State of Food and Nutrition in NSW Series

Report on the weight status of NSW: 2003

The University of Sydney

NSW HEALTH
Working as a Team

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NSW report on the weight status of NSW: 2003

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Contents

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List of abbreviations used

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
BMI	Body Mass Index
CDHAC	Commonwealth Department of Health and Ageing
CHD	Coronary Heart Disease
IOTF	International Obesity TaskForce
NHF	National Heart Foundation
NHMRC	National Health and Medical Research Council
NNS	*National Nutrition Survey, 1995* (Australia)
NSW	New South Wales
PAF	Population Attributable Fraction (see glossary)
RFPS	*Risk Factor Prevalence Study 1983* (Australia)
SEIFA	Socioeconomic indexes for areas
SIGNAL	Strategic Inter-Governmental Nutrition Alliance
SMR	Standardised Mortality Ratio
WHO	World Health Organization

Glossary

Standard definitions used by the Australian Institute of Health and Welfare

Age standardisation

A method of removing the influence of age when comparing populations with different age structures. This is usually necessary because the rates of occurrence of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, then the disease rates that would have occurred with that structure are calculated and compared.

Chronic diseases

Term applied to a diverse group of diseases, such as heart disease, cancer and arthritis (to name a few), that tend to be long-lasting and persistent in their symptoms or development. Although these features also apply to some communicable diseases (infections), the general term chronic diseases is usually confined to non-communicable diseases.

Co-morbidity

When a person has two or more health problems at the same time.

DALY (Disability-Adjusted Life Year)

Years of healthy life lost through premature death or living with disability due to illness or injury.

Hospital separation

The formal process by which a hospital records the completion of treatment and/or care for an admitted patient.

Incidence

The number of new cases (of an illness or event etc) occurring during a given period. Compare with prevalence.

Indigenous

A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander and is accepted as such by the community with which he or she is associated.

Morbidity

Refers to ill health in an individual and to levels of ill health in a population or group.

Mortality

Death.

Population attributable fraction (PAF)

The PAF indicates the extent to which each comorbidity is attributable to a condition (eg obesity) and conversely how much of that illness could be avoided if that condition was prevented. It is calculated using the formula P(RR-1)/[P(RR-1)+1], where P is the probability of a person having that condition (eg being obese) in a given population and RR is the relative risk for the disease in a person with that condition.

Prevalence

The number or proportion (of cases, instances, etc.) present in a population at a given time. Compare with incidence.

List of tables

List of figures

Preface

The work of the NSW Centre for Public Health Nutrition

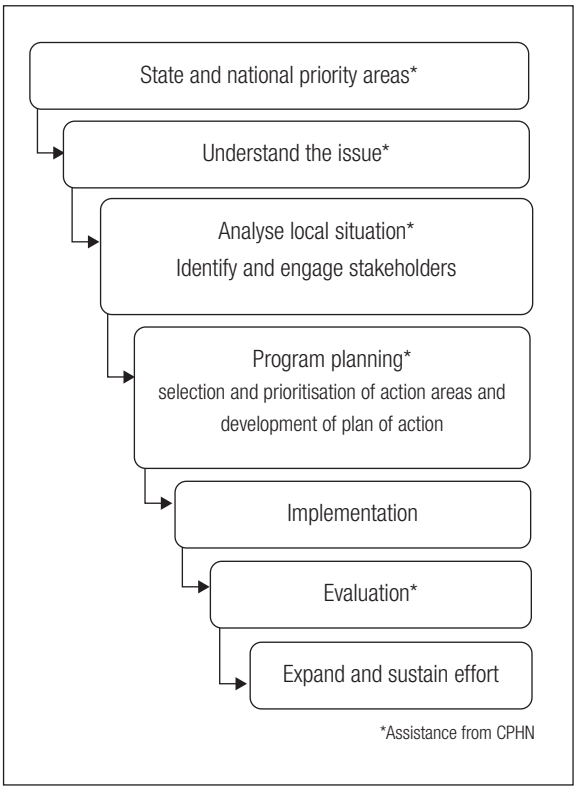
The NSW Centre for Public Health Nutrition (the Centre) was established in 2000 as an initiative of The NSW Health Department in collaboration with the Sydney University Nutrition Research Foundation. It is located on campus at Sydney University. The Centre builds on previous work in planning a nutrition information system for NSW Health.

The Centre has a remit to review research findings regarding nutrition policy and programs and to produce authoritative documents and guidelines, which help steer nutrition interventions in NSW. It undertakes work in four main streams of action:

- evidence-based planning
- food and nutrition monitoring and surveillance
- public health workforce development
- applied research and evaluation.

It is not intended that the work of the NSW Centre for Public Health Nutrition replace or supersede the usual health promotion planning processes of the public health nutrition workforce in NSW. Most health agencies and units work through a detailed process for the development, implementation, evaluation and expansion of nutrition actions within their community or target group, similar to the process set out in Figure A. The work program of the centre is focussed upon producing reviews and analyses, which assist nutrition professionals to work through this process more efficiently and with a greater level of understanding and confidence. As such the reports from the Centre are tools to help guide and facilitate rather than dictate practice.

Figure A. The health promotion planning process with reference to actions supported by CPHN work



Source: Adapted from Hawe et al, 1990.

Executive summary

Obesity is a serious public health problem within NSW and the degree of overweight and obesity is already well past acceptable levels for optimal community well-being. This situation is producing an enormous burden in terms of ill health, reduced quality of life and premature death that threatens to reduce recent gains in health in NSW.

Definition

Obesity is a condition of excess body fat to the extent that a person's health and wellbeing are adversely affected.

The two most useful measures for characterising excessive fat are Body Mass Index (BMI) and waist circumference. BMI is calculated from a person's weight and height and gives a reasonable estimate of total adiposity. A BMI between 18.5 and 25 kg/m^2 is considered acceptable whilst a BMI equal or greater than 30 is usually considered to indicate obesity. A waist circumference measurement gives an indication of the amount of fat stored within the abdomen, as this distribution of fat has been associated with worse health outcomes. In males, a waist circumference equal or greater than 102cm is usually considered very high risk, whilst in females the corresponding value is 88cm. BMI for age has been recommended as the most useful method of identifying excessive fat in Australian children.

Obesity and weight gain as a health problem

There is a very strong association between increasing BMI and premature death and the risk of developing a number of chronic non-communicable diseases such as type 2 diabetes, cardiovascular disease, gallbladder disease, and certain types of cancer. It has been calculated that about 66% of type 2 diabetes, 22% of coronary heart disease (CHD) and 29% of hypertension in Australia can be attributed to obesity (see Table A).

Obesity is also associated with a range of debilitating conditions, which can drastically reduce quality of life. These include arthritis, back pain, respiratory difficulties, skin problems and sleep apnoea. Excessive body weight is also frequently associated with psychosocial problems, much of which appears to result from the negative cultural bias and prejudice directed against obese people in Australia.

Table A. Health problems associated with excess weight

Condition	Estimated contribution of obesity to that condition
Type 2 diabetes	66%
Coronary heart disease	22%
Stroke	4%
Some cancers	4-39%
Osteoarthritis	14%
Gall bladder disease	52%
High blood pressure	29%
High blood lipids	11%
Respiratory problems	?
Fertility problems	?

The level of weight-related ill health is high in NSW and premature mortality from obesity-related conditions such as certain cancers and cardiovascular disease is increasing. It is estimated that around one quarter of adults 25 years and older have existing diabetes or impaired glucose metabolism. In addition, around 17% of NSW adults have indicated that they are receiving treatment for hypertension and 14% for dyslipidaemia.

It has been calculated that obesity cost Australia between $680-1,239 million in 1995/1996 and that obesity accounts for over 4% of the total burden of ill health.

The size of the obesity problem in NSW

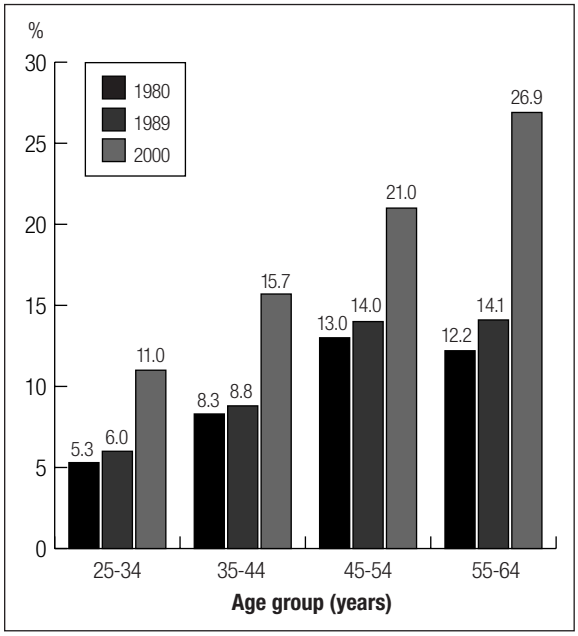
A total of 16.5% of adult males and 18.8% of female adults in NSW are obese. A further 46.5% of males and 27.2% of females are overweight. Therefore nearly two thirds of all adult males and almost one half of all adult females in NSW are overweight or obese. In addition, over 55% of all Australian adults are classified as abdominally overweight on the basis of an elevated waist circumference. Over 20% of all schoolchildren in NSW can be classified overweight or obese.

The level of overweight and obesity tends to be higher in more remote areas and lower in the more affluent metropolitan areas. It is also more common among people born in Southern Europe and the Middle East, socially disadvantaged women, and indigenous peoples.

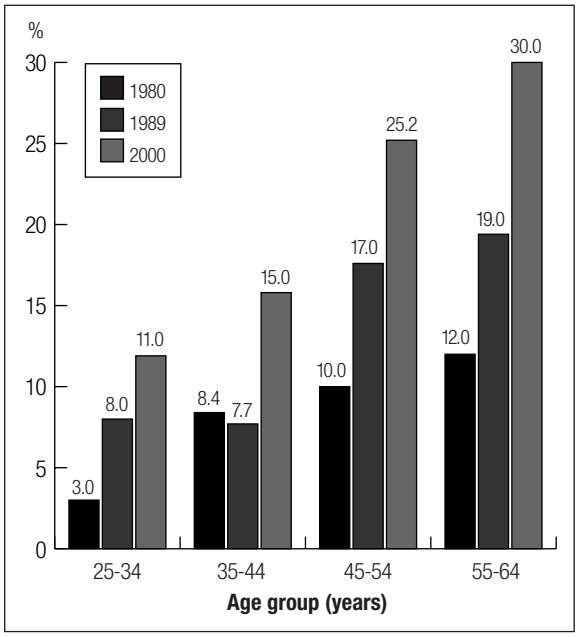
The level of overweight and obesity is rising rapidly. Adult obesity rates in Australia rose from 7.2% in men in 1980 to 17.1% in 2000. For women the rise has been even greater, moving from 7.0% obesity rates in 1980 to 18.9% in 2000 (see Figure B). In Australian children the rates of overweight have doubled and the level of obesity has tripled in the last 15 years.

Figure B. Changes in prevalence of obesity in Australia 1980-2000 by age groups

Males



Females



Factors contributing to weight gain in NSW

The primary cause of weight gain and obesity is a discrepancy in the long-term energy balance, with energy intake exceeding energy expenditure persistently over time. A number of key dietary and physical activity behaviours have been linked to a greater risk of obesity. These include the excessive consumption of high fat, energy dense foods and sweetened fluids, too-frequent consumption of fast foods, inadequate levels of physical activity, and too much time spent in sedentary behaviours. In addition the social, political and economic environment in which people live now inhibits appropriate dietary and physical activity patterns and encourages an energy imbalance.

Current dietary and physical activity behaviours are likely to be contributing to the problem of obesity in NSW. Over the past two decades, adults and children have increased their energy intake from food despite the fact that physical activity levels appear to be decreasing. Sedentary pastimes have replaced more active pursuits during leisure time (see Table B).

In Australia and NSW in particular:

- Adults and children consume excessive fat and energy, particularly from non-core foods, and have a high consumption of take-away foods and soft drink.
- Levels of physical activity continue to decline and television watching, computer games and other sedentary pursuits are now much more popular than active pursuits such as bike riding. Children watch an average of around 2.5 hours of TV each day while adults watch around 3.5 hours. A total of 15% of the adult population is effectively inactive most of the time.
- We have one of the highest rates of car ownership in the world and three quarters of all trips to work are now completed by car. Easy access to cheap fast foods, constant exposure to inappropriate advertising messages and concerns about neighbourhood safety make it difficult to adopt appropriate eating and exercise behaviours necessary to control weight.

Action to tackle the problem of obesity

There is an urgent need for action. NSW Health Services will need to develop a comprehensive and co-ordinated response to this problem based on an appropriate framework, such as *Eat Well NSW*. The resulting course of action will need to focus on development of programs for the prevention of obesity whilst also addressing the needs of the high proportion of the community who have an existing weight problem. The nature of this response will be addressed in a companion report focussing on where to invest health resources to achieve the best outcomes and improve the current weight status of NSW.

Table B. Summary of trends in obesity-related behaviours in NSW and Australia

	Adults		Children and adolescents	
Weight-related behaviour	**Current situation**	**Recent trends**	**Current situation**	**Recent trends**
Total energy (calorie) intake	High	Increased slightly (3-4%)	High	Increased substantially (11-15%)
Total fat intake	High	Decreased slightly (4-6%)	High	No change
Total sugar intake	High	Increased (6-12%)	High	Increased substantially (19-25%)
Sweetened drink intake	High	Increased (9-15%)	High	Increased substantially (29-48%)
Fast food consumption	High	Increased	High	Increased
Confectionery	Moderate	Increased 28%	High	Increased substantially (40-56%)
Frequency and duration of physical activity	Low	Decreased (9%)	Moderate	Probably stable
Passive leisure pursuits eg TV watching/computer games	High	Probably stable	High	Increased through computer use
Active travel to work/school	Low	Decreased	Low	Decreased

1 Introduction

1.1 The context of this report

The promotion of a healthy weight and the prevention of inappropriate weight gain is a key action area under *Eat Well NSW, NSW Health's Strategic Directions for Public Health Nutrition 2003-2007*. *Eat Well NSW* was developed as a statement of strategic directions for public health nutrition in NSW to guide and facilitate measurable population food and nutrition improvements in NSW. The statement provides:

- directions for integrating food and nutrition into public health policies and programs in NSW
- a guide to modifying or re-orienting current public health nutrition policies, strategies and programs
- priorities for new work and new investment in public health nutrition programs
- guiding principles for selecting public health approaches to improve nutrition
- a basis for advocacy with non-health sectors about the effect of their policies and programs on food and nutrition issues.

The *Eat Well NSW* priorities are directly relevant to the main issues of a number of important NSW public health policies and strategies, particularly *Healthy People 2005* and the NSW Health and Equity Statement.

This report on the weight status of the NSW population has been produced by the NSW Centre for Public Health Nutrition as part of the support material required to address the priority issues identified in *Eat Well NSW*. It assembles information to indicate the size of the problem, its health, social and economic consequences, as well as what is known about factors that contribute to the problem, and current services and programs that address the problem within NSW. It provides an argument for the need to invest resources and stimulate action to tackle the problem of overweight and obesity in NSW in a more considered and co-ordinated manner. The report also helps identify key target groups as well as key behaviours and features of the environment, which need to be considered in planning for this action. It does not contain information on which actions are most likely to yield the most benefit when addressing the problems of weight identified in the community. This is the subject of an additional report.

This report does not make detailed recommendations concerning the techniques for collecting or assessing anthropometric, dietary or physical activity data to monitor the weight status or the NSW population; nor does it propose a monitoring regime. These issues were dealt with in detail in a report from the NSW Food and Nutrition Monitoring Project that was presented to The NSW Department of Health in 1998. However, the present report does identify the core indicators of weight status and highlights changes or additions to the recommendations of the 1998 report.

1.2 The purpose of this report

This report provides the rationale for including healthy weight as a priority issue under *Eat Well NSW*. It reviews the information currently available about the extent of the problem throughout NSW and the factors that are most likely to contribute to the problem and/or provide potential action areas to address it. The report aims to:

- identify key indicators of the weight status of the NSW population from currently available sources of data
- identify gaps in the availability or quality of data available on key indicators of weight status
- provide an overview of the current weight status of the NSW population based on the key indicators of weight, health consequences, behavioural and environmental factors contributing to weight gain
- provide a brief overview of current programs and structures that address the prevention of inappropriate weight gain in the community and the management of weight problems in those individuals with an existing weight problem
- demonstrate how monitoring of weight status is an important element in the planning and evaluation of interventions to address the problem.

This report does not make recommendations about how to respond to the current problem of overweight and obesity in NSW. A separate report from the NSW Centre for Public Health Nutrition will identify the action areas to address when developing programs to combat the problems of overweight and obesity identified in this report.

1.3 Who is this report written for?

This report has been written to meet the needs of:

a. Area Health Services health workers

The information in this report will be useful to help clarify the size of the current weight problem within each area, indicate the connection with ill-health and health care costs, and identify some key dietary, physical activity and environmental factors that contribute to the problem. The report should also allow health workers to identify any special need groups in their community and to set a baseline against which the success of any interventions can be measured.

The report provides information necessary to advocate for action and to stimulate and begin the process of planning this action.

b. The NSW Department of Health

This report should be useful to the central units of NSW Health as a basis for the development of further strategies to address issues associated with healthy weight and the prevention of associated illness. It provides an overview of the current weight status of the NSW population and highlights the health, social and financial costs to NSW. This is useful background material for the Eat Well NSW strategy, but it also provides justification for addressing this issue in other program areas within NSW Health. It also supports the need for ongoing monitoring of weight status and the development of other indicators which can detect change in behavioural and environmental factors that influence the development of overweight.

c. Private sector, non-government organisations, and other government agencies that are stakeholders in addressing the issues associated with overweight and obesity.

It is important that all organisations that have a stakeholder role in addressing the problem of obesity also have access to information which clearly identifies the nature and size of the problem and identifies areas in which they have potential influence. It is intended that this report be used to raise the awareness of such organisations and gain their support for multi-sectoral action to address the problem. In addition, the report could help identify issues where such organisations have a direct influence on factors that underlie the development of obesity within the community.

1.4 A conceptual framework for identifying relevant monitoring information

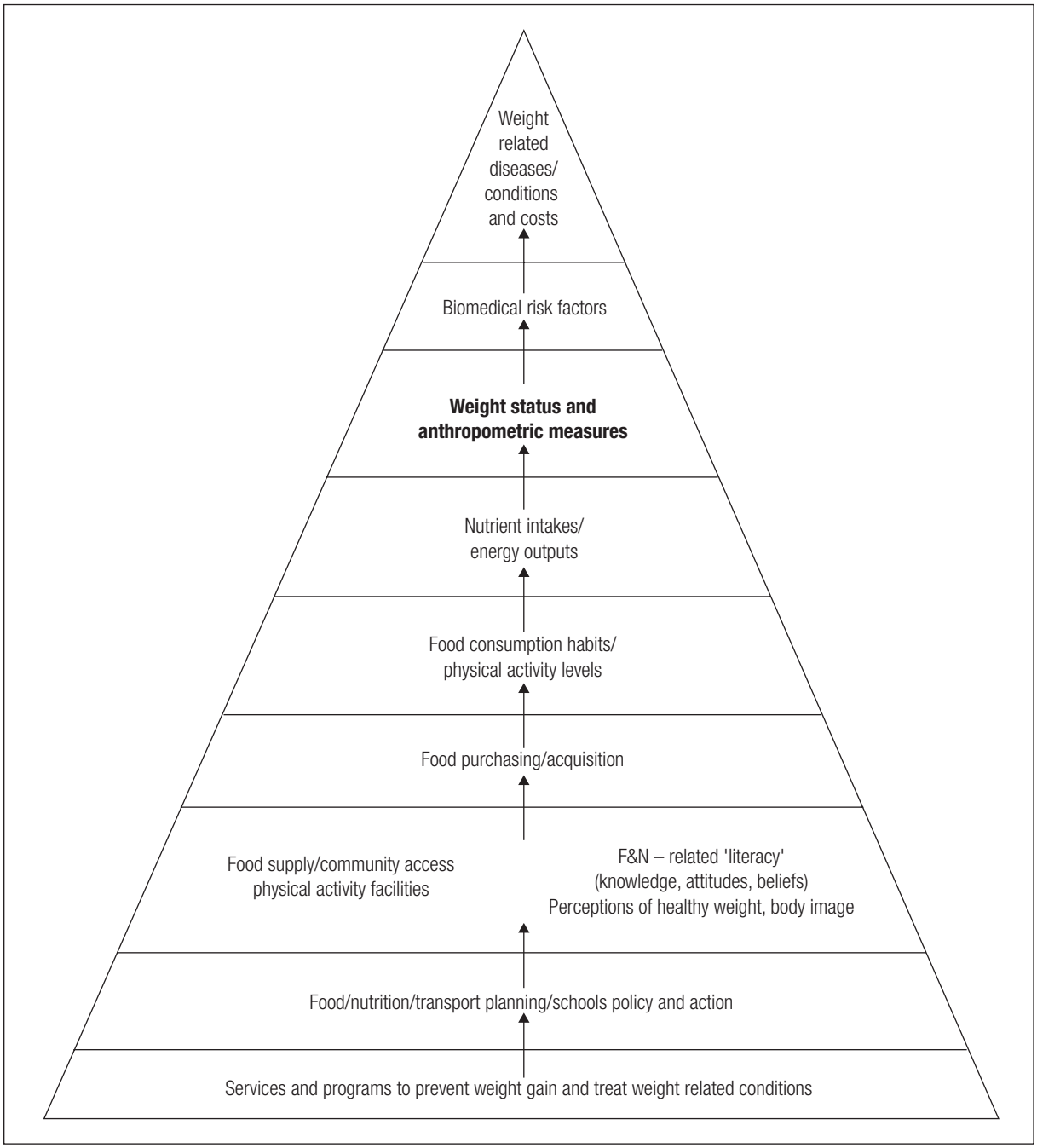
The framework outlined in Figure 1 has been used to guide the identification and presentation of appropriate information for this monitoring report. It is based on a concept developed by the Australian Food and Nutrition Monitoring Unit, to guide selection and development of national public health nutrition indicators and the presentation of information relevant to these *(Marks et al, 2001)*. The framework is discussed in more detail in a special report from the NSW Centre for Public Health Nutrition titled *MS-1: Data sources for food and nutrition monitoring in NSW; guidelines for preparing 'special issue' monitoring reports (Webb and Gill, 2001)*.

Usually, the lower levels of the hierarchy relate to action by the health and nutrition sector, while mid-levels relate to intermediate outcomes, such as consumer attitudes, actions, and habits. Upper levels relate to biomedical and health outcomes of the intended beneficiaries of the policy or program. This report has focussed on the middle to top levels of the hierarchy in an attempt to document the size of the problem and the key factors contributing to overweight and obesity in NSW. However, local health workers should collect information about the key determinants at the lower levels of the hierarchy within communities.

The information used within this report is not exhaustive but was selected on the following basis:

- is representative of NSW where possible, but relevant Australian or international data are presented where specific NSW information is not available or easily accessible
- is Area Health Service specific, where representative population data are available
- is in the public domain and comes from a reputable source
- comes from large scale or high quality surveys that are routinely collected to allow continued monitoring over time
- is based on valid, standardised and consistent measurement methods.

Figure 1. A conceptual framework for monitoring weight and related variables



2 The rationale for the promotion of healthy weight

During the last 100 years there have been enormous advances in the health status of most Australians. Better nutrition, improved living conditions and advances in therapeutic options have lead to gains in infant, child and adult health. Today most Australians can expect to live an average of 80 years, most of them relatively healthy. As the impact of infectious diseases and under-nutrition has diminished in Australia, these conditions are being replaced by chronic diseases of over-nutrition as the greatest cause of morbidity and premature mortality. Although there has been improvement in the management of these chronic diseases, their impact on the health of Australians remains significant and is likely to remain so for some time.

It is clear that the lifestyles of Australians today are closely associated with the rise in chronic disease, and the increasing levels of overweight and obesity in Australia have been implicated as a major contributor. A large increase in obesity rates among Australians has the potential to erode many of the recent health gains as excessive fatness has been associated with a wide range of chronic and debilitating illnesses such as diabetes, heart disease, some cancers, sleep apnoea, and osteoarthritis. It is now clear that there are numerous health benefits to be gained by individuals and the community as a whole by maintaining a healthy weight throughout life and preventing excessive weight gain. Urgent action is required to help address the problem of increasing levels of overweight and obesity but this action needs to be well planned, targeted and based on a good understanding of the problem in the community. It is also important that interventions avoid contributing to any existing problems of under-nutrition and disturbed eating in the community.

Measuring weight may be relatively simple but defining when it has become a health risk is more difficult. Obesity can be defined as a condition of excess body fat where the fat has accumulated to an extent that it is likely to be detrimental to health (WHO, 2000). However, obese individuals are not all the same; they vary considerably in the degree of excess body fat, the distribution of the fat within the body, and the health risks associated with the excess fat.

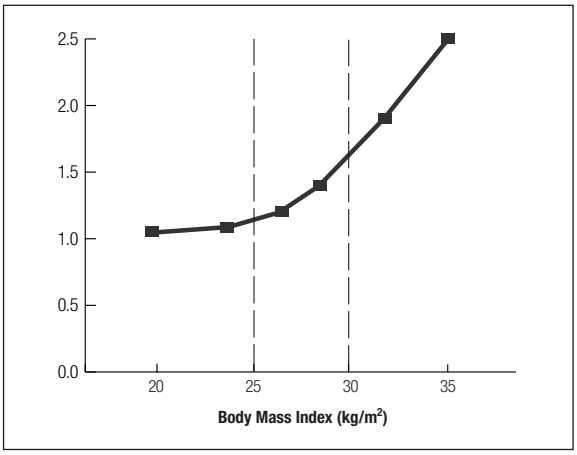
2.1 Health risk

For a long time, overweight and obesity were not perceived as serious health issues, but were viewed more as a cosmetic concern. However, there is now a wealth of evidence to show that the relationship between excess weight and risk of ill health is strong and consistent and begins at relatively low levels of BMI. Numerous health consequences of obesity have now been identified, ranging from an increased risk of premature death to several non-fatal but disabling complaints that reduce quality of life. In addition, the accumulation of excess fat around the abdomen has been found to further increase many of the risks to health.

Mortality

The risk of dying prematurely from a range of diseases increases as BMI increases. Whether there is also an increase in risk associated with leanness, suggesting a 'J' or 'U' shaped relationship between BMI and mortality, remains controversial. Recent analyses indicate that, when smoking and sub-clinical disease are accounted for, there is no specific lower threshold for increased risk of premature death, and the lowest risk is associated with a BMI between 18 and 25 kg/m^2 (Figure 2). In addition, research has shown that the longer the duration of obesity, the higher the risk of premature mortality. This implies that particular efforts should be made to control the weight of younger adults (*Linsted et al, 1991*).

Figure 2. The relationship between risk of premature death and BMI



Source: Adapted from Manson et al, 1995. This figure is based on data from 'never smoking', white US women.

Morbidity

There is a very strong association between increasing BMI and the risk of developing a number of chronic non-communicable diseases such as type 2 diabetes, CVD, gallbladder disease, and certain types of cancer (see Table 1). Information published in the NHMRC report *Acting on Australia's Weight* suggest that about 66% of type 2 diabetes, 22% of coronary heart disease (CHD) and 29% of hypertension in Australia can be attributed to obesity.

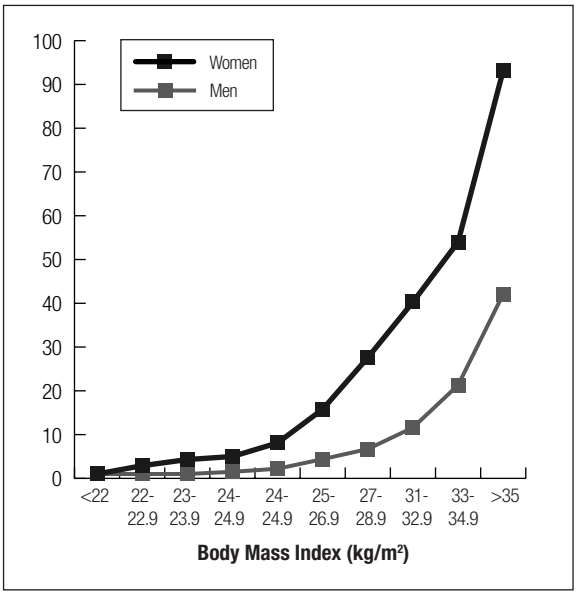
The association between obesity and type 2 diabetes is extremely strong. It is consistent for both men and women and across all age groups. The relative risk of diabetes begins to increase from a very low BMI: women with a BMI of 26 kg/m^2 already have eight times the risk of diabetes of those with a BMI of 21, whilst in men a similar comparison reveals a four-fold increase in risk. By the time BMI reaches 35 kg/m^2 the relative risk of diabetes in women has risen above 90 (see Figure 3).

Before life-threatening chronic disease develops, however, many overweight and obese patients develop at least one of a range of debilitating conditions that can drastically reduce quality of life (see Table 1). These include musculo-skeletal disorders, respiratory difficulties, skin problems and infertility that are often costly in terms of absence from work and use of health resources. Sleep apnoea is a serious and potentially life-threatening condition that is exacerbated by weight gain and obesity.

It is highly prevalent in certain Pacific communities within Australia. Excessive body weight is also frequently associated with psychosocial problems, many of which appear to result from the negative cultural bias and prejudice directed against obese people in Australia.

Weight gain has an independent and compounding effect on the risk of ill health, even in adults with a BMI within the normal range. The earlier people become obese, the longer they are obese, and the more weight they put on in

Figure 3. The relationship between BMI and the risk of type 2 diabetes



Source: Chan et al, (1994) and Colditz et al, (1995).

Table 1. Relative risk of health problems associated with obesity

Greatly increased (relative risk 2-3)	Moderately increased (relative risk 2-3)	Slightly increased (relative risk 1-2)
NIDDM	Coronary heart disease	Certain cancers (post-menopausal breast cancer, colon cancer)
Hypertension	Gallbladder disease	Reproductive hormone abnormalities
Sleep apnoea	Osteoarthritis (knees)	Polycystic ovary syndrome
Insulin resistance	Hyperuricaemia and gout	Impaired fertility
Breathlessness	Dyslipidaemia	Low back pain due to obesity
	Endometrial cancer	Increased anaesthetic risk
		Foetal defects associated with maternal obesity

Source: Adapted from WHO 2000.

adulthood, all have a negative influence on the risk of developing chronic diseases such as diabetes and CVD. It has been shown that compared to those who are able to maintain their weight within 2kg of their weight at 18-20 years of age, those who put on as little as 5-10kg have between 1.5 and 3 times the risk of developing gall bladder disease, hypertension, CHD or type 2 diabetes. The risk increases even further with larger gains in weight *(Willett et al, 1999)*. It has been shown that the risk of developing obesity is 80 times greater in women who are obese at 18 and put on a large amount of weight in early adulthood when compared to women who are lean at 18 years and put on less than 5kg. The effect is similar but smaller in men.

The risk of developing metabolic complications is exaggerated in people who have central obesity. This is related to a number of structural differences between intra-abdominal and subcutaneous adipose tissues, which makes the former more susceptible to both hormonal stimulation and changes in lipid metabolism. People of Asian descent as well as many Aborigines not following a traditional lifestyle are particularly susceptible to central obesity and tend to develop type 2 diabetes and CHD at lower levels of overweight than other populations *(WHO/IASO/IOTF, 2000)*.

Under-nutrition in pregnancy and childhood carries health risks associated with poor foetal development, low birthweight babies, and failure to thrive; but it has also been linked to development of a severe form of abdominal obesity later in life. Research has shown that children born to malnourished mothers who become obese in adult life develop NIDDM and CHD much earlier and with worse health consequences *(Barker et al, 1993).* This is of special concern to migrant and indigenous populations who may be subjected to poor nutrition in-utero, but who often gain weight when living in metropolitan areas of Australia.

The relationship between BMI and morbidity can be influenced by many factors including age, sex, ethnicity, and physical fitness. Maintaining a healthy lifestyle with a high level of physical activity and an appropriate healthy diet can attenuate the impact of obesity on health. The risk of developing diabetes and CHD is greatly reduced in obese men and women who exercise regularly.

Special risks of childhood obesity

The development of obesity during childhood not only results in an increased risk of developing the chronic weight-related diseases later in life, but also has a number of specific consequences (see Table 2).

The most common consequences of obesity in childhood and adolescence are those related to psychosocial functioning. Studies of adolescents have shown a consistent inverse relationship between level of overweight and dissatisfaction with their body as well as total self esteem *(French et al, 1995)*. Although it is difficult to find objective evidence of reduced self esteem in obese young children, they do report a strong negative reaction to an overweight body shape *(Hill & Silver, 1995)*.

Obesity in childhood is also associated with elevated risk factors for cardiovascular disease such as raised blood pressure, dyslipidaemia, insulin resistance and elevated fasting glucose. All these factors tend to track into adulthood, greatly increasing CVD risk at an earlier age as an adult. Even more concerning is the appearance of type 2 diabetes in Australian adolescents. Although still relatively uncommon, it is being diagnosed in increasing numbers and an analysis of data from the Australian Diabetes Supply Scheme suggest that type 2 diabetes is more common than type 1 diabetes in the Australian population by the age of 27 years *(P Williams, personal communication data from the Australian Diabetes Supply Scheme)*. Childhood obesity also leads to orthopaedic complications due to excessive weight bearing upon joints. The most serious of these problems include slipped capital femoral epiphyses, where the hip joint is forced out of alignment; and bone growth deformities such as Blount's disease.

Obstructive sleep apnoea is another important complication of childhood obesity which can lead to hypoventilation, its associated daytime somnolence, and in rare cases, sudden death. Hepatic complications of obesity may also be present in children, particularly non-alcoholic hepatic steatosis or fatty liver.

The most significant long-term consequence of childhood obesity is its persistence into adulthood, with all the attendant health risks. The older the child or adolescent with obesity, the more severe the obesity, and a family history of obesity, all contribute to a greater chance that it will persist into adulthood. In general obese children have a 25-50% chance of progression to adult obesity, although it may be as high as 78% in older obese adolescents *(Must and Straus 1999)*. Obese adults who were overweight as adolescents also have higher levels of weight-related morbidity and a higher risk of early mortality than those obese adults who only became obese in adulthood *(Must et al, 1992)*.

2.2 The burden of obesity in NSW and Australia

Premature mortality

The prevalence of most major metabolic conditions that have been linked to obesity remains high throughout NSW, contributing to an increased level of premature mortality. In recent years there has been a major increase in the premature mortality attributed to cancer, and cancer now ranks as the single most important cause of mortality within the 15-64 age group (see Table 3). Obesity-related cancers such as endometrial, breast, colon and kidney have made a major contribution to this increase (see Table 4).

Despite recent improvements, cardiovascular disease remains one of the major causes of premature mortality in NSW. In 1999 it accounted for 16% of male and 6% of female deaths before the age of 65 years, but almost 40% of all early deaths (before 75 years).

Table 2. Health consequences of childhood obesity

High prevalence	Intermediate prevalence	Low prevalence
Psychosocial problems	Hepatic steatosis	Orthopedic complications
Inappropriately fast growth and development	Abnormal glucose tolerance	Sleep apnoea
Persistence in adulthood		Polycystic ovary syndrome
Dyslipidaemia		Gall bladder inflammation Hypertension Type 2 diabetes

Source: Adapted from WHO 2000.

Table 3. Major cause of death for each sex in persons 15-64 years in NSW

Category	Males (% of all deaths)	Females (% of all deaths)
Cancers	20.1	16.8
Cardiovascular diseases	15.8	5.9
Injury and poisoning	15.4	3.9

Source: Public Health Division. Report of the Chief Health Officer. NSW Department of Health, 2000.

Morbidity

The *National Health Survey*, the *AusDiab Study (Dunstan et al, 2001)*, the *Report of the NSW Chief Health Officer (Public Health Division, 2000)* and the *NSW Health Survey (Public Health Division, 2002)* all provide evidence of the impact of obesity-related illness on the health of people within NSW. Diabetes, hypertension and dyslipidaemia are extremely prevalent despite attempts to tackle these problems at a clinical level (see Table 5). Type 2 diabetes is the condition that is most closely linked with the development of obesity, with around two-thirds of all diabetes being directly attributable to obesity in Australia. The *1997/98 NSW Health Survey* found that between 3-4% of the adult NSW population had been diagnosed as diabetic by their doctor. However, this is likely to be a gross underestimate of the true situation, as it is known that half of all diabetics remain undiagnosed. A more accurate indication is likely to be provided by the *AusDiab Study* released in 2000. It found that 8.0% of all males and 7.0% of females, or around 940,000 Australians aged 25 years and older, now had diabetes. This figure has trebled since 1981 with the largest increase being among younger age groups (see Figure 4). In addition, 16.3% of the population have impaired glucose metabolism, meaning that one in every four Australians 25 years and older has a problem that puts them at high risk of coronary heart disease and other chronic conditions.

Table 4. NSW cancer deaths, 1999

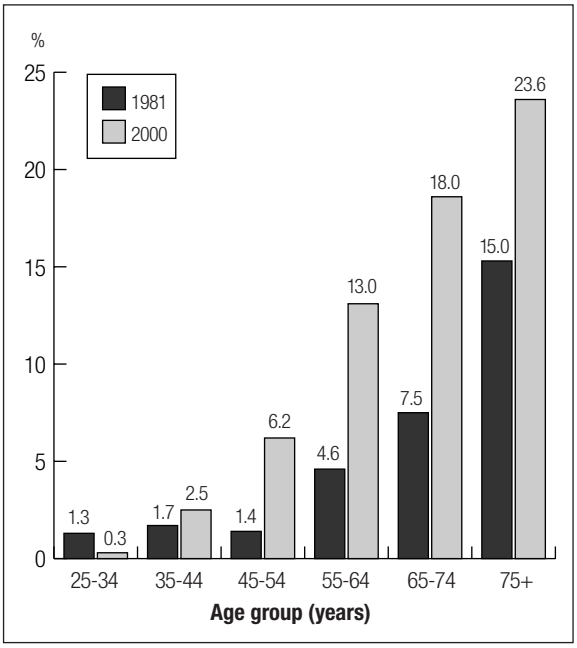
Cancer site	SMR* (/100,000) Male	SMR* (/100,000) Female	Contribution of obesity to that cancer (PAF) **
Colon cancer	16.6	11.2	11%
Breast cancer	0.3	20.9	9%
Uterine cancer	na	2.1	39%
Kidney	5.6	3.3	25%
Prostate	26.8	na	4%
Gallbladder	1.9	2.1	24%
Total (all cancers)	207.2	123.4	3.4% male 6.4% female

** Mortality rates per 100,000 standardised against the 1991 Australian pop – NSW Cancer Registry 2001.*

*** Figure taken from European study of Bergstrom et al,, 2001 see explanation under statistical and epidemiological terms.*

The *1997/98 NSW Health Survey* also reveals that around 17% of all adults surveyed had been diagnosed with hypertension by their doctor, which is consistent with the findings from the *1995 National Nutrition Survey* for all Australians, where blood pressure was measured. Around two-thirds of all adults included in the *NSW Health Survey* reported having their blood cholesterol measured at some stage, but only 14.9% of men and 13.6% of women indicated that their doctor had informed them that they had high blood cholesterol. This is in contrast with the findings of the *AusDiab Study,* which indicated that around 51% of men and women (25 years and older) had a measured total cholesterol greater than 5.5 mmol/L.

Figure 4. Increase in prevalence of diabetes between 1981 and 2000 by age groups



Source: Report of the AusDiab Study 2000.

It is difficult to get an accurate indication of the prevalence of many other obesity-related conditions such as coronary heart disease, strokes, gallbladder disease or osteoarthritis in the community because they are not easily detected in surveys. However, hospital separations and visits to the GP are other useful indicators of the extent of illness caused by the conditions. Table 6 shows the hospitalisation rates for some common obesity-related conditions in NSW. Although there are limitations with the use of hospital admission data – as some patients are admitted twice in the same year for the same condition, and one third of myocardial infarcts will result in death rather than admission, such data does indicate the enormous amount of health care resources needed to deal with these problems. Coronary heart disease is a major cause of hospitalisation with over one in every 1,000 males and half that number of females being admitted to NSW hospitals in 1999 (Table 6). Surprisingly, almost twice that number of people were admitted for care of osteoarthritis, and a similar number for back pain, indicating the huge burden these two obesity-related conditions put on NSW Health Care Services.

Table 5. Self-reported prevalence of common obesity-related diseases in NSW

Condition	Prevalence in		Contribution of obesity to that condition (PAF)
	Males	Females	
Type 2 diabetes	3.9% a	3.2% a	66%*
Hypertension	17.1% a	16.7% a	29%*
Dyslipidaemia	14.9% a	13.6% a	11%**

Source: Public Health Division, 1997/98 NSW Health Survey.

** Figure taken from NHMRC: Acting on Australia's Weight , NHMRC 1997.*

*** Figure taken from Canadian study of Birmingham et al, 1999.*

2.3 The economic burden of obesity

Obesity and its associated illnesses create a huge financial burden for society. In 1989 the direct cost of treating the major obesity-related illness in Australia was estimated to be $464 million or around 2% of the national health care expenditure *(NHMRC, 1997)*. This is equivalent to estimates in many other developed countries but below estimates from the US, where more obesity-related conditions were considered when assessing costs. Updated estimates for Australia in 1995/1996 suggest that the true cost of obesity may be between $680-$1,239 million *(S Crowley, unpublished data prepared for IOTF)*.

However, the costs of obesity within national health care systems account for only part of the huge overall economic burden to society. Other economic costs associated with overweight and obesity are referred to as 'intangible costs' and 'indirect costs' (Box 1).

Table 6. Hospitalisation rates for common obesity-related conditions in NSW, 1997/98

Condition	Hospitalisation rates		Contribution of obesity to that condition (PAF)
	Males	Females	
Coronary heart disease	1175/ 100,000[b]	524/ 100,000[b]	22%*
Ischeamic Stroke	293/ 100,000[b]	204/ 100,000[b]	4% (all stroke)
Gallbladder disease	144/ 100,000[c]	304/ 1000,000[c]	52%*
Osteoarthritis	2700/ 100,000[c]	4200/ 100,000[c]	14%*

b Hospital separation figures from the 1997/98 Report of the NSW Chief Health Officer.

c Australia-wide Hospital separation rates from Australia's Health 2000.

** Figure taken from Acting on Australia's Weight NHMRC 1997.*

*** Figure taken from Canadian study of Birmingham et al, 1999.*

Box 1. Economic costs associated with obesity

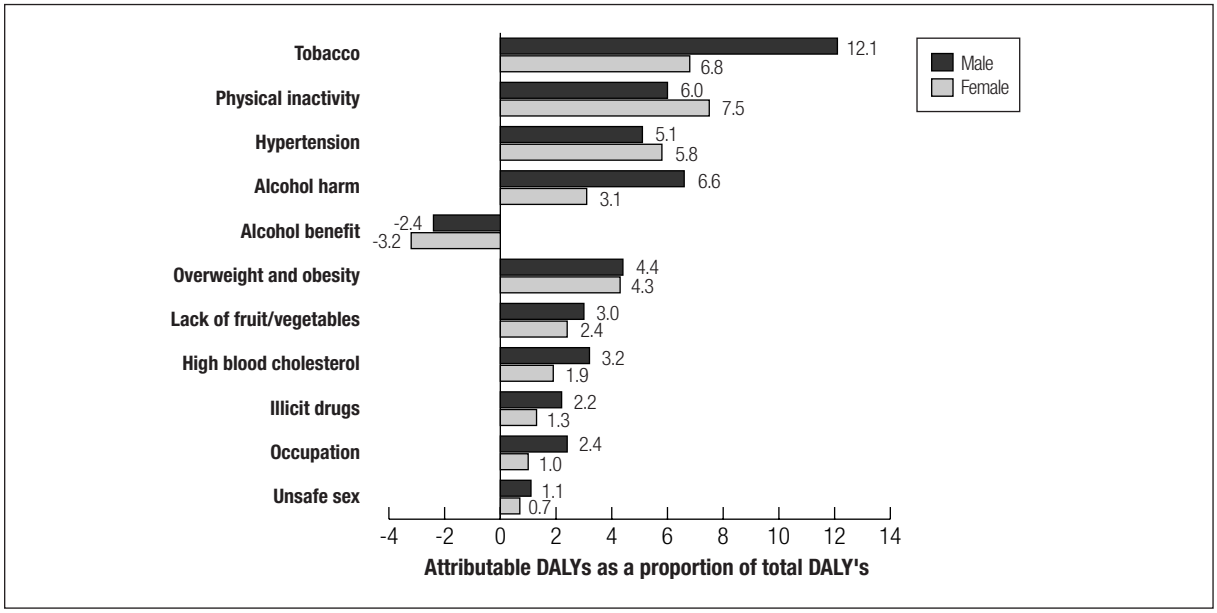
- 'direct costs': the cost to the individual and community arising as a direct result of treatment
- 'intangible costs': the cost to the individual in terms of ill health and reduced quality of life
- 'indirect costs': the cost to the rest of society in terms of lost production due to work-related absenteeism and premature death.

To try to capture all elements of the economic and social burden imposed by ill health the World Health Organization introduced the concept of disability adjusted life years (DALY) which combines the measures of years of life lost due to premature mortality (YLL) with healthy years lost due to disability (YLD).

Measuring the burden of illness through DALYs allows a comparison of the current situation to an ideal where everyone lives a long and full life free from disability. It is therefore an indicator of where potential health gain can be achieved. The Institute of Health and Welfare produced an analysis of the burden of illness in Australia in 1996 and identified that obesity contributed 4% of the total burden.

However, this is an underestimate of the potential reduction in burden of illness that could be achieved by action to prevent and treat obesity, because the contribution of obesity was discounted to avoid its influence on diabetes and heart disease being double counted in the overall burden analysis. Figure 5 shows that dealing with a range of nutrition and physical activity issues has the potential to contribute to a greatly reduced burden of illness in Australia.

Figure 5. Proportion of total burden of illness attributed to selected risk factors in Australia, 1996 by sex



Source: Mathers et al, 2000 AIHW The burden of Disease and Injury in Australia

2.4 The burden of underweight and eating disorders in Australia

It has been assumed that there is a significant health burden associated with excess slimness or underweight in adulthood because of the 'J' or 'U' shape association between BMI and mortality, with increased death rates within the leanest and heaviest weight ranges. However, the leanest group in the population is usually a mix of: smokers; those who have lost weight through some underlying condition; those who have maintained a low body weight as a consequence of genetic predisposition and a judicious lifestyle; and those who are under-nourished. When smoking and pre-existing illnesses are controlled for, the relationship between mortality and BMI becomes more linear, with the lowest rate of mortality in those who are the leanest. Therefore a BMI below the established normal range is not necessarily indicative of increased health risk and may even be associated with improved long-term health in adults. The World Health Organization recently reduced the lower limit of normal BMI from 20 kg/m^2 to 18.5 kg/m^2 based on an assessment of the level of body weight shown to be indicative of under-nutrition and reduced work performance in developing countries. However, many adults are fit and healthy at BMIs below this level and there are even suggestions that a BMI of 17.5 might be more indicative of true under-nutrition in certain ethnic groups.

Concern has also been expressed about the potential negative health consequences resulting from fluctuations in body weight that can result from deliberate attempts to control weight through dieting. Some studies have found increased morbidity among overweight people who have undergone weight cycling when compared against similarly overweight people who had experienced a steady increase in weight. Part of the problem in trying to assess the impact of weight cycling is that there is no standard definition of what constitutes cycling, and most adults go through a series of fluctuations in their weight over time. However, the largest review undertaken by the US National Taskforce on the Prevention and Treatment of Obesity (1994) found that, although weight cycling raises potential concerns, the relationship between intentional weight fluctuations and increased illness was not consistent or large enough to outweigh the potential benefits of moderate weight loss in obese patients.

Underweight in children has always been an area of concern, and in recent times there has been a heightened anxiety about the health consequences of low weight and attempted weight loss in teenagers. There is increasing evidence that low birthweight babies and young children who are very small are at increased risk of disease later in life. In addition, low body weight and failure to thrive resulting from poor nutrition early in childhood has many severe, negative health consequences. However, it is important to make a distinction between those children and adolescents who are naturally thin and those whose relative weight for height is low as a consequence of restricted nutrition. In any population there will be a small proportion of children whose weight will be low for their height, as definitions of relative weight are based on an expected normal distribution. There is no evidence that such lean children and teenagers have compromised health and development provided they continue to track along the same relative weight for height percentiles.

There is little doubt that children who achieve and maintain excessively low body weights through the manifestations of eating disorders suffer long-term physical and psychological ill health and high rates of mortality. Clinical eating disorders such as anorexia nervosa and bulimia are complex conditions that are more than extreme forms of dieting. True eating disorders appear to be rare, but other less severe disturbances in weight and eating patterns in adolescents, such as restrained eating, binge eating, purging and distortions of body image appear to be more prevalent and have been studied more widely. These practices raise a great number of concerns, but in most cases they are transient patterns of behaviour and do not result in an unhealthy low body weight or any longer term weight-related illness *(National Taskforce on the Prevention and Treatment of Obesity, 2000)*. There are, however, some indications that adolescents who engage in these behaviours are at greater risk of inappropriate dieting behaviours as adults. In addition, disturbed eating behaviours may contribute to the development of a clinical eating disorder in adolescents who have a genetic predisposition, biological vulnerability due to family circumstances, and certain personality disorders *(Wilson, 1995)*.

3 The size of the problem

3.1 How and what to monitor?

Defining and assessing the scale of the obesity problem, both from an individual and a population perspective, is a critical first step to establishing effective prevention and management strategies. This is usually a simple process (although there are some limitations addressed below which must be borne in mind) and data is usually available, or can be collected, on a national, state, and area basis.

To develop a clear picture of the problem it is recommended that the following data be monitored and assessed in relation to identified high risk groups in the population.

Adults

- Body Mass Index
- waist circumference.

Children

- Body Mass Index for age (as recommended by the NHMRC)
- indicators of disturbed eating.

Classifying overweight and obesity

Adults

Obesity is a condition of excessive fat stores but it is difficult to measure body fat directly and so surrogate measures such as the Body Mass Index (BMI), certain circumference measurements, or skin fold thickness are commonly used to indicate overweight and obesity in adults. Additional tools are available for the more detailed characterisation of obese individuals, but these tend to be reserved for special clinical situations and for research.

Body Mass Index (BMI)

The BMI provides the most useful and practical method for classifying overweight and obesity in adults and thus it is the most utilised tool for monitoring. It requires only two measurements, weight and height, both of which are routinely included in clinical and population health surveys.

Although BMI may over- or under-estimate the degree of fatness of certain individuals it is a reliable indicator of adiposity for the majority of the population. The BMI is calculated as shown in Box 2.

Box 2. Body Mass Index (BMI)

BMI = Weight (kg) / Height (m) x Height (m)

An adult who is 70kg in weight and 1.75m in height will have a BMI of 22.9kg/m^2

BMI = 70 (kg) / 1.752 (m^2) = 22.9kg/m^2

In order for BMI measurements to be understood more easily, a graded classification system has been developed (Table 7). This system was developed from original data that examined the relationship between BMI and mortality. Cut points for overweight and obesity were set at a BMI of 25kg/m^2 and 30kg/m^2 respectively, because risk of premature death began to rise gradually and then escalate rapidly from these two points. However, as indicated in the previous section, the risk of weight-related illness actually begins to rise well below a BMI of 25kg/m^2. In addition, the relationship between BMI and health is influenced by age, sex and ethnicity, and thus care must be taken in interpreting BMI classifications.

Measured versus self-reported weights and heights

A number of mail and telephone surveys rely on self-reported heights and weights to calculate BMI. In comparison studies, self-reported height is found to be over-estimated and weight underestimated, leading to an under-estimation of BMI by around 1kg/m^2. Unfortunately the level of under-reporting of weight tends to increase with increasing measured BMI. This makes self-reported measures less reliable as an indicator of the real size of the obesity problem but they remain a reasonable monitoring tool to assess trends.
A validation study of the *NSW Health Survey* (self-reported) data on height and weight found that measured weight and height classified 62% of males and 42% of females overweight or obese compared with 38% and 32%, respectively, from self-report *(Flood et al, 1999)*.

Fat distribution

The health risks of obesity are influenced by fat distribution and so it is important to assess where in the body the excess fat is stored. Two distinctive patterns of fat distribution have been characterised:

- Abdominal fat distribution: this pattern is characterised by fat deposition principally over and inside the abdominal cavity. Also known as 'android' and 'central' obesity, it carries significantly greater health risks than a more peripheral distribution of fat around the body.
- Peripheral fat distribution: fat is distributed more evenly and peripherally around the body, often over the hips. Also referred to as 'gynoid' obesity.

Waist circumference

Waist circumference is measured at the midpoint between the lower border of the rib cage and the iliac crest. It is a convenient and simple measurement tool for assessing abdominal fat accumulation. Changes in waist circumference tend to reflect changes in risk factors for cardiovascular disease and other forms of chronic illness.

Table 7. Classification of overweight in adults according to BMI

Classification	BMI (KG/M²)	Risk of co-morbidities
Underweight	<18.5	Low (but risk of other clinical problems increased)
Normal range	18.5-24.9	Average
Overweight	> 25.0	
Pre-obese	25.0-29.9	Increased
Obese class I	30.0-34.9	Moderate
Obese class II	35.0-39.9	Severe
Obese class III	>40.0	Very severe

Source: WHO, 2000.

Note: These BMI categories are independent of age and sex. However, because of differences in body proportions, BMI values may not correspond to the same degree of fatness in all individuals and populations.

As with all simple measures of fat distribution, however, the level of health risk associated with a particular waist circumference is not consistent. This varies across populations and between women and men. Sex-specific waist circumferences denoting increased risks to health have only been developed for a few populations. In the interim, WHO has recommended the use of criteria developed in the Netherlands and set out below (Table 8).

Waist-hip ratio

Fat distribution can also be assessed by determining the waist-hip ratio. A value of 0.9 or more in men, and 0.8 or more in women, indicates central obesity and an increased risk of obesity-related disease in caucasian populations. Some experts believe that the hip measurement provides valuable information related to gluteofemoral muscle mass and bone structure. Others have suggested that the ratio often hides increases in the level of central adiposity because an increase in waist circumference is often accompanied by an increase in hip circumference. This concern, together with the difficulty of ensuring consistency in two measurements rather than one, makes the waist circumference a more robust tool for initial screening.

Table 8. Interim waist circumference cut-points

	Risk of obesity-associated metabolic complications	
	Increased	Substantially increased
Men	> 94cm (37 inches)	> 102cm (40 inches)
Women	> 80cm (32 inches)	> 88cm (35 inches)

Source: WHO 2000.

Classifying overweight and obesity in children and adolescents

There is currently no standard methodology for measuring overweight and obesity in children and adolescents. However, an expert working group within Australia has identified BMI-for-age as the most appropriate measurement of adiposity in children *(Booth, Baur and Denney-Wilson, 2001*). Although no Australian BMI-for-age reference charts are available yet, the group has recommended that BMI percentile charts produced in the US by the CDC be used for clinical assessments of children's weight status, and that the International BMI for age cut-points proposed by Cole and others in a recent publication be applied in population and clinical research (see Appendix A). Some assessments of childhood weight status have already followed this approach but much of the childhood weight status data in Australia is still reported in terms of relative weight for height and age. The approaches used for defining overweight or obese children in terms of relative weight vary greatly, with some studies opting to use defined percentiles (eg 85th or 95th) as an indicator of obesity, whilst others opt for 120% of the median value.

Some key sources of data

Although height and weight is relatively easy to assess, large surveys where these parameters are physically measured across all sections of the population are irregular. In particular, statewide surveys of children's weight status are very infrequent. As a consequence, it is often necessary to use a range of data sources to find the information needed to characterise the weight status of a community. The *NSW Health Survey* has detailed information on a number of health characteristics on a large sample of NSW residents from across the state, but height and weight are self-reported. In addition, even large samples such as the *NSW Health Survey* can be subject to problems of reliability when data is analysed by area and age group because the number of subjects in each subgroup can drop very low. An accurate assessment of variations in weight status at a local level may often require a local survey.

Some useful existing sources of data on weight status are presented in Table 9.

Table 9. Some examples of existing sources of data on weight status in NSW

Source of data	How to access data	National	NSW	Area
1995 National Nutrition Survey	ABS reports	✓	✓	
2000 AusDiab Study	International Diabetes Institute	✓		
Australia's Health 2000	AIHW	✓		
AIHW CVD Risk Factor Report 2001	National Heart Foundation website	✓		
1997/98 NSW Health Survey	NSW Health website		✓	✓
1985 National Health and Fitness Study	Commonwealth Department of Health and Ageing	✓		
1997 NSW Schools Fitness and Activity Survey			✓	
1994 ABS Survey of Weight Status of Indigenous Australians	ABS reports	✓		
Various local surveys				✓
Analysis of Trends in Children's BMI Data by *Magarey et al, 2001*	*Medical Journal of Australia*	✓		

3.2 What we know about the current situation

Prevalence of overweight and obesity in Adults

There can be little doubt that overweight and obesity has now become a huge problem with serious health consequences. The *1995 National Nutrition Survey* revealed that 18.5% of all Australian men and 18.2% of women 19 years and older are classified as obese. In addition around half of all adult females and over 60% of males are now classified as overweight. National figures from the *1999/2000 AusDiab Study* remain similar with 19.1% of males aged 25 years and older and 21.8% of females being classified as obese.

The figures for NSW closely match those for the rest of Australia, although the level of obesity in men is slightly below the national average, while in women it is slightly higher. However, the overall level of overweight and obesity combined in NSW remains similar to the national average (see Table 10).

Variations by age and sex

The level of overweight and obesity is not consistent across age groups and varies between males and females. In men, the level of both overweight and obesity increases with age, reaching it's peak in the sixth decade and then declining slightly in later life. Women always have a lower level of combined overweight and obesity but have higher levels of obesity at every stage of life than men. Women reach a peak level of overweight and obesity in middle age (earlier than men) and the levels of overweight decline less in later life.

Variations by region

Although it is difficult to analyse the *1995 NNS* or *2000 AusDiab Study* data by NSW area health service regions, this information is available from an analysis of the *1997/98 NSW Health Survey*. This breakdown is useful for identifying differences between regions but because the heights and weights are self-reported, care must be taken in comparing these rates of overweight and obesity to figures from other surveys. Table 11 shows that there is considerable variation in weight status between regions in NSW, although it is clear that all areas have a serious problem with obesity (even without accounting for the level of under-reporting).

Further breakdowns of weight status by age for each area are presented in Appendix B.

Figure 6 shows that the level of overweight and obesity tends to be higher in more remote areas and lower in the more affluent metropolitan areas.

Table 10. Weight status of NSW Adults, 1995

	19-24	25-44	45-64	65-74	75 +	19 and over
Males						
Underweight	3.5	-	-	-	-	1.0
Acceptable	57.8	37.1	22.9	24.2	29.2	34.4
Overweight	32.0	48.2	50.0	54.1	39.0	46.5
Obese	6.7	13.4	25.8	17.6	16.9	16.5
Females						
Underweight	6.1	3.3	1.0	1.8	-	2.5
Acceptable	69.6	51.7	33.8	39.3	35.8	46.2
Overweight	14.3	23.8	34.5	31.2	33.4	27.2
Obese	7.9	14.8	28.1	24.4	15.6	18.8

Source: NSW data from the National Nutrition Survey.

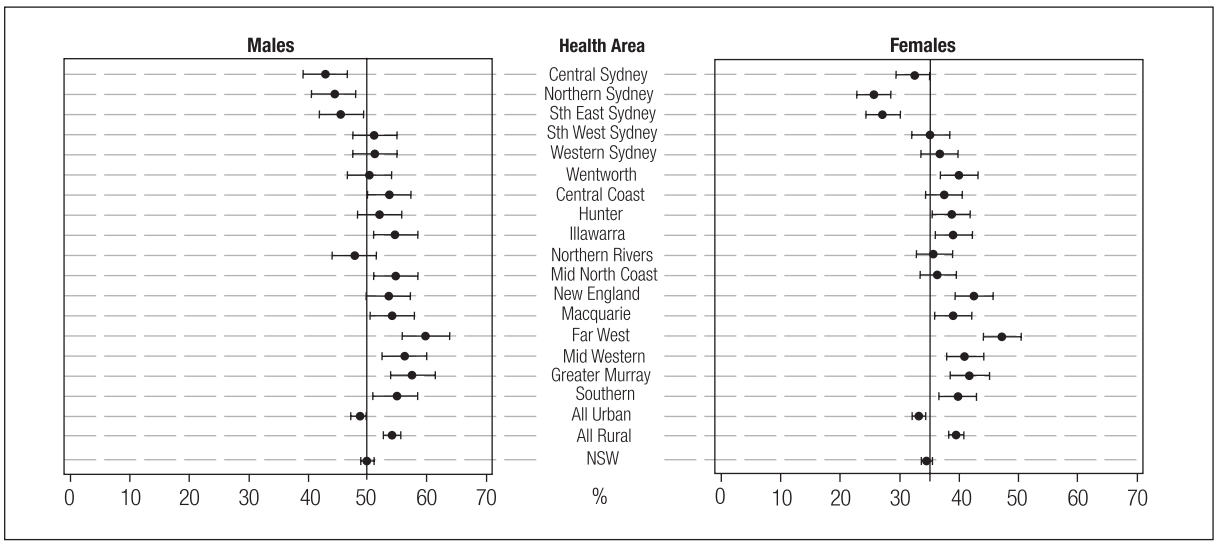
Table 11. Self-reported weight status (by BMI category) of NSW adults by Area Health Service region

Area Health Service	Under weight <18.5	Accept able 20-<25	Over-weight 25-<30	Obese 30 +
Males				
Central Sydney	2	56	33	9
Northern Sydney	2	53	38	8
Sth East Sydney	2	52	36	9
Sth West Sydney	2	46	39	13
Western Sydney	2	47	38	13
Central Coast	1	45	40	13
Wentworth	2	47	38	14
Hunter	1	47	38	14
Illawarra	2	43	41	14
Northern Rivers	3	49	37	11
Mid North Coast	1	44	43	12
New England	2	44	40	14
Macquarie	2	43	40	14
Far West	2	37	40	20
Mid Western	3	42	42	14
Southern	1	44	39	15
Greater Murray	3	39	45	13
All NSW	2	48	38	12

Area Health Service	Under-weight <18.5	Accept-able 20-<25	Over-weight 25-<30	Obese 30 +
Females				
Central Sydney	7	61	23	9
Northern Sydney	7	68	19	6
Sth East Sydney	8	65	19	8
Sth West Sydney	6	58	23	13
Western Sydney	7	57	23	13
Wentworth	5	55	25	15
Central Coast	5	57	26	12
Hunter	5	56	26	14
Illawarra	5	56	25	14
Northern River	7	58	24	12
Mid North Coast	7	56	24	12
New England	6	51	27	15
Macquarie	6	55	26	13
Far West	4	48	27	20
Mid Western	4	58	25	16
Southern	4	55	25	16
Greater Murray	4	54	26	16
All NSW	6	59	23	12

Source: NSW Health Survey 1997/98.

Figure 6. Overweight and obesity by Health Area and sex, persons aged 16 years and over, NSW 1997 and 1998



Source: NSW Health Survey 1997/1998.

Abdominal obesity

Evidence clearly indicates that abdominal fat stores are associated with an increased risk of metabolic disease. As a consequence many recent studies of population weight status have included some measure of abdominal obesity. Data from the *National Nutrition Survey* shows that a very high proportion of the NSW adult population can be classified as abdominally overweight or obese on the basis of waist-hip measurements. More than half (53.6%) of the men aged 19 and older had a waist-hip ratio greater than 0.9 and over a third (35.9%) of females exceeded the 0.8 level.

The *AusDiab Study* was able to directly measure waist circumference, which is seen as a more reliable guide to the amount of intra-abdominal fat stores. Using a cut point of 94 cm for males and 80 cm for females this study found that over half of all Australian adults could be classified as abdominally overweight or obese. Although young women had lower rates of abdominal overweight, by the age of 45 years women had reached a rate equivalent to males. The highest rates of abdominal overweight were found in post-menopausal women. Overall, equivalent numbers of men and women were classified abdominally overweight or obese, which contradicts the belief that abdominal obesity is largely a male concern (see Table 12).

Table 12. Age specific prevalence (%) of abdominal overweight as defined by excess waist circumference

	25-34	35-44	45-54	55-64	65-74	75+	Total
Males	40.1	51.3	58.3	66.6	71.2	64.8	55.2
Females	36.6	46.9	59.1	72.7	79.7	67.5	56.5
Person	38.4	49.1	58.7	69.6	75.9	66.3	55.9

Waist circumference males >94cm; females >80cm.

Source: AusDiab Study Report.

Trends

The level of overweight and obesity in Australia has risen at an alarming rate in the last 20 years. In 1980 when the National Heart Foundation conducted the first large national survey of CVD risk factors they found that 48% of men and 27% of women aged 25-64 years and living in capital cities were overweight. In the *2000 AusDiab Study*, the rates of overweight for the same population segment were 65% amongst men and 45% among women. Obesity rates rose from 7.2% in men in 1980 to 17.1% in 2000. For women the rise has been even greater, moving from 7.0% in 1980 to 18.9% in 2000. More alarming is that the greatest proportionate rise in rates of obesity has occurred in the youngest age groups. Figure 7 shows that the level of obesity in the 25-34 year old age group more than doubled in men in the last 20 years whilst in women it quadrupled in the same age group.

3.3 Obesity prevalence in children

Children have not been included in previous national CVD risk factors surveys but there have been a small number of large scale regional or state surveys that have attempted to define the level of overweight and obesity in children. Unfortunately these surveys have used different relative indices to define overweight and have not covered all age ranges, and thus the results have not been comparable. The recent consensus that BMI for age is the most effective tool for measuring adiposity in children and the release of some interim BMI for age cut-points to define overweight and obesity has allowed consistent analysis of the data collected in these samples and enabled comparisons across samples.

The *1997 NSW Schools Fitness and Physical Activity Study* was a statewide survey of 5,518 students in Years 2, 4, 6, 8 and 10. The results of this study are presented in Table 13 and show that for each age group and for both sexes, around one in every five children in NSW is overweight or obese. It is alarming that the problem of overweight in school children begins at such an early age and does not seem to resolve.

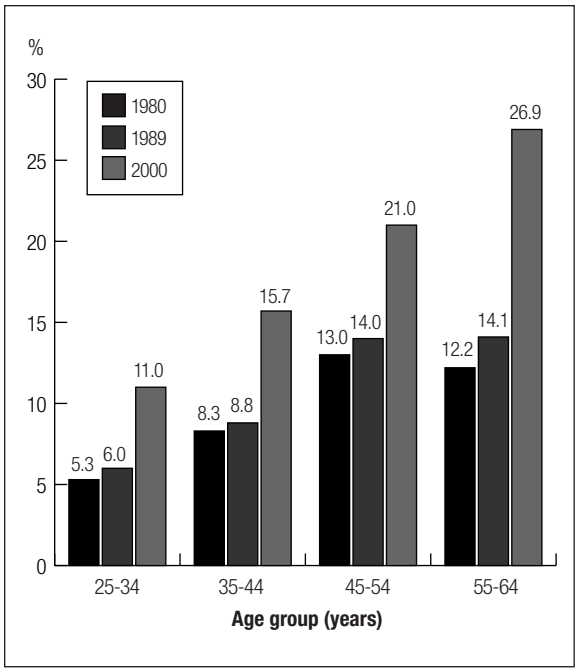
Both the *NSW Schools Fitness and Physical Activity Study* and the *1995 NNS* data show that there are only minor differences between sexes in the prevalence of overweight or obesity, although boys tend to have higher levels of overweight. There were no relationships between BMI category and age for girls, with the level of overweight being constant throughout the school years. Although the *1995 NNS* data indicates that levels of overweight are much lower in younger boys (age 7-11 years) when compared to older age groups (12-15 years), this pattern is not consistent with other major studies.

Trends

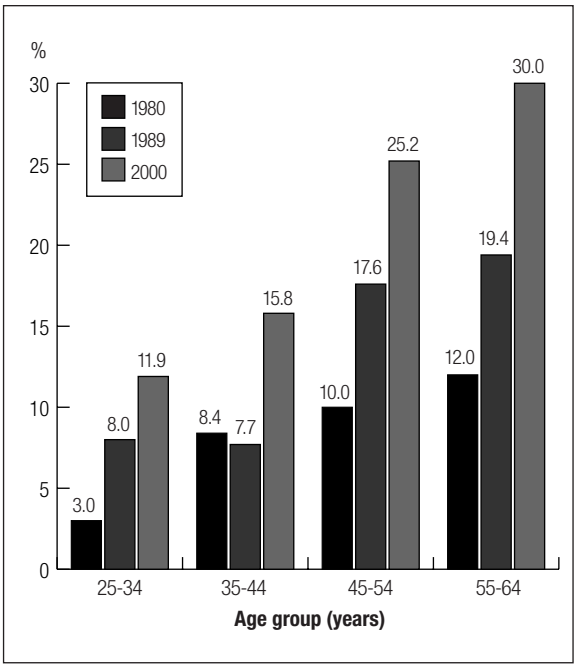
A comparison of two national surveys of children conducted in 1985 *(Australian Health and Fitness Survey)* and 1995 *(National Nutrition Survey)* revealed that there have been significant secular increases in the level of overweight and obesity that were most marked in older adolescents (see Table 14). In the ten-year period, 1985-1995 the level of combined overweight/obesity in children more than doubled in all but the youngest age group of boys whilst the level of obesity tripled in all age groups and for both sexes.

Figure 7. Changes in prevalence of obesity in Australia 1980-2000 by age group

Males



Females



Source: Report of the AusDiab Study 2000.

Table 13. Proportion of boys and girls in NSW in each BMI category

School year	2		4		6		8		10	
BMI grade	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**
Acceptable	81	78	79	78	80	77	79	82	81	80
Overweight	12	15	14	17	16	19	16	14	16	17
Obese	7	7	7	5	4	5	6	4	3	3
Overweight/obese	19	23	21	22	20	23	22	19	19	20

Source: NSW Schools Fitness and Physical Activity Survey, 1997 reported in Booth et al,, 2001.

Table 14. Proportion of Australian children overweight and obese in 1985 and 1995

	Boys				Girls			
Age	**7-11**		**12-15**		**7-11**		**12-15**	
BMI grade	**1985**	**1995**	**1985**	**1995**	**1985**	**1995**	**1985**	**1995**
Overweight	9.7	11.6	8.8	20.0	11.0	17.2	10.1	14.5
Obese	1.5	3.7	1.9	6.1	1.9	6.3	1.3	-4.4
Overweight/obese	11.2	15.3	10.7	26.1	12.9	23.5	11.4	18.9

Source: Magarey et al, 2001

Another study in Victoria compared the results of the *1985 Australian Health and Fitness Study* to a similar study of Victorian schoolchildren in 1997, which included children aged 7-12 years *(Lazarus et al, 2000)*. In almost every age group, the average BMI was significantly higher for both boys and girls in 1997 than in 1985, with the overall magnitude of the increase being equivalent to over one whole BMI unit (kg/m^2). This resulted in a shift in the distribution of BMI with the largest change experienced by those in the upper distribution of BMI (ie the heavier children became even heavier).

3.4 Which sections of the community are most affected by overweight?

The problem of overweight and obesity is so large and widespread throughout the community that it is difficult to identify any particular group within NSW that is not profoundly affected by this problem. However, there are some subsections of the population that bear a disproportionate burden of this condition. These groups include:

Lower socioeconomic status and poorly educated

A low socioeconomic status and low level of education is associated with a higher level of overweight and obesity, although the effect is more obvious in women and is not as strong as the relationship between social status and other illnesses. Analysis of the *1995 NNS* data shows that around 53% of women in the lowest socioeconomic group were overweight, compared with 44% of women in the highest socioeconomic group. In addition, 24% of women in the lowest socioeconomic group were obese compared with only 14% of those in the highest group. However, there was no significant difference in the number of overweight men (around 61%) or obese men (around 18%) in the highest when compared to the lowest socioeconomic groups.

The NSW Health Survey also demonstrates a consistent relationship between level of socioeconomic disadvantage and rate of overweight and obesity for women, with the highest level of disadvantage corresponding to the highest rates of overweight. Once again the relationship between disadvantage and weight is less clear in men although the highest level of overweight is found in men with the greatest socioeconomic disadvantage (Table 15).

A low level of education is also strongly associated with a high level of disadvantage but care must be taken to separate the effects of age and level of education as older people make up most of those who reported minimum formal schooling.

Table 15. Level of overweight and obesity by socioeconomic disadvantage score and sex, adults in NSW 16 years and older

Quintile of socio-economic disadvantage	Males %	Females %	Persons %
1st quintile	46.5	27.4	36.8
2nd quintile	51.4	33.5	42.4
3rd quintile	50.8	38.7	44.7
4th quintile	53.0	38.8	46.2
5th quintile	49.9	38.3	44.4
NSW	50.0	34.6	42.3

Certain ethnic groups

Results from both the *1995 NNS* and the *1997/1998 NSW Health Survey* show that the level of overweight and obesity is higher among people of Southern European and Middle Eastern ethnic origin, when compared to those of British origin or those who consider themselves to be Australian. Figure 8 illustrates this relationship by comparing level of overweight for country of birth. Both males and females born in Italy, Greece, Yugoslavia or Lebanon had substantially higher levels of overweight or obesity than those born in Australia. In contrast those born in South East Asia had substantially lower levels of overweight, although care must be taken in interpreting these figures as the current classification system may under-estimate overweight in Asians.

A similar relationship can be found when comparing on the basis of language spoken at home.

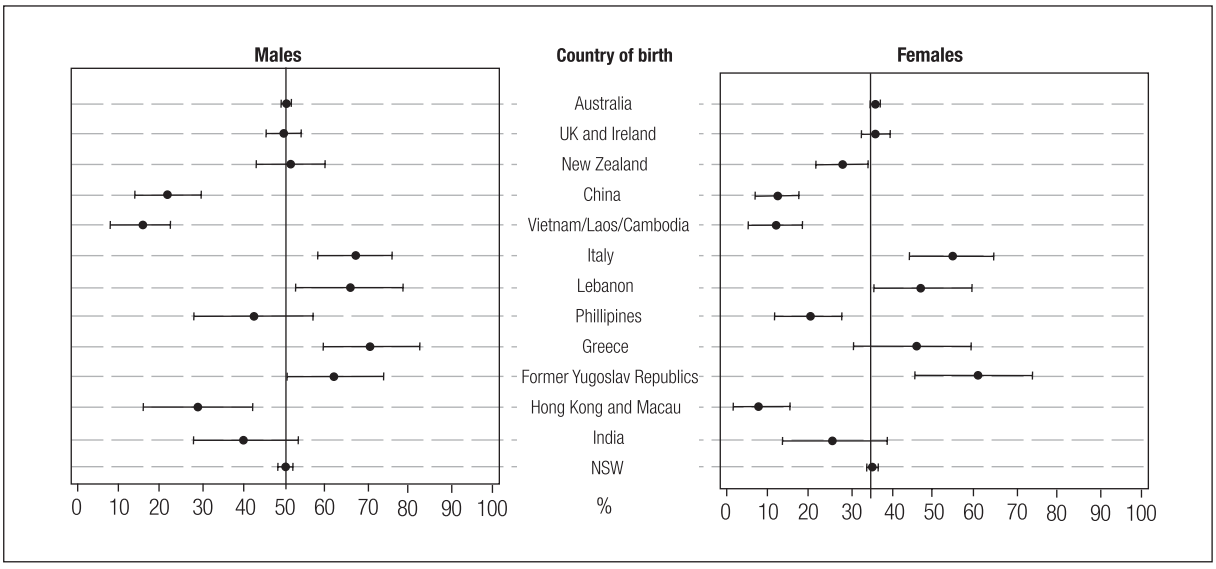
Rural and remote areas

The indication that rural and remote health communities may have higher levels of overweight and obesity, which emerges from analysis of the *NSW Health Survey* data by Health Areas, is also supported by an analysis of the same data by an index of accessibility/remoteness. As Table 16 shows, there is a substantial difference in the level of overweight for both males and females between people who have the greatest level of accessibility to services and support compared to those who are the most remote. The issue of access to appropriate foods and opportunities to engage in appropriate physical activity (which are discussed later in this report) are likely to be major contributing factors to these differentials.

Variations in children's weight status

Children's studies have revealed only a few consistent trends in weight status within the community. Only one study demonstrated an association between socioeconomic status (SES) and BMI category for girls older than 12 years, with the highest SES quintile of girls having fewer overweight/obese children than the other four SES quintiles, which did not differ. There was no relationship between BMI category and SES for boys.The prevalence of overweight/obesity was up to 3.6% higher in urban than rural areas among boys, but there were no differences between urban and rural girls. Finally, the data also indicated a higher prevalence of overweight/obesity among students from European or Middle-Eastern cultural backgrounds.

Figure 8. Overweight and obesity by country of birth and sex, persons aged 16 years and over, NSW 1997 and 1998



3.5 Problems of overweight and obesity in Indigenous populations

Although it is possible to identify information on the weight status of Aborigines and Torres Strait Islanders in both the *National Nutrition Survey (NNS)* and the *NSW Health Survey*, the small number of indigenous peoples within NSW investigated in these surveys makes meaningful analysis of such data difficult. It is therefore preferable to use data from the much larger *ABS Special Survey* of the weight status of indigenous Australians conducted in 1994. Comparing information from this survey with that collected on all Australians in the *1995 NNS* initially suggests that there is little difference between the age-adjusted proportion of overweight indigenous Australian men (62%) and all Australian men (63%). However, a closer examination of the data (Table 17) shows that almost 25% of indigenous Australian men were obese compared to only 18.5% for all Australian men. In addition, almost 60% of indigenous Australian women were overweight, a rate much higher than that seen among all Australian women (49%). Rates of obesity among indigenous Australian women were also much higher than among all Australian women (28% compared with 18%).

Differences in the level of overweight and obesity between indigenous and non-indigenous men and women are most pronounced in the younger age groups. High levels of obesity are found even among the youngest age groups of indigenous men and women and they continue to increase throughout life, up to the sixth decade.

Table 16. Body Mass Index categories by Accessibility/Remoteness Index (ARIA) and sex

	BMI categories % (95% CI)			
Aria	**Underweight <18.5**	**Acceptable 20-<25**	**Overweight 25-<30**	**Obese 30+**
Males				
Very remote	0	40	41	20
Remote	2	41	39	19
Mod. accessible	2	41	40	17
Accessible	2	43	42	13
Highly accessible	2	49	38	11
Females				
Very remote	1	46	35	18
Remote	5	50	26	19
Mod. accessible	5	52	26	17
Accessible	5	55	26	14
Highly accessible	6	61	22	11

Source: 1997/98 NSW Health Survey

3.6 *The level of underweight and possible undernutrition*

Very few studies of weight status have commented upon the levels of underweight in the Australian community. This may be a consequence of the small proportion of adults who fit into this category or it may reflect a lack of clarity in the relationship between underweight and health. Table 10 indicates that underweight is extremely rare in males in Australia and is only present in men aged less than 24 years. In women the level of underweight reaches 6.1% in the 19-24 year age group but drops quickly and remains below 2% throughout much of life. Given that underweight is restricted to the younger age groups, it might be reasonable to expect that many who fall within this category may in fact be very lean and fit rather than clinically underweight.

Defining underweight in groups of older children is even more complicated than for adults, as different rates and timing of growth and development make it difficult to define specific cut points for thinness. Underweight in children is usually defined in relation to the tracking of weight along an established percentile over time in an individual. As a consequence, most analyses of childhood weight data have avoided this category. However, the *1995 NNS* did undertake a specific analysis of childhood weight status using WHO BMI-for-age cut points. This analysis showed that boys were much more likely to have a low BMI-for-age than girls but that the level of underweight was quite small, with the largest level being 5.2% of 9-11 year old boys. Surprisingly a low BMI-for-age was not present in teenage girls aged 12-18 (Table 18).

Table 17. Weight status of indigenous Australians 1994

	18-24	25-34	35-44	45-54	55-64	65+	Total
Males							
Underweight	7	2	1	3	1	6	3
Acceptable	48	36	29	24	32	41	36
Overweight	27	39	36	43	40	40	36
Obese	18	22	34	30	27	14	25
Females							
Underweight	8	7	4	3	2	4	6
Acceptable	46	41	33	24	20	38	37
Overweight	23	26	32	40	29	29	29
Obese	22	26	30	34	48	29	28

Source: ABS survey on overweight and obesity, indigenous Australians

There have been surprisingly few reported studies on the prevalence and development of eating disorders in Australia. Studies in South Australia have shown that true anorexia nervosa is quite rare, affecting around 0.1% of girls aged 12-18 years. Anorexia bulimia is found in around 1-2% of adult women *(Ben Tovim et al, 1989 and 1990).* Despite media reports about the explosion of such eating disorders their rates appear to have remained quite stable over recent times. However, other less severe disturbances in weight and eating patterns in adolescents such as restrained eating, binge eating, purging and distortions of body image appear to be more prevalent and have been studied more widely, although usually in small select samples. These studies have usually found high levels of dieting behaviour among teenage girls, and to a lesser extent, boys, and have identified inappropriate weight loss practices, such as use of laxatives and diuretics and self-induced vomiting. However, it is difficult to quantify the extent of the problem across NSW from these small studies.

Table 18. BMI for age using WHO standard for children 9-18 years

	Boys			Girls		
BMI status	**9-11 %**	**12-15 %**	**16-18 %**	**9-11 %**	**12-15 %**	**16-18 %**
Low BMI for age	5.2	3.4	1.8	1.5	-	-
Normal BMI for age	74.1	68.9	74.9	72.1	80.6	78.2
At risk of overweight	13.3	20.3	14.7	16.3	11.9	13.7
Overweight	7.0	7.2	7.0	10.1	6.5	6.0

Source: 1995 NNS Nutrient Intakes and Physical Measurements. ABS.

4 Key factors contributing to overweight and obesity

4.1 How and what to monitor?

Monitoring key practices and behaviours that contribute to the development of overweight and obesity in the community is an important component of the overall assessment of weight status in NSW. As the potential causes of weight gain and obesity are many and varied, it is important to select a few key variables that will not only provide a good indication of level of exercise and food intake but also address behaviours, policies and programs that support or inhibit the maintenance of a healthy weight.

The following measures have been used in this report and are recommended for future monitoring because of their potential usefulness as an indicator of key behaviours or ability to describe the environment, as well as the relative ease of data collection. The rationale for their selection is explained in more detail in the following section.

Dietary behaviours

- total energy and selected nutrient intake
- consumption of high energy foods and drinks such as soft drinks and take-away foods.

Physical activity behaviours

- reported physical activity levels
- reported levels of inactivity
- surrogate indicators of activity/inactivity such TV viewing hours or sports participation.

Environmental influences on dietary and physical activity behaviours

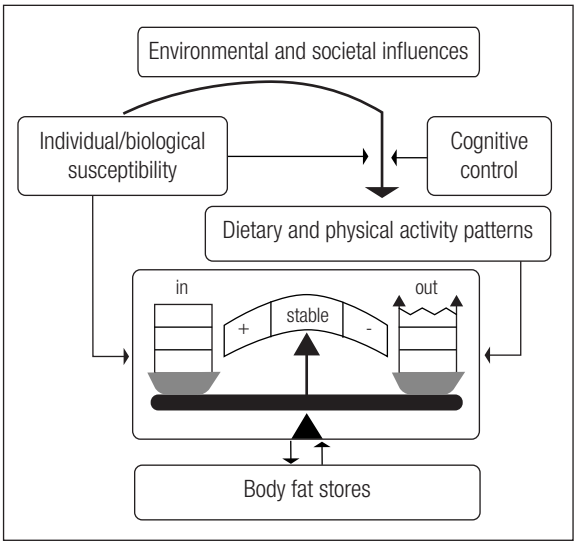
- food availability and pricing
- food advertising
- availability of exercise facilities and safe open spaces
- active transport options.

4.2 Factors important in the development of obesity

Weight gain and obesity develop when the energy intake from food and drink exceeds energy expenditure from physical activity and other metabolic processes. Thus there are obvious reasons for concentrating monitoring efforts on dietary and physical activity behaviours. However, this does not imply that obesity is self-inflicted, resulting simply from a wilful overindulgence on highly palatable foods and lack of exercise due to laziness. Research has consistently shown that numerous and diverse factors give rise to such weight gain promoting behaviours and it is the interaction between a number of these that underlies the development of obesity.

Figure 9 presents a simple model of energy balance and weight gain. Physiological 'energy regulation' mechanisms operate within each person to keep weight and body fat stores stable in the long-term. However, powerful societal and environmental forces influence energy intake and expenditure through effects on dietary factors and physical activity patterns, and may overwhelm the physiological control of body weight. The susceptibility of individuals to these forces is affected by genetic and other biological factors such as gender, age and hormonal activities, over which they have little or no control. Dietary factors and physical activity patterns are the major modifiable factors explaining excessive weight gain, which, if corrected, can serve to prevent obesity.

Figure 9. Factors influencing the development of obesity



Source: Adapted from WHO 2000.

Dietary and physical activity patterns

Food intake and physical activity patterns have a strong influence on energy balance. High fat/energy-dense diets and sedentary lifestyles are the two factors most strongly associated with increased prevalence of obesity worldwide.

Dietary factors

The total energy intake is the most crucial issue in energy balance, but fat plays a key role in undermining the body's weight regulatory systems; in comparison to protein and carbohydrate, it is very poorly regulated at the level of both intake and expenditure (Box 3).

In recent times there has been a renewed focus on the role of carbohydrate in weight gain, especially as the proportion of foods containing large amounts of refined carbohydrates (usually in the form of maltodextrins or corn syrup) has increased rapidly. These high refined carbohydrate foods can have the same energy-density as high fat foods. This is in contrast to foods high in unrefined carbohydrates that are often low in energy density. The role of sugar intake on body weight regulation is still unclear, but there is some evidence that sweetened drinks contribute to weight gain and a concern that eating too many high-sugar/high-fat foods may be an important underlying factor in the excess energy intakes of some people. Alcohol can also play a role; although alcohol energy cannot be stored or directly converted to fat stores, it is rapidly metabolised and provides energy that spares protein, fat and carbohydrate.

Box 3. Obesity-promoting qualities of dietary fat

Energy density: fat has more than double the energy per unit weight of protein and carbohydrate, making it relatively easy to passively consume excessive energy from fatty foods.

Appetite control signals: in comparison to unrefined carbohydrate and protein, fat has a poor ability to suppress hunger and to bring episodes of eating to an end. The appetite control signals are not strong enough, or are too delayed to prevent the rapid intake of energy from a fatty meal.

Body storage: in contrast to carbohydrate and protein, the capacity for fat storage in the body is virtually unlimited. Excess dietary fat is readily stored as body fat with a very high efficiency.

Autoregulation: the ability of dietary fat to stimulate its own metabolism in response to increased fat intake is very poor in comparison to the compensatory responses stimulated by excess protein and carbohydrate intakes.

Palatability: the potent sensory qualities of fat stimulate food intake. Sweetened high-fat foods may be particularly prone to over consumption.

Physical activity patterns

The decreased levels of physical activity and increased levels of sedentary behaviour associated with modern inactive lifestyles play an important role in weight gain and the development of obesity. The evidence to support this conclusion comes from a variety of sources (Box 4). People living modern sedentary urban lifestyles may find it difficult to attain the levels of physical activity required to avoid excessive weight gain simply by increasing activity during 'leisure time'. Thus physical activity monitoring and promotion needs to focus on incidental activity as well as leisure-time physical activity.

Box 4. Physical inactivity and obesity

- obesity is absent among elite athletes whilst those who give up sport frequently experience increases in body weight and fatness
- overweight and obese individuals tend to be less active than lean people
- increasing rates of obesity have paralleled increases in markers of inactivity such as the amount of time spent viewing television and the number of cars per household.
- the amount of television watched by young children is predictive of BMI later in life
- a low level of physical activity at leisure in adults is predictive of substantial weight gain (more than 5kg) in five years time.

Sedentary behaviour

Sedentary behaviour is not merely the inverse of being physically active. They are different, although inter-linked behaviours. For example, television viewing has been shown to have an association with obesity in childhood and this may be a consequence of inactivity, but it may also be a result of a decrease in metabolic rate or increased food intake which has been shown to accompany TV viewing. Other key sedentary behaviours to consider include: school work at home, video and computer games, reading, sedentary hobbies and chores and sitting in powered transport.

Environmental and societal factors

The external social, political and economic environment in which people live has a profound effect on the way people live and behave. Each day people interact with a wide range of services, systems and pressures in settings such as schools, the workplace, home, restaurants and take-away food outlets. In addition, these settings are influenced by laws, policies, economic imperatives and attitudes of governments, industry and society as a whole. Each of the features of this complex system, which shapes the environment we live in, has the capacity to inhibit or encourage appropriate dietary and physical activity patterns. The availability of open space, access to public transport, design of suburbs, access to buildings, the perceived level of safety, provision of lighting and many other factors influence our capacity and desire to be more physically active in our daily lives. Similarly, access to appropriate food outlets, advertising pressures, school food policies, nutrition information and labelling all potentially influence food selection. In past years the usual environment throughout much of Australia enforced a reasonable degree of physical activity and limited food choice. Today we have access to a wide variety of cheap, high fat/energy dense foods that are aggressively marketed and we are encouraged to avoid physical activity in our daily lives. This has led some researchers to term the environment in Australia today as 'obesogenic' or 'toxic' because it inhibits appropriate dietary and physical activity patterns and encourages energy imbalance (see Egger and Swinburn, 1997).

Some key sources of data

Large-scale surveys to collect information on the specific dietary intake of Australians are very infrequent, with no confirmed time for the repeat of the *1995 National Nutrition Survey*. Therefore it is necessary to obtain information on dietary habits of people within the community from a variety of other data sources. A number of other studies, such as the *NSW Health Survey*, have included specific questions designed to determine the level of certain practices that have been identified as good indicators of the general dietary patterns of the community. In certain circumstances, such questions may prove to be a more useful monitoring tool, especially if they address dietary behaviours that have been targeted for change. The *Australian School Students' Alcohol and Drug Survey* also contains some questions relating to dietary and physical activity behaviours of adolescents, and this is analysed at a NSW level. Other surveys from the Australian Bureau of Statistics, such as the household expenditure surveys and apparent consumption data, give a gross indication of likely dietary behaviours, although most of this data cannot be disaggregated for NSW alone. Other information can be obtained from market research surveys and from reports released by specific sectors of the food industry.

The difficulties of accurately assessing physical activity have been alluded to previously. However, simple questions on levels of physical activity have been included in a number of surveys and are regularly reported in publications by the Australian Institute of Health and Welfare and Active Australia. In addition, market research into our leisure behaviour and work practices gives valuable information about the level of activity and time spent in passive pursuits. Most of the information about the local environment is likely to be obtained from local environmental audits or community assessments or from small-scale research projects.

Some of the potential sources of data on these issues are listed in Table 19.

4.3 What do we know about current behaviours?

Current dietary behaviour

It is important to monitor the composition of the diet of people in NSW to ascertain the current dietary intake patterns, determine opportunities for intervention, and to monitor changes in dietary practices which are likely to contribute to weight gain. However, the assessment of dietary intake and dietary behaviour is a difficult and expensive task and as a consequence complete assessments of the diet of Australians are not undertaken frequently. The *1995 National Nutrition Survey* was the first co-ordinated collection of dietary data at a national level for many years.Therefore, indirect and surrogate measures of dietary behaviour from a wide range of sources need to be considered to gain a clear picture of the current intake patterns and trends over time in NSW.

Mean consumption of energy, fat, alcohol and sugar

An analysis of the *1995 National Nutrition Survey* for NSW participants reveals that energy intake levels peak in late adolescence for both males and females, although in women this peak occurs slightly later, when they are in their early 20s. The largest contribution to energy intake still comes from carbohydrate, which provides 45-50% of food energy for both males and females (Table 20). Around half of the carbohydrate is in the form of sugars (including fruit sugars), although younger children tend to consume more sugars and

Table 19. Some examples of existing sources of data on weight-related behaviours in NSW

Source of data	How to access information	National	NSW	Area
1995 National Nutrition Survey	Commonwealth Department of Health and Ageing	✓	✓	
ABS Apparent Consumption of Foodstuffs and Nutrients	ABS reports	✓		
ABS Household Expenditure Survey	ABS reports	✓		
AIHW publication – *Australia's Health 2000*	Government bookstore	✓		
ABS various occasional surveys	ABS reports	✓		
Australian Food and Nutrition Monitoring Unit. *Report on comparison of data between the 1983, 1985 and 1995 National Nutrition Surveys*	Australian Food and Nutrition Monitoring Unit website			
Active Australia reports and surveys	Commonwealth Department of Health and Ageing	✓	✓	
Market Research Reports on food and leisure activity – eg AC Neilsen, BIS Shrapnel	Listed on company website (often expensive to purchase)	✓		
The 1996 and 1999 Australian School Students' Alcohol and Drugs Survey	*NSW Health Report*	✓	✓	
NSW Health Survey	NSW Health website		✓	✓
NSW Child Health Survey	NSW Health website		✓	✓
Statewide research surveys	Variable		✓	
Local research surveys	Variable			✓

less starch. Fat intakes remain above target levels for both absolute levels of intake and the percentage of energy provided by fat. Variation with age tends to follow the variation pattern of energy intake. Alcohol provides a small but not insignificant contribution to the daily energy intake of drinkers with an average intake of 34.6g (and potentially 970kj) among male drinkers and 23.4g (potentially 690kj) among women.

Main food sources of fat energy

It is important to understand which foods are the main sources of fat in the diet so that specific food groups can be identified as the focus of interventions to reduce energy intake. This type of information is rarely available at the local or area level but it is reasonable to use national data as a guide. Table 21 shows the proportion of fat provided by different food groups using data from the *1995 NNS*. It indicates that the relative contribution of different food groups is consistent for both men and

Table 20. Median daily energy and macronutrient intake by age in NSW

Age	Total energy kj	Total fat (g)	% energy from fat	Total sugars (g)	% energy from sugars	Alcohol (g) per consumer
Males						
4-7	7,663	72	33.0	128	26.8	-
8-11	9,323	82	32.9	134	24.6	-
12-15	11,754	97	32.9	171	25.6	-
16-18	13,027	120	35.5	174	25.5	12.7
19-24	12,821	116	34.0	152	20.8	28.7
25-44	10,987	92	32.5	118	18.6	38.3
45-64	9,583	81	31.2	99	17.7	37.2
65-74	8,613	71	31.1	97	19.8	25.4
75+	7,670	64	31.6	94	19.9	36.7
19 and over	10,166	87	32.2	114	18.8	34.6
Females						
4-7	7,011	65	32.4	116	27.6	-
8-11	7,754	77	34.3	115	24.6	-
12-15	7,914	73	33.3	120	25.0	-
16-18	8,002	60	30.8	110	22.7	22.2
19-24	8,085	66	33.3	101	21.5	28.6
25-44	7,610	66	32.8	84	19.8	23.4
45-64	6,885	60	31.9	78	19.7	23.9
65-75	6,133	52	31.8	82	20.8	23.4
75+	5,860	47	31.6	80	22.2	13.1
19 and over	7,102	61	32.4	83	20.2	23.4

women. The fat content of meat and meat products is well understood by most in the community and it comes as no surprise that this food group provides the greatest percentage of fat in the diet of Australian adults. However, the fact that baked goods are now the second largest source of fat, contributing over 18% of all energy from fat, has important implications for identifying fat reduction strategies. Milk products and fat spreads and oils are still significant sources of fat, providing scope for reducing intake in the community. However, the fact that snack products, confectionery and sauces each contribute only around 2% of fat energy does not mean that their role is inconsequential; they can also be potential targets for fat reduction strategies, particularly in younger adults and children where the contribution is higher.

Table 21. Proportion of fat provided by selected food groups

Food group	Males	Females
Cereals and cereal products	6.2	6.7
Cakes, biscuits, pastries etc.	18.4	18.0
Vegetable products	9.0	9.6
Milk products	16.6	16.9
Meat, poultry and associated dishes	23.7	19.8
Fish and seafood	2.3	2.6
Egg products	2.1	2.0
Snack foods	1.2	1.5
Confectionery	1.7	2.4
Seeds and nuts	2.5	2.5
Fats and oils	11.8	11.4
Savoury sauces etc	2.1	3.0

Source: 1995 NNS

Inappropriate dietary behaviours

Identifying major sources of fat in the diet presents only part of the information required to inform decision making on which food items to target in energy control strategies. In some ways it is more important to identify inappropriate dietary habits and non-core foods that contribute unnecessary and avoidable fat and energy.

Adults

The *1997 and 1998 NSW Health Surveys* included five questions relating to fat intake that gave some indication of the level of particular dietary habits that have the potential to contribute to excessive energy intake and weight gain, although they did not adequately characterise fat intake within the community. These questions related to the consumption of fried foods, the consumption of fried potato products, the consumption of processed meat products, cooking meat with added fat, and type of milk consumed. The responses to these questions indicate that there are often considerable age and sex differences in these behaviours. The regular consumption of crumbed and fried food is most prevalent in younger males and declines with age. At every age group the consumption of fried foods was lower in females than males, however it was still over 20% among females aged 16-24 years. Very similar patterns of dietary behaviours could be found for use of low fat milk, where only 38% of males and 53% of females usually use low fat milk. Almost twice as many male respondents (30.2%) as female respondents (16.6%) reported eating fried potato products twice per week or more, and males (53.8%) were also much more likely than females (33.4%) to report eating processed meat products twice per week or more. Males more commonly reported cooking their meat fried or with added fat (28.7% for males versus 20.6% for females). Females were more likely to favour stir-frying, and were also almost twice as likely to report that they rarely or never ate meat.

Table 22. Proportion of NSW population aged 16 years and over eating battered/crumbed food twice or more per week by sex ,1997

Age (yrs)	Males %	Females %	Persons %
All	19.4	10.3	14.8
16-24	33.5	21.1	27.4
25-34	24.8	13.0	18.9
35-44	18.6	9.1	13.8
45-54	12.6	6.3	9.5
55-64	11.4	5.7	8.5
65-74	11.6	4.7	8.0
75+	7.7	6.8	7.2

Source: 1997/98 NSW Health Survey

Children

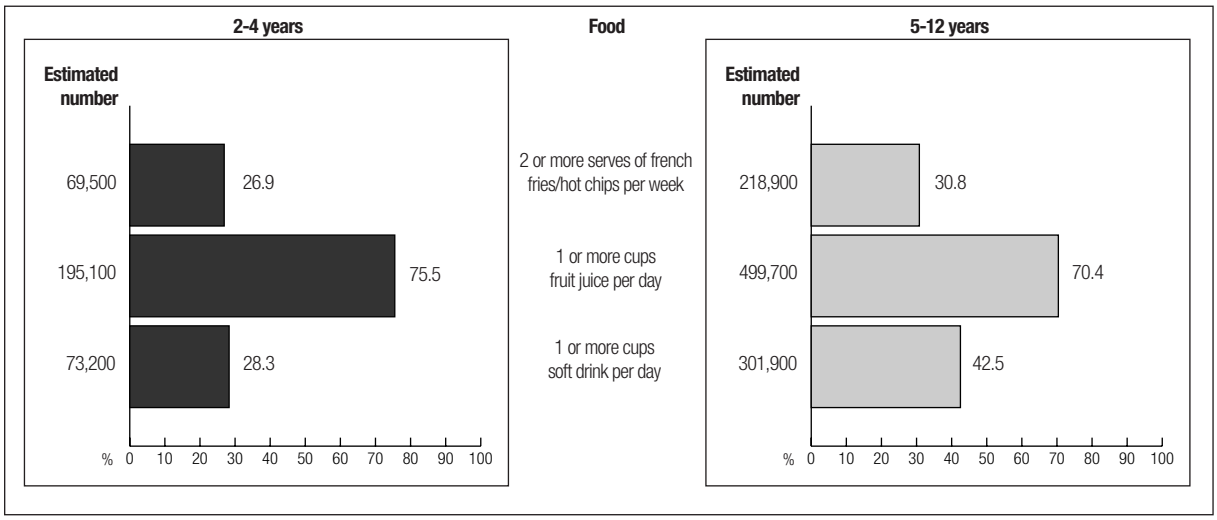
The *2001 NSW Child Health Survey* collected information on a range of health issues from 9,425 children, 12 years or younger, throughout NSW. It included questions about the consumption of specific food items that have the potential to contribute or protect against the development of obesity and associated diseases, including vegetable and fruit intake, milk, fruit juice, soft drinks and hot chips.

Hot potato chips contribute around 8% of the total dietary fat consumed by children aged 2-12 years in Australia and they are therefore a dietary habit of concern. Over two thirds of children reported eating at least one serve of hot chips or french fries each week (Figure 10) and around 27% of children aged 2-4 years and 31% of children aged 5-12 years ate two or more serves each week. One in ten children reporting consuming three or more serves each week.

Although there is no firm evidence that a high consumption of fruit and vegetables is associated with reduced intake of fat or energy, increasing fruit and vegetable intake has the potential to displace high energy snack foods within a child's diet. However only 15% of children aged 2-4 years and 12% of those aged 5-12 years reported eating the recommended levels of vegetables. A much greater proportion of children (78% of 2-4 year olds and 70% of 5-12 year olds) reported consuming the recommended minimum levels of fruit. Fruit juice was also consumed quite regularly, with over 70% of all children reporting a consumption of at least one cup each day. Nearly one in four children aged 2-4 and one in six 5-12 year olds reported consuming three or more cups of juice each day. The high energy content and lack of fibre in fruit juice may contribute to excess daily energy intakes in young children who have this level of intake.

The 1999 *Australian School Students' Alcohol and Drug Survey (ASSAD)* asked questions relating to the type of milk usually consumed. Around one quarter (27%) of males and one-third (38%) of females reported that they usually drank reduced fat or skim milk. In girls the proportion of low fat milk consumers tended to increase with age reaching a high of 47% in girls aged 17 years. In boys there was no association with age.

Figure 10. Consumption of selected foods by age group, children aged 2-12 years, NSW 2001



Analysis of the *1995 NNS* food intake data for children shows that foods not included in the core five food group model such as non-alcoholic beverages, cereal-based products, snack foods, sugar products and confectionery contributed around 25% of the total fat intake and 20% of total energy intake (Table 23 – Magarey, unpublished). This presents considerable scope for modifying the diet of children to avoid excess energy without compromising their nutrition or growth.

Intake of take-away, snack food and sweetened drinks

Some analyses have linked the increase in fast food consumption to increasing rates of obesity *(Binkley et al, 2000)* and others have found that fast food use is associated with increased energy and fat intake as well as higher body weight in females (but not males) *(French et al, 2000)*.

According to economic research firm BIS Shrapnel, food eaten away from home accounts for around 28% of the food expenditure in Australia. In 1999 this market was valued at 19 billion dollars and almost half of this expenditure (an estimated $8.5 billion) is on fast foods. Although this market is contracting slightly, the average Australian still bought 11 hamburgers in 2000 (two fewer than in 1997), 18 servings of hot chips (up from 16 in 1997), six servings of fish (up from four), 25 sandwiches (up from 24), eight pizzas (unchanged), six servings of Chinese (up from five) and seven pies (down from eight). This was the equivalent of around 1.4 billion meals.

Table 23. Median energy and fat contribution of core and selected non-core food groups to the diet of children

	% Total intake		
	Energy	**Total fat**	**Sugar**
Core	71	63	70
Non-core[1]	22	24	23

Source: Magarey 2000 unpublished

The *1999 Australian School Students' Alcohol and Drug Survey (ASSAD)* also asked children aged 12-17 years about their consumption of fast foods. Over three quarters of students had eaten a meal bought from a fast food outlet in the past week and 10% of males and 8% of females had eaten fast food on four or more occasions. The frequency of consumption generally increased with age, with 14% of males and 9% of females aged 17 reporting consuming fast food on four or more occasions in the past week (see Table 24).

According to research group MINTEL, Australians are the fourth largest consumers of snack foods behind the United States, Britain and Ireland. Australian households spend on average AU$600 per annum on snack foods, or 327 packets per annum (Australasian Confectionery Manufacturers Association, 1999).

In addition the consumption of carbonated drinks continues to rise. An average teenager (12-18 years old) soft drink consumer in NSW would drink between 300-600 ml of soft drink each day, which is more than their daily intake of milk. Apparent consumption of carbonated and aerated beverages in Australia has increased from the late 1980s figure of 87.4 litres consumed per capita to 113.0 litres

Table 24. Percentage of children aged 12-17 reporting consuming food from a fast food outlet during past week

		Age						
Frequency		***12***	***13***	***14***	***15***	***16***	***17***	***All***
None	M	22	18	24	16	19	15	19
	F	22	28	23	22	19	20	23
Once	M	43	40	39	37	30	30	37
	F	45	37	38	36	41	36	39
2-3 times	M	24	31	25	32	37	39	31
	F	22	26	30	31	28	34	28
4-5 times	M	4	2	5	9	8	9	6
	F	6	4	4	6	7	6	5
5 times or more	M	2	3	3	4	5	5	4
	F	3	1	3	4	3	3	3
Don't know /not stated	M	6	5	3	2	2	1	3
	F	3	2	2	1	1	1	2

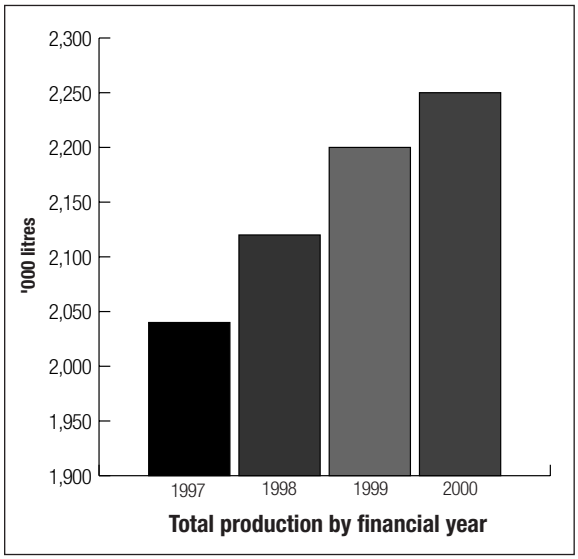
per capita in 1998-1999, an increase of 30% in a decade *(ABS 2000)*. The mean intake of soft drink for all ages rose from 26 to 31 cans per year in just two years between 1997-99 *(BIS Shrapnel 2000*). The *2001 NSW Child Health Survey* found that around 28.4% of children aged 2-4 years reported drinking at least one cup of soft drink, cordial or sports drink each day, with 13% indicating they consumed at least two cups each day. In older children (5-12 years) this figure was even higher, with 42.5% reporting consuming at least one cup whilst half of these reporting drinking two or more cups each day.

Trends in consumption

The Australian Food and Nutrition Monitoring Unit released a draft report in July 2001 which compared the nutrient intake figures from the *1995 National Nutrition Survey* with a similar survey carried out during the *1983 National Heart Foundation Risk Factor Prevalence Study*. The report gave an indication of change over time for adults. Although both surveys used a 24 hour recall, differences in samples and techniques meant that data had to be manipulated for the comparisons, and some caution is warranted in interpreting the results. The comparison study indicated that total energy intake actually increased significantly for both men and women between the surveys, in contradiction to the popular belief that we are now eating less. A significant increase in total carbohydrates appears to have contributed most of this increase in energy intake. Both total starch intake (up 28g in men and 25g in women) and total sugar intake (up 15g in men and 5g in women) increased significantly in both men and women. In contrast, the intake of total fat and alcohol declined for both men and women, although absolute fat intake remains very high at around 100g/day for men and 69g/day for women (Table 25). Most of the decline in fat intake appears to be the result of a reduced intake of fat spreads, oils, and meat, as the consumption of high fat snack products went up significantly.

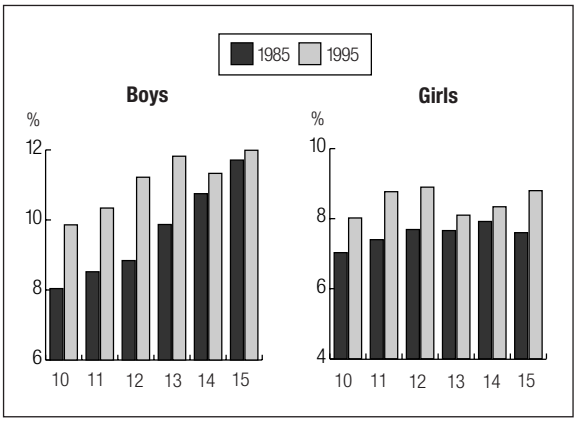
Comparisons of the *1985 National Dietary Survey of Schoolchildren* and the *1995 National Nutrition Survey* are even more problematic, as the techniques for assessing diet varied greatly. However, careful analysis from the Australian Food and Nutrition Monitoring Unit indicated that mean daily energy intake of 10 to 15 year old school children increased by around 15% in males (1400kJ) and 12% in females (900kj) between the 1985 and 1995 surveys. This increase occurred at every age (Figure 12).

Figure 11. Recent growth in the soft drink industry in Australia



Source: Australian Soft Drink Association, 2001.

Figure 12. Mean energy intake (MJ) of 10 to 15 year old children in 1985 and 1995



Source: Cook et al, 2001.

This increase in energy intake was derived from a 20% increase in total carbohydrate and a small increase in protein intake. There was no change in intake of basic cereal foods (rice, bread, breakfast cereals), but the intake of cereal-based foods (cakes, biscuits, pies, pizza and some desserts) increased significantly. In addition there was a 20% increase in total sugar intake brought about by significant increases in the consumption of confectionery and non-alcoholic drinks. Intake of total fat rose slightly for both boys and girls but not significantly, but the proportion of energy from fat decreased (Table 26). There was a significant decrease in intake of fats and oils, but this was balanced by an increase in intake of fat from other sources, such as cereal-based foods, confectionery and 'health' bars.

Variations in the community

Detailed analysis of responses to dietary behaviour questions within the adult *1997/98 NSW Health Survey* by age, sex, ethnicity and other characteristics can be found within the full report of the survey published on the NSW Health website. No such analysis is available yet for the *2001 NSW Child Health Survey.*

There were some variations in the dietary habits of adults between Area Health Services, but generally these were limited. Men and women in Wentworth and South Western Sydney reported more frequent consumption of fried potato products. Rural areas are more likely to fry meat with added fat, and report a higher consumption of processed meat but a lower intake of low fat milk.

Table 25. Comparison of estimated 24 hour intake of energy, total fat and alcohol for adults aged 25-64 yrs, 1983-1995

	Energy (kj)	95% CI	Total fat (g)	95% CI	Total carb.	95% CI	Alcohol (g)	95% CI
Males								
1983	10,824	10,685-10,963	106.1	104.3 -107.9	260	256 -264	23.8	22.4-25.1
1995	11,195	10.956-11,434	100.2	97.3 -103.0	304	296 -311	18.0	16.1-19.9
% change	+3%		-6%		+17%		-24%	
Females								
1983	7,299	7,204-7,395	72.4	71.2 -73.6	184	181-186	8.7	8.1-9.3
1995	7,624	7,464-7.785	68.6	66.6 -70.6	214	210 -219	7.6	6.4 -8.9
% change	+4%		-5%		+16%		-13%	

Source: Cook et al, Australian Food and Nutrition Monitoring Unit, 2001.

Table 26. Changes in the proportion of energy coming from different macronutrients in childrens' diet, 1985-1995

	Boys			Girls		
	1985	1995	% Change	1985	1995	% Change
Total energy	9,670	11,088	+15%	7,586	8,488	+12%
Total fat	96	101	+5%	75	77	+3%
Total carbohydrate	283	345	+22%	224	264	+18%
Total sugar	142	174	+23%	115	137	+19%
fibre (g)	20	23	+15%	16	18	+13%
% energy fat	36.2	33.3	-3%	35.9	33.1	-3%
% energy carbohydrate	49.5	51.5	+2%	49.0	51.5	+3%

Source: Cook et al,, Australian Food and Nutrition Monitoring Unit, 2001.

Consumption of low fat milk also varies with degree of remoteness, with the proportion of respondents in the most remote areas who reported consuming low fat milk being almost half that of the respondents from the most accessible centres (28.5% versus 47.1%) (Table 27). Indigenous status also influenced food choices. Indigenous respondents reported a lower intake of fried potato products but a higher intake of processed meat and were more likely than their non-indigenous counterparts to report usually frying their meat, or cooking it with added fat.

Australian-born respondents tended to report higher levels of consumption of high fat foods than those born in many other countries. Respondents born in many overseas countries were less likely to report eating fried potato products twice per week or more. Lebanese-born males were an exception, with more than half (54.8%) of these respondents reporting this. Respondents from Italy, Germany and the Netherlands were more likely than the Australian-born to report usually frying their meat, or cooking it with added fat, while those born in China, Vietnam and other South East Asian countries were less likely to report this. There was no clear trend in fried potato consumption with degree of socioeconomic disadvantage, although the highest rates of this behaviour were reported by males and females in the most disadvantaged quintile. The proportion of respondents reporting that they usually fried their meat, or cooked it with added fat, increased with increasing level of socioeconomic disadvantage. Respondents from the most disadvantaged quintile were 1.3 times more likely to report these cooking modes than respondents from the least disadvantaged quintile.

Current physical activity behaviour

Mapping physical activity patterns and behaviours in the community is an important element of community analysis in planning for programs to tackle unhealthy weight gain. It is also critical in the evaluation of interventions. However, determining the true level of physical activity and inactivity in the community is difficult because there are no simple, reliable, and objective measures of physical activity. Hence we tend to rely on self-reported behaviours and questionnaire assessments of the time spent doing various physical activities. These responses are then transformed into scores that indicate the nature, frequency and duration of activities undertaken by individuals. These can be compared against agreed measures of sufficiency. Recent surveys of physical activity in Australia have all used the same set of standard questions and have set a minimum level of 150 minutes of combined physical activity over the week and/or five sessions of at least 30 minutes each week as an indicator of sufficiency. As indicated previously, these levels of physical activity have been shown to have a positive effect on the risk of heart disease and other chronic diseases but may be well short of the minimum level of activity required to prevent weight gain.

Table 27. Proportion of NSW adults aged 16 years and over who usually use reduced/low fat milk by accessibility and remoteness and by sex

Remoteness/ accessibility (RIA) score	Males %	Females %	Persons %
Highly accessible	39.5	54.3	47.1
Accessible	31.9	48.1	40.0
Moderately accessible	30.8	46.8	39.0
Remote	34.1	51.0	42.2
Very remote	18.2	37.5	28.5
NSW	38.1	53.1	45.7

Surveys of physical activity

Adults

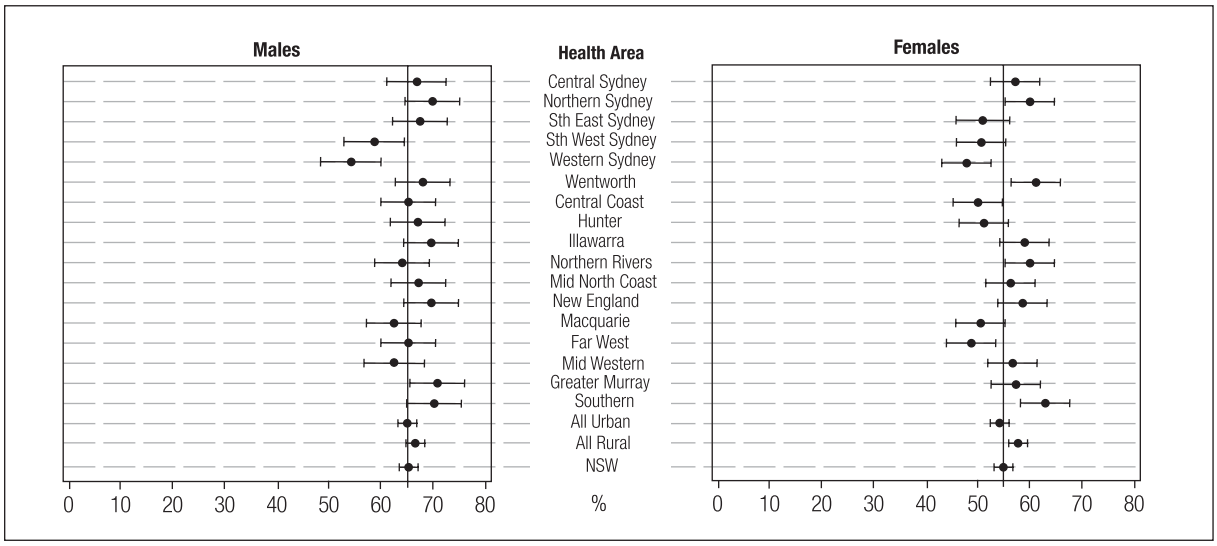
The *1998 NSW Health Survey* used this questionnaire approach to assess adequacy of physical activity levels among adults, but relied on an assessment of accumulated time rather than time and frequency of exercise. Although Active Australia *(Bauman et al, 2001)* considers this approach to be a less rigorous assessment of adequacy of activity levels, the results indicate that only 65% of all males and 57% of females undertook a minimum of 150 minutes of accumulated physical activity throughout a week. Throughout life, males are more likely than females to have adequate levels of physical activity and the proportion of adults meeting this minimum requirement for physical activity decreases consistently with age. However, even among the youngest age group of adults (16-24 years), more than one quarter of respondents reported inadequate levels of activity (Table 28).

Table 28. Those reporting adequate levels of physical activity by sex and age group

Age (Years)	Males %	Females %	Persons %
All	64.7	57.2	60.9
16-24	75.2	68.9	72.1
25-34	67.9	61.5	64.7
35-44	62.2	57.9	60.1
45-54	61.1	57.4	59.3
55-64	60.9	53.5	57.2
65-74	61.8	48.4	54.9
75+	52.6	34	41.7

Source: NSW Health Survey, 1998.

Figure 13. Adequate energy expenditure by Health Area and sex, persons aged 16 years and over, NSW 1998



Source: NSW Health Survey 1997/1998.

There is a reasonable degree of consistency across Area Health Services in the proportion of adults who meet the minimum level of physical activity. However, both males and females in Western Sydney had the lowest rates (54.5% and 50.9%) respectively whilst men in Greater Murray and Southern Health Areas and women in the Southern and Wentworth Areas reported the highest rates of adequate physical activity (see Figure 13). Based on Health Area of residence, rural residents, especially females, were more likely than urban residents to report adequate levels of physical activity. However, there was no clear relationship between reported adequate physical activity and degree of geographical remoteness.

The effect of socioeconomic status on levels of adequate physical activity appeared to be modest, with less disadvantaged males reporting slightly higher levels of physical activity. However, no similar pattern was evident for females. Similarly, better-educated participants were more likely to have adequate levels of activity, but this may be influenced by the relationship between education level and age. However, country of birth did appear to influence physical activity levels, especially among males. Rates of adequate physical activity were higher than the NSW average among male and female respondents born in New Zealand, and lower than the NSW average among respondents of both sexes born in China, Vietnam/Laos /Cambodia and Lebanon, females born in Italy and males born in the Philippines. This may indicate that increased focus needs to be placed on the physical activity participation of recent migrants from Asia and the Middle East.

There is also a marked decline in the level of adequate physical activity with increasing Body Mass Index, with obese persons reporting substantially lower rates of physical activity (Table 29). This is particularly marked in females. However, it is not possible to determine from a single measure of physical activity in this survey whether a low level of activity is the cause of obesity in respondents or whether this result reflects the fact that obese persons have a reduced capacity to exercise.

Children

Both the *1999 ASSAD Study* and the *2001 NSW Child Health Survey* contain questions to help characterise the physical activity levels of respondents. In the *ASSAD Study*, 89% of males and 84% of females, aged 12-17 years indicated that they played games or sport at least once each week, for 20 minutes or more, that left them out of breath. Around 30% of males and 15% of females across all age groups indicated that this occurred on every day. *The NSW Child Health Survey* also asked about childrens' participation in sports and physical activity outside school. Around 65% of males and 52% of females aged 5-12 years reported participating in organised sports at least once a week, whilst 29% of males and 23% of females participated more than once a week. A much smaller proportion of children reported participation in other organised physical activity such as dance, gymnastics and martial arts. Girls (43%) were much more likely than boys (19%) to report participation at least once a week in these activities.

Table 29. Those reporting adequate levels of physical activity by sex and BMI status

BMI Status	Males %	Females %	Persons %
All	64.7	57.2	60.9
Obese	58.7	48.8	54.0
Overweight	63.6	56.8	61.1
Acceptable	67.9	60.4	64.0
Underweight	63.5	61.4	62.0

Trends in levels of physical activity

The Australian Institute of Health and Welfare and Active Australia conducted repeat surveys of physical activity levels within the adult Australian population in 1997, 1999 and 2000. Although these surveys have not been analysed on a state-by-state basis, the national results give a reliable guide to the likely trends in NSW. Unfortunately the situation does not look promising, as the percentage of adult Australians achieving adequate physical activity for health benefits (at least 150 minutes of walking, moderate and/or vigorous activity per week) declined from 62.2% in 1997 to 56.6% in 1999, although it remained stable at 56.8% in 2000. If the additional criteria of five sessions of activity per week is also applied to assess adequacy, then the percentage of adults reaching this level was assessed at just 50.9% in 1997 and declined to 46.1% in 2000 (Figure 14). Whilst men and women have had similar drops in the level of physical activity it is disturbing to find that the greatest decline in physical activity levels has occurred in adults less than 45 years old. The proportion of older adults assessed as having sufficient physical activity declined only marginally from 43.1% to 41.3% in the 45-59 year old age group and actually increased slightly in those aged 60-75 (42.7% to 43.6%). However among 18-39 year olds the level of adequate physical activity dropped from 51.7% to 46.7% between 1997 and 2000, whilst in those aged 30-44 the decline was even greater (51.6% to 41.2%).

Even more alarming is the increasing level of Australians reporting no physical activity. This figure rose from 13.4% in 1997 to 15.3% in 2000. Changes in levels of no activity follow a similar trend to levels of adequate physical activity, with stabilising rates of sedentary behaviour in older age groups and marked increases in those aged less than 45 years (Table 30). Males have shown a greater increase in those assessed as sedentary and larger increases were also found in those who are better educated, although this may also be a reflection of their younger age.

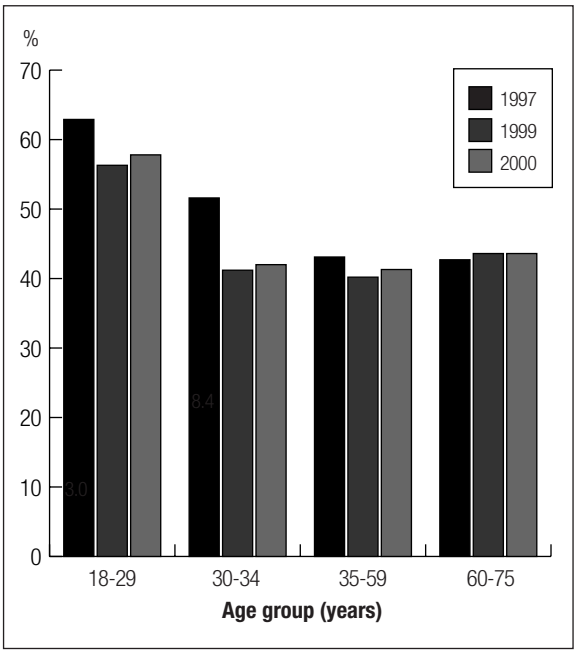
The only repeated measures of physical activity in children have come from the simple questions on physical activity included in both the *1996 and 1999 ASSAD Surveys*. Analysis of these questions shows that there was no significant difference in the reported levels of active play or sports between these two time periods.

Table 30. Percentage of Australian adults 18-75 years reporting no physical activity (ie sedentary)

	1997	1999	2000
Sex			
Men	13.7	14.6	17.5
Women	13.1	14.7	13.1
Persons	13.4	14.6	15.3
Age group			
18-29	7.3	6.3	10.1
30-44	11.7	16.9	15.6
45-59	18.1	18.2	18.2
60-75	19.2	17.9	18.3
Education level			
Less than 12 yrs schooling	18.2	19.5	20.1
Completed 12 yrs schooling	13.1	12.5	13.8
Tertiary qualifications	6.2	10.9	10.8

Source: Bauman A, Ford I & Armstrong T 2001

Figure 14. Percentage of people achieving sufficient activity time and sessions by age group



Source: Bauman A, Ford I & Armstrong T 2001

Surrogate indicators of activity and inactivity

Because of our limited ability to detect the true level of physical activity in the community (particularly in children), there is often value in examining surrogate markers of physical activity and inactivity. Personal habits and behaviours such as car use, time spent watching TV and video, and other inactive leisure pursuits, have been linked to increasing levels of overweight and obesity. In contrast, membership of active clubs and sports groups is often associated with lower levels of body weight. These types of data are rarely collected as a routine part of health surveys but such information can be obtained from a range of sources, including market research, reports from other government departments, academic research and local surveys.

It is important to understand that such proxy indicators are merely markers of activity/inactivity and may not be a direct cause of weight gain. In addition, the relationship between sedentary behaviour and weight gain may not be straightforward. For example, studies have suggested that there may be many explanations of the relationship between television watching and obesity that go beyond the time spent being inactive. These may include reduced time spent in active pursuits and increased snacking on less healthy food choices. A recent study in Melbourne showed that children watch an average of 2-3 hours of television per day, but that a quarter of children watch more than 3 hours per day. A clear relationship was found between hours of television viewed and a child's weight. However, when other factors such as parents' weight, diet and exercise were taken into account, the relationship between television viewing and childhood obesity became less clear *(Hesketh et al, 2001)*. A study of adults in NSW also found a consistent and graded association between hours of television watched and level of overweight with those adults reporting watching more than 4 hours television a day being 4 times more likely to be overweight than those who watched less than 1 hour of television *(Salmon et al, 2000)*. There was no direct relationship between television watching and level of physical activity but there was an interaction between high levels of television watching and low levels of physical activity resulting in the highest rates of overweight. This relationship between television watching and overweight has been found to be stronger in lower socioeconomic status women *(Crawford et al, 1999)*.

Television rating surveys also collect information on time spent watching television and the results in Table 31 show that on average Australians watch around three and a half hours of TV each day. However, viewing time varies greatly with age as older adults spend well above the average time watching TV while younger adults, teenagers and children are below the average. People living in non-metropolitan regions of Australia appear to have slightly higher rates of TV watching. A study in Tasmania showed that in 1996, country teenagers watched 3.7 hours of television a day, compared to 3.0 hours a day in urban areas *(Woodward et al, 1996)*.

Both the *1999 ASSAD Study* and the *2001 NSW Child Health Survey* included questions to assess the level of time spent in sedentary behaviours such as watching television. The *ASSAD Study* showed that 95% of NSW students spent at least some time every day watching TV. In general, boys watched slightly more TV than girls, with 14% of both boys and girls watching 5 or more hours each day, and another 34% watching for 3-4 hours. The study also showed that 75% of students aged 12-17 spent some time each day using the internet or playing computer games. Around 44% of the students reported spending one hour or less at the computer in their free time but 5% reported spending five or more hours each day. The *NSW Child Health Survey* suggested that younger children (5-12 years old) spent slightly less time watching television or using the computer. However, one third of these children reported watching between two and four hours of television, and 65% reported spending an additional hour or more playing computer games.

Table 31. Average daily time spent watching TV in 2000

Age	Metropolitan Australia	Regional Australia
5-12	2H 26M	2H 32M
13-17	2H 39M	2H 40M
16-24	2H 15M	2H 26M
25-39	3H 15M	3H 39M
40-54	3H 18M	3H 30M
55+	4H 18M	4H 35M
All Ages	3H 13M	3H 29M

Source: AC Nielsen Report, 2001.

Apart from television, a number of new sedentary leisure time pursuits are now available to children and are replacing more traditional active pastimes. A study conducted for the Cultural Ministers Council in 2002 indicates that electronic and computer games are popular with around 80% of boys and 60% of girls, and that they are played on average 3-4 hours per week by the 5-14 year old survey participants. Such games are now a more popular pastime and children spend more time playing them than riding bikes or other active pursuits such as skateboarding or rollerblading (Table 32).

Car ownership within Australia has increased rapidly in recent years and Australia now has the second highest level of car ownership in the world. In the 1940s there were 12.5 Australians per privately owned car but by 1999 the ratio was below two people per car. The average distance travelled by each resident in Sydney is 5,886 kilometres a year, 1.5 times the figure of London's. In outer regions of Sydney around 97% of households own a car. As a consequence, less than 10% of travel to work in Sydney involves some form of active transport such as walking or cycling (Figure 15).

Table 32. Participation in non-organised leisure activities by Australian children 5-14 years in 2000

	Skateboarding or rollerblading	Bike riding	Watching TV or videos	Playing electronic/ computer games
Participation rates (%)				
Boys	35.6	71.1	96.9	79.1
Girls	26.1	56.2	96.9	58.1
Total	30.9	63.8	96.9	68.9
Mean hours/2 week period-participants only				
Boys	6.4	7.2	21.7	9.0
Girls	3.9	4.9	21.6	5.6
Total	5.4	6.2	21.7	7.6

Source: Cultural Ministers Council, 2002.

Figure 15. Mode of travel to work, Sydney 1996

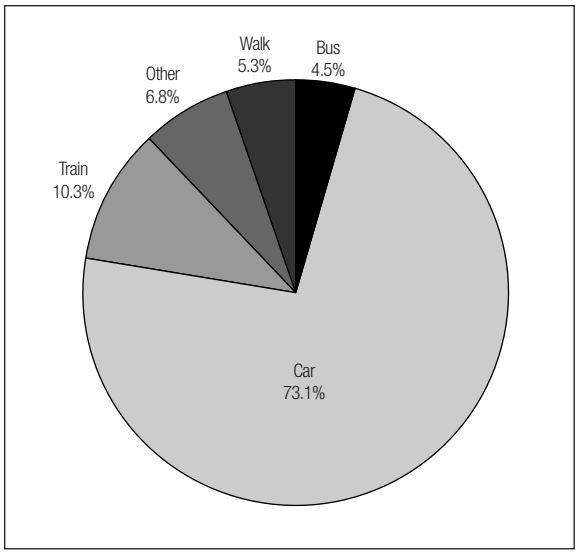
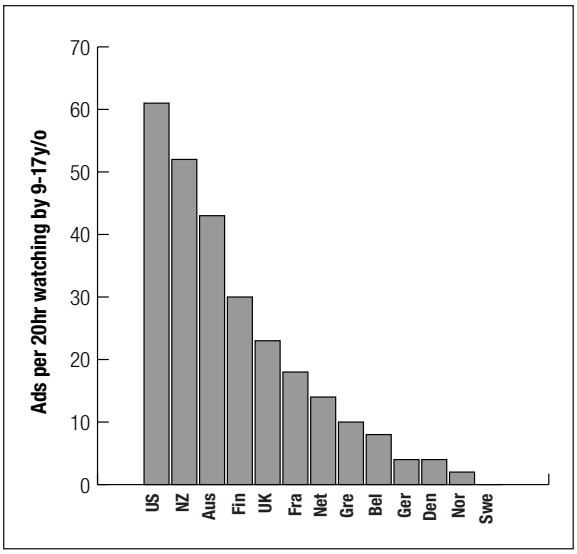


Figure 16. Number of advertisements for fast food restaurants in a 20 hour sample of children's television



Although there are at least one million bicycles in Sydney, only 1% of all journeys are made using this mode of transport.

Environmental influences on healthy eating and exercise behaviour

The physical environment within NSW has an enormous influence on weight-related behaviours and people's capacity to make appropriate changes. The design of towns and buildings, the provision of open, public places for exercise, the level of security and perceived safety of residents to use public facilities and walk in public spaces all influence people's willingness or ability to be active. Car use continues to dominate our daily life and the design of our cities and towns. This has numerous negative consequences for levels of physical activity. The decline in strip shopping centres and local food stores has led to a reliance on cars to take us to large shopping centres where we park close to the shops and use escalators to move between floors. In addition, aspects of the political and social environment also promote or inhibit improved activity behaviours. Alternative forms of transport are not well catered for and walking and cycling facilities receive little funding. The 1996 budget of the NSW Roads and Traffic Authority amounted to $2.1 billion, but only 0.4% of this was allocated to improved bicycle facilities.

The increasing time demands of employment, the proportion of families with both parents working, single parent households, and other factors such as underemployment, where parents have limited resources, creates a situation where people do not have the means or the time to actively engage with their children in recreational activities.

These same aspects of the physical and social environment create pressures that inhibit the purchase and consumption of appropriate foods. When one third of the household food budget is spent on food eaten away from home it is important to ensure that opportunity exists for appropriate and convenient food choices. Unfortunately, too many people within NSW have limited choices on these occasions. Market research shows that over half this money is spent on the purchase of fast foods and the prominence, siting and advertising of the large fast food chains has a great deal of influence over these food choices. Large fast food outlets are clustered around major arterial roads, meaning that there is a higher concentration in outlying health areas in NSW. In addition, television advertising by fast food chains dominates children's and family viewing times on television. The level of such advertising in Australia and New Zealand is just behind that of the USA, and more than twice that of most European countries (Figure 16).

The *2001 NSW Child Health Survey* asked parents a set of questions about the local community and their interaction with this environment. Two thirds of parents reported that they felt safe walking in the street after dark, 62% felt that most people in their community could be trusted, and 75% felt that their area had a reputation for being a safe place. On each of these questions, rural areas reported slightly higher levels of satisfaction than urban areas (see Figure 17). The survey also asked parents where children were allowed to play when not at school or in care. Not surprisingly, the backyard at home was the most popular area (69%) followed by inside the house (58%), suggesting that safety and supervision of children are still major concerns for parents. Around 29% of children played in the park, 24% at friends or relatives, 22% at a neighbour's house and only 10% of children played in the street.

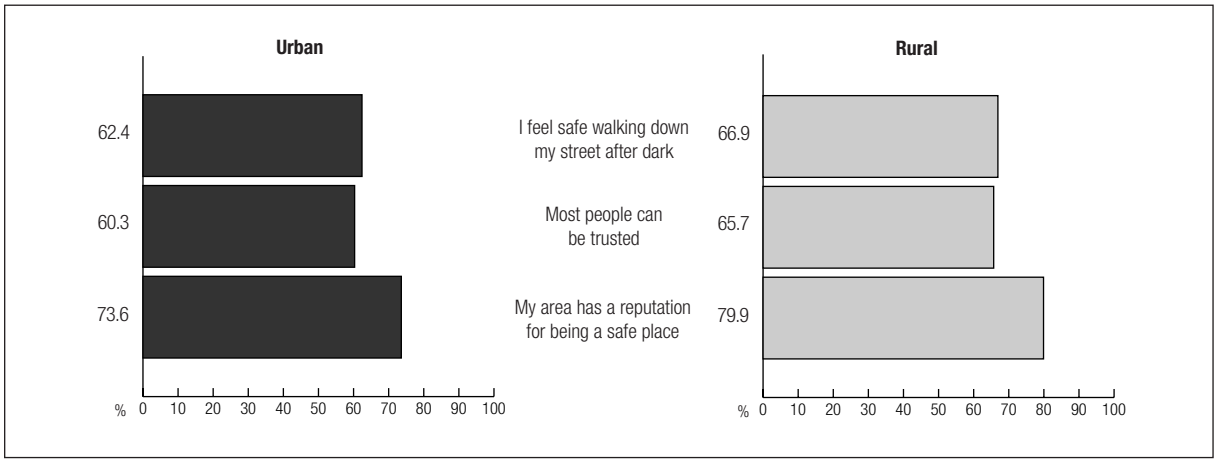
Mapping the local environment

As yet there is no set of key indicators that classify the condition of the environment and whether it supports or inhibits appropriate behaviours for the prevention of weight gain. However, it should be possible to identify national, state and local statistics that help map the environment in a particular area. These can be combined with additional information collected from community assessments or local studies to help create a profile of the community. This profile can then be used to identify problem areas and also as a baseline against which the impact of interventions can be measured.

Proposed markers to define the environment include:

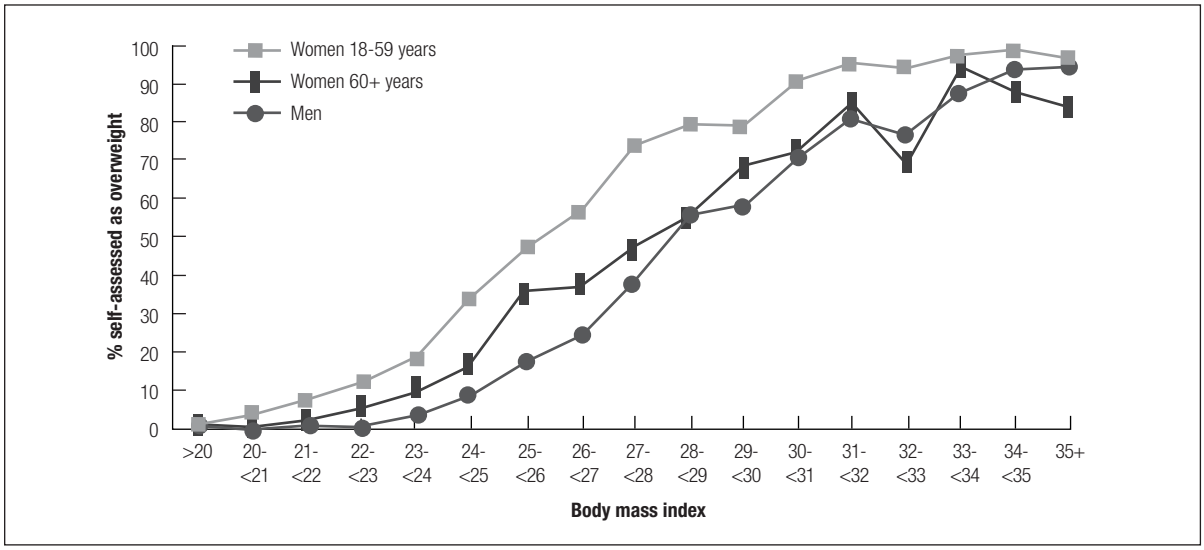
- space allocated to open parkland or recreational facilities
- public transport facilities
- total length of bike pathways provided
- expenditure on improving active transport options
- proportion of children walking or cycling to school
- membership of active recreational or sporting clubs
- improved opportunities for children to play safely within the neighbourhood
- number and type of take-away food outlets
- availability of food shopping facilities
- availability and pricing of appropriate low fat, low energy dense food choices
- promotion of appropriate compared to inappropriate food choices
- school food and physical activity policies.

Figure 17. Strongly agree or agree that their local area is safe by urban/rural Health Area of residence, parents/carers with children aged 9-12 years, NSW 2001



Source: 2001 NSW Child Health Survey.

Figure 18. Strongly agree or agree that their local area is safe by urban/rural Health Area of residence, parents/carers with children aged 9-12 years, NSW 2001



4.4 Current understanding and attitudes of the community to the problem of overweight and obesity

Only a few studies of community attitudes to overweight and obesity have been conducted in Australia. These have shown that both men and women see weight management and prevention of weight gain as an important issue and consider obesity as harmful. However, Australian adults, and in particular men who would be defined as overweight or obese based on their BMI, often have inaccurate perceptions of their own weight status. One study compared the measured BMI of adults with their self-reported perception of their own body weight and found that less than half of all men and only 70% of women with a BMI above 25 considered themselves overweight (Donath, 2000). The study showed that BMI had to reach a level of around 28 before a sizeable proportion of men (and older women) accepted they had a weight problem (Figure 18). Younger women were more likely to accept being overweight at a BMI level above 25, but around 12% believed they were overweight even though their measured BMI was below 25. In general women were more likely than men to accept that they had a weight problem and to take action to address this problem *(Timperio et al, 2000)*.

5 Existing programs and services focussed on overweight and obesity

5.1 Programs to prevent weight gain

It is important to have a firm appreciation of current initiatives for the prevention and management of obesity at all levels of planning to enable the most appropriate and effective programs of action to be developed within each health area. Although the issue of overweight and obesity has gained substantial attention in recent times there has been only limited action aimed specifically at its prevention. Australia was one of the first countries in the world to develop a national obesity prevention strategy but the framework set out in the 1997 NHMRC report, *Acting on Australia's weight*, has yet to be translated into practical programs at either the national, state or local level. Producing a clear and coherent analysis of the current situation is the first step in ensuring momentum on this issue.

Despite the current lack of reported action specifically addressing the prevention of obesity, there are numerous programs that address the key dietary and physical activity behaviours that contribute to the problem. Reviewing local and state health promotion program registers and monitoring the activities of key government agencies and non-government organisations will allow health areas to identify and build upon existing obesity initiatives.

Action at a national level

The Population Health Division of the Department of Health and Ageing is responsible for developing strategies for tackling the obesity problem from a national perspective. The Division relies on input from the two nationally representative bodies set up to provide strategic input on dietary and physical activity policies (ie the Strategic Inter-Governmental Nutrition Alliance SIGNAL; and the Strategic Inter-Governmental forum on Physical Activity and Health SIGPAH) and specifically from a Healthy Weight Reference Group formed from representatives of both these bodies. Until now, the Federal Government has restricted its action to identifying mechanisms for implementing the recommendations from the 1997 report but it is also working with the NHMRC on developing national guidelines for the treatment of obesity in adults and children. These guidelines should be ready for release in early 2004.

The Population Health Division is also responsible for other initiatives that promote improved physical activity and nutrition. In 2000 it released the *National Physical Activity Guidelines for adults*, and is responsible for the regular revision of the *Australian Dietary Guidelines*, which also contains recommendations relating to weight gain prevention.

The Active Australia Alliance was formed in 1999 with representation from the Australia Sports Commission, the former Commonwealth Department of Health and Aged Care, the Standing Committee on Recreation and Sport, Sport Industry Australia, SIGPAH, the sport and recreation industry sectors, and the health industry sector. The role of the Alliance was to formalise the intersectoral approach between sport, recreation, and health, and to oversee the monitoring of Active Australia. The Alliance then developed a *National Plan for 2000-2003*. This plan formed the basis of a national approach, aiming to enable and encourage agencies to work independently to achieve national outcomes.

In April 2001, the Prime Minister launched a new sport policy, *Backing Australia's sporting ability – a more active Australia*. Then in 2002, the Commonwealth Government announced a directional change for the Active Australia initiative and withdrew funding to State and Territory Departments for the promotion of the initiative. This policy has marked a shift in the focus of the Active Australia Alliance, away from promoting active communities, towards more organised, elite forms of sport.

A similar group, the Healthy Weight Alliance, Australia, was formed recently, with representation from the Australian Diabetes Society, the Australasian Society for the Study of Obesity, the Australian Association for Exercise and Sports Science, the Dietitians Association of Australia and the National Heart Foundation. It aims to provide opportunities for coordinated action and consistent public messages in the area of obesity prevention and management.

Action at a state level

The development of a program on healthy weight is a specific objective of the NSW Department of Health under the Eat Well NSW framework (*Strategic Directions for Public Health Nutrition 2003-2007*, NSW Department of Health, 2003). The initial emphasis on healthy weight will be the response to the 2002 NSW Childhood Obesity Summit. At the time of writing, the formal government response to the Summit resolutions was under development through a Senior Officers Coordinating Committee, chaired by the NSW Cabinet Office. Further, a preliminary response from the Minister for Health indicates a commitment to:

- establish a centre of excellence in overweight and obesity research
- provide support to school canteens through the NSW School Canteens Association, and the establishment of an intersectoral School Canteens Advisory Committee
- promote the acquisition of basic movement skills through support to the School Sports Foundation
- provide support to the Rock Eisteddfod and Croc festivals which encourage participation in physical activity through the performing arts
- funding to support a position in the Local Government Association of NSW and Shires Association of NSW to provide advice on public health issues including obesity.

The Centre for Health Promotion at NSW Health includes the Nutrition and Physical Activity (NUPA) Branch. The NUPA branch leads and coordinates the development of policy for the management of risks associated with diet related ill-health and sedentary lifestyles. The NUPA Branch is involved with a number of key initiatives in the promotion of healthy weight. Some examples include:

- playing a key role in developing the formal response to the NSW Childhood Obesity Summit and the Government action plan to address childhood obesity in NSW
- the development, implementation and evaluation of the state-wide, intersectoral plan to promote physical activity *Simply Active Everyday* through its role in the Physical Activity Task Force
- supporting the state-wide network of Nutrition and Physical Activity health promotion workers through the provision of opportunities for networking, professional development and information exchange.

Within NSW there are also a number of non-government organisations that plan and undertake actions to address obesity-related behaviours. These include the NSW branches of the National Heart Foundation, Diabetes Australia, and Nutrition Australia, as well as active transport advocacy groups such as Bicycle Australia and the Pedestrian Council of Australia.

Action at an area level

The NSW Nutrition Project Register indicated that almost one third of all 2000 and 2001 nutrition projects were focussed on actions likely to assist with weight management or weight gain prevention. Most of these projects were structured around group weight management programs involving classes on diet and exercise. Another 60% of projects dealt with actions that might also contribute to better weight maintenance. However, very few of these projects identified the prevention of weight gain as the key objective.

There is also a significant amount of work underway in the Area Health Services promoting physical activity. Although there is no project register similar to that provided by the Nutrition Network, regular reports provided by the Physical Activity Network indicate that there are an extensive number of programs promoting active lifestyles, targeted at a variety of groups across the lifespan, and in a variety of settings.

5.2 Services for the management of people with an existing weight problem

Although the prevention of unhealthy weight gain is likely to yield more return than investing resources heavily in treatment services, it is important not to ignore the needs of people who have an existing weight problem. This is particularly so for the treatment of overweight and obesity in children, where successful management of the problem at an early stage may allow a child or adolescent to return to a more healthy weight as they grow in stature over time. In addition, the effective management of obese adults and children may help prevent further weight gain and worsening health status regardless of whether weight loss can be achieved.

Policies and guidelines for the management of overweight and obesity

Throughout 2001 and 2002, the National Health and Medical Research Council (NHMRC) convened a working party to develop best practice guidelines for the management of overweight and obesity in both Australian adults, and children and adolescents. In October 2002, a draft version of these guidelines was provided for formal public consultation. At the time of writing, it was estimated that the final guidelines should be available early in 2004.

Specialist services

There is a significant demand on the few specialist services available for the management of overweight and obesity in NSW. The issue of the provision of appropriate specialist services was raised at the NSW Childhood Obesity Summit, and it is expected that a needs analysis and recommendation of the required services will be conducted. This recommendation would need to identify both the optimal mix of specialist and generalist services, and provide specification of appropriate prevention, early intervention, referral and treatment pathways.

The draft NHMRC guidelines suggest that a three-tiered approach should be taken to the clinical management of obesity. The first tier is appropriate for the majority of overweight/obese individuals who have eaten too much and exercised too little, and focuses on individual education and skills training. The second tier is appropriate for those with disordered eating patterns or cognitions and builds on this knowledge base but also includes behavioural/cognitive modification strategies. The third tier targets those who are overweight or obese and have co-morbidities, such as genetic or endocrine disorders, and utilises surgical and/or pharmacological therapies in management.

Specialist surgical services for overweight and obesity lie primarily in the private sector in NSW. This provides some financial difficulties for obese individuals seeking surgical intervention. As such, the review of the treatment services that follows from the NSW Childhood Obesity Summit should also include a review of surgical services. While there are limited training facilities for surgeons in NSW, specialist training in obesity surgical techniques is available in other Australian centres.

General health services

At the 2002 NSW Childhood Obesity Summit it was recognised that many of those providing primary care in general health services did not have the appropriate training and support for the screening, early intervention and referral of overweight and obese individuals. As such, the professional development needs of primary care givers in the general health system should also form a key part of the needs analysis for overweight and obesity management services.

Commercial services

A number of large national commercial weight control agencies operate within NSW, including Weight Watchers, Jenny Craig, and Ultralite. These programs vary greatly in cost and scientific validity and are generally only available in major metropolitan centres. Small, less organised programs are also available in regional centres throughout NSW. At a later date, there may be some merit in investigating the value of meshing commercial services with public obesity care services.

Private practice dietitians offer additional commercial services for weight control. The register of Accredited Practising Dietitians lists 42 dietitians in NSW who indicate that they specialise in weight management. Over one third of these dietitians are based in North Sydney whilst another third are located in Central or South eastern Sydney. Very few non-metropolitan centres are serviced by private dietitians, which limits the opportunity of obese patients in rural and remote areas of NSW to receive specialist weight control services.

Self-help services

Community health centres sometimes provide group training and support for overweight and obese patients as an alternative to individual clinical care. However, these programs are often of short duration and longer-term weight support groups are more likely to be controlled by an independent group. Area Health Services can make use of support groups run by community organisations such as adult education, or by private gyms and health NGOs such as the National Heart Foundation.

Services for eating disorders

There is an organised support group, the Eating Disorders Association of NSW, which often functions as a first point of contact for those seeking help. South Eastern Sydney Area Health Service provides a major eating disorders clinic and inpatient service for eating disorders, and a large private clinic operates within Northern Sydney. In addition, many dietetic departments throughout NSW provide limited inpatient and outpatient services on a needs basis. The Hunter Area has a half-time position allocated to the care of eating disorders.

A range of health professionals provides services in both the private and public systems for people with clinical eating disorders or disturbed eating behaviour. Usually this care is provided through mental health care services in NSW. In general services for eating disorders are better advertised and organised than those provided for obese patients. This may be a consequence of organised support groups and a clearer recognition of the serious health consequences of these conditions.

6 Conclusions and recommendations

Obesity is a serious public health problem within NSW and the level of overweight and obesity is already well past acceptable levels for optimal community well-being. This situation is producing an enormous burden in terms of ill health, reduced quality of life, and premature death, which threatens to reduce recent gains in health in NSW. It is also associated with increased health care costs and increased demand on health care services.

Levels of obesity are rising quickly in NSW, especially amongst children and young adults. There are some disparities in the burden of obesity with those who are socially disadvantaged, isolated, indigenous Australians or who are from certain ethnic groups experiencing higher levels of obesity.

Current dietary and physical activity behaviours are likely to be contributing to the problem of obesity. Over the past two decades, adults and children have increased their energy intake from food despite the fact that physical activity levels appear to be decreasing. Sedentary pastimes have replaced more active pursuits during leisure time. In addition, the physical and structural environment of most NSW communities inhibits improved physical activity and limits appropriate food selection.

There is an urgent need for action. NSW Health Services will need to develop a comprehensive and co-ordinated response to this problem based on an appropriate framework such as Eat Well NSW. The resulting course of action will need to focus on development of programs for the prevention of obesity whilst also addressing the needs of the high proportion of people in the community who have an existing weight problem.

There is more than sufficient evidence to warrant the inclusion of healthy weight as a priority area with the *NSW Strategic Directions for Public Health Nutrition 2003-2007*. To stimulate and facilitate action on this issue at both a central and area level the following recommendations are made:

1. NSW Health should continue the process of monitoring the weight status of the population in line with the recommendations of the 1998 report from the NSW Food and Nutrition Monitoring Project. However, in line with recent recommendations of other Australian and International Health Organisations:
    - the adult BMI classification systems proposed by the World Health Organisation (WHO 2000) should replace the old NHMRC classification
    - BMI for age cut points to define overweight and obesity in children developed by the International Obesity Task Force should replace the three different classification systems currently proposed to assess weight status of children (Appendix A)
    - regular collection of measured height and weight should be used to validate data on weight status in NSW collected by self-report
    - NSW data from the *1999/2000 AusDiab Study* should be obtained and an analysis of the weight status and weight-related risk factors be undertaken.
2. That an improved system for monitoring the weight status, diet and physical activity patterns of children be investigated to replace the ad hoc, irregular surveys. Given the importance of preventing the development of obesity in children and the need for early intervention when it does develop, consideration should be given to how measured weight and height could be collected at critical stages of a child's life through existing information collection processes.

3. Improved indicators for the monitoring of weight-related behaviours and environmental influences on weight gain must be developed for use within health surveys in NSW. These should include better indicators of total food energy intake, markers of physical activity and inactivity, and measures of how the physical and social environment supports or inhibits appropriate behaviour for the maintenance of healthy weight.

4. Mechanisms must be established within NSW Health to allow better co-ordination, planning and dissemination of information on programs developed to prevent unhealthy weight gain and services provided to manage those members of the community with an existing weight problem.

5. That Area Health Services use the information within this report, together with further community analysis to produce an assessment of the weight status of their community. This can be used as the basis of planning for action on healthy weight as well as serving as a baseline against which the impact of interventions can be assessed.

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A Appendix

Table 1. International Body Mass Index cut-offs for overweight and obesity by sex between 2 and 18 years, defined to pass through Body Mass Index 25 and 30 at age 18

	Body Mass Index		Body Mass Index	
Age	**25**		**30**	
(Years)	**Boys**	**Girls**	**Boys**	**Girls**
2	18.4	18.0	20.1	19.8
2.5	18.1	17.8	19.8	19.5
3	17.9	17.6	19.6	19.4
3.5	17.7	17.4	19.4	19.2
4	17.6	17.3	19.3	19.1
4.5	17.5	17.2	19.3	19.1
5	17.4	17.1	19.3	19.2
5.5	17.5	17.2	19.5	19.3
6	17.6	17.3	19.8	19.7
6.5	17.7	17.5	20.2	20.1
7	17.9	17.8	20.6	20.5
7.5	18.2	18.0	21.1	21.0
8	18.4	18.3	21.6	21.6
8.5	18.8	18.7	22.2	22.2
9	19.1	19.1	22.8	22.8
9.5	19.5	19.5	23.4	23.5
10	19.8	19.9	24.0	24.1
10.5	20.2	20.3	24.6	24.8
11	20.6	20.7	25.1	25.4
11.5	20.9	21.2	25.6	26.1
12	21.2	21.7	26.0	26.7
12.5	21.6	22.1	26.4	27.2
13	21.9	22.6	26.8	27.8
13.5	22.3	23.0	27.2	28.2
14	22.6	23.3	27.6	28.6
14.5	23.0	23.7	28.0	28.9
15	23.3	23.9	28.3	29.1
15.5	23.6	24.2	28.6	29.3
16	23.9	24.4	28.9	29.4
16.5	24.2	24.5	29.1	29.6
17	24.5	24.7	29.4	29.7
17.5	24.7	24.8	29.7	29.8
18	25.0	25.0	30.0	30.0

Source: Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000. 320: 1240-1240

B Appendix

Additional tables of weight status by Area Health Service from NSW Health Survey 1997/1998

(Additional to data already available on website).

Note:

1. The main change is the reclassification of acceptable and underweight BMI categories so the categories are comparable to those used in the National Nutrition Survey (and as currently recommended by WHO).
2. Extreme care must be taken when interpreting data from these tables as percentages in some BMI by age groupings are based on a very small number of respondents.

Table 1. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, in persons aged 18 years and over, by age categories and sex

	BMI categories % (95% CI)				
	Under-weight <18.5	**Accept-weight 18.5-<20**	**Accept-able 20-<25**	**Over-weight 25-<30**	**Obese 30+**
Males					
All	2	4	44	38	12
18-24	5	7	57	27	4
25-34	2	4	46	37	11
35-44	1	2	42	42	12
45-54	1	2	36	44	17
55-64	1	1	36	46	16
65-74	1	3	39	41	15
75+	3	6	54	32	5

	BMI categories % (95% CI)				
	Under-weight <18.5	**Accept-weight 18.5-<20**	**Accept-able 20-<25**	**Over-weight 25-<30**	**Obese 30+**
Females					
All	6	10	49	23	12
18-24	15	17	48	15	4
25-34	7	13	52	19	10
35-44	4	10	52	22	11
45-54	2	7	50	27	15
55-64	2	6	42	31	19
65-74	2	5	44	32	17
75+	8	9	48	27	8

Table 2. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, in persons aged 18 years and over, by Area Health Services and sex

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
Central Coast	1	4	41	40	13
Central Sydney	2	5	51	33	9
Far West	2	4	34	40	20
Greater Murray	3	3	36	45	13
Hunter	1	4	43	38	14
Illawarra	2	2	41	41	14
Macquarie	2	2	41	40	14
Mid Nth Coast	1	4	40	43	12
Mid Western	3	4	38	42	14
New England	2	4	40	40	14
Northern Sydney	2	5	48	38	8
Northern Rivers	3	4	45	37	11
Southern	1	3	41	39	15
Sth East Sydney	2	4	48	36	9
Sth West Sydney	2	4	42	39	13
Wentworth	2	5	42	38	14
Western Sydney	2	4	43	38	13
All NSW	2	4	44	38	12

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
Central Coast	5	9	48	26	12
Central Sydney	7	13	48	23	9
Far West	4	6	42	27	20
Greater Murray	4	8	46	26	16
Hunter	5	9	47	26	14
Illawarra	5	9	47	25	14
Macquarie	6	8	47	26	13
Mid North Coast	7	7	49	24	12
Mid Western	4	9	47	25	16
New England	6	6	45	27	15
Northern Rivers	7	10	48	24	12
Northern Sydney	7	13	55	19	6
Southern	4	8	47	25	16
Sth East Sydney	8	11	54	19	8
Sth West Sydney	6	10	48	23	13
Wentworth	5	8	47	25	15
Western Sydney	7	11	46	23	13
All NSW	6	10	49	23	12

Table 3. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Central Coast

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	1	3	41	13	1
18-24	4	2	56	36	2
25-34	4	6	36	39	15
35-44	0	1	41	44	14
45-54	0	1	32	46	20
55-64	0	1	30	49	20
65-74	0	1	51	33	15
75+	1	14	47	38	1

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	5	9	48	26	12
18-24	10	19	52	17	1
25-34	6	11	46	28	9
35-44	6	10	49	24	10
45-54	2	9	50	25	14
55-64	1	4	37	35	23
65-74	2	5	49	22	22
75+	5	3	54	31	7

Table 4. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Central Sydney

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	1	5	50	34	10
18-24	1	9	62	25	3
25-34	0	7	57	28	7
35-44	3	3	52	34	9
45-54	2	6	42	37	12
55-64	1	0	35	45	19
65-74	2	3	36	42	16
75+	1	5	59	34	0

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	7	13	48	23	9
18-24	12	16	52	16	5
25-34	8	19	50	17	6
35-44	4	13	56	17	11
45-54	5	6	45	32	13
55-64	3	11	35	41	10
65-74	6	2	36	35	20
75+	11	9	45	31	4

Table 5. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Far West

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	4	34	40	20
18-24	4	9	50	29	8
25-34	0	1	42	38	19
35-44	2	2	30	44	22
45-54	0	2	22	49	26
55-64	1	3	30	40	26
65-74	3	4	30	40	22
75+	9	19	40	23	8

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	4	6	42	27	21
18-24	12	14	48	17	9
25-34	6	5	49	22	18
35-44	1	6	39	27	27
45-54	2	3	35	32	29
55-64	2	3	38	30	27
65-74	1	3	40	38	18
75+	7	8	49	29	7

Table 6. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Greater Murray

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	3	36	46	13
18-24	10	3	51	28	9
25-34	2	4	39	40	15
35-44	0	0	34	56	10
45-54	1	1	24	54	19
55-64	0	4	35	42	19
65-74	2	4	36	49	9
75+	5	9	40	43	4

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	3	8	46	27	16
18-24	4	10	53	21	11
25-34	4	15	49	18	14
35-44	5	5	42	34	14
45-54	2	8	43	27	19
55-64	0	1	41	30	28
65-74	3	7	43	33	13
75+	5	11	53	23	9

Table 7. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Hunter

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	1	3	43	39	14
18-24	1	1	64	31	3
25-34	0	4	49	31	16
35-44	0	2	35	45	19
45-54	0	2	32	45	21
55-64	0	1	39	47	13
65-74	1	5	42	41	10
75+	12	4	45	29	10

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	4	9	47	27	14
18-24	13	17	50	19	1
25-34	4	8	53	21	15
35-44	4	11	47	28	11
45-54	2	5	46	28	19
55-64	3	5	42	26	25
65-74	1	6	39	35	19
75+	4	11	44	33	8

Table 8. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Illawarra

	BMI categories % (CI 95%)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	1	2	41	42	14
18-24	7	2	63	22	6
25-34	2	2	44	36	16
35-44	0	1	36	49	14
45-54	0	0	31	51	18
55-64	1	3	31	53	13
65-74	0	2	35	42	21
75+	1	6	55	36	1

	BMI categories % (CI 95%)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	5	8	47	26	14
18-24	13	17	52	13	5
25-34	6	9	48	25	13
35-44	4	11	51	23	11
45-54	3	2	43	31	22
55-64	2	5	39	36	18
65-74	0	3	44	33	19
75+	6	10	52	20	12

Table 9. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Macquarie

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	2	40	42	14
18-24	3	7	52	34	4
25-34	1	3	34	41	21
35-44	1	1	33	45	19
45-54	0	1	36	50	14
55-64	4	0	42	39	15
65-74	2	2	42	44	9
75+	0	2	74	22	2

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	5	7	47	27	14
18-24	13	14	50	18	5
25-34	5	9	53	20	12
35-44	6	6	50	24	15
45-54	2	3	43	35	16
55-64	4	4	40	32	20
65-74	4	7	42	30	17
75+	6	9	50	27	9

Table 10. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Mid North Coast

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	1	3	39	44	12
18-24	7	8	49	26	9
25-34	3	5	41	40	12
35-44	0	4	40	42	13
45-54	1	1	35	49	14
55-64	0	1	38	49	12
65-74	0	1	33	53	13
75+	1	3	46	41	9

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	8	7	48	25	12
18-24	14	18	42	9	17
25-34	14	8	46	24	9
35-44	4	10	55	20	11
45-54	5	8	47	28	13
55-64	5	5	42	31	17
65-74	4	3	47	33	12
75+	7	3	55	23	11

Table 11. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Mid Western

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	3	36	44	15
18-24	8	7	51	26	7
25-34	1	2	41	40	16
35-44	0	2	33	52	13
45-54	0	3	29	46	22
55-64	1	3	27	55	14
65-74	3	1	36	46	14
75+	1	11	45	35	8

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	3	8	47	26	16
18-24	6	14	56	17	6
25-34	2	9	51	21	18
35-44	3	6	50	24	18
45-54	3	4	46	26	22
55-64	0	3	42	35	20
65-74	3	11	40	30	15
75+	7	10	40	33	9

Table 12. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – New England

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	4	40	41	14
18-24	5	8	50	31	6
25-34	2	4	44	37	12
35-44	2	1	37	42	18
45-54	1	1	29	51	18
55-64	1	1	34	52	12
65-74	0	5	46	35	13
75+	0	15	45	24	16

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	5	6	45	28	16
18-24	11	13	51	18	9
25-34	6	7	45	27	15
35-44	5	6	50	24	15
45-54	2	4	45	30	18
55-64	3	3	34	35	24
65-74	2	3	37	36	22
75+	6	8	45	31	10

Table 13. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Northern Rivers

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	4	44	39	11
18-24	9	11	53	25	3
25-34	1	5	57	28	9
35-44	1	4	43	40	11
45-54	1	2	37	40	19
55-64	1	1	35	51	12
65-74	1	2	34	50	13
75+	4	1	57	31	7

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	6	9	48	24	13
18-24	15	11	60	9	5
25-34	5	17	43	22	13
35-44	5	14	56	18	7
45-54	2	7	46	29	16
55-64	1	1	50	31	17
65-74	2	3	42	31	22
75+	18	7	34	32	10

Table 14. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Northern Sydney

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	4	48	38	8
18-24	6	13	61	19	1
25-34	3	4	50	38	5
35-44	1	1	47	44	7
45-54	0	2	37	47	13
55-64	1	0	43	47	9
65-74	3	5	44	37	11
75+	1	9	69	17	5

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	6	13	55	20	7
18-24	15	24	45	14	1
25-34	8	16	61	11	4
35-44	4	13	61	18	4
45-54	4	10	55	24	7
55-64	5	6	47	27	15
65-74	3	5	53	27	13
75+	5	11	52	24	8

Table 15. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Southern

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	1	3	40	41	16
18-24	0	10	51	24	15
25-34	0	2	44	35	19
35-44	2	2	35	44	17
45-54	0	2	41	38	20
55-64	1	1	31	51	17
65-74	0	2	38	50	10
75+	2	5	50	42	1

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	4	7	47	26	16
18-24	9	16	52	15	8
25-34	6	6	50	22	17
35-44	3	8	53	23	14
45-54	4	8	46	25	17
55-64	1	2	40	32	25
65-74	3	4	40	36	16
75+	5	13	43	29	11

Table 16. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – South Eastern Sydney

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	4	48	37	9
18-24	5	10	60	23	3
25-34	2	3	52	37	7
35-44	0	3	49	39	9
45-54	3	2	40	43	12
55-64	0	0	36	42	22
65-74	1	4	43	38	14
75+	6	3	49	40	1

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	7	11	54	20	8
18-24	21	15	56	8	0
25-34	7	15	55	15	8
35-44	6	9	58	17	10
45-54	1	9	60	21	9
55-64	3	10	44	29	14
65-74	1	6	44	39	9
75+	10	8	51	23	8

Table 17. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – South Western Sydney

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	4	42	39	13
18-24	4	6	54	31	6
25-34	1	4	39	44	13
35-44	1	3	43	38	15
45-54	3	3	42	38	14
55-64	0	4	33	44	19
65-74	0	2	31	48	19
75+	0	5	62	28	5

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	6	9	48	23	13
18-24	17	20	46	12	5
25-34	6	11	51	18	13
35-44	6	7	48	27	13
45-54	1	5	49	31	14
55-64	0	4	43	30	23
65-74	1	4	51	27	18
75+	9	13	49	22	7

Table 18. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Wentworth

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	3	4	40	38	14
18-24	7	11	47	30	5
25-34	3	7	36	40	14
35-44	1	2	41	43	13
45-54	1	1	39	35	24
55-64	2	1	34	46	16
65-74	4	3	48	31	14
75+	0	4	59	30	8

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	5	7	46	26	15
18-24	17	10	43	23	7
25-34	5	7	52	21	15
35-44	1	9	49	22	19
45-54	2	5	49	27	18
55-64	3	0	42	38	16
65-74	2	5	37	38	19
75+	10	10	34	37	10

Table 19. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by age categories and sex in Area Health Services

Area Health Service – Western Sydney

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
All	2	3	43	39	14
18-24	4	6	56	30	4
25-34	2	3	43	39	12
35-44	0	3	42	45	11
45-54	0	1	36	42	21
55-64	2	2	38	41	17
65-74	2	3	36	32	26
75+	0	6	60	26	8

	BMI categories % (95% CI)				
	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Females					
All	6	11	45	24	14
18-24	17	18	35	25	6
25-34	8	11	48	24	8
35-44	4	11	49	22	13
45-54	1	7	51	22	21
55-64	2	11	42	25	20
65-74	0	5	41	34	19
75+	8	15	43	26	8

Table 20. Body Mass Index categories based on self-reported weights and heights from the NSW HS 1997/1998, in persons aged 18 years and over, by SEIFA quintile and sex

	BMI categories % (95% CI)				
SEIFA quintile	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
1st	2	5	47	38	8
2nd	2	4	42	39	13
3rd	2	3	43	39	12
4th	2	4	42	38	14
5th	3	4	43	38	13

	BMI categories % (95% CI)				
SEIFA quintile	Under-weight <18.5	Accept-weight 18.5-<20	Accept-able 20-<25	Over-weight 25-<30	Obese 30+
Males					
1st	7	13	54	18	8
2nd	6	9	51	24	10
3rd	6	10	47	23	13
4th	6	9	46	26	13
5th	6	9	46	25	14

Scale: 1 (least disadvantaged) – 5 (most disadvantaged)

Table 21. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, in persons aged 18 years and over, by Accessibility /Remoteness Index (ARIA) and sex

	BMI categories % (95% CI)				
ARIA	**Underweight <18.5**	**Acceptable 18.5-<20**	**Acceptable 20-<25**	**Overweight 25-<30**	**Obese 30+**
Males					
Very remote	0	1	39	41	20
Remote	2	3	38	39	19
Moderately accessible	2	3	38	40	17
Accessible	2	4	39	42	13
Highly accessible	2	4	45	38	11

	BMI categories % (95% CI)				
ARIA	**Underweight <18.5**	**Acceptable 18.5-<20**	**Acceptable 20-<25**	**Overweight 25-<30**	**Obese 30+**
Females					
Very remote	1	3	43	35	18
Remote	5	8	42	26	19
Moderately accessible	5	7	45	26	17
Accessible	5	8	47	26	14
Highly accessible	6	11	50	22	11

Table 22. Body Mass Index categories based on self-reported weights and heights from the NSW Health Survey 1997/1998, by country of birth and sex

	BMI categories % (95% CI)				
Country of birth	**Underweight <18.5**	**Acceptable 18.5-<20**	**Acceptable 20-<25**	**Overweight 25-<30**	**Obese 30+**
Males					
Australia	2	4	43	38	12
UK & Ireland	1	2	46	42	9
New Zealand	4	5	38	38	15
China	5	9	64	20	2
Vietnam	4	12	69	15	0
Cambodia	0	0	73	27	0
Laos	24	0	59	17	0
Italy	1	0	30	48	21
Lebanon	2	3	30	43	22
Philippines	3	6	49	40	2
Greece	0	0	29	52	19
Fmr Yugoslav Republics	3	1	33	53	10
Hong Kong	3	9	61	20	8
India	1	10	48	32	9

	BMI categories % (95% CI)				
Country of birth	**Underweight <18.5**	**Acceptable 18.5-<20**	**Acceptable 20-<25**	**Overweight 25-<30**	**Obese 30+**
Females					
Australia	6	10	49	24	12
UK & Ireland	6	7	54	24	9
New Zealand	8	10	55	17	10
China	11	20	58	8	3
Vietnam	19	22	47	11	0
Cambodia	7	0	65	14	15
Laos	25	0	75	0	0
Italy	3	3	40	39	15
Lebanon	7	7	38	28	20
Philippines	3	7	70	15	6
Greece	2	5	41	41	10
Fmr Yugoslav Republics	2	3	47	44	5
Hong Kong	21	16	54	6	2
India	6	10	53	30	1

Notes

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