

# WORKING P A P E R

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## An analysis of the economic, social and environmental impact of the rising prevalence of overweight and obesity in the European Union

Inception report

MAUREEN LANKHUIZEN  
WIJA J. OORTWIJN  
JONATHAN CAVE  
FLAVIA TSANG

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## Preface

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The European Commission, Directorate-General Health and Consumer Protection (DG SANCO) has asked RAND Europe to contribute to the Commission's impact assessment of the Communication on nutrition and physical activity strategy that will be published in spring 2007. This Communication sets a comprehensive approach to reduce the prevalence and incidence of diet and physical activity related conditions (such as diabetes, cardiovascular disease, cancer etc).

This inception report first examines the nature and extent of the problem posed by diet and physical activity related conditions in Europe, which provides the rationale and focus for the associated policy initiative. Next, we develop a conceptual approach that discusses how diet and physical activity is linked to macroeconomic development. This approach is then used to examine the future impacts of a successful policy on a number of aspects. The results of this examination will then be applied to a comparison of the four policy options.

The primary audience for this report is DG Health and Consumer Protection of the European Commission, which is responsible for drafting the proposed Communication. However, the report may also be of interest to the wide variety of stakeholders that are affected by the Communication, such as other DGs of the Commission (e.g. DG Enterprise), the food industry, consumer associations, and special interest groups.

This report is completed, and has been peer-reviewed in accordance with RAND's quality assurance standards (see <http://www.rand.org/about/standards/>).

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## CHAPTER 1 **Introduction**

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### 1.1 **The problem of physical inactivity and unhealthy diet**

Industrialization, urbanization and mechanized transport have reduced physical activity, even in developing countries. This poses significant health risks. Physical inactivity has become the second most important risk factor for ill health, after tobacco smoking, and is related to about 2 million deaths per year worldwide in industrialized countries (WHO, 2002). Obesity-related diseases such as coronary heart diseases, diabetes, hypertension, and overweight are the main prevailing conditions arising from sedentary lifestyles (Wen et al, 2005). This is both an aggregate and a specific problem; the incidence of adverse health impacts is unevenly spread across the population along lines of gender, ethnicity, income, education, regional location, etc.

These problems arise in large part from changing social conditions. Patterns of physical activity have changed as a result of increased availability of powered transport, changes in economic geography and changes in levels and nature of activity associated with employment and leisure. Key influences on diet have been the introduction of new products, increasing scarcity of time for obtaining and preparing food, and changes in food economics. Increased concentration and global competition in food value chains has driven price competition, the increased use of fats and other nutritionally-suboptimal additives, intensive agriculture, etc. There have also been 'lifestyle' changes in demand for fast food, smoking and drinking. In addition to such direct influences on activity and diet, social and market forces operate directly on weight; the growing weight-loss industry, the emergence of 'technological' (biomedical) approaches to overweight and obesity, and – perhaps most critically – changing attitudes towards body image among key vulnerable groups.

The alarming severity of the health effects and the great costs of fighting obesity-related diseases increased international awareness for cost-effective prevention strategies. In line with this, the European Commission is working towards a comprehensive nutrition and physical activity strategy to reduce the prevalence and incidence of obesity-related conditions by improving the diet and increasing physical activity. This will improve health outcomes and increase healthy life years and in turn contribute to higher productivity and sustainable economic development in the EU in line with the Lisbon Strategy objectives.

### 1.2 **The proposed policy**

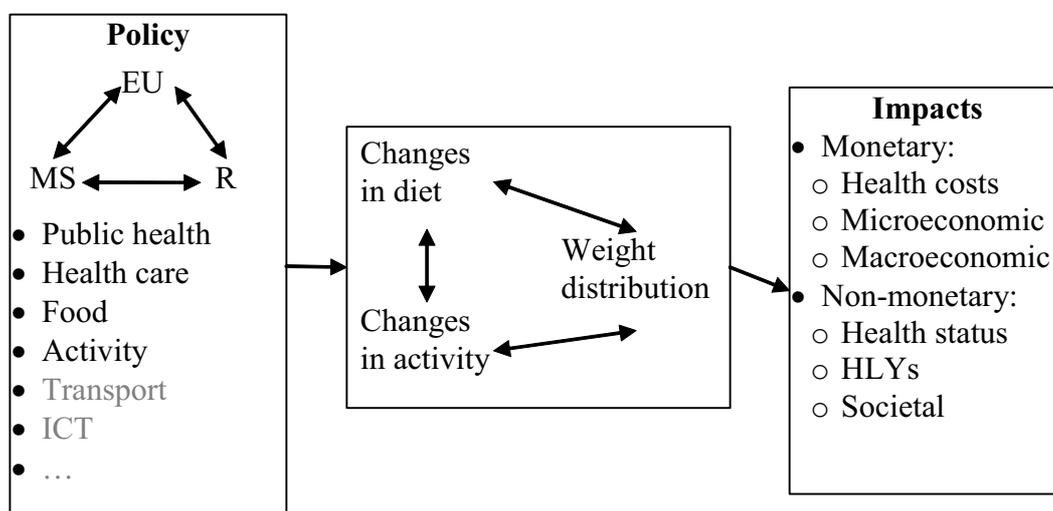
There is at present little in the way of unified or coherent policy, despite the fact that the drivers and impacts of obesity cross policy, (economic) sectoral and government (regional, national, international, private sector) domains.

Among the most important policy domains are: education, health care; public health; food; and physical activity.

Existing policies (and policy evaluations) at national level do more to document problems than to capture or share good practice – because the record of success is modest at best. In particular, they appear highly fragmented, leaving open the possibility that integrated strategy at EU level could improve information exchange and initiate or support coordinated action across policy domains, sectors and jurisdictions, which might succeed where more closely-delimited policies have, frankly, failed. Even granting the need for such a strategy, the merits of different modes of action (co-ordinating policies across domains, direct legislation, facilitating industry self-regulation) are unclear.

In order to evaluate the need for such a strategy and the cost-effectiveness of different options, there is a need to: take stock of current evidence; develop an evidence-based mechanism for exploring policy impacts; and evaluate some exemplary scenarios and policies.

The following simplified ‘process model’ underpins the evaluation framework – in the “Policy” box, the diagram shows links among EU, Member State (MS) and Regional levels of governance (R).



**Figure 1: Overall process framework**

This simplified model captures the main evaluation domains, but does not fully describe the roles of key parties. These are shown in the following figure.

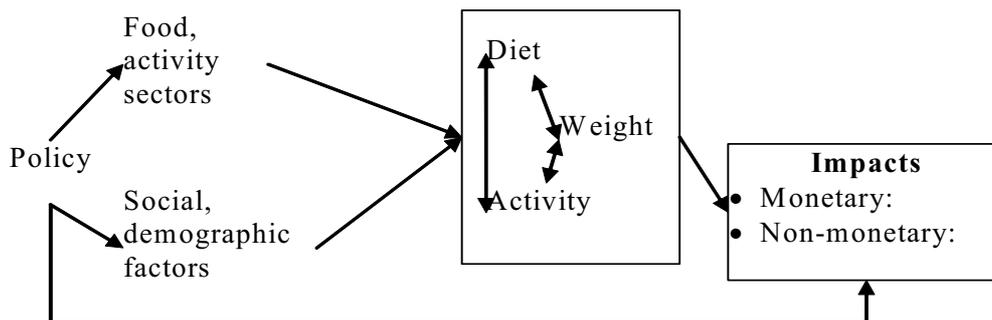


Figure 2: Key entity map

### 1.3 Objectives and scope

Currently, there is no existing comprehensive nutrition and physical activity strategy and related policy document in the European Union. The Commission is planning to publish a White Paper on a comprehensive nutrition and physical activity strategy in spring 2007. The main strategic objective is to reduce the prevalence and incidence of conditions related to diet and physical activity. A secondary aim is to reduce costs associated with these conditions, improve overall economic productivity and sustainability throughout the EU and ultimately to increase both the economic, physical and quality of life aspects of citizens' welfare in line with the Lisbon Strategy.

For this purpose, the Commission is conducting an *ex ante* impact assessment of a comprehensive and unified strategy document relating to diet and physical activity. The Commission has asked RAND Europe to support the impact assessment by conducting an evaluation of a range of possible futures that might result from four specific strategic options:

- Option A:* Maintenance of status quo
- Option B:* A strategy at Community level along traditional lines, i.e. which seeks to further develop, and set within a clear framework, Community level actions in the field of nutrition and physical activity. Measures could include, inter alia:
- Bringing coherence as far as possible to existing Community policies from an obesity perspective (Here there already encouraging initiatives: AGRI interest to reform of Fruit and Vegetables CMO, and developing policy coherence between public health and the policies of EAC and TREN)
  - Revising relevant SANCO legislation, e.g. on of nutrition labelling.
- Option C:* A comprehensive nutrition and physical strategy that not only seeks to develop actions at Community level but which also aims to galvanise action at local and regional level within Member States, and through new channels that are not normally responsive or reachable using innovative approaches. This option comprises Option B + actions and develops new mechanisms to influence activity at national and local level, for example:
- Seek the development new forms of partnership with grassroots organisations
  - Seek new approaches to private actors willing to commit to supporting the Nutrition/PA agenda
- Option D:* Purely regulatory – i.e. nutrition labelling, restrictions on advertising to children etc.

The specific intervention logic is to improve diet and physical activity to halt or even reverse current adverse trends, which will in turn help attain broader economic, public health and welfare objectives. Thus the immediate focus is on the two right-hand-side elements of Figure 1 (above).

Because implementing the strategy entails use of a broad portfolio of interrelated and diffused activities, it requires a *common basis for quantifying changes in diet and activity*. The current evaluation is intended to provide this basis. In this sense, **obesity** is primarily an indicator that we will use in the evaluation. More specific, the evaluation will:

- Provide a summary and statistical analysis of trends in relation to: i) the prevalence and incidence of obesity; ii) the behaviourally-determined factors contributing to obesity (including nutrition patterns, food (energy) consumption, food supply and availability and spending patterns related to diet and activity; and iii) the differential impact of obesity on healthcare costs, macroeconomic (labour) productivity, and measures of health status (prevalence and incidence of selected diseases for which obesity is a risk factor, and change in health status)
- Combine these data with analysis of the market and behavioural aspects of diet and activity and a 'functional' description of policy options to develop a set of core indicators and an associated model for predicting and quantifying the effects of changes in diet and activity in terms of the specified impacts
- Use the data and model structure to project and interpret the impacts of policy in general (in other words, to quantify possible future scenarios that might be achieved through suitable policy options)
- Use the structure specifically to consider the cost-effectiveness of the concrete policy options specified in the box above.

#### 1.4 **Structure of the report**

<p><b>This report focuses on clarifying the definitional issues, assessing availability and quality of evidence, the methodological approach and the evidence strategy for the evaluation.</b></p>
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The second Chapter provides a description of the problem: definitions, current extent, important changes in drivers and policy making to tackle the rising trend of obesity in the European Union. Chapter 3 lays out the methodological challenges of ex ante impact assessment, our methodological approach, assessing different policy options in the area of nutrition and physical activity in terms of a) their effect on different stakeholders and b) impact on direct and indirect costs, and non-monetary impact.

## CHAPTER 2 **The problem of rising prevalence of overweight and obesity in the European Union**

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### 2.1 **Introduction**

The evaluation will be based on information gathered from databases, interviews, a workshop and documentary sources (press/internet, policy and peer-reviewed literature). In the following sections we specify the evidence found in the literature and databases to describe the problem of rising prevalence of overweight and obesity. We start with an overview of the definitions used in this report.

### 2.2 **Definitions**

Key definitions used in the evaluation are physical activity, diet, obesity and body mass index.

#### 2.2.1 **Physical activity**

Physical activity is defined as any body movement produced by skeletal muscles requiring energy expenditure (Casperson et al, 1985; National Institutes of Health, 1995). It encompasses physically intense activities but also moderate activities such as walking, cycling and climbing stairs. Research literature often makes the distinction between work, transport, domestic and leisure related physical activities. In the literature, it is mentioned that at least 30 minutes of regular, moderate-intensity physical activity on most days of the week 'is sufficient for cardiovascular/metabolic health, but not for all health benefits' (WHO, 2003).

Physical inactivity has become the second most important risk factor for ill health, after tobacco smoking. Coronary heart diseases, diabetes, hypertension, obesity (including overweight) are the main prevailing diseases arising from sedentary lifestyles (Wen et al, 2005). In the evaluation, we focus mainly on obesity. For preventing obesity, the recommendation is to conduct 60 minutes a day of moderate-intense activities (WHO, 2003).

#### 2.2.2 **Diet**

In this report we defined diet as food consumption, which is expressed in kilocalories per capita per day (WHO, 2003). This definition is often used for measuring and evaluating the evolution of the global and regional food situation.

### 2.2.3 Overweight and obesity

Overweight and obesity are both labels for ranges of weight that are greater than what is generally considered healthy for a given height (US Department of Health and Human Services, 2006). Obesity is an excess of body fat that frequently results in a significant impairment of health. The most significant consequences include hypertension and hyperlipidaemia (major risk factors), coronary heart disease, ischemic stroke, diabetes mellitus type 2, certain types of cancer, osteoporosis and psychosocial problems (De Jong et al, 2005).

### 2.2.4 Body Mass Index: indicator of obesity

The most commonly used indicator of obesity is the Body Mass Index (or BMI), a measure of body weight (in kilograms) divided by height (in metres) squared. The World Health Organization (WHO) has defined obesity as a BMI  $\geq 30\text{kg/m}^2$  (WHO, 2000). The threshold for normal weight is set at 18.5 - 24.9  $\text{kg/m}^2$ , that for overweight at 25 and over.<sup>1</sup> In the International Obesity Task Force (IOTF) EU Platform Briefing Paper (2005) it is mentioned that 'a WHO expert group has recommended that for Asian populations in a lower 'action point' of BMI  $\geq 23$  should apply in assessing weight and health status, given evidence of their vulnerability to heightened risk for related chronic diseases at lower BMI levels'.

Although a BMI  $\geq 30\text{kg/m}^2$  is the common definition of obesity, some (older) studies used different definitions. For instance, Colditz (1992) and Wolf and Colditz (1994), Lévy et al. (1995) use cut-off points of  $\geq 29\text{kg/m}^2$  and  $> 27\text{kg/m}^2$ , respectively. Still, in this study we adopt the definition of obesity as a BMI  $\geq 30\text{kg/m}^2$ .

## 2.3 Trends in obesity

A review of the prevalence of obesity by Millstone et al (2006) as part of the PorGrow project showed that there have been no cross-national surveys in Europe, with the exception of the WHO MONICA (Monitoring Cardiovascular Disease) project (1980-1995, sampling populations in 38 locations in 21 countries worldwide - [http://www.who.int/cardiovascular\\_diseases/en/](http://www.who.int/cardiovascular_diseases/en/)). In general, (health) surveys of national and sub-national samples are used to estimate prevalence of obesity. The most up-to-date and comparable figures are collated by the IOTF. The data is retrieved from the WHO non-communicable disease database for the years 1980-2005, differentiating between adults (males/females) and children (boys/girls).

From the historical data it can be concluded that rising trends in obesity exists for all countries and age groups. Figures 3 - 6 show trends in obesity prevalence in *adult male, adult females and children (boys and girls)* in EU-25 for the years 1990-2005 presented by the IOTF on their website (<http://www.iotf.org/database/TrendsInObesityPrevalence.htm>).

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<sup>1</sup> Note that there can be confusion about the use of the word 'overweight'. It may refer to all persons with a BMI of 25 or more, or it may refer only to those persons with a BMI between 25 and 29.99 (sometimes this is referred to as 'overweight non-obese' or 'preobese') (Millstone et al, 2006).

Figure 3. Adult male prevalence of obesity in Europe, 1990-2005

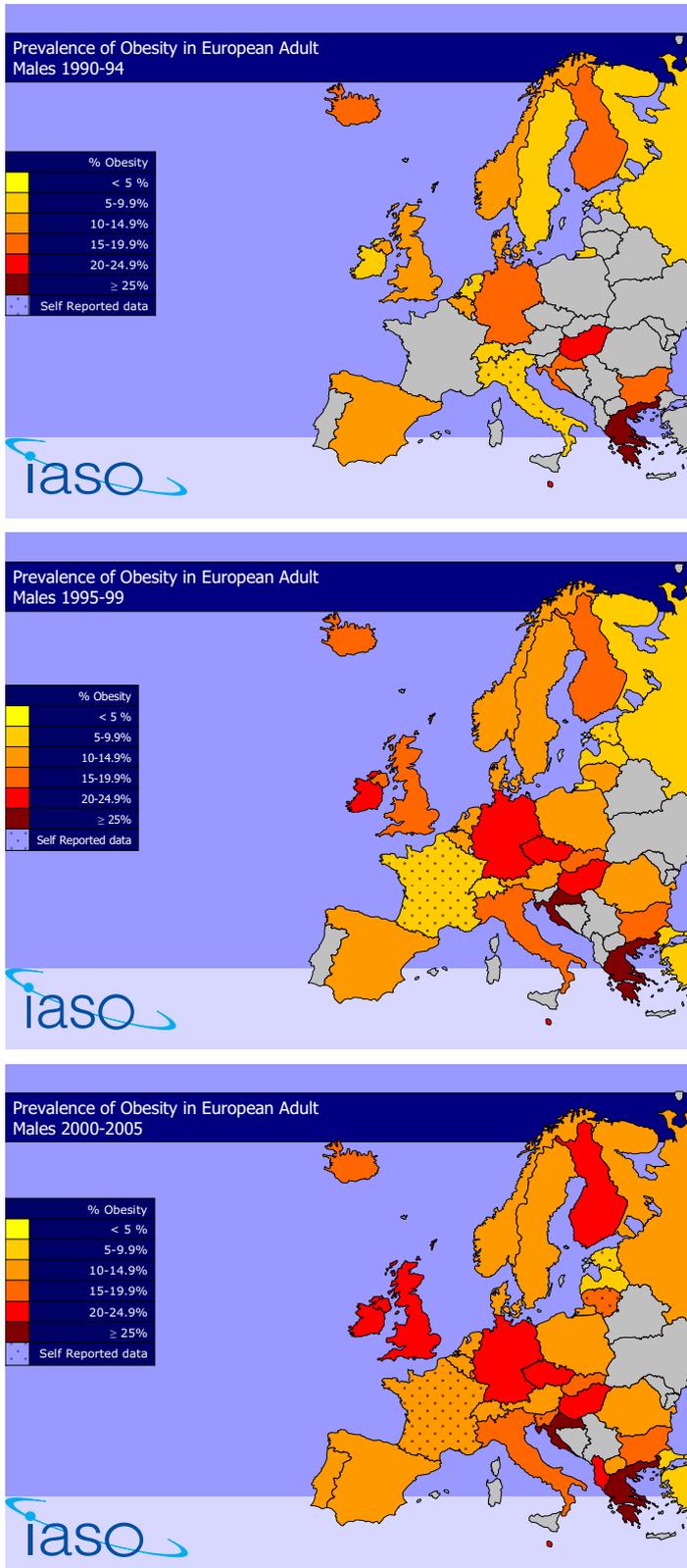


Figure 4. Adult female prevalence of obesity in Europe, 1990-2005

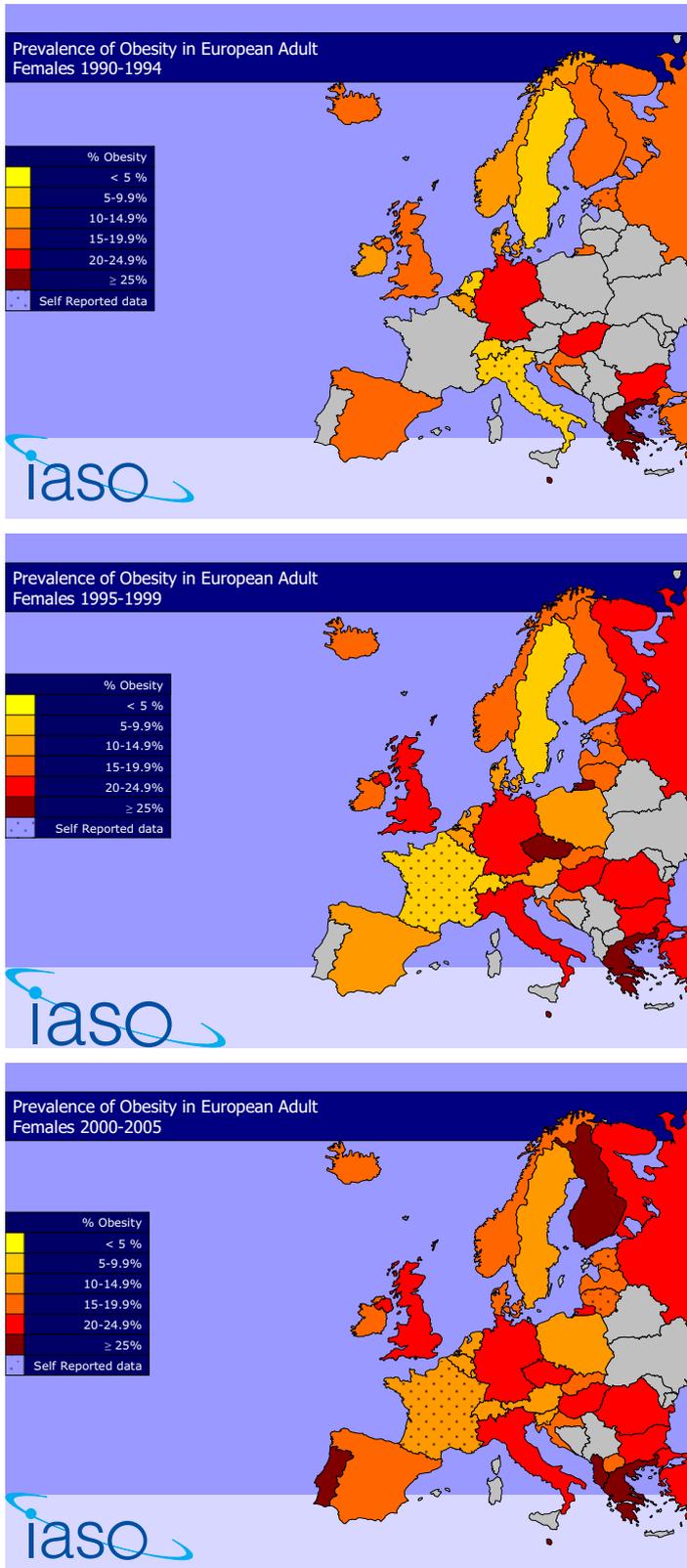
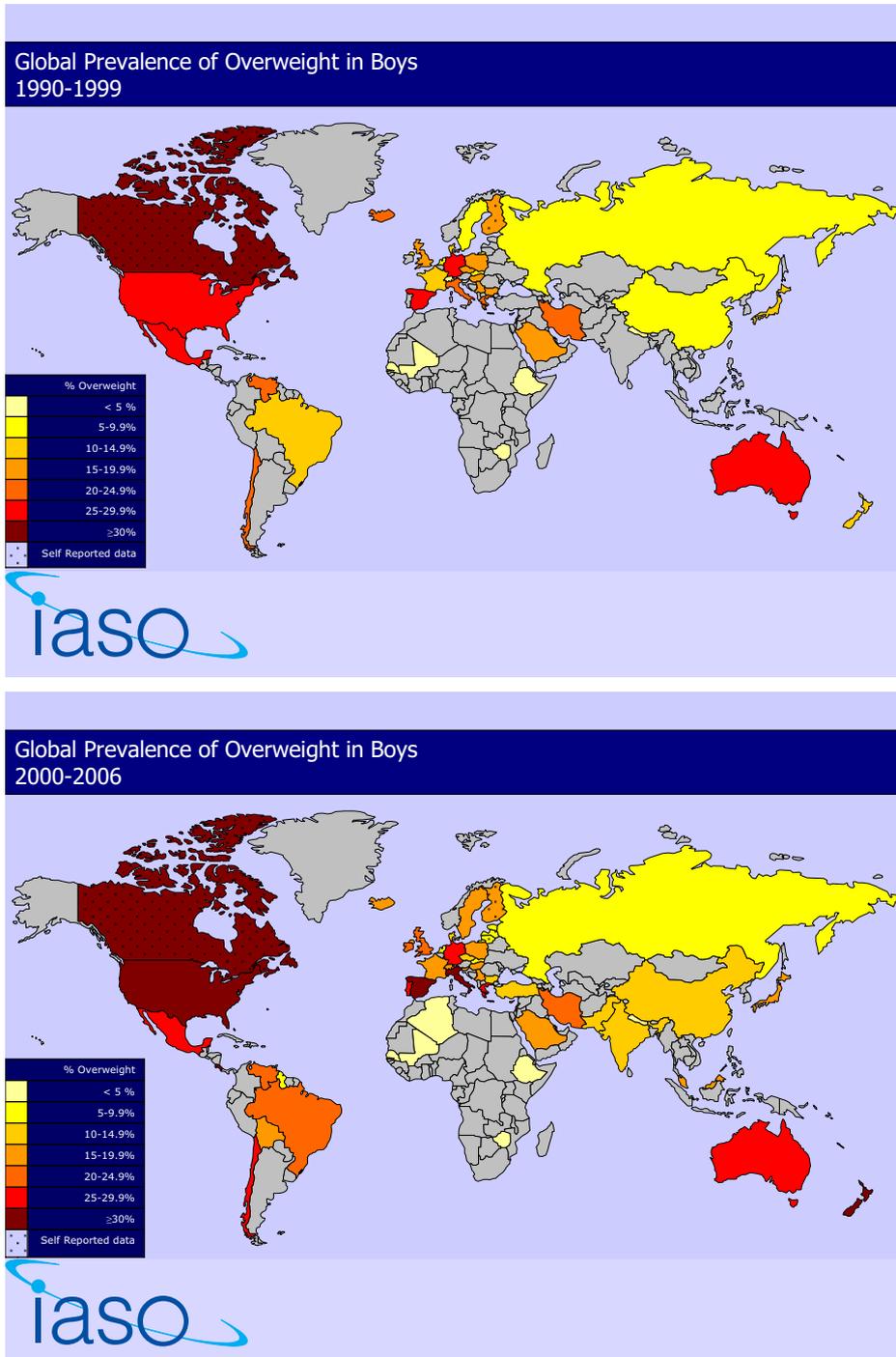
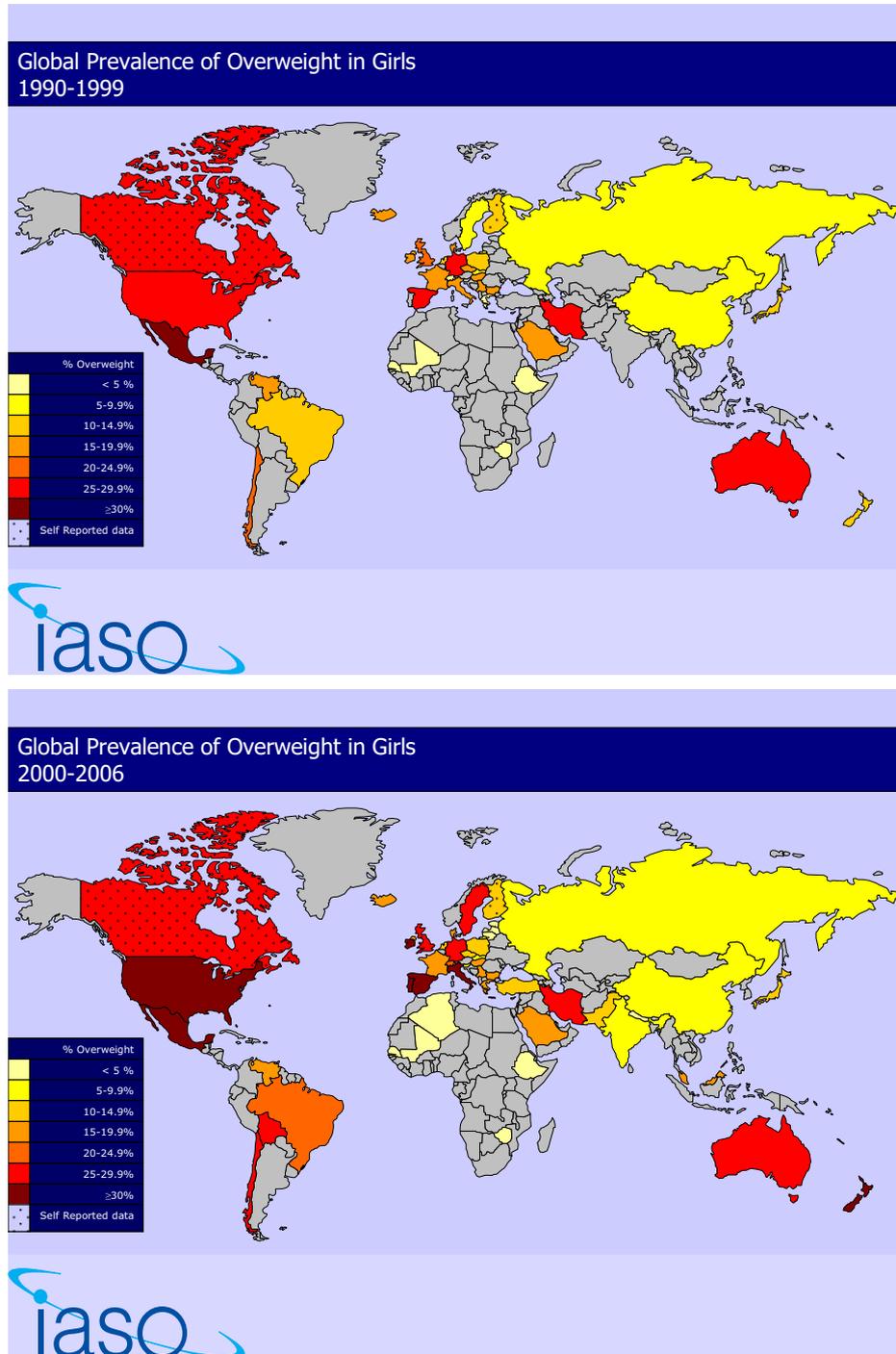


Figure 5. Children male prevalence of obesity in the world, 1990-2006



**Figure 6. Children female prevalence of obesity in the world, 1990-2006**



It appears that estimates of overweight and obesity among adult women range from around 35% (Italy, France) to about 70% (Malta). For adult males, the prevalence range from about 45% (Estonia) to around 75% (Germany and Czech Republic). The estimates of overweight and obesity in children aged 7-17 range from 9% (Netherlands, Slovakia) to about 35% (Malta) (Millstone et al, 2006).

The growing prevalence of obesity is one of the most visible indicators of a population wide worsening lifestyle characterized by **poor diets and low levels of physical activity**.

## 2.4 Trends in dietary consumption patterns

As consumers gain affluence, their attention turns from having enough food, to the quality of food they eat. Consumers in wealthy, industrialized nations are becoming more concerned about healthy diets. Additionally, consumers are becoming more concerned about food safety, like pathogens and disease risks.

There have been a number of social and environmental transformations over the last few decades which have produced changes in dietary consumption patterns. These include changes to consumption patterns of fats, particularly saturated fats and trans-fatty acids; sugar; salt; fruits, vegetables and other sources of dietary fibre; energy-dense and micronutrient poor foods. The main trends identified are:

- Food and Agriculture Organization (FAO) figures suggest that during 1961-2001, the energy supplied by food grew over 15% in Europe, mostly due to *increased* consumption of vegetable oils, fruits and vegetables (Food Balance Sheet at [http://www.fao.org/waicent/portal/statistics\\_en.asp](http://www.fao.org/waicent/portal/statistics_en.asp)).
- Data from DAFNE show (Naska et al, 2006) narrow differences between Northern and Southern European consumption of fat, although Southern Europeans still consume significantly more olive oil and pulses. The EPIC study also found differences in consumption of animal-derived and processed foods, with Greece and Italy consuming least and the Netherlands, Germany and the UK consuming most (Slimani et al, 2002). Several European countries report evidence of increasing consumption of individual foods that are lower in fat than their traditional counterparts (see Finnish National Public Health Institute, 1999; Foreign Agriculture Service, 1996). Egg consumption has fallen in Europe due to cholesterol concerns (Gracia and Albisu, 2001). In the EU, most member states, with the exception of Portugal and Ireland, report diets with greater than 35 percent of calories from fat, and the percentage of total energy from fat actually rose very slightly between 1996 and 1998 (Economic Research Service, 2004).
- In addition to reducing their intake of foods that can damage health, consumers are trying to increase their intake of foods linked to disease reduction, but are not yet consuming recommended amounts. In the EU, fruit and vegetable intake varies substantially, and in many countries is inadequate - the consumption is high in Greece, Spain and Italy, and low in Northern European countries (WHO-HFA, 2005; Byrne, 2001). It has increased over time, however (Gracia and Albisu, 2001). In half of the EU member states, the average fruit and vegetable consumption is less than 70 percent of the WHO recommended value (Robertson and Knai, 2000).
- Food safety concerns, mostly concerns about contaminants and pathogens in food, are changing consumers' purchasing behaviour. Consumption by European households has seen changes in the meat sector, with its share of consumption falling significantly, by about 2 points, between 1994 and 1999 in almost all countries: Belgium was the great exception, with a rise from 19% in 1994 to 27% in 1999. Consumption of bread and cereals appears to have increased proportionately over the same period in many countries (BE, IE, DK, ES, LU, FI, UK).
- The only pan-European data on children's food consumption patterns are WHO surveys of self-reported health behaviour of children between 11 and 15. In 2001-2002 nearly 50% did not

regularly eat breakfast on school days and most did not eat vegetables or fruit daily. Prevalence of soft drink and candy consumption was about 30% overall, topping 40% in some countries (WHO Regional Office for Europe, 2004).

- While several reviews note that early breastfeed is associated with reduced risk of obesity later in childhood, in 17 out of the 23 European countries surveyed most mothers did not breastfeed at all by six months. However, there is some evidence of an increasing trend during the 1990s, especially in Nordic countries (WHO Regional Office for Europe, 1999).

## 2.5 Trends in physical activity patterns

Physical inactivity has become the second most important risk factor for ill health, after tobacco smoking, and is related to about 2 million deaths per year worldwide in industrialized countries (WHO, 2002). Although physical activity patterns are far less well recorded than consumption patterns and obesity prevalence, we found the following evidence for trends in physical activity patterns:

- A 2002 EU-wide survey of self-reported behaviour found low levels of physical activity; almost 40% of adults had not engaged in any moderate activity during the week before the survey and only 15% had done so daily. Indeed, only 40% even engaged in very light activity, such as ten minutes' continuous walking (European Commission, 2003).
- The 2001-2002 Health Behaviour of School Children survey found that only 1/3 achieved the recommended hour of moderate activity 5 days per week (especially girls), while between 25-50% watched 4 or more hours of television per day (especially on weekends) (WHO, 2004).
- The harmonised European Time Use Survey (HETUS) provides data on how much time a person spent on a various activities for 13 European countries (European Communities, 2004). From the data for the years 1998-2002 it appears that men are more active than woman in sports and exercise (23-42 vs. 15-35 minutes per day, excluding walking/cycling to work/shop etc.). Also, countries differ in the amount of time spent on physical activity - inhabitants of Finland, Sweden, Germany, Slovenia and Norway spent more time on sports and exercise compared to other European countries.

## 2.6 Distributional factors

Successful intervention is cognizant of a number of patterns and correlations, which are described below.

### 2.6.1 Prevalence of obesity relates to age and gender

- Prevalence appears to increase through adulthood with highest levels among adults in their 50s and 60s (Millstone et al, 2006). Older people may be less overweight or obese due to healthier lifestyles during youth and/or selective attrition of the more obese members of the cohorts.
- Gender differences are not uniform regarding obesity. Some ethnic groups have significantly more obesity among women. In some countries, women tend to have a higher prevalence of obesity while men tend to have a higher prevalence of non-obese overweight.

### 2.6.2 Socio-economic status and the causes of obesity

Socio-economic status also plays an important role with respect to diet and physical activity.

- In Europe a positive association between socio-economic status and healthy eating is evident, especially in Northern Europe (Roos et al, 2001, Kunst et al, 1999).

There appears to be an inverse relationship between socio-economic status (defined by e.g. household income, occupation and education level) and physical activity. The WHO (Robertson et al, 2004) summarizes the findings of a number of studies:

- A fitness survey in England found that people who had more education or own their homes tended to engage in more physical activity (Health Education Authority and Sports Council, 1992);
- Unemployed men, and to some extent unemployed women, tend to be more sedentary than those in employment (Health Education Authority, 1995);
- In 1997-1998, the WHO Health Behaviour in School-aged Children study found consistent links between greater family affluence and more self-reported exercise among 15-year-olds surveyed in several European countries (Currie et al, 2000);
- A consumer survey in the EU suggested that adults with less education are more likely to have physically active jobs and more likely to spend time in sedentary leisure when not working (Kafatos et al, 1999).

### 2.6.3 Obesity and socio-economic status

Trends also indicate that obesity is a great problem among certain groups including those with lower educational attainment, lower social states and lower self-esteem (Millstone et al, 2006). From the literature we encountered that:

- Data from 80,000 adults in the WHO MONICA (Monitoring Cardiovascular Disease) project ([http://www.who.int/cardiovascular\\_diseases/en/](http://www.who.int/cardiovascular_diseases/en/)) found an inverse correlation between BMI and education in only about half of the male population groups, but in virtually all female groups. The differentials appeared to be increasing over time.
- A study of the correlates of health indicators in developed economies showed that both obesity and diabetes were more strongly correlated with inequality indicators (e.g. income Gini coefficients) than with national average income (Pickett et al, 2005). This result, which is consistent with the hypothesis that socio-economic status may be linked to obesity through relative rather than absolute poverty in wealthier countries – is consistent with other data showing that economic growth is more closely linked to inequalities in education than to average levels.<sup>2</sup>
- Perceived social status and self-esteem are also correlated in ways that suggest a link to health behaviour, consistent with studies showing that most health outcomes are correlated with social status. This both reinforces the inverse correlation between obesity and income and suggests that prevention and treatment may be less successful among lower-income groups.

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<sup>2</sup> A study for the United States shows that highest rates of obesity and diabetes are found among the lower-income groups (Drewnowski and Darmon, 2005). According to these authors the observed links between obesity and socio-economic position may be related to dietary energy density and energy cost: refined grains, added sugars, and added fats are among the lowest-cost sources of dietary energy. On the other hand, the more nutrient-dense lean meats, fish, fresh vegetables and fruit generally cost more. The authors conclude that obesity is a largely economic issue.

- There seem to be significant ethnic correlations with higher levels of obesity, especially after several generations of residence. These may be partially attributable to socio-economic factors but may also reflect culturally-specific health-related behaviour patterns.

## 2.7 The economic importance of the food and fitness industry

The food industry is one of the major key stakeholders in any nutrition policy in terms of its size and in terms of international competitiveness (also section 3.4.1). With a value added of EUR 175.6 billion recorded in 2001 by structural business statistics (SBS), food is Europe's second largest manufacturing sector after the metal industry. Germany, the United Kingdom and France together produce over 51% of the Community's value added and 53% of its production in this sector. Most new member states are highly active in the sector (Cyprus and the Baltic States being prime examples). Greece, Denmark and the Netherlands also tend to specialise in food.

**Table 1. The food industries in the European Union, 2001**

Sector (NACE Rev.1)	Total EU employment (000)	Total EU value added (EUR billion)	Main contributor to value added, EU
Meat	987.9	31.1	Germany
Fruit & vegetables	262.9	10.4	United Kingdom
Dairy products	404.8	17.4	France
Other food products	1865.6	65.1	Germany
Beverages	446.1	31.2	United Kingdom
Other miscellaneous food products	455.2	20.4	United Kingdom
Food industries	4422.5	175.6	Germany
Manufacturing	34249.5	1535.6	-

Source: Statistics in Focus, Eurostat, 2004

In 2003 the European Union exported food products valued at EUR 39.8 billion to the rest of the world and imported food worth EUR 39.4 billion – reflecting an average annual growth of 4.5% and 4.3% respectively between 1999 and 2003.<sup>3</sup> External-trade data show that intra-Community trade in food accounts for over 75% of all trade, with flows of around EUR 120 billion.

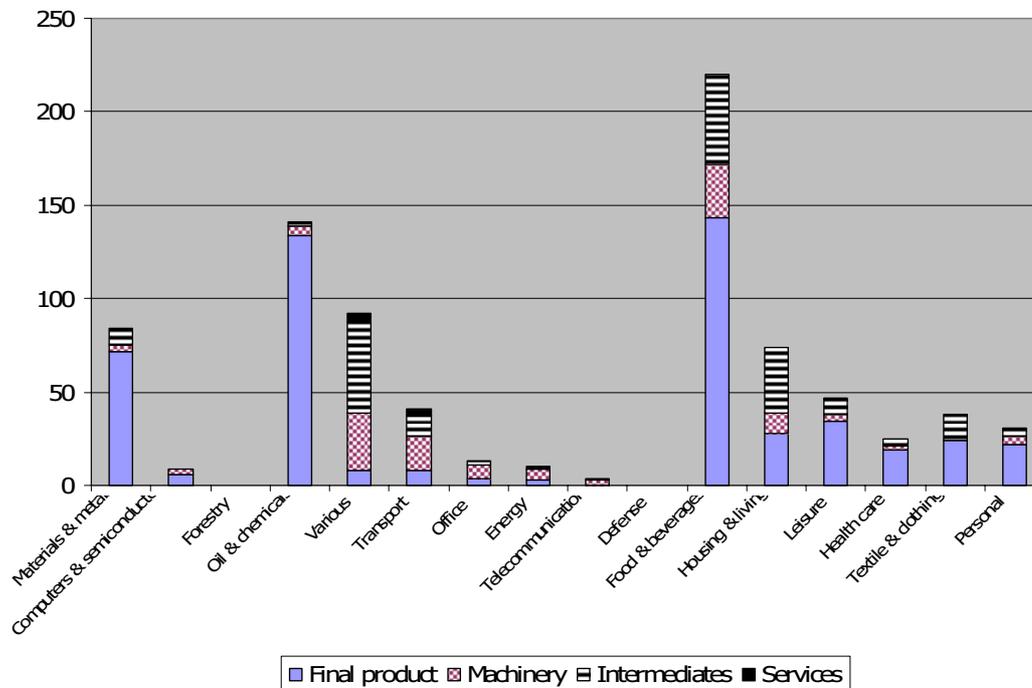
The numbers above refer to final food products. A study by Jacobs and Lankhuizen (2006) on the competitiveness of the Dutch industry shows that in fact the entire food cluster, i.e. including machinery, intermediary products as well as final products, is an important source of export strength (see Figure 7). The figure shows that the Dutch food and beverage cluster has the largest number of

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<sup>3</sup> To put these numbers in context, manufacturing in general grew by an average of 6.2% for exports and 5.5% for imports over the same period.

competitive products and competitiveness is spread across machinery, intermediary products as well as final products.<sup>4</sup>

**Figure 7. Competitiveness of Dutch food and beverage cluster**



In addition to the food industry, the 'fitness' industry is of importance, e.g. by providing sports facilities and physical activity monitoring devices. However, we have not (yet) found information about the size of the fitness industry in Europe.

These sectors are both part of the problem and an essential part of the solution, e.g. impacts on the sectors should be counted among the costs and benefits of the intervention and the incidence of these costs and benefits will determine levels of compliance and complementary actions to address problems of diet and physical activity - and thus the overall cost-effectiveness of the policy options.

## 2.8 Direct effects of obesity

The burden of obesity can be described by direct and indirect effects on obesity. With respect to the direct effects of obesity, so-called cost-of-illness studies provide important information about costs, while benefits concern e.g. the way in which the food industry make money out of selling people unhealthy food. In the following sections, we focus on the costs because evidence on benefits was difficult to find in the literature.

<sup>4</sup> The figure presents the number of product groups (Harmonised System (HS)-classification, 6-digit level) that are more competitive than the Dutch industry overall. Competitiveness is defined as the share of exports from the Netherlands in total world exports. Dutch exports in total represent 3.8% of world exports in 2003. Individual products or product groups are considered competitive if they account for more than 3.8% of world exports in their respective product category. This methodology is based on Michael Porter's well-known cluster approach (Porter, 1990).

### 2.8.1 Cost-of-illness studies

The aim of cost-of-illness studies is "to identify and measure all the costs of a particular disease, including the direct, indirect, and intangible dimensions". The result of such a study is an estimate of the total burden (in monetary terms) of a particular disease to society (Byford, Torgerson, Raftery, 2000). Cost of illness can be measured using the prevalence or incidence method. The prevalence method is the commonest and estimates the total cost of a disease incurred in a given year. The incidence method involves calculating the lifetime costs of cases first diagnosed in a particular year, providing a baseline against which new interventions can be evaluated (Byford, Torgerson, Raftery, 2000). However, the cost of illness approach has been recently criticized by Roux and Donaldson (2005). These authors make the case that the role of economics is not in measuring the economic burden of obesity but in evaluating, through formal economic evaluation, the use of scarce health care resources in different strategies to prevent and treat obesity.

Anyway, the literature by and large distinguishes two categories of costs: the direct costs of treating obesity and the costs of treating diseases attributable to obesity. Please note that obesity is only one of many effects of poor diet and low levels of physical activity. Therefore assessing costs linked to obesity alone will be a conservative estimate of total cost of poor diets/low activity etc.

### 2.8.2 Direct costs of treating obesity

This covers e.g. the cost of consultations, the cost of hospital admissions and outpatient admissions, and the cost of drugs prescribed to help obese patients to lose weight (National Audit Office, 2001).

### 2.8.3 The cost of treating diseases attributable to obesity

Our literature survey indicated that coronary heart disease, Type II diabetes, hypertension, osteoarthritis are among the diseases which can be attributed directly to obesity. The cost of treating these diseases is generally estimated by calculating relevant population-attributable risk fractions. The latter reflect the overall impact of morbidity and mortality from a factor (e.g. obesity) in the specified population (WHO, 1998).<sup>5</sup> See Table 2 for a description of diseases attributed to obesity found in a number of key studies.

How reliable are the 'cost of illness' estimates? One thing to note with respect to population-attributable fractions is that diseases may be interrelated. Hence, an analysis of based on population-attributable fractions may overestimate the cost of obesity (Detournay et al, 2000). The estimate of FF 8.7 billion (for France, Table 2) should therefore be regarded as an upper range estimate. However, the authors point out that the result concerning lower medical consumption of other diseases by obese persons is unclear and needs to be confirmed by other investigations (Detournay et al, 2000, p.154). On the other hand, cost estimates obtained by other methods are in the same order of magnitude. For instance, Detournay et al (2000) use data from the French 1991-1992 National Household Survey. The authors began by comparing medical resource utilization of a representative group of obese people to that of a control group (BMI 18.5 - 24.9 kg/m<sup>2</sup>). The extra cost attributable to obesity was then extrapolated to the national level. In the next step, the medical consumption of both the obese group and the control group were disaggregated according to prevalent diseases in the sample, both obesity-related diseases and all other diseases. The extra cost in the obese group associated with obesity-related diseases was then extrapolated again to the national level. The authors

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<sup>5</sup>  $PAF = \frac{p \cdot (RR - 1)}{1 + p \cdot (RR - 1)}$ , where  $p$  = prevalence of risk factor (obesity) in a population and  $RR$  = relative risk = incidence of disease in an obese person divided by the incidence of disease in a non-obese person.

conclude that their range of estimates is consistent with the results for France by Lévy et al (1995) (see Table 2). Likewise, Finkelstein et al (2003) obtain an estimate of obesity-attributable medical spending in the US that is within half a percentage point of estimates by Wolf and Colditz (1998). Finkelstein et al (2003) extrapolate national expenditure attributable to obesity from household surveys using a four-equation regression approach.<sup>6</sup> The results by Detournay et al (2000) and Finkelstein et al (2003) suggest that the estimates based on population-attributable risk fractions are pretty robust.

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<sup>6</sup>See Manning et al. (1987) for full details on this estimation approach.

**Table 2. Empirical studies on costs of obesity**

	Direct costs			Indirect costs		Definition of obesity
	Estimate	Method	Co-morbidities	Estimate	Indicators	
Germany (Kurscheid & Lauterbach, 1998)	Direct costs of obesity itself of DM 0.850 billion  Attributable to co-morbidities DM 8.6 – 11.5 billion or 3.1 – 4.2% of Health care costs	Obesity per se Population attributable fractions <sup>a</sup>	Coronary heart disease (CHD) Type II diabetes Hypertension Hypercholesterolaemia Gall-bladder disease Cerebrovascular disease Osteoarthritis of knee Endometrial cancer		Value of lost productivity;	BMI>30kg/m <sup>2</sup>
France (Lévy et al., 1995)	FF 1.24 billion obesity per se (both BMI>27kg/m <sup>2</sup> and BMI>30kg/m <sup>2</sup> )  FF 10.65 billion or approx. 2% of health care costs for BMI>27kg/m <sup>2</sup> ;  FF 4.54 billion or approx. 1% of health care costs for BMI>30kg/m <sup>2</sup>	Obesity per se Population attributable fractions <sup>a</sup>	Hypertension (24.1) <sup>b</sup> Myocardial infarction (13.9) Angina pectoris (20.5) Stroke (25.8) Venous thrombosis (7.7) Non-insulin-dependent diabetes mellitus (24.1) Hyperlipidaemia (7.7) Gout (20) Osteoarthritis (11.8) Gall-bladder disease (14.3) Colorectal disease (4.7) Breast cancer (3.2) Genitourinary cancer (9.1) Hip fracture (-3.5) <sup>b,c</sup>	FF 0.577 billion for BMI>27kg/m <sup>2</sup> ;  FF 0.243 billion for BMI>30kg/m <sup>2</sup>	Cost of absenteeism	BMI>27kg/m <sup>2</sup> BMI>30kg/m <sup>2</sup>
The Netherlands  (Seidell and Deerenberg, 1994)	4% for BMI>25kg/m <sup>2</sup>  1% for BMI>30kg/m <sup>2</sup>					BMI>25kg/m <sup>2</sup> BMI>30kg/m <sup>2</sup>

Sjöström et al. (1995)				6 billion crowns during 1 year given full employment (7% of total indirect costs due to sick leave and disability pension)	Absenteeism	BMI>30kg/m <sup>2</sup>
England (NAO, 2001)	£9.4 million in 1998  £469.9 million in 1998  Total 1.5% of total healthcare expenditure due to obesity	Obesity per se  Population attributable fractions <sup>a</sup>	Hypertension (36) <sup>b,d</sup> Type 2 diabetes (47) Angina pectoris (15) Myocardial infarction (18) Osteoarthritis (12) Stroke (6) Gallstones (15) Colon cancer (29) Ovarian cancer (13) Gout (47) Prostate cancer (3) Endometrial cancer (14) Rectal cancer (1)	Over 40,000 years of working life lost ~ £827 million in 1998  Over 18 million days of sickness ~ £1,322 million in 1998	Earnings lost due to premature mortality;  Earnings lost due to sickness absence	BMI>30kg/m <sup>2</sup>
England (House of Commons, 2004) <sup>e</sup>				£1.05-1.15 billion in 2002 (€1.65-1.80 billion)  £1.3-1.45 billion in 2002 (€2.05-2.28 billion)  Total £2.35-2.60 billion in 2002 (€3.70-4.10 billion)	Earnings lost due to premature mortality;  Earnings lost due to sickness absence	
France (Detournay et al., 2000)	FF 4.2 billion or 0.7% of total health care expenditure in	Medical resource utilization in representative group of obese compared to a				BMI>30kg/m <sup>2</sup>

	1992  FF 8.7 billion or 1.5% of total health care expenditure in 1992	control group. The FF 4.2 billion is the extra cost attributable to obesity  Breakdown of medical consumption into: <sup>f</sup> - Cost of obesity - Obesity related disease cost - All other diseases Again comparison of two groups. The FF 8.7 billion is the direct costs of obesity and the extra costs of diseases attributable to obesity	Osteo-articular disease <sup>g</sup> Coronary heart disease Diabetes mellitus Gastric complications Gout Hypertension Dyslipidaemia Myocardial infarction Venous disease Gallbladder disease			
US (Wolf and Colditz, 1998)	5.7% of US national health spending in 1995	Relative risk of disease for obese versus non-obese people	Type 2 diabetes Coronary heart disease Hypertension Gallbladder disease Musculoskeletal disease Breast cancer Endometrial cancer Colon cancer			
US (Finkelstein et al., 2003)	5.3% of medical spending in 1996-1998	4 equation regression <sup>h</sup>				BMI>30kg/m <sup>2</sup>

<sup>a</sup>  $PAF = \frac{p \cdot (RR - 1)}{1 + p \cdot (RR - 1)}$ , where  $p$  = prevalence of risk factor (obesity) in a population and  $RR$  = relative risk = incidence of disease in an obese person divided by the incidence of

disease in a non-obese person (WHO, 2004).

<sup>b</sup> Proportions of disease attributable to obesity (%)

<sup>c</sup> Reduced incidence of hip fracture

<sup>d</sup> Based on systematic review of literature

<sup>e</sup> Provides an update of indirect costs by NAO (2001).

<sup>f</sup> Detournay et al. (2000) estimate lower medical consumption by obese persons of other diseases. This explains that total medical consumption by obese persons is in fact lower than the direct costs of obesity and of diseases attributable to obesity.

<sup>g</sup> Diseases with a statistically significant relative risk between BMI > 30 kg/m<sup>2</sup> and 18.5-25 kg/m<sup>2</sup>

<sup>h</sup> See Manning et al. (1987) for full details on this estimation approach.



## 2.9 Indirect effects of obesity

With respect to the indirect effects of obesity, the literature by and large distinguishes two categories: the indirect costs of obesity and the non-monetary impact of obesity.

### 2.9.1 Indirect costs

The indirect costs of obesity are primarily measured by employment-related costs, usually loss of productivity due to work-related absenteeism and premature mortality (see Table 2).

The estimates of the indirect costs in Table 2 are likely to be underestimates. For instance, the 2002 estimates for the UK exclude back pain associated with obesity. Back pain is one of the most common causes of sickness absence (Millstone et al, 2006). Second, the estimates in

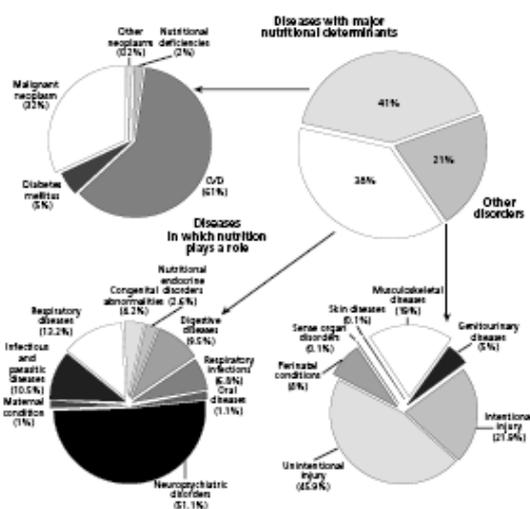
Table 2 refer only to adult obesity. Finally, in addition to the employment-related costs above, the literature pointed out a number of additional costs. Overweight people are likely to be on lower earnings (perhaps reducing the lost-days-of-work costs) and are more likely to suffer low self-esteem and depression (Millstone et al, 2006). These costs may (further) add to the direct health costs and employment-related indirect costs above. Psychiatric problems, especially depression, are the largest single cause of lost days of healthy life in developed economies, and besides the human costs they are a major cost to the health services and a cause of lost productivity and more generally of social welfare (Millstone et al, 2006).

### 2.9.2 Non-monetary impact of obesity

Besides the quantifiable direct and indirect costs of obesity, there are intangible costs related to personal suffering and loss in quality of life (e.g. WHO, 2004; Detournay et al, 2000). Excess bodyweight is e.g. linked to a lower likelihood of finding a marriage partner, of finding work and of being promoted (Millstone et al, 2006).

We approximate the non-monetary impact of obesity by the loss of disability-adjusted life years (DALYs) associated with the diseases attributable to obesity. In the WHO report on food and health in Europe (2004) an overview is given of the contribution of nutrition to the burden of disease in Europe (see Figure below).

**Figure 8. Loss of healthy life years in the European Union, 2000**



Source: WHO report "Food and health in Europe", 2004: p. 8.

Also, Table 2 (column 4) gives the diseases most commonly attributed to obesity. Recently, the DALYs associated with different diseases have recently been published by Mathers and Loncar (2006). Their projections for diabetes, for example, include the projected trends for obesity and overweight.

## 2.10 **Summary**

Taken together, the cited findings suggest the importance of demographic variation and distributional considerations, the importance of qualifying the projections and the necessity to start from clearly-defined assumptions about the exact nature of changes in diet and activity. The linkage of these to specific policies is a matter of judgement, and will be tackled through interviews with key stakeholders. This issue will be further addressed in Chapter 3.

### 3.1 Introduction

In this Chapter, we describe our methodological approach of this evaluation. This study aims to assess the prevalence of obesity and associated consequences in 2020 given:

- no intervention
- different nutrition and physical activity policy options

The point is that the interventions being assessed come on top of what is already happening and likely to happen at the Member State and private sector level. This means that no intervention ('zero option') is not really zero, and the value-added derives from integration and 'levelling-up', so that taken together these separate and ongoing initiatives do not have gaps, duplicate/wasted effort, overshoot/overkill or contradictory/cross purpose/rebound effects in terms of diet and activity, and do not conflict with other policies or policy objectives.

In the case of no intervention we will estimate the prevalence of obesity in 2020. We will use data from the WHO (online non-communicable disease database) to extrapolate current trends (see section 3.3).

In the case of intervention we will assess different policy options in the area of nutrition and physical activity in terms of

- Their effect on different stakeholders. In other words we will investigate the acceptability of various policy options among different stakeholder groups. This is important because policies that face high resistance among stakeholders, e.g. industry, are less likely to be effective (see section 3.4).
- Impact (see section 3.5).

There are two ways to go about the impact assessment: a quantitative and a qualitative one. In this study, we first and foremost propose a quantitative approach. First of all, the literature offers quantitative links between fat consumption and physical activity on the one hand and obesity on the (i.e. correlations, not causality). Through the quantitative effects of policy on fat reduction and increased physical activity, we can link the nutrition and physical activity policy to obesity. In other words, we can calculate what the effect of different policy interventions will be on obesity prevalence in 2020. Next, the quantitative approach gives us the opportunity to also quantify the impact of policy in terms of direct and indirect costs by using cost estimates.

As a first step in the analysis we need to establish what can realistically be expected from the different options that the EC proposes. For instance, according to Astrup (2001) a reduction in fat consumption by 10% corresponds to about one BMI unit or about 5% difference in obesity prevalence. Can we assume that the policy options proposed by the EC have this impact? If not all, which options? If not 10%, how big is the effect?

However, the quantitative approach may be too narrow. The analysis may miss out effects that have not been quantified and the data themselves induce bias (e.g. women underestimate weight, men overestimate weight). As a result, the true impact will be underestimated. It is therefore necessary to complement the quantitative analysis by a qualitative analysis of the impacts of the different policy options (i.e. to get the real causal mechanisms and determinants of their effectiveness). It will be done through discussions with experts. The expert interviews proposed in this study will also serve to appraise the assumptions of our quantitative model. For instance we need to check whether the quantitative relations we found in the peer-reviewed literature are in fact adequate (see section 3.6).

Before going into details regarding the approach, we present the methodological challenges surrounding ex ante impact assessment.

### 3.2 The four challenges of ex ante impact assessment

Ex ante impact assessment is a complex issue. The quality of the results depends as much on the method used as on the specifics of the proposed policy, the multitude of actors or stakeholders involved, and the quality of the evidence on the current nature and direction of the problem that is targeted. Four challenges are particularly important.

#### **Challenge 1: Achieving a comprehensive and evidence-based analysis of direct and indirect impacts**

Policies affect individuals, regions, sectors, countries and supranational regions in different ways. Some impacts are direct (e.g. the costs of compliance with regulations), while many others are indirect (e.g. the impact on consumers of requirements imposed on producers). Impacts can be economic, social, environmental as well as relating to sustainability; they refer to the present (the current problem) and the future under different scenarios; and they include synergies and trade-offs with other policy areas. The challenge is to be comprehensive without being exhaustive, to cover all the bases necessary for an impact assessment, and to support the analysis of the impacts with evidence.

#### **Challenge 2: Predicting individual and group behaviour**

Three challenges will have to be met in order to determine the impacts that new policies, regulations, and expenditure programmes may have in the future:

- Some impacts derive directly from the policy, but the greater part will emerge from adjustments in the behaviour of stakeholders. It is therefore necessary first of all to gauge the future response of different groups of stakeholders to changes in their environment, notably with respect to their primary incentives.
- Where the response of individual types of stakeholder can perhaps be considered fairly predictable, it is at least conceptually more difficult to assess the response of *all* stakeholders together. We can predict how a food retailer will respond to changes in regulation, but the dynamics will change when we consider the aggregate supply response of all food retailers together. The picture landscape becomes even thornier when the assessment turns to the combined (market equilibrium or dynamic) response of consumers, regulators, retailers and other parties. A second requirement is therefore to capture the complexity of system response in an integrated multi-stakeholder policy impact assessment.
- The dynamics of emerging and rapidly evolving policy domains include the rise of new stakeholders, whose incentives have yet to be determined. The complexity and uncertainty of such domains further complicate the impact assessment, because new stakeholders can alter

the relationships among all stakeholders. A third requirement is thus to assess future changes in behaviour of existing and potentially new stakeholders and their social, economic, environmental and sustainability impacts. This includes the responses of existing policy makers and others to the underlying problem – in this sense, the policy impact is incremental.

Macroeconomic analysis concerns the equilibrium behaviour of large aggregate indicators of economic activity, but to understand or predict these it is necessary to revisit the micro- or behavioural foundations of these overall relationships, not least because the policies under consideration operate at the level of conscious choice by citizens and firms alike.

### **Challenge 3: The effectiveness of instruments**

The impacts of the Communication on diet and physical activity will depend on the way its objectives are translated into practical policy measures and instruments and the extent to which this changes in the behaviour of consumers, producers, and governments.

The Commission has three generic types of implementation mechanism at its disposal:

- **Regulations and Directives or Rule Setting:**
  - *Laws and Regulations:* e.g. food labelling, composition requirements, taxation, intellectual property rights
  - *Voluntary Standards:* e.g. nutritional labelling schemes, commitments to offer healthy options or eliminate “trans fats”, voluntary individual agreements, performance standards
- **Rewards and Incentives or Financing:**
  - *Direct Subsidies to Projects:* institutional funds, programme funds, project funds
  - *Supply of Capital:* government loans, government co-investment, public-private ventures
  - *Financial Incentives:* loan guarantees, tax incentives
- **Communication and Coordination or Facilitating:**
  - *Knowledge Management, Networking:* broker services, clearinghouse for information, consulting services, networking instruments
  - *Participatory Instruments:* mandatory “green” procurement, national procurement centre, public-private partnerships (pilot projects)

The first two methods of implementation are considered “hard” instruments, whereas the third is seen as a “soft” instrument. We expect that assessing the impacts of the third group of methods will be more difficult, mainly because stakeholder response is more difficult to gauge. Our assessment will include a brief look at the effectiveness of as yet unspecific policies on a long timescale. This assessment will unavoidably be tentative given that the various options have not yet been fleshed out in detail.

### **Challenge 4: Quantifying and monetizing impacts**

In impact assessment quantitative evidence is often considered superior to qualitative evidence, because it makes it possible to assign a specific magnitude to an impact. Since most, if not all, policies, spending programmes, and action plans involve money, it is equally important to express the impacts in monetary terms. In ex ante impact assessment the challenge is to carefully predict (or forecast) future impacts, and to support quantification and monetization with sound

information (e.g. from theory and previous studies) and reliable statistics. Indicating the nature and direction of effects generally takes precedence over quantifying or monetizing the impacts.

### 3.3 Using available evidence and analyses

Below we specify what data and methods we would like to use for which purpose in extrapolating trends.

#### 3.3.1 Extrapolate trend in obesity

Objective:

Calculate the development of obesity *without* policy intervention.

Method and data:

We would forecast obesity prevalence in 2020 by extrapolating historical trends by applying time series regression on a sufficiently large number of observations (years). Such analysis will require data on obesity prevalence that is (1) more or less continuous annually and (2) internationally comparable. Checking with the IOTF we were referred to the WHO Global Infobase as the main source of information.<sup>7</sup>

The WHO Global Infobase gives estimates for BMI that are comparable across 196 countries worldwide.<sup>8</sup> Data distinguish between males and females and age groups 15-100 and 30-100. We can use the data on prevalence to calculate the development of obesity without policy intervention. However, a limitation of the dataset is that estimates are only available for 2002, 2005, 2010 and 2015, leaving only 4 data points for the time series regression analysis. This compels a very careful analysis and interpretation of the trend in the period 2002-2015 to come up with an estimate of the obesity prevalence in 2020. Confidence intervals may necessarily be relatively wide. These averages do not give a good basis for modelling policy impacts. We may need to look further to find out how the projections were made (a different question than what data were used) to see how we could modify the projections to things like changes in the age and income distribution. In terms of the data, we will probably need to trade off comparability against resolution, since this 'lowest common denominator' certainly does not give a projected obesity that is a reliable indicator for the various costs, etc. we want to shift.

Figure 9 gives an example of the WHO data for three EU countries and one year.

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<sup>7</sup> We contacted the IOTF to ask them about the data they used for their calculation of trends (see below) and see whether it was possible to obtain the raw data. In a reply we were informed that the kind of information we were looking for, i.e. annual time series on obesity prevalence, does not exist. We were referred to the WHO Infobase.

<sup>8</sup> The WHO Global Infobase and the WHO Global Database on Body Mass Index give a complete list of all surveys relating to BMI / Overweight / Obesity for all countries between 1982 and 2004. Sources include national surveys and data from the peer-reviewed literature. Data are available for only a few years. The data are empirical and have been verified that they apply internationally recommended BMI cut-off points. However, the data are not directly comparable both within and between countries since they vary in terms of sampling procedures, age ranges and the year(s) of data collection.

**Figure 9. BMI / Overweight / Obesity, BMI  $\geq$  30kg/m<sup>2</sup>, 2002**

Males (> 15 years)	Country	Prevalence (%)
	Austria	19.5
	Belgium	11.4
	Czech Republic	17.4
Females (>15 years)	Austria	20.4
	Belgium	9.5
	Czech Republic	20

Source: WHO Global InfoBase (infobase.who.int)

### 3.3.2 Relation between physical activity, diets and obesity

#### Objective:

Establish the relationship between nutrition and physical activity, and obesity.

The growing prevalence of obesity is one of the most visible indicators of a population wide worsening lifestyle characterized by poor diets and low levels of physical activity. Hence, the independent variables are physical activity and diet.

#### Method and data:

In this study it is important to know how changes in nutrition (e.g. %-reductions in the intake of fats) and physical activity jointly affect obesity prevalence.

We have examined the Cochrane Database for systematic reviews of the relation between nutrition and physical activity on the one hand and obesity on the other. The results concerning the effects are mostly qualitative (see e.g. Hillsdon et al, 2005; Shaw et al, 2006; Summerbell et al, 2005).

Regarding *quantitative* relations we found the following evidence:

- With respect to the relation between physical activity and obesity Vuori (2001) finds that physically active people are **50% less** likely to become obese. This figure was compiled from some ten recent peer-reviewed publications.
- A meta-analysis in Astrup (2001) of 16 ad libitum dietary interventions suggested that a reduction in fat content by 10% corresponds to about 1 MJ reduction in energy intake and about 3 kg in body weight.<sup>9</sup> At a population level, 3 kg equates to about **one BMI unit or about 5% difference in obesity prevalence** (WHO, 2004).

Knowing the quantitative relation between nutrition and physical activity on the one hand and obesity on the other will enable us to assess the impact of policy in the following sense: if (we assume) policy is capable of reducing – let's say – food energy by x% this will have an effect on obesity of x/2%.

We will seek expert advice to assess the relations between nutrition and physical activity and obesity mentioned above. Through interviews, we will establish whether the estimates are indeed realistic and robust, or whether we should consider other functional forms, relationships and/or explanatory variables (see also section 3.6).

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<sup>9</sup> Trials of ad libitum high-fat versus low-fat diets of at least two months duration.

A thing to bear in mind with regard to the impact of physical activity and nutrition on obesity is the interaction between these effects. A recent report on the treatment of overweight and obesity concluded (among others) that physical activity contributes to weight loss both alone and in combination with dietary therapy (Astrup, 2001). With respect to estimating the joint impact of physical activity and nutrition on obesity it is important to distinguish between an additive and synergetic effect. In the latter case, the positive impact of policy will obviously be higher. As a first-order approach, interaction terms (e.g. diet\*activity) can be included in the equation explaining obesity, but a more robust assessment can be obtained by recognising that diet and activity not only jointly affect obesity, but reciprocally affect each other, which calls for the use of e.g. instrumental variable methods (using e.g. income, education, etc. as instrument).

Although the analysis in this step will be less based on primary data, we did identify a number of relevant data sources:

- Nutrition:
  - FAO Food balance sheets provide time series on per capita food energy supply; per capita supplies of animal and vegetable fats/oils; per capita supplies of vegetables and fruit. These data can be used as proxies for dietary patterns. Comparisons of trends across more than 30 countries have shown that the rate of increase in the prevalence of obesity is correlated with increases in the per capita supply of food energy (Silventoinen et al, 2004).
  - The European nutrition and health report (Elmadfa and Weichselbaum (eds.), 2005) has data on energy and nutrient intake in the European Union. Compared to the FAO data on food energy *supplies*, the latter data are an approximation of actual energy *consumption*. Data are based on national surveys and available for only a limited number of (survey) years
  - The Special Eurobarometer on health and food (2006).
- Physical activity:
  - The WHO Global Infobase has information on physical inactivity.
  - The Special Eurobarometer on physical activity (2003).
  - Eurostat data on travel patterns for 2003 and 2005: Another life style related factor which is of key policy relevance is daily travel patterns. The modern way of life has encouraged a separation of our daily activities in space and time. Some people do their daily workout on an exercise bike, while for transportation they use expensive and polluting vehicles instead of walking or cycling. Therefore, it will be highly interesting to investigate the correlation between obesity and car dependency. The Eurostat data on travel mode splits will support this analysis. The analysis lead to policy questions on how to promote active commuting. Further, it will lead us to wider policy context related to transport and land-use development. For example, certain development patterns make biking or walking unpleasant or unsafe, such as lack of sidewalk and cycle lanes or extensive construction of high-speed roads.
  - The harmonised European Time Use Survey (HETUS) measures the amount of time spent on - various activities by the population. The HETUS data on minutes per average day spent on sports will certainly be useful for quantifying the level of physical activities. Additionally, it will also be highly interesting to explore the linkages between obesity level and time spent at work. Because of the transition towards service and knowledge economy, more and more people are now involved in sedentary occupations which involve minimal physical activities. From this analysis, we shall be able to provide evidence on how the overwork culture is affecting the population's health and draw conclusions on

policy implications. The HETUS data is disaggregated by gender and age group, and that allow us to create a dataset which represent the same population as represented in the WHO BMI data. Data is available for thirteen European countries for 1998 to 2002.

### 3.4 How do the EC policy options operate?

As described, we will assess four different policy options in this evaluation. The assessment of the intervention logic behind these EC policy options must take two aspects into account. The first is the *modus operandi* of policy *per se*. Informational policies affect lifestyle attitudes and differentially target demographic groups. Economic sectors (e.g. the food industry) are influenced by regulation and legislation and also by policies that change consumer preferences and demand (by encouraging healthy choices or altering relative prices) (see section 3.4.1). The second aspect, which flows from the complexity of the overall system, involves the calibration of expected impact on variables of interest (see section 3.4.2).

#### 3.4.1 The stakeholders and their powers

An analysis of stakeholders is used to create a better understanding of the behaviour, intentions, interrelations and interest of actors and to assess the influence they have on decision-making and implementation of policies. Below (Table 3) we briefly outline the actors involved in developing policies or strategies on obesity and/or evaluating obesity-related policy actions and international organisations conducting studies of the problem and possible lines of attack.

**Table 3. Entities engaged with Obesity Policy**

Level	Organisation
European	<ul style="list-style-type: none"> <li>• Council of the European Union (Member State Governments) - several different Council ‘configurations’, covering such policy areas as: industry, trade, transport, environment, health and education.</li> <li>• European Parliament (citizens) – uses cooperation procedure to modify EC directives and regulations, uses assent procedure to participation in international arrangements and co-decision procedure to agree legislation with the Council.</li> <li>• European Commission - the only institution that can propose new EU legislation, it can also take action to help bring about agreement within the Council and between the Council and Parliament. Although primary responsibility for health-related policies lies with Member States, the EC can propose Directives and issue Regulations (which are binding on Member States without national legislation). The Commission may also make non-binding Recommendations.</li> <li>• European Economic and Social Committee (civil society) – must be consulted on e.g. work-related issues, may comment on others</li> <li>• Committee of the Regions</li> </ul>
Other International	<ul style="list-style-type: none"> <li>• Codex Alimentarius Commission (Codex), jointly run by WHO and FAO to set standards for international trade in food relating to labelling, nutrition information and health claims for marketing.</li> <li>• UN Food and Agriculture Organization (FAO) - agricultural specialists, food security, food safety and nutrition programme support.</li> <li>• United Nations Children’s Fund (UNICEF) - supports educational programmes and health protection measures (Code of Marketing of Breast milk Substitutes, Convention on the Rights of the Child).</li> <li>• World Health Organization – esp. Regional Office for Europe, several sections concerned with obesity policy, e.g. nutrition and physical activity</li> </ul>

NGO

- sections in Non-Communicable Disease and Lifestyles department, social inequalities in health and family health sections.
- Confederation of the Food and Drink Industries of the EU (CIAA) - represents food and drink manufacturers.
  - European Association for the Study of Obesity (EASO) - more than 2500 members in 27 countries, including dietitians, doctors, scientists and sports specialists, aims to “promote research into obesity, facilitate contact between individuals and organisations, and promote action that tackles the epidemic of obesity.”
  - European Consumers Organisation (BEUC) - Brussels-based federation of 40 independent national consumer organisations from EU, accession and EEA countries.
  - European Heart Network (EHN) - alliance of heart foundations and heart-health non-governmental organisations in 25 European countries.
  - European Medical Association – concerned with (e.g.) health workers’ training.
  - European Network for the Promotion of Health-Enhancing Physical Activity (HEPA Europe) - collaborative project “for better health through physical activity among all people in the WHO European Region, by strengthening and supporting efforts to increase participation and improve the conditions for healthy lifestyles.”
  - European Public Health Alliance (EPHA) - represents over 100 nongovernmental and other not-for-profit organisations working on public health in Europe.
  - Federation of European Nutrition Societies - 25 countries.
  - International Diabetes Federation – Europe, which promotes diabetes prevention programmes in the region.
  - International Sport and Culture Association - based in Denmark, hosts European Youth and Sport Forum.

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Next to a brief description of the stakeholders and their level of influence, it is important to describe their positions on policies to combat overweight and obesity. To measure the *acceptability* (and thus compliance and effectiveness) of policy options it is therefore necessary to assess the alignment of the policy’s intended or unintended impacts with stakeholder interests. The stakeholders are known to differ with regard to different policy options to addressing obesity in the European Union. This was e.g. studied in the PorGrow project<sup>10</sup>, which we use as a **starting point** in this evaluation. This will be further elaborated in the remainder of this evaluation.

The PorGrow study surveyed 21 different key stakeholder groups<sup>11</sup> in nine EU member states<sup>12</sup> (191 persons) as to which policy or combination of policies might provide the most effective means to reverse the rising trend in the prevalence of obesity. The following Table presents the (clusters of) 20 options that were taken into account and the preferences of the different stakeholders as well as their views on the implementation of the different policy options.

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<sup>10</sup> <http://www.sussex.ac.uk/spru/1-4-7-1-8.html>

<sup>11</sup> Food producers (e.g. farmers and manufacturers), doctors, nutritionists, teachers, food retailers, advertisers, public policy makers, consumer and sports organizations, self-help groups and members of the research and public policy communities

<sup>12</sup> Cyprus, Finland, France, Greece, Hungary, Italy, Poland, Spain, and the UK

**Table 4. Stakeholders views regarding policy options to tackling obesity<sup>13</sup>**

Cluster	Options <i>(bold options were used as core options - addressed by all interviewees)</i>	Priority per stakeholder group <sup>14</sup> <i>(1 represents highest priority, 20 lowest priority)</i>								Conditions
		NGO	Large Food Chain Commercial operators	Small Food & Fitness Commercial operators	Large Non-Food Commercial operators	Policy makers	Public service providers	Public health specialists	All	
Exercise and physical activity oriented	<b>Change planning and transport policies</b>	15	18	16	16	15	13	16	16	Changes in planning and transport have strong additional social and health benefits. However they are cost to public sector (also applies to sports facilities). Pace of implementation is problem. Monitoring devices are technically feasible, less costly but also less effective.
	<b>Improve communal sports facilities</b>	5	7	8	6	8	12	5	5	
	Increase the use of physical activity monitoring devices	16	6	12	13	12	15	13	14	
Modify the support of, and demand for, food stuffs	<b>Control sales of foods in public institutions</b>	14	17	15	10	10	5	11	7	Potential impact on lower income households (taxes). Actions influence patterns of demand with educational and health promotion initiatives. Favourable to public sector finances (taxes, not for subsidies). Controls on food composition have low additional benefits, but are feasible, acceptable and effective in combating obesity.
	<b>Provide subsidies on healthy foods (fiscal)</b>	17	19	17	19	19	17	15	19	
	<b>Impose taxes on obesity- promoting foods (fiscal)</b>	20	20	19	20	29	20	19	20	
	Control the composition of processed food products	7	9	5	18	6	3	12		
	Provide incentives to promote food composition	13	14	14	12	9	14	14		
	Provide incentives to caterers to provide healthier menus	10	5	11	7	11	8	4	6	

<sup>13</sup> Based on the PorGrow project. Available at: [http://www.sussex.ac.uk/spru/documents/eu\\_report\\_english.pdf](http://www.sussex.ac.uk/spru/documents/eu_report_english.pdf)

<sup>14</sup> Criteria used: whether the options would a) provide additional social benefits, b) provide additional health benefits, c) be effective in dealing with obesity, d) lead to economic costs or benefits for the public sector, for individuals or for the commercial sector, e) be practically and technically feasible and f) be socially acceptable.

Information-related initiatives	<b>Require mandatory nutrition labelling</b>	8	12	6	9	7	4	7		Labelling and control on marketing terms have good feasibility and social acceptability, but controls on advertising are more effective in tackling obesity. All have costs for industry
	<b>Controls on food and drink advertising</b>	12	15	13	14	14	9	9		
	Control the use of marketing terms ('diet', 'light' etc)	9	10	9	15	5	6	17		
Educational and research initiatives	Improve training for health professionals in obesity care and prevention	2	4	10	3	3	7	3	3	Effective and of fairly low costs, feasible and acceptable. Options are dependent on a) environmental factors to promote unhealthy choices, b) improved availability of information, c) access to healthier diets and d) improved opportunities for physical activity
	Improve health education for the general public	4	3	2	2	2	2	2	2	
	Include food and health in the school curriculum	1	1	1	1	1	1	1	1	
	Increase research into obesity prevention and treatment	6	8	3	4	4	11	8	4	
Technological innovation	Increase the use of medication to control bodyweight	19	13	18	8	18	19	10	17	Low score on social acceptability, but has some commercial benefit. Substitutes of fat and sugar are perceived as ineffective and of questionable safety
	Increase the use of synthetic fats and artificial sweeteners (substitutes for sugar and fat)	18	16	20	11	17	16	20	18	
Institutional reforms	Create a new governmental body to coordinate policies on obesity	3	2	7	17	16	10	6		Costs for industry (especially CAP). CAP is more socially acceptable, but less technical feasible than setting up a new governmental body
	Reform the Common Agricultural Policy to support nutritional targets	11	11	4	5	13	18	18	15	

From the stakeholder group comparison it appeared that:

- Several options were supported, but were often seen to 'constitute a complementary set because their individual performance was seen as depending on the effective implementation of other options'<sup>15</sup>
- Improving communal sports facilities was mentioned as one of the highest priorities for NGO's and Public Health professionals.
- The option 'healthier catering menus' was among the top 5 for Large Food Chain Commercial operators and Public Health professionals.
- The Small Food & Fitness Commercial operators and the Large Non-Food Commercial operators gave a strong emphasis to the reform of the Common Agriculture Policy.
- The NGO's and the Large Food Chain Commercial operators gave a strong preference to a new governmental body to coordinate policies on obesity.
- The information related activities showed variation between the stakeholders with regard to their preference for specific options. For example, strengthening controls on use of marketing terms was *not* a preferred option for the Large Non-Food Commercial operators and Public Health professionals, but it was for Small Food & Fitness Commercial operators and Public Service providers.
- With regard to educational and research activities there was consistency between the stakeholder groups that priority should be given to improving health education for the general public and to including education about food and health on schools.
- Large Non-Food Commercial operators (including pharmaceutical companies) were in favour of offering medication for weight control and use of synthetic fats and artificial sweeteners.
- Unpopular options for the different stakeholder groups were:
  - Taxes on obesity promoting foods, substitutes for fat and sugar and subsidies on healthy foods (all stakeholder groups except for public health specialists)
  - Planning and transport policies (Large Food Chain Commercial operators, Small Food & Fitness Commercial operators, Large Non-Food Commercial operators, and Public Health professionals)
  - Medication for weight control (NGO's, Small Food & Fitness Commercial operators, Policy makers and Public service providers)
  - Common Agricultural Policy reform (Public service providers and Public health professionals)
- The economic and social costs of not taking action would be high.
- There was common ground that "the costs of the various policy options were *less* important than the social and health benefits, efficacy, acceptability and feasibility of the options".<sup>16</sup>

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<sup>15</sup> [http://www.sussex.ac.uk/spru/documents/eu\\_report\\_english.pdf](http://www.sussex.ac.uk/spru/documents/eu_report_english.pdf)

<sup>16</sup> [http://www.sussex.ac.uk/spru/documents/13\\_cross\\_national\\_presentation.ppt](http://www.sussex.ac.uk/spru/documents/13_cross_national_presentation.ppt)

### 3.4.2 Impact of policy options

What impact in terms of improving diet and increasing physical activity can realistically be expected of each of the options? Our aim here is to come up with some realistic range of effects.

Taking both aspects (diet and physical activity) into account, we can draw up a number of scenarios for policy interventions. A first activity is to identify the key dimensions along which the scenarios vary. For instance, these could be the responsiveness of industry to policy initiatives and the coherence of individual responses in terms of diet and activity (because evidence thus far seems to suggest that people are more likely to respond to obesity information by dieting than by exercise, with the consequence that the impact of falling obesity on health care costs is less than it might otherwise be (and thus that obesity ceases to be a relevant single-variable indicator to drive direct and indirect costs)). We can here simply indicate that the dimensions will be selected after analysing the key uncertainties in the data – those things with a large expected impact on policy effectiveness, but which can neither be directly influenced by the policy options considered nor predicted on the basis of existing data.

The effects from these scenarios in terms of diet and physical activity will subsequently be used in the calculation of obesity prevalence in 2020 given policy intervention.

We will conduct a number of interviews with experts. These interviews will provide input for

- Answering the question how different policy options affect different stakeholder groups and thus how well accepted different options are (likely to be);
- Estimations of the impact of the policy options in terms of improving diet and increasing physical activity.

The interviews referred to in section 3.6 serve to corroborate our research model.

## 3.5 Calculations of impacts

In the following section, we specify the objectives and how we propose to calculate the impacts of the different policy options.

### 3.5.1 Range of impacts

Objective:

Calculate (1) direct and (2) indirect costs, and (3) non-monetary impact of obesity. This will be done separately for the scenarios developed under section 3.4 above, taking into account the correlations established in section 3.3.2.

Method and data:

- Use cost estimates in % of total health expenditures from existing studies to calculate the effect of obesity on direct and indirect costs for different scenarios of obesity. However, once we have the basic data, we can explore alternative formulations.
- Data on EU or national health expenditures. Source: Eurostat.
- Use population-attributable fractions from existing studies to calculate the effect of obesity on the increase in attributable diseases for different scenarios of obesity. The corresponding loss of DALYs associated with these diseases is then taken as an approximation of the non-monetary impact of obesity.

### 3.5.2 Discounting future costs

There are several theoretical arguments in favour of discounting costs and health benefits occurring in the distant future in order to adjust for their timing. First, most people have positive time preferences, where an immediate gain (e.g. more money or better health) is preferred to the same gain in a year's time. This is related to the second argument, that future consumption involves both risk and uncertainty – we do not know whether we will be alive or dead in a year's time, and we do not know of our own wealth or how the price of goods (including health care) will develop over time. Positive time preference is therefore risk-avoiding behaviour. The third argument is that, in a world where goods (including health care) have diminishing marginal utility, the more we acquire of a good, the less we value the last unit acquired. The marginal value of future health care is therefore less than the value of health care today. The fourth argument is quite different and is based on the economic principle of opportunity cost. Wealth that we obtain today can be invested and will earn interest; if we first get the wealth in a year's time, this interest is forfeited.

There is no general agreement on the most appropriate rate of discounting. There is a big amount of literature on social rates of discount and the different rates applicable to e.g. public and private money. Also, the rate at which individuals discount future risks is neither uniform (across individuals or classes of risk) nor constant – this in turn leads to time-inconsistency in their decisions, which is an important aspect of the behavioural aspects of response to health information – and one reason why 'prevention' interventions aimed at (pre-obese) children are likely to be far more effective than 'curative' interventions aimed at those whose patterns and beliefs are already set.

According to Drummond et al (1997), 5% is common in the literature, but this is neither theoretically nor empirically justified. The US Panel on Cost Effectiveness in Health and Medicine (Siegel et al, 1996) recommends the use of a 3% discount rate, reflecting the interest rate of US government bonds, but also additional analysis with a 5% rate to allow comparison with other analyses; further sensitivity analyses using rates between 0 and 7% are also recommended. The Canadian guidelines (Torrance et al, 1996) recommend the use of a 5% discount rate, with sensitivity analysis to test the effect of this parameter.

For the purpose of this study we choose a discount rate of 5%.

## 3.6 Summary and seeking expert opinion and advice

The previous sections have presented an outline of our methodological approach. However, as described in the introduction of the Chapter we believe that in order to substantiate the methodology expert advice through key informant interviews (5-8) is needed. Elements or questions to be addressed in these interviews include:

- Data: are there data sources that we missed; data issues
- Use of the literature: this study relies strongly on the existing literature with respect to relations between trends. We will seek expert advice to assess the literature and identify the sources to be used in this impact assessment. For instance, estimates of direct costs of obesity in Table 2 range between 2-5.7%. A question to be discussed with the experts then is what range of cost estimates to use in this study. Also, do we need separate estimates for different countries, or is there a cost estimate that applies EU-wide? These discussions are also needed with respect to the relation between diet and physical activity on the one hand and obesity on the other. Selecting appropriate and realistic size estimates is a crucial step in the study.

- Development of scenarios: What can realistically be expected or assumed of each of the options in terms of their impact in terms of improving diet and increasing physical activity? For instance, should we expect reductions of 0.X% or X%. Our aim here would be to come up with some realistic range of effects. These effects will subsequently be used in the calculation of the trend in obesity given policy intervention.
- Impact on the industry: what effect could labelling have on the industry?
- Analysis: Should we offer to undertake an analysis calibrated to (but not estimated from) real data of the likely impact of the policy options on prices, types of food available and profitability?

We propose to identify key persons to be interviewed in close consultation with the European Commission. This will be the first step in the remainder of this evaluation.

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