



# Overweight and obesity: the public health problem

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**This section of the toolkit focuses on the public health case for developing a local overweight and obesity strategy. It discusses the terms overweight and obesity; provides data on the prevalence and trends of overweight and obesity in children and adults; discusses the health risks of excess weight and the health benefits of losing excess weight; gives current and predicted future direct and indirect costs of overweight and obesity; and examines the causes of overweight and obesity as detailed by Foresight.<sup>5</sup>**

## What are 'overweight' and 'obesity'?

Overweight and obesity are terms used to describe increasing degrees of excess body fatness.

### Energy imbalance – the cause of overweight and obesity

Essentially, excess weight is caused by an imbalance between 'energy in' – what is consumed through eating – and 'energy expenditure' – what is used by the body. Hence it is an individual's biology (eg genetics and metabolism) and/or behaviour (eating and physical activity habits) that are primarily responsible for maintaining a healthy body weight. However, there are also significant external influences such as environmental and social factors (eg changes in food production, motorised transport and work/home lifestyle patterns) that predispose body weight. Thus, the causes of obesity can be grouped into four main areas: human biology, culture and individual psychology (behaviour), the food environment and the physical environment.<sup>5</sup> (More information on this is provided on page 30.)

### Effects of excess weight on health

Overweight and obesity can lead to increasingly adverse effects on health and wellbeing. Potential problems include respiratory difficulties, chronic musculoskeletal problems, depression, relationship problems and infertility. The more life-threatening problems fall into four main areas: cardiovascular disease problems; conditions associated with insulin resistance such as type 2 diabetes; certain types of cancers, especially the hormonally-related and large bowel cancers; and gallbladder disease.<sup>13</sup> (For more on the conditions associated with obesity, see page 23.) The likelihood of developing life-threatening problems such as type 2 diabetes rises steeply with increasing body fatness. Hence, there is a need to identify the ranges of weight at which health risks to individuals increase, using simple assessment methods such as Body Mass Index (BMI).

### Measuring excess weight

Overweight and obesity in children and adults are commonly assessed by using Body Mass Index (BMI), which is defined as the person's weight in kilograms divided by the square of their height in metres ( $\text{kg}/\text{m}^2$ ). However, in adults the waist circumference measurement is also used to assess a patient's abdominal fat content or 'central' fat distribution.



**Tools E3 and E4** provide further detailed information about the various methods for measuring and assessing overweight and obesity in adults and children.

## Prevalence and trends of overweight and obesity

### Prevalence of overweight and obesity among adults



#### KEY FACTS

##### Prevalence

- According to the latest figures (2006), 23.7% of men and 24.2% of women are obese and almost two-thirds of all adults (61.6%) – approximately 31 million adults – are either overweight or obese. The proportion who are severely (morbidly) obese (with a BMI over 40kg/m<sup>2</sup>) is 1.5% in men and 2.7% in women.<sup>10</sup>

##### Age

- In both men and women, mean BMI (kg/m<sup>2</sup>) generally increases with age, apart from in the oldest age group (those aged 75 plus).<sup>10</sup>
- In both men and women aged 16-74 years, prevalence of raised waist circumference increases with age.<sup>10</sup>

##### Gender

- Men have a higher mean BMI than women (27.2kg/m<sup>2</sup> in comparison to 26.8kg/m<sup>2</sup>).<sup>10</sup>
- A greater percentage of men than women are either overweight or obese (67.1% of men compared to 56.1% of women).<sup>10</sup>
- A larger proportion of men (43.4%) are overweight than women (31.9%).<sup>10</sup>
- There is very little difference in the proportion of men and women who are obese (23.7% versus 24.2% respectively).<sup>10</sup>
- Approximately twice as many women (2.7%) as men (1.5%) are severely obese.<sup>10</sup>
- Raised waist circumference is more prevalent in women (41%) than in men (32%).<sup>10</sup>

##### Sociocultural patterns

- Overweight and obesity are more common in lower socioeconomic and socially disadvantaged groups, particularly among women.<sup>14</sup>
- Women's obesity prevalence is far lower in managerial and professional households (18.7%) than in households with routine or semi-routine occupations (29.1%).<sup>12</sup>
- The prevalence of morbid obesity (BMI over 40kg/m<sup>2</sup>) among women is also lower in managerial and professional households (1.6%) than in households with routine or semi-routine occupations (4.1%).<sup>12</sup>

##### Ethnic differences

- In women, the mean BMI is markedly higher in Black Caribbeans (28.0kg/m<sup>2</sup>) and Black Africans (28.8kg/m<sup>2</sup>) than in the general population (26.8kg/m<sup>2</sup>), and markedly lower in Chinese (23.2kg/m<sup>2</sup>).<sup>15</sup>
- In men, the mean BMI of those of Chinese (24.1kg/m<sup>2</sup>), Bangladeshi (24.7kg/m<sup>2</sup>) and Indian origin (25.8kg/m<sup>2</sup>) is significantly lower than that of the general population (27.1kg/m<sup>2</sup>).<sup>15</sup>
- The increase in waist circumference with age occurs in all ethnic groups for both men and women.<sup>15</sup>

### Regional differences

- In both men and women, the prevalence of obesity is greatest in the West Midlands Government Office Region (GOR) (both 29%), and lowest in the London GOR (19% and 21% respectively). In women, the prevalence of morbid obesity is highest in the West Midlands GOR (4%). However, levels are consistent across the rest of England (ranging from 2% to 3%). In men, levels of morbid obesity are also consistent across England (range 1% to 2%).<sup>10</sup>
- The West Midlands GOR has the highest prevalence of overweight (including obese) in men and women (76% and 62% respectively). The London GOR has the lowest levels of overweight (including obese) in England (61% and 49% respectively).<sup>10</sup>
- The prevalence of overweight among men is greatest in the East of England GOR (48%), West Midlands GOR (47%) and South East GOR (46%). The lowest prevalence can be found in the North East GOR (35%). Among women, the East of England GOR has the highest prevalence of overweight (36%), and London has the lowest (28%).<sup>10</sup>

### Prevalence of combined health risk associated with overweight and obesity\*

- Among men, 20% are estimated to be at increased risk, 13% at high risk and 21% at very high risk of health problems associated with overweight and obesity. The equivalent percentages for women are 14% at increased risk, 16% at high risk and 23% at very high risk.<sup>10</sup>

**Notes:**

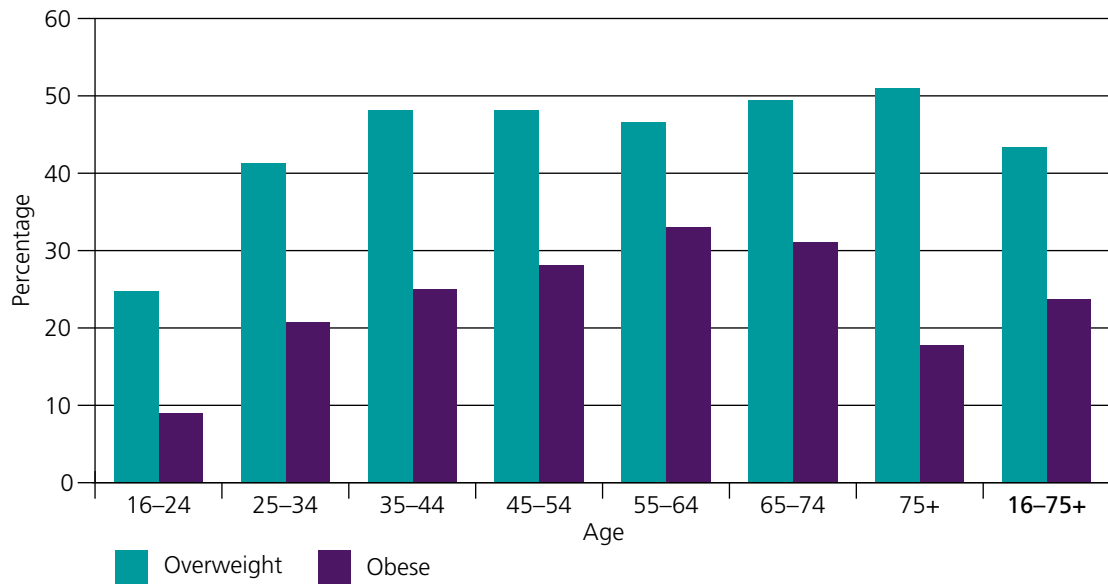
The Health Survey for England (HSE) figures are weighted to compensate for non-response. (Before the HSE 2003, data were not weighted for non-response.)

A raised waist circumference is defined as 102cm or more for men, and 88cm or more for women.<sup>12</sup>

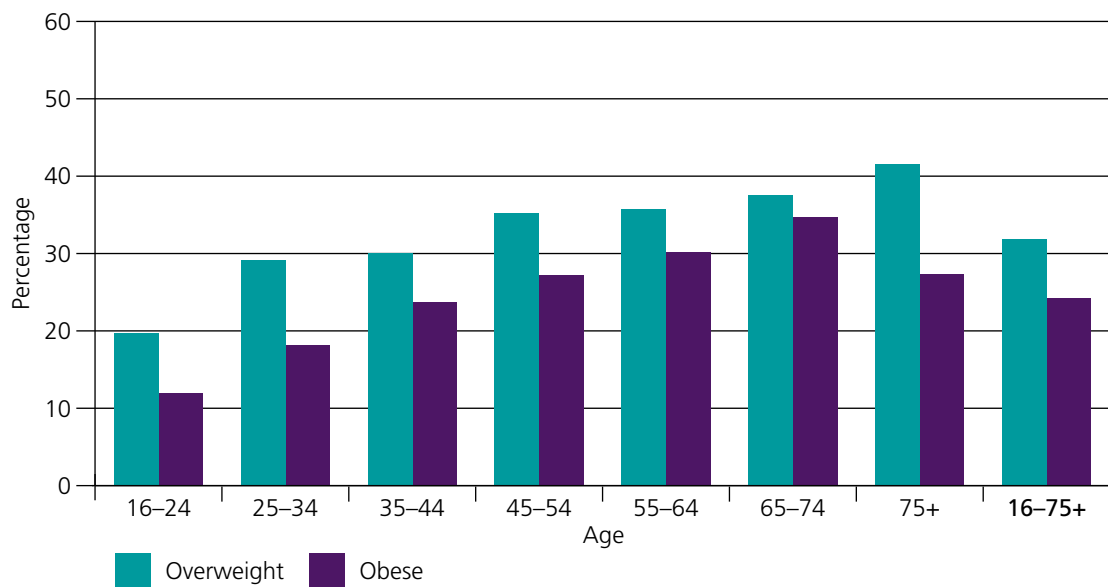
\* NICE guidelines define low, high and very high waist measurements for men and women. A high or very high waist circumference is associated with increased health risks for those with a BMI below 35kg/m<sup>2</sup>. Health risks are very high for those with a BMI of 35kg/m<sup>2</sup> or more with any waist circumference.<sup>6</sup>

**Figure 1** Prevalence of overweight and obesity among adults, by age and sex, England, 2006

**Men**



**Women**



**Note:** Figure 1 uses the Health Survey for England figures which are weighted to compensate for non-response.

Source: Health Survey for England 2006<sup>10</sup>

**Table 1** Prevalence of obesity and central obesity among adults aged 16 and over living in England, by ethnic group, 2003/2004

GENDER	Black Caribbean	Black African	Indian	Pakistani	Bangladeshi	Chinese	General population (2003)
<b>MEN</b>							
Overweight (including obese)	67%	62%	53%	55%	44%	37%	67%
Obese (including severely obese)	25%	17%	14%	15%	6%	6%	23%
Severely obese	0%	0%	0%	1%	0%	0%	1%
Raised waist-hip ratio	25%	16%	38%	36%	32%	17%	33%
Raised waist circumference	22%	19%	20%	30%	12%	8%	31%
<b>WOMEN</b>							
Overweight (including obese)	65%	70%	55%	62%	51%	25%	57%
Obese (including severely obese)	32%	38%	20%	28%	17%	8%	23%
Severely obese	4%	5%	1%	2%	1%	0%	2%
Raised waist-hip ratio	37%	32%	30%	39%	50%	22%	30%
Raised waist circumference	47%	53%	38%	48%	43%	16%	41%

**Note:** The prevalence figures in this table are weighted to compensate for non-response in different groups.

Source: Health Survey for England 2004. Volume 1: The health of minority ethnic groups<sup>15</sup> and Health Survey for England 2003. Volume 2: Risk factors for cardiovascular disease<sup>12</sup>

## Trends in overweight and obesity among adults



### KEY FACTS

- There has been a marked increase in the levels of obesity (BMI above 30kg/m<sup>2</sup>) among adults in England. The proportion of men classified as obese increased from 13.2% in 1993 to 24.9% in 2006 – a relative increase of 89%; and from 16.4% of women in 1993 to 25.2% in 2006 – a relative increase of 54%.<sup>10</sup>
- The prevalence of overweight including obesity has increased in men from 57.6% in 1993 to 69.5% in 2006 – a 21% increase – and among women from 48.6% to 58% – a 19% increase.<sup>10</sup>
- The proportion of men who are morbidly obese (BMI above 40kg/m<sup>2</sup>) rose from 0.2% in 1993 to 1.4% in 2006 – ie a seven-fold increase. For women it rose from 1.4% to 2.7% – ie it almost doubled.<sup>10</sup>
- Mean BMI increased by 1.5kg/m<sup>2</sup> in men and by 1.3kg/m<sup>2</sup> in women between 1993 and 2006.<sup>10</sup>

**Note:** For accuracy, unweighted figures have been used for time comparisons. (Before the Health Survey for England 2003, HSE data were not weighted for non-response.)

Future trends in overweight and obesity among adults<sup>5, 16</sup>

## KEY FACTS

### Gender <sup>a</sup>

- By 2015, it has been estimated that 36% of men and 28% of women in England will be obese.
- By 2025, it has been estimated that 47% of men and 36% of women will be obese.
- By 2050, it has been estimated that 60% of men and 50% of women could be obese.
- The proportion of men having a healthy BMI (18.5-24.9kg/m<sup>2</sup>) has been estimated to decline from about 30% in 2004 to less than 10% by 2050.
- It is estimated that the proportion of women in the 'healthy weight' category (BMI 18.5-24.9kg/m<sup>2</sup>) will fall from about 40% in 2004 to approximately 15% by 2050.

### Sociocultural patterns <sup>a, b</sup>

- The prevalence of obesity among men in 2004 was about 18% in social class I and 28% in social class V. There is no evidence for a widening of social class difference by 2050 – it is estimated that, by 2050, 52% of men in social class I and 60% in social class V will be obese.
- For women, 10% in social class I and 25% in social class V were obese in 2004. It has been estimated that this gap will widen by 2050 with 15% in social class I and 62% in social class V being classified as obese.

### Ethnic differences <sup>a, c</sup>

- Black Caribbean, Bangladeshi and Chinese men are estimated to be less obese by 2050 (from 2006 to 2050: 18% to 3%, 26% to 17%, and 3% to 1% respectively).
- Black Caribbean and Chinese women are predicted to become less obese by 2050 (from 2006 to 2050: 14% to 1%, and 3% to 1% respectively).
- Black African, Indian and Pakistani men are estimated to be more obese by 2050 (from 2006 to 2050: 17% to 37%, 12% to 23%, and 16% to 50% respectively).
- Black African, Indian, Pakistani and Bangladeshi women are estimated to be more obese by 2050 (from 2006 to 2050: 30% to 50%, 16% to 18%, 22% to 50%, and 24% to 30% respectively).

### Regional differences <sup>a</sup>

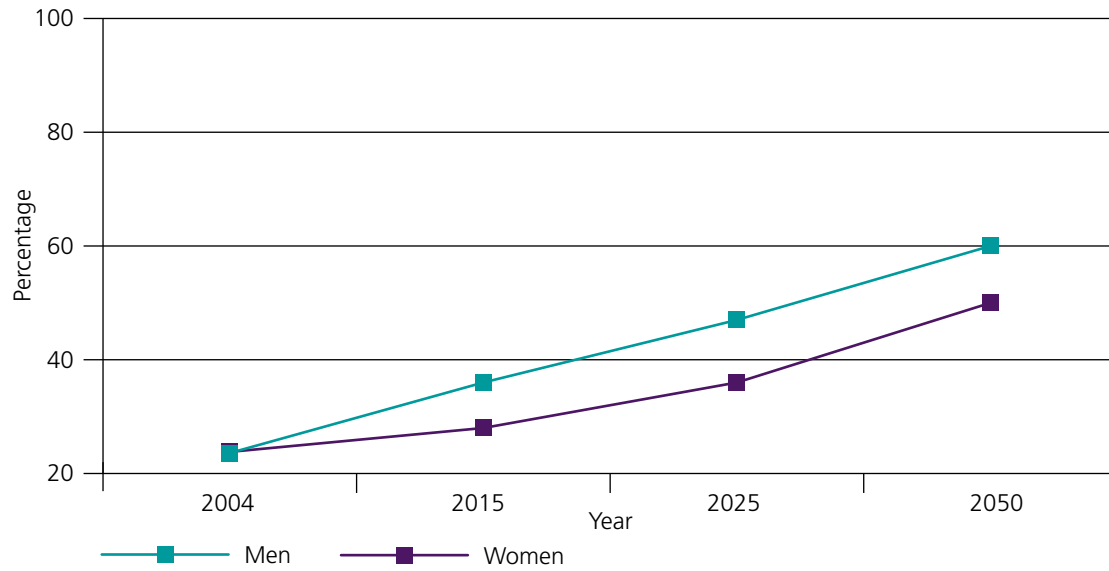
- It is estimated that the incidence of obesity will generally be greater in the north of England than in the south-west of England.
- Among women in Yorkshire and Humberside, obesity levels are estimated to reach 65% by 2050 compared with the south-west of England where the predicted level is 7%, a reduction from 17% currently.
- Among men in Yorkshire and Humberside, West Midlands and the north-east of England, obesity levels are predicted to reach about 70% by 2050, compared with London where the predicted rise is to 38%.

#### Notes:

**a** Future obesity trends have been extrapolated by Foresight using Health Survey for England unweighted data for 1994-2004. Although the 10-year dataset on which the extrapolations are built demonstrates clear and stable trends, predicted figures should be viewed with caution as confidence intervals (CIs) associated with these figures grow larger as one projects into the future.

**b** Social class (I-V) rather than socioeconomic category (professional/routine occupations) data were used by Foresight for time comparisons. Figures found elsewhere in this report are socioeconomic category data.

**c** Some sample sizes (ie Chinese and Bangladeshi) are very small, so extrapolations should be treated with particular caution.

**Figure 2** Future trends in obesity among adults, 2004-2050

**Note:** The graph excludes confidence intervals (CIs), so the figures should be viewed with caution. CIs grow larger as one projects into the future. By 2050, the 95% CIs are frequently 10 or more percentage points. 2004 data are unweighted HSE data, for adults aged 16-75+ years. Estimated data for 2015-2050 (from Foresight) are for adults aged 21-60 years.

Source: Health Survey for England 2005;<sup>9</sup> and Butland et al, 2007<sup>5</sup>



## Prevalence of overweight and obesity among children aged 2-15 years



### KEY FACTS

#### Prevalence

- The most recent figures (2006) show that, among children aged 2-15, almost one-third – nearly 3 million – are overweight (including obese) (29.7%) and approximately one-sixth – about 1.5 million – are obese (16%). The mean BMI (kg/m<sup>2</sup>) for children aged 0-15 is 18.4kg/m<sup>2</sup>.<sup>11</sup>

#### Age

- Among children aged 11-15 years, the prevalence of obesity (17.4%) and overweight (including obesity) (32.9%) is greater than among children aged 2-10 years (15.2% and 27.7% respectively).<sup>11</sup>
- There is a marked difference in obesity levels for girls aged between 2-10 years (13.2%) and 11-15 years (17%). For boys, there is little difference (17.1% and 17.7% respectively).<sup>11</sup>
- Boys and girls aged 11-15 years (boys 32.6%, girls 33.2%) have a greater prevalence of overweight (including obesity) than boys and girls aged 2-10 years (boys 29.3%, girls 25.9%).<sup>11</sup>
- Between the ages of 2 and 15, the mean BMI (kg/m<sup>2</sup>) increases steadily with age.<sup>11</sup>

#### Gender

- The mean BMI (kg/m<sup>2</sup>) for boys and girls aged 2-15 years is similar (18.3kg/m<sup>2</sup> and 18.5kg/m<sup>2</sup> respectively).<sup>11</sup>
- A greater percentage of boys (17.3%) than girls (14.7%) aged 2-15 years are obese. But a similar proportion – around three in ten – of boys (30.6%) and girls (28.7%) are overweight (including obese).<sup>11</sup>
- Among children aged 11-15 years, a similar percentage of boys and girls are overweight (including obese) (32.6% and 33.2% respectively) and obese (17.7% and 17% respectively).<sup>11</sup>
- Among children aged 2-10 years, a greater proportion of boys (17.1%) than girls (13.2%) are obese. A higher percentage of boys (29.3%) than girls (25.9%) are also overweight (including obese).<sup>11</sup>

#### Sociocultural patterns

- Among boys and girls aged 2-15, the prevalence of obesity is higher in the lowest income group – boys 20% compared to 15% in highest income group, and girls 20% compared to 9% in highest income group. The prevalence gap between income groups is widest for girls (11% compared to 5% for boys).<sup>11</sup>

#### Ethnic differences

- Mean BMIs are significantly higher among Black Caribbean and Black African boys (19.3kg/m<sup>2</sup> and 19.0kg/m<sup>2</sup> respectively) and girls (20.0kg/m<sup>2</sup> and 19.6kg/m<sup>2</sup> respectively)<sup>15</sup> than in the general child population. (In 2001-2002 boys in England had a mean BMI of 18.3kg/m<sup>2</sup> and girls had a mean BMI of 18.7kg/m<sup>2</sup>.)<sup>17</sup>

- Prevalence of overweight (including obese) among Black African (42%), Black Caribbean (39%) and Pakistani (39%) boys is significantly higher than that of the general population (30%). The same is true of Black Caribbean (42%) and Black African (40%) girls who have a markedly higher prevalence than that of the general population (31%).<sup>15</sup>
- Obesity is almost four times more common in Asian children than in white children.<sup>18</sup>

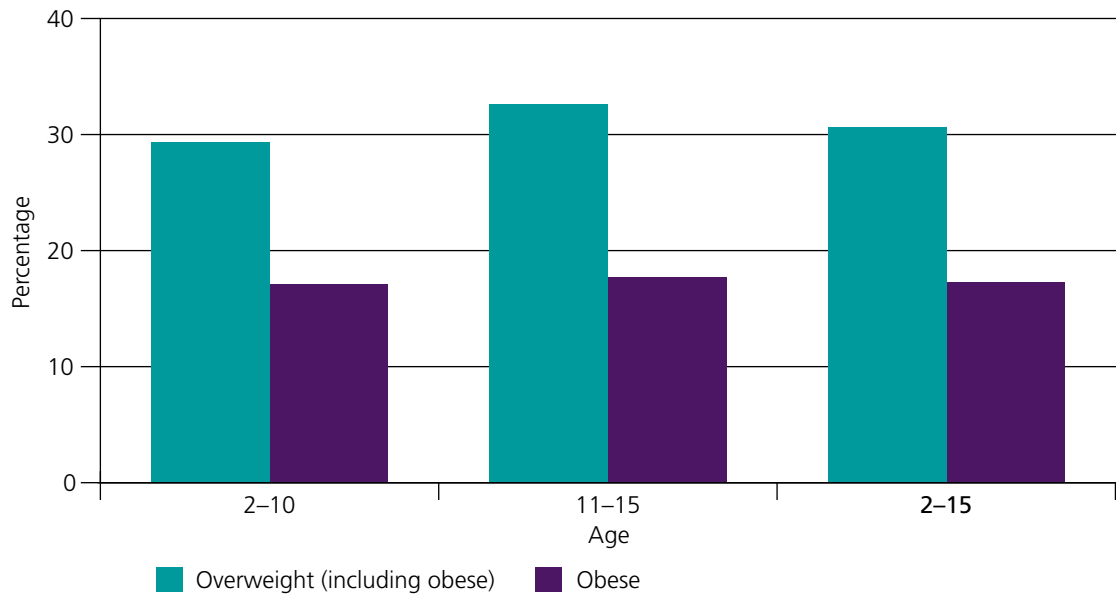
### Regional differences

- Among boys, the London Government Office Region (GOR) has the highest prevalence rates of obesity (24%) and the East of England GOR and North West GOR have the lowest rates (both 14%). Among girls, East Midlands GOR has the highest rates (18%) and the East of England GOR has the lowest (10%).<sup>11</sup>
- London GOR and the North East GOR have the highest rates of overweight (including obese) for boys (36% and 37% respectively) and Yorkshire and the Humber GOR has the lowest rates (26%). For girls, North West GOR has the highest prevalence of overweight (including obese) (34%) and the East of England GOR has the lowest prevalence (22%).<sup>11</sup>

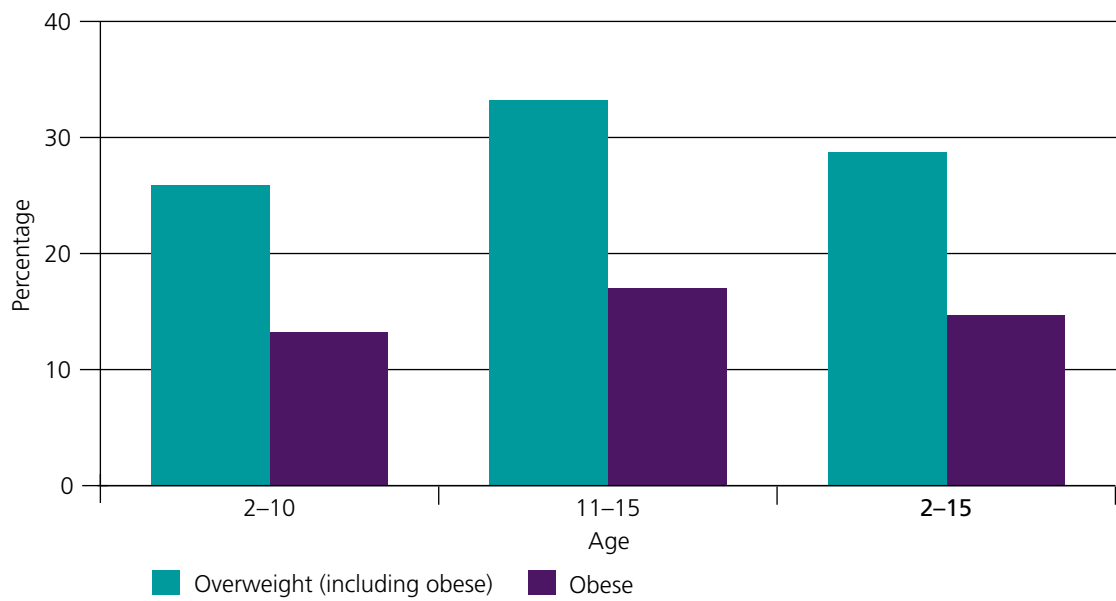
**Note:** The Health Survey for England (HSE) figures are weighted to compensate for non-response. (Before the HSE 2003, data were not weighted for non-response.)

**Figure 3** Prevalence of overweight and obesity among children aged 2-15, by age and sex, England, 2006

**Boys**



**Girls**



Source: Health Survey for England 2006<sup>11</sup>

**Table 2** Prevalence of obesity among children aged 2-15 living in England, by ethnic group, 2004

GENDER	Black Caribbean	Black African	Indian	Pakistani	Bangladeshi	Chinese	General population (2001-02)
<b>BOYS</b>							
Overweight	11%	11%	12%	14%	12%	8%	14%
Obese	28%	31%	14%	25%	22%	14%	16%
Overweight including obese	39%	42%	26%	39%	34%	22%	30%
<b>GIRLS</b>							
Overweight	15%	13%	11%	10%	14%	22%	15%
Obese	27%	27%	21%	15%	20%	12%	16%
Overweight including obese	42%	40%	31%	25%	33%	34%	31%

Source: Health Survey for England 2004: The health of ethnic minority groups<sup>15</sup>

## Prevalence of overweight and obesity among children in Reception and Year 6 in England, 2006/07



### KEY FACTS

#### Prevalence

- In Reception year children (aged 4-5 years), almost one in four of the children measured was either overweight or obese (22.9%). In Year 6 children (aged 10-11 years), this rate was nearly one in three (31.6%).<sup>19</sup>

#### Age

- The prevalence of obesity is significantly higher in Year 6 than in Reception – 17.5% compared to 9.9% respectively.<sup>19</sup>
- The percentage of children who are overweight is only slightly higher in Year 6 than in Reception (14.2% and 13% respectively).<sup>19</sup>

#### Gender

- The prevalence of obesity is significantly higher in boys than in girls in both age groups: Reception boys 10.7%, girls 9%; Year 6 boys 19%, girls 15.8%.<sup>19</sup>
- The percentage of children who are overweight is similar for boys (14.2%) and girls (14.1%) in Year 6. In Reception, this rate is slightly higher for boys (13.6%) than for girls (12.4%).<sup>19</sup>

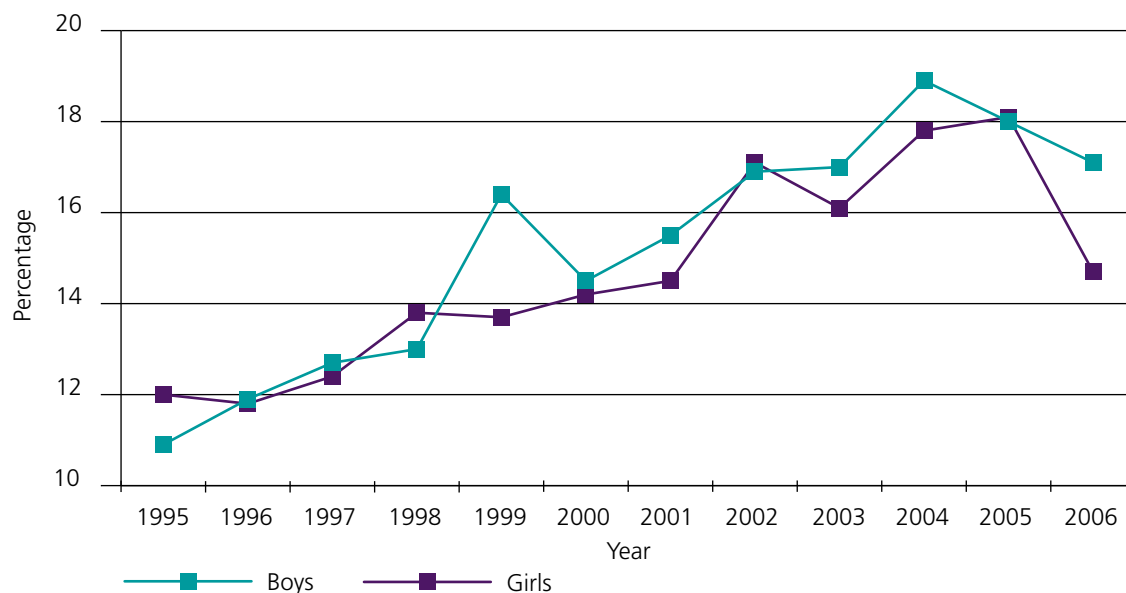
**Note:** Children were measured in the school year 2006/07 as part of the National Child Measurement Programme (NCMP).

## Trends in overweight and obesity among children

**KEY FACTS**

- Mean BMI (kg/m<sup>2</sup>) among children aged 2-15 increased between 1995 and 2006. For boys mean BMI rose from 17.7kg/m<sup>2</sup> to 18.2kg/m<sup>2</sup> (0.5kg/m<sup>2</sup> growth), and for girls mean BMI rose from 18.1kg/m<sup>2</sup> to 18.4kg/m<sup>2</sup> (0.3kg/m<sup>2</sup> growth).<sup>11</sup>
- Obesity among children aged 2-15 rose from 11.5% in 1995 to 15.9% in 2006 – a relative increase of 38%. A more marked increase was observed in obesity levels among boys (57%) – from 10.9% in 1995 to 17.1% in 2006. Among girls, obesity levels rose from 12% in 1995 to 14.7% in 2006 – an increase of 23%.<sup>11</sup>
- The proportion of children aged 2-15 who were classified as overweight (including obese) rose by 20% between 1995 and 2006 (from 24.5% to 29.5% respectively). For boys, there was a 27% increase (from 24% in 1995 to 30.4% in 2006) and for girls, there was a 14% increase (from 25% in 1995 to 28.6% in 2006).<sup>11</sup>
- For children aged 2-10, obesity rose by 53% from 9.9% in 1995 to 15.1% in 2006. Obesity among boys rose by 75% (from 9.6% in 1995 to 16.8% in 2006) but among girls the growth was noticeably slower at 29% (from 10.3% to 13.3% respectively).<sup>11</sup>
- Children aged 2-10 classified as overweight (including obese) increased from 22.7% in 1995 to 27.6% in 2006 – an increase of 22%. Among boys, there was a 30% rise in the prevalence of overweight (including obese) from 22.5% in 1995 to 29.2% in 2006; and among girls there was a 13% increase from 22.9% to 25.9% respectively.<sup>11</sup>
- Among 11-15 year olds, obesity rose by 21% (14.4% in 1995 to 17.4% in 2006). For boys, there was a 30% increase in the levels of obesity (13.5% and 17.6% respectively) and among girls, an 11% increase (15.4% and 17.1% respectively).<sup>11</sup>
- The levels of overweight (including obese) among 11-15 year olds increased from 28.1% in 1995 to 32.9% in 2006 – an increase of 17%. For boys, the prevalence of overweight (including obese) rose by 20% (26.9% and 32.4% respectively) and for girls by 14% (29.3% and 33.3% respectively).<sup>11</sup>

**Note:** For accuracy, unweighted figures have been used for time comparisons. (Before the Health Survey for England 2003, HSE data were not weighted for non-response.)

**Figure 4** Obesity trends among children aged 2-15, England, by sex, 1995-2006

**Note:** For accuracy, Figure 4 uses unweighted figures. (Before the HSE 2003, data were not weighted for non-response.)

Source: Health Survey for England 2006<sup>11</sup>

## Future trends in overweight and obesity among children and young people aged under 20 years<sup>5, 16</sup>



### KEY FACTS

#### Prevalence

- The proportion of children who are obese in the under 20 age group will rise to approximately 15% in 2025 (with slightly lower prevalence in boys than in girls).
- By 2050, it is estimated that 25% of under 20 year olds will be obese.
- By 2050, it is predicted that 70% of girls could be overweight or obese, with only 30% in the healthy BMI range. For boys, it is estimated that 55% could be overweight or obese and around 45% could be in the healthy range.

#### Age

- Among children aged 6-10 years, boys will be more obese than girls, with an estimate of 35% of boys being obese by 2050, compared with 20% of girls.\*
- Among children aged 11-15 years, more girls than boys will be obese by 2050 – 23% of boys and 35% of girls.

#### Notes:

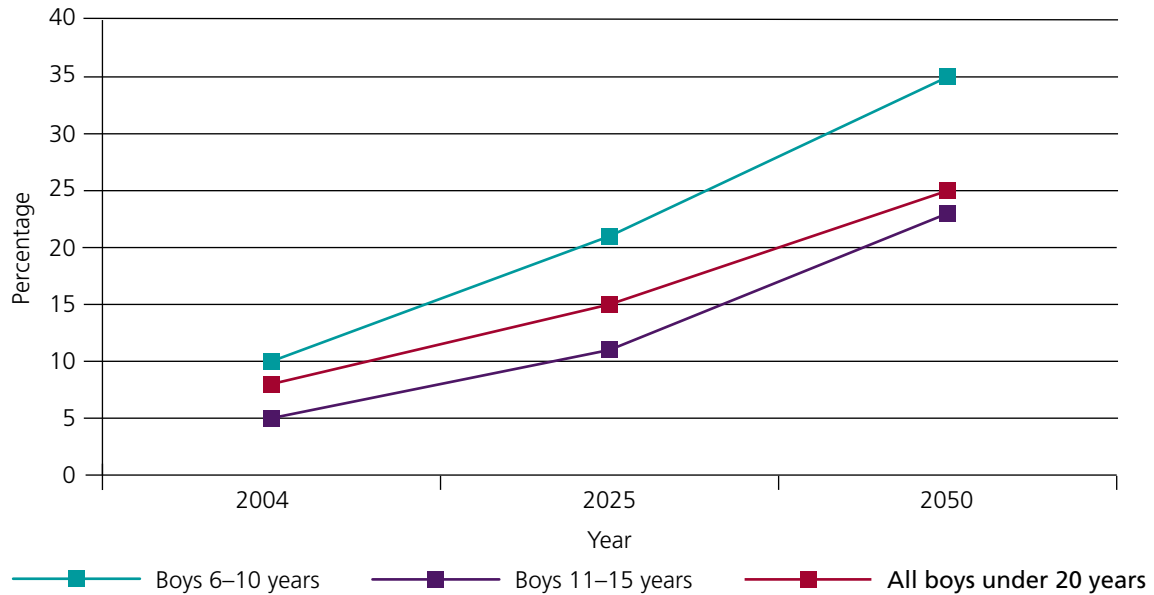
Future obesity trends were extrapolated by Foresight in 2007 using Health Survey for England unweighted data for 1995-2004. The estimates were based on the International Obesity Task Force (IOTF) definition of childhood obesity, so data found here will be different from figures found elsewhere in this toolkit.

Predicted figures should be viewed with caution as confidence intervals (CIs) associated with these figures grow larger as one projects into the future.

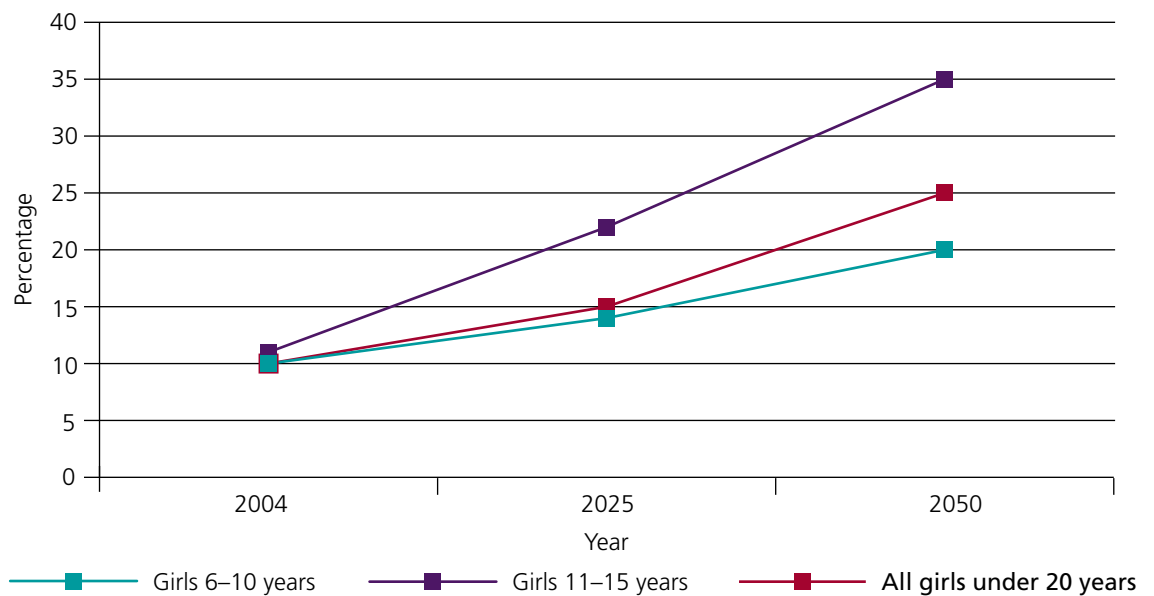
\* The CIs on the 2050 extrapolation for girls aged 6-10 are very large.

**Figure 5** Future trends in obesity among children and young people aged under 20 years, 2004-2050

**Boys**



**Girls**



**Note:** Data have been estimated using the International Obesity Task Force (IOTF) childhood obesity definition. The graph excludes confidence intervals (CIs), so figures should be viewed with caution. CIs grow larger as one projects into the future. The CIs on the 2050 extrapolation for girls aged 6-10 is very wide.

Source: Butland et al, 2007<sup>5</sup>

## The health risks of overweight and obesity

### Premature mortality

It has long been known that obesity is associated with premature death. Obesity increases the risk of a number of diseases including the two major killers – cardiovascular disease and cancer. It is estimated that, on average, obesity reduces life expectancy by between 3 and 13 years – the excess mortality being greater the more severe the obesity and the earlier it develops.<sup>20</sup>

### Obesity-related morbidity

In public health terms, the greatest burden of disease arises from obesity-related morbidity. Table 3 gives details of the health problems associated with obesity.

**Table 3** Relative risks of health problems associated with obesity

<b>Greatly increased risk</b> (Relative risk much greater than 3)	<b>Moderately increased risk</b> (Relative risk 2-3)	<b>Slightly increased risk</b> (Relative risk 1-2)
<ul style="list-style-type: none"> <li>• Type 2 diabetes</li> <li>• Insulin resistance</li> <li>• Gallbladder disease</li> <li>• Dyslipidaemia (imbalance of fatty substances in the blood, eg high cholesterol)</li> <li>• Breathlessness</li> <li>• Sleep apnoea (disturbance of breathing)</li> </ul>	<ul style="list-style-type: none"> <li>• Coronary heart disease</li> <li>• Hypertension (high blood pressure)</li> <li>• Stroke</li> <li>• Osteoarthritis (knees)</li> <li>• Hyperuricaemia (high levels of uric acid in the blood) and gout</li> <li>• Psychological factors</li> </ul>	<ul style="list-style-type: none"> <li>• Cancer (colon cancer, breast cancer in postmenopausal women, endometrial [womb] cancer)</li> <li>• Reproductive hormone abnormalities</li> <li>• Polycystic ovary syndrome</li> <li>• Impaired fertility</li> <li>• Low back pain</li> <li>• Anaesthetic risk</li> <li>• Foetal defects associated with maternal obesity</li> </ul>

**Note:** All relative risk estimates are approximate. The relative risk indicates the risk measured against that of a non-obese person of the same age and sex. For example, an obese person is two to three times more likely to suffer from hypertension than a non-obese person.

Source: Adapted from World Health Organization, 2000<sup>21</sup>

The associated health outcomes of childhood obesity are similar to those of adults and include:<sup>22, 23</sup>

- hypertension (high blood pressure)
- dyslipidaemia (imbalance of fatty substances in the blood)
- hyperinsulinaemia (abnormally high levels of insulin in the blood).

(The above three abnormal findings constitute the 'metabolic syndrome' – see page 25.)

Other possible consequences for children and young people include:

- mechanical problems such as back pain and foot strain
- exacerbation of asthma
- psychological problems such as poor self-esteem, being perceived as unattractive, depression, disordered eating and bulimia
- type 2 diabetes.

Some of these problems appear in childhood, while others appear in early adulthood as a consequence of childhood obesity. The most important long-term consequence of childhood obesity is its persistence into adulthood and the early appearance of obesity-related disorders and diseases normally associated with middle age, such as type 2 diabetes and hypertension. Studies have shown that the higher a child's BMI (kg/m<sup>2</sup>) and the older the child, the more likely they will be an overweight or obese adult.<sup>24</sup> Furthermore, research has demonstrated that the offspring of obese parents have a greater risk of becoming overweight or obese adults,<sup>25</sup> increasing the likelihood of developing such health problems later in life.



## Conditions associated with obesity



### KEY FACTS

#### Type 2 diabetes

- Ninety per cent of type 2 diabetics have a BMI of more than 23kg/m<sup>2</sup>.

#### Cardiovascular disease

- Among those aged under 50 years, there is 2.4-fold increase in risk of coronary heart disease in obese women compared with non-obese women, and a two-fold increase in risk in obese men compared with non-obese men.<sup>26</sup>
- Seventy per cent of obese women with hypertension have left ventricular hypertrophy (thickening of the heart muscle's main pumping chamber, the left ventricle).
- Obesity is a contributing factor to heart failure in more than 10% of patients.

#### Hypertension (high blood pressure) and stroke

- Obese people have a five-fold risk of hypertension compared with non-obese people.
- Sixty-six per cent of cases of hypertension occur in overweight people (BMI 25-29.9kg/m<sup>2</sup>).
- Eighty-five per cent of cases of hypertension occur in people with a BMI of more than 25kg/m<sup>2</sup>.
- Those who are overweight or obese and who also have hypertension have an increased risk of ischaemic stroke.

#### Metabolic syndrome

- The development and severity of all the component risk factors of the metabolic syndrome (see page 25) are linked to the predominant risk factor of central obesity.<sup>27</sup>
- In the UK, it is estimated that 25% of the adult population show clear signs of the metabolic syndrome.<sup>27</sup>

#### Dyslipidaemia

- Dyslipidaemia progressively develops as BMI increases from 21kg/m<sup>2</sup> with a rise in low density lipoprotein (LDL).

#### Cancer

- Ten per cent of all cancer deaths among non-smokers are related to obesity (and 30% of endometrial cancers).
- Obesity increases the risk of colon cancer by nearly three times in both men and women.<sup>28</sup>

#### Gallbladder disease

- Thirty per cent of overweight and obese people have gallstones compared with 10% of non-obese people.

#### Non-alcoholic fatty liver disease (NAFLD)

- It has been reported that 10-20% of obese children and over 75% of obese adults have been diagnosed with NAFLD.<sup>29-32</sup>

**Reproductive function**

- Six per cent of primary infertility in women is attributable to obesity.<sup>26</sup>
- Impotency and infertility are frequently associated with obesity in men.

**Mechanical disorders such as osteoarthritis and low back pain**

- Among elderly people, these conditions are frequently associated with increasing body weight. Among older people, the risk of disability attributable to osteoarthritis is equal to the risk of disability attributable to heart disease, and is greater than for any other medical disorder of the elderly.

**Respiratory effects**

- Neck circumference of more than 43cm in men and more than 40.5cm in women is associated with obstructive sleep apnoea (OSA), daytime somnolence and development of pulmonary hypertension.
- Between 60% and 70% of people suffering from OSA are obese.<sup>33</sup>

Source: Adapted from Kopelman 2007<sup>34</sup>

*Type 2 diabetes*

Perhaps the most common obesity-related co-morbidity, and that which is likely to cause the greatest health burden, is type 2 diabetes.<sup>35</sup> Ninety per cent of type 2 diabetics have a BMI of more than 23kg/m<sup>2</sup>. Diabetes is about 20 times more likely to occur in people who are very obese (BMI over 35kg/m<sup>2</sup>) compared to individuals with a BMI of between 18.5 and 24.9kg/m<sup>2</sup> (healthy weight).<sup>34</sup>

For women, the Nurses' Health Study showed that the single most important risk factor for type 2 diabetes was overweight and obesity.<sup>36</sup> The risk is especially high for women with a central pattern of fat distribution, characterised by a large waist circumference (often described as 'apple-shaped') and often mediated through the metabolic syndrome (see the next page). The risk is less for women with a similar BMI who tend to deposit their excess fat on the hips and thighs ('pear-shaped').<sup>20</sup> For men, data from the Health Professionals Follow-up Study indicated that a western diet (high consumption of red meat, processed meat, high-fat dairy products, French fries, refined grains, and sweets and desserts), combined with lack of physical activity and excess weight (BMI in excess of 30kg/m<sup>2</sup>), dramatically increases the risk of developing type 2 diabetes.<sup>37</sup>

*Coronary heart disease*

Coronary heart disease is often associated with weight gain and obesity. In general, the relationship between BMI and coronary heart disease is stronger for women than for men. The Framingham Heart Study found that, among those under the age of 50 years, the incidence of coronary heart disease increased 2.4-fold in obese women (BMI over 30kg/m<sup>2</sup>), and two-fold in obese men.<sup>26</sup>

For women, the Nurses' Health Study showed a clear relationship between coronary heart disease and elevated BMI even after controlling for other factors such as age, smoking, menopausal status and family history. The risk of coronary heart disease increased two-fold with a BMI between 25 and 28.9kg/m<sup>2</sup>, and three-fold (3.6) for a BMI above 29kg/m<sup>2</sup>, compared with women with a BMI of less than 21kg/m<sup>2</sup>.<sup>20, 38</sup>

For men younger than 65 years, a US study showed that there was an increased risk of coronary heart disease the higher the BMI. At a BMI of 25-28.9kg/m<sup>2</sup>, men were one and a half times (1.72)

at risk, at a BMI of 29.0-32.9kg/m<sup>2</sup> men were two and a half times (2.61) at risk, and at a BMI of more than 33kg/m<sup>2</sup> men were three and a half times at risk, compared with the risk at a BMI of less than 23kg/m<sup>2</sup>.<sup>39</sup>

### *Hypertension (high blood pressure) and stroke*

Obesity is a major contributor to the development of hypertension – a person with a BMI of 30kg/m<sup>2</sup> or more (obese) is five times more likely to develop hypertension compared with non-obese people. Sixty-six per cent of hypertension cases are linked with excess weight (BMI 25-29.9kg/m<sup>2</sup>), and 85% are associated with a BMI of more than 25kg/m<sup>2</sup> (overweight).<sup>34</sup> The Framingham Heart Study estimated that 75% of the cases of hypertension in men and 65% of the cases in women are directly attributable to overweight/obesity.<sup>40</sup> Long duration obesity does not appear necessary to elevate blood pressure as the relationship between obesity and hypertension is evident in children.<sup>41</sup>

Overweight/obesity is thought to be a major risk factor in stroke. Several studies have shown an increased risk for stroke with increasing BMI (kg/m<sup>2</sup>) but others have found no association. In some studies there was an association with waist-to-hip ratio, but not BMI, suggesting that central obesity rather than general obesity is the key factor.<sup>42</sup> In a 28-year study of men in mid-life, it was found that obesity can have a significant impact on stroke risk, doubling its likelihood later in life. Men with a BMI of between 20kg/m<sup>2</sup> and 22.49kg/m<sup>2</sup> were significantly less likely to suffer a stroke than those with a BMI of more than 30kg/m<sup>2</sup>.<sup>42</sup>

### *Metabolic syndrome*

Metabolic syndrome refers to a cluster of risk factors related to a state of insulin resistance, in which the body gradually becomes less able to respond to the metabolic hormone insulin. People with the metabolic syndrome have an increased risk of developing coronary heart disease, stroke and type 2 diabetes.<sup>43</sup> The component risk factors related to insulin resistance are:

- increased waist circumference
- high blood pressure
- high blood glucose
- high serum triglyceride
- low blood HDL cholesterol (the 'good' cholesterol).

The development and severity of all the components are linked to the predominant risk factor of central obesity. Previously known as Syndrome X, metabolic syndrome is becoming increasingly common although the true prevalence of the disease is unknown. In the UK, it is estimated that as much as 25% of the adult population show clear signs of the metabolic syndrome,<sup>27</sup> a figure which is expected to increase in parallel with the rising epidemic of obesity.<sup>44</sup> Incidence has been found to be higher in certain ethnic sub-groups such as Asian and African-Caribbean groups.<sup>45</sup> In addition, it has been noted that in people with normal glucose tolerance, the prevalence of the metabolic syndrome increases with age and is higher in men than women, but these differences are not seen in diabetic patients.<sup>46</sup> Childhood obesity is a powerful predictor of the metabolic syndrome in early adulthood.<sup>14</sup>

### *Dyslipidaemia*

Obesity is associated with dyslipidaemia. Dyslipidaemia is characterised by increased triglycerides, elevated levels of LDL cholesterol (the 'bad' cholesterol) and decreased concentrations of HDL cholesterol (the 'good' cholesterol).<sup>47</sup> Dyslipidaemia progressively develops as BMI increases from 21kg/m<sup>2</sup>, with a rise in LDL.<sup>34</sup> On average, the more fat, the more likely an individual will be dyslipidaemic and to express elements of the metabolic syndrome. However, location of fat, age and gender are important modifiers of the impact of obesity on blood lipids:

- *Location of fat* – Fat cells exert the most damaging impact when they are centrally located because, compared to peripheral fat, central fat is insulin resistant and more rapidly recycles fatty acids.<sup>48</sup>
- *Age* – Among the obese, younger people have relatively larger changes in blood lipids at any given level of obesity.<sup>47</sup>
- *Gender* – Among overweight women, excess body weight seems to be associated with higher total, non-HDL and LDL cholesterol levels, higher triglyceride levels, and lower HDL cholesterol levels. Total cholesterol to HDL cholesterol ratios seem to be highest in obese postmenopausal women, due to the much lower HDL cholesterol concentrations.<sup>47</sup>

### *Cancer*

Ten per cent of all cancer deaths among non-smokers are related to obesity.<sup>34</sup> Research suggests that, for women, obesity increases the risk of various types of cancer, including colon, breast (postmenopausal), endometrial (womb), cervical, ovarian and gallbladder cancers. Obesity is estimated to account for 30% of endometrial cancer deaths<sup>34</sup> and for 20% of all cancer deaths in women.<sup>49</sup> For men, obesity increases the risk of colorectal and prostate cancer. A clear association is seen with cancer of the colon: obesity increases the risk of this type of cancer by nearly three times in both men and women.<sup>28</sup>

### *Gallbladder disease*

Obesity is an established predictor of gallbladder disease. The risk of developing the disease increases with weight gain although it is unclear how being overweight or obese may cause gallbladder disease. However, the most common reason for gallbladder disease is gallstones, for which obesity is a known risk factor. Research suggests that 30% of overweight and obese people have gallstones compared to 10% of non-obese people.<sup>50</sup>

### *Non-alcoholic fatty liver disease*

Non-alcoholic fatty liver disease (NAFLD), the liver manifestation of the metabolic syndrome, is now considered to be the most common liver problem in the western world. A significant proportion of patients with NAFLD can progress to cirrhosis, liver failure, and hepatocellular carcinoma (liver tumour).<sup>51</sup> It has been reported that over 75% of obese adults have been diagnosed with NAFLD.<sup>29</sup> For children, with the rise in childhood obesity, there has been an increase in the prevalence, recognition and severity of paediatric NAFLD with about 10-20% of obese children being diagnosed with the condition.<sup>30-32</sup> It is the most common form of chronic liver disease among children.<sup>52</sup>

### *Reproductive function*

For women, obesity has a significant adverse impact on reproductive outcome. It influences not only the chance of conception – 6% of primary infertility in women is attributable to obesity<sup>26</sup> – but also the response to fertility treatment. In addition, obesity increases the risk of miscarriage, congenital abnormalities (such as neural tube defects) and pregnancy complications including hypertension, pre-eclampsia and gestational diabetes. There are also potential adverse effects on the long-term health of both mother and infant.<sup>53</sup> For men, impotency and infertility are frequently associated with obesity.<sup>34</sup>

### *Mechanical disorders such as osteoarthritis and low back pain*

Osteoarthritis (OA), or degenerative disease of the weight-bearing joints such as the knee, is a very common complication of obesity, and causes a great deal of disability.<sup>28</sup> There is a frequent association between increasing body weight and OA in the elderly, and the risk of disability attributable to OA is equal to the risk of disability attributable to heart disease, and is greater than

for any other medical disorder of the elderly.<sup>34</sup> Pain in the lower back is also frequently suffered by obese people, and may be one of the major contributors to obesity-related absences from work. It is likely that the excess weight alone, rather than any metabolic effect, is the cause of these problems.<sup>28</sup>

### *Respiratory effects*

A number of respiratory disorders are exacerbated by obesity. A neck circumference of more than 43cm in men and more than 40.5cm in women is associated with obstructive sleep apnoea (OSA), daytime somnolence and development of pulmonary hypertension. One of the most serious of these is OSA, a condition characterised by short, repetitive episodes of impaired breathing during sleep. It has been estimated that as many as 60-70% of people suffering from OSA are obese.<sup>33</sup> Obesity, especially in the upper body, increases the risk of OSA by narrowing the individual's upper airway. OSA can increase the risk of high blood pressure, angina, cardiac arrhythmia, heart attack and stroke.

### *Breathlessness*

Breathlessness on exertion is a very common symptom in obese people.<sup>54</sup> For example, in a large epidemiological survey, 80% of obese middle-aged subjects reported shortness of breath after climbing two flights of stairs compared with only 16% of similarly aged non-obese controls, and this was despite smoking being significantly less frequent in the obese.<sup>55</sup> In another study of patients with type 2 diabetes, one-third reported troublesome shortness of breath and its severity increased with BMI.<sup>56</sup> Importantly, breathlessness in the obese may be due to any of several factors including co-existent (but often obesity-related) cardiac disease, unrelated respiratory disease or the effects of obesity itself on breathing, although it is not clear whether breathlessness at rest can be attributable to obesity.<sup>54</sup>

### *Psychological factors*

Psychological damage caused by overweight and obesity is a huge health burden.<sup>57</sup>

In childhood, overweight and obesity are known to have a significant impact on psychological wellbeing, with many children developing a negative self-image, lowered self-esteem and a higher risk of depression. In addition, almost all obese children have experiences of teasing, social exclusion, discrimination and prejudice.<sup>58-62</sup> In one study, it was shown that children as young as six years demonstrated negative perceptions of their obese peers.<sup>63</sup>

In adults, the consequences of overweight and obesity have led to clinical depression, with rates of anxiety and depression being three to four times higher among obese individuals.<sup>64</sup> Obese women are around 37% more likely to commit suicide than women of normal weight.<sup>57</sup> Stigma is a fundamental problem. Many studies (for example: Gortmaker et al, 1993,<sup>65</sup> Wadden and Stunkard, 1985<sup>63</sup>) have reported widespread negativity regarding obese people, particularly in terms of sexual relations. The psychological experiences of overweight and obesity are extremely complex and are linked to culture and societal values and 'norms'.

### **Impact of overweight and obesity on incidence of disease in the future**

Analysis of BMI predictions from 2005 to 2050 indicate that the greatest increase in the incidence of disease would be for type 2 diabetes (an increase of more than 70% from 2004 to 2050) with increases of 30% for stroke and 20% for coronary heart disease over the same period.<sup>5, 16</sup>

## The health benefits of losing excess weight

Weight loss in overweight and obese individuals can improve physical, psychological and social health. There is good evidence to suggest that a moderate weight loss of 5-10% of body weight in obese individuals is associated with important health benefits, particularly in a reduction in blood pressure and a reduced risk of developing type 2 diabetes and coronary heart disease.<sup>66, 67</sup> Table 4 shows the results of losing 10kg.<sup>22, 68</sup>

**Table 4** The benefits of a 10kg weight loss

	<b>Benefit</b>
<b>Mortality</b>	<ul style="list-style-type: none"> <li>• More than 20% fall in total mortality</li> <li>• More than 30% fall in diabetes-related deaths</li> <li>• More than 40% fall in obesity-related cancer deaths</li> </ul>
<b>Blood pressure (in hypertensive people)</b>	<ul style="list-style-type: none"> <li>• Fall of 10mmHg systolic blood pressure</li> <li>• Fall of 20mmHg diastolic blood pressure</li> </ul>
<b>Diabetes (in newly diagnosed people)</b>	<ul style="list-style-type: none"> <li>• Fall of 50% in fasting glucose</li> </ul>
<b>Lipids</b>	<ul style="list-style-type: none"> <li>• Fall of 10% of total cholesterol</li> <li>• Fall of 15% of low density lipoprotein (LDL) cholesterol</li> <li>• Fall of 30% of triglycerides</li> <li>• Increase of 8% of high density lipoprotein (HDL) cholesterol</li> </ul>
<b>Other benefits</b>	<ul style="list-style-type: none"> <li>• Improved lung function, and reduced back and joint pain, breathlessness, and frequency of sleep apnoea</li> <li>• Improved insulin sensitivity and ovarian function</li> </ul>

Source: Adapted from Jung, 1997;<sup>68</sup> Mulvihill and Quigley, 2003<sup>22</sup>

In relation to reduction in co-morbidities, the Diabetes Prevention Program in the US has shown that, among individuals with impaired glucose tolerance, a 5-7% decrease in initial weight reduces the risk of developing type 2 diabetes by 58%.<sup>69</sup>

It is important to recognise that, for very obese people, such changes will not necessarily bring them out of the 'at-risk' category, but there are nevertheless worthwhile health gains. A continuous programme of weight reduction should be maintained to help continue to reduce the risks.

Weight reduction in overweight and obese people can improve self-esteem and can help tackle some of the associated psychosocial conditions. It should not be forgotten that small changes can have a positive impact on the overall health and wellbeing of individuals by increasing mobility, energy and confidence.

## The economic costs of overweight and obesity

The costs of obesity are very likely to grow significantly in the next few decades. Apart from the personal and social costs such as morbidity, mortality, discrimination and social exclusion, there are significant health and social care costs associated with the treatment of obesity and its consequences, as well as costs to the wider economy arising from chronic ill health.<sup>5</sup> The Foresight programme<sup>5, 16</sup> forecast the direct costs to the NHS of treating obesity and its consequences and the indirect costs such as absence from work, morbidity not treated in the health service and reduction in quality of life. These forecasts were estimated from 2007 to 2050 (see Table 5 and Figure 6).<sup>16</sup>

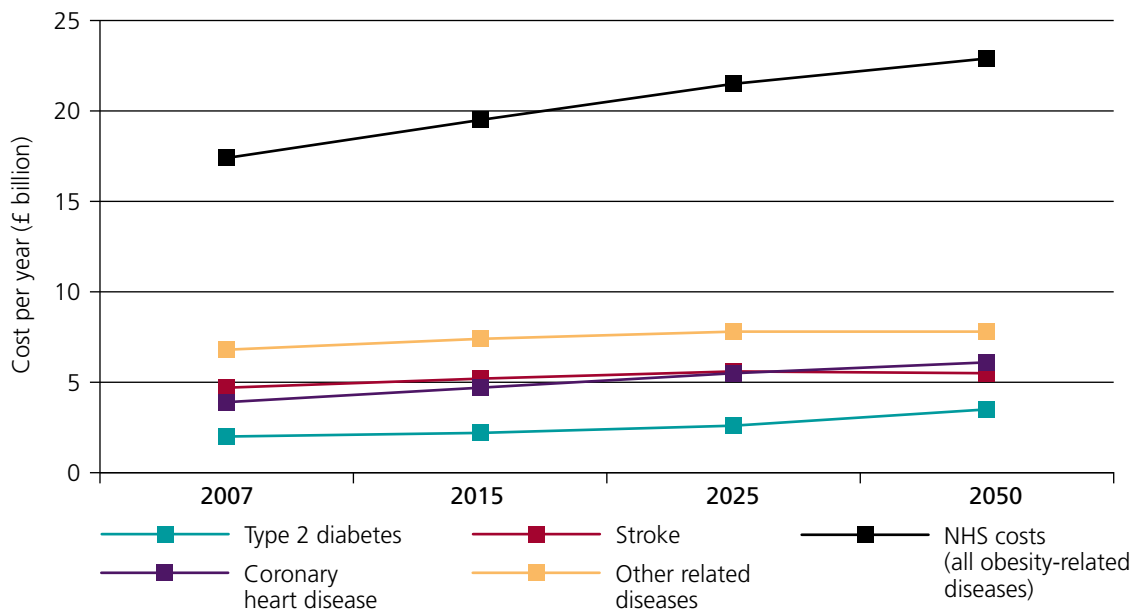
In 2007, the total annual cost to the NHS of diseases for which elevated BMI is a risk factor (direct healthcare costs) was estimated to be £17.4 billion, of which overweight and obesity were estimated to account for £4.2 billion, and obesity alone for £2.3 billion. By 2050, it has been estimated that the total NHS costs (of related diseases) could rise to £22.9 billion, of which overweight and obesity are predicted to cost the NHS £9.7 billion and obesity alone £7.1 billion.<sup>16</sup> In 2007, the indirect costs of overweight and obesity were estimated to be as much as £15.8 billion. The wider cost of overweight and obesity to society by 2050 is estimated to be £49.9 billion.<sup>16</sup>

**Table 5** Future costs of elevated Body Mass Index

	£ billion per year			
	2007	2015	2025	2050
Total NHS cost (of related diseases)	17.4	19.5	21.5	22.9
NHS costs directly attributable to overweight and obesity	4.2	6.3	8.3	9.7
NHS costs directly attributable to obesity	2.3	3.9	5.3	7.1
Wider total costs of overweight and obesity	15.8	27	37.2	49.9
Projected percentage of NHS costs at £70 billion	6%	9.1%	11.9%	13.9%

Source: Butland et al, 2007;<sup>5</sup> McCormick et al, 2007<sup>70</sup>

**Figure 6** Estimated future NHS costs of elevated Body Mass Index, 2007-2050



Source: Butland et al, 2007;<sup>5</sup> McCormick et al, 2007<sup>70</sup>

## Causes of overweight and obesity

The causes of overweight and obesity are complex. But in essence the accumulation of excess body fat over a period of time is caused by more energy ('calories') taken in through eating and drinking than is used up through metabolism and physical activity – an imbalance between 'energy in' and 'energy out'.

Thus, an individual's biology (genetics) and behaviour (eating and physical activity habits) primarily influence energy balance in the body:

- Genes may play an important role in influencing metabolism and the amount and position of fatty tissue in the body. It is also likely that an individual's eating and physical activity behaviour may, at least in part, be genetically determined.<sup>5</sup>
- Eating (and drinking) behaviour is key – an individual's energy intake is determined by their drive and opportunity to eat, and may vary from zero to several thousand calories a day.<sup>5</sup>
- Physical activity behaviour is also crucial. Energy expenditure is largely determined by the frequency, intensity and duration of activity as well as an individual's metabolic predisposition.<sup>5</sup>

However, these primary determinants of an individual's energy balance may themselves be strongly influenced by a range of secondary psychological, social and environmental determinants – for example: parents rewarding children with sweets or crisps, the availability of inexpensive takeaway fried foods, and the increase in car ownership, TV viewing and computer games.<sup>5</sup>

### Human biology

There is a range of specific genes associated with excess weight. Obesity-related genes could affect how food is metabolised and how fat is stored, and they could also affect an individual's behaviour, inclining an individual towards lifestyle choices that may increase the risk of obesity:

- Some genes may control appetite, making an individual less able to sense fullness.<sup>71, 72</sup>
- Some genes may make an individual more responsive to the taste, smell or sight of food.<sup>73</sup>
- Some genes may affect the sense of taste, giving preferences for high-fat foods and repelling healthy foods.<sup>74</sup>
- Some genes may force an individual to be less likely to engage in physical activity.<sup>74</sup>

People with obesity-related genes are not destined to be obese but they will have a higher risk of obesity. In the modern environment, they may need to work harder than others to maintain a healthy body weight by making long-term, sustained lifestyle changes.

The pattern of growth during early life also contributes to the risk of excess weight. A baby's growth rate in the womb and following birth is in part determined by parental factors, especially with regard to the mother's diet, and what and how she feeds her baby. Breastfed babies show slower growth rates than formula-fed babies and this may contribute to the reduced risk of obesity later in life shown by breastfed babies.<sup>75</sup> Weaning practices are also thought to be important, given the association between characteristic weight gain seen in early childhood at about 5 years and later obesity.<sup>5</sup>



## The food environment

Systems of food production, storage and distribution have created an increasingly attractive, diverse and energy-dense food supply. Food is widely available, and promotion and advertising provide additional exposure to food cues (the sight or smell of food which can stimulate the appetite and promote higher consumption). The cost of food, which might otherwise be a barrier to consumption, is low in historical terms despite recent rises, with the cheapest lines often being processed, energy-dense foods served in large portions.<sup>73</sup> High-fat meals are particularly energy-dense as fat contains more than twice as many calories per gram as protein or carbohydrate. (Fat contains 9kcal per gram, compared with 4kcal per gram for protein or carbohydrate.)

In parallel with the transformation of the food supply, social norms related to eating have changed. Children are given more control over food choices. Grazing, snacking, eating on the go and eating outside of the home are common and contribute a substantial proportion of total calorie intake.<sup>73</sup> From 1940 to 2006, the average household energy intake (calories consumed in the home) showed a decline of approximately 12%.<sup>76</sup> However it is only since 1992 that the National Food Survey has taken account of alcoholic drinks, soft drinks and confectionery brought home, and only since 1994 that it has included food and drink purchased and eaten outside the home.<sup>76</sup> In 2006, these components accounted for an extra 13% of energy intake.

Eating outside the home is becoming increasingly popular,<sup>28</sup> and surveys indicate that food eaten out tends to be higher in fats and added sugars than food consumed in the home.<sup>20, 28, 76</sup> Food eaten outside the home is also frequently offered in extra-large portions – notably soft drinks, savoury snacks and confectionery – often at minimal additional cost. There is growing evidence that people eat more when presented with larger portions<sup>77</sup> and calorie intake is increased without necessarily making the individual feel full.<sup>28</sup>

The modern food environment has therefore contributed to too much saturated fat, added sugar and salt and not enough fruit and vegetables in the UK diet. (See page 40 for dietary recommendations and current intake levels.)

## The physical environment

Over the past 50 years, physical activity has declined significantly in the UK. There are many reasons for this, including:

- fewer jobs requiring physical work as the UK has changed from an industrial to a service-based economy
- increased labour-saving technology in the home, work and retail environments
- changes in work and shopping patterns – from local to distant – that have resulted in greater reliance on motorised transport
- increased self-sufficiency in the home, including entertainment, food storage and preparation, controlled climates and greater comfort<sup>78</sup>
- poor urban planning where provision for pedestrians and cyclists has been given a much lower priority than for motor vehicles<sup>79, 80</sup>
- creation of transport systems which favour the car and not walkers and cyclists<sup>79, 80</sup>
- a decline in quality of urban public parks – only 18% are in good condition – and loss of recreational outdoor facilities.<sup>79, 80</sup>

The modern physical environment has therefore contributed to increasingly sedentary lifestyles. Data from the National Travel Survey<sup>81</sup> show that in England between 1975/76 and 2007 the average number of miles per year travelled by foot fell by around a quarter and by cycle by around a third. (However, these data exclude walking and cycling for leisure.) Over the same period the average number of miles per year travelled by car increased by just under 70%, with the number of people in a household without a car falling from 41% to 19%.<sup>81</sup>

Physical activity is a particular issue in children. Schools in England are at the bottom of the European league in terms of time allocated to physical education in primary and secondary schools. Only 5% of children use their bicycles as a form of transport in the UK compared with 60-70% in the Netherlands, and 41% of primary school children and 20% of secondary school children are now taken to school by car, compared with 9% in 1971.<sup>81, 82</sup> Furthermore, British children are increasingly spending more time in front of the television or computer screen – an average of 5 hours and 20 minutes a day, up from 4 hours and 40 minutes five years ago.<sup>83</sup>

### Culture and individual psychology

Our eating, drinking and exercise habits are greatly influenced by social and psychological factors.<sup>84</sup> High consumption of fatty foods and low consumption of fruit and vegetables are strongly linked to those in routine and manual occupations. Over-consumption of sweet foods and drinks can be a reaction to more negative feelings including low-self esteem or depression. So-called 'comfort foods' (ie foods high in sugar, fat and calories) seem to calm the body's response to chronic stress. There may be a link between so-called modern life and increasing rates of over-eating, overweight, and obesity.<sup>85</sup> One study showed that men were more likely to eat when stressed if they were single, divorced or frequently unemployed. Among women, those who felt a lack of emotional support in their lives had a greater tendency to eat to cope with stress.<sup>86</sup> Understanding these behavioural determinants in greater depth is critical in engaging with individuals and helping to devise rational treatment strategies.<sup>20</sup>



See **Tool D4** *Identifying priority groups*.