2	46.1	56.2
65–75	25.9	18.3	35.2	17.0	12.9	21.9	57.2	49.4	64.6
Persons									
18–34	61.3	52.9	69.1	20.5	15.0	27.4	18.2	13.4	24.2
35–44	49.7	42.9	56.5	21.6	17.5	26.4	28.7	23.5	34.4
45–54	38.0	32.3	44.0	23.7	19.6	28.3	38.3	32.7	44.3
55–64	26.8	22.7	31.2	27.4	24.1	30.9	45.8	41.4	50.3
65–75	27.2	21.1	34.4	23.7	18.2	30.2	49.1	43.7	54.5

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

20/3,653 have no valid data.

Prevalence by selected risk factors

Table 2.8 describes the association of obesity (defined by BMI using Europid cut-points) with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of obesity was not related to: country of birth; language spoken at home; or marital status. Compared with those who undertook sufficient activity, those who were physically inactive were more likely to be obese. Sedentary behaviour was also related to obesity: those sitting for at least eight hours per day were more likely to be obese than those who sat for less than eight hours per day. Ex-smokers were more likely to be obese than were non-smokers. The prevalence of obesity was higher in: those who rated their health as fair or poor compared with those who rated their health as good or excellent; those with hypertension compared with those without, and in those with dyslipidaemia compared with those with normal lipid levels (Table 2.8).

Table 2.8 Prevalence of obesity and risk of being obese, by selected risk factors

	Prevalence of obesity %	95% CI		Age and sex-adjusted odds ratio of being obese (95% CI)
Country of birth				
Australia	26.0	22.7	29.6	1.0
Overseas	20.2	15.8	25.6	0.7 (0.5–1.1)
Language spoken at home				
English	24.7	21.8	28.0	1.0
Other	23.7	17.9	30.7	0.9 (0.6–1.5)
Marital status				
Married/living with a partner	21.8	19.3	24.5	1.0
Other[a]	26.7	21.4	32.7	0.7 (0.5–1.1)
Physical activity				
Sufficiently active	21.9	19.2	24.9	1.0
Insufficiently active or inactive	29.6	26.4	33.1	1.5 (1.3–1.9)
Sedentary behaviour				
< 8 hours of total sitting per day	231	20.8	25.6	1.0
≥ 8 hours of total sitting per day	27.1	22.7	31.9	1.3 (1.0–1.6)
Smoking				
Non-smoker	22.5	19.9	25.3	1.0
Ex-smoker	31.7	24.8	39.5	1.4 (1.1–1.8)
Current smoker[b]	24.0	19.7	28.9	1.1 (0.8–1.6)
Self-rated general health				
Good/very good/excellent	21.2	19.1	23.6	1.0
Fair/poor	46.7	39.7	53.9	3.4 (2.4–4.9)
Hypertension				
No	19.8	17.7	22.0	1.0
Yes	40.4	33.4	47.9	2.6 (2.0–3.2)
Dyslipidaemia				
No	16.8	14.2	19.7	1.0
Yes	30.4	27.4	33.6	2.2 (1.8–2.8)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval

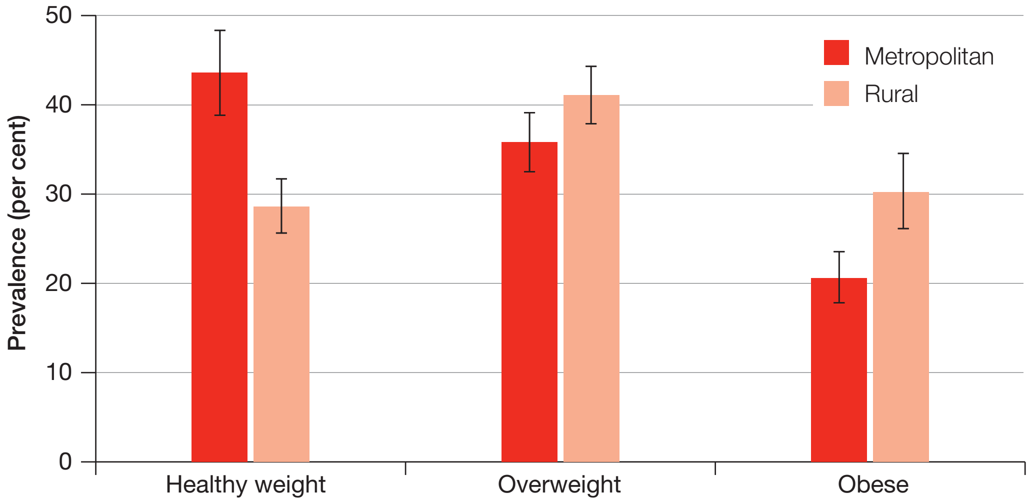
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and then standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 2.1 and Table 2.9 show the prevalence of obesity by metropolitan and rural status. After adjusting for age and sex, rural Victorians were more likely to be obese than were metropolitan Victorians ($p = 0.002$).

Figure 2.1 Prevalence and 95% CI of adiposity categories (defined by BMI using Europid cut-points) according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 2.9 Prevalence of adiposity categories (defined by BMI using Europid cut-points) according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Healthy weight	42.6	37.9	47.4	29.5	26.2	33.0
Overweight	36.3	33.0	39.7	40.9	37.5	44.3
Obese	21.1	18.4	24.2	29.7	25.5	34.1

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Hypertension

Hypertension is an important risk factor for heart disease, stroke, peripheral vascular disease and kidney failure, accounting for 7.3 per cent of the total disease burden in Australia (AIHW 2006). Among those with diabetes, it is a risk factor for micro-vascular complications as well as being an additive risk factor for cardiovascular disease (United Kingdom Prospective Study (UKPDS) 1998a; 1998b). Thus, hypertension is of major significance to the whole population.

Definitions

According to the WHO guidelines on hypertension (Guidelines Subcommittee of the World Health Organization – International Society of Hypertension (WHO-ISH) 1999), people who reported taking drug treatment for hypertension or having high blood pressure greater than or equal to 140/90 mmHg were classified as hypertensive (Table 2.10). Participants who had systolic blood pressure or diastolic blood pressure greater than or equal to 140/90 mmHg and who were not on anti-hypertensive medication were defined as having untreated hypertension.

Table 2.10 Classification of hypertension

Classification	Definition
Hypertension	Systolic blood pressure $\geq$ 140 mmHg and/or diastolic blood pressure $\geq$ 90 mmHg or currently taking anti-hypertensive medication

Results

Overall prevalence

Table 2.11 also shows the age-standardised prevalence of hypertension in people aged 18–75 years. The prevalence of hypertension in the total population was 25.1 per cent. The prevalence of hypertension was higher in men (31.4 per cent) than in women (19.1 per cent), $p < 0.001$.

Applying the prevalence of hypertension to the total population of Victoria in 2008 produces an estimate of 951,500 people aged 18–75 years who are hypertensive.

Prevalence by age group and sex

Table 2.11 also shows the prevalence of hypertension according to age group. The prevalence of hypertension rose with increasing age group for both men and women (p for trend < 0.001).

The diagnostic criteria for hypertension recommended by the WHO (WHO-ISH 1999) includes both untreated people with hypertension and those who have been diagnosed and are on treatment. The Victorian Health Monitor found that, at all ages, untreated hypertension was more common among men than women ($p < 0.05$), although the prevalence of treated hypertension was similar for men and women (Table 2.12). For every participant being treated for hypertension there was one other untreated.

Medication to control hypertension was being taken by 12.8 per cent of the population: 13.7 per cent of men and 12.0 per cent of women. For both men and women, the use of such medication increased with age group, from levels of less than one per cent for the youngest age group, to more than 42 per cent for the oldest age group.

Table 2.11 Prevalence of hypertension according to sex and age group

	Blood pressure status					
	Normal			Hypertension		
	%	95% CI		%	95% CI	
Men						
18–34	87.4	79.3	92.7	12.6	7.3	20.7
35–44	80.7	72.9	86.7	19.3	13.3	27.1
45–54	61.9	53.9	69.3	38.1	30.7	46.1
55–64	46.9	40.9	53.0	53.1	47.0	59.1
65–75	30.2	22.4	39.3	69.8	60.7	77.6
Total	**68.6**	**64.8**	**72.2**	**31.4**	**27.8**	**35.2**
Women						
18–34	96.7	92.8	98.5	3.3	1.5	7.2
35–44	91.5	87.5	94.3	8.5	5.7	12.5
45–54	78.5	73.2	83.0	21.5	17.0	26.8
55–64	63.7	58.5	68.6	36.3	31.4	41.5
65–75	41.6	35.4	48.0	58.4	52.0	64.6
Total	**80.9**	**79.2**	**82.5**	**19.1**	**17.5**	**20.8**
Persons						
18–34	92.1	87.4	95.1	8.0	4.9	12.6
35–44	86.2	81.7	89.7	13.8	10.3	18.3
45–54	70.3	65.9	74.3	29.7	25.7	34.1
55–64	55.4	51.2	59.5	44.6	40.5	48.8
65–75	36.0	31.0	41.4	64.0	58.6	69.0
Total	**74.9**	**72.4**	**77.2**	**25.1**	**22.8**	**27.6**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

20/3,653 participants have no valid data.

Table 2.12 Prevalence of treated and untreated hypertension according to sex and age group

	Hypertension					
	Untreated			Treated		
	%	95% CI		%	95% CI	
Men						
18–34	12.0	6.9	20.1	0.5	0.1	2.3
35–44	15.2	10.9	20.9	4.0	2.1	7.6
45–54	22.7	17.7	28.6	15.4	11.5	20.4
55–64	20.3	16.2	25.2	32.8	26.4	39.9
65–75	27.7	19.4	37.9	42.0	33.6	50.8
Total	**17.7**	**14.9**	**20.9**	**13.7**	**11.9**	**15.7**
Women						
18–34	2.9	1.2	6.5	0.5	0.1	1.9
35–44	3.6	2.2	5.8	5.0	2.9	8.3
45–54	8.5	5.4	13.0	13.0	9.4	17.8
55–64	12.0	8.9	16.1	24.3	19.1	30.3
65–75	15.8	11.8	20.9	42.6	36.3	49.2
Total	**7.1**	**5.8**	**8.6**	**12.0**	**10.7**	**13.5**
Persons						
18–34	7.4	4.5	12.1	0.5	0.2	1.4
35–44	9.4	6.9	12.6	4.5	3.0	6.7
45–54	15.5	12.3	19.3	14.2	11.3	17.7
55–64	16.1	13.0	19.8	28.4	23.9	33.5
65–75	21.6	16.5	27.6	42.3	38.4	46.3
Total	**12.3**	**10.4**	**14.5**	**12.8**	**11.5**	**14.3**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

21/3,653 participants have no valid data for hypertension.

Prevalence by selected risk factors

Table 2.13 describes the associations of hypertension with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of hypertension was not related to country of birth, language spoken at home, marital status, sedentary behaviour status, physical activity status or smoking status. The prevalence of hypertension was higher in those who self-reported their health as fair or poor compared with those who reported it as good or excellent, those who were obese (using either BMI or waist circumference) versus those who were not, and those with dyslipidaemia versus those with normal lipid levels (Table 2.13).

Table 2.13 Prevalence of hypertension and risk of having hypertension, by selected risk factors

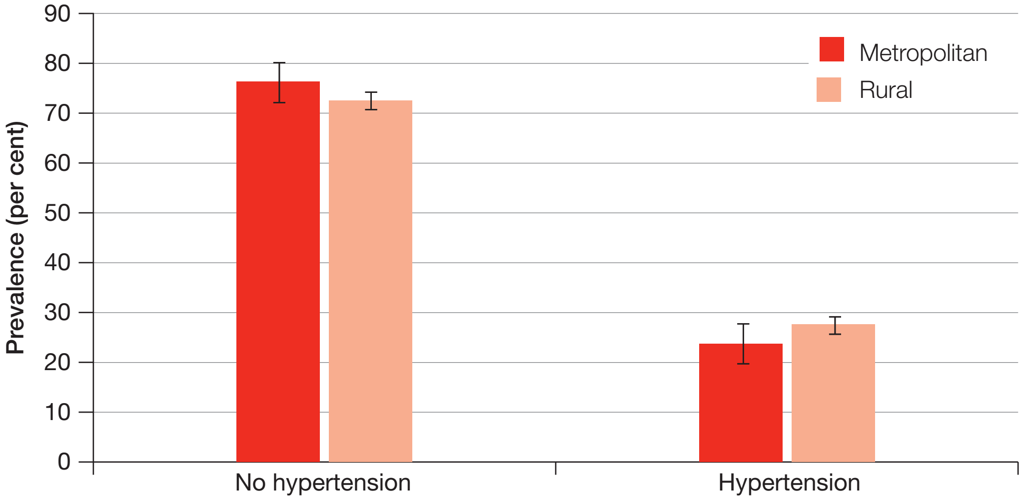
	Prevalence of hypertension %	95% CI		Age and sex-adjusted odds ratio of having hypertension (95% CI)
Country of birth				
Australia	25.1	22.8	27.5	1.0
Overseas	25.8	22.4	29.4	1.0 (0.8–1.3)
Language spoken at home				
English	25.0	22.7	27.4	1.0
Other	26.3	22.2	30.7	1.1 (0.8–1.4)
Marital status				
Married/living with a partner	25.5	23.1	27.9	1.0
Other[(a)]	22.6	19.4	26.2	1.0 (0.8–1.3)
Physical activity				
Sufficiently active	24.8	22.3	27.5	1.0
Insufficiently active or inactive	26.1	22.9	29.7	1.1 (0.9–1.4)
Sedentary behaviour				
< 8 hours of total sitting per day	23.1	20.8	25.6	1.0
≥ 8 hours of total sitting per day	27.1	22.7	31.9	1.0 (0.7–1.3)
Smoking				
Non-smoker	25.2	22.6	28.0	1.0
Ex-smoker	24.3	21.3	22.5	0.9 (0.7–1.1)
Current smoker[(b)]	23.8	20.0	28.0	0.8 (0.6–1.1)
Self-rated general health				
Good/very good/excellent	23.6	21.3	26.1	1.0
Fair/poor	35.7	29.7	42.3	2.2 (1.5–3.3)
Obesity (BMI)				
No	21.0	18.9	23.2	1.0
Yes	37.0	32.6	41.6	2.6 (2.1–3.2)
Obesity (waist)				
No	20.1	17.7	22.7	1.0
Yes	34.8	31.4	38.4	2.8 (2.3–3.4)
Dyslipidaemia				
No	21.3	18.3	24.6	1.0
Yes	27.9	25.1	30.9	1.5 (1.2 –1.9)

(a) Other includes people who are widowed, divorced, separated or never married
(b) A daily or occasional smoker
95% CI = 95 per cent confidence interval; BMI = body mass index
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and then standardised to the 2006 Victorian population.
Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 2.2 and Table 2.14 show the prevalence of hypertension by metropolitan and rural status. The prevalence of hypertension was similar for metropolitan and rural Victorians after adjustment for age and sex.

Figure 2.2 Prevalence and 95% CI of hypertension according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 2.14 Prevalence of hypertension according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
No hypertension	75.1	70.9	78.9	74.7	72.9	76.4
Hypertension	24.9	21.1	29.1	25.3	23.6	27.2

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Among those who were on treatment for hypertension, 46.1 per cent had adequate blood pressure control (< 140/90 mmHg in those without diabetes; < 130/80 mmHg in those with diabetes). The proportion of people achieving blood pressure targets was similar in men and women (Table 2.15).

After age and sex adjustment, the proportion of Victorians meeting blood pressure targets was similar for metropolitan and rural Victorians (Table 2.15).

Table 2.15 Proportion of persons achieving blood pressure targets

	Proportion taking hypertensive treatment who meet blood pressure targets (< 140/90 mmHg for no diabetes, < 130/80 mmHg for those with diabetes) %	95% CI		Age and sex-adjusted odds ratio of meeting targets for hypertension (95% CI)
Sex				
Men	43.9	37.0	51.1	1.0
Women	48.5	39.7	57.4	1.2 (0.8–2.0)[a]
Locality				
Metropolitan	45.3	36.9	53.9	1.0
Rural	47.1	39.7	54.6	1.1 (0.7–1.7)

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

(a) Age-adjusted odds ratio of meeting targets for hypertension.

Dyslipidaemia

Blood lipid levels reflect genetic background but may be modified by body weight and other lifestyle factors. Total cholesterol levels are a crude but consistent measure of risk of cardiovascular disease, and particularly coronary heart disease. The total cholesterol level includes a protective fraction or 'good' high-density lipoprotein (HDL) cholesterol, which if low indicates a high risk of developing cardiovascular disease and diabetes. The 'bad' cholesterol fraction is low-density lipoprotein (LDL) cholesterol. Elevated triglyceride levels may also indicate higher cardiovascular disease risk, especially if the HDL cholesterol levels are low, as occurs in diabetes and the metabolic syndrome.

Definitions

Classification of individual lipid abnormalities was made on the basis of the following plasma levels (Table 2.16). Dyslipidaemia was defined as those who were taking lipid-lowering medication and/or had any one of the following: total cholesterol greater than or equal to 5.5 mmol/L, LDL cholesterol greater than or equal to 3.5 mmol/L, HDL cholesterol < 1.0 mmol/L (men) or <1.3 mmol/L (women), triglycerides greater than or equal to 2.0 mmol/L.

Table 2.16 Classification of lipid levels

	Serum lipid concentration (mmol/L)[a]			
Classification	Total cholesterol	HDL cholesterol	LDL cholesterol	Triglycerides
Normal[b]	< 5.5	≥ 1.3 for women, ≥ 1.0 for men	< 3.5	< 2.0
Abnormal lipid levels[c]	≥ 5.5	< 1.3 for women, < 1.0 for men	≥ 3.5	≥ 2.0

HDL cholesterol = high-density lipoprotein cholesterol; LDL cholesterol = low-density lipoprotein cholesterol

(a) Based on recommendations by the National Heart Foundation and Australian Institute of Health (1990).

(b) If ALL fractions were within normal limits

(c) If ANY fraction was beyond normal limits

Results

Overall prevalence

Table 2.17 shows the age-standardised prevalence of dyslipidaemia defined as having an abnormality in one of four lipids or reporting lipid-lowering therapy in people aged 18–75 years. The prevalence of dyslipidaemia in the total population was 56.8 per cent. The age-standardised prevalence was similar in men and women.

Table 2.17 Prevalence of dyslipidaemia according to sex and age group

	No dyslipidaemia			Dyslipidaemia		
	%	95% CI		%	95% CI	
Men						
18–34	65.3	58.1	71.9	34.7	28.1	41.9
35–44	36.6	31.2	42.4	63.4	57.7	68.8
45–54	27.3	21.6	34.0	72.7	66.1	78.4
55–64	21.8	16.3	28.5	78.2	71.5	83.7
65–75	25.3	19.3	32.3	74.7	67.7	80.7
Total	**40.7**	**37.5**	**43.9**	**59.3**	**56.1**	**62.5**
Women						
18–34	63.7	53.8	72.5	36.3	27.5	46.2
35–44	57.1	50.1	63.7	42.9	36.3	49.9
45–54	36.7	31.3	42.5	63.3	57.5	68.7
55–64	20.6	15.9	26.2	79.4	73.8	84.1
65–75	17.2	11.2	25.4	82.8	74.6	88.8
Total	**45.5**	**41.3**	**49.7**	**54.5**	**50.3**	**58.7**
Persons						
18–34	64.5	58.0	70.6	35.5	29.5	42.0
35–44	46.9	42.0	51.9	53.1	48.2	58.0
45–54	32.1	28.1	36.3	67.9	63.7	71.9
55–64	21.2	17.2	25.8	78.8	74.2	82.9
65–75	21.1	16.6	26.4	78.9	73.7	83.4
Total	**43.2**	**40.1**	**46.3**	**56.8**	**53.7**	**59.9**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

26/3,653 participants have no valid data.

Applying the prevalence of dyslipidaemia to the total population of Victoria in 2008 produces an estimate of 2,153,500 people aged 18–75 years who have dyslipidaemia.

Prevalence by age group and sex

Tables 2.18 to 2.21 also show the prevalence of the various manifestations of dyslipidaemia by age group and sex. The prevalence of each type of dyslipidaemia rose with age group in both men and women (p for trend < 0.01), except for the prevalence of low HDL cholesterol, which showed no association with age group.

Table 2.18 shows the age-standardised prevalence of elevated total cholesterol in people aged 18–75 years. The prevalence of elevated total cholesterol in the total population was 35.6 per cent. The prevalence was similar in men and women.

Table 2.18 Prevalence of elevated total cholesterol according to sex and age group

	Level of total cholesterol					
	Normal			Elevated total cholesterol		
	%	95% CI		%	95% CI	
Men						
18–34	79.7	73.6	84.7	20.3	15.3	26.4
35–44	51.5	44.8	58.2	48.5	41.8	55.2
45–54	52.1	45.0	59.0	47.9	41.0	55.0
55–64	55.9	49.5	62.2	44.1	37.8	50.5
65–75	69.0	63.1	74.3	31.0	25.7	36.9
Total	**63.5**	**60.1**	**66.7**	**36.5**	**33.3**	**39.9**
Women						
18–34	84.4	78.0	89.2	15.6	10.8	22.0
35–44	72.9	66.8	78.3	27.1	21.7	33.2
45–54	54.5	48.2	60.8	45.5	39.2	51.8
55–64	43.8	35.9	52.0	56.2	48.0	64.1
65–75	40.4	31.9	49.4	59.6	50.6	68.1
Total	**65.4**	**62.4**	**68.3**	**34.6**	**31.8**	**37.6**
Persons						
18–34	82.1	77.4	86.0	17.9	14.0	22.6
35–44	62.3	57.1	67.2	37.7	32.8	42.9
45–54	53.3	49.4	57.2	46.7	42.8	50.6
55–64	49.7	44.1	55.4	50.3	44.6	55.9
65–75	54.2	49.1	59.2	45.8	40.8	50.9
Total	**64.4**	**62.1**	**66.6**	**35.6**	**33.4**	**37.9**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

26/3,653 participants have no valid data.

Table 2.19 shows the age-standardised prevalence of elevated LDL cholesterol in people aged 18–75 years. The prevalence of elevated LDL cholesterol in the total population was 32.3 per cent. The prevalence was higher in men (36.4 per cent) than in women (28.4 per cent), $p < 0.01$.

Table 2.19 Prevalence of elevated LDL cholesterol according to sex and age group

	Level of LDL cholesterol					
	Normal			Elevated LDL cholesterol		
	%	95% CI		%	95% CI	
Men						
18–34	79.7	72.4	85.4	20.3	14.6	27.6
35–44	54.6	49.0	60.1	45.4	39.9	51.0
45–54	50.7	45.5	55.9	49.3	44.1	54.5
55–64	55.8	47.3	63.9	44.2	36.1	52.7
65–75	68.1	61.1	74.4	31.9	25.6	38.9
Total	**63.6**	**60.2**	**66.9**	**36.4**	**33.1**	**39.8**
Women						
18–34	82.9	75.6	88.4	17.1	11.6	24.4
35–44	76.2	70.0	81.4	23.8	18.6	30.0
45–54	66.4	59.6	72.5	33.6	27.5	40.4
55–64	55.6	48.6	62.3	44.4	37.7	51.4
65–75	58.2	49.0	66.9	41.8	33.1	51.0
Total	**71.6**	**67.8**	**75.1**	**28.4**	**24.9**	**32.2**
Persons						
18–34	81.3	76.3	85.4	18.7	14.6	23.7
35–44	65.5	61.6	69.3	34.5	30.7	38.4
45–54	58.7	54.6	62.8	41.3	37.2	45.4
55–64	55.7	49.7	61.5	44.3	38.5	50.3
65–75	63.0	57.5	68.1	37.0	31.9	42.5
Total	**67.7**	**65.0**	**70.4**	**32.3**	**29.6**	**35.1**

95% CI = 95 per cent confidence interval; LDL cholesterol = low-density lipoprotein cholesterol

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

67/3,653 have no valid data.

Table 2.20 shows the age-standardised prevalence of low HDL cholesterol in people aged 18–75 years. The prevalence of low HDL cholesterol in the total population was 15.4 per cent. The prevalence was lower in men (12.0 per cent) than in women (18.8 per cent), $p < 0.001$.

Table 2.20 Prevalence of low HDL cholesterol according to sex and age group

	Level of HDL cholesterol					
	Normal			Low HDL cholesterol		
	%	95% CI		%	95% CI	
Men						
18–34	91.0	86.3	94.2	9.0	5.8	13.7
35–44	86.8	80.0	91.6	13.2	8.4	20.0
45–54	87.0	80.4	91.6	13.0	8.4	19.6
55–64	86.1	77.7	91.7	13.9	8.3	22.3
65–75	86.1	80.4	90.3	13.9	9.7	19.6
Total	**88.0**	**84.9**	**90.5**	**12.0**	**9.5**	**15.1**
Women						
18–34	78.2	68.3	85.6	21.8	14.4	31.7
35–44	80.8	74.5	85.9	19.2	14.1	25.5
45–54	85.1	80.3	89.0	14.9	11.0	19.7
55–64	81.5	76.0	86.0	18.5	14.0	24.0
65–75	85.5	79.7	89.9	14.5	10.1	20.3
Total	**81.2**	**76.9**	**84.9**	**18.8**	**15.1**	**23.1**
Persons						
18–34	84.6	78.6	89.1	15.4	10.9	21.4
35–44	83.8	80.3	86.8	16.2	13.2	19.7
45–54	86.1	81.9	89.4	13.9	10.6	18.1
55–64	83.8	78.7	87.8	16.2	12.2	21.3
65–75	85.8	81.7	89.1	14.2	10.9	18.3
Total	**84.6**	**81.8**	**87.0**	**15.4**	**13.0**	**18.2**

95% CI = 95 per cent confidence interval; HDL cholesterol = high-density lipoprotein cholesterol

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

26/3,653 participants have no valid data.

Table 2.21 shows the age-standardised prevalence of hypertriglyceridaemia in people aged 18–75 years. The prevalence of hypertriglyceridaemia in the total population was 14.0 per cent. The prevalence was higher in men (18.5 per cent) than in women (9.7 per cent), $p < 0.001$.

Table 2.21 Prevalence of hypertriglyceridaemia according to sex and age group

	Level of triglycerides					
	Normal			Hypertriglyceridaemia		
	%	95% CI		%	95% CI	
Men						
18–34	90.1	83.5	94.2	9.9	5.8	16.5
35–44	78.4	72.6	83.2	21.6	16.8	27.4
45–54	74.5	67.5	80.5	25.5	19.5	32.5
55–64	77.7	71.8	82.7	22.3	17.3	28.2
65–75	78.9	70.9	85.2	21.1	14.8	29.1
Total	**81.5**	**78.9**	**83.9**	**18.5**	**16.1**	**21.1**
Women						
18–34	93.8	87.9	96.9	6.2	3.1	12.1
35–44	95.1	92.3	96.9	4.9	3.1	7.7
45–54	89.6	85.1	92.8	10.4	7.2	14.9
55–64	83.6	79.2	87.3	16.4	12.7	20.8
65–75	82.3	76.2	87.1	17.7	12.9	23.8
Total	**90.3**	**88.5**	**91.9**	**9.7**	**8.1**	**11.5**
Persons						
18–34	91.9	88.6	94.3	8.1	5.7	11.4
35–44	86.8	83.1	89.8	13.2	10.2	16.9
45–54	82.1	78.1	85.6	17.9	14.4	21.9
55–64	80.7	76.7	84.2	19.3	15.8	23.3
65–75	80.7	75.6	84.9	19.3	15.1	24.4
Total	**86.0**	**84.3**	**87.5**	**14.0**	**12.5**	**15.8**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

26/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 2.22 describes the associations of the prevalence of dyslipidaemia with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of dyslipidaemia was not related to country of birth, language spoken at home or marital status. The prevalence of dyslipidaemia was higher in those who were physically inactive or insufficiently active versus those who undertook sufficient activity, those who sat for greater than or equal to eight hours per day versus those who did not, current smokers versus non-smokers, those who rated their health as fair or poor compared with those who rated their health as good or excellent, those who were obese versus those who were not (using either BMI or waist circumference), and those with hypertension compared with those without.

Table 2.22 Prevalence of dyslipidaemia and risk of having dyslipidaemia, by selected risk factors

	Prevalence of dyslipidaemia			Age and sex-adjusted odds ratio of dyslipidaemia (95% CI)
	%	95% CI		
Country of birth				
Australia	56.7	53.8	59.5	1.0
Overseas	57.1	50.4	63.5	1.0 (0.8–1.3)
Language spoken at home				
English	55.8	53.1	58.3	1.0
Other	61.9	53.6	69.6	1.3 (0.9–1.9)
Marital status				
Married/living with a partner	59.7	56.5	62.8	1.0
Other[a]	53.2	48.6	57.8	0.8 (0.6–1.0)
Physical activity				
Sufficiently active	54.7	51.0	58.3	1.0
Insufficiently active or inactive	62.1	59.0	65.1	1.4 (1.2–1.8)
Sedentary behaviour				
< 8 hours of total sitting per day	55.0	51.7	58.2	1.0
≥ 8 hours of total sitting per day	60.8	56.4	65.0	1.4(1.1–1.7)
Smoking				
Non-smoker	54.2	51.1	57.4	1.0
Ex-smoker	56.8	50.2	63.1	1.1 (0.9–1.4)
Current smoker[b]	64.8	58.4	70.7	1.7 (1.2–2.3)
Self-rated general health				
Good/very good/excellent	55.4	52.2	58.5	1.0
Fair/poor	66.4	60.8	71.6	1.8 (1.3– 2.4)
Obesity (BMI)				
No	53.0	49.6	56.4	1.0
Yes	70.3	66.0	74.3	2.2 (1.8–2.8)
Obesity (waist)				
No	51.9	48.7	55.1	1.0
Yes	68.0	62.5	73.0	2.2 (1.7–2.8)
Hypertension				
No	54.9	51.4	58.3	1.0
Yes	67.4	60.8	73.3	1.5 (1.2–1.8)

(a) Other includes people who are widowed, divorced, separated or never married
(b) A daily or occasional smoker
95% CI = 95 per cent confidence interval; BMI = body mass index
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.
Refer to pages xiii–xvi for definition of terms.

Lipid-lowering therapy

Lipid-lowering therapy was taken by 8.5 per cent of the population, comprising 9.5 per cent of men and 7.6 per cent of women (Table 2.23). Of the 8.5 per cent of the population on lipid-lowering therapy, 51.9 per cent were found to have at least one abnormality in one of the four lipid fractions. Of the 91.5 per cent of the population not on lipid-lowering therapy, the prevalence of people with at least one abnormality of the four lipid fractions was 54.3 per cent. Table 2.23 also shows the impact of combining the prevalence of lipid-lowering therapy with each of the categories of lipid abnormality to estimate the total burden of lipid abnormalities. It should be noted that information on specific types of lipid-lowering drugs was not collected, and that since statins (used to treat hypercholesterolaemia and elevated LDL cholesterol) are by far the most common type of lipid-lowering therapy in use, the data relating to combination therapy with low HDL cholesterol and hypertriglyceridaemia should be interpreted with caution.

Table 2.23 Prevalence of taking lipid-lowering therapy and combinations of lipid-lowering therapy with an abnormality in any of the four lipids according to sex

	Men			Women			Persons		
	%	95% CI		%	95% CI		%	95% CI	
Lipid-lowering treatment	9.5	8.0	11.1	7.6	6.4	9.1	8.5	7.5	9.6
Elevated total cholesterol or lipid-lowering treatment	44.5	41.1	48.0	40.3	37.6	43.0	42.4	40.0	44.9
Elevated LDL cholesterol or lipid-lowering treatment	44.5	41.0	48.0	34.9	31.6	38.4	39.6	36.8	42.4
Low HDL cholesterol or lipid-lowering treatment	19.4	16.6	22.5	24.7	21.0	28.9	22.0	19.2	25.2
Hypertriglyceridaemia or lipid-lowering treatment	25.3	22.5	28.4	15.6	13.8	17.6	20.4	18.6	22.4

95% CI = 95 per cent confidence interval; HDL cholesterol = high-density lipoprotein cholesterol; LDL cholesterol = low-density lipoprotein cholesterol

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Data on combination of lipid-lowering therapy with low HDL cholesterol and with hypertriglyceridaemia should be interpreted with caution (see text above table).

Among those with cardiovascular disease and/or those who had ever had a cardiovascular intervention, such as angina, myocardial infarction, stroke or an intervention such as coronary bypass surgery or percutaneous coronary intervention, and who met the PBS criteria for treatment with a lipid-lowering drug, 50.4 per cent were on treatment. For those with diabetes and hypertension who met the PBS criteria for treatment, 51.1 per cent and 25.2 per cent, respectively were on treatment (Table 2.24).

Table 2.24 Proportion of people eligible for lipid-lowering medications who are being treated

	Prevalence			% of people eligible for lipid-lowering medications under PBS subsidy criteria who are being treated[a]		
	%	95% CI		%	95% CI	
With cardiovascular disease[b]	3.0	2.4	3.7	50.4	40.4	60.4
With known diabetes but no cardiovascular disease	2.9	2.1	3.9	51.1	37.9	64.2
Without cardiovascular disease or known diabetes	94.2	93.1	95.1	58.3	52.0	64.4
With treated hypertension but no cardiovascular disease or known diabetes	11.4	9.4	13.6	25.2	16.4	36.6

(a) All people who reported taking lipid-lowering medications were considered to have been eligible for treatment under PBS criteria.

(b) Cardiovascular disease/intervention included angina, myocardial infarction, stroke, coronary bypass surgery or percutaneous coronary interventions.

95% CI = 95 per cent confidence interval

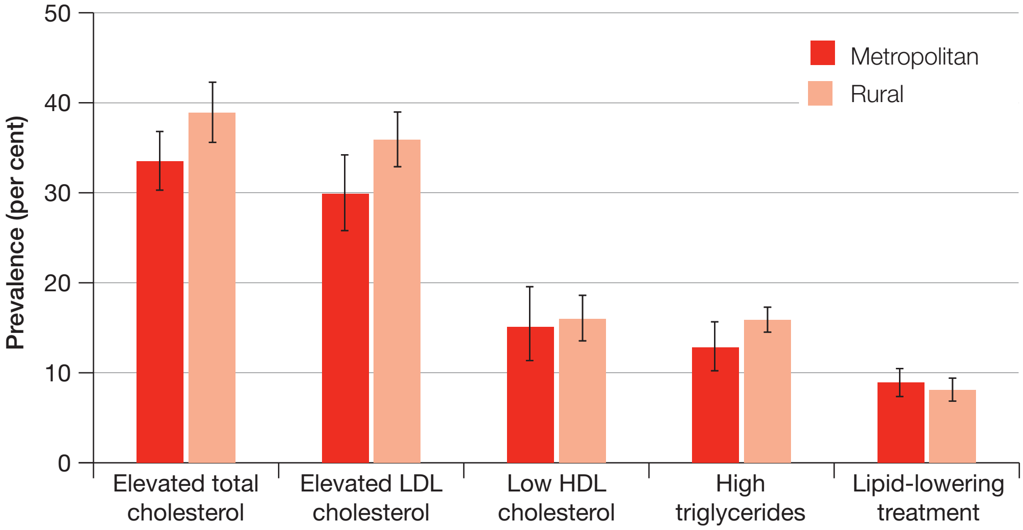
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 2.3 shows the prevalence of elevated total cholesterol, LDL cholesterol, triglycerides or low HDL cholesterol and lipid-lowering treatment according to metropolitan and rural status. The prevalence of elevated total cholesterol, LDL cholesterol, triglycerides or low HDL cholesterol was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 2.3 Prevalence and 95% CI of dyslipidaemia (individual lipid abnormalities) according to locality



The error bars represent the 95 per cent confidence intervals; HDL cholesterol = high-density lipoprotein cholesterol; LDL cholesterol = low-density lipoprotein cholesterol.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 2.25 and Figure 2.4 show the prevalence of dyslipidaemia by metropolitan and rural status. The prevalence of dyslipidaemia was similar in metropolitan and rural Victorians after adjustment for age and sex.

Table 2.25 Prevalence of dyslipidaemia and individual lipid abnormalities according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Elevated total cholesterol	34.4	31.2	37.7	37.3	33.7	41.0
Elevated LDL cholesterol	30.6	26.6	34.8	34.7	31.7	37.8
Low HDL cholesterol	15.0	11.5	19.4	16.0	13.5	18.9
Hypertriglyceridaemia	13.1	10.6	16.0	15.4	13.9	17.0
Lipid-lowering treatment	9.6	8.1	11.4	7.2	6.2	8.4
Dyslipidaemia[(a)]	55.9	51.0	60.8	58.5	55.9	61.0
No dyslipidaemia	44.1	39.2	49.1	41.6	39.0	44.1

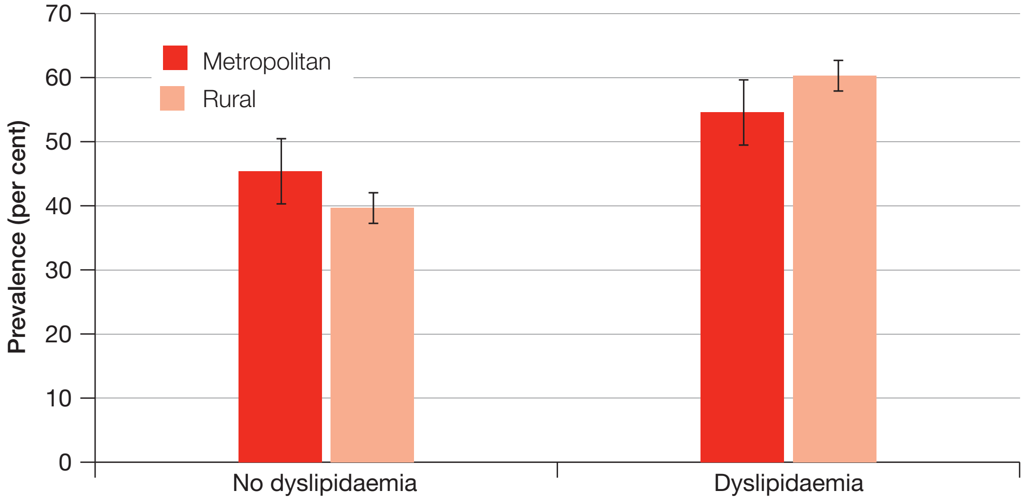
(a) any of the lipid abnormalities and those on lipid-lowering treatment

95% CI = 95 per cent confidence interval; HDL cholesterol = high-density lipoprotein cholesterol; LDL cholesterol = low-density lipoprotein cholesterol.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Figure 2.4 Prevalence and 95% CI of dyslipidaemia according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Discussion

Using BMI, over one-quarter of Victorians are obese, with little difference between men and women. Using waist circumference to define obesity, the prevalence of obesity was higher, with almost a third of Victorians being classified as obese. Compared with data from the National Health Survey from 2007–08 (ABS 2009), the obesity prevalence using BMI was similar, with both surveys reporting a prevalence around 25 per cent.

Compared with Victorians in the 1999–2000 AusDiab survey (Cameron et al. 2003), the prevalence of obesity was slightly higher (24.5 per cent in the Victorian Health Monitor versus 20.8 per cent in AusDiab). Obesity prevalence was also higher in rural than metropolitan Victorians. Obesity prevalence measured by waist circumference in the Victorian Health Monitor was 32.0 per cent and was higher in women than men. This figure was also higher than was reported in the AusDiab 1999–2000 survey (30.3 per cent in AusDiab).

A quarter of Victorians have high blood pressure, with more men than women being classified as having hypertension. The prevalence of hypertension did not differ by locality. Compared with similar studies in Australia, such as the 1999–2000 AusDiab survey (Briganti et al. 2003), hypertension prevalence in the Victorian Health Monitor population was lower (25.1 per cent versus 28.6 per cent in AusDiab). Among those with hypertension, a large proportion (53.9 per cent) of Victorians failed to meet blood pressure targets. This highlights a group in which treatment may not have been optimised.

Over 50 per cent of Victorians have an abnormality in one of the four lipids measured or were taking lipid-lowering therapy. This proportion did not differ by locality. However, the prevalence of dyslipidaemia in the Victorian Health Monitor was lower than that reported in AusDiab, where 64 per cent of Australians had an abnormality in one of the four lipids or were taking lipid-lowering drugs (Dunstan et al. 2001). The prevalence of elevated total cholesterol (35.6 per cent versus 51.2 per cent), LDL cholesterol (32.3 per cent versus 49.8 per cent) and triglycerides (14.0 per cent versus 20.5 per cent), were each lower in the Victorian Health Monitor than in the AusDiab study. The prevalence of low HDL cholesterol cannot be directly compared due to the use of different thresholds in earlier surveys.

In relation to lifestyle factors, the prevalence of obesity and dyslipidaemia prevalence was lower in those who undertook sufficient physical activity versus those who did not and were higher in those who reported their health as fair or poor compared with those who reported their health as good or excellent. The prevalence of dyslipidaemia and obesity was higher in those who were sedentary for at least eight hours a day versus those who were not.

In summary, similar to other developed populations, Victorians appear to be becoming more obese over time. The upward trend in obesity prevalence appears to be apparent whether obesity is defined by either waist circumference or BMI. Prevalence rates were also higher in rural areas than the metropolitan area. These findings highlight the need for the development of obesity prevention strategies that can reduce these trends especially in rural areas. Although the prevalence of other key risk factors such as hypertension and dyslipidaemia appear not to be increasing over time, the absolute prevalence of these risk factors in Victorians is high and thus these findings highlight subgroups in the Victorian population that would benefit from lifestyle prevention strategies focused on the reduction of smoking, hypertension and dyslipidaemia.

Finally, despite the abundance of evidence relating to the benefit of lipid-lowering therapy, a substantial proportion of those with cardiovascular disease who meet the PBS criteria for treatment and should be on such therapy do not appear to be taking it. Improving the use and uptake of lipid-lowering therapy could therefore have a significant impact on the incidence of cardiovascular disease.

3. Diabetes and the metabolic syndrome

3 Diabetes and the metabolic syndrome

Diabetes

The term diabetes mellitus describes a metabolic disorder with multiple causes characterised by chronically elevated blood glucose levels (hyperglycaemia), with disturbances of carbohydrate, fat and protein metabolism (WHO 1999a). The long-term effects of diabetes result from dysfunction and failure of various organs and tissues, and include cardiovascular disease, as well as vision loss, amputations and kidney failure.

The prevalence of diabetes has more than doubled over recent decades (Dunstan et al. 2002). It is the fourth leading cause of the disease burden (Begg et al. 2007) and one of the top 10 leading causes of death in Australia (ABS 2010). It is also responsible for an estimated 1.9 per cent of the annual total allocated recurrent health expenditure (AIHW 2008b).

Type 1 and type 2 diabetes are the two most common forms of diabetes. Type 1 diabetes is due to an absolute deficiency of insulin, whereas type 2 diabetes is typically due to a combination of reduced tissue sensitivity to insulin and reduced production of insulin. Type 2 diabetes is often associated with a sedentary lifestyle, and accounts for approximately 90 per cent of all adults with diabetes.

Impaired fasting glucose describes a state of elevated blood glucose levels in the fasting state that are above normal but not high enough to be diagnosed as diabetes. People with impaired fasting glucose are at increased risk of developing type 2 diabetes and cardiovascular disease.

Definitions

Diabetes and impaired fasting glucose are defined according to the values for venous fasting plasma glucose concentration outlined in the WHO report on the diagnosis and classification of diabetes (Table 3.1) (WHO 2006). People who reported taking oral hypoglycaemic medications and/or insulin were classified as having diabetes, regardless of their plasma glucose levels.

Participants were classified as having known diabetes if they reported a previous diagnosis of diabetes and were either currently receiving glucose-lowering medication (in the form of tablets or insulin) or had a fasting plasma glucose value over the cut–off point for diabetes. Participants were classified as having newly diagnosed diabetes if they reported no prior diagnosis of diabetes but had a fasting plasma glucose value over the diabetes cut-off point.

In this report, results for type 1 and type 2 diabetes have not been presented separately, as 94.8 per cent of diabetes cases were classified as type 2.

Table 3.1 Classification of glucose tolerance status

Classification	Fasting plasma glucose (mmol/L)
Diabetes	≥ 7.0
Impaired fasting glucose	6.1 to < 7.0
Normal fasting glucose	< 6.1

All participants on oral hypoglycaemic medication or insulin were classified as having diabetes.

Results

Overall prevalence

Table 3.2 shows the age-standardised prevalence of diabetes in people aged 18–75 years. The prevalence of diabetes in the total population was 4.6 per cent. The prevalence of type 1 and type 2 diabetes were 0.6 per cent and 4.0 per cent, respectively. The prevalence of diabetes was similar in men and in women. The prevalence of known diabetes (3.4 per cent) was higher than that of newly diagnosed diabetes (1.2 percent), $p < 0.001$ (Table 3.3).

The prevalence of impaired fasting glucose in the total population was 4.3 per cent (Table 3.2). The prevalence of impaired fasting glucose was higher in men (5.7 per cent) than in women (2.9 per cent), $p = 0.002$ (Table 3.2).

Applying the prevalence of diabetes to the total population of Victoria in 2008 suggests that up to 236,000 people aged 18–75 years had the disease.

Prevalence by age group and sex

Table 3.2 describes the prevalence of diabetes, impaired fasting glucose and normal fasting glucose by age group and sex.

The prevalence of diabetes increased with age in men (p for trend = 0.034) and in women (p for trend = 0.001). For men the prevalence of diabetes increased steadily with age and peaked in the 65–75 year age group. For women the prevalence of diabetes peaked in the 55–64 year age group.

The prevalence of impaired fasting glucose increased with age in men (p for trend = 0.001) and in women (p for trend < 0.001). In comparison to the steady and continuous increase in the prevalence of impaired fasting glucose in women, the prevalence of impaired fasting glucose plateaued after the age of 45 years in men.

The prevalence of normal fasting glucose decreased steadily with age in men (p for trend = 0.001) and in women (p for trend < 0.001).

Table 3.2 Prevalence of glucose tolerance status according to sex and age group

	Glucose tolerance status								
	Normal fasting glucose			Impaired fasting glucose			Diabetes		
	%	95% CI		%	95% CI		%	95% CI	
Men									
18–34	94.0	80.9	98.3	2.1	0.5	8.0	3.9	1.1	12.9
35–44	97.2	93.6	98.8	1.6	0.5	4.7	1.2	0.3	4.5
45–54	85.2	79.7	89.4	10.3	6.5	16.1	4.5	2.7	7.3
55–64	84.1	78.3	88.6	8.5	5.4	13.0	7.4	4.5	12.0
65–75	69.4	63.1	75.1	11.3	6.3	19.6	19.3	13.4	26.9
Total	**88.9**	**85.5**	**91.5**	**5.7**	**4.0**	**8.1**	**5.5**	**4.2**	**7.0**
Women									
18–34	98.4	92.5	99.7	0.0	–	–	1.6	0.3	7.5
35–44	98.6	94.2	99.7	1.3	0.3	6.0	0.2	0.0	0.7
45–54	93.0	88.7	95.7	2.5	1.3	5.1	4.5	2.2	8.9
55–64	83.8	77.2	88.8	7.0	4.6	10.7	9.2	4.9	16.5
65–75	81.5	73.5	87.4	10.2	6.1	16.4	8.4	5.2	13.3
Total	**93.2**	**91.5**	**94.7**	**2.9**	**2.3**	**3.8**	**3.8**	**2.6**	**5.7**
Persons									
18–34	96.2	89.0	98.8	1.0	0.3	4.1	2.7	0.9	8.1
35–44	97.9	95.7	99.0	1.4	0.6	3.3	0.7	0.2	2.3
45–54	89.1	86.0	91.6	6.4	4.2	9.6	4.5	2.9	7.0
55–64	83.9	79.4	87.7	7.7	5.5	10.8	8.3	5.5	12.4
65–75	75.6	70.6	80.0	10.7	7.0	16.1	13.7	10.4	17.6
Total	**91.1**	**89.2**	**92.7**	**4.3**	**3.3**	**5.7**	**4.6**	**3.7**	**5.7**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

39/3,653 participants have no valid data.

Table 3.3 Prevalence of known and newly diagnosed diabetes according to sex

	Known diabetes			Newly diagnosed diabetes		
	%	95% CI		%	95% CI	
Men	4.1	2.8	6.1	1.4	0.8	2.3
Women	2.8	1.9	4.1	1.0	0.4	2.6
Persons	3.4	2.6	4.5	1.2	0.7	1.9

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

39/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 3.4 describes the associations of the prevalence of diabetes with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of diabetes was not related to country of birth but was higher in those who did not usually speak English at home versus those who did. The prevalence of diabetes was not related to marital status but was higher in those who were physically inactive or insufficiently active versus those who were sufficiently physically active and those who sat for greater than or equal to eight hours per day versus those who did not. The prevalence of diabetes was not related to smoking status, but was higher in those who rated their health as fair or poor versus those who did not, those who were obese (using either BMI or waist circumference) versus those who were not, and those with hypertension versus those without. The prevalence of diabetes was not related to the presence of dyslipidaemia but was higher in those with the metabolic syndrome versus those without and those with cardiovascular disease versus those without. The prevalence of diabetes was not related to the presence of indicators for chronic kidney disease.

Table 3.4 Prevalence of diabetes and risk of having diabetes, by selected risk factors

	Prevalence of diabetes			Age and sex-adjusted odds ratio of having diabetes (95% CI)
	%	95% CI		
Country of birth				
Australia	4.0	3.2	4.9	1.0
Overseas	6.5	3.6	11.5	1.7 (0.9–3.2)
Language spoken at home				
English	3.9	3.2	4.8	1.0
Other	7.8	4.4	13.3	2.2 (1.1–4.6)
Marital status				
Married/living with a partner	4.0	3.3	5.0	1.0
Other[(a)]	4.4	3.1	6.0	1.6 (0.8–2.9)
Physical activity				
Sufficiently active	3.9	2.9	5.2	1.0
Insufficiently active or inactive	5.9	4.0	8.5	1.7 (1.0–3.0)

Table 3.4 Prevalence of diabetes and risk of having diabetes, by selected risk factors (continued)

	Prevalence of diabetes %	95% CI		Age and sex-adjusted odds ratio of having diabetes (95% CI)
Sedentary behaviour				
< 8 hours of total sitting per day	3.9	3.2	4.6	1.0
≥ 8 hours of total sitting per day	6.2	4.0	9.3	1.8 (1.0–3.1)
Smoking				
Non-smoker	4.1	3.0	5.7	1.0
Ex-smoker	4.4	3.5	5.7	1.2 (0.8–1.7)
Current smoker[(b)]	5.3	3.2	8.7	1.1 (0.6–2.1)
Self-rated general health				
Good/very good/excellent	3.8	2.9	4.8	1.0
Fair/poor	10.5	7.7	14.2	3.3 (2.0–5.5)
Obesity (BMI)				
No	2.6	1.8	3.7	1.0
Yes	9.9	6.2	15.5	4.2 (2.3–7.7)
Obesity (waist)				
No	2.5	1.7	3.7	1.0
Yes	8.1	4.8	13.2	3.6 (1.8–7.1)
Hypertension				
No	2.8	1.8	4.2	1.0
Yes	9.7	5.8	15.7	3.0 (1.7–5.3)
Dyslipidaemia				
No	3.1	1.9	4.9	1.0
Yes	5.2	3.7	7.3	1.5 (0.7–3.1)
Metabolic syndrome				
No	1.2	0.5	2.5	1.0
Yes	16.5	10.6	24.7	14.4 (5.0–41.8)
Cardiovascular disease				
No	4.1	3.2	5.2	1.0
Yes	13.9	10.6	18.1	3.7 (2.2–6.4)
Indicators for chronic kidney disease				
No	4.5	3.5	5.6	1.0
Yes	5.7	3.6	9.0	1.5 (0.8–3.0)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

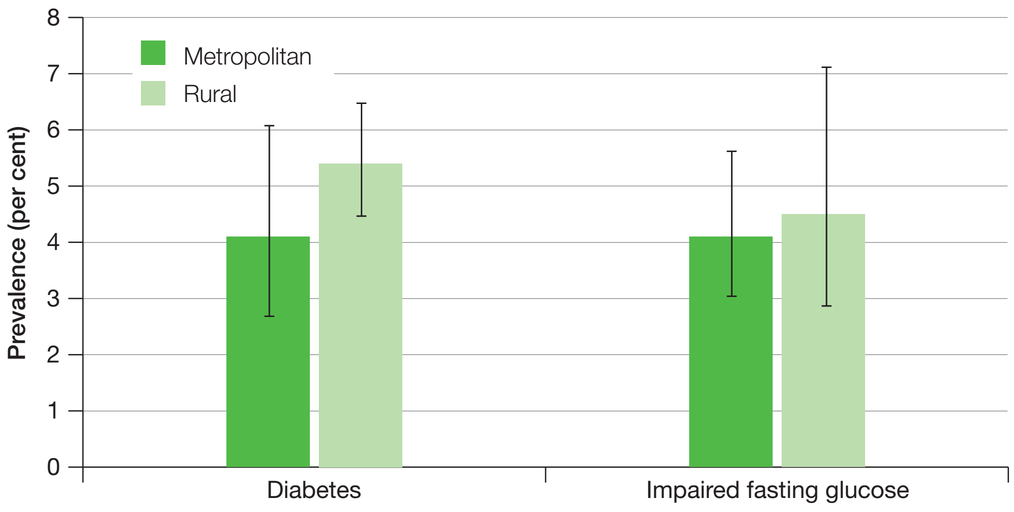
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 3.1 and Table 3.5 show the prevalence of diabetes and impaired fasting glucose by metropolitan and rural status. The prevalence of diabetes and impaired fasting glucose was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 3.1 Prevalence and 95% CI of diabetes and impaired fasting glucose according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 3.5 Prevalence of diabetes and impaired fasting glucose according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Diabetes	4.1	2.7	6.1	5.4	4.5	6.5
Impaired fasting glucose	4.1	3.0	5.6	4.5	2.9	7.1

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Diabetes control in people with known diabetes

General characteristics of people with known diabetes

Table 3.6 summarises the characteristics of people with known diabetes. Of those with known diabetes, the median age when people were diagnosed with diabetes was 49 years. The percentage of people who reported seeing various healthcare professionals in the previous 12 months ranged from 24.0 per cent seeing a dietician to 74.5 per cent seeing a general practitioner. The percentage of Victorians with known diabetes reporting having their feet or eyes checked over the previous 12 months was 61.2 per cent and 81.2 per cent, respectively.

Percentage of Victorians with known diabetes achieving diabetes control

According to the current Australian guidelines (Diabetes Australia 2010), patients with diabetes who have glycated haemoglobin A1c ≤ 7.0 per cent, blood pressure ≤ 130/80 mmHg, total cholesterol < 4.0 mmol/L, LDL cholesterol < 2.5 mmol/L, HDL cholesterol > 1.0 mmol/L and triglycerides < 1.5 mmol/L, are considered to have adequate control for glucose, blood pressure and lipids, respectively.

The target levels were met for haemoglobin A1c by 39.0 per cent, blood pressure by 42.9 per cent, total cholesterol by 31.3 per cent, LDL cholesterol by 49.3 per cent, HDL cholesterol by 72.7 per cent and triglycerides by 50.6 per cent of Victorians with known diabetes (Table 3.7). A total of 0.6 per cent of Victorians with known diabetes met all target levels, while 3.9 per cent met none of them.

Diabetes control by treatment

The median age when people started insulin therapy was 50 years in those with type 2 diabetes. Of those with known diabetes, 91.6 per cent were receiving oral hypoglycaemic medications and/or insulin. The proportion of people achieving a haemoglobin A1c ≤ 7.0 per cent was similar between those who were on diet alone and those who were taking oral hypoglycaemic agents and/or insulin (Table 3.8).

Table 3.6 Healthcare utilisation in persons with known diabetes

	Known diabetes		
	%	95% CI	
Median age at diagnosis (year)	49		
Consultations in the previous 12 months with:			
a general practitioner	74.5	51.9	88.8
a podiatrist or chiropodist	26.8	17.4	38.8
a diabetes educator or nurse	45.5	28.6	63.4
a nutritionist or dietician	24.0	14.9	36.3
a specialist	42.1	24.0	62.6
Having a foot examination in the previous 12 months	61.2	46.3	74.2
Having an eye examination in the previous 2 years	81.2	56.1	93.6

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Table 3.7 Percentages and 95% CI of persons with known diabetes meeting haemoglobin A1c, blood pressure and lipids targets

	Percentage of persons with known diabetes achieving targets[a]		
	%	95% CI	
Haemoglobin A1c ≤ 7.0 per cent	39.0	26.3	53.4
Blood pressure ≤ 130/80 mmHg	42.9	25.6	62.2
Lipids			
Total cholesterol < 4.0 mmol/L	31.3	21.0	43.9
LDL cholesterol < 2.5 mmol/L	49.3	35.0	63.7
HDL cholesterol > 1.0 mmol/L	72.7	59.7	82.6
Triglycerides < 1.5 mmol/L	50.6	32.9	68.1

(a) According to *Diabetes Management in General Practice* (Diabetes Australia 2010)

95% CI = 95 per cent confidence interval; HDL cholesterol = high-density lipoprotein cholesterol; LDL = low-density lipoprotein cholesterol

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Table 3.8 Percentages and 95% CI of persons with known diabetes achieving haemoglobin A1c ≤ 7.0 per cent according to treatment

	Percentage of known diabetes			Percentage achieving haemoglobin A1c ≤ 7.0 per cent		
Treatment for known diabetes	%	95% CI		%	95% CI	
Diet alone	8.4	3.5	18.8	41.2	14.6	74.2
Oral hypoglycaemic agents	60.7	43.6	75.5	36.9	26.2	49.1
Oral hypoglycaemic agents and/or insulin	30.9	15.4	52.4	42.6	13.7	77.7

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Metabolic syndrome

The metabolic syndrome is characterised by central or abdominal (visceral and retroperitoneal) obesity and clustering of other cardiovascular risk factors including abnormal glucose tolerance (diabetes, impaired fasting glucose or impaired glucose tolerance), elevated triglycerides, decreased HDL cholesterol, elevated blood pressure and hyperinsulinaemia with underlying insulin resistance (Alberti et al. 2009). The clustering of these risk factors together confers a higher risk of diabetes and cardiovascular disease.

Definitions

The metabolic syndrome was classified according to an international consensus statement for the clinical diagnosis of the metabolic syndrome (Table 3.9), which was released in 2009 (Alberti et al. 2009). The presence of any three of five risk factors would qualify a person for the metabolic syndrome.

Table 3.9 Classification of the metabolic syndrome

Component	Threshold
• Elevated waist circumference	Europids: ≥ 94 cm in men, ≥ 80 cm in women; Asians, ethnic central and South Americans: ≥ 90 cm in men, ≥ 80 cm in women
• Elevated triglycerides fasting glucose	≥ 1.7 mmol/L or specific treatment of this lipid abnormality
• Reduced HDL cholesterol	<1.0 mmol/L in men; < 1.3 mmol/L in women or specific treatment for this lipid abnormality
• Elevated blood pressure	Systolic blood pressure ≥ 130 mmHg or diastolic blood pressure ≥ 85 mmHg or treatment of previously diagnosed hypertension
• Elevated fasting glucose	Fasting plasma glucose ≥ 5.6 mmol/L or previously diagnosed type 2 diabetes

HDL cholesterol = high-density lipoprotein cholesterol

Results

Overall prevalence

Table 3.10 shows the age-standardised prevalence of the metabolic syndrome in people aged 18–75 years. The prevalence of the metabolic syndrome in the total population was 20.9 per cent. The prevalence of the metabolic syndrome was higher in men (24.9 per cent) than in women (17.0 per cent), $p < 0.001$ (Table 3.10).

Applying the prevalence of the metabolic syndrome to the total population of Victoria in 2008 produces an estimate of 792,500 people aged 18–75 years with the syndrome.

Prevalence by age group and sex

Table 3.10 also describes the prevalence of the metabolic syndrome by age group and sex. The prevalence of the syndrome increased steadily with age group in both men and women (p for trend < 0.001 in men and women).

Table 3.10 Prevalence of the metabolic syndrome according to sex and age group

	Without the metabolic syndrome			With the metabolic syndrome		
	%	95% CI		%	95% CI	
Men						
18–34	90.5	84.8	94.1	9.5	5.9	15.2
35–44	81.5	75.2	86.5	18.5	13.6	24.8
45–54	70.7	62.7	77.6	29.3	22.4	37.3
55–64	57.2	48.0	65.9	42.8	34.1	52.0
65–75	47.3	40.8	53.9	52.7	46.1	59.2
Total	**75.1**	**71.8**	**78.1**	**24.9**	**21.9**	**28.2**
Women						
18–34	92.3	86.6	95.7	7.7	4.3	13.4
35–44	91.9	88.1	94.5	8.2	5.5	11.9
45–54	80.9	74.4	86.1	19.1	13.9	25.6
55–64	68.2	61.9	73.8	31.8	26.2	38.1
65–75	61.4	53.1	69.2	38.6	30.9	47.0
Total	**83.0**	**80.6**	**85.1**	**17.0**	**14.9**	**19.5**
Persons						
18–34	91.4	87.8	93.9	8.6	6.1	12.2
35–44	86.7	83.2	89.6	13.3	10.4	16.8
45–54	75.9	72.0	79.4	24.1	20.6	28.0
55–64	62.8	57.1	68.1	37.2	31.9	42.9
65–75	54.6	49.4	59.7	45.4	40.4	50.6
Total	**79.1**	**76.6**	**81.4**	**20.9**	**18.7**	**23.4**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

32/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 3.11 describes the associations of the prevalence of the metabolic syndrome with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of the metabolic syndrome was not related to country of birth, language spoken at home or marital status. The prevalence of the metabolic syndrome was higher in: those who were physically inactive or insufficiently active versus those who were sufficiently physically active; those who sat for greater than or equal to eight hours per day versus those who did not; those who were current or ex-smokers versus those who were non-smokers; and those who rated their health as fair or poor versus those who did not.

Table 3.11 Prevalence of the metabolic syndrome and risk of having the metabolic syndrome, by selected risk factors

	Prevalence of the metabolic syndrome			Age and sex-adjusted odds ratio of having the metabolic syndrome (95% CI)
	%	95% CI		
Country of birth				
Australia	20.6	18.2	23.1	1.0
Overseas	22.4	18.0	27.5	1.1 (0.8–1.5)
Language spoken at home				
English	20.3	18.3	22.5	1.0
Other	24.5	18.2	32.1	1.3 (0.8–2.0)
Marital status				
Married/living with a partner	20.9	18.8	23.2	1.0
Other[a]	19.6	16.2	23.4	1.0 (0.7–1.3)
Physical activity				
Sufficiently active	19.6	17.1	22.3	1.0
Insufficiently active or inactive	24.0	20.8	27.5	1.4 (1.1–1.8)
Sedentary behaviour				
< 8 hours of total sitting per day	19.6	17.5	21.9	1.0
≥ 8 hours of total sitting per day	24.2	20.0	28.9	1.3 (1.0–1.8)
Smoking				
Non-smoker	17.8	15.0	20.9	1.0
Ex-smoker	23.7	20.2	27.5	1.4 (1.0–2.0)
Current smoker[b]	26.1	21.7	31.1	1.5 (1.2–2.1)
Self-rated general health				
Good/very good/excellent	18.6	16.5	21.0	1.0
Fair/poor	37.4	32.2	42.9	3.0 (2.2–4.0)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval

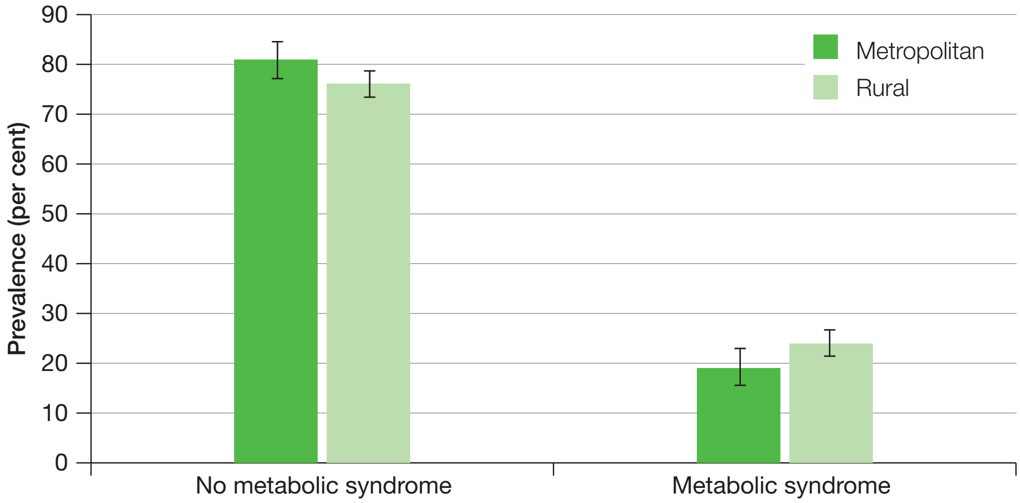
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 3.2 and Table 3.12 show the prevalence of the metabolic syndrome by metropolitan and rural status. The prevalence of the metabolic syndrome was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 3.2 Prevalence and 95% CI of the metabolic syndrome according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 3.12 Prevalence of the metabolic syndrome according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
No metabolic syndrome	80.3	76.2	83.8	77.6	75.0	80.1
Metabolic syndrome	19.7	16.2	23.8	22.4	19.9	25.0

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Discussion

The results from the Victorian Health Monitor suggest the prevalence of diabetes among adults in Victoria was 4.6% in 2009–2010. This would suggest that up to 236,000 adults aged 18-75 years had diabetes in Victoria in 2009–2010. This is comparable to the prevalence estimate from Diabetes Australia-Victoria, who reported in November 2011 that as many as 250,000 Victorians (all ages) had diabetes, according to data derived from the National Diabetes Services Scheme (NDSS).

Over 90 per cent of participants with diagnosed diabetes in the Victorian Health Monitor were taking oral hypoglycaemic agents and/or insulin in 2009–2010. However, despite the high level of anti-diabetic medication use, only 39 per cent of participants with diagnosed diabetes achieved a haemoglobin A1c target (≤7.0 per cent). Similarly diabetes control was poor in those with diagnosed diabetes using dietary therapy alone in the Victorian Health Monitor, as only 41.2 per cent met the haemoglobin A1c target.

It is also worth noting that while the AusDiab study (1999-2000) reported that there was one undiagnosed case of diabetes for every diagnosed case (Dunstan et al. 2002), the Victorian Health Monitor indicates that there may now only be one undiagnosed case for every three diagnosed cases.

The prevalence estimate from the Victorian Health Monitor for the metabolic syndrome was 20.9 per cent. This was based on the latest consensus statement for clinical diagnosis. A survey participant had to have at least three of the following five risk factors to be classified as having metabolic syndrome: elevated triglyceride levels, reduced HDL cholesterol, elevated blood pressure, increased waist circumference and elevated fasting glucose.

The prevalence of diabetes and the metabolic syndrome was substantially higher in people who were not physically active or who were characterised as having sedentary behaviour than those who were not. These findings indicate that a healthy lifestyle, at a population level, is a priority for Victoria, as it is essential to limiting the prevalence of diabetes and the metabolic syndrome in the general population.

4. Chronic kidney disease

4. Chronic kidney disease

Background

Chronic kidney disease is the occurrence of kidney damage or reduced kidney function, lasting at least three months. Chronic kidney disease is common in the general community and causes significant physical and mental disability (Chadban et al. 2003; Chow et al. 2003). This disease is commonly referred to as a 'silent killer' because people often don't realise they have kidney disease and up to 90 per cent of kidney function can be lost before symptoms become evident (AIHW 2009). Chronic kidney disease is a major complication of diabetes, is the second leading cause of death among adults with diabetes (AIHW 2009) and is the leading cause of death among the Aboriginal population of Central Australia who have diabetes (Phillips et al. 1995). People with chronic kidney disease are at risk of developing end-stage kidney failure requiring dialysis or transplantation and are also predisposed to develop premature cardiovascular disease, with an increased risk of death due to heart attack or stroke (Anavekar et al. 2004; Go et al. 2004).

The number of new cases (incidence) of end-stage kidney disease in Australia is currently 95 per million population per annum, with diabetes being the leading cause (McDonald et al. 2006). Currently, 30 per cent of all new end-stage kidney disease is due to diabetes (McDonald et al. 2006), compared with 17 per cent in 1994 (Disney 1996). The other common causes of end-stage kidney disease include glomerulonephritis (25 per cent) and vascular kidney disease related to hypertension or atherosclerosis (13 per cent) (McDonald et al. 2006).

This chapter presents the prevalence of indicators for chronic kidney disease and associated risk factors.

Definitions

Two aspects of kidney function were measured. The glomerular filtration rate assesses the capacity of the kidneys to undertake their primary role of filtering the blood. Albuminuria measures the amount of albumin (a protein) that leaks into the urine from the blood through the kidneys. Low levels of albumin in the urine are normal, but elevated levels occur when kidney damage is present.

Impaired glomerular filtration

The glomerular filtration rate can be estimated from the results of blood levels of creatinine (Levey et al. 2009). Impaired estimated glomerular filtration rate is defined as an estimated glomerular filtration rate of < 60 mL/min/1.73m^2 (Levey et al. 2009).

Albuminuria

Albuminuria is defined from the spot urine albumin:creatinine ratio greater than or equal to 2.5 mg/mmol for men and greater than or equal to 3.5 mg/mmol for women.

Results

Impaired glomerular filtration

Overall prevalence

Table 4.1 shows the age-standardised prevalence of impaired estimated glomerular filtration rate (eGFR< 60 mL/min/1.73m^2) in people aged 18–75 years. The prevalence of impaired estimated glomerular filtration rate in the total population was 3.5 per cent. The prevalence was lower in men (2.9 per cent) than in women (4.1 per cent), $p < 0.05$.

Applying the prevalence of impaired estimated glomerular filtration rate to the total population of Victoria in 2008 produces an estimate of 132,500 people aged 18–75 years who have impaired estimated glomerular filtration rate.

Prevalence by age group and sex

Table 4.1 also describes the prevalence of impaired estimated glomerular filtration rate by age group and sex. Impaired estimated glomerular filtration rate was infrequent in those aged under 45 years, but increased to more than 15 per cent in men and more than 23 per cent in women aged 65–75 years (Table 4.1). The relationship between the impaired estimated glomerular filtration rate and increasing age group was significant in men and women (*p* for trend < 0.001).

Table 4.1 Prevalence of impaired estimated glomerular filtration rate according to sex and age group

	Normal estimated glomerular filtration rate			Impaired estimated glomerular filtration rate		
	%	95% CI		%	95% CI	
Men						
18–34	100.0	–	–	0.0	–	–
35–44	100.0	–	–	0.0	–	–
45–54	98.8	95.4	99.7	1.2	0.3	4.6
55–64	93.1	87.5	96.3	6.9	3.7	12.5
65–75	84.9	78.5	89.7	15.1	10.3	21.5
Total	**97.1**	**95.7**	**98.0**	**2.9**	**2.0**	**4.3**
Women						
18–34	99.7	97.5	100.0	0.3	0.0	2.5
35–44	99.8	98.8	100.0	0.2	0.0	1.2
45–54	98.3	96.6	99.1	1.7	0.9	3.4
55–64	93.3	89.3	95.8	6.7	4.2	10.7
65–75	76.7	68.4	83.4	23.3	16.6	31.6
Total	**95.9**	**94.7**	**96.8**	**4.1**	**3.2**	**5.3**
Persons						
18–34	99.8	98.7	100.0	0.2	0.0	1.3
35–44	99.9	99.4	100.0	0.1	0.0	0.6
45–54	98.5	96.7	99.4	1.5	0.6	3.3
55–64	93.2	90.0	95.5	6.8	4.5	10.0
65–75	80.7	74.8	85.5	19.3	14.5	25.2
Total	**96.5**	**95.4**	**97.3**	**3.5**	**2.7**	**4.6**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

26/3,653 have no valid data.

Prevalence by selected risk factors

Table 4.2 describes the associations of impaired estimated glomerular filtration rate with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of impaired estimated glomerular filtration rate was not related to country of birth, language spoken at home or marital status. The prevalence of impaired estimated glomerular filtration rate was higher in those who were physically inactive or insufficiently physically active versus those who undertook sufficient activity but was not related to sedentary behaviour (total time spent sitting per day). The prevalence of impaired estimated glomerular filtration rate was not related to smoking status, self-rated health status, obesity status (using either BMI or waist circumference), dyslipidaemia status, hypertension status, the presence of diabetes, or the presence of cardiovascular disease (Table 4.2).

Table 4.2 Prevalence of impaired estimated glomerular filtration rate and risk of having impaired estimated glomerular filtration rate, by selected risk factors

	Prevalence of impaired estimated glomerular filtration rate			Age and sex-adjusted odds ratio of impaired estimated glomerular filtration rate (95% CI)
	%	95% CI		
Country of birth				
Australia	3.4	2.6	4.6	1.0
Overseas	3.6	2.6	5.1	1.1 (0.7–1.7)
Language spoken at home				
English	3.6	2.7	4.7	1.0
Other	3.1	1.9	5.0	0.9 (0.5–1.7)
Marital status				
Married/living with a partner	3.9	3.0	5.0	1.0
Other[(a)]	3.3	2.4	4.6	1.0 (0.6–1.5)
Physical activity				
Sufficiently active	2.9	2.1	4.2	1.0
Insufficiently active or inactive	4.4	3.3	5.8	1.6 (1.0–2.5)
Sedentary behaviour				
< 8 hours of total sitting per day	3.4	2.5	4.6	1.0
≥ 8 hours of total sitting per day	4.5	3.2	6.4	1.4 (0.9–2.4)
Smoking				
Non-smoker	3.6	2.6	5.0	1.0
Ex-smoker	3.6	2.5	5.1	1.1 (0.6–1.9)
Current smoker[(b)]	4.0	2.2	7.3	1.2 (0.7–2.3)
Self-rated general health				
Good/very good/excellent	4.1	2.6	6.2	1.0
Fair/poor	3.5	2.6	4.5	1.2 (0.7–1.9)

Table 4.2 Prevalence of impaired estimated glomerular filtration rate and risk of having impaired estimated glomerular filtration rate, by selected risk factors (continued)

	Prevalence of impaired estimated glomerular filtration rate			Age and sex-adjusted odds ratio of impaired estimated glomerular filtration rate (95% CI)
	%	95% CI		
Obesity (BMI)				
No	3.5	2.6	4.6	1.0
Yes	3.6	2.6	5.0	1.1 (0.7–1.5)
Obesity (waist)				
No	3.3	2.3	4.8	1.0
Yes	3.7	2.8	4.8	1.2 (0.8–1.7)
Dyslipidaemia				
No	3.6	2.3	5.4	1.0
Yes	3.5	2.6	4.7	1.0 (0.6–1.8)
Hypertension				
No	3.0	2.3	7.9	1.0
Yes	4.1	2.5	6.4	1.4 (0.9–2.3)
Diabetes				
No	3.4	2.6	6.4	1.0
Yes	4.4	2.6	7.1	1.3 (0.7–2.4)
Cardiovascular disease				
No	3.4	2.5	4.6	1.0
Yes	6.8	5.0	9.3	1.7 (0.8–3.5)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

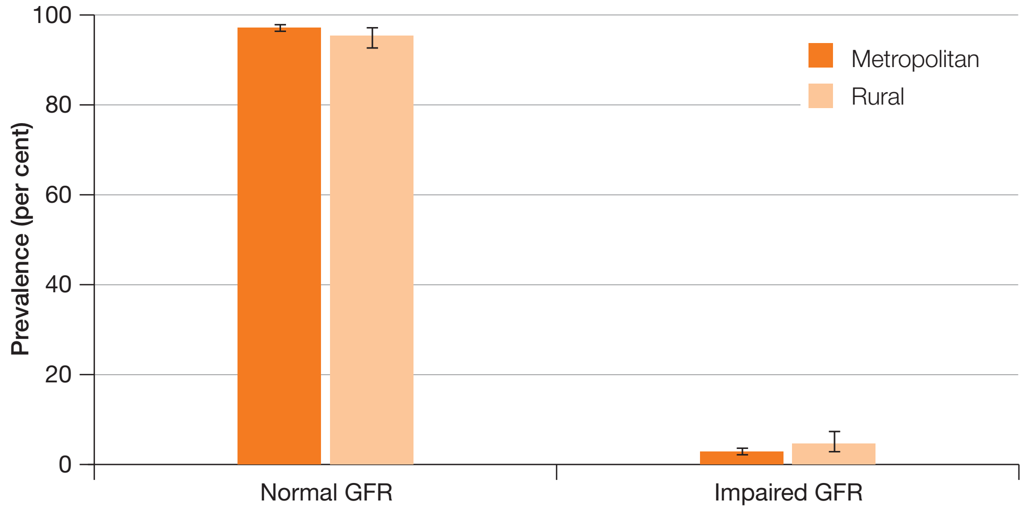
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 4.1 and Table 4.3 show the prevalence of impaired estimated glomerular filtration rate by metropolitan and rural status. The prevalence of impaired estimated glomerular filtration rate was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 4.1 Prevalence and 95% CI of impaired estimated glomerular filtration rate according to locality



eGFR = estimated glomerular filtration rate

The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Table 4.3 Prevalence of impaired estimated glomerular filtration rate according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Normal eGFR	97.0	96.1	97.7	96.0	93.5	97.5
Impaired eGFR	3.0	2.3	3.9	4.0	2.5	6.5

95 CI = 95% per cent confidence interval; eGFR = estimated glomerular filtration rate.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Albuminuria

Overall prevalence

Table 4.4 shows the age-standardised prevalence of albuminuria in people aged 18–75 years. The prevalence of albuminuria in the total population was 6.4 per cent. The prevalence was similar in men and in women.

Applying the prevalence of albuminuria to the total population of Victoria in 2008 produces an estimate of 242,500 people aged 18–75 who have albuminuria.

Prevalence by age group and sex

Table 4.4 describes the prevalence of albuminuria by age group and sex. The prevalence of albuminuria in men increased with age group (p for trend < 0.001). In women, the increase in albuminuria with age group was not significant (Table 4.4).

Table 4.4 Prevalence of albuminuria according to sex and age group

	No albuminuria			Albuminuria		
	%	95% CI		%	95% CI	
Men						
18–34	97.1	93.4	98.8	2.9	1.2	6.6
35–44	96.3	90.5	98.6	3.7	1.4	9.5
45–54	93.2	90.1	95.4	6.8	4.6	9.9
55–64	90.9	87.5	93.4	9.1	6.6	12.5
65–75	78.9	72.1	84.5	21.1	15.5	27.9
Total	**93.2**	**91.7**	**94.4**	**6.8**	**5.6**	**8.3**
Women						
18–34	93.7	88.9	96.6	6.3	3.4	11.1
35–44	96.9	95.0	98.2	3.1	1.8	5.0
45–54	94.4	90.5	96.7	5.6	3.3	9.5
55–64	94.5	90.6	96.9	5.5	3.1	9.4
65–75	89.7	83.6	93.6	10.3	6.4	16.4
Total	**94.0**	**92.3**	**95.4**	**6.0**	**4.6**	**7.7**
Persons						
18–34	95.4	92.4	97.3	4.6	2.7	7.6
35–44	96.6	94.2	98.0	3.4	2.0	5.8
45–54	93.8	91.0	95.8	6.2	4.2	9.0
55–64	92.7	90.3	94.6	7.3	5.4	9.7
65–75	84.5	79.4	88.5	15.5	11.5	20.6
Total	**93.6**	**92.4**	**94.7**	**6.4**	**5.3**	**7.6**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

31/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 4.5 describes the associations of albuminuria with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of albuminuria was not related to country of birth, language spoken at home, marital status, sedentary behaviour or physical activity status. The prevalence of albuminuria was higher in: those who were ex-smokers versus non-smokers; those who rated their health as poor or fair compared with those who rated their health as good or excellent; those who were obese (using either BMI or waist circumference) versus those who were not; those who had dyslipidaemia versus those who did not; those who had hypertension versus those who did not; those who had diabetes versus those who did not, and those who had cardiovascular disease versus those who did not (Table 4.5).

Table 4.5 Prevalence of albuminuria and risk of having albuminuria, by selected risk factors

	Prevalence of albuminuria			Age and sex-adjusted odds ratio of albuminuria (95% CI)
	%	95% CI		
Country of birth				
Australia	6.4	5.2	7.9	1.0
Overseas	5.7	4.3	7.5	1.0 (0.7–1.4)
Language spoken at home				
English	6.3	5.2	7.6	1.0
Other	6.8	4.7	9.7	1.1 (0.6–1.8)
Marital status				
Married/living with a partner	6.6	3.9	10.9	1.0
Other[(a)]	7.6	5.4	10.6	0.6 (0.3–1.1)
Physical activity				
Sufficiently active	5.9	4.7	7.4	1.0
Insufficiently active or inactive	7.3	4.9	10.6	1.3 (0.8–2.2)
Sedentary behaviour				
< 8 hours of total sitting per day	6.1	5.1	7.3	1.0
≥ 8 hours of total sitting per day	6.1	4.2	8.8	1.1 (0.7–1.8)
Smoking				
Non-smoker	5.1	4.1	6.4	1.0
Ex-smoker	12.5	8.2	18.6	1.9 (1.3–2.9)
Current smoker[(b)]	6.8	4.8	9.7	1.3 (0.8–2.1)
Self-rated general health				
Good/very good/excellent	10.2	6.3	16.0	1.0
Fair/poor	5.8	4.8	6.9	2.0 (1.1–3.9)

Table 4.5 Prevalence of albuminuria and risk of having albuminuria, by selected risk factors (continued)

	Prevalence of albuminuria			Age and sex-adjusted odds ratio of albuminuria (95% CI)
	%	95% CI		
Obesity (BMI)				
No	4.9	3.8	6.2	1.0
Yes	10.1	6.1	16.3	2.3 (1.3–3.0)
Obesity (waist)				
No	4.9	3.6	6.5	1.0
Yes	9.1	5.6	14.1	2.1 (1.2–3.5)
Dyslipidaemia				
No	4.2	3.1	5.7	1.0
Yes	7.9	6.3	9.9	1.7 (1.1–2.7)
Hypertension				
No	4.0	2.9	5.3	1.0
Yes	10.4	7.8	14.2	3.4 (2.3–5.0)
Diabetes				
No	5.6	4.6	6.8	1.0
Yes	13.6	8.9	20.2	4.5 (2.5–8.0)
Cardiovascular disease				
No	6.2	5.1	7.5	1.0
Yes	14.1	9.8	19.9	2.0 (1.1–3.9)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

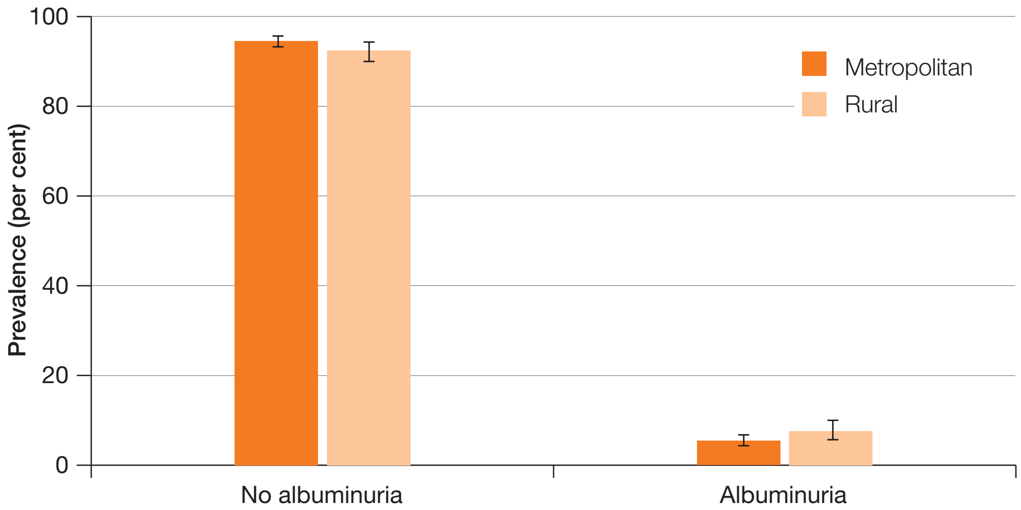
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence of albuminuria by locality

Figure 4.2 and Table 4.6 show the prevalence of albuminuria by metropolitan and rural status. The prevalence of albuminuria was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 4.2 Prevalence and 95% CI of albuminuria according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 4.6 Prevalence of albuminuria according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
No albuminuria	94.3	93.0	95.4	92.6	89.9	94.6
Albuminuria	5.7	4.6	7.1	7.5	5.4	10.1

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Indicators of chronic kidney disease

Impaired estimated glomerular filtration rate and albuminuria represent two different pathological processes of chronic kidney disease. Some people may have impaired estimated glomerular filtration and not have albuminuria, or vice versa. However, both measures indicate impaired renal function and are associated with poor outcomes.

Overall prevalence

Table 4.7 shows the age-standardised prevalence of having either impaired estimated glomerular filtration or albuminuria in people aged 18–75 years. The prevalence of having either of these indicators of chronic kidney disease in the total population was 9.1 per cent. The prevalence was similar in men and women.

Applying the prevalence rate to the total population of Victoria in 2008 produces an estimate of 345,000 people aged 18–75 who have either an impaired estimated glomerular filtration rate or albuminuria.

Prevalence by age group and sex

Table 4.7 describes the prevalence of having either an impaired estimated glomerular filtration rate or albuminuria by age group and sex. Prevalence increased with age in men and in women (p for trend < 0.001) (Table 4.7).

Table 4.7 Prevalence of indicators of chronic kidney disease (albuminuria or impaired estimated glomerular filtration rate) according to sex and age group

	No indicators of chronic kidney disease			Indicator of chronic kidney disease		
	%	95% CI		%	95% CI	
Men						
18–34	97.1	93.4	98.8	2.9	1.2	6.6
35–44	96.3	90.5	98.6	3.7	1.4	9.5
45–54	93.0	89.8	95.2	7.0	4.8	10.2
55–64	85.0	78.2	90.0	15.0	10.0	21.8
65–75	68.0	60.5	74.6	32.0	25.4	39.5
Total	**91.1**	**89.4**	**92.5**	**8.9**	**7.5**	**10.6**
Women						
18–34	93.4	88.5	96.3	6.6	3.7	11.5
35–44	96.7	94.8	97.9	3.3	2.1	5.2
45–54	92.7	88.1	95.6	7.3	4.4	11.9
55–64	89.2	84.0	92.9	10.8	7.1	16.0
65–75	69.9	61.1	77.4	30.1	22.6	38.9
Total	**90.6**	**88.6**	**92.3**	**9.4**	**7.7**	**11.4**
Persons						
18–34	95.3	92.2	97.1	4.7	2.9	7.8
35–44	96.5	94.2	97.9	3.5	2.1	5.8
45–54	92.8	89.7	95.1	7.2	4.9	10.3
55–64	87.2	83.0	90.4	12.8	9.6	17.0
65–75	69.0	61.8	75.3	31.0	24.7	38.2
Total	**90.9**	**89.3**	**92.2**	**9.1**	**7.8**	**10.7**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Discussion

In this study, the prevalence of indicators of chronic kidney disease as measured by the impaired estimated glomerular filtration rate and albuminuria was 3.5 per cent and 6.4 per cent, respectively. The prevalence of having at least one of these indicators was higher at 9.1 per cent.

Although data on chronic kidney disease in Australia is sparse, in the 1999–2000 AusDiab survey, 6.6 per cent of adult Australians had albuminuria (Atkins et al. 2004; Chadban et al. 2003). This figure from the AusDiab study is very similar to the prevalence of albuminuria observed in the Victorian Health Monitor. In another study, using formula for calculating eGFR (Mathew et al. 2007), 7.8 per cent of participants (AIHW 2009) had chronic kidney disease (in stages 3–5 (eGFR < 60 mL/min/1.73 m^2)).

Diabetes, smoking, hypertension and obesity are well-established risk factors for chronic disease, however, they were not found to be significantly associated with impaired estimated glomerular filtration rate in this study. It should be noted that although statistical significance was not seen, the prevalence of impaired estimated glomerular filtration rate did appear to increase with each of these risk factors, and it may be that insufficient numbers of participants with impaired estimated glomerular filtration rate limited the ability to detect significant findings.

Despite these findings, addressing the common risk factors for chronic kidney disease such as diabetes, high blood pressure and cardiovascular disease will be important for reducing its incidence and the need for kidney replacement therapy in Victoria. The silent nature of the early stages of chronic kidney disease presents challenges for monitoring the true impact of the disease because people may progress through to more serious stages without detection.

In summary, the prevalence of indicators of chronic kidney disease in Victorians is not insignificant. The burden of chronic kidney disease is expected to rise through an increase in risk factors such as diabetes, hypertension and an ageing population. Continued monitoring of chronic kidney disease in Victoria through studies that can accurately measure its prevalence in all stages of disease is essential to help understand population trends, and to implement the appropriate strategies to prevent this disease.

5. Cardiovascular disease and biomedical risk factors

5. Cardiovascular disease and biomedical risk factors

The term cardiovascular disease encompasses a group of disorders of the heart and blood vessels. The most frequent pathology underlying cardiovascular disease is atherosclerosis, the result of a build up of fatty deposits and plaque formation in the inner lining of the arteries.

Cardiovascular disease is the leading cause of death in Australia. In 2008 it was responsible for 33.7 per cent of all deaths (ABS 2010). Furthermore, cardiovascular disease is the second leading cause of the disease burden (18 per cent of the total burden) (Begg et al. 2007) and the most expensive group of diseases in Australia. The total direct healthcare expenditure for cardiovascular disease amounted to $5.94 billion in 2004–05, which represents an estimated 11 per cent of total allocated expenditure (AIHW 2008c).

This chapter describes the prevalence of cardiovascular disease and how it relates to its major biomedical risk factors in Victorians aged 18–75 years. The prevalence of the risk factors themselves is addressed in earlier chapters of this report.

Definitions

Cardiovascular disease in this report includes the major manifestations of self-reported atherosclerotic events. They include angina, myocardial infarction, stroke, coronary bypass surgery and percutaneous coronary interventions.

Results

Overall prevalence

Table 5.1 shows the age-standardised prevalence of cardiovascular disease in people aged 18–75 years. The prevalence of cardiovascular disease in the total population was 3.1 per cent. The prevalence of cardiovascular disease was higher in men (4.3 per cent) than in women (1.9 per cent), $p < 0.001$.

Applying the prevalence of cardiovascular disease to the total population of Victoria in 2008 produces an estimate of 117,500 people aged 18–75 years with one or more major cardiovascular diseases or events.

Prevalence by age group and sex

Table 5.1 also describes the prevalence of cardiovascular disease by age group and sex. The prevalence of cardiovascular disease increased with age in both men and women (p for trend < 0.001 in men and women). No one under the age of 35 reported a history of cardiovascular disease, but among the 65–75-year age group, 16.4 per cent of men and 8.0 per cent of women reported a history of cardiovascular disease.

Table 5.1 Prevalence of cardiovascular disease according to sex and age group

	Status of cardiovascular disease					
	Without cardiovascular disease			With cardiovascular disease		
	%	95% CI		%	95% CI	
Men						
18–34	100.0	–	–	0.0	–	–
35–44	98.8	95.8	99.6	1.3	0.4	4.2
45–54	97.3	95.1	98.6	2.7	1.4	4.9
55–64	88.8	84.1	92.2	11.2	7.8	15.9
65–75	83.5	76.4	88.9	16.4	11.1	23.7
Total	**95.7**	**94.6**	**96.6**	**4.3**	**3.4**	**5.4**
Women						
18–34	100.0	–	–	0.0	–	–
35–44	99.0	97.5	99.6	1.0	0.4	2.5
45–54	97.7	95.2	98.9	2.3	1.1	4.8
55–64	98.6	96.8	99.4	1.4	0.6	3.2
65–75	92.0	87.1	95.1	8.0	4.9	12.9
Total	**98.1**	**97.4**	**98.6**	**1.9**	**1.4**	**2.6**
Persons						
18–34	100.0	–	–	0.0	–	–
35–44	98.9	97.6	99.5	1.1	0.5	2.4
45–54	97.5	96.0	98.5	2.5	1.5	4.0
55–64	93.8	91.2	95.6	6.3	4.4	8.8
65–75	87.9	83.4	91.3	12.1	8.7	16.6
Total	**96.9**	**96.3**	**97.4**	**3.1**	**2.6**	**3.7**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

18/3,653 participants have no valid data.

Prevalence by selected risk factors

Table 5.2 describes the associations of the prevalence of cardiovascular disease with selected risk factors, and indicates whether any differences were statistically significant after adjustment for age and sex.

The prevalence of cardiovascular disease was not related to country of birth or language spoken at home but was lower in those who were married or living with a partner versus those who were widowed, divorced, separated or never married. The prevalence of cardiovascular disease was higher in those who were physically inactive or insufficiently active versus those who were sufficiently physically active but was not related to sedentary behaviour (total time spent sitting per week) and smoking status. The prevalence of cardiovascular disease was higher in those who self-rated their health as fair or poor versus those who did not and those who were obese defined by BMI versus those who were not. It was not related to the presence of obesity defined by elevated waist circumference. The prevalence of cardiovascular disease was higher in those with diabetes versus those without but was not related to the presence of hypertension and dyslipidaemia. The prevalence of cardiovascular disease was higher in those with the metabolic syndrome versus those without but was not related to the presence of indicators of chronic kidney disease.

Table 5.2 Prevalence of cardiovascular disease and risk of having cardiovascular disease, by selected risk factors

	Prevalence of cardiovascular disease			Age and sex-adjusted odds ratio of having cardiovascular disease (95% CI)
	%	95% CI		
Country of birth				
Australia	3.3	2.7	4.0	1.0
Overseas	2.8	2.0	3.7	0.8 (0.6–1.2)
Language spoken at home				
English	3.2	2.6	3.9	1.0
Other	2.7	1.7	4.3	0.8 (0.5–1.4)
Marital status				
Married/living with a partner	2.9	2.3	3.7	1.0
Other[(a)]	3.8	3.0	4.7	1.6 (1.1–2.2)
Physical activity				
Sufficiently active	2.5	1.9	3.2	1.0
Insufficiently active or inactive	4.3	3.3	5.5	2.0 (1.4–2.8)
Sedentary behaviour				
< 8 hours of total sitting per day	2.8	2.2	3.6	1.0
≥ 8 hours of total sitting per day	4.1	2.7	6.2	1.4 (0.7–2.6)
Smoking				
Non-smoker	2.5	1.8	3.4	1.0
Ex-smoker	4.0	3.0	5.4	1.5 (0.9–2.5)
Current smoker[(b)]	3.2	2.0	5.0	1.2 (0.7–2.1)
Self-rated general health				
Good/very good/excellent	2.2	1.7	2.8	1.0
Fair/poor	9.0	6.6	12.3	5.2 (3.0–9.0)

Table 5.2 Prevalence of cardiovascular disease and risk of having cardiovascular disease, by selected risk factors (continued)

	Prevalence of cardiovascular disease %	95% CI		Age and sex-adjusted odds ratio of having cardiovascular disease (95% CI)
Obesity (BMI)				
No	2.7	2.1	3.4	1.0
Yes	3.9	3.0	5.0	1.7 (1.1–2.6)
Obesity (waist)				
No	2.9	2.2	3.9	1.0
Yes	3.2	2.6	4.0	1.4 (0.9–2.1)
Diabetes				
No	2.5	2.1	3.1	1.0
Yes	7.1	5.1	9.8	3.5 (2.2–5.6)
Hypertension				
No	2.7	1.9	3.9	1.0
Yes	3.9	3.1	5.0	1.5 (0.9–2.5)
Dyslipidaemia				
No	2.2	1.4	3.5	1.0
Yes	3.3	2.7	4.1	1.7 (1.0–2.9)
Metabolic syndrome				
No	2.3	1.7	3.1	1.0
Yes	4.9	3.5	6.9	2.1 (1.2–3.6)
Indicators of chronic kidney disease				
No	2.9	2.4	3.5	1.0
Yes	13.5	12.0	15.0	1.7 (0.8–3.4)

(a) Other includes people who are widowed, divorced, separated or never married

(b) A daily or occasional smoker

95% CI = 95 per cent confidence interval; BMI = body mass index

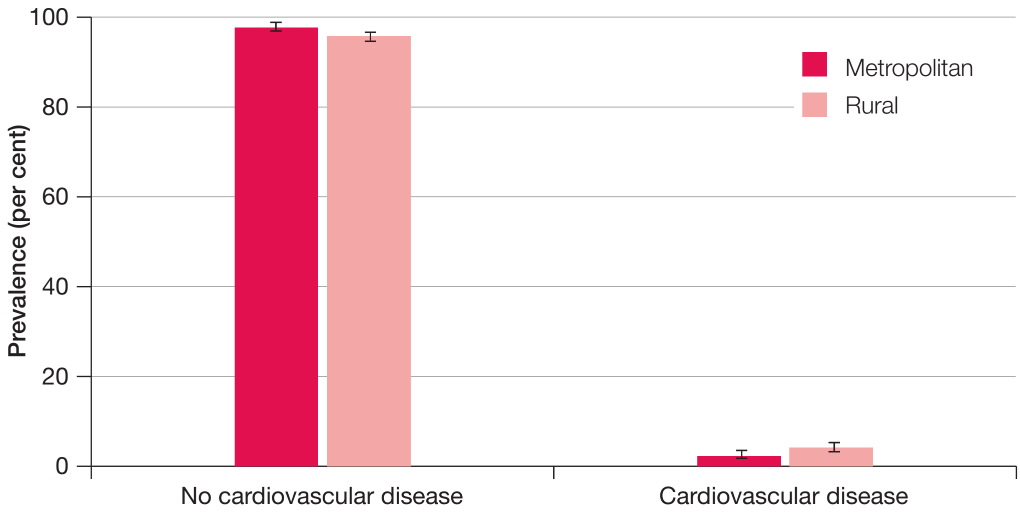
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by locality

Figure 5.1 and Table 5.3 show the prevalence of cardiovascular disease by metropolitan and rural status. After adjusting for age and sex, the prevalence of cardiovascular disease was higher in rural areas than in the metropolitan area of Victoria ($p < 0.05$).

Figure 5.1 Prevalence and 95% CI of cardiovascular disease according to locality



The error bars represent the 95 per cent confidence intervals.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 5.3 Prevalence of cardiovascular disease according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
No cardiovascular disease	97.4	96.7	98.0	96.2	95.2	97.1
Cardiovascular disease	2.5	2.0	3.3	3.8	2.9	4.8

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Discussion

The Victorian Health Monitor showed that 3.1 per cent of Victorians aged 18–75 years had a history of one or more major cardiovascular events including angina, myocardial infarction, stroke, coronary bypass surgery or percutaneous coronary interventions. The prevalence of cardiovascular disease in the Victorian Health Monitor was lower than the 5.2 per cent reported for the national population aged 18 years and over in the 2007–08 National Health Survey (ABS 2009). After stratification into 10-year age groups, the age-specific prevalence of cardiovascular disease in the Victorian Health Monitor was lower than those reported in the 2007–08 National Health Survey. The lower prevalence of cardiovascular disease observed in the Victorian Health Monitor than that in the National Health Survey may be explained by the broader criteria used to define cardiovascular disease in the National Health Survey, which included ischaemic heart disease, stroke, oedema and heart failure, as well as diseases of the arteries, arterioles and capillaries.

The prevalence of cardiovascular disease in the Victorian Health Monitor was approximately half the 6.0 per cent reported for participants aged 25–75 years who participated in the AusDiab survey in 1999–2000 (unpublished data), despite the fact that cardiovascular disease only included angina, heart attack and stroke in the AusDiab study.

In summary, the prevalence of cardiovascular disease in Victorians is not insignificant, but the prevalence rates were higher in rural versus metropolitan areas. Ongoing prevention of metabolic disorders, including obesity, physical inactivity and diabetes, are important in controlling the burden of cardiovascular disease in the Victorian population, particularly for those who reside in the rural areas of the state.

6. Social determinants of health

6. Social determinants of health

Background

Over the past 50 years, the health of Australians has markedly improved. These improvements have mainly been due to the control of infectious diseases resulting from improved hygiene and standards of living, successful vaccination programs, widespread antibiotic use, and the introduction of public health initiatives. During this period there has also been a decline in cardiovascular disease mortality due to substantial decreases in the prevalence of major risk factors including smoking, hypertension and elevated total cholesterol (Knuiman et al. 1995), as well as marked improvements in the treatment and management of cardiovascular disease (Beaglehole et al. 1989; Hobbs et al. 2004). There has also been a downward trend in deaths due to lung, colorectal and breast cancer. Despite these favourable trends, health gains have not been equally shared across all sections of the population and there exists considerable health disparities among subgroups in Australia.

The social determinants of health include factors such as birthplace, ethnicity, working environment, education, income, religion, age, locality and the health system. Such conditions are influenced by the distribution of wealth and resources at international, national and local levels, and by government policy. The social determinants of health are important contributors to the health disparities experienced by people in the community (WHO – Commission on Social Determinants of Health 2008).

This chapter will examine two key social determinants of health – socioeconomic status and social support— in relation to risk factors for chronic diseases such as diabetes, cardiovascular disease and chronic kidney disease, and health service utilisation.

Socioeconomic status and disease

Socioeconomic status is usually conceptualised and measured using individual-level or area-level markers of socioeconomic status. Individual-based markers of socioeconomic status include education and income. Area-based markers are composite indices based on certain attributes of an area or its population.

Education and income

Education is considered a robust measure of social economic status, and has been strongly associated with health-related risk factors such as smoking, insufficient physical activity, high blood pressure and obesity (Luoto et al. 1994; Lynch et al. 1997). Previous Australian studies have found that people with higher education levels have less morbidity (Mathers 1994) and better health-risk-factor profiles (Bennett 1995; Conwell et al. 2003; Hill et al. 1998; Owen & Bauman 1992). Income is also used as a measure of socioeconomic status.

A recent study in Australia found that low socioeconomic status (measured by education and income) is more consistently associated with a worse profile of biomarkers for cardiovascular disease and diabetes for women than men (Kavanagh et al. 2010).

Area-based measures of socioeconomic disadvantage

Where we live can also influence our health (Marmot & Wilkinson 2005). Factors such as how far away we live from large cities or accessibility and availability of services and infrastructure can be important determinants of health (Glover et al. 1999). There have been several area-based indices developed to measure the impact of our surroundings on our health. The Accessibility/ Remoteness Index of Australia (ARIA) (Department of Health and Ageing 2007) is a standard classification and index of remoteness (identified with lack of accessibility to services). This index was developed as a tool to help understand the difficulties of living in rural and remote areas in terms of accessing services.

The Index of Relative Socioeconomic Disadvantage is an area-based measure of socioeconomic disadvantage collected as part of the Socioeconomic Indices for Areas developed by the ABS. It was developed using population census data and reflects the overall level of socioeconomic disadvantage of an area measured on the basis of attributes such as income, educational attainment, levels of public sector housing, unemployment, and the skill level of available jobs (ABS 2006a).

Within Australia, residents of disadvantaged areas have: higher death rates (Draper et al. 2004; Yu et al. 2000; Turrell et al. 2006a); poorer general and oral health (Brennan & Spencer 2002; Chen 2002; Sanders et al. 2008: Sanders & Spencer 2004); a more adverse risk factor (Giskes et al. 2011) and health behaviour profile (Mathers 1994; Turrell et al. 2010); higher rates of general practitioner use (Turrell et al. 1994); higher rates of cancer (Bentley et al. 2008); and lower use of preventive health services (Taylor et al. 2001) than do residents of more advantaged areas.

Social support

Social support is the physical and emotional comfort given to people by their family, friends, co-workers and others. Social support measures the function and quality of social relationships such as perceived availability of help or support actually received (Glover et al. 1999). It occurs through an interactive process and can be related to altruism, a sense of obligation, and the perception of reciprocity. Health and wellbeing gained through social support is not merely the result of actual support provision but is also a consequence of participation in a meaningful social context (Gottlieb & Bergen 2010). The concept of social support being linked to health outcomes is now becoming increasingly recognised, and many studies have demonstrated that social support acts as a factor in the development of psychological and/or physical disease such as coronary heart disease (Kawachi et al. 1996).

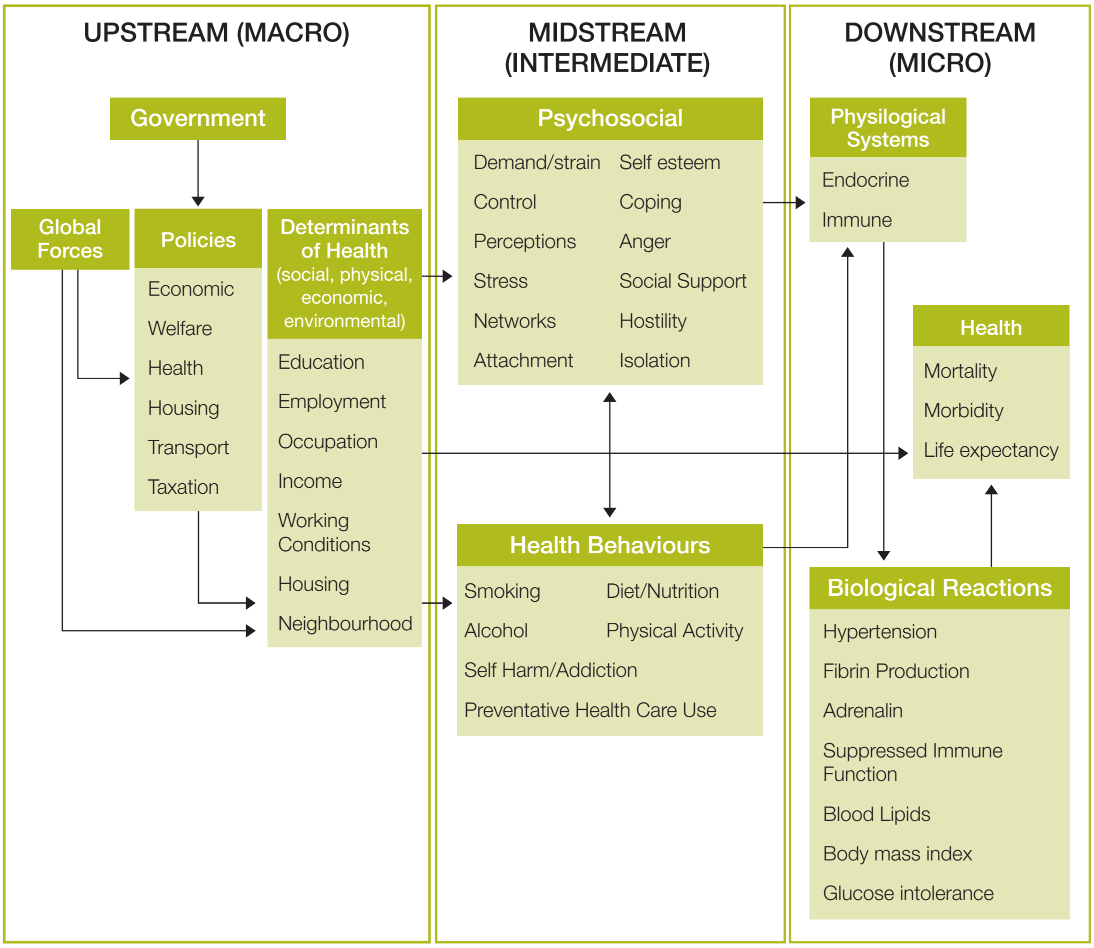
This chapter describes the social determinants of health using the framework proposed by Turrell and colleagues (Turrell et al. 1999) (Figure 6.1).

The model consists of three interrelated components that together help explain the social determinants of health. Turrell and others have identified a series of upstream factors which comprise the most fundamental determinants of health. These include the social, physical, economic and environmental determinants, as well as the factors which influence them – government policy and the global context. Midstream factors include the social, physical, economic and environmental context, which has a more direct impact on our daily lives. These factors include psychosocial factors, health behaviours and the healthcare system. The downstream factors in the model include morbidity and mortality, which are the result of adverse biological reactions, due to changes in physiological systems.

This chapter is structured in three parts:

- Part A: Examines the relationships between social determinants of health and disease risk factors (including psychological distress, smoking, obesity, hypertension and dyslipidaemia).
- Part B: Focuses on the relationships between social determinants of health and disease states (including poor self-reported general health, diabetes, chronic kidney disease, and cardiovascular disease).
- Part C: Examines the relationships between social determinants of health and health service utilisation (as assessed by self-report frequency of cholesterol testing, diabetes and blood pressure within the previous two years).

Figure 6.1 Social determinants of health model



Source: Turrell et al. 1999

Definitions

Education and household income

Education and household income were ascertained by self-report. Participants were asked about highest levels of education achieved, with education then categorised into three groups: high school or less; TAFE/certificate/diploma; and tertiary education. Household income was categorised as less than $30,000; $30,000–$70,000; and $70,000 plus.

The Accessibility/Remoteness Index of Australia

The ARIA index was developed by the Australian Government (Department of Health and Ageing 2007) and calculates remoteness as accessibility to some 201 service centres based on road distances. Remoteness values for 11,340 populated localities are derived from the road distance to service centres in four categories (a weighting factor is applied for islands). Remoteness values for each populated locality are then interpolated to a 1 km^2 grid that covers the whole of Australia; averages are calculated for larger areas. To create an associated classification, ARIA values are grouped into five categories.

Remoteness areas:

1. Highly accessible areas: relatively unrestricted accessibility to a wide range of goods and services and opportunities for social interaction.
2. Accessible: some restrictions to accessibility of some goods, services and opportunities for social interaction.
3. Moderately accessible: significantly restricted accessibility of goods, services and opportunities for social interaction.
4. Remote: very restricted accessibility of goods, services and opportunities for social interaction.
5. Very remote: very little accessibility of goods, services and opportunities for social interaction.

In the Victorian Health Monitor, there were no areas classified as remote or very remote.

Index of Relative Socioeconomic Disadvantage

The Index of Relative Socioeconomic Disadvantage is constructed using principal component analysis and is compiled at the Census Collector's District (CD) level (each CD contains approximately 250 dwellings). For this study, participants were classified into quintiles of socioeconomic disadvantage according to the value of the Index of Relative Socioeconomic Disadvantage for their CD of residence, with quintile 1 corresponding to the highest socioeconomic disadvantage, and quintile 5 the lowest.

Psychological distress

The Kessler 6 psychological distress scale (Kessler et al. 2002), a validated, six-item scale, was used to measure psychological distress (Table 6.1). The Kessler 6 instrument asks respondents how frequently they have experienced psychological distress over the previous 30 days; responses are measured on a five-point scale. The maximum score for an individual is 24 (Kessler et al. 2003). Those scoring 13 points or more on the Kessler 6 instrument are likely to have psychological distress. For this study, we refer to those with scores greater than or equal to 13 as having an elevated or high level of psychological distress.

Table 6.1 Classification of psychological distress

Classification	Definition
Low	Score of 0–7: psychological distress unlikely
Moderate	Score of 8–12: psychological distress possible
High	Score of 13–24: very likely to have psychological distress

Social support

Social support was measured using questionnaire items asking about support from family, friends and neighbours in which responses are given on a five-point Likert scale (Table 6.2). Responses to the social support questions were dichotomised into two groups: 1–3 were classified as 'No' and 4 was classified as 'Yes'.

Table 6.2 Social support questions

	Questions
1	Can you get help from family members when you need it?
2	Can you get help from neighbours when you need it?
3	Can you get help from friends when you need it?
4	Could one of your relatives or friends care for you (or your children) in an emergency? This refers to relatives or friends not living with you.
Possible response were: (1) No, not at all; (2) Not often; (3) Sometimes; (4) Yes, definitely or (5) Don't know.	

A social support score was derived such that the dichotomised responses to questions 1–3 were summed to provide the following categories. Scores from 0 to 3 were possible where a score of '0–1' indicated no social support could be obtained from family, friends and or neighbours when needed, a score of '2' indicated social support could be obtained by two sources (two of either family, friends or neighbours) and a score of 3 indicated social support was available from all of the sources. Data from question 4 were analysed separately.

Health service utilisation

Health service utilisation was measured using questionnaire items relating to having health checks performed. For example: 'Have you had your blood pressure checked in the last two years?'. Questions were asked in relation to having had blood pressure checked, a test for cholesterol, and a test for diabetes.

The risk factors examined in relation to the social determinants of health include smoking, obesity, hypertension and dyslipidaemia. The chronic diseases examined are diabetes, cardiovascular disease and chronic kidney disease, and self-rated health. The definitions of these can be found in earlier chapters.

Results

Part A: Social determinants of health and risk factors

The following describes the relationship of individual-based and area-based social determinants of health to risk factors including psychological distress, smoking, obesity, hypertension and dyslipidaemia. Social support is also examined in relation to these risk factors. All analyses are adjusted for age, and results are expressed as odds ratios (OR) with 95 per cent confidence intervals. A detailed explanation of how to interpret an odds ratio can be found on page xvi.

Psychological distress

Men: Compared with those who had completed a tertiary education, men with lower levels of education were more likely to have elevated psychological distress. Household income levels were related to elevated psychological distress, with men from households with lower incomes more likely to report high levels of psychological distress compared with those from households with high incomes. The degree of accessibility was associated with psychological distress levels; men living in areas with less accessibility were more likely to report elevated psychological distress levels than those living in highly accessible areas. Men living in the most disadvantaged areas (quintiles 1 and 2 of the Index of Relative Socioeconomic Disadvantage) were more likely to have elevated levels of psychological distress than those in the least disadvantaged areas. Social support was associated with elevated levels of psychological distress for men, with those who reported little or no help from family, friends or neighbours being at least three times more likely to have elevated levels of psychological distress. Men who did not have access to help from any of family, friends or neighbours in an emergency were five times more likely to have elevated levels of psychological distress (Table 6.3).

Women: Compared with those who had completed a tertiary education, women with lower levels of education were more likely to have elevated psychological distress. Women in the lowest income bracket were almost five times more likely to have elevated levels of psychological distress than those with higher incomes. Living in moderately accessible areas compared with living in a highly accessible area was associated with a two-fold increase in the chance of having an elevated level of psychological distress. Women living in the most disadvantaged areas of the state (quintile 1 of the Index of Relative Socioeconomic Disadvantage) were more likely to report elevated levels of psychological distress than those in the least disadvantaged areas (quintile 5). Women who reported lower levels of social support, in terms of help from family, friends or neighbours compared with those who reported having access to help, were at significantly increased odds of elevated levels of psychological distress. There was no relationship between having access to help in an emergency and elevated levels of psychological distress (Table 6.3).

Table 6.3 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of elevated levels of psychological distress

	Risk of having elevated psychological stress					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	7.5	1.7	32.5	3.3	0.9	12.7
High school or lower	4.6	1.6	13.7	3.5	1.1	10.8
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.1	0.3	4.1	1.8	0.6	5.1
Less than $30,000	3.3	1.0	10.6	4.8	2.0	11.2
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	2.0	0.7	5.6	0.7	0.3	1.6
Moderately accessible	3.9	1.3	11.6	1.9	1.0	3.9
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	6.7[(a)]	0.7	63.4	1.4	0.3	7.1
3	5.1[(a)]	0.4	59.4	1.1	0.2	5.1
2	15.3[(a)]	1.6	146.9	1.7	0.3	9.4
1 (Most disadvantaged)	23.9[(a)]	2.6	217.1	4.5	1.1	18.7
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.7	0.6	4.9	4.9	1.5	15.9
Help from 1 or none	10.3	3.8	27.7	12.2	4.3	34.4
Help in an emergency:						
Yes	1.0			1.0		
No	5.3	2.0	14.3	1.8	0.8	4.1

(a) The estimate is not reliable due to a small number of cases in cells.

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Smoking

Men: Compared with those who had completed a tertiary education, men with lower education levels had a higher prevalence of smoking. There was no association between income level and the prevalence of smoking in men. Those living in moderately accessible areas were more likely to smoke compared with those living in highly accessible areas. Men living in the most disadvantaged areas were more likely to smoke than those living in the least disadvantaged areas. There were no relationships between social support and the prevalence of smoking in men (Table 6.4).

Women: Prevalence rates of smoking were significantly higher among the least educated compared with the well educated, and in those residing in low-income households versus those living in higher income households. Women living in accessible areas were more likely to smoke compared with those living in highly accessible areas. Women living in areas with high levels of socioeconomic disadvantage were more than two times more likely to smoke than those living in the least disadvantaged areas. There were no relationships between social support and the prevalence of smoking in women (Table 6.4).

Table 6.4 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of smoking

	Risk of smoking					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.5	1.0	2.2	1.9	1.0	3.7
High school or lower	2.2	1.5	3.3	2.7	1.6	4.5
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.3	0.9	1.8	1.5	0.9	2.6
Less than $30,000	1.2	0.8	2.0	2.7	1.5	4.8
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.3	0.8	1.9	1.5	1.0	2.3
Moderately accessible	1.9	1.3	2.7	1.3	0.7	2.4
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.1	0.6	2.0	1.0	0.5	2.2
3	1.1	0.7	1.7	1.4	0.6	3.1
2	1.7	1.0	2.7	1.7	0.8	3.8
1 (Most disadvantaged)	1.8	1.1	2.9	2.0	1.0	4.2
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.1	0.7	1.8	1.3	0.9	2.0
Help from 1 or none	1.0	0.6	1.7	0.7	0.4	1.2
Help in an emergency:						
Yes	1.0			1.0		
No	1.2	0.6	2.5	0.7	0.3	1.8

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Obesity

Men: Compared with men with a tertiary level qualification, men with lower educational qualifications were more likely to be obese. In contrast, men with low incomes were less likely to be obese than men with high incomes. Those living in accessible areas were more likely to be obese compared with those living in highly accessible areas. There were no relationships between the prevalence of obesity and the Index of Relative Socioeconomic Disadvantage. Men who reported low levels of social support, in terms of help from family, friends or neighbours compared with those who reported having access to help, were at significantly increased odds of obesity. There was no relationship between having access to help in an emergency and elevated levels of psychological distress (Table 6.5).

Women: Compared with women who had completed a tertiary education, those with lower levels of educational attainment were more likely to be obese. Household income was not related to obesity prevalence in women. Compared with those living in highly accessible areas, those in accessible and moderately accessible areas were more likely to be obese and there was approximately a two-fold increase in risk of obesity for women in the highest two quintiles of disadvantage (Index of Relative Socio-economic Disadvantage: quintile 1 and quintile 2) compared with those in the areas of least disadvantage (quintile 5). Women who reported low levels of social support, in terms of help from family, friends or neighbours compared with those who reported having access to help, were at significantly increased odds of obesity. There was no relationship between having access to help in an emergency and elevated levels of psychological distress (Table 6.5).

Table 6.5 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of obesity

	Risk of obesity					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.5	0.9	2.6	1.9	1.2	3.0
High school or lower	1.5	1.0	2.1	1.5	1.1	2.1
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.0	0.7	1.5	1.3	0.9	1.9
Less than $30,000	0.6	0.4	0.9	1.4	0.9	2.1
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.5	1.1	2.2	1.7	1.0	2.7
Moderately accessible	1.3	0.6	2.7	2.5	1.9	3.4
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.1	0.6	2.0	1.1	0.7	1.8
3	1.5	0.7	3.0	1.6	0.7	3.7
2	1.2	0.6	2.4	1.6	1.0	2.7
1 (Most disadvantaged)	1.4	0.8	2.7	2.2	1.4	3.5
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.2	0.8	1.7	0.9	0.6	1.2
Help from 1 or none	1.3	1.0	1.8	1.5	1.0	2.2
Help in an emergency:						
Yes	1.0			1.0		
No	1.0	0.7	1.5	1.1	0.6	1.9

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Hypertension

Men: There were no relationships between the prevalence of hypertension and education and income. Area-accessibility and the Index of Relative Socioeconomic Disadvantage were not related to the prevalence of hypertension in men. There were no associations observed between measures of social support and the prevalence of hypertension in men (Table 6.6).

Women: Compared with women with a tertiary-level education qualification, women with lower educational qualifications were almost two times more likely to have hypertension. There was a relationship between income and the prevalence of hypertension in women, with those on low incomes being 1.8 times more likely to be hypertensive, compared with those on high incomes. Compared with those living in highly accessible areas, those living in moderately accessible areas were more likely to have hypertension. The prevalence of hypertension was not related to area-level disadvantage or social support in women (Table 6.6).

Table 6.6 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of hypertension

	Risk of hypertension					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	0.9	0.6	1.3	1.3	0.8	2.0
High school or lower	1.1	0.8	1.5	1.9	1.3	2.8
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.1	0.8	1.5	1.4	1.0	2.1
Less than $30,000	1.0	0.7	1.5	1.8	1.1	2.8
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	0.8	0.6	1.1	1.2	0.9	1.6
Moderately accessible	1.0	0.7	1.4	1.5	1.2	1.8
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	0.9	0.5	1.6	0.9	0.6	1.3
3	0.6	0.3	1.1	1.0	0.6	1.7
2	0.7	0.4	1.1	1.1	0.7	1.7
1 (Most disadvantaged)	1.1	0.6	2.1	1.4	0.9	2.3
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.2	0.9	1.6	1.2	0.8	1.7
Help from 1 or none	1.1	0.6	1.9	1.0	0.7	1.5
Help in an emergency:						
Yes	1.0			1.0		
No	0.9	0.4	2.3	1.0	0.5	2.0

95%C = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Dyslipidaemia

Men: There were no relationships between the prevalence of dyslipidaemia and educational attainment, income levels, ARIA classifications and the Index of Relative Socioeconomic Disadvantage or social support in men (Table 6.7).

Women: Education was related to the prevalence of dyslipidaemia, with those of low educational attainment having a higher prevalence of dyslipidaemia than those of high educational attainment. There were no significant relationships between income level and dyslipidaemia. Women living in accessible areas were more likely to have dyslipidaemia than those in highly accessible areas, and women from more disadvantaged areas were two to three times more likely to have dyslipidaemia as were those from less disadvantaged areas. Social support was not related to the prevalence of dyslipidaemia in women (Table 6.7).

Table 6.7 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of dyslipidaemia

	Risk of dyslipidaemia					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	0.9	0.7	1.2	1.5	1.0	2.3
High school or lower	0.9	0.6	1.2	1.6	1.2	2.3
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	0.9	0.6	1.2	1.3	0.9	1.8
Less than $30,000	0.6	0.4	1.1	1.6	0.9	2.9
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.0	0.8	1.3	1.3	1.0	1.9
Moderately accessible	0.9	0.6	1.6	1.2	0.9	1.8
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.2	0.7	2.2	1.5	1.0	2.5
3	0.9	0.5	1.6	1.4	0.8	2.5
2	1.1	0.6	1.9	2.5	1.4	4.2
1 (Most disadvantaged)	1.3	0.7	2.2	3.0	1.8	4.9
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.0	0.6	1.6	0.9	0.7	1.3
Help from 1 or none	1.2	0.8	1.8	1.1	0.7	1.6
Help in an emergency:						
Yes	1.0			1.0		
No	0.5	0.2	1.3	1.1	0.5	2.3

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Part B: Social determinants of health and disease

The next section of the report focuses on individual-based and area-based measures of the social determinants of health and their associations with chronic diseases including diabetes, cardiovascular disease and chronic kidney disease. This section will also present the association of the social determinants of health with poor or fair self-rated health. All analyses are adjusted for age and expressed as an odds ratio (OR) with the 95 per cent confidence interval.

Fair or poor self-rated health

Men: Education was related to self-rated fair or poor health in men. Men who had a low level of education were more likely to rate their health as fair or poor than those with a high level of education. Household income was also related to fair or poor health in men. The prevalence of fair or poor health increased as household income decreased. There were no relationships between fair or poor health with area-accessibility in men. However, compared with men in the quintile of least disadvantage, those in the more disadvantaged quintiles were more likely to rate their health as fair or poor. Compared with men who had access to help from family, friends, neighbours or from any of these in an emergency, men who did not were more likely to rate their health as fair or poor (Table 6.8).

Women: Education was related to self-rated fair or poor health in women. Compared with women with a tertiary education, those with lower levels of educational attainment were more likely to rate their health as poor or fair. Compared with women with a high income, women in the lowest income category were more likely to rate their health as fair or poor. Area-accessibility and the Index of Relative Socioeconomic Disadvantage were not related to the prevalence of self-rated fair or poor health in women. Compared with women who had access to help from family, friends or neighbours when they needed it, those who did not were more likely to rate their health as fair or poor. There was no relationship between having access to help in an emergency and self-rated fair or poor health in women (Table 6.8).

Table 6.8 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of fair/poor health

	Risk of fair/poor health					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.0	0.5	1.8	2.3	1.3	4.1
High school or lower	1.6	1.1	2.4	2.4	1.4	4.2
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.4	1.0	2.2	1.4	0.9	2.4
Less than $30,000	2.2	1.4	3.4	2.4	1.5	3.8
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.2	0.7	2.2	1.7	0.9	2.9
Moderately accessible	1.2	0.7	2.4	0.6	0.4	1.1
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.3	0.9	2.0	0.9	0.4	2.1
3	1.2	0.7	2.0	1.8	0.7	4.7
2	1.9	1.0	3.3	1.9	0.9	4.1
1 (Most disadvantaged)	1.7	1.0	2.8	1.5	0.6	3.9
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	2.0	1.2	3.3	1.6	1.1	2.4
Help from 1 or none	3.7	2.4	5.7	4.4	2.8	7.0
Help in an emergency:						
Yes	1.0			1.0		
No	3.3	1.9	5.7	1.5	0.7	3.2

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Diabetes

Men: Men who had a low educational qualification were more likely to have diabetes than those who had completed a tertiary education. Compared with high income earners, those in the lower income categories were twice as likely to have diabetes. Compared with men living in highly accessible areas, men who lived in areas of moderate accessibility were more likely to have diabetes. The Index of Relative Socioeconomic Disadvantage was not related to the prevalence of diabetes in men. There were no associations observed between measures of social support and the prevalence of diabetes in men (Table 6.9).

Women: Education was associated with diabetes. Compared with women with a tertiary education qualification, those with lower education qualifications were more likely to have diabetes. Income and area-accessibility were not related to diabetes prevalence. The Index of Relative Socioeconomic Disadvantage was not related to the prevalence of diabetes. There were no associations observed between measures of social support and the prevalence of diabetes in women (Table 6.9).

Table 6.9 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of diabetes

	Risk of diabetes					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.2	0.6	2.2	0.7	0.2	2.3
High school or lower	2.6	1.2	5.9	4.0	1.3	12.7
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	2.1	1.0	4.4	1.3	0.4	4.2
Less than $30,000	2.3	1.1	4.9	2.2	0.8	6.3
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.3	0.6	3.1	0.9	0.4	2.2
Moderately accessible	2.0	1.3	3.0	0.6	0.2	1.5
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	0.8	0.4	1.8	1.6[(a)]	0.2	12.2
3	0.4	0.2	0.9	4.0[(a)]	0.9	18.6
2	1.6	0.7	3.8	3.7[(a)]	0.7	18.9
1 (Most disadvantaged)	1.5	0.7	3.0	3.5[(a)]	0.7	17.9
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.8	0.8	3.8	1.1	0.5	2.2
Help from 1 or none	1.6	0.5	5.2	0.8	0.4	1.7
Help in an emergency:						
Yes	1.0			1.0		
No	1.0	0.4	2.3	2.1	0.7	6.5

(a)The estimate is not reliable due to a small number of cases in cells.

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Self-reported cardiovascular disease

Men: The prevalence of self-reported cardiovascular disease was almost two times higher in men with a lower level of educational attainment compared with those who had a tertiary education qualification. There were no relationships between the prevalence of cardiovascular disease in men and income level, area-accessibility, the Index of Relative Socioeconomic Disadvantage or social support (Table 6.10).

Women: Self-reported cardiovascular disease was more than two times more likely to be reported in those with a lower level of educational attainment compared with women who had a tertiary education. There was a strong gradient of increased reporting of cardiovascular disease with decreasing household income category. Area-accessibility was not related to the prevalence of cardiovascular disease in women. Compared with those living in the least disadvantaged quintile, women living in quintiles 1 and 3 of the Index of Relative Socioeconomic Disadvantage were more likely to report having a cardiovascular disease. Social support was not related to cardiovascular disease in women (Table 6.10).

Table 6.10 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of cardiovascular disease

	Risk of cardiovascular disease					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.6	0.8	3.0	0.9	0.3	2.8
High school or lower	1.6	1.0	2.7	2.2	1.0	4.8
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.5	0.9	2.4	3.0	1.0	9.0
Less than $30,000	0.9	0.4	1.9	5.0	2.0	12.7
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.3	0.7	2.2	1.3	0.7	2.4
Moderately accessible	1.5	0.5	5.1	1.5	0.7	3.3
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.2	0.5	2.6	2.6	0.7	9.6
3	1.3	0.7	2.6	3.8	1.2	12.0
2	0.9	0.5	1.7	2.1	0.6	7.8
1 (Most disadvantaged)	1.1	0.5	2.6	3.7	1.1	11.6
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	1.3	0.7	2.6	1.2	0.5	2.8
Help from 1 or none	1.2	0.6	2.4	1.8	0.8	3.7
Help in an emergency:						
Yes	1.0			1.0		
No	0.4	0.1	1.2	1.0	0.3	3.6

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Indicators of chronic kidney disease

Men: There were no relationships between educational attainment and the prevalence of indicators of chronic kidney disease in men. Those in the middle household income group were more likely to have indicators of chronic kidney disease than those earning high household incomes; men living in accessible areas were more likely to have a high prevalence of indicators of chronic kidney disease than those from highly accessible areas. The Index of Relative Socioeconomic Disadvantage was not related to the prevalence of indicators of chronic kidney disease in men. Those who had less access to help from family, friends or neighbours were more likely to have indicators of chronic kidney disease than men who could access help when needed. There were no associations observed between having access to help in an emergency and the prevalence of indicators of chronic kidney disease in men (Table 6.11).

Women: There were no relationships between individual-based or area-based markers of the social determinants of health and indicators of chronic kidney disease. Social support was not related to indicators of chronic kidney disease in women (Table 6.11).

Table 6.11 Age-adjusted associations (OR, 95% CI) between the social determinants of health and the risk of indicators of chronic kidney disease

	Risk of chronic kidney disease					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.5	0.7	3.6	1.1	0.6	2.0
High school or lower	1.2	0.6	2.3	2.1	0.8	5.2
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	2.5	1.1	5.6	1.5	0.5	3.9
Less than $30,000	1.0	0.4	2.3	1.4	0.5	3.9
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	2.2	1.0	4.9	1.3	0.6	2.6
Moderately accessible	0.6	0.2	1.7	0.7	0.3	1.6
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	3.2	0.9	11.0	1.1	0.4	2.9
3	0.5	0.1	2.4	0.6	0.3	1.3
2	3.2	0.8	12.2	1.3	0.5	3.2
1 (Most disadvantaged)	2.3	0.7	8.2	0.9	0.4	2.1
Social support						
Help from family, friends or neighbours:						
Help from all	1.0			1.0		
Help from 2 of above	2.5	1.4	4.4	0.7	0.3	1.6
Help from 1 or none	0.9	0.4	2.0	1.2	0.7	2.0
Help in an emergency:						
Yes	1.0			1.0		
No	0.3	0.0	1.7	1.7	0.4	6.7

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Part C: Health service utilisation

The following section examines the associations between individual-level and area-based indicators of socioeconomic status with having had a blood pressure check, and having had blood tests for elevated cholesterol and diabetes in the previous two years. All analyses are adjusted for age and expressed as an odds ratio (OR) with the 95 per cent confidence interval.

Blood pressure test

Men: There were no significant relationships between educational attainment, income level, area-accessibility and having had a blood pressure check in the previous two years. Compared with those living in areas of lowest socioeconomic disadvantage, men living in areas of highest disadvantage were more likely to have had their blood pressure checked in the previous two years (Table 6.12).

Women: There were no relationships between educational attainment, income level and area-based measures of socioeconomic disadvantage and having had a blood pressure check in the previous two years (Table 6.12).

Table 6.12 Age-adjusted associations (OR, 95% CI) between the social determinants of health and having had a blood pressure check in the previous two years

	Risk of having had a blood pressure test					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	0.8	0.5	1.3	1.1	0.5	2.7
High school or lower	0.8	0.5	1.3	1.1	0.6	1.9
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	0.9	0.6	1.3	1.2	0.7	1.9
Less than $30,000	1.6	0.8	3.0	0.8	0.4	1.7
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	0.7	0.5	1.1	1.1	0.5	2.1
Moderately accessible	1.2	0.8	1.7	1.6	0.7	3.6
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	2.9	1.4	5.9	2.2	0.8	5.6
3	1.7	0.8	4.0	1.1	0.5	2.4
2	1.4	0.8	2.6	1.5	0.6	4.0
1 (Most disadvantaged)	1.8	1.0	3.3	0.9	0.3	2.1

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Cholesterol tests

Men: There were no relationships between any of the social determinants of health and having had a test for cholesterol in the previous two years (Table 6.13).

Women: There were no relationships between any of the social determinants of health and having had a test for cholesterol in the previous two years (Table 6.13).

Table 6.13 Age-adjusted associations (OR, 95% CI) between the social determinants of health and having had a cholesterol check in the previous two years

	Risk of having had a cholesterol test					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	1.0	0.7	1.5	1.0	0.7	1.5
High school or lower	1.0	0.6	1.6	1.2	0.9	1.7
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	1.0	0.6	1.4	1.2	0.8	1.7
Less than $30,000	0.8	0.4	1.4	1.2	0.8	1.8
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	1.0	0.5	2.1	0.8	0.6	1.1
Moderately accessible	1.1	0.6	2.0	0.7	0.4	1.3
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.3	0.8	1.9	1.3	0.8	2.2
3	1.2	0.8	2.0	1.0	0.6	1.5
2	1.0	0.4	2.2	1.1	0.7	1.7
1 (Most disadvantaged)	1.2	0.8	1.8	1.2	0.8	1.7

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Diabetes test

Men: There were no relationships between education, income level, Index of Relative Socioeconomic Disadvantage and having had a diabetes test in the previous two years. Compared with men living in highly accessible areas, those living in moderately accessible areas were more likely to have had a test for diabetes in the previous two years (Table 6.14).

Women: Compared with women with a tertiary education, those with lower educational attainment were more likely to have had a diabetes test. There were no relationships between household income or area-based measures of socioeconomic disadvantage and the prevalence of having had a diabetes test in the previous two years (Table 6.14).

Table 6.14 Age-adjusted associations (OR, 95% CI) between the social determinants of health and having had a diabetes test in the previous two years

	Risk of having had a diabetes test					
	Men			Women		
	OR	95% CI		OR	95% CI	
Education						
Tertiary education	1.0			1.0		
TAFE/diploma/certificate	0.9	0.5	1.4	1.7	1.3	2.4
High school or lower	0.7	0.5	1.2	1.1	0.8	1.6
Income						
$70,000 plus	1.0			1.0		
$70,000–$30,000	0.8	0.6	1.2	1.2	0.9	1.5
Less than $30,000	1.5	0.9	2.6	1.1	0.8	1.7
ARIA						
Highly accessible areas	1.0			1.0		
Accessible areas	0.9	0.5	1.5	1.4	0.9	2.2
Moderately accessible	1.5	1.1	2.2	1.4	0.7	2.7
IRSD						
5 (Least disadvantaged)	1.0			1.0		
4	1.1	0.7	1.6	1.0	0.6	1.7
3	1.0	0.5	1.9	0.8	0.4	1.7
2	0.9	0.5	1.6	1.0	0.6	1.7
1 (Most disadvantaged)	1.3	0.8	2.0	1.3	0.8	2.1

95% CI = 95 per cent confidence interval; ARIA = Accessibility/Remoteness Index of Australia IRSD = Index of Relative Socioeconomic Disadvantage; OR = odds ratio

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Refer to pages xiii–xvi for definition of terms.

Table 6.15 Summary of significant associations of individual and area-based social determinants of health with chronic disease risk factors, selected chronic diseases and health service utilisation

	Men					Women				
	Education	Income	ARIA	IRSD	Low social support	Education	Income	ARIA	IRSD	Low social support
Risk factors										
Psychological distress	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Smoking	✓	✗	✓	✓	✗	✓	✓	✓	✓	✗
Obesity	✓	✓[(a)]	✓	✗	✓	✓	✗	✓	✓	✓
Hypertension	✗	✗	✗	✗	✗	✓	✓	✓	✗	✗
Dyslipidaemia	✗	✗	✗	✗	✗	✓	✗	✓	✓	✗
Diseases										
Fair/poor self-rated health	✓	✓	✗	✓	✓	✓	✓	✗	✗	✓
Diabetes	✓	✓	✓	✗	✗	✓	✗	✗	✗	✗
Cardiovascular disease	✓	✗	✗	✗	✗	✓	✓	✗	✓	✗
Chronic kidney disease	✗	✓	✓	✗	✓	✗	✗	✗	✗	✗
Health utilisation[(b)]										
Blood pressure checked	✗	✗	✗	✓	NA	✗	✗	✗	✗	NA
Cholesterol test	✗	✗	✗	✗	NA	✗	✗	✗	✗	NA
Diabetes test	✗	✗	✓	✗	NA	✓	✗	✗	✗	NA

(a) This result indicates that those with low incomes are less likely to be obese than those with high incomes.

(b) Significant associations all indicate that those in lower categories of the social determinants of health (such as those less well educated) were more likely to report having had the specified test.

ARIA = Accessibility/Remoteness Index of Australia; IRSD = Index of Relative Socioeconomic Disadvantage; NA = not analysed;

✓ = indicates a significant positive finding (such as low levels of education associated with the risk factor or disease); ✗ = indicates non-significant findings

Refer to pages xiii–xvi for definition of terms.

Discussion

Overall, individual and area-based measures of the social determinants of health measured in the Victorian Health Monitor were related to a higher prevalence of risk factors and chronic disease in Victorians (Table 6.15).

For the individual-based social determinants of health, low education was related to a high prevalence in each of the five risk factors examined in women, and three of the five risk factors in men. Low income was related to a higher prevalence of risk factors, more so in women (3/5) than men (2/5). These findings are similar to a recent study showing that low socioeconomic status (low income and low educational attainment) was related to higher blood pressure, elevated glucose and high cholesterol in women (Kavanagh et al. 2010). For chronic disease, education was associated with three out of the four chronic diseases in both men and women.

Where Victorians resided was also related to risk factor profiles. Those living in areas of low accessibility had greater odds of having risk factors such as smoking and obesity for both sexes. Similarly, living in disadvantaged areas was associated with greater odds of having risk factors such as smoking, obesity and dyslipidaemia in women. For men, living in such areas was only related to smoking. This work broadly confirms findings by Turrell and colleagues showing that area-level deprivation was associated with smoking and obesity in men and women in a similarly aged population (Turrell et al. 2006b). For chronic disease, area-level disadvantage was related to cardiovascular disease (in women), while low area-accessibility was related to diabetes and indicators of chronic kidney disease (in men). This is in contrast to findings by Turrell and colleagues who showed that in 2001 diabetes was associated with area-level disadvantage in women, but not men (Turrell et al. 2006b).

Poor or fair self-rated health was related to both individual and area-level measures of the social determinants of health in men and women. In men, it was related to poor education, low income and area-based disadvantage. In women, it was related to low income and poor education. In work by Turrell and colleagues, poor self-rated health was related to both individual and area-based markers of the social determinants of health (Turrell et al. 2006b).

Not having access to good social networks or access to support from family, friends and neighbours when needed appeared to be an important determinant of an adverse risk factor profile. Of note, higher prevalences of elevated psychological distress and those reporting their health as poor or fair were related to the absence of social support from family and friends. This was apparent for both men and women. Low social support was also related to obesity in men and women and to indicators of chronic kidney disease in men. Such findings highlight areas where appropriately designed interventions may be beneficial. Psychological distress was related to all the social determinants of health in men and women.

In general, health service utilisation was not associated with the social determinants of health. In men, it was only related to area-based measures of socioeconomic disadvantage, and in women, having a diabetes test was related to poor education. These findings show that those with lower socioeconomic status were more likely to have blood pressure measured and a diabetes test, and may indicate that greater healthcare utilisation was associated with greater disadvantage. This is in contrast to other Australian studies, which have shown that those living in disadvantaged areas were less likely to access preventive health services (Turrell et al. 2006b).

Limitations

There are several caveats that need to be considered when interpreting these findings. There are no areas classified as remote or very remote in Victoria. This has undermined the extent to which geographic (remoteness/accessibility) variations in health could be analysed. Further, in some of the subgroups analysed, there were insufficient cases to be able generate reliable estimates of effect – as indicated by wide confidence intervals. In such cases, the effect size becomes less reliable and should be interpreted with caution.

In conclusion, socioeconomically disadvantaged groups were more likely to engage in behaviours such as smoking or have a risk factor profile consistent with poorer health status. Socioeconomic inequalities for many of the health-related indicators were found for both men and women, and they were evident irrespective of how socioeconomic status was measured. The health burden in the Victorian population attributable to socioeconomic disadvantage is large; and much of this burden is potentially avoidable.

7. Environmental and nutritional indicators and psychological distress

7. Environmental and nutritional indicators and psychological distress

Blood lead levels

Lead is a heavy metal that occurs naturally in the environment and is used in the manufacture of batteries, various alloys, plastics and protective coatings. It does not occur naturally in the human body and is not required for human health. Small exposure to lead can have adverse effects on human health and it can be particularly problematic for babies and small children. Legislation has resulted in the removal of lead from a number of manufactured goods such as petrol, plastics and paints, reducing exposure to the general community. However, exposure to lead still occurs through industrial and hobby activities such as home and furniture restoration, pottery, soldering and lead casting. Lead is primarily absorbed through breathing in contaminated fine dust particles and the ingestion of contaminated dust and soil. Long-term exposure to lead can result in lead poisoning, which has varying health consequences for children and adults (National Health and Medical Research Council 2009).

Definitions

The National Health Medical Research Council (NHMRC) has recommended that all Australians have a blood lead level below 0.48 μmol/L (10 μg/dL) (NHMRC 2009) (Table 7.1).

Table 7.1 Classification of elevated blood lead levels

Classification	Definition
Elevated lead level	Blood lead ≥ 0.48 μmol/L
Normal lead levels	Blood lead < 0.48 μmol/L

Results

Overall prevalence

There were 19 people identified with an elevated blood lead level (≥ 0.48 μmol/L), accounting for less than one per cent (0.7 per cent, 95% CI: 0.3–1.6) of all blood lead concentration measures obtained in the study.

The mean (0.07 μmol/L) for the Victorian population aged 18–75 years was well below the NHMRC blood lead level threshold (Table 7.2). The median blood lead level obtained in the study was 0.05 μmol/L, with blood lead concentrations ranging between 0.05 and 1.22 μmol/L.

Blood lead levels by age group and sex

The mean blood lead level for males was significantly higher than the level for females, and blood lead concentration increased significantly by age group for both sexes ($p < 0.05$) (Table 7.2).

Table 7.2 Blood lead levels (μmol/L) according to sex and age group

	Mean	95% CI		Median	Range	
Men						
18–34	0.06	0.06	0.07	0.05	0.05	0.76
35–44	0.07	0.06	0.08	0.05	0.05	0.52
45–54	0.08	0.07	0.09	0.05	0.05	0.90
55–64	0.10	0.09	0.11	0.11	0.05	1.22
65–75	0.11	0.10	0.12	0.12	0.05	0.66
Total	**0.08**	**0.07**	**0.08**	**0.05**	**0.05**	**1.22**
Women						
18–34	0.05	0.05	0.06	0.05	0.05	0.18
35–44	0.06	0.06	0.06	0.05	0.05	0.22
45–54	0.07	0.06	0.07	0.05	0.05	0.72
55–64	0.08	0.08	0.09	0.05	0.05	0.46
65–75	0.09	0.08	0.10	0.10	0.05	0.51
Total	**0.06**	**0.06**	**0.07**	**0.05**	**0.05**	**0.72**
Persons						
18–34	0.06	0.06	0.06	0.05	0.05	0.76
35–44	0.06	0.06	0.07	0.05	0.05	0.52
45–54	0.07	0.07	0.08	0.05	0.05	0.90
55–64	0.09	0.08	0.10	0.10	0.05	1.22
65–75	0.10	0.09	0.11	0.11	0.05	0.66
Total	**0.07**	**0.07**	**0.07**	**0.05**	**0.05**	**1.22**

The means in the table are geometric means. They have been weighted to the age and sex distribution of the 2008 Victorian population and the totals have been age-standardised to the 2006 Victorian population.

The medians in the table have been weighted to the age and sex distribution of the 2008 Victorian population.

31/3,653 participants have no valid data.

Blood lead levels by locality

Table 7.3 shows blood lead levels by metropolitan and rural status. Mean lead levels were similar between metropolitan and rural areas of Victoria.

Table 7.3 Blood lead levels (μmol/L) according to locality

	Mean	95%CI		Median	Range	
Metropolitan	0.07	0.07	0.07	0.05	0.05	1.22
Rural	0.07	0.07	0.07	0.05	0.05	1.03

The means in the table are geometric means. They have been weighted to the age and sex distribution of the 2008 Victorian population and the totals have been age-standardised to the 2006 Victorian population.
The medians in the table have been weighted to the age and sex distribution of the 2008 Victorian population.
31/3,653 participants have no valid data.

Vitamin B12 deficiency

Vitamin B12 is involved in the production and maintenance of the myelin surrounding nerve cells, red blood cell formation and the breakdown of fatty and amino acids to produce energy. Vitamin B12 deficiency usually occurs either as a result of a lack of adequate dietary intake (often in the elderly or those on vegan diets) or as a result of a failure to absorb dietary B12 (due to a lack of intrinsic factor or to malabsorption). Vitamin B12 deficiency may result in fatigue, loss of appetite, weight loss, depression, anaemia and, in serious cases, a variety of neurological conditions.

Definitions

Vitamin B12 levels were measured in blood samples taken during the study. Vitamin B12 deficiency was defined based on the thresholds in Table 7.4.

Table 7.4 Classification of vitamin B12 deficiency

Classification	Definition
Vitamin B12 deficiency	≤ 180 pmol/L
Normal vitamin B12	> 180 pmol/L

Results

Overall prevalence

Table 7.5 shows the age-standardised prevalence of vitamin B12 deficiency in people aged 18–75 years. The prevalence of vitamin B12 deficiency in the total population was 7.7 per cent. The prevalence of vitamin B12 deficiency was similar in men and women.

Applying the prevalence of vitamin B12 deficiency to the 2008 Victorian population produces an estimate of 292,000 people aged 18–75 years who have vitamin B12 deficiency.

Prevalence by age group and sex

Table 7.5 also describes the prevalence of vitamin B12 deficiency by age group and sex. The prevalence of vitamin B12 deficiency increased with age in men (p for trend = 0.001) but not in women. The age group with the highest prevalence of vitamin B12 deficiency was for men aged 65–75 years (Table 7.5).

Table 7.5 Prevalence of vitamin B12 deficiency according to sex and age group

	Normal vitamin B12			Vitamin B12 deficiency		
	%	95% CI		%	95% CI	
Men						
18–34	96.5	91.6	98.6	3.5	1.4	8.4
35–44	95.6	91.3	97.9	4.4	2.1	8.7
45–54	90.8	85.8	94.2	9.2	5.8	14.2
55–64	93.6	89.6	96.1	6.4	3.9	10.4
65–75	83.0	73.9	89.4	17.0	10.6	26.1
Total	**93.4**	**90.9**	**95.3**	**6.6**	**4.7**	**9.1**
Women						
18–34	88.0	82.7	91.8	12.0	8.2	17.3
35–44	91.8	86.1	95.3	8.2	4.7	13.9
45–54	94.3	91.4	96.3	5.7	3.7	8.6
55–64	93.0	88.8	95.7	7.0	4.3	11.2
65–75	92.0	87.6	95.0	8.0	5.0	12.4
Total	**91.2**	**89.1**	**92.9**	**8.8**	**7.1**	**10.9**
Persons						
18–34	92.2	89.5	94.3	7.8	5.7	10.5
35–44	93.7	90.6	95.9	6.3	4.1	9.4
45–54	92.6	90.7	94.1	7.4	5.9	9.3
55–64	93.3	90.5	95.3	6.7	4.7	9.5
65–75	87.7	82.0	91.7	12.3	8.3	18.0
Total	**92.3**	**90.8**	**93.6**	**7.7**	**6.5**	**9.2**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

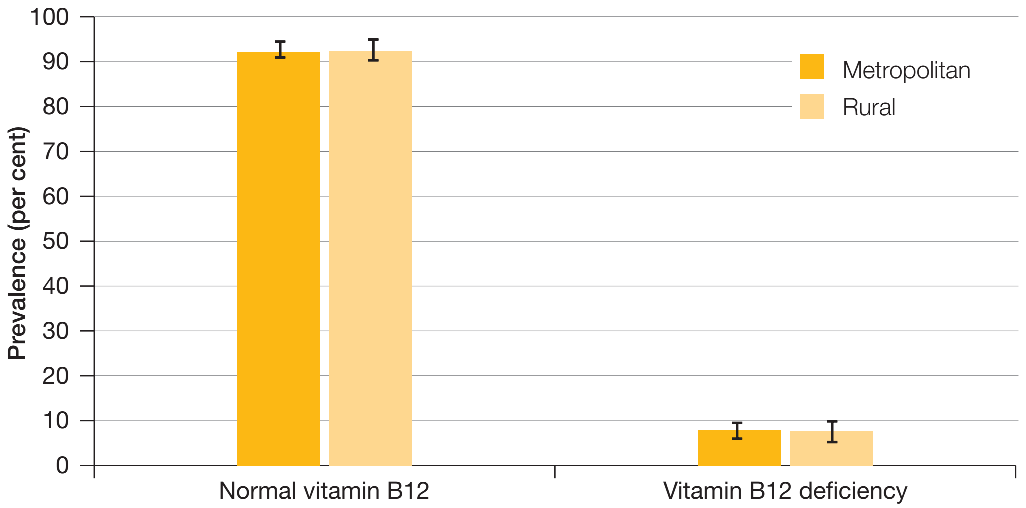
Refer to pages xiii–xvi for definition of terms.

26/3,653 have no valid data.

Prevalence by locality

Figure 7.1 and Table 7.6 show the prevalence of vitamin B12 deficiency by metropolitan and rural status. The prevalence of vitamin B12 deficiency was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 7.1 Prevalence and 95% CI of vitamin B12 deficiency according to locality



The error bars represent 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 7.6 Prevalence of vitamin B12 deficiency according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Normal vitamin B12	92.2	90.3	93.8	92.4	89.7	94.4
Vitamin B12 deficiency	7.8	6.2	9.7	7.6	5.6	10.3

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Folate

Folate deficiency is a nutritional condition produced by a deficiency of folic acid in the diet. Folic acid is abundant in green leafy vegetables, yeast, liver and mushrooms. Folate deficiency may cause anaemia.

Definitions

Red blood cell folate levels were measured in blood samples taken during the study. Folate deficiency was defined based on the thresholds in Table 7.7.

Table 7.7 Classification of folate deficiency

Classification	Level of folate
Folate deficiency	≤ 400 nmol/L
Normal folate	> 400 nmol/L

Results

Overall prevalence

The prevalence of folate deficiency in the total population was 0.006 per cent.

Applying the prevalence of folate deficiency to the 2008 Victorian population produces an estimate of 200 people aged 18–75 years who have folate deficiency.

Anaemia

Haemoglobin is a protein in red blood cells that transports oxygen from the lungs to the rest of the body. A low level of haemoglobin is called anaemia and can be the result of: blood loss; deficiencies of iron, vitamin B12 or folate; the destruction of red blood cells; or a chronic illness. It most commonly manifests as fatigue and pallor but can lead to breathlessness when severe.

Definitions

Table 7.8 Classification of anaemia

Classification	Men	Women
Anaemia	< 130 g/L	< 115 g/L
Normal haemoglobin	≥ 130 g/L	≥ 115 g/L

Results

Overall prevalence

Table 7.9 shows the age-standardised prevalence of anaemia in people aged 18–75 years. The prevalence of anaemia in the total population was 2.0 per cent. The prevalence of anaemia among men and women was similar.

Applying the prevalence of anaemia to the 2008 Victorian population produces an estimate of 76,000 people aged 18–75 years who have anaemia.

Prevalence by age group and sex

Table 7.9 also describes the prevalence of anaemia by age group and sex. The prevalence of anaemia had a U-shaped distribution in men (being highest in the oldest and youngest age groups, and lowest in the middle years). No clear pattern in relation to age was observed in women. The age group with the highest prevalence of anaemia was among men aged 65–75 years and women aged 35–44 years.

Table 7.9 Prevalence of anaemia according to sex and age group

	Normal			Anaemia		
	%	95% CI		%	95% CI	
Men						
18–34	97.7	92.8	99.3	2.3	0.7	7.2
35–44	99.5	96.5	99.9	0.5	0.1	3.5
45–54	99.3	97.9	99.8	0.7	0.2	2.1
55–64	97.2	94.7	98.5	2.8	1.5	5.3
65–75	95.3	92.2	97.2	4.7	2.8	7.8
Total	**98.0**	**96.6**	**98.8**	**2.0**	**1.2**	**3.4**
Women						
18–34	99.2	98.1	99.7	0.8	0.3	1.9
35–44	95.7	90.5	98.1	4.3	1.9	9.5
45–54	97.8	95.3	99.0	2.2	1.0	4.7
55–64	99.1	97.5	99.7	0.9	0.3	2.5
65–75	97.9	92.4	99.4	2.1	0.6	7.6
Total	**98.0**	**96.8**	**98.7**	**2.0**	**1.3**	**3.2**
Persons						
18–34	98.5	96.3	99.4	1.5	0.6	3.7
35–44	97.6	94.9	98.9	2.4	1.1	5.1
45–54	98.6	97.3	99.2	1.5	0.8	2.7
55–64	98.2	96.6	99.0	1.8	1.0	3.4
65–75	96.6	94.5	97.9	3.4	2.1	5.5
Total	**98.0**	**97.3**	**98.5**	**2.0**	**1.5**	**2.7**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

31/3,653 have no valid data.

Table 7.10 describes the prevalence of vitamin B12 deficiency among people with anaemia. The prevalence of vitamin B12 deficiency among men and women who had anaemia was 15.2 per cent and 2.4 per cent, respectively.

Table 7.10 Prevalence of vitamin B12 deficiency among Victorians with anaemia

	Normal vitamin B12			Vitamin B12 deficiency		
	%	95% CI		%	95% CI	
Men	84.8	72.4	92.3	15.2	7.8	27.6
Women	97.6	89.8	99.5	2.4	0.5	10.2
Persons	89.7	80.8	94.8	10.3	5.2	19.2

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

31/3,653 have no valid data.

Prevalence by locality

Table 7.11 shows the prevalence of anaemia by metropolitan and rural status. The prevalence of anaemia was similar in metropolitan and rural Victorians after adjustment for age and sex.

Table 7.11 Prevalence of anaemia according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
No anaemia	98.3	97.4	98.8	97.6	96.6	98.4
Anaemia	1.8	1.2	2.6	2.4	1.6	3.4

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Vitamin D deficiency

The main natural source of vitamin D is through exposure of the skin to the sun's ultraviolet radiation. However, small amounts of vitamin D can also be derived through our diet and dietary supplements. Exposure to sunlight varies throughout the year due to seasonal changes in sunlight hours and weather conditions, ultraviolet light intensity, outdoor activity levels and coverage of skin by clothing. Outside the tropics, an individual's level of vitamin D is typically highest in the summer months and lowest in the winter months (Stamp & Round 1974; Webb et al. 1988). The main role of vitamin D in the body is to regulate calcium absorption and the mineralisation of bone. The most serious clinical consequence of vitamin D deficiency in adults is osteomalacia (Scharla 2008), often associated with bone and muscle pain. In children, vitamin D deficiency may result in clinical rickets (Greer 2008). Lesser degrees of vitamin D deficiency in adults may be associated with accelerated bone loss (demineralisation) and an increased risk of falls, due to muscle weakness. Fractures are more likely as a result of brittle bones, which increase the risk of falls (Holick 2006). There is some evidence suggesting a low level of vitamin D is also associated with an increased risk of a range of other diseases, including colon cancer (Giovannucci 2007), cardiovascular disease (Pittas et al. 2010a) and diabetes mellitus (Mattila et al. 2007; Pittas et al. 2010b); however, more conclusive evidence from randomised controlled trials is required to establish causality.

Definitions

Vitamin D status was defined by the serum levels of 25-hydroxy vitamin D listed in Table 7.12 (Nowson et al. 2012).

Table 7.12 Classification of vitamin D status

Classification	Level of vitamin D (nmol/L)
Severe deficiency	< 12.5
Moderate deficiency	12.5 to 29
Mild deficiency	30 to 49
Adequate	≥ 50

Results

Overall prevalence

Table 7.13 and Figure 7.2 show the prevalence of vitamin D deficiency (< 50 nmol/L) in people aged 18–75 years. The prevalence of deficient vitamin D levels in the population was 42.6 per cent. Applying the prevalence of deficient vitamin D levels to the total population in Victoria in 2008 produces an estimate of about 1,590,000 people aged 18–75 years who have vitamin D deficiency. This overall figure should be used with some caution however, as prevalence is variable depending upon season, with vitamin D deficiency more common in winter and spring than in summer and autumn. The prevalence of vitamin D deficiency by season is covered in Table 7.16.

Optimal levels of serum 25-hydroxy vitamin D are currently controversial. A recent Institute of Medicine report states levels of greater than 50 nmol/L are adequate (Institute of Medicine of the US National Academies 2010), while a recent position statement from the International Osteoporosis Foundation (Dawson-Hughes et al. 2010) suggests a level up to 75 nmol/L may be necessary for optimal bone health in older adults. A recent Australian position statement recommends a level of 50–60 nmol/L for bone health and muscle function (Nowson et al. 2012).

Prevalence by age group and sex

The prevalence of vitamin D deficiency was similar between men and women and across all age groups (Table 7.13 and Figure 7.2).

Table 7.13 Prevalence of vitamin D deficiency, by sex and age group

	Vitamin D status					
	Deficient			Adequate		
	%	95% CI		%	95% CI	
Men						
18–34	45.1	36.9	53.6	54.9	46.4	63.1
35–44	51.7	40.0	63.2	48.3	36.8	60.0
45–54	45.4	34.4	57.0	54.6	43.0	65.6
55–64	39.5	32.2	47.4	60.5	52.6	67.8
65–75	34.7	26.8	43.4	65.3	56.6	73.2
Total	**44.8**	**38.0**	**51.7**	**55.2**	**48.3**	**62.0**
Women						
18–34	42.2	32.4	52.5	57.8	47.5	67.6
35–44	36.7	27.2	47.4	63.3	52.6	72.8
45–54	42.2	33.7	51.2	57.8	48.8	66.3
55–64	38.7	30.8	47.4	61.3	52.6	69.2
65–75	39.9	32.6	47.8	60.1	52.2	67.4
Total	**40.5**	**33.6**	**47.7**	**59.5**	**52.3**	**66.4**
Persons						
18–34	43.6	36.0	51.6	56.4	48.4	64.0
35–44	44.2	34.5	54.3	55.8	45.7	65.5
45–54	43.8	35.0	53.0	56.2	47.0	65.0
55–64	39.1	33.4	45.2	60.9	54.8	66.6
65–75	37.4	31.0	44.2	62.6	55.8	69.0
Total	**42.6**	**36.1**	**49.3**	**57.4**	**50.7**	**63.9**

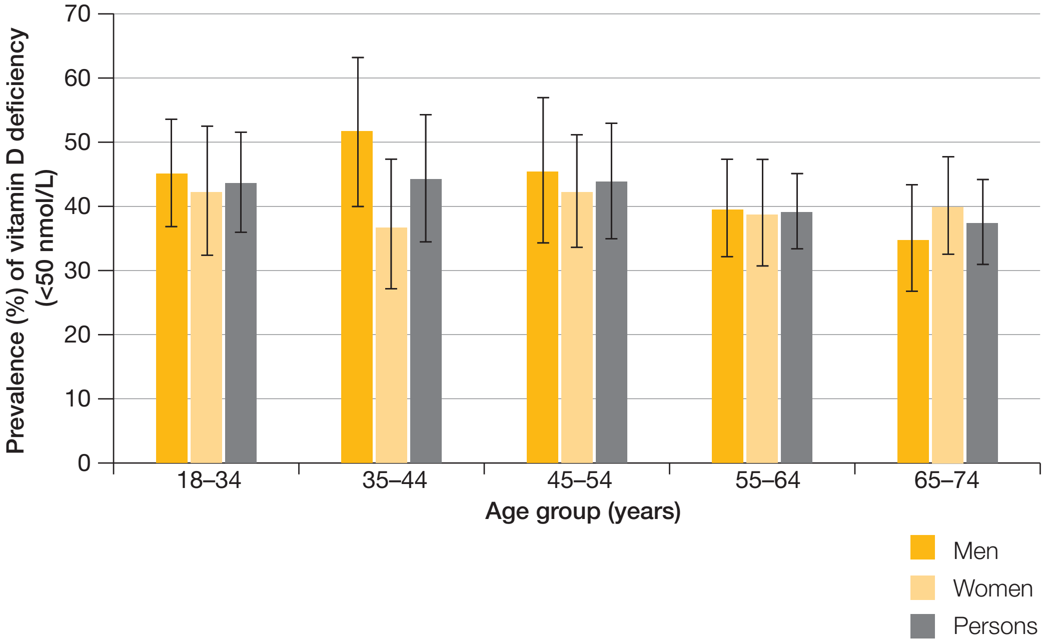
95% CI = 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

26/3,653 have no valid data.

Figure 7.2 Prevalence of vitamin D deficiency, by sex and age group



The error bars represent the 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.

Table 7.14 Prevalence of vitamin D deficiency, by severity and sex

	Men			Women			Persons		
Classification	%	95% CI		%	95% CI		%	95% CI	
Severe deficiency	5.1	3.1	8.2	3.9	2.3	6.5	4.5	2.9	7.0
Moderate deficiency	8.3	6.5	10.6	8.3	5.9	11.6	8.3	6.5	10.6
Mild deficiency	31.4	27.3	35.8	28.2	24.9	31.8	29.7	26.4	33.3
Adequate	55.2	48.3	62.0	59.5	52.3	66.4	57.4	50.7	63.9

95% CI = 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

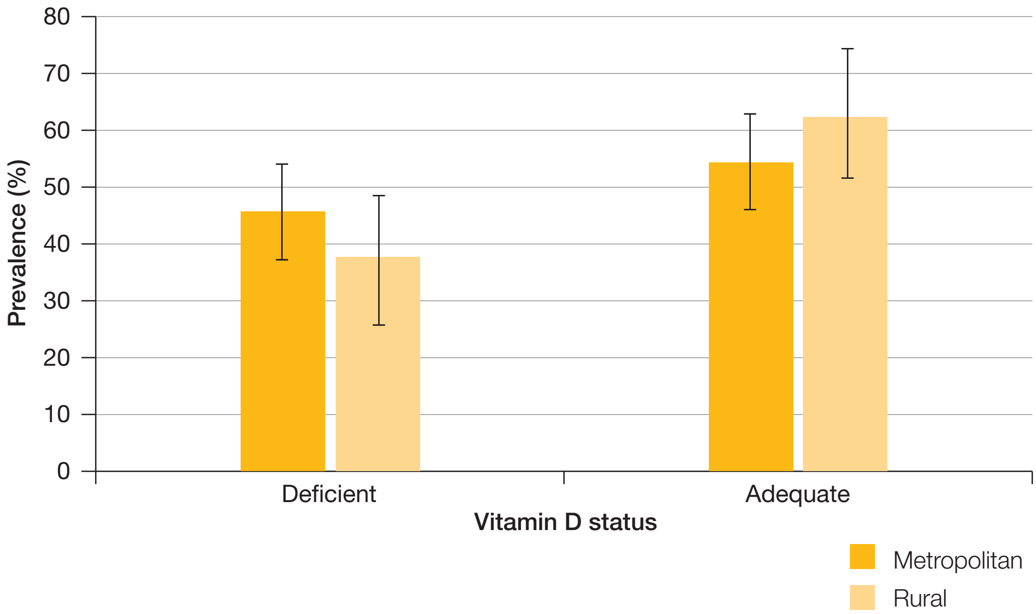
Refer to pages xiii–xvi for definition of terms.

The prevalence of each of the three different levels of severity of vitamin D deficiency is shown in Table 7.14. The prevalence of vitamin D deficiency by level of severity was similar between men and women.

Prevalence by locality

Figure 7.3 and Table 7.15 show the prevalence of vitamin D deficiency by metropolitan and rural locality. The prevalence of vitamin D deficiency was similar among metropolitan and rural Victorians, after adjustment for age and sex.

Figure 7.3 Prevalence of vitamin D deficiency, by locality



The error bars represent the 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 7.15 Prevalence of vitamin D deficiency, by locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Deficient	45.7	37.4	54.2	37.7	27.0	49.8
Adequate	54.3	45.8	62.6	62.3	50.2	73.0

95% CI = 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Prevalence by season

Table 7.16 shows the prevalence of vitamin D deficiency was 19.9 per cent in summer and 53.4 per cent in winter. Men and women had a lower prevalence of vitamin D deficiency in summer and autumn than in winter and spring. The prevalence of vitamin D deficiency in men and women was similar in summer compared with autumn, and in winter compared with spring.

Table 7.16 Prevalence of vitamin D deficiency, by season and sex

	Vitamin D status					
	Deficient			Adequate		
	%	95% CI		%	95% CI	
Men						
Summer	17.9	9.3	31.9	82.1	68.1	90.7
Autumn	25.8	19.6	33.1	74.2	66.9	80.4
Winter	57.9	51.0	64.6	42.1	35.4	49.0
Spring	51.4	41.7	60.9	48.6	39.1	58.3
Women						
Summer	24.3	16.1	34.8	75.7	65.2	83.9
Autumn	23.7	19.3	28.7	76.3	71.3	80.7
Winter	49.4	41.7	57.2	50.6	42.8	58.3
Spring	51.6	39.5	63.5	48.4	36.5	60.5
Persons						
Summer	19.9	15.0	26.1	80.1	73.9	85.0
Autumn	25.1	20.3	30.7	74.9	69.3	79.7
Winter	53.4	46.3	60.4	46.6	39.6	53.7
Spring	51.4	41.0	61.7	48.6	38.3	59.0

95% CI = 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Mean levels of vitamin D

Table 7.17 shows that mean levels of vitamin D were similar between men and women and across all age groups. Table 7.18 shows the mean level of vitamin D was higher in summer and autumn and lower in winter and spring.

Table 7.17 Mean levels of vitamin D (nmol/L), by sex and age group

	Mean	95% CI	
Men			
18–34	55.4	50.2	60.6
35–44	53.9	47.2	60.5
45–54	53.9	48.2	59.6
55–64	57.6	53.6	61.6
65–75	58.9	55.1	62.7
Total	**55.4**	**51.4**	**59.4**
Women			
18–34	57.3	50.9	63.6
35–44	57.4	52.9	61.9
45–54	55.2	50.7	59.6
55–64	56.0	52.4	59.6
65–75	55.2	51.9	58.6
Total	**56.4**	**52.4**	**60.5**
Persons			
18–34	56.3	51.3	61.4
35–44	55.6	50.6	60.7
45–54	54.6	49.9	59.3
55–64	56.8	53.7	59.9
65–75	57.0	53.8	60.2
Total	**55.9**	**52.1**	**59.8**

95% CI = 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Table 7.18 Mean levels of vitamin D (nmol/L), by season

	Mean	95% CI	
Men			
Summer	68.2	63.9	72.5
Autumn	67.8	65.1	70.5
Winter	47.1	43.7	50.5
Spring	51.1	46.1	56.1
Women			
Summer	72.2	65.2	79.2
Autumn	66.3	64.4	68.2
Winter	50.7	47.6	53.7
Spring	49.8	44.4	55.2
Persons			
Summer	72.2	63.4	81.0
Autumn	66.7	64.3	69.0
Winter	49.0	45.8	52.3
Spring	50.5	45.6	55.4

95% CI = 95 per cent confidence interval.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Association between vitamin D deficiency and skin type

The Fitzpatrick Scale is a six-point scale for ranking combined observations of colour of the skin, hair, eyes and propensity to burn when exposed to sunlight (Fitzpatrick 1988). It was developed for clinical use by dermatologists to categorise an individual's skin sensitivity to UV light and consequent clinical risks. The original scale was modified for use in this study with four mutually exclusive categories, so that it could be self-administered as a survey instrument. This is referred to as the Modified Fitzpatrick Scale. The Modified Fitzpatrick Scale asks participants the colour of their skin, hair and eyes, as well as their skin's reaction to sun exposure. Each individual is then given a score that reflects their skin type (Table 7.19).

Table 7.19 Classification of skin type using the Modified Fitzpatrick Scale

Category	Score	Skin, hair and eye colour	Characteristics
1	10–12	Skin white; fair, may have freckles; red or blond hair; blue, green or grey eyes	Always or usually burns, never tans or tans with difficulty
2	8–9	Skin light brown or olive; brown or sandy hair colour; green or hazel eyes	Sometimes mild burn, usually tans
3	6–7	Brown or olive skin (such as Mediterranean or Asian); brown, sandy or dark hair colour; hazel or brown eyes	Rarely burns, tans with ease
4	4–5	Skin dark brown or black; black or dark brown hair; dark brown eyes	Never burns, tans very easily

Table 7.20 describes the association between vitamin D deficiency and the four categories of skin type calculated from the Modified Fitzpatrick Scale. The melanin in dark skin absorbs more UV light (making it unavailable for vitamin D production) and provides protection against high exposure to UV light from the sun experienced in tropical and sub-tropical regions.

Participants in category 4 of the Modified Fitzpatrick Scale were five times more likely to be vitamin D deficient than were those in category 1. This increase was significant for both males and females. Men in category 3 were also twice as likely to be vitamin D deficient as those in category 1.

Table 7.20 Odds of having vitamin D deficiency according to skin type

	Category of skin type (Modified Fitzpatrick Scale)									
	1	2			3			4		
	OR	OR	95% CI		OR	95% CI		OR	95% CI	
Men	1.0	0.8	0.5	1.0	2.0	1.5	2.6	6.1	2.9	13.1
Women	1.0	1.1	0.8	1.4	1.2	0.8	1.8	3.8	1.5	9.2
Persons	1.0	0.9	0.7	1.1	1.6	1.3	2.0	5.0	2.6	9.4

95% CI = 95 per cent confidence interval; OR = odds ratio.
Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria.
Odds ratios have been adjusted for the season that participants had their vitamin D status tested.
83 /3,653 have no valid data.

Iodine levels

Iodine is an essential nutrient for human growth and development. The thyroid gland is dependent on iodine for the production of thyroid hormone. Iodine deficiency is associated with a wide spectrum of mental and physical disorders and is particularly important for normal brain development.

Definitions

Iodine levels were measured in urine samples taken during the study. Median urinary iodine concentrations (MUIC) were used to determine iodine status in the population and iodine deficiency was defined using the following criteria (Table 7.21) (Li et al. 2001; WHO 1994).

Table 7.21 Population median urinary iodine concentration thresholds

Classification	Threshold (µg/L)
Severe iodine deficiency	0 to < 20
Moderate iodine deficiency	20 to < 50
Mild iodine deficiency	50 to < 100
No iodine deficiency	≥ 100

Results

Overall median urinary iodine concentrations

Table 7.22 shows MUIC levels for all people aged 18–75 years. The MUIC level for the total population was 86 µg/L, which falls within the threshold for mild iodine deficiency based on the standard criteria for defining population iodine status (Table 7.21). The overall MUIC levels for men and women were 84 µg/L and 88 µg/L, respectively, indicating a mild level of iodine deficiency for both sexes (Table 7.22).

Median urinary iodine concentrations by age group and sex

Table 7.22 also shows MUIC levels by age group and sex. All MUIC levels in the table are between 50 to < 100 µg/L, indicating a mild level of iodine deficiency for both sexes, within each age group.

Table 7.22 Population median urinary iodine concentrations according to sex and age group

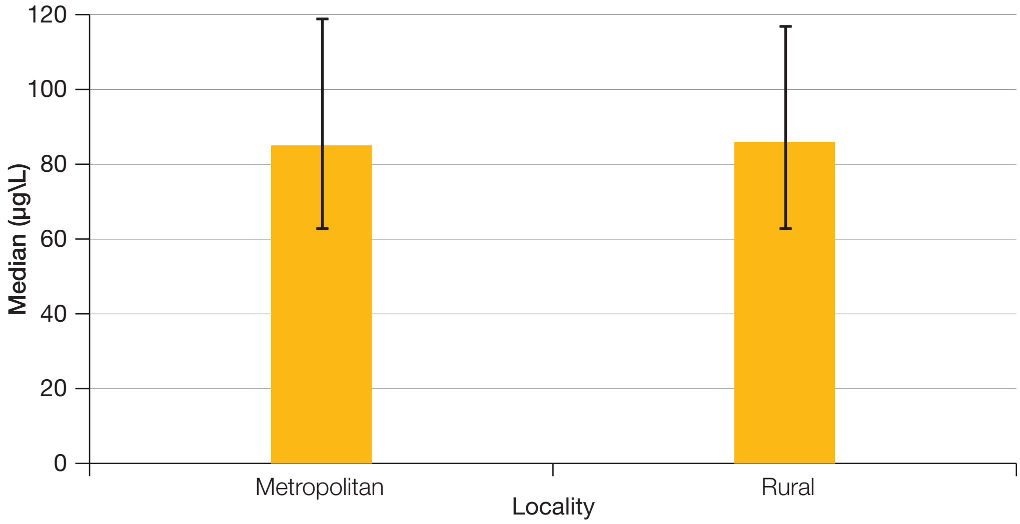
	Median (μg/L)	Interquartile range (μg/L)	
Men			
18–24	80	57	97
25–34	85	57	109
35–44	87	68	116
45–54	81	61	115
55–64	83	60	113
65–75	96	68	134
Total	**84**	**63**	**113**
Women			
18–24	90	65	124
25–34	87	60	121
35–44	89	62	134
45–54	88	67	117
55–64	85	67	129
65–75	92	68	129
Total	**88**	**64**	**124**
Persons			
18–24	84	64	108
25–34	85	60	112
35–44	88	65	123
45–54	83	64	116
55–64	84	63	120
65–75	92	68	130
Total	**86**	**63**	**118**

Data are weighted to the age and sex distribution of the 2006 estimated residential population of Victoria.
The interquartile range includes the 25th–75th percentile.

Median urinary iodine concentrations by locality

Figure 7.4 and Table 7.23 show MUIC levels and iodine status according to locality. There was a mild level of iodine deficiency for both metropolitan and rural Victorians.

Figure 7.4 Population median urinary iodine concentrations according to locality



The error bars represent the interquartile range (25th–75th percentile).
Data are weighted to the age and sex distribution of the 2006 estimated residential population of Victoria.

Table 7.23 Population median urinary iodine concentrations according to locality

	Median (µg/L)	Interquartile range (µg/L)	
Metropolitan	85	63	119
Rural	86	63	117

Data are weighted to the age and sex distribution of the 2006 estimated residential population of Victoria.
The interquartile range includes the 25th–75th percentile.

Median urinary iodine concentrations pre- and post-fortification of bread with iodised salt

Table 7.24 shows MUIC levels for Victorians by month for the period that the Victorian Health Monitor testing was carried out. The mandatory fortification of bread with iodised salt was introduced in August 2009, during the Victorian Health Monitor testing period. The table shows that MUIC levels were higher (90 µg/L) for the period following fortification of bread, compared with the level pre-fortification (79 µg/L), after adjustment for age and sex ($p < 0.05$). However, although MUIC levels increased following fortification, iodine status for the population did not change. The MUIC levels both pre- and post-fortification of bread were within the threshold for a mild level of iodine deficiency.

Table 7.24 Population median urinary iodine concentrations according to month of testing

Month of testing	Median (µg/L)	Interquartile range (µg/L)	
Pre-fortification of bread with iodised salt			
May, 2009	77	55	106
June, 2009	79	61	105
July, 2009	80	57	100
May–July 2009	79	57	103
Post-fortification of bread with iodised salt			
August, 2009	91	66	124
September, 2009	82	62	110
October, 2009	77	52	112
November, 2009	81	60	103
December, 2009	92	76	133
February, 2010	111	84	157
March, 2010	102	80	145
April, 2010	101	79	173
August 2009 – April 2010	90	67	129

Data are weighted to the age and sex distribution of the 2006 estimated residential population of Victoria.
The interquartile range includes the 25th–75th percentile.

Additional biomarkers tested

Mean (95% CI) and median levels (25th and 75th percentiles) of a series of additional biomarkers tested in this study are listed in Table 7.25 and Table 7.26. Mean or median levels did not differ according to locality.

Table 7.25 Mean and median levels for additional biomarkers according to sex

	Men			Women			Persons		
	Mean	95% CI		Mean	95% CI		Mean	95% CI	
Haemoglobin (g/L)	152.7	151.7	153.6	134.7	134.1	135.2	143.6	142.9	144.3
Mean cell volume (fl)	90.6	90.3	90.9	90.4	90.0	90.8	90.8	90.5	91.2
	Median	IQR		Median	IQR		Median	IQR	
Red cell folate (nmol/L)	802	686	921	959	833	1110	877	743	1021
Blood lead (µmol/L)	0.05	0.05	0.12	0.05	0.05	0.05	0.05	0.05	0.11
Vitamin B12 (pmol/L)	301	235	374	305	238	382	303	237	376

95% CI = 95 per cent confidence interval

The interquartile range (IQR) includes the 25th to 75th percentile.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and means are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 7.26 Mean or median for additional biomarkers according to locality

	Metropolitan			Rural		
	Mean	95% CI		Mean	95% CI	
Haemoglobin (g/L)	143.6	142.7	144.4	143.7	142.5	145.0
Mean cell volume (fl)	90.4	90.1	90.8	90.9	90.4	91.4
	Median	IQR		Median	IQR	
Red cell folate (nmol/L)	876	746	1022	879	740	1018
Blood lead (µmol/L)	0.05	0.05	0.11	0.05	0.05	0.11
Vitamin B12 (pmol/L)	304	234	377	303	242	375
Iodine (µg/L)	85	63	119	86	63	117

95% CI = 95 per cent confidence interval

The interquartile range (IQR) includes the 25th to 75th percentile.

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and means are standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Psychological distress

In this survey, the Kessler 6 scale (Kessler et al. 2002) was used to measure psychological distress. The Kessler 6 scale asks participants how frequently they have experienced different components of psychological distress over the previous 30 days on a five-point scale (from ‘all of the time’ to ‘none of the time’). The maximum score for an individual is 24 (Kessler et al. 2003). Those scoring 13 points or greater are considered to have an elevated level of psychological distress.

Definitions

Table 7.27 Classification of psychological distress using the Kessler 6 scale

Classification	Definition
Non-elevated	Score of 0–12
Elevated	Score of 13–24

Results

Overall prevalence

Table 7.28 shows the age-standardised prevalence of an elevated level of psychological distress in people aged 18–75 years. The prevalence of elevated psychological distress in the total population was 2.8 per cent. There was a higher proportion of women with elevated psychological distress (3.9 per cent) than men with elevated psychological distress (1.8 per cent), $p < 0.001$.

Applying the prevalence of elevated psychological distress to the total population of Victoria in 2008 produces an estimate of 106,000 people aged 18–75 years who have elevated levels of psychological distress.

Prevalence by age group and sex

Table 7.28 also describes the prevalence of elevated psychological distress by age group and sex. The prevalence of elevated psychological distress was not associated with increasing age in men or women.

Table 7.28 Prevalence of elevated psychological distress according to sex and age group

	Non-elevated psychological distress			Elevated psychological distress		
	%	95% CI		%	95% CI	
Men						
18–34	98.8	95.6	99.7	1.2	0.3	4.4
35–44	98.9	97.2	99.6	1.1	0.4	2.8
45–54	97.6	95.1	98.9	2.4	1.1	5.0
55–64	98.7	97.1	99.5	1.3	0.5	2.9
65–75	96.5	92.7	98.4	3.5	1.6	7.3
Total	**98.2**	**97.3**	**98.9**	**1.8**	**1.1**	**2.7**
Women						
18–34	95.6	92.2	97.6	4.4	2.4	7.8
35–44	95.9	90.8	98.3	4.1	1.7	9.2
45–54	97.7	95.3	98.9	2.3	1.1	4.8
55–64	95.6	93.3	97.1	4.5	2.9	6.7
65–75	96.4	93.4	98.1	3.6	1.9	6.6
Total	**96.1**	**94.4**	**97.3**	**3.9**	**2.7**	**5.6**
Persons						
18–34	97.2	95.3	98.4	2.8	1.6	4.7
35–44	97.4	94.9	98.7	2.6	1.3	5.1
45–54	97.6	95.7	98.7	2.4	1.3	4.3
55–64	97.1	95.5	98.2	2.9	1.8	4.5
65–75	96.5	94.4	97.8	3.5	2.2	5.6
Total	**97.2**	**96.1**	**98.0**	**2.8**	**2.0**	**3.9**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

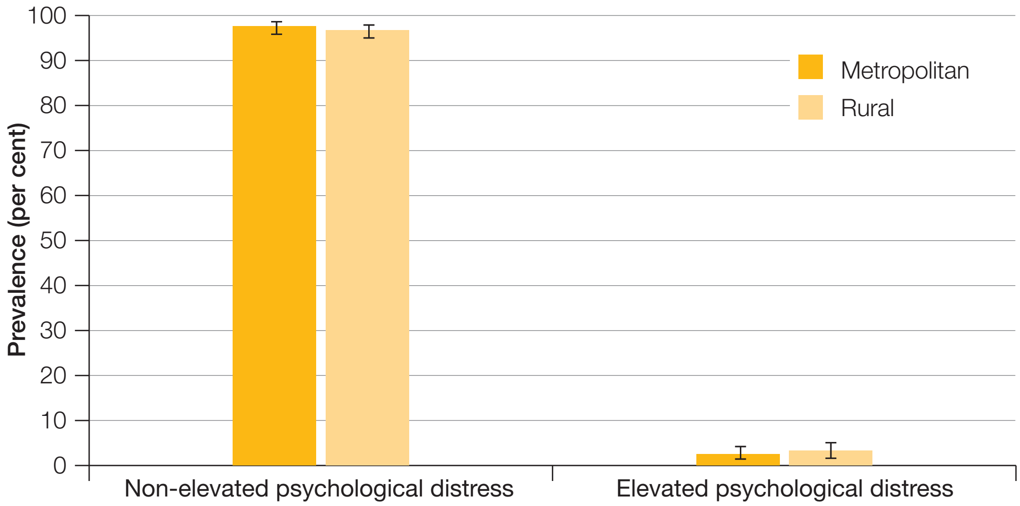
Refer to pages xiii–xvi for definition of terms.

40/3,653 have no valid data.

Prevalence by locality

Figure 7.5 and Table 7.29 show the prevalence of elevated psychological distress by metropolitan and rural status. The prevalence of elevated psychological distress was similar in metropolitan and rural Victorians after adjustment for age and sex.

Figure 7.5 Prevalence and 95% CI of elevated psychological distress according to locality



The error bars represent the 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 7.29 Prevalence of elevated psychological distress according to locality

	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Non-elevated psychological distress	97.5	95.8	98.6	96.7	94.9	97.9
Elevated psychological distress	2.5	1.4	4.2	3.3	2.1	5.1

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Self-rated health status

Self-rated health status has been shown to be a reliable predictor of ill health, future healthcare use and premature mortality, independent of other medical, behavioural or psychosocial risk factors (Burstrom & Fredlund 2001; Idler & Benyamini 1997; Miilunpalo et al. 1997).

Results

Overall prevalence

Table 7.30 shows the age-standardised prevalence of self-rated health status for people aged 18–75 years. The prevalence of good, very good or excellent health status in the population was 87.9 per cent. The prevalence of good, very good or excellent health status was similar in men and women.

Applying the prevalence of good, very good or excellent health to the total population of Victoria in 2008 produces an estimate of 3,332,500 people aged 18–75 years who reported their health status as good, very good or excellent.

Prevalence by age group and sex

Table 7.30 also describes the distribution of self-rated health status among Victorians by age group and sex. The prevalence of good, very good or excellent health did not increase with age group.

Table 7.30 Prevalence of self-rated health status according to sex and age group

	Self-rated health status					
	Good/very good/excellent			Fair/poor		
	%	95% CI		%	95% CI	
Men						
18–34	86.9	79.0	92.1	13.1	7.9	21.0
35–44	91.4	87.2	94.2	8.7	5.8	12.8
45–54	88.6	84.4	91.8	11.4	8.2	15.6
55–64	86.9	82.3	90.5	13.1	9.5	17.7
65–75	84.7	78.5	89.4	15.3	10.6	21.5
Total	**88.0**	**85.4**	**90.2**	**12.0**	**9.8**	**14.6**
Women						
18–34	86.7	78.9	91.9	13.3	8.1	21.1
35–44	89.8	84.9	93.2	10.2	6.8	15.1
45–54	88.2	83.5	91.7	11.8	8.3	16.5
55–64	87.5	80.3	92.3	12.5	7.7	19.7
65–75	86.4	80.9	90.4	13.6	9.6	19.1
Total	**87.6**	**84.1**	**90.4**	**12.4**	**9.6**	**15.9**
Persons						
18–34	86.8	81.3	90.9	13.2	9.2	18.7
35–44	90.6	87.2	93.1	9.4	6.9	12.8
45–54	88.4	85.2	91.0	11.6	9.0	14.8
55–64	87.2	83.3	90.3	12.8	9.7	16.7
65–75	85.6	81.7	88.7	14.4	11.3	18.3
Total	**87.9**	**85.5**	**89.9**	**12.1**	**10.1**	**14.5**

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and total prevalence estimates are standardised to the 2006 Victorian population.

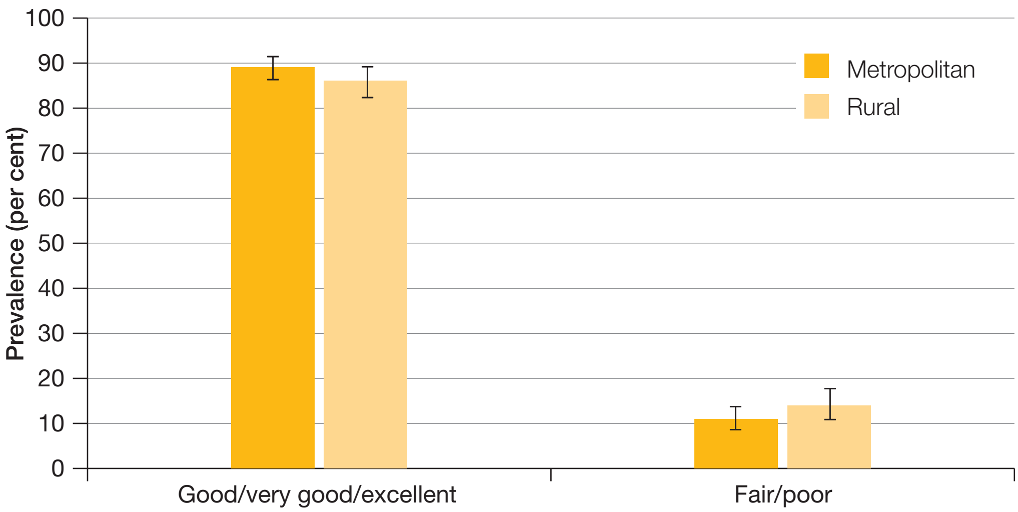
Refer to pages xiii–xvi for definition of terms.

15/3,653 have no valid data.

Prevalence by locality

Figure 7.6 and Table 7.31 show the prevalence of good, very good or excellent health by metropolitan and rural status. The prevalence of good, very good or excellent health was similar for metropolitan and rural Victorians after adjustment for age and sex.

Figure 7.6 Prevalence and 95% CI of self-rated health status according to locality



The error bars represent the 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Table 7.31 Prevalence of self-rated health status according to locality

	Self-rated general health					
	Metropolitan			Rural		
	%	95% CI		%	95% CI	
Good/very good/excellent	89.1	86.4	91.4	86.1	81.9	89.4
Fair/poor	10.9	8.6	13.6	13.9	10.6	18.1

95% CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated residential population of Victoria and standardised to the 2006 Victorian population.

Refer to pages xiii–xvi for definition of terms.

Discussion

This study is one of the first studies in Australia to measure blood levels of lead at the population level. The results of the Victorian Health Monitor provide baseline estimates against which future population-level measures may be compared. The average blood lead level for adult Victorians was low at 0.07 µmol/L, well below the NHMRC (2009) threshold for elevated blood lead levels (≥ 0.48 µmol/L). Despite the introduction of legislation that has resulted in the removal of lead from a number of manufactured goods such as petrol, plastics and paints, community exposure to lead still occurs. It is unknown whether exposure is through industrial or hobby activities such as home and furniture restoration, pottery, soldering and lead casting. The study identified 19 participants with a blood lead level above the acceptable threshold (≥ 0.48 µmol/L). This equates to 0.7 per cent of all blood lead level samples from the Victorian Health Monitor.

The prevalence of vitamin B12 deficiency was low at 7.7 per cent, as was the prevalence of anaemia (2.0 per cent). Red cell folate levels were excellent, with only one survey participant shown to have deficient levels.

More than 40 per cent of Victorians were deficient in vitamin D. This was apparent despite adjustment for season. The likelihood of having vitamin D deficiency increased with skin colour, with those with the darkest skin being five times more likely to have vitamin D deficiency compared with those with the palest skin. Vitamin D deficiency can occur in areas of lower sunlight exposure (such as Victoria), and/or when behaviour reduces sunlight exposure through protective clothing or sunlight avoidance. Among men and women, levels of vitamin D were higher in summer and autumn compared with winter and spring. Our results are consistent with the findings from many studies that showed that the seasonal variability of sun exposure affected the production of vitamin D, with higher levels in summer and autumn months, and lower levels in winter and spring months (Stamp & Round 1974; Webb et al. 1988).

The median urinary iodine concentration was 86 µg/L, indicating a mild level of iodine deficiency in the Victorian population. This level is similar to a previous Australian study (88 µg/L) in healthy adults (Li et al. 2001). In August 2009 mandatory iodine fortification of bread was introduced in Australia. This report shows that median urinary iodine concentration increased in the time period post-fortification compared with the time pre-fortification. However, both the urinary iodine concentrations in the time period pre- and post-fortification were within the threshold for a mild level of iodine deficiency.

The proportion of Victorians who rated their health status as good, very good or excellent was over 80 per cent. This study also found that the proportion of Victorians experiencing elevated levels of psychological distress was 2.8 per cent, with more women than men experiencing this condition. This figure suggests that many Victorians, especially women, are experiencing poor mental health, which places them at risk of other chronic diseases.

8. Implications for health policy

8. Implications for health policy

The vast majority of results reported here suggest that Victorians enjoy good health. A testament to this is the high proportion of Victorians (88 per cent) rating their health as good, very good or excellent. A range of lifestyle behaviours influence health status and the health risk profile of people. Modifiable risk factors, such as smoking and physical inactivity or sedentary behaviour, contribute significantly to the burden of disease in Victoria, providing opportunities for future health gain through early prevention and appropriate management. The results of this study suggest there have been some important gains in the health profile of the Victorian population in recent years and that Victorians are indeed heeding the advice delivered by public health campaigns in Victoria.

Smoking

Tobacco smoking is the single largest preventable cause of the disability burden in Victoria; however, the prevalence rate for current smoking has decreased significantly in recent years. This ongoing decline has the potential to contribute to a reduction in chronic disease over time. However, less encouraging is that the age group with the highest proportion of daily smokers for both men and women was the 18–34-year age group.

Physical activity and sedentary behaviour

Comparisons with earlier studies suggest Victorians have increased their levels of physical activity. This may be, in part, due to an increased awareness of the health benefits associated with increased physical activity and a subsequent increase in actual physical activity levels, but may also be due to an overestimation of the time spent in physical activity.

The Victorian Health Monitor study is one of the only population-based surveys to collect detailed information about sedentary behaviour. The results indicate that adult Victorians spend a large portion of their day participating in sedentary activity including watching TV and sitting for work. Physical inactivity and high levels of sedentary behaviour were associated with a high prevalence of the majority of the risk factors and diseases explored in this report. While the adverse effects of physical inactivity are well established (Healy et al. 2008), the harmful health effects of 'sitting' are only now becoming understood. Sedentary behaviour has been linked to adverse cardio-metabolic profiles (Wijndaele et al. 2010), diabetes (Thorp et al. 2010), cardiovascular disease and death (Dunstan et al. 2010). Recent data suggests that sitting for long periods of time can even negate the health benefits of purposeful physical activity, even though the level of activity on its own meets guidelines (Thorp et al. 2010). This study provides a great impetus for the introduction of public health campaigns that focus on reducing sitting time for Victorians. In particular, reductions of sitting time at work would appear to be a very important public health target.

Dyslipidaemia and hypertension

Comparison with earlier studies suggests that hypertension and dyslipidaemia levels in Victorians have improved over time. This could be due to better treatment of these risk factors or increased awareness on the adverse effects of poor lifestyle choices and a subsequent shift towards a healthier lifestyle. While these results are encouraging, absolute levels of dyslipidaemia and hypertension remain high and may result in a large burden of diabetes and cardiovascular disease in the future.

Obesity

Other risk factors, such as being overweight or obese, are also detrimental to the health and wellbeing of people, and can contribute to the development of several chronic diseases. Like most parts of the world, obesity prevalence in Victoria is increasing. The drivers of obesity include decreased physical activity levels and increased caloric intake. Although self-reported physical activity rates are increasing among Victorians, the increase is not sufficient to offset the increase in sedentary behaviour that has become endemic in our daily lives. It is also possible that the increase in caloric intake and/or a changing pattern of food intake may be contributing to the increasing rates of obesity and overweight. The recent public health focus on tackling obesity must be continued. It needs to address all factors impacting on weight maintenance at both the individual and societal level, with particular emphasis on caloric intake, physical activity and sedentary behaviour.

Vitamin D, red cell folate, vitamin B12 and iodine levels

Similar to other developed countries, vitamin D deficiency is very common in Victorians. Approximately 42.6 per cent of Victorians were deficient in vitamin D, with concentrations lower in those with dark skin. Vitamin D deficiency has been associated with diabetes, obesity, cardiovascular disease and osteoporosis. Programs to improve the vitamin D status of Victorians, such as fortification and/or supplementation, may be required.

The prevalence of vitamin B12 deficiency was 7.7 per cent. Red cell folate levels were very good, with fewer than one per cent of Victorians having a folate deficiency. Note that in September 2009 Food Standards Australia New Zealand introduced the mandatory fortification of bread-making flour in Australia to increase folate intake in women of child-bearing age, with the aim of reducing the risk of children being born with neural tube defects.

The median urinary iodine concentration was 86 μg/L, indicating a mild level of iodine deficiency in the Victorian population. This result was similar to the result from an earlier study of healthy adults in Australia (Li et al. 2001). One of the major causes of the reduced iodine intake is the reduction of iodine in milk since the dairy industry replaced iodine-rich cleaning solutions with other sanitisers. Other causes relate to the use of non-iodised salt, with only 10 per cent of Australians thought to purchase iodised salt (Li et al. 2001). Iodine is important for normal brain development and its deficiency is associated with a wide spectrum of mental and physical disorders such as cretinism and endemic goitre (Bleichrodt & Born 1994; The Lancet 2008). Fortification of bread with the addition of iodised salt has shown a positive effect on iodine levels in Victorians, but despite this, the urinary iodine concentrations in the time period post-fortification were still within the threshold for a mild level of iodine deficiency.

Management of those with chronic disease

Among those who were on treatment for hypertension, 46.1 per cent had adequate blood pressure control. This means that more than 53 per cent of Victorians undergoing treatment for hypertension failed to meet blood pressure targets. This highlights a group of people at high risk of cardiovascular disease in which treatment has not been optimised.

For diabetes, nearly all those with known diabetes were taking pharmaceutical therapy. However, the level of adequate management of those with diabetes, as measured by haemoglobin A1c within the target range (≤ 7.0 per cent), was low. If diabetes control remains unchecked, diabetes complications are likely to increase in the coming years.

For prevention of cardiovascular disease, the analysis highlighted areas that need attention in terms of treatment with lipid-lowering drugs. Among those with cardiovascular disease and who meet the PBS criteria for treatment with a lipid-lowering drug, while more than 50 per cent were on treatment, more than 49 per cent were not on treatment. For those with diabetes and hypertension who met the PBS criteria for lipid-lowering treatment, 51.1 per cent and 25.2 per cent, respectively were on treatment. This means that 48.9 per cent and 74.8 per cent of those with diabetes and hypertension, respectively who met the PBS criteria for lipid-lowering treatment, were not on treatment. These results suggest that many Victorians could benefit from treatment with lipid-lowering therapy.

Diabetes

The results from the Victorian Health Monitor suggest the prevalence of diabetes among adults in Victoria was 4.6% in 2009–2010. This is a similar level of prevalence to other estimates derived from alternative sources and would suggest that up to 236,000 adults aged 18-75 years had diabetes in Victoria in 2009–2010. The results of the AusDiab study in 1999-2000 suggested there was one undiagnosed case of diabetes for every diagnosed case in the population. The Victorian Health Monitor indicates there may now be only one undiagnosed case for every three diagnosed cases. This is consistent with an increase in screening activities, which have served to increase diabetes awareness. Of concern however, although the survey results suggest that more than 90 per cent of adults with diagnosed diabetes were taking oral hypoglycaemic agents and/or insulin, a relatively low proportion of these study participants achieved the haemoglobin A1c target (≤7.0 per cent). This has important implications for secondary prevention in Victoria as diabetes control is important in preventing or slowing the development of many diabetes complications, including cardiovascular disease.

Social determinants of health

Despite the fact that the majority of findings in this report demonstrate an improvement in the prevalence of chronic disease and the risk factors for chronic disease, it also shows distinct patterns of social and health inequalities in Victoria. Individual-based and area-based measures of the social determinants of health were related to higher prevalence of disease risk factors and to chronic disease in Victorians. Such health inequalities limit the life opportunities of many people and create an economic burden for society. To tackle health inequalities, it must be accepted that they exist, that they have significant social and economic consequences, and that they can be prevented. This report provides updated evidence that these inequities are real, and if not addressed, may lead to a greater burden of chronic disease in future years.

Cardiovascular disease and indicators of chronic kidney disease

Compared with earlier studies, the prevalences of cardiovascular disease and indicators of chronic kidney disease from the Victorian Health Monitor were lower than previously reported. While the treatment of cardiovascular disease has advanced considerably over the past 20 years and resulted in a decrease in cardiovascular disease mortality rates, cardiovascular disease remains the leading cause of death for Australians (ABS 2010). Furthermore, the gains in mortality due to a decrease in tobacco consumption, the introduction of statins and the development of preventive technology may be reversed with increasing rates of obesity and diabetes in the future. Evidence of this has been shown in several studies in other countries including Australia (Backholer et al. 2011).

The plateauing rates of cardiovascular disease may also impact on the prevalence of chronic kidney disease in the future. It has been hypothesised that the prevention of cardiovascular disease, particularly in those with diabetes, may lead to an increase in chronic kidney disease as survival rates for those with diabetes improve.

Concluding remarks

The implications of these findings for Victoria are significant. While many of the diseases reported here appear to be plateauing, the absolute rates and numbers of people affected are high, and are expected to increase with population ageing and advancements in medical technology. For Victoria, the most obvious implication of the chronic disease burden is related to cost. A large burden of chronic disease will lead to an increase in direct healthcare costs. A significant chronic disease burden will also lead to an increase in indirect costs such as increases in carer's costs and changes to employment structures. For individuals, the impact is equally as great. With greater numbers of people with chronic disease or risk factors for chronic disease, there is likely to be an increase in medication use, associated changes in social and work circumstances, increased emotional distress, behaviour change and an increase in the proportion of Victorians living with disability.

The latest analysis of trends in healthy ageing suggest that, along with decreases in mortality, the developed world is experiencing increases in disease prevalence but postponement of limitations and disability in those aged 85 and under (Christensen et al. 2009). This is known as healthy ageing. However, it has been hypothesised that current trends in obesity, as seen in this study, will reverse these healthy ageing trends, by increasing mortality, disease and disability. The personal and financial cost of this reverse in the healthy ageing trend is expected to be vast.

Appendix

Appendix

A two-stage weighting process was used in the Victorian Health Monitor. In summary, person weight = selection or base weight (swt) x population benchmark weight (pbmark).

The selection or base weight reflects the probability of selection of the respondent. It takes into account: the probability of selection of the census collector district (CD); the probability of selection of a household within the CD; and the probability of selection of the respondent within the household.

Once adjustments had been made for the probability of selection of each respondent, the data were then benchmarked to reflect the age and gender distribution within each of the eight Victorian Department of Health regions. This was done based on the 2008 Victorian estimated residential population figures as released by the Australian Bureau of Statistics.

Selection weight

W_{bhij} = the selection (base) weight for the k^{th} person in the ^{jth} household in the i^{th} CD, for a given stratum *h*

$= 1 / \prod_{hi} \times 1/\prod_{hij} \times 1/\prod_{hijk}$

Where:

$\prod_{hi}$ = probability of selection of the CD

$\prod_{hij}$ = probability of selection of a household within the CD

$\prod_{hijk}$ = probability of selection of the respondent within the household

and:

$\prod_{hi} = m_h M_{hi} / N_h$

Where:

m_h = number of CDs selected from stratum *h*

M_{hi} = number of people in CD_i

N_h = number of people in stratum *h*

All households were attempted, but not all responded. Within a given CD the probability of responding is:

$\prod_{hij} = n_j / N_j$

Where:

n_j = number of responding households in CDs

N_j = estimated total number of eligible households in CD

The probability of selection of a person within a household is:

$\prod_{hijk} = 1 / n_k$

Where:

n_k = number of eligible people in a household

Population benchmark weight

Further to the selection weight, a population benchmark component was applied to ensure that the adjusted sample distribution matched the 2008 estimated residential population distribution for the combined cross-cells of age group and sex by eight regions. The categories used for each of the variables were:

- age group: 18–24, 25–34, 35–44, 45–54, 55–64 and 65–75 years
- sex: male, female
- regions: eight Department of Health regions.

The population benchmark component was calculated by dividing the population of each cross-cell by the sum of the selection weight components for all respondents in the sample within that cross-cell.

For each cross-cell (i), the formula for this component was:

$$pbmark_i = \frac{N_i}{\sum_j^i SWT_{ij}}$$

Where:

i	= the i^{th} cross-cell
j	= the j^{th} person in the cross-cell
Ni	= the population of the ith cross-cell
$\sum_j^i$	= means the sum for each person (j) in cross-cell (i), of
SWT_{ij}	= the selection weights for each respondent (1 thru j) in the i^{th} cross-cell

References

References

Alberti, K 1996, 'The clinical implications of impaired glucose tolerance', *Diabetic Medicine*, vol. 13, pp. 927–937.

Alberti, KG, Eckel, RH, Grundy, SM, Zimmet, PZ, Cleeman, JI, Donato, KA, Fruchart, JC, James, WP, Loria, CM & Smith, SC Jr 2009, 'Harmonizing the metabolic syndrome: a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity', *Circulation*, vol. 120, pp. 1640–1645.

Anavekar, NS, McMurray, JJ, Velazquez, EJ, Solomon, SD, Kober, L, Rouleau, JL, White, HD, Nordlander, R, Maggioni, A, Dickstein, K, Zelenkofske, S, Leimberger, JD, Califf, RM & Pfeffer, MA 2004, 'Relation between renal dysfunction and cardiovascular outcomes after myocardial infarction', *New England Journal Medicine*, vol. 351, pp. 1285–1295.

Armstrong, T, Bauman, A & Davies, J 2000, *Physical activity patterns of Australian adults: results of the 1999 National Physical Activity Survey*, AIHW, Canberra.

Atkins, RC, Polkinghorne, KR, Briganti, EM, Shaw, JE, Zimmet, PZ & Chadban, SJ 2004, 'Prevalence of albuminuria in Australia: the AusDiab Kidney Study', *Kidney International* vol. Supplement, pp. S22–S24.

Australian Bureau of Statistics 1995, *National Nutrition Survey: Foods Eaten, Australia 1995*, ABS, Canberra.

Australian Bureau of Statistics 2006a, *Information paper: an introduction to socio-economic indexes for areas (SEIFA) 2006*, ABS, Canberra.

Australian Bureau of Statistics 2006b, *Population by age and sex, Australian states and territories June 2006*, ABS, Canberra.

Australian Bureau of Statistics 2008, *How Australians use their time 2006*, ABS, Canberra.

Australian Bureau of Statistics 2009, *National Health Survey: summary of results 2007–2008*, ABS, Canberra.

Australian Bureau of Statistics 2010, *Cause of death, Australia, 2008*, ABS, Canberra.

Australian Institute of Health and Welfare 1998, *Standard questions on the use of tobacco among adults*, AIHW, Canberra.

Australian Institute of Health and Welfare 2006, *Australia's health 2006*, AIHW, Canberra.

Australian Institute of Health and Welfare 2008a, *Australia's health 2008*, AIHW, Canberra.

Australian Institute of Health and Welfare 2008b, *Diabetes: Australian facts 2008*, AIHW, Canberra.

Australian Institute of Health and Welfare 2008c, *Health care expenditure on cardiovascular diseases 2004–05*, AIHW, Canberra.

Australian Institute of Health and Welfare 2009, *An overview of chronic kidney disease in Australia*, AIHW, Canberra.

Backholer, K, Stevenson, C, Nusselder, WJ, Boyko, EJ, Moon, L, Tonkin, AM & Peeters, A 2011, 'Age-specific trends in cardiovascular mortality rates in Australia between 1980 and 2005', *Australasian Epidemiologist* vol. 18, pp. 33–37.

Beaglehole, R, Dobson, A, Hobbs, MS, Jackson, R & Martin, CA 1989, 'CHD in Australia and New Zealand', *International Journal Epidemiology*, vol. 18, pp. S145–S148.

Begg, S, Vos, T, Barker, B, Stevenson, C, Stanley, L & Lopez AD 2007, *The burden of disease and injury in Australia 2003*, AIHW, Canberra.

Bennett, SA 1995, 'Cardiovascular risk factors in Australia: trends in socioeconomic inequalities', *Journal of Epidemiology and Community Health*, vol. 49, pp. 363–372.

Bentley, R, Kavanagh, AM, Subramanian, SV & Turrell, G 2008, 'Area disadvantage, individual socio-economic position, and premature cancer mortality in Australia 1998 to 2000: a multilevel analysis', *Cancer Causes Control*, vol. 19, pp. 183–193.

Biemer, PP & Christ, SL 2008, 'Constructing the survey weights', in: Levy, PS & Lemeshow, S (eds.), *Sampling of populations: methods and applications*, 4th edn, John Wiley and Sons, Inc., Hoboken, New Jersey.

Bleichrodt, N & Born, MP 1994, 'A metaanalysis of research on iodine and its relationship to cognitive development.', in: Stanbury, JB (ed.) *The Damaged Brain of Iodine Deficiency*. Cognizant Communication Corporation, New York.

Brennan, DS & Spencer, AJ 2002, 'Influence of patient, visit, and oral health factors on dental service provision', *Journal Public Health Dentistry*, vol. 62, pp. 148-157.

Briganti, EM, Shaw, JE, Chadban, SJ, Zimmet, PZ, Welborn, TA, McNeil, JJ & Atkins, RC 2003, 'Untreated hypertension among Australian adults: the 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab)', *Medical Journal Australia*, vol. 179, pp. 135-139.

Burstrom, B & Fredlund, P 2001, 'Self-rated health: is it as good a predictor of subsequent mortality among adults in lower as well as in higher social classes?', *Journal of Epidemiology and Community Health*, vol. 55, pp. 836–840.

Cameron, AJ, Welborn, TA, Zimmet, PZ, Dunstan, DW, Owen, N, Salmon, J, Dalton, M, Jolley, D & Shaw, JE 2003, 'Overweight and obesity in Australia: the 1999–2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab)', *Medical Journal Australia*, vol. 178, pp. 427–432.

Chadban, SJ, Briganti, EM, Kerr, PG, Dunstan, DW, Welborn, TA, Zimmet, PZ & Atkins, RC 2003, 'Prevalence of kidney damage in Australian adults: The AusDiab kidney study', *Journal of the American Society of Nephrology*, vol. 14, pp. S131–S138.

Chen, MS 2002, 'Oral health status and its inequality among education groups: comparing seven international study sites', *International Journal Health Services*, vol. 32, pp. 139–161.

Chow, FY, Briganti, EM, Kerr, PG, Chadban, SJ, Zimmet, PZ & Atkins, RC 2003, 'Health-related quality of life in Australian adults with renal insufficiency: a population-based study', *American Journal of Kidney Disease*, vol. 41, pp. 596–604.

Christensen, K, Doblhammer, G, Rau, R & Vaupel, JW 2009, 'Ageing populations: the challenges ahead', *The Lancet*, vol. 374, pp. 1196–1208.

Colagiuri, S, Lee, CM, Colagiuri, R, Magliano, D, Shaw, JE, Zimmet, PZ & Caterson, ID 2010, 'The cost of overweight and obesity in Australia', *Medical Journal Australia*, vol. 192, pp. 260–264.

Conwell, LS, O'Callaghan, MJ, Andersen, MJ, Bor, W, Najman, JM & Williams, GM 2003, 'Early adolescent smoking and a web of personal and social disadvantage', *Journal of Paediatric Child Health*, vol. 39, pp. 580–585.

Dawson-Hughes, B, Mithal, A, Bonjour, JP, Boonen, S, Burckhardt, P, Fuleihan, GEH, Josse, RG, Lips, P, Morales-Torres, J, & Yoshimura, N 2010, *IOF position statement: vitamin D recommendations for older adults*, viewed 30 September 2011, <www.iofbonehealth.org/download/osteofound/filemanager/health_professionals/pdf/endorsed-papers/vitamin-d-position-statement.pdf>

Department of Health and Aged Care 1999, *National physical activity guidelines for adults*, Australian Government, Canberra.

Department of Health and Ageing 2007, *Measuring remoteness: Accessibility/Remoteness Index of Australia (ARIA), Occassional papers,* Revised edn Australian Government, Canberra.

Diabetes Australia 2010, *Diabetes management in general practice*, 16th edn, Diabetes Australia, Canberra.

Disney, APS 1996, *The 18th report of the Australia and New Zealand Dialysis and Transplant Registry 1995,* Australia and New Zealand Dialysis and Transplant Registry, Adelaide.

Draper, G, Turrell, G & Oldenburg, BF 2004, *Health inequalities in Australia: mortality*, Heath Inequalities Monitoring Series No. 1, Queensland University of Technology; Australian Institute of Health and Welfare, Canberra.

Dunstan, D, Zimmet, PZ, Welborn, TA, Sicree, R, Armstrong, T, Atkins, R, Cameron, A, Shaw, J, Chadban, S and on behalf of the AusDiab Steering Committee 2001, *Diabesity and associated disorders in Australia 2000 – the accelerating epidemic. Australian Diabetes, Obesity and Lifestyle Report*, International Diabetes Institute, Melbourne.

Dunstan, DW, Barr, EL, Healy, GN, Salmon, J, Shaw, JE, Balkau, B, Magliano, DJ, Cameron, AJ, Zimmet, PZ & Owen, N 2010, 'Television viewing time and mortality: the Australian Diabetes, Obesity and Lifestyle Study (AusDiab)', *Circulation*, vol. 121, pp. 384–391.

Dunstan, DW, Zimmet, PZ, Welborn, TA, De Courten, MP, Cameron, AJ, Sicree, RA, Dwyer, T, Colagiuri, S, Jolley, D, Knuiman, M, Atkins, R & Shaw, JE 2002, 'The rising prevalence of diabetes and impaired glucose tolerance: the Australian Diabetes, Obesity and Lifestyle Study', *Diabetes Care*, vol. 25, pp. 829–834.

Fitzpatrick, TB 1988, 'The validity and practicality of sun-reactive skin types I through VI', *Archives of Dermatology*, vol. 124, pp. 869–71.

Giovannucci, E 2007, 'Epidemiological evidence for vitamin D and colorectal cancer', *Journal of Bone Mineral Research*, vol. 22 Suppl 2, pp. V81–V85.

Giskes, K, Turrell, G, Bentley, R & Kavanagh, A 2011, 'Individual and household-level socioeconomic position is associated with harmful alcohol consumption behaviours among adults', *Australian and New Zealand Journal of Public Health*, vol. 35, pp. 270–277.

Glover, J, Harris, K & Tennant, S 1999, *A social health atlas of Australia*, 2nd edn, University of Adelaide, Adelaide.

Go, AS, Chertow, GM, Fan, D, McCulloch, CE & Hsu, CY 2004, 'Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization', *New England Journal Medicine*, vol. 351, pp. 1296–1305.

Gottlieb, BH & Bergen, AE 2010, 'Social support concepts and measures', *Journal of Psychosomatic Research*, vol. 69, pp. 511–20.

Greer, FR 2008, '25-Hydroxyvitamin D: functional outcomes in infants and young children', *American Journal of Clinical Nutrition*, vol. 88, pp. 529S–533S.

Guidelines Subcommittee of the World Health Organization – International Society of Hypertension (WHO-ISH) 1999, '1999 World Health Organization – International Society of Hypertension Guidelines for the Management of Hypertension', *Journal of Hypertension*, vol. 17, pp. 151–183.

Hartz, A, Rupley, D, Kalkhoff, R & Rimm, A 1983, 'Relationship of obesity to diabetes: influence of obesity level and body fat distribution', *Preventive Medicine*, vol. 12, pp. 351–357.

Healy, GN, Wijndaele, K, Dunstan, DW, Shaw, JE, Salmon, J, Zimmet, PZ & Owen, N 2008, 'Objectively measured sedentary time, physical activity, and metabolic risk: the Australian Diabetes, Obesity and Lifestyle Study (AusDiab)', *Diabetes Care*, vol. 31, pp. 369–371.

Hill, DJ, White, VM & Scollo, MM 1998, 'Smoking behaviours of Australian adults in 1995: trends and concerns', *Medical Journal Australia*, vol. 168, pp. 209–213.

Hobbs, MS, McCaul, KA, Knuiman, MW, Rankin, JM & Gilfillan, I 2004, 'Trends in coronary artery revascularisation procedures in Western Australia, 1980–2001', *Heart*, vol. 90, pp. 1036–1041.

Holick, MF 2006, 'The role of vitamin D for bone health and fracture prevention', *Current Osteoporosis Reports*, vol. 4, pp. 96–102.

Idler, EL & Benyamini, Y 1997, 'Self-rated health and mortality: a review of twenty-seven community studies', *Journal of Health and Social Behaviour*, vol. 38, pp. 21–37.

Institute of Medicine of the US National Academies 2010, *Dietary reference intakes for vitamin D and calcium*, Institute of Medicine of the US National Academies, Washington.

Kavanagh, A, Bentley, RJ, Turrell, G, Shaw, J, Dunstan, D & Subramanian, SV 2010, 'Socioeconomic position, gender, health behaviours and biomarkers of cardiovascular disease and diabetes', *Social Science and Medicine*, vol. 71, pp. 1150–1160.

Kawachi, I, Colditz, GA, Ascherio, A, Rimm, EB, Giovannucci, E, Stampfer, MJ & Willett, WC 1996, 'A prospective study of social networks in relation to total mortality and cardiovascular disease in men in the USA', *Journal of Epidemiology and Community Health*, vol. 50, pp. 245–251.

Kessler, RC, Andrews, G, Colpe, LJ, Hiripi, E, Mroczek, DK, Normand, SL, Walters, EE & Zaslavsky, AM 2002, 'Short screening scales to monitor population prevalences and trends in non-specific psychological distress', *Psychological Science*, vol. 32, pp. 959–976.

Kessler, RC, Barker, PR, Colpe, LJ, Epstein, JF, Gfroerer, JC, Hiripi, E, Howes, MJ, Normand, SL, Manderscheid, RW, Walters, EE & Zaslavsky, AM 2003, 'Screening for serious mental illness in the general population', *Archives of General Psychiatry*, vol. 60, pp. 184–189.

Knuiman, MW, Jamrozik, K, Welborn, TA, Bulsara, MK, Divitini, ML & Whittall, DE 1995, 'Age and secular trends in risk factors for cardiovascular disease in Busselton', *Australian Journal of Public Health*, vol. 19, pp. 375–382.

Levey, AS, Stevens, LA, Schmid, CH, Zhang, YL, Castro, AF, 3rd, Feldman, HI, Kusek, JW, Eggers, P, Van Lente, F, Greene, T & Coresh, J 2009, 'A new equation to estimate glomerular filtration rate', *Annals of Internal Medicine*, vol. 150, pp. 604–612.

Li, M, Ma, G, Boyages, SC & Eastman, CJ 2001, 'Re-emergence of iodine deficiency in Australia', *Asia Pacific Journal of Clinical Nutrition*, vol. 10, pp. 200–203.

Luoto, R, Pekkanen, J, Uutela, A & Tuomilehto, J 1994, 'Cardiovascular risks and socioeconomic status: differences between men and women in Finland', *Journal of Epidemiology and Community Health*, vol. 48, pp. 348–354.

Lynch, JW, Kaplan, GA & Salonen, JT 1997, 'Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socioeconomic lifecourse', *Social Science and Medicine*, vol. 44, pp. 809–819.

Marmot, M & Wilkinson, RG 2005, *Social determinants of heath*, Oxford University Press, USA.

Mathers, C 1994, *Health differential among adult Australians aged 25–64 years*, AIHW health monitoring series no.1, AIHW, Canberra.

Mathew, TH, Johnson, DW & Jones, GR 2007, 'Chronic kidney disease and automatic reporting of estimated glomerular filtration rate: revised recommendations', *Medical Journal of Australia*, vol. 187, pp. 459–463.

Mattila, C, Knekt, P, Mannisto, S, Rissanen, H, Laaksonen, MA, Montonen, J & Reunanen, A 2007, 'Serum 25-hydroxyvitamin D concentration and subsequent risk of type 2 diabetes', *Diabetes Care*, vol. 30, pp. 2569–2570.

McCarthy, M, Abbott, J, Durkin, S, Wakefield, M & Germain, D 2009, *Smoking prevalence and consumption in Victoria: key findings from the 1998–2008 population surveys*, CBRC research paper series no. 39, Centre for Behavioural Research in Cancer, The Cancer Council Victoria, Melbourne.

McDonald, SP, Excell, L & Shtangey, V 2006, *The 28th report of the Australia and New Zealand Dialysis and Transplant Registry 2005*, Australia and New Zealand Dialysis and Transplant Registry, Adelaide.

Miilunpalo, S, Vuori, I, Oja, P, Pasanen, M & Urponen, H 1997, 'Self-rated health status as a health measure: the predictive value of self-reported health status on the use of physician services and on mortality in the working-age population', *Journal of Clinical Epidemiology*, vol. 50, pp. 517–528.

National Health and Medical Research Council 2009, *NHMRC information paper: blood lead levels for all Australians*, NHMRC, Canberra.

National Heart Foundation & Australian Institute of Health 1990, *Risk factor prevalence study no. 3 1989*, National Heart Foundation & Australian Institute of Health, Canberra.

Nowson, CA & Margerison, C 2002, 'Vitamin D intake and vitamin D status of Australians', *Medical Journal of Australia*, vol. 177, pp. 149–152.

Nowson, CA, McGrath, J, Ebeling, PR, Haikerwal, A, Daly, RM, Sanders, K, Seibel, MJ & Mason, RS 2012, ' Vitamin D and health in adults in Australia and New Zealand: a position statement', *Medical Journal of Australia*, vol. 196, pp. 686–687.

Owen, N & Bauman, A 1992, 'The descriptive epidemiology of a sedentary lifestyle in adult Australians', *International Journal of Epidemiology*, vol. 21, pp. 305–310.

Phillips, CB, Patel, MS & Weeramanthri, TS 1995, 'High mortality from renal disease and infection in Aboriginal central Australians with diabetes', *Australian Journal of Public Health*, vol. 19, pp. 482–486.

Pittas, AG, Chung, M, Trikalinos, T, Mitri, J, Brendel, M, Patel, K, Lichtenstein, AH, Lau, J & Balk, EM 2010a, 'Systematic review: Vitamin D and cardiometabolic outcomes', *Annals of Internal Medicine*, vol. 152, pp. 307–314.

Pittas, AG, Sun, Q, Manson, JE, Dawson-Hughes, B & Hu, FB 2010b, 'Plasma 25-hydroxyvitamin D concentration and risk of incident type 2 diabetes in women', *Diabetes Care*, vol. 33, pp. 2021–2023.

Sanders, AE & Spencer, AJ 2004, 'Social inequality in perceived oral health among adults in Australia', *Australian and New Zealand Journal of Public Health,* vol. 28, pp. 159–166.

Sanders, AE, Turrell, G & Slade, GD 2008, 'Affluent neighborhoods reduce excess risk of tooth loss among the poor', *Journal of Dental Research*, vol. 87, pp. 969–973.

Scharla, S 2008, 'Diagnosis of disorders of vitamin D-metabolism and osteomalacia', *Clinical Laboratory*, vol. 54, pp. 451–459.

Schultz, M, Austin, J, Letcher, T, Mansfield, Y, Purcell, K, Scollo, M, Tobin, C & Vandenberg, B 2009, *Australia: the healthiest country by 2020. National Preventative Health Strategy – the roadmap for action*, AIHW, Canberra.

Stamp, TC & Round, JM 1974, 'Seasonal changes in human plasma levels of 25-hydroxyvitamin D', *Nature*, vol. 247, pp. 563–565.

Taylor, RJ, Mamoon, HA, Morrell, SL & Wain, GV 2001, 'Cervical screening by socio-economic status in Australia', *Australian and New Zealand Journal of Public Health*, vol. 25, pp. 256–260.

The Lancet 2008, 'Iodine deficiency – way to go yet', *The Lancet*, vol. 372, pp. 88.

Thorp, AA, Healy, GN, Owen, N, Salmon, J, Ball, K, Shaw, JE, Zimmet, PZ & Dunstan, DW 2010, 'Deleterious associations of sitting time and television viewing time with cardiometabolic risk biomarkers: Australian Diabetes, Obesity and Lifestyle (AusDiab) study 2004–2005', *Diabetes Care*, vol. 33, pp. 327–334.

Turrell, G, Haynes, M, Burton, NW, Giles-Corti, B, Oldenburg, B, Wilson, LA, Giskes, K & Brown, WJ 2010, 'Neighborhood disadvantage and physical activity: baseline results from the HABITAT multilevel longitudinal study', *Annals of Epidemiology*, vol. 20, pp. 171–181.

Turrell, G, Kavanagh, A & Subramanian, SV 2006a, 'Area variation in mortality in Tasmania (Australia): the contributions of socioeconomic disadvantage, social capital and geographic remoteness', *Health Place*, vol. 12, pp. 291–305.

Turrell, G, Oldenburg, B, McGuffog, I & Dent, R 1999, *Socioeconomic determinants of health: towards a national research program and a policy and intervention agenda*, AusInfo, School of Public Health, Queensland University of Technology, Canberra.

Turrell, G, Stanley, L, de Looper, M & Oldenburg, B 2006b, *Health inequalities in Australia: morbidity, health behaviours, risk factors and health service use*, Health inequalities monitoring series, AIHW, Canberra.

Turrell, G, Western, JS & Najman, JM 1994, 'The measurement of social class in health reserach: problems and prospects', in: Wadell, C & Petersen, AR (eds.), *Just health: inequality in illness, care, and prevention*, Churchill Livingstone, Melbourne.

United Kingdom Prospective Study (UKPDS) 1998a, 'Efficacy of atenolol and captopril in reducing risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 39. UK Prospective Diabetes Study Group', *British Medical Journal*, vol. 317, pp. 713–720.

United Kingdom Prospective Study (UKPDS) 1998b, 'Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. UK Prospective Diabetes Study Group', *British Medical Journal*, vol. 317, pp. 703–713.

Webb, AR, Kline, L & Holick, MF 1988, 'Influence of season and latitude on the cutaneous synthesis of vitamin D3: exposure to winter sunlight in Boston and Edmonton will not promote vitamin D3 synthesis in human skin', *Journal of Clinical Endocrinology and Metabolism*, vol. 67, pp. 373–378.

Wijndaele, K, Healy, GN, Dunstan, DW, Barnet, AG, Salmon, J, Shaw, JE, Zimmet, PZ & Owen, N 2010, 'Increased cardio-metabolic risk is associated with Increased TV viewing time', *Medicine and Science in Sports and Exercise*, vol. 42, pp. 1511–1518.

World Health Organization – Commission on Social Determinants of Health 2008, *Closing the gap in a generation: health equity through action on the socialdeterminants of health. Final report of the Commission on Social Determinants of Health*, WHO, Geneva.

World Health Organization 1994, *Indicators for assessing iodine deficiency disorders and their control through salt iodisation*, WHO, Geneva.

World Health Organization 2006, *Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia*, WHO, Geneva.

World Health Organization 1999a, *Definition, diagnosis and classification of diabetes mellitus and its complications, part 1: diagnosis and classification of diabetes mellitus*, WHO, Department of Noncommunicable Disease Surveillance, Geneva.

World Health Organization 1999b, *Diabetes and Noncommunicable Disease Risk Factor Surveys – a field guide*, WHO, Geneva.

World Health Organization 2000, *Obesity – preventing and managing the global epidemic: Report of a WHO consultation on obesity*, WHO, Geneva.

Yu, Z, Nissinen, A, Vartiainen, E, Song, G, Guo, Z & Tian, H 2000, 'Changes in cardiovascular risk factors in different socioeconomic groups: seven year trends in a Chinese urban population', *Journal of Epidemiology and Community Health*, vol. 54, pp. 692–696.