

## Review Article

## Health economics of weight management: evidence and cost

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The World Health Organization estimates that around one billion people throughout the world are overweight and that over 300 million of these are obese and if current trends continue, the number of overweight persons will increase to 1.5 billion by 2015. The number of obese adults in Australia is estimated to have risen from 2.0 million in 1992/93 to 3.1 million in 2005. The prevalence of obesity has been increasing due to a convergence of factors - the rise of TV viewing, our preference for takeaway and pre-prepared foods, the trend towards more computer-bound sedentary jobs, and fewer opportunities for sport and physical exercise. Obesity is not only linked to lack of self esteem, social and work discrimination, but also to illnesses such as the metabolic syndrome and hyperinsulinaemia (which increases the risk of developing heart disease, diabetes, hypertension, fatty liver), cancer, asthma, dementia, arthritis and kidney disease. It has been estimated that the cost of obesity in Australia in 2005 was \$1,721 million. Of this amount, \$1,084 million were direct health costs, and \$637 million indirect health costs (due to lost work productivity, absenteeism and unemployment). The prevalence cost per year for each obese adult has been estimated at \$554 and the value of an obesity cure is about \$6,903 per obese person. Government efforts at reducing the burden remain inadequate and a more radical approach is needed. The Australian government, for example, has made changes to Medicare so that GPs can refer people with chronic illness due to obesity to an exercise physiologist and dietitian and receive a Medicare rebate, but so far these measures are having no perceptible effect on obesity levels. There is a growing recognition that both Public Health & Clinical approaches, and Private & Public resources, need to be brought to this growing problem. Australian health economist, Paul Gross, from the Institute of Health Economics and Technology Assessment claims there is too much reliance on health workers to treat the problem, especially doctors, who have not been given additional resources to manage obesity outside a typical doctor's consultation. Gross has recommended that further changes should be made to Medicare, private health insurance, and workplace and tax legislation to give people financial incentives to change their behaviour because obesity should not just be treated by governments as a public health problem but also as a barrier to productivity and a drain on resources. A Special Report of the WMCACA (Weight Management Code Administration Council of Australia) ([www.weightcouncil.org](http://www.weightcouncil.org)) on the "Health Economics of Weight Management" has been published in the Asia Pacific Journal of Clinical Nutrition in September 2006. This report explores the cost benefit analysis of weight management in greater detail.

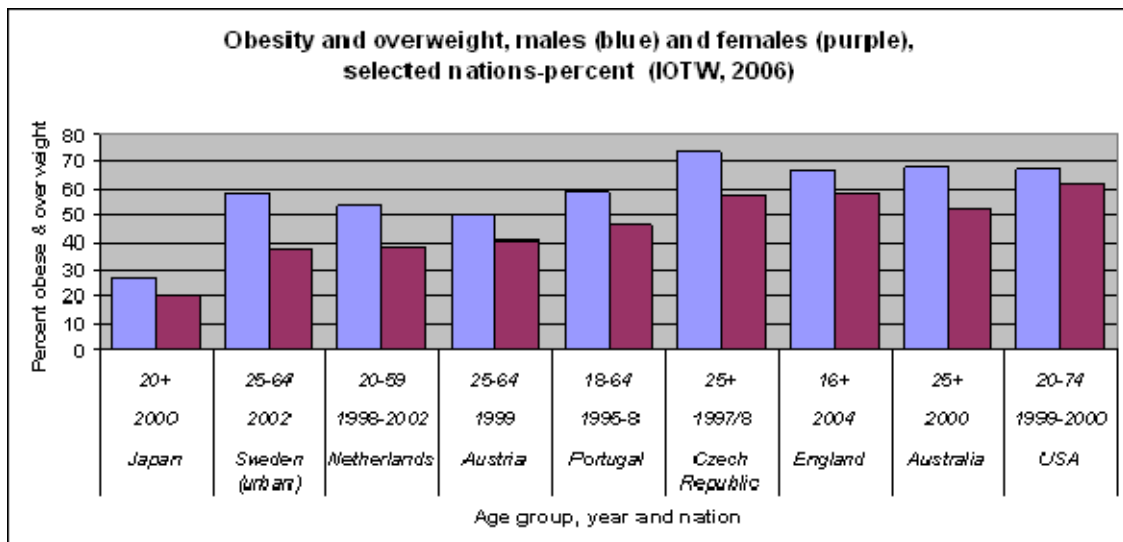
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### Prevalence

The World Health Organization estimates that around one billion people throughout the world are overweight and that over 300 million of these are obese.<sup>1</sup> It is predicted that if current trends continue, that number of overweight persons will increase to 1.5 billion by 2015. According to the International Obesity Taskforce, by 2025 one in every three adults will be obese if current trends continue. Unfortunately, comprehensive data are not available on the weight status of all countries within the Asia-Pacific region and where data is available the quality can be variable. Emerging data indicates that obesity is rapidly increasing

in developing countries and even in nations such as China, where the overall obesity rate is <5%, obesity prevalence reaches 20% in some cities. In Australia, obesity now affects more people than smoking, heavy drinking, or poverty. Over 50% have inadequate physical activity. Australia is a fat nation by world standards. In 2006, 62% of Australian men and 45% of women are overweight or

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**Figure 1.** Obesity and overweight in Australia compared with other countries<sup>6</sup>

obese. This is up from 52 and 37% 10 years ago, according to the annual National Health Survey, Australian Bureau of Statistics (Fig 1)<sup>2</sup> The number of obese adults is estimated to have risen from 2.0 million (in 1992/93) to 3.1 million (in 2005). The prevalence has been increasing since the 1970s due to a convergence of factors - the rise of TV viewing, our preference for takeaway and pre-prepared foods, the trend towards more computer-bound sedentary jobs, and fewer opportunities for sport and physical exercise. The almost two-thirds of men and nearly half of women who are obese or overweight pay a huge price - not just in the lack of self esteem, social and work discrimination, but also in the illnesses that go along with being overweight such as the metabolic syndrome/ hyperinsulinaemia (which increases the risk of developing heart disease, diabetes, hypertension, fatty liver), cancer, asthma, dementia, arthritis and kidney disease.

In 2003 Australians died from cardiovascular disease as a result of excess body weight and 10,500 people will die this year in Australia because they're carrying excess kilos. It has been predicted that 228,000 people will become either diabetic or contract serious illness like bowel or breast cancer, because of their obesity and will live shorter lives because of their increasing girth.<sup>3</sup> Over the last 20 years, the levels of coronary heart disease, diabetes, stroke and certain cancers have been rising steadily throughout the Asia-Pacific region in parallel to the obesity epidemic. Seven out every ten deaths in the region is now attributed to non communicable diseases.<sup>4</sup> It has been estimated that over the next 10 years China alone will lose 558 billion USD as a result of premature deaths from heart disease, stroke and diabetes.<sup>11</sup> Apart from the development of chronic diseases, many overweight and obese patients develop one or more debilitating conditions such as musculo-skeletal disorders, respiratory difficulties, skin problems and infertility. These not only affect quality of life but can be costly in terms of absence from work and use of health resources.

#### **Costs to governments, communities and to individuals**

Obesity is associated with a very costly set of chronic diseases. Compared with a non-obese person, the obese

or overweight person has a higher relative risk of having a range of chronic conditions shown in Table 1.

Overweight and obesity have the following costs:

- 1) to governments via the formal health care system for the treatment of obesity and its complications (direct costs)
- 2) to the individual in terms of ill health and reduced quality of life (intangible costs)
- 3) to society in terms of lost workdays (absenteeism) and the loss of productivity when at work (presenteeism) and premature disability pensions (indirect costs).

Murphy and Yates (2006)<sup>5</sup> have estimated that the cost of obesity in Australia in 2005 was \$1,721 million. Of this amount, \$1,084 million would be direct health costs, and \$637 million indirect health costs or a prevalence cost per year for each obese adult of \$554. They also estimated the value of an obesity cure is about \$6,903 per obese person. Alarmingly these costs are going to keep rising because the percentage of people who are overweight or obese will rise. Australia's first national study of absenteeism alone, using data on about 10,000 employed men and women from the ABS 2001 National Health Survey identified the following:<sup>6,7</sup>

- a) compared with non-obese workers, obese workers had a 17% higher absence from work as a result of injury or disease in the two weeks before the survey, and that they had one extra day off (3.8 versus 3.0 days) when absent
- b) obese persons aged 45-64 years, a third of the labour force, were 8% less likely to be in the labour force and 20% less likely to be in full-time work than non-obese workers in the same age group
- c) absences due to personal illness or injury caused the loss of about 3.12 million days of work in the two weeks before the survey, and of these about 585,700 days were lost by obese persons compared with 2,267,200 days by non-obese persons.

Applying the average days lost by the non-obese employees (0.33 days) to the number of obese employees, the authors estimated that 163,600 fewer workdays would have been lost in the two weeks before the survey, or roughly 4.25 million days per year. The study by the Australian Bureau of Statistics concluded that "...obesity

**Table 1.** Disorders associated with overweight and obesity

Disorder associated with obesity	Relative risk of obese	Relative risk of overweight
	to non-obese	to non-obese
I. Cardiovascular disease	1.60	1.30
II. Cancer	2.00	1.30
III. Mental disorders	1.50	1.20
Depression	1.40	1.20
Anxiety disorders	2.00	1.20
Sleep disorders-sleep apnea	2.10	1.20
IV. Digestive disorders	2.30	1.50
Gall bladder disease	3.00	1.50
Non-alcoholic fatty liver disease	2.30	1.40
V. Musculoskeletal disorders	2.00	1.40
Osteoarthritis	2.00	1.40
Low back pain	2.00	1.50
VI. Asthma	1.60	1.20
VII. Diabetes	3.40	1.80
VIII. Alzheimers type dementias	1.75	1.40
IX. Urinary stress incontinence	2.40	1.40

Source ABS. 4364.0-National Health Survey: Summary of Results, 2004/05. Canberra, 27 February 2006.<sup>2</sup>

*may be influencing absenteeism and preventing workers from staying in the workforce should they wish to do so, possibly through its association with chronic diseases and injury”.*

Obesity represents one of the largest costs in national health care budgets, accounting for up to 6% of total expenditure in some developed countries.<sup>8</sup> With a 6% share of direct health expenditures, obesity would be the fourth ranked cause of all such costs after heart disease (11%), musculoskeletal disease (9.6%), injuries (8.3%) and about the same as all mental disorders (6.1%). In the USA in 1995, for example, the overall direct costs (hospitalisations, outpatients, medications and allied health professionals' costs) were approximately the same as those for diabetes, 1.25 times greater than those for CHD, and 2.7 times greater than those for hypertension.<sup>9</sup> Obesity is fast approaching cigarette smoking as the major preventable cause of mortality in the USA.<sup>10</sup> The costs associated with pre-obesity [BMI 25-30 kg/m<sup>2</sup>] are also substantial because of the large proportion of individuals involved. Overweight and obesity are responsible for a considerable proportion of both.<sup>11</sup>

Estimates of the economic impact of overweight and obesity in less developed countries are not available. However, the relative costs of treatment in developing or transitional communities are likely to exceed those in more affluent countries for a number of reasons. These include the accompanying rise in coronary heart disease and other non-communicable diseases, the "double burden of disease" that is often found in these countries (e.g. communicable diseases along side obesity related health problems), preconceptual and maternal under-nutrition, the need to import expensive technology with scarce foreign exchange, and the need to provide specialist training for health professionals.<sup>8,11</sup>

The most troublesome situation, especially seen in developing countries, is that of maternal undernutrition, with intrauterine growth retardation, compromised lactation and infant feeding, leading to stunting in early life

and to abdominal obesity and its consequences later in life. Weight management in these situations requires pre-conceptual interventions, effective maternal-child health programmes and life-long approaches to avoid inappropriate gene programming and body compositional disorders. It is unlikely that narrow strategies, located solely around energy balance, will do more than attenuate this growing burden of disease for most of the world's populations. The pluralistic approaches to health required are likely to build on more effective lifestyle, behavioural and pharmacotherapeutic strategies to weight management, and do so at all ages, from conception to later life.<sup>12</sup>

### Socio-economic factors

It is generally recognized that there is a strong social class stratification in risk of overweight and obesity, which in turn has much to do with educational and economic advantage.<sup>12,13</sup> In developed countries, the prevalence of obesity is higher in lower socio-economic groups and the reverse is true for developing countries. In developing countries, during the early stages of economic transition, the advantaged may be more overweight, but later, as long term health becomes a priority, the advantaged secure measures to minimize body compositional disorders.<sup>13</sup>

It is clear from the evidence that both diet and physical activity are important in terms of obesity aetiology but the specific behavioural drivers contributing to obesity are not well understood and require further study.<sup>13</sup> For example, a limited number of behavioural factors have been linked to obesity such as fast food consumption, skipping breakfast, low intakes of fruits and vegetables, consumption of meat, and television viewing.<sup>13,14</sup> Even less is known about socio-economic factors and how they contribute to obesity - occupation, education and income are at best only crude indicators. For example, better nutrition knowledge is related to healthier dietary intakes and higher socio-economic status is associated with greater nutrition knowledge, and it is therefore plausible

that knowledge mediates the relationship between socio-economic status and dietary intake.<sup>13</sup> Other factors which have been linked to socio-economic status and which in turn could influence weight management include: body weight dissatisfaction and weight control practices, physical activity enjoyment and self-efficacy, values and beliefs about diet and health, cooking skills, access to fast food outlets, access to supermarkets, free-for-use physical activity resources.<sup>13</sup>

Body image itself, which can be influenced by culture and ethnicity, can also play a significant role, interactive with socio-economic factors in body composition. Pacific Islanders demonstrate this particularly well.<sup>15</sup> The same factors presumably operate in some of the geographical disparity in weight disorder prevalence. In rural and urban populations in Australia, poorer farming and mining communities may be more obese than their city counterparts.<sup>12</sup>

What about environmental contributors to obesity (e.g. labour saving devices)? The environment is increasingly implicated as an important contributor to the obesity epidemic but the empirical evidence linking specific environmental exposures with obesity risk is not strong. Ball and Crawford state that "*the specific behavioural, social and environmental drivers leading to the energy imbalance that causes obesity remain poorly understood --and in explaining the increased risk of obesity amongst those of low socio-economic position*".<sup>13</sup>

Contrary to popular belief, not everybody is gaining weight.<sup>16</sup> Therefore, Ball and Crawford propose that an alternative research strategy that may be useful for guiding interventions to prevent weight gain involves the identification and description of predictors of weight maintenance. They believe that the application of this construct represents a promising avenue for innovative research into obesity prevention among those of low socio-economic position.<sup>13</sup>

### Current therapies for treating obesity

Practitioners need to be informed about the evidence base and efficacy of current therapies and their combinations to enhance choice of suitable methods for achieving the optimal weight loss required by the patient. Using a combination of weight loss therapies is likely to provide optimal outcomes in tackling obesity, a chronic relapsing condition. Management needs to be multifaceted aiming to achieve sustainable behavioural changes to physical activity and diet to alter the patient and family micro-environment to one favouring better weight control. A range of therapies including specific diets, calorie counting, meal replacements, very low calorie diets, pharmacotherapy, intragastric balloons and surgery can provide very useful additional benefit. Practitioners, however, need to be aware that the overwhelming evidence is that most people cannot maintain weight loss despite initially being highly motivated.<sup>17</sup> Only about 20% of those who follow a weight reducing program will achieve permanent weight loss of at least 10%.<sup>5</sup>

### Treatment Goals

Due to long term difficulty by obese individuals in adhering to energy restricted diets and programmed exercise

regimens it has been proposed that less emphasis should be placed on weight loss per se in favor of the management of comorbid conditions, weight maintenance and reduction in waist circumference. Greater attention should be given to lifestyle approaches (like increasing incidental activity and walking, reducing portion sizes) to maintain weight or prevent further weight gain in the obese and the never-obese, and weight regain after weight loss.<sup>18,19</sup>

### Table 2. The spectrum of weight management<sup>20</sup>

- Prevention of weight gain (*should receive greatest attention*)
- Weight maintenance
- Management of obesity co-morbidities
- Weight loss (*should receive less attention*)

Treatment of overweight is recommended above a BMI of 27 kg/m<sup>2</sup> for Caucasians and above 24 kg/m<sup>2</sup> for Asians.<sup>17</sup> Patients with co-morbidities (such as type-2 diabetes, obstructive sleep apnea or dyslipidaemia) who are more likely to improve with weight loss, are at greater risk of complications and thus treatment options should be more aggressive. As little as 5-10% weight loss (about 5-10kg) will achieve significant health benefits such as improvements in insulin sensitivity and lowering of blood pressure and blood lipids.<sup>21</sup> However, no outcome study has yet shown that this degree of weight loss, when sustained, prevents premature/excess mortality. Nevertheless, patients who have lost weight have better biochemical profiles (lower lipids and insulin levels and glucose control) and quality of life profiles than those who have similar BMIs without having lost weight. These patients may still technically be overweight or obese by BMI definition after weight loss.<sup>22</sup>

It is now recognised that body-fat distribution should also be taken into account. Intraabdominal adipose tissue is now known to be an active endocrine organ that secretes biologically-active substances (adipokines). Secretion of undesirable pro-inflammatory, pro-atherogenic adipokines such as interleukin-6, tumour necrosis factor-alpha, plasminogen activator inhibitor-1 and C-reactive protein all increase with increased abdominal obesity, whereas secretion of adiponectin, an apparently cardio-protective adipokine, is reduced in abdominally obese individuals.<sup>48</sup> The main clinical goal in obesity management is the reduction of risk, therefore management should target abdominal obesity and associated cardio-metabolic risk parameters. Waist circumference has been identified as the most useful measure of abdominal obesity.<sup>48</sup> Most individuals measure the effectiveness of a weight loss programme simply in terms of weight loss in kilograms. However, waist circumference is one of the most useful clinical measures of disease risk and is easy to determine in practice (Table 3).

Those in later life are relative survivors. Whilst, especially abdominal fatness, and unfitness, are important factors in age-related health problems (eg. diabetes, cardiovascular disease), there is evidence that the elderly (over 70 years) tolerate more body fat (BMI >30) than their younger peers.<sup>23</sup> In later years, particularly, fitness may be more important than fatness.<sup>24</sup> Regular physical activity staves off disability for several years.<sup>12</sup>

**Table 3.** Realistic goals for weight loss<sup>48</sup>

Duration	Weight	Waist circumference
Short term	1–4 kg/month	1–4 cm/month
Medium term	10% of initial weight	5% after 6 weeks
Long term (1–5 yrs)	10–20% of initial weight	<88 cm (women) <102 cm (men)

**Changes to food habits**

The evidence to date suggests that the best dietary changes that facilitate modest weight loss or for weight management include<sup>17</sup>: decreasing total fat intake, increasing lean protein to enhance satiety from a meal, promoting a low glycemic index diet to those known to be insulin resistant, watching portion sizes, avoiding excessive liquid calorie intake and giving advice regarding healthy alcohol consumption. There may be some debate regarding the protein and carbohydrate proportions that assist in weight loss. To date the evidence suggests that reduced carbohydrate intake works in the short term, but may not provide any weight loss advantage in the long term. A recent study of obese patients found that those randomly assigned to consume a low-carbohydrate diet for 6 months, compared with those assigned to a low-fat diet, lost more weight (5.8kg vs. 1.9kg, respectively) and had greater improvements in triglyceride levels and insulin sensitivity.<sup>25</sup> Weight losses of the two groups did not differ significantly at 1 year.<sup>26</sup> In contrast, there is very good evidence that a low fat diet lowers energy intake, reduces long term energy intake and assists in the longer term maintenance of weight loss.<sup>17,27</sup>

**Low Calorie Diets and Partial Meal Replacements**

Low calorie diets (LCD) providing around 1200–1500 kcal should be used for those with a BMI 27–30 kg/m<sup>2</sup> or risk adjusted BMI 20–27 kg/m<sup>2</sup>. Both the US Diabetes and the Finnish Diabetes Prevention Programs have shown that an LCD designed to reduce body weight by 5–7% coupled with lifestyle modification were successful in preventing development of diabetes.<sup>17</sup> Chief among these approaches is the use of meal replacements, in the form of shakes and bars (e.g. Ultralim, Slimfast). Meal replacements provide patients a fixed amount of food with a known calorie content. They also simplify food choices, require little preparation, and allow dieters to avoid contact with problem foods. This may increase patients' adherence to their targeted calorie goals.

Heymsfield *et al.*,<sup>28</sup> showed that meal replacements result in medically significant weight losses - 7% average weight loss at 3 months and 7–8% at 1 year. Along with the weight loss there was also an improvement in some heart disease and diabetes risk factors such as blood glucose and insulin levels, blood lipid profiles and blood pressure (soy based meal replacements have been shown to lower blood lipids to a greater extent than milk based meal replacements).<sup>29</sup> Two groups of dieters were studied. The partial meal replacement (PMR) group replaced 1–2 meals daily with 1–2 vitamin/mineral fortified liquid meal

replacements but included at least one meal of regular foods. The reduced calorie diet group (RCD) consumed the same number of calories as the PMR (800–1600kcal/day) but did not consume any meal replacements. A significantly greater weight loss was achieved in subjects receiving the meal replacements compared with the RCD group. The former lost 7–8% body weight and the latter 3–7% i.e. the PMR group lost 2.5kg more. There were also significantly less dropouts in the PMR group after 1 year. No reported adverse events were attributable to either weight loss regimen at one year.<sup>28</sup> In another study, patients who continued to replace one meal and one snack per day maintained a loss of 11% at 27 months and 8% at 51 months.<sup>30</sup> These studies suggest that replacing as little as one meal a day with fortified liquid meal replacements (shakes or soups) may help with weight management.

**Very Low Energy Diets (VLEDs) and Complete Meal Replacements**

VLEDs are dietary preparations (e.g. Optifast) that provide all nutritional requirements together with between 1845 and 3280 KJ (450 and 800 Kcal) per day. VLED is low in carbohydrate and the patients become mildly ketotic. Mild ketosis results in reduced hunger and slows the rate of muscle loss (this should not be confused with ketoacidosis - a variant of ketosis that occurs in untreated diabetics and can be fatal). VLEDs usually result in rapid and large weight loss whilst preserving vital lean body mass. They are typically prescribed for the morbidly obese or for patients in whom rapid weight loss is medically necessary.<sup>31</sup> An individual takes the VLED meal replacement three times daily as a substitute for breakfast, lunch and dinner for about 8–16 weeks. In addition, a bowl of non-starchy vegetables once daily provides some fibre and helps to satisfy the social aspect of eating. A teaspoon of oil on the vegetables contracts the gall bladder to minimise the risk of gall stone formation. VLEDs provide excellent weight loss, immediate improvement in comorbidity and assists in motivation, as successful weight loss is a great motivator. They are accepted as being safe with the following minor side effects:<sup>31</sup> halitosis, headache, poor tolerance to the cold, hair loss, irritability, postural dizziness, constipation. VLEDs can also be used as partial meal replacements during weight maintenance. VLEDs require supervision by an experienced health professional. There is no

**Table 4.** Long-term weight losses for different treatment modalities

Diet	Weight loss 1–2 years	Weight loss > 2 years
Ad lib low fat	-3.9 kg	-2.7 kg
Low energy	-6.7 kg	-1.1 kg
Very low energy	-11.8 kg	-4.1 kg
Meal replacement	-5.5 kg	-6.5 kg
'Popular' diets	Not known	Not known

From NH&MRC of Australia "Evidence Based Guidelines for the treatment of Overweight and obesity" 2000

evidence that VLED programmes lead to worse long-term results or are associated with more untoward effects than programmes with low calorie or other dietary approaches. In fact, patients on VLEDs lose significantly more weight initially and maintain significantly greater weight losses than followers of low energy, balanced diets.<sup>32</sup> There appears to be little evidence that the faster you lose weight (as with VLEDs) the quicker you regain it.

### **Physical activity**

An estimated 70% of type 2 diabetes cases and 25% of coronary heart disease (CHD) cases are attributable to excess weight with each kilogram of weight gained during mid-adulthood increasing the risk of diabetes by 4.5% and CHD by 3.1%.<sup>19</sup> However, as little as 30 minutes of moderate-intensity physical activity per day like walking can lower the risk of developing these diseases by 30-50%. A similarly low level of activity (not necessarily leading to cardiorespiratory fitness) is needed to improve "metabolic syndrome" (cluster of conditions including impaired glucose intolerance, elevated blood pressure, and dyslipidaemia) or metabolic fitness.<sup>19</sup> Abdominal obesity increases the risk of developing the "metabolic syndrome" which in turn increases the risk of developing heart disease, diabetes, hypertension and fatty liver. Nevertheless, it should not be assumed that the dose of exercise required for weight management is the same for either metabolic fitness or cardio-respiratory fitness and that health benefits may also be expected with exercise training at higher levels of intensity than low to moderate exercise.

Increased physical activity may decrease the risk of cardiovascular morbidity and mortality, even in the absence of achieving normal body weight. Lee and colleagues<sup>33</sup> found in a longitudinal study of over 21,000 men that those who were fit but obese had lower rates of death from cardiovascular disease than those who were lean but unfit. Collectively, these findings indicate that obese individuals should increase their physical activity to improve their health, regardless of its impact on their weight.

Andersen and colleagues<sup>34</sup> compared the effects of programmed (e.g gym) and lifestyle activity (taking stairs, parking car further away) in women. Results revealed that both types of activity, when combined with a 1200 kcal/d diet, produced a weight loss of approximately 8 kg in 16 weeks. Participants in the lifestyle activity group tended to maintain their weight losses better than those in the programmed-exercise group, although the difference was not statistically significant.

Weight loss studies have reported a dose-response relationship between reductions in weight and body fat and walking. The addition of 30 minutes of walking, five times a week, to a behavioural weight-loss program increases weight loss by an average of 2 kg over 16-26 weeks, a modest amount considering the effort involved.<sup>35</sup>

#### *For metabolic fitness and weight maintenance*<sup>19,36</sup>

About 30min/day of walking or other moderate intensity exercise is required (or 195-220min/wk,<sup>48,49</sup> 1500-1750 kcal/wk)

#### *For weight loss and prevention of weight gain*<sup>19,36</sup>

About 30-45min/day of walking or other moderate intensity exercise is required (or 250-300min/wk,  $\geq 2000$

kcal/wk). Jakicic and colleagues<sup>37</sup> similarly found, in secondary analyses of results of a randomized trial, that obese individuals who exercised 200 or more minutes a week achieved significantly greater weight losses at 18 months than persons who exercised less than 150 minutes a week.

#### *Prevention of weight regain after weight reduction*<sup>19,36</sup>

About 60min/day of walking or other moderate intensity exercise is required (400-500min/wk, 2000-2500 kcal/wk). On a long-term basis, increased physical activity is the single best predictor of weight loss maintenance. Numerous studies have shown that persons who continue to exercise regularly, after losing weight, are more likely to keep the weight off than are individuals who lapse in their physical activity.<sup>19</sup>

#### *Stepping*

As little as 5-10minutes of stair climbing daily has been shown to improve fitness and cardiovascular risk factors and to be equivalent to a 30min walk.<sup>49</sup> Stepping up and down from a single step/bench is a convenient replacement for a staircase. Stepping is suitable for those who do not have major joint problems or who are housebound (for various reasons). Stepping is cheap and convenient and may help strengthen one of the largest muscles of the body (thigh) thus facilitating weight loss, improving fitness and balance (especially important in the elderly).

### **Pharmacotherapy**

About 25-30% of obese people may require some form of adjunctive therapy to supplement diet and lifestyle changes.<sup>48</sup> Medication is generally reserved for those whose health is impaired and who have been unsuccessful at losing weight in other ways.<sup>48</sup> Pharmacotherapy should be considered for people who have: a) BMI of  $\geq 30$  kg/m<sup>2</sup> or  $\geq 27$  kg/m<sup>2</sup> together with other risk factors or b) failed to lose weight through diet, exercise and behavioural therapy. Pharmacotherapy should not be viewed as an 'easy option' that can replace diet and lifestyle change – clinical studies demonstrating successful weight loss have combined pharmacotherapy with an energy-restricted diet. If less than 5% of body weight is lost during the first 6 months then discontinuation of pharmacotherapy should be considered.<sup>48</sup>

There is very good evidence that the small number of available weight loss pharmaceuticals are effective. A recent systematic review reported that sibutramine, orlistat and phentermine achieve mean weight losses of 4.5kg, 2.9kg and 3.6 kg respectively when compared with placebo.<sup>38</sup> However the noradrenergic agonists like Phentermine (Duromine) and Diethylpropion (Tenuate Dospan) have side effects and their long-term safety have not been tested. When given to patients taking Fenfluramine, Phentermine caused cardiac valvular abnormalities in some patients.<sup>39</sup> Since no long term studies have been conducted with these agents it is inadvisable to use them continuously for more than 3 months. Sibutramine (Reductil) is a tertiary amine whose secondary and primary amine metabolites inhibit both serotonin and nor-adrenaline reuptake and may cause side effects such as an increase in blood pressure (of 1 to 3 mmHg) and heart rate (4 to 5 beats per minute).<sup>48</sup> The endocannabinoid-CB

(1) blocking drug, Rimonabant, achieves a mean weight loss of 4.7 kg along with improvements in insulin resistance and inflammation. This is achieved through the activation of cannabinoid-1 (CB<sub>1</sub>) receptors which alters appetite and glucose and lipid metabolism.<sup>48</sup> Rimonabant treatment for up to 2 years is well tolerated, with adverse events reported in clinical trials being mostly mild to moderate and transient (e.g. mild nausea, diarrhoea, dizziness and mood disorders). AOD-9604 is a novel anti-obesity drug which is currently being trialled that is thought to stimulate fat metabolism by selectively mimicking the activity of growth hormone on adipose tissue. In preclinical trials weight gain was inhibited in obese rodents, an effect thought to be associated with an increase in fat breakdown and decrease in fat storage. A Phase IIb clinical trial conducted in five centres across Australia demonstrated significantly greater weight loss with AOD-9604 (1–30 mg) than with placebo.<sup>25</sup>

Unfortunately, weight loss medications only work while being taken and their long term safety and efficacy are yet to be established. Ideally, weight loss medications should be combined with lifestyle changes for maximum results. This has been elegantly demonstrated recently, with sibutramine alone, lifestyle modification and the combination of the two, producing 5.0 kg, 6.7 kg and 12.1 kg of weight loss at 1-year respectively.<sup>36</sup>

Two factors need to be emphasised. The first is the role of pharmacotherapy in weight loss maintenance, a concept rather like the long-term control of hypertension. Secondly, the absolute necessity for diet, activity and behaviour change (a "lifestyle programme") to underpin abdominal fat loss, weight loss and maintenance.<sup>48</sup>

#### **Behavioural therapy, Group therapy, Patient contact**

The addition of more formal behavioural therapy (BT) or cognitive behavioral therapy (CBT) can facilitate weight loss when combined with diet, exercise and pharmacotherapy. Strategies seek to aid stimulus control, reinforce principles, aid self-monitoring and problem solving, and help with goal setting. The Cochrane review found BT and CBT useful when combined. BT and CBT provided an additional 2.3 (95% CI, 1.4–3.3) kg and 4.9 (95% CI, 2.4–7.3) kg weight loss when combined with lifestyle modification<sup>40</sup> and pharmacotherapy.<sup>41</sup> Behavioural treatment has been shown to be effective in inducing a loss of 7%–10% of initial weight and that losses of this size are associated with significant improvements in health, as shown by the Diabetes Prevention Program.<sup>42</sup>

A well-controlled study found that group treatment induced a larger initial weight loss (approximately 2 kg) than did individual treatment.<sup>43</sup> This held true even for patients who indicated that they preferred individual treatment but were randomly assigned to receive group care. These individuals lost more weight than people who preferred individual treatment and received it. Group treatment also is more cost-effective than usual care. Studies between 1996 and 2002 show that patients treated with a comprehensive group behavioural approach lose approximately 10.7kg (about 10% of initial weight) in 30 weeks of treatment. In addition, about 80% of patients who begin treatment complete it.<sup>36</sup>

Numerous studies have shown the benefits of patients

continuing to attend weight maintenance classes after completing an initial 16–26 week weight-loss program. Perri and colleagues,<sup>44</sup> for example, found that individuals who attended every-other-week group maintenance sessions for the year following weight reduction maintained 13.0kg of their 13.2kg end-of-treatment weight loss, whereas those who did not receive such therapy maintained only 5.7kg of a 10.8kg loss. Maintenance sessions appear to provide patients the support and motivation needed to continue to practice weight control skills, such as keeping food records, maintaining calorie goals, and exercising regularly.<sup>36</sup> In reviewing 13 studies on this topic, Perri and Corsica found that patients who received long-term treatment, which averaged 41 sessions over 54 weeks, maintained 10.3 kg of their initial 10.7 kg weight loss.<sup>45</sup>

Perri and colleagues<sup>46</sup> found that participants who received mail and phone contact for 24 weeks following 15 weeks of on-site treatment, achieved and maintained significantly greater losses (9.2 kg at the end of treatment and 10.3 kg 1 year after treatment concluded) than did those who received no further contact (8.5 kg at the end of treatment and 2.9 kg at 1 year after treatment). Maintaining the same contact person is an important component of its effectiveness.

Recent studies indicate that the internet and e-mail can be used to provide both short- and long-term behavioural treatment. These studies, taken together, underscore the importance of completing behavioural assignments (e.g., food and activity records) and suggest that even the most effective internet interventions are likely to produce only half the weight loss of traditional on-site behavioural programs.<sup>36</sup>

Internet-delivered interventions, for both the induction and maintenance of weight loss, currently are not as effective as traditional face-to-face behavioural interventions. Nonetheless, internet-based programs do induce clinically significant weight losses and potentially could be provided to the millions of overweight and obese individuals who do not have access to behavioural weight control, as delivered at academic medical centers.<sup>36</sup>

#### **Surgery or Invasive techniques**

Intra gastric balloons act to produce an early sense of satiety with eating a meal and allow substantial weight loss (14 – 15 kg) during the period of up to 6 months when they remain in the stomach. The current balloons must be removed at 6 months after placement. Whilst a patient could have a balloon placed on a second or subsequent occasion its efficacy and safety as long-term weight loss therapy is not established.<sup>17</sup>

For those who need to achieve and sustain greater than 15 kg of weight loss and have failed other attempts to lose weight, surgery should be considered. Obesity surgery appears to be the only therapy that allows early and prolonged satiety following a small meal despite very significant weight loss. Following substantial weight loss, obesity surgery patients should be hungry, but they are not. Currently two procedures make up the vast majority of bariatric surgical procedures throughout the world. These are laparoscopic adjustable gastric banding (LAGB) and roux-en-Y gastric bypass (RYGB), with neither producing malabsorption of macronutrients. These

provide 50 - 60% long term excess weight loss, but the more invasive RYBG is followed by more rapid weight loss during the first 12–18 months followed typically by a period of weight gain. The adjustability of the LAGB procedure has provided a unique research tool. By altering the amount of fluid in the band and thus varying the diameter of the stoma, the procedure can be effectively switched on and off. When fluid is removed from the band an increase in appetite is soon experienced. A correctly adjusted band gives early satiation and prolonged satiety following a meal and assists the LAGB patient in choosing to consume smaller meals, providing the background to substantial weight loss and maintenance.<sup>17</sup> A third procedure, bilio-pancreatic diversion (BPD), is the most invasive malabsorptive procedures, is used far less frequently and has a component of macronutrient malabsorption as part of its action. It provides greatest weight loss with a sustained loss of 65–70% of excess weight, but at significant nutritional risk. The gentleness, safety, and reversibility combined with extensive publication of favorable outcome data regarding nutrition, body composition, pregnancy, and psychosocial measures make the LAGB the logical choice as a primary bariatric surgical procedure. Recent publications also indicate that obesity surgery increases life expectancy.<sup>17</sup>

#### **Governance, health care systems, the regulatory System and Codes of Practice**

It is increasingly clear that favourable health outcomes at all stages of life depend on a number of crucial factors<sup>12</sup>:

1. Maternal literacy
2. Good governance and accountability
3. The regulatory system; mandated and voluntary (especially for sanitation, food, immunization, child care, education, safety, contracts, competition, and much more). In the areas of body compositional disorders and weight management, consumer movements are playing a vital role in dealing with exploitative practices; in Australia this has led to a “Code of Practice for the Weight Management Industry” [www.weightcouncil.org](http://www.weightcouncil.org) in 1994.<sup>47</sup> The Code provides a framework for the industry specifying standards in the following areas: advertising, disclosure, contracts, cooling-off periods, refunds, complaint resolution, sanctions, staff training and qualifications, sales practices, health, data collection and management, guarantees/assurances, food and nutrition, privacy and discrimination. It provides a comprehensive guide for the protection of consumers’ rights and the conduct of weight management businesses. Ideally, all centres, programs and professionals in the industry should have in place business practices and regimens that comply with the Code. The more members of this industry who are willing to modify their business practices and regimens to comply with the Code, the more accountable the industry will be and the better the products and services will be for consumers. The Code has the potential to be implemented in other countries. The Australian Weight Management Code of Practice can be a model for the rest of the world to establish standards by which this huge industry can be governed. This could

be of value in transitional and other advanced economies.

4. Economic development which takes account of health. Health advancement and economic development may proceed together, but do not necessarily do so. The role of government is to establish a regulatory framework in which they can move together favourably. Education and empowered consumers, especially women, can be monitors and effective advocates for the process. It is women who have been most alert to body compositional disorders in themselves and their families, not only because of social norms about beauty, but also because of a keen sense that these disorders are indicative of health prospects-at-large. Men, too, are now catching on to this reality.
5. Affordability for the various preventive and management options (lifestyle, pharmacotherapeutic, surgical) will be critical in transitional economies where daily income is often well below the cost of commercial products.

#### **Tackling the obesity epidemic**

Australian health authorities first became aware of the problem in the 1970s, but there was little response from governments until 2002, when the state and federal health ministers set up a National Obesity Taskforce, composed of doctors’ groups, consumers’ associations, retailers, food industry bodies, sporting bodies and others. The aim of this taskforce was to develop a national action plan for tackling the increasing incidence of overweight and obesity in Australia. In 2003, the task-force released its National Action Agenda for children and young people and their families in their paper *Healthy Weight 2008, Australia’s Future*. This action plan focuses on promoting healthy weight strategies for young people. It is hoped that this, in turn, will lead to less overweight and obesity issues across the population into the future. However, while this is a positive long term strategy, it does not address the problems associated with existing overweight and obesity levels. In 2004 the federal government committed \$116 million over four years for programs aimed at families and schools to promote nutrition and physical activities. The Australian government has also made changes to Medicare so that GPs can refer people with chronic illness due to obesity to an exercise physiologist and dietitian and get a Medicare rebate. But so far these measures are having no perceptible effect on obesity levels.

A report by Murphy and Yates<sup>50</sup> published in *APJCN* in 2005 on the economic comparisons of weight loss programmes versus drug treatments for the management of obesity concluded that weight reduction programs (like *Weight Watchers*) are far more economic than weight loss pills and that the government should spend more budget dollars on the former rather than the latter. However, the costs were based on a 3 month *Weight Watchers* program versus a 12 month supply of a weight loss drug like *Rimonabant*. It was not clear from this report if a 12 month weight reduction program would have similar costs to a 12 month supply of weight loss medication. Encouraging more and more WMCACA approved (*Weight Management Code Administration Council of Australia* -



www.weightcouncil.org) commercial weight management programmes with built in maintenance strategies for the long term are desirable. Translating a short-term weight reduction into a lasting control of weight relies on permanent changes in behaviour in areas such as diet, physical activity and cognitive restructuring. Well-known weight reduction programs such as Weight Watchers aim to achieve permanent changes in behaviour. For this reason, Yates and Murphy 2006<sup>48</sup> estimated the expected benefit per enrolment in a 3 month Weight Watchers Program to be \$690 with an associated program cost of \$202 per enrolment. This calculation takes into account that only 20% of dieters will maintain a weight loss of 10% in the long term. Even so, the benefits of this weight loss program far outweighs the costs.

Health economist, Paul Gross<sup>6</sup>, from the Institute of Health Economics and Technology Assessment claims there is too much reliance on health workers to treat the problem, especially GPs, who have not been given additional resources to manage obesity outside a typical doctor's consultation. He suggests that GP's, as health coaches, could become more effective agents of behavioral change if they also receive appropriate incentives beyond the Medicare fee-for-service rebate. Gross has recommended that further changes should be made to Medicare, private health insurance, and workplace and tax legislation to give people financial incentives to change their behaviour because obesity should not just be treated by governments as a public health problem but also as a barrier to productivity and a drain on resources. While medical savings accounts that provide incentives to young households are one promising vehicle, government subsidies for weightloss programs such as Weight Watchers and PBS subsidies for some anti-obesity drugs may now be justified.

*Gross says governments should consider<sup>6</sup>:*

- 1) giving employers financial incentives to offer nutrition and weight loss programs to employees, in exchange for a cut in the corporate tax rate; improve national productivity via workers' compensation arrangements
- 2) allowing private health funds to give subsidies or discounted premiums to members who enrol in such programs and maintain their weight loss (measures not allowed at present under the community rating system) - funds could encourage personal responsibility in risk factor reduction, particularly obesity.
- 3) Pharmaceutical Benefits Scheme (PBS) subsidies for selected weight loss drugs for people who are seriously obese, where considered appropriate by their doctors;
- 4) Medicare rebates for accredited weight loss programs.

*For the workforce Gross proposes the following:*

- 1) better measurement of the health of the Australian workforce using confidential data generated by a secure linkage of Medicare, health insurance and workers' compensation insurance claims databases;
- 2) assessment of the potential role of Medicare and new forms of health insurance that would provide incentives to the workforce to reduce their personal risk factors (including overweight and obesity);
- 3) systematic reform of the workers' compensation

arrangements using tax credits for employers who either provide weightloss programs at the workplace or who embed within employee compensation schemes incentives to workers to reduce their risk factors.

Gross is calling for a new body, a National Council on Obesity and Chronic Disease, to oversee a properly funded, targeted national policy, reporting directly to federal Cabinet.

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