

Submission No. 113

(Inq into Obesity)

JAC 4/7/08



Our Ref: 08/285

Committee Secretary  
Standing Committee on Health and Ageing  
House of Representatives  
PO Box 6021  
Parliament House  
CANBERRA ACT 2600

The Secretary,

**Re: CSIRO's Submission to Inquiry into Obesity in Australia by the House of Representatives Standing Committee on Health and Ageing.**

We thank you for the opportunity to provide a submission to the Inquiry into Obesity in Australia by the House of Representatives Standing Committee on Health and Ageing. The attached comments are written with an understanding that CSIRO is actively undertaking research of particular relevance to address the issues of overweight and obesity in Australia.

CSIRO is committed to delivering sustainable economic, social and environmental solutions to current and emerging issues affecting society, industry and the environment. CSIRO's cross disciplinary approach, embodied by programs such as the Preventative Health National Research Flagship, provides the platform to address some of Australia's biggest, most complex problems, including that of overweight and obesity.

Overweight and obesity must be viewed as a societal problem that affects not just the individuals concerned. It is important to note that there is no "silver bullet" solution and the complexity of the problem requires a cross disciplinary approach that encompasses capabilities across Australia's innovation system.

In addition to our submission, where we strongly argue the case for greater capability coordination, CSIRO would also be willing to provide a private technical brief to the committee.

Please do not hesitate to contact me or the main submission contact should you require any further information.

Yours sincerely

A handwritten signature in black ink that reads "Joanne Daly". The signature is written in a cursive, flowing style.

Dr Joanne Daly  
Group Executive  
CSIRO Agribusiness

23 June 2008



**CSIRO Submission 08/285**  
**Inquiry into Obesity in Australia**  
**June 2008**

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# Executive Summary

Overweight and obesity have arisen as a societal problem because of a trend to greater consumption and lower exercise patterns in the population. Over the past 20 years, this has led to an increase in the Australian population's average adult weight of 4 kilograms. This population weight gain has resulted in greater prevalence of chronic diseases including cancer and cardiovascular diseases with consequent increases in treatment costs. The peak prevalence of overweight and obesity is expressed in the middle years of 55-64 years. As the average age of the population of Australia is increasing, the consequences of overweight and obesity will incur increasing substantial health costs and productivity losses, even if the increase in overweight and obesity is arrested. Defining the problem as "obesity" may not be the most productive approach as many in the community do not recognise that they are overweight or obese. Further, this narrow definition of the "problem" may indeed be counter productive to finding effective solutions that arrest excess weight gain in the community.

CSIRO research suggests that efforts to address the overweight and obesity problem should be directed into 4 key areas:

- **Surveillance:** Develop innovative mechanisms for the capture of key data across Australia relating to food intake and physical activity behaviours including the collection of biological data and medical management. This regular national monitoring of health, nutritional and energy intakes, lifestyle behaviours and energy expenditure on a regular (3-5 yearly) basis would provide the necessary foundation on which to evaluate prevention initiatives. Additionally, the introduction of regular weight monitoring within the healthcare system that encourages tracking of body weight may assist in alerting individuals of the importance of the issue where currently many do not recognise excess weight as a significant health problem.
- **Prevention:** Rational resource allocation and engagement in the primary prevention of the consequences of obesity is critically hampered by a lack of community awareness of excess weight as a society problem as well as a lack of cost-effective approaches to weight gain prevention. Hence there is an urgent need to both raise this awareness as well as develop an evidence base for lifestyle interventions that target both weight and disease risk management. Reframing the problem by avoiding the use of the negative term "obesity" may assist in greater personal ownership general excess weight and overconsumption as the main driver of our societal problem. Additionally, the potent effects of lifestyle management that promotes weight loss, healthy diet and appropriate physical activity is generally underestimated and underutilised. There are many lost opportunities within the public healthcare system where lifestyle strategies are either not addressed or are given a token recognition.

Healthy lifestyle education and regular measurement and tracking of body weight needs to be part of standard healthcare delivery. Examples would be in routine antenatal and post partum care, at the 4 year old and 45 year old Medicare Health Check. Including weight and healthy lifestyle checks within the National Breast Screen Program and Colon Cancer Screening Programs are strategies that exploit existing prevention initiatives. The inclusion of evaluation and economic modelling of the cost effectiveness of these approaches is vital. Engaging in partnerships with the health, food and pharmaceutical industries in innovative workable, commercial solutions may be productive. Examples may include incentives for industry to invest in research and development which aims to reduce the kilojoule density and improve the nutrient density of foods.

- **Control:** As the numbers (and proportion) of individuals in middle age is increasing with the advancing age of the population, identifying those at high risk of chronic disease may be both a control and preventative strategy to delay morbidity and associated costs. Evidence of cost effective targeted programs is needed prior to investment at a national level. Programs for those in lower socioeconomic groups may need particular attention. Research funding pathways for such activity will be vital.

- **Coordination:** Addressing the increasing excess weight in the population will require an urgent cultural shift in eating and exercise behaviours at the population level, in addition to control strategies. Producing such a shift will not be easy and will require the coordinated effort of many federal agencies. It cannot be achieved through a fragmented, piecemeal approach. For this reason, CSIRO suggests establishing an alliance between all the major Federally (Appropriation) funded agencies in human health which have responsibilities relating to obesity and expertise relevant to addressing the problem. Drawing on the successful National Research Flagship model, such an alliance could draw on the substantial strengths of existing capabilities in an integrated, synergistic approach to controlling overweight and obesity through Surveillance, Prevention and Control strategies.

# Introduction

CSIRO is Australia's National Research Agency that helps offer Australia appropriate solutions to current and emerging issues affecting society, industry and the environment. We conduct strategic and applied research that delivers economic, environmental and social benefits for Australia. We have contractual interactions with the food industry, pharmaceutical industry and Government agencies, both State and Federal, in the areas of human health including research based activities in relation to obesity. This places CSIRO in a unique position to facilitate mediating dialogue as well as implementing strategic initiatives between industry, State and Federal Governments, universities and public health groups, which is critical for success. CSIRO places utmost importance on its reputation and integrity to benefit its primary stakeholder, the Australian public.

CSIRO has historically been a major source of nutritional research activity in Australia and has provided key information over many years to society, the biomedical community and industry to assist in identifying the beneficial effects of food in relation to human health. Specifically, in areas of cardiovascular disease and more recently, diabetes and cancer, we have been and are committed to research that leads to impact. This often requires *translation* of research findings to the general population, as well illustrated by CSIRO's Total Wellbeing Diet which has sold over 1 million copies and, more importantly, has encouraged thousands of overweight Australians to reduce weight and improve food choices. The extent to which we believe obesity is a major problem that needs attention and focus is reflected by CSIRO's creation of an Obesity Theme in its Preventative Health Flagship and a great deal of the content of this submission reflects our current thinking in this area.

Currently the Obesity Theme aims to contain the social and economic burden of obesity primarily through translational science. Specifically we are developing cost effective targeted lifestyle programs with a focus on weight management in those most at risk of the consequences of excess weight. This entails 3 streams of activity with outputs integrated with public and private sector stakeholder engagement and strategic communication to achieve impact.

These three streams are:

## **1. LIFESTYLE PROGRAMS FOR ADULTS**

- Weight Management and Cardiovascular Disease (CLIP Program)
- Weight Management and Reproductive Health
- Weight Management and Type 2 Diabetes
- Weight Management for the Metabolic Syndrome (CSIRO Total Wellbeing Diet)

## **2. LIFESTYLE PROGRAM FOR CHILDREN AND FAMILIES**

- Obesity Prevention and management for children and families

## **3. NOVEL PHARMACEUTICALS, FOODS OR FOOD SUPPLEMENTS FOR WEIGHT MANAGEMENT**

We are also currently engaged in the National Children's Nutrition and Physical Activity Survey ("Kids Eat Kids Play"), conducted for the Australian Government Department of Health and Ageing involving collaboration between CSIRO and key Universities.

# Overview of Obesity

## Definition:

Obesity is defined as a body mass index (BMI) of 30 kg/m<sup>2</sup> or more. (A BMI of 25 kg/m<sup>2</sup> or higher is classified as overweight).

The BMI is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults (Table 1). BMI is defined as the weight in kilograms divided by the square of the height in metres (kg/m<sup>2</sup>). For example, an adult who weighs 70kg and whose height is 1.75m will have a BMI of 22.9.

$$\text{BMI} = 70 \text{ (kg)} / 1.75^2 \text{ (m}^2\text{)} = 22.9$$

**Table 1: The International Classification of adult underweight, overweight and obesity according to BMI** (Adapted from WHO, 1995, WHO, 2000 and WHO, 2004).

Classification	BMI (kg/m <sup>2</sup> )	
	Principal cut-off points	Additional cut-off points
<b>Underweight</b>	<b>&lt;18.50</b>	<b>&lt;18.50</b>
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
<b>Normal range</b>	<b>18.50 - 24.99</b>	<b>18.50 - 22.99</b>
		<b>23.00 - 24.99</b>
<b>Overweight</b>	<b>≥25.00</b>	<b>≥25.00</b>
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
<b>Obese</b>	<b>≥30.00</b>	<b>≥30.00</b>
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different ethnic populations due, in part, to different body proportions. Furthermore BMI does not provide a robust indication of body fatness which is better represented by measures of waist circumference (Table 2).

**Table 2: Waist circumference and health risks (WHO Expert Consultation, 2004).**

	<b>Female Waist Circumference</b>	<b>Male Waist Circumference</b>
<b>Normal (Target)</b>	<ul style="list-style-type: none"> <li>• less than 80 cm for Caucasians, south Asians, Chinese</li> <li>• less than 75cm for Japanese women</li> </ul>	<ul style="list-style-type: none"> <li>• less than 94 cm for Caucasians</li> <li>• less than 90cm for south Asians, Chinese</li> <li>• less than 85cm for Japanese men</li> </ul>
<b>Increased Risk of Health Complications<sup>1</sup></b>	• 80–88 cm	• 94–102 cm
<b>Substantially Increased Risk of Health Complications<sup>1</sup></b>	• more than 88 cm	• more than 102 cm

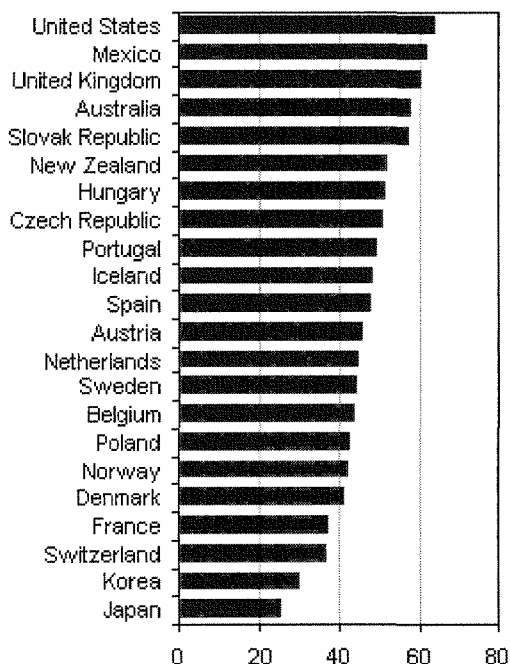
<sup>1</sup>relates to Caucasian data only as no non Caucasian data available

### What is the problem worldwide?

Increasing excess weight is a global problem for both western economies as well as emerging economies such as India and China. Overweight and obesity account for an estimated 8%-15% of the burden of disease in industrialised countries, while high cholesterol accounts for 5%-12% (WHO, 2002).

There are differences in prevalence and rate of increase most likely related to cultural factors as well as economic factors. Australia ranks amongst the most obese countries globally.

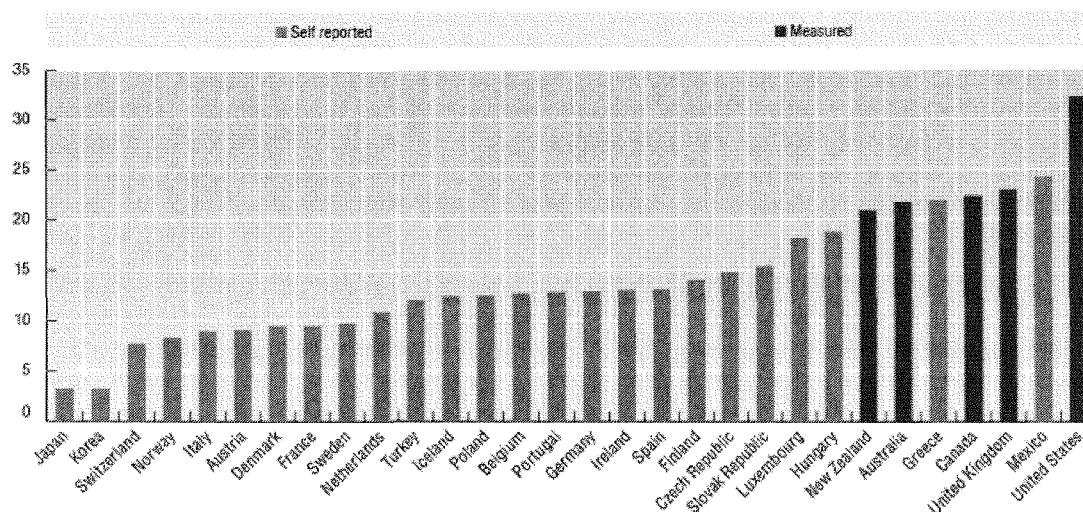
Recent Australian data indicates that at 2005 Obesity rates in Australia had increased to 26% (Figure 1). This is still below the US prevalence of 34% which now appears to have stabilised.



**Figure 1.** Percentage of obese plus overweight population by country (OECD Health Statistics, 2004).



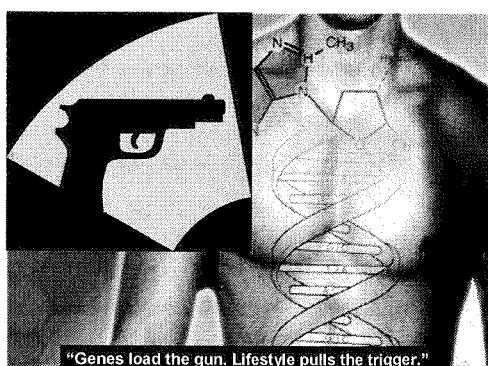
The most recent OECD data (published 2008) on obesity available is as below demonstrating that the US prevalence is significantly higher than Australia. The Australian data is far from robust and is lower than more recent estimates from self reported data.



### Causes of overweight and obesity

To say that weight gain and obesity are caused by consuming more calories than the body needs, whilst true, is not a useful description of the problem. The imbalance between calories consumed and calories burned can be caused by a number of genetic, hormonal, behavioural, environmental and societal and cultural factors.

Obesity is not simply a behavioural issue. Researchers are on the forefront of medical research into the mechanisms of metabolism and hunger and appetite regulation and their connection to obesity. CSIRO has conducted studies in this area and demonstrated that in some at risk groups the control of hunger and appetite may be impaired (Moran 2004). An individual's environment and culture may also affect the development of obesity. There is also an inherited genetic predisposition for obesity. Twin studies show that twins reared apart resemble each other and their biological parents rather than their adopted parents showing that a major influence on body weight is genetically determined. Some genes and hormones, including leptin, have been identified as playing a role. There are more to be found that may offer new opportunities and this work promises to reveal why some individuals may find weight management challenging whilst others may not. It has been suggested that whilst genetic factors load the gun, "lifestyle [factors] pulls the trigger".



While there is clear evidence that obesity is inherited and that obese people tend to have obese offspring, the incidence of obesity is increasing. This is partly due to the reduced need for physical activity in the work place and to excess food consumption driven by the continuous availability of high kilojoule foods. However there are also likely epigenetic changes (changes in which the environment modulates DNA to cause a permanent change in gene expression) that influence body weight and feelings of hunger, fullness and satisfaction after eating could have a major influence mediating part of the increased incidence of disease. These

changes are imprinted early in life. The metabolic environment of the foetus and patterns of feeding in the early postpartum period can affect metabolism throughout the lifetime ("imprinting") and surprisingly even in further generations. Patterns of appetite regulation, of food preferences,

and of physical activity can be influenced early in life. This has been experimentally demonstrated. Animals fed a high kilojoule diet early in age become obese and later defend that obesity when fed a normal diet. Starvation in early pregnancy also results in offspring with a propensity for obesity. Thus insufficiency and abundance during development both lead to obesity in adult life. What are these epigenetic changes that mediate this disease? How can they be influenced? Excess pregnancy weight gain has been identified as a risk factor for long term BMI (Amorim, 2007). Studies strongly support education during preconception regarding the importance of optimal BMI at the start of pregnancy to help to achieve better pregnancy outcomes in obese and overweight women (Jain 2007). These types of studies indicate the critical need to target prevention programs prior, during and after pregnancy as in early childhood.

While there have been major advances in the past 5 years on understanding energy metabolism and appetite, we are still profoundly ignorant of the molecular details involved. The fundamental inability to control intake of freely available food is central to the problem and recent research has suggested that there are analogies to drug addiction (Volkow & Wise, 2005). Understanding why it is often difficult to control consumption may shift our approach to weight management from a model defined by exerting "self control" to a more sophisticated understanding of how characteristics of certain foods may drive compulsive eating in susceptible individuals. This may be exacerbated in those who are experiencing stress and may be one explanatory factor in why obesity is overrepresented in lower socioeconomic groups. The role of stress and its interaction with sleep disturbances which are in turn associated with greater fatigue, daytime sleepiness (Vgontzas 2008) and increased hunger (Knutson 2007) provide a vicious cycle that further fuels obesity.

An economic challenge to Australia is the cost of pharmaceutical treatment for obesity. Whilst the search for solutions is often focussed on drugs that affect metabolic pathways or appetite regulation, it is possible that drugs that modulate stress and its consequent food seeking behaviour may be promising. While this is probably insignificant compared to the challenges facing us in treating the diseases caused by obesity and their associated complications, a drug might have Pharmaceutical Benefits Scheme (PBS) subsidy costs in excess of those associated with cholesterol lowering drugs which cost the PBS in excess of 1 billion dollars annually. If Australia were to develop such a drug this would have high impact and potential global sales.



Surveys in 1977-78 and 1983.

**When body mass index was calculated from data collected in 2004-5, 62% of men and 45% of Australian women were classified as being in the overweight or obese groups.**

## What is the current situation in Australia?

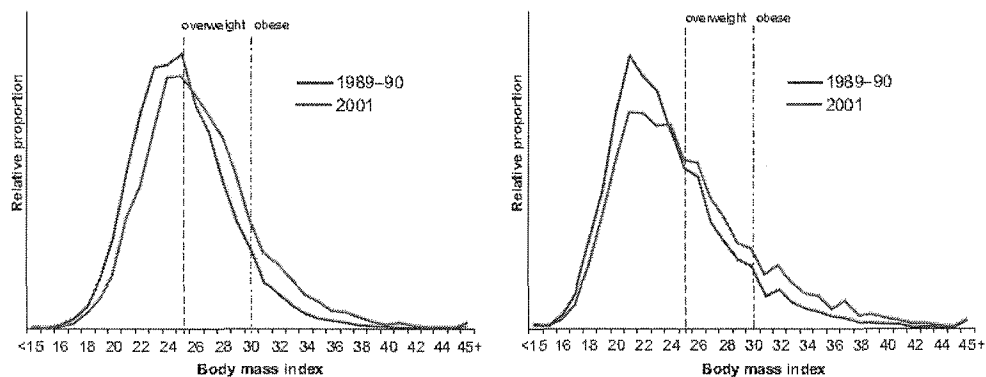
### Obesity Statistics

**Obesity is not a "new" disease with information dating back 30 000 years ago** showing prehistoric statuettes, including the famous Venus of Willendorf, depicting anatomically accurate abdominally obese women. However, in recent decades there have been increases in the proportions of the population that are classified as either overweight or obese and this has extended to children as well as adults.

The Australian Bureau of Statistics has undertaken triennial health surveys from 2001 and has documented **self-reported** weight and height from nationally representative samples. This data includes very limited information on food intake such as vegetable intake. National Health Surveys were conducted in 1989-90 and 1995, and prior to that as Australian Health

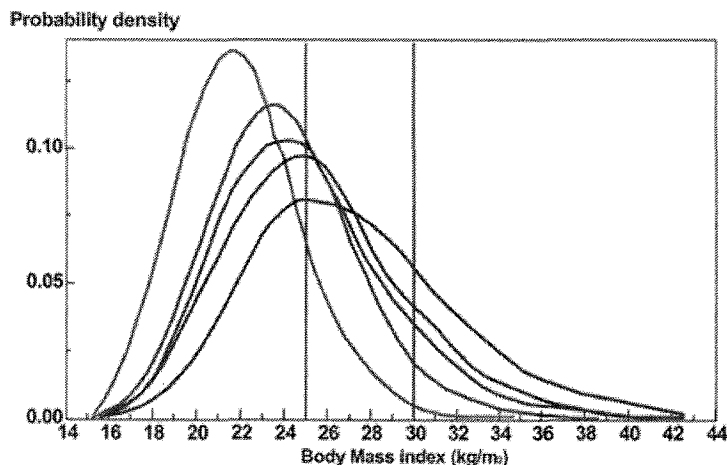
**However, there was a lack of awareness of excess weight by individuals as only 32% of men and 37% of women assessed themselves as being overweight.**

For both men and women the proportions classified as overweight or obese were highest in the middle age groups (72% of men and 58% of women aged 55 to 64 years were overweight or obese). Furthermore the proportion of adults classified as overweight or obese had increased over the previous ten years: for men from 52% to 62% and for women from 37% to 45%.



**Figure 2.** Change in distribution of BMI for males (left) and females (right) from 1989 to 2001 (O'Brien & Webbie, 2003).

The data presented in Figure 2 echoes what we see below in Figure 3 from the work of Geoffrey Rose (Rose 1991) which shows that there is a close associations between the population average of BMI and the prevalence of overweight and obesity. Rose concluded that “the frequency of “cases” can be understood only in the context of a population’s characteristics. The population thus carries a collective responsibility for its own health and well being, including that of its deviants.” In other words, although we may ascribe overweight and obesity as a black and white “problem” for those individuals with the “condition”, the reality is that the problem lies in the average weight of the population which requires a small downwards shift for all.

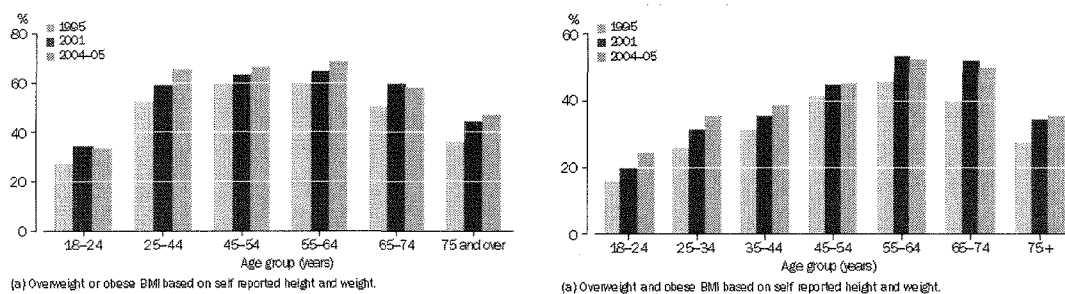


**Figure 3.** The relationship between the shift in BMI distributions and the increasing prevalences of overweight and obesity (Rose, 1991).

The data in Figure 4 below show that excess weight also tends to increase with age, peaking in the 55-64 year age category. In addition, there has been an increase in the population weight over time, which differs in magnitude depending on age and gender category. It has been estimated that on average, women in 1999 weighed 4.8 kg more than their counterparts in 1980 and men 3.6 kg more. Data from the

National Dietary Survey of Adults and the National Nutrition Survey, respectively, indicated that energy intake increased by around 350 kilojoules per day for adults aged 25–64 years living in state capital cities between 1983 and 1995 (Cook et al. 2001). The weight gain represents 51.6 million excess kilos which if translated in food terms could feed an additional 460 people for 1 year.

The latter point highlights that causal factors in the increasing prevalence of overweight and obesity may lay in society as a whole rather than only in those afflicted.



**Figure 4. Overweight or obesity prevalence by age category in men (left) and women (right) between 1995-2004** (Australian Bureau of Statistics Cat no 4102.0).

#### Data Limitations

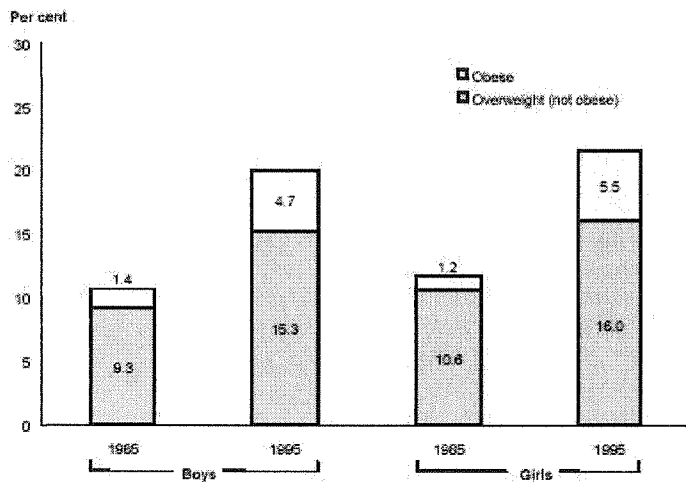
It must be noted that there are significant limitations to Australian national data available on food intake, weight and health status. The last comprehensive survey of adult dietary intakes was conducted in 1995. Unlike the US National Health and Examination Survey which is conducted every 5 years, Australia does not have objective diet and health monitoring and surveillance. As such, it is not possible to track reliably over time the relationships between food intake, body weight and health status. This is a key reason for a commitment to **regular national monitoring and surveillance** of measured weight and body composition.

At present the CSIRO, in conjunction with the University of South Australia and Flinders University, is completing a long overdue national survey of body weight, physical activity and dietary intakes in children. These data will be available in July 2008.

Data from other state-based surveys in children indicate that the increase in overweight and obesity may have slowed and this is consistent with data from the US. However, the fact remains that one in five Australian children are overweight or obese – an alarming statistic.

Details of past national surveys, as below, show that the picture for children is not any more optimistic than for adults (Figure 5).

- 15.3% of boys and 16.0% of girls (aged 7–15 years), were overweight in 1995, compared to 9.3% of boys and 10.6% of girls in 1985
- 4.7% of boys and 5.5% of girls (aged 7–15 years) were obese in 1995, compared to 1.4% of boys and 1.2% of girls in 1985
- 21.5% of girls and 20% of boys were either overweight or obese in 1995
- from 1985 to 1995 the prevalence of obesity alone among 7–15 year-olds more than tripled.



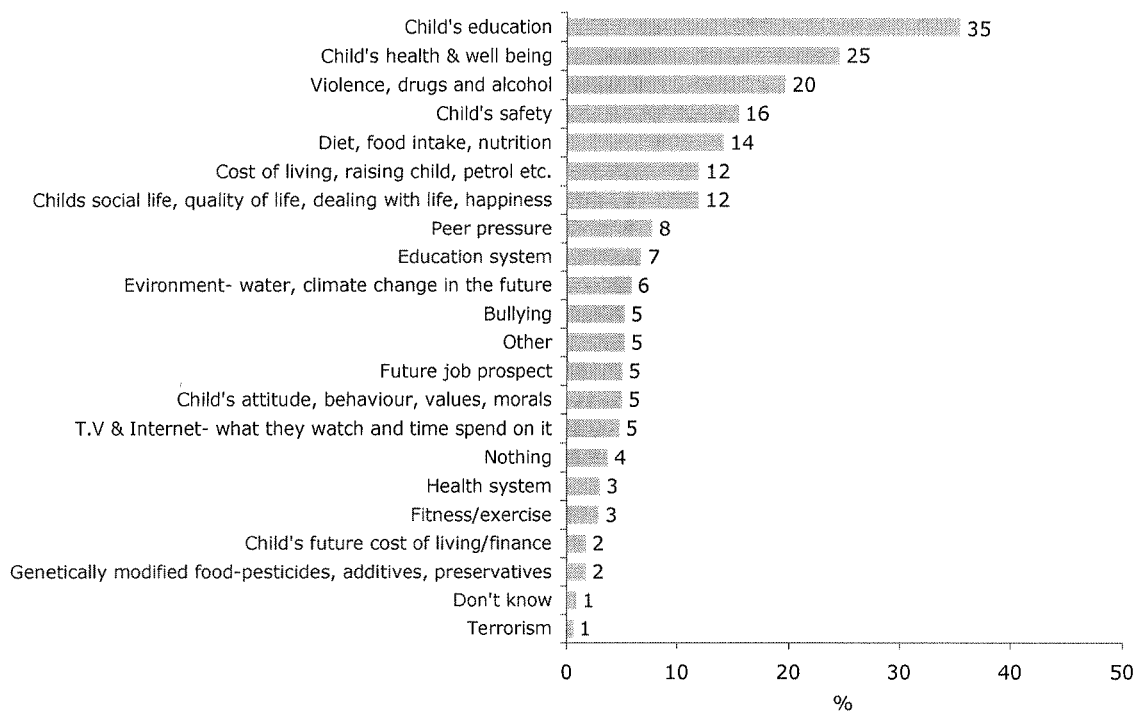
**Figure 5. Prevalence of overweight and obesity among boys and girls aged 7-15 years between 1985-95 (Magarey et al., 2001).**

### Obesity and socioeconomic status

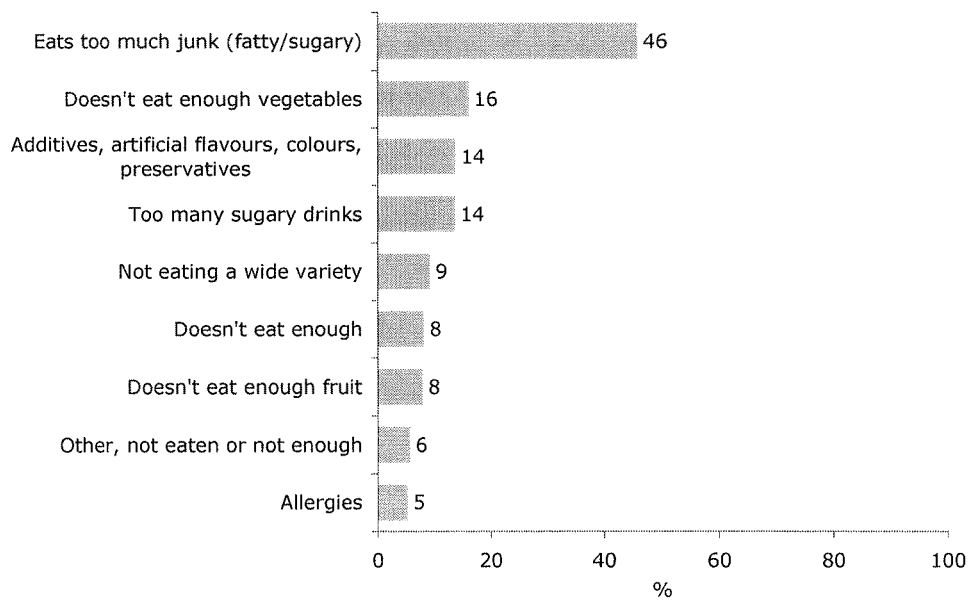
While rates of obesity are generally increasing across the entire population, certain groups appear at higher risk. These include **children, young adult women, and people** with low education, low incomes, or low status occupations). These groups are also less likely to perceive themselves as overweight or obese (O’Dea, 2008). **Indigenous Australians and Middle Eastern/Arabic and Pacific Islanders** are specific at risk groups that warrant particular focus in obesity prevention efforts.

#### *Parental Concerns about Obesity, Food Intake and Physical Activity*

A nationally representative survey of 1202 Australian parents/caregivers conducted in December 2007 by CSIRO, suggests that parental concerns relate predominately to the education and health of their children. Diet or nutrition was mentioned specifically by only 1 in 7 parents/caregivers, and very few mentioned exercise / fitness. Obesity was not mentioned spontaneously as an issue. The results of the survey is summarized below.



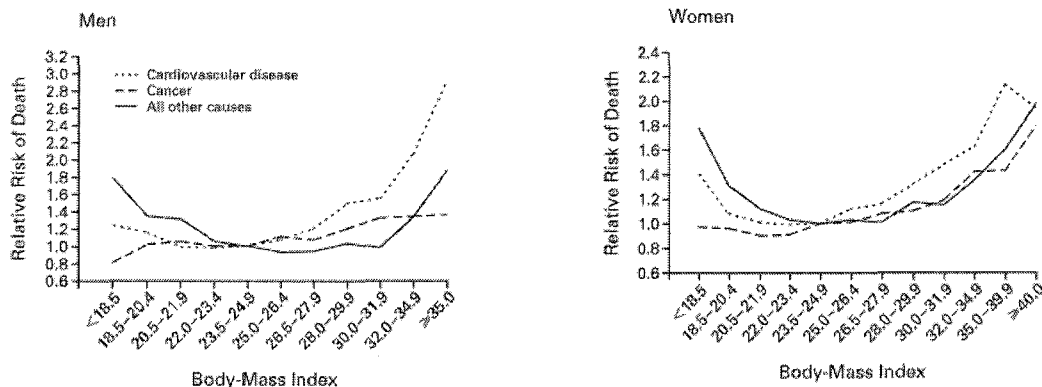
With respect to the concerns regarding food intake, parents/caregivers are more concerned about factors perceived to be external, such as eating too much junk food.



# Why is Obesity a Problem?

## 1. Health risks

The health risks associated with increasing BMI are continuous, as noted in Figure 6. Hence, to describe obesity as the “problem” does not take account of the fact that health risks relate to the overweight category as well as the obese categories. In this submission we will discuss both overweight and obesity.



**Figure 6. Multivariate relative risk of death from cardiovascular disease, cancer, and all other causes** (Calle et al., 1999). The reference category was made up of subjects with a body-mass index of 23.5 to 24.9kg/m<sup>2</sup> (*Centers for Disease Control and Prevention: National Center for Chronic Diseases Prevention and Health Promotion*).

Overweight and obesity are associated with significant medical problems that affect individual quality of life for adults and children, as well as incurring costs associated with managing health problems. Overweight and obese people are at an increased risk of developing the conditions identified in the box below:

<b>Cardiovascular disease</b> <ul style="list-style-type: none"> <li>● Hypertension</li> <li>● Hyperlipidemia</li> <li>● Myocardial infarction</li> <li>● Stroke</li> </ul>	<b>Gastrointestinal disease</b> <ul style="list-style-type: none"> <li>● Fatty liver</li> <li>● Cirrhosis</li> <li>● Gastroesophageal reflux</li> <li>● Gallstones</li> </ul>
<b>Diabetes</b> <ul style="list-style-type: none"> <li>● Type 2</li> <li>● Type 1</li> </ul>	<b>Osteoarthritis</b>
<b>Cancer</b> <ul style="list-style-type: none"> <li>● Breast</li> <li>● Endometrium</li> <li>● Colon</li> <li>● Prostate</li> <li>● Other</li> </ul>	<b>Alzheimer's disease</b>
<b>Pulmonary dysfunction</b> <ul style="list-style-type: none"> <li>● Obstructive sleep apnea</li> <li>● Hypoventilation syndrome</li> </ul>	<b>Increase in surgical risk</b>
	<b>Fertility and pregnancy problems</b>
	<b>Physical discomfort</b>
	<b>Depression</b>
	<b>Suicide</b>

Of particular concern is that overweight and obese women are also more prone to infertility and may require assisted reproduction technologies such as in vitro fertilisation (IVF). CSIRO in conjunction with the University of Adelaide has conducted extensive studies in young women of reproductive age, demonstrating that weight loss can markedly restore reproductive performance. It has been shown that the most important single method to improve reproductive performance in these women is weight loss, which can be achieved with lifestyle changes and diet. If women conceive when obese, this can lead to a cycle of obesity in their offspring. There is

pressure on Government to tackle the emotive issue of childhood obesity, and evidence based programs will serve a much needed gap in guiding cost effective service delivery. A recently completed study by CSIRO and the University of Adelaide has shown that weight management in overweight/obese women even as part of IVF treatment can lead to improved rates of conception. This has both significant potential social and economic benefits.

Children who are overweight in childhood are more likely to be so in adulthood. Quality of life for children starts to decline as soon as children are over the average weight and it continues to decline the heavier they are. Low self-esteem and poor health became an issue as soon as children are above the accepted weight level. Evidence suggests that obesity is associated with higher frequency of disability pension (Neovius 2008) and hence poorer employment prospects. There are few validated programs for the management of excess weight in children and families and no cost effectiveness data is available.

## 2. Increased health costs

The costs of obesity (not including overweight) in Australia have been estimated by Access Economics in 2005 to be \$21 billion - double the cost that Government provides for Medicare. These costs include cost to the individual of not being able to work, cost of carers being out of the workforce, pension costs, cost to the economy generally of decreased productivity, as well as direct costs of medical intervention.

This report estimated that:

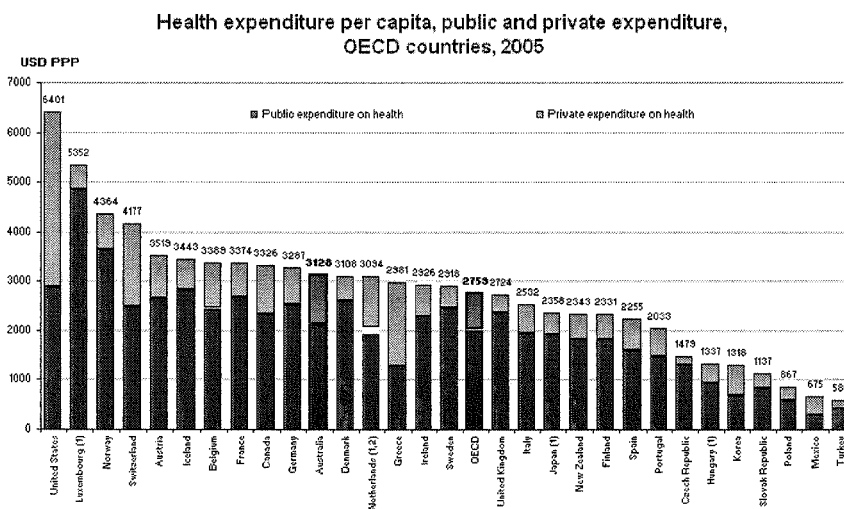
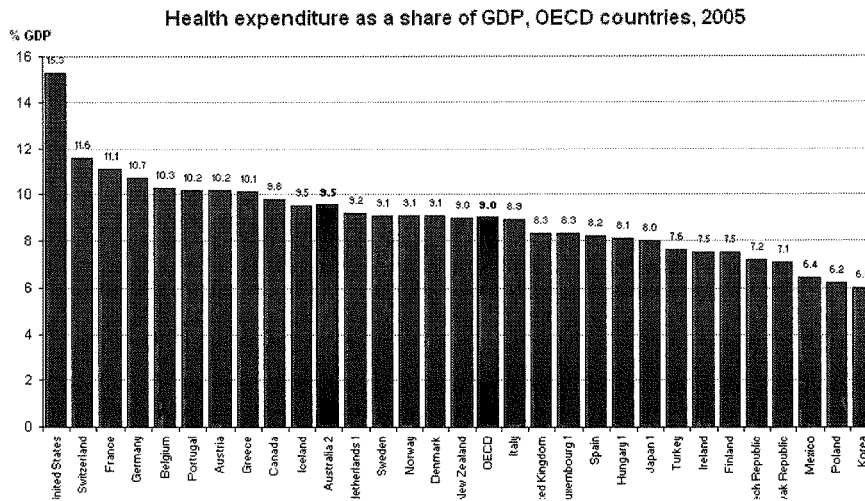
- 102,204 Australians had Type 2 diabetes as a result of being obese (10.8% of all people with Type 2 diabetes);
- over 379,00 Australians had CVD as a result of being obese (obesity causing 14% of hypertension, 12% of CHD and 12% of stroke);
- over 225,000 Australians had osteoarthritis as a result of being obese (14% of all people with osteoarthritis); and
- 20,430 Australians had cancer as a result of being obese (obesity)

Cardiovascular disease generated the highest costs of any disease group, \$12.6 billion, followed by cancers, \$3.9 billion, and diabetes \$2.3 billion. The net cost of lost wellbeing (the dollar value of the burden of disease, netting out financial costs borne by individuals) was valued at \$17.2 billion. These are conservative estimates as the impact of overweight was not assessed. A substantial portion of obesity costs consists of direct financial costs to the health care system. For example, of total costs estimated at A\$3.7 billion in Australia, direct costs make up A\$870 million, or almost one quarter (Access Economics, 2006).

The future role of government in regulation, investment and promotion of good health is likely to change. Healthcare spending in 2004 in Australia (69% of which is publicly funded) was 9.5% of GDP. A recommendation of the OECD Report "Towards High Performing Healthcare Systems" recommends reallocations of health-system resources from cure to prevention.

**Australia** also ranks above the OECD average in terms of total health spending per capita, with spending of \$2876 USD in 2003 (adjusted for purchasing power parity), compared with an OECD average of 2550 USD (Figure 7).





**Figure 7. Health expenditure per capita, public and private expenditure, OECD countries 2005** (OECD Health Data 2007, July 2007). Data are expressed in US dollars adjusted for purchasing power parities (PPPs), which provide a means of comparing spending between countries on a common base. PPPs are the rates of currency conversion that equalise the cost of a given 'basket' of goods and services in different countries.

### 3. Decreased Productivity

Productivity is, in the long term, the key to building a more internationally competitive economy – one that can produce more output from its existing resource base. Australia was ranked behind 14 other OECD nations in the OECD comparison of whole economy productivity levels in 2006. The Productivity Commission has estimated that health conditions (most of which are related to obesity) such as cancer, cardiovascular, mental and nervous conditions, injury and diabetes, reduce labour force participation rates by between 12 and 40 per cent. Obesity and being overweight during adulthood have been consistently linked to increased risk for development of dementia later in life, especially Alzheimer's disease. They have also been associated with cognitive dysfunction and brain structural alterations in otherwise healthy adults.

The annual productivity loss from obesity-related illness is estimated to be approximately \$1.7 billion. The Productivity Commission has also estimated that with modest investments in health promotion and prevention, as many as 175,000 additional people could be in the workforce by 2030. This represents an increase of around 0.6 of a percentage point in the workforce

participation rate – a substantial increase at a time of significant skills shortages around the country.

#### 4. Greenhouse Gas Emissions

One socio-economic implication of obesity is that it reduces passenger vehicle fuel economy (i.e., the miles per gallon achieved by automobiles, which include cars and light trucks driven for non-commercial purposes). Research indicates that in the US, since 1988, no less than 272 million additional gallons of fuel are consumed annually due to average passenger weight increases. This number grows to approximately 938 million gallons of fuel when measured from 1960, which corresponds to approximately 0.7% of the nation's annual fuel consumption, or almost three days of fuel consumption by automobiles. Moreover, more than 39 million gallons of fuel are estimated to be used annually for each additional pound of average passenger weight (The Engineering Economist, 2006).

It has also been suggested that obesity epidemic and global warming are linked through energy use. Eggar (2007) has proposed a personal carbon trading scheme aimed at reducing fossil fuel usage could act as a "stealth intervention" for reducing obesity by increasing personal energy use such as walking or cycling. Lenzen and Dey (2002) have estimated that in 1995 greenhouse gas emissions from food consumed in Australia was 6000kg CO<sub>2</sub>-e per person per year.

If we calculate the kilojoules required to maintain a stable body weight for a hypothetical 50 year old male or female as per Table 4 below, we see that as BMI increases from the lean to the obese state there is an increase in 15-17% kilojoules required. If we assume that this increase derives from a cross section of total food intake, this amounts to an extra 900-1020kg extra greenhouse gas emissions per person per year. This is a conservative estimate as we have only considered mild obesity. The corollary of this is that reducing body weight to a healthy range through moderating food consumption may be an important strategy to reduce carbon emissions.

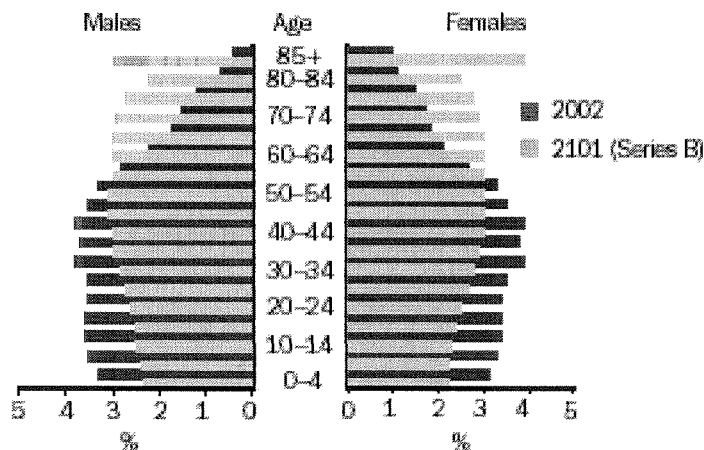
**Table 4: Kilojoules required to be consumed to maintain weight at different categories of weight status.**

MALE <sup>1</sup>				FEMALE <sup>1</sup>			
Weight (kg)	BMI	kilojoules		Weight (kg)	BMI	kilojoules	
75	23	10154		60	22	7809	
80	25	10490	+3%	65	24	8047	+3%
85	26	10826	+7%	70	26	8285	+6%
90	28	11162	+10%	75	28	8523	+9%
95	29	11498	+13%	80	29	8761	+12%
100	31	11834	+17%	85	31	8999	+15%

<sup>1</sup>calculated for a male 180cm in height and female 165cm in height in sedentary state

## What are the implications for Australia? – What is the penalty if we do nothing?

By 2020 more than half of the population of Australia (53%) over 15 years of age will be aged 45 years and over (Figure 8). Because of the increase in excess weight with age, even if the rates of obesity remained stable, the increase in the aging of the Australian population will be a significant factor increasing the numbers of people that will be overweight or obese.



**Figure 8. Predicted changes to population age structure this century**  
 (Population Projections, Australia, 2002-2101, ABS cat. No. 3222.0, 2003)

A baseline prevalence projection by Access Economics (with no further change in age-gender prevalence rates, such that all further increases are due to demographic ageing alone) indicates that by 2025, a total of 4.2 million Australians (16.7% of the population) are forecast to be obese. However, if rates continue to increase at historical rates, there could be as many as 7.2 million obese Australians by 2025 (28.9% of the population). This will place a considerable burden on healthcare costs as well as impact on productivity.

Having sound research to drive healthy weight and healthy ageing to understand what works and why, will become increasingly important as the population ages. Although intentional weight loss by overweight older people is probably safe and beneficial, caution should be exercised. Weight loss diets should be combined with an adequate protein intake and an exercise program to preserve muscle mass. This is because dieting results in loss of muscle as well as fat, and older people have lower muscle mass which requires preservation. Research is also important to support government policy and program managers, service and provider organisations, advocacy organisations, consumers and the wider community to realise the potential of healthy ageing. A well coordinated, targeted national effort that can mobilise capable researchers and research organisations to build the evidence base on healthy ageing and weight management would be advisable.

However, if chronic disease preventative strategies including weight management are implemented in the older population, much of this productivity loss could be reduced and net healthcare costs may be lower. There are international examples of prevention programs that have been highly cost effective, such as in type 2 diabetes prevention through weight management and exercise, which has been shown to be more effective than pharmaceutical management (Crandall et al., 2008). This US program demonstrated that reversion to a normal BMI is unnecessary to achieve these gains. As little as a 4kg weight loss sustained for 4 years was sufficient to achieve a 58% reduction in the development of type 2 diabetes. A cost effectiveness assessment subsequently showed that the lifestyle intervention was estimated to delay the development of type 2 diabetes by 11 years and to reduce the absolute incidence of diabetes by 20% (Herman 2005).

The corresponding figures for the pharmaceutical metformin were 3 years and 8%, respectively. The cost per quality adjusted life year (QALY) was approximately \$US1100 dollars for the lifestyle intervention and \$US31,300 for the metformin intervention. From a societal perspective, the interventions cost approximately 8800 dollars and 29,900 dollars per QALY, respectively. Programs that have demonstrated effectiveness and cost effectiveness are necessary to be

trialled in the Australian context, as merely extrapolating overseas programs to the Australian scenario will have many challenges. Amongst these will be the delivery mechanisms which are unique to the Australian healthcare setting, different social norms in eating and physical activity, amongst others.

## What is the Relationship of Obesity in Australia to the Key Socioeconomic Drivers for the Coming Decades in Australia?

Major characteristics of the Australian population and the relationship between our population and human health have been the substance of Federal Government discussion for some time. These include the Intergenerational Report 2002-3 Budget Paper No. 5, highlighting the significant ageing population of Australia. Consistent with that Report was the PMSEIC Report Promoting Healthy Ageing in Australia which amongst other things drew attention not so much to the issue of individuals in Australia living longer, but rather healthy ageing. As with any population, the draw down on public expenditure in human health is influenced by demographics. The reduction of the standard chronic disorders such as cardiovascular disease and cancer is paramount with an ageing population. The consequences of an ageing population with respect to potential reduced productivity in the work force have also been identified as key issues in Australia. The more recent appearance of obesity in the Australian population may overlay the entire demographic shifts. The consequences could be:

- With an ageing population and with the influence of chronic disease affecting productivity, it is essential that the younger contributors to the population have a capacity for high productivity. This in turn requires optimal health. Early onset of disease as a consequence of childhood obesity will run counter to that position.
- Australia has traditionally been a society where participation in the workforce has been associated with the support of those not in the workforce (e.g. the aged) and the same arguments apply if obesity reduces productivity in the younger working population.
- It also must be remembered that obesity is not an exclusive problem of the young but rather is very prevalent in the middle aged. Obesity of the middle aged provides a setting for further impact of chronic diseases where those diseases are linked to obesity. This has been highlighted in the most recent World Cancer Research Fund Report 2007 (e.g. linking obesity and overweight to numerous cancers).

# What are the current challenges?

## Why is obesity such a difficult problem to deal with?

### **The food and economic environments**

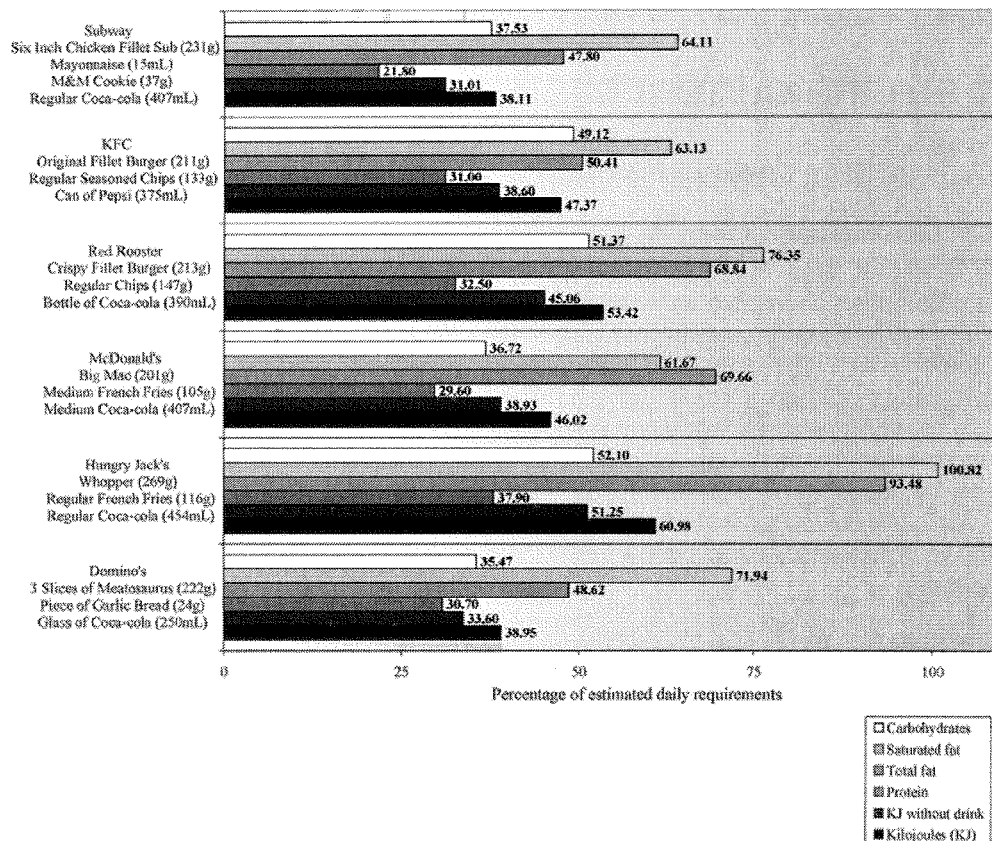
Notwithstanding that there is individual susceptibility to excess weight gain, the obesogenic environment has often been cited as a key factor in developing effective responses to obesity. Modern transport, sedentary occupations, lack of time for food preparation, greater access to food 24 hours a day, increased food portion sizes, increased snacking, low cost of food, increased availability of high kilojoule highly palatable foods are but a few of the many factors which make controlling excess food consumption a challenge. Our culture of convenience has seen an increase in the proportion of food eaten outside the home over the past 4 decades. Whilst high fat foods have often been implicated in contributing to overconsumption, the increased availability of low fat foods in the food supply has apparently achieved little in reducing kilojoule intake. This is likely related to the fact that lower fat foods may still be energy dense and high in kilojoules.

There is evidence that consumers in Australia do read labels for total fat content (Chan, Patch & Williams, 2005) but without a concerted focus on total kilojoules, fat consciousness will do little to stem total kilojoule consumption. Fast food chains, whilst often attempting to cater for a heightened consumer demand for healthier options are also utilising the "fat count" as a marketing strategy.

A CSIRO nationwide study of over 20,527 Australians (Mohr et al., 2007) showed that predictors of more frequent consumption of fast food included: lower age - especially under 45 years; relative indifference to health consequences of behaviour; greater household income; more exposure to advertising; greater receptiveness to advertising; lesser allocation of time for eating; and greater allocation of time to home entertainment. The possibility is that creating a greater awareness of kilojoule content of foods through overt labelling strategies is worth trialling as a potential strategy to alter consumer choice away from energy dense foods.

It has often been assumed that low income groups in whom obesity is overrepresented frequent fast food establishments more often. A move towards healthier options at fast food establishments suggests a cultural shift in the industry and receptivity of the community to such choices. Such data also suggests that advice to curtail fast food intake is unlikely to be successful and that strategies that encourage a metamorphosis of foods available at such outlets to healthier options may be more productive in reducing kilojoules. A CSIRO study by Brindal et al (2008, in press) showed that meals consumed at different fast food outlets can vary significantly in kilojoules content and portion sizes (Figure 9). Selectivity in fast food chain patronage can affect energy intake by 50% and this amount can be halved again through the purchase of a 'healthy' alternative at most fast food chains. Removing a sugar-sweetened beverage also offers an easy way to reduce energy intake from a fast food meal.

Intake of sweetened beverages including fruit juices are amongst the few individual foods that have been associated with overweight and obesity in Australian children (Sanigorski, Bell & Swinburn, 2007), although a recent meta-analysis has cast doubt on this suggestion (Forshee 2008). If, as we propose, excess kilojoules from sweet beverages only affect those with a genetic susceptibility to excess weight gain, we are unlikely to observe strong relationships in a population where consumption of such products is universal.



**Figure 9. Percentage of daily guidelines of macronutrients accounted for by traditional fast food meals** (Brindal et al., 2008).

There have been concerns that trans fats in the food supply may contribute to obesity. Trans fatty acids are produced by the industrial processes of hydrogenation and are naturally present in beef and dairy fat. Evidence from observational studies and one intervention study in primates shows enhanced weight gain and intra-abdominal deposition of fat (Kavanagh, 2007). To what extent this may be a contributor to obesity is not known but in the Australian context, trans fats have been phased out of margarine manufacture. This has been confirmed through clear reductions in the levels of trans fats in adipose tissue in Australians in the late nineties (Clifton, 2004).

Few other foods have been shown to be differentially consumed by lean and obese adults or children, although it has been noted that overweight/obese individuals are more likely to under report dietary intakes. However, the focus on "low fat" options without consideration of kilojoule content will do little to reduce excess energy intake. Hence there a challenge for the food industry is to develop lower energy foods that are acceptable alternatives to the consumer, and result in a demonstrated net reduction in kilojoules and weight. The potential of consumer education on total kilojoules consumed needs validation to determine whether this approach may impact on purchase and consumption behaviour. Innovation in foods for better appetite control, foods with lower energy density and foods with smaller portions are all potentially promising ways that may sustain the competitiveness of the food industry, as advising consumers to "eat less" may not be a palatable option for consumers or commercial interests. Ensuring that such options are environmentally sustainable provides another dimension to this innovation challenge.

## Do we have enough information and is it the “right” information?

Turning the tide of overweight and obesity that has assumed epidemic proportions during the course of the 20th century requires fundamental changes in the social norms that regulate individual and collective behaviours (Rose, 1992). Such changes can only be achieved by wide ranging surveillance, prevention and control strategies. The contribution and cooperation of the public and private sector is needed to address the social norms in part responsible for excess food intake and inactivity. Rational resource allocation and engagement in primary prevention of the consequences of obesity is critically hampered by a lack of cost-effective approaches. Hence there is an urgent need to develop an evidence base for lifestyle interventions that target both weight and disease risk management. The potent effects of lifestyle management that promotes weight loss, healthy diet and appropriate physical activity is generally underestimated and underutilised. There are many lost opportunities within the public healthcare system where lifestyle strategies are either not addressed or are given a token recognition. This may be consequential to the fact that much of the science that has demonstrated the potency of lifestyle change on health has been delivered in clinical research environments and hence may not be considered relevant to the general community. However, translation of this research into community programs is feasible, provided that appropriate multisectoral partnerships are established to ensure a program delivery and support pathway necessary for long term sustainability.

## How can we improve on current programs/initiatives?

Overweight and obesity is not a problem only for those afflicted – it is a societal problem that can only be tackled at a societal level which implies both private and public sector co-operation.

**The key area for attention is an integration of effort in Surveillance, Prevention, Control and Coordination strategies.**

We understand the scale of the problem (i.e. increasing weight at a societal level rather than “obesity” per se). It is clear that excess weight is increasing, and even this is arrested, Australia’s aging demographic will still see an increase in the numbers of individuals who will be overweight or obese. However, the scale of the problem has not sufficiently penetrated the community mindset nor has the community taken ownership of the problem. It is also clear that there is a great deal of excellent work already underway seeking to better characterise the problem identify the primary factors causing it and striving to develop solutions. However, while research is taking place it is often uncoordinated, spread across many players in the innovation system and often lacking effective connections with those who will need to understand and apply the research results if they are to have effect. When research is small scale it is often difficult for it to address problems in an holistic way, especially when dealing with such a complex issue as obesity, which requires a multidisciplinary approach integrating the efforts not just of dieticians and a whole range of medical related researchers, specialists and service providers but also of a wide range of social scientists, community educators and so on. A more integrated approach would bring together the various bodies responsible for funding research and providing guidance to relevant service providers to agree on a forward plan based on agreed outcomes. This could provide a cohesive evidence base, a means for the effective evaluation of research findings and the testing of current models. A greater degree of integration and coordinated planning could also help to develop explicit and effective links between those doing the research and those who will be putting the research findings into practice.

In order to realise the potential of the abovementioned approaches, coordination of effort is critical, particularly in a country with a small population as Australia. Aligning Government policy,

initiatives and programs that may assist in managing excess weight gain in conjunction with surveys that are able to track and evaluate such efforts would be ideal. Targeted research which feeds into this process and provides a basis for rational financial investment would also assist in the process.

Australian government resources are available which collectively could provide a comprehensive effort in:

- Surveillance
- Prevention
- Control
- Coordination

## What would CSIRO Advocate as an Appropriate Approach to the Problem?

### Surveillance

As mentioned, we have relatively poor data in Australia on eating and exercise patterns and how they have changed over time. Australia has conducted only three national surveys of diet in the past 50 years. Any implementation of national approaches to address obesity will need to be tracked for effectiveness – highlighting the need for a national food and physical activity monitoring and surveillance system. Such an approach can dovetail with sophisticated geospatial imaging, which may be able to identify how the built environments in different communities link to average BMI, dietary and physical activity patterns and medical service use. Data linkage such as this provides expansive scope to better understand the drivers of overweight and obesity to identify vulnerable areas that might benefit most from public preventative health and support services.

#### **What would CSIRO Advocate as an Appropriate Approach to Surveillance?**

Regular national nutrition and physical activity surveys are needed to monitor the impact of future interventions as well as to identify vulnerable groups. Innovative mechanisms are possible for the capture of key data across Australia relating to food intake and physical activity behaviours including the collection of biological data. Included in this would be the need to monitor regularly nutritional and energy intakes as well as energy expenditure and weight and height, on a 3-5 yearly basis across the Australian population. Consideration could also be given to critical points of weight monitoring within the healthcare system that encourages tracking of body weight. Engagement and education of General Practitioners to check weight at each GP visit and for hospitals to check weight at each outpatient visit, would be a low cost approach to communicate the importance of the issue to the population. It may also provide an opportunity to consider the possibility for data capture and linkage. Tracking of population attitudes as well as physical data would be helpful.

### Prevention

Secondly, whilst we have robust data on how to manage weight in individuals in the short term, it is clear that ongoing support is necessary for longer term weight loss maintenance.

At the forefront of prevention however is the need to raise the consciousness of individuals on the need to act – both for personal and societal reasons. A clear lack of acknowledgement of personal weight status or that of their children is a likely barrier to engage in lifestyle change. Increasing awareness of weight status whilst managing the risks that may be associated with increasing anxiety will require sensitivity in communication best tackled in adults. Furthermore, it



is likely that once the decision to control weight is made, without support mechanisms, individuals will find sustaining weight loss difficult. The funding of lifestyle coaches is an important step in this direction. However, the implementation of cost effective community based large scale healthy lifestyle and weight management programs needs pilot research before government commits investment to such programs. The reproductive years (18-40) as well as the "middle-aged" 45+ sectors of the community would seem important target groups, as preventing excess weight gain or achieving weight loss in this group would most benefit prevention of chronic disease and maintain productivity.

It is noteworthy that the CSIRO Total Wellbeing Diet, a high protein eating plan for weight control, attained public popularity, selling over 1 million copies in Australia alone. This success suggests that the public are receptive to communication on healthy lifestyles when it is provided by a credible body and the information is presented in a practical and mainstream manner. A study which has evaluated the impact of the CSIRO Total Wellbeing Diet has shown that over 65% of Australians have heard of it and that a projected 500,000 people have claimed to have lost an average of 6 kilograms using this approach. Whilst this is promising, maintaining continued public awareness, motivation and support for weight control is necessary for long term success. An additional initiative in primary prevention is the evaluation of a cardiovascular health weight management program (CLIP) for those eligible for the 45 – 49 year old Medicare health check. This is aimed at being piloted and delivered through telephone counselling in parallel to usual care by GPs. If cost effective in reducing weight and improving health status, such a program could be implemented nationally and funded through the public or private sector.

#### **What would CSIRO Advocate as an Appropriate Approach to Prevention?**

The first step must be to increase community awareness of the problem. Rather than using the term "obesity" with which many do not identify, it may be preferable to reframe the issue around excess weight gain and behaviours that might prevent this. Secondly, a consideration to funding pilot education programs at critical points of the lifecycle that dovetail with the healthcare system. These would include comprehensive healthy lifestyle education and tracking of body weight. Examples would be in routine ante natal and post partum care, at the 4 year old and 45 year old Medicare Health Check. Examples include incorporating weight and healthy lifestyle checks within existing preventative strategies such as the National Breast Screen Program, incorporating healthy lifestyle recommendations within the Colon Cancer Screening Program. These strategies are important opportunities to exploit existing prevention initiatives.

The inclusion of evaluation and economic modelling of the cost effectiveness of these approaches is vital. Engaging in partnerships with the health, food and pharmaceutical industries in innovative workable, commercial solutions may be productive. Providing incentives for investment into research and development which may assist product and service development that assists in weight management warrants attention. Examples would be a food innovation program that encourages industry to invest in developing novel foods or food processing techniques that render them less energy dense.

#### **Control**

There are many individuals in the population with existing diseases such as cardiovascular disease and type 2 diabetes. Those individuals who are already overweight are at increased risk of many health problems including cancer and dementia. The lack of awareness of excess weight in individuals may be major barrier to the urgency of lifestyle change. Monitoring of body weight as a routine by health professionals may assist in alerting those at risk, *if* supportive programs are in place. Ensuring resources for lifestyle management and support could rationalise the need for pharmaceuticals and prevent or minimise hospitalisation.

In people with existing disease, there is evidence that control of the disease with weight management can effectively improve health status. At 1 year, an intensive lifestyle program in type 2 diabetes patients resulted in clinically significant 8.6% weight loss and fitness which was associated with improved diabetes control and a reduced need for medicines (Look Ahead, 2007).

However, research on evidence based programs that are effective in the Australian context is needed, and, once such programs are identified, they will have the potential to be funded by the public and private health sector. Metrics for success are required and these necessitate outcomes not only in terms of self reported weight and risk factor changes, but impacts on the use of medical and healthcare services. Data linkage through Medicare and private health insurance industries may facilitate this if issues of patient privacy can be effectively dealt with. Specific programs evaluated in the Australian setting are in progress. These are primarily targeting type 2 diabetes but are being evaluated in Victoria (Eakin et al., 2007) and Queensland (Young et al., 2007) and will provide valuable models of controlling chronic disease. The CSIRO has developed a Comprehensive Lifestyle Program (CLIP) for weight management and cardiovascular health that is planned for evaluation in overweight general practice patients.

#### **What would CSIRO Advocate as an Appropriate Approach to Control?**

As the numbers (and proportion) of individuals in middle age are increasing with the advancing age of the population, identifying those at high risk of chronic disease may be both a control and preventative strategy to delay morbidity and associated costs. Evidence of cost effective targeted programs is needed prior to investment at a national level. Again, consideration as to how they may be funded, delivered and evaluated within the Australian healthcare system is advantageous. Programs that target overweight adults, children and families for additional support beyond the population approach may assist those who are most at risk. The private health insurance industry may consider funding these activities. Programs for those in lower socioeconomic groups may need particular attention as food costs (both in time and currency terms) may be particular barriers that require solution. To maximise the public health benefit of a sustainable healthy lifestyle intervention program partnering with industry and government(s) to produce a cultural shift toward healthier diet and lifestyle choices may achieve what any part alone cannot.

#### **Coordination**

Legitimising the need for effort in coordination is critical. Focussing on prevention of lifestyle related diseases has become a national priority of the Federal Government. Financing prevention requires long term coordinated solutions that involves both the public and private sector.

To achieve this, CSIRO strongly recommends the development of an approach that brings together relevant players to provide an integrated, coordinated approach to controlling overweight and obesity through Surveillance, Prevention and Control strategies.

To maximise the co-ordinated effort needed to tackle excess weight in the Australian community, one solution that could be considered is the creation of a single cohesive approach that will have sufficient critical mass that links R&D to policy, service and implementation.

**CSIRO suggests that a research services alliance, bringing together the relevant expertise and skills, be implemented in human health. Drawing on the successful National Research Flagship model that alliance could produce an entity of dimensions to comprehensively tackle overweight and obesity in the Australian community.**

The terms of reference for the alliance might include providing direction and execution of key areas:

- Development of a policy framework to tackle excess weight in the community
- Establishment of a monitoring and surveillance plan to track and link weight, food intake, eating and exercise patterns, biomedical data and health system usage.
- Development of a research agenda which aims to define and prioritise translational research including the evaluation of pilot lifestyle programs for cost effectiveness within the Australian healthcare system.
- Developing a model and incentives for private sector partnerships.

The alliance would need to involve the active participation of the major research funding, research performing, policy and service delivery bodies that have responsibilities for, or are active in tackling the problems of overweight and obesity.

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