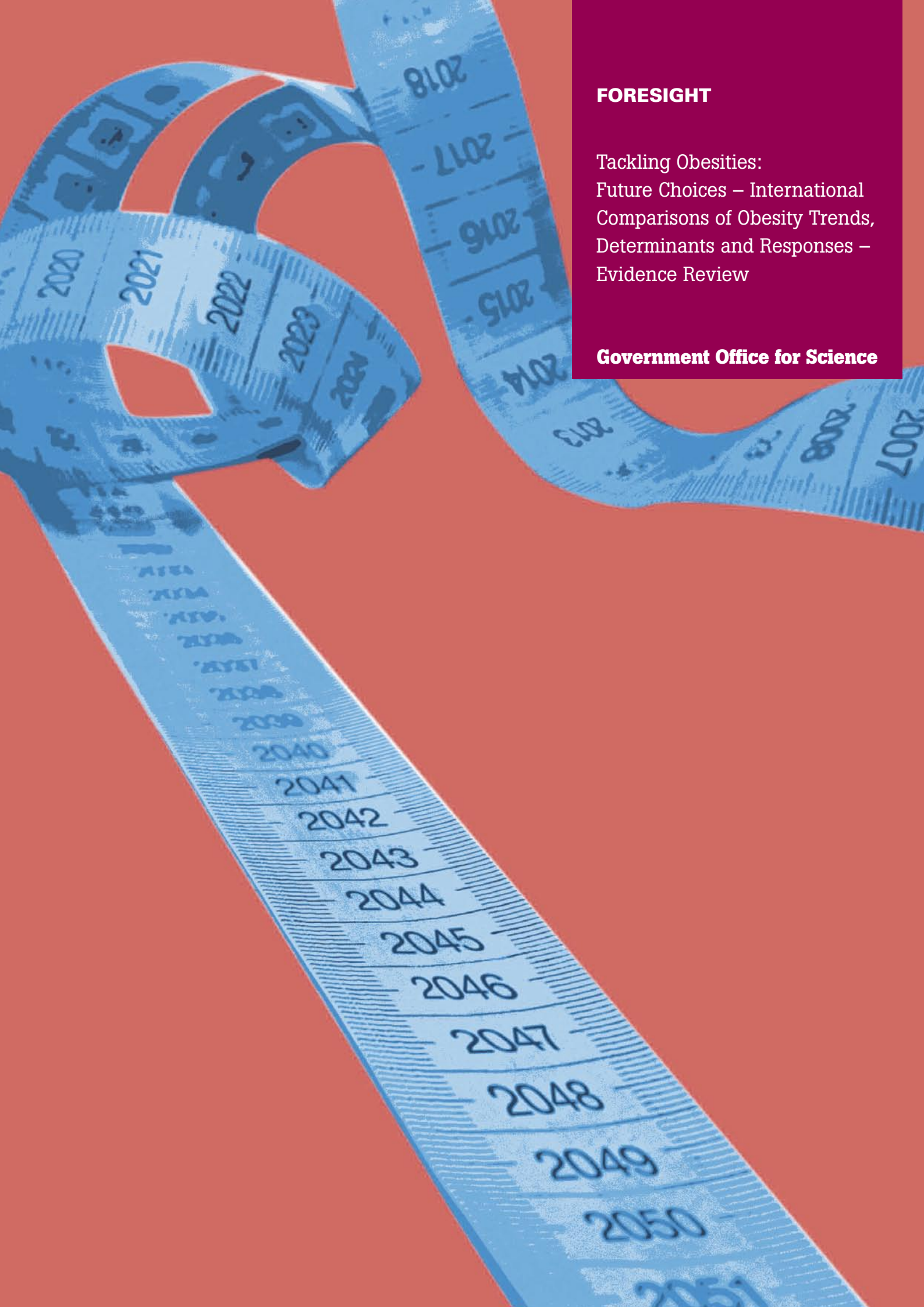

FORESIGHT

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

2 Children

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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.

Details of all the reports and papers produced within this Foresight project can be obtained from the Foresight website (www.foresight.gov.uk). Any queries may also be directed through this website.

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Part 2

Children

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1 Definitions, consequences, prevalence in children

For ease of reference, the data on children has been presented separately in Part Two of this report. However, drivers determining adult obesity, such as food policy, which are discussed in greater detail in Part One, clearly also affect children and the two parts should therefore be read together.

Definitions of obesity in children

As with adults, there is a disparity between what is the most appropriate measure of overweight and obesity for individual diagnosis in children, and that for population-based monitoring. Although precise definitions matter with regard to individuals and potential treatment protocols, relatively crude indicators such as BMI are sufficient for population-wide public health policies.

In very young children **'weight for height'** is the 'gold standard'. Babies are generally weighed and measured routinely. When using this method, care should be taken to choose an appropriate reference population. A WHO review found that the US National Centre for Health Statistics (NCHS) did not take into account the differences between breast-fed and non-breast-fed children.[1]

BMI for age using reference charts. This method is commonly used. BMI varies with age and gender. It is common to classify those between the 85th and 95th centile as 'overweight' (the NCHS recommends that this is referred to as being 'at risk of overweight') and those in the 95th centile or over as 'obese' (NCHS recommends this is referred to as 'overweight'). Again, care must be taken to choose a reference chart on the basis of the most appropriate reference population.

BMI based on adult cut-off points. In 2000, age- and gender-specific cut-off points were published by the IOTF.[2] These cut-off points were based on international data from six different reference populations that project to adult cut-offs of 25kg/m² for overweight and 30kg/m² for obesity. These cut-off points may not be appropriate in Asian populations as discussed in Part 1, Adult Obesity. Cut-off points of 23+ and 25+ may be more appropriate.

Much of the published literature now uses one or more of the above methods to define overweight and obesity. The Health Survey for England data was published using Department of Health (85th- and 95th-centile) and IOTF cut-offs from 1995 to 2002. However, the 2003 survey only used the Department of Health 85th- and 95th-centile cut-off points.

Consequences of obesity

The consequences of obesity are not confined to adults. The rising obesity rates in children are being accompanied by many obesity-related health problems.[3] Table 1 identifies the health problems associated with childhood and adolescent obesity.

Table 1: Health problems associated with childhood and adolescent obesity

Pulmonary	**Orthopaedic**
Sleep apnoea	Slipped capital epiphyses
Asthma	Blount's disease (tibia vara)
Pickwickian syndrome	Tibial torsion Flat feet Ankle sprains Increased risk of fractures
Neurological	**Gastroenterological**
Idiopathic intracranial hypertension (e.g. pseudotumour cerebri)	Cholelithiasis Liver steatosis/non-alcoholic fatty liver
	Gastro-oesophageal reflux
Endocrine	**Cardiovascular**
Insulin resistance/impaired glucose tolerance Type 2 diabetes Menstrual abnormalities Polycystic ovary syndrome Hypercorticism	Hypertension Dyslipidaemia Fatty streaks Left ventricular hypertrophy
Other	
Systemic inflammation/raised C-reactive protein	

Current global prevalence of childhood obesity

Overweight data for children from selected countries in each region are shown in Table 2. All the data is based on overweight (including obesity) using the IOTF cut-off.[2] Data available to the authors for 55 countries around the world can be found in Appendix 8, Table 1. The highest figures in overweight and obesity are found in the WHO Americas Region, the Eastern Mediterranean Region and the European Region, with the lowest rates in the Africa Region.

Table 2: Childhood prevalence (% of population) of overweight (including obesity) in selected countries, by WHO region using IOTF definitions

	Year of survey	Age (years)	Boys	Girls
WHO Africa Region				
Algeria	2003	7–17	6.0	5.6
Mali	1993	5–17	0.2	0.5
South Africa	2001–4	6–13	14	17.9
WHO Americas Region				
Brazil	2002	7–10	23.0	21.1
Chile	2000	6	26.0	27.1
USA	2003–2004	6–11	31.7	37.5
WHO Eastern Mediterranean Region				
Bahrain	2000	12–17	29.9	42.4
Iran	1995	6	24.7	26.8
Saudi Arabia	2002	5–17	16.7	19.4
WHO European Region				
Czech Republic	2001	5–17	14.7	13.4
Portugal	2002/3	7–9	29.5	34.3
Spain	1998–2000	5–16	31.0	19.5
England	2001	5–17	21.8	27.1
WHO South-East Asia Region				
India	2002	5–17*	12.9	8.2
Sri Lanka	2002	10–15	1.7	2.7
Thailand	1997	5–15	21.1	12.6
WHO Western Pacific Region				
Australia	1995	7–17	21.1	21.3
China	1999–2000	11, 15	14.9	8.0
Japan	1996–2000	6–14	16.2	14.3
New Zealand	2000	11, 12	30.0	30.0
*5–15 for girls				

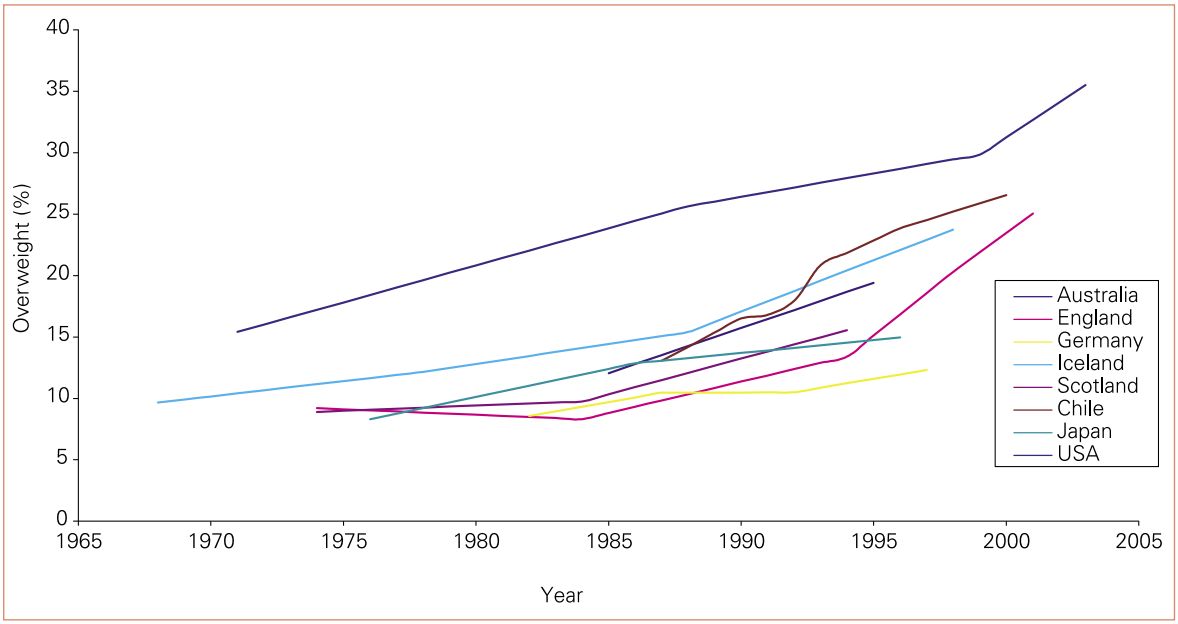
Self-reported data: a health warning

As with adults, care should be taken when interpreting self-reported data. The extent to which children under or overestimate their heights and weights when asked to self-report is not as clear as for adults. However, generally, those who are overweight tend to underestimate weight and overestimate height. It should be noted that, in a study in Saudi Arabia, 60% of the children did not know their height or weight and, in a study in Spanish adolescents, high BMI was underestimated by over 30%. A summary of the findings from self-reported vs measured studies is included in Appendix 8, Figures 1–3.

Obesity, then and now

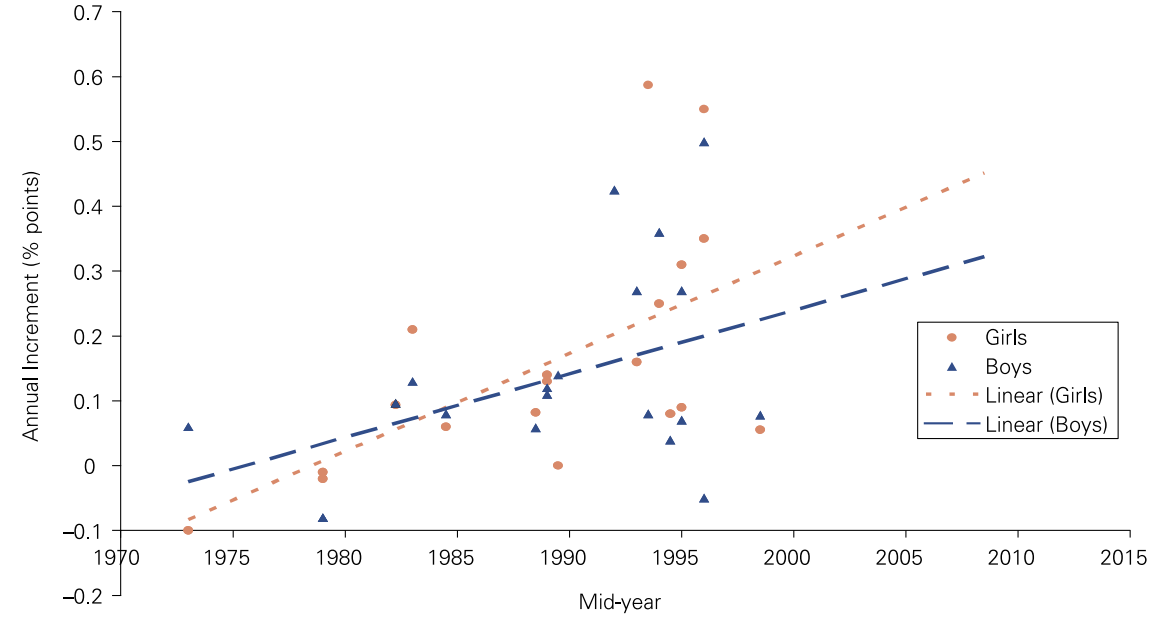
In children, rising obesity rates are of even greater concern than they are in adults. Figure 1 shows increasing rates of overweight (including obesity) from selected countries around the world.

Figure 1: Increasing childhood overweight in children from selected countries around the world



Not only is the prevalence of overweight and obesity among children rising in the European region, but the annualised rates of increase are themselves increasing, as shown in Figure 2.[4] Unless action is taken to counteract these trends, by the year 2010 the European Union (EU) can expect to see the numbers of overweight and obese children rising by approximately 1.3 million children per year, of which the numbers of obese children will be rising by over 0.3 million per year.[4]

Figure 2: Annualised change in prevalence rates of obesity among children (EU25), projected to year 2010



Further data on annualised changes in prevalence of overweight in children from around the world can be found in Appendix 8.

Table 3 demonstrates current estimates in the prevalence of overweight and obesity in children, including projections for 2010 by WHO region.

Table 3: Current estimates in the global prevalence of overweight and obesity in children and adolescents, by WHO region, with projections to 2010

	Projected 2006		Projected 2010	
WHO region (dates of most recent surveys)	**Overweight, including obesity (%)**	**Obesity (%)**	**Overweight, including obesity (%)**	**Obesity (%)**
Americas (1988–2002)	40.0	13.2	46.4	15.2
Eastern Mediterranean (1992–2001)	35.3	9.4	41.7	11.5
Europe (1992–2003)	31.8	7.9	38.2	10.0
South-East Asia (1997–2002	16.6	3.3	22.9	5.3
West Pacific (1993–2000)	20.8	5.0	27.2	7.0

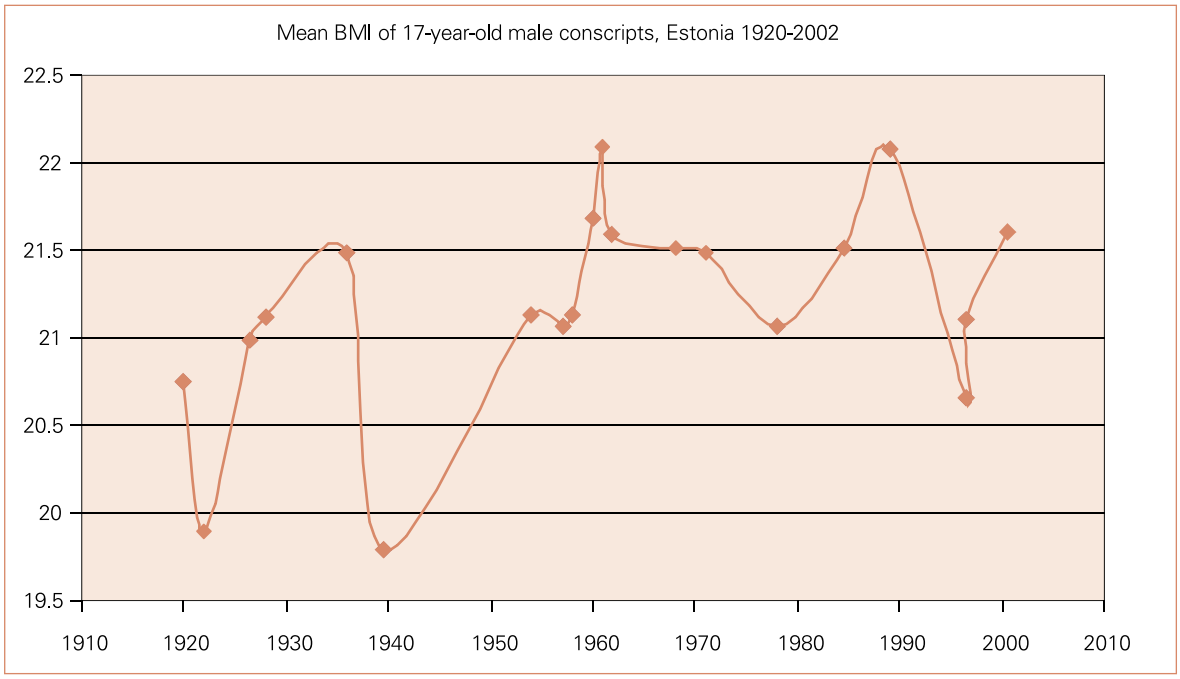
*There were insufficient data on school-age children in the WHO Africa Region to make estimates of projected prevalence rates.
Source: Adapted from Wang and Lobstein.[5]

Decreasing prevalence

When economic development suffers a reversal, as witnessed in some eastern European economies and in the Russian Federation during the late 1980s and early 1990s, child overweight levels may actually show decreasing prevalence. A study of children's body height and mass in Poland from 1930 to 1994 indicated that the lowest values for both traits were found after the Second World War (1948–9), increasing to the end of the 1970s, and falling again during the recession of the 1980s. When the economy recovers, the prevalence of overweight and obesity can increase sharply.[6]

Figure 3 shows the rise and fall of mean BMI in male adolescents in Estonia, sampled at the age of conscription into military service (age 17). Although this sample can't be considered representative of the whole Estonian population, it can provide an indication of what was happening to at least a section of the population as the economic conditions changed. The BMI levels appear to follow national economic fluctuations: a reduced BMI during the Second World War is followed by two decades of rising BMI, and a fall during the recession years of the mid-1970s to mid-1980s. The fall in BMI at the end of the 1990s may relate to possible changes in conscription selection procedures.

Figure 3: Mean BMI of 17-year-old male conscripts, Estonia 1920–2002



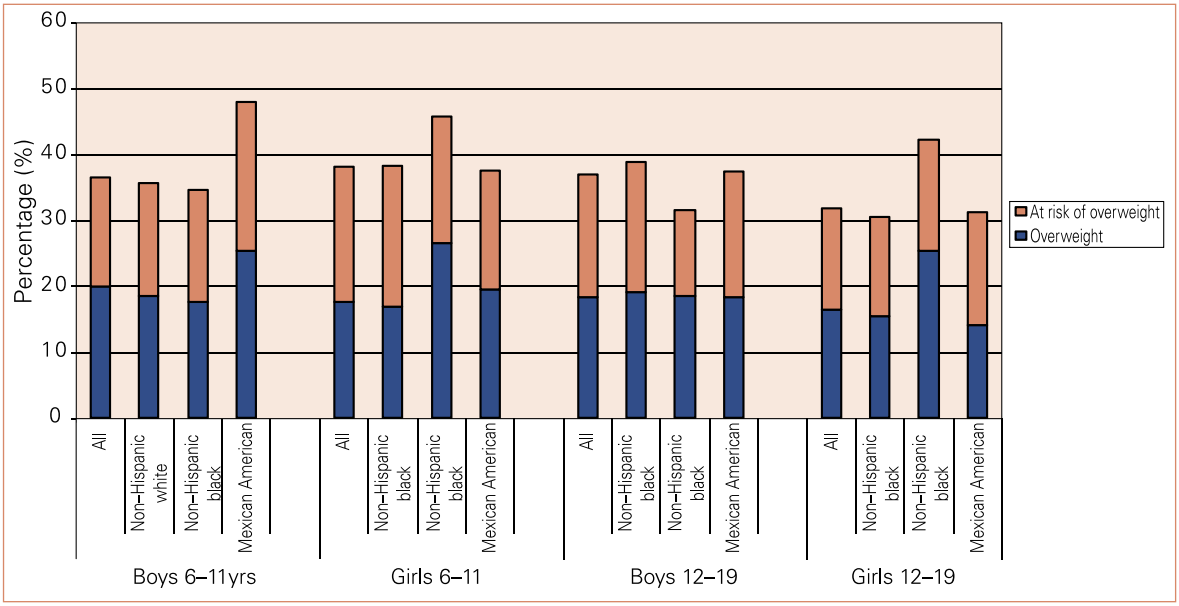
Risk factors

Risk factors are discussed extensively in Part 1 on adult obesities. Many, such as geography and socioeconomic status of the family, impact on children. Ethnicity is also an important risk factor.

A recent study by Wardle et al. found strong evidence to link ethnicity, overweight and obesity in English girls. They found that the prevalence of overweight in Afro-Caribbean girls was almost double that of white girls and that this effect persisted over the total duration of the study (five years).[7]

In the USA, the high prevalence of 'at risk of overweight' and 'overweight' is apparent in girls (in both the 6–11 and 12–19 age groups). Perhaps surprisingly, the situation is reversed in boys. Figure 4 shows that black non-Hispanic boys have lower rates of 'overweight' and 'at risk of overweight' than other groups. This highlights the requirement for policies to take into consideration the risks to and needs of different population groups.

Figure 4: Prevalence of 'at risk of overweight' and 'overweight' in US children and adolescents



Consequences of obesity

Children are increasingly being diagnosed with obesity-related co-morbidities. In a recent study, it was estimated that in the EU (i.e. EU25) over 20,000 children have Type 2 diabetes and more than 400,000 have impaired glucose tolerance, as shown in Table 4.[8] The study concluded that the issue of childhood obesity was a public health issue rather than a health service issue. Emphasis needs to be switched from treatment to large-scale population-wide prevention. Both 'downstream' (school, home and neighbourhood environment) and 'upstream' (policies for food supplies, marketing etc.) measures need to be taken.

Table 4: Minimum estimated numbers of children in EU25 with obesity-related disease indicators within specified age groups

	Lowest likely prevalence among obese children (%)	Lowest likely number of obese children affected in EU25 (million)
Raised triglycerides	21.5	1.09
Raised total cholesterol	22.1	1.12
High LDL cholesterol	18.9	0.96
Low HDL	18.7	0.95
Hypertension	21.8	1.11
Impaired glucose tolerance	8.4	0.42
Hyperinsulinaemia	33.9	1.72
Type 2 diabetes	0.5	0.027
Metabolic syndrome (3+)*	23.9	1.21
Metabolic syndrome (4+)* (age 10–17.9 years)	4.6	0.13
Hepatic steatosis	37.9	1.42
Elevated aminotransferase	12.8	0.65

Notes:
1 There is considerable overlap in the numbers of obese children with the various risk factors.
2 Estimates are for 2006.
3 Age range is 5.0–17.9 years, unless indicated otherwise.
*Metabolic syndrome was defined as having a number of the following: hypertension, central adiposity, raised HDL blood cholesterol, raised blood triglycerides, raised blood-glucose levels.

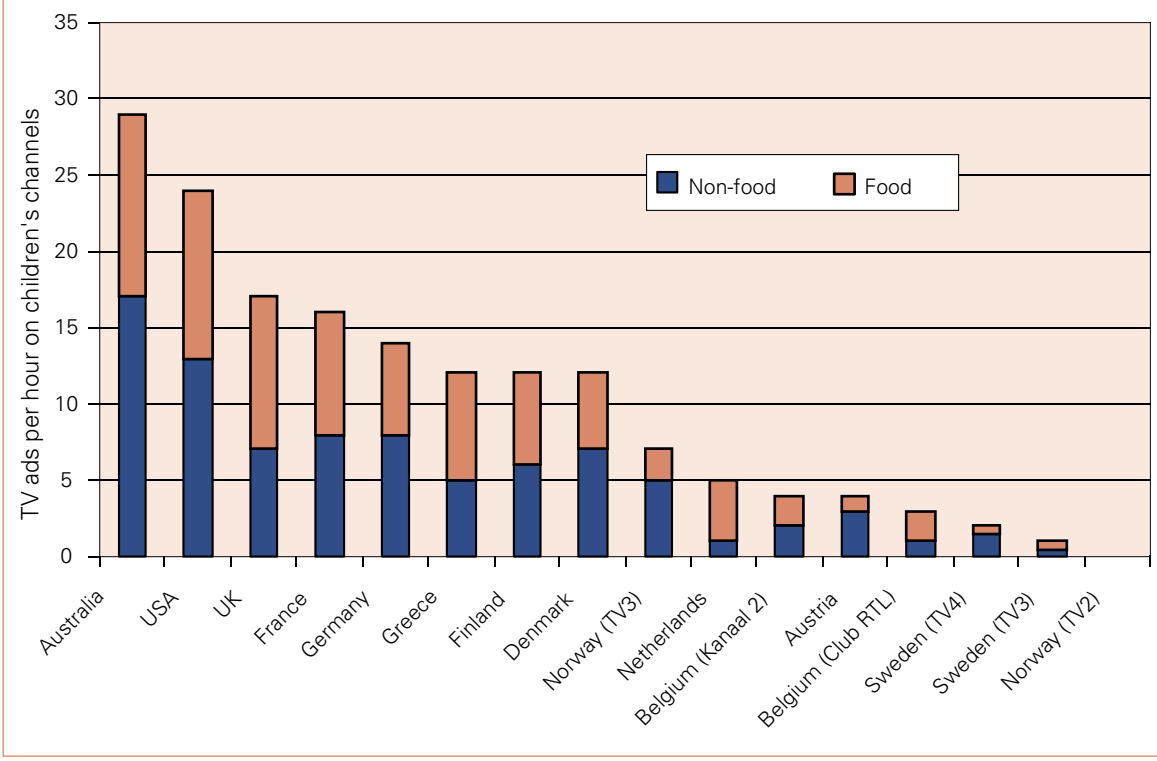
2 Drivers affecting obesity in children

An analysis of drivers affecting obesity appears in Part 1.

Diet and food marketing to children

The UK has one of the highest levels in Europe of TV food advertising directed towards children, although this is exceeded by countries such as Australia and the USA (see the comparative illustration in Figure 5). Furthermore, analyses of the prevalence of overweight among children in relation to the levels of children's TV advertising for calorie-rich foods indicate a significant correlation that is not found when comparing overweight prevalence with the advertising of healthier foods (Figures 6 and 7).

Figure 5: Comparison of the number of food and non-food-based advertisements shown during children's television programmes, by country



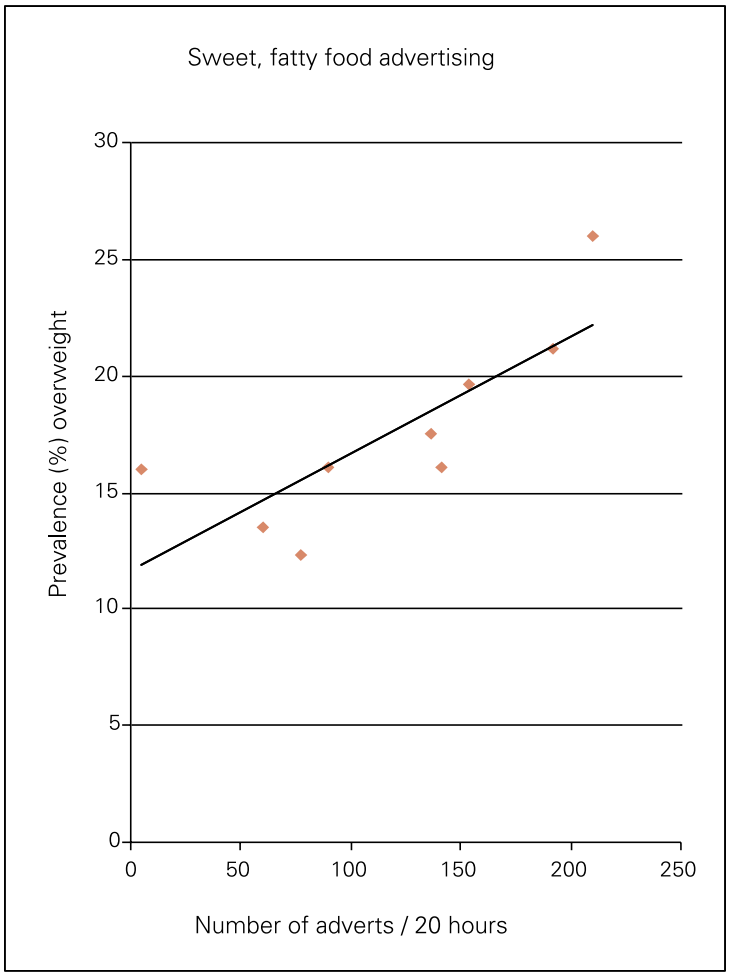
Note: Average number of advertisements per hour based on approximately 20 hours of children's television programmes over a seven-day period, Jan–Feb 1996.
Source: Dibb.[9]

Figure 6: Correlation between overweight in children and frequency of advertising for obesogenic items in seven EU countries, the USA and Australia

Association between numbers of adverts for sweet and fatty foods shown on children's television and the prevalence of overweight children in the population

Seven EU countries, USA and Australia

Correlation r=+0.86, p<0.005



Lobstein and Dibb, *Obesity Reviews* (6) 2005

Source: Lobstein and Dibb.[10]

Physical activity

Self-reported levels of physical activity among children in Europe were examined in the Health Behaviour of School-Aged Children survey of 2001–2002.[11] Overall, the survey found that approximately two-thirds of children were not achieving an hour's moderate activity per day on five or more days a week. Boys (40%) were more likely to achieve the target than girls (27%) and, for girls especially, the amount of physical activity declined between ages 11 and 15. The lowest levels of activity were found among children in Belgium (Flemish), Estonia, France, Italy, Norway and Portugal, with fewer than 20% of children meeting the target.

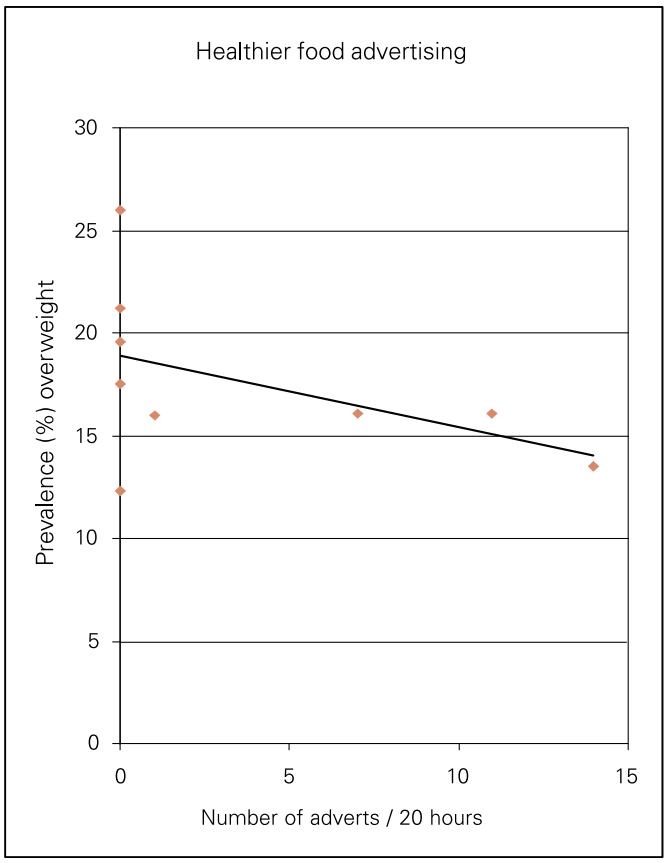
Self-reported activity among children indicates that significant numbers are achieving the recommended minimum levels of at least 30 minutes' moderately

Figure 7: Association between numbers of adverts for healthier foods shown on children's television and prevalence of overweight children in the population in seven EU countries, the USA and Australia

Association between numbers of adverts for healthier foods shown on children's television and the prevalence of overweight children in the population

Seven EU countries, USA and Australia

Correlation r= – 0.56, p<0.10



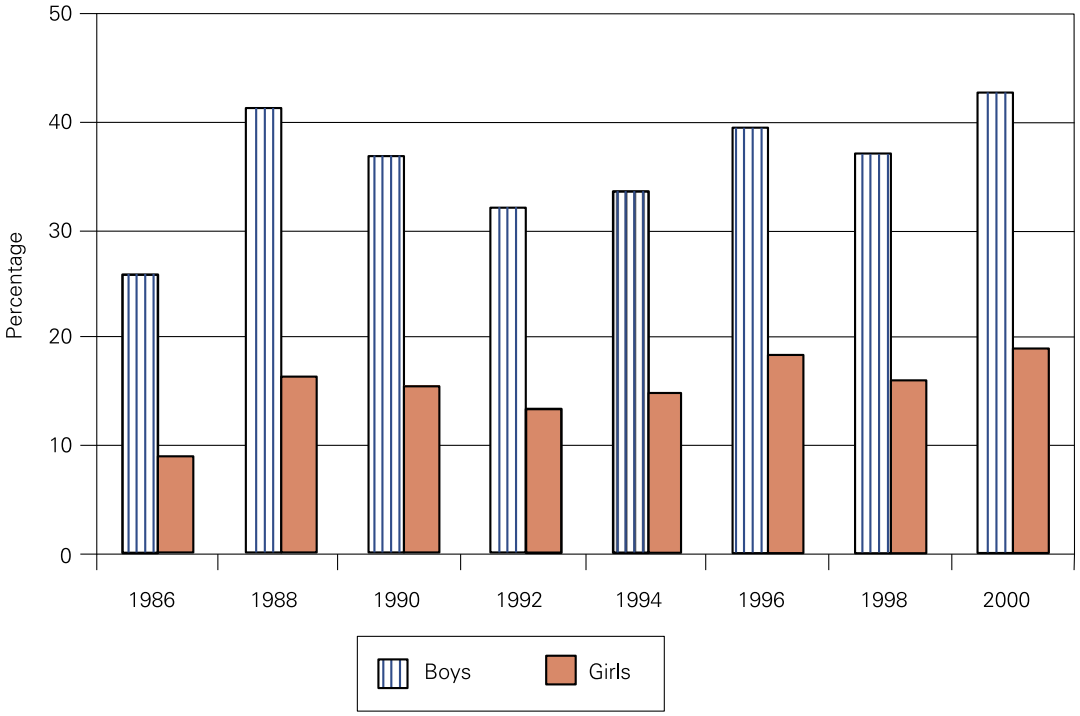
Lobstein and Dibb, *Obesity Reviews* (6) 2005

Source: Lobstein and Dibb.[10]

intense activity on at least five days per week. The survey of Health Behaviour in School-Aged Children[11] included samples from England, Scotland and Wales. Some 29% of girls and 48% of boys in England, 23% of girls and 38% of boys in Scotland and 18% of girls and 39% of boys in Wales are meeting the recommended activity levels.[12] (The children were aged 11–15 and were sampled in 2001–2002.)

The Welsh Assembly Technical Report on Young People reported on the percentage of children in Wales undertaking at least four hours of physical activity per week across the 14 years from 1986 to 2000.[13] School-based physical activity was not included. The results suggest no specific increase or decrease in out-of-school activity levels, and a similar lack of secular trends was found in terms of the proportion of children exercising on at least four occasions (time limit unspecified) outside of school (Figure 8).

Figure 8: Proportion of children in Wales exercising for at least 4 hours per week, 1986–2000



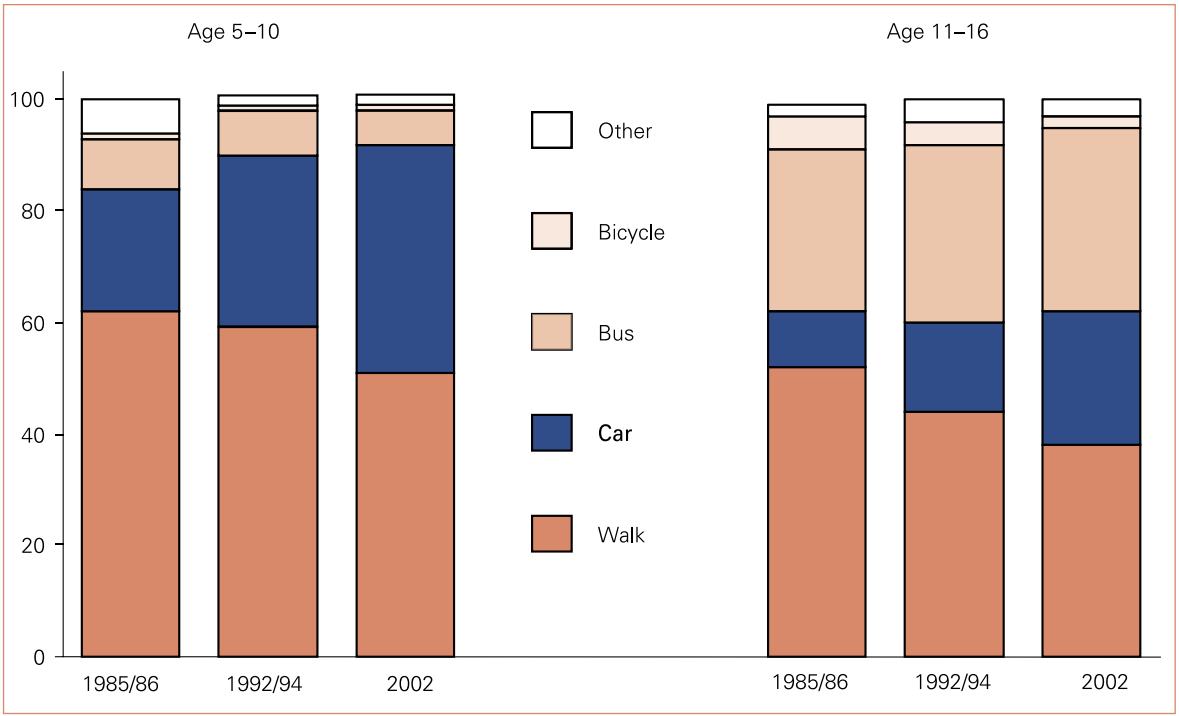
Source: Roberts et al.[13]

A 2000 survey of participation in out-of-school sporting activities showed a trend towards increased numbers of children becoming active in sport during the period 1994–1999,[14] rising from 36% to 45% of children, but the figure declined to 42% in 2002.[15]

School curricula in Britain are widely reported as having reduced the number of hours of physical exercise in the timetable since the 1980s, but there is some doubt as to whether this has a significant effect on children's overall activity levels. A comparison of the measured activity (using accelerometers) of children from three schools with very different timetabled exercise levels suggests that children compensate. Out-of-school activity levels for children in schools with low levels of timetabled activity fully compensated for the lost exercise.[16]

There is evidence that the proportion of primary- and secondary-level children walking or cycling to school has fallen in the last two decades (Figure 9). In both age groups, the proportion being driven to school by car has approximately doubled, although the total is still less than half of primary children and a quarter of secondary children.

Figure 9: Modes of transport to school: trends over three decades, 1985/6–2002



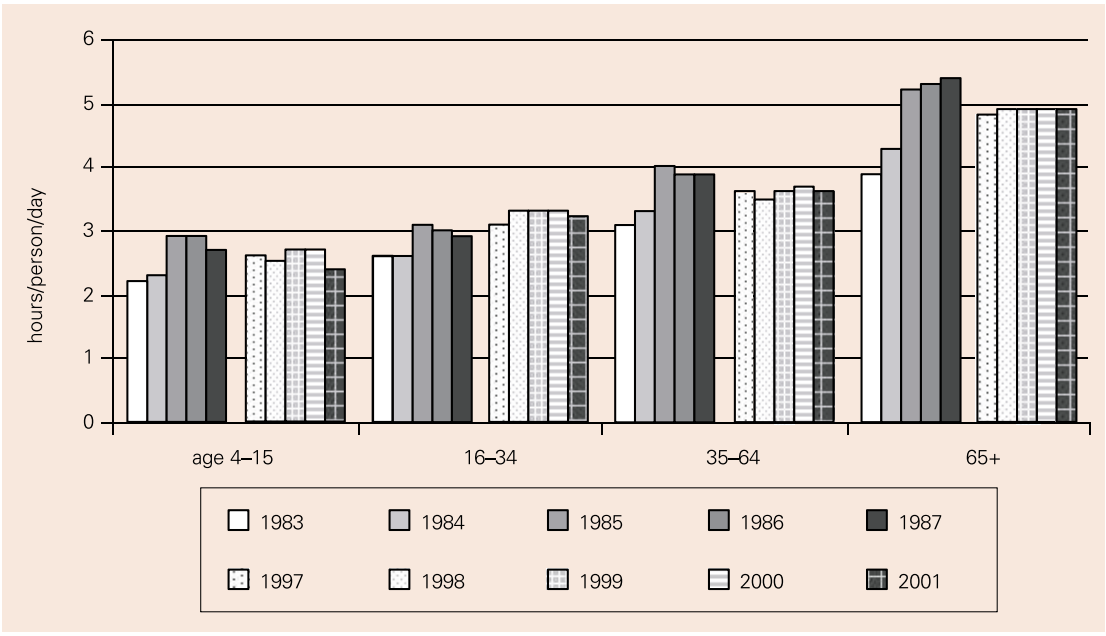
Source: Department for Transport.[17]

According to the UK 2000 Time Use Survey, British adults on average spend 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 spend 10.2 hours asleep, 2.3 hours watching TV, 1.1 hours eating and 1.2 hours on the other inactive behaviours.[18]

Using a different survey methodology, figures for television watching suggest an average adult spends 3.6 hours per day watching television (averaged across 1997–2001). This survey shows children to be watching about 2.6 hours per day (Figure 10).[19,20]

Trends in television watching indicate no significant increase in children's viewing hours since the early 1980s, when children aged 12–15 were recorded as watching 2.5 hours per day. This rose to 3.2 hours in the late 1980s with the advent of Channel 4 and increased daytime and breakfast broadcasting, but fell back to 2.6 hours and 2.7 hours for four-year-olds and 15-year-olds respectively in the early 1990s.[21] By the late 1990s, it remained at 2.6 hours per day.

Figure 10: Leisure-time broadcast television watching, 1983–1987 and 1997–2001, child and adult age groups

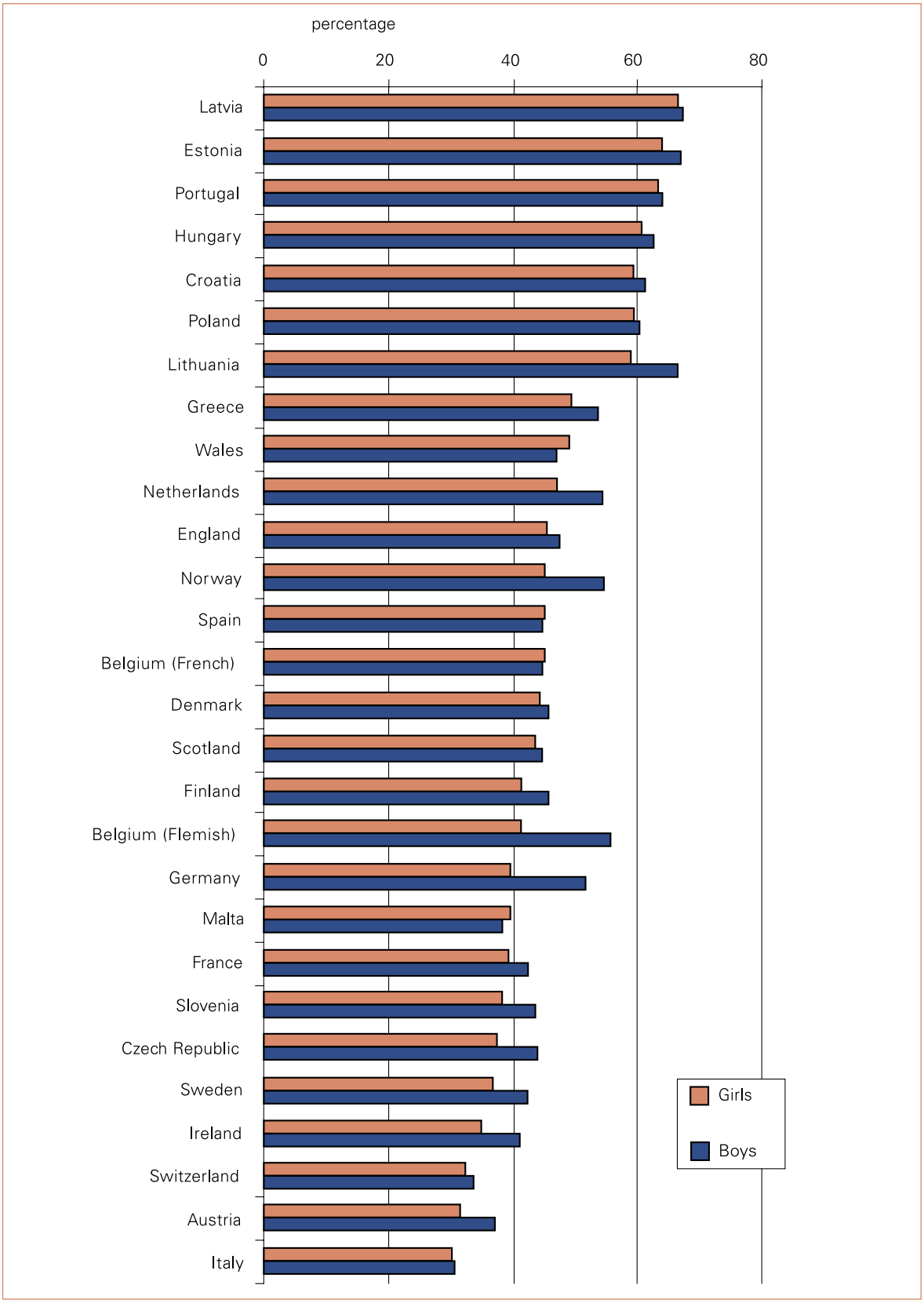


Source: Broadcasters' Audience Research Board;[19] *Social Trends*, 1985, 1989.[20]

In the multi-national survey of children's health behaviour, more than a quarter of all respondents (26%) reported watching television for four or more hours each weekday, rising to 45% of children watching four or more hours of television per day at weekends (Figure 11).[11] Countries and regions show little consistency between weekday and weekend viewing or between age groups, although Estonia, Latvia and Lithuania were consistently in the top quartile of television use, and Austria and Switzerland in the lowest.

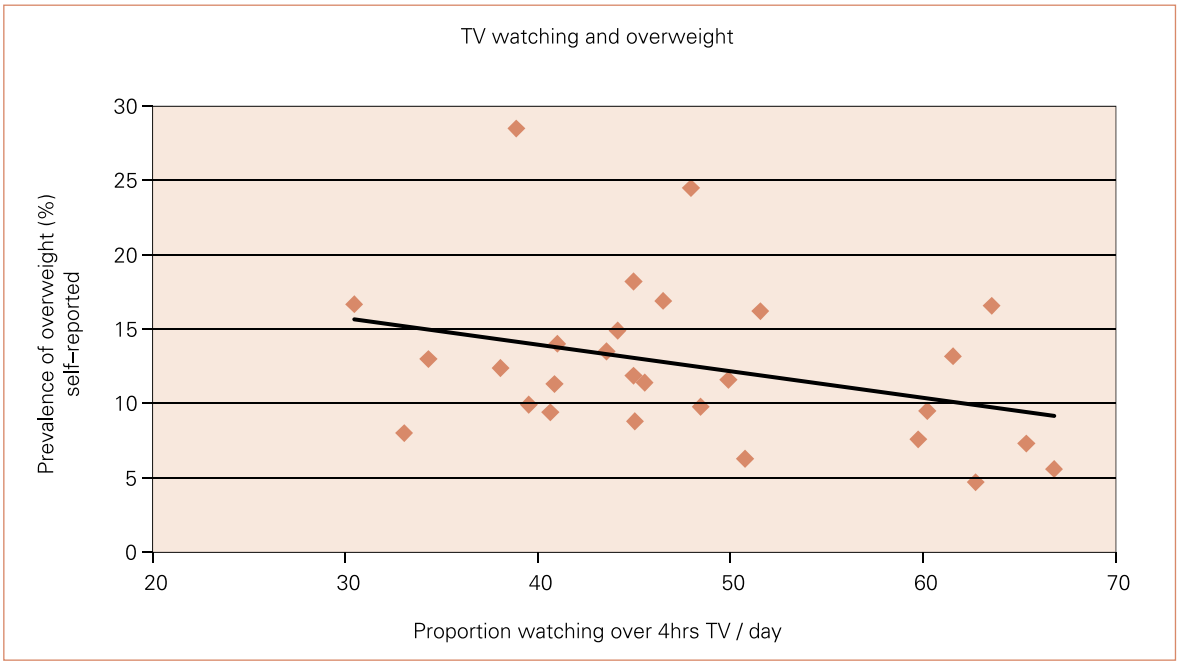
Comparisons of the proportion of children in a country reporting that they watched over four hours of television per weekend day, with a prevalence of overweight among those same children based on their self-reported weights and heights, shows no significant relationship (Figure 12). If anything, the children who watched most TV were slightly less likely to be overweight, but the trend was not statistically significant.

Figure 11: Percentage of children aged 13 watching four or more hours television each day on weekends



Source: HBSC survey.[11]

Figure 12: Prevalence of overweight and percentage of children viewing more than four hours' television per weekend day



Note: This analysis should be repeated using measured BMI rather than self-reported BMI.
Source: IOTF using HBSC survey.[11]

3 Existing policies to tackle child obesity

Examples of child-focused interventions are shown in Figure 13 (see also Table 5). There have been very few evaluations of interventions. The few that there have been are discussed in an overview of interventions written by the IOTF for the WHO ministerial meeting in November 2006.[22]

Figure 13: Examples of child-focused interventions to tackle obesity

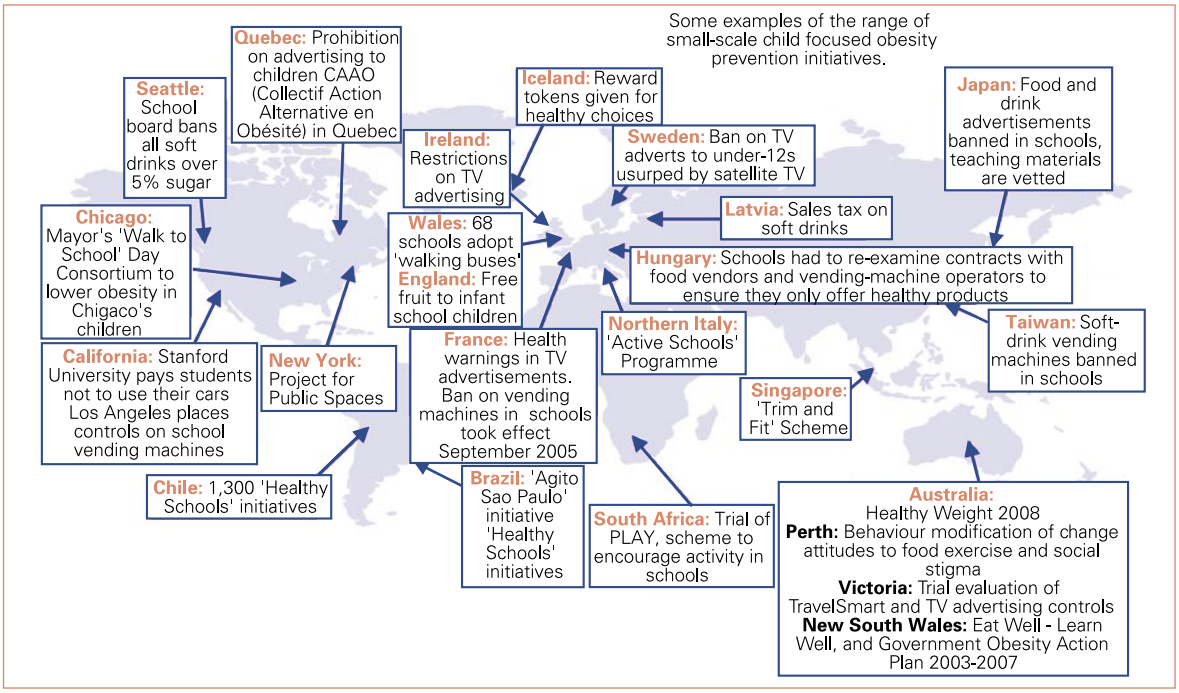


Table 5: Examples of unevaluated initiatives that may help prevent child obesity

Localised policies	Country
'1% or less': social marketing to reduce milk-fat intake	USA
Agita Sao Paulo Programme: promotion of physical activity	Brazil
Pricing policy on healthy foods in Minnesota	USA
'Water is Cool in School' project against soft-drink sales	UK
'Walking buses': active transport to school	UK
Child-Friendly Schools, safe food, safe play	India
Vending machines banned in schools	Taiwan, Japan
Nutrition standards for school food shops	Greece, Brazil
School food shops/canteens can't be run by fast-food chains	Greece

Table 5: Examples of unevaluated initiatives that may help prevent child obesity (*Continued*)

Localised policies	Country
School teaching: the mobile food museum	Mexico
School teaching: peer-led child-to-child health	Ecuador
Children Teach Parents, programme for health	Ecuador
Student Health Brigades, includes vegetable gardens	Ecuador
Rural Health Motivators for maternal nutrition	Swaziland
Heart-Healthy Lunches in kindergartens	Canada
Healthy Heart Awards for kindergartens	New Zealand
Fruit and vegetable eating will help get school swimming pool	UK
School milk bar replaces vending machines	UK
'Let's Beat Diabetes' cycleways, paths and parks programme	New Zealand
'Ever Active' school sports programme	Canada
Breakfast for Learning, nutrition in schools project	Canada
Collectif Action Alternative en Obésité	Canada
'Reach for the Moon' game for cardiovascular teaching	Canada
Nutrition and Activity Awards, $2,000 to Healthy School Zones	USA
Project LEAN for schools, with 'Bright Ideas' suggestions zone	USA
Supermarkets provide activity areas while parents shop	Sweden, Cambodia
Companies give advice to employees about their child's overweight	Switzerland
15-minute work-out for school staff and pupils every morning	Cyprus
Subsidised use of sports centres for local schools	Hong Kong, UK
Sport Waikato 'Teddy Bear' project for fitness in under fives	New Zealand
Children leaving schools in cars must stay back 10 minutes	Wales (UK)
Population-wide policies	**Country**
Nutrition standards for school meals	Japan, Scotland, Crete
Monitoring authority for commercial material in schools	Germany
Six-a-day programme to promote fruit and vegetable intake	Denmark
Fighting Fat, Fighting Fit, TV campaign	UK.
Controls on TV advertising to children	Sweden, Greece, Ireland
Tax on adverts for soft drinks	France
Ban on vending machines in schools	France
Ban on junk food in schools	Latvia
Review of sales, restriction on unhealthy foods and promotion of healthy foods in schools (2006)	Hungary

Table 5: Examples of unevaluated initiatives that may help prevent child obesity (*Continued*)

Population-wide policies	Country
Maternal leave to promote breast-feeding	Norway, Sweden
Baby Friendly Hospitals promoting breast-feeding	1,000 hospitals in India
Ban on advertising unhealthy foods near schools	Brazil
Sales tax on sweet or fatty food (proposed)	Switzerland
Sales tax on 'luxury' foods	UK
Review use of colouring additives in energy-dense foods	Cambodia

Source: IOTF, material collected 2004–2005.

Within the school setting, reviewers have suggested that a 'whole school' approach is most likely to be successful. This includes meal services, other foods available, classroom health education, branded products and sponsorship in the school, activity in the curriculum and activity opportunities during break times, after-school opportunities and the involvement of parents and pupils in school policy development.

In respect of child obesity, nearly all proposals include educational material for parents and children, along with school-based programmes for improving children's health and nutrition knowledge, improving the provision of foods available in the school (either by broadening choices to include more healthy items or restricting the availability of unhealthy items) and increased physical activity classes.

However, such policies, which act directly on children's immediate environments, represent downstream or localised solutions that are designed to act on individual children or children in school classes. In the reports discussed below, recognition is also given to the role of upstream, society-wide or population-based approaches that tackle obesogenic influences at an earlier stage in the causal pathway. These population-based approaches are considered further here.

International Obesity TaskForce

Following an expert meeting in Prague, 2004, the IOTF published a document identifying around 80 proposals for preventing child obesity.[23] The options were categorised into policies relevant to the European Commission, those relevant to national governments, those for the food production, catering and retailing sectors, those for local governments and local school services.[24]

Specific proposals at national and international levels included those listed in Table 6.

Table 6: Selection of IOTF proposals for prevention of child obesity

European Commission options

- Appoint an EC public health co-ordinator to oversee a comprehensive cross-departmental obesity prevention strategy engaging member states, civil society and business as part of a new public health programme.
- Establish an independent public health agency to monitor progress on the prevention of obesity, diabetes, cardiovascular disease and cancers, with powers to inspect the implementation of, and compliance with, prevention policies and to propose regulatory measures.
- Require health and obesity impact statements in all Commission policies (including agriculture, trade, education, media, transport).
- Introduce measures to control the marketing to children of foods with high energy density.
- Introduce a simplified food labelling scheme with clear symbols warning of high energy density, and extend food labelling requirements to include catering establishments.
- Review the technological need for organoleptic food additives (e.g. colourings and flavourings) used in energy-dense children's food products.
- Support member state initiatives to educate and inform parents and children about healthy lifestyles, and support healthy infant feeding practices and the promotion of breast-feeding.

Member state governmental options

- Develop national nutritional targets, and develop food standards to help industry meet those targets.
- Conduct health audits of commercially sponsored materials for schools, clinics etc.
- Support moves to make public sector catering the 'gold standard' for healthy eating.
- Ensure that school inspection criteria include appraisals of school health programmes, including food provision, physical activity provision, health and nutrition education.

Fiscal controls and market regulation options

- Consider the application of sales taxes and other fiscal measures to support national nutrition targets, e.g. adding taxes to energy-dense foods, and use the revenue from these taxes to support measures for obesity prevention and health promotion.
- Consider the application of levies to recover the production subsidies for oils, sugars and dairy fats given under the Common Agricultural Policy.
- Subsidise the distribution and marketing of fruit and vegetables to children, and review tax exemptions given to the marketing of energy-dense foods to children.
- Use public procurement contracts to encourage a sustainable and expanding market for healthier food products.

Further options are detailed in Lobstein and Baur.[23]

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