Baker IDI
HEART & DIABETES INSTITUTE

Australia's Future 'Fat Bomb'

A report on the long-term consequences of Australia's expanding waistline on cardiovascular disease

June 2008

This report was prepared by:

Professor Simon Stewart
Dr Gabriella Tikellis
Dr Melinda Carrington
Dr Karen Walker
Professor Kerin O'Dea

Any enquiries about or comments on this publication should be directed to:

Professor Simon Stewart
Head, Preventative Cardiology
Baker IDI Heart and Diabetes Institute
PO Box 6492, St Kilda Road Central
Melbourne Victoria 8008
Australia

T: +61 3 8532 1640
F: +61 3 8532 1100
M: 0438 302 111
E: simon.stewart@bakeridi.edu.au
W: www.bakeridi.edu.au

Suggested Reference:

Stewart S, Tikellis G, Carrington C, Walker K, O'Dea K. *Australia's future 'Fat Bomb'*: *A report on the long-term consequences of Australia's expanding waistline on cardiovascular disease*. April 2008, Baker IDI Heart and Diabetes Institute, Melbourne, Australia

This report is available (pdf file) on request from:
Dr Gabriella Tikellis: gabriella.tikellis@bakeridi.edu.au

Table of contents

Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute for Health and Welfare
AusDiab	Australian Diabetes, Obesity and Lifestyle Study
BMI	Body Mass Index
CV	Cardiovascular
CVD	Cardiovascular disease
IDI	International Diabetes Institute
NBPSD	National Blood Pressure Screening Day
NHS	National Health Survey
NNS	National Nutrition Survey
RFPS	Risk Factor Prevalence Study
RPS	Renfrew- Paisley Study

Summary and key findings

Obesity is a key risk factor and major contributor to some of Australia's most important health problems. This includes cardiovascular disease (CVD), its common precursor Type 2 diabetes and a variety of cancers. As such, it represents one of our most important targets for disease prevention. Indeed, obesity was recently named a National Health Priority at the Australian Health Ministers' Conference.

Importantly, middle-aged Australians are most at risk of experiencing highly preventable CVD-related hospitalisations and fatal events relating to their excess weight over the next 20 years.

In this report we provide data to describe the current epidemic of excess weight in middle-aged Australians and its potential consequences on their future "heart health" using the best available research. It is within this context that this report quantifies the size and cost of our growing 'Fat Bomb'.

We further report what would happen if Australia attempted to "defuse" this future 'Fat Bomb' by reducing everyone's weight by 5kg or more. In the process we outline some of the practical solutions that can achieve this modest target by supporting individuals and our society as a whole.

Key findings

- Overall, almost 4 million adult Australians are currently obese.
- The 'Fat Bomb' is loudly ticking in middle-aged Australians with around 7 out of 10 men and 6 out of 10 women aged between 45 and 64 years being overweight or obese.
- Overall, around 1.5 million middle-aged Australians are currently obese and therefore at high risk of a CV event in the longer-term.
- Based on the best available evidence, our expanded middle-aged waistlines will result in an extra 700,000 CVD-related admissions in the next 20 years.
- These highly preventable admissions will conservatively cost (in today's terms) an extra $6 billion ($2.9 billion in hospital costs alone) in health care.
- An estimated 123,000 men and women will die (many prematurely) from CVD over the next 20 years as a result of their excess weight: more than the seating capacity of the MCG!
- A simple strategy such as losing 5kg in 5 months has the potential to result in 27% to 34% fewer CVD-related hospital admissions and deaths over the next 20 years.

In summary, this report supports obesity being named a National Health Priority. The individual and societal cost of not defusing our future 'Fat Bomb' in terms of excess hospital admissions, deaths (many of them premature) and public expenditure has been clearly described in this report.

Professor Simon Stewart
Head, Preventative Cardiology
Baker IDI Heart and Diabetes Institute
June 2008

Introduction

1.1 Background

Despite the high profile of obesity as a major public health issue, the number of Australians (both young and old) who become overweight or obese shows no sign of abating - reaching epidemic proportions in recent years.

The future health implications of this potential 'Fat Bomb' are evident in the escalating morbidity and mortality associated with weight-related risk factors such as high blood pressure and high blood cholesterol as well as chronic disease states such as Type 2 diabetes and CVD (including heart attacks and strokes) – see below. Obesity is also linked to cancers (which are not the focus of this report) and kidney disease. As National Health Priority Areas, their prevention, early detection and treatment will remain a key health challenge for all with obesity taking centre stage.

Combined, CVD and Type 2 diabetes are Australia's largest health problem

CVD affects close to 4 million Australians at any one time *(AIHW 2004b)* and accounts for close to 50,000 deaths per annum, with direct costs alone making it the most expensive disease in Australia *(AIHW 2004a)*. Ischemic heart disease and stroke remain the two leading causes of death from CVD in both men (accounting for 59% of deaths in 2001) and women (48% of deaths) *(AIHW 2004b)*.

Considered primarily a risk factor for heart disease, Type 2 diabetes itself represents a major health concern due not just to an escalating epidemic in adults but also from its emergence in children *(Fagot-Campagna A, 2000)*.
The 1999-2000 Australian Diabetes, Obesity and Lifestyle Study *(Cameron AJ et al, 2003)* reported that 80% of people with diabetes were overweight or obese compared to 59% without diabetes *(AIHW 2008)* thus increasing their risk of complications such as CVD. In 2005, diabetes affected 1 in 25 Australians and either caused or contributed to 1 in 11 deaths in Australia *(AIHW 2008)*.

While childhood obesity represents a major challenge to protect Australia's future "heart health", it is middle-aged Australians (45-64 years) who naturally represent the primary target for any initial attempts to minimise the impact of our future 'Fat Bomb' for two key reasons:

1. Middle-aged Australians have the highest combined rates of overweight and obesity compared to other age groups *(NHS 2004; NBPSD 2008)*.
2. This age group is most at risk of developing Type 2 diabetes and CVD, and therefore, are most likely to experience preventable hospital admissions and premature death in the next 20 years.

The critical period of time for the two in three men and one in two women who will be affected by CVD in their life-time, is middle age (45 to 64 years): with men typically affected 5-10 years earlier than women *(Hawthorne VM et al, 1995; Murphy NF et al, 2006; AIHW 2004)*.

Unfortunately, the combination of a continued rise in the proportion of middle-aged Australians and a trend towards rapidly expanding waistlines sets the scene for serious and negative economic and social outcomes in the medium to longer-term.

1.2 How strong is the evidence that the 'Fat Bomb' is ticking?

Numerous reports provide undeniable evidence that the prevalence of overweight and obese Australians has continued to increase at alarming rates in the last few decades.

Large-scale population studies such as the *National Health Survey* (1995, 2001, 2004-05), the *National Nutrition Survey* (NNS), the *Risk Factor Prevalence Study* (RFPS), the *National Aboriginal and Torres Strait Islanders Health Survey* (2004-05) and most recently the *Australian Diabetes, Obesity and Lifestyle* (AusDiab) *Study* (1999-2000 and 2004-05). Whilst these data highlight the association between weight status and various adverse health conditions such as CVD and Type 2 diabetes, the strength of the evidence in Australia is somewhat limited by the following:

1. Current data is often out-dated or simply not available.
2. Measures of associated CV risk factors, such as diabetes, are often self-reported in some surveys, thereby reducing their accuracy/reliability.
3. Most surveys are cross-sectional and therefore assess both outcome and risk factors at a single point in time.
4. Lack of accurate and detailed data that includes information on CV events (fatal and non-fatal), hospital admissions and related costs.
5. Lack of an Australian-based study that provides detailed information on the long-term CV consequences of obesity such as hospitalisations and deaths.
6. Lack of data on the long-term trends and benefits of physical activity and dietary intake of Australians on CV outcomes.

Overall, there is a paucity of data regarding the projected, long-term impact of obesity on CV morbidity and mortality in middle-aged Australians. This "missing" information is critical as it would provide estimates of the direct and indirect costs of Australia's future 'Fat Bomb' on our hospitals, health services and health departments.

In the absence of such data (which will, unfortunately, take a long time to obtain) there is urgent need to accurately determine the future impact of excess weight in middle-aged Australians in respect to their long-term "heart health". It is only with such data can that we can prepare the health care system and public health initiatives to defuse our future 'Fat Bomb'.

1.3 Purpose of the report

This report has been prepared by Preventative Cardiology at the Baker IDI Heart and Diabetes Institute with the primary objective:

- To provide the Australian public with an accurate description of their current weight profile with a particular focus on middle-aged Australians and the likely consequences of their expanded waistlines on CVD-related admissions and deaths in the next 20 years.

In order to achieve this primary goal, we aimed to:

- Generate national data to describe the contemporary weight profile of Australian adults with a focus on those aged 45 – 64 years.
- Provide long-term projections of the potential impact of excess weight on future CV events (both fatal and non-fatal) in middle-aged Australians.
- Outline the potential impact of "defusing" our future 'Fat Bomb' through achievable weight targets and waistline reductions on future CV events.
- Describe practical strategies that would enable Australians to collectively tighten their expanded waistlines.

2. Impact of obesity on cardiovascular health

2.1 Key facts

A number of key facts provide preliminary evidence of the impact of obesity on the overall "heart health" of Australians.

- In 2000, 60% of Australians aged 25 years were reported to be overweight or obese

Currently, Australia is experiencing a rapid increase in the number of Australians who are overweight or obese *(Access Economics 2005)*. On average, middle-aged Australians report the heaviest body weight, however, a typical individual continues to gain weight at least to 75 years *(AIHW Bulletin 12, 2004)*.

- Obesity is a significant contributor to CVD and Type 2 diabetes

Excess body weight (in particular obesity) has been identified as an independent risk factor for CVD. It also indirectly leads to CVD via a greater risk of developing of Type 2 diabetes, high blood pressure and high blood cholesterol *(NHFA 2004)*. In 2004-05, Australians with Type 2 diabetes were twice as likely to have had a heart attack, four times as likely to have a stroke and diabetes-related complications accounted for over half a million hospitalisations that equated to a cost of nearly 2% ($907 million) of the total health expenditure *(AIHW 2008)*. In fact, the increase prevalence of obesity in Australia has been a significant contributor to the epidemic-like increases of Type 2 diabetes and CVD (refer to Figure 1).

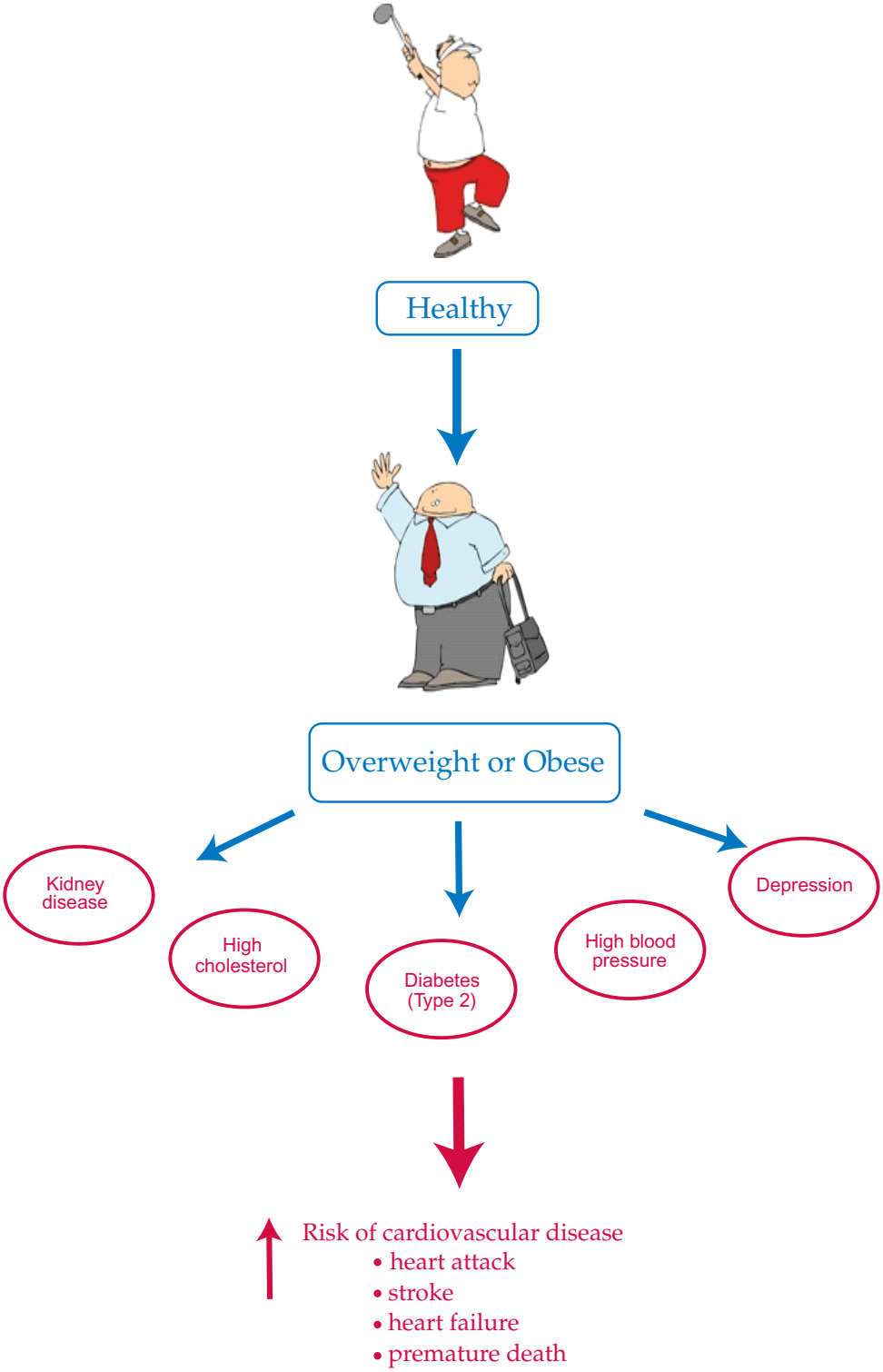
- The evidence for an "epidemic" of obesity is widespread

Reports of an obesity epidemic have emerged from several diverse sources as detailed in section 1.2 and include the *National Health Survey*, the *AusDiab Study* and the *National Aboriginal and Torres Strait Islanders Health Survey*. As such, the number of Australians who are overweight or obese has reached unprecedented levels. Those most at risk include adult males, children, Indigenous Australians and those from lower socio-economic backgrounds (particularly in rural and regional areas of Australia).

- The key risk factors for CVD such as obesity and insufficient physical activity are MODIFIABLE

Most of the major risk factors associated with CVD including excess body weight, Type 2 diabetes, tobacco smoking, insufficient physical activity, raised blood pressure and abnormal cholesterol levels are modifiable. As indicated, many of these risk factors are interrelated, with clear evidence indicating that reducing or eliminating some of these modifiable factors can reduce the risk of a heart attack or stroke.

Figure 1: Impact of obesity on the risk of developing Type 2 Diabetes and CVD.



2.2 Relationship between obesity and other risk factors

Most modifiable risk factors for CVD and Type 2 diabetes are related with many individuals suffering from a combination of conditions related to poor health choices and lifestyles. The following facts highlight the potential to reduce CV risk through a sustainable weight loss program:

- Incorporation of healthy eating and fitness habits into everyday lifestyle can reduce all metabolic risk factors that include cholesterol levels, blood sugar levels and blood pressure *(Grundy SM et al, 2005)*.
- Randomised trials provide strong evidence of the benefits associated with losing weight on blood pressure. Studies involving almost 19,000 patients showed that an average reduction of 12-13 mmHg in systolic blood pressure over 4 years was associated with a 25% reduction in CVD mortality and a 13% reduction in all-cause mortality *(He J et al, 1999)*.
- Research shows that intensive control of low-density lipoprotein cholesterol significantly increases the chance of an individual surviving a CV event *(Grundy SM et al, 2005)*.
- The *Diabetes Prevention Program* showed that lifestyle intervention reduced the risk for diabetes to a greater extent than the anti-diabetic drug 'metformin' (58% vs. 13%) *(Knowler WC et al, 2002)*.
- Weight loss also improves the metabolic syndrome (a group of risk factors that contribute to the development of CVD and Type 2 diabetes) by lowering cholesterol levels, blood pressure and blood sugar levels thus reducing the overall risk of CV diseases *(Grundy SM et al, 2004)*.

3. Current profile of the Australian 'Fat Bomb'

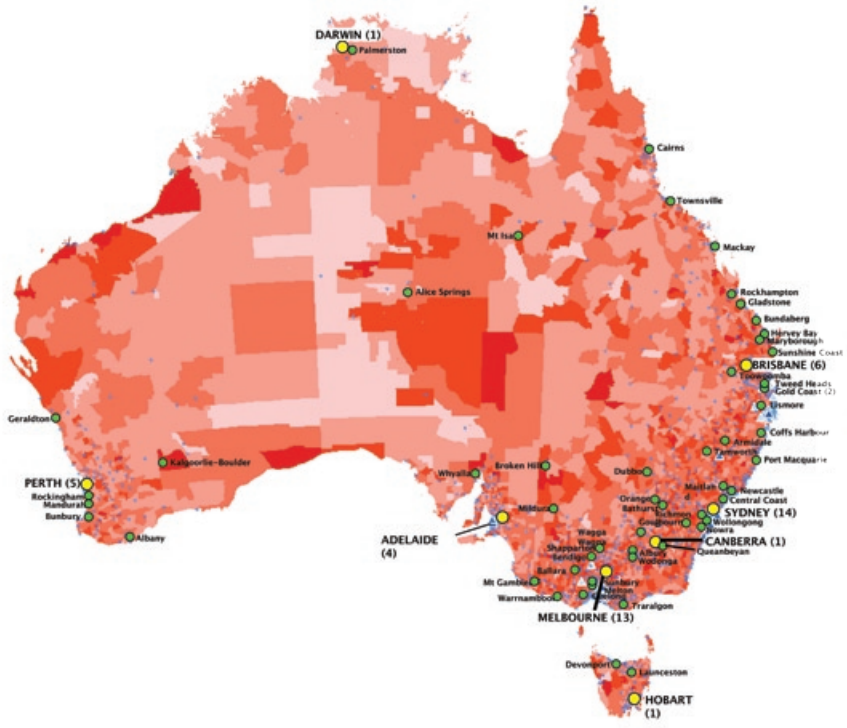
Although we know that CVD currently affects the quality of life of 1 in every 6 Australians, the long-term impact of obesity on CV outcomes has not been specifically evaluated.

Preventative Cardiology at the Baker IDI Heart and Diabetes Institute has been significantly involved in two key research studies that, when combined, provide a unique opportunity to estimate the future impact of Australian's expanding waistline.

3.1 The National Blood Pressure Screening Day (NBPSD)

We recently examined the weight profile of close to 14,000 Australian adults aged between 18 and 95 years of age as part of a national screening program of common CV risk factors conducted in June 2007. The program was conducted in 100 centres nation-wide (Figure 2) by a team of 300 Registered Nurses. The study collected information on CVD risk factors such as age, gender, blood pressure, smoking status, education level, measures of obesity (body mass index (BMI)), as well as a self reported history of CV-related illnesses.

Figure 2: Distribution of the 100 monitoring centres for the "National Blood Pressure Screening Day".



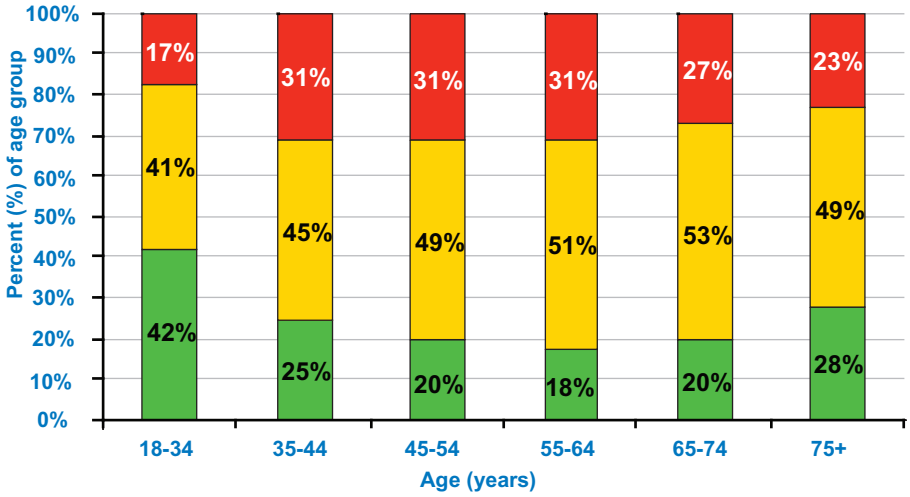
This representative cohort was subject to careful measurement of height, weight and waist circumference. Data from this large sample were used to estimate the proportion of overweight (BMI) 25 – 30 kg/m^2) and obese (BMI 30+ kg/m^2) men and women of the same age in Australia using age and sex specific rates and 95% confidence intervals based on the observed counts and numbers screened.

These rates were then applied to the demographic profile of the Australian population according to the 2006 Australian Bureau of Statistics Census, to estimate the total number of Australians affected within our target gender and age groups.

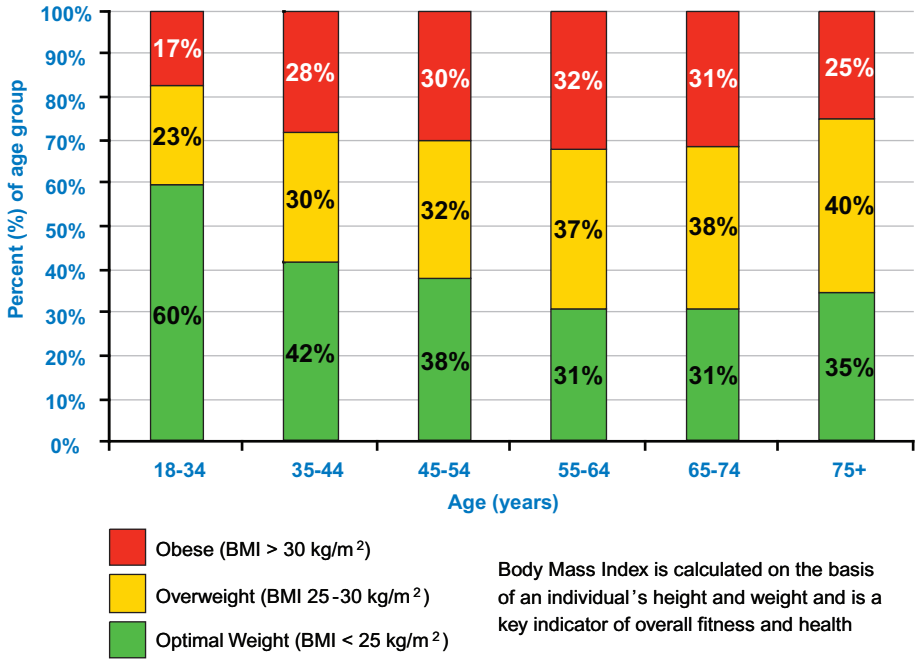
Figure 3 illustrates the weight profile of Australian men and women who participated in the NBPSD. In summary, 26% of adult men aged 18 years and older were overweight whilst 41% were classified as obese (Figure 3a). In comparison, whilst 20% of women were overweight, 54% were obese (Figure 3b).

Figure 3: Weight profile of Australian Men and Women who participated in the NBPSD.

3a) Adult Men



3b) Adult Women

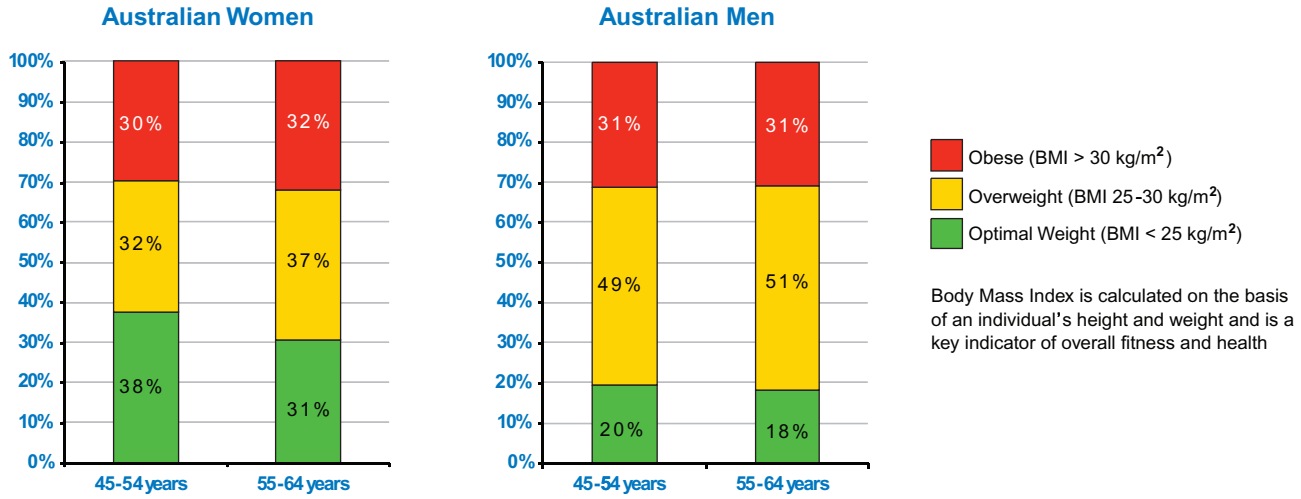


In both men and women, the highest proportion of overweight or obesity occurred in middle-age participants i.e. those aged between 45-64 years of age. As a result, this group of Australians are at greater risk of developing a spectrum of CV related outcomes largely attributed to their increase in weight status.

3.2 Weight profile of middle-aged Australians: The National Blood Pressure Screening Day (NBPSD)

Results from the total of 5,873 men and women aged 45-64 years who participated in the NBPSD according to their BMI status is depicted in Figure 4. In summary, this screening program showed that obesity was prevalent in about 30% of men and women aged between 45 and 64 years of age.

Figure 4: Weight profile of middle-aged men and women who participated in the NBPSD: A representative snapshot of modern-day Australia.



NB. Although the full methods and results of this study are in preparation for publication they have been accepted for presentation by Dr Carrington at the prestigious European Society of Cardiology Scientific Meeting in Munich (September 2008).

3.3 The Renfrew-Paisley Study (RPS)

Australia still lacks comprehensive data to describe the potential long-term cost impact of obesity on fatal, non-fatal and recurrent CV events. In this respect, we need to rely on large population-based studies such as the Framingham Heart Study *(Levy D et al, 2002)* and the RPS *(Hawthorne VM et al, 1995; Murphy NF et al, 2006)* that have followed-up large representative communities over a prolonged period. It is within this context that Professor Simon Stewart, in collaboration with colleagues from the University of Glasgow, undertook a unique epidemiologic study that examined the long-term consequences of obesity on CVD-related events in the Renfrew-Paisley cohort of middle-aged men and women *(Murphy NF et al, 2006).*

This key study examined CV outcomes in 15,402 middle-aged men and women from the towns of Renfrew and Paisley in the West of Scotland over a 20-year period using the unique Scottish Morbidity Record Scheme to track fatal and non-fatal events for each individual. Importantly, it represents the largest population-based cohort of 45-64 year old participants and is currently the only study to have examined the association between obesity and a broad spectrum of CV events over the longer-term that included fatal/non-fatal/recurring coronary heart disease (heart attack), cerebrovascular disease (stroke), heart failure, blood clots (deep vein thrombosis) and the most common irregular heart beat (atrial fibrillation).

The long-term importance of weight status on CV-related hospital admissions and deaths in 45-64 year old women and men are shown in Figures 5a & 5b (CV-related admissions) and Figures 6a & 6b (CV-related deaths). For participants who were obese, the risk of being admitted into hospital or dying from CVD was significantly greater compared to those with an optimal weight at baseline, independent of age, number of cigarettes smoked per day and social status. Overall, this key report from the RPS *(Murphy NF et al, 2006)* showed that compared to men and women of optimal weight, obesity was associated with the following outcomes:

- A 2-fold increased risk of being admitted or dying from chronic heart failure or a blood clot in the leg or arm
- An 80% increased risk of being admitted or dying from an irregular heart beat affecting the atria (top chambers of the heart)
- A 60% increased risk of being admitted or dying from coronary heart disease
- A 40% increased risk of being admitted or dying from a stroke

These unique data, when combined with accurate and contemporary data to describe the current weight profile of middle-aged Australians such as the NBPSD (i.e. those most at risk of suffering non-fatal and fatal CV events), provide an ideal platform to project the number of excess CV-related events in Australia due to our expanding waistlines.

4. Methods used to estimate the impact of Australia's future 'Fat Bomb'

4.1 Combining data from the NBPSD and RPS

The RPS provides a clear indication of the independent impact of excess weight on the frequency and type of CV-related hospitalisations and deaths over 20 years. We applied the relative difference in the rate of these events (as opposed to absolute events which would increase the potential for error) to our estimated number of middle-aged Australians to determine the number of excess CV events in 20 years in these individuals. Our estimates take into account the age and sex of affected individuals and we also applied the 95% confidence intervals from the RPS analysis of CV-related hospitalisations and fatalities to determine the likely, worst and best-case scenarios.

In order to estimate the direct costs associated with the identified number of "excess" CV-related hospitalisations within the next 20 years, we used the best available cost estimates on a condition-specific basis (i.e. heart attack versus stroke versus heart failure) to derive the total cost of these future hospitalisations (per episode) based on 2008 health care costs.

Finally, using our data from the NBPSD, we examined the impact of everyone losing 5kg or 10kg (i.e. shifting more middle-aged people towards a healthier weight and BMI range). These newly calculated data were then used to derive new estimates of the proportion of middle-aged Australians who would be overweight or obese and applied to ABS census data *(AIHW 2004a)*. These new numbers were then entered into the same models used to project the number of excess CV-related deaths and hospitalisation over the next 20 years attributable to a substantial, but reduced, epidemic of obesity in Australia. The same hospital costs were then applied to determine the cost impact of achieving these simple weight targets in middle-aged Australians.

4.2 Limitations

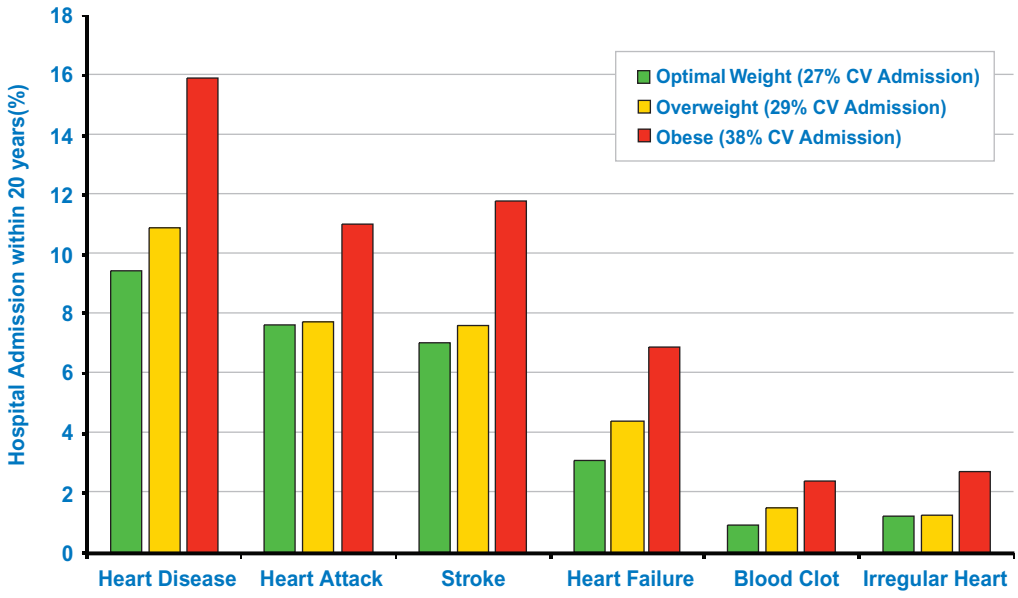
It is important to note that this report is based on currently available data for the Australian population. It has been prompted by a general lack of "hard" data to inform Australia's response to a growing epidemic of excess weight and obesity in Australia. As such it has its own limitations that require consideration when interpreting our key findings.

The main limitations of this report are the lack of specific long-term data to describe the morbidity and mortality related to CVD in Australia in addition to the direct and indirect cost of each CVD-related hospital admission and death.

Therefore, our reported estimates are likely to be an underestimation of the true burden associated with the 'Fat Bomb'. This is especially true in respect to the direct and indirect costs of future hospital and fatal events: there are no reliable Australian data to accurately estimate the cost of hospital events and we have not considered the overall societal costs of non-fatal and fatal events on wider health care costs (including the need for long-term medications or nursing home care) in addition to the loss of productivity within the Australian economy.

Figure 5: Long-term importance of weight (BMI) on CV-related hospital admissions over 20 years.

5a) Middle-aged Women



5b) Middle-aged Men

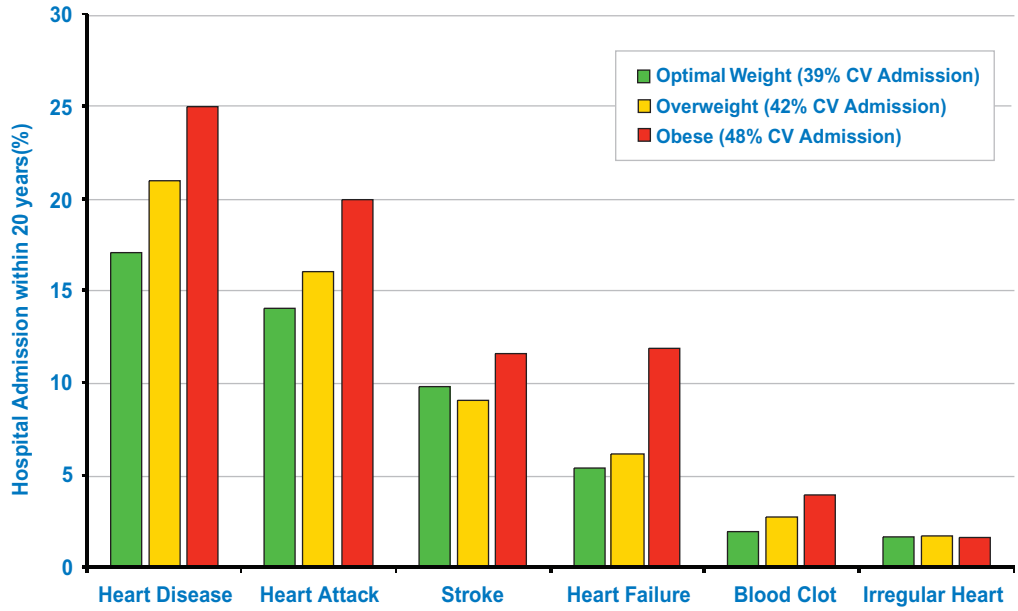
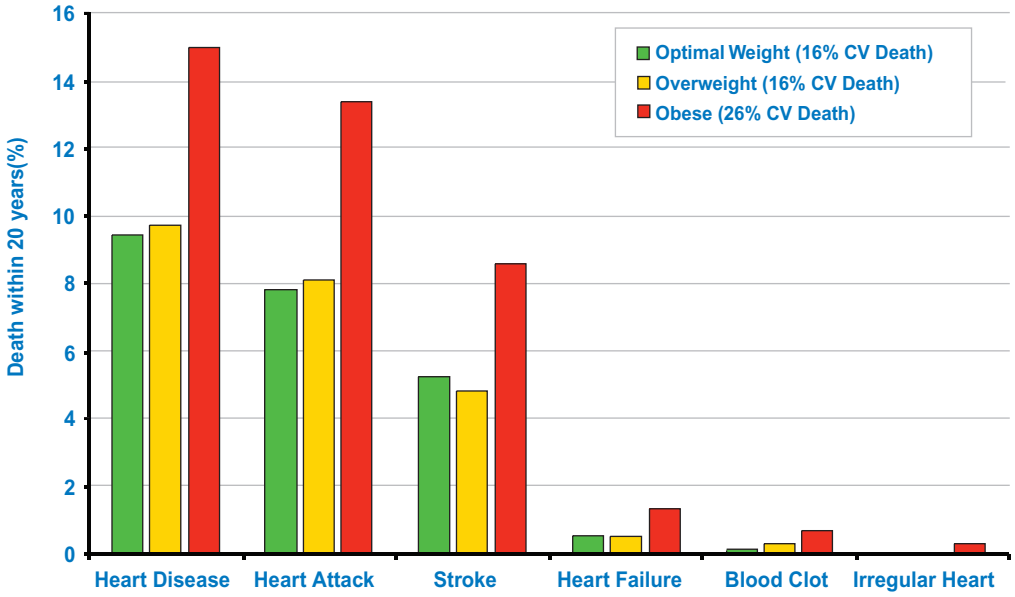
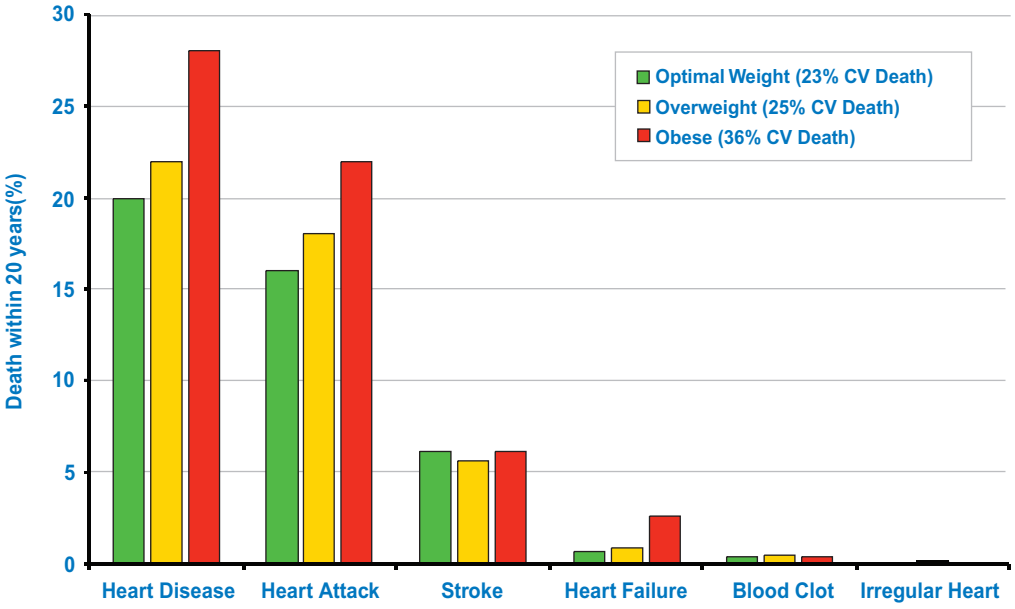


Figure 6: Long-term importance of weight (BMI) on CV-related deaths over 20 years.

6a) Middle-aged Women



6b) Middle-aged Men



5. The impact of Australia's future 'Fat Bomb'

5.1 Overweight & obese Australians

Using the results of our recent NBPSD, Table 1 and Table 2 shows the proportion and number of Australian men and women who are currently overweight (o/w) or obese.

Table 1: Projected proportion and number of overweight (o/w) Australians.

1a) Australian adult Men

	o/w (%)	Aus Pop'n	Likely o/w	Lower 95% CI	Upper 95% CI	Best case	Worse Case
18-34 years	0.41	2,273,113	931,976	0.39	0.43	886,514	977,439
35-44 years	0.45	1,437,252	646,763	0.42	0.48	603,646	689,881
45-54 years	0.49	1,360,072	666,435	0.48	0.52	652,835	707,237
55-64 years	0.51	1,096,125	559,024	0.48	0.54	526,140	591,908
65-74 years	0.53	668,451	354,279	0.49	0.56	327,541	374,333
75+ years	0.49	517,516	253,583	0.43	0.55	222,532	284,634
Total		7,352,529	**3,412,061**			3,219,207	3,625,431

1b) Australian adult Women

	o/w (%)	Aus Pop'n	Likely o/w	Lower 95% CI	Upper 95% CI	Best case	Worse Case
18-34 years	0.23	2,279,198	524,216	0.21	0.25	478,632	569,800
35-44 years	0.30	1,500,590	450,177	0.29	0.33	435,171	495,195
45-54 years	0.33	1,402,440	462,805	0.31	0.35	434,756	490,854
55-64 years	0.37	1,096,554	405,725	0.35	0.40	383,794	438,622
65-74 years	0.38	704,986	267,895	0.34	0.41	239,695	289,044
75+ years	0.40	753,436	301,374	0.35	0.45	263,703	339,046
Total		7,737,204	**2,412,192**			2,235,751	2,622,561

These projections indicate that a staggering 5.8 million Australian adults are currently overweight with the proportion of men exceeding that of women. This estimate based on NBPSD data indicates that 46% of men and 31% of women who are aged 18 years and older are overweight.

These data highlight the urgent need to implement effective strategies that will prevent these overweight individuals from becoming obese.

Table 2: Projected proportion and number of obese Australians.

2a) Australian adult Men

	o/w (%)	Aus Pop'n	Likely Obese	Lower 95% CI	Upper 95% CI	Best case	Worse Case
18-34 years	0.17	2,273,113	386,429	0.15	0.19	340,967	431,891
35-44 years	0.31	1,437,252	445,548	0.28	0.34	402,431	488,666
45-54 years	0.31	1,360,072	421,622	0.29	0.34	394,421	462,424
55-64 years	0.31	1,096,125	339,799	0.28	0.34	306,915	372,683
65-74 years	0.27	668,451	180,482	0.24	0.30	160,428	200,535
75+ years	0.23	517,516	119,029	0.19	0.28	98,328	144,904
Total		7,352,529	**1,892,909**			1,703,490	2,101,104

2b) Australian adult Women

	o/w (%)	Aus Pop'n	Likely Obese	Lower 95% CI	Upper 95% CI	Best case	Worse Case
18-34 years	0.17	2,279,198	387,464	0.16	0.19	364,672	433,048
35-44 years	0.28	1,500,590	420,165	0.26	0.31	390,153	465,183
45-54 years	0.30	1,402,440	420,732	0.29	0.32	406,708	448,781
55-64 years	0.32	1,096,554	350,897	0.30	0.34	328,966	372,828
65-74 years	0.31	704,986	218,546	0.29	0.35	204,446	246,745
75+ years	0.25	753,436	188,359	0.21	0.30	158,222	226,031
Total		7,737,204	**1,986,163**			1,853,166	2,192,616

The projected number of obese adults in Australia stands at just under 4 million with the number of women exceeding that of men. Our projections show that 26% of the Australian adult population is likely to be obese.

5.1 Overweight & obese middle-aged Australians

The proportion of overweight Australian men and women aged 45-64 years ranges from 49 to 51% and 33 to 35% respectively; men clearly being more likely to be overweight than women in this age category (Tables 1 and 2). On a national basis, this equates to a total of 1.23 million overweight men and 0.85 million overweight women. Nationally therefore, we estimate that there are close to 2.1 million overweight middle-aged Australians. Within our confidence limits, the "best case scenario" would be a total of just under 2 million affected individuals and "worst case scenario" of more than 2.2 million overweight middle-aged Australians.

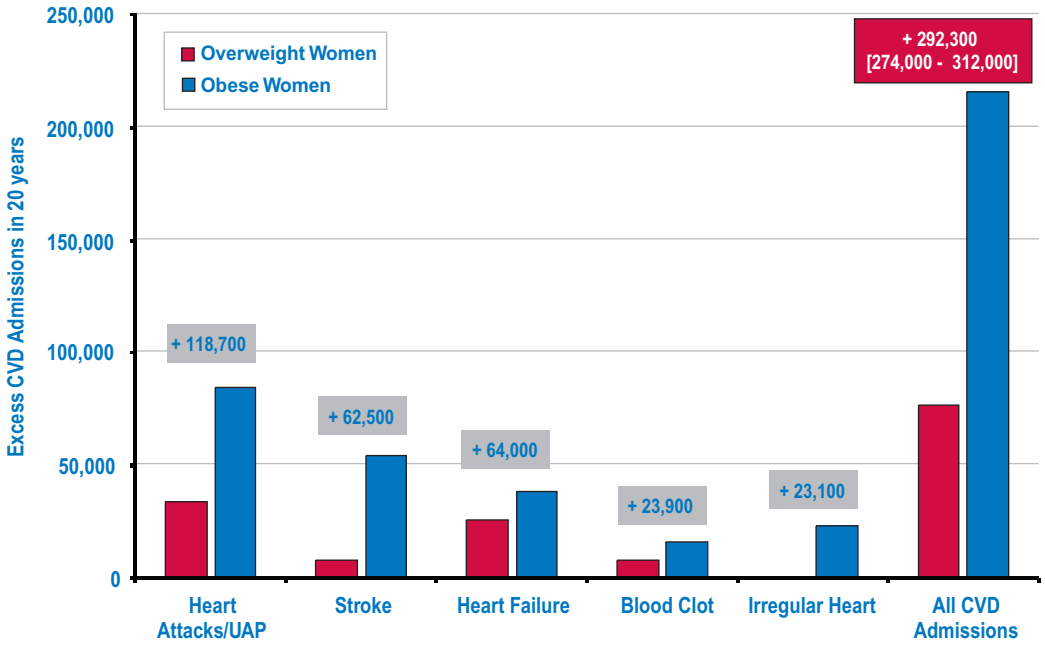
The results of the NBSPD also suggested that a similar proportion of middle-aged men and women (30 – 32%) in Australia are obese. Overall, this equates to more than 1.5 million obese Australians currently aged 45-64 years at increased risk of future CVD-related events. Within our confidence limits, the "best case scenario" would be a total of just over 1.4 million affected individuals and a "worst case scenario" of more than 1.6 million obese middle-aged Australians. When combined, we estimate that around 3.5 million middle-aged Australians are either overweight or obese.

5.2 Projected CVD-related hospitalisations due to obesity

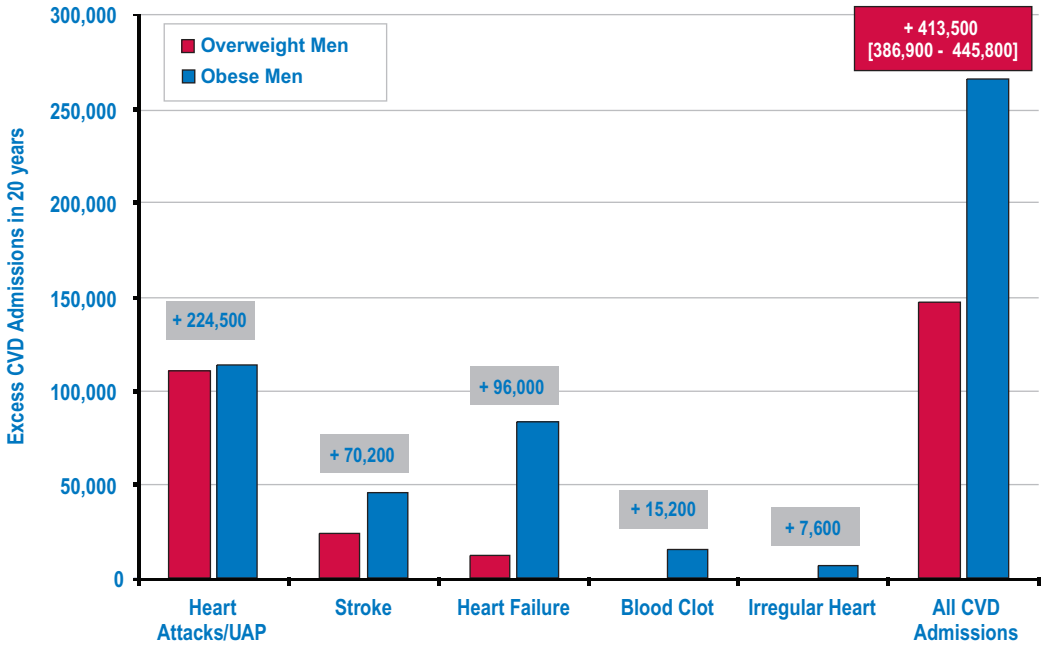
Figure 7a (women) and Figure 7b (men) show the likely excess number of CVD-related hospitalisations related to overweight or obese status in approximately 3.5 million middle-aged Australians over the next 20 years. In women we estimate this equate to close to 300,000 excess CVD-related admissions (range of 274,000 to 312,000). For men, we estimate the same figure will be more than 400,000 excess CV-related admissions (range 387,000 to 446,000).

Figure 7: Projected impact of an expanded waistline on excess CV-related hospital admissions in 20 years.

7a) Middle-aged Women



7b) Middle-aged Men

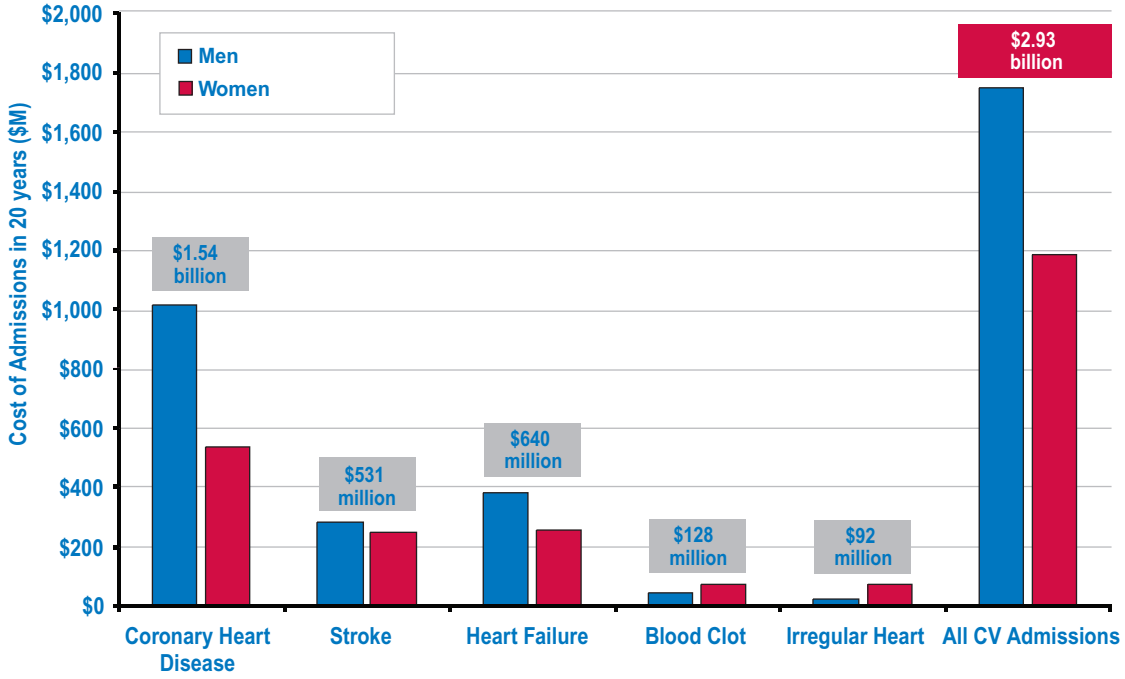


5.3 Projected cost of excess CV-related hospitalisations due to excess weight

Figure 8 shows the cost of these additional 700,000 CVD-related hospitalisations over the next 20 years that can be attributed to excess weight and obesity in middle-aged Australians. In today's terms, the total cost of these excess hospitalisations equates to $2.93 billion over the next 20 years or $147 million per annum. The greatest component of this cost will be coronary artery disease ($1.54 billion or just over 50% of total weight-related expenditure). Not unexpectedly, excess weight in men will have the greatest cost impact.

It is important to note that we have applied extremely conservative hospitalisation costs when calculating these estimates and these figures could easily be expanded by a factor 1.5 – 2.0 to take into account the increasing cost of hospital care. It's also important to note that hospital admissions typically represent only 60 – 70% of CVD-related health care *(Stewart et al, 2002; Stewart et al, 2003)* and the social and economic cost of an acute event cannot be under-estimated. Overall, therefore, an estimate of $6 billion in direct health care costs attributable to excess weight in middle-aged Australians is clearly within the realms of a "best-case scenario".

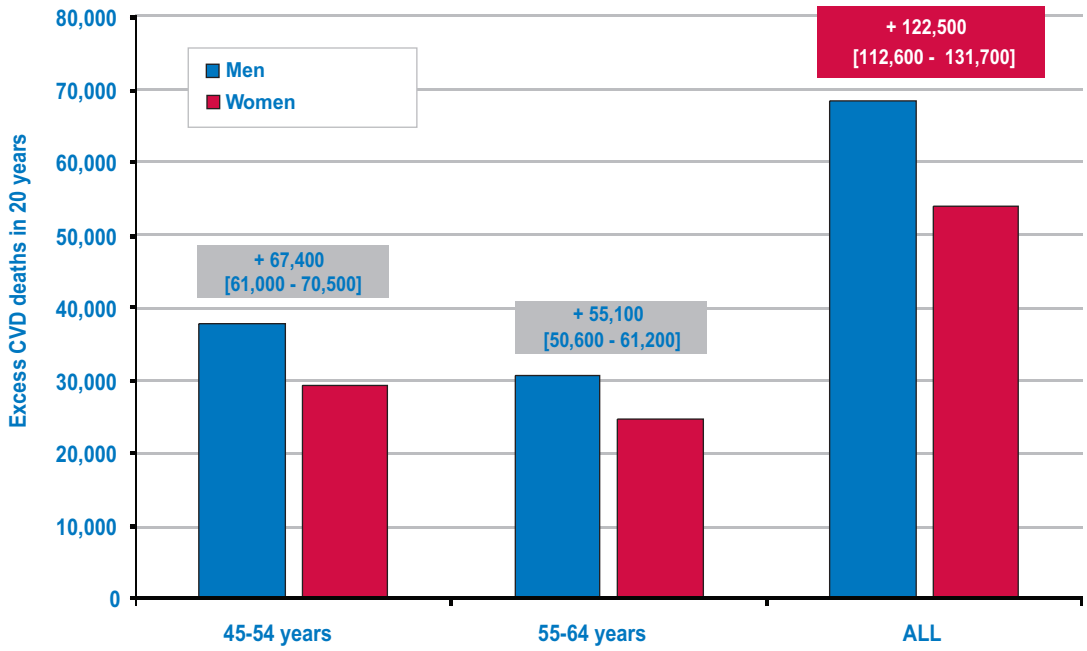
Figure 8: Projected impact of obesity in middle-aged men and women: Cost of excess CV-related hospitalisations in 20 years.



5.4 Projected excess of CV-related deaths due to obesity

Figure 9 shows the likely excess CV-related deaths (predominantly "premature" relative to normal life-expectancy) relating to an epidemic of obesity in middle-aged Australians only. Overall, in the next 20 years there will be 122,500 potentially avoidable deaths (estimated range of 113,000 to 132,000) attributable to obesity. It is important to note that for those middle-aged men and women aged 45-54 years, all fatalities (close to 70,000) will be "premature" and many will occur when these individuals are still of a working age.

Figure 9: Projected impact of obesity in middle-aged men and women: Excess CV-related deaths in 20 years.



6. Diffusing our future 'Fat Bomb'

The estimated impact of our future 'Fat Bomb' demands a national response focussing on individual and community-based initiatives to collectively reduce our waistlines.

6.1 "Lose 5 in 5" (5kg in 5 months)

We examined the potential impact of recommending an Australia-wide "Lose 5 in 5" (5kg in 5 months) strategy for every middle-aged Australian who is currently overweight or obese on excess CV-related hospital admissions. This would represent an achievable target and would require sustainable changes in health and life-style behaviours.

We further examined the potential impact of doubling the dose of "Losing 5 in 5" (i.e. aiming to lose another 5kg in 5 months after the initial period to achieve a total of 10kg in weight loss over 10 months). The strategies needed to achieve this major public health initiative from the individual to the societal level are discussed below.

Table 3 firstly shows the impact of a universal weight loss of 5kg and 10kg in the estimated 1.99 million (761,500 obese) and 1.62 million (771,600 obese) middle-aged men and women, respectively, currently affected by excess weight. If achieved, it would have the impact of reducing the combined number of overweight and obese individuals by 0.8 to 1.5 million, representing a reduction of 22% to 43% in at risk middle-aged men and women.

Table 3: Universal impact of losing 5kg and 10kg of weight respectively given the current prevalence of overweight or obese middle-aged Australians.

	Overweight Men	Overweight Women	Obese Men	Obese Women	All
Current Status	1, 225,500	846,600	761,400	771,600	3.61 million
Lose 5kg in weight	1,066,000 (- 13%)	715,000 (-15%)	491,200 (- 35%)	531,000 (- 32%)	2.80 million (- 22%)
Lose 10 kg in weight	799,300 (- 35%)	568,800 (- 33%)	316,200 (- 48%)	366,900 (- 42%)	2.1 million (- 43%)

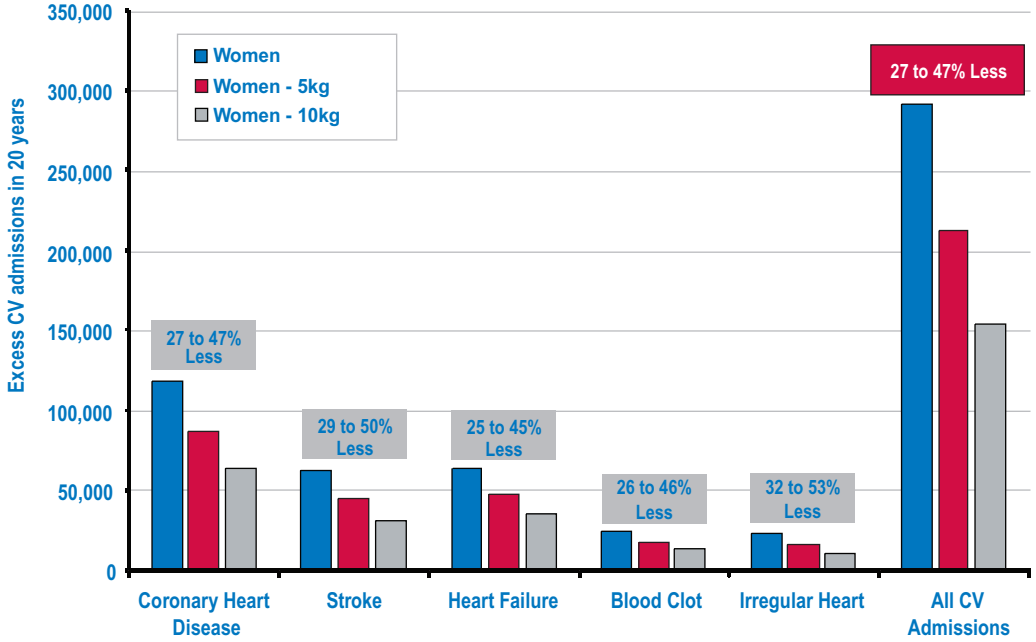
Figure 10a shows what an initial dose of "Lose 5 in 5" would do to the pattern and number of excess CV-related hospital admissions over the next 20 years in those Australian women currently overweight or obese. It also shows what a follow-up dose of "Lose 5 in 5" (to achieve a 10kg weight reduction) would achieve.

In women, an initial dose of "Lose 5 in 5" would also result in a 27% reduction in CV admissions (79,200 less CV admissions). A further loss of 5kg (total 10kg) would result in a 47% reduction in CV admissions (from 292,300 to 154,000 admissions) overall. In men (Figure 10b), an initial dose of "Lose 5 in 5" would result in a 27% reduction in CV-related admissions (114,000 less CV admissions). A further loss of 5kg (total 10kg) would result in a 50% reduction in CV admissions (from 413,000 to 207,000 CV admissions over 20 years) overall.

Figures 11a (women) and 11b (men) show the potential cost impact of reducing fewer CV-related admissions via the strategy of "Lose 5 in 5" in women (Figure 9a) and men (Figure 9b). Overall, a loss of 10kg over 10 months has the potential to save somewhere between $472 - $1,272 million over a 20 year period.

Figure 10: Projected impact of a universal weight loss of 5kg and 10kg on CV-related hospitalisations in 20 years.

10a) Middle-aged Women



10b) Middle-aged Men

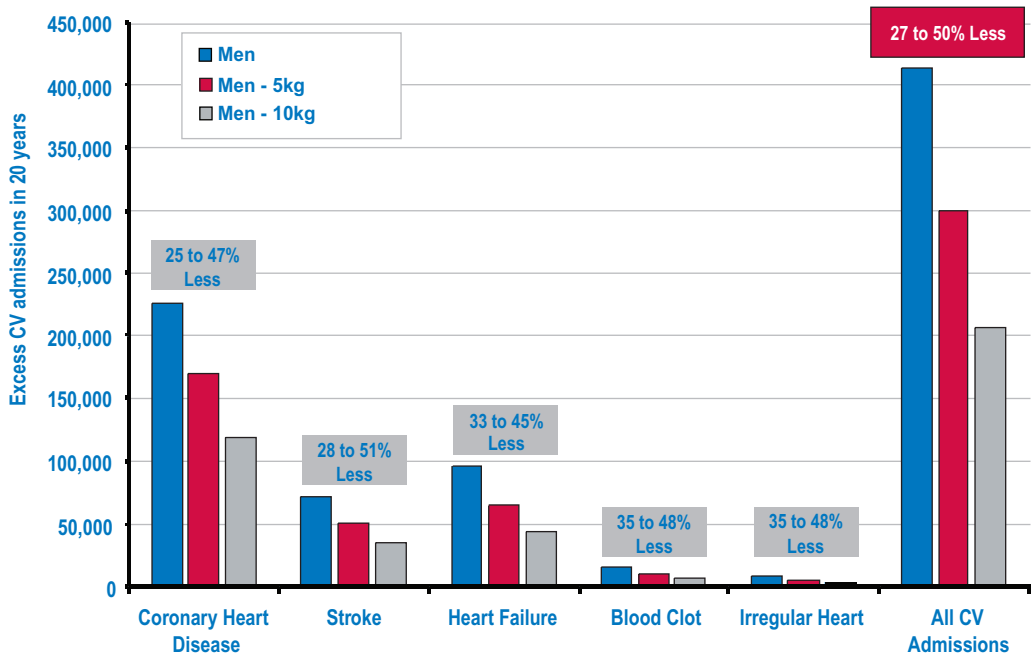
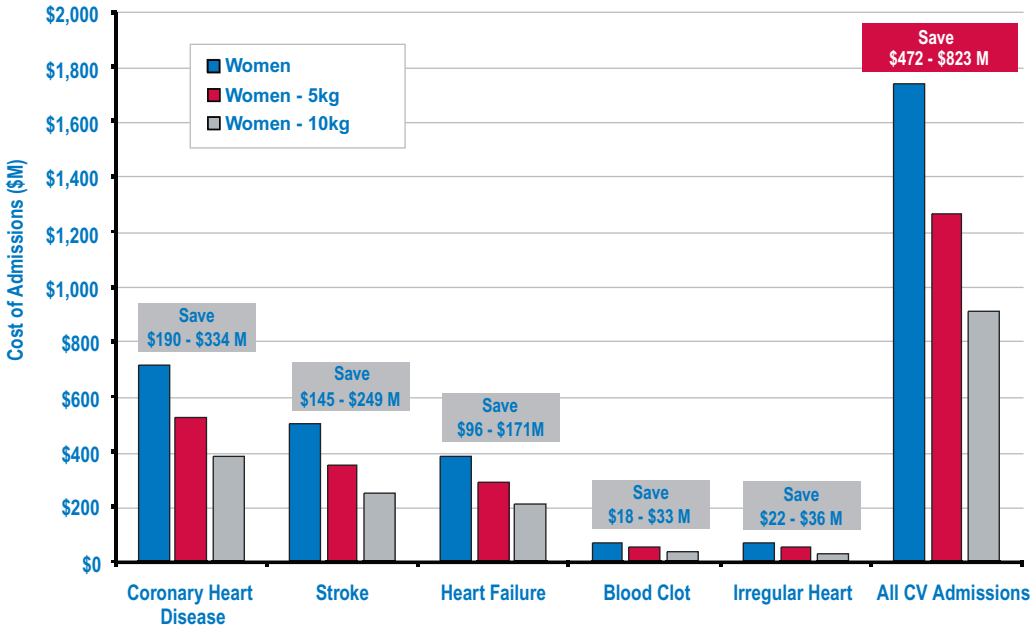
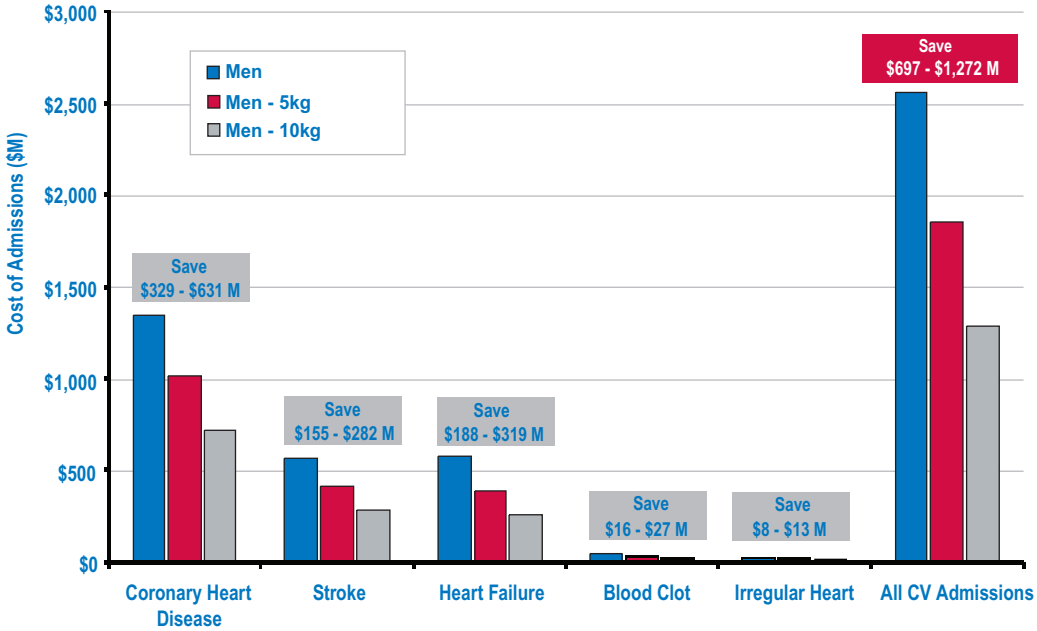


Figure 11: Projected impact of a universal weight loss of 5kg and 10kg on cost savings for CV-related hospitalisations in 20 years.

11a) Middle-aged Women

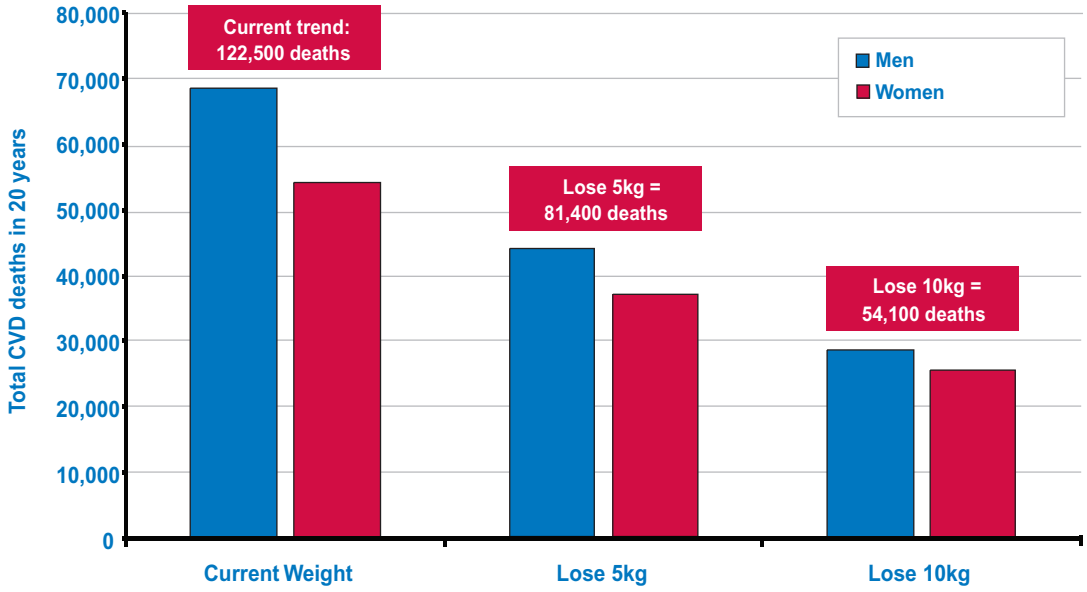


11b) Middle-aged Men



The potential impact of a 5kg and 10kg weight loss with respect to excess CV-related deaths is shown in Figure 12. The current trend indicates that in 20 years there will be an excess of 122,500 deaths attributed to CVD. A loss of 5kg, would result in 34% fewer deaths (n= 41,100) whereas a loss of 10kg would result in 56% less deaths (n=68,400). This indicates a realistic potential to significantly lower the excess number of hospitalisations and deaths due to obesity-induced CVD.

Figure 12: Projected impact of a universal weight loss of 5kg and 10kg in middle-aged women and men on CV-related deaths in 20 years.



6.2 "Healthy Towns": a community-based incentive to a healthier lifestyle

In addition to providing individuals with a realistic target for weight loss that would have a profound impact on the overall heart health of Australia, we would advocate that the Federal and State governments adopt a "Healthy Town" competition similar to the "TidyTowns" program.

The idea would encourage communities to enrol in local, regional and national competitions to determine which community has the best weight profile (age and sex adjusted) with a pool of funding provided to 'reward' key targets via nominated community developments with a health focus (e.g. a new sports facility that would support the longer-term "heart health" of the community).

7. Realistic strategies to diffuse our future 'Fat Bomb'

Australia has a range of options to diffuse our future 'Fat Bomb' that depend on an individual and collective desire to improve our overall heart health.

7.1 Changes in dietary behaviour

Improving diet and increasing exercise habits remain the healthiest and least risky ways of losing weight. An over abundance and consumption of food (particularly energy dense foods) together with our significantly reduced levels of physical activity have been key factors in our ever expanding waistlines. Therefore, we need to significantly change our energy balance so that energy consumption does not grossly exceed expenditure. This change in energy balance can by achieved by:

- Decreasing energy intake
- Increasing physical activity BUT
- Preferably both together

Decreasing energy intake involves decreasing the total number of calories eaten per day and requires a balance between eating a good variety of food and over-consumption. This is more important than trying to restrict a particular macronutrient (like fat). To achieve this there are several strategies that have been suggested by the National Health & Medical Research Council as part of the *Dietary Guidelines for Australians* that are consistent with healthy traditional Asian and Mediterranean diets:

- A diet that incorporates a wide variety of foods (such as vegetables, legumes, fruits, cereals (pasta, rice, bread), fish, sea foods, and olive oil)
- Drinking plenty of water rather than calorific drinks (e.g. soft drinks)
- Limiting the amount of saturated fat intake
- Choosing food low in salt
- Limiting your alcohol intake if you choose to drink
- Consuming only moderate amounts of sugars and foods containing added sugars
- Eating according to your energy needs

However, whilst a varied diet of the right type of foods can provide greater nutritional benefit, it can also result in higher energy intake if care is not taken with portion size. Given the evolution of the modern sedentary society, an increase in physical activity combined with a reduction in portion size (a regular serve rather than a supersize) of foods, especially of the energy-dense foods, helps reduce the risk of becoming overweight and obese.

7.2 Community-based strategies for weight reduction and control

The increasing number of middle-aged adults who are overweight or obese indicates that most Australians do not achieve the right balance between energy intake and expenditure. This may be attributed to current lifestyles, the environment, social norms, and economic conditions promoting over-consumption of energy dense foods and drinks as well as underactivity. The underlying causes are largely the result of external changes that influence behaviour in subtle, unintended ways.

Reversing such trends can be achieved through community-based campaigns that motivate and support people to reduce their energy intake and/or increase their energy expenditure. This will involve changes in the work and home environments as well as lifestyle changes that will assist people to maintain a healthy weight and lifestyle.

One of the key strategies will need to address better monitoring of food cost and quality that will involve:

- Overcoming barriers that prevent individuals from changing their food selection and preparing their own food. Currently, too many people are time-poor and lack confidence in choosing nutritious foods and preparing them quickly.
- Clear labelling of foods to indicate energy content .There have been calls to bring in the UK "traffic-light" food labelling system to Australia which puts separate green light symbols on the packet when the product is low in fat, saturated fat, sugars and salt. 'Low fat', 'fat free', or 'low GI' can be very misleading as these products can be high in refined sugars and can have high energy (calorie) content.
- Reducing the high cost associated with good quality healthy foods making less nutritional foods a more affordable choice.

As described above, we would advocate innovative ways to support individuals and communities (e.g. "*Healthy Towns")* to achieve fundamental changes in their eating habits and the type of foods they consume. This, of course, should not be achieved in isolation with increased physical activity being a key target for all Australians.

7.3 Increase the frequency, duration and intensity of physical activity

Research conducted at the Baker IDI Heart and Diabetes Institute has shown that regular exercise has important short and long term beneficial CV effects *(Jennings GL et al, 1997)*. This includes reducing the risk of coronary heart disease and the impact of high blood pressure and blood cholesterol *(Jennings GL, 1995*). In addition, the HEART project conducted amongst Australian General Practitioners, suggests that lifestyle strategies aimed at dietary modification and increased physical activity may reduce the need for pharmacological therapy for high blood pressure and other CV risk factors *(Reid CM et al, 2000)*. The news is also positive for people without high blood pressure. In a group of people with normal blood pressure, regular walking was just as effective as moderate exercise in reducing the risk of developing high blood pressure *(Kingwell BA et al, 1993)*.

Food intake and daily activity need to be considered and addressed in tandem, therefore, to prevent the 'Fat Bomb' from exploding. The development of a healthier 'macro-environment' that encourages healthier diets and a more physically active lifestyle will need to involve governments, business and health professions as well as individual motivation.

While some may choose to participate in more strenuous activities such as jogging or playing sport, a more practical but just as beneficial concept is that of increasing 'incidental activity'. That is, increasing the amount of walking undertaken on a daily basis by undertaking activities such as using stairs instead of lifts, walking to shops or stations rather than driving and reducing the amount of time spent being sedentary in front of a computer or watching television. The *AusDiab* Study has indicated that television viewing is associated with a number of metabolic risk variables such as increased fasting plasma glucose, systolic blood pressure and waist circumference that are associated with Type 2 diabetes, hypertension and obesity respectively (*Healy GN et al, 2008; Sugiyama T et al, 2008)*.

8. Summary

In essence, reducing weight (as measured by a reduction in BMI) has the potential to reduce the risk of an individual developing:

- High blood pressure
- High blood cholesterol
- Type 2 diabetes
- **Cardiovascular disease**
- Kidney disease
- Depression
- Certain cancers
- Sleep apnoea
- Osteoarthritis

Our research has produced the following key findings by combining two key studies to examine the current weight profile of middle-aged Australians and the longer-term consequences of an expanded waistline on CVD-related hospital admissions and deaths. These include:

- Almost 4 million adult Australians are currently obese
- The 'Fat Bomb' is ticking loudly with 72% of middle-aged males and 58% of middle-aged females being overweight or obese
- Approximately 1.5 million middle-aged Australians are currently obese and therefore at high risk of a CV event in the longer-term
- Based on the best available evidence, our expanded middle-aged waistlines will result in an extra 700,000 CV-related admissions in the next 20 years
- These highly preventable admissions will conservatively cost Australia's tax payers (in today's terms) an extra $3 billion in health expenditure and $6 billion overall when all costs are considered
- An estimated 122,500 men and women will die (many prematurely) from CVD related to their excess weight in the next 20 years
- A simple strategy such as losing 5kg in 5 months has the potential to result in 27% fewer CVD-related hospital admissions and 34% fewer deaths over the next 20 years

To put these findings into perspective, the estimated number of excess CV-related hospital admissions due to excess weight in middle-aged Australians over the next 20 years (700,000) represents close to 2 years worth of hospital activity given current estimates. Similarly, the additional 122,500 deaths due to obesity over the next 20 years represents 2.5 years worth of fatalities due to CVD.

Fortunately, weight loss can be achieved through lifestyle changes such as increased physical activity and dietary modifications which positively impact on the quality of life of all Australians at risk of developing CVD. We advocate the application of strategies that comprehensively support the individual and whole communities to make a positive impact on their collective waistlines. This includes initiating changes in our food supply, eating and exercise habits and restructuring the way we monitor and intervene to improve the risk profile of individual Australians and, indeed, whole communities.

The individual and societal cost of not intervening urgently to challenge our future 'Fat Bomb' has been clearly described in this report.

9. References

ABS (Australian Bureau of Statistics) 2006a. Diabetes.

Access Economic Report: The shifting burden of cardiovascular disease in Australia 2005.

AIHW 2002. Australian Social Trends, 2002 AIHW Cat No. 4102.0 Canberra: AIHW.

AIHW: Bennett SA, Magnus P & Gibson D 2004. Obesity trends in older Australians. Bulletin no. 12. AIHW cat. no. AUS 42. Canberra: AIHW.

AIHW 2004a. Health system expenditure on disease and injury in Australia, 2000-01. AIHW Cat. No. HWE 25. Canberra: AIHW (Health and Welfare Expenditure Series No. 19).

AIHW 2004b. Heart, stroke and vascular diseases- Australian Facts 2004. AIHW Cat. No. CVD27. Canberra: AIHW and National Heart Foundation of Australia (Cardiovascular Disease Series No.22).

AIHW: O'Brien K 2005. Living dangerously: Australians with multiple risk factors for cardiovascular disease. Bulletin No. 24. AIHW Cat. NO. AUS 57. Canberra: AIHW.

AIHW 2008. Diabetes: Australian facts 2008. Diabetes series no.8. Cat.no. CVD40. Canberra: AIHW.

Cameron AJ, Welborn TA, Zimmet PZ, et al. Overweight and obesity in Australia: the 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab). MJA 2003;178:427-432.

Carrington M, Jennings G, Stewart S. National Blood Pressure Screening Day. 2008 Baker Heart Research Institute, Melbourne, Australia.

Fagot-Campagna A. Emergence of type 2 diabetes mellitus in children: epidemiological evidence. J Pediatr Endo Met 2000;13 Suppl 6:1395-402.

Grundy SM, Brewer HB Jr, Cleeman JI, et al. Definition of metabolic syndrome: Report of the NIH and Blood Institute/American Heart Association conference on scientific issues related to definition. Circulation 2004;109:433-438.

Grundy SM, Cleeman JI, Daniels SR, et al. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. Circulation 2005;112:2735-2752.

Hawthorne VM, Watt GC, Hart CL, et al. Cardiorespiratory disease in men and women in urban Scotland: baseline characteristics of the Renfrew/Paisley (midspan) study population. Scot M J 1995;40:102-107.

He J, Whelton PK. Elevated systolic blood pressure and risk of cardiovascular and renal disease: overview of evidence from observational epidemiologic studies and randomized controlled trials. Am Heart J 1999: 138(pt2):211-219.

Healy GN, Dunstan DW, Salmon J, Shaw JE, Zimmet PZ, Owen N. Television time and continuous metabolic risk in physically active adults. Med Sci Sports Exerc 2008;40:639-645.

Jennings GL. Mechanisms for reduction of cardiovascular risk by regular exercise. Clin Exp Pharmacol Physiol 1995;22:209-211.

Jennings GL, Chin-Dusting JP, Kingwell BA, Dart AM, Cameron J, Esler M, Lewis TV. Modulation of vascular function by diet and exercise. Clin Exp Hypertens 1997;19:727-737.

Kingwell BA, Jennings GL. Effects of walking and other exercise programs upon blood pressure in normal subjects. Med J Aust 1993;158:234-238.

Knowler WC, Barrett-Connor E, Fowler S, et al. Nathan DM. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002;346:393-403.

Levy D, Kenchaiah,S, Larson MG, et al. Long-term trends in the incidence of and survival with heart failure. N Engl J Med 2002;347: 1397-1402.

Murphy NF, MacIntyre K, Stewart S, et al. Long-term cardiovascular consequences of obesity: 20-year follow up of more than 15 000 middle-aged men and women (the Renfrew-Paisley study). Eur Heart J 2006;27:96-106.

NHFA (National Heart Foundation of Australia) 2004. The relationship between overweight, obesity and cardiovascular disease. AIHW Cat. No. CVD 29. Canberra: AIHW (CVD Series No. 23).

Reid CM, Maher T, Jennings GL, Heart Project Steering Committee. Substituting lifestyle management for pharmacological control of blood pressure: a pilot study in Australian general practice. Blood Press 2000;9:267-274.

Stewart S, Murphy N, McGuire A, McMurray JJV. The current cost of angina pectoris to the National Health Service in the United Kingdom. Heart 2003;89:848-853.

Stewart S, Jenkins A, Buchan S, Capewell S, McGuire A, McMurray JJ. The current cost of heart failure in the UK – An economic analysis. Eur J Heart Fail 2002;4:361-371.

Sugiyama T, Healy GN, Dunstan DW, Salmon J, Owen N. Is television viewing time a marker of a broader pattern of sedentary behaviour? Ann Behav Med 2008;35:245-245. Epub 2008 Mar 21.

10. List of tables and figures

10.1 List of tables

10.2 List of figures

Baker IDI
HEART & DIABETES INSTITUTE

An exciting new era in improving the health of all Australians and protecting the health of future generations has begun at the Baker IDI Heart and Diabetes Institute. With an unparalleled opportunity to combat obesity, the global epidemic of diabetes and their devastating cardiovascular complications, Baker IDI Heart and Diabetes Institute will endeavour to dramatically reduce death and disability caused by these serious health issues through state of the art research, clinical care, education and advocacy.