Social Policy Evaluation and Research Unit

superu

The wider economic and social costs of obesity: A discussion of the non-health impacts of obesity in New Zealand

JANUARY 2015

NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Our purpose

The Social Policy Evaluation and Research Unit's (Superu's) purpose is to increase the use of evidence by people across the social sector so that they can make better decisions – about funding, policies or services – to improve the lives of New Zealanders, New Zealand communities, families and whānau.

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Foreword

If there's one issue that is top-of-mind at the moment, it's obesity. It's covered extensively in research, reports and throughout the popular media, and there's no doubt it's a serious issue. The growing rate of obesity in New Zealand and other countries has health implications for individuals, families and communities.

But what of the non-health impacts of obesity on people's lives, such as the social and economic costs at an individual and societal level?

With this in mind we commissioned the New Zealand Institute of Economic Research (NZIER) to provide a review of the evidence on the non-health social and economic costs of obesity.

This report highlights the impact obesity has on our economic, social, cultural and environmental well-being. At an individual and family level it can affect our income levels, educational achievement, self-esteem and social participation. As a society it affects how our taxes are used in government subsidies and even infrastructure.

The report also sets out some areas of focus for the future so we can inform policy decisions. The issue of obesity in New Zealand suffers from too much uncertainty and lack of research at this stage so future work on obesity must be targeted at:

- identifying the issues by estimating the wider cost of obesity for New Zealand
- assessing the intervention opportunities and proposing solutions.

We trust you find this evidence thought-provoking and useful.

Dr Gail Kelly
DIRECTOR CLIENT SERVICES
& SECTOR CHANGE

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established Quarterly Survey of Business Opinion and Quarterly Predictions.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

Each year NZIER devotes resources to undertake and make freely available economic research and thinking aimed at promoting a better understanding of New Zealand's important economic challenges.

NZIER was established in 1958.

Authorship

This report was prepared at NZIER by Peter Clough and Killian Destremau.

It was quality approved by Derek Gill.

The assistance of Sarah Spring is gratefully acknowledged.

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01

Introduction

Obesity is defined as an excessively high amount of body fat in relation to lean body mass, and is associated with an increased risk of a number of health conditions (Ministry of Health, 2013).

The increase in weight can be attributed to an increase in food energy intake (calories), due to changes in the availability and composition of food, and decrease in people's energy expenditure.

The factors contributing to the rise in obesity across a population are not known with any precision. The increasing size of people within populations is a trend which is evident in many countries.

Superu has asked NZIER to review the evidence of wider economic and social impacts of obesity. This report identifies the broad range of social and economic costs of obesity for New Zealand, excluding the direct health costs relating to obesity. The discussion is structured in two sections:

(1) Obesity has become a major health concern
(2) The wider economic and social costs of obesity.

1.1 Obesity has become a major health concern

Obesity is now a major national health issue in New Zealand. The incidence of obesity in New Zealand has trebled since 1977. Today a third of New Zealand's population aged 15 years and over is obese.

In 2011, an OECD review of the prevalence of obesity placed New Zealand as the third most obese country in the developed world – only the United States and Mexico were higher.

The incidence of obesity varies amongst New Zealand's different socio-economic groups. Pacific peoples and Māori are much more likely to be obese. Similarly individuals living in socially deprived areas are more likely to be obese.

1.2 Aim and methodology

NZIER has surveyed the literature on the wider/non-health impacts of obesity and summarised the costs arising from them.

Obesity has adverse impacts on a population's economic and social functioning. These impacts can be debilitating, restrict individuals' activities and cause heightened risk of a range of health effects from which other consequences flow.

Studies in various countries have attempted to quantify the effects of obesity in economic terms. Many of these focus on the direct costs to the community of diagnosis and treatment of obesity, including medical services, hospital-related costs and personal healthcare costs (such as medication).

There are also non-health costs resulting from obesity. Non-health costs have received less attention in the research literature than the direct medical-related costs, particularly in New Zealand.

This report examines the evidence for non-health impacts from the international literature and considers their applicability to New Zealand.

The intention is not to develop a definitive estimate of these non-direct costs for New Zealand, but to infer from available evidence how large the different impacts might be in the New Zealand context.

The aim is to guide future efforts in researching knowledge gaps and prioritising new policy initiatives towards areas where they could alleviate the greatest economic costs.

See Appendix C for a bibliography of the publications referred to in the report. All the publications uncovered from the literature search are listed in Appendix D.

The incidence of obesity in New Zealand has trebled since 1977. Today

1/3

of New Zealand's adult population is obese.

1.2.1 _ Framing the issues raised by effects of obesity

The framework we use in this report is the notion of the three well-beings – economic, socio-cultural and environmental.

This framework provides a way of sorting the evidence on the impacts of obesity according to the main effect they have on people – on their social and cultural interactions, their economic opportunities, and the natural environment in which they live.

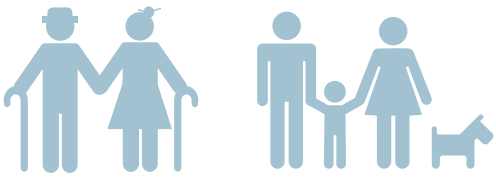
We point out the relationships between the different costs of obesity across the three main categories, that is economic, socio-cultural and environmental.

Obesity is often portrayed as a purely personal problem. The effect of individuals' choices over diet and exercise has predictable results that are attributable to personal decisions.

As a result, the consequences of obesity are commonly seen as a private matter, felt primarily by the obese themselves. But obesity has wider effects on families and communities.

We therefore distinguish between the impacts on:

- individuals and their families and extended whānau – suffering from poorer mental health, lower educational attainment and discrimination
- the nation – impact on government expenditure and environmental costs.



1.3_ Implications

We conclude this report with a summary of the findings and a discussion of the implications of the evidence on the wider costs of obesity for New Zealand.

The implications that NZIER raises for Superu are that:

- New Zealand has one of the highest rates of obesity in the OECD
- obesity has significant non-health costs
- the costs of obesity are inter-related
- the impacts of obesity on families can have lifelong consequences
- the impacts of obesity are greater for women, and especially girls
- the incidence of obesity differs among ethnic groups
- there is a lack of evidence of the impact of obesity in New Zealand.

02

Causes and prevalence of obesity in New Zealand

2.1 Definition of obesity

The internationally agreed definition of obesity is provided by the World Health Organisation (WHO).

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health.

(WHO, 2014)

In New Zealand, the Ministry of Health similarly defines obesity as:

An excessively high amount of body fat in relation to lean body mass. Obesity is associated with a substantially increased risk of a number of health conditions.

(Ministry of Health, 2013)

BMI:

≥ 25
IS OVERWEIGHT

≥ 30
IS OBESE

The body mass index (BMI) is the commonly used measure to classify underweight, overweight and obesity in both children and adults. The BMI is calculated using a person's weight in kilograms divided by the square of his/her height in metres (kg/m^2)

The WHO definition is:

- a BMI greater than or equal to 25 is overweight
- a BMI greater than or equal to 30 is obese.

BMI provides the most useful population-level measure of overweightness and obesity as it is the same for both sexes and for all ages of adults (WHO, 2014).

The BMI cut-offs shown in Table 1 below apply to all ethnic groups (Ministry of Health, 2013):

TABLE 01

International cut-off points for adults aged 18 years and over

Source: Ministry of Health, 2013

Classification	BMI score kg/m²	Risk of co-morbidity (multiple diseases)
Underweight	< 18.50	Low risk (but risk of other clinical problems increased)
Normal range	18.50–24.99	Average risk
Overweight	25.00–29.99	Increased risk
Obese:	≥ 30.00	High risk
Obese (class I)	30.00–34.99	Moderate risk
Obese (class II)	35.00–39.99	Severe risk
Obese (class III)	≥ 40.00	Very severe risk

For children aged 2–17 years, sex and age-specific BMI cut-off points are used to define thinness, overweight and obesity. They are designed to coincide with the WHO BMI cut-off points for adults at age 18 years (Ministry of Health, 2013).

There is empirical literature that shows BMI is not the same for all genders and ethnicities for a given age group. A particularly important consideration for New Zealand is the BMI cut-off for Māori and Pacific peoples. There is evidence that supports a higher BMI cut-off for these two groups.

2.2_ Obesity is caused by a range of factors

In this section, we discuss the factors that cause obesity overall as well as additional factors that drive child obesity.

2.2.1 _ Causes of obesity

The immediate cause of being overweight or obese is an energy imbalance between calories consumed and calories expended. This imbalance has been largely associated with changes in dietary and physical activity patterns. The main causes for these pattern changes are the environmental and societal shifts that have changed our way of life (WHO, 2014).

The rapid increase in the prevalence of obesity in recent years has been mainly attributed to an increasingly 'obesogenic' environment – one that promotes over-consumption of food and drinks and limits opportunities for physical activity (Ministry of Health, 2013). Although there is a genetic component to obesity, this does not explain the recent rise in its prevalence (Crowle & Turner, 2010).

The causes of the increase in incidence of obesity have attracted a lot of research interest but the evidence is patchy. The WHO has reviewed the strength of the evidence for the causes of obesity, from convincing to insufficient, for each suggested cause (see Table 2).

TABLE 02

Summary of strength of evidence on factors that might promote obesity

Source: Noor, Poh & Hashim (2005); WHO (2003).

Strength of evidence	Causes or factors
Convincing	High intake of energy-dense nutrient-poor foods Sedentary lifestyles
Probable	Heavy marketing of energy-dense foods and fast-food outlets Adverse social and economic conditions (in developed countries, especially in women)
Possible	Sugar sweetened soft drinks and fruit juices[1] Large portion sizes High proportion of food prepared outside the home (western countries) "Rigid restraint / periodic disinhibition" eating patterns
Insufficient	Alcohol consumption

The volume of research on the causes of obesity has generated a number of frameworks looking at a wide range of factors. Perhaps one of the most comprehensive frameworks was developed in the United Kingdom by the Government Office for Sciences (Vandenbroeck, Goosens, & Clemens, 2007). Nonetheless, there isn't a commonly agreed model that can explain the rise of obesity at this time in the literature.

2.2.2 _ Causes of child obesity

A more complex web of factors affects weight outcomes in children than in adults (see Figure 1). The Australian Productivity Commission points out that not all factors that affect children's weight outcomes will be completely within their control, and decisions about eating and exercise are not made exclusively with weight in mind (Crowle & Turner, 2010).

Davison and Birch (2001) group the possible causes or factors of child obesity into three categories, which are:

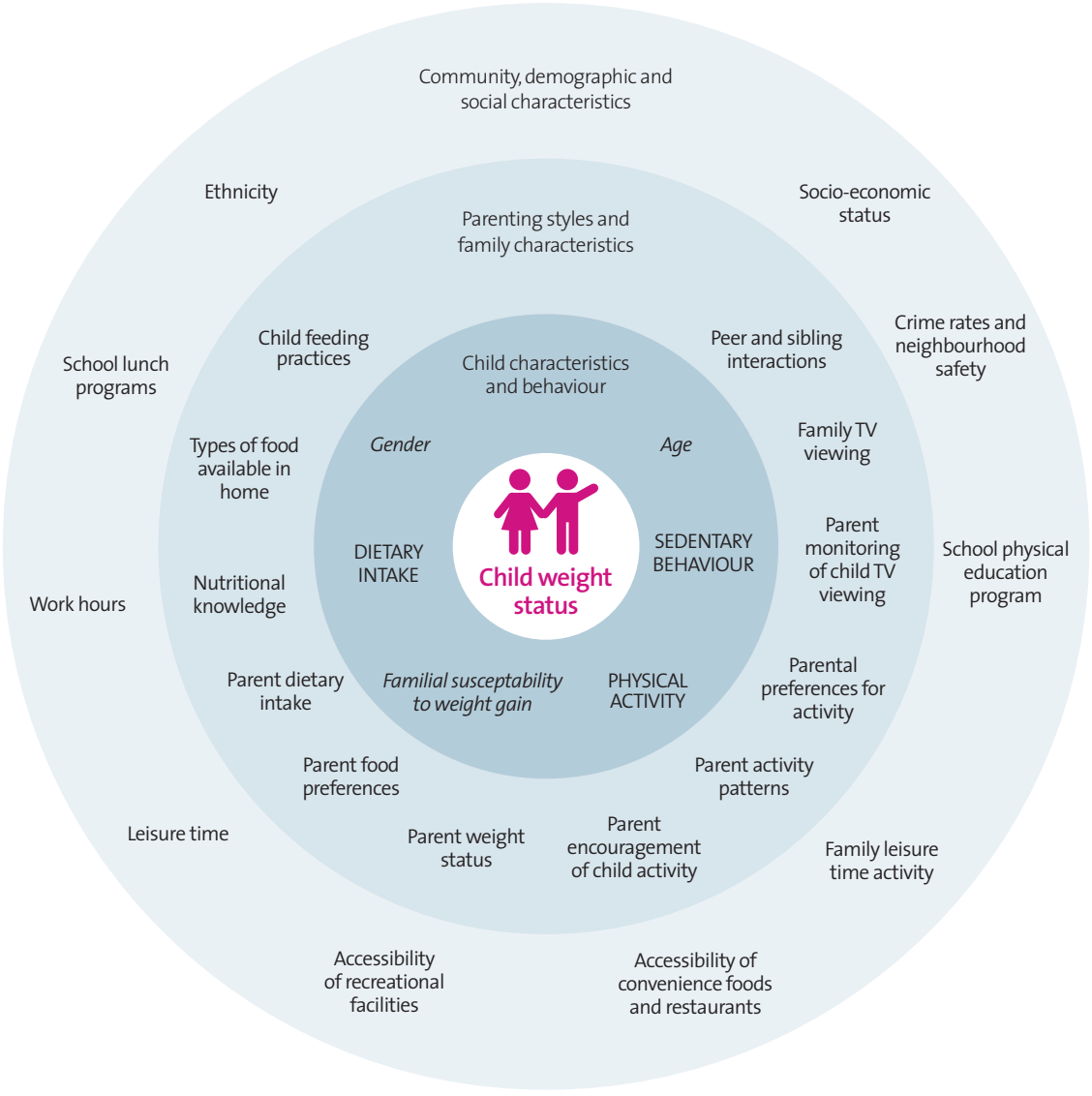
- *"child characteristics and behaviours"*, which includes genetics (child characteristics) and behaviours such as dietary intake, physical activity and sedentary behaviour
- *"parenting styles and family characteristics"*, which can affect a child's behaviour
- *"community, demographic and societal characteristics"*, which can influence parents' and families' and children's behaviours – advertising, socio-economic status (SES), education, ethnicity and the physical environment are discussed here.

As shown in Figure 1, the factors in the outer layers affect those in the inner layers, culminating in the child's behaviour. For example, socio-economic status might influence the types of food available in the home, which can influence dietary intake of children.

[1] Recent research, for example Hu (2013) indicates that sugar sweetened soft drinks and fruit juices are major contriibutors to obesity.

Figure 1_ Understanding the causes of child obesity

Child behaviours (in upper case lettering) are associated with the development of overweight and obesity. Characteristics of the child (in italics) interact with child behaviours and contextual factors to influence the development of overweight and obesity.



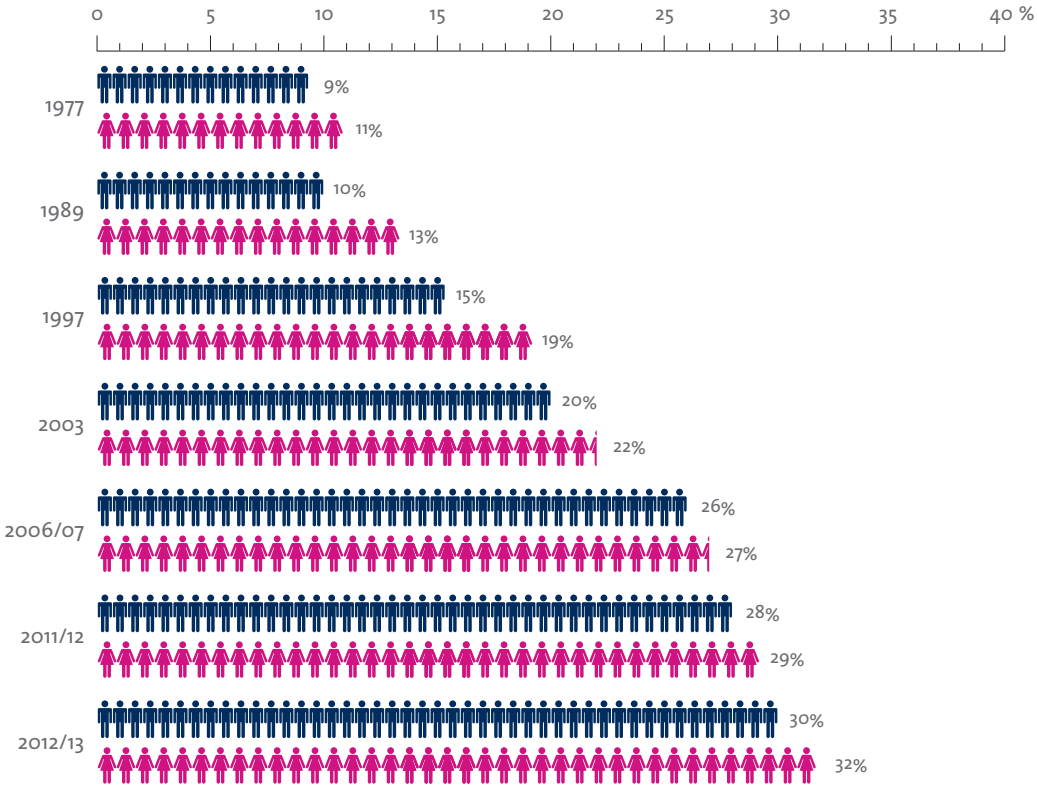
Source: Crowle & Turner, 2010

2.3_ The incidence and trends of obesity in New Zealand

As shown in Figure 2, the prevalence of obesity in New Zealand has trebled since 1977. Three in ten adults (31%) were obese in 2012/13 which is over 1.1 million adults. The obesity rate has increased significantly for all ages, sex and ethnic groups.

Figure 2 _ Prevalence of adult obesity in New Zealand

Prevalence of obesity in the adult population aged 15 years and over; Total by sex

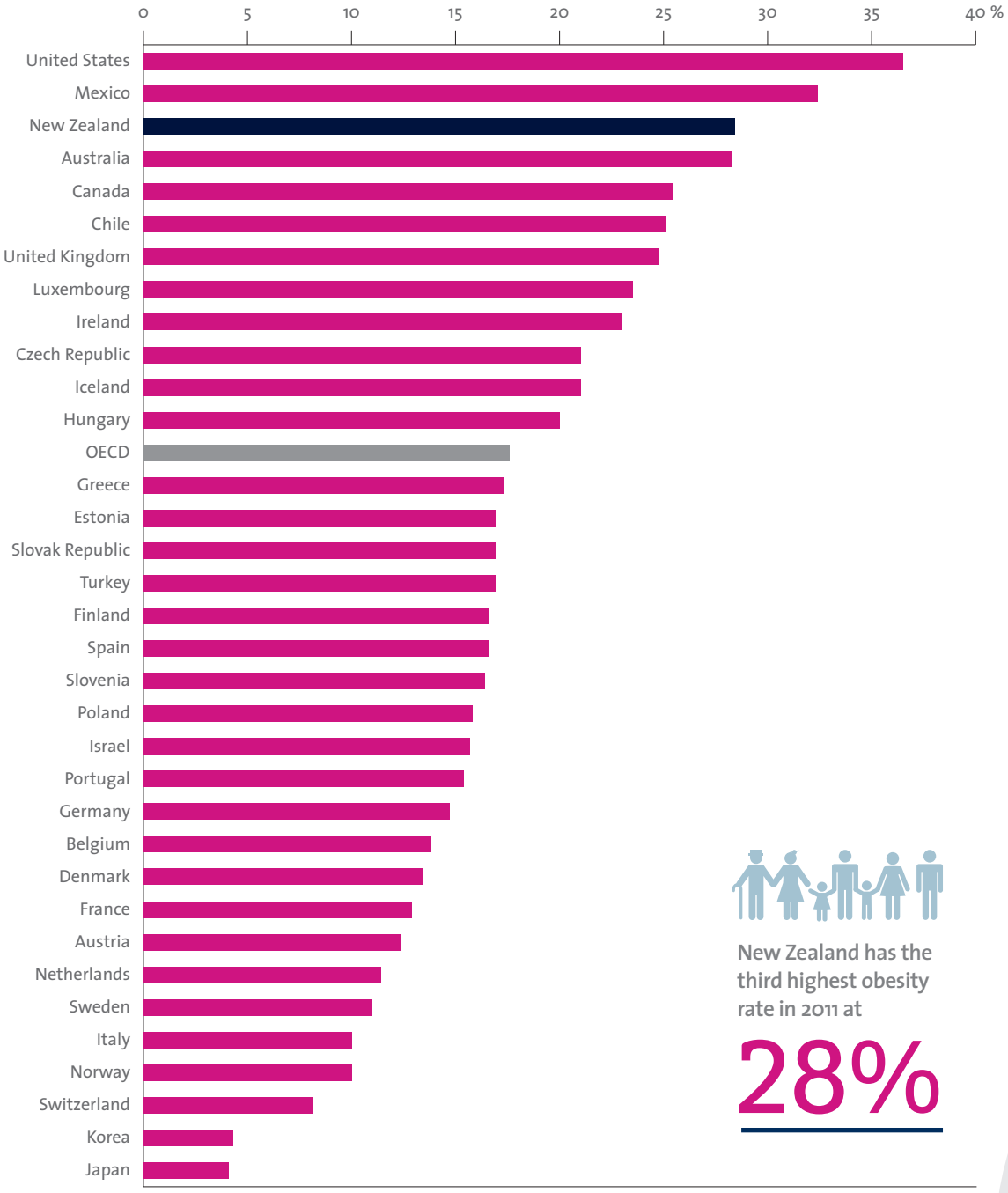


Source: Ministry of Health, 2013; Ministry of Health, 2004

The prevalence of obesity in New Zealand is among the highest in the OECD, with the third highest obesity rate in 2011 at 28%. The prevalence of obesity in Australia was only marginally lower than that of New Zealand. The OECD average rate in 2011 was 17%.

Figure 3 _ OECD comparison of the incidence of obesity

2011; Obese population aged 15 years and over; Proportion of total population



Source: OECD (2014)

New Zealand has the third highest obesity rate in 2011 at

28%

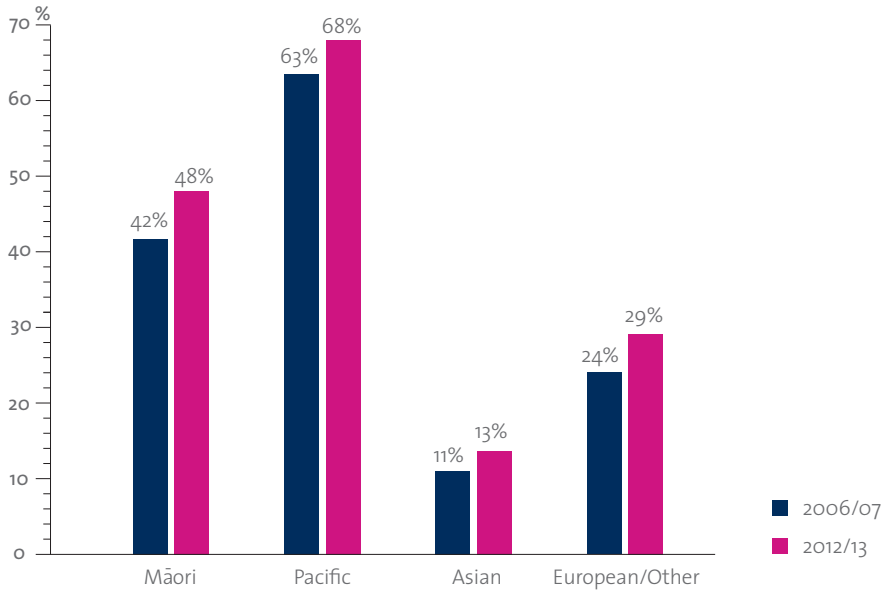
The prevalence of obesity varies with ethnicity. Data from the Ministry of Health (see Figure 4) shows that obesity rates are highest amongst Pacific adults, where over two-thirds (68%) were obese. Rates of obesity were also high among Māori adults, among whom almost half (48%) were obese.

68%

Obesity rates were highest amongst Pacific adults, where over two-thirds (68%) were obese.

Figure 4 _ Prevalence of adult obesity in New Zealand by ethnic group

Prevalence of obesity in the adult population aged 15 years and over

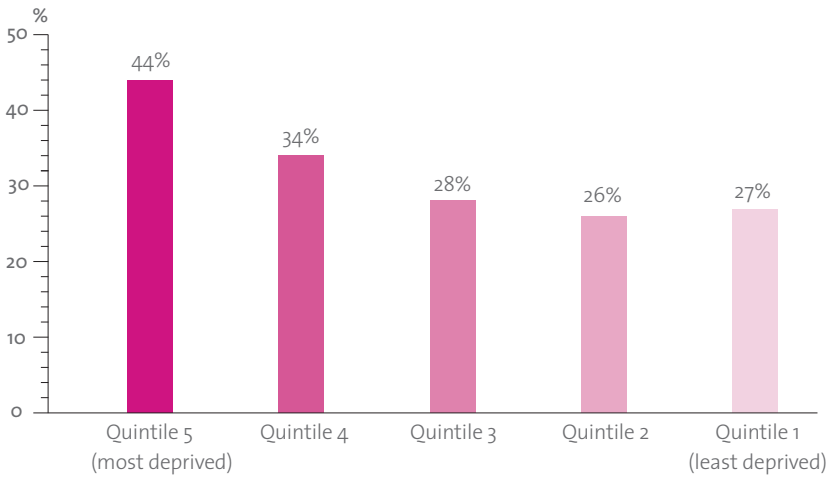


Source: Ministry of Health, 2013

Ministry of Health (2013) data show that adults living in the most deprived areas are 1.6 times as likely to be obese as those living in the least deprived areas (1.5 times after adjusting for age, sex and ethnicity).

Figure 5 _ Prevalence of adult obesity in New Zealand by deprivation quintile

2012/13; Neighbourhood deprivation (NZDep2006 quintile 1); Not adjusted for age, sex and ethnicity



Source: Ministry of Health, 2013

In 2006, adults living in the most deprived areas were 1.6 times more likely to be obese as those living in the least deprived areas (1.5 times after adjusting for age, sex and ethnicity).[2]

[2] The NZDep2006 Index of Deprivation describes the deprivation experienced by groups of people in small areas. The Index of Deprivation is based on income, home ownership, family support, employment, qualifications, living space, access to communication and access to transport (White, Gunston, Salmond, Atkinson, & Crampton, 2008).

03

The wider economic costs of obesity to New Zealand

3.1 The non-health impacts of obesity, evidence from the literature

Table 3 summarises the literature survey findings into the non-health impacts of obesity. We provide a brief description of the individual impacts.

TABLE 03

Non-health impacts of obesity

Source: NZIER

Impacts	Evidence highlights
Wages	People who are obese or overweight earn less.
Productivity Absenteeism	Obesity is a well-known risk factor for sick leave, disability pension and premature death and is therefore presumably related to lower productivity.
Education	Lower child and adolescent educational achievement.
Occupational attainment	Obesity limits promotional opportunities in the workplace.
Employment	Obesity acts as a barrier to employment.
Discrimination	Obese people may be stereotyped and discriminated against in the workplace because of higher absenteeism and lower productivity. Obese children and adults are also vulnerable targets of stigma and bullying from society and from within the family.
Infrastructure	Organisational adjustment to obesity.
Disability and fewer productive years	Severe or morbidly obese people tend to retire earlier than those of healthier weight, reducing their lifetime earnings and contribution to national productivity.
Premature mortality	Premature mortality reduces an obese person's production, consumption and contribution to society. Additionally, there is the pain, grief and suffering it causes family and friends, and the loss of income and security for family left behind.
Government subsidy	There is a burden on society for the additional taxes to pay for obesity-related public services[3].
Self-esteem and mental health	Obese people are at a greater risk of depression, anxiety, low self-esteem and low body satisfaction.
Intergenerational impact	The likelihood of youth obesity is influenced by: parent's obesity, status, education, mental health, race, sex and family size.
Socio-economic status	Obesity is higher in families of lower socio-economic status.
Discrimination Transport	Larger vehicles are needed to transport the same number of commuters and travellers each year. This produces an economic cost (in the form of greater spending on fuel), as well as potential environmental costs in the form of greater emissions of greenhouse gases and particulates.
Crime	Obese individuals are less likely to commit crime and be arrested.

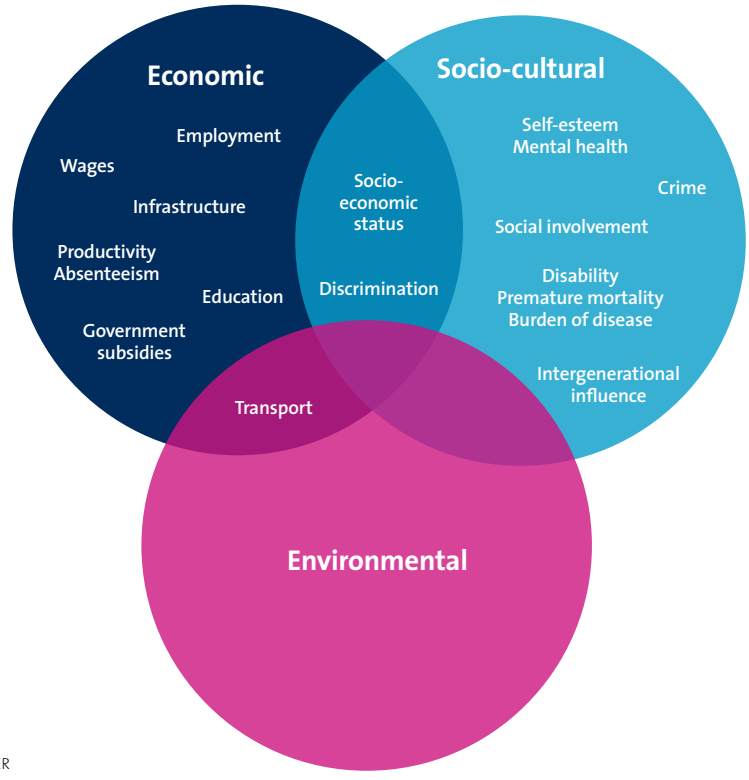
[3] Deadweight loss (DWL) from obesity-related transfer payments.

3.2_ The economic, socio-cultural and environmental costs of obesity to New Zealand

The impacts of obesity create costs that span (and sometimes overlap) the economic, social-cultural and environmental well-beings. Figure 6 explains how the impacts from obesity affect the three well-beings.

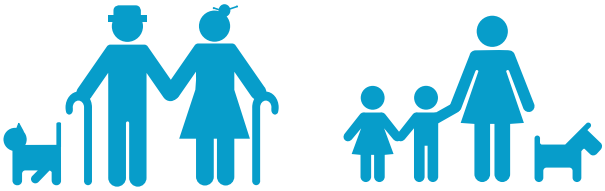
The literature review has not uncovered much specific to the cultural consequences of obesity, so we have collapsed the four well-beings framework into three by combining social and cultural well-beings. The framework provides a broad organising guide, not a firm categorisation.

Figure 6 _ The three well-beings framework and the costs of obesity



Source: NZIER

The three aspects of well-being are closely interconnected. For example, there are clear overlaps between the economic and socio-cultural costs of obesity that relate to socio-economic status and discrimination. Consequences of obesity for employment and income directly affect *economic* well-being, but in affecting disposable income they also indirectly affect opportunities for participation in community activities and *social* well-being. Conversely, lower levels of social well-being affect self-esteem and mental health; in turn these are drivers of lower educational and occupational attainment. Discrimination as a result of obesity has economic as well as social costs, for example discrimination in the workplace.



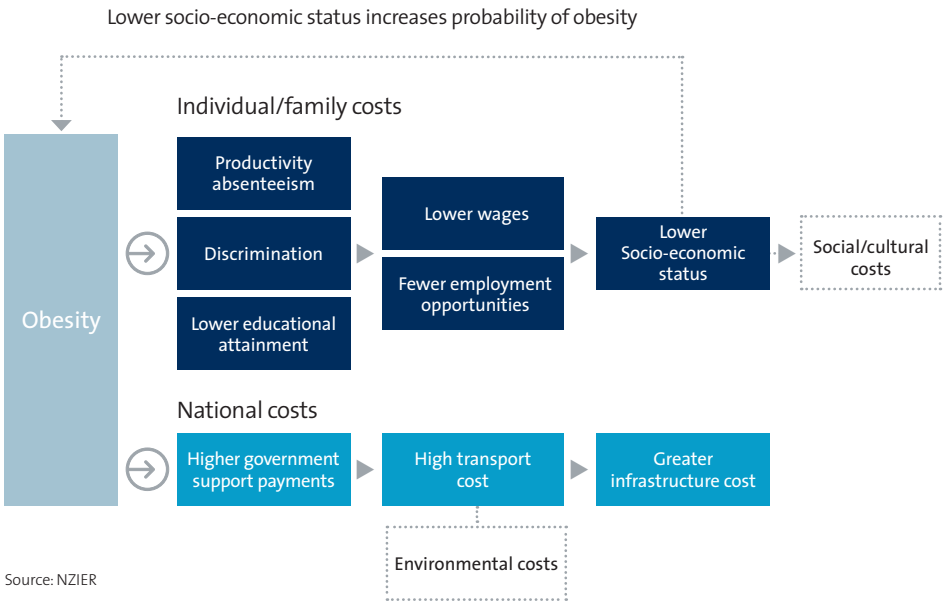
04

Economic costs

Figure 7 sets out the economic costs of obesity. It shows the interrelation amongst the costs as well as allocates them to the 'level' (i.e. individual/family or national level) which bears each of the respective costs. Naturally, one could argue that all costs of obesity are a national loss of welfare to New Zealand. However, through this framework we differentiate where specific costs are born in large parts by the obese individual/family or by everyone (national costs).

We point out an important feedback loop of obesity arising from lower socio-economic status. Accounting for all the economic costs of obesity to the individual and the family, the overall outcome from obesity is lower socio-economic status. But in turn lower socio-economic status increases the probability of obesity itself.

Figure 7_ The economic costs of obesity



Source: NZIER

To summarise the important aspects of the economic costs of obesity, we focus on the main interaction taking place. In one way or another all the costs of obesity are related, whether it's between the three main categories of costs (economic, socio-cultural and environmental) or between the different community 'levels' (individual/family and national costs).

4.1_ Individual and family costs

4.1.1 _ Productivity, discrimination and education

The bulk of the economic costs are borne by the individual or the family. The socio-economic cost of obesity is essentially a result from the other, more specific, costs of obesity on the individual and family. Furthermore socio-economic status has socio-cultural costs.

The most commonly measured costs of obesity (outside of medical costs) are those arising from loss of productivity due to obesity-related time off work (absenteeism) or reduced effectiveness in the workforce (presenteeism).

If the rate of absenteeism among the obese can be identified, there are methods available to provide an aggregate estimate of its total cost to the economy.

Lal, Moodie, Ashton, Siahpush, & Swinburn (2012) estimate the lost productivity costs of overweight and obesity in New Zealand in 2006. They found that the total productivity loss cost lay between $98m to $225m and the health costs were estimated to be $623.9m. This study is the only estimate of the non-health cost of obesity in New Zealand we were able to locate and the findings are inconsistent with two Australian studies which put the non-health impacts much higher than the health impacts.

Medibank Health Solutions (2010) estimate that in Australia the loss in productivity in 2008/09 due to obesity through absenteeism, presenteeism and premature death is $6.4 billion a year. In comparison, their total direct medical cost estimate of obesity was $1.3 billion. Another study by Access Economics (2008) for Australia has estimated the loss in productivity at $3.6 billion and the direct medical cost at $2 billion in 2008.

Costs related to absenteeism, disability and other productivity losses resulting from obesity are at least as high as costs related to health care according to INSPQ (2014), which reports on numerous US and Canadian studies that estimate both health and non-health impacts of obesity.

Obese workers may face discrimination in the labour market, both in terms of lower probability of employment and lower level of wages they are paid, caused in many instances by their assumed lower productivity in the workplace.

Jitendra, Bartels, Manczyk, Mithilesh and Barat (2011) find that obesity is a key driver of injury claims and healthcare costs and that absenteeism led to discrimination against overweight workers in the United States.

Findings show that girls obese at 11 years had lower academic attainment at 11, 13 and 16 years compared with those of a healthy weight.

On the other hand, Dackehag, Gerdtham and Nordin (2011) find that there are income penalties for obesity but no evidence of discrimination in Sweden. In other words, those perceived penalties reflect lower actual productivity rather than a prejudice based on stereotypes.

Lower educational attainment at childhood is another fundamental cause of lower socio-economic status of obese people in their later life. The international literature suggests that the educational attainment of girls is more negatively affected by obesity than for boys.

For example, Sabia (2007) finds a significant negative relationship between body mass index and grade point average (GPA) for white females aged 14-17 in the United States. Okunade, Hussey and Karakus (2009) find no adverse impact of overweight or obesity on timely high school completion for males, but a significant average negative effect on females. Booth et al. (2014) find that girls obese at 11 years had lower academic attainment at 11, 13 and 16 years compared with those of a healthy weight.
The main reason put forward is the higher social pressure on obese girls and women than on boys and men and therefore a greater self-esteem impact that in turn negatively affects their educational performance.

4.1.2 _ Wages and employment

Productivity loss, discrimination and lower educational attainment lead to lower wages and fewer education employment opportunities for obese workers. There is substantial evidence that obesity negatively impacts wages.

That being said, the impact can vary across countries. D' Hombres and Brunello (2005) use European-wide data to investigate the impact of obesity on wages in nine European countries, ranging from Ireland to Spain. They find a negative relationship between BMI and wages in the countries of the European "olive belt" (Spain, Greece, Italy and Portugal) and a positive relationship in the countries of the "beer belt" (Austria, Ireland, Denmark, Belgium and Finland). As a result they argue that such differences could be driven by the interaction between the weather, BMI and individual productivity. Han, Norton and Stearns (2009) find evidence that the wage penalty faced by obese workers increases as they get older, beyond their mid-twenties.

There is evidence that the negative impact of obesity on wages for women is greater than on men. Cawley (2004) finds that weight lowers wages for white females but does not find a significant impact for males or other ethnicities. The author estimated that a difference in weight of two standard deviations (roughly 65 pounds or 29.5 kilograms) is associated with a difference in wages of nine percent. In absolute value, this is equivalent to the wage effect of roughly one and a half years of education or three years of work experience.

Greve (2008) provides a further insight by looking at the impact of obesity in the public and private sector in Denmark. The results suggest that in the private sector BMI has a negative effect on wages for women but an inverted u-shaped effect on wages for men. Results from the public sector show that BMI has no influence on wages for either men or women.

The inverted u-shaped effect of BMI on wages for men suggests that obesity is correlated with lower wages after a certain threshold. The author measures the top of the curve at a BMI of 29, after which wages are negatively correlated with BMI. Obesity is defined as a BMI over 30, which is the top end of the spectrum in a population's weight distribution.

The impacts of obesity are also specific to certain occupations. Han et al. (2009) allow the effect of BMI to vary by type of interpersonal relationships required in each occupation to estimate its impact on wages. They find that the often-reported negative relationship between the BMI and wages is larger in occupations requiring interpersonal skills with presumably more social interactions.

The negative impact of obesity on employment largely results from productivity losses, discrimination and education. A number of studies have found that obesity has a significant negative effect on employment probability. The evidence spans a number of countries, Radice, Zanin and Marra (2013) in Italy, Morris (2007) in England and Han et al. (2009) in the United States (with the exception of black women).

There is more disparate evidence that women are more negatively impacted than men. Greve (2008) analyses the relationship between body mass index (BMI) and employment status in Denmark. The results show a strictly negative effect of BMI on employment for women and again an inverted u-shaped effect for men. Dackehag et al. (2011) find an even stronger disparity in Sweden where excess weight for women, but not men, results in a significant employment penalty.

The disparity of results across countries (most of them in Europe) suggest that country specific characteristics (labour market regulation, anti-discrimination laws towards obese people, level of social acceptance of the condition) do mitigate the impact of obesity on employment.

Severely and morbidly obese employees are more likely to retire earlier than healthy-weight individuals, incurring a loss of income, reduction in their lifetime earnings and contribution to economic production (Dor et al., 2010). The authors also report that the wage and employment costs are greater for obese women than for obese men, and that the incremental costs of obesity are much higher than the incremental costs of being overweight.

4.1.3 _ Other private costs for obese individuals and families

Various other consumer-related costs for the obese have been identified in the literature, including extra costs for non-regular sized clothing, air travel, transport, furniture, or even the cost of larger caskets and equipment to handle them in funerals.

With the exception of transport costs, there is no published research that gives insight into the economic cost of such matters, although anecdotal reports suggest these costs could be significant (Dor, Ferguson, Langwith and Tan, 2010).

4.1.4 _ Socio-economic status

The end consequence of the range of economic costs of obesity is lower socio-economic status for obese people. Furthermore, socio-economic status is a key driver of the likelihood of obesity itself.

The lower socio-economic status of obese people is a major driver of the prevalence of obesity. This is both confirmed by the higher rates of obesity in deprived areas in New Zealand and by more rigorous statistical work supporting this relationship in the international literature.

Gorstein and Grosse (1994), and Murasko (2009) find that obesity is inversely related to family socio-economic status as measured by poverty status (or in the case of New Zealand, measured by the NZDep2006, University of Otago; see White et al., 2008).

This suggests that obesity creates a vicious cycle as the impact works in both directions. Families suffering from obesity face challenges to improve their socio-economic status because of discrimination, lower productivity and lower education. Those lead in turn to lower wages, employment and social deprivation which increase the likelihood of obesity.

4.2_ National costs

4.2.1 _ Greater infrastructure costs

Obesity can result in the need to change what might be called social infrastructure, including transportation systems and public buildings. Venues such as theatres may increase seat sizes to cater for larger bodies, reducing the capacity of auditoria and increasing the cost per seat for obese and non-obese alike.

Greater infrastructure costs from obesity arise from accessibility or safety regulation issues as well as providing comfort for patrons.

NZIER's literature search has not identified any academic research on the greater infrastructure costs due to obesity.

4.2.2_ Increased government subsidies

Government subsidies are commonly included in cost of disease studies because of interest in the fiscal implications for government of social welfare payments to the unemployed or infirm.

From an economic perspective, government subsidies are transfer payments from taxpayers to the recipients with no consequence to total well-being. There can be a resource cost in collecting and redistributing this money – a deadweight cost of taxation – but these are less than the face value of the transfer. In other words, increased government subsidy is not a cost to well-being at the time of the transfer but over time. On the other hand, as government supports those who are unemployed due to obesity, this will create a cost to society if the obese person does not return to work.

Runge (2007) finds that obesity affects expenditures by local, state and national governments, where programmes compensate for or cover some of the private and workforce costs of illness and unemployment.

A number of airlines have put in place 'pay-as-you-weigh pricing' on air tickets.

Colagiuri et al. (2010) estimate the total annual direct cost of overweightness and obesity in Australia in 2005 was $21 billion. The main contributions to the direct health care costs were prescription medication, hospitalisation and ambulatory services. For obesity, hospitalisation accounted for 36% of costs, prescription medication for 33%, and ambulatory services for 25%. In comparison, overweight and obese individuals received $35.6 billion in government subsidies. The authors do not break down the subsidy into different welfare payments. The estimate is based on the different subsidy per person between healthy, overweight and obese persons.

But the inclusion of these subsidies as a cost from obesity is suspect. The authors include old age pensions and unemployment benefits, the attribution of which to obesity is by no means clear, unless in retiring earlier the obese are entitled to additional social welfare payments that are not available to those of healthy weight.

Finally, obesity is associated with premature mortality and therefore could reduce the social welfare spending. It is unclear to NZIER if this 'benefit' has been taken into account for the reviewed estimate of government subsidies resulting from obesity.

4.2.3_ High transport costs

The increased cost of obesity on transport produces economic costs in the form of greater spending on fuel and sometimes reconfiguration of vehicle seating, which both increases costs and reduces payload capacity. Dannenberg, Burton and Jackson (2004) calculate that weight gain in the United States required approximately 350 million extra gallons of jet fuel in the year 2000. At a prevailing price of $0.79/gallon, they calculate the extra airline fuel cost due to higher obesity to be approximately $275 million in the year 2000 alone.

Jacobson and McLay (2006) provide an estimate of the fuel-use impact of obesity in the United States. They estimate that approximately 39 million additional gallons of fuel (worth $105 million at current prices) is needed annually in this sector for each one pound of additional average passenger weight. These papers have focused on how fuel efficiency in travel is affected by rising passenger weight, but obesity can affect fuel efficiency before transport choices are made.

There has been a marked correlation between the growth in obesity since the 1970s and the sales of light trucks as private non-commercial use. Increases in body weight means potentially larger vehicles are needed to transport the same number of commuters and travellers each year. Li, Law, Lo Conte and Power (2009) provide empirical analysis showing that the greater prevalence of overweight and obesity has had a substantial effect on the size and fuel economy of new vehicles purchased in the United States.

The additional cost of obesity (particularly on air transport) has led some airlines to put in place 'pay-as-you-weigh pricing' on air tickets, whereby the price of traveling on certain airlines will be a function of the person's weight (Bhatta, 2013).

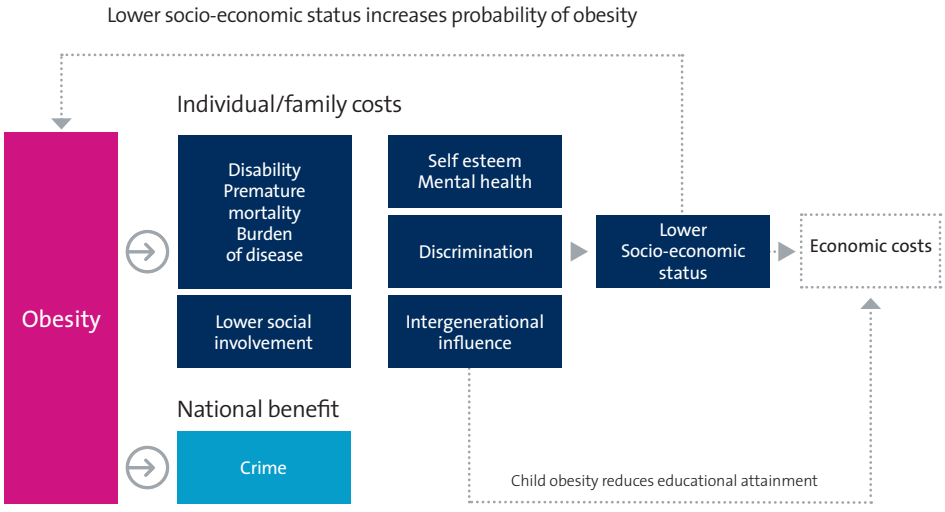
05

Socio-cultural costs

Figure 8 summarises the socio-cultural costs of obesity. Again, we focus on the main interactions taking place.

All the socio-cultural costs of obesity are borne by the individual or the family. The only socio-cultural impact of obesity at the national level is the smaller likelihood of involvement in crime for people who are obese.

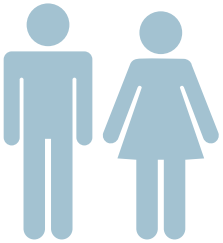
Figure 8_ The socio-cultural costs and benefits of obesity



Source: NZIER

The intergenerational influence of obesity, the greater likelihood within a family of the child being obese if parents are also obese, has an important link to economic costs. As obese children have been found to achieve lower educational attainment, the parents' influence on the child has lifelong consequences on the socio-economic status of their offspring.

5.1_ Individual and family costs



5.1.1_ Costs arising from disability, premature mortality (burden of disease)

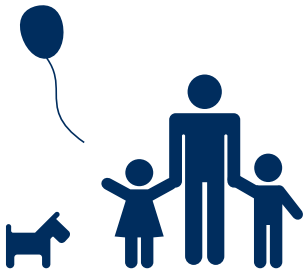
Welfare cost, or burden of disease, is the individual discomfort of obesity reflecting individuals' aversion to the pain, suffering and risk of premature mortality associated with the condition.

The burden of disease measure is meant to be a measure of welfare cost of premature loss of life years and disability years before mortality. There are recognised approaches to valuing the burden of disease in international literature, but applying these depends on identifying the amount of disability associated with obesity in New Zealand. There is no estimate of the burden of disease of obesity for New Zealand. Studies in Australia have found that the burden of disease contributes a large share of the total cost of obesity.

Access Economics (2008) estimates the net cost of lost well-being for Australia (the dollar value of the burden of disease, netting out financial costs borne by individuals) was valued at a further $17.2 billion in 2005. The total cost of obesity estimated was $21.0 billion.

Medibank Health Solutions (2010) estimate the direct and indirect costs of obesity and obesity-related illnesses in 2008/09 were $37.7 billion. The welfare cost was estimated to be $30 billion.

However, the Australian estimates suffer from a methodological caveat. The approach used was to extrapolate the value of statistical life from the risk of instant death in transport accidents. The value of statistical life is used to estimate the burden of disease. The issue with this methodology is that the value of statistical life calculated is applied with adjustments to the long term risk of reduced health and heightened risk of life-threatening conditions arising from obesity.



5.1.2_ Intergenerational influence of obesity

The intergenerational impact of obesity is the key impact to consider in a family context. The intergenerational influence is the greater likelihood within a family of the children being obese if their parents are obese. In a similar way to socio-economic status, this is another impact of obesity that creates a vicious cycle. The impact of obesity on families is multifaceted. Cole, Power and Moore (2008) agree that maternal obesity operating prenatally cannot explain the intergenerational increase in obesity. Instead, they argue that the intergenerational increase arises from the postnatal environment. They propose that intergenerational obesity is driven by the family environment and involves both the father and the mother.

Li, Law, Lo Conte and Power (2009) and Classen (2006b) observe that excessive BMI gains of parents during childhood and adulthood were associated with a higher BMI and risk of obesity in their offspring. It is not clear whether the mother or the father have a greater influence on the child's probability to be obese, but the evidence tends to support a greater influence from mothers.

Whitaker, Jarvis, Beeken, Boniface and Wardle (2010) find that mother-child associations for body mass index were significantly stronger than father-child associations. They also find that the impact was as significant for sons and daughters and increased with age.

Similarly Classen (2006a) finds that variables that significantly influence the likelihood of youth obesity or overweight outcomes include the mother's obesity status and education. Furthermore, the author finds that women who were overweight or obese in early adulthood obtain less education and produce sons who attain lower levels of education than their peers.

Murasko (2009) provides further evidence that obesity is inversely related to family socio-economic status as measured by poverty status in the United States (or in the case of New Zealand, measured by the Index of Deprivation).

Because the socio-economic status of obese people and therefore their families is subject to economic costs as well, lifting themselves from their situation is very challenging. The influence of parents also increases the likelihood of obesity in childhood but also in adulthood for their offspring. That is to say that an obese child is more likely to be obese in their later life than their normal-weight peers.

5.1.3_ Social discrimination and barriers to social involvement

Obese people often face prejudice or discrimination in the job market, at school, and in social situations. Feelings of rejection, shame, or depression are common among obese people.

Obese individuals are excluded from social interactions, and are discriminated against in others. The international research indicates a high negative impact on social experiences of individuals who are obese with family, friends, co-workers and the general public.

Lewis and Van Puymbroeck (2008) illustrate the presence of significant interpersonal constraints to social and community engagement in that people who are significantly overweight often experience discrimination in family, social and work environments and a general feeling of disapproval from others. The authors also focus on the specific participation in leisure activities and find again that it is the negative self-concept related to physical appearance that acts as a significant constraint.

5.1.4_ Self-esteem and mental health impact of obesity

Obesity often carries a stigma that negatively impacts the social, emotional, and psychological functioning of those who are obese. Wellman and Friedberg (2002) argue that emotional suffering may be among the most painful aspects of obesity to the individual. The authors explain that society emphasises physical appearance and often equates attractiveness with slimness, especially for women.

The embedded social messages may be devastating to obese people. The general opinion becomes that obese individuals are gluttonous, lazy, or both, even though there is no evidence supporting the claim. Latzer and Stein (2013) find that being overweight in childhood, and adolescence more specifically, is associated with a host of psychological and social problems including:

- reduced school and social performance
- less favourable quality of life
- societal victimisation and peer teasing
- lower self-and body-esteem
- neuropsychological dysfunction.

They report that overweight children show elevated depression, anxiety, behaviour problems, attention deficit hyperactivity disorder and disordered eating. Parents' perception of their child's overweightness also highly influences the well-being of obese children and the way in which they perceive themselves.

Obese people often face prejudice or discrimination in the job market, at school, and in social situations.

5.1.5_ Socio-economic status

Society's poor perception of obese people, particularly women, is a major handicap to socio-economic progress.

All the socio-cultural costs of obesity contribute to a greater or lesser extent to lower socio-economic status. Social discrimination reduces the likelihood of social involvement; both in turn have negative impact on the person's self-esteem and mental health. As a result, Enzi (1994) supports the view that obese people, particularly women, are socially stigmatised, which adversely affects their educational, socio-economic and marital status.

Enzi (1994) finds the inverse relationship between obesity and social class is more evident in women. Obese women were found to complete fewer years of school, be less likely to marry, and have lower household incomes compared with women of normal weight. They were also less likely to improve their social status on marriage.

Society's poor perception of obese people, particularly women, is a major handicap to socio-economic progress.

5.2_ National costs

5.2.1_ Crime

A social impact of obesity that has consequences, not only at the individual level, but also at the national level, is a lower propensity to commit crime among obese people.

Kalist and Siahaan (2013) investigate the link between obesity and the likelihood of arrest for young adults in the United States. They hypothesise that obese individuals are less likely to commit crime and be arrested in that the body weights of obese people may prevent them from successfully engaging in certain criminal activities (particularly those that are physically intensive).

These authors find that obesity is negatively related to arrest and estimate that the odds of an obese man being arrested are 64% of those of a healthy weight man. They conclude that the social costs of obesity may be overstated if obesity reduces the likelihood of arrest. That is because the obese are less criminally active, which is a benefit to society.

06

Environmental costs

6.1_ High transport costs

As well as economic costs, the increased cost of obesity on transport produces environmental costs in the form of greater greenhouse gas emissions (Hammond & Levine, 2010). Michaelowa and Dransfield (2006; cited in Hammond & Levine, 2010) conducted an OECD-wide study of the impact of obesity on greenhouse gas emissions through three channels:

- higher fuel consumption needed to transport heavier people
- greater food production needed to feed a population with higher caloric intake
- higher methane emissions resulting from the greater organic waste generated by a heavier population.

They estimate that reduction of average weight by five kilograms across the OECD could reduce CO_2 emissions from the transportation sector by approximately 10 million tonnes annually.

07

Summarising the wider cost of obesity

Table 4 summarises the costs of obesity with respect to the three well-beings (socio-cultural, economic and environmental) and the different community 'levels'.

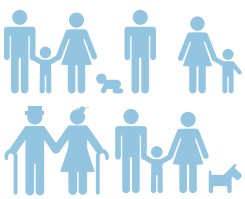
The purpose of this table is to provide an overall picture of the non-health costs of obesity. It also provides insights as to how the costs are actually incurred at the different levels and well-beings.

This table points out that in our organising framework, the wider community and national costs are not the sum of family and individual costs. We consider wider community and national costs as those which not only borne by the individual that is suffering from obesity but also by the rest of the community.

TABLE 04

Summarising the wider costs of obesity

Source: NZIER
Grey shaded cells are direct health costs and out of scope for this study



	Social & Cultural	Economic	Environmental
Individual	Ill-health/quality of life	Ill-health/quality of life	
	Low self-esteem	Welfare loss - reduced quality of life and premature mortality	
	Low participation in social and recreational activities	Medication	
		Low fitness, higher injuries	
	Employment discrimination due to prejudice or real productivity differential	Forgone income: lower probability of employment, probability of lower wages	
		Transport - larger less fuel efficient vehicles; higher fuel consumption	Fuel use emissions contribute to local air quality and global greenhouse gases
		Personal consumption - outsized clothing, larger and stronger furniture, funerals	Increased use of materials such as in clothing and furniture
Family		Limited income for parents transmitted to limited lifetime prospects for children	
	Exclusion, ostracism and bullying	Reduced educational attainment	
		Reduced employment prospects and lifetime earnings and productivity	
Wider community/ National	Exclusion and ostracism - loss of positive contribution to community activity	Publicly funded medical treatment and ancillary services	
	Reduced fitness and engagement in crime	Heightened injury claims with ACC and other insurers	
		Employers' productivity loss; premature death and accelerated recruitment costs	
		Public transport - change in vehicle seating and payload, increased fuel use	Fuel use emissions contribute to local air quality and global greenhouse gases
		Public sporting venues - increase in seating size and reduced seating capacity	Increased use of materials such as furniture

08

Findings and implications

8.1_ Obesity has significant non-health costs to New Zealand

The findings of this research underline the importance of understanding and accounting for the wider costs of obesity.

The impacts of obesity are multifaceted and affect individuals who suffer from the condition, families and communities around them, and the country's social, economic and environmental well-being.

There is conflicting evidence about the extent of costs arising from non-health impacts (the bulk of which are productivity losses) and whether they are less than, equal to or greater than the health impacts of obesity. We do know that the wider costs of obesity are significant and create a substantial welfare loss to New Zealand.

Yet, the focus of literature on the non-health costs of obesity is generally more on causative linkages rather than on consequences. In other words, there is very little research internationally that has quantified non-health costs other than productivity and transport costs of obesity. The literature also shows that costs are higher for the more severely obese.

8.2_ New Zealand has one of the highest rates of obesity

New Zealand ranked as the third most obese nation in the developed world in 2014. Obesity is a major health issue today in New Zealand. Given the significantly higher rate of prevalence in New Zealand relative to other OECD countries, it is likely that the costs incurred are as significant, if not more, than those estimated abroad.

8.3 The costs of obesity are related

The overall impact of obesity is that it reduces life opportunities. When accounting for all the wider impacts of the condition, the overall outcome is a greater probability of obese people to have lower socio-economic status.

The literature explains that this is due to a range of reasons. Probably the most important interrelation of economic costs is the productivity loss that increases the probability of lower wages and employment for those who are obese. Lower socio-economic status for obese people in turn constrains social well-being.

Emotional suffering through discrimination and marginalisation is regarded by some authors as the largest cost to obese people. The social cost of obesity arises also from economic costs and manifests in lower self-esteem, mental health and social involvement of people affected by the condition.

8.4 Impacts on New Zealand families

The health and wealth of New Zealand families are central to the well-being of New Zealand and obesity negatively affects both of these.

The key detrimental effect of obesity on families is that children of obese parents are much more likely to be obese throughout their upbringing and in later life.

The evidence of a negative relationship between obesity and educational attainment suggests a vicious cycle that constrains the opportunities of families suffering from obesity. Deprived families are particularly more likely to suffer from obesity but also have therefore fewer opportunities to improve their socio-economic status.

8.5 Impact on women and especially on girls

The international literature reveals a greater impact of obesity on women and girls in the workplace, in self-esteem and educational attainment. This is an important finding and also needs further investigation in New Zealand.

The social pressures and stereotypes on women who are obese are much greater than for men which intensifies the detriment that obesity causes.

8.6_ Impact on different ethnicities

It is particularly important to understand who bears the costs of obesity. The Ministry of Health estimates that Pacific children were more than three times as likely to be obese as non-Pacific children and Māori children were more than twice as likely to be obese as non-Māori children.

It is apparent that Pacific and Māori families bear a large part of the individual costs of obesity, social as well as economic. Furthermore, Pacific and Māori families are predominant in deprived areas which exacerbates the impacts of obesity.

8.7_ Lack of evidence for the impact of obesity in New Zealand

This report highlights the need for further research on the wider costs of obesity to New Zealand. The rate of obesity has trebled since 1977 and one can suggest that the cost incurred for more than 30 years would be a large detriment to New Zealand's well-being.

Very little evidence is available on the extent of the cost of this condition aside from the direct health impacts. This is particularly true for the social costs of obesity on families and different ethnic groups.

09

Next steps – providing a direction to future work

A key purpose of a future stream of work on the impact and cost of obesity is to inform policy decisions. Yet the issue of obesity in New Zealand suffers from too much uncertainty and lack of research at this stage.

Future work on obesity must be targeted at:

- identifying the issues by estimating the wider cost of obesity for New Zealand
- building on evaluated interventions which have proven to be effective in a local context.

9.1_ Quantifying the wider cost of obesity to New Zealand

In order to efficiently conduct research that will provide insights for policymakers, one must refine the problem definition around obesity and estimate the cost of obesity to New Zealand.

Building on the findings of this report, we recommend quantifying the wider economic and social costs of obesity to New Zealand. More specifically, the following three key wider costs of obesity can be estimated for New Zealand.

9.1.1_ Growing Up in New Zealand

The intergenerational influence of obesity is a major cost to New Zealand families suffering from obesity. That is because children who are obese show worse educational performance and are also more likely to be obese in adulthood.

Growing Up in New Zealand is a longitudinal study that has monitored and collected data on more than 6,000 children since 2009. We recommend that the impact and costs of obesity for New Zealand families should be investigated using Growing Up in New Zealand data.

The analysis could provide evidence in assessing the impact and the cost of obesity to children and families, with regards to education, intergenerational influence, for different ethnicities and socio-economic status.

9.1.2_ Update the cost of productivity losses to New Zealand

The latest and only estimate of the cost of productivity loss from obesity to New Zealand by Lal et al. (2012) estimated that in 2006 the total cost lay between $98m to $225m. Since 2006, the prevalence of adult obesity has increased from 26% to 31%.

We recommend that the cost of productivity losses to New Zealand be updated using the 2013 evidence on the rate of obesity in New Zealand. We also recommend that the estimation approach for the cost of productivity should be consistent with the Australian publications to ensure comparability.

9.1.3_ Estimate the higher transport cost of obesity

Finally, the higher transport costs are quantifiable and we recommend these should be estimated for New Zealand. Obesity creates both economic and environmental costs to New Zealand's well-being.

9.2 Assessing intervention opportunities

New Zealand was the third most obese nation in the OECD in 2014. Future research should explore whether there are specific factors at play in our country that are creating a more conducive environment for obesity. It is important to better understand what is driving the increase in New Zealand today. The intent of the next piece of work should be to provide a frame and direction for future investigation towards policy recommendations.

9.2.1 Understanding obesity for New Zealand communities

The non-health consequences of obesity are largely borne by the Māori and Pacific communities. A possible next step is an assessment of potential interventions to address the major health, economic and social issues of obesity by:

- identifying the drivers of obesity in New Zealand's Māori and Pacific communities
- building an understanding of the relevant lessons learned from overseas and in New Zealand on effective interventions that help reduce the incidence of obesity in these communities.

9.2.2 Lessons from overseas and New Zealand on intervention

In light of the causes of obesity identified, the next logical step is to consider tools and interventions available to tackle the problem of obesity.

Two examples of programmes with demonstrated efficacy in combating childhood obesity in New Zealand are Project Energize and the APPLE Project (New Zealand Medical Association, 2014). Although these interventions focus on health benefits to participants and their communities, effective programmes such as these are likely to have flow-on positive economic and social benefits.

Project Energize is a nutrition and exercise initiative funded by the Waikato District Health Board. Established in 2005, more than 44,000 primary school children and 244 schools now participate in the project. Formal evaluation showed that obesity rates decreased between 2006 and 2011, and that children weighed less, had lower BMIs and demonstrated increased fitness and health literacy levels.

The APPLE Project used a wider community approach to address obesity in Dunedin and Otago. It created a fun exercise and activity environment for children, and discouraged excessive television watching and unhealthy eating habits. Formal evaluations demonstrated the success of the two-year programme, with on-going benefits two years post-intervention.

9.3 Next steps

The New Zealand Medical Association (2014) makes clear policy recommendations to tackle obesity. They emphasise a multi-faceted approach incorporating communities, health professionals and government initiatives. Approaches to address obesity should emphasise the wider positive economic and social impacts to individuals, their whānau and society in addition to the well-documented health benefits of maintaining a healthy weight.

Appendix A

The externality framework and the costs of obesity

The primary aim of this report was to provide a review of the range of impacts and costs of obesity. We provide in Appendix A an additional framework that can help us to think about the impact of obesity.

In examining the costs of obesity, it is useful to consider the economic concept of *externalities*, which economics defines as side-effects or spill-overs of an activity. Economics distinguishes:

- technical externalities - which involve real resource costs and hence affect consumption possibilities and economic well-being across the community
- pecuniary externalities - which are transmitted through the price system and result largely in redistribution of well-being rather than its enlargement or contraction.

For example, if demand for a product increases faster than supply so that prices rise, the suppliers gain a pure transfer of economic surplus from consumers who are willing to pay more, with no effect on total well-being or resource use efficiency.

In a report on childhood obesity, Crowle and Turner (2010) argue that, in contrast to alcoholism and tobacco smoking (which inflicts injury, property damage and exposure to second-hand smoke on other people), obesity causes few technical externalities that materially affect others' well-being.

Rather, the increased demand for services resulting from obesity (increased general taxes and service charges) are more of a pecuniary than a technical externality. It is reflected in a change in the 'price' the community pays for its services shared with the obese.

On the other hand, NZIER emphasises that obesity does not exclusively cause pecuniary externalities. A number of costs of obesity are driven by an increase in real resource costs used for dealing with excessive weight, which leaves the collective of taxpayers and collective service contributors less well off.

There are also real opportunity costs from overweight-related days off work, which are borne at least in part as externalities by employers and fellow employees.

Finally, obesity results in an efficiency cost in raising additional taxes to pay for any increased resource use in publicly-funded services.

The assessment of the impacts of obesity with respect to technical and pecuniary externalities would provide a further understanding of the ways in which obesity impacts New Zealand's overall well-being.

Appendix B

Further information on the incidence of obesity in New Zealand

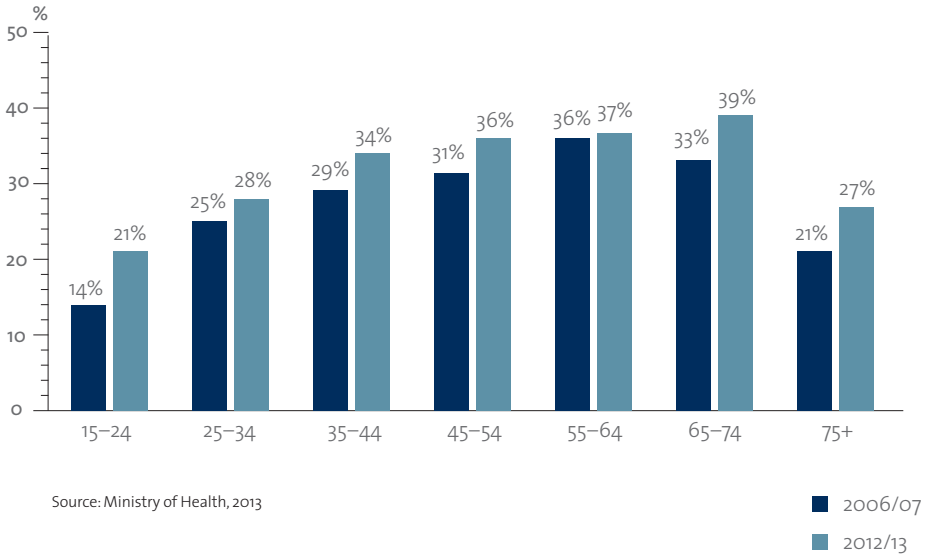
One-fifth (21%) of 15–24-year-olds were obese in 2012/13, reaching 39% in adults aged 65–74 years.

1 in 9

children aged 2–14 years were obese in 2012/13

Figure 9_ Prevalence of adult obesity in New Zealand by age group[3]

Prevalence of obesity in the adult population aged 15 years and over

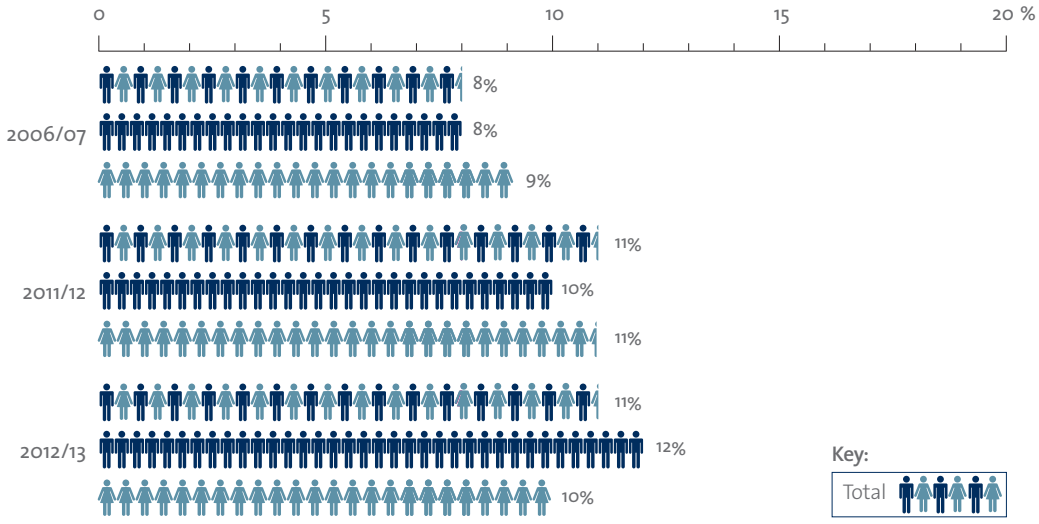


Source: Ministry of Health, 2013

One in nine (11%) children aged 2–14 years were obese in 2012/13, a rate which has significantly increased since 2006/07, meaning that 1.2 million New Zealanders (adult and child) are obese.

[3] The relatively lower incidence of obesity for the 75+ age group is most likely due to the combination of a larger population surveyed as opposed to a 10-year window and to the premature mortality impacts of obesity.

Figure 10 _ Prevalence of child obesity in New Zealand since 2006/07



Source: Ministry of Health, 2013; Ministry of Health, 2004

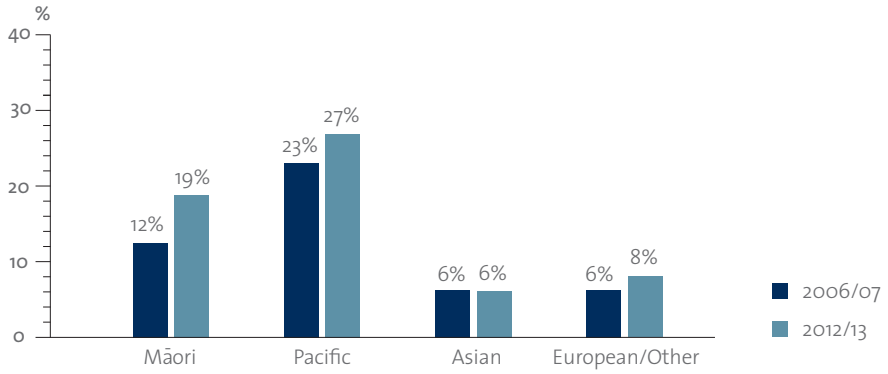
1 in 4

One in four Pacific children was obese in 2013

One in four Pacific children was obese (27%) in 2013. After adjusting for age and sex differences, Pacific children were more than three times as likely to be obese as non-Pacific children.

One in five Māori children was obese (19%). After similar adjustment, Māori children were more than twice as likely to be obese as non-Māori children.

Figure 11 _ Prevalence of child obesity in New Zealand by ethnic group



Source: Ministry of Health, 2013

The childhood obesity rate was much higher in children living in the most deprived areas (20%) than in children living in the least deprived areas (5%).

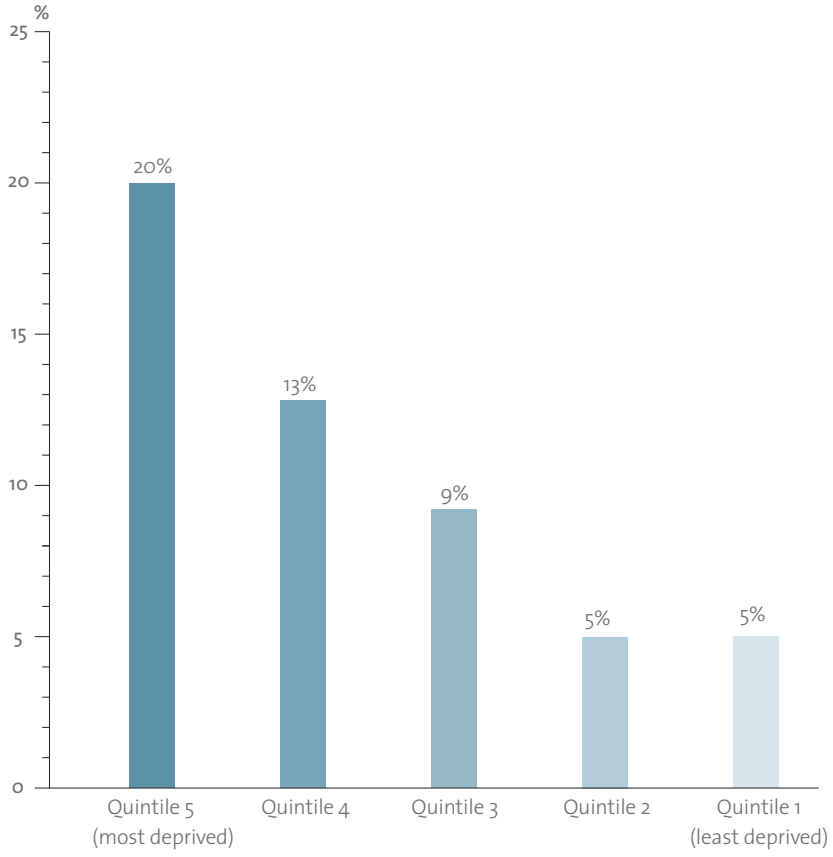
In particular, children living in the most deprived areas are four times as likely to be obese as children living in the least deprived areas (three times as likely to be obese after adjusting for age, sex and ethnicity).

x 4

children living in the most deprived areas are 4 times as likely to be obese

Figure 12_ Prevalence of child obesity in New Zealand by deprivation quintile

2012/13; Neighbourhood deprivation (NZDep2006 quintile); Non adjusted for age, sex and ethnicity



Source: Ministry of Health, 2013

Appendix C

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