

State of Food and Nutrition in NSW Series



Best options for promoting healthy weight and preventing weight gain in NSW



The University of Sydney



*The NSW Centre for Public Health Nutrition is funded by the NSW Department of Health
and supported by the Sydney Nutrition Research Foundation*

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A NSW Centre for Public Health Nutrition project for NSW Health
prepared by Tim Gill, Lesley King and Karen Webb.

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NSW Department of Health

NSW Nutrition Network

NSW Health Promotion Directors' Forum

National Heart Foundation (NSW Division)

Australian Food and Grocery Council

NSW Centre for Public Health Nutrition

List of abbreviations

AHS	Area Health Service
BBC	British Broadcasting Corporation
BMI	Body Mass Index
CDC	Center for Disease Control
CVD	Cardiovascular disease
CPHN	Centre for Public Health Nutrition
DARE	Database of Abstracts of Reviews of Effectiveness
FDC	Family day care
GPs	General Practitioners
IOTF	International Obesity Task Force
LDC	Long Day Care
NGOs	Non government organisations
NHMRC	National Health and Medical Research Council
NPHP	National Public Health Partnership
NSW	New South Wales
OSHC	Outside school hours care
SEPA	Supportive environments for physical activity
SIGNAL	Strategic Inter-governmental Nutrition Alliance
SIGPAH	Strategic Inter-governmental Forum on Physical Activity and Health
UNICEF	United Nations International Cultural and Education Fund
WA	Western Australia
WHO	World Health Organisation

Glossary

Active transport

Any form of transport that involves incidental physical activity, such as walking, cycling and public transport.

Chronic diseases

Term applied to a diverse group of (usually) non-communicable diseases, such as heart disease, cancer and arthritis that tend to be long lasting and persistent in their symptoms or development.

Efficacy

Efficacy relates to the ability to produce a beneficial effect under ideal conditions and effectiveness relates to the demonstration of a beneficial effect within the community or population group.

Glycaemic index (GI)

Glycaemic index is a ranking of carbohydrates based on their immediate effect on blood glucose levels. Carbohydrates that break down quickly have the highest GIs; the glucose response is fast and high. Low GI foods affect appetite by keeping a feeling of fullness for longer, while low GI diets can help weight loss.

Incidental activity

Any movement performed freely and spontaneously; accumulation and range of activity in everyday life.

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.

Interventions

Interventions include policies, programs or actions intended to bring about identifiable outcomes.

Intervention Portfolio

A mix of interventions designed to address a particular public health problem within specified resource limits. The notion of a portfolio recognises the merits of balancing investment in tried and tested interventions for which there is evidence of effect, with prudent investment in 'high risk' but potentially high-gain interventions. The strategies or programs comprising a portfolio can have differing target groups.

Multi-faceted interventions

Multi-faceted interventions are defined as those involving more than one component which are delivered to the same target group in combination and at the same time. While the strategies in an intervention portfolio may have a mix of target groups, the strategies in a multi-faceted intervention are all aimed at a single target group.

Obesogenic

Contributing to a positive energy balance and weight gain. The term is usually applied to the prevailing physical, social and political environments.

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Preface

Public Health Nutrition

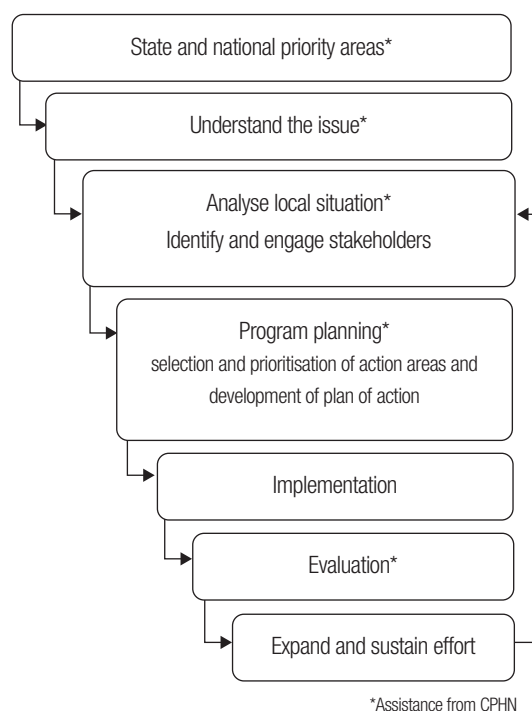
The NSW Centre for Public Health Nutrition (the Centre) was established in 2000 as an initiative of NSW Health, in collaboration with the Sydney University Nutrition Research Foundation. It is located on campus at Sydney University. The Centre builds on previous work in planning a nutrition information system for NSW Health. The Centre is now also a partner organisation in the NSW Centre for Overweight and Obesity, established in 2003. The Centre for Public Health Nutrition contributes specialist expertise in nutrition epidemiology, evidence-based intervention planning and applied nutrition research to this collaboration.

The Centre for Public Health Nutrition 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 focused 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 the CPHN



*Assistance from CPHN

Source: Adapted from Hawe et al 1990.

Executive summary

The promotion of healthy weight and the prevention of weight gain in adults are key international, national and state health priorities. This report on interventions to promote healthy weight follows and complements the *Report on the weight status of NSW 2003*, produced by the NSW Centre for Public Health Nutrition. The monitoring report provided detailed information about population weight status, the burden of illness associated with overweight and obesity, the rationale for addressing overweight and obesity and the range of factors contributing to the problem in NSW.

This report on promoting healthy weight focuses on prevention and applies a structured planning framework as the basis for proposing the adoption of multi-faceted interventions at local level, and a broad portfolio of actions at state level.

Context

At state level, the recent *Prevention of Obesity in Children and Young People: NSW Government Action Plan 2003-2007* and *Eat Well NSW: NSW Health's Strategic Directions for Public Health Nutrition 2003-2007* each endorse healthy weight as a public health priority and signal the commitment by government to take action.

This report fits with the national framework for the prevention of obesity (Commonwealth Department of Health and Ageing 2003). Further, it builds upon national initiatives related to the promotion of physical activity and nutrition, including *Getting Australia Active* and *Eat Well Australia*.

There is also a significant international context for addressing obesity. Recent reports, such as *Obesity prevention: the case for action* (IOTF 2002) and the World Health Assembly *Global Strategy on Diet, Physical Activity and Health* (WHO 2004) are calls to action, and particularly to reduce the prevalence of obesogenic environments which have become endemic to western countries and lifestyles.

Framework for addressing the problem of overweight and obesity

There are several important reasons to address the prevention of obesity, rather than its treatment and/or management. The prevention of weight gain (or the reversal of small gains) and the maintenance of a healthy

weight are likely to be easier, less expensive and potentially more effective than the treatment of obesity after it has fully developed.

The report proposes that the objectives of plans to tackle the problem of overweight and obesity in NSW should focus on prevention of weight gain in adults and the promotion of a healthy weight in children. Prevention of weight gain is a simple message of relevance to all adults in NSW, regardless of current weight status. The maintenance of a healthy weight for children ensures issues such as respect and body image are considered as part of the objectives.

An analysis of contributing factors, and identification of factors that are amenable to change, is the basis for identifying potential points of intervention in efforts to prevent weight gain. Research has consistently shown that numerous and diverse factors, including environmental and social factors, influence behaviours that in turn can lead to excessive weight gain. As the environments become more 'obesogenic' (obesity-promoting), the behaviours that lead to obesity are increasingly the default or automatic ones.

The report reflects and reinforces the 10 key principles for efforts to prevent obesity at a population level, promulgated by the International Obesity TaskForce (Kumanyika et al 2002).

Evidence of effectiveness

This report applies a structured planning framework to identify potential interventions to promote healthy weight and prevent weight gain, and synthesises findings from published studies of evidence on the effectiveness of different interventions.

In seeking to produce an evidence base of information from controlled trials, detailed reviews of the scientific literature have been conducted. These revealed a number of systematic and non-systematic reviews of reported programs addressing the prevention of obesity. Key findings were that only a limited number of evaluated programs were addressed by each review and that a small band of studies formed the basis for most reviews; and there was too small a body of research to provide firm guidance on consistently effective interventions for adults or children.

Ultimately, a broader approach to evidence of effectiveness has been adopted. It is argued that evidence of potential effectiveness may come from a range of sources.

The portfolio model proposed by Hawe and Shiell (1995) allows the selection of interventions to be based on the best available evidence, whilst not excluding untried but promising strategies and offers particular appeal for the selection of the best options for the prevention of weight gain and promotion of healthy weight because of the limited body of well conducted and evaluated studies. On this basis, the report considers the level of potential health gain and level of uncertainty or risk associated with different interventions, as a basis for decision-making about programs, and adopts the concept of 'promising', to allow a more accurate description of the judgements that are being made. It is proposed that the term 'promising' presents the suggestion that an intervention is deemed worthy of systematic implementation and evaluation. The term creates links rather than opposition between the urgency to get on with implementation, and recognition of the value of building further evidence. In this approach, the basis for expectations explicitly involves consideration of effectiveness, appropriateness and feasibility.

Settings-based action areas

Settings-based approaches provide a sound, integrated way of reaching specific target groups and influencing behavioural and social/environmental factors. Thus, potential interventions are organised in terms of the following settings and target groups: families and communities; early childhood care; school community; worksites; and health services. For each action area, the report describes:

- The rationale for interventions in this action area
- A summary of evidence of effectiveness of interventions
- Ratings of selected promising interventions.

Global enabling action areas

There is a range of global enabling actions that can underpin or support actions in other settings-based action areas. Interventions in these enabling action areas can serve to build the capacity of systems, in ways that

reinforce, strengthen and potentially multiply the effects of community-based actions. The three enabling action areas covered in this report comprise: community attitudes and capacity; environmental, system and policy; and service capacity. The report discusses specific actions that can be applied within these enabling action areas, including mass media and social marketing, monitoring and surveillance, changes to food supply and physical environments, leadership, workforce development and collaboration.

Conclusions and recommendations

At a national, state or regional level, action plans need to be broad, comprehensive and multifaceted to address the wide range of factors which are influencing energy balance in the community and contributing to continued weight gain. The portfolio approach offers a useful model for achieving this objective. The report recommends that NSW Health pursue the range of identified enabling actions, including social marketing campaigns, a media information and briefing strategy, a broad workforce development strategy for government and community sectors, and collaboration with food industry groups to address food supply, labelling and food marketing issues.

At the local or area level, interventions within the broad action plan could target single issues or behaviours in a comprehensive and multifaceted manner. This would ensure that these interventions had sufficient intensity and reach to positively address energy balance. Using this approach may be more resource efficient, provided the whole portfolio of action is addressed over time.

New initiatives should build upon existing systems and programs, as there is already a wide range of nutrition, physical activity, chronic disease prevention and other public health programs in NSW. However, tackling the problem of obesity in a truly comprehensive fashion by addressing the wide range of environmental factors that influence energy balance is beyond the scope of the health sector alone. It will require partnership within government and across all sectors of society. The health sector is well placed to take a leadership role and provide the management, coordination and specialised expertise to enable this to occur.

1 Introduction

1.1 The context of this report

The promotion of healthy weight and the prevention of inappropriate weight gain are key national and state health priorities and have been the focus of a range of policy documents and statements.

Australia was one of the first countries in the world to develop a national obesity prevention strategy, with the production of the NHMRC strategic plan *Acting on Australia's Weight* in 1997 (NHMRC 1997). This plan proposed a broad national approach to the prevention of overweight and obesity and a population focus through settings-based initiatives. Unfortunately, there has been no systematic process to drive the implementation of this plan. More recently the national nutrition policy document *Eat Well Australia* (SIGNAL 2001), identified promoting healthy weight as a national priority and proposed a nationally coordinated approach in line with *Acting on Australia's Weight*. The revised *Dietary Guidelines for Australian Adults* (NHMRC 2003a) also acknowledged the serious obesity problem and included the guideline 'prevent weight gain – be physically active and eat according to your energy needs'. The corresponding guideline for children and adolescents is 'children and adolescents need sufficient nutritious foods to grow and develop normally' (NHMRC 2003b).

The infrastructure for action and direction on the issue of overweight and obesity in Australia is still being developed. At a national level, responsibility rests with the Australian Department of Health and Ageing, which relies on the nationally representative bodies – SIGNAL (nutrition) and SIGPAH (physical activity) – to provide strategic advice in this area. In 2002, the National Obesity TaskForce was established by the Australian Government to develop a truly coordinated national response to the problem of obesity in the Australian community. In late 2003, they released a report, *Healthy Weight 2008: Australia's future*, which set out a framework for action on obesity over a five-year timeframe but stopped short of identifying specific strategies (Australian Department of Health and Ageing 2003).

At a state level, there have also been a number of reports and government strategies, which endorse healthy weight as a public health priority and signal the

commitment by government to take action.

These include:

- *Eat Well NSW: NSW Health's Strategic Directions for Public Health Nutrition 2003–2007* (NSW Department of Health 2004a), which was developed as a statement of strategic directions for public health nutrition to guide and facilitate measurable population food and nutrition improvements in NSW. It includes the goal 'to promote healthy weight in children and adolescents and prevent weight gain in adults'.
- *Prevention of Obesity in Children and Young People: NSW Government Action Plan 2003-2007* (NSW Department of Health 2003b), represents a cross-government response to the resolutions and key messages arising from the NSW Childhood Obesity Summit convened by the NSW Government in September 2002.
- *The NSW Chronic Disease Prevention Strategy 2003-2007* (NSW Department of Health 2003a), which identifies a limited number of risk factors that contribute to a small number of chronic disease conditions that, in turn, account for the majority of the disease burden in NSW. This cluster approach is designed to facilitate more integrated approaches to primary prevention, including settings-based approaches.

Other important NSW public health policies and strategies such as *Healthy People 2005* (NSW Department of Health 2000a) and the *NSW Health and Equity Statement* (NSW Department of Health 2004c) have influenced the development of action on obesity, nutrition and physical activity by defining the principles of public health action for the NSW health system.

There is also a significant international context for addressing obesity. The WHO Technical report *Obesity: preventing and managing the global epidemic* (WHO 2000) describes the global significance and seriousness of the problem, its relevance to developing – as well as developed – countries and presents the foundations of a comprehensive public health strategy for prevention and management. The later report *Obesity prevention: the case for action* (IOTF 2002) represents a call to broad action, particularly to reduce the prevalence of obesogenic environments which have become endemic to western countries and lifestyles.

The intervention approaches described in this report are compatible with policy and planning approaches described in the documents noted, and build upon specific initiatives related to the promotion of physical activity, as well as nutrition. At a state level *Simply Active Everyday: A plan to promote physical activity in NSW 1998-2002* (developed by the NSW Physical Activity Task Force 1998) and at a national level, the Active Australia initiative (designed to provide a national participation framework for all sport, recreation and everyday physical activities across the country) have provided a sound base of physical activity initiatives (Commonwealth Department of Health and Family Services 1998). More recently, *Getting Australia Active*, describes current evidence supporting physical activity initiatives and provides guidance to practitioners in this area (Bauman et al 2002).

1.2 The purpose of this report

This report on interventions to promote healthy weight and prevent weight gain in the community follows and complements the *Report on the Weight Status of NSW 2003* produced by the NSW Centre for Public Health Nutrition (2003a).

Best Options for Promoting Healthy Weight and Preventing Weight Gain builds on a range of previous work and identifies and describes specific actions with the potential for addressing the problems of overweight and obesity within NSW. It provides part of the specific reference material required to address the priority issues identified in *Eat Well NSW*. The specific objectives of this report are:

1. To develop a planning framework for addressing the problem of obesity based on health promotion planning tools, by:
 - identifying a range of promising areas for action to tackle the problem of obesity at a state and local level
 - specifically focusing on preventing weight gain
 - considering new initiatives, in addition to building upon existing nutrition and physical activity interventions.
2. To provide the rationale and evidence for effective interventions in selected action areas
3. To synthesise a variety of sources of evidence, in order to guide action
4. To identify examples of projects within selected action areas
5. To identify potential areas for future research and evaluation.

1.3 Audience for this report

This report has been written to meet the needs of:

- a. **Relevant Area Health Services personnel**
The information in this report is specifically oriented to be useful to Area Health Service staff involved in providing services and planning prevention initiatives. This is the primary target audience, as a significant amount of the action to address community weight gain prevention occurs at a local level.
- b. **NSW Health**
This report is intended for use by central units of NSW Health, as a basis for the development of central and statewide strategies to address issues associated with healthy weight and the prevention of associated illness.
- c. **Private sector, non-government organisations and other government agencies that are stakeholders in addressing the issues associated with overweight and obesity**
Comprehensive strategies to maintain healthy weight and prevent weight gain in the community will require coordinated action from a wide range of sectors in society. This report provides information for many organisations that have a stakeholder role in addressing the problem of obesity and identifies action areas in which they have potential influence. It is intended that this report be used to develop a common framework for planning interventions and for coordinating actions across sectors.

2 Conceptual framework for promoting healthy weight

The issues surrounding the development and effective prevention of overweight and obesity in NSW are complex and numerous. A range of previous reports have attempted to define the nature of the problem, the objectives of action and the global strategies to address the problem, but none have identified specific interventions to achieve these objectives. Taking this important step from strategy to action requires the application of the health promotion planning process (identified in Figure A within the preface). This process of producing an action plan capable of achieving the objective of *Eat Well NSW* – ‘to promote healthy weight in children and adolescents and prevent weight gain in adults’ – involves a series of decision points, which correspond to key planning concepts.

This section deals with some of these key concepts.

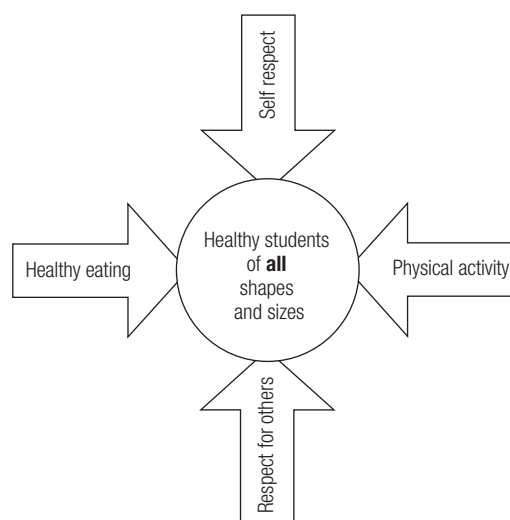
2.1 What is a healthy weight?

Despite its widespread use in public health documents, the concept of healthy weight is rather vague and ill defined and means different outcomes to different people. *Acting on Australia's Weight: The Dietary Guidelines for Australians* and *Eat Well Australia* use the term without providing a definition. Healthy weight is usually defined in adults as a range of body mass index – a reference point between underweight and overweight. The promotion of healthy weight usually relates to the avoidance of underweight and overweight or obesity. However this is a very narrow definition, as it implies that weight alone defines health and suggests that any weight within this BMI range is associated with good health. In its broadest sense, a healthy weight could be defined as a weight associated with a high level of physical, social and emotional health, which is linked with a low risk of future chronic illness and premature death. However, these outcomes can be difficult to measure and their relationship to weight varies greatly between individuals.

In children, the definition of healthy weight is complicated further by the fact that height is still increasing and body composition and adiposity changes over time. Identifying the weight most appropriate to the overall health of individual children at a set point in time is difficult. The healthy weight range for children is usually defined as a BMI-for-age that is below the 85th percentile (cut point for overweight) and above the 5th percentile

(cut point for underweight). More importantly, BMI-for-age should track along the same percentile and avoid excessive swings in relative weight status. It is even more important that the promotion of healthy weight in children does not simply focus on actions to avoid underweight and overweight. It is important that a focus on excess weight does not become associated with stigmatisation or inappropriate body image and unsafe weight reduction practices in adolescence. The Healthy Weight Advisory Group of the Michigan Department of Community Health has therefore proposed a healthy weight concept model (see Figure 1) which includes the elements of self-respect and respect for others, as well as healthy eating and physical activity. Messages about weight presented to children need to be consistent and positive.

Figure 1. The Michigan healthy weight concept model



Source: Michigan Department of Education 2001

2.2 Why focus on weight gain prevention in adults?

The lack of clarity surrounding healthy weight is one of a range of reasons why a focus on weight gain prevention in adults is usually a more appropriate objective (see Table 1). While it has been known for some time that elevated BMI is associated with ill health, recent research has shown that modest weight gain in adulthood is also associated with increased health risk and that this risk is independent of absolute BMI (Willett et al 1999).

Table 1. Reasons for focusing on weight gain prevention in adults

<ul style="list-style-type: none"> • Weight gain in adulthood carries an independent risk of ill health
<ul style="list-style-type: none"> • Risk for chronic disease begins to increase from low BMI levels and significant weight gain can occur within normal limits
<ul style="list-style-type: none"> • Extended periods of weight gain are difficult to reverse
<ul style="list-style-type: none"> • Weight gain in adulthood is mostly fat gain
<ul style="list-style-type: none"> • The relationship between absolute BMI and health risk varies with age and ethnicity but no such variations occur in the relationship between weight gain and ill health
<ul style="list-style-type: none"> • A focus on weight gain prevention avoids exacerbation of inappropriate dieting behaviours
<ul style="list-style-type: none"> • Weight maintenance can serve as a first stage goal for weight treatment programs
<ul style="list-style-type: none"> • The message is equally relevant to all sections of the adult population
<ul style="list-style-type: none"> • It avoids further stigmatisation of people with an existing weight problem
<ul style="list-style-type: none"> • It avoids reference to poorly understood terms such as 'healthy weight'.

A large weight gain in a lean individual may carry equivalent risk to maintaining a stable, but slightly elevated BMI in an overweight individual. In addition, the risk of developing many chronic diseases begins to increase quite rapidly from a BMI of around 21, and may reach substantial levels within the 'healthy' BMI range. For example, the risk of coronary heart disease in women at a BMI of 26 is already twice that of a woman with a BMI of 21, whilst for men the risk is 1.5 times in those with a BMI of 26 compared to 21. Assessments of health risk based only on an absolute level of BMI or BMI grade can be misleading and increases in weight in those within acceptable BMI ranges often attract no concern from health care professionals.

There are a number of other important reasons why a focus on weight gain prevention should be central to all strategies to tackle the obesity problem. Although the process of weight gain is still poorly understood, it is widely

recognised that once a person has entered a phase of weight gain, the longer the period, the more difficult it becomes to slow or reverse. Almost all weight gain in adulthood is fat gain and is usually associated with a disproportionate increase in abdominal fat stores. As a consequence, the relationship between BMI and risk varies with age and there appear to be similar variations between absolute BMI and the level of health risk between different ethnic groups. These issues are redundant at a population level if the major focus is weight gain and not absolute BMI.

In addition, weight maintenance can also serve as an appropriate goal of weight control programs in individuals with an existing weight problem (Rossner 1992). Shifting the focus away from weight loss to weight maintenance also avoids exacerbating inappropriate dieting behaviours which have been reported in teenage girls and young women.

2.3 Evidence-based planning

Evidence-based decision making is now widely accepted as the most appropriate process for determining where to apply resources when addressing health problems. However, there remains much debate about how this process should be best applied to decision-making within public health and health promotion planning (Rychetnik 2003; McQueen 2002).

A central element of this debate is the nature and definition of evidence and how the quality of evidence and effectiveness is defined. Evidence-based medicine has developed a rigid hierarchy of rules for assessing the quality of scientific evidence that relates to the nature of study design (Rychetnik and Frommer 2002). This system has proved effective in enabling comparisons of the relative merit of single clinical interventions, but many commentators suggest that this approach to defining and grading evidence is far too narrow to be directly applied to public health and health promotion. The complex, interactive and social nature of health promotion interventions make them significantly different from physiological or clinical interventions where there is a higher degree of control and little influence from social factors (McQueen and Anderson 2001; Green 2001).

There has been a range of suggested approaches to improving the evidence base for decision making in public health and health promotion. The WHO European Working Group on Health Promotion Evaluation (1998) recommended the use of multiple evaluation methods, with a mix of process and outcome information, to build a body of evidence about interventions. Systems for broadening the evidence base in health promotion have also been proposed by Tang et al (2003) and the *Guide to Community Preventive Services* (Briss et al 2000).

There are a number of more specific tools that can contribute to appropriate evidence-based appraisal of health promotion interventions. For example, logic models and theory can be used to identify pathways between short and long-term outcomes. This can be used to support the connections between measured changes and longer-term outcomes or goals, or to strengthen the credibility of certain findings (Rychetnik et al 2002; Truswell 2001; Swinburn and Gill 2003). For example, where measured outcomes are behavioural, then assumptions about physiological pathways and other aetiological studies are used to draw out the implications for later disease outcomes. The absence of excellent evidence does not make evidence-based decision-making impossible. What is required is the best evidence available, not the best evidence possible (Muir Gray 1997). In addition, Green (2001) argues that evidence of effectiveness is not sufficient by itself to guide appropriate decision-making. He argues that it is inappropriate to assume that evidence from one population or situation gathered in a controlled trial is insufficient to identify the best solution in another situation. Green's suggestion is to focus on best processes to allow the development of programs of action that fit specific circumstances.

2.4 The nature of evidence

In its broadest sense, evidence is a body of facts or information that provides a level of certainty that a proposition is true or valid. Thus, effective decision-making in health promotion and public health should include all information of relevance including the organisational and social context in which it was gathered (Rychetnik 2002; Nutbeam 2003).

In this project we have tried to produce an evidence base in relation to information from *observational and*

experimental studies where suitable. However, because this approach can be extremely limited and does not necessarily provide an appropriate basis for identifying complex community interventions, other forms of evidence have also been incorporated into the assessments of effectiveness and feasibility. Thus, the analysis of intervention research has also considered:

- *Process evidence* – Information from process evaluation of programs indicating that promising interventions can be implemented as planned
- *Impact evidence* – Information from non-experimental impact evaluations of obesity prevention programs showing an effect on presumed intermediate variables (knowledge, attitudes etc)
- *Parallel evidence* – Information from the evaluation of programs that address a behaviour or environmental issue of relevance to obesity (a parallel program) eg Sunsmart, or a demonstration of influencing factors eg advertising of toys to children and their subsequent increase in sales
- *Indirect or intuitive evidence* of likely effect – that is, inferring effects based on actions by other sectors – eg the investment by food companies in TV advertising
- *Expert opinion* – the considered opinion of experts who have the expertise to be able to understand and interpret the policy implications of the scientific literature as well as appreciating the context in which it will be applied.

2.5 Expected outcomes of interventions

It is often assumed that intervening within the community to address the problems of excess weight should result in a reduction in the levels of overweight and obesity. However, Australia and NSW are currently experiencing a period of very rapid increases in the mean population BMI, resulting from a large energy surplus. Reversal of this trend will require a substantial reduction in this energy surplus, which will need to be maintained for a significant period of time.

Few interventions are capable of reducing energy intake or increasing energy expenditure sufficiently, or for long enough, to achieve this effect. More appropriate outcomes would be the prevention of weight gain or weight stability

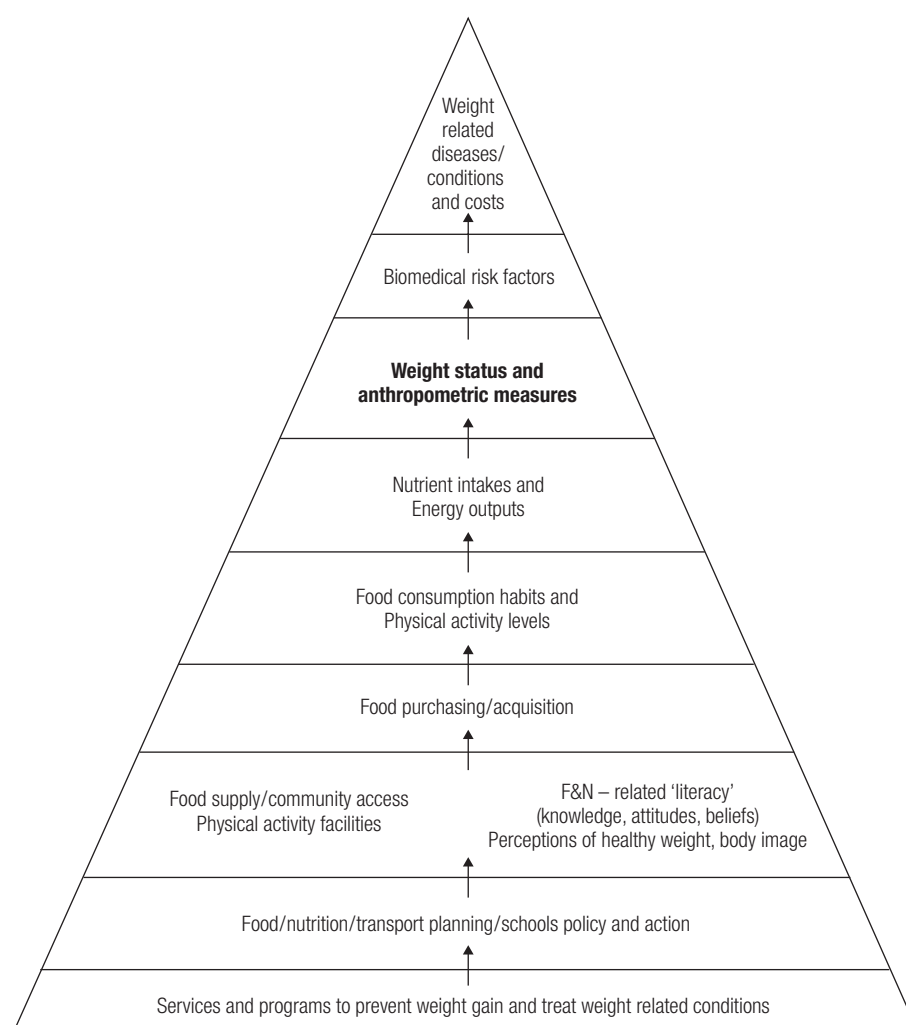
in adults, and the achievement of appropriate growth and development in children. These outcomes will only be achieved through the maintenance or re-establishment of energy balance.

However, even population weight stability may be difficult to achieve in the short term, as a large proportion of Australian adults are in a state of positive energy balance, gaining weight over time. Therefore, it may be necessary to identify more sensitive short and medium-term outcomes to evaluate programs of actions to address obesity.

The conceptual framework for monitoring weight and related variables (see Figure 2), which was presented in the preceding *Report on Weight Status of NSW 2003*

(CPHN 2003a) can serve as a useful guide for measuring 'lower order outcomes' desired by preventive programs. Changes in dietary and physical activity behaviours have been shown to precede changes in weight status in adults and children, and can be detected within a timeframe of one to two years. If changes in diet, physical activity or sedentary behaviours are large enough to impact positively on improved energy balance, then these may serve as useful intermediary outcomes. Also, important 'process evaluation' indicators such as measured changes in policies, services, professional practices and community facilities can be used to show that preventive programs are being implemented as planned, which is an important first step in the lead up to dietary and physical activity changes in the population.

Figure 2. A conceptual framework for monitoring weight and related variables



Source: CPHN 2003a

Process for addressing the current problem of overweight and obesity in NSW

3.1 The case for obesity prevention action

The case for immediate action on obesity in NSW is overwhelming. The report, *State of Food and Nutrition in NSW: Report on Weight Status in NSW 2003* (CPHN 2003a), provides detailed information about population weight status, the burden of illness associated with overweight and obesity, the rationale for addressing overweight and obesity and the range of factors contributing to the problem, as a basis for understanding the problem in NSW. The report concluded:

- 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 that 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 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 opposes 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 program 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 who have an existing weight problem.

There are several important reasons why the response to the weight problem of NSW should focus on preventive efforts. First, obesity develops over time and, once established is very difficult to treat. A number of reviews have highlighted the difficulties in sustaining the short-term success of obesity treatments (NHS 2002). Second, the health consequences associated with obesity result from the cumulative metabolic and physical stress of excess weight over a long period of time, and may not be fully reversible by weight loss (Visser and Seidell 2001). Third, the proportion of the population that is either overweight or obese is now so large that the cost of offering treatment to all is likely to be unacceptable.

It can be argued, therefore, that the prevention of weight gain (or the reversal of small gains) and the maintenance of a healthy weight are easier, less expensive, and potentially more effective options.

3.2 Planning interventions to prevent weight gain and promote a healthy weight

Good planning is the cornerstone of good health promotion. Effective planning is especially important when dealing with issues such as the prevention of obesity where there has been little coordinated action to address the problem in the past. Therefore, this report draws upon planning guidelines that have been used in the development of past successful programs of action. The process outlined in Table 2 is based upon the National Public Health Partnership's *Planning Framework for Public Health Practice* (National Public Health Partnership 2000)

Table 2. Stages in the planning and practice framework

- | |
|--|
| 1. Identify the determinants of the problem |
| 2. Identify potential intervention points based on analysis of determinants |
| 3. Identify and assess the intervention options |
| 4. Decide on the best mix of interventions (a portfolio) using explicit criteria |
| 5. Implement the intervention mix |
| 6. Review the interventions |

with modifications in reference to other published health promotion planning guidelines (Hawe et al 1990; Green and Kreuter 1999; Central Sydney AHS 1994).

This report applies the planning framework to identify potential interventions to promote healthy weight and prevent weight gain (steps 1 and 2). It also uses the framework to synthesise findings from published studies of evidence on the effectiveness of different interventions (step 3) and to offer some ideas about the level of potential health gain and level of uncertainty or risk associated with different interventions. These outcomes then serve as a basis for decision making about programs (step 4).

3.3 Developing a portfolio approach

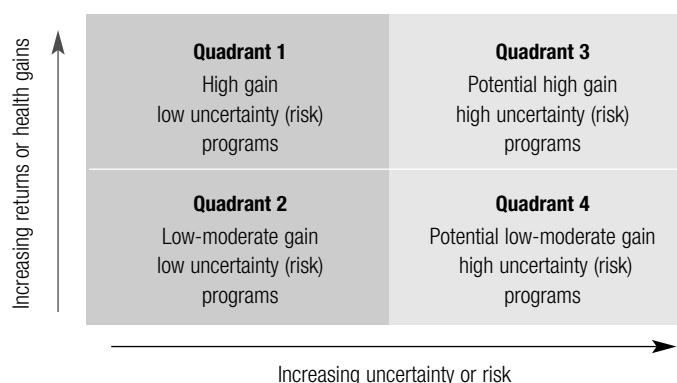
The later steps of the planning framework are based on the portfolio approach to health promotion first proposed by Hawe and Sheill (1995). This approach allows the selection of interventions to be based on the best available evidence whilst not excluding untried but promising strategies. It offers particular appeal for the selection of the best options for the prevention of weight gain and promotion of healthy weight because of the limited body of well conducted and evaluated studies that have addressed this issue to date.

The portfolio approach is drawn from the field of financial planning, where the focus is on returning maximum financial yield on the investment of resources. Within this domain, assets are rated on their likely return and the level of risk. Ideal investor portfolios contain a mix of low risk assets with small to moderate return (eg bonds) through to high risk but high potential return assets (eg speculative stock). The same concept can be applied to decision-making about investments in health promotion actions to address obesity prevention (see Figure 3).

In health promotion, return is measured in terms of health gains and non-health outcomes instead of financial terms. Risk relates to the consistency of return which has been shown by past health promotion programs or, where this has not been measured, by the uncertainty about their effectiveness. Thus, intensive interventions within small groups or individuals might be low risk, as they consistently result in changes in behaviour and other outcomes. However the overall return may only be small to moderate as the effect of the intervention may be small and result in only a slight impact on the health status of the community as a whole.

The process for assessing and weighing up potential gains and risks then leads to adopting a mix of interventions, or a portfolio, to balance the risks. This portfolio approach is discussed further and applied in Section 5 of the report.

Figure 3. Weighing up potential gains and risks in the portfolio approach



Source: Hawe and Sheill 1995

4 Identifying intervention points

4.1 Factors contributing to 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. However, this does not imply that obesity is self-inflicted, resulting simply from deliberate over-eating and lack of exercise. Research has consistently shown that numerous and diverse factors, including environmental and social factors, influence behaviours that in turn can lead to excessive weight gain. As the environments become more 'obesogenic' (obesity-promoting), the behaviours that lead to obesity are increasingly the default or automatic ones.

Many analyses have attempted to define the key determinants of obesity and there remains a degree of controversy over which factors have made the greatest contribution to the recent rise in the rates of obesity in Australia today. The most comprehensive assessment of the situation has been undertaken by the World Health Organisation in the *Expert Report on Diet, Nutrition and the Prevention of Chronic Disease* (WHO 2003). This report examined the current literature and identified a range of key factors which either increase or decrease the risk of weight gain and the development of obesity (see Table 3).

4.2 Identifying potential intervention points

Potential intervention points should be chosen from within the list presented in Table 3, with particular attention to those factors that have a high level of evidence to support their role in the development of obesity (ie probable or convincing). When choosing intervention points, it is also important to consider those factors that are amenable to change and to consider the relevance of these factors to the NSW obesity problem. It is important to understand that addressing the obesogenic environment is critical to achieving sustained changes to eating and physical activity patterns (Egger and Swinburn 1997).

Table 3. Summary of the strengths of evidence on factors that might promote or protect against weight gain and obesity

Evidence	Decreases risk	Increases risk
Convincing	Regular physical activity High dietary fibre intake	High intake of energy-dense foods* Sedentary lifestyles
Probable	Home and school environment that supports healthy food choices for children Promoting linear growth	Heavy marketing of energy-dense foods and fast foods outlets Adverse social and economic conditions in developed countries (especially for women) Sugar-sweetened soft drinks and juices
Possible	Low glycaemic index foods Breastfeeding	Large portion sizes High proportion of food prepared outside of homes Rigid restraint/periodic disinhibition eating patterns
Insufficient	Increased eating frequency	Alcohol

* Energy-dense foods are high in fat/sugar and energy dilute foods are high in fibre and water such as vegetables, fruits, legumes and whole grain cereals

Source: Adapted from WHO 2003

Diet and physical activity behaviours

The previous Report on the *Weight Status of NSW: 2003* (CPHN 2003a) examined the current situation in relation to the key dietary and physical activity behaviours related to obesity and identified recent trends. These are summarised in Table 4 below.

Table 4. 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	High	Increased substantially
Total fat intake	High	Decreased slightly	High	No change
Total sugar intake	High	Increased	High	Increased substantially
Sweetened drink intake	High	Increased	High	Increased substantially
Fast food consumption	High	Increased	High	Increased
Confectionery	Moderate	Increased	High	Increased substantially
Frequency and duration of physical activity	Low	Decreased	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

When this information is combined with the WHO analysis (WHO 2003) it is possible to identify a number of key behaviours which could conceivably influence energy balance sufficiently to contribute to the prevention of weight gain and obesity. These include:

A. Reducing energy intake

- Reducing the intake of high energy dense foods (ie foods high in fat/sugar)
- Increasing the intake of low energy-dense foods (especially vegetables and fruits)
- Reducing the consumption of sugar-sweetened soft drinks and juices
- Reducing the level of food prepared outside of the home
- Reducing portion sizes.

B. Increasing energy expenditure

- Regular physical activity
- Reduced time spent in sedentary behaviours (especially TV watching).

C. Increasing daily physical activity

- Increased incidental activity
- Increased participation in active recreation
- Increased use of active transport.

Social and physical environments

Physical, social, political and economic environments have 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, and commercial settings. In turn, these settings are influenced by laws, policies, economic imperatives and the attitudes of governments, industry and society as a whole. Each of the features of this complex system has the capacity to inhibit or encourage appropriate dietary and physical activity patterns. The *Report on Weight Status in NSW: 2003* (CPHN 2003a) identified a range of environmental factors such as 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 that influence our capacity and desire to be more physically active in our daily lives.

Similarly, advertising pressures, access to appropriate food choices, school food policies, nutrition information and labelling all potentially influence food selection. In Australian society today there is also a large commercial drive to promote products that contribute to obesogenic behaviours (cars and food are the two most advertised products on television). The economic imperative (ie profits) behind these promotions creates a challenge

for policies and attitudes to turn the tide on the obesity epidemic.

Trying to motivate people to make healthy choices, when the external environment does not readily provide them, is unlikely to succeed. The approach most likely to succeed is to create the easy environment and then promote the healthy choices within it.

Working the margins

It is often assumed that those factors that potentially contribute most to energy imbalance offer the greatest opportunity for change and thus should take primacy in any obesity prevention strategy. However, the largest contributory factors are often less amenable to change and may require a greater investment of resources to achieve small change, especially in the short term. This does not necessarily justify the exclusion of such factors from the list of potential intervention points, but it is important to recognise that addressing a collection of factors that make a smaller contribution to energy imbalance may yield superior return. The principle of addressing a range of smaller contributory factors rather than focusing solely on the largest contributory factors has been shown to be an effective approach to tackling a range of societal problems. For staff within Area Health Services 'working the margins' may offer an opportunity to devise an achievable plan of action on obesity and thus it should be considered when selecting intervention points.

4.3 Key groups to target

Deciding where to invest limited time and resources in obesity prevention is a difficult task. While decisions about who to target will often need to be made at a local level after a thorough community assessment, there are some general principles that will apply to every region of NSW.

Whole community as a target group

Overweight and obesity are public health problems of relevance to the whole community. Strategies are needed that focus on population-wide change rather than attempting to address individuals or very small groups in isolation from the community in which they live. However, it is difficult to formulate interventions that reach the whole community in a meaningful and substantial form, and thus

for practical purposes, interventions are often designed to reach specific population groups, or segments.

A focus on children and families

Children should be a major focus of any obesity prevention strategy. A primary reason is that a high proportion of overweight or obese children will become obese adults. Furthermore, studies have shown that childhood obesity persisting into adulthood results in a more severe form of obesity, with a higher level of morbidity and early mortality, than adults whose obesity begins later in life. Also, childhood obesity has immediate negative effects on health; conditions such as diabetes are increasingly prevalent in children today. Lastly, childhood (particularly young childhood) is a period where prevention efforts have a higher chance of success as children grow rapidly and increase the level of lean body mass as they age, and so reducing or keeping fat mass constant allows the normalisation of weight over time.

Because children have little direct control over the environment in which they live, and decisions concerning food availability and opportunities for activity are mostly controlled by parents and other caregivers, a family focus is an appropriate avenue for influencing their behaviour. In addition, the behaviours of parents and other siblings have a profound effect upon the diet and physical activity behaviours of children. For this reason, it is preferable to focus childhood obesity prevention efforts on the family and childcare/school environments, rather than directly on children as individuals.

High risk groups

The *Report on the Weight Status of NSW: 2003* (CPHN 2003a) identified a number of groups within NSW that appear to be at higher risk of developing overweight and obesity (see Table 4). These groups may warrant special attention and include:

- those with a family history of weight problems
- socially disadvantaged and isolated communities
- certain ethnic groups
- smokers who have recently quit
- those who have recently lost weight.

Critical life stages

There are certain times in a person's life when they are more prone to weight gain. The WHO report, *Obesity: Preventing and Managing the Global Epidemic* (WHO 2000), identified a range of critical life stages for weight gain (see Table 5) which included:

- Pre-natal
- Adiposity rebound (5–7 years)
- Adolescence
- Early adulthood

- Pregnancy
- Menopause.

Those with an existing weight problem

In developing weight gain prevention strategies, it is important not to neglect those with an existing weight problem that could benefit from more intensive efforts to help prevent further weight gain. However this should be achieved as part of, rather than at the expense of, a concerted community-wide program.

Table 5. Identifying at-risk groups for obesity in terms of life stages

Critical ages and life stages	Reason for increased risk
Pre-natal	There is evidence to suggest that in-utero development has permanent effects on later growth and energy regulation.
Adiposity rebound (5-7 years)	Body mass index begins to increase rapidly after a period of reduced adiposity during pre-school years. Food and activity patterns change as a result of exposure to other children and school. Early and rapid weight rebound often precedes the development of obesity.
Adolescence	Period of increased autonomy which is often associated with irregular meals, changed food habits and periods of inactivity during leisure combined with physiological changes which promote increased fat deposition, particularly in females.
Early adulthood	Early adulthood usually correlates to a period of marked reduction in physical activity. In women this usually occurs between the ages of 15-19 years but in men it may be as late as the early 30s.
Pregnancy	Excessive weight gain during pregnancy often results in retention of weight after delivery, particularly with early cessation of breastfeeding. This pattern is often repeated after each pregnancy.
Menopause	In Western societies weight generally increases with age but it is not certain why menopausal women are particularly prone to rapid weight gain. The loss of the menstrual cycle does affect food intake and reduces the metabolic rate slightly.
High risk groups	
Family history of weight problems	There is no longer any doubt that given the same environment some individuals are more prone to depositing fat. The basis of these differences in individual susceptibility to obesity is yet to be fully elucidated but is believed to involve a number of physiological processes associated with fat deposition and oxidation and involuntary energy expenditure.
Certain ethnic groups	In NSW, recent migrants from southern Mediterranean countries and the Middle East are more likely to be obese and their children are more likely to develop a more severe form of obesity which leads to immediate health consequences.
Socially or economically disadvantaged	In NSW, there is an inverse association between income and education level and obesity which is most pronounced among women and children. It is argued that cheaper foodstuffs are usually high in fat and energy dense and those with less financial resources spend more time in sedentary activities such as watching TV.
Recent successful weight reducers	Successful weight loss is usually followed by the regain of one third to one half of the weight loss over the following year. It is believed that biological and behavioural processes act to drive body weight back to baseline levels (Wing 1995).
Recent past smokers	Smokers are usually thinner than non-smokers because smoking tends to depress appetite, increase the basal metabolic rate and, after each cigarette, induce a surge in heart and metabolic rate. The effect on metabolism of smoking 24 cigarettes per day has been estimated at around 200 kcal per day.

Source: Gill 1997

5 Identifying intervention options (action areas)

Deciding where to intervene in relation to the contributing factors identified as potential intervention points requires a close assessment of the results of previous efforts to address obesity as well as drawing on the experience of past public health campaigns. This section provides an overview of the information used to guide these decisions as well as a discussion of sources of evidence. More detailed descriptions of the evidence of effectiveness for specific interventions are presented in Section 6.

5.1 Assessing available information and evidence

In gathering evidence on which to consider potential intervention options or areas in which to act, we applied a range of methods including:

- Assessment of currently published reviews on obesity prevention within the scientific and public literature
- Extensive literature search of online reference databases (Medline and Embase where possible) using defined search terms (see below)
- Scans of the Web using the Google search engine and defined search terms
- Reference to previously published Australian and international reports
- Citation search and follow up of references cited in key reports
- Authors' expertise and understanding of the issue
- Audit of health promotion project registries
- Discussion with experts in the field of paediatric and adult obesity as to their knowledge of current programs and follow up
- Direct contact with program managers regarding programs and evaluation reports
- Information from Non Government Organisations.

5.1.1 Reviews of interventions to prevent obesity or weight gain

A detailed review of the scientific literature revealed a number of systematic and non-systematic reviews of reported programs addressing the prevention of obesity. The search for reviews was comprehensive and broadly in line with the process set out by the National Public Health

Partnership's *Schema for Evaluating Evidence on Public Health Interventions* (Rychetnik and Frommer 2002).

A key finding was that only a limited number of evaluated programs were addressed by each of the reviews and that a small band of studies formed the basis for most reviews.

The list of systematic reviews examined is shown in Table 6 and more detailed summaries are provided in Appendix A. The most rigorous review of obesity prevention initiatives in children was a Cochrane review conducted by Campbell et al (2002). This assessment was only able to identify 10 studies that met their criteria for inclusion and only seven of these studies had a follow up of 12 months or more. Another review, which also adopted strict inclusion criteria by Reilly et al (2002), included only three studies.

Less stringent criteria were applied in reviews by Dietz and Gortmaker (2001) and French et al (2001).

Nearly all programs identified in these reviews were conducted in the school setting and whilst many of these produced valuable results, their findings were inconsistent. The authors concluded that there was simply too small a body of research conducted in a limited number of settings to provide firm guidance on consistently effective interventions. However, reviews of childhood obesity prevention initiatives indicated that certain approaches appear to be associated with greater success:

- Intensive interventions in small groups were successful as a management strategy in children, as was involving all the family
- Reducing levels of inactivity was successful at both treating and preventing weight gain
- Some interventions which increased time spent in formal physical activity were successful in controlling weight gain
- Intensive short-term interventions addressing one or two issues showed the greatest change in weight status in children but generally multi-component programs which addressed a range of strategies were deemed to hold the most promise.

Reviews of interventions to prevent obesity in adults are even more limiting. Systematic reviews by Douketis et al (1999) and Glenny et al (1997) were only able to identify three to four studies, none of which were successful in preventing weight gain in adults. Some of these studies were many years old and were part of the Stanford or

Minnesota heart disease prevention trials and others were workplace-based education programs. A review by Fogelholm and Kukkonen-Harjula (2000) of the influence of physical activity on weight gain prevention also found

inconsistent results, although there was some evidence to support a positive benefit of regular physical activity on weight maintenance in adults.

Table 6. List of systematic reviews examined

Review	Target group	Setting/s addressed
Interventions for treating obesity in children. (Cochrane Review). Summerbell CD, Waters E, Edmunds L, et al 2003	Children under 18 years	Clinical services
Interventions for preventing obesity in children (Cochrane review). Campbell K, Waters E, O'Meara S, et al 2002	Children	School Childcare Family
The prevention and treatment of childhood obesity. NHS CRD (Centre for Reviews and Dissemination) 2002	Children	School Family
The effectiveness of school-based strategies for the primary prevention of obesity and for promoting physical activity and/or nutrition, the major modifiable risk factors for type 2 diabetes: A review of reviews. Micucci S, Thomas H, Vohra J 2002	Children	School
Obesity: diagnosis, prevention, and treatment; evidence based answers to common questions. Reilly JJ, Wilson ML, Summerbell CD, Wilson DC 2002	Children	School Clinical services
Preventing obesity in children and adolescents. Dietz WH, Gortmaker SL 2001	Children and adolescents	School Family
Environmental influences on eating and physical activity. French SA, Story M, Jeffery RW 2001	Children and adolescents	School Family Fiscal strategies
The importance of physical activity in the prevention of overweight and obesity in childhood: a review and an opinion. Steinbeck KS 2001	Children	School Family Community Clinical services
Role of physical activity in the prevention of obesity in children. Goran MI, Reynolds KD, Lindquist CH 1999	Children and adolescents	School Family
The effectiveness of worksite physical activity programs on physical activity, physical fitness, and health. Proper et al 2003	Working adults	Worksites
How much physical activity is enough to prevent unhealthy weight gain? Outcome of the IASO 1st Stock Conference and consensus statement. Saris et al 2003	Adults	Clinical services
An updated systematic review of interventions to improve health professionals' management of obesity. Harvey et al 2002	Health professionals	Primary care Clinical services
Management of overweight and obese adults. Noel et al 2002	Adults	Primary Care Clinical services

Table 6. List of systematic reviews examined (continued)

Review	Target group	Setting/s addressed
Advice on low-fat diets for obesity. (Cochrane Review). Pirozzo et al 2003	Adults	Clinical services, primary care Community
Appropriate intervention strategies for weight loss and prevention of weight regain for adults. American College of Sports Medicine 2001	Adults	Primary care Clinical services
Long-term efficacy of dietary treatment of obesity: a systematic review of studies published between 1931 and 1999. Ayyad et al 2000	Adults	Clinical services
Does physical activity prevent weight gain – a systematic review. Fogelholm et al 2000	Adults	Multiple settings Community Clinical services
Interventions to prevent weight gain: a systematic review of psychological models and behaviour change methods. Hardeman et al 2000	Adults and children	Families Schools
Periodic health examination, 1999 update: 1. Detection, prevention and treatment of obesity. Douketis et al 1999	Adults	Community Clinical services
Physical activity in the treatment of the adulthood overweight and obesity: current evidence and research issues. Wing I 1999	Adults	Clinical services Community
The role of physical activity in the prevention and management of obesity. Rippe and Hess 1998	Overweight adults	Clinical services
The treatment and prevention of obesity: a systematic review of the literature. Glenny et al 1997	Adults	Community Worksite Clinical services
A meta-analysis of the past 25 years of weight loss research using diet, exercise, or diet plus exercise intervention. Miller et al 1997	Overweight adults	Clinical services
The prevention and treatment of obesity. NHS CRD 1997	Adults	Community Worksite Clinical services
Worksite intervention for weight control: a review of the literature. Henrikus et al 1996	Adults	Worksites

5.1.2 Non-systematic reviews

Many reports of promising interventions may be excluded from systematic reviews because of the strict inclusion criteria. It was therefore considered appropriate to examine the wider range of publications addressed in non-systematic reviews and summary articles (see Table 7). Although the studies reported in these reviews are selected by the authors and may not represent the whole body of research on this issue, the conclusions of

the wide range of articles assessed were highly consistent. The main issues raised included:

- A significant lack of reports on well-evaluated prevention interventions addressing the general population (Thomas 1995; Maggio and Pi Sunyer 1997; Muller et al 2001; James and Gill 2004). There was general agreement that efforts should be heavily oriented towards preventing obesity in children because of the greater likelihood of success at a younger age

Table 7. List of non-systematic reviews examined

Non systematic review
Prevention of obesity. James and Gill 2004
Preventive strategies against weight gain and obesity. Swinburn and Egger 2002
Public health strategies for obesity treatment and prevention. Jeffery 2001
Self help in the long-term treatment of obesity. Latner 2001
Prevention of obesity – is it possible? Muller et al 2001
Pediatric overweight: a review of the literature: Centre for Health and Weight, UC Berkeley Ritchie et al 2001
Television viewing and childhood obesity. Robinson 2001
Diet, nutrition and the prevention of obesity: WHO – background paper for the WHO consultation on diet, nutrition and the prevention of chronic diseases. Swinburn et al 2001
Public health interventions for the prevention and treatment of obesity. Schmitz and Jeffery 2000
School-based approaches for preventing and treating obesity. Story 1999
The prevention and treatment of obesity: application to type 2 diabetes. Maggio and Pi Sunyer 1997
Prevention of obesity. Thomas 1995
School-based obesity prevention. Population versus high-risk intervention. Reniscover 1993

- The effective prevention of obesity will require a comprehensive set of complementary strategies, that are delivered in wide range of settings and are sustained for a significant period of time. Strategies that focus on a single factor are unlikely to be effective, in isolation, in the long term prevention of inappropriate weight gain. There is greater potential for multi-component programs to make a significant contribution to the prevention of obesity in both adults and children

- Interventions that include environmental strategies as well as behavioural change components are required and should be trialled and evaluated. These actions will support the adoption of behaviours conducive to weight control and reduce reliance on simple educational and behavioural approaches.

As there are only a small number of published randomised trials of interventions specifically aimed at the prevention of obesity, it is difficult to formulate conclusions about the most useful interventions from this information alone. Therefore, the evidence base to identify best options for preventing weight gain must also draw from studies examining weight gain or weight loss as an intermediate outcome, extrapolation from action in other public health areas, and studies on specific weight-related nutrition and physical activity behaviours.

5.1.3 Gaps in information gathered from reviews of obesity prevention initiatives

In collating the information gathered from an assessment of reviews of obesity prevention interventions, we attempted to identify both the major strategies employed by the interventions and the settings in which they were implemented. The results of this assessment are shown in Appendix A. Reported settings for interventions included:

- Tertiary health care facilities or outpatient departments
- Primary Care
- Families or individuals
- Early childhood care facilities
- Schools
- Neighbourhoods
- Community-wide.

However, there was a very strong concentration of studies within schools and family settings, or individually oriented, and only a very small number of studies examined community or neighbourhood-wide intervention and combination strategies.

The types of strategies employed in studies within these reviews was even more limiting, and was restricted to health education or behaviour modification with a smaller number of studies addressing formal exercise programs, or modifications to the physical activity environment.

Intervention strategies involving legislative or regulatory options, mass media, modifications to the food supply, peer support or strategies aimed at capacity building were not covered by any reviews assessed.

These gaps in coverage by systematic reviews are important, as there is huge potential for addressing the problem of obesity in the settings and strategies omitted from current literature reviews. Thus, it is important to examine information and evidence from outside the field of obesity intervention research, in order to help guide the selection of the most appropriate options for action. Therefore an examination of literature from other public health interventions, as well as the combined experience of past health promotion initiatives, was examined to gather appropriate information to guide the planning process.

5.1.4 Community chronic disease prevention trials

Conducting large-scale, community-wide trials to address the prevention of obesity is a very expensive and difficult process. As a consequence, evidence of this nature is very limited. However, there have been a number of large cardiovascular disease (CVD) and diabetes prevention trials, which have included weight as an intermediary outcome. Such trials have demonstrated that it may be possible to prevent weight gain, if not reduce weight at a population level and thus they can provide useful information about effective strategies to address obesity.

The results of the early large-scale community CVD prevention trials, such as the Stanford Three Community and Five Community studies, as well as the Minnesota Heart Health Program, had limited impact on weight status and reinforced the difficulty of preventing weight gain in

the community. However, later programs, such as the Pawtucket Heart Health Program, were able to make a modest impact on weight gain in the intervention community. These programs demonstrated the large time lag (5–10 years) that can be expected between the implementation of a truly community-wide program and the extent of behavioural change likely to be required to impact upon the weight status of the community. An analysis of the trials by Jeffery (1995) suggests that unless weight is the primary outcome of the intervention, it is unlikely that sufficient focus will be placed on achieving the level of change required to impact on energy balance and community weight status.

Recent large community-based trials examining the progression to diabetes in persons identified as glucose intolerant have produced significant reductions in diabetes rates by attention to exercise and diet, with small, but significant, weight losses of around 3–4 kg on average (see Table 8).

5.1.5 Interventions addressing diet and physical activity behaviours

Several reviews have identified a number of promising interventions that have the potential to positively influence physical activity and dietary behaviours to a sufficient level to potentially impact on energy balance and assist with the prevention of weight gain. The most successful of these interventions involved targetting high risk groups or small groups, were based on theory, and included goal setting. Also, interventions were more likely to succeed if part of an integrated program of actions, rather than an isolated action. Interventions to increase incidental activity through modification of the physical environment, improvement of

Table 8. Results from recent type 2 diabetes prevention trials

Country/Reference	Sweden 1991 (Eriksson et al 1991)	China 1997 (Pan et al 1997)	Finland 2001 (Tuomilehto et al 2001)	USA 2002 (DPPRG 2002)
Weight loss control intervention	+1.7 per cent –3.7 per cent	+0.3 kg –1.8 kg	–0.8 kg –3.5 kg	–0.1 kg –2.1 kg –5.6 kg
Per cent reduction in diabetes	50 per cent	42 per cent	58 per cent	31 per cent (drugs) 58 per cent (lifestyle)

facilities and policy reform offer the strongest promise for improving the level of physical activity in the community.

Although school and workplace settings remain the most common settings for interventions to address physical activity and dietary behaviours, reviews have indicated that supermarkets and other points of sale and mass media interventions also offer promise, when included as part of a larger program of action. Findings from specific studies and in relation to specific interventions are discussed in further detail in Section 6.

5.2 Building on the principles of public health action

The International Obesity TaskForce examined a wide range of successful public health programs to identify common features that would be appropriate for action on obesity. In their report *Obesity Prevention: The case for action*, they identified 10 key principles upon which efforts to prevent obesity at a population level should be based (IOTF 2002). These were:

1. Education alone is not sufficient to change weight-related behaviours. Environmental and societal intervention is also required to promote and support behaviour change
2. Action must be taken to integrate physical activity into daily life, not just to increase leisure time exercise
3. Sustainability of programs is crucial to enable positive change in diet, activity and obesity levels over time
4. Political support, inter-sectoral collaboration and community participation are essential for success
5. Acting locally, even in national initiatives, allows programs to be tailored to meet real needs, expectations and opportunities
6. All parts of the community must be reached – not just the motivated healthy
7. Programs must be adequately resourced
8. Where appropriate, programs should be integrated into existing initiatives
9. Programs should build on existing theory and evidence
10. Programs should be properly monitored, evaluated and documented. This is important for dissemination and transfer of experiences.

In addition, the US Centers for Disease Control and Prevention also evaluated past programs addressing major chronic diseases such as coronary heart disease, hypertension, diabetes and cancers. They identified a range of features which they consider to be best practice for addressing chronic disease (CDC 2001). Such practices and programs:

- Focus on the elimination of disparities
- Are affordable and sustainable
- Are population based
- Are science based and effective
- Are replicable and relatively easy to implement
- Are well defined with clear goals and measurable objectives
- Are valued by stakeholders
- Are comprehensive and inclusive
- Are acceptable to the target population
- Are accessible
- Focus on growing communities and building social capital.

5.3 A comprehensive framework for action on obesity

The integration of the available information and evidence from interventions to address obesity, together with the experience from past public health and health promotion action, has guided the identification of target groups and settings most likely to produce effective action on obesity. Whilst it is important to retain a whole-of-community approach to the prevention of weight gain and obesity, a settings-based approach provides a sound, integrated way of reaching specific target groups and influencing behavioural and social/environmental factors within the community.

Thus, the following action areas based on settings and target groups are proposed as the basis for developing and implementing appropriate interventions to promote healthy weight and prevent weight gain in NSW:

- Families and communities
- Early childhood care
- School community
- Worksites
- Health services.

The interventions will clearly differ between each action area, as will the level of responsibility shared by different sections of the health sector, and relevant agencies and stakeholders. The following sections provide information concerning the rationale and current understanding of issues within each action area, and summarise the specific evidence regarding the effectiveness of interventions within that action area.

The planning, implementation, uptake and sustaining of any health promotion program cannot occur without the appropriate social, cultural and educational environment to enable and support such action. This is even more important in programs to address obesity because of the scale of problem, the variety of sectors and stakeholders required to facilitate action and the wide range of strategies required within an integrated program of action. Leadership and coordination, supportive infrastructure, system and policy support and media resources are some of the enabling actions required to implement obesity-related interventions successfully. Such enabling actions are discussed in Section 7 of this report.

In November 2003, the National Obesity TaskForce released a report titled *Healthy Weight 2008: Australia Future*, which set out a broad framework for action on obesity in Australia. Although this report focuses on children and their families, the framework for action the National Obesity TaskForce present is very similar to that proposed within this report. Thus action at an Area Health Service and NSW level can be planned in the confidence that it is consistent with the national framework.

5.4 Defining promising interventions in action areas

The appraisal of specific interventions to include within the program of action (or portfolio) requires clearly defined criteria. The limited evidence provided from systematic reviews of intervention studies can be offset by the inclusion of information and evidence from a much broader range of sources. However, it does require a classification system, which is based on potential for change, rather than demonstrated effectiveness. To achieve this, it is proposed that interventions be selected and assessed in terms of how 'promising' they may be in addressing population weight gain, using a health gain/risk framework.

The first stage of the appraisal process requires the selection of potential interventions from within the literature and reported public health experience.

Although useful for defining key action areas, the systematic reviews within the literature are very limiting in the range of potential interventions they assessed. Thus a wider base of information has been used to identify potential interventions. The 'criteria' used to select interventions for inclusion at this stage are:

- Some evidence of a positive impact on weight status, energy balance or a behaviour underlying energy balance:
 - Evidence of efficacy/effectiveness
 - Evidence for feasibility of implementation
- Sound theoretical base or rationale
- The scope for potential health gain
- The potential reach of the intervention
- Ability to reduce health inequalities
- Potential sustainability
- Policy relevance/program logic.

5.4.1 Balancing health gain and risk

The portfolio model proposed by Hawe and Shiell (1995) and introduced in Section 2 provides a framework that allows the selection of interventions to be based on the best available evidence, whilst not excluding untried but promising strategies (see Figure 3). Because there has been so little previous work in the prevention of weight gain in the community, developing and implementing interventions will inevitably involve a higher level of risk taking than in other areas of health promotion. Thus the matrix of health gain and risk has been expanded to accommodate additional categories, and to grade the level of promise of different combinations (see Figure 4). However, some interventions will offer greater potential gains than others and this needs to be factored into selection. The classification of interventions as a product of the potential gain in health and the level of certainty of achieving a favourable outcome (risk), using the portfolio matrix approach, provides a useful way of defining the 'promise' of an intervention.

The return or **health gain** can be defined in terms of demonstrated or modelled efficacy (from previous studies), potential population reach, and likely uptake (estimated).

Uncertainty or **risk** can be defined in terms of the level of information or evidence to support the effectiveness of the intervention.

This document has reviewed the literature and attempted to ascertain the status of particular interventions within each identified action area, in relation to the level of risk and gain. In view of the limited number of intervention studies reported in the literature, particularly those addressing the whole of the community, it has not been possible to identify interventions that have been shown to provide very high health gains at low risk or uncertainty. The only low-risk interventions identified were clinical interventions in individuals and were thus ruled inappropriate for this report dealing with population prevention approaches. Therefore, the following classifications have been applied to interventions and programs reported or proposed in the health literature to correspond with four relevant quadrants of the portfolio approach:

Quadrant 1 – very promising

Quadrant 2 – promising (moderate gain)

Quadrant 3 – promising (high risk)

Quadrant 4 – some promise.

5.4.2 Planning a portfolio (selecting interventions) using the four quadrants

The construction of a state or regional action plan based on the portfolio approach should involve the selection of a range of interventions from each of these four quadrants, dependent upon community need, resources, staff capacity, etc.

It is important to note that the classification of interventions within these quadrants is fluid. As our experience in the effective prevention of weight gain grows and more evidence is produced on strategies addressing weight gain, it will be possible to reassess the level of risk or uncertainty that proposed interventions carry. In addition, local environments, resources and priorities could influence how proposed programs are classified under this system.

The selection of the best mix of intervention is very dependent on context and can only be made at the local level. There are further criteria that need to be applied to assist with decision making, which focus on implementation issues, such as capacity, resources, cost, community acceptance and engagement etc. This is discussed in more detail in Section 8.

Figure 4. The modified process for weighing up potential gains and risks in a portfolio planning approach



The following sections are organised by settings-based action areas, with each sub-section presenting:

- The rationale for interventions in this action area
- A summary of evidence of effectiveness of interventions
- Ratings of promising selected interventions. Note that the 'selected' interventions may be single, discrete interventions or a mix and are based on an assessment of all available evidence sources or ideas gleaned from case studies (see Appendix B).

The organisation of information by settings-based action areas is also designed to encourage the development of multi-faceted interventions within action areas (see Section 8).

6.1 Families and communities

6.1.1 Rationale

Families as points of intervention

Despite recent changes in the social structure of Australia, the family remains the basic unit of Australian society. It is also the arena where a great many decisions are made about the food and physical activity behaviours that underlie the development of obesity. There is now strong evidence that the food and activity attitudes, beliefs and behaviours of parents are amongst the strongest influences on the development of food and activity behaviours of children (Fogelholme et al 1999; Kohl and Hobbs 1998). Past research has also shown that diet and physical activity behaviours track from childhood into adulthood (Kelder et al 1994).

Our understanding of the nature of the family environment and its influence on obesity development in Australia is still very limited. However, there are a number of key family-linked behaviours which may provide opportunities for effective interventions. These include television watching and other sedentary pursuits, family meal practices, food buying behaviour and the role parents play in modelling physical activity and eating behaviour for children (Campbell and Crawford 2001).

Preliminary data from a study at Deakin University showed that the total number of hours of television and total commercial television viewing was greatest among children of the lowest SES respondents. This group was

also more likely to watch television while eating the evening meal, with adults wanting television on at this time (Campbell et al 2002).

Recent literature from the US shows strong associations between unstructured and uncontrolled mealtimes (including television watching), and higher fat/energy diets with fewer vegetables and fruits. More regular and structured family meals were associated with improved dietary behaviours (Birch and Davidson 2001). The family environment also influences physical activity patterns. A study of parents and children in the USA reported strong and consistent associations between family support for physical activity and the use of afternoon time for sports and physical activity and enjoyment of physical education (Sallis et al 1999). Children of parents who play with them on a regular basis and provide transportation for them to their activities are more active (Strauss et al 2001).

Communities as points of intervention

Families live in communities that assist or constrain their attempts to develop and promote appropriate behaviours. Communities refer to groupings of people based on geography, culture and language, religion, sport or any other way by which people themselves identify a common bond/link. People will belong to many different communities at the same time and will seek different things from different communities. Local communities consist not only of a collection of families, but also commercial operators, government agencies, non-government organisations and religious groups, as well as the physical infrastructure and services available within that locality. There are a range of community factors that influence eating and physical activity and which therefore constitute potential points of intervention.

The Families First strategy in NSW is an example of an integrated government approach to supporting parents and children in their family and community contexts and is concerned with family support services, as well as community building initiatives (NSW Government 2003).

Community nutrition interventions

Analysis of the complex food and nutrition system that produces, processes, prepares and distributes foods to communities and households in Australia provides the basis for identifying points of intervention in relation to nutrition (Heywood and Lund-Adams 1991; CPHN 2003b).

In this system, both 'food supply' and 'food access' are important factors (McComb et al 2000).

The food supply in a community refers to the food produced, processed and sold in retail outlets, prepared and sold/ provided in commercial and institutional food services, and food and meals distributed to the poor. Food supply is controlled by a wide range of businesses and commercial organisations. By contrast, food access refers to the resources and capacity of families, households and communities to purchase or acquire healthy food choices – in sufficient amounts to meet family needs. Such resources include income, employment, education, skills, transportation, location of residence and so forth. These resources are influenced by family circumstances, but also by government and employer policies and programs.

Over the past two decades, a substantial body of work has been conducted internationally and in Australia to design and implement policies and other interventions to improve aspects of the local food supply and food access (Webb et al 2001).

While many of the changes needed to improve the food supply in communities in line with population nutrition objectives (including the prevention of obesity) are at the national level (see Section 7), much can and should be done locally in communities and neighbourhoods (Grossman and Webb 1991; Hawe and Stickney 1997). In presenting data on a range of indicators of food supply, such as the distribution of supermarkets, variations in availability of healthy food items at supermarkets and price differentials between healthy and standard items, the NSW catalogue of data on food and nutrition (Stickney et al 1994) illustrates a wide range of potential intervention points.

The location and type of food outlets available within a neighbourhood are ways in which community infrastructure influences purchasing behaviours. Supermarkets are the primary food retail outlet for most NSW families, but the distribution of supermarkets, their pricing policy and the range and quality of goods available, varies between regions. For example, access to supermarkets is often limited in new housing estates on the outskirts of cities and rural and remote areas. Lack of public transport to supermarkets can also restrict access.

The location of a store may also influence the quality, range and price of fresh produce, making these less appealing and more expensive options than higher fat and energy dense, ready prepared foods. Pricing policies (of fresh foods compared to soft drinks and snack foods, and full fat and low fat products) within stores also influence purchasing. A study of the Queensland food system (Hughes et al 1997) identified variations in price and supply of healthier food choices in rural and remote communities.

The prevalence of fast food outlets is a further factor influencing community members' eating patterns (Stickney et al 1994). Food prepared or eaten away from home accounts for almost 30 per cent of total food expenditure in Australia and half of this is spent on fast food purchases (BIS Shrapnel 2000). Fast food restaurants also tend to be clustered around arterial roads and thus in lower income areas (Winkleby and Cubbin 2003) and are seen as a source of employment opportunities for youth and low-skilled workers. Fast food and takeaway outlets are also prominent near industrial estates and major worksites.

There is a demonstrable link between fast food consumption and overweight and obesity (Jeffery and French 1999). Fast foods have been shown to have a higher total and saturated fat content than food prepared at home (Ashton and Hughes 2000). In addition, large serving sizes and the policy of many fast food chains to market 'meal deals' and encourage customers to 'upsized' for a small additional cost also adds greatly to their potential to contribute to excessive energy intake. The effect of this policy within fast food restaurants on energy intake was examined recently in an article by Cameron-Smith et al (2003). They found that an average 12 per cent increase in purchase cost increased energy availability by 23 per cent, with a 25 per cent increase in fat (10.3 g) and a 38 per cent increase in sugars (18.8 g).

Many other food items have also seen a substantial increase in portion size in recent years with confectionery, snack foods and soft drink products now sold in greatly increased package sizes. The increase in portion size is now also found in foods prepared at home, with families consuming larger servings of common foods than occurred in the past (Young and Nestle 2002).

One way of working to improve aspects of local food systems is through local food policy coalitions (Webb et al 1998). Several local food policy coalitions have been formed in North America, Europe and Australia, where the coalitions have formulated local policies that address local circumstances and needs to promote sustainable and healthier food systems.

Local government can be a key player in local food policy coalitions (Webb et al 1998); it is also in a position to influence local food supply and food access in its own right. As a credible organisation, concerned with protecting the welfare of local citizens and the local environment, local government has a specific role in food safety, liaison with local business and urban planning, including retail planning (Webb et al 2001; King et al 1999; Yeatman 1995). Nevertheless, there are also significant challenges in working with and through local government on the local food system, as nutrition and health promotion are not core business and they have no particular mandate in monitoring the details of food businesses (such as foods stocked) (Webb et al 2001; King et al 1999; Yeatman 1995).

Community physical activity interventions

Local governments also have the structures, resources, skills and experience in working with the community and the environment to play a valuable role in collaborating with the public health sector to influence physical activity (King et al 1999). Access, use and density of facilities, safety, street design (connectivity), density of housing, availability of public transport, pedestrian and bicycle facilities and land use all influence physical activity behaviours (Bauman et al 2002).

A recent review of studies examining environment/behaviour associations with physical activity found that the accessibility of facilities and aesthetic attributes was significantly associated with physical activity (Humpel et al 2002). Accessibility of recreational facilities appears to be necessary to increase activity levels in populations by creating opportunities and removing barriers that prevent people being more active (Giles-Corti and Donovan 2002). Access to programs, facilities and opportunities for physical activity was also consistently associated with physical activity in a recent review of correlates of physical activity in children and adolescents (Sallis et al 2000). In pre-school children, outdoor activities were associated

with increased levels of children's physical activity (Klesges et al 1990).

Active transport to and from school is an ideal way for many children to incorporate regular moderate activity into daily life. In addition to the physical activity benefits, walking and cycling to school is economically and environmentally a better choice than driving children to school. Furthermore, educational aspects (traffic safety, nature, environment) can be included in walk-to-school programs (Western Australian Government 2002). The promotion of walking or cycling to and from school is an important aspect of wider community support for a school-based approach to child health promotion.

6.1.2 Currently available evidence

Family-focused weight management

The merits of a family centred approach to support behaviour change and weight loss has been demonstrated through considerable work on treatment programs for overweight children and such an approach is likely to be of benefit in developing population-based strategies to prevent weight gain in children. The most effective weight management programs for children are those that involve parents and other siblings and require parents to model the desired physical activity and dietary behaviours (Golan et al 1998).

Some programs have attempted to reduce sedentary behaviours – such as time spent watching television – and found that active play was automatically increased as a result (Epstein et al 2000). Most of the programs encouraging children to reduce television viewing time have been school-based, although often they have a family component as well (Gortmaker et al 1999; Robinson 1999). A more recent program targeting African-American girls was run as an after-school dance program, and contained a five-session program on reducing TV and video watching which was delivered in the participants' home (Robinson et al 2003). This pilot study, which was well received by participants, demonstrated a trend towards reduced BMI and waist circumference and a significant reduction in television and video usage.

Parental skills development

A key element in programs requiring dietary and physical activity behaviour change within the family is the ability of the parents to negotiate such change. Parents control

access to food and physical activity options and model important behaviours in food purchasing, preparation, consumption, television viewing and participation in physical activity. Some obesity management programs are now beginning to focus on skilling and supporting parents in negotiating changes. Although there is no firm evidence available yet on the impact of parental involvement in influencing obesity prevention, parents who are able to negotiate change with their children, set limits and are consistent in their intervention have produced promising improvements in other psycho-social problems (Sanders 1999). The family can also reinforce or contradict programs initiated in other settings. One school-based program in the USA was able to demonstrate improvements in diet and physical activity at school, but found that compensation occurred at home, negating the positive benefits on energy balance (Donnelly et al 1996).

Community-based weight gain prevention initiatives

There have been few reports of successful or effectively implemented community-based strategies to prevent weight gain. This was a major gap identified by our systematic review of the literature. The 'Pound of Prevention' trial (Jeffery and French 1999) was conducted in a community setting and involved providing information and support on weight gain prevention through a newsletter and feedback process. Unfortunately, it was unable to demonstrate improved weight gain prevention among the intervention group compared to the control group. Other similar, low intensity interventions have utilised a range of education strategies including mass media, seminars, printed literature, newsletters and a restaurant program (Glenny et al 1997). Most other community-based obesity initiatives to address obesity have focused on group weight management, usually conducted by private providers or health services. For example, *GutBusters* (Egger et al 1996; Egger 2000) was a highly successful group weight loss program for men (also discussed in Section 6.5 and described as a case study in Appendix B).

Beyond these specific community-based weight gain prevention programs, there is a wealth of knowledge and experience on community-based interventions of relevance to obesity prevention. Section 5.3 addresses the impact of large-scale coronary heart disease and diabetes prevention trials on changes in weight status. While most CHD prevention trials had little impact on weight, the Pawtucket

Heart Health Program was an exception. It involved a 10-year educational program supported by organisational and structural change. The program relied on community engagement and heavily utilised volunteers to help develop and coordinate programs, seminars, cooking trials, exercise programs and community weigh-ins, supported by a strong social marketing program. The program was able to demonstrate a significant reduction in the amount of weight gained by the intervention town when compared to the control (Carleton et al 1995). In addition, as noted previously, recent community-based diabetes prevention trials have demonstrated that simple advice on low-fat eating, combined with increased levels of walking and supported by regular review and encouragement of health professionals or 'coaches', can lead to small but significant weight loss of three to four kilograms (Tuomilehto et al 2001; Diabetes Prevention Program Research Group 2002).

Community nutrition interventions

There is extensive evidence that community nutrition interventions can be effective in changing attitudes, knowledge and eating practices (Contento et al 1995). A major systematic review of behavioural dietary interventions (AHRQ 2000) reported that there is considerable evidence regarding the effectiveness of interventions to help people modify their dietary intake of fats and fruit and vegetables (foods that are highly relevant to weight status). Specific strategies that have been found to be effective include group education in food preparation and cooking, goal setting, social support, social marketing campaigns, and point of sale education and promotion in food retail outlets.

Internationally, a number of trials have examined the influence of point-of-purchase education and demonstrations to influence food behaviours; however, only one study has examined the influence on energy intake of shoppers. This study, set in Virginia USA, provided shopping support and advice on purchasing changes to a small group of shoppers and assessed their purchase. The intervention resulted in a reduction in the amount of energy provided by fat in the diet (Winett et al 1991). Also, a number of trials have examined the effects of point-of-selection guides, menu changes or price manipulation in food service settings. Many of these studies have found that identifying and promoting the most appropriate dishes

leads to increased selection of that item in the short term, however there has been no attempt to assess the impact on total diet and energy intake (Hider 2001).

In Australia, impact evaluation studies provide local support for the feasibility and potential effectiveness of community nutrition interventions. The *Towards a Healthy Diet* project in Shepparton, Victoria attempted to address public policy initiatives in eating places, schools and health services to promote healthy eating. The formal evaluation was able to demonstrate some environmental change through increased availability of healthy menus and school canteen policies and improved shopping behaviours (Dunt et al 1999). Other examples include the modification of the nutritional composition of meals and snacks sold in fast food outlets (such as the National Heart Foundation of Australia 'Tips on Chips' program).

An important development has occurred via a more generic approach – improving local food supply and food access through establishment of local food policy coalitions or councils, linked to or set within local government. A seminal example from the US is the Knoxville Food Policy Council, created in the 1970s as a standing committee of the City Council, with both mayoral (political) and organisational support. This model has served as a basis for the development of many food coalitions throughout the USA, Canada and more recently Australia (Webb et al 1998). The Penrith and South Sydney case studies illustrate the collaborative processes and policy and system changes that can be achieved (Hodge and Finlay 1994; Webb et al 2001). Specific initiatives within this framework include advocacy for supermarkets to be built in low-income areas where shoppers have been reliant on high-priced convenience stores (South Sydney Council 1995), improved public transportation for food shopping and development of a network of home delivered fruit and vegetables for underserved areas (Penrith City Council 1994).

Food supply audits, training of food store managers and involvement of the community in the selection of stock have been found to be effective components of interventions to improve food supply in isolated Aboriginal communities (Lee et al 1995). Similarly, the healthy food basket methodology has been used in community nutrition interventions, as a basis for advocacy and to facilitate the development of local policy (Stickney et al 1994).

Community physical activity interventions

The effectiveness of interventions seeking to influence physical activity by improving community infrastructure or increasing access to places to exercise was demonstrated in a recent review by the US Task Force on Community Preventive Services (Kahn et al 2002). The studies that were identified and reviewed involved interventions conducted mainly at worksites, but also in local communities. Changes included the provision of walking trails and exercise facilities, access to existing nearby facilities and building redesign. These changes produced improvements in the level of physical activity, aerobic capacity, energy expenditure and in some case weight loss within the community or worksite assessed.

An environmental modification program aimed at households, the WA *TravelSmart* program (Western Australian Government May 2002), involved a direct marketing program about alternative transport options. This program effectively improved physical activity levels in the community. The trial showed that marketing increased the proportion of active transport trips (walking, cycling, public transport) by over six per cent (97 more trips per year) in the South Perth area. Just the walking and cycling components of this result amounted to an increase of about 30 minutes of physical activity per resident, per week.

Numerous campaigns and programs exist in Australia and internationally to promote active travel to and from school (Hills and Cambourne 2002), such as walk-to-school campaigns (see case study, Appendix B). A controlled trial in Thailand included walking before school as part of the program and resulted in lower BMI values in girls in the exercise group than in the control group (Mo-suwan et al 1998).

Research indicates that people are 50 per cent more likely to walk for recreation or transport if they have a footpath in their street, that they are twice as likely to walk if they have a pleasant physical environment; and are more than twice as likely to walk if they have friends or social influences encouraging them to do so (Queensland Health 2001).

The National Heart Foundation of Australia's (NHFA) program, 'Supportive Environments for Physical Activity' (SEPA) encourages local government to implement and coordinate innovative and collaborative approaches to make environments more conducive to active living

(National Heart Foundation Australia 1998). The program demonstrates an accepted and feasible method for engaging local councils in environmental changes that influence physical activity (MacDougall et al 2002). The Heart Foundation of Australia also conducts an annual award scheme to give recognition to local government initiatives that encourage healthy eating, physical activity and enhance recreation facilities (see case study in Appendix B).

The 'Concord, a great place to be active' program (described in Appendix B) demonstrated the impact of a community intervention in partnership with local government combined with social marketing and community initiatives, on increased physical activity in women (Wen et al 2002).

Getting Australia Active (Bauman et al 2002) identifies a number of environments where people can be increasingly active and other potential modifications to facilitate this goal, based on evidence and theoretical and practical rationales. These include:

- Recreation spaces (parks, green areas)
 - Improving quantity, facilities (eg playgrounds, skate parks), safety, cleanliness, attractiveness etc
- Recreation facilities (recreation centres, sports clubs etc)
 - Improving quantity, quality, programs, costs etc
- Walking and cycling
 - Providing and improving footpaths, walkways, pedestrian-centred crossings
 - Increasing and improving cycle paths and tracks
 - Safe Routes to School for walking and cycling
- Public transport
 - Increasing availability, access and affordability
 - Promotion programs for public transport (eg TravelSmart)
- Car traffic
 - Policies, planning, pricing, designs, enforcement strategies to reduce the amount and speeds of car traffic
- Public liability
 - Liability legislation to protect users and providers of physical activity facilities and spaces and reduce excessive claims and premiums

- Urban planning
 - Zoning regulations which promote the development of recreation areas, sidewalks, bicycle trails in new communities and business parks
 - Zoning regulations to promote mixed land use and provide ready access to destinations using active transport (including public transport)
 - Urban and street design to support active transport and recreation
 - Link approval of building permits to assessments of impacts of design on physical activity
- Active Transport to and from school
 - The development and wider implementation of new and existing programs to encourage children and parents to use active transport to school (walking or cycling) instead of driving in a car
 - Research into the effectiveness of active transport on maintaining weight.

6.1.3 Some promising interventions

Using the criteria set out in Section 5.4, we identified some potential interventions within the families and communities action area and assessed their promise using the risk/return matrix (see Table 9, p27). It is anticipated that a range of other interventions could also be assessed in this manner to build upon this table.

Given that there is limited evidence, at present, to indicate the efficacy of family focused programs addressing parenting skills or knowledge and that they will not reach a large component of the community, these potentially useful interventions have been rated as having some promise. There is a much greater level of evidence to support community programs addressing dietary behaviours, although the efficacy of these interventions in relation to energy balance is still under question. The potential reach and return of initiatives to improve the food environment by working with local governments is high but, because of limited past action in this area, the level of evidence concerning their efficacy is still lacking and thus, these initiatives are rated as promising.

A similar rating is also made in relation to social marketing programs to improve diet and physical activity. There is more information concerning the efficacy of local government programs to alter the environment to improve

Table 9 Promising interventions within the families and communities action area

Potential interventions	Very promising	Promising	Promising	Some promise
	High gain, moderate uncertainty	Moderate gain, moderate uncertainty	High gain, high uncertainty	Moderate gain, high uncertainty
Family-focused weight management programs				✓
Parent skills training programs that teach skills in negotiating dietary change and setting limits on TV and computer use				✓
Community-based programs to influence weight-related food behaviour		✓		
Work with local governments to develop local nutrition plans that address issues of supply and access to appropriate low energy dense foods at an affordable price			✓	
Local food policy coalitions to improve a range of local systems for food access and food supply.			✓	
Local community audits of food (and physical activity) environments			✓	
Work with local governments to develop local physical activity plans that address issues of availability and access to safe and enjoyable opportunities to be active (using NHFA Supportive Environments for Physical Activity guidelines for local governments)		✓		
Build upon the NHFA award system for local government that promote the development of a local environment that supports appropriate eating and increased physical activity		✓		
Comprehensive, multi-faceted community-wide healthy weight initiatives, with possible participatory action research components	✓			
Community social marketing programs on healthy eating and reducing sedentary behaviour				✓
Other ideas arising from the NSW Childhood Obesity Summit				
Advocate for traffic calming measures around children's play areas				✓
Skilling of people who work on a paid and voluntary basis with children in the community to encourage physical activity and impart appropriate food skills				✓
Links to other action areas				
Policy – see Section 5, enabling actions			✓	
Breastfeeding – see health services				✓
Social marketing to communities – see Section 7, enabling actions		✓		
Food service – see worksites			✓	

physical activity, although these programs have only shown moderate uptake and impact. They are also rated as promising. Comprehensive programs involving a range of strategies developed in consultation with stakeholders and sustained over a long period of time are rated as highly promising, because of their potential reach and uptake and the likely impact that this approach will have on key behaviours based on other public health actions.

6.2 Early childhood care

6.2.1 Rationale

A number of longitudinal studies have indicated clearly that obesity in childhood tracks into obesity in adulthood (Dietz 2001). Whilst it is difficult to define excess adiposity in very young children, some studies suggest that obesity can be defined in children as young as three years of age (Klesges et al 1995). A major lesson learnt from the treatment of childhood obesity that is likely to be applicable to the prevention of adult obesity is that the earlier the intervention, the greater the likelihood of being able to effect change. In addition, many of the behaviours linked to inappropriate weight gain, such as eating habits, food preferences, motor skills and enjoyment of physical activity and play, are being formed in the early period of life before school, making this age group an important target for the prevention of later obesity.

One of the most effective ways to reach children aged from three to five years is through early childhood care facilities. Changes in work practices and family structures within Australia have created a situation where a large proportion of young children are being cared for outside of their homes for a significant period of the day. The Australian Institute of Health and Welfare has estimated that around 527,000 children aged four years or less (66 per cent of all children of this age group) used some form of day care in 1999. This included around 42 per cent of children younger than 12 months and almost 83 per cent of all children of four years of age (AIHW 2002).

Care occurs in both formal and informal settings. The Australian Institute of Health and Welfare (2002) divides early childcare services into the following groupings:

- *Long Day Care (LDC)* provides care and developmental activities for children under school age. Operating for at least 8 hours a day, 5 days per week, and 48 weeks a year.
- *Pre-schools and kindergartens* offer educational and developmental programs for children in the one or two years prior to school. Traditional pre-schools offer programs that are usually sessional and run during school terms. Children usually meet for 3–4 sessions a week, with each session usually lasting half the school day (3–5 hours).
- *Family Day Care schemes (FDC)* are networks of people that provide care and developmental activities in their own homes for children 0–12yrs. FDC providers are recruited and supported by a central coordination unit, which administers the scheme.
- *Occasional Care Services* generally provide care and developmental activities for children under school-age for short periods only, to assist parents who need care for personal reasons to undertake education, shopping or attend appointments, or simply for respite.
- *Outside School Hours Care (OSHC)* is care and developmental activities for primary school-aged children out of school hours. The main types of services provided include before and after school care, vacation care and care on pupil free days.
- *Multifunctional Centres* are usually located in rural areas and offer a range of services from a single building including playgroups, long day care and out-of-school-hours care. Sometimes these services are culturally specific to meet the needs of Aboriginal communities
- *Informal childcare services* are provided by relatives and friends or paid individuals such as nannies and babysitters.

Formal childcare services provide an important opportunity to influence food and activity patterns in young children. Australian children of childcare age eat on average five to seven meals and snacks per day and a high proportion of these are eaten within a childcare setting (ABS 1997), although the method of food provision varies between services. The Queensland Childcare Nutrition Survey

(Queensland Health and Department of Families Youth and Community Care 1999) found that only around 55 per cent of long day care facilities and 22 per cent of family day care facilities provide significant amounts of food to children in their care (although this figure is likely to vary between states). The survey also found that where parents provided food it often fell well short of the recommended nutrition standards applied to formal childcare centres. The quality and training of childcare staff can have a tremendous impact on the quality of services offered. One fifth of all food preparation staff surveyed in Western Australian had no food service or cooking training/qualifications (Pollard et al 1999) and 7.2 per cent of those surveyed said there was a need for more nutrition resources for menu planning.

Childcare centres also provide an opportunity to introduce children (and their parents) to appropriate food and physical activity behaviours that will help promote good health and growth but prevent excessive weight gain. Post weaning years may be a critical age for developing preferences. Studies have shown that it is important to expose children to healthy foods, as familiarity is an important influence on consumption in this age group (Birch 1987).

This is also a critical time for development of physical activity behaviours (Klesges et al 1990). However, children need to be encouraged and supported to develop new skills and spend time in play. As children often spend a high percentage of their available playtime at a day care centre, the opportunities for physical activity within the centre are critical. Physical design and space within the centre is a key element in encouraging physical activity, with one study showing a direct correlation between the amount of play space provided for children in different care centres and their level of body fatness at 12 months of age (Mulligan et al 1998). Others have shown that the more challenging and complex the playground design, the higher the level of physical activity (Herkowitz 1979). Time spent outdoors is also an extremely strong predictor of childhood physical activity (Sallis 1994).

As indicated in Section 6.1, parents play an important role in modelling good behaviours to their children and every opportunity should be taken to include them in activities associated with nutrition and physical activity in childcare programs.

Formal childcare services are mainly provided by local government, non-government organisations and private-for-profit bodies, who receive the majority of their funding from the Australian Government under the Childcare Program. The exception is pre-schools, which are mostly funded by states and territories. The quality of care provided by childcare centres is governed by a national process of accreditation and set of standards (AIHW 2002). However, the nutritional standards are very broad. At state level, NSW has specific regulations that govern the operation and licensing of centre-based long and occasional care services, as well as family-based day care services. The licensing system involves specific regulations covering physical space, safety, staff qualifications, number of children and the programs of activities. They also include specific regulations related to nutrition and referenced to the NSW Health's program *Caring For Children* (Bunney and Williams 1996). The implementation of these regulations has been supported by this program, which has been implemented statewide through Area Health Services (see further information in Appendix B).

6.2.2 Currently available evidence

Although there has been much activity to improve nutrition in childcare centres, there have been very few evaluated programs and even fewer trials of interventions to specifically address and measure weight-related outcomes. There is some evidence from simple, short-term evaluations of community-based initiatives focused on improved food service and nutrition policies and practices. This is consistent with the conclusion reached by a Victorian overview report on opportunities for nutrition interventions in organised settings for children (Montague 2002).

Childcare (LDC and FDC)

Most of the activity to address weight-related behaviours in childcare has focused on the effective implementation of policy. This makes sense, as there is a well-established infrastructure for the implementation, assessment and accreditation already in place.

The *Start Right-Eat Right* award scheme was implemented in Western Australia as an incentive to bring about an improvement in food service, in line with government policy. It included food service training for meal preparers, as well as evaluation of menus by a dietitian.

Impact evaluation demonstrated that the award scheme could bring about improvements in the quality of food service, with 80 per cent of centres making changes to their menus. Two years post-launch, 40 per cent of centres registered with the scheme (Pollard 2001).

Similar programs, such as the *Caring For Children* and *Good Food for Children* programs have been implemented and evaluated in NSW (Central Sydney Area Health Service 1996; Bunney and Williams 1996; Plaskett et al 1996; Sangster et al 1999). *Good Food for Children* has also been adapted, implemented and evaluated for Family Day Care, and Long Day Care where food is brought from home (Bravo and Cass 2003; Sangster et al 2003).

Pre-schools and kindergartens

Healthy Start is a CVD risk factor reduction program conducted in nine separate New York centres. The program aims to reduce total and saturated fat in pre-school meals and snacks, as well as provide a comprehensive health and nutrition education curriculum. A quarter of the food service criteria were adopted after 12 months of the program. Changing to low fat milk was identified as the single most important, quickest and least expensive food service modification resulting in lower fat meals (Williams et al 1998).

A long-term controlled trial of the effects of the implementation of a specific regimen of exercise (15 minutes of walking plus 20 minutes of aerobic exercise) for seven months by physical activity specialists was undertaken in a Thai kindergarten. A reduction in the prevalence of obesity and tricep skinfolds was observed at six months post-intervention (Mo-suwan et al 1998).

Five A Day, Let's Eat and Play is a nutrition education program for pre-school children designed to increase the awareness and intake of fruits and vegetables among children aged 3-5 years. Pre and post-test questionnaires (65 students) showed that recognition of fruits and vegetables rose an average of 50 per cent. Parental questionnaires showed that nearly 90 per cent of children also ate more fruit and 62 per cent ate more vegetables (Levy and Cooper 1999).

Out-of-hours school care

Nutrition Ready-to-Go at Out of School Hours Care was undertaken in 41 OOSH centres in the South East Sydney Area Health Services between November 2001 and June 2003. It focused on improving nutrition and food safety by:

- increasing the number of children who are provided with food and drinks consistent with the Australian Dietary Guidelines for Children and Adolescents
- increasing the number of services with a food safety and nutrition policy
- improving food safety practices.

The program strategies were developed in conjunction with an Advisory Committee of stakeholders and included food and nutrition policy development, staff training, resource and menu development and the awarding of small grants to disadvantaged communities.

Evaluation of the program revealed that it was able to achieve significant improvements in the types of foods available, with increases in calcium and iron-rich foods, cereals, vegetables and fruits and fewer cordials and high sugar/fat snacks. The program also resulted in improved knowledge and food safety practices in centre workers (Sangster and Knowles 2004). The project also led to the production of the *Food is Fun* training manual in partnership with the Network of Community Activities and Central Coast Health (Marshall et al 2003). There is potential for further developments that also address improvements in physical activity in OOSH centres.

A special program of activities for primary school children with an existing weight problem has been established in Western Sydney, as a means of increasing physical activity during the after-school period. This program is yet to be evaluated (The Children's Hospital at Westmead 2002).

A vacation program for overweight children which requires participation by parents has been run in the UK for a number of years and evaluation of this program has shown improvements in the skills and behaviours of children and their parents, as well as significant weight loss 12 months after the completion of the project (Gately 2002).

6.2.3 Some promising interventions

Although early childhood care offers enormous potential for addressing important issues linked to the development of childhood weight problems, only a few programs have published the results of their intervention and even fewer have sought to evaluate outcomes in terms of weight-related variables. This has meant that there is a high level of uncertainty concerning the efficacy of potential interventions within this action area, and influences their ratings of promise, presented in Table 10. Interventions which focus on education or curricula to improve children's or parents' knowledge or eating and exercise behaviour fall into this category, although those that directly influence the food available or the level of physical activity undertaken have a greater potential return and are thus ranked more promising. Those programs that include a range of strategies that address both diet and physical activity through formal curricula and environment within the care facility in addition to parental education, are rated as more promising, given that evidence from other areas of action (parallel evidence), health promotion theory and past public health action all support the efficacy of such approaches. Similar after-school care programs are supported by the same evidence, but have potentially greater levels of return because of the large amount of discretionary time available to increase physical activity and the potential to reduce snack food consumption during this period.

6.3 The school community

6.3.1 Rationale

In 2002 there were 3115 schools in NSW, of which 2233 were Government schools. Within these schools there were 629,500 primary students and 475,000 secondary students, taught by 74,300 teachers. As schooling is compulsory up until the age of 16 in NSW, schools represent a tremendous opportunity to address health issues. In addition, weight-related behaviours are directly influenced by what happens within the school environs. Children spend 6–7 hours a day at school, 40 weeks per year. While at school, children eat 1–2 meals plus snacks everyday, and engage in free play and organised physical education. Nutrition and physical activity policies, healthy canteens, fruit and vegetable promotions, access to drinking water and encouraging children to play actively –

in conjunction with professional development for teachers and support staff and the involvement of parents and the community – are all strategies that can be combined to comprehensively address obesity prevention within a school setting.

However, schools cannot be seen as the sole focus for action in relation to childhood obesity. Australian school children may consume around 37 per cent of total energy in foods eaten at school during a school day, but this averages out to only about 16 per cent of the energy of the total diet of school children across a full-year period (Bell and Swinburn 2004). Also, the relatively structured nature of school hours means that most of the potential for increasing physical activity is outside school hours, especially in the after-school period on week days (3–6 pm), weekends and holidays. Despite these constraints, school-based interventions are central to a comprehensive obesity prevention program. There is enormous potential to promote appropriate dietary practices through curricula and food services, and to increase the amount of physical activity in which children participate while at school.

Most schools exhibit a high degree of control over the food supplied within the school grounds through the canteen or in vending machines. A high proportion of schools operate a canteen, making them the largest takeaway food network in Australia (NSW School Canteen Association 2002). The NSW School Canteen Association provides advice and support for the establishment and effective operation of canteens within NSW schools, and has operated an award system that recognises healthy school canteens.

Vending machines are becoming more popular within NSW schools and they usually dispense a range of regular snack foods and soft drinks that are high in energy and low in other nutrients. These points of purchase can be covered in any school nutrition policy, and there are opportunities for stocking machines with better quality snacks and drinks, and promoting the uptake of the more appropriate selections.

Recently the NSW Government began implementing the NSW Healthy School Canteen Strategy, which was developed as a result of recommendations from the NSW Childhood Obesity Summit held in September 2002. This program is based on *Australian Dietary Guidelines* and provides schools with criteria for determining foods in school

Table 10. Promising interventions within the early childhood care action area

Potential interventions	Very promising	Promising	Promising	Some promise
	High gain, moderate uncertainty	Moderate gain, moderate uncertainty	High gain, high uncertainty	Moderate gain, high uncertainty
Adapt existing childcare nutrition programs to incorporate specific educational components for childcare staff on maintaining healthy weight and promoting physical activity.				✓
Educational programs for parents on issues appropriate to pre-school children including what foods to provide, how to encourage and model increase physical activity.			✓	
Award and incentive schemes that recognise and encourage adherence to nutrition guidelines			✓	
Programs for kindergartens and pre-schools which target both food service and educational curricula on nutrition and physical activity		✓		
Introduce a specific regime of exercise into childcare and kindergarten settings			✓	
Work with carers to integrate appropriate physical activity and nutrition policies into after-school care programs	✓			
Develop special weight-focused services within the after school care setting to specifically address the needs of children with an existing weight problem				✓
Develop a vacation care program for young children which requires parental involvement and teaches physical activity and nutrition skills.		✓		
Work at a national level to ensure the development, implementation and monitoring of comprehensive food service and physical activity policies		✓		
Other ideas arising from NSW Childhood Obesity Summit				
Enhance the capacity of communities to support families with young children by encouraging and supporting direct community involvement in program development, implementation and evaluation.		✓		

canteens and vending machines that should be restricted in their sale, selected carefully or encouraged and promoted.

Opportunities for physical activity include physical education (PE) classes, exercise and fitness programs, extra curricular sports and active play at morning and lunchtime recess, during which access to school equipment, playgrounds and sporting fields encourages activity. Currently, there is no national policy that stipulates the quantity of physical education in which children should participate while at school. Within NSW, the Department of Education has recommended that primary schools aim to

provide a minimum of 120 minutes per week to planned physical activity in each year from Kindergarten to Year 6. In Years 3 to 6, this time is inclusive of the Department's current requirement of 60 minutes per week for school sport. From Kindergarten to Year 2, the time is through their PE program, as well as through the learning that occurs across other subjects where students are physically active (NSW Department of Education 1998).

Recess and lunch breaks provide a regular scheduled time for unstructured physical activity of up to one hour per day (Zask et al 2001). Basic skill development in physical

activity improves coordination and builds confidence, while lack of skills has been highlighted as a barrier to children participating in regular physical activity (Booth 2000). Surprisingly, only a small proportion of Australian children and adolescents have mastered fundamental movement skills like running, jumping, catching and throwing (Booth 2000).

In addition, a very high proportion of students are driven to school and the number of children walking or cycling to school is dropping. Increasing rates of active transport to and from school has the potential to promote daily physical activity in children (see Section 6.1.1).

Concern may be raised that addressing the issue of childhood overweight and obesity in a school setting may result in increased eating disorders and an increased stigmatisation of overweight or obese children. While these are important concerns, there does not appear to be any evidence to support these views (Steinbeck 2001). However, it is important to emphasise that any school-wide intervention should promote improved eating and physical activity habits, rather than overtly focus on overweight and obesity.

It is possible to use schools as a mode of access for children with an existing weight problem requiring some form of intervention. Children are often identified as having a weight problem by school health screening programs, and parents often seek some immediate advice on appropriate action. School-based weight control programs risk further stigmatising overweight children if they are identified for special care; however, schools have been used as a successful recruitment point into family-based programs run outside school hours.

NSW Health's *Health Promoting Schools Framework* (NSW Department of Health 2000b) provides a suitable framework for addressing these issues in a systematic manner in the school setting. It is based on the framework developed by the World Health Organisation and is already familiar to a number of NSW schools and health services. The framework encourages schools to develop a multi-strategic approach to health issues that extends beyond a classroom-based curriculum. It advocates the creation of a supportive environment that will encourage all children to develop active, healthy lifestyle habits and does not single out overweight or obese children.

6.3.2 Currently available evidence

Comprehensive school-based programs specifically addressing weight

A number of reviews have discussed the evidence for school-based obesity prevention initiatives (Campbell et al 2002; Story 1999; Centre for Weight and Health 2001; Micucci et al 2002). Some school-based obesity interventions have been successful in impacting on weight (Gortmaker et al 1999; Simonetti et al 1986; Flores 1995; Sallis et al 1997; Robinson 1999, Muller et al 2001; Manios et al 1999) while other studies, although not impacting on weight, have been successful in changing children's eating and physical activity knowledge and behaviour (Leupker et al. 1996; Sahota et al 2001a; Davis et al 1999).

Although short term, high intensity programs have reported the greatest impact on children's weight, the sustainability of these approaches and the impact on weight status is not known (Flores 1995). Interventions that are sustained for at least 12 months are likely to be associated with medium to long-term success (Micucci et al 2002). Thus, ultimately the aim should be to create an environment conducive to promoting healthy weight, rather than putting an emphasis on short-term weight change that cannot be sustained.

Most of the longer-term programs tackling weight-related issues at school have been undertaken in the USA and they may not be directly applicable in Australia. However, the principles of these interventions and the processes they followed provide useful models of what could be designed and implemented in NSW. In addition, there are a limited number of well conducted intervention trials addressing weight issues conducted in Australian schools and sustained for at least one year. Examples of programs are listed below; more details are provided in case studies in Appendix B.

Comprehensive school-based programs addressing weight

Assessment of the systematic reviews of school-based obesity prevention programs by the *Canadian Effective Public Health Practice Project* indicated that interventions that include a combination of environmental, curriculum and family strategies are the most effective in influencing risk factors, as well as being the most sustainable.

This was consistent with the findings of a review by Lister-Sharp et al (1999). Involvement of parents and family is particularly critical to the success of school interventions, especially in primary school aged children (Micucci et al 2002). The most effective health interventions within the school setting are likely to be well resourced, multi-component programs which involve the whole school community, and include:

- Formal curriculum
- Other planned activities
- Organised physical activity and sport
- Free play
- Canteens and food services
- Fundraising and sponsorship
- Availability of water
- Teacher training
- Parent and community support.

There was a strong relationship between duration of an effective program and the level of effect, supporting the need for programs to be sustained over a long period of time (Micucci et al 2002). In addition, programs often had different age, sex and ethnic group outcomes, suggesting that programs may need to be tailored to the special needs of these groups.

The *Planet Health* intervention (Gortmaker et al 1999) is the only controlled project identified in reviews that implemented combined diet and physical activity strategies both in and out of school hours. This program was conducted in a range of multi-ethnic middle (early high) schools in Boston. It focused on reducing television viewing time to two hours or less per day, increasing moderate and vigorous physical activity, decreasing fat consumption and increasing fruit and vegetable intake. The program involved a mix of improved physical activity lessons, nutrition curricula, staff training and financial incentives for staff to produce better lesson plans and family involvement. The program was effective in decreasing TV viewing and improving all the dietary indicators in girls. The level of obesity two years post-intervention was reduced in both girls and boys, although the effect was significant only for girls.

Another comprehensive school-based program identified in the literature review is the Singapore *Trim and Fit* program. Because this study has only been briefly reported in the scientific literature it has not been included in systematic reviews. However, the program is credited with achieving a significant reduction in the level of obesity in school children of all ages in Singapore. Since the introduction of the program, obesity levels have declined in prevalence from 16.6 per cent to 14.6 per cent among Primary 6 students (11–12 year olds) and from 15.5 per cent to 13.1 per cent among Secondary 4 students (15–16 year olds) between 1992 and 2000 (Toh et al 2002). The program involves an integrated nutrition and physical activity curricula that includes intensive training and specialist support for teachers. The foods sold in school canteens are tightly controlled and water coolers are provided in all schools. In addition, there is a system of identification of overweight students and referral to a special program whilst those requiring immediate intervention are referred to the doctor and dietitian available within the school health services. The program also offers a system of grading of all students on fitness and weight and awards schools that meet certain criteria in terms of these assessments.

Another comprehensive school-based intervention, the *APPLES* program, was conducted in 10 primary schools in Leeds (UK). This program focused specifically on preventing weight gain and involved teacher training, modification of school meals, and the development of school action plans targetting the curriculum, physical education, canteens, and playground activities. The intervention produced very modest effects in the outcome measures of adiposity and weight, and resulted in some improvements in vegetable consumption and feelings of self-worth (Sahota et al 2001a). The evaluation also showed structural changes within the school that would enable such programs to be maintained, including changes in the attitudes of teachers and the knowledge, attitudes and some self-reported health behaviours of the children (Sahota et al 2001b).

Other comprehensive school-based health programs

There have been a number of other comprehensive programs addressing other health issues within the school setting. A very large intervention trial (CATCH), addressing risk factors for coronary heart disease, was conducted in

96 primary schools in four states in the USA. Intervention components included increased physical activity through structured PE and play, and altered nutrition behaviours through nutrition curricula, family activities and food service modifications at school (Luepker et al 1996). The program was able to achieve improvements in total fat and sodium intake, as well as activity levels, but produced no measurable effect on weight status.

The *Tooty Fruity Vegie Program* conducted in Northern Rivers AHS is an example of a multi-strategy intervention that has been shown to be both effective in increasing students' fruit and vegetable consumption, and acceptable for implementation in NSW schools (Northern River Area Health Service Health Promotion 2003). The long-term goal of the project is to reduce heart disease and obesity in the community, by working with primary school children to develop healthy eating habits early in life. The project used a whole-of-school approach in implementing a range of evidence-based school and community strategies promoting fruit and vegetable consumption in 10 selected schools in Northern Rivers. Initial evaluation after two years has shown that the project improved children's fruit and vegetable related knowledge, attitudes and preparation skills as well as their access to fruits and vegetables at home and school. Amongst participating children, vegetable consumption increased by 14 per cent, and fruit intake by 18 per cent. In contrast, the vegetable intake of control children dropped by four per cent over the two-year intervention period and the fruit intake dropped by 14 per cent. All 10 schools have continued the project beyond the two-year supported intervention.

A systematic review of effectiveness has indicated that nutrition and physical activity interventions applying those principles of comprehensive interventions that characterise the health promoting school framework have been successful and that this framework is a promising approach to health promotion in schools (NHS Centre for Reviews and Dissemination, 2002). It has been implemented successfully in NSW to address nutrition, physical activity and weight issues, although the effect on outcome measures is unsure, as effective evaluation has not always been performed. By comparison, Mitchell et al (2000) found that, while explicit use of a health promoting schools framework by schools did not ensure the effectiveness of programs conducted under this auspice,

the principles nevertheless provide a model for implementation that fosters partnership, sustainability and a multi-faceted approach.

School-based nutrition programs

Nutrition is a common component of the health education curriculum of NSW schools and can provide children with the knowledge required to make healthy food choices as well as the opportunity to gain practical skills through experiential learning. Learning practical skills in food preparation and cooking is especially valuable for those children who do not gain such skills in the home.

Studies show that 15 hours of nutrition education can bring about a change in knowledge, but 50 hours of education are needed to bring about a change in attitude and behaviour (Micucci et al 2002). In addition, children who receive more nutrition lessons have more positive behaviours than those who receive fewer lessons (CDC 1996), which highlights the benefit of a sustained and comprehensive approach.

School food services

School canteen award programs have been shown to be successful in increasing children's access to nutritious foods (Carter and Swinburn 1999). The mandatory strategy for canteens within NSW state schools will greatly facilitate the development and maintenance of a healthy school food environment.

Preferential pricing is one strategy that has been used to promote the uptake of preferred products from canteens and vending machines within schools. A series of trials in the USA by French et al (2003) demonstrated that price reduction had a positive impact on the sales of low fat snacks from vending machines, with a 50 per cent reduction in price leading to a doubling of sales. A similar impact on fruit and vegetables sales within canteens was achieved by subsidising appropriate products within canteens. This is discussed further in Section 7.2.1.

The *CATCH* trial in the USA (Luepker et al 1996), which was discussed previously, included a strong focus on modification to the school food supply. The *Eat Smart* component of this program was able to demonstrate significant decreases in the intake of fat and sodium of children in the intervention schools over the two-year period.

Drinks at school

Because increased soft drink consumption is correlated with higher rates of obesity (Ludwig et al 2001), the sale of soft drinks in primary schools has been banned in some states in the USA and Canada. This approach has been supported by a number of public health and consumer groups including the American Academy of Pediatrics (2004). A recent controlled trial within six primary schools in Christchurch, UK focused on a reduction of soft drinks and increased consumption of water. The intervention was curriculum based and involved education, tasting, demonstrations and competitions. At the end of 12 months the rates of overweight and obesity increased in the control schools by 7.5 per cent and decreased by 0.2 per cent in the intervention group (James et al 2004).

Water is a more appropriate drink and can be promoted to replace sweetened beverages in the school menu.

Surveys of drinking water facilities in schools (eg Petter et al 1995) have identified barriers to increased consumption including:

- Drinking water provision in schools is very variable and generally inadequate to meet the needs of the students
- Very few schools allow free access to drinking water throughout the day
- In schools with water facilities, these are often unattractive (unpalatable, warm or poor tasting water), or restricted (eg drinks only available on request, at certain times of day, or in a couple of sites)
- The commonest site for water facilities is the toilet area.

A number of comprehensive programs have included the promotion of water as a drink, but few programs have been able to identify the impact of such an intervention on water consumption. However, a program conducted in Slough in the UK has been successful in increasing consumption of water and decreasing consumption of sweetened drinks (Collings 2003). The program involved working with water companies to improve access and attractiveness of water supply and production of curricula support material promoting the importance of water. It also involved multiple contacts with the schools to assess and improve the water supply and the appointment of 'water champions' within the school to assist with development of materials and promote the campaign to their peers.

Provision of free fruit within schools

There is some limited evidence to suggest that increased fruit and vegetable consumption is associated with reduced intake of other snack foods and thus reduced weight (Epstein et al 2002). However, regardless of effect on weight status, there are many good reasons to recommend a focus on increasing fruit and vegetable intake through schools. A recent review of paediatric overweight concluded that the availability of subsidised fruit and vegetables in schools led to a significant increase in consumption (Ritchie et al 2001). In 2000, the UK introduced free fruit for schools, as part of its *5 a Day* program to increase fruit and vegetable consumption.

Under the scheme, all 4–6-year-old children in state schools are entitled to a free piece of fruit or vegetable each school day (currently either an apple, banana, pear or mandarin). This is a major undertaking which involves distributing around 440 million pieces of fruit to over two million 4–7-year-olds in some 18,000 schools across England each year. The pilot program of over 500 schools was able to demonstrate that the scheme could be managed efficiently to provide good quality fruit to schools and that almost all schools (99 per cent) and over three-quarters of parents responded extremely positively to the project (UK NOP World Consumer 2003). The scheme appeared to be well accepted by children; 44 per cent of schools found that pupils' consumption had increased over a six-week period and children continued to consume the fruit provided over the period of the pilot. Only six per cent of schools noticed a decrease in consumption over the year, as the novelty of the scheme wore off (UK Department of Health 2001).

School-based physical activity programs

Getting Australia Active (Bauman et al 2002) considers that increasing the time allocated to physical activity and improving students' fundamental motor skills are promising approaches to increasing levels of physical activity at school and this is supported by the results of projects such as *SPARK*.

SPARK is a physical education curriculum and staff development program for students in grades K–6. The program involves 3 weekly PE classes: 15 minutes of health-fitness and 15 minutes of skill-fitness activities. It teaches behaviour change skills (self-monitoring,

reinforcement, goal setting, stimulus control, problem solving). Parents are involved through homework and monthly newsletters and incentives are provided to encourage goal achievement. Improvements in levels of physical performance were observed for SPARK students compared with controls for a period of two years after intervention with some additional improvement seen in classes led by a specialist compared to classes led by teachers (Sallis et al 1997). No effect was observed on skinfold thickness values.

An earlier, more intensive and extended intervention program (Dwyer et al 1983) with Adelaide primary school students involved 75 minutes of structured physical activity each school day (compared to 30 minutes PE three times per week) over two years. This intervention resulted in a significant reduction in the skinfold thickness of children (38 mm in 5th Graders, after two years).

Take 10 is a classroom-based program designed to promote physical activity among primary school students by integrating 10-minute periods of physical activity with standard academic lessons. It is designed to complement, rather than replace, other opportunities for exercise. The program encourages teachers to find ways of combining static learning processes with short bursts of activity. This has been shown to assist students to develop a more active lifestyle but also results in improved attention during lessons. However, its impact on energy expenditure and weight have not been assessed (ILSI 2003).

Active play

While several studies have shown that time spent outdoors is associated with increased physical activity (Klesges et al 1990; Sallis et al 1994), a study of schools showed that few students use opportunities to be physically active during leisure time at school (McKenzie et al 2000). School environments with a high level of supervision have been shown to encourage children to be more active (McKenzie et al 1997; Sallis et al 2000). The US Centers for Disease Control and Prevention advocates the provision of extracurricular activity programs and access to school sporting equipment that meets the needs and interests of all students (CDC 1997).

Active transport to schools

As discussed in the section on Families and Communities above, active transport is a promising strategy to increase regular physical activity, even though its contribution to energy expenditure is likely to remain small (Harten and Olds 2004). There are numerous current campaigns and programs promoting active travel to school in Australia and overseas (Hills and Cambourne 2002). Walking before school was included in a controlled trial in Thailand and resulted in lower BMI values in girls in the exercise group, compared to the control group (Mo-suwan et al 1998). A few of the many 'Walk to School' campaigns in Australia have been evaluated. For example, a campaign conducted with Forest Lodge Public School in Sydney showed a short-term increase of 11 per cent of students walking to school (Central Sydney Health Promotion Unit 2002).

School-based weight-management programs

A review of school-based programs for weight control by Story (1999) indicated that most programs demonstrated modest success in the short term. However, such programs should only be viewed as a small component of a schools program. Neumark-Sztainer et al (2000) conducted focus groups with adolescent boys and girls from junior high and high schools in Minnesota. They found that students want weight control programs that are fun, interactive, accessible, convenient, low in cost, sensitive to the needs of adolescents, include multiple physical activity options and are offered to all students, regardless of their weight.

6.3.3 Some promising interventions

Schools offer enormous potential for the promotion of healthy weight and prevention of weight gain. However, as indicated previously, care must be taken to address a range of action areas and not focus solely on schools. Children spend a considerable amount of time in school and it is an important learning environment, however, programs also need to address the out-of-school influences on eating and exercise behaviours. In addition, the primary objectives of schools are educational outcomes.

Interventions that tackle the availability of foods and drinks in schools and the requirement for compulsory physical activity have the highest potential for return because they reach all schoolchildren and do not require active uptake. The evidence concerning an increased level of compulsory

physical activity (not necessarily sports) is moderate and consistent. There is a growing body of information concerning the positive benefits of a restriction of soft drinks and the consumption of plain water, which is based on epidemiology and intervention trials, as well as theory logic and parallel evidence. The same applies to removal of snack foods from the school canteen.

Other potential interventions with potential high return, but less evidence available to support their efficacy at present, include programs that set up a structure such as an alliance between schools and the community or health sectors, and programs dealing with incidental physical activity. Such programs are difficult to evaluate in terms

of weight outcomes, but other forms of evidence are available to support their consideration. Enhancing existing school-based programs, improvements in curricula for physical activity and nutrition and the use of specialist physical education teachers have a higher level of evidence, but are likely to yield moderate return.

School-based weight control programs have a much lower reach and uptake (and thus potential gain), although there is a moderate amount of evidence about their effectiveness. Questions remain about their potential harm, and thus they are rated low on the level of promise. Similar levels of promise appear for school-based breakfast programs.

Table 11. Promising interventions within the school community action area

Potential interventions	Very promising	Promising	Promising	Some promise
	High gain, moderate uncertainty	Moderate gain, moderate uncertainty	High gain, high uncertainty	Moderate gain, high uncertainty
Comprehensive or integrating approaches				
Assist school communities to develop a comprehensive program of action to help maintain healthy weight and prevent inappropriate weight gain in students – based on the Health Promoting Schools framework	✓			
Establish alliances between schools, health agencies and communities (especially in relation to after-hours access to school facilities)			✓	
Adapt and expand existing school nutrition programs such as <i>Tooty Fruity Veggie</i> program with a physical activity component and modification of nutrition components to increase focus on healthy weight		✓		
Physical activity strategies				
Encourage children and parents to use active transport to school (walking or cycling) instead of driving in a car			✓	
Develop walk-to-school campaigns (ie not a one-off promotional event)		✓		
Enhanced implementation of structured physical activity at school (eg through teacher training)		✓		
Implement programs for daily structured physical activity by students	✓			
Promote and incorporate unique ways to add physical activity to the school day			✓	

Table 11. Promising interventions within the school community action area (continued)

Potential interventions	Very promising	Promising	Promising	Some promise
	High gain, moderate uncertainty	Moderate gain, moderate uncertainty	High gain, high uncertainty	Moderate gain, high uncertainty
Nutrition strategies				
Develop a set of mandatory rules for the operation of school canteens and the foods available for sale	✓			
Ensure that all children receive basic food skills, awareness and exposure to a wide range of low energy foods at school			✓	
Develop a set of single portion sizes appropriate for children of varying ages and encourage adherence through school canteens			✓	
Restrict or ban soft drink vending machines and the sale of soft drinks within the school	✓			
Subsidising the cost of low fat snacks and fruit and vegetables sold in school canteens	✓			
Provide easy access to a supply of good quality drinking water	✓			
Curriculum related				
Integrate concepts, issues and skills related to energy balance into school health education curricula		✓		
Targetted weight management				
Provide school-based weight management clinics for students and families with an identified weight problem				✓
Other ideas arising from NSW Childhood Obesity Summit				
Specialist physical education teachers within NSW schools to help children develop fundamental skills		✓		
Implement or expand school food programs that offer convenient and appealing meal options				✓
Encourage the provision of healthy foods at all school activities			✓	

6.4 Worksites

6.4.1 Rationale

Worksites have been a popular and useful setting for a wide range of chronic disease prevention programs. Their appeal as a setting for healthy weight interventions is based on a number of factors. First, worksite interventions can reach a large number of people at a relatively low cost. Most importantly, the workplace is one of the few settings that is successful at recruiting males into health promotion programs and can also engage members of some disadvantaged groups, who may not otherwise become engaged in programs. The hierarchy and communication systems that exist in workplaces also allow a rapid spread of information and recruitment channels for health promotion programs. Second, the social structure of workplaces can be used to provide support and positive reinforcement for appropriate change, such as eating and exercise behaviours. Third, environmental changes can sometimes be achieved at worksites, as food services, workspace layout, building design and exercise facilities are under centralised control. Lastly, health promotion activities may have economic appeal to employers who also stand to benefit from increased productivity through improved employer health, less illness and absenteeism and reduced disability costs (US Surgeon General 2001).

There are currently around 3.1 million adults attending workplaces in NSW each day. At present, the nature and operation of many worksites are more likely to be making a major contribution to the increasing weight of the population, rather than assisting in its control. Many existing workplace practices support reduced energy expenditure. Long working hours, with no protected time for meal breaks, can lead to reduced opportunity for physical activity and poor food choices, with meals purchased and eaten quickly. Work patterns are often established in such a manner to keep workers seated at their desk and much of the work is undertaken on computers. Modern building design, poorly located and dimly lit stairwells and security issues often result in workers being required to use lifts instead of stairs. Workers who choose to use an active form of transport to travel to work also need facilities to park a bike and take a shower, as do those who take some form of

exercise during their lunch break. In recent times there have been major shifts away from employment in manual work towards more sedentary occupations such as service and information industries. Not only do the traditionally labour intensive occupations of agriculture, mining and manufacturing account for a small proportion of the NSW workforce, they are increasingly using energy-saving methods (NSW Dept of State and Regional Development 2003).

In addition, workers consume at least one meal and one to two snacks at work. The food available within worksite canteens or food outlets may be of poor nutritional quality and high in fat and energy. In buildings where there are no catering facilities there are often vending machines that supply energy-dense snack foods and drinks. Workers who purchase food outside the workplace may be limited in choices, as fast food outlets often dominate in large industrial estates.

Whilst there has been a general focus on worksite health promotion to address occupational health and safety issues, the use of the workplace to address more general health issues has been ad hoc. There are numerous opportunities to address issues of relevance to obesity through the workplace, but a number of well-identified barriers exist. The *Pathways to Better Health* project (Commonwealth DHHS 1993) identified seven important elements for the success of worksite health promotion initiatives:

- Active support by senior management
- Worker participation at all stages, usually through committee structures
- Flexible content determined by analyses of the needs of workers
- A range of activities which are linked with community activities
- An emphasis on creating supportive physical and social environments, as well as individual behavioural change
- Programs being run on company time where at all possible
- Voluntary participation in programs by employees.

6.4.2 Currently available evidence

Despite the enormous potential to influence the working environment in a positive way to support behaviour change associated with improved weight status in adults, there has been very little evaluated work in this area. This is not surprising, given the very limited attention to interventions to prevent weight gain in adults.

Worksite weight control programs

There has only been one review of worksite interventions to control weight or prevent weight gain, however there have been a number of reviews that have examined workplace nutrition and physical activity programs. The findings of these reviews have been mixed, although many of the programs they reviewed achieved some degree of weight loss in the short-term.

A review of worksite interventions to control weight by Hennrikus and Jeffery (1996) identified a large number of weight loss programs that had targetted individuals with an existing weight problem within a worksite. On average, programs produced a weight loss of a half to one kilogram per week in those who completed the programs. Maintenance of this weight loss at six to 12 months after the intervention varied considerably across each study, and level of adherence to the program greatly influenced outcome. Only two of the programs included in the review attempted to prevent weight gain across the whole workforce. One of these was a CVD risk reduction program in European factories that produced very small reductions in weight (0.4 per cent) over six years in the total population. This intervention was conducted in the early 1980s, when the rate of community weight gain was much lower than it is today and thus its likely effectiveness in today's environment is questionable. More recent community-based programs have attempted to develop strategies to assist with weight gain prevention such as regular monitoring, peer support groups, newsletters and electronic access to experts. But these have also not produced any significant benefits over a two-year period (Douketis et al 1999).

A NSW study examined four different workplace interventions to address cardiovascular risk factors. BMI increased in all intervention groups across the 12 months of the study – although somewhat less in a cognitive behaviour therapy group (Gomel et al 1993).

Worksite physical activity programs

The effectiveness of worksite programs aimed at improving physical activity is also undetermined. A recent meta-analysis of worksite physical activity interventions (Dishman et al 1998) found no clear evidence of effectiveness, although the analysis was limited by the reach, design and evaluation of the studies included. Many of the programs involved increased availability of cardiovascular fitness activities, exercise equipment and group classes, but little attention was paid to environmental change to encourage incidental activity. In contrast, a less rigorous review of 52 studies, which examined the effect of worksite fitness and exercise programs (Shephard 1996), showed that in almost all cases these programs achieved a small weight loss of around one to two per cent, over periods as short as eight to 12 weeks. More committed participants lost larger amounts of weight and some programs resulted in significant reductions in body fat content (mean 13 per cent).

Although many of the studies have very short timeframes, these improvements in body weight and fat persisted for up to three years of follow-up in some studies. The key factors associated with a favourable outcome included:

- the intensity of the intervention
- the regularity of participation
- associated dietary change
- supervision of the exercise program
- the addition of other elements such as personal counselling and environmental change.

Other assessments have been able to show improvements in the level of daily physical activity by encouraging stair use at work (Bauman et al 2002).

Worksite nutrition programs

A Canadian review of nutrition interventions for cancer prevention (Sahay et al 2000) identified a number of worksite intervention projects that were effective in producing dietary changes that may be applicable to weight control. The two interventions that they classified as best practice (*Eatwell 5 a Day* and *Working Well*) were based on a model of intervention developed by Heimindinger et al (1990) involving action at individual and environmental levels. Individual interventions consisted of direct education/skill building via educational series and campaigns, media posters and videos delivered in the

workplace. Environmental interventions consisted of catering policy changes, vending machine offerings and point-of-purchase labelling.

The interventions also involved participatory strategies to engage workers in the planning, implementation and evaluation of the project. Both interventions were evaluated in randomised control trials. Self-reported measures showed positive intervention effects on dietary fat, fibre and fruit and vegetable consumption. Family support was mobilised in the *Eatwell 5 a Day* project through the use of a family learn-at-home program, family newsletters and annual family picnics. Outcome measures showed that workers receiving the family intervention fared better than those who did not, even though workers in this group did not perceive a great deal of household support in their change efforts. This comprehensive worksite intervention model has proven to be effective for improving dietary practices among adult workers.

A series of studies by French and co-workers (French 2003) have shown that subsidies for healthier (low fat) food choices in worksite food outlets result in higher

consumption of these foods. These researchers showed that as the cost of low-fat snack foods decreased, the level of sales increased, so that a 50 per cent price reduction led to a doubling of sales. Similarly when the price of fruit and salads was reduced in canteens there was a four-fold increase in sales. However, sales returned back to almost the pre-intervention levels when the price subsidy was removed.

6.4.3 Promising interventions

Worksites remain a relatively unexplored option for addressing weight gain prevention and the promotion of healthy weight. There is some evidence to support the value of both price controls in the canteen, and the development of comprehensive programs, which are designed in consultation with employers and employees. Environmental change within the workplace, such as promoting the use of stairs, needs further investigation but offers potentially high return if they reach all staff. Weight loss programs have a reasonable level of evidence but their potential return is moderate unless extended to include all employees and their families.

Table 12. Promising interventions within the worksites action area

	Very promising	Promising	Promising	Some promise
Potential interventions	High gain, moderate uncertainty	Moderate gain, moderate uncertainty	High gain, high uncertainty	Moderate gain, high uncertainty
Targetted weight loss programs conducted at workplaces				✓
Programs to encourage the use of stairs in place of lifts at work			✓	
Pricing and promotions for healthier choices at workplace canteens and food outlets		✓		
Working with employers to develop a comprehensive worksite healthy weight program that addresses individual skills as well as addressing environmental factors to support and encourage behaviour change		✓		
Other ideas arising from NSW Childhood Obesity Summit				
The development of practical strategies for creating family-friendly workplaces			✓	

6.5 Health Services

6.5.1 Rationale

This section describes the contribution of interventions conducted within health care facilities and settings (interventions conducted by health services in community settings are covered in other action areas). The existing health infrastructure within NSW includes services that play an important role in addressing the obesity problem, through promoting physical activity and healthy eating and by treating overweight and obesity using a variety of methods. Harnessing these important resources to provide more weight gain prevention initiatives is a major challenge, but one that has enormous potential.

Community health services and primary medical care

These services can potentially assist with the broad promotion of healthy weight and prevention of weight gain. Primary medical care usually deals with the treatment of individuals who have an existing weight problem. However, there is a tremendous opportunity to involve such services in family-focused prevention programs which assist children (and their parents) to avoid excessive weight gain or lose (relative) weight over time and return to a more appropriate weight. Community health services, and particularly dietitians and general practitioners, are well positioned to offer specialist advice and support and monitor those children and adults at high risk of developing a weight problem.

The sheer numbers, distribution and contacts that general practitioners have with the community in NSW make them an important element in health service action on weight gain prevention. In NSW there were 6409 registered GPs in 1998/99 and they have on average 6.3 consultations per person each year and see about 83 per cent of the adult population each year (Commonwealth Department of Health and Ageing, 2003). Whilst much of the work of general practice involves clinical care, there has been increased interest and focus on the role of GPs in health promotion (Royal Australian College of General Practitioners, 1998).

One approach to facilitate the involvement of general practice in health promotion actions is the use of 'brief interventions'. This is a well-researched preventive

strategy specifically designed to be compatible with short clinical consultations. This strategy has been extensively promoted and disseminated through academic detailing and training programs, particularly in relation to tobacco control, and more recently physical activity (Harris and Mercer 2001; Smith et al 2003). It is a central feature of the *SNAP* (smoking, nutrition, alcohol and physical activity) program being developed by the Commonwealth Department of Health and Ageing for general practice.

Local community health services also have well developed structures and networks within the community and are in a good position to address the issue of obesity prevention and management in both children and adults. In NSW, the early childhood health services and child and family health services have a particularly important role to play in addressing childhood weight issues through clinical, group and community programs. In addition, population health services, including health promotion, already have substantial experience in the development and implementation of nutrition and physical activity strategies, and this can be built upon to tackle healthy weight.

It is often not possible to identify a clear divide between interventions aimed at community weight gain prevention and those aimed at weight control in the individual. As Figure 5 shows, intervention options run the full spectrum from individual medical approaches to those addressing the environmental barriers to good health. However, often services delivered within a clinical or tertiary health care facility can have components that address broader community issues, whilst community-based programs can also deal with individual clinical problems.

Currently, the vast majority of the resources of the health system in NSW are focused on secondary and tertiary care and there are only limited opportunities for clinical and tertiary care staff (6300 specialist medical staff and over 35,000 nurses) to be actively involved in preventive efforts. There may be opportunities for staff to be involved in providing brief dietary and exercise advice or referring overweight and obese persons to appropriate weight management programs. There is also scope for health services to ensure that specialist services that involve lifestyle programs, as part of a rehabilitation or treatment program (such as cardiac rehabilitation or diabetes programs), enhance their interventions so as to reflect current best practice guidelines (NHMRC 2003c).

Health professionals from all work areas can provide leadership in the development of public policies on obesity, and advocacy for an improved environment that supports healthy eating and improved physical activity, both through individual efforts and through their representative organisations.

To help facilitate improved action on obesity, health workers within NSW health services will require support and ongoing knowledge and skills development. It will be important to ensure health workers have the capacity to coordinate multi-component interventions to address the gamut of factors that are driving weight gain in the community. It is possible to achieve this via two paths – broadening the skills of existing specialist workers or specialised skills training of generalist health workers.

It is also important to recognise the important role that health service facilities may play in influencing the general health behaviours of the public who attend them. It would be consistent if the practices and products available within these facilities reflected the public health messages issued by the health service. The catering provided within these facilities, the contents of vending machines, the opportunities to be physically active etc, all serve to reinforce recommendations relating to appropriate food and exercise behaviours that the general community receives from health promotion bodies. In addition, health care service facilities are workplaces that employ a large number of staff and thus provide opportunities for worksite interventions. This provides further opportunities to integrate health care

facilities and the staff within them into an overall weight gain prevention strategy for the community.

6.5.2 Currently available evidence

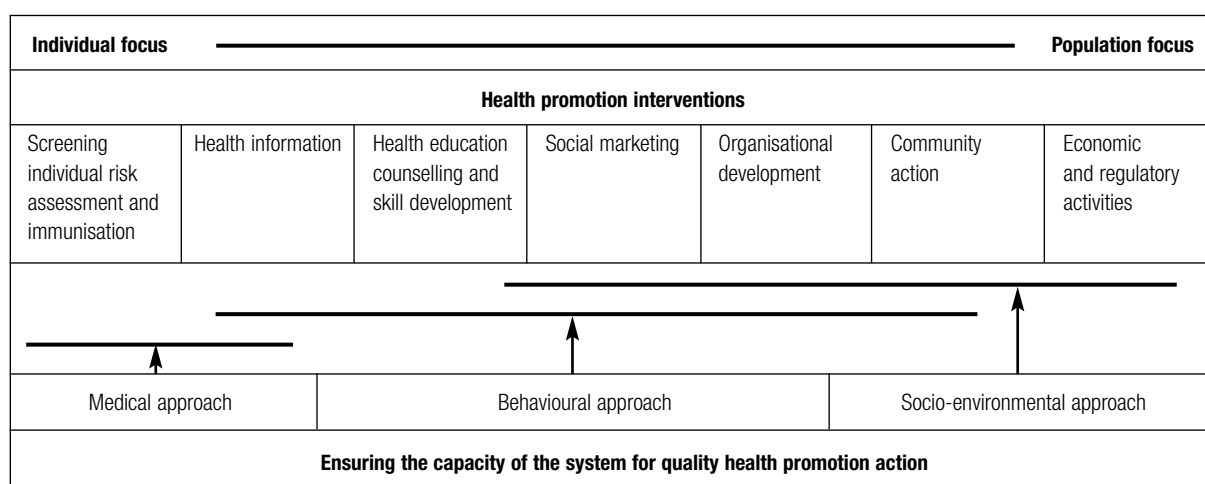
Weight gain prevention programs

Although there is considerable effort invested in programs to prevent community weight gain by health care workers in health care facilities, there are very few published reports of successful programs within this setting. The *Lighten Up* group weight management program is one of the few reported programs which has been evaluated closely (Harvey et al 1996). The program involves training primary health care professionals to implement a structured group weight management program. A three-year follow-up of participants found that 79 per cent had not gained weight in this period, and that there was mean weight loss of 2.4 kg for women and 1.2 kg for men (after adjusting for self-report bias).

There is very limited evidence of the effectiveness of interventions to increase physical activity undertaken in health care settings, apart from programs conducted in general practice (Bauman et al 2002). This may be because interventions undertaken in health care services are often limited in size and duration and are not established in a manner that allows them to be evaluated clearly.

In contrast, there has been a much wider range of studies that have looked at the effectiveness of treating both children and adults with an existing weight problem in a

Figure 5. Spectrum of health interventions



Source: Department of Human Services Victoria

health care setting. The findings from these studies have important implications for the broader prevention of weight gain in the community.

Adult weight management programs

A number of systematic reviews have addressed the management of overweight and obesity in adults in health care settings and there has been even more reviews examining the effectiveness of different treatment strategies in this setting. A review by the UK National Health Service, Centre for Reviews and Dissemination (1997) found that group weight management programs in health care settings produced weight loss that was sustained at two years. In contrast to other chronic conditions, inpatient treatment programs were found to be more effective than outpatient programs. A Canadian review also found an important role for health professionals and programs delivered from health care facilities and noted that long-term supervision by professionals was a key factor in sustaining weight loss (Douketis et al 1999). Evidence from the United States suggests that programs delivered by multi-disciplinary teams may prove more effective at sustaining any improvement in weight (Mellin and Frost 1992; Nonas 1998).

A recent Cochrane systematic review examined interventions to improve health professionals' management of obesity and the organisation of care for overweight and obese people (Harvey et al 2002). Although the review found little coherent evidence of what are the best strategies for improving the management of obesity, it did identify a number of promising practices. These included reminder systems to encourage GPs to promote dietary change, brief training sessions for GPs on obesity management, encouragement of shared care between hospitals and primary care, and the use of specialist leaders for self-help weight control programs.

The recent release of the NHMRC *Clinical Practice Guidelines for the Management of Overweight and Obesity in Australia* (NHMRC 2003c) provides an opportunity to focus on treatment of obesity for adults and children within general practice and primary care. Programs need to be developed that assist GPs to understand and apply these guidelines in the broadest sense.

Children's weight management programs

There have been more studies aimed at the management of childhood obesity than adult obesity, within health care settings. Much of this has been discussed in Section 4.3. A recent Cochrane review found that despite very promising results, most individual studies were too small or lacked the rigour to show a true effect (Summerbell et al 2003). However, the UK National Health Service Centre for Reviews and Dissemination (2002) takes a more positive view of the findings of these studies, and suggests that multi-faceted, family-based programs that involve parents, increase physical activity, provide dietary advice and target reductions in sedentary behaviour may help children lose weight. The existing knowledge on effectiveness of family-based group programs in assisting with the control of inappropriate weight gain in children should not be ignored. A simple program involving a set number of sessions could be developed for implementation through the existing community health infrastructure, where there is already the capacity and skill base to implement such group work. After evaluation, this program could be further developed for implementation by other primary care services and by trained lay health workers.

Self-help and support groups

The provision of facilities and professional advice and support for the establishment and maintenance of self-help and support groups for weight management may be a useful and cost-effective strategy. There are a wide variety of modalities of self-help, including purely self-prompted help, self-administered manuals, computer-assisted therapy, professionally assisted correspondence courses, and non-profit and commercial self-help groups (Latner 2001). Although few of these approaches have been shown to be effective alone in producing weight loss (Heshka et al 2003), there is evidence that they are valuable in achieving weight maintenance and the prevention of weight re-gain. A recent review concluded that self-help groups provide opportunity for low-cost maintenance programs as well as providing a useful adjunct to more intensive therapies (Latner 2001). Promising results have also been achieved in a pilot program in the UK where general practitioners provide a referral to community or commercial weight loss programs free of charge (similar to exercise prescriptions) for a set period (Avery 2000).

Brief interventions by health professionals

Whilst there is strong evidence for the effectiveness of brief interventions in general practice to reduce smoking and alcohol consumption, the evidence for effecting changes in diet and physical activity is less available (Ashenden et al 1997). Studies in Australia have shown that brief interventions involving verbal advice and supporting literature provided in general practice can be successful in improving levels of physical activity (Eakin et al 2000; Eaton and Menard, 1998). *Getting Australia Active* summarises the evidence on general practice interventions to promote physical activity (Bauman et al 2002). Brief advice or counselling on exercise was a common feature of these interventions, and across the studies produced short-term, modest, favourable increases in participation in physical activity. There are also reports indicating that brief interventions can be successful in achieving an increase in fruit and vegetables in low-income groups (Steptoe et al 2003) and particularly in colorectal cancer screening clinics (Baker and Wardle 2002). However, more detailed changes in dietary behaviour may be difficult to achieve with brief interventions (Moore et al 2003).

Breastfeeding

Breastfeeding is the optimal method of feeding babies and infants and there is some evidence that it may play a role in preventing childhood obesity (Clifford 2003). There is convincing evidence that health service practices can effectively increase population rates of initiation and duration of breastfeeding (CPHN 2004). Research consistently shows that many hospital practices can improve breastfeeding initiation and short-term duration, with early skin-to-skin contact (Anderson et al 2003), rooming-in (Protheroe et al 2003; WHO 1998) and the non-use of commercial hospital discharge packs (Donnelly et al 2000) shown to be particularly effective. As well as hospital practices, education of mothers – before and immediately after birth – has been found to be effective in achieving higher rates of initiation. Both lay and professional support strategies also have a significant impact on duration and exclusivity of breastfeeding. Peer support may be particularly effective in reaching and influencing low income and more disadvantaged groups. The review by CPHN (2004) found that a mix of prenatal and postnatal contacts appears to be most effective overall. Postnatal support by a health professional and/or

trained peer counsellors was the most effective way to promote duration of breastfeeding. This may include one or more of the following: early intervention services; parenting groups; face-to-face contacts; and home visiting. The overall assessment showed that educational and support interventions have substantial and significant effects on breastfeeding initiation and duration up to three months.

6.5.3 Promising interventions

Because interventions to prevent weight gain and promote healthy weight that are delivered in health care settings are more targeted, only one intervention has the potential reach and likely uptake and effect to be considered high gain. Although evidence on the value of breastfeeding in protecting against obesity is inconsistent, it is sufficient to justify the inclusion of the promotion of breastfeeding as part of the overall strategy for tackling overweight and obesity.

There is significant information and evidence on the benefits of weight management programs delivered through health care systems but their overall effect within the community is likely to be moderate. The same rationale applies to brief GP interventions, although there is less evidence concerning the efficacy of various educational approaches within primary care and with the concept of GP-commercial weight loss partnerships. However, all are worth considering in the overall plan of action.

6.6 Implementation issues

There are a number of complex variables and issues to manage in implementing programs aiming to prevent weight gain or promote healthy weight in the action areas described. Some of the implementation issues identified in the area of promoting healthy weight in schools, childcare, workplaces, families, communities and through health services include:

- Efforts are required at all stages of a program, in order to develop and maintain community ownership and participation. This requires a consultative approach, longer timeframes and, in some cases, less direct approaches to addressing a problem
- Efforts by health services generally benefit from working with partner organisations, as well as the community of interest. This needs to occur at all stages of a program and requires specific actions

Table 13. Promising interventions within the health services action area

Potential interventions	Very promising	Promising	Promising	Some promise
	High gain, moderate uncertainty	Moderate gain, moderate uncertainty	High gain, high uncertainty	Moderate gain, high uncertainty
Subsidised/health service sponsored weight loss programs, with GP referral systems				✓
Implementation of best practice guidelines in management of obesity by specialist services		✓		
GP brief interventions, including weight monitoring and 'prescribed' diet and PA		✓		
Implementation of the <i>Lighten up</i> group weight loss program		✓		
Coordination and facilitation of self-help weight loss programs				✓
Community health based family-focused programs to prevent inappropriate weight gain in children				✓
Health professionals' brief interventions and advice				✓
Health professionals practices and health service systems to foster breastfeeding			✓	
Other ideas arising from the NSW Childhood Obesity Summit				
All health professional training programs should include education on the importance of good nutrition and exercise and the skilling to allow them to apply these principles in their interactions with families and communities.				✓
Health Care settings and workplaces take the lead by providing opportunities for physical activity and healthier food choices.			✓	

to foster and maintain partnership arrangements. Inter-sectoral action requires good understanding of other sectors, their organisation and methods

- In working with families, communities and other sectors, there is a need for sensitivity, as weight and food are strongly influenced by cultural, religious and social factors
- As comprehensive, multi-faceted interventions are generally indicated, the set of interventions is likely to include policy, structural and environmental changes as well as more direct promotional and educational strategies. Policy, structural and environmental approaches may not be familiar to all partners and may face resistance. The (longer) timeframes for these approaches may also pose difficulties or create delays. The benefits of working with the community of interest and partner organisations are that it potentially

diversifies the range of actions undertaken and generally increases the possibility of making environmental, structural or policy changes.

In some cases, policy, structural and environmental changes may be beyond the scope of area-based services and require interventions at state or national levels, although local initiatives may be dependent on them (see Section 7)

- As proposed actions initially arise from health concerns, they may not be perceived as core business by key people in the relevant implementation setting or sector. In schools, for example, health concerns may be seen as secondary to educational objectives. Thus, any proposed actions may be given low priority in relation to competing demands in terms of time (such as time within a curriculum), management support (in a workplace or local government, for example), or

resources (such as staff time for auditing local environments)

- Amassing sufficient capacity for the implementation of interventions on sufficient scale to succeed is a critical issue facing efforts in all action areas. In the first instance, sufficient capacity refers to the level of skills and resources required to implement an intervention for sufficient duration and with sufficient intensity to have an impact within a setting. This is, however, a multi-layered issue, and resources and capacity are required not only to ensure a measurable impact and size of effect within a given implementation setting, but also to:
 - Ensure that the effect within a given setting has an impact on the target group overall. For example, to ensure that any changes in eating and physical activity at school or work are maintained, and are meaningful in relation to daily patterns (net impact of effect)
 - Support implementation across many settings/sites within communities, in order to have a population impact (scope of implementation)
 - Sustain ongoing action or changes that have occurred over time (sustainability).

Capacity and resource issues are critical to success. Without sufficient capacity, interventions may not be of sufficient size, scope or duration to have a measurable impact

- There are a number of evaluation challenges, including:
 - Difficulty in defining the effects of environmental, system or policy changes, as factors are difficult to disentangle and frequently linked
 - Risk of premature evaluation, as estimating appropriate timeframes for the effects of actions to be apparent and able to be measured is difficult
 - Lack of agreed measures on many intermediate variables, such as policy, environmental factors and some behaviours
 - Ethical and practical difficulties in identifying appropriate comparison settings for study purposes
 - Risk of negative evaluation findings from evaluations of interventions that were poorly or insufficiently implemented, so intervention was inadequately trialled.
- There are some implementation issues that are specific to an action area or strategy. For example, the childcare sector is a fragmented and decentralised sector, and thus requires different interventions, formats and approaches for different sections. Similarly, the nature of General Practice is disparate. There are limited tools for reaching and influencing all independent practices and practitioners, and to do so can be labour-intensive. Working with food services requires specialised expertise and this implementation issue can apply across school, childcare and worksite action areas.

7 Global enabling action areas

The promising interventions within each setting-based action area described in Section 6 focus on changing inappropriate dietary and physical activity behaviours and on altering the environments in which decision about these behaviours are made. However, there are broader systems and structures that usually operate at a regional, state or national level that will exert enormous influence on efforts to address the problems of obesity within each setting. Economos et al (2001) found overwhelming agreement that policy, environmental and other system changes make important contributions to long-term changes in health. Other international taskforces and experts (WHO 2000; Hider 2001) agree with the need for a broader systems approach to support community and individual actions.

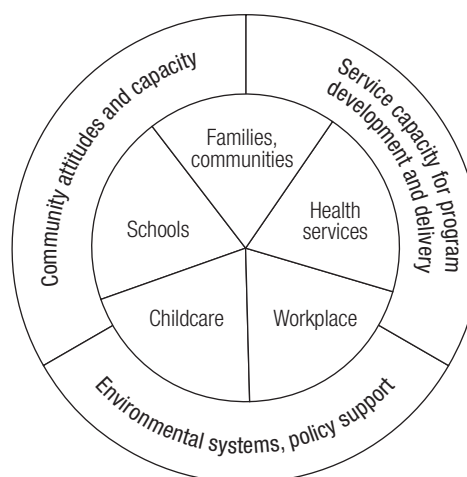
Interventions within the five settings-based action areas discussed in Section 6 can be perceived within the broader context of 'enabling action areas' or systems (Figure 6). The enabling action areas that are described in this report cover support, development and capacity building actions in different social systems:

- Community attitudes and capacity, through mass media and social marketing actions
- Environmental support to prevent weight gain, through policies, systems and facility development
- Building the capacity for program development and delivery, through leadership, management and coordination.

Each of the three global enabling action areas is described below. Interventions within these three enabling action areas or systems can be implemented at the local, state or national level and provide a more conducive and facilitating environment for local and area actions. Enabling actions also have the potential to produce population impacts in their own right.

Such actions or interventions correspond to strategic management and implementation and workforce initiatives identified in *Eat Well NSW* (NSW Department of Health 2004a) and can provide the framework and context for local actions preventing overweight and obesity throughout NSW.

Figure 6: Enabling points of intervention, in relation to settings-based action areas



The nature of the relationship between global enabling actions and any health-related outcome is complex and often difficult to define, as factors are frequently interlinked (Chapman 1993). Consequently, evidence to link changes in enabling action areas with improvements in community weight status is not readily available. Thus, the following sections provide descriptions and rationale that rely more heavily on theoretical models, logic, expert opinion and parallel evidence. As in the case of food security, where this situation is also encountered, theoretical models offer a sound basis for identifying intervention points, including potential enabling actions (CPHN 2003b).

7.1 Community attitudes and capacity

Working within communities to effect changes in the nutrition and physical activity environments related to healthy weight behaviours is not a simple task, and will require considerable commitment to change from all sections of the community. Change will be required in the current knowledge, beliefs and attitudes of the community, as well as in their skills or capacity to act. These types of changes are not sufficient alone to prevent weight gain in the community, but they are an important component of any program of action to tackle the problem of overweight and obesity in NSW. It can be argued that such changes in the social agenda and social climate are a necessary first stage in a longer process of change (Bauman et al 2002; Owen and Bauman 1995).

Communication through mass media and social marketing has been a feature of many previous public health campaigns. Smoking cessation, road safety, immunisation and sexual health have all benefited from well-coordinated and conducted communication campaigns. It is well accepted that such campaigns are unlikely to change behaviour directly, but they can publicly increase awareness of issues and set an agenda for action. They are also useful for introducing new information and concepts to the public and in helping shape attitudinal change.

The process of changing community beliefs and behaviours is usually initiated by persuading individuals to make some minor modifications to the way they live. Effective, well-targeted, and influential communication is critical to get the message out, persuade, educate and initiate dialogue within the community.

As discussed in relation to global enabling actions generally, there are obvious difficulties in attempting to measure and separate the impact of a social marketing program from the myriad of factors which influence the attitudes and behaviours of a community. Nevertheless, there have been a number of evaluation studies that have demonstrated the positive impact of social marketing on health behaviours associated with sexual health, injury prevention, smoking, drug and alcohol problems as well as protection of the environment (Kotler, Roberto and Lee 2002).

7.1.1 Community social marketing

Social marketing is a technique that can provide a useful framework for public communication. Social marketing is much more than mass communication or education, and applies the principles of commercial marketing to influence the way the community perceives a problem and reacts to the issue. It has been described as, 'the design, implementation, and control of programs seeking to increase the acceptability of a social idea or practice in a target group' (Lefebvre and Flora 1988). 'It utilizes concepts of market segmentation, consumer research, idea configuration, communication, facilitation, incentives and exchange theory to maximize target group response' (Lefebvre and Flora 1988).

Clearly the development of an effective social marketing plan requires considerable analysis and background research. The optimal social marketing campaign is tailored to the unique perspective, needs, and experiences of the target audience, hopefully with input from representative members of this group. However, there are some common features of all social marketing strategies, many of which are based on the '5Ps' – product, price, place, promotion and positioning (Alcalay and Bell 2000).

Thus, social marketing activities at a community level would include local media, advertising, public relations, promotions and community events.

There are a number of obesity-related topics that can be addressed through social marketing. One of the first is awareness by the broad community that obesity is a serious health issue for the whole community and that the focus of attention should be on finding community-based solutions, rather than further stigmatisation of individuals who have an existing weight problem. There is still a high level of negative attitudes directed towards very overweight individuals within Australia. There is a belief that obesity is a reflection of a moral failure resulting from a lack of self control; a view that is found to varying degrees across gender, race and age (Harris and Smith 1998). As a result of this stigmatisation, overweight people tend to leave school with poorer levels of education, are less likely to enter some professions, earn less and have more problems in finding a partner (WHO 2000).

This bias against overweight individuals also exists within the health care professions. Studies in the USA (Price et al 1987) and the UK (Cade and O'Connell 1991) have found GPs perceive overweight patients to be lazy, lacking self control and sad. Even health professionals who specialise in the research and care of obesity are not immune from this bias (Schwartz et al 2003).

Although Australians recognise obesity as an important issue and agree that it is harmful, they do not see weight as an issue of personal concern. Men, in particular, have inaccurate perceptions of their own weight status (Donath 2000) and see very little need for action, although their current weight is well above appropriate levels. It appears that, in general, women are more likely than men to accept that they have a weight problem and to take action to address this problem (Timperio et al 2000).

7.1.2 Mass media campaigns

Mass media interventions represent an opportunity to reach almost all the NSW population, and to provide information to frame the problem and indicate potential solutions. They can also provide specific cues for individual action. There have been very few reported mass media campaigns that have specifically targetted obesity (CDC 2001). The only study to assess the impact of the use of mass media on obesity levels over a reasonable time frame (three years) showed no significant effect on weight (Meyer et al 1980).

In 1999 the British Broadcasting Corporation (BBC) ran a large-scale health education program to encourage people to eat a more healthy diet and to become more active with the explicit aim of helping them to control their weight. The *Fighting Fat, Fighting Fit* campaign ran for seven weeks of peak and daytime programming across BBC television and radio. The campaign consisted of a series of programs and advertisements, with accompanying literature and a book and video (Wardle et al 2001). The community was encouraged to register for an additional support program, which involved returning three registration cards that charted their progress in weight loss, eating and exercise behaviour change over a six-month period. An evaluation of the progress of 6000 people randomly selected from the 33,474 campaign registrants found significant self-reported reductions in weight and improvements in dietary and exercise behaviours (Miles et al 2001). Although the authors of the evaluation point out the limitations of such a study and of mass media campaigns in general, they believed that such an approach could make a significant contribution to the management of population weight when combined with other strategies.

There have also been a number of studies that have examined the impact of social marketing and media on behaviours closely aligned to prevention of weight gain. The *Pawtucket Heart Health Program* was one of the first community-wide projects to apply the social marketing principles to diet and physical activity behaviours and was able to demonstrate modest improvements in weight, in contrast to previous community CVD prevention programs (Del Prete et al 1993).

There is also research from past mass media campaigns on diet, physical activity and smoking that demonstrates the role of mass media in setting an agenda and disseminating new information (Bauman et al 2002; Booth and Bauman 1992; Owen and Bauman 1995).

Project *LEAN* (Low-Fat Eating for America Now) is a national campaign whose goal is to reduce dietary fat consumption to 30 percent of total calories through public service advertising, publicity and point-of-purchase programs in restaurants, supermarkets and school and worksite cafeterias. A number of US states have implemented local campaigns and have broadened the campaign to promote increased vegetable and fruit consumption and other low fat/nutrient dense eating behaviours with a strong focus on community-based social marketing.

In California, an adolescent program under Project *LEAN* titled *Food on the Run* targetted low-income adolescents using a variety of social marketing strategies. Rather than focus on individual behaviour change, the program employed a systems change approach to skill adolescents in nutrition, physical activity, media advocacy and policy. Students were trained to conduct research, set goals, and formulate policy solutions to improve their schools' food and physical activity environments. An evaluation of the program demonstrated a number of important improvements in their attitudes and behaviours, as well as the environment. Statistically significant increases were made in the availability of healthy food and physical activity options at *Food on the Run* schools (eg adding salad bars and convincing school districts to switch from high fat to low fat milk; Agron et al 2002).

Another successful nutrition social marketing campaign was run by the US Center for Science in the Public Interest. The *1% Or Less* campaign aimed to reduce the total and saturated fat consumption of communities by encouraging adults and children over two years to drink one per cent or fat-free (skim) milk. The campaign focused on milk because although milk is an important source of calcium, whole and two per cent milk make a substantial contribution to the amount of saturated fat consumed by Americans. Switching to one per cent, or skim milk is one of the easiest ways for Americans to reduce their saturated and total fat intake. The campaign involved a variety of strategies including media, community presentations, supermarket

signage, school activities and a strong social marketing component at the local level. A seven-week *1% Or Less* campaign in Clarksburg, West Virginia doubled the community's low-fat-milk consumption from 18 per cent to 41 per cent of milk sales and increased overall milk sales by 25 per cent (Reger et al 1998).

In relation to physical activity, only a small number of studies used comparison groups and reviews have identified little robust evidence impact on promoting physical activity. Australian physical activity campaigns, including *Active Australia* and campaigns by the National Heart Foundation of Australia, have demonstrated good reach and improvements in community understanding (Bauman et al 2002).

Social attitudes about obesity appear difficult to change. Teachman et al (2003) attempted to influence group attitudes by manipulating beliefs about causes of obesity and inducing empathy for obese persons. When subjects were told that obesity was caused primarily by genetics they did not reduce bias against obese persons but when told that obesity is caused primarily by the person's behaviour, implicit anti-fat bias was increased. Research shows that the most important factor leading to less negative attitudes toward overweight patients amongst health professionals is a personal or family experience of weight problems (Maiman et al 1979; Oberrieder et al 1995; Schwartz et al 2003).

Dietitians who perceived themselves as overweight were more likely to be sympathetic to their overweight clients whilst those who were at an acceptable weight were more likely to hold negative ideas about overweight clients. Thus, interventions that enhance personal appreciation of the experiences of obese individuals could be useful in changing attitudes and as a strategy for the effective education of professionals. Ogden and Hoppe (1997) suggest that the learner centred approach, using personal reflection and problem solving, offers more scope for health professionals to learn from the client's experience about being overweight, than the traditional approach.

7.1.3 Potential enabling actions

Community-wide social marketing and media campaigns can have an important agenda-setting role that can support and enable behaviour change interventions. Thus, they can form a significant part of a coherent national, state or regional obesity prevention plan. There is a wide range of potential messages to be communicated and strategies could include:

- Mass media campaign to increase public awareness and alter community attitudes about the need for greater action to prevent weight gain. Such campaigns would also require a point of contact for further information/advice concerning appropriate action to help prevent obesity
- Social marketing campaign that targets families and focusses on opportunities to be more active as a family, promotes less time watching TV and other sedentary pursuits and provides simple advice on changing key dietary behaviours to prevent weight gain
- Social marketing campaigns to encourage more families to consume low-fat milk
- Social marketing campaigns to encourage a healthy body image and shift weight focus onto prevention of weight gain rather than weight loss
- Systematic approaches to briefing journalists with information about the causes of obesity and the need to avoid further bias against obese individuals
- Advocacy for a fairer representation of obese people within TV programs
- Systems for identifying and rewarding media representatives that present accurate information on weight issues – through production of a 'merit list'.

7.2 *Environmental, system and policy support*

There are many potential areas where ‘upstream’ policy development, resource allocation or structural and environmental change could support and promote appropriate nutrition and physical activity behaviours in NSW and thus contribute to prevention of weight gain in the community. Some key areas requiring attention include:

- Nutrition environments, specifically food supply and marketing of food products
- Physical activity environments, specifically transport systems and recreation facilities.

Interventions within these areas should have the following objectives:

- Eliminate barriers to improved nutrition and physical activity behaviours
- Provide explicit support, reinforcement and inducement for appropriate behaviour change
- Direct resources to those sections of the NSW population in greatest need (to assist equity of outcome)
- Ensure other actions undertaken to prevent weight gain in NSW are achievable and sustainable.

7.2.1 *Nutrition environments – food supply and marketing of food products*

The adequacy of the food supply within NSW has enormous potential to influence the health and weight status of the population. In the past two to three decades, interest has grown in modifying food environments, to support educational and other strategies directed to dietary improvements of consumers (Glanz 1988; Milio 1990; WHO 1990). Making such changes requires an understanding of the complex food and nutrition system that produces, processes, prepares and distributes foods to communities and households in Australia and other developed nations. Heywood and Lund-Adams (1991), described the main components of the food and nutrition system in Australia, and proposed that the ‘system’ be used as a basis for identifying needs for changes in food supply and nutrition policy and action in Australia.

There has been a tendency to develop policies and structures that have viewed adequacy of the food supply only in terms of sufficiency and have actually sought to maintain or increase the availability of food energy to the Australian population – ironically, it is now apparent that food insecurity may contribute to excessive energy intake through cycles of restricted and excessive food intake (Townsend et al 2001). More recently, the goals of Australian nutrition policies and recommended changes to the food supply have been focused around the prevention of heart disease. Similar principles, opportunities and challenges apply to the area of modifying the food supply to prevent obesity.

While there is some scope for community initiatives to influence local food supply, as discussed in Section 6, many of the policy changes needed to improve the food supply in line with population nutrition objectives (including the prevention of obesity) are at the national level as they relate to the macro environment.

As identified in the *Food Security Options Paper* prepared by the NSW Centre for Public Health Nutrition (CPHN 2003b), points of intervention to improve the food supply include location of food outlets, availability of food products, price and marketing. These points of intervention are equally relevant to promotion of healthy weight and prevention of weight gain in NSW.

Location of food outlets

The location of food outlets has a significant effect on purchasing behaviours and can be influenced by national and state factors, as well as by local factors (discussed in Section 6). For example, planning and development decisions at state government level influence urban planning and location of food outlets. In addition, the location and accessibility of food outlets is greatly influenced by transport options and access by public transport. Whilst food purchased from supermarkets may contribute the largest proportion of total food consumed within families, a significant number of purchases are made from convenience stores and specialist food shops such as greengrocers. Location and ease of access of smaller stores is influenced by traffic flow and pedestrian crossings and parking restrictions, which are under the control of both state and local regulations.

Availability of food products

Industrial and commercial interests, as well as government regulations, in relation to food production and food processing ultimately influence the supply of food products, in terms of composition, portion size and packaging. This is a complex area, with enormous potential to make a positive contribution to managing the obesity epidemic. There have already been significant shifts in the food supply in response to the public and professional appeal for healthier food options. However, unregulated food product development in response to consumer demand does not always result in the desired outcome. For example, there are a growing number of low-fat food items marketed as healthy options which contain as many (or in some cases more) calories than their full fat varieties. Often, the best public health outcome requires the input and coordination of government agencies and may not require further regulation.

The Nutrition TaskForce of the UK Health of the Nation Committee suggested that there be an audit of existing food products to determine where small modifications to their composition could be made to bring them more in line with the nutrition and food objectives of the *Health of the Nation* program without the need for a total re-formulation of the product. (UK Department of Health 1994).

While a number of analyses have attempted to identify the impact of changes in the food supply on dietary behaviour, few have examined the impact on weight status. There is some evidence that improving the supply and access to healthier (and less energy-dense) foods such as fruit and vegetables results in increased consumption. Work done on remote Aboriginal settlements where food policies were instigated to maintain a constant supply of fruit and vegetables at a subsidised price has shown that consumption can be maintained and improved (Lee et al 1996). Finland was able to dramatically increase the consumption of fruit and vegetables through the introduction of a regulation that required all meals provided by food service outlets to be served with vegetables or salad (Puska et al 1999).

As discussed previously, the food available in schools, childcare and public institutions is an area where there is enormous scope for supportive government policies and regulations that address the issue of prevention of weight gain.

Price

There is evidence that price is an important determinant of food purchasing behaviour and that its manipulation has the potential to influence the intake of appropriate foods. Altering demand by influencing price through taxation has been used very effectively in control of tobacco consumption, but its potential in influencing food selection is more difficult to predict due to the lack of understanding about price inelasticity in food purchasing behaviour. It was observed that a 10 per cent increase in the price of pork resulted in dietary change that produced an 11 per cent reduction in fat intake among economically disadvantaged consumers and 5 per cent in the more affluent (Guo et al 1999). Work by French et al (2001) has shown that manipulation of the price of snacks and fruit and vegetables can lead to increased sales of these preferred products when sold in the canteen or through vending machines. Specific taxes on snack foods and soft drinks are used in various parts of the United States (Jacobson and Brownell 2000). These taxes are generally fairly small (eg a 7.25 per cent sales tax on soft drinks in California). Nevertheless, it has been estimated that if the price inelasticity for soft drinks were about the same as that for cigarettes, a five per cent tax would result in a two per cent decline in sales of soft drinks.

Small taxes or levies on products such as snack foods and soft drinks may not be sufficient to directly influence consumption, but the money raised can be set aside to support more effective health promotion initiatives. Governments at all levels in Australia impose levies to raise revenue for specific purposes. The South Australian government, for example, adds a five-cent levy to the cost of bottled drinks to encourage proper disposal and to cover the cost of recycling. The Australian government applies a wide range of levies to food and non-food items to cover agricultural subsidies and program development. Currently there are existing levies on milk (11 cents per litre) and sugar (18 cents per kilogram), which fund compensation schemes to dairy farmers and cane growers to support industry restructuring (Gordon 2002).

Large increases in the cost of high fat/high energy dense foods and drinks may disproportionately disadvantage low-income groups. However, price subsidies to healthy options and the provision of free produce (such as vegetables and fruit), to encourage consumption, have been shown to be effective in supporting desired dietary change without the regressive features of additional taxation. Consumption of low fat milk in Finland was greatly increased when it was subsidised to allow price parity with full fat milk (Puska et al 1999). The provision of free fruit to schools in the UK led to an increase in overall fruit consumption during the trial (UK Department of Health 2001). This is discussed further in Section 6.3.

Marketing of food products

Television advertising by snack food companies and fast food chains dominates children's and family viewing times in Australia. Australian studies (Hill and Radimer 1997) show that more than three quarters of foods advertised during children's programs were for 'non core' foods (foods that dietary guidelines recommend children consume only 'sometimes' or 'in small amounts'). In addition, a survey of 13 OECD countries found that Australia had the highest rates of food advertising per hour (Dibb 1996). Food companies spend millions of dollars on advertising their products on television and these advertisements tend to cluster around children's television viewing time (Zuppa et al 2003).

Such heavy exposure to a message to consume 'non core' foods and drinks has enormous potential to negatively impact on the eating behaviours of children, during a critical stage of their development. The impact of food advertising directed at children on food consumption and behaviour has been the subject of a number of reports, including a recent large review undertaken for the Food Standards Agency in the UK. This review, based on 122 studies, concluded that food promotion to children does influence their food preferences, purchase behaviour and consumption. The effect was found to be independent of other factors and influenced not only which brand but also the type of food chosen (Hastings et al 2003). In addition, advertising increases children's requests for advertised products and this can undermine parents' attempts to provide a healthy diet for their children.

A study by Halford et al (2004) showed that obese children have a heightened alertness to food-related cues and exposure to such cues increases food intake in all children. Also, the ability to recognise food advertisements was significantly correlated with the amount of food eaten after exposure. An intervention by Robinson et al (2001) showed that reducing exposure to television advertising leads to a reduction in requests from children to their parents to purchase toys.

While marketing in Australia occurs within the context of Australian Government regulations and voluntary codes, the current system is complex and does not offer clear protection for children against heavy exposure to advertising (CFAC 2003).

Food labelling

Another aspect of food marketing which has the potential to influence food consumption behaviours is the provision of simple and instructive information on composition. Although regulations agreed by Food Standards Australia and New Zealand (FSANZ) already require nutrition labelling on package goods, research indicates that consumers are looking for more meaningful representations of the energy (calorie) content per portion of common foods. The *Pick the Tick* program of the National Heart Foundation of Australia is often cited as an illustration of a simple and effective food selection guide that informs rather than confuses consumer decision-making. Brazil has recently introduced a colour-coded system for defining the relative levels of energy and macronutrients in foods to enable consumers to make choices in relation to the issue of most concern to them (Coitinho et al 2002).

While consumers consistently request simple food guides to identify the most appropriate products to include in their usual diet, there is only indirect evidence that these schemes can influence weight status. A community survey in the US found that food label use was significantly associated with lower fat intake and better diet in consumers (Neuhouser, 1999). Research from the National Heart Foundation of Australia reveals that 60 per cent of consumers report using the tick to guide food purchases suggesting that such approaches have considerable potential.

7.2.2 Physical activity environments: transport systems and recreational facilities

There is increasing recognition that environments play an important role in facilitating or hindering physical activity (Bauman et al 2002). Environmental factors include access, use and density of facilities, safety, street design (connectivity), density of housing, availability of public transport, pedestrian and bicycle facilities and land use mix. While some of these factors can be addressed at a local level and have been discussed in Section 6.3.3 'Families and communities action area', they are also influenced by state and national actions.

Transport systems

Transport systems have the potential to influence both eating and physical activity levels. For example, the fact that local shops can only be reached by road transport by the majority of the population is likely to increase sedentary behaviour and reduce active transport (cycling, walking). Consumers are also likely to purchase food from retail outlets that they can more easily access.

The role of active transport and recreational facilities in promoting physical activity is not discussed in detail in this report, as it is covered comprehensively in relevant physical activity planning and policy reports.

The NSW Childhood Obesity Summit (NSW Department of Health 2002) considered a range of potential actions relevant to transport and planning, including:

- urban design and decentralised location of food shops and activity facilities
- support for infrastructure and access plans to support active transport
- public provision of drinking water.

Recreation facilities and services

Changes to recreation facilities, such as creation of cycleways, walking paths, recreational facilities and community/activity centres, and influencing land zoning for recreation use can have long-term effects on physical activity levels. As described in *Getting Australia Active* (Bauman et al 2002), there is a modest amount of quantitative research identifying the relationships between environments and levels of physical activity. For example, people are 50 per cent more likely to walk for recreation

or transport if they have a footpath in their street, twice as likely to walk if they have a pleasant physical environment and over twice as likely to walk if they have friends or social influences encouraging them to walk (Queensland Health 2001). National and state policies and funding for sport and recreation, as well as planning and transport decisions, influence urban planning and the funding, provision and distribution of recreational facilities.

7.2.3 Potential enabling actions

There are a number of potential policy and systems changes that the Australian and NSW Government and regional organisations can make to help provide an environment which supports the adoption of appropriate dietary and physical activity behaviours necessary to help prevent weight gain. These include:

- Developing integrated national and state policies that support appropriate dietary and physical activity behaviours and help prevent weight gain
- Developing a policy impact tool to assess both the positive and negative impact of all government policies on diet, physical activity and weight status
- Ensuring that all planning applications and transport policies and program examine the impact on physical activity and weight gain
- Reviewing regulations on the distribution and access to food outlets within residential areas in NSW
- Developing and implement mandatory rules on food available for sale through school canteens
- Advocating for price parity between low-fat and full-fat milk
- Considering options for introducing a NSW levy on soft drinks and/or snack foods to fund obesity action in NSW
- Supporting the tightening of national regulations on food advertising directed at children or a ban on advertising during children television viewing time
- Considering programs for the provision of free fruit and vegetables in primary schools
- Reviewing planning and development regulations and ways of ensuring the provision of adequate recreation facilities and open space with walking trails within residential areas
- Promoting and support programs that encourage use of public transport and active transport.

7.3 *Service capacity for program development and delivery*

Improving the capacity of the NSW health sector to tackle the problem of obesity is best achieved by a combination of strategies, including structures, policies, coordination and planning (Leeder 2000).

There is a need for a strong partnership approach, within the health sector, with other organisations and with the community, to allow for a sharing of expertise and communication exchange. The development of coalitions with common objectives was an important element identified by Economos et al (2001) from other attempts to guide social change. One part of the essential coalition to address overweight and obesity is the linkages between nutrition and physical activity interventions and agendas.

Coordination of efforts is essential in order to both strengthen and diversify interventions, and to develop synergy between efforts. It is only by mounting a substantial effort, with significant resources, popular support and community reach, that sufficient impact on those factors that currently promote weight gain will be made. Thus, a key element in any weight gain prevention strategy is to develop the organisational capacity that can mount and sustain substantial changes to a wide range of individual and environmental factors. Particular aspects of coordination and capacity building identified in public health theory and identified as ingredients for success (NHMRC 1995; Webb and Marks 1997) include:

- Development of systems for monitoring weight status, in order to provide current information on the extent and nature of the problem in the NSW population and key subgroups
- Improvement of the knowledge base about effective interventions to promote healthy weight, for example through research and demonstration projects
- Development of effective structures for coordination, collaboration, and service and program delivery
- Ongoing development of a large and heterogeneous workforce, harnessed across sectors.

These substantial infrastructure issues are critical in amassing a significant public health effort to address obesity. Inadequate capacity may undermine the implementation of any obesity action plan.

7.3.1 *Monitoring and surveillance*

Keeping track of the dietary practices, physical activity levels and weight status of the NSW population is important for quantifying and defining the nature of the problem, identifying trends, targetting subgroups of the population for intervention, guiding state and area planning, evaluating the impact of interventions and supporting public policy change. The companion report, *Report on the Weight Status of NSW 2003* (CPHN 2003a) discusses the selection of indicators of weight status and presents a comprehensive picture of weight status in NSW. This report also provides detailed discussion of the requirements for monitoring systems, to enable good tracking of changes and influences on weight status of adults and children. While there are a number of data sources used in that report, key surveys comprise the National Nutrition Survey 1995 and the rolling NSW Health Surveys (for adults and children).

The NSW Health Surveys provide a key vehicle for ongoing monitoring of weight status for children and adults. These surveys have the advantage of collecting from a large sample across NSW, enabling analysis at area health service level and collection of comparative information over time. A disadvantage is the reliance on self-reported height and weight data, as it is known that this leads to systematic biases in BMIs (AFMNU 2001).

While surveys conducted on an occasional basis can strengthen the information base by using physical measurements and more detailed dietary assessments, they do not by themselves constitute a comprehensive monitoring and surveillance system (CPHN 2003a).

7.3.2 *Development of the knowledge base on interventions*

The lack of a comprehensive evidence base for interventions means that it is important to focus attention on applied intervention research. The extent and seriousness of the problem, and the development of the problem at a population level means that there is an imperative to take action, rather than delay. This has been argued strongly in national and international publications (Kumanyika 2001; Dietz 2002).

In this situation, priority needs to be given to applied intervention research studies that utilise best practice planning processes to designing intervention programs,

involve concerted and well managed program implementation, and rigorous process and impact evaluation to identify effective programs and program components. Ideally a range of applied intervention research studies would be conducted, to develop and investigate a range of program strategies, action areas and types.

In NSW, health promotion research and demonstration grants provide one method for fostering and supporting applied intervention research at the same time as addressing community health priorities.

7.3.3 Effective structures for leadership, coordination, collaboration and service and program delivery

Given the range of influences on population weight status and number of stakeholders, it is well recognised that actions need to occur at different levels, including national, state, and local levels.

The first critical element for achieving this common focus and vision is leadership. The promotion of healthy weight and successful prevention of community weight gain in NSW will require sustained action over many years, often in the face of difficulties and opposition. Strong leadership, which supports action in line with a well-designed action plan, is an essential requirement to achieve the overall aim. The successful implementation of any program of action will require this leadership to be provided for an extended period of time and at national, state and regional levels.

At the national level, the National Obesity Taskforce was established to provide direction and has produced a national framework for action (National Obesity Taskforce 2003). Further coordination is required across government (between health, education, agriculture, transport and planning sectors) and between government, industry and non-government organisations. Such partnerships between government, industry and community are an objective in *Prevention of Obesity in Children and Young People: NSW Government Action Plan 2003-2007*. However, there is a need at national and state levels to coordinate strategic development and coordinated implementation of these actions, such as occurs with illegal drugs and physical activity. One initial way of coordinating efforts

to address overweight and obesity at all levels, is to link nutrition and physical activity services and programs at all levels.

There are a number of tools and guides available to support efforts in coordination and collaboration, including the *Key Components for Successful Intersectoral Collaboration* (Harris et al 1995) and checklists and indicators of capacity (Hawe et al 1999).

7.3.4 Workforce development

Successful implementation of any action plan on obesity in NSW will need an appropriately sized and skilled public health and health care workforce to deliver programs. The current capacity of these services to plan and deliver programs varies across different parts of NSW, and thus it will be necessary to identify and provide training and education for key management and operational staff. There is a particular need to ensure that all those who are providing services and programs are delivering consistent and accurate messages.

In addition to nutrition and physical activity specialists, who have an essential contribution to make, many professional groups have a potential role that will need further development. Health promotion professionals, General Practitioners, maternal and child health professionals, physiotherapists, dentists, community health service staff, medical specialists, and non-specialist health workers should also be included in any planning for workforce development.

Workforce development requires the creation of general organisational systems, as well as individual professional development initiatives (NSW Department of Health 2004b). The development of an education framework should focus on improving understanding of weight-related issues and developing the leadership, planning and evaluation skills necessary to effectively address community weight gain. Reference to specialist support and advice (especially from academic institutions) will help augment this process. Knowledge and skill transfer within the workforce can be enhanced by training 'champions' of weight gain prevention in key areas of the health workforce and other appropriate sectors.

7.3.5 Potential enabling actions

A number of approaches could be used to improve the management coordination and support with NSW Health to enable more effective support for action on obesity. These include:

- Enhance existing statewide monitoring and surveillance systems by linking data from a wider range of sources
- Continue to provide leadership and co-ordination within the NSW Government on the issue of obesity
- Support innovation by funding research demonstration projects across each setting-based action area
- Develop tools to guide and support the evaluation of weight gain prevention initiatives
- Ensure coordination of healthy weight initiatives across NSW
- Develop a systematic approach to the development of workforce development and enhancing the capacity of different workforce groups in relation to weight gain prevention.
- Identify and resource local 'champions' in the area of obesity who can provide further professional development and help build capacity of local workforces through NSW.

8 Deciding on the best mix of interventions

This report has reviewed a broad range of literature and information in an attempt to identify the most appropriate actions for the promotion of healthy weight and the prevention of weight gain in NSW. It has provided a framework for that action through the identification of a number of key action areas. It has also provided guidance on the relative merit of various interventions within those action areas by a critical application of all available evidence. More importantly, though, it has provided a process for the development of a comprehensive and coherent program of action which is based on the National Public Health Partnership's *Planning Framework for Public Health Practice* (NPHP 2000). This process is based around the development of a portfolio of action that provides the best mix of interventions to effectively address community weight issues. There is a clear need for national and state leadership and policy development on the prevention of obesity, however, as any portfolio of action will be implemented and evaluated at the local level, the selection of the best mix of interventions will need to be developed at that level, albeit within a larger regional, state or national framework.

8.1 Planning a portfolio

The portfolio approach was first proposed by Hawe and Shiell (1995) and allows the selection of interventions to be based on the best available evidence, whilst not excluding untried but promising strategies or those strategies where information is still limited. Because previous work on the prevention of weight gain in the community has been limited, the approach was adapted to produce a matrix of promising interventions. The matrix, which is set out in Section 5, identifies the level of promise of particular interventions based on a product of their potential health gain and the level of certainty surrounding a favourable outcome. As such it serves as a useful tool for defining a portfolio of action on obesity and should serve as a valuable aide to most cost effective allocation of resources.

The available evidence supported the development of four quadrants within which potential interventions were designated as: very promising, promising (moderate gain), promising (high risk), and some promise.

The construction of a state or regional action plan based on the portfolio approach should involve the selection of

a range of interventions from each of the four appropriate quadrants, dependent upon community need, resources, staff capacity etc. Interventions identified as very promising (Quadrant One of the modified model) should take a high priority in the initial construction of a portfolio.

8.2 Criteria for defining best mix of interventions

Specific criteria were applied to the selection of interventions within each setting-based action area to assess their level of promise. However, these criteria related to broad concerns around efficacy of the intervention and its policy relevance. To make judgements concerning the best mix of interventions for local portfolios of action will require the application of a more specific set of criteria which reflects the potential of interventions to produce a favourable outcome, given the specific features and capacity of the community and the services within it. These local level criteria could include:

- Relevance and acceptability to the community
- Likely cost of implementation
- Availability of appropriate resources
- Capacity of staff
- Level of engagement of key partners.

8.3 Defining appropriate objectives that focus on energy balance

Despite the difficulty of achieving total energy balance, weight stability and a reduction in the level of overweight and obesity in the community, it is important that objectives of any program or intervention addressing this problem must be clearly related to achieving energy balance and preventing weight gain. This does not mean that there should be an excessive focus on weight and weight loss, but rather that an intervention be planned to achieve sufficient impact on dietary intake and/or energy expenditure to influence energy balance and weight status. Imprecise objectives relating to healthy eating or active living are not an accurate reflection of the changes sought. Weight gain prevention is not achieved by merely putting a range of interventions focusing on nutrition and physical activity into a healthy weight program.

8.4 Achieving intensity and breadth

Three issues are of critical importance in attempting to achieve a sufficiently large enough change in dietary or physical activity habits to influence energy balance – intensity, breadth and sustainability of effort. In essence, all three of these features are important to any program of action but the implementation of a portfolio, in circumstances of restricted resources, is often necessary to balance breadth and intensity of effort.

Building intensity of effort

Intensity is usually achieved by focusing resources on effecting change in a single target group or setting, or in relation to specific behavioural and/or environmental outcomes. Intensity is not usually produced by the application of a single intervention or approach, but generally implies the utilisation of a variety of strategies to achieve the desired outcome. Intensity needs to be sustained to effect change. This is critical, as weak or less intense interventions are unlikely to be able to impact sufficiently upon energy balance to assist with weight gain prevention. A lack of intensity appears to be a common limitation of existing health promotion action to address obesity and this has been identified as one of the likely reasons for our inability to impact upon the problem (Jeffery 1995).

Building breadth of effort

Breadth implies that efforts are directed to a wide range of target groups or settings, or are directed to achieving a number of specific behavioural and environmental outcomes. This may be achieved by applying a single strategy across all action areas, but more usually involves the application of a wide range of strategies – that is, through a portfolio approach. Breadth of action is important in achieving the prevention of weight gain in the community, as no one single intervention or strategy will achieve sufficient change to the level of change necessary to influence community weight status.

Reviews of the effectiveness of health promotion interventions often indicate the value of a multi-faceted approach. However, the term can be interpreted in a variety of ways in relation to breadth and intensity. At a state or regional level the focus in development of a plan of action is generally on breadth of effort. It is crucial that a comprehensive portfolio of action is developed at this level, to ensure that a wide range of strategies can be put in place to address all action areas. However, at a local level it may be more resource effective to tackle fewer action areas or target groups from within the overall portfolio of action with greater intensity. In this circumstance, breadth of effort can be achieved by addressing remaining elements of the portfolio over time. These are decisions that will need to be made in relation to the capacity and resources of specific services and units.

8.5 Engaging stakeholders and partners

Comprehensive strategies to maintain healthy weight and prevent weight gain in the community will require coordinated action from a wide range of sectors of society. Some programs may be planned and implemented within a single section of a local health service or the Department of Health. However, most will require cooperative action across the entire health service and often involve external organisations and agencies. Although engaging external agencies may be time consuming and challenging, it is imperative that these organisations are engaged as soon as possible in the planning process to ensure that participation is meaningful and committed.

9 Conclusions and recommendations

1. Obesity is a serious public health problem in NSW and the level of overweight and obesity has surpassed 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 threaten to reduce recent health gains in NSW. Rates of overweight and obesity continue to rise at an alarming rate and the problem needs urgent and concerted action.
2. The prevention of weight gain (or the reversal of small gains) and the maintenance of a healthy weight are likely to be easier, less expensive and potentially more effective than the treatment of obesity after it has developed.
3. There are a number of reasons why objectives of any action plan to tackle the problem of overweight and obesity in NSW should focus on prevention of weight gain in adults and the promotion of a healthy weight in children. Prevention of weight gain is a simple message of relevance to all adults in NSW, regardless of current weight status. The maintenance of a healthy weight for children is a more difficult concept to explain and measure but it ensures issues such as respect and body image are considered as part of the objectives.
4. Addressing the problem will require a comprehensive and integrated approach that addresses energy intake, energy expenditure and sedentary behaviour. There should not be an excessive focus on weight and weight loss. Planning must focus on strategies that have the potential to positively impact on energy balance and thus the weight status of the community, rather than on poorly defined objectives relating to healthy eating and active lifestyle. Whilst a change in weight status (or other measures of adiposity) is the most reliable measure of long-term success of an obesity-prevention intervention, it is important to identify more sensitive short-medium term outcomes associated with process of weight-related behaviours, to evaluate the relative merit of programs.
5. As overweight and obesity are widespread and prevalent within the community in NSW, strategies should seek to target the whole of the community where appropriate. However, there is also merit in targeting those groups who are disadvantaged and more at risk of weight gain within the community. It is also important not to forget those with an existing weight problem within weight gain prevention strategies because they are likely to benefit from the prevention of further weight gain.
6. There are a number of key points of intervention for strategies to prevent weight gain. These include:
Reducing energy intake:
 - Reducing the intake of high energy dense foods (ie foods high in fat/sugar)
 - Increasing the intake of low energy-dense foods (especially vegetables and fruits)
 - Reducing the consumption of sugar-sweetened soft drinks and juices
 - Reducing the level of food prepared outside of the home
 - Reducing portion sizes.**Increasing energy expenditure:**
 - Regular physical activity
 - Reduced time spent in sedentary behaviours (especially TV watching)
 - Increased incidental activity
 - Increased participation in active recreation
 - Increased use of active transport.
7. Comprehensive planning in line with the health promotion planning process is essential to produce coherent strategies to tackle overweight and obesity in NSW. The National Public Health Partnership's *Planning Framework for Public Health Practice* provides a useful approach to the planning and implementation of appropriate interventions.

8. At a national, state or regional level, action plans need to be broad, comprehensive and multi-faceted to address the wide range of factors which are influencing energy balance in the community and contributing to continued weight gain. The portfolio approach offers a useful model for achieving this objective.

At the local or area level, interventions within the broad action plan could target single issues or behaviours in a comprehensive and multi-faceted manner, to ensure sufficient intensity and reach to positively influence aspects of energy balance can be achieved. This may be more resource efficient, provided the whole portfolio of action is addressed over time.

9. The selection of intervention options to prevent weight gain in the community should be made with reference to the evidence of effectiveness, feasibility of implementation, as well as additional factors relating to scope, costs, sustainability, equity and partnerships.
10. Evidence from controlled trials for the efficacy or effectiveness of interventions to prevent weight gain in the community is presently limited. However, information and evidence of potential effectiveness may come from a range of sources, including evidence from past public health intervention, theory, policy and program logic, intuitive evidence and expert opinion. In selecting intervention to include within a portfolio it is important to weigh the potential health return of an intervention against the current lack of evidence of effectiveness. This provides a matrix of promising interventions.
11. A range of interventions options has been identified in five settings-based action areas – families and communities, early childhood care services, schools, workplaces and health services. Within each settings-based action area, interventions have been assessed in relation to the dimensions of the promising matrix.

12. In addition, a number of global enabling action areas, have been identified which are essential elements of any comprehensive weight gain prevention strategy and require inputs at local, area, state and federal levels. The enabling action areas that are described cover:

- Community attitudes and capacity, through mass media and social marketing actions
- Environmental support to prevent weight gain, through policies, systems and facility development
- Building the capacity for program development and delivery, through leadership, management and coordination.

13. There are already a number of actions being undertaken within NSW that directly or indirectly address issues related to the prevention of weight gain. There are a wide range of nutrition, physical activity, chronic disease prevention and other public health programs that address weight-related behaviours. Where possible these should be built upon, rather than instituting new programs and structures to address overweight and obesity.
14. Tackling the problem of obesity in a truly comprehensive fashion by addressing the wide range of environmental factors that influence energy balance is beyond the scope of the health sector alone and will require partnership within government and across all sectors of society. However, the health sector needs to take a leadership role and provide the management, coordination and specialised expertise in community health promotion programs and health-issue social marketing to enable this to occur.
15. Within the context of national and state strategic plans, Area Health Services should develop regional action plans on obesity by selecting a portfolio of action relevant to their community within the key action areas set out in this document.

Health promotion groups within each Area Health Service should then select and develop multi-faceted interventions to address single issues or target groups identified within the area action plan on obesity.

Specific recommendations

- i The NSW Government continues to support and implement the *Prevention of Obesity in Children and Young People: NSW Government Action Plan 2003-2007*, through a whole-of-government approach and in collaboration with community, industry and other relevant organisations.
- ii The NSW Government regularly reviews and refines the implementation of the *Government Action Plan*, to ensure ongoing commitment and breadth of effort sufficient to achieve improvements in population weight status.
- iii The NSW health system continues to provide leadership in preventing obesity through the contribution of specialised expertise and active coordination and facilitation of government, industry and community actions.
- iv The NSW health system provides leadership, management and coordination for government, community and industry efforts to prevent weight gain in adults.
- v The NSW Department of Health develops further resources to guide and assist state, area and community health initiatives directed towards healthy weight.
- vi NSW Health pursues the range of promising enabling actions identified in this report, including:
 - a. Social marketing campaigns
 - b. Production of media information and a dissemination strategy
 - c. A broad workforce development strategy for government and community sectors
- vii NSW Health funds and supports demonstration projects in each settings-based action area where the project involves an intense, multi-faceted intervention based on promising initiatives, as described in this report.
- viii NSW Health identifies and support expert 'champions' in addressing obesity, who can provide further professional development and help build capacity of local workforces through NSW.

References

- Agron P, Takada E, Purcell A (2002) California Project LEAN's Food on the Run Program: An evaluation of a high school-based student advocacy nutrition and physical activity program. *Journal of the American Dietetic Association* 102 (3 Suppl): S103-S105.
- AHRQ (2000) *Efficacy of interventions to modify dietary behaviour related to cancer risk*. Summary, Evidence Report/Technology Assessment: No. 25. AHRQ Publication No. 01-E028, November 2000. Agency for Healthcare Research and Quality, Rockville, MD. www.ahrq.gov/clinical/epcs/sums/dietsumm.htm
- Alcalay R and Bell RA (2000) *Promoting Nutrition and Physical Activity through Social Marketing: Current Practices and Recommendations*. Center for Advanced Studies in Nutrition and Social Marketing. University of California, Davis, CA.
- American Academy of Pediatrics (2004) Soft drinks in schools. Policy Statement. www.nsba.org/site/doc_micro.asp?TRACKID=&VID=38&CID=1120&DID=32689 (Accessed 31 May 2004).
- American College of Sports Medicine (2001) *Appropriate Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults: Position statement*. Medicine and Science in Sports and Exercise.
- Anderson GC, Moore E, Hepworth J, Bergman N (2003) Early skin-to-skin contact for mothers and their healthy newborn infants. *The Cochrane Library*, Vol 3, 2003. (Most recent update 16 April 2003).
- Ashenden R, Silagy C, Weller D (1997) A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 14 (2): 160-175.
- Ashton B and Hughes R (2000) *Take-away food project report No 1: a review of public health nutrition intelligence of the take-away food sector*. Griffith University, Brisbane.
- Australian Bureau of Statistics (1997) *National Nutrition Survey Selected Highlights 1995*. AGPS, Canberra.
- Australian Food and Nutrition Monitoring Unit (2001) *Monitoring food habits in the Australian population using short questions*. Commonwealth Department of Health and Ageing, Canberra.
- Australian Institute of Health and Welfare (2002) *Australia's Welfare 2001*. Australian Institute of Health and Welfare, Canberra.
- Avery, A (2000) Tackling obesity in primary care: assessing the practicalities of working in partnership with the commercial slimming sector. *Journal of Human Nutrition and Dietetics* 16 (5): 370.
- Ayyad, C, Andersen T (2000) Long-term efficacy of dietary treatment of obesity: a systematic review of studies published between 1931 and 1999. *Obesity Reviews* 1: 113-119.
- Baker A H., Wardle J (2002) Increasing Fruit and Vegetable Intake Among Adults Attending Colorectal Cancer Screening: The Efficacy of a Brief Tailored Intervention. *Cancer Epidemiol Biomarkers Prev* 11: 203-206
- Bauman A, Bellew B, Vita P, Brown W, Owen N (2002) *Getting Australia active: towards better practice for the promotion of physical activity*. National Public Health Partnership. Melbourne.
- Bell AC and Swinburn BA (2004) What are the key food groups to target for preventing obesity and improving nutrition in schools? *European J Clinical Nutrition*, 58(2): 258-263.
- Birch LL (1987) The role of experience in children's food acceptance patterns. *J Am Diet Assoc*. 87: S36-S40.
- Birch LL and Davison KK (2001) Family environmental factors influencing the developing behavioural controls of food intake and childhood overweight. *Pediatr Clin North Am*. 48:893-907.
- BIS Shrapnel (2000) *Fast Food in Australia*, 4th ed. (Extract). BIS Shrapnel, North Sydney: 1-5, 45-46, 65-66, 151-158, 166-169, 182-185.
- Booth M (2000) What strategies can be used to help promote and maintain adequate levels of physical activity in Australian children? Recommendations for nutrition and physical activity for Australian children. *Medical Journal of Australia* 173: S1-S16.
- Booth M, A. Bauman, et al (1992). Effects of a national mass-media campaign on physical activity participation. *Health Promotion International* 7(4): 241-247.
- Bravo A and Cass Y (2003) *Good Food in Family Day Care – Improving Nutrition and Food Safety in Family Day Care. Implementation and Evaluation Report*. Health Promotion Service, South East Sydney Area Health Service.
- Briss PA, Pappaioanou M et al (2000) Developing an evidence-based guide to community preventive services – Methods. *Am. J. Prev. Med.* 18: 35-43.
- Bunney C, Williams L (1996) *Caring for Children: Food, Nutrition and Fun Activities*. 3rd ed., NSW Department of Health, Sydney.
- Cade J and O'Connell S (1991) Management of weight problems and obesity: Knowledge, attitudes and current practice of General Practitioners. *British Journal of General Practice* 41: 147-150.
- Cameron-Smith D, Burke LM, Angus RJ et al (2003) A short-term, high-fat diet up-regulates lipid metabolism and gene expression in human skeletal muscle *Am J.Clin Nutr.* 77:313-318.
- Campbell K and Crawford D (2001) Family food environments as determinants of pre-school aged children's eating behaviours: implications for obesity prevention policy. A review. *Australian Journal of Nutrition and Dietetics* 58 (1): 19-25.
- Campbell K, Waters E, O'Meara S, Kelly S, Summerbell C (2002). *Interventions for preventing obesity in children*. Cochrane Database Systematic Review 2: CD001871.
- Carleton RA, Lasater TM, Assaf AR, Feldman HA, McKinlay S (1995) The Pawtucket Heart Health Program: community changes in cardiovascular risk factors and projected disease risk. *Am J Public Health* 85:6 777-785.

References

- Carter, M and Swinburn, B (1999) Measuring the impact of a school food program on food sales in New Zealand. *Health Prom Int* 14(4): 307-16.
- Central Sydney Area Health Service (1994) *Program Management Guidelines for Health Promotion*. NSW Department of Health Department, Sydney.
- Central Sydney Area Health Service (1996) *Caring for Infants: Food and Nutrition for 0 to 1 Year Olds in Long Day Care Centres*. Unpublished report.
- Central Sydney Health Promotion Unit (2002) Walk to School Programs in *Healthy Happenings*. Central Sydney AHS.
- Centre for Public Health Nutrition (NSW) (2003a) *State of Food and Nutrition in NSW Series: Report on the Weight Status of NSW: 2003*. Sydney, NSW Department of Health.
- Centre for Public Health Nutrition (NSW) (2003b) *Improving Nutrition in NSW Series: Food Security Options Paper: A Planning Framework and Menu of Options for Policy and Practice Interventions*. Sydney, NSW Department of Health.
- Centre for Public Health Nutrition (NSW) (2004) *Report on breastfeeding in NSW 2004*. NSW Health, Sydney.
- Centre for Weight and Health (2001). Position Paper. *Prevention of Childhood Overweight – What Should Be Done?* University of California, Berkley.
- Centers for Disease Control and Prevention (US) TaskForce on Community Preventive Services (2001) *The Community Guide – Promoting Physical Activity*.
- Centers for Disease Control and Prevention (US) (1996) *Guidelines for school health programs to promote lifelong healthy eating*. www.cdc.gov/mmwr/preview/mmwrhtml/00041446.htm
- Centers for Disease Control and Prevention (US) (1997) *Guidelines for school and community programs to promote lifelong physical activity among young people*. www.cdc.gov/mmwr/preview/mmwrhtml/00046823.htm
- Centers for Disease Control and Prevention (US) (2001) *Increasing physical activity: A report on recommendations of the TaskForce on Community Preventive Services*. *MMWR* 50 (No. RR-18).
- Chapman S (1993) Unravelling gossamer with boxing gloves: problems in explaining the decline in smoking. *BMJ* 307:429-32.
- Clifford TJ. (2003) Breast feeding and obesity. *BMJ* 327:879-880
- Coalition on Food Advertising to Children (CFAC) (2003) *Children's Health or Corporate Wealth? The case for banning television food advertising to children*. Adelaide, CFAC.
- Coitinho D, Monteiro CA, Popkin BM (2002) What Brazil is doing to promote healthy diets and active lifestyles. *Public Health Nutr*. 5:263-7.
- Collings (2003) Water in schools. Pilot project in Slough. www.bhps.org.uk/documents/WaterInSchoolsReport02.pdf
- Commonwealth Department of Health and Ageing (2003) *General Practice Statistics*, AGPS, Canberra. www.health.gov.au/hsdd/gp/stats/
- Commonwealth Department of Health and Family Services (1998) *Developing an Active Australia: A framework for action for physical activity and health*. AGPS, Canberra.
- Commonwealth Department of Health and Human Services (1993) *Pathways to Better health: National Health Strategy*. Issues paper No. 7. AGPS, Canberra.
- Contento I, Balch GI, Bronner YL, Lytle LA, Maloney SK, Olson CM, Swadener SS (1995) Effectiveness of nutrition education and implications for nutrition education policy, programs and research: a review of research. *Journal of Nutrition Education* 27(6): 191.
- Davis SM, Going SB, Helitzer DL, Teufel NI, Gittelsohn J, Metcalfe L, Arviso V, Evans M, Smyth M, Brice R, Altaia J (1999) Pathways: A culturally appropriate obesity-prevention program for American Indian schoolchildren. *American Journal of Clinical Nutrition* 69 (4 Suppl): 796S-802S.
- Del Prete L, English C, Caldwell M, Banspach SW, Lefebvre C (1993) Three-year follow-up of Pawtucket Heart Health's community-based weight loss programs. *American Journal of Health Promotion* 7: 182-187.
- Diabetes Prevention Program Research Group (2002) Reduction in the Incidence of Type 2 Diabetes with Lifestyle Intervention or Metformin. *NEJM*: 346:393-403.
- Dibb S (1996) *A Spoonful of Sugar: Television Food Advertising Aimed at Children: An International Comparative Survey*. Consumers International UK.
- Dietz WH (2001) The obesity epidemic in young children: Reduce television viewing and promote playing. *BMJ* : 322(7282): 313-14.
- Dietz W, Gortmaker S (2001) Preventing obesity in children and adolescents. *Annual Review of Public Health* 22: 337-353.
- Dishman R, Oldenburg B, O'Neal H, Shephard R (1998) Worksite physical activity interventions. *Am J. Prev. Med* 15(4): 344-361.
- Donath SM (2000) Who's overweight? Comparison of the medical definition and community views. *Medical Journal of Australia* 172: 375-377.
- Donnelly JE, Jacobsen DJ, Whatley JC et al (1996) Nutrition and physical activity and metabolic fitness in elementary school children. *Obes Research* 4: 229-243.
- Donnelly A, Snowden HM, Renfrew MJ, Woolridge MW (2000) Commercial hospital discharge packs for breastfeeding women. In *The Cochrane Library* 3 (Most recent update 30 May 2000).
- Douketis J, Feightner J, Attia J, Fieldman WF (1999) Periodic health examination, 1999 update No.1. Detection, prevention and treatment of obesity. *Canadian Medical Association Journal* 160 (4): 513-525.

References

- Dunt D, Day N, and Pirkis J (1999) Evaluation of a community-based health promotion program supporting public policy initiatives for a healthy diet. *Health Promotion International* 14: 317-327.
- Dwyer T, Coonan W, Leitch D, Hetzel B, and Baghurst R (1983) An investigation of the effects of daily physical activity on the health of primary school students in South Australia. *International Journal of Epidemiologists* 12(3): 308-313.
- Eakin EG, Glasgow RE, Riley KM (2000) Review of primary care-based physical activity intervention studies: Effectiveness and implications for practice and future research. *Journal of Family Practice* 49(2): 158-168.
- Eaton C B and Menard L M (1998) A systematic review of physical activity promotion in primary care office settings. *British Journal of Sports Medicine* 32(1): 11-16.
- Economos CD, Brownson RC, DeAngelis MA, Novelli P et al (2001) What lessons have been learned from other attempts to guide social change? *Nutrition Reviews* 59(3): S40-S56.
- Egger G et al (1996) Effectiveness of an abdominal obesity reduction program in men: the GutBusters 'waist loss' program. *Int J Obes.* 20:227-231.
- Egger G and Swinburn B (1997) An 'ecological' approach to the obesity pandemic. *British Medical Journal* 315 (7106): 477-480.
- Egger G (2000) Intervening in men's nutrition: lessons from the GutBusters program. *Australian Journal of Nutrition and Dietetics* 57(1):46-9.
- Epstein LH, Paluch RA, Gordy CC, Dorn J (2000) Decreasing sedentary behaviours in treating paediatric obesity. *Archives of Pediatrics and Adolescent Medicine* 154: 220-226.
- Eriksson KF, Lindgarde F (1991) Prevention of type 2 (non-insulin dependent) diabetes mellitus by diet and physical exercise. The 6-year Malmö feasibility study. *Diabetologia* 34(12): 891-898.
- Flores R (1995) Dance for health: improving fitness in African American and Hispanic adolescents. *Public Health Rep.* 110(2): 189-193.
- Fogelholm M, Kukkonen-Harjula K (2000) Does physical activity prevent weight gain – A systematic review. *Obesity Reviews* 1: 95-111.
- Fogelholm M, Nuutinen O, Pasanen M, et al (1999) Parent-child relationship of physical activity patterns and obesity. *International Journal of Obesity and Related Metabolic Disorders* 23: 1262-1268.
- French, S., Story, M., Fulkerson, J. and A. Gerlach (2003) Food environment in secondary schools: A la carte, vending machines, and food policies and practices. *American Journal of Public Health* 93 (7): 1161-1167.
- French S, Story M, Jeffery RW (2001) Environmental influences on eating and physical activity. *Annual Review of Public Health* 22: 309-335.
- Gately P (2002) An evaluation of a residential weight loss camp programme for overweight and obese children. www.leedsmet.ac.uk/ces/lss/research/weightloss.htm
- Giles-Corti B and Donovan RJ (2002) The relative influence of individual, social and physical environment determinants of physical activity. *Social Science and Medicine* 54: 1793-1812.
- Gill TP (1997) Key issues in the prevention of obesity. *British Medical Bulletin* 53 (2): 359-388.
- Glanz K. (1988) Environmental interventions to promote healthy eating: A review of models, programs and evidence. *Health Education Quarterly* 25: 395-415.
- Glenny AM, O'Meara S, Melville A, Sheldon TA, Wilson C (1997) The treatment and prevention of obesity: a systematic review of the literature. *International Journal of Obesity and Related Metabolic Disorders* 21(9): 715-737.
- Golan M, Weizman A, Apter A, Fainaru M (1998) Parents as the exclusive agents of change in the treatment of childhood obesity. *American Journal of Clinical Nutrition* 67(6): 1130-1135.
- Gomel M, Oldenburg B, Simpson JM, Owen N (1993) Work-site cardiovascular risk reduction: A randomised trial of health risk assessment, education, counselling and incentives. *American Journal of Public Health.* 83(9): 1231-1238.
- Goran M, Reynolds KD, Lindquist CH (1999) Role of physical activity in the prevention of obesity in children. *International Journal of Obesity*, 23(Suppl 3): S18-S33.
- Gordon, J. (2002) Bevy of levies. In *The Sunday Age*, Melbourne. 15 September, 2002.
- Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, Laird N (1999) Reducing obesity via a school-based inter-disciplinary intervention among youth: Planet Health. *Archives of Pediatrics and Adolescent Medicine.* 153(4): 409-418.
- Green L (2001) From research to best practice in other settings and populations. *Am J. Health Beh.* 25: 165-178.
- Green L and Kreuter M (1999) *Health Promotion Planning: an educational and ecological approach* (3rd ed). Mayfield Publishing, CA.
- Grossman J and Webb K (1991) Local Food and Nutrition Policy. *Australian Journal of Public Health* 15(4): 271-276.
- Guo X, Popkin BM, Mroz TA, Zhai F (1999) Food price policy can favorably alter macronutrient intake in China. *J Nutr.* 129(5): 994-1001.
- Halford JCG, Gillespie J, Brown V, Pontin EE, Dovey TM (2004) Effect of television advertisements for foods on food consumption in children. *Appetite* 42: 221-225.
- Hardeman W, Griffin S, Johnston M, Kinmonth AI, Wareham NJ (2000) Interventions to prevent weight gain: a systematic review of psychological models and behaviour change methods. *International Journal of Obesity* 24(2): 131-43.

References

- Harris E, Wise M, Hawe P, Finlay P, Nutbeam D (1995) *Working Together: Intersectoral Action for Health*. Sydney, National Centre for Health Promotion, Department of Public Health and Community Medicine, University of Sydney.
- Harris M and Mercer P (2001) Reactive or preventive: the role of general practice in achieving a healthier Australia. *MJA* 175: 92-93.
- Harris MB and Smith SD (1998) Beliefs About Obesity: Effects of age, ethnicity, sex and weight. *Psychological Reports* 51: 1047-1055.
- Harten N and Olds T (2004) Patterns of active transport in 11-12 year old Australian children. *Aust NZ J Public Health* 28(2): 167-172.
- Harvey E, Glenny AM, Kirk SFL, Summerbell CD (2002) An updated systematic review of interventions to improve health professionals' management of obesity. *Obesity Reviews* 3: 45-55.
- Harvey P and Kirkwood J (1996) *The dissemination of the Lighten Up program in Queensland. Final Evaluation Report*. Technical Report Series 96-02, Queensland Health.
- Harvey P, Wilkes T, Allsop R (1996) *Three year follow-up of the 1993 Wide Bay Lighten Up Programs, Final report*. Technical Report Series 96-01, Queensland Health.
- Hastings G, Stead M, McDermott L, Forsyth A, MacKintosh A, Raynor M, Godfrey C, Caraher M, Angus K (2003) *Review of the Research of the Effects of Food Promotion to Children*. Centre for Social Marketing, Glasgow.
- Hawe P, Degeling D, Hall J (1990) *Evaluating Health Promotion*. MacLennan and Petty, Sydney.
- Hawe P, King L, Noort M, Jordens C, Lloyd B (1999). *Indicators to Help with Capacity Building in Health Promotion*. NSW Department of Health, Sydney.
- Hawe P, Shiell A (1995) Preserving innovation under increasing accountability pressures: The health promotion investment-portfolio approach. *Health Promotion Journal of Australia* 5: 4-9.
- Hawe P and Stickney E (1997) Developing the effectiveness of an intersectoral food policy coalition through formative evaluation. *Health Education Research* 12(2): 213-225.
- Heimendinger J, Thompson B, Ockene J, Sorensen G, Abrams D, Emmons K, Varnes J, Eriksen M, Probart C, and Himmelstein J (1990) Reducing the Risk of Cancer Through Worksite Intervention. In *Occupational Medicine: State of the Art Reviews*. Hanley and Belfus, Inc. Philadelphia, PN. 6: 4 (Oct-Dec) 707-723.
- Hennrikus D, Jeffery RW (1996) Worksite intervention for weight control: A review of the literature. *American Journal of Health Promotion* 10(6): 471-498.
- Herkowitz, J (1979) Developmentally engineered equipment and play spaces for motor development and learning. In *Psychology of motor behaviour and sport*. C. H. Nadeau, W. R. Halliwall, K. W. Newell and G. C. Roberts. Champaign IL, Human Kinetics.
- Heshka S, Anderson JW, Atkinson RL, Greenway FL, Hill JO, Phinney SD, Kolotkin RL, Miller_Kovach K, Pi_Sunyer FX (2003) Weight loss with self-help compared with a structured commercial program: a randomized trial. *JAMA* 289: 14 1792-8.
- Heywood and Lund-Adams (1991) The Australian food and nutrition system: a basis for policy formulation and analysis. *Australian Journal of Public Health* 15: 258-270.
- Hider PN (2001) *Environmental interventions to reduce energy intake or density: A critical appraisal of the literature*. NHTZA Report 4(2).
- Hill JM and Radimer KL (1997) A content analysis of food advertisements in television for Australian children. *Australian Journal of Nutrition and Dietetics* 54(4): 174-181.
- Hills A and Cambourne B (2002) Walking to school – A sustainable environmental strategy to prevent childhood obesity. *Australasian Epidemiologist* 9(2): 15-18.
- Hodge W, Finlay P (1994) Good food for all: towards a food policy for South Sydney City Council. *Health Promotion Journal of Australia* 4(2): 33-38.
- Hughes R, Beck K, Ambrosini G, Marks G (1997) *The Queensland Food System: description of distribution, marketing and access*. Nutrition program, University of Queensland, Technical report Series 97-01.
- Humpel N, Owen N, Leslie E (2002) Environmental factors associated with adults' participation in physical activity – A review. *American Journal of Preventative Medicine* 22(3): 188-199.
- International Life Sciences Institute (ILSI) (2003) *Childhood obesity – advancing effective prevention and treatment: an overview for health professionals*. www.chp.ilsa.org/School-HC-CommtyProgramsList.pdf (Accessed 31 May 2004)
- Jacobson M. and Brownell KD (2000) Small taxes on soft drinks and snack foods to promote health. *Am J. Public Health* 90(8): 854-857.
- James J, Thomas P, Cavan, D Kerr D (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ* 328: 1237.
- James WPT, Gill TP (2004) *Prevention of obesity*. Pages 75-96 in the *Handbook of obesity*. (Bray G, Bouchard C, James WPT eds), Marcel Dekker, New York.
- Jeffery RW (1995) Community programs for obesity prevention: The Minnesota Heart Health Program. *Obesity Research* 3: S283-S288.
- Jeffery RW (2001). Public health strategies for obesity treatment and prevention. *American Journal of Health Behaviour* 25(3): 252-259.
- Jeffery RW and French SA (1999) Preventing weight gain in adults: the pound of prevention study. *American Journal of Public Health* 89(5): 747-751.

References

- Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, Stone EJ, Rajab MW, Corso P (2002) The effectiveness of interventions to increase physical activity – A systematic review. *American Journal of Preventative Medicine* 22(1): 73-107.
- Kelder SH, Perry CL, Klepp KI, Lytle LL (1994) Longitudinal tracking of adolescent smoking, physical activity and food choice Behaviours. *Am J Pub Health* 84:1121-1126.
- King L, Hawe P, Corne S (1999) What is local government's capacity for partnership in promoting physical activity? A case study. *Health Promotion Journal of Australia* 9(1): 39-43.
- Klesges RC, Eck LH, Hanson CL, Haddock CK, Klesges LM (1990) Effects of obesity, social interactions, and physical environment on physical activity in pre-schoolers. *Health Psychology* 9(4): 435-449.
- Klesges RC, Klesges LM, Eck LH, Shelton ML (1995) A longitudinal analysis of accelerated weight gain in pre-school children. *Pediatrics* 95(1): 126-130.
- Kohl HW and Hobbs KE (1998) Development of physical activity behaviours among children and adolescents. *Pediatrics* 101: 549-554.
- Kotler, P, Roberto, N, Lee, N (2002) *Social Marketing: Improving the Quality of Life* 2nd ed. Thousand Oaks, Sage Publications, CA.
- Kumanyika S (2001) Minisymposium on obesity: overview and some strategic considerations. *Ann. Rev. Public Health* 22(1): 293-308.
- Kumanyika S; Jeffery RW; Morabia A; Ritenbaugh C; Antipatis VJ – Public Health Approaches to the Prevention of Obesity (PHAPO) Working Group of the International Obesity Task Force (IOTF) (2002). Obesity Prevention: The case for action. *Int J Obes* 26(3): 425-36
- Latner JD (2001) Self-help in the long-term treatment of obesity. *Obes Rev* 2: 87-97.
- Lee A, Hobson V and Katarski L (1996) Review of the nutrition policy of the Arnhem Land Progress Association. *Aust. NZ J Public Health* 20: 538-544.
- Lee AJ, Bonson AP, Yarmirr D, O'Dea K and Mathews JD (1995) Sustainability of a successful health and nutrition program in a remote aboriginal community. *Med J Aust* 162: 632-5
- Leeder S (2000) Obesity and public health. *Australian Doctor*, 24 March: 31.
- Lefebvre C and Flora J (1988) Social marketing and public health interventions. *Health Education Quarterly* 15: 229-315.
- Levy PM and Cooper J (1999) Five a day. Let's eat and play: A nutritional education program for pre-school children. *Journal of Nutrition Education* 31: 235B.
- Lister-Sharp D, Chapman S, Stewart-Brown S, and Sowden A (1999). Health promoting schools and health promotion in schools: two systematic reviews. *Health Technol Assess* 3 (22).
- Ludwig, DS, Peterson, KE and Gortmaker, SL (2001). Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *The Lancet* 357(9255): 505-508.
- Luepker RV, Perry C L, McKinlay SM, Nader PR, Parcel GS, Stone EJ, Webber LS, Elder JP, Feldman HA, Johnson CC, Kelder S and Wu M (1996) Outcomes of a field trial to improve children's dietary patterns and physical activity. The Child and Adolescent Trial for Cardiovascular Health. CATCH collaborative group. *JAMA* 275(10): 768-76.
- MacDougall C, Wright C, Atkinson R. (2002) Supportive environments for physical activity and the local government agenda: a South Australian example. *Australian Health Review* 25(2): 175-181.
- Maggio CA, Pi-Sunyer FX (1997) The prevention and treatment of obesity: Application to type 2 diabetes. *Diabetes Care* 20(11): 1744-1766.
- Maiman LA, Wang VL, Becker MH, Finlay J, Simonson M (1979) Attitudes toward obesity and the obese among professionals. *Journal of the American Dietetic Association* 74: 331-336.
- Manios Y, Moschandreas J, Hatzis C, Kafatos A (1999) Evaluation of a health and nutrition education program in primary school children of Crete over a three-year period. *Preventative Medicine* 28(2): 149-159.
- Marshall L, Cooke L, Sangster J (2003) *Nutrition Ready to Go*. Network of Community Activities.
- McComb J, Webb K, Marks GC (2000) What do we mean by 'food access' and 'food supply'? *Food Chain*. Newsletter of the Strategic Inter-Governmental Nutrition Alliance, Commonwealth Department of Health and Ageing, Canberra.
- McKenzie TL, Sallis JF, Kolody B, Faucette N (1997) Long term effects of a physical education curriculum and staff development program, Project SPARK. *Res Q Exer Sport* 68: 280-291.
- McKenzie TL, Marshall SJ, Sallis JF, Conway TL (2000) Leisure-time physical activity in school environments: an observational study using SOPLAY. *Preventative Medicine* 30(1): 70-77.
- McQueen D (2002) The evidence debate. *J Epidemiol and Community Health* 56: 83-4.
- McQueen DV & Anderson L (2001). What counts as evidence: issues and debates. In I. Rootman (Ed) *Health Promotion Evaluation: Principles and perspectives*. WHO Regional Publications. European series, No. 92
- Mellin LM and Frost L (1992) Child and adolescent obesity: the nurse practitioner's use of the SHAPEDOWN method. *Journal of Pediatric Health Care* 6(4): 187-193.
- Meyer AJ, Nash JD, McAlister AL, Maccoby N, Farquhar JW (1980) Skills training in a cardiovascular health education campaign. *Journal of Consulting and Clinical Psychology* 48(2): 129-142.

References

- Michigan Department of Education (2001) *The role of Michigan Schools in Promoting a Health Weight: A consensus paper*. Office of School Excellence, Michigan.
- Micucci S, Thomas H, Vohra J (2002) *The Effectiveness of School-Based Strategies for the Primary Prevention of Obesity and for Promoting Physical Activity and Nutrition, the Major Modifiable Risk Factors for Type 2 Diabetes: Review of Reviews*. Public Health Research, Education and Development Program. Hamilton, Canada.
- Miles A, Rapoport L, Wardle J, Afuape T, Duman M. (2001) Using the mass-media to target obesity: an analysis of the characteristics and reported behaviour change of participants in the BBC's 'Fighting Fat, Fighting Fit' campaign. *Health Education Research* 16(3): 357-372.
- Milio N (1990) *Nutrition Policy for Food-Rich Countries: A Strategic Analysis*. The Johns Hopkins University Press, Baltimore.
- Miller W, Koceja DM, Hamilton EJ (1997). A meta-analysis of the past 25 years of weight loss research using diet, exercise or diet plus exercise intervention. *International Journal of Obesity* 21: 941-947.
- Mitchell J, Palmer S, Booth M, Powell Davies G (2000) A randomised trial of an intervention to develop health promoting schools in Australia: the south western Sydney study. *Australian and New Zealand Journal of Public Health* 24(3): 241-245.
- Montague M (2002) *Public health nutrition policy in organised settings for children aged 0-12: An overview of policy, knowledge and interventions*. National Heart Foundation of Australia (Victorian Division).
- Moore LL, Gao D, Bradlee ML et al (2003) Does early physical activity predict body fat change throughout childhood? *Preventive Medicine* 37(1): 10-17
- Mo-suwan L, Pongprapai S, Junjana C, Puetpaiboon A (1998) Effects of a controlled trial of a school-based exercise program on the obesity indexes of pre-school children. *American Journal of Clinical Nutrition* 68(5): 1006-1011.
- Muir Gray JA, Hayner R, Sackett D, Cool D, Guyat G (1997) Transferring evidence from research into practice: 3. Developing evidence-based clinical policy. *ACP Journal Club* 126(2), A14-16.
- Muller MJ, Asbeck I, Mast M, Langnase K, Grund A (2001) Prevention of obesity – more than an intention. Concept and final results of the Kiel Obesity Prevention Study (KOPS). *International Journal of Obesity and Related Metabolic Disorders* 25 (Suppl 1): S66-S74.
- Mulligan LB, Specker D, Buckley D, O'Connor LS and Ho M (1998) Physical and environmental factors affecting motor development, activity level and body composition of infants in child care centres. *Pediatric physical therapy*. Williams and Wilkins. Philadelphia, Lippincott: 156-161.
- National Health and Medical Research Council (1995) *Promoting health in Australia: a review of the infrastructure supports for national health advancements*, Canberra.
- National Health and Medical Research Council (1997) *Acting on Australia's Weight: A strategic plan for the prevention of overweight and obesity* NHMRC, Canberra.
- National Health and Medical Research Council (2003a). *Food for Health. Dietary Guidelines for Australian Adults*, NHMRC, Canberra.
- National Health and Medical Research Council (2003b) *Food for Health. Dietary Guidelines for Children and Adolescents in Australia* NHMRC, Canberra.
- National Health and Medical Research Council (2003c) *Clinical Practice Guidelines for the management of overweight and obesity in adults, adolescents and children*. NHMRC, Canberra.
- NHS Centre for Reviews and Dissemination (1997) The prevention and treatment of obesity. *Effective Health Care Bulletin* 3(2).
- NHS Centre for Reviews and Dissemination (2002) The prevention and treatment of childhood obesity. *Effective Health Care Bulletin* 7(6).
- National Heart Foundation Australia (1998) *Supportive Environments for Physical Activity Guidelines for Local Governments*.
- National Obesity Task Force (2003) *National Obesity TaskForce Report. Healthy Weight 2008. Australia's Future*. Department of Health and Ageing, Canberra.
- National Public Health Partnership (2000) *Public Health Planning and Practice Improvement: A Planning Framework for Public Health Practice*. National Public Health Partnership, Victoria.
- Neuhouser ML, Kristal AR, Patterson RE (1999) Use of food nutrition labels is associated with lower fat intake. *Journal of the American Dietetic Association* 99(1): 45-53.
- Neumark-Sztainer D, Martin SL, Story M (2000) School-based programs for obesity prevention: what do adolescents recommend? *Am J Health Promot*. 14(4): 232-5.
- NHS Centre for Reviews and Dissemination (2002) The prevention and treatment of childhood obesity. *Effective Health Care Bulletin*, 7(6).
- NOP World Consumer (2003) A study into parents' and teachers' views of the National School Fruit Scheme. UK Department of Health, London.
- NSW Department of Education and Training (1988) Memorandum to Principals: *Student Fitness and Physical Activity Plan* 98/263 (S.217).
- NSW Department of Health (2000a) *Healthy People 2005*. NSW Department of Health, Sydney.
- NSW Department of Health (2000b) *Health Promotion with Schools: a policy for the health system*. NSW Department of Health, Sydney.

References

- NSW Department of Health (2002) *NSW Childhood Obesity Summit Communiqué*.
www.health.nsw.gov.au/obesity/adult/summit/summit.html
- NSW Department of Health (2003a) *NSW Chronic Disease Prevention Strategy 2003-2007*. NSW Department of Health, Sydney.
- NSW Department of Health (2003b) *Prevention of Obesity in Children and Young People: NSW Government Action Plan 2003-2007*.
- NSW Department of Health (2004a) *Eat Well NSW. NSW Department of Health's Strategic Directions for Public Health Nutrition 2002-2007*.
- NSW Department of Health (2004b) *Strengthening health promotion in NSW. A map of the work and implications for workforce planning and development*.
- NSW Department of Health (2004c) *NSW Health and Equity Statement. In All Fairness*. Sydney: NSW Department of State and Regional Development (2003) Facts and statistics.
www.business.nsw.gov.au/facts/
- NSW Government (2003) *Families First Facts. Fact Sheet 6*. (Accessed February 2004).
- NSW Physical Activity Task Force (1998) *Simply active everyday: A plan to promote physical activity in NSW 1998-2002*. NSW Department of Health, Sydney.
- NSW School Canteen Association (2002). Childhood obesity to be addressed in the school canteen. www.ausissues.com/ausissues/AINews.nsf/0/DC328B07B3F00B14CA256C2E007CFD2D?OpenDocument
- Northern Rivers Area Health Service Health promotion. *The Tooty Fuity Veggie (TFV) Project*. Report posted on NSW Health Promoting Schools website www.health.nsw.gov.au/public-health/health-promotion/settings/schools/case-studies.html (accessed 15 January 2004).
- Noel PH and Pugh JA (2002). Management of overweight and obese adults. *British Medical Journal* 325(7367): 757-61.
- Nonas CA. (1998) A model for chronic care of obesity through dietary treatment. *Journal of the American Dietetic Association* 98 (10 Suppl 2): S16-S22.
- Nutbeam D. (2003) How does evidence influence public health policy? Tackling health inequalities in England. *Health Promot. J Australia* 14: 154-8.
- Oberrieder H, Walker R, Monroe D, Adeyanju M (1995) Attitudes of dietetic students and registered dietitians toward obesity. *Journal of the American Dietetic Association* 95(8): 914-916.
- Ogden J, Hoppe R. (1997) The relative effectiveness of two styles of educational package to change practice nurses' management of obesity. *International Journal of Obesity* 21: 963-971.
- Owen N, Bauman A et al (1995) Serial mass-media campaigns to promote physical activity: reinforcing or redundant? *American Journal of Public Health* 85(2): 244-248.
- Pan XR, Li GW, Hu YU et al (1997) Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. *Diabetes Care* 20(4): 537-544.
- Penrith City Council (1994) *Penrith City Council Strategic Plan 1994-1997*. Penrith Food Policy Committee.
- Petter, LPM, Hourihane, J O'B and Rolles, CJ (1995) Is water out of vogue? A survey of drinking habits of 2-7 year olds. *Arch Dis Child* 72: 137-140.
- Pirozzo S, Summerbell C, Cameron C, Glasziou P (2003). Advice on low-fat diets for obesity. In *The Cochrane Library*, Issue 3. Oxford, Update Software.
- Plaskett J, Cook L, Hodge W (1996) *Nutrition in Long Day Care Centres: Implementing the Caring for Children Program in Central Sydney*. Health Promotion Unit, Central Sydney Area Health Service, Sydney.
- Pollard C, Lewis J, Miller M (2001) Start right-eat right award scheme: Implementing food and nutrition policy in child care centres. *Health Education and Behaviour* 28(3): 320-330.
- Pollard CM, Lewis JM, Miller MR (1999) Food service in long day care centres – An opportunity for public health intervention. *Australia New Zealand Journal of Public Health* 23(6): 606-610.
- Price JH, Desmond SM, Krol RA, Synder FF, O'Connell JK (1987) Family practice physicians' beliefs, attitudes and practices regarding obesity. *American Journal of Preventative Medicine* 3(6): 339-345.
- Proper KI, Koning M, van de Beek AJ, Hildebrandt VH, Bosscher RJ, van Mechelen W (2003) The effectiveness of worksite physical activity programs on physical activity, physical fitness and health. *Clinical Journal of Sports Medicine* 13: 106-117.
- Protheroe L, Dyson L, Renfrew MJ, Bull J, Mulvihill C (2003) *The effectiveness of public health interventions to promote the initiation of breastfeeding: Evidence briefing*. Health Development Agency. www.had.nhs.uk/evidence/ebbd.html#pub (Accessed 30 November 2003)
- Puska P, Tuomilehto J, Nissinen A, Vartiainen E (1995) *The North Karelia Project – 20 year results and experiences*. National Public Health Institute, Helsinki.
- Queensland Health and Department of Families Youth and Community Care (1999) *Food and nutrition practices in Queensland family day care centres: A baseline survey*. Queensland Health, Brisbane.
- Queensland Health (2001) *Physical Activity Facts*. Queensland Health, Brisbane.

References

- Reger B, Wootan MG, Booth-Butterfield S, Smith H (1998) 1% or less: A community-based nutrition campaign. *Public Health Reports* 113: 410-419.
- Reilly JJ, Wilson ML, Summerbell CD (2002) Obesity: diagnosis, prevention and treatment – Evidence-based answers to common questions. *Archives of Disease in Childhood* 86(6): 392-394.
- Resnicow K (1993) School-based obesity prevention. Population versus high-risk interventions. *Annals of the New York Academy of Sciences* 699: 154-66.
- Rippe J and Hess S (1998) The role of physical activity in the prevention and management of obesity. *Journal of the American Dietetic Association* 98(10): S31-S38.
- Ritchie L, Ivey S, Masch M, Woodward-Lopez, G, Ikeda J and Crawford P (2001). *Pediatric Overweight: A review of the literature*, The Centre for Weight and Health, College of Natural Resources, University of California, Berkeley.
- Robinson TN (1999) Reducing children's television viewing to prevent obesity: A randomised controlled trial. *Journal of the American Medical Association* 282(16): 1561-1567.
- Robinson TN (2001) Television viewing and childhood obesity. *Pediatric Clinics of North America* 48(4), 1017-25.
- Robinson TN, Killen JD, Kraemer HC, Wilson DM, Matheson DM et al (2003) Dance and reducing television viewing to prevent weight gain in African-American girls: The Stanford GEMS pilot study. *Ethnicity and Disease* 13 (1 Suppl 1): S65-S77.
- Rossner S. (1992). Factors determining the long-term outcome of obesity treatment. In: Bjorntorp P, Brodoff BN, eds, *Obesity*. Philadelphia, Lipincott, pp 712-719
- Royal Australian College of General Practitioners (1998). www.racgp.org.au/document.asp?id=872.
- Rychetnik L (2003) Evidence-based practice and health promotion. *Health Promotion Journal of Australia* 14: 133-136.
- Rychetnik L, Frommer M (2002) *A Schema for Appraising the Evidence for Effectiveness*. National Public Health Partnership Secretariat, Melbourne.
- Sahay T, Rootman I, Ashbury F (2000) Review of nutrition interventions for cancer prevention. Prepared for the Division of Cancer Prevention, Cancer Care Ontario. www.cancercare.on.ca/pdf/ReportFinalNutritionReview.pdf
- Sahota P, Rudolf M, Dixey R, Hill AJ, Barth J, Cade J (2001a) Evaluation of implementation and effect of school based intervention to reduce risk factors for obesity. *British Medical Journal* 323: 1027-1029.
- Sahota P, Rudolf M, Dixey R, Hill AJ, Barth J, Cade J (2001b) Randomised controlled trial of school based intervention to reduce risk factors for obesity. *British Medical Journal* 323 (7320): 1029-1032.
- Sallis JF (1994) Determinants of physical activity behaviour in children. In RR Pate and RC Hohn (eds.). *Health and Fitness Through Physical Education*. Champaign, IL: Human Kinetics.
- Sallis JF, McKenzie TL, Kolody B, Lewis M, Marshall S, Rosengard P (1999) Effects of health-related physical education on academic achievement: Project SPARK. *Res Q Exerc Sport* 70:127-34.
- Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Faucette N, Hovell MF (1997) The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. *Sports, Play and Active Recreation for Kids. American Journal of Public Health* 87(8): 1328-1334.
- Sallis JF, Prochaska JJ, Taylor WC, Hill JO, Geraci JC (1999) Correlates of physical activity in a national sample of girls and boys in grades 4 through 12. *Health Psychology* 18(4): 410-415.
- Sallis JF, Prochaska JJ, Taylor WC (2000) A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise* 32(5): 963-975.
- Sanders MR (1999) The Triple-P Positive parenting program. Towards an empirically validated multilevel parenting and family support strategy for the prevention of behaviour and emotional problems in childhood. *Clinical Child Family Psychology Review* 2: 71-90.
- Sangster J and Knowles N. *NRG @ OOSH – A project to promote good nutrition and physical activity for children*. NIOSHA news downloaded from www.niosha.org.au/ (accessed 10 February 2004)
- Sangster S, Chopra M, Eccleston P (1999) *Good Food for Children 0-5 Project Report: Improving Food and Nutrition in Long Day Care Centres*. Health Promotion Unit, South East Sydney AHS.
- Sangster J, Eccleston P and Stickney B (2003) Improving what's in the lunchbox. *Health Promotion J. Australia* 14(3): 171-4.
- Saris W, Blair S, van Baak MA, Eaton SB, Davies PSW et al (2003) How much physical activity is enough to prevent unhealthy weight gain? Outcome of the IASO 1st Stock Conference and consensus statement. *Obesity Reviews* 4: 101-114.
- Schmitz MK, Jeffery RW (2000) Public health interventions for the prevention and treatment of obesity. *Medical Clinics of North America* 84(2): 491-512.
- Schwartz MB, Chambliss ONeal, Brownell KD, Blair SN, Billington C (2003) Weight bias among health professionals specialising on obesity. *Obesity Research* 11: 1033-1039.
- Shephard RJ (1996) Worksite fitness and exercise programs: a review of methodology and health impact. *Am J. Health Promotion* 10: 436-53.
- Simonetti D'Arca A, Tarsitani G, Cairella M, Siani V, De Filippis S, Mancinelli S, Marazzi MC, Palombi L (1986) Prevention of obesity in elementary and nursery school children. *Public Health* 100(3): 166-173.

- Smith BJ, Merom D, Harris P, Bauman AE (2003) *Do physical activity interventions to promote physical activity work? A systematic review of the literature*. National Institute of Clinical Studies, Melbourne.
- South Sydney Council (1995) *What's eating South Sydney?*
- Steinbeck K (2001) The importance of physical activity in the prevention of overweight and obesity in childhood: a review and an opinion. *Obesity Reviews* 2: 117-130.
- Steptoe A, Perkins-Porras L, McKay C, Rink E, Hilton S, Cappuccio FP (2003) Behavioural counselling to increase consumption of fruit and vegetables in low income adults: randomised trial. *BMJ* 326: 855.
- Stickney B, Webb K, Campbell C, Moore A (1994) *Food and nutrition in New South Wales: A catalogue of data*. NSW Department of Health, Sydney.
- Story M (1999) School-based approaches for preventing and treating obesity. *International Journal of Obesity and Related Metabolic Disorders* 23 (Suppl 2): S43-S51.
- Strategic Inter-Governmental Nutrition Alliance (SIGNAL) (2001) *Eat Well Australia: An Agenda for Action for Public Health Nutrition, 2000-2010*. National Public Health Partnership, Victoria.
- Strauss et al (2001) Epidemic increase in childhood overweight. *JAMA* 286: 2845-8.
- Summerbell CD, Waters E, Edmunds L, O'Meara S, Campbell K et al (2003) Interventions for treating obesity in children. In *The Cochrane Library* Issue 3, Oxford, Update Software.
- Swinburn B, Egger G (2002) Preventive strategies against weight gain and obesity. *Obesity Reviews* 3: 289-301.
- Swinburn B, Caterson I, Seidell JC, Dietz WH, James WPT (2001). Diet, nutrition and the prevention of obesity. *WHO – background paper for the WHO consultation on diet, nutrition and the prevention of chronic diseases*. World Health Organisation, Geneva.
- Swinburn B. and Gill T (2003) *Best Investments to Address Childhood Obesity: A Scoping Exercise – A Final Report*. A report commissioned by the Commonwealth Department of Health and Ageing.
- Tang KC, Ehsani JP, McQueen D (2003) Evidence-based health promotion: recollections, reflections and reconsiderations. *J Epidemiol. Community Health* 57: 841-843.
- Teachman BA, Gapinski KD, Brownell KD, Rawlins M, Jeyaram S (2003) Demonstrations of implicit anti-fat bias: the impact of providing causal information and evoking empathy. *Health Psychology* 22: 68-78.
- The Children's Hospital at Westmead Institute for Sports Medicine (CHISM) (2002). *Be active after School: New Pilot program in after-school care settings*. Information obtained from CHISM website www.chw.edu.au/prof/services/chism/ (accessed March 2004)
- Thomas PR (ed.) (1995) *Prevention of obesity. Weighing the options: Criteria for evaluating weight-management programs*. The National Academy of Sciences, Washington: 152-162.
- Timperio A, Cameron-Smith D, Burns C, Crawford D (2000) The public's response to the obesity epidemic in Australia: weight concerns and weight control practices of men and women. *Pub Health Nutr* 3: 417-424.
- Toh C, Cutter J, Chew SK (2002) School based intervention has reduced obesity in Singapore. *Brit. Med. Journal* 324(7334): 427-427.
- Townsend MS, Peerson J, Love B, Achterberg C, Murphy SP (2001) Food Insecurity is Positively Related to Overweight in Women. *Journal of Nutrition* 131: 1738-1745.
- Truswell AS (2001) Levels and kinds of evidence for public health nutrition. *Lancet* 357(9262):1061-2.
- Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukaanniemi S, Laakso M, Luoheranta A, Rastas M, Salminen V, Uusitupa M (2001) Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine* 344(18): 1343-1350.
- UK Department of Health – Health of the Nation (1994) *Eat Well: An action plan from the Nutrition Task Force to achieve the Health of the National targets on diet and nutrition*, Department of Health, Lancashire.
- UK Department of Health (2001) *The National School Fruit Scheme: Evaluation Summary* [www://dh.gov.uk/assetRoot/04/01/92/32/04019232.pdf](http://www.dh.gov.uk/assetRoot/04/01/92/32/04019232.pdf) (Accessed April 2004)
- UK Department of Health (2003) Research report. A study into parents' and teachers' views of the national fruit scheme. [www://dh.gov.uk/PolicyAndGuidance/HealthandSocialCare/topics/FiveaDay/FiveaDayGeneralInformation/](http://www.dh.gov.uk/PolicyAndGuidance/HealthandSocialCare/topics/FiveaDay/FiveaDayGeneralInformation/)
- US Surgeon General (2001) *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Office of the Surgeon General.
- Visser T, Seidell J. et al (2001) A comparison of body mass index, waist-hip ratio and waist circumference as predictors of all-cause mortality among the elderly: the Rotterdam study. *Int J Obes Relat Metab Disord*. 25(11): 1730-5.
- Wardle J, Rapoport L, Miles A, Afuape T, Duman M (2001) Mass education for obesity prevention: The penetration of the BBC's 'Fighting Fat, Fighting Fit' campaign. *Health Education Resource* 16(3): 343-355.
- Webb K, Hawe P, Noort M (2001) Collaborative intersectoral approaches to nutrition in a community on the urban fringe. *Health Education and Behaviour*, Special issue on Policy and System level approaches to health promotion in Australia 28 (3): 55-59.

References

- Webb K and Marks G (1997) *Characteristics of successful programs in public health nutrition*.
www.cphn.biochem.usyd.edu.au
- Webb KL, Pelletier D, Maretzki AN, Wilkins J (1998) Local Food Policy Coalitions: Evaluation issues as seen by academics, project organisers and funders. *Agriculture and Human Values* 15: 65-75.
- Wen L, Thomas M, Jones H, Orr N, Moreton R, King L, Hawe P, Bindon J, Humphries J, Schicht K, Corne S, Bauman A (2002) Promoting physical activity in women: evaluation of a 2-year community-based intervention in Sydney, Australia. *Health Promotion International* 17: 127-137
- Western Australian Government (May 2002) TravelSmart (Transport). www.travelsmart.transport.wa.gov.au
- Willett, WC, Dietz, WH, Colditz, GA (1999) Guidelines for healthy weight. *N Engl J Med* 341: 427-434.
- Williams L (1993) *Caring for Children Project Stages 1 and 2*. NSW: Nutrition Department of Central Coast Area Health Service.
- Williams L, Squillace M, Bollela MC, Brotanek J, Campanero L, D'Agostino L, Pfau C, Sprance J, Strabina L, Spark A, Boccio L (1998) Healthy start: a comprehensive health education program for pre-school children. *Preventive Medicine* 27: 216-23.
- Winett RA, Moore JF, Wagner JL, Hite LA, Leahy M, Neubauer TE, Walker WB, Walberg JL, Lombard D, Geller ES (1991) Altering shoppers' food purchases to meet nutritional guidelines: An interactive system. *Journal of Applied Behaviour Analysis* 24: 95-105.
- Wing R (1995) Changing diet and exercise behaviours in individuals at risk of weight gain. *Obesity Research* 3 (suppl 2): 277s-282s.
- Wing R (1999) Physical activity in the treatment of adulthood overweight and obesity: current evidence and research issues. *Medicine and Science in Sports and Exercise* 31(11): S547-S552.
- Winkleby MA, Cubbin C (2003) Influence of individual and neighbourhood socioeconomic status on mortality among black, Mexican-American, and white women and men in the United States. *J Epidemiol Community Health* 57(6): 444-52.
- World Health Organization (1990) *Diet, Nutrition and the prevention of chronic disease*. Report of a WHO Study Group, WHO Regional Office for Europe. Technical Report Series 797. WHO, Copenhagen.
- World Health Organization (1998) *Health promotion evaluation: recommendations to policy-makers*. Report of the WHO European Working Group on Health Promotion Evaluation.
- World Health Organisation (1998) *Evidence for the Ten Steps to Successful Breastfeeding*. WHO/CHD/98.9. Division of Child Health and Development, Geneva.
www.who.int/reproductive-health/docs/breastfeeding.pdf
- World Health Organization (2000) *Obesity: Preventing and Managing the Global Epidemic*. Report of a WHO Consultation: WHO Technical Report Series 894, Geneva.
- World Health Organization (2003) Joint WHO/FAO Expert Report on Diet, Nutrition and the Prevention of Chronic Disease. WHO Technical report series 916, Geneva.
- World Health Organization (2004) *World Health Assembly Global Strategy on Diet, Physical Activity and Health*. Geneva, WHO
- Yeatman H (1995) National Review of Food and Nutrition Issues in Local Government.
www.health.gov.au:80/pubhlth/publicat/document/nutrit.pdf
- Young L and Nestle M (2002) The contribution of expanding portion sizes to the US obesity epidemic. *Am J. Pub. Health* 92(2): 246-249.
- Zask A, Van Beirden E, Barnett L, Brooks L, Dietrich U (2001) Active school playgrounds: myth or reality. Results of the Move it. Groove it' project. *Prev. Med*, 33: 402-8.
- Zuppa JA, Morton H, Metha KP (2003) Television food advertising: Counterproductive to children's health? A content analysis using the Australian Guide to Healthy Eating. *Nutrition and Dietetics* 60: 78-84.

Appendix A

Summary of systematic and non-systematic reviews on the prevention of weight gain

Table A1: Summary of *systematic reviews* of public health interventions to manage or prevent obesity
– with weight as the outcome measure
– *children and/or adolescents*

Table A2: Summary of *systematic reviews* of public health interventions to manage or prevent obesity
– with weight as the outcome measure – *Adults*

Table A3: Overview of *non-systematic reviews (summaries)* of public health interventions to manage or prevent obesity

Table A1. Summary of systematic reviews of public health interventions to manage or prevent obesity – with weight as the outcome measure – children and/or adolescents

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
<p><i>Interventions for treating obesity in children.</i> (Cochrane Review).</p> <p>Summerbell CD, Waters E, Edmunds L, O'Meara S, Campbell K, Kelly S, Ashton VJ. In: The Cochrane Library, Issue 3, 2003. Oxford: Update Software.</p> <p>Last updated May 2003. Literature searched up to 2001.</p>	<p>1) Evaluate any combination of lifestyle interventions when compared to any other combination of these interventions or no treatment.</p> <p>2) Identify characteristics of the intervention that are related to positive and negative outcomes (as assessed by a process evaluation).</p> <p>– Children under 18 (obese)</p> <p>– Dietary, physical activity or behavioural therapy intervention for children themselves (with or without support of family members) delivered by professionals</p> <p>– Clinical settings (particularly specialist obesity clinics)</p> <p>– RCT study designs</p>	<p>1) Reviewers concluded that most of the 18 trials included were too small to have enough power to show an effect. Studies were also limited by high drop-out rates and unreliable outcome measures.</p> <p>A meta-analysis was not conducted as few trials included the same intervention comparisons and outcome measures.</p> <p>The trials of physical activity interventions were mostly too small to show benefits in terms of weight reduction, although there is some data favouring a reduction of sedentary behaviour. Reviewers concluded that children should be encouraged to increase levels of physical activity due to the proven health benefits for everyone regardless of weight, even if there is not much proven effect in terms of weight reduction.</p> <p>2) Because obesity clusters in families, reviewers suggest interventions should be targetted to children whose parents are overweight. However, reviewers found insufficient data on the components of programs to treat childhood obesity to favour one program over another. As a result, they state that no direct or generalisable conclusions can be drawn with confidence from this review.</p> <p>Review recommends further research to examine the psychosocial determinants for behaviour change in the treatment and management of obesity; cost-effective programs for primary and community care; interventions for specific ethnicities, religions and culturally diverse populations; and what aspects of the physical and social environment outside the health sector could bring about increased healthy lifestyle behaviour (eg food industry, sporting organisations and the media).</p>	<p>Review rigorously conducted under auspice of Cochrane.</p> <p>Most recently published review.</p> <p>Selected studies with minimum of six month follow-up.</p>	<p>Treatment interventions for those already obese and in clinical settings.</p> <p>Study populations drawn from homogeneous, motivated groups (white, middle-class, better motivated and educated families) in hospital settings (eg specialist obesity clinics).</p> <p>Thus generalisability is questionable.</p> <p>Reviewers found only a few studies conducted process evaluations to assess the compliance to lifestyle advice.</p> <p>Process evaluation data was not recorded in this review – will be included in 2005 update.</p> <p>Reviewers conclude that a remarkable feature of their findings is the mismatch between the prevalence and significance of the condition of childhood obesity, and the insufficient knowledge-base from which to inform treatment strategies.</p>

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
<p><i>Interventions for preventing obesity in children</i> (Cochrane review).</p> <p>Campbell K, Waters E, O'Meara S, Kelly S, Summerbell C. In: The Cochrane Library, Issue 4, 2002. Oxford: Update Software. Most recent update Jan 2002.</p>	<p>1) Evaluation of the effect of the following interventions:</p> <p>a) Dietary education vs control</p> <p>b) PA vs control</p> <p>c) Dietary education vs PA</p> <p>d) Combined dietary education and PA vs control</p> <p>– Children</p> <p>– HEd and behaviour modification</p> <p>– School, childcare, family</p> <p>– RCTs and Cohort</p> <p>2) Describe interventions to identify characteristics that are related to positive and negative effects.</p>	<p>Reviewers found limited high quality data on the effectiveness of obesity prevention programs. No generalisable conclusions could be drawn other than the interventions with most potential to prevent obesity in children are those that encourage <i>reduction in sedentary behaviour and increase in physical activity</i>.</p> <p>Identify need for research on the relative importance and effectiveness of targetted antecedent behaviours in endeavours for obesity prevention.</p> <p>The review included seven longer-term studies (min 12 months follow-up) and three short-term studies (min three months).</p> <p>a) <i>Diet vs control</i> – Two longer-term studies evaluated diet vs control. One was a school-based intervention targetting 3-9yrs olds which found a high intensity multimedia strategy (printed pamphlets audiovisual aids and qualified staff) resulted in 12 per cent reduction in overweight and 12 per cent reduction in obesity compared to no change in control schools (pamphlet only or no intervention). A second study targetted 6-11yrs children in families with at least one obese parent and evaluated the effect of increased fruit/veg intake dietary intervention compared to a control decreased fat/sugar diet (delivered to parents). The reduction in the percentage of overweight in the children was only 1-2 per cent in both groups.</p> <p>b) <i>PA vs control</i> – One longer-term study examined a PA intervention for Thai kindergarten children 4-5yr olds (15 mins walking + 20 mins aerobics for 30 weeks). Post intervention both groups had a reduction in obesity prevalence (-2.8 per cent compared to -4.1 per cent) which was almost statistically significant, but six months later the two groups were almost the same (10.8 per cent and 10.2 per cent).</p> <p>One short-term study examined the effect of a 50-minute dance PA curriculum (three sessions per week, for 12 weeks) which replaced a regular PA curriculum for 110 African American and Hispanic 10-13 yrs olds. Results showed significant reductions in BMI (-0.8 compared to -0.3) and improved fitness in intervention group.</p> <p>A second short term study examined the effect of an intervention aimed at reducing sedentary behaviour (not to promote PA) ie to reduce TV, video, video game use in primary school 8-9 yr olds.</p> <p>Delivered by existing school staff, 18 x 30-50min lessons over six months. The intervention group had decreases in all measures of body fatness. The intervention group also had decreases in children's reported TV viewing and number of meals eaten in front of TV. There were no changes in high fat food intake or PA of fitness.</p>	<p>Review rigorously conducted under auspice of Cochrane.</p> <p>Focused on prevention rather than treatment.</p> <p>7/10 studies included one-year follow-up measures.</p>	<p>Most studies conducted in US schools.</p> <p>Limited data led reviewers to state that it was difficult to recommend one strategy or a combination of strategies as more important.</p> <p>Reviewers conclude that a remarkable feature of their findings is the mismatch between the prevalence and significance of the condition of childhood obesity, and the insufficient knowledge-base from which to inform prevention strategies</p>

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		<p>However, no measure available beyond those conducted after intervention at six months – although current RCT of schools with 12 and 18 month measures is ongoing.</p> <p>c) <i>Diet vs PA</i> (no studies)</p> <p>d) <i>Combined diet and PA vs control</i> – Four longer term studies examined interventions that combined diet and PA.</p> <p>– One study ‘Planet Health’ targetted 10-15yr olds, promoting diet, PA and emphasised reduced sedentary behaviour. Two years post intervention, obesity was significantly more reduced among girls in the intervention group. Boys had reduced obesity in both groups and thus the difference was not significantly different to the control. Intervention reduced TV viewing in boys and girls, and in girls each hour of reduced TV viewing predicted reduced prevalence of obesity.</p> <p><i>Three other studies examining combined interventions had no significant impact on obesity.</i></p> <p>– 1x2-year intervention in primary school, where in-school behaviours changed but were compensated by out of school behaviours –esp as intervention group did less PA out of school than controls.</p> <p>– The other primary school study in the UK (APPLES study) included whole of school activities; teacher training, school meals, curriculum, PA, tuckshop, playground activities. At one year there was no change in BMI or dieting. Process evaluation showed intervention resulted in school-level changes, but had little effect on children’s behaviour.</p> <p>– The fourth long term study (KOPS) targetted 5-7yr olds in Germany and included the same educational and behavioural messages to children AND parents (eat fruit and veg, reduce high fat food, keep active 1 hr per day, watch TV less than 1 hr per day). Baseline overweight was 24.1 per cent in the intervention schools and 27.7 per cent in control schools – at one-year follow-up there was no significant difference in these BMI figures.</p> <p>– One short-term study examined an intervention targetting African American girls and their mothers. 11 weeks/1hr per week sessions focusing on diet and activity through experiential learning. At 12 weeks there were no differences in weight, although intervention groups ate fewer per cent calories from fat.</p>		

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The prevention and treatment of childhood obesity. NHS CRD (Centre for Reviews and Dissemination) <i>Effective Healthcare Bulletin</i> 2002; 7(6)	Summary of RCT evidence selected from two Cochrane reviews on treating and preventing obesity in children (Summerbell 2003 and Campbell 2002). – Children – Health Ed, PA only, multi-faceted – Schools, Families – RCT only	Note – distinguish between PA interventions that promote exercise only (conclude these have not been shown to reduce weight); and PA interventions that promote exercise and reduce sedentary behaviour (potential effectiveness in treating and preventing obesity). Reviewers conclude: 1) Multi-faceted, family-based programs that involve parents, increase PA, provide dietary education and target reductions in sedentary behaviour may help children lose weight. 2) Multi-faceted, school-based programs that promote PA, modification of diet and target sedentary behaviours may reduce obesity in school children, particularly girls.	Derived from RCT literature collated for Cochrane reviews.	As above
The effectiveness of school based strategies for the primary prevention of obesity and for promoting physical activity and/or nutrition, the major modifiable risk factors for type 2 diabetes: A review of reviews. Micucci S, Thomas H, Vohra J. <i>Effective Public Health Practice Project</i> , Hamilton, Canada, March 2002.	1) Are school based strategies effective in the primary prevention of obesity? – Children – Multiple strategies – Schools – Existing reviews of evidence 2) A school based strategies effective for promoting physical activity and/or nutrition?	12 quality (strong or moderate) reviews were included in the report. (11 other reviews were identified but classed as weak and not included in the findings.) However – only one review (Campbell 2002) examined obesity/weight as an outcome. Campbell did not combine results or make a general conclusion due to the heterogeneity of the interventions and the outcome measures in the primary studies. Micucci's review of reviews could also not combine the results as planned. Indeed, over 35 different outcome measures were reported in the six reviews that reported outcomes. Reviewers also found variations in results reported by gender, ethnicity and country. Reviewers concluded there is evidence that multi-component, school-based interventions were more effective at modifying risk factors for obesity, PA and nutrition than single component interventions. Multi-component interventions tended to include a combination of environmental change (eg cafeteria), classroom work/curricula changes, and family or community involvement. More effective interventions were also based on behaviour theory, sustained for greater periods, had more contact hours and regular booster sessions. Interventions tended to be more effective at modifying knowledge than behaviour, though children were more amenable to changes in behaviour than adolescents. Due to heterogeneity, reviewers were not able to identify which aspects of the design and the components of interventions are most effective for reducing obesity or promoting PA and/or nutrition.	Rigorous review of reviews, with explicit search strategy, quality appraisal criteria and data extraction process. Examined whether reviews considered intervention implementation (integrity) and the theoretical basis of interventions. Nine of the 12 reviews attempted to report the theoretical models on which interventions were based.	Reviewers identified only one review that examined obesity as an outcome. Only two reviews reviewed implementation of policies and Micucci et al identify implementation of policies as a concern. When implementation is examined there is considerable variation in how intervention components are defined and measured. Measures of quantity (dose) and quality (fidelity) are often based on self-report with uncertain reliability and validity. Reviewers noted the theoretical models of interventions are not always clear in the primary studies.

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Obesity: diagnosis, prevention, and treatment; evidence based answers to common questions. Reilly JJ, Wilson ML, Summerbell CD, Wilson DC. <i>Archives of Disease in Childhood</i> 2002, 86: 392-395	1) Is childhood obesity preventable? – Children – Health Education/ Behaviour modification, intense and resource intensive – School-based interventions, in USA – RCT study designs 2) Is childhood obesity treatable? – Children (obese) – Resource intensive and complex behaviour modification (ie diet and lifestyle) – Specialist clinics – RCT study designs	1) Two of the three studies found were classified as 'low risk of bias' and used in the findings. One study found no effect at three-year follow-up, while the second study found the obesity risk reduced in girls, but not boys. Conclusion: there is 'some doubt as to whether obesity is preventable in school age children using currently available strategies'. 2) Three of 13 studies found were used in the findings. Concluded that intensive behaviour modification interventions (whole family involvement) conducted in specialist clinics and aimed at reducing sedentary behaviour (TV watching) and increasing physical activity (walking) have been shown to reduce measures of overweight and obesity. Generalisability of the evidence on treatment strategies is questionable and review recommends further research. Meanwhile, reviewers suggest expert committee recommendations on treatment ie to focus on diet and control of sedentary behaviour, with family involvement.	Methodological rigour explicitly assessed. Selected studies with minimum 12 month follow-up post intervention	No details of interventions. 1) Reviewers question the generalisability of the findings on both the prevention and treatment interventions as both were highly resource intensive. 2) Treatment interventions for those already obese and focused on clinical setting
Preventing obesity in children and adolescents. Dietz WH, Gortmaker SL. <i>Annu. Rev. Public Health</i> , 2001, 22:337-53	1) What are the most promising family- and school-based approaches to the prevention of childhood and adolescent obesity? – Children and Adolescents – Multiple strategies – Family, School – Study designs included in the review are not described beyond 'experimental'	– Reductions in time spent watching TV shown to reduce weight gain in children and decrease weight among overweight adolescents. No evidence for reducing video/ computer use. School-based interventions that focus on reducing fat consumption and replacing some TV viewing time with activity demonstrate reductions in prevalence of obesity among girls which is directly related to TV viewing time. – Suggested that eating meals as a family and division of responsibility for food intake between parents and children (parents in charge of what and when; child responsible for decision to consume) are promising strategies. May affect consumption of fruit/veges and other consumption patterns, but lack of evidence for weight-related outcomes.		Narrative review, with scope, search methods, etc. not described. Effectiveness of many potential strategies described in terms of outcomes unrelated to weight (Particularly community strategies, eg effect of walking school bus on truancy and crime).

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
Environmental influences on eating and physical activity. French SA, Story M, Jeffery RW <i>Annu. Rev. Public Health</i> , 2001; 22:309-35	What are the public health interventions and strategies with greatest potential for addressing obesity by promoting an environment that supports a healthy diet and physical activity? – Children and Adolescents – School Curriculum and home TV locking devices/timers – School, Family – Cohort? NCT? (not clear)	– 18-session school-based (primary school age) curriculum and TV 'time manager' with locking device produced 33 per cent decrease in TV watching hours and smaller gains in BMI and skinfold thickness (no effect on PA levels/sedentary behaviours, intake of high-fat foods or TV-associated snacking behaviour). – Supply of TV watching monitors/controls to parents through school (grades 6–8) produced significant decreases in time spent watching TV, and TV viewing mediated two-year changes in obesity. – Authors highlight the need for research into similar interventions for adult populations.	Explicit search strategy	Search strategy lacked focus (exploratory) Small number and limited type of intervention studies reviewed for weight-related outcomes
The importance of physical activity in the prevention of overweight and obesity in childhood: a review and an opinion. Steinbeck KS. <i>Obesity Reviews</i> , 2001,2: 117-130	What is the role of reduced PA to increasing obesity in children? What are the potential strategies for obesity intervention and prevention? – Children – Multiple strategies (reduced TV watching, school curriculum, skill development (children and parents)). – School, Family, Community – Mixed – RCTs, NCTs, pre and post-test.	– Need for focus on reducing sedentary behaviours among children – evidence for reducing TV watching, need for more evidence regarding reduction of other sedentary activities (computers, video games, etc). Such interventions should incorporate positive parenting strategies, early childhood centre education, family and school alliances. – Schools should promote PA and learning of skills that allow lifelong PA (special consideration required for adolescent girls and some ethnic groups). – Environmental review and change (with active community involvement and alliance with services that don't consider obesity their core business) required to support children's engagement in PA outside school hours. NB: recommendation is least evidence-based. – Family-based strategies for increased PA/reduced sedentariness targetted at children with generational high-risk (ie Obese parents or those with early-onset morbidities). Direct intervention from health professionals (ie Shift from family-focused) only from late primary-school age (requires increase in health profs skills and knowledge for intervention prescription).	Focus on multi-component intervention strategies with greatest potential for obesity prevention	– Narrative review – No explicit inclusion criteria – Minimal critical appraisal of studies in weighting the evidence and making conclusions

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<p>Role of physical activity in the prevention of obesity in children.</p> <p>Goran MI, Reynolds KD, Lindquist CH. <i>International Journal of Obesity</i>, 1999, Suppl 3: S18-S33</p>	<p>Review of previous attempts to promote physical activity for changes in body composition and obesity-related variables among children.</p> <ul style="list-style-type: none"> – Children and Adolescents – School Curriculum, Parent education, school-based health screening – School, Family, Environment/Policy – RCTs, NCTs, ITSs 	<p>School-based interventions – Israeli curriculum intervention including PA component demonstrated lower BMI among 6-8 year olds in intervention compared with control schools; Same program in Crete High schools demonstrated sign. lower BMI increases in intervention compared with control schools – but neither measured PA behaviour.</p> <p>Australian 11year-olds – structured classroom-based fitness instruction in two conditions; greater reductions in triceps skinfold in one PA condition compared with controls; no effect on BMI (approx one-year FU).</p> <p>USA High school 20-week Social Cognitive theory-based program (delivered by program staff) – increase in regular PA among sedentary and positive effect on fitness, BMI, tricep and subscapular skinfold (two-month FU).</p> <p>Family-based – no positive effects on weight or PA behaviour. One study showed reduction in fat intake, another demonstrated positive effect on blood pressure in both adults and children.</p> <p>Environmental/Policy – more research required to assess potential of these for children. No demonstrated behavioural or weight outcomes.</p> <p>Greatest potential = family interventions integrated with school and community level programs.</p>	<p>Focus on primary prevention; excluded studies targetting only obese.</p>	<p>Narrative review; not all studies reviewed on basis of weight-related outcomes (NB: only weight-related findings provided here).</p>

Table A2. Summary of systematic reviews of public health interventions to manage or prevent obesity – with weight as the outcome measure – Adults

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
The effectiveness of worksite physical activity programs on physical activity, physical fitness and health. Proper KI, Koning M, van der Beek AJ, Hildebrandt VH, Bosscher RJ, van Mechelen W. <i>Clinical Journal of Sport Medicine</i> , 2003 13: 106-117	To systematically assess the effectiveness of WPAPs (with primary focus on increasing PA or fitness) on physical activity, fitness, and health. – Working adults – Multiple workplace strategies (Individual and Organisational) – Worksites – RCTs and NCTs	– 15 RCTs and 11 NCTs – Strong evidence for positive effects on physical activity behaviour (n = 8), no evidence for blood serum lipids (n = 7) and blood pressure (n = 5), and inconclusive evidence for effect on cardiorespiratory fitness (n = 16), body weight (n = 10), body composition (n = 10) and general health (n = 7). – Inconsistent findings likely to be due to poor adherence (poorly reported so unable to verify), insufficient PA for weight outcomes, and small potential weight outcomes among generally healthy non-obese populations.	Systematic review including methodological quality assessment. Prevention focus. Includes qualitative summative effect on weight and other CVD risk factor outcomes 'weighted' for methodological quality.	
How much physical activity is enough to prevent unhealthy weight gain? Outcome of the IASO 1st Stock Conference and consensus statement. Saris WHM, Blair SN, van Baak MA, Eaton SB, Davies PSW, Di Pietro L, Fogelholm M, Rissanen A, Schoeller D, Swinburn B, Tremblay A, Westerterp KR, Wyatt H. <i>Obesity Reviews</i> , 2003 4:101-114.	How much PA is required to prevent the transition to overweight or obesity? – Adults and children – Prescribed exercise or exercise + diet programs – Clinical, individuals – Reviews (mixed inclusion criteria)	– Current PA guideline for adults is 30 min moderate activity daily to reduce health risks for CHD and Diabetes. This level of PA is insufficient however for preventing weight gain or regain. The recommendation is 45-60 min per day to prevent transition to overweight. Formerly obese individuals are recommended 60-90 min PA daily. – Review of weighed mean results in studies examining PA for maintenance after weight loss suggest that exercise slowed weight regain by approximately 0.02 kg/week. – Positive effects of PA on weight demonstrated more clearly for men than women (probably due to gender differences in intensity of preferred modes of PA). – Lack of evidence for required PA to prevent weight gain in older children; difficulties in establishing required PA for younger children due to lack of consensus about normal weight change attributable to normal development ('growing').		Not a review of relative effectiveness of specific strategies – focus on evidence to recommend amount/intensity of PA required for weight loss/maintenance. Narrative review. Reviews interventions for overweight/obese groups.

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
<p>An updated systematic review of interventions to improve health professionals' management of obesity.</p> <p>Harvey EL, Glenny AM, Kirk SFL, Summerbell, CD. Obesity Reviews 2002 3: 45-55</p> <p>Also in Cochrane Database of Systematic Reviews</p>	<p>1) Evaluating interventions to improve professional care vs usual care; and</p> <p>2) comparing different types of care</p> <ul style="list-style-type: none"> – Health professionals for adult patients (overweight or obese) – Strategies to improve professional practice – Primary care/ clinical settings – RCTs, controlled clinical trials (CCTs), controlled before and after studies (CBAs) and interrupted time series (ITSs). 	<p>Studies included were highly heterogenous in terms of the interventions, target groups, settings, and quality. Reviewers concluded that although health professionals, especially GPs have the potential to access a large number of patients, there is currently little firm evidence about how practice or the organisation of care may be improved. The following are identified as promising and worth further investigation: reminder systems, brief training interventions, shared care, inpatient care and dietitian-led treatments.</p> <p>Two studies of reminders sent to doctors indicate this approach may increase the number of diets being given and reviewed, and can lead to improved weight loss among their patients. Further research is required to assess whether this is generalisable across other settings, professionals and patients.</p> <p>Brief educational interventions on obesity management for GPs are a quick/cheap method of improving practice in the short term. However, sustainability and the effect on patient outcomes are uncertain and need to be further evaluated.</p> <p>An intervention aimed at improving practice by shared care (GPs with hospital-run obesity clinics) resulted in greater weight loss among patients in the short term, but this was not sustainable at 26 weeks.</p> <p>One study found weight loss in clinics run by a professional therapist was better than that run by a self-help leader previously trained by a professional – however the quality of the study was not high. Another study identified six counselling sessions given by a dietitian was better than usual doctor care.</p> <p>Overall, the review found that many studies of interventions aimed at improving professional practice were not of adequate quality to be included.</p>	<p>Review followed rigorous methods of the Cochrane Effective Practice and Organisation of Care (EPOC) Group.</p> <p>Review examines structural interventions in that they target professional groups or organisation of services</p>	<p>Treatment and management of obesity by health professionals.</p> <p>(However, does also examine effectiveness of organisational change).</p> <p>Details about intervention implementation and intervention strategies are not available from the review – may be available in primary studies.</p> <p>Reviewers noted given the repertoire of interventions that could be employed to improve practice or the organisation of care, that only a small number have been rigorously evaluated, and only one study examined cost-effectiveness.</p>

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
Management of overweight and obese adults. Noel PH, Pugh JA. <i>BMJ</i> , 2002, 325: 757-761. Clinical review of evidence	1) Evaluating weight loss treatments – Adults (obese) – Behaviour modification – Primary care/ clinical setting – existing systematic reviews and evidence-based clinical guidelines 2) Sustainability of weight loss – clinical guidelines and systematic reviews 3) Psychological and physiological effects of weight reduction – as above – existing systematic reviews	1) Lifestyle strategies that combine a controlled diet, increased physical activity, and behaviour therapy provide the most success treatment for weight loss and maintenance of weight loss. 2) Obesity is often a chronic condition, and clinical trials with long term follow-up indicate most weight is regained within five years. Limited evidence suggests that continued professional contact and self-help groups can help to sustain weight loss. 3) No evidence of adverse effects from dieting and repeated weight loss and regain on body composition, energy expenditure, risk factors for CHD, or effectiveness of future attempts at weight loss. No evidence that dieting induces eating disorders or psychological disfunction.	A summary of existing systematic reviews and evidence-based guidelines.	Treatment interventions for those already obese in primary care settings.
<i>Advice on low-fat diets for obesity.</i> (Cochrane Review) Pirozzo S, Summerbell C, Cameron C, Glasziou P. In: The Cochrane Library, Issue 3, 2003. Oxford: Update Software. Last updated August 2002. Substantive Update Feb 2002.	To assess the effect of advice on low-fat diets as a means of achieving sustained weight loss compared to other weight reducing diets (eg calorie restriction). – Adults (overweight or obese) – Dietary behaviour modification – Primary care, outpatients, recruitment through community advertisement – RCTs	No clinically significant difference was found in weight loss (or serum lipids, blood pressure, and fasting glucose levels) at six, 12 or 18 months among those given advice on a low-fat diet compared those advised calorie restricted diets. Conclude that for long term weight loss, advice on low-fat diets has the same effect as advice on calorie restricted diets. However, reviewers note that although fat restrictions have no additional benefit on weight loss, they have been shown to reduce incidence of cardiovascular events, particularly in high risk patients. Suggest that given the difficulty of sticking to diets, dietary preferences of patients are used to guide dietary advice.	Review rigorously conducted under auspice of Cochrane. Selected studies with minimum of six to 18 months follow-up.	Treatment and management of obesity by health professionals. Implications of these findings for community-wide health education message are unknown.

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
Appropriate intervention strategies for weight loss and prevention of weight regain for adults. American College of Sports Medicine (ACSM). <i>Medicine and Science in Sports and Exercise</i> , 2001 33 (12): 2145-2156.	Provides a summary of ACSM recommendations on weight loss for those undergoing supervised treatment for obesity and for the lay public. – Adults – Energy expenditure, energy intake – Clinical, primary care – Various	– Recommend if BMI ≥ 25 , consider reducing body weight, especially if weight is accompanied by abdominal adiposity. If BMI ≥ 30 individuals encouraged to seek weight loss treatment. – Aim for weight loss minimum 5-10 per cent – Long term maintenance of weight loss (± 2.3 kg) – Modify energy intake and energy expenditure (incorporating behaviour modification techniques) – Reduce current intake by 500-1000 Kcal/d (dietary fat to < 30 per cent total E intake) – Increase exercise to 150 min/week PA of moderate intensity, progress to 200-300 min/week for maintenance of weight loss. Include resistance exercise for strength and endurance.	Summary of current clinical guidelines in terms of the physiological targets (energy expenditure and energy intake) that should be aimed at by those seeking to lose weight or prevent weight regain.	Not a systematic review. Provides summary of physiological targets for interventions to treatment obesity – does not examine the effectiveness of interventions aimed at achieving those targets! Recommendations referenced, but evidence not critically appraised.
Long-term efficacy of dietary treatment of obesity: a systematic review of studies published between 1931 and 1999. Ayyad C, Anderson T <i>Obesity Reviews</i> , 2000 1: 113-119.	1) What is the long-term efficacy of dietary treatment of obesity? (with or without behaviour therapy, active follow-up and group support). 2) What is the relative long-term efficacy of very low calorie diets (VLCD) compared to conventional diets (CD)? – Adults – Diet modification – Clinics (not clear – various) – Randomised and non-randomised trials with controls)	Identified 898 papers, but only 17 met the inclusion criteria (eg diet, adults, follow-up \geq three years and ≥ 50 per cent participants, weight as outcome). 1) Reviewers conclude the evidence indicates that dietary treatment can result in long-term success of 15 per cent (between 9-11 kg weight loss), which is a relatively stable outcome for up to 14 years post intervention. Studies indicate that group therapy during dieting and active follow-up improve long-term outcomes, but the evidence is of relatively poor quality. 2) Evidence on which type of diet is more effective is inconclusive due to poor quality studies and variable findings. The only available RCT on this question indicates the long-term outcomes very low calorie diets and conventional diets are similar.	Explicit search strategy and inclusion criteria.	Treatment interventions for those already obese and focused on clinical setting. Dietary compliance not examined. Reviewers noted paucity of long-term randomised controlled trials comparing different treatment programs, and that scientific level and data quality did not improve over time.

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
Does physical activity prevent weight gain – a systematic review. Fogelholm M, Kukkonen-Harjula K <i>Obesity Reviews</i> , 2000, 1; 95-111	Effect of interventions for weight maintenance/ to prevent weight gain (with or without prior weight reduction) – Caucasian adults – Behaviour therapy, low-energy diet, exercise – Multiple settings (Primary Care? Clinical?) – Separate reviews of weight reduction interventions with no randomisation for PA, those with randomisation to PA (with or without diet) intervention, and those with randomised PA (with or without diet) and additional randomisation for PA intervention for weight maintenance after weight reduction.	– 19 non-randomised (PA) weight-reduction interventions (7 focused on vigorous exercise not lifestyle PA). Twelve studies found a large (?) amount of PA at FU associated with less weight regain after weight loss (one study reported no association), and all studies (four) that examined change in PA (baseline = after initial weight loss) reported association between increased PA and smaller weight regain. Inconsistent results among studies using only baseline (beginning of weight maintenance phase) PA data. – Eight randomised (PA) weight reduction interventions (all aerobic exercise with 1.5-3hr/week target, all included some diet modification, 1 also behaviour therapy). Four studies found no improved weight maintenance with PA, two studies found less weight regain in exercising compared to non-exercising. – Three interventions with randomised weight-maintenance (PA) phase after weight reduction. Inconsistent results (positive effect for aerobic exercise intervention compared with control but not other weight-reduction groups, less weight regain among diet counselling plus moderate walking group compared with counselling alone, negative effect for structured exercise compared with weight-focused problem-solving group). – Inconsistent findings likely to be due to adherence (review assesses effects on basis of 'intention-to-treat') or differences in intensity of PA. Differences of 5-8 kg between 'high' exercising groups and 'low' exercising groups across studies. – Need for more research on effects of lifestyle/ multiple short-bout PA on weight maintenance.	Rigorous inclusion criteria (no populations composed solely of patients with other chronic disease; minimum weight change >five per cent initial body weight; minimum one year follow-up) Review on basis of weight-related outcomes	Reviews interventions for weight maintenance only in those previously/initially overweight/obese.

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
Interventions to prevent weight gain: a systematic review of psychological models and behaviour change methods. Hardeman W , Griffin S, Johnston M, Kinmonth AL, Wareham NJ. <i>International Journal of Obesity</i> , 2000, 24: 131-143.	To describe and review published interventions aimed at preventing weight gain. – Adults and Children – Psychological and behaviour change methods – Schools and Family – RCTs and non-randomised trials	Nine studies were identified but most were of poor quality. Only one of the randomised studies reported a significant effect on weight. This intervention involved a correspondence program and a mix of behaviour change methods including goal setting, self-monitoring, and contingencies (Forster et al 1988). Reviewers make suggestion that studies should better articulate the models and methods of behaviour change underlying interventions so future systematic reviews may be able to identify which models are most effective.	Explicit search strategy. Study designs identified. Reviewers identify and report the theoretical model, behaviour change methods, and modes of delivery for each study included in the review. (Reviewers attribute a model using a prior criteria if one is not identified in the paper).	Most studies in the review appeared to be of poor quality. Reviewers report appraisals of study quality in a way that makes it difficult to assess which study findings can be taken into account and should be discounted. Only published literature included.
Periodic health examination, 1999 update: 1. Detection, prevention and treatment of obesity. Douketis JD , Feightner JW, Attia J, Feldman WF, with the Canadian Task Force on Preventive Health Care. <i>Canadian Medical Association Journal</i> , 1999; 160(4): 513-525.	1) Evaluate evidence on the effectiveness of methods to prevent obesity – Adults – Multi-strat (Health Ed/Media) – Community – RCT and Cohort 2) Evaluate evidence on the effectiveness of methods to treat obesity – Adults – Diet and behaviour modification – Primary care – RCT and Cohort	1) Identified three cohort studies of community based health promotion interventions that included seminars, mailed education packages and mass media participation. All studies indicate these types of health promotion interventions have no effect on the mean weight of the community. 2) Evidence shows that weight loss is most effective during period of supervised dietary treatment, but this is not sustainable and weight tends to be regained once supervision is withdrawn. Long term dietary counselling (with and without cognitive behaviour therapy) can assist with more sustainable modest weight loss (40 per cent patients sustained 4.5 kg loss over four years).	Rigorous review conducted to the accepted and explicit standards of the Canadian Task Force. 1) Review question directly relevant to this NHF project.	1) Available evidence indicates that improving community knowledge does not lead to behaviour change or weight loss. Though some methodological weaknesses in the evaluations were identified. 2) Treatment of already obese individuals

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
Physical activity in the treatment of the adulthood overweight and obesity: current evidence and research issues. Wing RR. Medicine and Science in Sports and Exercise, 1999, 31(11): S547-S552.	1) Does exercise alone produce weight loss? 2) Does exercise plus diet produce great weight loss than diet alone? 3) Does exercise plus diet produce better maintenance of weight loss than diet alone? – Adults – Behav. mod (PA and Diet) – Clinical or selected Individuals in community	Conclusions 1) Exercise alone produces modest weight losses (average of 1-2kg). 2) In most studies, exercise does not <i>significantly</i> increase initial weight loss over and above that obtained with diet only (though in almost all studies the direction is towards the diet plus exercise group losing more weight than diet alone.) 3) Correlational data indicates that continued exercise is associated with long-term maintenance of weight loss. RCTs support this finding (ie in all reviewed long-term RCTs, weight loss at follow-up is greater in diet plus exercise group than diet only, though the difference was statistically significant in only 2 of the 6 RCTs.) A key identified research issue is how to improve adherence to exercise in overweight people.	Expert panel and review of evidence.	Treatment interventions for those already overweight and obese
The role of physical activity in the prevention and management of obesity. Rippe JM, Hess S. <i>Journal of the American Dietetic Association</i> 1998, 98 (10) Suppl.2: S31-S38.	What is the relationship between PA and both prevention and management of obesity? – Overweight/ Obese Adults – Prescribed diet or diet + exercise (aerobic or aerobic + resistance training). – Clinical – RCTs and NCTs	– Effect of different protocols on weight loss/body composition; combination of energy restriction plus PA with other components of behaviour modification yields most positive results for maintenance of weight loss. <five per cent who lose weight through energy restriction alone maintain weight loss for two years or more. Large amounts of PA required to achieve weight loss when increased PA is implemented as an isolated intervention. – Majority of controlled exercise training studies demonstrate modest (2-3kg) weight loss. – Failure to control diet and inadequate FU makes it difficult to adequately assess role of PA in weight loss/ prevention of weight gain.		Focus on weight loss treatment in overweight/obese or weight maintenance in previously overweight/obese.
The treatment and prevention of obesity: a systematic review of the literature. Glenny AM, O'Meara S, Melville A, Sheldon TA, Wilson C.	Published version of NHS CRD Report, 1997 (see below).			

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
A meta-analysis of the past 25 years of weigh loss research using diet, exercise, or diet plus exercise intervention Miller WC, Koceja DM, Hamilton EJ. <i>International Journal of Obesity</i> , 1997, 21: 941-947.	Seeks to identify pooled effect of diet, exercise or combined interventions for weight loss. – Adults (overweight) – Behaviour modification – Clinical, GP – various study designs?	Conclude that short term weight loss through diet alone, and diet and exercise was an average of 11kg (over 3-4 months). Exercise alone was three kg. At 12 months follow-up, diet plus exercise tended to be the most effective programs, with average 8.5 kg weight loss maintained.		Not a systematic review. Evaluation study design was not an inclusion criterion. Examined effect treatment interventions for overweight adults
The prevention and treatment of obesity. NHS CRD (Centre for Reviews and Dissemination) <i>Effective Healthcare Bulletin</i> , 1997, 3(2).	1) Evaluate evidence on prevention and treatment of obesity in children. Superseded by 2002 and 2003 Cochrane Reviews and 2002 Bulletin on prevention and treatment of obesity in children. 2) Evaluate evidence on prevention and treatment of obesity in adults. – Adults – HEd and behaviour modification – select individuals and community-wide – RCTs and Cohorts	2) In the Stanford Five Cities Project a multi-media community education program reduced average weight gain at 12 months. In Minnesota Heart Health Program, a monthly newsletter on weight control and financial incentives reduced the proportion of people gaining weight among a sample of normal weight participants; but a broader community-based weight reduction program failed to prevent weight gain.	Rigorous review which selected the more rigorous studies for their conclusions.	2) Review examines studies from 1996 or earlier. Generalisability of findings in US studies is unclear.

Publication	Review questions - Population(s) - Intervention/ Strategies - Setting(s) - Study designs included	Review findings and conclusions	Strengths of evidence	Limitations of evidence
<p>Worksite intervention for weight control: a review of the literature.</p> <p>Hennrikus DJ, Jeffery RW. <i>American Journal of Health Promotion</i>, 1996, 10(6): 471-498.</p>	<p>To examine the success of worksite weight control programs in</p> <ol style="list-style-type: none"> 1) reaching populations in need; and 2) achieving sustained weight loss. <ul style="list-style-type: none"> – Adults – Multiple strategies (mainly Health Ed/ Behav mod, plus some incentives/ competitions.) – Worksites – Various 	<p>Reviewed 44 empirical studies from 1968-1994; however, many were poor quality/uncontrolled case studies, which were given less weight.</p> <ol style="list-style-type: none"> 1) Programs reached 39 per cent of those already overweight/obese (population in need) 2) Two key RCTs indicate worksite programs have been successful in achieving short-term weight loss in program completers. However, none of the controlled programs examined maintenance of weight loss beyond 6 months. The uncontrolled studies indicate maintenance of weight loss at 6 months ranged from 0-80 per cent. (Reviewers note these studies are likely to overestimate extent of weight maintenance). <p>Concludes that these types of worksite interventions appear no better than clinic based programs for weight maintenance. Weight regain after treatment is the most common experience.</p>	<p>Quality of studies graded and taken into account.</p> <p>Literature derived from a broader search on workplace HP programs conducted by CDC and supplemented by search of internal reference files (not sure if this is unpublished literature, if so – US only?).</p>	<p>Treatment overweight rather than prevention</p>

Table A3. Overview of non-systematic reviews (summaries) of public health interventions to manage or prevent obesity

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
Preventive strategies against weight gain and obesity. Swinburn B, Egger G. <i>Obesity Reviews</i> , 2002, 3:289-301	Overview of preventive strategies and approaches to addressing obesity in adults and children in a variety of settings. Evidence from systematic reviews, evaluation research, expert opinion. Not all interventions discussed are in relation to weight outcomes.	Public health framework is applicable to the problem of rising prevalence of obesity. Many potential interventions exist to address obesity in a variety of settings. Many environmental strategies to address obesity exist however currently there is little evidence to support these interventions. Children should be the priority for population-based interventions as weight loss strategies for adults are less successful and there are more options in terms of interventions for children. School-based interventions may be effective in improving dietary intake and amounts of PA but may not affect obesity rates.	Further research in new intervention areas and settings is necessary.
Public health strategies for obesity treatment and prevention. Jeffery RW. <i>American Journal of Health Behaviour</i> , 2001, 25(3):252-259	Review of 5 studies conducted by University of Minnesota (only three examined weight as an outcome) Covers worksite, community-based, individuals in the community, mostly adult populations. Literature review of five studies.	– Worksite education classes and financial incentives showed no long term significant effect on weight. – MHHP: Community-wide intervention focusing on reducing CVD risk factors involving risk factor screening, mass-media education, adult education, worksite and school programs, point of purchase education in supermarkets and restaurants, health professional education resulted in increased BMI in intervention and control groups. – POP: Education program, classes and contests as an intervention for volunteer individuals in the community showed no significant difference between control and intervention groups. Other two studies examined worksite environmental change – outcome food choices. Educational approaches alone have not been successful. Suggests reasons for this may be inherent weakness in education message, inadequate funding for education versus large advertising expenditure of food industry.	

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
<p>Self help in the long-term treatment of obesity.</p> <p>Latner JD. <i>Obesity Reviews</i>, 2001, 2(2):87-97</p>	<p>Effectiveness of self-help in treatment of obesity over longer term.</p> <p>Modalities include: bibliotherapy, computer-assisted interventions, non-profit self-help groups, commercial self-help and self-help in conjunction with other interventions.</p> <p>Population: Individual adults in community.</p> <p>Reviews primary evaluation studies: effectiveness and cost-effectiveness.</p>	<p>Initial studies show self-help manuals not effective in weight loss or maintenance. More recent studies indicate more intensive self-help with assignments, monetary deposits etc are modestly effective and a recent meta-analysis of bibliotherapy supports this.</p> <p>There may be relationship between success and degree of therapist contact. Note RCTs discussed did not show effect.</p> <p>Computer and TV assisted interventions only evaluated over short term and yield modest weight loss. Need further evaluation.</p> <p>Non-profit self-help group's behaviour modification interventions are effective but high attrition. Inadequate data re: commercial programs.</p> <p>Self-help interventions may be useful adjunct to more intensive treatments.</p> <p>Self-help may be effective for certain populations of patients and in mild obesity a stepped approach to care commencing with self-help may be cost-effective.</p>	
<p>Prevention of obesity – is it possible?</p> <p>Muller MJ, Mast M, Asbeck I, Langnase K, Grund A. <i>Obesity Reviews</i>, 2001, 2(1):15-28</p>	<p>Strategies to prevent obesity.</p> <p>Discusses prevention in terms of universal, selective, targetted for children and adults.</p> <p>Settings: community-wide, family-based, school-based.</p> <p>Evidence based on primary evaluation studies.</p>	<p>Community-wide programs addressing CVD had no effect on BMI.</p> <p>Community education messages about diet and exercise may produce negative effects on weight in low-income women.</p> <p>School-based PA promotion program (SPARK), health education programs (including parents) generally not effective.</p> <p>Targetted prevention of obese/overweight children with family-based approach may be effective. School-based interventions show mixed results.</p> <p>Suggests only effective treatment of adult obesity is prevention of paediatric obesity.</p> <p>Suggested interventions to prevent weight gain:</p> <p>– Simple strategies: eating regular meals, avoid snacking, drinking water instead of high calorie drinks, decreasing dietary fat, decreasing TV time and/or increasing PA.</p> <p>Little evaluation of universal prevention in large populations.</p> <p>No structured framework for obesity prevention nor clear ideas for comprehensive interventions.</p>	<p>Further evaluation of school-based programs for prevention of obesity. Need to evaluate interventions on population level.</p>

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
<p>Pediatric overweight: a review of the literature: Centre for Health and Weight, UC Berkeley</p> <p>Ritchie L, Ivey S, Masch M, Woodward-Lopez G, Ikeda J, Crawford P. (2001)</p>	<p>Executive summary of overview.</p> <p>Population: children.</p> <p>Settings: environmental, school.</p> <p>Literature review of primary evaluation, guidelines.</p>	<p>General lack of success in large scale programs for healthy school children for reduction/prevention of overweight.</p> <p>Policy/legislative interventions not well evaluated.</p> <p>Success of social marketing (ie replacing full fat milk with low fat milk) limited. Social marketing holds promise but needs further development using behavioural theories. Note unclear if outcome was weight in assessing this intervention.</p>	
<p>Television viewing and childhood obesity.</p> <p>Robinson TN. <i>Pediatric Clinics of North America</i>, 2001, 48(4): 1017-25</p>	<p>Interventions to reduce sedentary behaviour for weight loss or prevention of weight gain.</p> <p>Population: children and adolescents.</p> <p>Settings: family, school.</p> <p>Reviews experimental studies that include strategies to reduce sedentary behaviour.</p>	<p>Two family-based weight loss programs for obese children (8-12 yr olds) were evaluated. Families randomised to intervention that either focused on increasing physical activity or on reducing sedentary behaviour, in addition to a comprehensive family-based dietary and behavioural treatment. One study demonstrated significantly greater weight decreases among those receiving treatment for reducing sedentary behaviour compared with that focused in increasing physical activity; the other showed significant weight decreases in both groups that were not significantly different from each other.</p> <p>Reducing TV viewing and other sedentary behaviours as part of comprehensive weight control program can help promote weight loss in obese children.</p> <p>Two school-based RCTs focused on decreasing TV viewing and other sedentary behaviours. One study included additional educational components for reducing fat intake and increasing consumption of fruit and vegetables, and demonstrated significant reductions in prevalence of obesity among intervention girls compared with control girls, but no significant effect on prevalence of obesity in boys. Reductions in TV viewing mediated the intervention effect. Other study used social cognitive theory-based curriculum and parent newsletters focusing exclusively on reduction of sedentary behaviour, and demonstrated significant decreases in TV viewing, video game use, BMI, triceps skinfold thickness, waist circumference and waist-to-hip ratio compared with controls.</p> <p>Manipulation of TV viewing alone can result in body fat changes in general population of children and adolescents. Reducing TV viewing is a promising strategy for preventing childhood obesity. Experimental studies involving larger and more socio-demographically diverse samples needed to confirm and generalise findings, and to better establish the mechanisms linking TV viewing behaviour and obesity.</p>	<p>Experimental studies involving larger and more socio-demographically diverse samples needed to confirm and generalise findings, and to better establish the mechanisms linking TV viewing behaviour and obesity.</p>

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
<p>Diet, nutrition and the prevention of obesity: WHO – background paper for the WHO consultation on diet, nutrition and the prevention of chronic diseases;.</p> <p>Swinburn B, Caterson I, Seidell JC, Dietz WH, James WPT (2001).</p>	<p>Influences on obesity – commentary and general overview.</p> <p>Populations: adults and children</p> <p>Settings: community, schools, workplaces.</p> <p>Evidence from primary evaluation studies, reviews.</p>	<p>Currently insufficient evidence to support widespread community-based health education interventions.</p> <p>School-based programs can influence behaviours but less likely to change prevalence of obesity.</p> <p>Nutrition panels and signposts on food appears to influence food choices especially in women.</p> <p>Note: No weight-based outcome assessed.</p> <p>Currently no evidence exists on environmental change such as advertising bans/fiscal policies.</p> <p>There is substantial evidence on treatment.</p>	<p>Further evaluation of interventions to prevent obesity, particularly environmental change, required.</p>
<p>Public health interventions for the prevention and treatment of obesity.</p> <p>Schmitz MK, Jeffery RW. <i>Medical Clinics of North America</i>, 2000, 84(2): 491-512</p>	<p>Review of public health approaches to prevention and treatment of obesity in adults and children.</p> <p>Settings: school, worksite, community-based.</p> <p>Evidence based on primary evaluation studies, reviews, expert opinion.</p>	<p>Treatment of childhood obesity: Clinical treatment of childhood obesity more effective than treatment of adults. Targeting parents and child together for treatment more effective than targeting child alone.</p> <p>Decreasing sedentary behaviour more effective than adding exercise.</p> <p>School-based obesity treatment (including education, behaviour modification, exercise) for high risk children is effective in short-term although methodological limitations to studies examining this.</p> <p>Obesity Prevention:</p> <ul style="list-style-type: none"> – School-based PA interventions for prevention of obesity from South Australia and Singapore promising (Sth Australia study used skin fold thickness as measure of obesity). Other school-based programs concentrating on chronic disease risk factor reduction have mixed results but interventions are heterogenous and not assessed over the long term. – Current worksite interventions (weight loss classes with behaviour modification and financial incentives) comparing long-term effects are not successful. – Six studies evaluating community-based education interventions reviewed. Studies used mass media, school, church, social organization, works sites, some made environmental changes including building community exercise facilities. Only two studies showed small significant obesity-related treatment effects (attenuation of increases in relative weight/BMI). <p>Suggests failure of programs in outcome (successful in delivery) due to focus on health education and not on environmental change. Suggests education alone not effective in preventing weight gain at community level.</p> <p>Four small studies evaluating environmental change on food choice in worksites and school promising but weight not an outcome.</p> <p>Recommends tackling obesity with four steps from a public health model. For interventions, recommends using environmental and legislative changes as well as relying on individual behavioural change.</p>	<p>Need to identify what in school-based interventions makes them effective.</p> <p>Lack of evidence on environmental change – needs evaluation.</p>

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
<p>School-based approaches for preventing and treating obesity.</p> <p>Story M. <i>International Journal of Obesity</i>, 1999, 23(Suppl 2): S43-51</p>	<p>Overview of preventive and treatment options for obesity in children.</p> <p>School setting with most interventions based on combination of nutrition education and PA. Only one study involved food service modification.</p> <p>Based on identified controlled studies.</p>	<p>School-based interventions show a positive effect on reducing overweight however the results are modest and evaluated over the short term only.</p> <p>Broad-based cardiovascular disease prevention programs in schools targetting multiple behaviours are not effective in reducing obesity in children. Suggests multiple level interventions including food service or interventions directed at obesity may be necessary.</p> <p>Outlines a proposed comprehensive model to address obesity in schools.</p>	
<p>The prevention and treatment of obesity: application to type 2 diabetes.</p> <p>Maggio CA, Pi-Sunyer FX. <i>Diabetes Care</i>, 1997, 20(11): 1744-1766</p>	<p>Addresses four questions on obesity, two relevant:</p> <ol style="list-style-type: none"> 1. Have effective strategies for the prevention of obesity been identified? (If so, what is the impact of such strategies on the prevention of type 2 diabetes?) 2. How effective are current treatment strategies in promoting weight loss in obese individuals with type 2 diabetes? (In addition what are the effects of these strategies on glycaemic control?) <p>Population: adults and children.</p> <p>Settings: community-wide, family-based, individual.</p>	<p>Multifaceted community-wide education campaign not effective for sustaining weight loss >one year. Lack of success due to no environmental change.</p> <p>Lifestyle intervention program on individuals in community including diet/ physical training successful in weight reduction (volunteer sample). Further research re: factors related to success necessary.</p> <p>Native American community-based exercise and weight-control program decreased weight. Intervention included aerobic exercise and weight loss competition (mean follow up 50 weeks)</p> <p>Family-based behavioural therapy effective in attenuating weight gain in obese children and effects persist to young adulthood – suggests treatment in childhood results in prevention as an adult.</p> <p>Little evaluation of prevention in populations. Need more, well designed studies on prevention.</p>	<p>Community-based programs may be culturally specific – no evaluation of this. Further evaluation of what makes some public health interventions aimed at individuals successful and what not.</p>

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
Prevention of obesity. Thomas PR (ed). (1995) In: Weighing the Options: Criteria for Evaluating Weight-Management Programs. Washington: The National Academy of Sciences: 152-162.	Interventions to prevent obesity. Discusses prevention programs in context of universal, selective and indicated prevention for children and adults. Settings include family-based, school-based, work-site based, community-wide, environmental change. Refers to primary evaluation studies, some reviews and author's expert opinion. May give reference to only one evaluation study as evidence.	Universal prevention: – Health education to parents of infants can reduce prevalence of obesity. – School-based nutrition programs have mixed results. One review found nutrition education and exercise components showed significant benefits, others evaluating PA alone show no effect on weight. – Work-site based programs for weight control are disappointing. – Community-wide programs to reduce CVD risk factors are not successful for obesity. – Little or no research on environmental change programs ie regulation of fat/sugar content of processed foods, regulating advertising, modifying economic policies related to food, developing bicycle lanes, maintaining stairwells. Commercial weight loss programs may be effective. RCTs show diet, exercise, behavioural therapy for children targetted with parents do best, also suggests exercise should be aerobic and incorporated into lifestyle. Prevention literature appears focused on higher risk groups and less so at the general population.	School-based programs need further evaluation research. Evaluation research on environmental programs is needed.
School-based obesity prevention. Population versus high-risk intervention. Reniscow K. <i>Annals of the New York Academy of Sciences</i> , 1993, 699:154-66.	School-based interventions for high risk (overweight) students and school-wide interventions. Reviews primary evaluation studies. Excludes those with less than 25 students.	Six studies involving high risk populations evaluated. All shown to be effective in either subjects gaining less weight, subjects losing weight or net change in percent overweight. Effects greater for heavier children, inconsistent sex differences, mixed results for parent participation. Validity and generalisability of studies questioned. Some studies used volunteers only, interventions multicomponent (education, exercise, behaviour modification), intervention and follow-up brief. Hence no knowledge re: maintenance. Nine studies involved school-wide populations. Interventions used health behaviour change models in the classroom but focus on risk factor reduction for chronic disease. Some offered risk factor screening and parental involvement. Three studies showed significant BMI effect, two showed skin-fold effect. Three studies found no effect. Studies that measured weight effect were not significant. Validity of these studies also questioned due to lack of randomisation of schools, high attrition, multicomponent interventions, measurement bias. Schools potentially useful for interventions. Effects of interventions for high risk population more consistent than school wide.	Evaluation of effect of various components of school-based interventions necessary.

Publication	Review topic - Population(s) - Intervention/ Strategies - Setting(s) - Evidence base	Review findings and conclusions	Implications
Prevention of obesity. Chapter 5, Handbook of Obesity 2004. James WPT, Gill TP.	Overview of issues in obesity prevention. Adults and children in a variety of settings. Evidence from reviews, primary studies, guidelines.	Suggested targets to influence for obesity prevention: low fat/low energy diet, food eaten away from home, sweetened drinks, increasing PA, decreasing sedentary behaviours, improving infant feeding and maternal nutrition – note: outcome examined in not necessarily weight. For children, limited data on obesity prevention and often not generalisable. Insufficient data to make firm conclusions on effectiveness of school-based and non-school-based interventions to change PA behaviour on weight outcomes. No evidence to show interventions to prevent obesity in adults are effective. Interventions examined are a variety of education strategies. Prevention of weight gain in high-risk individuals with interventions involving exercise and dietary change in supervised clinical settings can be effective. Concludes there is poor understanding of effective prevention strategies, particularly at population level.	

Appendix B

Examples of practices and programs to address weight gain prevention

The following examples comprise a collection of interventions to address weight gain which have been implemented within NSW, other regions of Australia or overseas. They have been identified by a review of the literature or provided by health services within Australia as examples of current practice. These examples are provided to give an indication of the broad range of actions possible within this area. In some instances the case studies have been referred to in the relevant section on 'evidence of effective settings-based interventions'. However, overall, the examples in this section are not intended to represent best practice in this area. Rather the case studies illustrate a mix of interventions in terms of scale, duration, complexity and effectiveness.

1. Families and communities

Family-focused programs

Click Off-Click On – Turn Off the TV Week

In 1996 Eumemmerring Secondary College in Victoria ran a Turn Off the TV Week and organised a program of alternative activities for students and families. This trial has now influenced other school projects, where children are encouraged to switch off the TV for a week and do something more active, interesting or social with their time.

Bodywise (Wentworth AHS)

Bodywise is a family group education program, developed by Wentworth Area Health Service, targeting overweight and obese children and their families. The program incorporates a multi-disciplinary approach including dietitians, counsellors, fitness leaders, psychologists and social workers. The goal of the program is to utilise a holistic, family-centred approach to improve children's nutrition, increase participation in physical activity and reduce levels of inactivity, maintain a high level of self-esteem and confidence, and promote family-based lifestyle changes for effective, long-term weight management. Educating parents and children on good nutrition, healthy family eating and managing obesity, promoting self-esteem and confidence, increasing awareness of and encouraging participation in physical activity, and providing follow-up sessions, are all essential

key strategies. Six months post program, evaluation showed that approximately half of overweight/obese children stabilised or reduced their body mass index for age, and that obese parents had achieved some weight loss. Qualitative indicators reflect positive social and emotional changes for children. The program is ongoing and dietitians are investigating the idea of the program being run in schools as part of the curriculum. *Reference: NSW Nutrition Project Register, 2001.*

Family Lifestyle Program (Illawarra AHS)

This is an adaptation of the Westmead Family Weight Management Model into a community-based family focused approach, directed to children aged 5–7 years. The project was piloted in a primary school in a lower socio-economic area and aimed to build on families' choices and skills, through addressing healthy eating, increased family activity and understanding of self-image and self-acceptance. Key intervention activities and strategies included parent-focused interactive education sessions, children's activity programs and activity events for parents and children. No evaluation to date.

Reference: NSW Nutrition Project Register, 2001.

Community-based physical activity programs

'Concord: A great place to be active' (Central Sydney AHS)

This was a community-based multi-strategic health promotion intervention promoting physical activity in women aged 20–50 years, conducted by the Central Sydney Health Promotion Unit in partnership with Concord Council. The intervention involved local social marketing campaign. Community walking events and council environmental projects that made changes in parks, walking paths and maps of walking routes. Conducted over a two-year period, the intervention was effective in producing statistically significant reductions in the proportion of sedentary women.

Reference: Wen et al (2002).

Walk to School Programs (Central Sydney AHS)

Walk to school events have been developed in many local communities and promoted through many groups including the Pedestrian Council of Australia. For example, the Central Sydney Health Promotion Unit collaborated with Leichhardt Council in a project that resulted in participation by 24 schools in the local area. The project

incorporates a survey, education campaign, road safety audit, mapping routes to school, banners, posters, School Travel Plan, student Travel Diary, a Walking Bus and a 'Walk Safely to School Day'. The results of a pilot study at one school showed an increase of up to 11 per cent of students walking to school and a decrease of 14 per cent of children being driven at the end of Term One.

Reference: CSAHS Healthy Happenings 2002.

Also www.travelsmart.gov.au/schools/schools3.html

Community interventions

Heart Health Awards for Local Government (National Heart Foundation of Australia)

The Heart Foundation Kellogg Local Government Awards give recognition to local governments working with their communities to impact health and encourage healthier lifestyles. Since 1992, these Awards have celebrated the important role that local governments have in fostering the health of individuals and members of their community. They have been presented to local governments and collaborative projects undertaken that support and improve heart health, which involve initiatives that typically encourage healthy eating, physical activity and recreation. The Awards aim to assist local governments in continuing to work towards improving the heart health of their communities.

The Wagga Wagga Aboriginal Heart Care Project (WWAHCP, Greater Murray AHS)

This project was launched in July 1998. It aimed to reduce the prevalence of heart disease and improve the health and wellbeing of Wagga Wagga's indigenous community. A heart health risk factor and lifestyle survey was developed and conducted to collect baseline information on the prevalence of heart disease risk factors in the local adult community. In addition, two nutrition projects were conducted with the community: one described the cost and availability of healthier food choices in Wagga Wagga; and the other investigated barriers and possible solutions to accessing healthier food choices. The WWAHCP has been involved in several initiatives, namely the NSW State Youth Indigenous Athletics Carnival, Yandarra health and lifestyle event, nutrition training, Wagga Wagga Aboriginal Elders Physical Activity Group, Wagga Wagga Aboriginal Passive Smoking Campaign, the development of culturally appropriate educational material and many nutrition initiatives (such as supermarket tours and cooking programs).

The Karuah Family Nutrition and School Access Project (Hunter AHS, 2002)

This project was established in response to the recognition by the Hunter Aboriginal Nutrition Project of the need for more nutrition interventions among Aboriginal communities. The project aimed to improve the nutritional status of children and their families living in the Karuah Aboriginal Community reserve, to improve school attendance through nutritional strategies for children living in Karuah and to improve the access and availability of nutritious food in the community. Key strategies include a cooking skills program focusing on healthy after school snacks, parent education sessions on healthy eating and food choice, a breakfast program for school children, modifying the existing shop smart food budgeting program to make it more culturally appropriate, training the Aboriginal health worker, conducting nutrition and breastfeeding awareness sessions, and developing resources to promote breastfeeding and oral health. However, evaluation has not been conducted but there are future plans to involve schools and teachers. The project is due to end in October 2004.

Community nutrition programs

GutBusters

GutBusters is a group weight loss program for men, developed in 1991 in response to the large number of overweight or obese men in Australia, and to target men in blue collar jobs who had not benefited from traditional health promotion and weight loss programs. It was the first large-scale program in the world to use waist measurement, rather than weight, as an indicator of body fat loss. The program was designed as a six-session educational program for men, based on the scientific principles of energy balance and exchange. The goal initially was to achieve a reduction in waist size by one per cent per week, through strategies that targetted diet (reducing dietary fat and alcohol, and increasing dietary fibre) and physical activity (low intensity planned and incidental movement). It was promoted as a 'no gimmick' program aimed to fit in with, not alter, men's lifestyle. In 2000, over 70,000 men completed the program in Australia, resulting in significant losses in and maintenance of waist size, and changes in fat and alcohol consumption and physical activity. The program is no longer operating as it was taken over by Weight Watchers.

Reference: Egger 2000; Egger et al 1996.

Food for Thought (Hunter AHS, New England AHS)

The Food for Thought – Healthy Lifestyle Program is another example of a group weight loss program, developed in Hunter Area Health and adopted by New England Area Health Service, to target overweight and obese adults. The program involves the following strategies: conducting a seven-week program that addresses healthy eating, physical activity, self esteem and food choice, including other health professionals in the program, running supermarket tours and conducting review sessions. Results from process and outcome evaluation showed that approximately three-quarters of participants were maintaining lifestyle and behavioural changes.

Reference: NSW Nutrition Project Register 2003.

Waistaway (Mid West AHS)

The Mid West Area Health Service developed a self-help educational resource known as 'Waistaway'. This do-it-yourself 'waist' loss package was tailored to rural men, to increase the number of men in the region accessing health service nutrition and lifestyle advice, and to also decrease their waist measurement and therefore their risk of chronic disease. The resource is being used within current dietetic services.

Reference: NSW Nutrition Project Register 2003.

2. Early childhood care**Good Food for Children (South East Sydney AHS)**

Good Food for Children is a series of programs designed to improve the nutritional quality and safety of food provided to children 0–5 years in child care settings. The program has comprised specific initiatives with: Long Day Care centres that provide food; Long Day Care centres where food is provided from home; and Family Day Care. The intervention strategies involve a mix of educational workshops, distribution of written information in various formats and feedback on policies. Evaluation studies show that the initiatives increase staff knowledge and lead to specific changes in the nutritional quality of food provided. The program has been developed and conducted in South East Sydney Area Health Service.

Reference: Bravo A, Cass Y. 2003; Sangster S, Chopra M, Eccleston P 2002.

Caring for Children (Central Coast AHS, Central Sydney AHS)

This is a series of programs designed to improve the nutritional quality of food provided to children in child care settings. There are initiatives for services providing care for children 0–1 years; and for Long Day Care Centres (children 0–5 years) that provide food. The intervention strategies are a mix of educational workshops, distribution of written information in various formats and feedback on policies. Evaluation studies show that the initiatives increase staff knowledge and lead to specific changes in the nutritional quality of food provided. The program has been developed and conducted in Central Coast Area Health Service and Central Sydney Area Health Service.

As NSW has regulations for the accreditation of childcare centres that include nutrition, the Good Food Children and Caring for Children programs have not included an award scheme, as has occurred in WA.

Reference: Bunney and Williams 1996; Central Sydney Area Health Service 1996; Plaskett et al 1996.

Start Right – Eat Right

This is an award program for centres which provide at least 50 per cent of the recommended dietary intakes for children. The scheme involves nutrition training in food service planning and food safety, and centre-based policies.

Reference: Pollard et al 2001.

3. The school community**CATCH (Coordinated Approach to School Health)**

A multi-level, multi-component intervention to promote a healthy school environment as well as improve healthy eating behaviours and physical activity levels for students in grades K–5. The intervention involved modifications to school food services to reduce fat intake, enhanced PE and classroom curricula. In addition, certain schools also participated in a home curriculum program. Positive changes in knowledge, attitudes and behaviours (including fat intake), but not weight status, have been reported from trials and have been sustained during the three-year period of involvement in the program.

Reference: Luepker et al 1996.

SPARK

This is a physical education curriculum and staff development program for students in grades K–6. Students from third grade to sixth grade are engaged in a self-management curriculum that includes in-school and family participation. The program involves three weekly PE classes: 15 minutes of health-fitness and 15 minutes of skill-fitness activities. It teaches behaviour change skills (self-monitoring, reinforcement, goal setting, stimulus control, problem solving). Homework and monthly newsletters involve parents and incentives are provided to encourage goal achievement. A SPARK staff member trains teachers through workshops and follow-up consultations. Improvements in levels of physical performance were observed for SPARK students compared with controls for a period of two years after intervention. Materials include a set of physical education and self management textbooks.

Reference: Sallis et al 1997.

Planet Health

The Harvard Prevention Research Center created this curriculum that integrates health messages into physical activity sessions and lessons in social studies, science, language arts and math. The program has a focus on decreasing sedentary behaviour, decreasing high fat foods, increasing fruit and vegetable intake, and increasing moderate to vigorous activity. It contains self-assessment, goal setting, evaluations and incentives to teachers. The curriculum has been piloted in Boston public schools. A guide that offers practical advice on taking local action to improve school nutrition as well as background materials explaining the importance of healthy eating to children's long term health and well-being.

Reference: Gortmaker 1999.

Take 10

'Take 10' is a classroom-based program designed to promote physical activity among primary school students by integrating 10-minute periods of physical activity with standard academic lessons. It is designed to complement rather than replace other opportunities for exercise. The program encourages teachers to find ways of combining static learning processes with short bursts of activity. This has been shown to assist students to develop a more active lifestyle but also results in improved attention during lessons.

Reference: ILSI 2003. See <http://www.take10.net>

Adelaide School Fitness Trial

Conducted in 1978, this trial examined the effect within 10-year-old children of 75 minutes of endurance exercise each day when compared to 75 minutes of skills training and the usual thrice weekly 30-minute PE sessions. Those who underwent the fitness training for 14 weeks showed significantly reduced body fat. A follow-up study found these improvements were maintained after two years and were also accompanied by improvements in CVD risk factor measurements.

Tooty Fruity Vegie (Northern Rivers AHS)

The Tooty Fruity Vegie school nutrition program developed by Northern Rivers AHS provides a good example of a multi-faceted school health promotion program. The thorough process and impact evaluation of this program shows that it has been successfully implemented, with high levels of engagement by school stakeholders, and that it has had an impact on children's eating behaviours. There is potential to further develop the framework and content of this program to encompass a healthy weight focus. This is likely to involve inclusion of a physical activity component and some changes in the nutrition resources and activities.

Reference: www.hprb.health.nsw.gov.au/public-health/health-promotion/settings/schools/case-studies.html#tooty

Active Programme Promoting Lifestyles in Schools (APPLES)

Most UK school-based approaches have targetted obese children; an alternative strategy is to implement an intervention aimed at all students. The UK had not reported a primary prevention school-based intervention until the development of APPLES, a one-year multi-disciplinary, multi-agency program designed to influence diet and physical activity, in addition to knowledge. This school-based health promotion program was designed to reduce risk factors for obesity and to evaluate the implementation process and its effect on the school. Ten UK primary schools were recruited for the program, which consisted of teacher training, modification of school meals, and the development of school action plans targetting the curriculum, physical activity, tuck shops and playground activities. Evaluation showed that there were no significant differences in BMI, other psychological measures or dieting behaviour between intervention and control children at the end of the one-academic year of program implementation. Even though the children showed minimal

behavioural changes, the program was successful in its implementation, the results demonstrating an increase in vegetable consumption, and positive changes in school meals, tuck shops and playground activities.

Reference: Sahota et al 2001a and 2001b.

WA Enrichment School Program

The 'enrichment' program, which represented a controlled trial of health promotion programs in 11-year-old school children in Metropolitan Perth, was based on a teacher-parent-student triad program. The program aimed to evaluate the short- and long-term benefits of a school and home-based physical activity 'enrichment' program for children at higher risk of cardiovascular disease.

The program focused on increasing physical activity in children who were distinguished mainly by excess body fat and physical inactivity. There were significant improvements in fitness levels in boys and girls in the enrichment program, however there was no significant difference in physical activity at the end of the intervention.

Reference: Burke et al 1998.

4. Worksites

Head Start Workplace Guide

The Head Start Bureau has published a Training Guide for the Head Start Learning Community: 'Enhancing Health in the Head Start Workplace'. The guide addresses the importance of health in the workplace and presents health promotion principles and activities that can be applied to a variety of workplace health issues, including achieving and maintaining a healthy weight.

Heart Health Workplace Program

The worksite cardiovascular risk reduction program illustrates the importance of worksite interventions as a component of a community-wide approach to prevent cardiovascular disease. This randomised trial aimed to assess comparative efficiency of four programs (health risk assessment, risk factor education, behavioural counselling, behavioural counselling plus incentives intervention) designed to decrease cardiovascular risk factors, in employees of 28 ambulance stations within metropolitan Sydney. Individuals from various interventions were provided with either educational videos, printed material, individual counselling, or financial incentives that were offered for behavioural changes and meeting risk factor

reduction targets up to six months. Results showed that interventions incorporating behavioural approaches were more effective in modifying cardiovascular risk factors than screening and educational interventions.

Reference: Gornall et al 1993.

5. Health services

Lighten Up – Group Weight Management Program (Queensland Health 1996)

Lighten Up is a well-developed program of Queensland Health. It is a weight management program incorporating educational, skill development, self-help and environmental strategies, designed to provide participants with support in weight loss and subsequent weight maintenance, and to enable professionals to coordinate a scientific based educational program. The program places equal emphasis on healthy eating, increasing physical activity and dealing with habits. The program aims to establish sustainable social support networks with links to the health service, to establish a mechanism for program implementation and evaluation state wide, and to provide community health workers with sufficient knowledge. Evaluation shows that this program is effective in achieving short-term weight management and behaviour change. Long-term evaluation of weight management is difficult to obtain. However, Queensland Health actively supports continued implementation of the program.

Reference: Harvey and Kirkwood 1996; Harvey et al 1996.

KidShape

A family-centred paediatric weight management program, developed in response to the development of type 2 diabetes in Los Angeles youth. This program involves the family in basic education and counselling, coupled with physician-directed activities to guide obese youth.

Reference: <http://Kidshape.com>

A New Leaf

This program, developed at the University of North Carolina, is a structured nutrition, physical activity and smoking cessation assessment and intervention program for cardiovascular disease reduction among low-income individuals. New Leaf integrates behaviour change theory with nutrition and exercise science in a clinically feasible intervention tool.

Reference: New Leaf Intervention, www.hdpd.unc.edu/wisewoman

Bright Future

These guidelines for professionals provide practical information, effective preventive techniques and health promotion materials for health supervision of infants, children and adolescents. The materials include a nutrition guide, a physical activity guide and information about iron deficiency anaemia screening, hyperlipidemia screening and hypertension screening.

Reference: National Maternal and Child Health Clearinghouse, www.brightfutures.org

Baby Friendly Hospital Initiative

This program recognises hospitals and birth centres that have taken steps to provide an optimal environment for the promotion, protection and support of breast-feeding. Hospitals receive the 'Baby-Friendly' designation when they successfully implement the WHO/UNICEF 'Ten Steps to Successful Breastfeeding'.

Reference: WHO/UNICEF 1998.

Committed to Kids Pediatric Weight Management Program

This is an integrated, multi-disciplinary team approach to prevent and treat obesity in children. Four program components are conducted in group sessions with support from family and others. Training and consultation staff members are available. Curriculum guides and a procedures manual are available.

Reference: www.committed-to-kids.com

Social marketing practices and programs**1% or Less Campaign**

Multiple messages and activities are used to influence communities to increase consumption of low-fat milk. A feature of the campaign is the 1% or Less School Kit, which contains materials for primary and secondary school students – idea sheets, fact sheets, marketing strategies, model press releases, handouts, posters and instructions for conducting taste tests.

Reference: Center for Science in the Public Interest, www.cspinet.org/kids

Eat Smart, Play Hard

This campaign is designed to foster positive changes in eating and physical activity Behaviours targeting children aged 2-18 years and their caregivers. The campaign themes focus on breakfast, snacks, balance and physical activity. Suggested activities are consistent with the Dietary Guidelines for Americans and the Food Guide Pyramid.

Reference: USDA Food and Nutrition Service, www.fns.usda.gov/FNS/mascot/mascot.htm

Fighting Fat, Fighting Fit Campaign

BBC's 'Fighting Fat, Fighting Fit' (FFFF) Campaign is an example of using the mass media to target obesity. Mass media health campaigns were designed to inform people about the need for active obesity prevention and to educate and encourage them to eat more healthily and become more physically active. The aim of the campaigns, launched in 1999, was to achieve small and permanent lifestyles changes, rather than dieting and short-term weight loss. The health campaigns involved seven weeks of programming across BBC television and radio, and support via a website, book, video and telephone. The campaign message was made up of fitness and nutrition experts, behavioural psychologists and health education experts. The FFFF mass media campaign proved to be highly popular in the UK, generating tremendous interest nationwide; over half the population was aware of the campaign. The majority of participants reported a lower weight but the average was still in the obese category.

Reference: Miles et al 2001; Wardle et al 2001.

