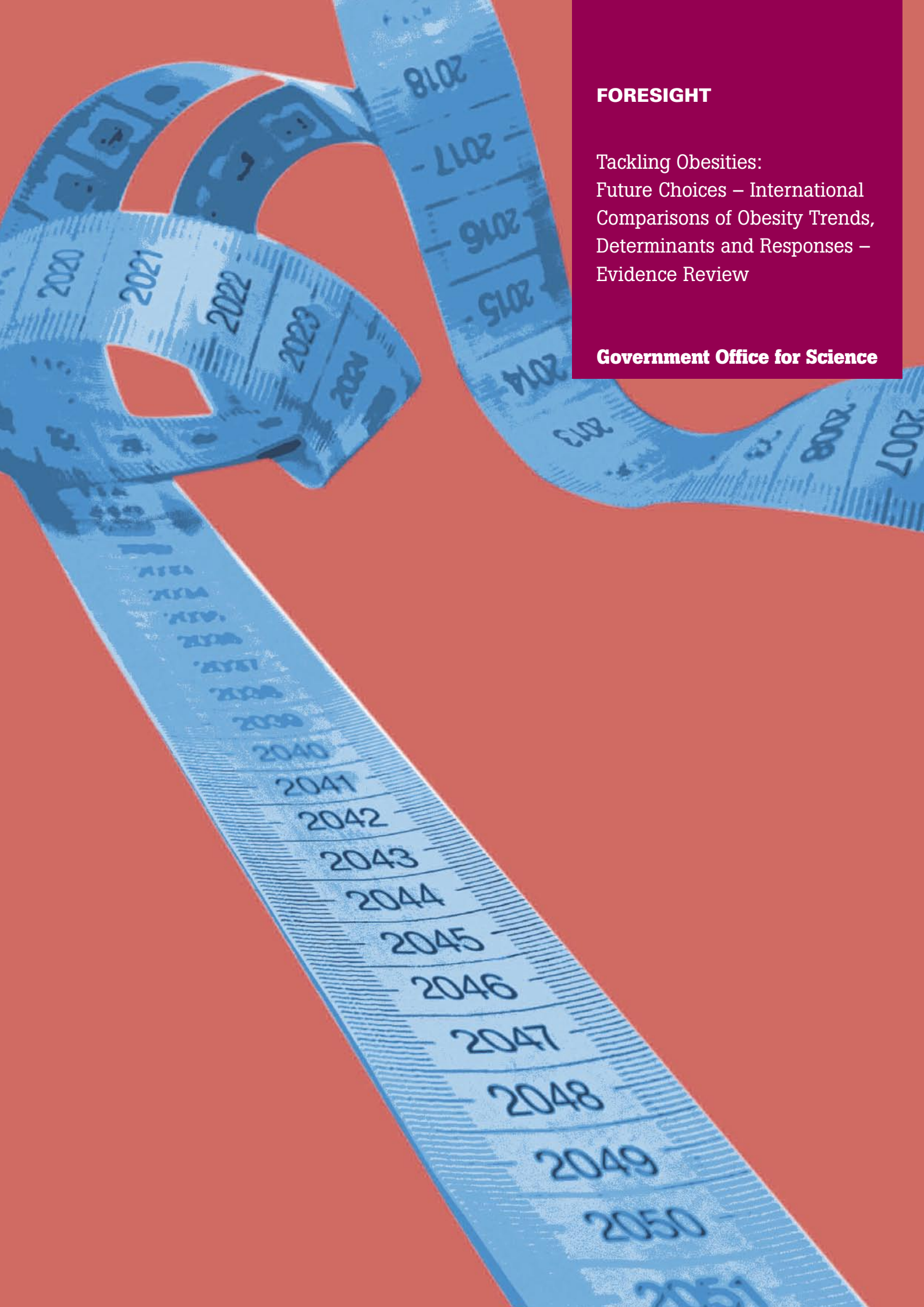

FORESIGHT

Tackling Obesities: Future Choices – International Comparisons of Obesity Trends, Determinants and Responses – Evidence Review

Government Office for Science

Fore*sight*

Tackling Obesities: Future Choices – International Comparisons of Obesity Trends, Determinants and Responses – Evidence Review

1 Adults

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This report has been produced by the UK Government's Foresight Programme. Foresight is run by the Government Office for Science under the direction of the Chief Scientific Adviser to HM Government. Foresight creates challenging visions of the future to ensure effective strategies now.

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International comparisons

A compilation of material on international aspects of obesity: *prevalence, co-morbidities, diet, physical activity, economic drivers, prevention strategies and governmental policies.*

Part 1
Adult obesity

Contents

List of tables

List of figures

1 Adult obesity

Definition of obesity

Definitions: At present, BMI is routinely used as a measure for overweight and obesity. Although it is of benefit on a population scale, it has limitations at an individual level, where underwater weighing or skinfold measurement may be more useful and accurate (see Appendix 1 for further information). However, the use of these alternative, more precise, measurements on a large scale is simply not possible. Height and weight measurements are taken routinely across the world and therefore this provides a simple but crude measure to estimate prevalence of overweight and obesity on a large scale.

BMI is weight (kg) divided by height squared (m^2). The standard cut-off points for overweight and obesity published by the WHO in 2000 are shown in Table 1.[1]

Table 1: Classification of adults, by BMI

Classification	BMI	Risk of co-morbidities
Underweight	<18.50	Low (but risk of other clinical problems increased)
Normal range	18.5–24.99	Average
Overweight	≥25.00	
Pre-obese	25.0–29.99	Increased
Obese class I	30–34.99	Moderate
Obese class II	35–39.99	Severe
Obese class III	≥40.00	Very severe

However, BMI does not account for changes in body fat distribution and, more recently, research has suggested that waist circumference has a closer association with morbidity and mortality. At present, however, waist measurements are not routinely taken (though health practitioners are increasingly being encouraged to do so) and the data is not available. This is of particular concern when dealing with Asian populations. It is not only the amount of fat a body has, but its distribution. Research has indicated that Asians are more likely to store fat abdominally. To allow for this, Table 2 illustrates the alternative level of risk of co-morbidities at different cut-off points, with a provision for waist circumference as published for adult Asians.[2]

Table 2: Risk of co-morbidities associated with different levels of BMI and suggested waist circumference in adult Asians

Classification	BMI	Risk of co-morbidities	
		Waist circumference	
		<90cm (men) <80cm (women)	≥90cm (men) ≥80cm (women)
Underweight	<18.5	Low (but risk of other clinical problems increased)	Average
Normal range	18.5–22.9	Average	Increased
Overweight:	≥23.00		
At risk	23.0–24.9	Increased	Moderate
Obese class I	25–29.99	Moderate	Severe
Obese class II	≥30	Severe	Very severe

Related health problems

The relative risks relating to obesity, as published by the WHO,[1] are presented in Table 3.

Table 3: Relative risk of health problems associated with obesity in adults

Greatly increased (relative risk much greater than 3)	Moderately increased (relative risk 2–3)	Slightly increased (relative risk 1–2)
Non-insulin-dependent diabetes mellitus	Coronary heart disease	Cancer (breast cancer in post-menopausal women, endometrial cancer, colon cancer)
Gall-bladder disease	Hypertension	Reproductive hormone abnormalities
Dyslipidaemia	Osteoarthritis (knees)	Polycystic ovary syndrome
Insulin resistance	Hyperuricaemia and gout	Impaired fertility
Breathlessness		Low-back pain due to obesity
Sleep apnoea		Increased risk of anaesthesia complications
		Foetal defects associated with maternal obesity

Note: All relative risk values are approximate

There are also the psychological effects of obesity, which are less quantifiable, and studies have shown conflicting results. It is clear that many obese individuals suffer from depression, body-shape dissatisfaction or eating disorders (binge-eating, night-eating syndrome etc.).

Current prevalence of obesity

Adults

Current obesity levels around the world are shown in Table 4, which includes selected countries from each region by way of illustration. Due to the limited availability of data, the figures are not age-standardised. Data available to the authors for 146 countries around the world can be found in Appendix 3. The highest prevalences were found in the Pacific Islands, the Middle East and the USA, with the lowest prevalences found in African countries.

Table 4: Adult obesity prevalence in selected countries, by WHO region

Country	Year of data collection	Age category	Males		Females	
			Overweight	Obesity	Overweight	Obesity
			% BMI 25–29.9	% BMI 30+	% BMI 25–29.9	% BMI 30+
WHO European Region						
England	2004	16+	43.9	22.7	34.7	23.8
Germany	2002	25+	52.9	22.5	35.6	23.3
Poland	2002	18–94	39.0	19.0	29.0	20.0
Spain	1990–2000	25–60	45.0	13.4	32.2	15.8
WHO Eastern Mediterranean Region						
Iran	2000	20+	42.0	10.0	45.0	30.0
Pakistan	n/a	18+	18.3	4.5	21.4	5.9
Saudi Arabia	1995–2000	30+	42.4	26.4	31.8	44.0
WHO Western Pacific Region						
Australia	2000	25+	48.2	19.3	29.9	22.2
China*	2002	n/a	18.9	2.9	18.9	2.9
Tonga**	1998–2000	15–85	37.4	46.6	22.7	70.3
WHO Africa Region						
Congo (urban)	1996	15+		2.3		5.8
Mali (female)	1996	15–49			7.2	1.2
South Africa	1998	15+	21.1	10.1	25.9	27.9
WHO Americas Region						
Argentina (urban)	2003	18–65	24.6	19.5	10.8	17.5
Mexico	2000	20–69	41.3	19.4	36.2	29.0
USA	2003–2004	20+	39.7	31.1	28.6	33.2

Table 4: Adult obesity prevalence in selected countries, by WHO region (*Continued*)

Country	Year of data collection	Age category	Males		Females	
			Overweight	Obesity	Overweight	Obesity
			% BMI 25–29.9	% BMI 30+	% BMI 25–29.9	% BMI 30+
WHO South-East Asia Region						
India	1998	18+	4.4	0.3	4.3	0.6
Indonesia	2001	15+	7.3	1.1	14.2	3.6
Thailand	1997	20–59	15.7	3.5	25.1	8.8

Notes:
*Combined figure for males and females.
**IOTF estimate.

Ideally, nationally representative data would be used, but unfortunately, at present, this is not available for many countries. Regional surveys tend to be carried out in largely populated urban areas. Depending on the country being considered, urban figures may overestimate the problem. The extent to which it overestimates the prevalence will depend on the urban:rural population ratio and the stage of economic development of the country in question.

When comparing data, care must be taken to look at the age range of the population surveyed, the year of the survey, the method of survey – self-report or measured, regional or nationally representative – the sample size, age-standardisation and, finally, to establish the cut-off points used to define obesity. For the purpose of this review, the WHO cut-off points described above (i.e. BMI 25–29.9 overweight and BMI≥30, are used. Data have been selected according to the appropriateness for use.

Further information on overweight and obesity rates can be found in the WHO infobase.[3] Differences will be found between data sources according to data availability at the time. It should also be noted that the WHO has undertaken additional work to provide estimates in countries for which the organisation has as yet no data.

Self-reported data

Care should be taken when interpreting self-reported data. Those who are overweight tend to underestimate their weight, especially overweight women. Men and the elderly tend to overestimate their height. The more overweight an individual is, the more likely they are to underestimate their weight. Differences also occur based on ethnicity. For example, a survey in Oxford found that approximately 20% of adults were misclassified as a result of self-reporting. A summary of findings from self-report vs measured studies can be found in Appendix 2.

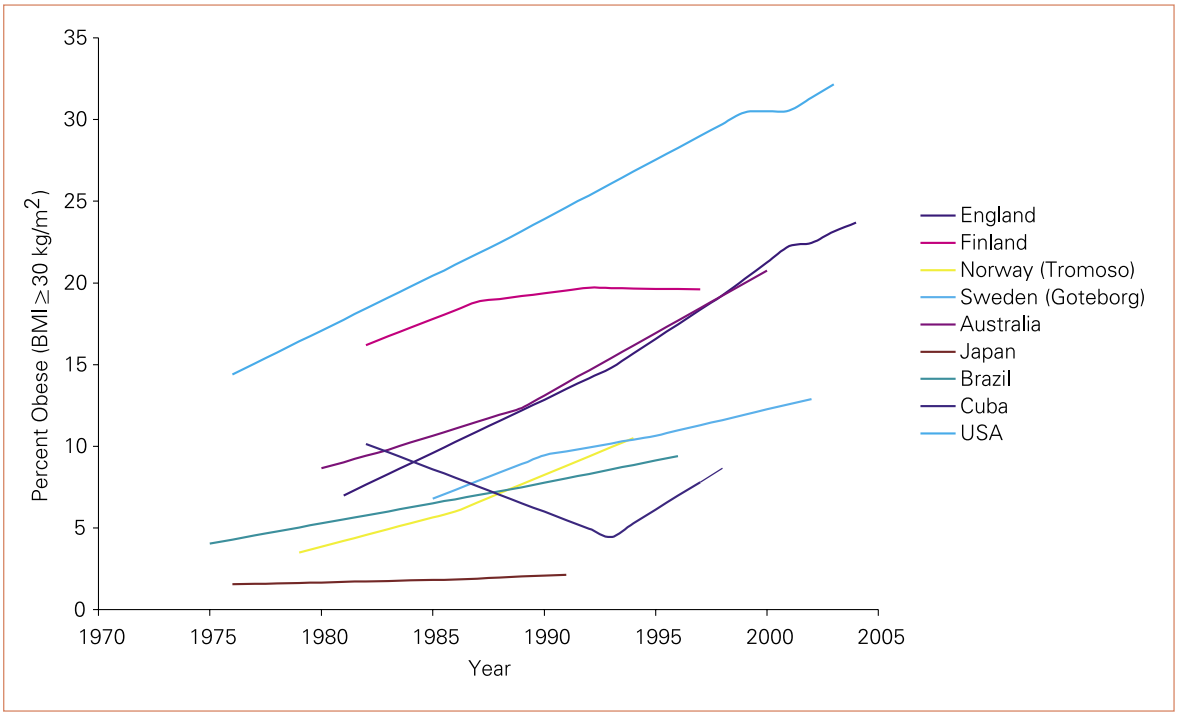
Obesity, then and now

It is well documented that rates of obesity are increasing. In some countries, the rates of obesity have more than doubled in the last 20 years. As shown in Figure 1, in England the rate of obesity in the 1980s was less than 10%. By the late 1990s it had doubled to almost 20%, and it is now around 23%. In the USA, rates were in the region of 14% in the 1970s, by the 1990s they had reached 20%, and they now exceed 30%. In Norway, two regional studies have shown obesity to have doubled between the 1980s and the late 1990s, but this is not the picture throughout Europe.

Finland had very high levels of obesity in the 1980s, similar to the USA at over 15%, but the country appears to have contained these and the figures still stand at around 20%, compared to the USA's 30%. Although Finland still has a problem with obesity, it appears to be doing something to minimise the extent of the rise. In the 1970s, Dr Pekka Puska and colleagues set up the North Karelia project. The project was such a success in terms of reducing coronary heart mortality that it was later extended throughout Finland. This project is referred to again later in this review.

Cuba has seen a period of nutrition transition closely linked to its economic fortunes. In the early 1980s, rates of obesity were around 10%. This dropped to less than 5% in the 1990s and is now increasing. As the economy underwent significant change and the standard of living dropped significantly, the prevalence of obesity dropped, but it appears to be rising again as the economy stabilises.

Figure 1: Trends in adult obesity prevalence in selected countries around the world

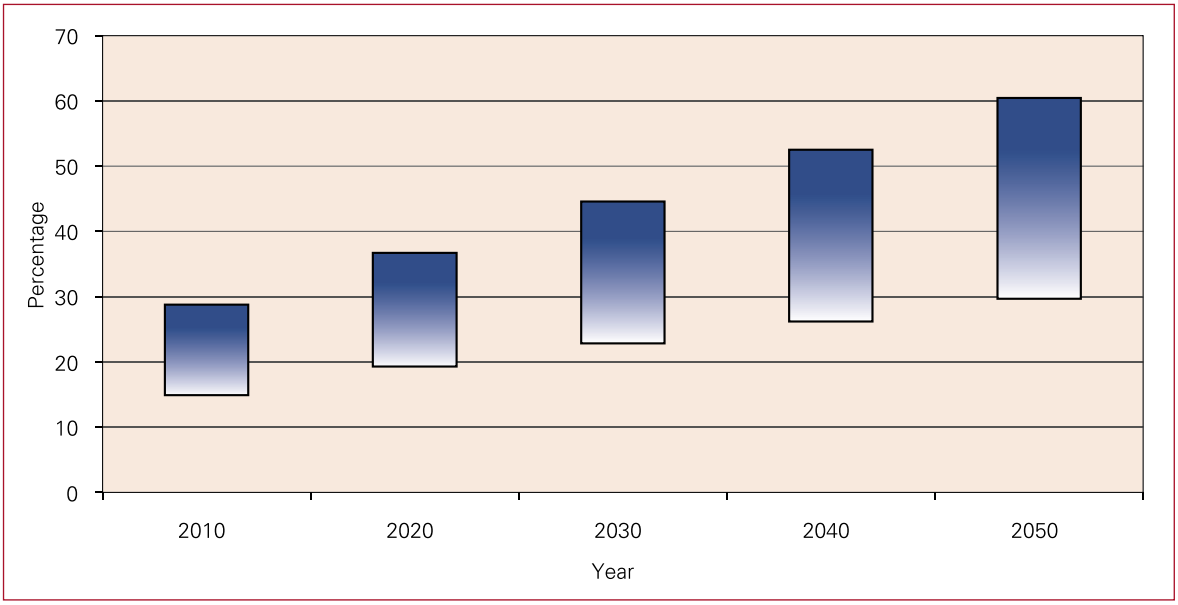


A further illustrative example of changes in obesity over time in European adults 1985–2005, can be found in Appendix 4.

Figure 2 shows linear projections to 2050 based on reliable data from England, Finland, France (the latter is based on self-report so may represent an underestimate), Germany, Norway, Scotland and Sweden. It is important to consider that these projections do not take into account any changes that may be made in the future to halt or reduce prevalence and it is unlikely that rates would continue to rise at this rate. Looking at the data, it would appear that, although prevalence of obesity is increasing, the rate at which it is rising is steady or even perhaps slowing in some European countries. Further analysis would be required to substantiate this.

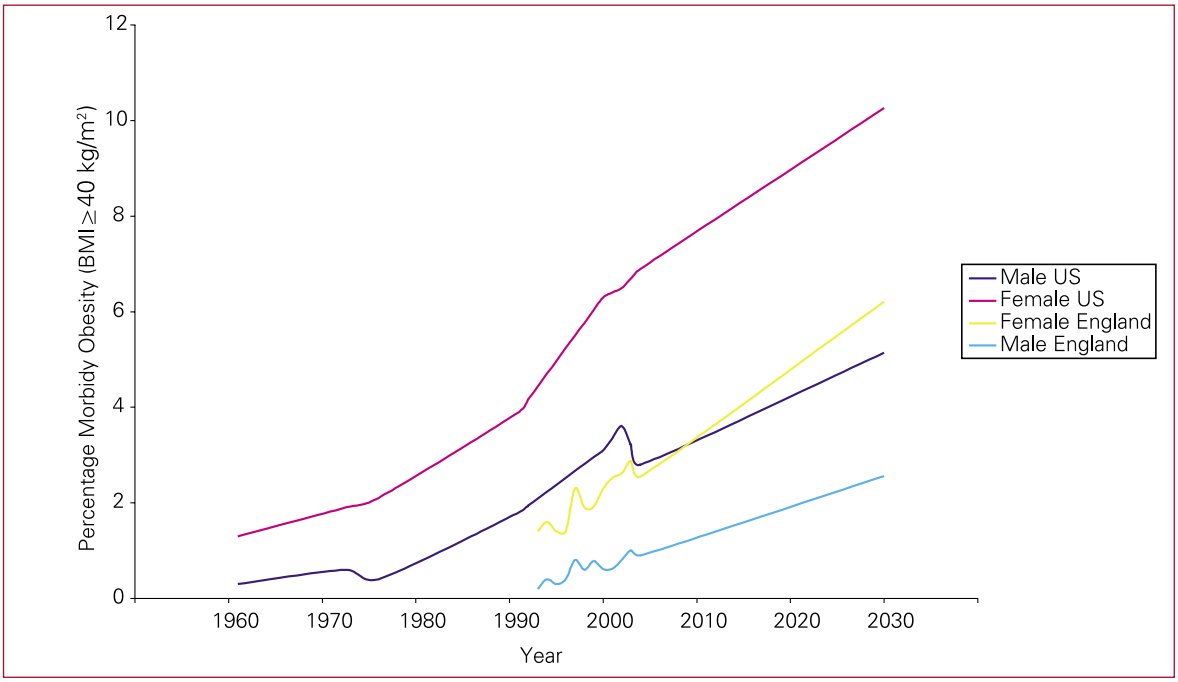
The rates of morbid obesity are also increasing. Unfortunately, only limited data are available. Figure 3 shows the increasing rates of morbid obesity in England and the USA.[4,5] Of particular note is the fact that English women are showing a similar rate of increase to that of the USA. Morbid obesity is of great concern due the debilitating nature of the disease and, from an economic perspective, the extra costs to the NHS (drugs, extra staffing, special equipment such as beds, wheelchairs etc.), and to the individual (loss of earnings, special equipment).

Figure 2: Projected obesity range for European adults



Source: IOTF estimates based on linear trends in Europe, 1979–2004.

Figure 3: Morbid obesity prevalence in the England and the USA, projected to 2030



The data suggests that, if current trends continue and rates continue to rise unabated, females in England will have a higher prevalence of morbid obesity than males in the USA by 2030.

Risk factors

Age

An ageing population is amplifying the problem, as obesity rates tend to increase with age. The considerable reduction in weight seen in the old does not occur until around the age of 75 years, an effect especially apparent in women. Even with this decline in obesity rates for the 75+ age category, more than 20% of this group in England, and more than 25% in Scotland and the USA, are obese. Figures 4 and 5 show examples of the age-related differences in obesity prevalence.

Figure 4: Male age-related obesity prevalence in selected countries

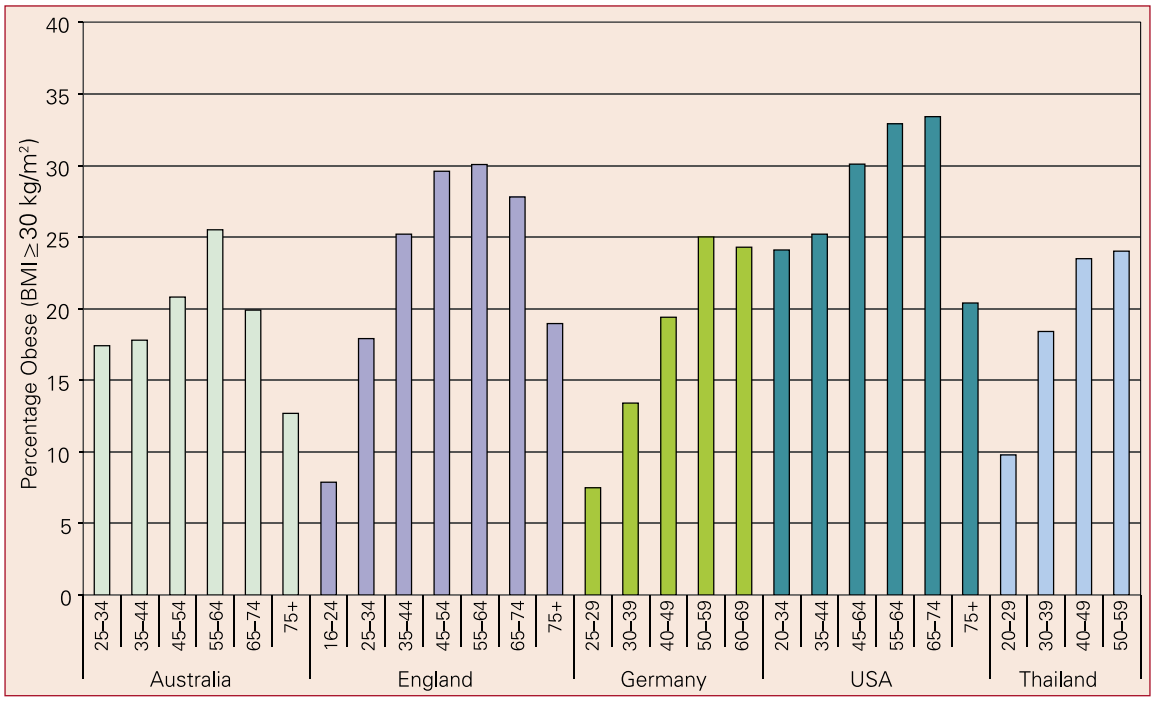
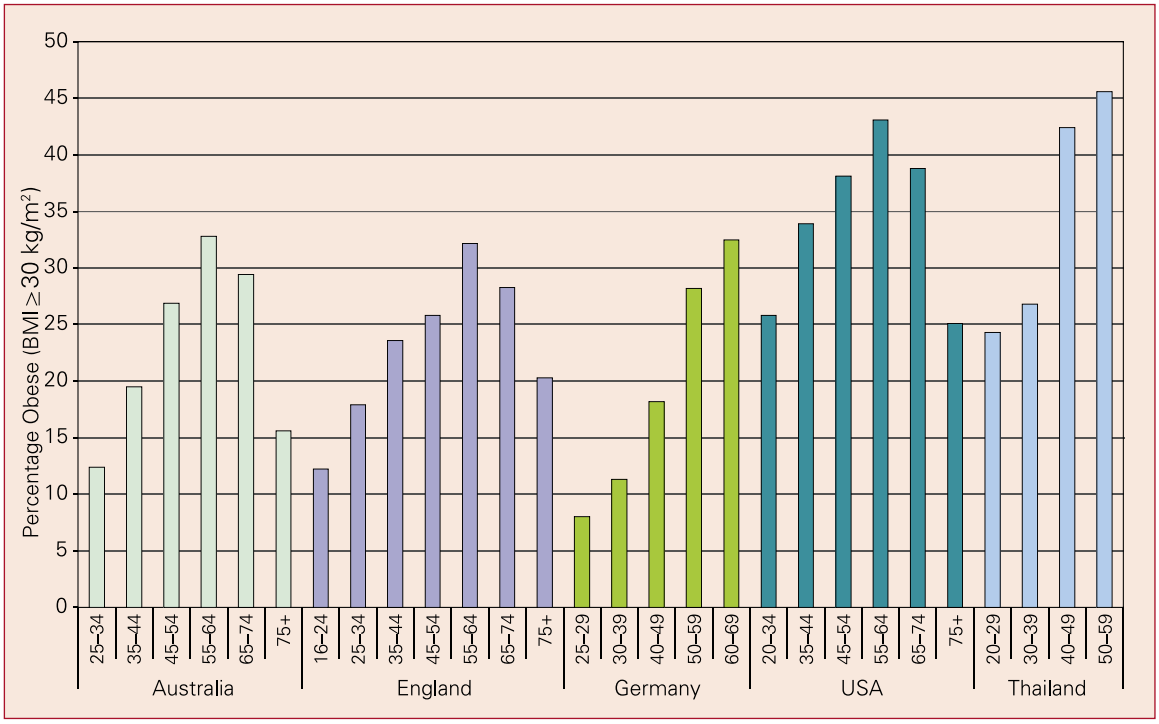


Figure 5: Female age-related obesity prevalence in selected countries



The risks of increased morbidity with overweight and obesity, especially in middle age, have been clearly documented. However, it is not only the risk of morbidities that increases, but mortality too. A recent study from the USA found that, for individuals who were obese during midlife, and who had never smoked, the risk of death was two or three times that of those who were not obese. Being overweight increased risk of death in the region of 20–40%.[6] In Scotland, obesity rates in women aged 55–65 are greater than 30% and, in the 65–74 year category, they are more than 40%.[7]

Race

Race is a significant factor in the likelihood of obesity. Risks of co-morbidity can also increase at lower BMI thresholds depending on race. Therefore, although the obesity rates by race may not be as high as some countries' levels, the risk of obesity-related morbidity may be as high if not higher. As shown in Figures 6 and 7, the impact of race is very clear in the USA. Approximately 30% of white non-Hispanic women are obese, but this increases to almost 50% of Afro-American women being obese.

Figure 6: Obesity prevalence in male adults, by race, in the USA, England and Malaysia

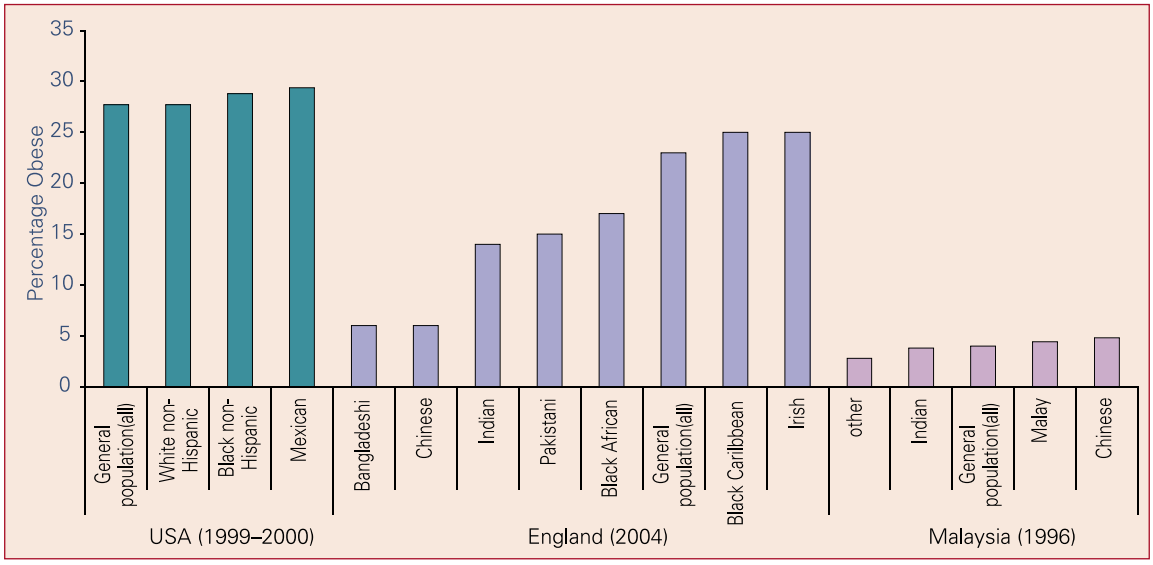
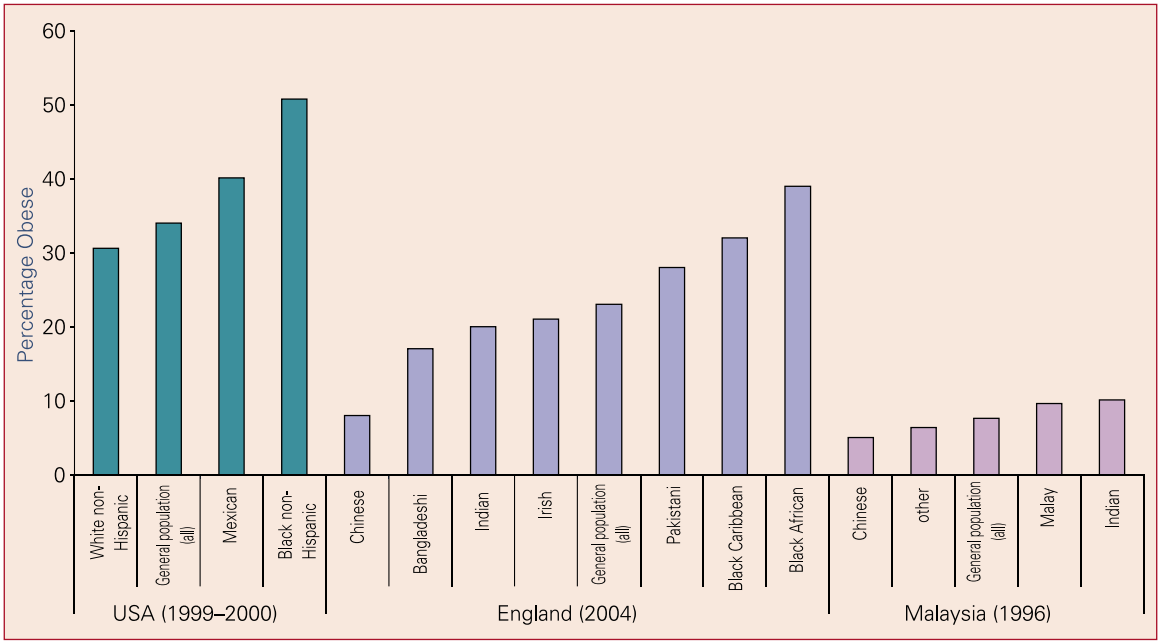
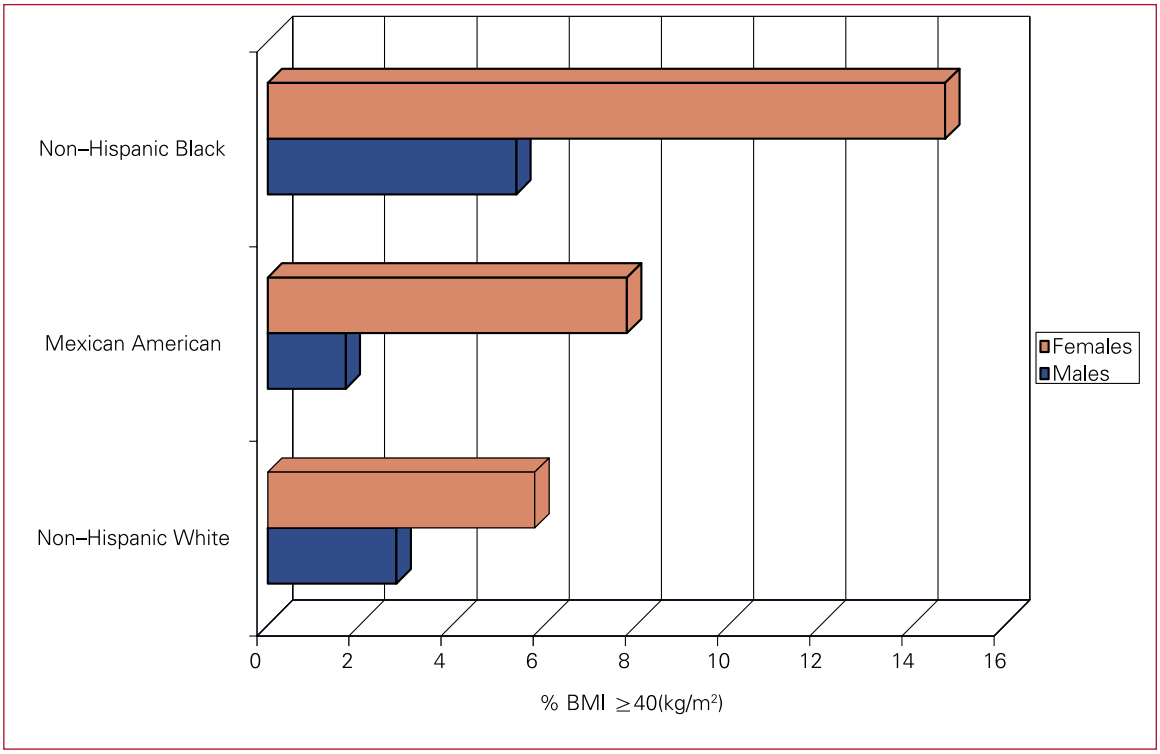


Figure 7: Obesity prevalence in female adults, by race, in the USA, England and Malaysia



Of particular concern are the rates of morbid obesity. The ethnic breakdown for morbid obesity is shown in Figure 8. The obesity prevalence in Afro-American non-Hispanic women is in the region of 50%, but the morbid obesity rate of non-Hispanic Afro-American women in the USA is over 14%. This is more than double that of non-Hispanic white women.[4]

Figure 8: Prevalence of morbid obesity in US adults, 2003/2004

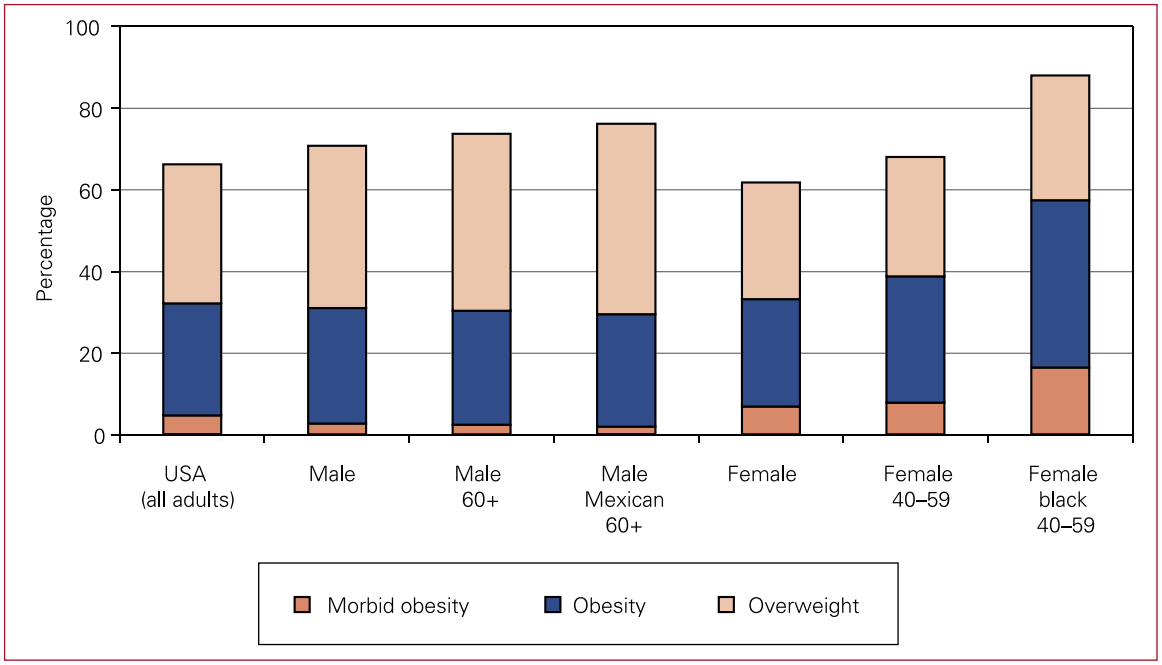


The US population has a very high prevalence – around 65% – of overweight and obesity. When we analyse the different subgroups within the population, the situation is more alarming. As shown in Figure 9, more than 85% Afro-American women aged 40–59 are either overweight or obese, with the majority being obese and almost 20% morbidly obese.

Socioeconomic status

The relationship between socioeconomic status and adult obesity in European countries does not appear to be as pronounced as the links between socioeconomic status and other chronic diseases. Data from some 80,000 adults in the WHO Monitoring Trends and Determinants in Cardiovascular Disease (MONICA) Project, covering 26 population groups, found lower educational achievement (as an indicator of socioeconomic status) to be linked to higher BMI (as an indicator of obesity) in only about half of the population's groups with respect to men, but in virtually all the groups with respect to women. The trend over time suggested that the differentials were increasing.[8]

Figure 9: Varying prevalence of overweight, obesity and morbid obesity in US adults



A more recent survey using national indicators of wealth and of inequalities showed that both obesity and diabetes were linked less strongly to national wealth than to national indicators of inequalities (such as the GINI index, which measures the extent to which the distribution of income among individuals within an economy deviates from a perfectly equal distribution), implying that the links between socioeconomic status and obesity may be mediated by the degree of relative inequality rather than indicators of absolute deprivation.[9] Furthermore, perceived social status and self-esteem may influence health behaviour,[10] and obesity prevention and treatment may be less successful among lower-income groups.[11]

The links between obesity and socioeconomic status may be influenced by specific lifestyle factors, including smoking, diet and physical activity. Tobacco smoking is closely linked to socioeconomic status but may be inversely linked to obesity while increasing the risk of heart disease and other risk factors for chronic disease. Alcohol intake, especially in binge sessions, may show a similar pattern. Access to traditional Mediterranean diets may also influence health outcomes and may be found most commonly among older-aged, lower-income groups in southern Europe. Pre-natal nutritional status and stunted growth in infancy also raises the risk of abdominal obesity and chronic disease, and, given the widespread prevalence of semi-starvation and poor diets in parts of Europe during and after the Second World War, children born then are now at their most vulnerable age for displaying the impact of their excess weight on their risk of

diabetes and cardiovascular disability. Their social inequality may amplify their enhanced health risk. (In addition, abdominal obesity may not be adequately measured using BMI. Measures of waist circumference or waist:hip ratio may be a better indicator.) These various influences need elaborating and their policy implications making clear.

Besides economic status, ethnicity and migrant status show differential effects on obesity. Several surveys have found some ethnic groups to be at increased risk of obesity,[12,13] possibly independently of economic status, and this has implications for targeting preventive measures and interventions. Migrant status also shows links to obesity prevalence, both in settled immigrant communities[14] and among travelling communities such as the Roma. Reports of high levels of adult obesity among Roma adults are given in the Sastipen Network Information System.[15] Data relating to Roma children are available elsewhere.[16]

The effects of nutrition transition

In Brazil, it has been found that in the more developed areas of Brazil, the prevalence of obesity increased in all women between 1975 and 1989. Between 1989 and 1993, the prevalence of obesity again increased in all women but, on further examination of the data, obesity in women in the lowest income category (the lowest quartile) increased from 7.9% in 1989 to 12.6% in 1997, and that of those in the highest income category (highest quartile) decreased from 14.1% in 1989 to 10.9% in 1997.[17]

In low-income countries the greatest increases in overweight are found in the highest socioeconomic status categories, but in high-income countries the greatest increases are found in the low socioeconomic status categories.[18] This is substantiated by a recent article, which suggests that a rapid increase in obesity is occurring in the low–middle-income developing countries, and that the rate of change appears to be greater than that found in the high-income countries.[19]

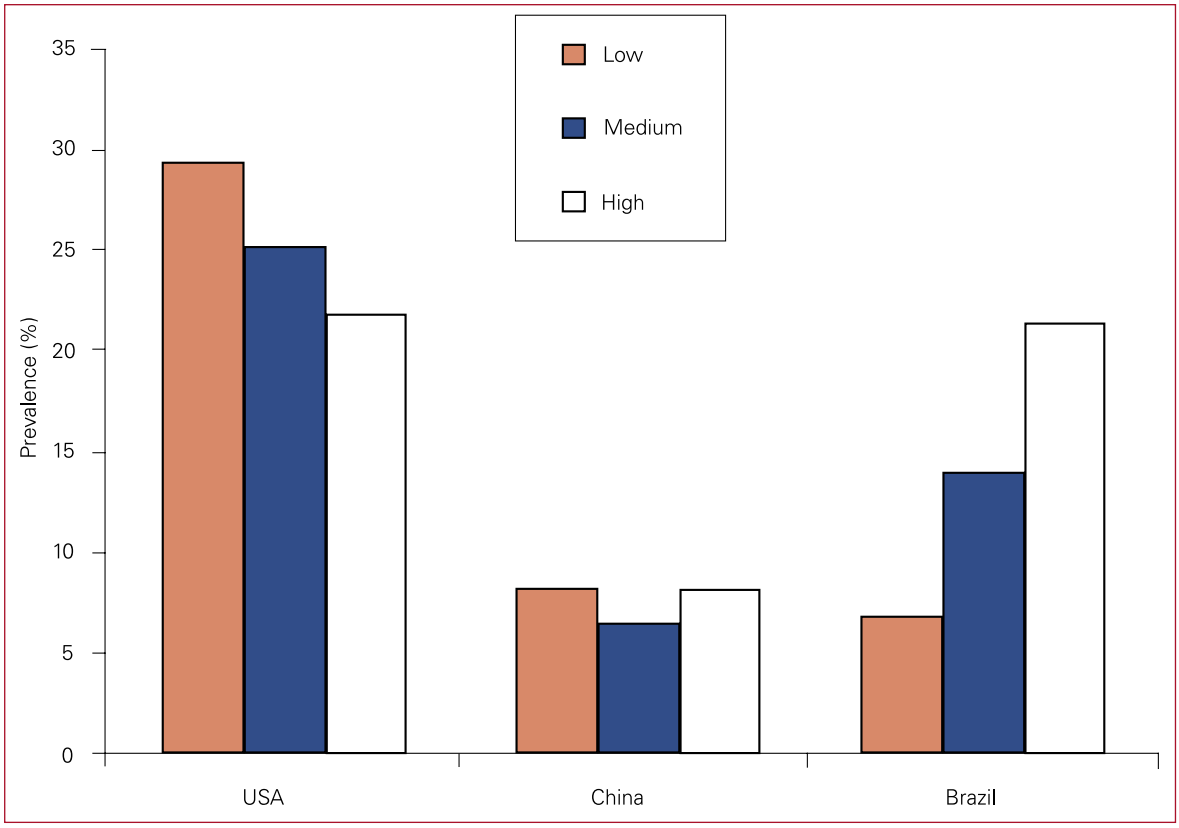
In terms of socioeconomic status, developed countries are different from developing countries. In developed countries, higher obesity rates are found in low economic groups. In developing countries, the situation is reversed, and higher obesity rates are found in people belonging to higher socioeconomic groups. Traditionally, in developing countries, underweight and under-nutrition have been the primary concern. However, in most developing countries now, the prevalence of overweight in young females exceeds underweight, especially in countries at higher levels of socioeconomic development.[20] Studies in Latin America and the Caribbean show that under- and over-nutrition may exist in the same family.[21]

In the UK, a study looking at both the socioeconomic position in childhood and adulthood found that the odds ratio of being obese in adulthood if they were both born into and remained in a manual class was 2.38, though this reduced to 1.68 if

they were born into a manual class but moved into a non-manual class in adulthood. However, it would appear that class in adulthood is the overriding factor as, if they were born into a non-manual class but moved down to a manual class, the odds ratio rose to 1.73.[22]

Figure 10 demonstrates the clear differences in nutrition transition. In the USA, children of the highest earners are the thinnest – they have reached the final phase of transition – 'behavioural change'. Fat intake is reduced, fruit and vegetable and fibre intake is increased. Sedentarism is replaced with activity resulting in reduced body fat.[18] In China, the population hasn't reached this stage yet and Brazil is at an earlier stage in transition. In Brazil, those who can afford it change their traditional intake and increase consumption of fat, sugar and processed foods. Meanwhile, changes in technology result in increased sedentarism. It is important to note that this study looked at the whole of Brazil rather than just the developed area.

Figure 10: Prevalence of overweight in children aged 6–18 years in the USA (1988–1994), China and Brazil (1997), by family-income level[23]



Note: Overweight as defined by IOTF criteria.

A study in China highlighted the impact of rapid income growth on diet behaviour and looked at the relationship of this to socioeconomic level. It found that those in low-income groups have the largest increase in detrimental effects due to increased income.[24] On the other hand, reversals in economic development can be reflected in sharply increased obesity rates when the economy recovers.[25]

The relationships between obesity and economic factors are considered again in subsequent sections.

Socioeconomic status and ethnicity

In England, in almost all ethnic groups, those in the lower socioeconomic groups had higher rates of obesity than those in higher socioeconomic groups (defined in this instance by manual and non-manual professions) as shown in Figures 11 and 12. The only exceptions were in Indian, Pakistani and Irish males. The differences were clearer for females than for males.

Findings in the USA suggest that, to reduce the disparities between ethnic groups, one needs to look beyond income and education and focus on factors such as environmental and sociocultural factors.[26] This is substantiated by Kumanyika and Grier, who found that low-income, minority children live in areas where they typically have more fast-food restaurants and fewer healthy food outlets, the streets are unsafe, the parks are dilapidated and facilities are sparse.[27]

Figure 11: Prevalence of obesity in males, by socioeconomic status and ethnicity in England (Health Survey for England – The Health of Minority Ethnic Groups 1999)

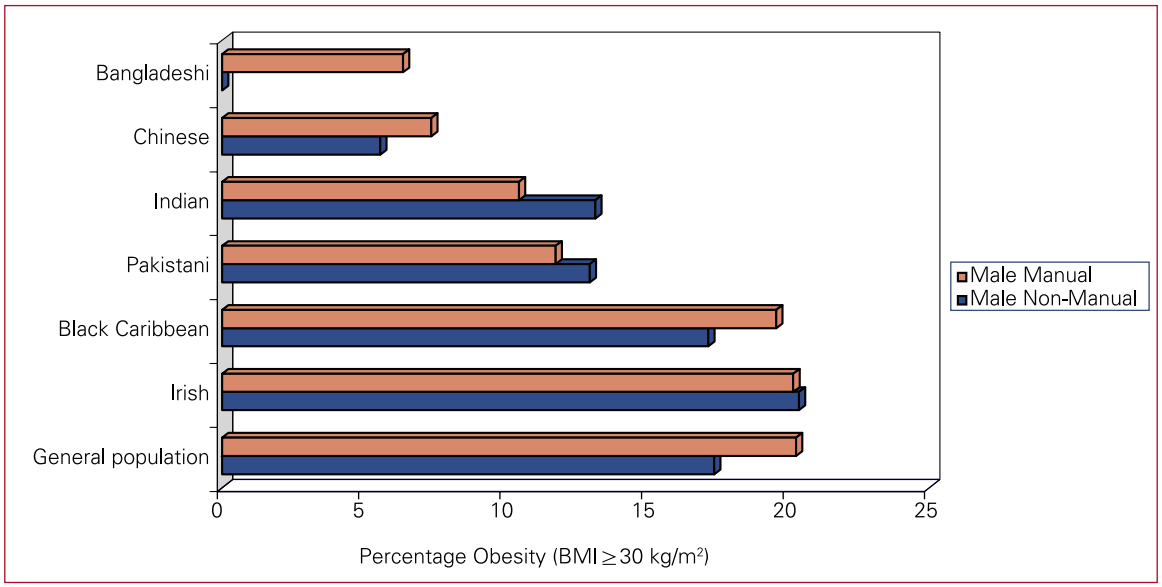
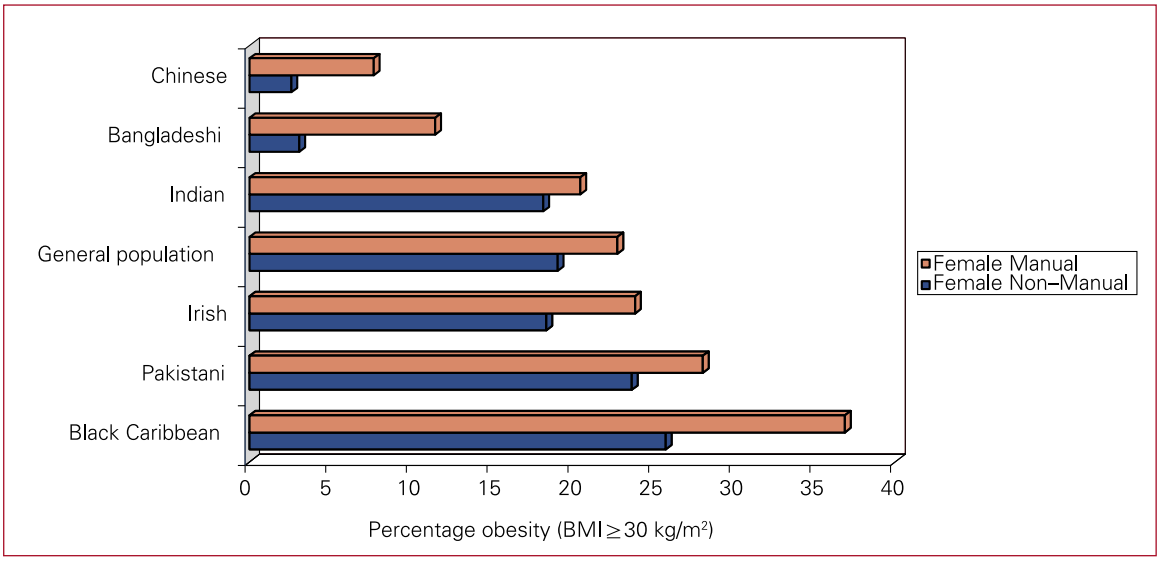


Figure 12: Prevalence of obesity in English females, by socioeconomic status and ethnicity

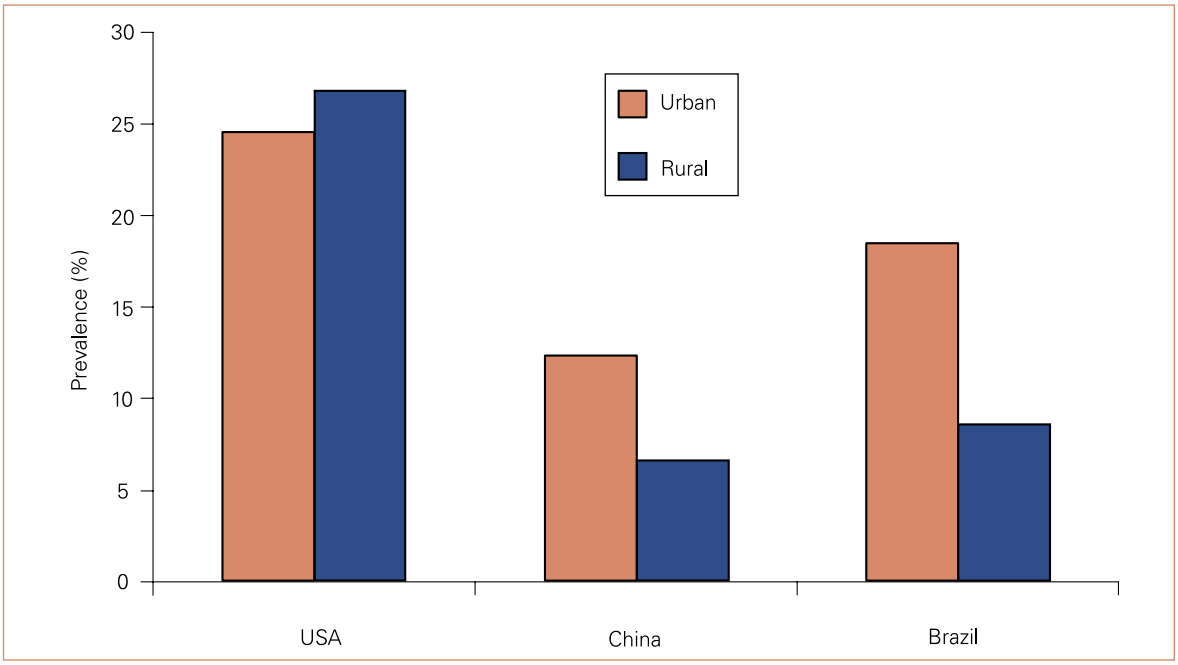


Geography

Historically, those living in rural communities were likely to be poorer and in a lower socioeconomic category, with limited access to food and lower levels of BMI. However, in recent years, as economic transition has taken place, while those living in rural communities may have a slightly lower GDP, they are at the same, if not greater, risk of having a high BMI. In Canada, however, no significant difference between urban and rural populations based on a national self-reported study[28] has been found. Yet, in the USA, differences have been identified between rural and urban communities, with rural communities having a higher prevalence of obesity,[23] as shown in Figure 12.

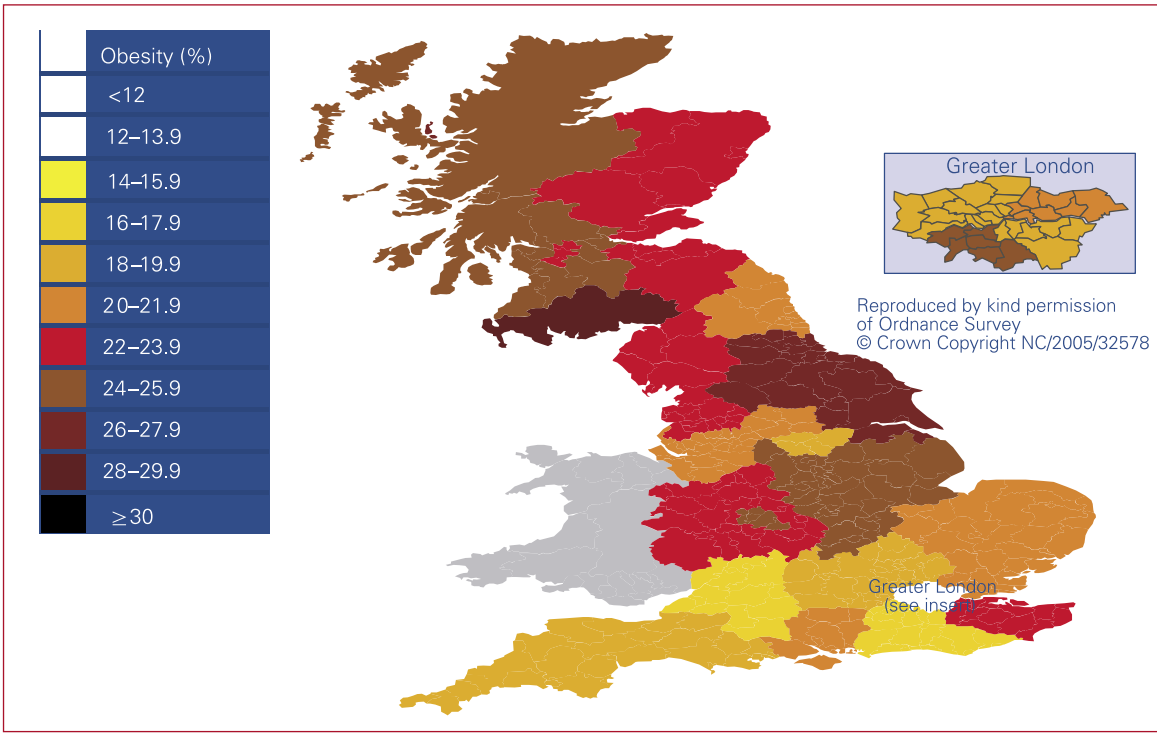
As shown in Figure 14, the UK obesity rates are clearly higher in Scotland and the north-east than in the south.

Figure 13: Prevalence of overweight in children aged 6–18 years in the USA (1988–1994), China and Brazil (1997), by residential area [23]



Note: Overweight as defined by IOTF criteria.

Figure 14: Prevalence of obesity in Scotland (2003) and England (2000–2002), by local health authority district



In France, the only data available are self-reported. However, only little difference is evident in prevalence of obesity by region. The northern regions of France are generally higher in prevalence than those in the south (Figure 15).[29]

Figure 16 looks at the difference in the increase in obesity on a regional basis in France between 1997 and 2003. The greatest increases were seen in the north, with the lowest increases in the east.

Figure 15: Self-reported prevalence of obesity in France, 2003, by region[29]

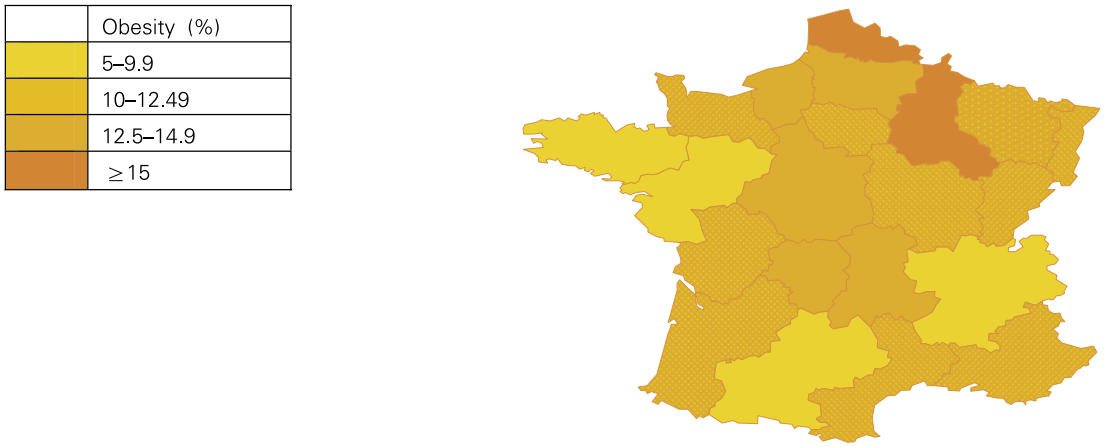
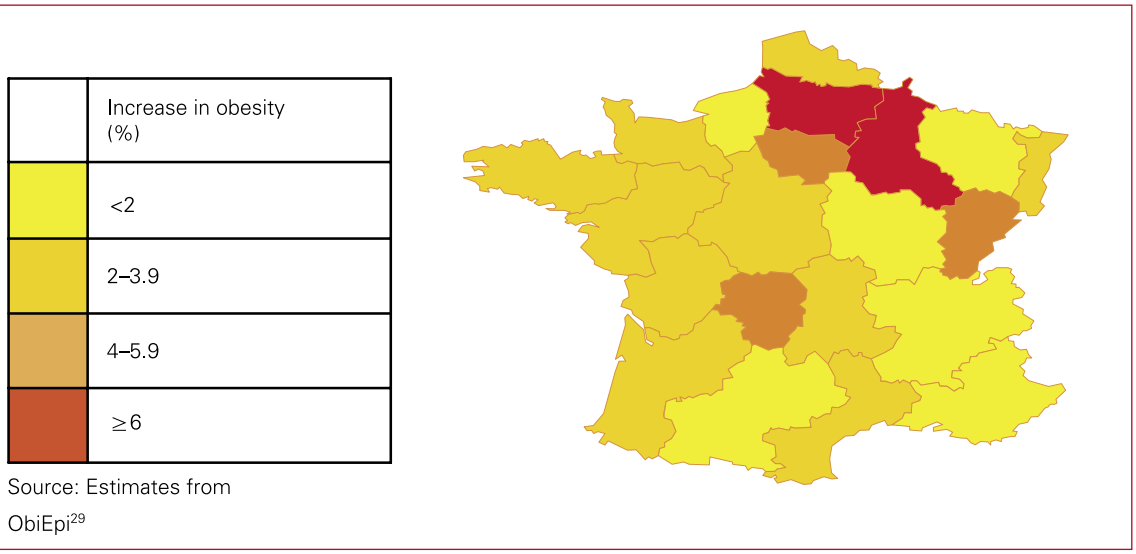


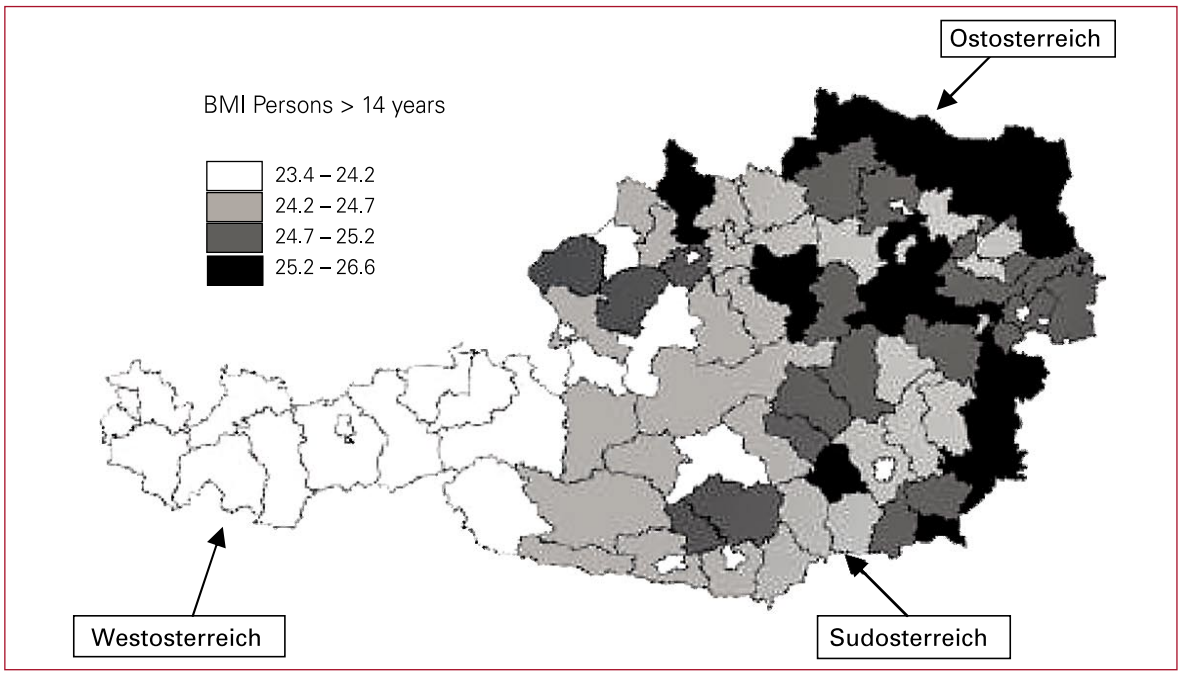
Figure 16: Percentage increase in obesity in France (1997–2003) based on self-reported data, by region



Source: Estimates from ObiEpi.[29]

In Austria, there is a very clear difference between eastern and western parts of the country. Figure 17 highlights the mean BMI in persons >14 years of age in Austria.

Figure 17: Mean BMI (aged >14) in Austria, by region



Source: Adapted from Waldhor et al.[30]

In Austria, in areas with higher GDP per person, BMI appears to be lower and, in areas of lower GDP, mean BMI is higher. Table 5 shows that, for example, in Vorarlberg, where the GDP per inhabitant in 2003 was approximately €29,000, the mean BMI is in the lowest category (23.4–24.2); in Vienna, the GDP was €39,500 and the mean BMI is 24.2–24.7; yet, in the poorer regions, such as Burgenland, the GDP per inhabitant was less than €20,000 and the mean BMI is in the highest category 25.2–26.6.[31]

Table 5: Austrian regions, by GDP and predominant BMI category[31]

Region	GDP per inhabitant 2003 (€)	Predominant BMI category 1, 2, 3 or 4, where: 1 = 23.4–24.2 2 = 24.2–24.7 3 = 24.7–26.6 4 = 25.2–26.6
Eastern Austria		
Burgenland	19,596	4
Niederösterreich	22,388	3/4
Vienna	39,530	2
Southern Austria		
Kärnten	23,609	2
Steiermark	23,779	2
Western Austria		
Oberösterreich	26,096	2
Salzburg	30,823	1
Tirol	28,726	1
Vorarlberg	29,459	1

Consequences of obesity

The consequences of obesity are seen most strikingly in its co-morbidities. Table 6 demonstrates the difference in obesity co-morbidities accordingly. For example, type 2 diabetes is found in 10% of white obese adults, increasing to 15% in Afro-Caribbean obese adults, and to 18% in obese adults with a low income, but it decreases to 8.5% in obese adults with higher education. With hypertension, 13% of normal-weight whites are estimated to be hypertensive; this increases to 35% in obese whites and increases further still to 44% in obese Afro-Caribbeans.

Table 6: Obesity co-morbidities, by gender, race, income, education and weight category in US adults[32]

	Underweight	Normal weight	Overweight	Obese	P
Type 2 diabetes					
Male	3.0	3.6	5.6	8.3[a]	<0.001
Female	1.6	2.8	6.8	13.0[a]	<0.001
White	1.5	2.8	5.6	10.0	<0.001
Afro-Caribbean	7.3	5.3	8.1	15.0	0.001
Hispanic	1.8	4.8	7.8	7.3	0.2
Lower income	2.5	5.0[b]	9.7[c]	18.0[d]	<0.001
Higher income	1.8	2.9[b]	5.4[c]	9.0[d]	<0.001
Lower education	6.1	6.5[e]	11.8[f]	19.3[g]	<0.001
Higher education	1.1	2.7[e]	4.7[f]	8.5[g]	<0.001

Table 6: Obesity co-morbidities, by gender, race, income, education and weight category in US adults[32] (*Continued*)

	Underweight	Normal weight	Overweight	Obese	P
Hypertension					
Male	11.4	11.5	20.7[a]	35.4	<0.001
Female	7.1	13.3	25.0[a]	36.0	<0.001
White	7.5	13.0[b]	22.0[c]	35.2[d]	<0.001
Afro-Caribbean	18.2	18.1[b]	32.1[c]	44.0[d]	<0.001
Hispanic	5.5	5.0[b]	15.1[c]	24.4[d]	<0.001
Lower income	8.7	14.6	27.5[e]	39.0	<0.001
Higher income	7.8	12.1	21.5[e]	35.0	<0.001
Lower education	18.4[f]	22.1[g]	35.8[h]	46.0[i]	<0.001
Higher education	5.8[f]	11.0[g]	19.5[h]	33.1[i]	<0.001
Heart disease					
Male	11.3	7.3[a]	8.4	8.2	0.5
Female	6.7	5.7[a]	6.8	9.8	0.004
White	7.7	7.0	8.0	8.8[b]	0.2
Afro-Caribbean	15.8	6.4	9.6	12.8[b]	0.1
Hispanic	7.5	2.4	4.3	2.0[b]	0.2
Lower income	10.6	8.2	11.0	16.0[c]	0.004
Higher income	7.0	6.1	7.2	7.2[c]	0.3
Lower education	21.1[d]	15.6[e]	15.5[f]	18.2[g]	0.5
Higher education	4.8[d]	4.8[e]	6.0[f]	6.8[g]	0.08
High-serum cholesterol					
Male	6.0	8.5[a]	15.0	19.1	<0.001
Female	5.3	11.5[a]	18.7	21.1	<0.001
White	6.7	11.5[b]	18.6[c]	22.5[d]	<0.001
Afro-Caribbean	6.1	5.0[b]	7.8[c]	16.6[d]	<0.001
Hispanic	0	3.8[b]	11.3[c]	10.2[d]	N/A
Lower income	4.6	7.5	14.1	18.4	<0.001
Higher income	5.7	10.6	16.8	20.6	<0.001
Lower education	11.4	12.1	16.8	17.1	<0.08
Higher education	4.2	10.0	16.4	21.2	<0.001

Notes:
All estimates are weight estimates.
Data are presented as percentages.
For each disease, the numbers with same superscript are significantly different, P <0.01.
P is the value for the difference in row percentages across four weight categories.
N/A = not applicable because one cell was empty.

The extent to which overweight and obesity influence morbidities varies. Table 7 describes the relative risks associated with obesity in UK adults. Obese men appear to be particularly at risk of myocardial infarction and obese women are particularly at risk of hypertension.

Table 7: Relative risks associated with obesity (BMI ≥30) in the UK

	Males	Females
Myocardial infarction	3.2	1.5
Stroke	1.3	1.3
Hypertension	2.6	4.2
Angina	1.8	1.8

Note: Relative risks specified only in relation to obesity (BMI ≥30). Derived from 48 unspecified studies after a systematic review of 3,537 studies.
Source: National Audit Office.[33]

It is also clear that obesity and its morbidities are multi-factorial. Table 8 presents the odds ratio, with adjustment for gender, race and socioeconomic status.

Table 8: Odds ratio of obesity-related co-morbidities, by weight category (after adjustment for socioeconomic status, gender and ethnicity)[32]

Weight category	Odds ratio	95% confidence interval	P
Diabetes			
Underweight	0.6	(0.2–1.3)	0.2
Normal weight	1.0	–	–
Overweight	1.7	(1.3–2.2)	<0.001
Obese	3.4	(2.6–4.4)	<0.001
Hypertension			
Underweight	0.5	(0.3–0.7)	0.001
Normal weight	1.0	–	–
Overweight	1.9	(1.6–2.2)	<0.001
Obese	4.1	3.4–5.0)	<0.001
Heart disease			
Underweight	1.1	(0.7–2.0)	0.6
Normal weight	1.0	–	–
Overweight	1.0	(0.8–1.3)	0.7
Obese	1.4	(1.1–1.8)	0.003
High-serum cholesterol			
Underweight	0.5	(0.3–0.9)	0.03
Normal weight	1.0	–	–
Overweight	1.7	(1.4–2.1)	<0.001
Obese	2.3	(1.9–3.0)	<0.001

Notes:
Weighted estimates, adjusted for age, race, gender, income, education and smoking.
Normal weight is the reference category (odds ratio = 1).

Until recently, cancer was not considered to be overweight- or obesity-related. However, Table 9 demonstrates the proportion of cancers attributable to overweight and obesity in the European Union (EU). These figures were provided by the International Agency for Research on Cancer

Table 9: Proportion of cancer cases attributable to overweight and obesity in EU countries, by cancer site[34]

	Breast	Colon		Prostate	Endometrium	Kidney		Gall bladder		Total	
Country	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Austria	7.4	10.5	9.5	4.2	35.1	23.9	21.9	22.6	20.7	3.7	6.0
Belgium	8.8	11.6	11.2	4.6	40.8	25.9	25.9	24.8	24.4	2.9	6.7
Denmark	5.4	9.7	6.8	3.9	26.0	22.1	16.0	20.9	15.1	2.9	3.9
Finland	9.1	12.6	11.6	5.0	41.6	28.4	26.4	26.8	24.9	4.4	7.2
France	7.6	10.7	9.6	4.3	35.6	24.2	22.2	22.8	21.0	3.1	6.1
Germany	8.8	12.7	11.2	5.1	40.4	28.5	25.6	27.0	24.1	4.9	6.8
Greece	10.0	11.1	12.4	4.4	44.2	25.1	28.2	23.7	26.6	2.1	5.9
Ireland	7.8	10.1	9.9	4.0	36.4	22.9	22.8	21.7	21.5	3.1	5.0
Italy	9.1	11.4	11.6	4.6	41.7	25.9	26.5	24.5	25.0	3.1	7.5
Luxembourg	8.1	10.7	10.3	4.3	37.8	24.5	23.8	23.1	22.4	2.6	6.7
Netherlands	6.3	9.8	7.9	3.9	29.8	22.4	18.5	21.2	17.4	3.1	4.8
Portugal	9.5	10.7	12.0	4.3	42.9	24.5	27.3	23.1	25.8	2.9	7.1
Spain	10.7	10.8	13.5	4.4	47.3	24.1	30.5	22.8	28.8	2.6	8.8
Sweden	6.3	9.5	8.0	3.8	30.0	21.7	18.6	20.5	17.5	3.8	5.2
United Kingdom	7.8	10.0	9.8	4.0	36.1	22.7	22.7	21.4	21.4	2.7	4.9
European Union	8.5	11.1	10.7	4.4	39.2	25.5	24.5	24.8	23.7	3.4	6.4

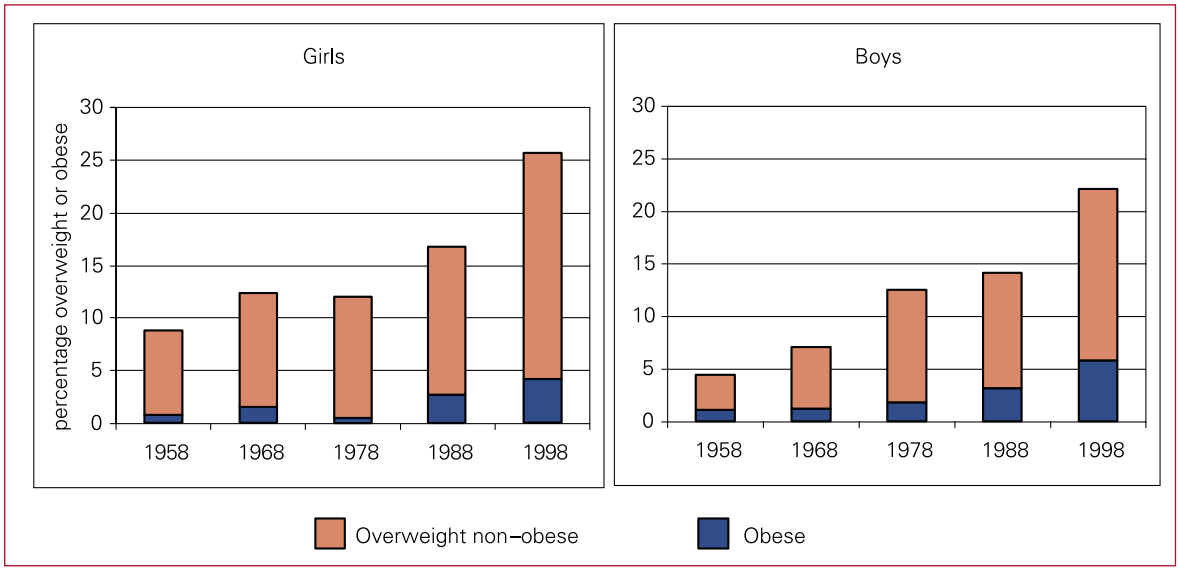
2 Analysis of drivers of obesity

Researchers have identified a wide variety of biological factors that are determinants of body weight and weight gain. The main contenders in terms of explaining the recent rise in obesity are diet (increased food-energy consumption), physical activity (decreasing to levels that are insufficient to burn the level of food-energy intake) and economic issues. These are considered in more detail later.

Other factors are briefly summarised here, together with an appraisal of their contribution to obesity levels. More detailed information on each is to be found in the short science reviews written for the Foresight Tackling Obesities project.[35] None is sufficient to account for the recent rapid rise.

- **Genetic influence.** Most people are predisposed to gaining weight, but genes indicate where you are on the spectrum, not whether the spectrum is moving upward/downward for all. Genes can't explain the dramatic recent trends, especially in genetically stable populations (e.g. Iceland, Figure 18).
- **Thermogenic effects**. There is less need to burn body fat for warmth because we live in warmer environments (climate change, central heating/air conditioning). This possibility needs more research among communities with differing obesity levels.
- **Environmental chemical obesogens**, e.g. endocrine disruptors in the food supply. There is some evidence of their increase, especially in industrialised communities, but there is insufficient research among communities with differing obesity levels.

Figure 18: Rapid rise in child overweight in a genetically stable population (Iceland) – the figures show the proportion (%) of the child population classified as overweight and obese[36]



- **Sleep debt**. Lower levels of sleep are linked to weight gain, but there is insufficient research among communities with differing obesity levels.
- **Decreased smoking**. Non-smokers have a lower metabolic rate, reducing energy needs. This may contribute to adult obesity prevalence but it doesn't explain the rise in child obesity levels.
- **Pharmaceutical obesogens**, e.g. antidepressants. Their increased use in adults may be a possible contributor to obesity prevalence but it doesn't explain child obesity.
- **Demographic changes** in population, e.g. increased ageing or changing ethnicity. This may explain some of the overall increase in obesity prevalence, but it doesn't explain the increases in prevalence within specific age groups or ethnic populations.
- **Reproductive selection** for increased BMI. Higher fertility, intergenerational or uterine effects, preferential mating and later childbearing are all possible contributors, but there is insufficient research among communities with differing obesity levels.

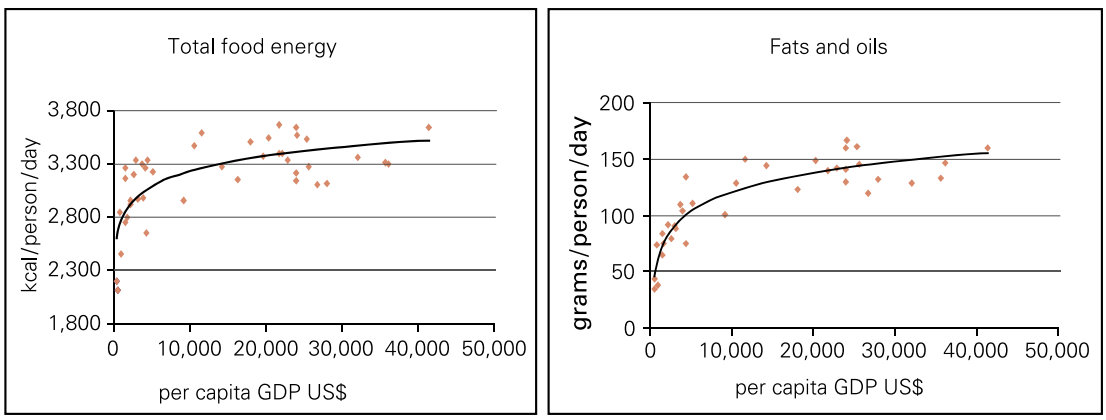
Dietary factors

GDP and food consumption

Taking the WHO European Region member states (including the former USSR), average per capita food-energy and dietary-fats consumption (market consumption) can be plotted against GDP. This shows an expected increase in food consumption as GDP improves, with a plateau indicating little further increase above per capita average GDP of $15,000–20,000, as shown in Figure 19.[37]

This relationship has led to the analysis of the 'nutrition transition', which identifies a change in dietary patterns as household budgets increase and as households become a marketing target for processed, mass-produced foods. The results can

Figure 19: Relationship between GDP and food consumption, WHO European Region member states



Source: WHO Euro Health For All Database.[37]

Figure 20: Relationship between income quartile and obesity prevalence: women in south-east Brazil, 1975–1997[17]

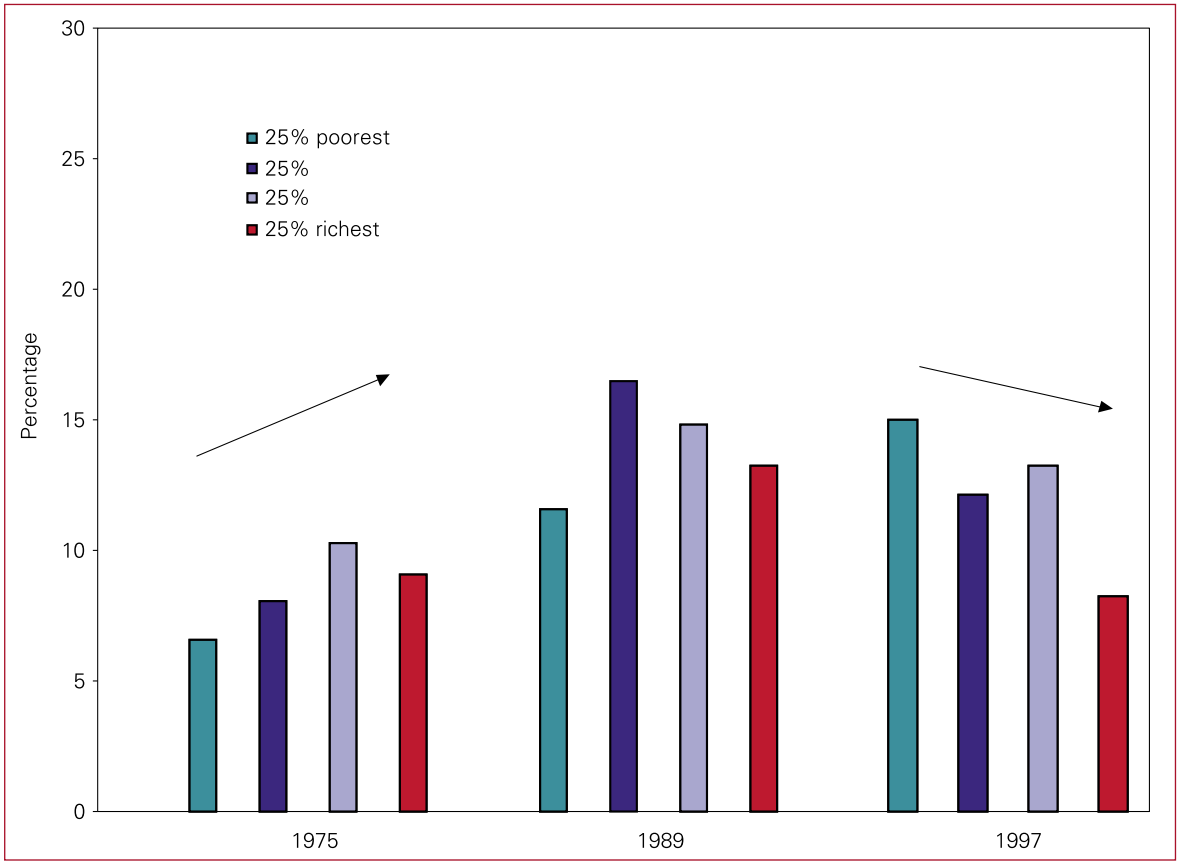


Figure 21: Predicted prevalence of obesity among women in south-east Brazil, according to per capita GNP

be shown in terms of obesity (Figure 20). Data from three surveys of women in southern Brazil show the socioeconomic status gradient of obesity shifting over a two-decade period, from one where the poorest women are thinnest, to one where the poorest are fattest.

The authors of this Brazilian study suggest that the changeover can be mapped against rising incomes, with a cross-over point around a per capita income of less than $3,000 for this community, as shown in Figure 21.

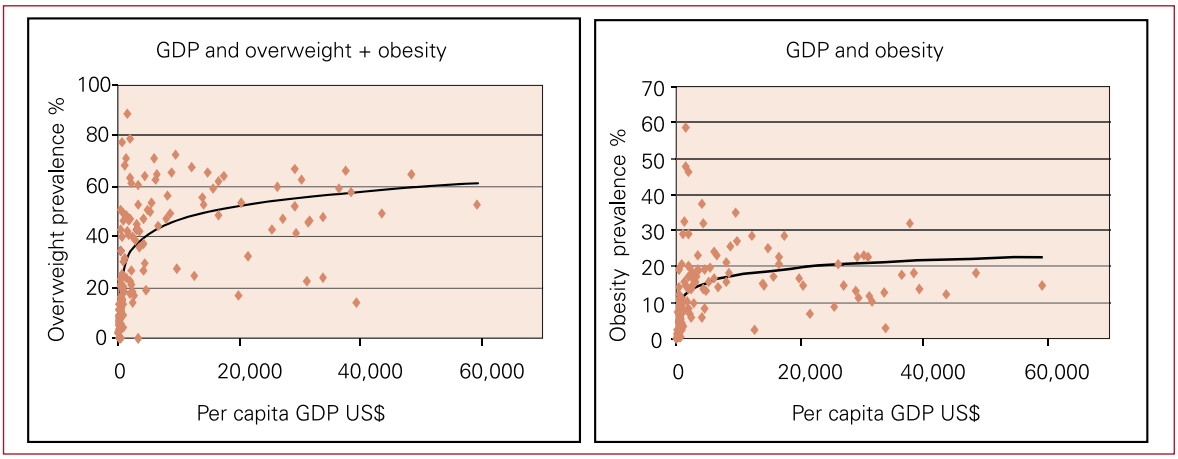
However, the link between national wealth and obesity doesn't appear to hold up well at higher levels of GNP/GDP. Figure 22 shows the relationship between GDP and obesity prevalence. It is clear that neither overweight (including obesity) nor obesity per se are linearly related to GDP. Other factors, such as physical activity levels, environment (urban–rural) and socioeconomic status factors will influence the results, and sampling procedures may differ between countries.

Inequalities

One concern related to health issues is the degree of inequality within a country, measured using income distribution criteria such as the GINI index. An analysis of 22 countries of the Organisation for Economic Co-operation and Development (OECD) for which both the Gini index and adult obesity levels were available shows a strong relationship between the two: a significant positive correlation between greater prevalence of obesity and greater income inequality ($r = 0.57$, $p < 0.05$ men, $r = 0.60$, $p < 0.05$ women). The relationships are even more significantly associated if the data are weighted for population size ($r = 0.88$ for both genders, $p < 0.001$). These are shown in Figure 23.

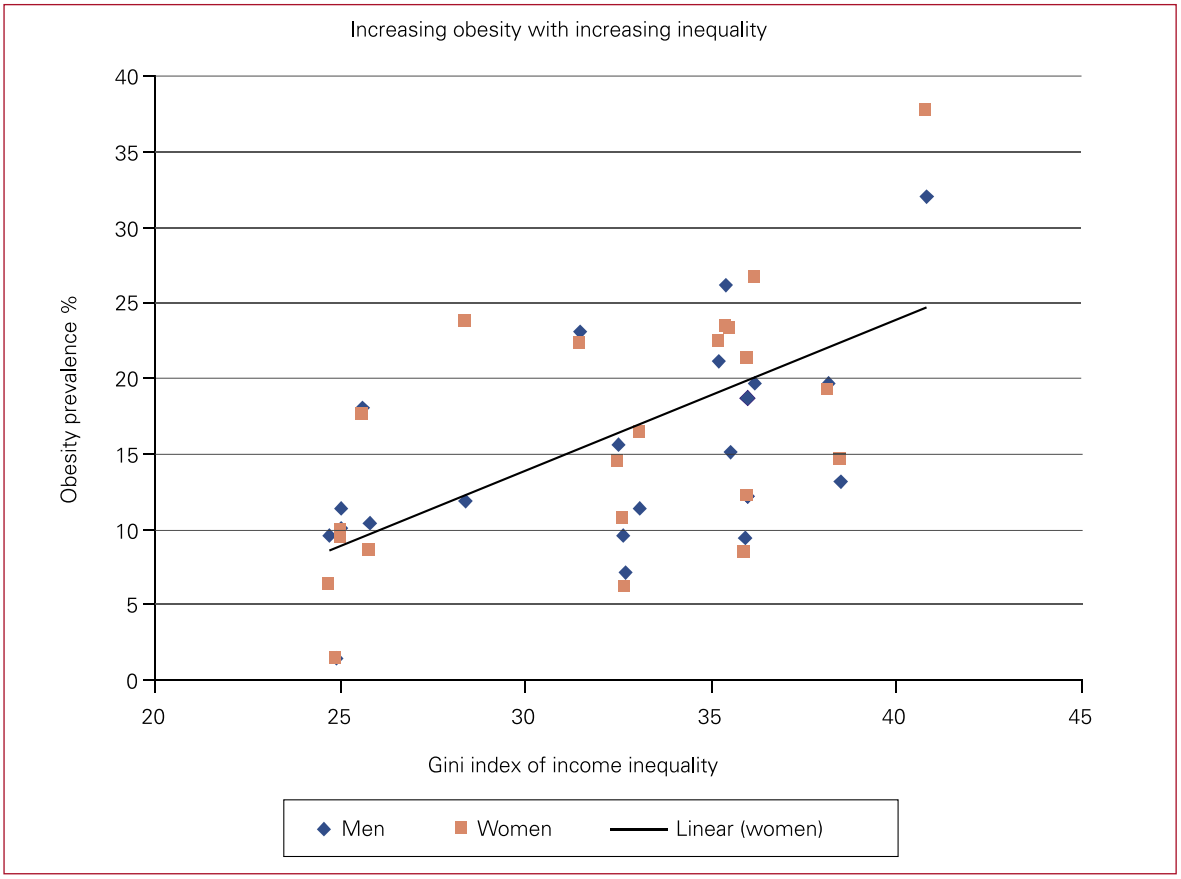
The implication is that absolute level of income and the distribution of that income can have an impact on obesity. The links between these population-wide relationships and their expression at individual, biological level merit further discussion.

Figure 22: Relationship between GDP and overweight and obesity prevalence



Sources: IOTF database, UNDP indicators.[38]

Figure 23: Increasing obesity prevalence with increasing inequality



Source: UNDP 2005 (p273) and WHO database for 2002.

Economic factors

The price of food. In developed economies, and in urban areas of developing economies, there are plentiful sources of relatively cheap foods. The amount of household income needed to spend on food supplies has fallen on average to 20% in the UK, although it exceeds 23% among lower-income households, and is below 15% in higher-income households. Cheaper food sources, however, tend to be more energy-dense and nutrient-poor, that is, they provide plentiful calories especially in the form of fats and sugars, but relatively low levels of vitamins and minerals. Dietary patterns recommended for good health have low levels of fat and sugar, high levels of vegetables and whole grains and moderate levels of fish and lean meat. In terms of the provision of a person's needs for approximately 2,000kcal per day, the price list of common foods in terms of cost per 100kcal (Table 10) indicates the ease with which daily calorific needs can be met from fatty and sugary foods, compared with recommended foods.

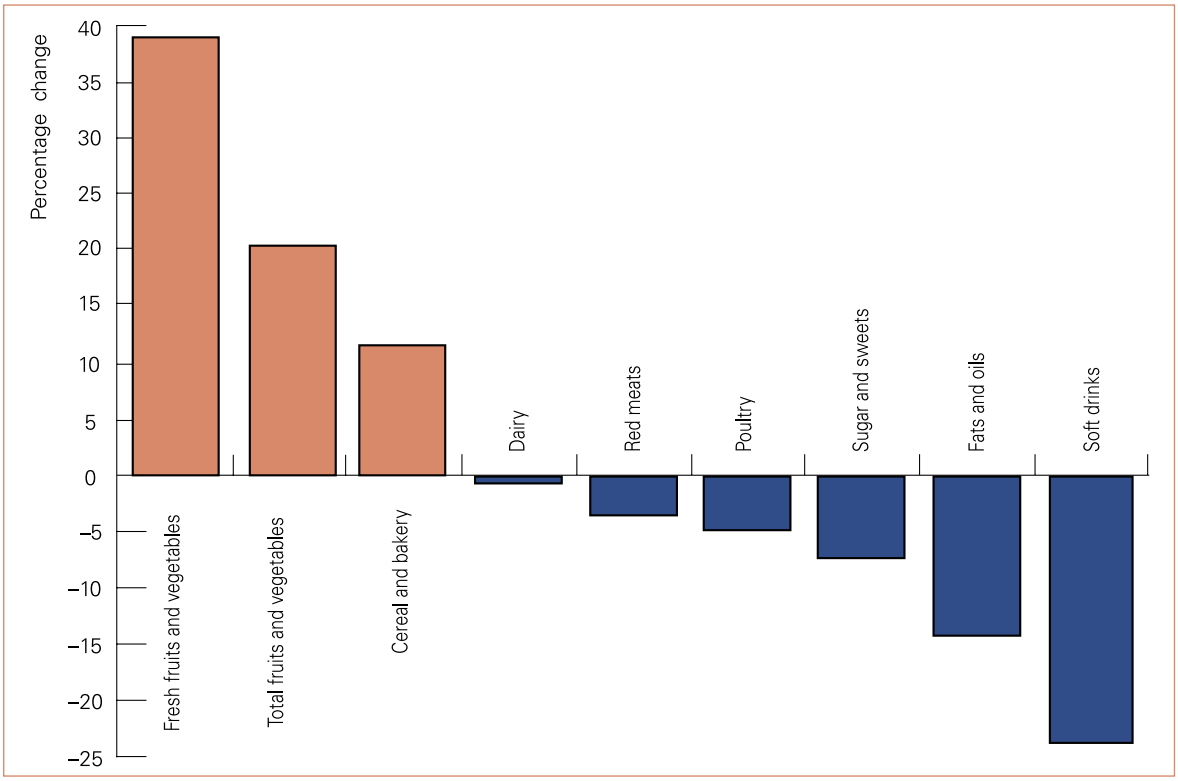
Table 10: UK food prices (price per 100kcal), 2004

	Price per 100kcal
Margarine	2p
Lard	2p
White bread	3p
Custard cream biscuits	5p
Sweet tea	8p
Chips	8p
Chocolate	10p
Fresh lean pork	14p
Carrots	15p
Bananas	15p
Apples	22p
Cabbage	27p
Tomatoes	77p
Lettuce	£1.22
Bagged watercress	£10.70

Sophisticated modelling techniques have been undertaken by researchers in France who have shown that the impact of increasing restraint on costs – as found in lower-income households – reduced the proportion of energy contributed by fruits and vegetables, meat and dairy products and increased the proportion from cereals, sweets and added fats.[39] However, the model specifically held energy intake as a constant, whereas, in reality, the energy component would probably increase.[40] Research on price elasticities in Italy indicated that, as income available for food purchasing went down, energy from food increased.[41]

Differential trends in prices. US data provides clear evidence for the differential effects of price changes on different components of the diet. The declining real process of staple commodities worldwide, with the exceptions of horticultural products and fish, has already been noted. US studies of changes in real purchasing costs of different foods show a similar tendency for the costs of fruits and vegetables to have increased as a component of the food budget, while fats and oils and starches and sugars have decreased (Figure 24).[42]

Figure 24: Changes in food prices differentially affecting dietary components, USA, 1985–2000



Source: Institute for Agriculture and Trade Policy.[42]

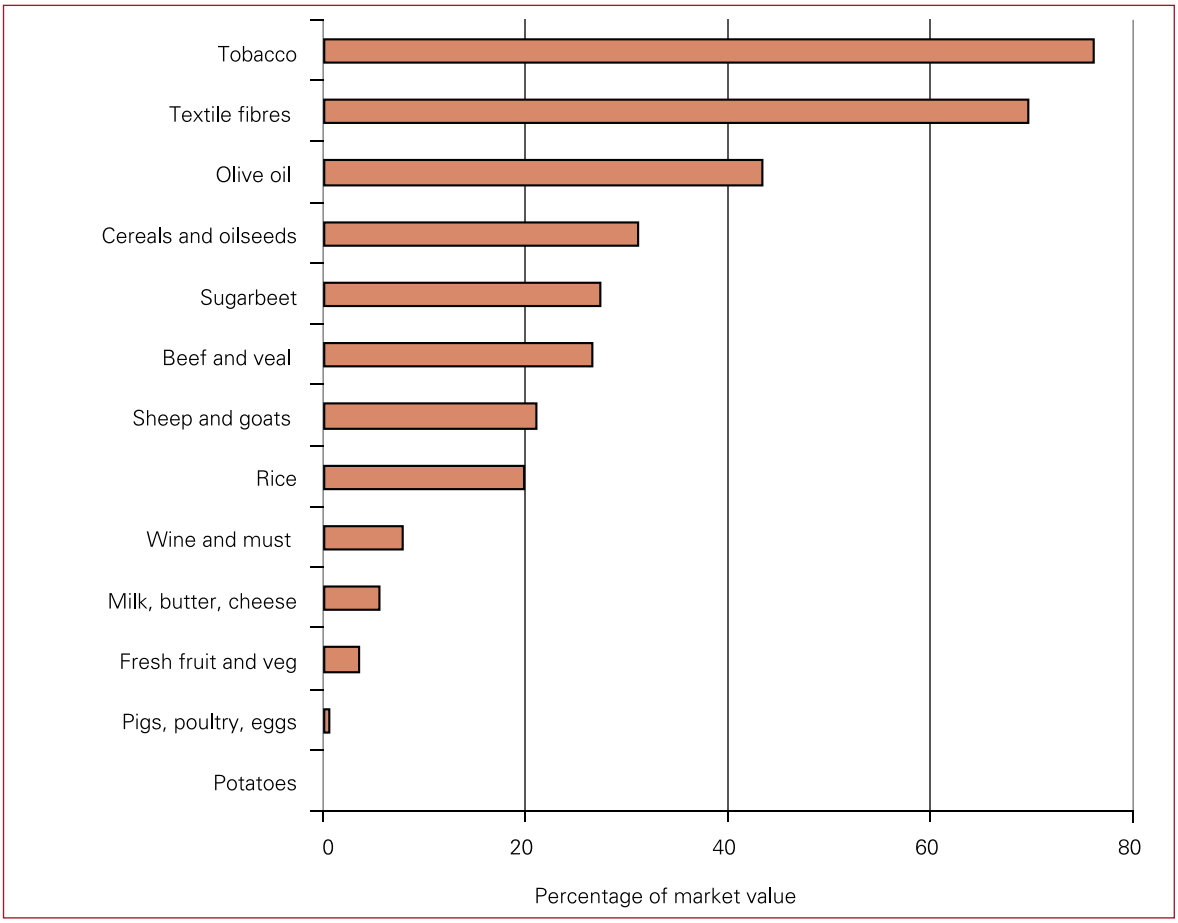
Agricultural production

The capitalisation of agricultural production has had two impacts relevant to obesity. The first is the remarkable reduction in the proportion of the population engaged in agricultural activities, which traditionally required physical activity at a greater level than typical urban employment activities.

The second result of agricultural capitalisation is the tendency for production to provide commodities that either can be stored and processed relatively easily, without significant loss of marketable quality, or have relatively high added value. The former category is dominated by vegetable oils, grains, starches and sugar and the latter is dominated by meat and dairy products.

The European Union has been particularly affected by the capitalisation process, with an annual budget of over €40 billion being allocated through the Common Agriculture Policy (CAP) – technically the European Agricultural Guidance and Guarantee Fund (EAGGF) – in which direct payments and market support mechanisms are directed towards a range of food production sectors, as well as alcohol and tobacco (Figure 25). The extent of that support (worth some €38 billion) can be seen when contrasting the EEAGF funding with the estimated

Figure 25: EAGGF support as proportion of market value, 2004



Note: Over 50% of cereals and oilseeds production goes to animal feed, including pigs and poultry.
Source: European Commission DG Agriculture.[43]

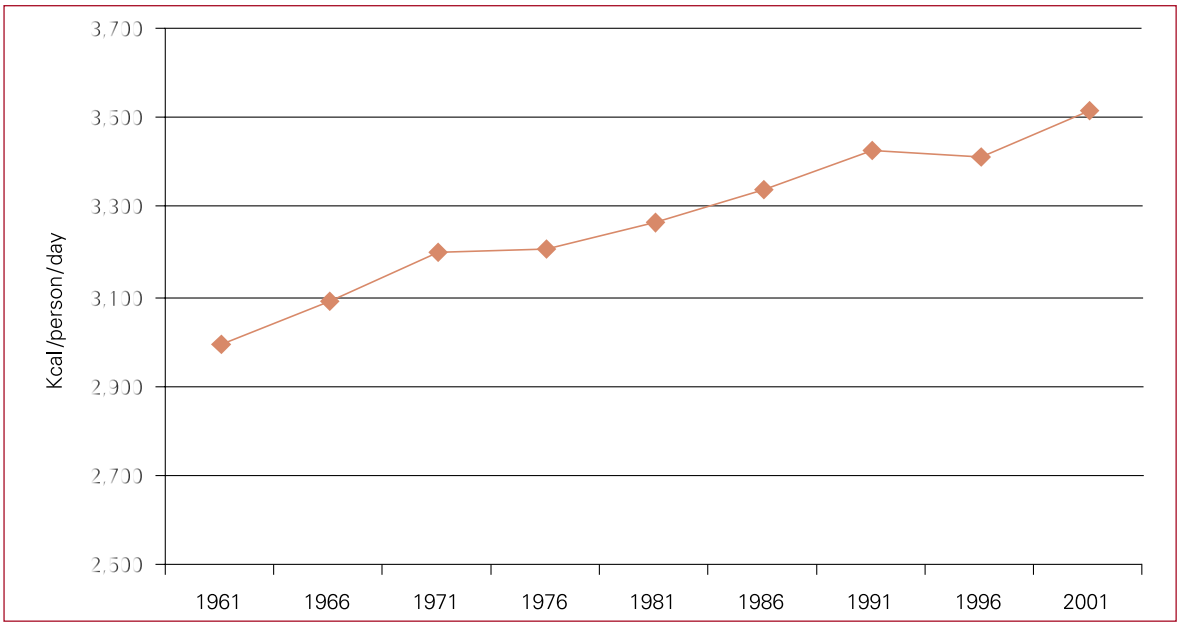
farmgate value of the produce (worth some €306 billion) and an argument could be made for adjusting the support policies to better match health needs – or at least to claw back a CAP refund levy from the relevant parts of the food chain.

With fats, oils, starches and sugars being produced in increasing abundance, commodity prices have fallen accordingly, both locally and on world markets (for examples of commodity price changes, see Appendix 8). It is notable that, while grains/starches, oils and sugar have shown long-term reductions in price, the trends for horticultural produce do not show a similar decline: the prices of citrus fruits, for example, have been rising. Fish prices have also increased as stocks decline.

Food supplies

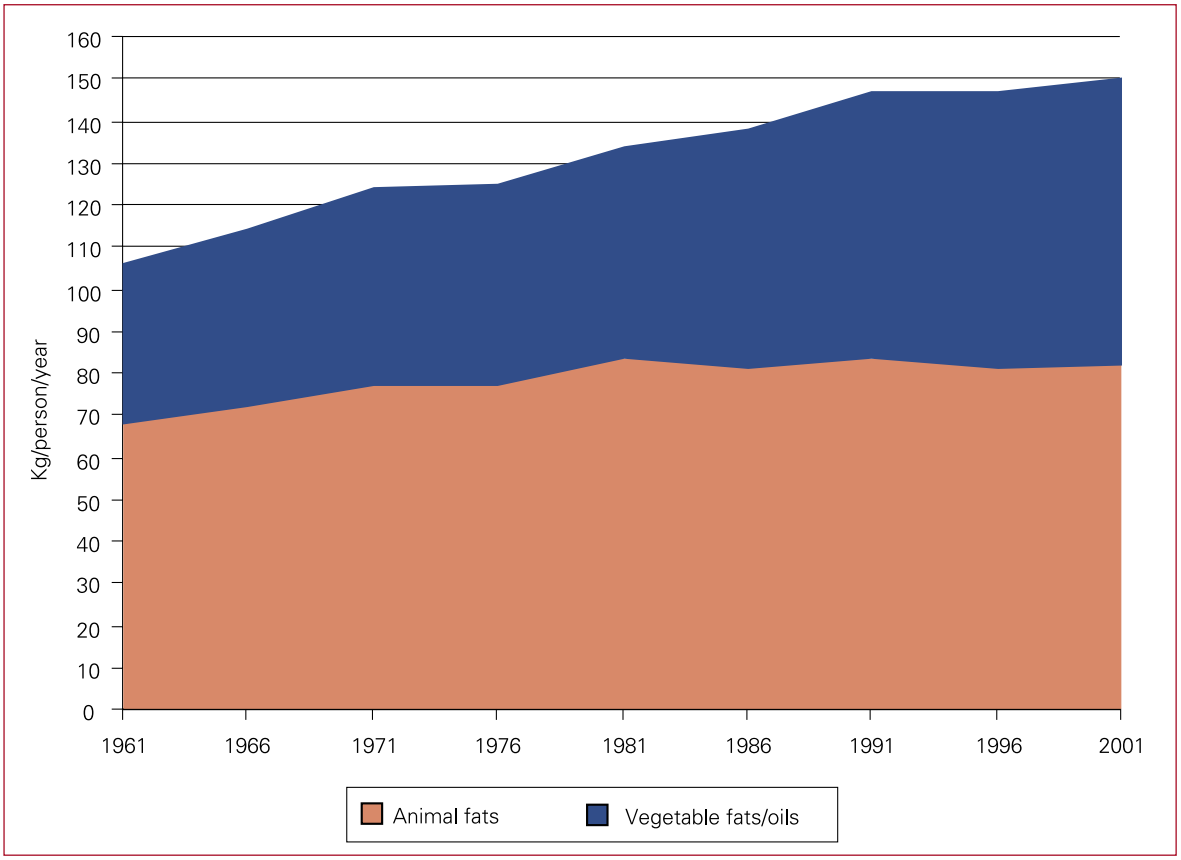
Figures 26–28 show trends in food supplies moving onto the consumer market aggregated across the EU (EU15, 1961–2001).[44]

Figure 26: Per capita food-energy supply, EU15, 1961–2001



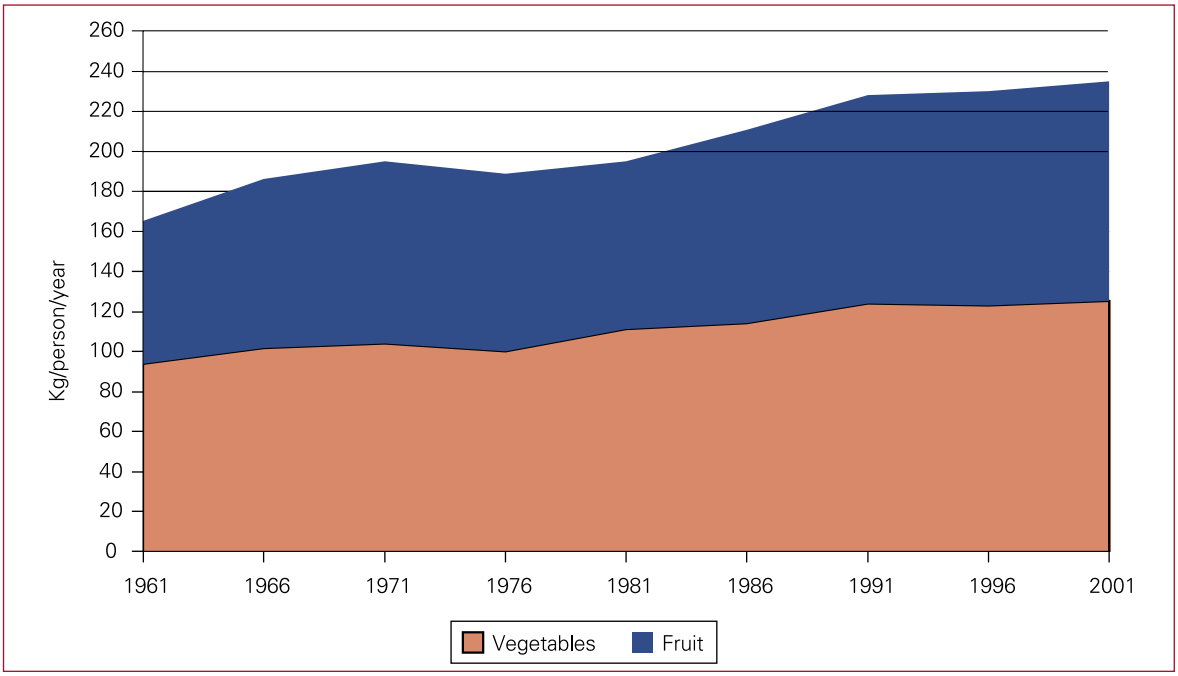
Source: United Nations Food and Agriculture Organisation Food Balance Sheets.[44]

Figure 27: Per capita supplies of animal and vegetable fats/oils, EU15, 1961–2001



Source: United Nations Food and Agriculture Organisation Food Balance Sheets.[44]

Figure 28: Per capita supplies of raw and processed vegetables and fruit, EU15, 1961–2001



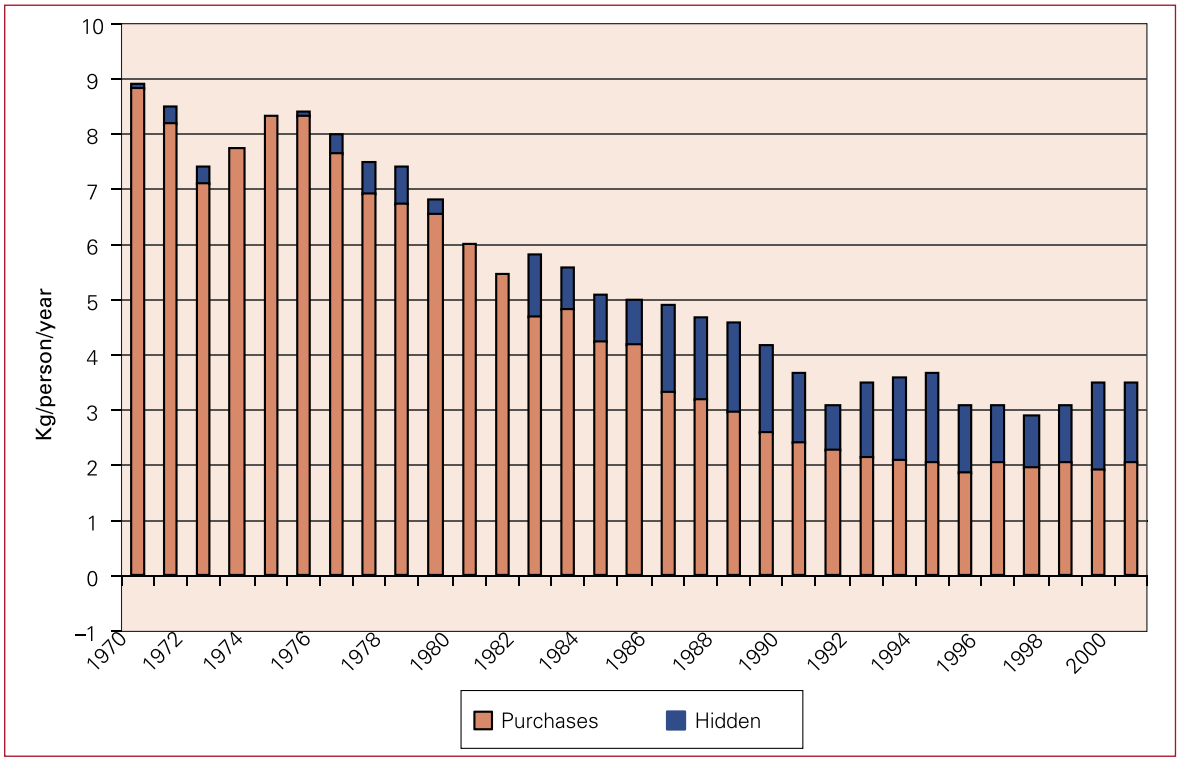
Source: United Nations Food and Agriculture Organisation Food Balance Sheets.[44]

However, these trends should allow for the shift from domestic food preparation to manufacturer preparation, for example, in the increased production of processed fruits (juice, concentrate, flavourings etc.). The shift from domestic consumption to manufacturer consumption is shown very clearly in the trends in UK sugar utilisation (Figure 29), where a substantial decline in household purchases has been matched by a remarkable increase in sugar being used in manufactured food and beverage products (e.g. 'hidden' sugar in soft drinks, snacks, confectionery).

With declining prices in the major non-perishable commodities, manufacturers have developed a much greater range of food products from the raw ingredients. These processed foods and beverages have to be marketed in competition both with each other and with relatively unprocessed foods, such as fresh fruits and vegetables, fish etc. Compared with fresh and perishable foods, highly processed foods usually have several advantages, including longer shelf life, thanks to preservatives, packaging technology etc., and formulation control, which ensures the consistency and reliability of the product and the opportunity to include attractive colouring and flavouring agents.

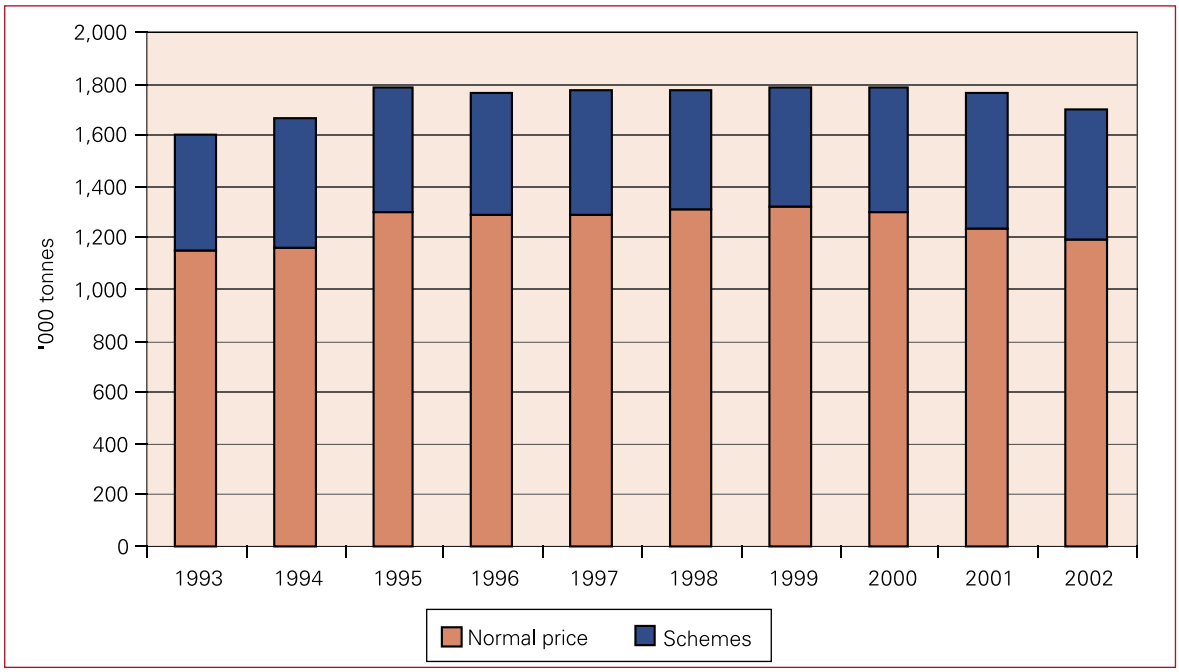
Butter is a case in point, where the most health-damaging component of the milk supply is the recipient of a particularly beneficial package of measures under the CAP. It ensures that all production is fed into the human food chain, despite health education messages asking consumers to reduce their consumption of saturated fats such as butter. Butter intervention subsidies for industry now account for nearly one-third of total butter consumed in Europe (Figure 30).

Figure 29: Changes in sugar consumption in the UK



Source: United Nations Food and Agriculture Organisation Food Balance Sheets[44] and National Food Surveys.[45]

Figure 30: EU trends in butter subsidies, 1993–2002



Source: European Commission DG Agriculture.[43]

Food marketing

It can be argued that these trends in agricultural production and food supplies largely follow demand, but demand itself is responsive to cultural, educational and promotional influences. Aggressive promotional marketing using a wide variety of techniques stimulates total market growth as well as brand switching. Promotional marketing includes pricing (e.g. special offers, discounts), positioning (e.g. checkout displays for impulse purchases), the presentation of the product itself (including packaging, formulation, additives) and specific promotional activities (including advertising, sponsorships etc.). Other factors include accessibility issues (e.g. distribution and availability in lower-income communities) and market segmentation (e.g. supplied through institutional catering, commercial catering, supermarkets and corner shops).

Promotional marketing, such as TV advertising and sports sponsorships, provides consumers with specific messages about what they should be eating, and these may not support the recommended diets for health. Surveys of TV advertising during children's TV show that food constitutes the largest category of advertisements being shown, and that 70–90% of the food advertisements are for foods containing high levels of fats and/or sugars, in directly contradicting food-based dietary guidelines.

Compared with the balance of foods we should be consuming, advertising promotes a very unhealthy diet (Figure 31). In the UK, the contrast between health educational messages and food marketing is highlighted by the size of the budgets available (Figure 32).

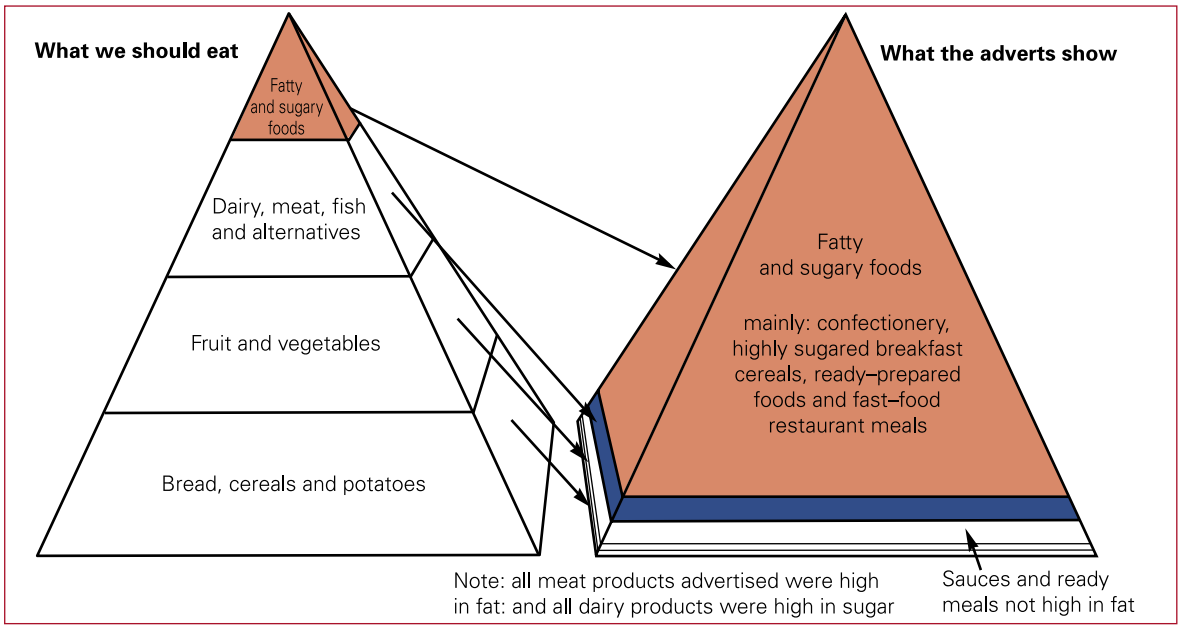
US figures show that the processing and marketing costs of food are now far greater than the farmgate costs of the ingredients, and the ratio between the two has grown most rapidly in the last two decades. Processing and marketing form an increasing proportion of the price of food paid by consumers (Figure 33).

Economic mechanisms supporting the drivers of obesity

Foreign direct investment

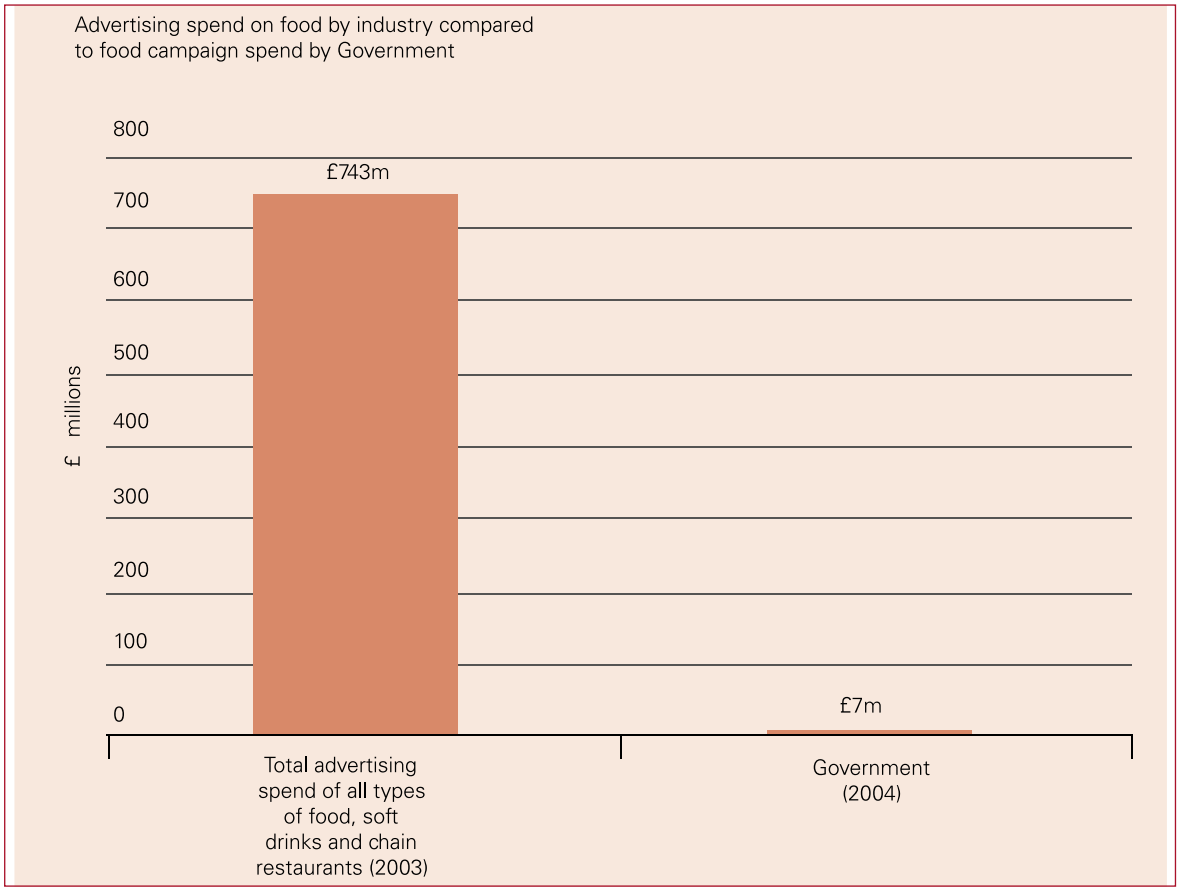
FDI – the purchase by overseas companies of local production facilities with the intention of reducing import costs, expanding local production capacity and hence expanding market share and total market size – grew six-fold between 1990 and 2000, faster than global GDP or global trade.[49] For developing countries, FDI represents their largest source of external financing for economic growth, and FDI from the USA alone amounts to nearly 1,000 times the amount invested in chronic disease prevention (Figure 34).

Figure 31: Comparison between the foods we should be consuming and those advertised



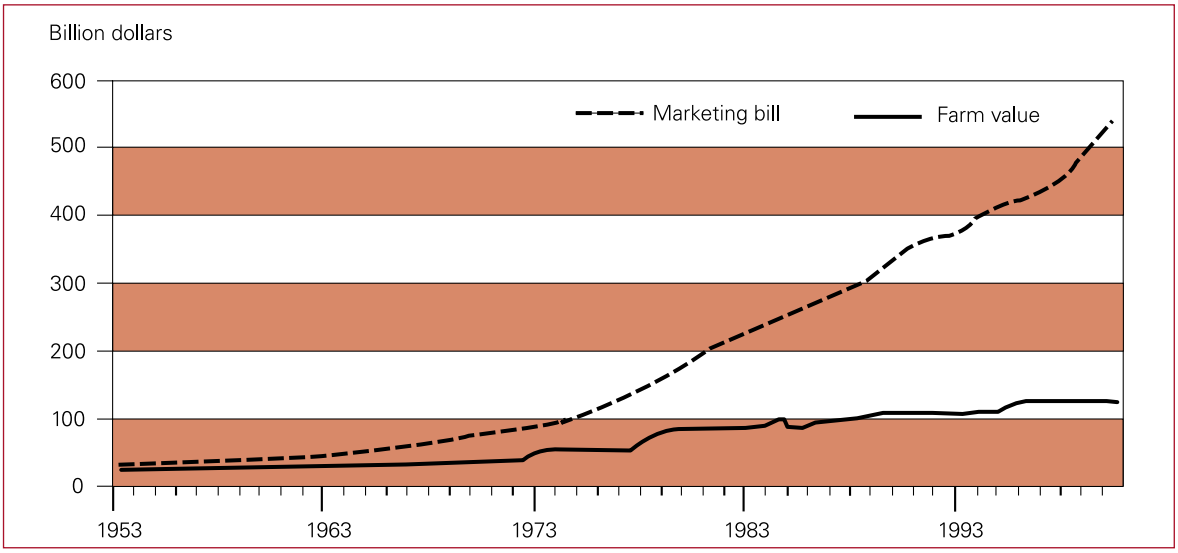
Source: IACFO.[46]

Figure 32: Comparison between advertising spends by the food industry and Government



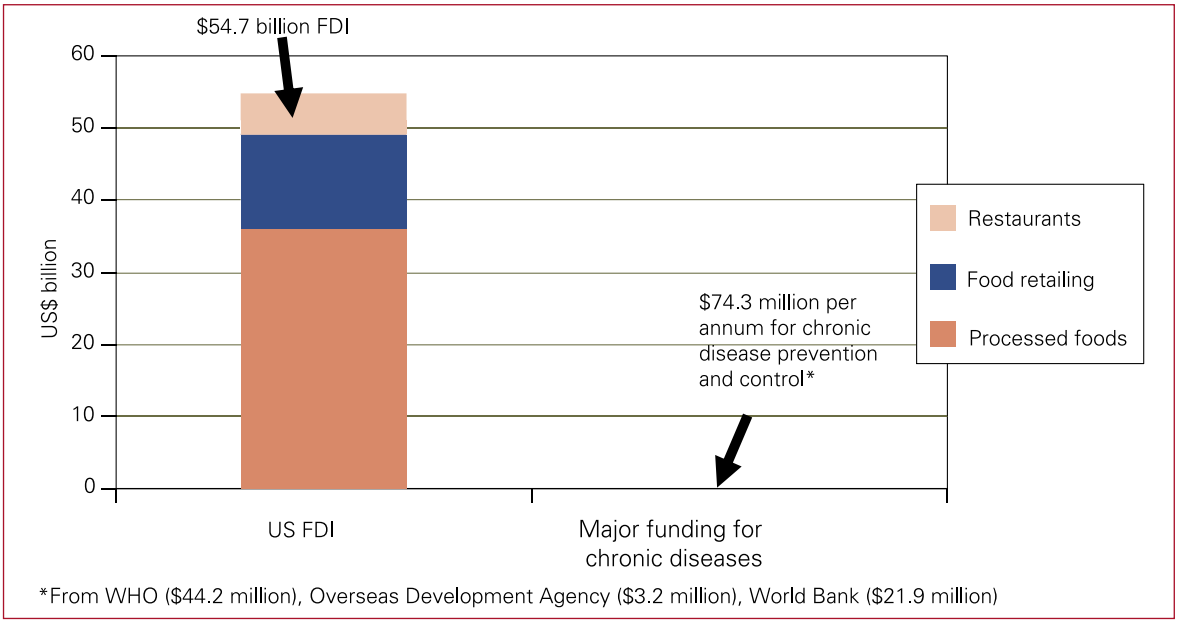
Source: Department of Health.[47]

Figure 33: Comparison between marketing costs and farmgate costs, 1950s–1990s



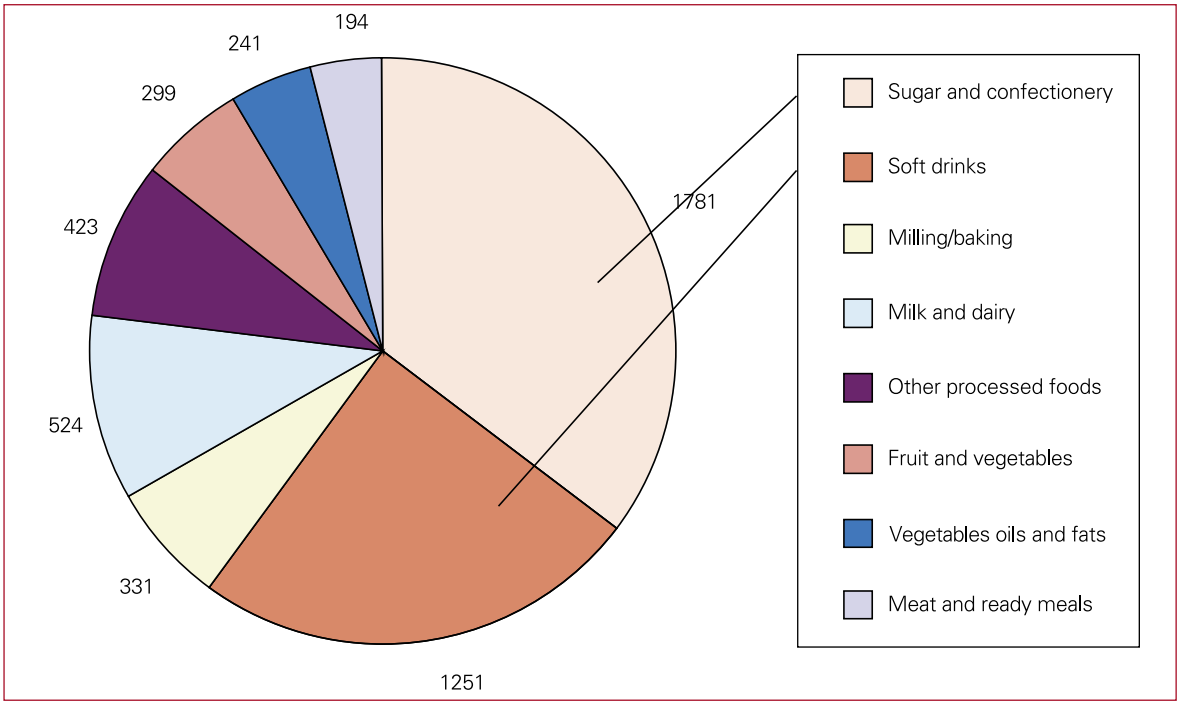
Source: Variyam.[48]

Figure 34: Foreign direct investment from US food companies relative to global funding for chronic diseases



An example of food investment is provided by the OECD for eastern Europe during the transitional period of the 1990s, when formally centralised 'command' economies were being dismantled in favour of liberalised market economies. Nearly two-thirds of the inward investment was being put into just two areas of food production: confectionery and soft drinks. The results of this investment encouraged growth in the consumption of particular foods. In Poland, for example, chocolate confectionery sales rose 26% in the period 1999–2004, while sugar confectionery consumption rose 22% and soft drinks consumption rose over 50% (Figure 35).[47,48]

Figure 35: Foreign direct investment in agro-food production in eastern Europe,* 1990–1997 ($ million)



Notes:
*Albania, Bulgaria, Croatia, Czech Rep, Estonia, Hungary, Lithuania, Poland, Romania, Russia, Ukraine.
Alcohol and tobacco sectors not included.
Source: OECD.[52]

Investment in mass-produced foods such as soft drinks can show significant returns in capturing a local market, and reduced costs ensure that products that were formerly only available to a small section of the population are available to many more. Figures from the soft-drinks industry show that increasing capacity for a single canning unit from 300 cans per minute to 800 cans per minute reduces the production cost from nearly 6p per litre to less than 3p per litre.[53] Further increases in capacity cause a smaller fall in price per litre, but they allow much greater volumes to be produced. These simple relationships underpin the expansion of markets in emerging and developing economies. In Africa, for example, the soft-drinks company, Coca-Cola, invested nearly $500 million from 1993 to 2003. At the end of that period, the company reported sales worth over $800 million in 2003 alone, with revenue growing by over 20% per annum.[54]

Further examples can be shown for economies in transition. In Russia, the market for snacks is reported to be growing rapidly. In just two years, 1998–2000, it grew from 66,000 tonnes to 200,310 tonnes, and grew a further 85% in 2001.[55] Russian children's diets are also changing. Surveys of Moscow mothers' practices in 2002 and 2005 showed a 49% decline over the period in the number of mothers making traditional kasha porridge for their infants, and a 52% decline in the number making fruit purees,[56] and children aged five were rapidly adapting to 'western' foods: 81% were regularly eating potato chips, 78% chocolate, 70% chewing gum and 66% drinking carbonated drinks.[57]

Similar trends have been reported elsewhere. Figures for the five-year period from 1998 to 2003 show the volume of soft drinks sold in the Latin America region rising from 48 billion litres to 61 billion litres while, in the Asia–Pacific region, the volume of soft-drinks sales grew from 39 billion litres to 67 billion litres.[58]

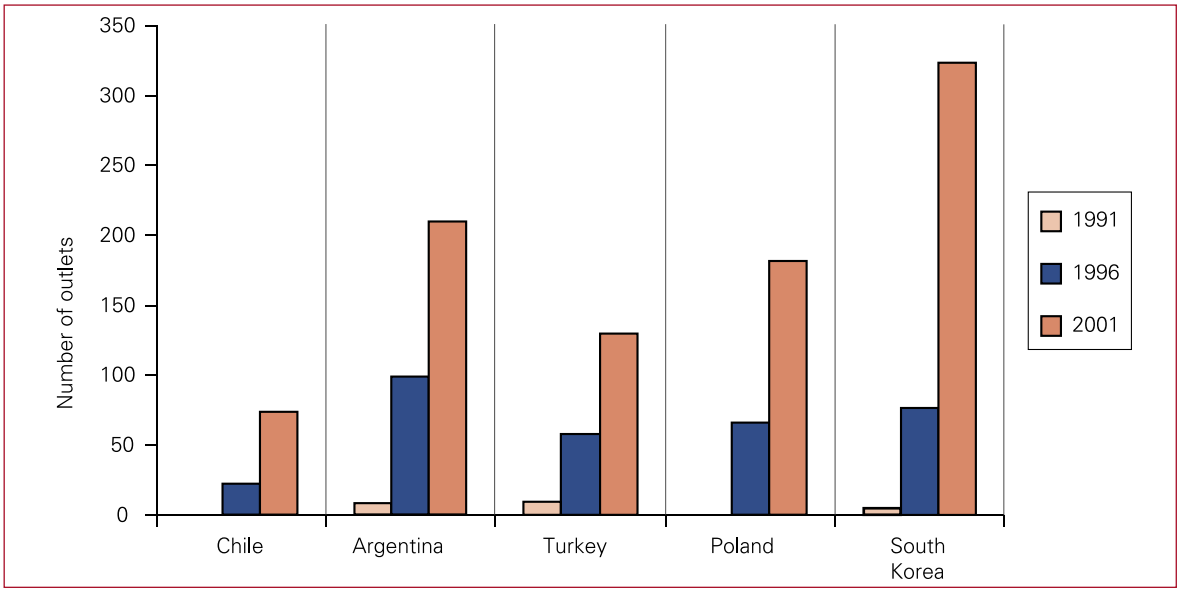
Fast-food stores have also seen rapid growth in the developing world. In the ten years from 1991 to 2001, the number of brand leader McDonald's outlets increased from around 200 to over 1,500 in Latin America, and from 1,400 to over 6,700 in the Asia–Pacific region (Figure 36).[59,60] (The UK alone has some 250 outlets.)

Purchasing capacity

The urbanisation of the population and its ability to purchase processed foods has been increasing to match the falling costs of food commodities and investments in processed food production. Wages and prices are notoriously difficult to compare between different regions of the world, but use of the 'Big Mac' index allows comparison of relative purchasing ability and the opportunity to contrast this with the levels of overweight prevailing locally. Figures 37 and 38 illustrate a clear trend: countries within a region that have the lowest-priced Big Macs (in terms of hours of work required to purchase the product) tend to have the higher levels of adult overweight, at least among men.

Similar processes have been noted in the USA, where total costs of food have been reducing relative to total consumer price indices, and where eating out has become increasingly available, especially in fast-food restaurants (Figure 39–41).

Figure 36: Rise of McDonald's outlets in developing markets



Source: McDonald's Corporation.[59,60]

Figure 37: Comparison between the prevalence of overweight and the number of hours of labour required to buy a Big Mac in Europe, the Americas and Australia and New Zealand

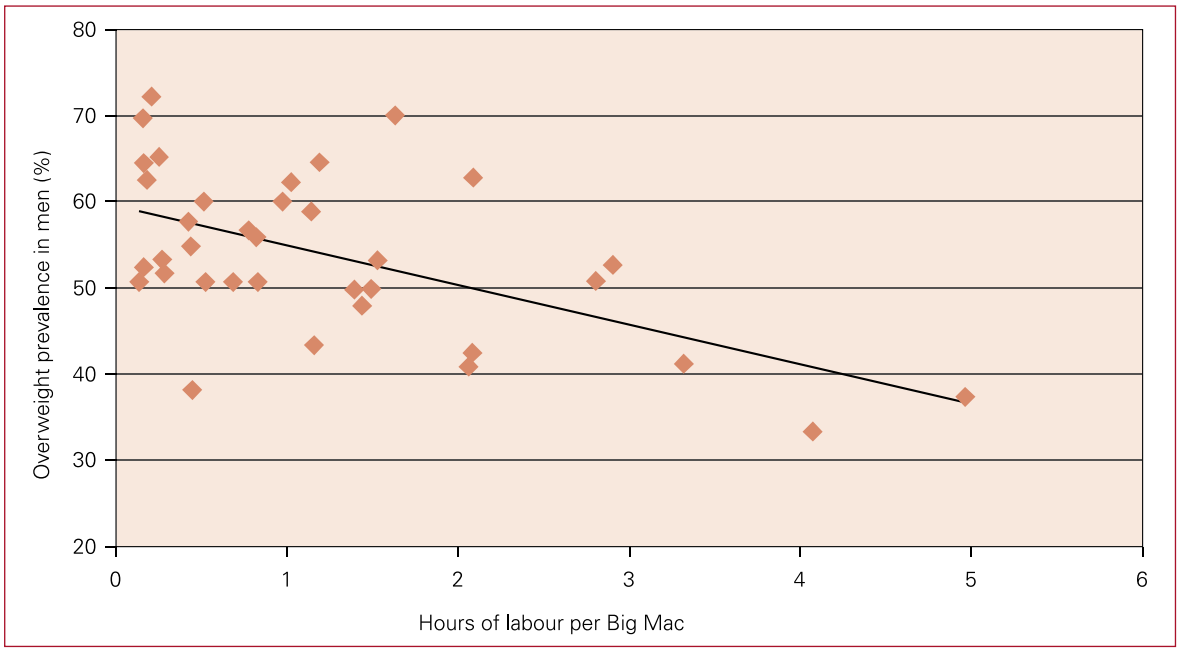
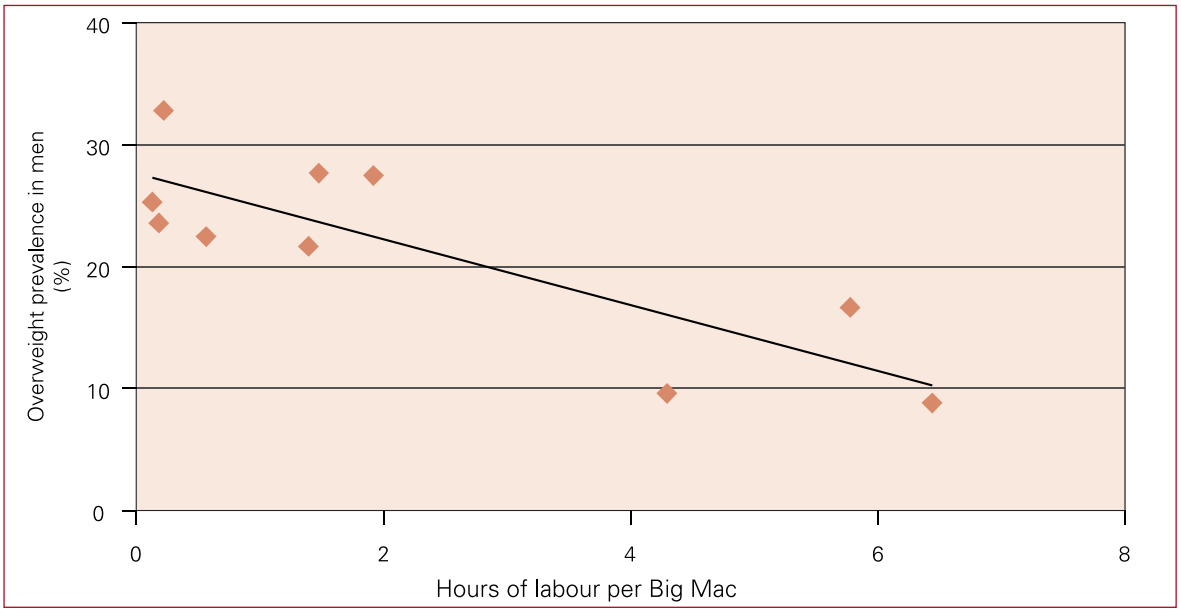
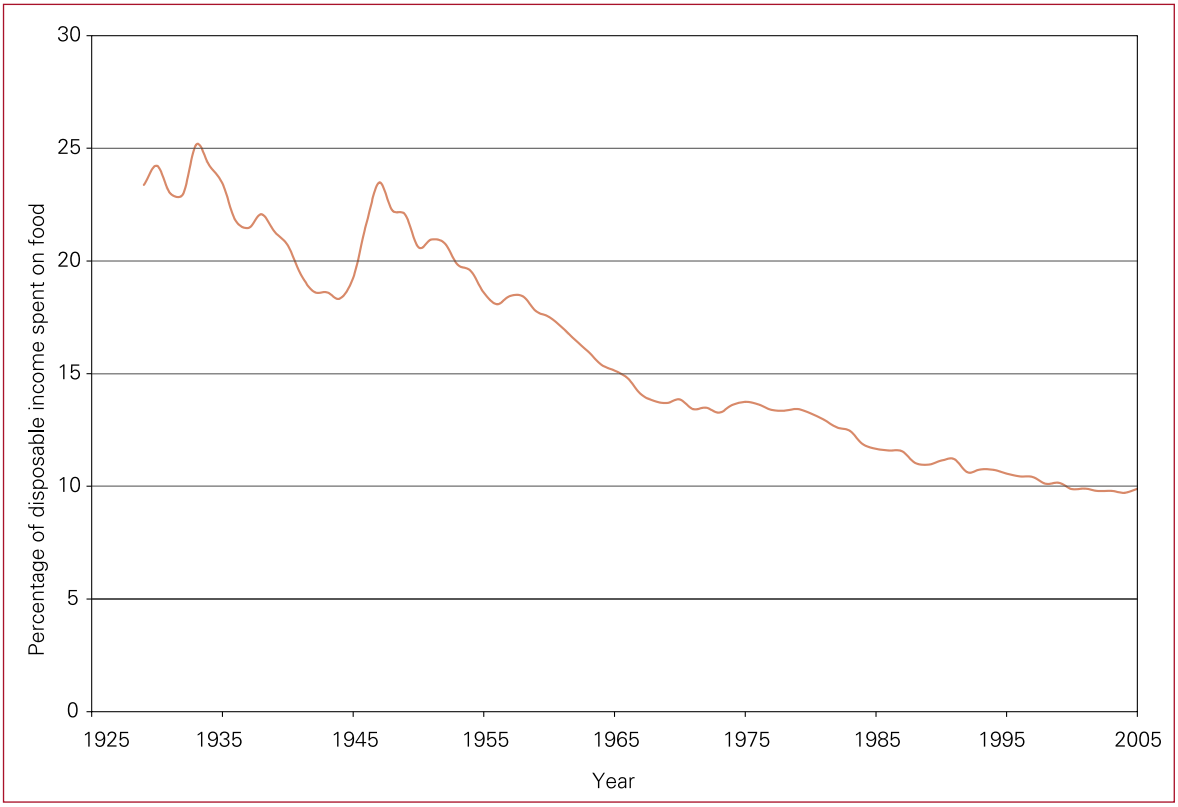


Figure 38: Comparison between the prevalence of overweight and the number of hours of labour required to buy a Big Mac in Asian populations



Source: IOTF based on ILO wage rates and *The Economist* Big Mac index.

Figure 39: Relative cost of food as a proportion of disposable income

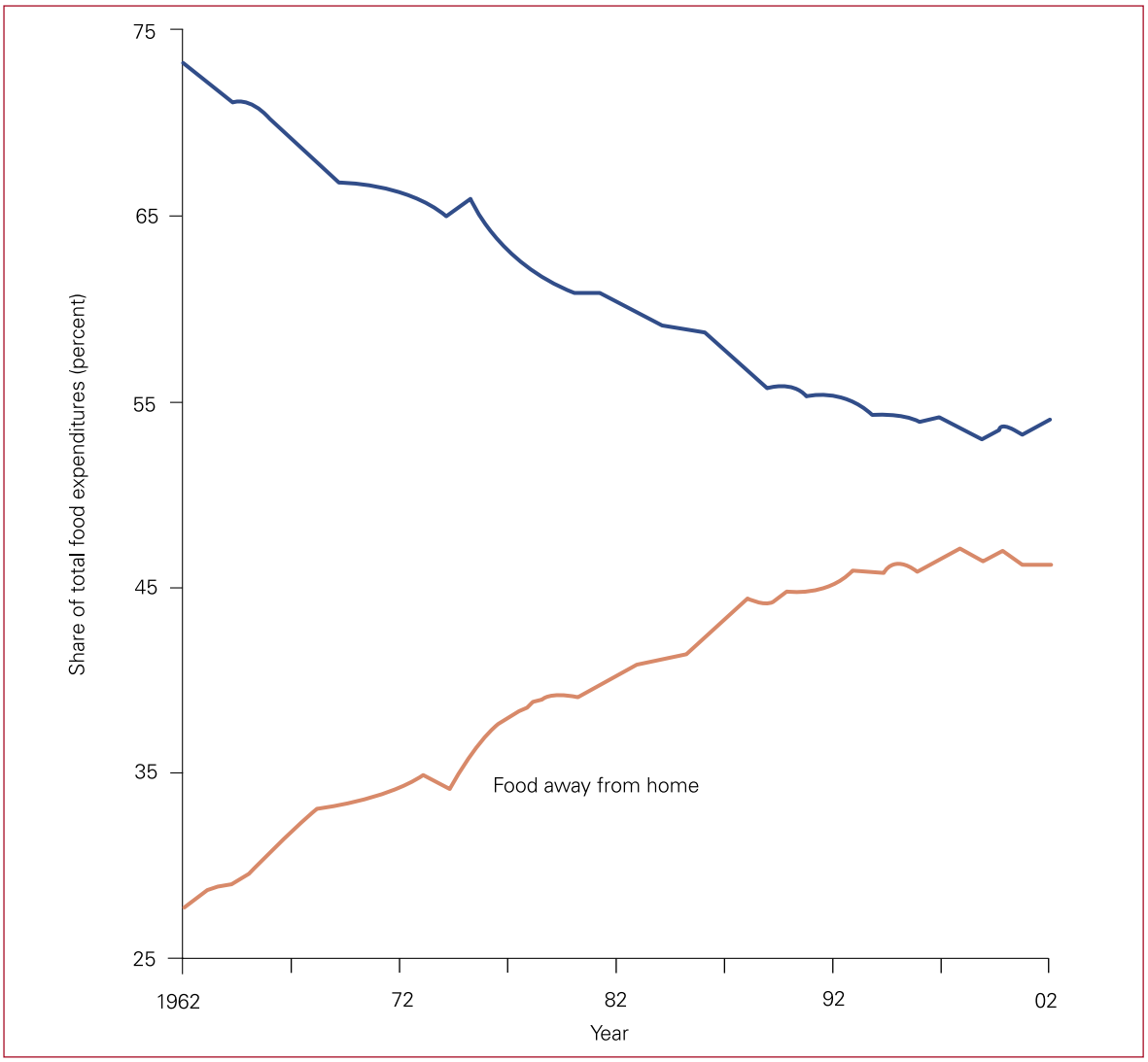


Source: Variyam.[48]

As income increases, people tend to spend a greater proportion of their additional income on dining out than on foods prepared at home. US studies show that a 10% increase in income leads to a 4.6% increase in a household's away-from-home food expenditures, compared with a 1.3% increase in at-home food expenditures.[63] The share of total food expenditure that Americans spend on dining out has risen from 28% in 1962 to 47% in 2003. Ounce for ounce, foods eaten away from home are more calorie-dense than foods prepared at home, and this is especially true for fast-food menu items.

One of the related factors, which may also help to explain the links between obesity levels and household income levels, is a change in the perceived value of domestic free time. Greater numbers of women are entering employment, especially those from lower-income groups, either as single-parent earners or as part of a two-earner family. US data shows that from 1970 to 1999, the fraction of married women with children under 6 who participated in the labour force doubled, from 30% to 62%, while those with children aged 6–17 rose from 49% to 77%. While the costs of food ingredients may have fallen, the cost of food preparation – in terms of time available for domestic cooking – has risen, and this has led to much greater use of pre-prepared foods (frozen pizza, ready meals, etc.) and increased eating out – both for more formal meals and snacks. Ready-prepared foods, snack foods (and beverages) and fast foods have a higher density

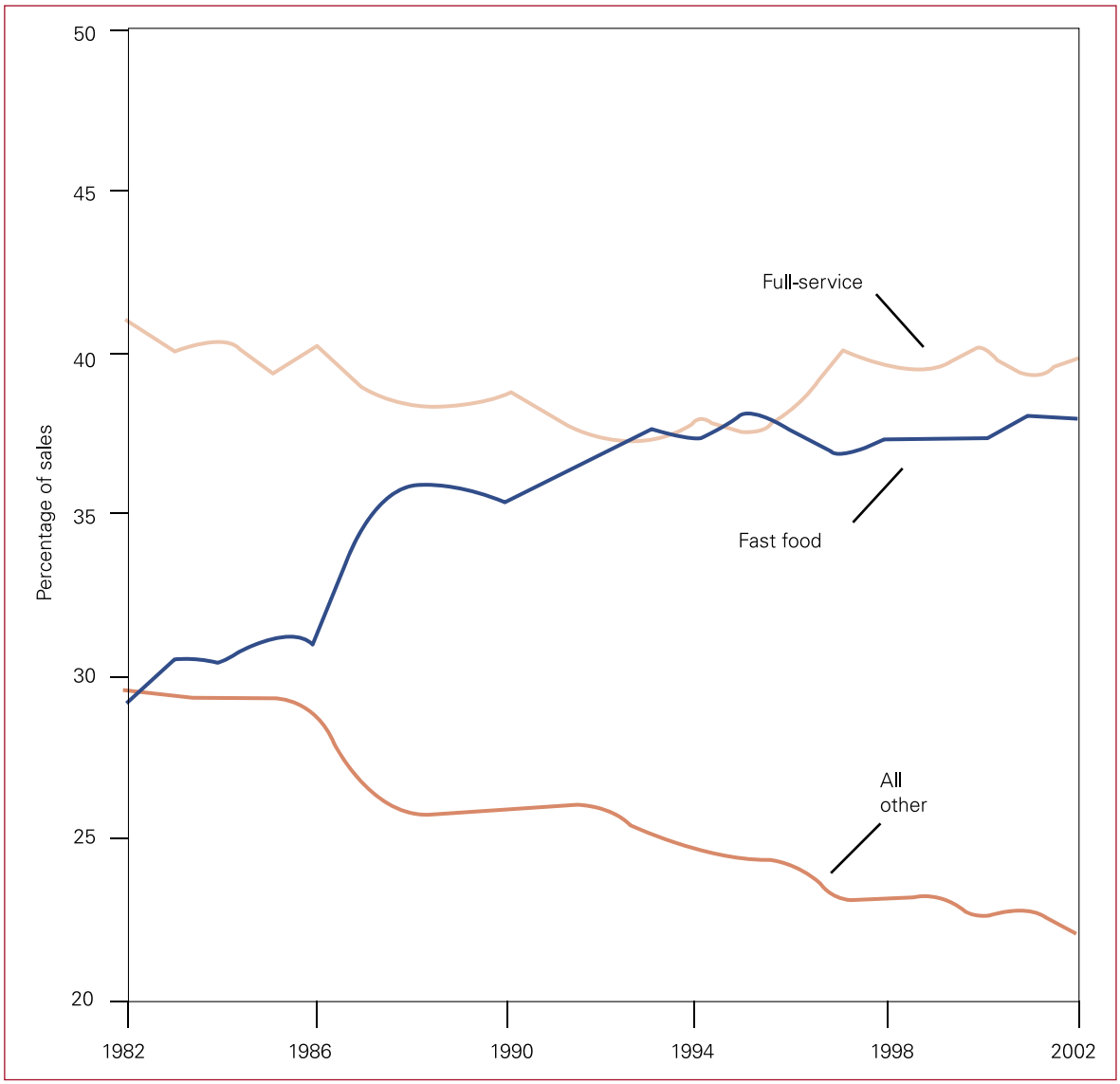
Figure 40: Change in trend of total food expenditure (%) in a US population, i.e. food purchase for home vs food purchased away from home



of calorific energy than domestically prepared foods[64] and therefore encourage greater calorie intake. Noteworthy is the finding that obesity prevalence in the USA has risen most for married women, who have reduced their time preparing food more than any other group.[65,66]

Further evidence of the link between the value of non-labour time as a causative explanation for the consumption of increased food energy is shown not only in US data (where, holding income constant, increased average hours worked is significantly correlated with obesity prevalence[67]), but there is also a significant correlation between average hours worked and the prevalence of obesity (Figure 42), taking data across 21 OECD countries for both men and women ($r = 0.55$ for both genders, $p < 0.01$). (Note: Japan is a major exception, and the correlation is around 0.75 if Japan is dropped from the analysis.)

Figure 41: Change in trend of foods purchased away from home, by food-outlet type

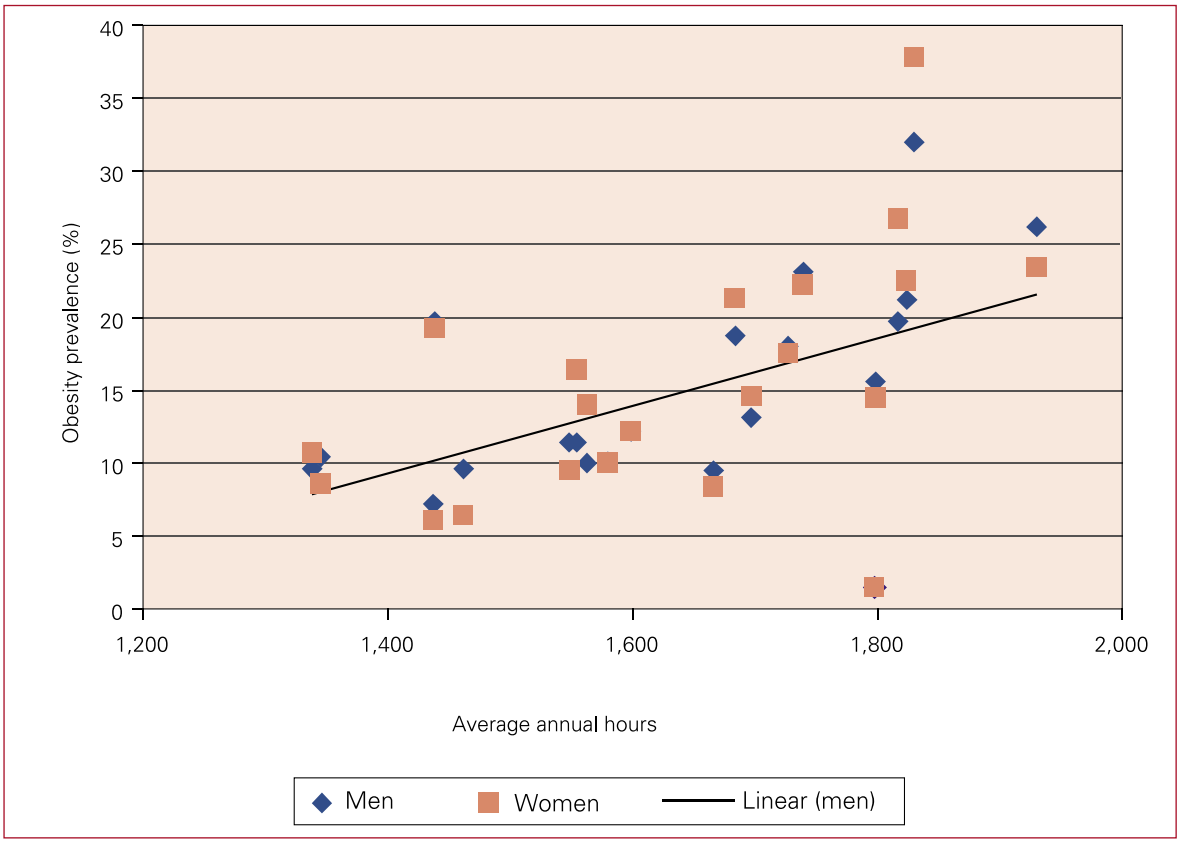


Source: United States Development Agency.[61,62]

Price elasticity

Other aspects of food prices should also be considered. The relationship between the prices of different foods and their consumption, both within a food category and across categories (where a price change in one category leads to a consumption change in another) has long been considered important when linking agricultural policies to food markets and consumer purchases.

Figure 42: Association between obesity and average hours worked



Source: IOTF based on data from OECD and WHO.[68]

Figure 43: Impact on nutrition following a 1% rise in the price of canned fish

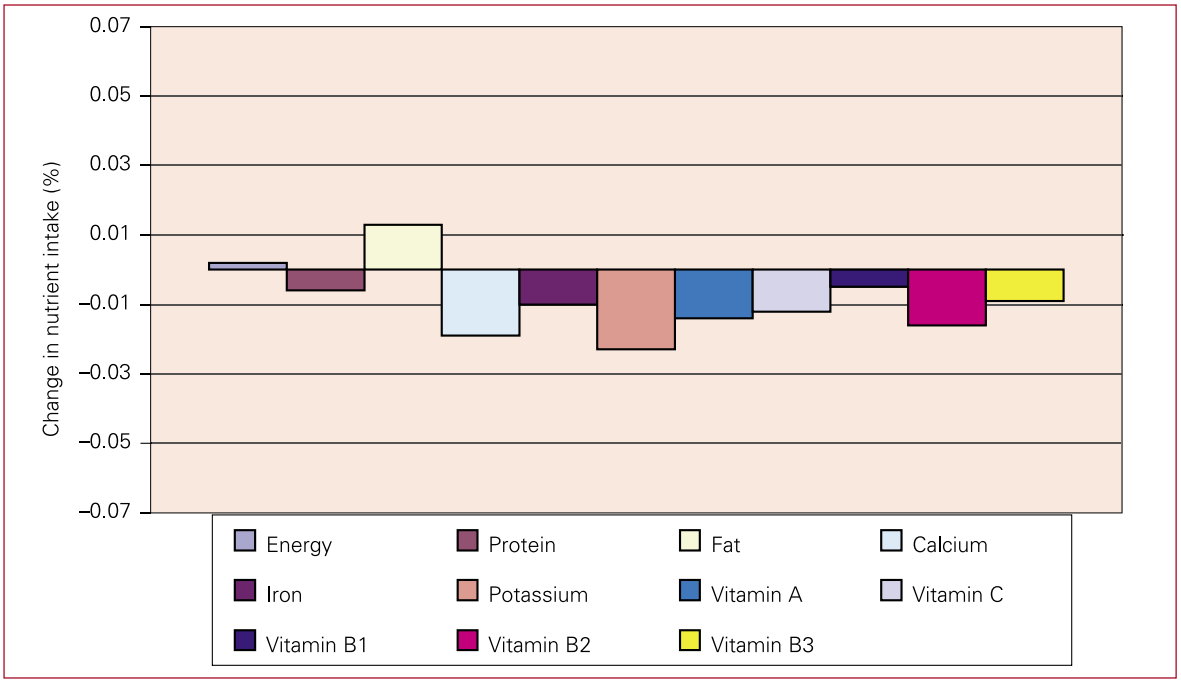
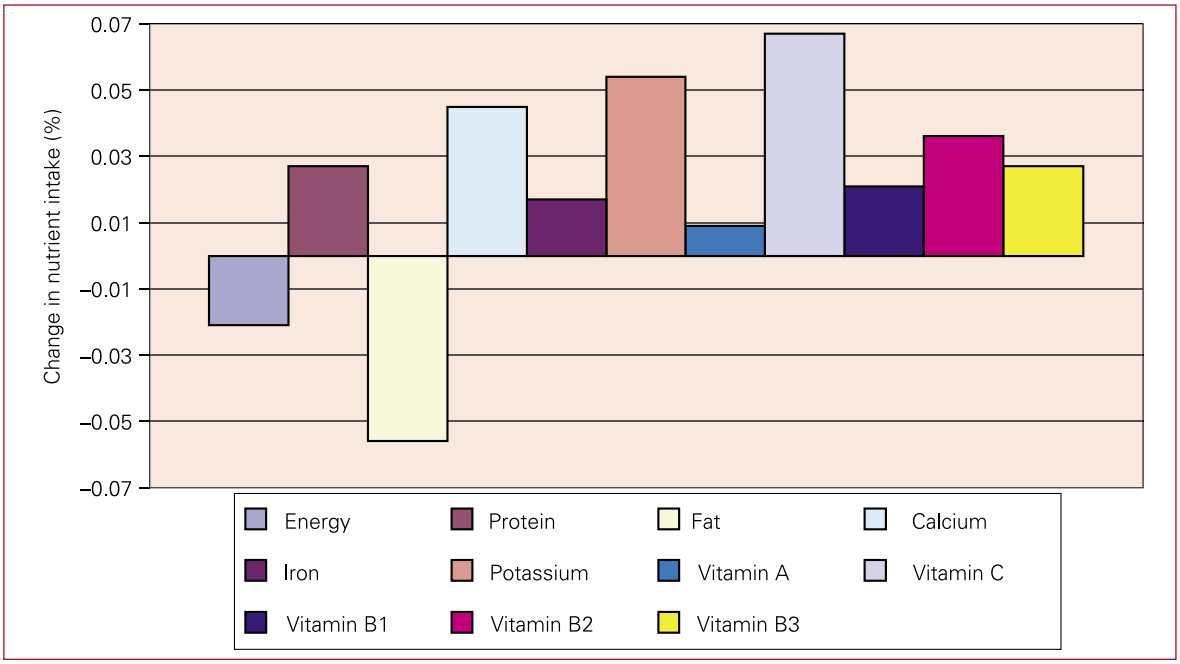


Figure 44: Impact on nutrition following a 1% rise in the price of vegetable oil



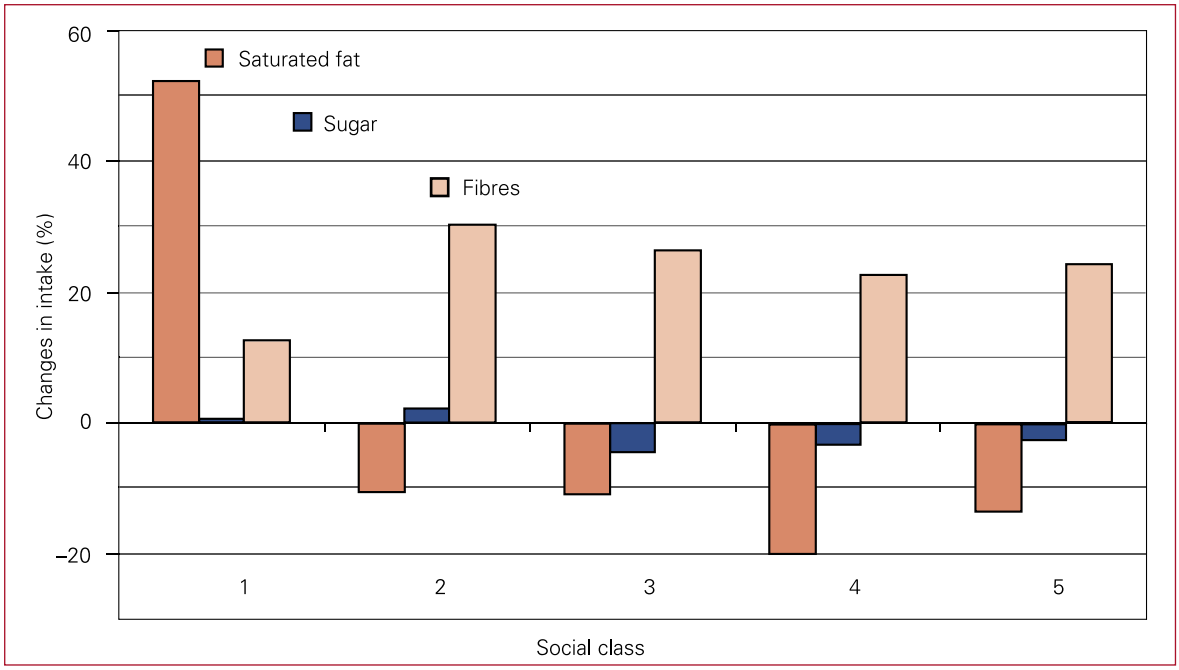
Source: Huang.[69]

Research by the United States Department of Agriculture (USDA) on price elasticities and cross-price elasticities has led to estimates of the degree of change in the consumption of various nutrients as a result of alterations in key food-commodity prices. Examples are shown in Figures 43 and 44, firstly in the case of a 1% rise in the price of canned fish[69] – leading to little change in calorific-energy intake and a reduction in the intake of several key nutrients – and a 1% increase in the price of vegetable oils – leading to reduced energy intake, reduced fat intake and improved nutrient intakes.

In a modelling exercise undertaken in Denmark, Smed et al. showed that altering sales tax but preserving revenue would influence consumption differentially between socioeconomic groups.[67] A reduction in tax on vegetables, fruit and wholegrains from 25% to 22% and an increase in tax on butter, cheese, beef, pork and fatty meats from 25% to 31%, along with an extra sugar tax created no net change in income to the Government, while it resulted in dietary changes that benefited lower-income groups. Those in the lowest socioeconomic groups gained most from these changes (Figure 45). Although those in the highest socioeconomic groups showed an increase intake of saturated fat, they had a smaller intake to begin with, so the impact was low.

The relationship between food prices and consumption patterns, however, is complex, with elasticities likely to vary with income level, age group and number of people in a household (especially single vs multiple households), and cross-price elasticities can be affected more by the prices of non-food items, such as

Figure 45: Sales-tax manipulation in Denmark



Source: Smed et al.[67]

housing costs, than by other categories of food. Nonetheless, proposals have been made for imposing small taxes on foods – such as soft drinks and confectionery – that are most likely to be contributing to excess calorie intake.

There is no direct evidence that such taxes influence overall consumption levels, although data from tobacco and alcohol taxation may be helpful here. Table 11 indicates where soft-drinks taxes have been imposed in several US states (and, after political pressure, removed in some). Other countries have also imposed taxes on confectionery. Indeed, the UK imposes VAT on certain 'luxury' food items. An extension of this approach could be considered. Subsidies on the production or distribution of healthier foods have also been considered[70] and distribution subsidies have been shown to increase fruit and vegetable consumption in Norway.[71]

Whether small taxes effectively reduce consumption is not fully understood. The fact that the soft-drink and snack-food industries oppose and have campaigned against special taxes on their products may indicate a loss of sales: certainly in response to their lobbying, 12 additional states, counties or cities repealed or reduced their snack or drink taxes.[71] Direct evidence that small changes in pricing can influence purchasing choices towards more healthful products comes from US researchers examining school food purchases. They showed that school vending services succeeded in raising the sales of reduced-fat snacks by up to 93% according to the proportion of price discount relative to non-low-fat equivalents (Figure 46).[73] In the absence of price changes, promotional activities using labels and signs to encourage low-fat snack purchases raised sales by only 8%.

Table 11: Taxes on soft drinks and snack foods introduced by local US authorities

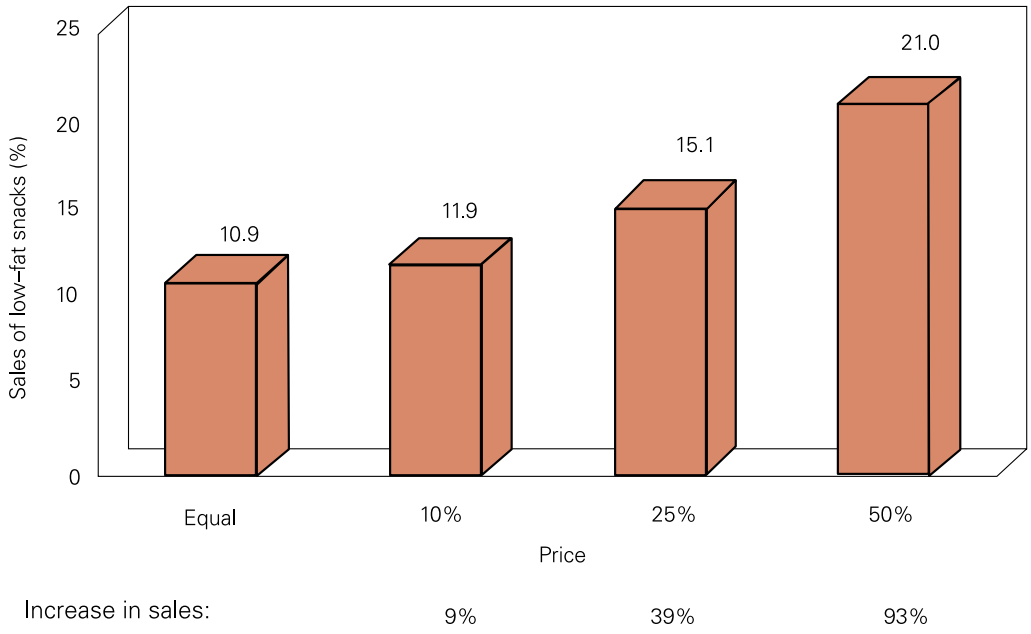
State or locality	Year enacted or effective	Sales or other tax specifically applied; representative foods taxed	Annual income ($)	Use of revenues/ notes
Arkansas	1992	$0.21 per gallon of liquid soft drink; $2 per gallon of soft drink syrups	40,435,799	Funds Medicaid; tax also approved on a ballot initiative in November 1993
California	1933	Sales tax (7.25%) on soft drinks	218,000,000 (estimate)	General funds
Chicago	1993	Distributors pay 3% on sales of containers, 9% on syrups	8,218,975	General funds
District of Columbia	1993	Sales tax (5.75%) on snack foods, soft drinks	4,000,000	General funds
Illinois	Mid-1980s	Full sales tax (6.25%) on soft drinks (other foods taxed at 1–2%)	69,000,000	General funds
Indiana	1963	Sales tax (5%) on candy, gum, soft drinks, bottled water, dietary supplements	43,000,000	General funds
Kentucky	1972	Sales tax (6%) on candy, gum, soft drinks	34,000,000	Gneral funds
Maine	1991	Sales tax (5.5%) on snack foods, soft drinks, carbonated water, ice cream, toaster pastries	14,600,000 (state's estimate of snack food items added under 1991 law)	General funds
Minnesota	1982	Sales tax (6.5%) on candy, carbonated drinks, fruit drinks (not containing any fruit juice), chewing gum, single-serve ice cream	45,000,000 (estimate)	General funds
Missouri	1962	$0.003 per gallon of soft drinks produced	400,000–500,000	General funds (for health department inspections of bottling plants)
New Jersey	1966	Sales tax (6%) on candy, carbonated soft drinks	67,000,000	General funds
New York	1965	Sales tax (7.5%, includes average of 3.5% for local jurisdictions) on soft drinks, candy, confectionary, fruit drinks with less than 70% natural fruit juices	203,000,000 (state's estimate)	General funds
North Dakota	1985	Sales tax (5%) on candy, chewing gum, carbonated beverages, soft drinks with less than 70% fruit juice, powdered drink mixes	5,000,000 (estimate)	General funds

Table 11: Taxes on soft drinks and snack foods introduced by local US authorities (*Continued*)

State or locality	Year enacted or effective	Sales or other tax specifically applied; representative foods taxed	Annual income ($)	Use of revenues/ notes
Rhode Island	1984	$0.04 per case (24 12oz cans) of soft drinks, soda water, mineral water, beer paid by wholesaler	700,000	General funds (but originally earmarked for environmental management, litter control)
Tennessee	1963	1.9% (increased in 1981 from 1.5%) of gross receipts from soft drinks and soft drink ingredients paid by manufacturers and bottlers	11,600,000	21% for highway litter control (beginning in 1981)
Texas	1961	Sales tax (6.25%) on carbonated and noncarbonated packaged soft drink beverages, diluted juices, candy	160,000,000 (state's estimate for soft drinks only); 56,000,000 (estimate for candy)	General funds
Virginia	1977	Small excise tax on wholesalers and distributors based on total sales of carbonated soft drinks	93,000	Litter control and recycling fund
Washington	1989	$1 per gallon of syrup	9,500,000	Violence prevention and drug enforcement
West Virginia	1951	$0.01 per half-litre of carbonated and noncarbonated soft drinks, fruit drinks, and chocolate milk and $0.80 per gallon of syrups paid by manufacturers or wholesalers	12,539,000	West Virginia University medical, dental, and nursing schools

Source: Jacobson and Brownell.[72]

Figure 46: Influence of price reduction on sales of low-fat snacks

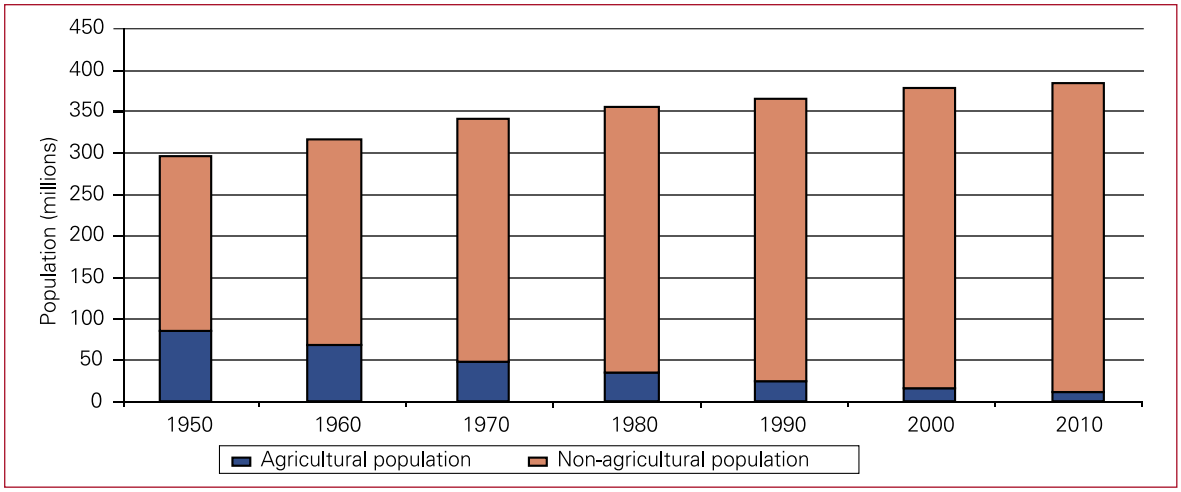


Source: French et al.[73]

3 Physical activity

Opinions differ on the degree to which changes in physical activity levels in the population can account for the increase in overweight and obesity prevalence. As already noted, the proportion of the population engaged in occupations requiring substantial physical effort has declined. In particular, there has been a remarkable reduction in the proportion of the population engaged in agricultural activities (Figure 47, Table 12), which traditionally required physical activity at a greater level than typical urban employment activities.

Figure 47: Numbers of the population in agricultural and non-agricultural activity, EU15



Source: United Nations Food and Agriculture Organisation.[74]

The change in employment-related physical activity has been connected directly to increased body weight. US analyses of different levels of activity at work have shown that a woman who spends one year in the least strenuous job has 0.9 units more of BMI than one who spends a year in the most strenuous job.[76] However, these data need to be interpreted with care, as an individual's choice of occupation may be affected by their pre-existing weight and desire or ability to undertake strenuous work. Nonetheless, the trends in occupation towards lower general activity levels, with activity displaced into non-occupation leisure time, have been frequently remarked on and the comment made that, where once people were paid to do hard physical labour, they now have to pay to do so.

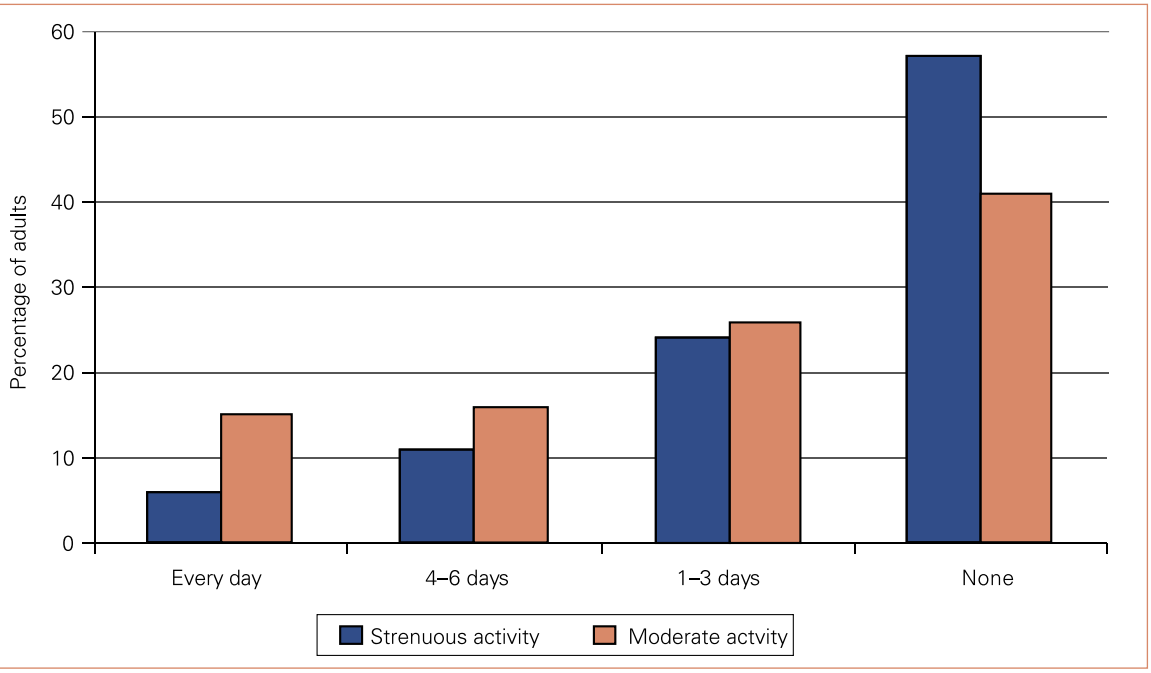
Table 12: Percentage change in agricultural population, 1980–1990 and 1990–2000

	Agricultural population	
	Annual percentage change	
	1980–1990	1990–2000
Developed countries	–1.7	–3
Industrialised countries	–2.7	–3.3
Transition economies	–1.0	–2.7
Developing countries	1.1	0.7
Latin America and the Caribbean	–0.9	–0.8
Near East and North Africa	0.1	0.5
Sub-Saharan Africa	2.3	1.8
East and South-east Asia	1.1	0.2
South Asia	1.2	1.0
Oceania (developing)	1.8	1.6
North America (developing)	0.0	–6.3
Continental groupings		
Africa	1.9	1.6
Asia	1.1	0.6
Latin America	–0.9	–0.8
Caribbean	0.1	–0.6
North America	–1.7	–2.1
Oceania	1.3	1.1
Europe	–2.8	1.4

Source: United Nations Food and Agriculture Organisation.[75]

Physical activity is not easy to measure and most surveys have relied on self-reported estimates of time spent in various forms of activity and inactivity. A questionnaire survey of some 16,000 adults in all the (then 15) member states of the EU, conducted by Eurobarometer in 2002, found that nearly 60% of adults had undertaken no strenuous physical activity (Figure 48) and 40% no moderate activity in the week before the survey. Only 15% undertook moderate activity on a daily basis.[77]

Figure 48: Number of days in the week when adults undertook strenuous activity and moderate activity, EU15



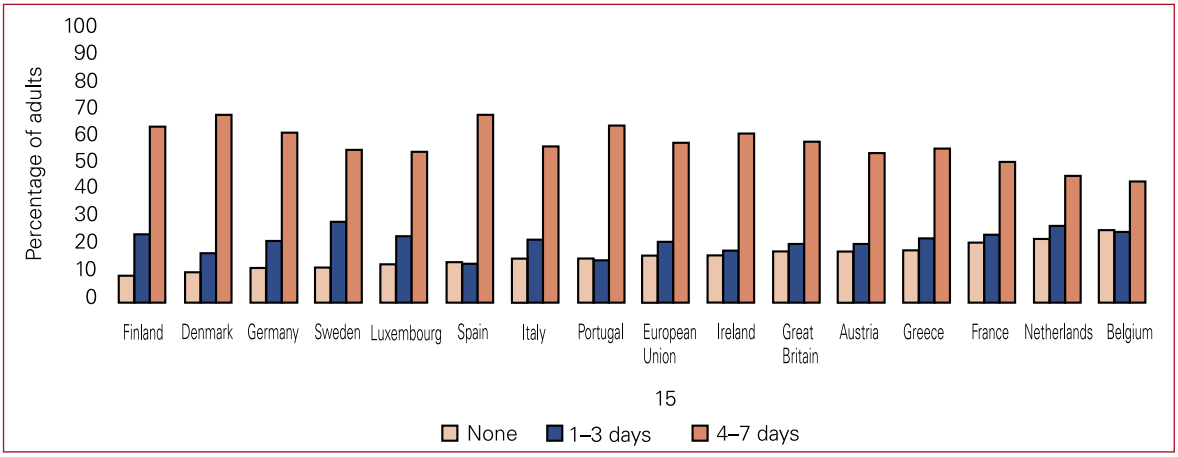
Note: Self-reported activity levels.
Source: Eurobarometer.[77]

Moderate activity was defined as 'carrying light loads, cycling or playing tennis' but excluded walking. Of those who reported moderate activity in the past week, only 20% reported moderate activity lasting more than an hour on any given day.

Low levels of activity, such as ten minutes' continuous walking, were undertaken by a larger proportion of the population on a routine basis, although, even then, barely 40% of adults did this amount of activity daily, and, in the Netherlands and Belgium, more than 50% of adults said they undertook this activity on fewer than four days a week (Figure 49).

However, comparing these responses with the prevalence of overweight in the respective countries (Figures 50 and 51) revealed no significant association between reported walking activities or leisure activities and overweight prevalence (average of men and women).

Figure 49: Percentage of adults taking regular physical activity in leisure time



Note: Self-reported data.
Source: Eurobarometer.[77]

Figure 50: Prevalence of overweight and proportion of population reporting no walking activity

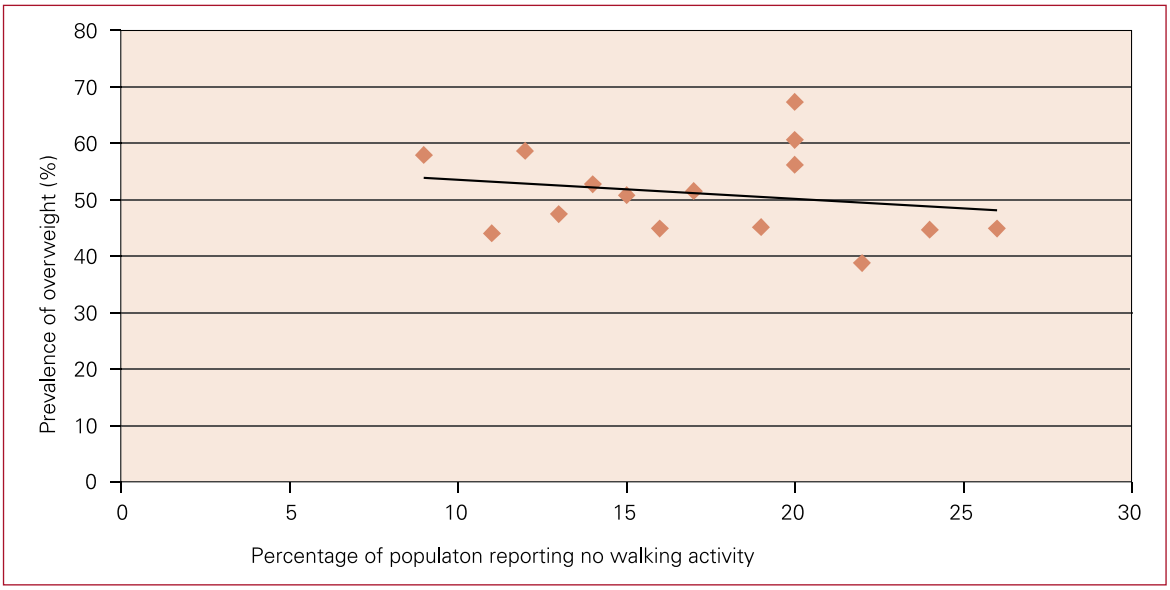
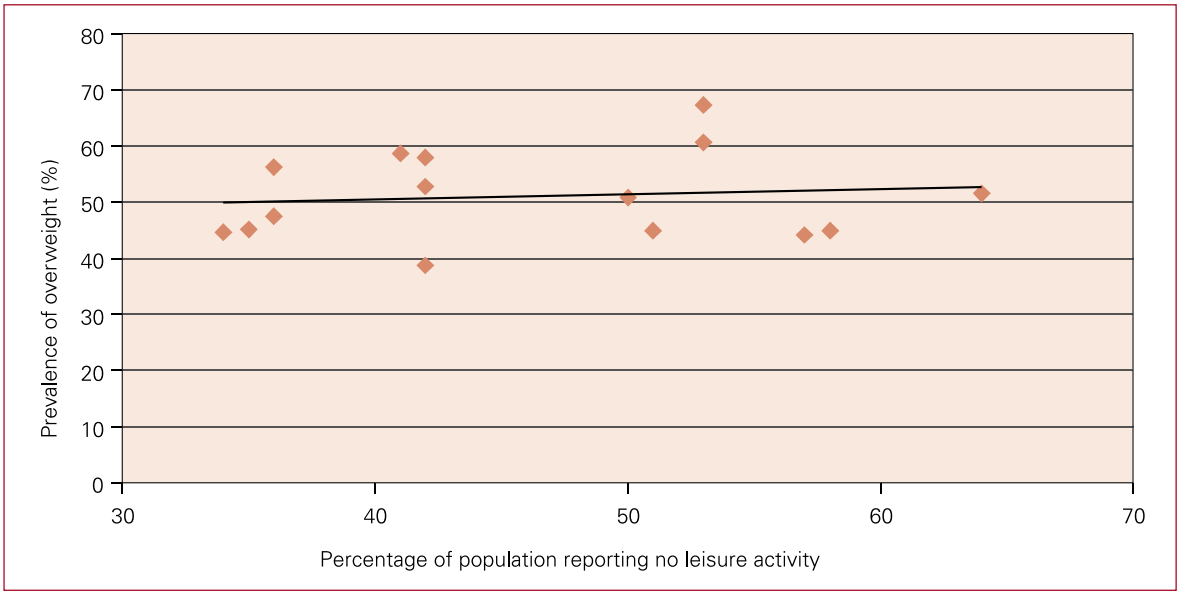


Figure 51: Prevalence of overweight and proportion reporting no leisure-time activity



Source: Eurobarometer.[77]

UK data on physical activity also show relatively low levels of participation by the majority of the population. A questionnaire survey of over 1,000 adults in Great Britain, conducted for Eurobarometer in 2002, found that around 60% of the respondents had taken no vigorous physical activity in the previous seven days.[77] Only 15% had taken vigorous physical activity more than three times in that period. Similarly, some 45% of respondents had not undertaken any moderate physical activity (e.g. cycling or carrying light loads, but excluding walking). About 18% said they had not undertaken as much as a 10-minute walk in the last week.

Trends in physical activity and inactivity over time have not been consistently measured. The Eurobarometer survey was the first of its kind, so no previous comparable figures are available. The 2003 Health Survey for England found only a slight increase on previous surveys showing around a third of adult men and a fifth of adult women were meeting the recommended minimum physical activity levels for cardiovascular fitness (self-reported statement agreeing that the participant took 'at least 30 minutes of moderate-intensity activity at least five days per week'). Figures were higher for younger men and dropped dramatically for men post-retirement age (Table 13).

Table 13: Percentage of adults achieving cardiovascular physical activity recommendations

	Age							Total %
	16–24 %	25–34 %	35–44 %	45–54 %	55–64 %	65–74 %	75+ %	
Men								
1997	49	41	37	32	23	12	7	32
1998	53	45	41	34	30	14	6	34
2003	53	44	41	37	32	17	8	35
Women								
1997	26	26	29	24	19	8	5	21
1998	28	28	28	25	18	9	3	21
2003	30	29	30	30	23	13	3	24

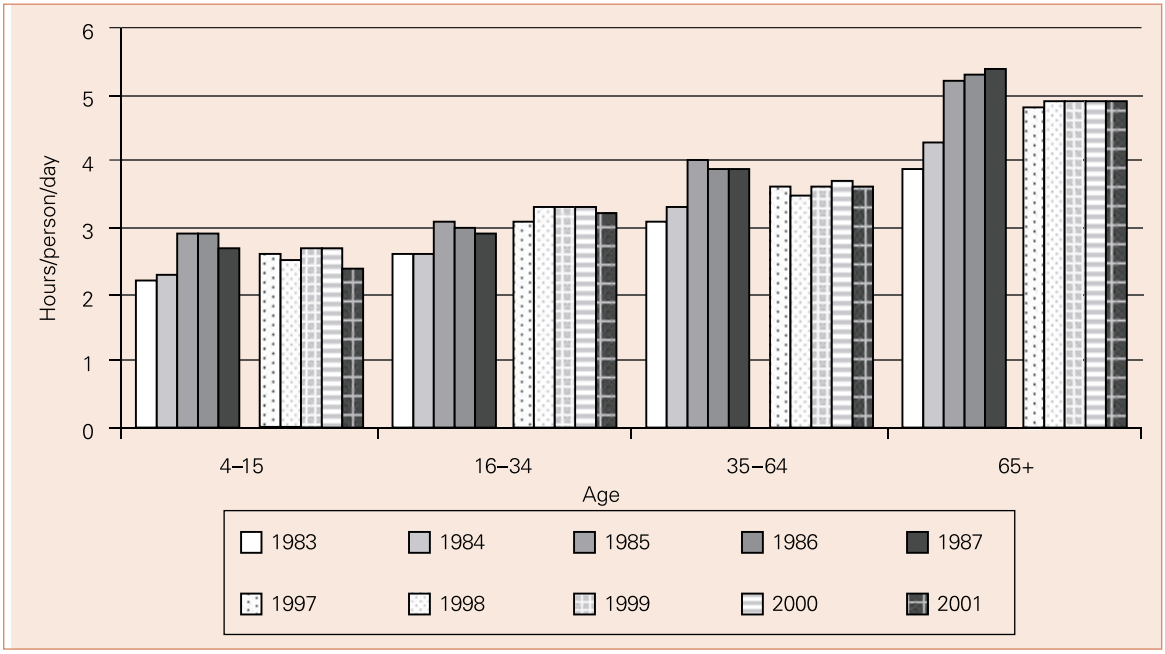
Source: National Statistics.[78]

In terms of inactivity, the Eurobarometer survey found that British adult respondents said they were typically inactive (sitting at a desk, reading, chatting, viewing television) for less than 3 hours a day, or 3–5.3 hours a day, or more than 5.3 hours a day in almost equal numbers. According to the UK 2000 Time Use Survey,[79] British adults on average spent 8.7 hours asleep each day, 2.5 hours watching television, 1.4 hours eating and drinking, and 1.8 hours listening to music, reading, chatting or 'resting'. Children aged 8–15 spent 10.2 hours asleep, 2.3 hours watching TV, 1.1 hours eating and 1.2 hours on the other inactive behaviours.

Using a different survey methodology, figures for television watching suggested an average adult spends 3.6 hours per day watching television (averaged across 1997–2001), dropping to 3.2 hours among higher-income households and rising to 4 hours among lower-income households (Figure 52). The figures are also strongly age-dependent, rising from 3.1 hours at age 16–34 to 4.9 hours at age 65+.[80,81]

Despite the lack of a clear relationship between these measures of physical activity or sedentary behaviour and the consequential effects on body weight, there are good reasons to believe that increasing physical activity would be beneficial for the population generally, as well as for those attempting to maintain a healthy body weight or lose excess weight.

Figure 52: Leisure-time broadcast television watching, child and adult age groups, 1983–1987 and 1997–2001



Source: Broadcasters' Audience Research Board;[80] Social Trends 1985, 1989.[81]

The reduced physical activity that has been suggested has been the result of a number of economic drivers, including more sedentary forms of employed occupation; the cost of leisure activity facilities; increased use of cars, e.g. for school runs and for shopping in large retailers; access to multi-channel television; and greater non-TV screen-watching – for entertainment, gaming, internet use etc. Reduced use of open spaces may reflect changes in people's perceptions of the safety of streets and other open spaces, both in terms of traffic hazards, play-space hazards and threats to personal security through perceived increased levels of crime and/or reduced presence of community policing.

4 Examples of actions and policies to tackle obesity

Many hundreds of initiatives are being introduced worldwide, most of which are not (and may never be) properly evaluated. The IOTF is currently compiling a database of interventions. Systematic reviews of interventions have found few scientifically conducted trials that have shown a direct effect on BMI or obesity prevalence, although some were able to alter – if only temporarily – the determinants of weight gain, such as dietary choices and activity levels. However, many commentators have pointed out that the controlled trials that are available for systematic review suffer from a strong 'settings bias' – i.e. the interventions use controllable settings such as schools and clinics – whereas more positive results may be achieved in settings that are harder to control scientifically – such as changing the marketing and pricing of food and activity products.

Some examples of child-focused interventions are shown in Part 2. Unfortunately, there have been very few evaluations of interventions, with a few systematic reviews and a Cochrane review. These are discussed in an overview of interventions written by the IOTF for the WHO ministerial meeting in November 2006.[82]

National policy documents

This review has identified a number of significant national policy documents that target obesity and related ill health. A summary is given in Table 14.

Table 14: Examples of countries and regions that have developed strategies or action plans to promote healthy eating and physical activity and to prevent obesity

Country	Strategy or action plan	Source and/or description
Australia	*Best Options for Promoting Healthy Weight and Preventing Weight Gain in New South Wales*	Gill, T, King, L. and Webb, K. 2005. NSW Centre for Public Health Nutrition. http://www.health.nsw.gov.au/pubs/2005/pdf/healthyweight.pdf (accessed June 2007).
	Prevention of Obesity in Children and Young People	New South Wales Government Action Plan 2003–2007
	Acting on Australia's Weight. A Strategic Plan for the Prevention of Obesity	National Health and Medical Research Centre, 1997
	Building a Healthy, Active Australia, including: – Active Australia Schools Networks (AASN) – Targeted Sports Participation Programme (TSPP) – Choose Health – Be Active >60s	Australian Government Initiatives, 2004 National Obesity Task Force, 2003
	Healthy Weight 2008 – Australia's Future. The National Action Agenda for Children and Young People and their Families	Strategic Inter-Government Nutrition Alliance of the Public Health Partnership, 2001
	Eat Well Australia. A Strategic Framework for Pubic Health Nutrition 2000–2010	
Canada	*Improving the Health of Canadians: Promoting Healthy Weights*	Canadian Institute for Health Information, 2006
	The Integrated Pan-Canadian Healthy Living Strategy	Intersectoral Healthy Living Network, in partnership with Federal/Provincal/Territorial (F/P/T) Healthy Living Task Group and the F/P/T Advisory Committee on Population Health and Health Security (ACPHHS) 2005
	Healthy Schools Guideline Toolbox	Simcoe Regional Strategy
	Canada Food Guidelines for Healthy Living	

Table 14: Examples of countries and regions that have developed strategies or action plans to promote healthy eating and physical activity and to prevent obesity (*Continued*)

Country	Strategy or action plan	Source and/or description
Chile	*Global Strategy Against Obesity*	Ministry of Health, 2005
China	*Pilot Scheme Based on Healthy Nutrition: An Essential Element of a Health-Promoting School Promotion in Schools 2000–2002*	Scheme developed by the Chinese Ministry of Health and FAO/WHO, 1998
Denmark	*National Action Plan Against Obesity. Recommendations and Perspectives* *Danish Government Programme on Public Health Promotion 1999–2008*	National Board of Health, 2003 http://www.folkesundhed.dk/media/folkesundhed_engelsk
Finland	*Finnish Nutrition Recommendations* *Government Resolution on Policies to Develop Health-Enhancing Physical Activity in Finland* *Sports Act 1980 and Further Second Sports Act 1999* *Additional material has been published on the North Karelia project, and subsequent national programmes, which were designed to tackle heart disease but are also relevant to countering obesity*	National Nutrition Council, National Public Health Institute, Ministry of Agriculture and Forestry, 1998 Ministry of Social Affairs and Health, 2002 Finland Government Various scientific evaluations of Finnish public health interventions
France	*Taking Charge of Obesity in Children and Adolescents* *National Nutritional Health Programme (PNNS) 2001–2005*	Agence Nationale D'Accréditation et D'évaluation en Santé, 2003 Ministry of Health

Table 14: Examples of countries and regions that have developed strategies or action plans to promote healthy eating and physical activity and to prevent obesity (*Continued*)

Country	Strategy or action plan	Source and/or description
Germany	*Better Diet, More Exercise Contest (seeks to use pull together information from regional and local initiatives to evaluate programmes for the benefit of the nation)*	Federal Agency for Agriculture and Food http://www.besseressenmehrbewegen.de/index.php?id=425#8518b542aa8291bae1737ad587656abf
Hungary	*Four-Point Programme of Health Education*	Department of Health, 2006
Ireland	*Obesity: The Policy Challenges. The Report of the National Taskforce on Obesity* *The National Health Promotion Strategy 2000–2005*	National Taskforce on Obesity, 2005 http://www.dohc.ie/publications/national_health_promotion_strategy.html
Italy	*2005–2007 National Prevention Plan*	Ministry of Health
Japan	*Nutrition and Diet in: Health Japan 21*	National Institute of Health and Nutrition, Japan
Netherlands	*Living Longer in Good Health*	Ministry of Health, Welfare and Sport, 2004 http://www.hepa.ch/gf/hepa/expertmeeting/material/Policy%20Paper%20Health-Care%20Prevention.pdf
New Zealand	*Healthy Eating – Health Action DHB Toolkit – Obesity/Physical Activity*	
Norway	*Prescription for a Healthier Norway*	Ministry of Social Affairs, 2002–2003 http://www.odin.dep.no/filarkiv/184595/folkehelse-eng.pdf
Poland	*National Health Programme 2006–2015*	National Food and Nutrition Institute Ministry of Health http://www.mz.gov.pl/ (website generally in Polish, limited English pages available)
Portugal	*National Programme Against Obesity*	Portuguese Ministry of Health and Portuguese General Directorate of Health, 2005
Slovenia	*Resolution on The National Programme of Food and Nutrition Policy 2005–2010*	National Institute of Public Health, Republic of Slovenia, 2005
Spain	*Spanish Strategy for Nutrition, Physical Activity and Prevention of Obesity*	Ministry of Health and Consumer Affairs, 2005

Table 14: Examples of countries and regions that have developed strategies or action plans to promote healthy eating and physical activity and to prevent obesity (*Continued*)

Country	Strategy or action plan	Source and/or description
Sweden	*Background Material to the Action Plan for Healthy Dietary Habits and Increased Physical Activity*	National Food Administration and National Institute of Public Health, 2005
	Healthy Dietary Habits and Increased Physical Activity: The Basis for an Action Plan	National Institute of Public Health, 2005
United Kingdom	*Choosing Health: Making Healthy Choices Easier*	Department of Health/National Health Service, 2004
	Food and Health Action Plan	Department of Health
	The National School Fruit Scheme	Department of Health
	Game Plan: A Strategy for Delivering the Government's Sport and Physical Activity Objectives	Department for Culture, Media and Sport/ Prime Minister's Strategy Unit
Nordic countries	*Nordic Plan of Action on Better Health and Quality of Life through Diet and Physical Activity*	The Nordic Council of Ministers for Fisheries and Aquaculture, Agriculture, Foodstuffs and Forestry; The Nordic Council of Ministers for Social Security and Health Care, 2006
Europe	*Children's Environment and Health: Action Plan for Europe*	World Health Organisation, 2004
	Green Paper – Promoting Healthy Diets and Physical Activity: A European Dimension for the Prevention of Overweight, Obesity and Chronic Diseases	Commission of the European Communities, 2005
	Diet, Physical Activity and Health – EU Platform for Action	European Commission, 2006
	Healthy Eating for Young People in Europe: A School-Based Nutrition Education Guide	International Planning Committee, 1999 (WHO Regional Office Europe, European Commission and the Council of Europe)

Table 14: Examples of countries and regions that have developed strategies or action plans to promote healthy eating and physical activity and to prevent obesity (*Continued*)

Country	Strategy or action plan	Source and/or description
Global	*Diet, Nutrition and the Prevention of Chronic Diseases*	World Health Organisation, 2003
	Global Strategy on Diet, Physical Activity, and Health	World Health Organisation, 2004
	Preventing Chronic Diseases: A Vital Investment	World Health Organisation, 2006
United States	*The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*	Department of Health and Human Services, 2001
Pacific	*Obesity in the Pacific: Too Big to Ignore*	Secretariat of the Pacific Community, 2002
Latin America	*Global Strategy on Healthy Eating, Physical Activity and Health (DPAS): Implementation Plan for Latin America and the Caribbean 2006–2007*	Pan-American Health Association/World Health Organisation, 2005
	Regional Strategy and Plan of Action on an Integrated Approach to the Prevention and Control of Chronic Diseases, including Diet, Physical Activity, and Health	Pan-American Health Association/World Health Organisation, 2006
	Regional Strategy on Nutrition in Health and Development 2006–2015	Pan-American Health Association/World Health Organisation, 2006

SOURCE: Adapted from (1) IASO–IOTF Policy Database; (2) Institute of Medicine;[83] (3) Crombie et al.[84].

Population-based policy options suitable for the European context

The strategies and activities suggested in the policy documents listed in Table 14 offer a wide variety of possible approaches to tackling obesity. No specific measure alone would be sufficient, but a coherent set of policies are widely assumed to be needed, and these cover both local and national actions, dealing with education, information, pricing, availability and other factors that ensure that healthy options are easy to choose by all members of the population.

1 International obesity taskforce

The IOTF published a document identifying around 80 proposals for preventing child obesity. This is summarised in the child section of this review.

2 Finland – north karelia project

This highly regarded public health programme was developed for the North Karelia region of Finland and launched in 1972 in response to the exceptionally high coronary heart disease mortality rates. It included a range of comprehensive activities, involving health and other services, schools, non-governmental organisations, innovative media campaigns, local media, supermarkets, the food industry, agriculture etc.[85]

The experience of running this public health programme was reflected in a set of recommendations by the national public health institute[86] summarised here:

- Preventive community programmes should pay attention to the well-established principles and rules of general programme planning, implementation and evaluation.
- Preventive community programmes should be concerned both with appropriate medical/epidemiological frameworks to select the intermediate objectives and with relevant behavioural/social theories in designing the actual intervention programme.
- Good understanding of the community ('community diagnosis'), close collaboration with various community organisations and full participation of the people are essential elements of successful community intervention programmes.
- Community intervention programmes should combine well-planned media and communications messages with broad-ranged community activities involving those in primary healthcare, voluntary organisations, the food industry and supermarkets, worksites, schools, local media, and so on.
- Community intervention programmes should seek the collaboration and support both of formal community decision makers and informal opinion leaders.

- Successful community intervention programmes need to combine sound theoretical frameworks with dedication, persistence and hard work.
- A major emphasis and strength of a community intervention programme should be its attempts to make the social and physical environments in the community more conducive to health and healthy lifestyles.
- Major community intervention programmes can be used for a target community, but can also have broader impact as a national demonstration programme. For this, proper evaluation should be carried out and results disseminated.
- For national implications, the project should work in close contact with national health policy makers throughout the programme.

3 Other reports relevant to the UK context

Healthy Dietary Habits and Increased Physical Activity: The Basis for an Action Plan, Public Health Institute of Sweden[87]

This report notes these principles:

- The action plan should originate from the Government and/or Parliament.
- Health promotion concerning healthy dietary habits and increased physical activity should be institutionalised at the local and regional levels in order to ensure co-ordination and continuity.
- All those affected by the action plan should have a participatory role.
- An action plan should not be designed as a wish list. It must be possible to put the plan into practice. It is insufficient to merely suggest *what* is to be achieved, e.g. providing a healthy school meal; there must also be a description of *how* this can be achieved.
- Adequate resources should be guaranteed for advocacy, development and implementation. The implementation of an action plan requires continuity, structure, far-sightedness and resources.
- Methods should be created for monitoring and evaluation during the implementation phase. Quantifiable targets should be continually evaluated.

Other documents such as the Irish Obesity Task Force report,[88] the Spanish *Estrategia NAOS*[89] and the Danish *National Action Plan Against Obesity*,[90] also provide valuable ideas for possible implementation in the UK. A summary of the more relevant policies is given in the Table 15.

Table 15: Measures proposed in various national policy statements that might be applicable in a UK setting

Community environments
Planning guidelines for open spaces could include security and safety to improve the design for physical activity for all.
Planning guidelines for housing could include physical activity for children and adults.
Building regulations and building awards could contribute to physical activity, e.g. encouraging people to regularly use the stairs.
An index could be developed for surveying food availability and accessibility covering the supply and price of a range of foods including fruit, vegetables and energy-dense foods. The index could be used for local planning.
Municipalities could audit their facilities for exercise and sport from the point of view of gender equality, cultural relevance and equal opportunities.
School and pre-school environments
School playing fields could be retained and made accessible to communities.
School and pre-school playgrounds could be renovated to ensure suitability for play, movement, sport and outdoor education.
Education authorities and schools could adopt a commercial sponsorship policy that restricts the promotion of branded products including foods and beverages.
Guidelines for physical activity and food for under-5s provided by childcarers, nurseries and pre-schools could be developed, disseminated and evaluated.
Community and voluntary organisations offering children opportunities for physical activity (appropriate for culture and gender) could be supported with public funds.
Quality indicators and inspection criteria for school food policies, physical activity and health-promoting environments could be developed. Similar criteria would be needed for under-5s facilities licensed by local authorities.
The quality audits of the work of pre-schools and schools performed by municipalities could include a report on how the environment promotes diet and physical activity. Teaching diet habits and health could also form one of the indicator domains.
Workplaces
Certificates and awards could be given to health-promoting workplaces, including having policies for food and physical activity.
Knowledge and skills on food and physical activity could be included in re-employment training programmes.
Guidelines for food provided in the workplace could be developed, disseminated and evaluated.
Institutional framework
Co-ordination of health policy would require cross-departmental collaboration at Cabinet level. Scrutiny of this process could rest with an appropriate agency, such as Parliament. Evaluation, monitoring of progress and policy reviews could rest with an agency such as an 'obesity observatory', possibly located in an institution promoting public health in liaison with the Chief Medical Officer.
National government's role as an employer and as a purchaser of food could be reviewed to ensure all possible opportunities are being taken to prevent obesity and to promote health in the workplace.

Table 15: Measures proposed in various national policy statements that might be applicable in a UK setting (*Continued*)

Local authorities could be encouraged to establish a public health committee advised by experts in the areas of diet and physical activity to oversee the integration of obesity prevention into community-based health promotion.
Every municipality could adopt a policy regarding the food provided in municipal establishments and in establishments licensed by the authority, such as child and elderly care facilities.
Health authority catering for patients, staff and visitors to restaurants, cafés, vending machines, kiosks, etc. could ensure that healthful foods dominate the total supply.
EU member states could collaborate to ensure cross-border commercial communications do not expose children to marketing of foods and beverages.
A health impact assessment of policy proposals could be routinely undertaken across all departments. In particular, food supply policies, including trade agreements and the CAP, could be 'obesity proofed' as a priority.
A health impact assessment could be included as a criterion when allocating funding to nature conservation programmes. The projects could be evaluated from a public health perspective.
Regulatory interventions
Food labelling policies, including nutrition labelling, could prioritise clear and simple information for consumers in order to ensure that healthy choices are easy to make. A front-of-pack 'traffic light' labelling scheme could be mandatory. Labelling could include menu displays in multi-chain restaurants and menus offered by institutional caterers.
Food formulation regulations could be reviewed, in particular to discourage the use of non-nutritive additives (e.g. colours, flavouring agents, emulsifiers) as a means of making energy-dense foods more attractive.
A code of marketing of energy-dense foods to children could be adopted as a statutory regulation and monitored by an agency independent of the commercial sector. Sufficient sanctions could be available to ensure code compliance.
Monitoring and research
A national database could be set up for reporting and monitoring children's height and weight. This work could be carried out in collaboration with child and school healthcare services. Data on breast-feeding from child healthcare records could be included in the database.
Methods could be developed for monitoring children's dietary habits and physical activity and aspects of mental health in combination with socioeconomic factors.
Data on food supply, food prices and marketing of certain food groups (fruit, vegetables, sweets, crisps, soft drinks, cakes, biscuits and ice cream) could be compiled and published annually.
Health impact assessment methods could be developed to determine the effects of changes in the marketing, price, availability and consumption of energy-dense and low-nutrient foods.
Training and capacity-building
Health communication could be improved within the maternity and child healthcare services as part of health promotion efforts for all pregnant women and parents, other relatives and family support programmes.
Training in motivational interviewing techniques could be provided for healthcare professionals in the maternity, child, dental, primary, secondary and school healthcare services.
Cultural competence could be improved in health promotion and disease prevention concerning healthy lifestyles for specific population groups.

Table 15: Measures proposed in various national policy statements that might be applicable in a UK setting (*Continued*)

Consumer organisations could apply for public funding for monitoring and publicising developments in the marketing of soft drinks, sweets, crisps, cakes and biscuits and ice cream directed at children, and could initiate debates on marketing.
Vocational training for jobs in healthcare, pre-school, the food sector and social services, such as nursing assistants, catering staff and childcarers, could contain the core subjects of diet, physical activity and health.
Fiscal measures
An enquiry could be set up to investigate the potential for reducing the consumption of energy-dense foods, such as confectionery and soft drinks, using taxation or other economic instruments (e.g. through VAT reform).
The costs of marketing energy-dense foods such as confectionery and soft drinks could be made a disallowable expense against food companies' taxable income.
A European conference could be convened on the scope for tax and subsidy measures within the areas of diet and health.
Grants could be made available to municipal authorities implementing measures to encourage pedestrian and bicycle traffic, with a state programme for co-funding new footpaths and cycleways in rural and urban areas.
Payments made to the CAP for fruit and vegetable sector support (largely used to remove produce from the market) could be directed towards support for wider distribution, especially to more remote communities (already operating in Norway).

5 Lessons and gaps in data

Several questions on the causes and consequences of obesity remain open for future research, for example:

Monitoring the present

Far more effort will be needed to monitor current trends in health and in the determinants and drivers of health, not only to enable us to predict future demand for health services but to allow us to evaluate any interventions that are implemented.

Marketing and behaviour

Greater insights are needed about the various influences on consumer choices in order to help us understand the extent to which external influences – such as price, promotion, packaging, positioning, availability and knowledge base – play a part in determining food purchases.

How shopping links to diet

Better information is needed on how purchases affect actual dietary patterns for the purchaser and/or the members of their family (e.g. what women buy for their husbands, what parents buy for their children, what men buy in front of other men). Also, we need to know more about the relative impact of catering (both public sector and private) on dietary choices.

Market adjustments

Better understanding is required about the forms of market failure or mis-function and the types of externalities influencing food supply and physical activity opportunity that lead to sub-optimal choices for health.

Cost-effectiveness

Comparative efficiency and effectiveness of alternative public policy interventions to reduce the prevalence of obesity are important, and the Melbourne group's work on cost-effectiveness in policy choices should be developed. This group has evaluated the predicted changes in BMI associated with interventions during childhood and a provisional estimate of the cost-effectiveness – using Australian data – is shown in Table 16.

Table 16: Australian example of the cost-effectiveness of various interventions

Intervention	BMI reduction per child (kg/m²)	Population health gain (disability-adjusted life years saved)	Cost per health gain
Laparoscopic adjustable gastric banding	13.90	12,000	Medium
Targeted family-based programme	1.70	4,700	Low
Multi-faceted school-based including active physical education	1.10	8,200	Low
Orlistat therapy	0.86	450	Medium
Targeted multi-faceted school-based programme	0.52	1,500	Low
TV viewing	0.45	6,700	Medium
Targeted GP programme	0.25	510	Medium
TV advertising	0.17	37,000	Very low
Multi-faceted school-based without active physical education	0.14–0.31	1,600	Medium
Fizzy drinks	0.13	5,300	Low
TravelSMART	0.04	50	High
Walking school bus	0.03	30	High
Active-after-school communities	0.002	450	High

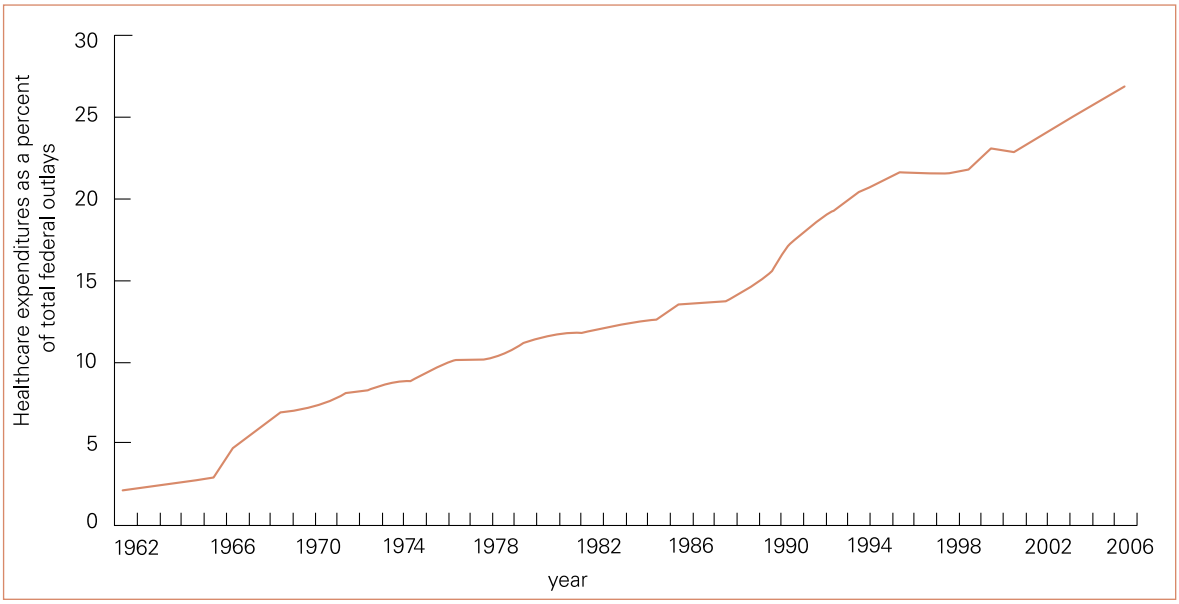
Source: State of Victoria;[91] Haby et al.[92]

Making the economic case

Further research is needed to calculate the costs of doing nothing about rising obesity levels. US budgets for healthcare rose from less than 5% total federal budget in the early 1960s to 15% in 1990, and were likely to have exceeded exceed 25% in 2006 (Figure 53).

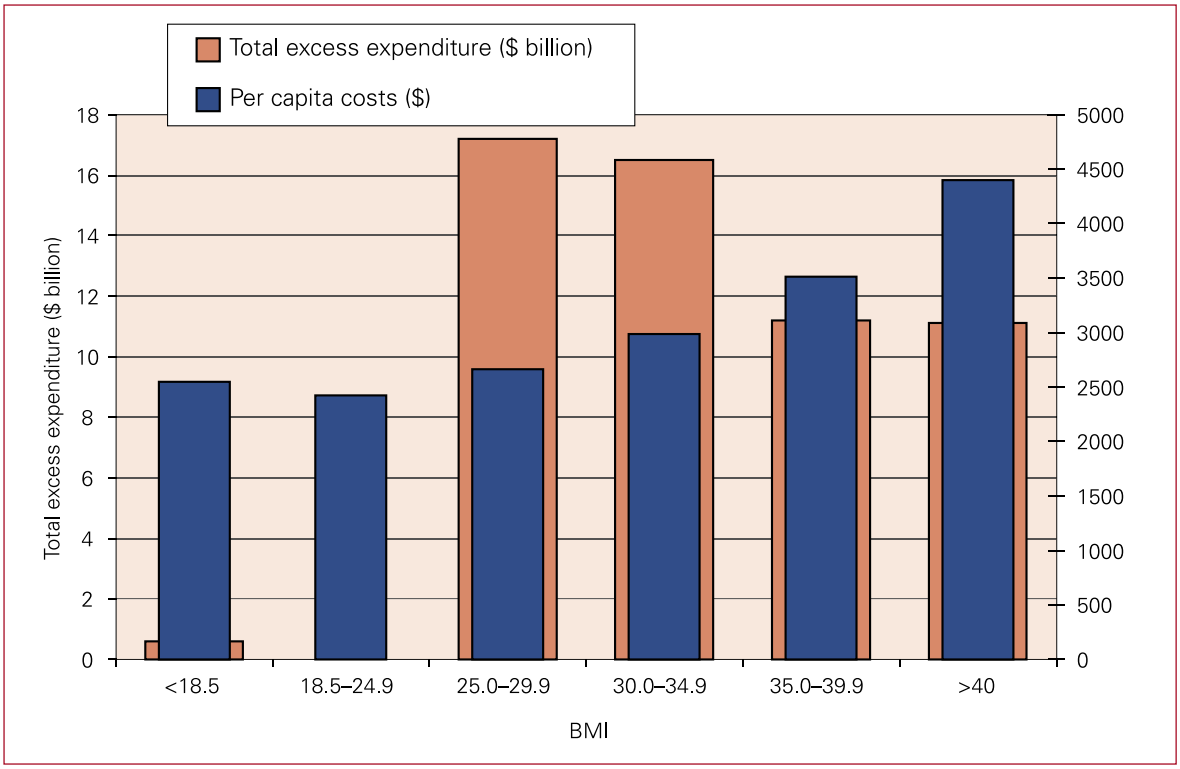
While there is a well-known relationship between the severity of obesity in an individual and the average healthcare costs for that individual, Figure 54 shows the different relationship between severity of obesity and the total healthcare budget required for treatment. This arises because the absolute number of people in the population with moderate obesity outnumber those with severe obesity.

Figure 53: Rising proportion of US federal budget spent on health services



Source: Kuchler and Ballenger.[93]

Figure 54: The costs of different degrees of excess weight in the USA



Source: Arterburn et al.[94]

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SUMMARY URN 07/926A1.
ADULTS URN 07/926A2.
CHILDREN URN 07/926A3.
APPENDICES URN 07/926A4.