

Chapter 1

Introduction: Obesity and the Economics of Prevention

Unprecedented improvements in population health have been recorded in OECD countries during the past century, thanks to economic growth and to public policies in education, sanitation, health, and welfare. Yet industrialisation and prosperity have been accompanied by increases in the incidence of a number of chronic diseases, for which obesity is a major risk factor. This chapter looks at the impact of obesity on health and longevity and the economic costs that obesity generates, now and for the future. It examines the role of prevention in mitigating these effects and presents a case for how an economic perspective on the prevention of chronic diseases linked to lifestyles and obesity can provide insight into better ways of addressing the obesity epidemic.

Obesity: The extent of the problem

Unprecedented improvements in population health have been recorded in OECD countries during the past century. Life expectancy has increased on average by as much as 25-30 years. Major infectious diseases have been eradicated. Infant mortality rates have been dramatically reduced. People have gained in height and weight over time, with a substantial number moving out of under-nutrition. Economic growth has played an important role in these achievements, and so have public policies in education, sanitation, public health, and the development of welfare systems. However, industrialisation and prosperity have been accompanied by increases in the incidence of a number of chronic diseases. Advances in medical care have, in some cases, prevented increasing incidence from translating into higher mortality, but industrialised societies bear growing burdens of disability, which are contributing to rising health care expenditures.

Lifestyles have played an important part in the health changes described here. In high-income countries, smoking alone is estimated to be responsible for 22% of cardiovascular diseases, and for the vast majority of some cancers and chronic respiratory diseases. Alcohol abuse is deemed to be the source of 8-18% of the total burden of disease in men and 2-4% in women. Overweight and obesity account for an estimated 8-15% of the burden of disease in industrialised countries, while high cholesterol accounts for 5-12% (WHO, 2002).

Studies conducted in the 1970s and 1980s in the county of Alameda, California, showed that healthy habits concerning aspects of diet, physical activity, smoking, alcohol consumption and sleeping patterns could reduce mortality rates by 72% in men and 57% in women, relative to rates observed in those who had mostly unhealthy habits (Breslow and Enstrom, 1980). A recent study in England produced similar findings, suggesting that combining healthy habits has the strongest impact on mortality. People who lead a physically active life, do not smoke, drink alcohol in moderate quantities, and eat plenty of fruits and vegetables have a risk of death that is less than one fourth of the risk of those who have invariably unhealthy habits (Khaw et al., 2008). In Ireland, almost half of the reduction in CHD mortality rates during 1985-2000 in the age group 25-84 was attributed to declining trends in the number of smokers and in the mean levels of cholesterol and blood pressure (Bennet et al., 2006). Active lifestyle change may reap large benefits, as demonstrated, for instance, by a 25-year intervention on adult men in

Finland, named the North Karelia project, which is purported to have led to a 68% decline in cardiovascular disease mortality, 73% in coronary heart disease, 44% in cancer, 71% in lung cancer, and to a 49% decline in deaths from all causes (Puska et al., 1998).

Among the many epidemics that hit the world in the 20th century, two have contributed to a substantial proportion of the burden of chronic diseases, especially in high-income countries: tobacco smoking and obesity.

Cigarette smoking was a phenomenon of negligible importance in the early 1900s, but smoking rates increased steadily during the course of the century, in line with the mass production of cigarettes. The increase was particularly large between the 1930s and the 1960s. During the 1960s and 1970s, smoking rates reached peaks of 50% or more in many OECD countries, before starting to decline.

Solid evidence of the harm caused by tobacco to the health of smokers has been available at least since the 1950s. In 1964, the US Surgeon General issued a landmark report outlining the sheer scope of the health risks associated with smoking. However, it took many more years for the addictive nature of tobacco and the dangers of passive smoking to be fully and widely recognised, amidst deceptive actions by the tobacco industry and a heavy involvement of the judiciary.

The obesity epidemic has developed more recently. Height and weight have been increasing since the 18th century in many of the current OECD countries, as income, education and living conditions gradually improved over time. Surveys began to record a sharp acceleration in the rate of increase in body mass index (BMI) in the 1980s, which in many countries grew two to three times more rapidly than in the previous century. While gains in BMI had been largely beneficial to the health and longevity of our ancestors, an alarmingly large number of people have now crossed the line beyond which further gains become more and more detrimental. Before 1980, obesity rates were generally well below 10%. Since then, rates have doubled or tripled in many countries, and in almost half of OECD countries 50% or more of the population is overweight.

Evidence of a link between body weight and mortality dates back to the early 1950s (Dublin, 1953), but the harmful effects of specific nutrients and those of increasingly sedentary jobs and lives has proved much more difficult to ascertain. It was only in recent years that a clear link between unsaturated (trans) fats, particularly hydrogenated oils, and coronary heart disease was established (Mozaffarian and Stampfer, 2010). But for most nutrients, including other types of fats, sugar and salt, the issue is rather to determine at what levels their consumption may become a health hazard. The factors that influence what people eat and the activities in which they engage are so many

and so diverse that capturing the fundamental causes of the obesity epidemic and acting on the levers which may effectively and durably change the course of the epidemic is a considerable challenge.

Obesity, health and longevity

Obesity is a major public health concern because it is a key risk factor for a range of chronic diseases (Malnick and Knobler, 2006), with diabetes being the most closely linked. The severely obese have a risk of developing type 2 diabetes up to 60 times larger than those at the lower end of the normal weight spectrum. High blood pressure and high cholesterol are also more common as BMI increases. These links make the obese more likely to develop heart disease, particularly coronary artery disease, and stroke, and to die from these diseases. A large proportion of major cancers such as breast and colorectal cancer is linked to obesity and physical inactivity. Obesity also increases the chances of developing a number of respiratory and gastrointestinal diseases, as well as osteoarthritis, some mental conditions, and many other diseases and complaints, too numerous to list here. Some of the consequences of obesity may not even be known yet.

Chronic diseases are currently the main cause of both disability and death worldwide. They affect people of all ages and social classes, although they are more common in older ages and among the socially disadvantaged (WHO, 2002). Globally, of the 58 million deaths that occurred in 2005, approximately 35 million, or 60%, were due to chronic causes. Most deaths were due to cardiovascular disorders and diabetes (32%), cancers (13%), and chronic respiratory diseases (7%) (Abegunde *et al.*, 2007). This burden is predicted to worsen in the coming years. A WHO study projected an increase of global deaths by a further 17% in the period 2005-15, meaning that of the 64 million estimated deaths in 2015, 41 million people will die of a chronic disease (WHO, 2005).

The burden of chronic diseases is proportionally even larger in OECD countries. In 2002, these caused 86% of deaths in the European region (WHO, 2004). However, the prevalence of many chronic diseases, including diseases of the circulatory system, digestive and respiratory diseases, was substantially lower at the end of the 20th century than it had been at the start of the century in countries such as the United States (Fogel, 1994). Mortality for cardiovascular diseases more than halved in the United States in the latter part of the last century, after the end of World War II. Deaths decreased by a further 13% between 1996 and 2006, as case fatality dropped by almost 30%. In many countries, mortality declined more rapidly among the better off. Social disparities in premature mortality from cardiovascular diseases and many cancers widened in countries such as Finland, Norway, Denmark, Belgium, Austria and England (Mackenbach, 2006).

Such a dramatic fall in mortality, which was not mirrored by comparable declines in disease incidence, and a general increase in longevity, led to a substantial growth of morbidity associated with chronic diseases in recent years. In Denmark, an estimated 40% of the population lives with long-term conditions (WHO Europe, 2006), while in the United States the majority of 70-year-olds is affected by at least one chronic condition, with cardiovascular diseases alone affecting 40% of males (Adams et al., 1999). OECD research showed a generalised increase in the prevalence of diabetes among the elderly. Alarming trends were observed even in countries traditionally minimally affected by such disease. For instance, Japan saw a 5.3% average annual increase in the prevalence of diabetes in the period 1989-2004 (Lafortune and Balestat, 2007). Co-morbidities also increase with age, and populations are ageing rapidly in the OECD area. In western Europe, the number of people aged over 64 has more than doubled in the last 60 years, while the number of those aged over 80 has quadrupled. As a consequence, several chronic diseases can co-exist in many individuals. At least 35% of men over 60 years of age have been found to have two or more chronic conditions (WHO Europe, 2006), and of the 17 million people living with long-term chronic diseases in the United Kingdom, up to 70-80% would need support for self-care (Watkins, 2004).

Obesity, mortality and life expectancy

Unhealthy diets, sedentary lifestyles and obesity are responsible for a considerable proportion of the burden of ill health and mortality described here. The largest existing study of the link between obesity and mortality, covering close to one million adults in Europe and North America, came to the conclusion that mortality increases steeply with BMI once individuals cross the 25 kg/m² threshold (the lower limit of the overweight category) (Prospective Studies Collaboration, 2009). The lifespan of an obese person with a BMI between 30 and 35 is two to four years shorter than that of a person of normal weight. The gap increases to eight to ten years for those who are severely obese (BMI of 40-45), mirroring the loss of life expectancy suffered by smokers. An overweight person of average height will increase their risk of death by approximately 30% for every 15 additional kilograms of weight.

The link is not as strong beyond age 70 (Stevens et al., 1998; Corrada et al., 2006). Many cross-sectional studies of older individuals have even found a lower mortality among the overweight and those who are mildly obese than in normal weight individuals – the so-called “obesity paradox” – although detailed longitudinal studies have shown that this is mostly an effect of the weight loss associated with chronic diseases (Strandberg et al., 2009).

The overall impact of the obesity epidemic on trends in life expectancy is still somewhat uncertain, despite the large amount of evidence gathered in

recent years. A widely cited analysis published in a leading medical journal predicted that the rise in obesity will lead life expectancy to level off or even decline during the first half of this century in the United States (Olshansky et al., 2005). Roughly at the same time, the UK Department of Health claimed that if the growth of obesity continued unchanged, projected increases in life expectancy to 2050 would have to be revised downwards by over five years (UK Department of Health, 2004). More recent estimates, however, are not so pessimistic. A detailed model-based analysis for England concluded that the loss of life expectancy due to increasing obesity will more likely be in the order of a fraction of a year by 2050 (Foresight, 2007). A US-based analysis estimated that the growth of obesity will offset the positive effects of falling smoking rates, but the net effect will be that increases in life expectancy projected by 2020 will be held back by less than one year (Stewart et al., 2009). Overall, downward trends in mortality from a range of chronic diseases are likely to continue to prevail over the negative effects of the obesity epidemic, although it is unquestionable that progress in longevity would be much faster if fewer people were overweight.

However, a growing body of research shows that the impact of obesity on disability is far larger than its impact on mortality (Gregg and Guralnik, 2007). The obese not only live less than their normal weight counterparts, they also develop chronic diseases earlier in life and live longer with those diseases and with disability (Vita et al., 1998). In ten European countries, the odds of disability, defined as a limitation in activities of daily living (ADL), are nearly twice as large among the obese as in normal weight persons. The odds are three to four times as large in men and women who are severely obese (Andreyeva et al., 2007). In the United States, the obese did not benefit from general improvements in cardiovascular health as much as those with normal weight did. While disability decreased in the latter group, it increased among the obese between the late 1980s and the early 2000s (Alley and Chang, 2007). At age 70, an average obese person can expect to live over 40% of their residual life expectancy with diabetes, over 80% with high blood pressure and over 85% with osteoarthritis, while the corresponding shares for a normal weight person are 17%, 60% and 68% (Lakdawalla et al., 2005).

The economic costs of obesity

The strong association between obesity and chronic diseases suggests that the obese are likely to make a disproportionate use of health care, leading to a substantially larger expenditure relative to normal weight individuals. A wealth of studies has shown this based on data from at least 14 OECD countries and some non-OECD countries, mostly focusing on medical care expenditures. However, the question of the economic impact of obesity is not so simple when addressed over the lifetime and at a population level.

Estimates based on widely different approaches and methods suggest that obesity is responsible for approximately 1% to 3% of total health expenditure in most countries, with the notable exception of the United States, where several studies estimate that obesity may account for 5% to 10% of health expenditures (Tsai et al., 2010). At the individual level, an obese person incurs health care expenditures at least 25% higher than those of a normal weight person, according to a range of studies from a variety of countries (Withrow and Alter, 2010). When production losses are added to health care costs, obesity accounts for a fraction of a percentage point of GDP in most countries, and over 1% in the United States. The figure rises to over 4% in China, according to one study of the economic impact of overweight (rather than obesity), which estimated production losses in the region of 3.6% of GDP (Popkin et al., 2006; Branca and Kolovou Delonas, forthcoming).

The lifetime perspective

Because of the time lag between the onset of obesity and related health problems, the rise in obesity over the past two decades will mean higher health care costs in the future. Taking the example of England, the costs linked to overweight and obesity could be as much as 70% higher in 2015 relative to 2007 and could be 2.4 times higher in 2025 (Foresight, 2007).

Only a few of the many studies exploring health care costs associated with obesity have taken a lifetime perspective. These are all model-based studies, and unfortunately their results are not fully consistent, leaving a great deal of uncertainty on the long-term impacts of obesity. Two studies published in 1999, both based on US data, suggest that obesity increases lifetime expenditures (Thompson et al., 1999; Allison et al., 1999). At least one of these studies (Allison et al., 1999) accounts for the disease and health care implications of the longer life expectancy of people who are not obese, reaching the conclusion that after age 80 the expected health care expenditures of a non-obese person outgrow those of an obese person, as the gap in mortality between the two increases with age. However, the health care expenditures incurred by the obese at earlier ages are so much greater than those of the non-obese that, on balance, the obese still have higher lifetime costs.

This conclusion is in line with the findings of a later study (Lakdawalla et al., 2005) that entailed a simulation analysis for a cohort of 70-year-olds based on data from the US Medicare Current Beneficiary Survey (MCBS). The study concluded, perhaps unsurprisingly, given its focus on individuals who were still alive at age 70, that an overweight (but not obese) person has health care expenditures about 7% higher than those of a normal weight person, during the course of their remaining life spans, while the expenditures of an obese person are over 20% higher than those of a normal weight person. However, a further study published in 2008, based on data from the

Netherlands, found that decreased longevity of the obese makes them likely to incur lower health care expenditures than the non-obese, over a lifetime (van Baal *et al.*, 2008). According to this study, an average obese person, during their entire life span, will incur 13% lower health expenditures than a normal weight person, but 12% higher than an average smoker. The sign of these differences did not change in the study under a wide range of assumptions.

Cost-of-illness (COI) studies like the ones described here do provide some useful information, but is this the information policy makers really need to devise sound prevention strategies? When a study claims that obesity is responsible for a given amount of health care expenditure, or that obesity is associated with X% higher health care expenditures, what these claims really mean is the following: "If there were a treatment that made all obese people non-obese and equivalent in health to people who had never been obese, and if this treatment cost nothing to apply, and it were given to all obese people, then in the immediately subsequent time period direct health care costs would be reduced by [X%]" (Allison *et al.*, 1999). This hypothetical situation, of course, is very different from the reality policy makers face. Any prevention programme, at best, will produce a marginal shift in people's levels of risk. If prevention is successful in moving a certain number of people from obesity to pre-obesity, or from the latter to normal weight, those who change their condition are likely to be the ones who used to be borderline above the threshold, and their change in weight will probably take them just slightly below the same threshold. The changes in health care expenditures following a real preventive intervention are unlikely to bear much of a relationship with the estimates provided by COIs.

In the work which led to this book, the OECD deliberately avoided producing new generic estimates of health care expenditures, or costs, associated with obesity. Rather, it focused on estimating how specific forms of prevention may potentially modify existing health care needs and expenditures, as part of a broader economic analysis in which the costs of prevention are contrasted with its effectiveness. The methods and findings of this work are illustrated in Chapter 6.

The implications for social welfare and the role of prevention

OECD health care systems offer a wide range of treatments for chronic diseases, aimed at minimising their consequences. Many treatments generate benefits that justify their costs, notably in terms of quality of life. Still, the need to develop ever better ways to improve quality of life must inevitably confront the question of resources: are there limits to what can be spent on improving the quality of life and extending the life expectancy of those who suffer from chronic diseases? How do investments in prevention fit into the equation?

Few countries, if any, have similarly organised systems for the prevention of chronic diseases, although many initiatives have been taken to counter specific risk factors. As the burden of chronic diseases increases, and as societal expectations in terms of quality of life and longevity also increase, prevention may offer a valuable alternative to treatment, especially since in principle, it has the potential for increasing well-being and longevity even more than treating existing disease.

However, the costs and benefits associated with prevention are not always as obvious as many would think. Unlike treatment, prevention does not target diseases, but aims at modifying the conditions that make disease possible or likely, such as living conditions, lifestyles and the education people receive. Changing these often involves some kind of individual sacrifice. Examples may include switching from motorised transport to walking or cycling; opting for home cooked meals rather than ready-made and fast food restaurant meals; walking an extra distance to buy fresh produce which may not be available in the neighbourhood; and many others.

Health is not everything

The obesity epidemic is at least in part the result of changes that may be positive in themselves. Food has become more plentiful and food prices have fallen dramatically. Food is produced and delivered in ways which have cut the time people have to spend preparing meals, at a time when employment among women, who have traditionally done and still do most of food preparation, has been steadily on the rise. "In 1965, a married woman who didn't work spent over two hours per day cooking and cleaning up from meals. In 1995, the same tasks take less than half the time" (Cutler et al., 2003). For an increasing number of people, labour is no longer a synonym for work, as jobs have become less and less physically demanding. Motorised transport is commonplace, even to the local grocery store or school. Obesity, to a certain extent, is a side effect of these and other changes, which Philipson and Posner (2008) call the "positive aspects of the growth in obesity". If, hypothetically, those changes were to be reversed for the sake of a slimmer population, on the whole, people would be worse off.

A central tenet in an economic approach to prevention is the recognition that improving health is not the sole, and often not the most important, goal of human life. Individuals wish to engage in activities from which they expect to derive pleasure, satisfaction, or fulfilment, some of which may be conducive to good health, others less or not at all. Health is complementary with many forms of non-health-related consumption. It is necessary for individuals to flourish as consumers, parents, workers, and in other capacities. But activities from which individuals derive pleasure and fulfilment may also be in conflict with health. Some of these are fairly obvious,

such as smoking, drinking to excess, or indulging in unhealthy eating. Prevention will inevitably affect the pursuit of activities that are in conflict with health. As a consequence, individuals will be inhibited to some degree from enjoying those activities.

The benefits of prevention over time and across social groups

Why should people change their ways of life? What does prevention have to offer in exchange for the sacrifices it imposes on individuals? The benefit people derive from prevention is not an immediately tangible improvement in their condition. Rather, it is the prospect of a reduced risk of developing certain diseases sometime in the future. Both the size of the risk reduction, often relatively small, and the time required for such risk reduction to materialise, make it difficult for people to fully appreciate the value of prevention. People's attitudes towards risk, and their preferences concerning outcomes that may occur at different points in time, have a great influence on the perceived value of prevention.

The impact of prevention on social welfare depends on the balance between the costs of prevention, including the sacrifices imposed on those whose environments and lifestyles are affected, and the value attached to future risk reductions. Good prevention practices are those which provide real opportunities for increasing social welfare, by ensuring the value of prevention is greater than its cost. This is the first and foremost goal of prevention. In addition, prevention may provide opportunities for improving the distribution of welfare, or some component of it, such as health, across individuals and population groups.

Health disparities are ubiquitous and persistent in OECD countries, and many governments have made commitments to reducing them on equity grounds. Prevention always has an impact on the distributional aspects of health and welfare. Different individuals have different probabilities of developing chronic diseases, and have different health expectancies once diseases occur. Different individuals also respond differently to preventive interventions, and some will gain more than others from prevention. These distributional effects need to be accounted for in assessing the value of prevention, and they should be an integral part of the motivation for delivering prevention programmes. Prevention can be an effective way of pursuing equity in health when interventions are carefully designed to achieve this goal.

What economic analyses can contribute

This book provides an economic perspective on the prevention of chronic diseases linked to lifestyles and obesity. That perspective is about more than

counting the costs associated with diseases, whether medical care costs or productivity losses. And it involves more than assessing the cost-effectiveness of preventive interventions, although this is an important role for health economics. The potential for an economic approach to shape and inform the debate on prevention stretches beyond those aspects. It can also:

- Help in understanding the pathways through which chronic diseases are generated, which have at least as much to do with social phenomena as with human biology.
- Provide the tools for interpreting the individual and social choices that constitute a fundamental part of those pathways.
- Help in identifying opportunities for intervening on such choices with a view to improving social welfare.
- Help in understanding and addressing potential conflicts between the goals of increasing overall welfare and improving the distribution of health across individuals and population groups.

The economic approach proposed in this book provides a framework for analysing the consequences of prevention strategies and draws upon the contributions of other disciplines such as psychology, sociology, epidemiology, and public health. The proposed approach rests on the hypothesis that countering the obesity epidemic with appropriate prevention strategies may be preferable to treating the disease consequences of obesity. This hypothesis is subjected to rigorous testing based on the best existing knowledge and data, including new analyses undertaken by the OECD.

What do people want?

Identifying the potential for welfare gains from disease prevention means, above all, understanding what people value and why they value certain outcomes more than others. Lifestyles are the result of the balancing of multiple, sometimes conflicting objectives. The pursuit of each goal, including the maintenance of good health, finds a limit in the tradeoffs that emerge. Individuals who experience the consequences of unhealthy lifestyles, like obesity, or develop chronic diseases, may be willing to sacrifice the pursuit of other goals in order to improve their chances of preserving or restoring their own health. But when there is only a risk of disease, a more or less remote chance of developing disease in the future, individual priorities may be different and the relative importance attached to goals other than maintaining good health may increase substantially. An assessment of the role of prevention must not ignore those competing goals. To the extent that individuals are the best judges of their own welfare, the chances of success of any prevention programme will depend on how people value those goals.

On the other hand, the economic approach taken here recognises that individual lifestyles are subject to influences and constraints that may prevent people from making the choices that would maximise their welfare. The ability of individuals (obese and not obese) to make choices that would maximise their own welfare is limited. Even if all individuals were perfectly rational, the environment in which they live could still prevent them from making the best possible choices. O'Donoghue and Rabin (2003) emphasise that "economists will and should be ignored if [they] continue to insist that it is axiomatic that constantly trading stocks or accumulating consumer debt or becoming a heroin addict must be optimal for the people doing these things merely because they have chosen to do it". The same applies to obesity. It cannot be assumed that all those who become obese willingly accept this as a necessary consequence of behaviours from which they otherwise derive satisfaction and fulfilment.

Markets can fail

Economics interprets people's choices and interactions with their environment as market dynamics. There are strong indications, and some empirical evidence, as discussed in Chapter 4, that the market mechanisms through which individuals make their lifestyle choices (whether or not money is involved), may sometimes fail to operate efficiently. Obesity is partly the result of these failures, interpreted in this book as "market failures", potentially limiting the ability of individuals to maximise their own welfare.

Information failures provide a good example of what we mean by market failures. The assumption that the consumer has adequate information concerning the health effects of food and physical activity is not always tenable. But even if the information is complete and unambiguous, many consumers may not have the tools needed to use the information provided to their best advantage. For instance, many consumers would find it difficult to say whether "energy dense" and "high calorie" are the same thing. This is not just a question of lack of education. In a survey of 200 primary-care patients in the United States, two-thirds of whom had been to college, only 32% could correctly calculate the amount of carbohydrates consumed in a 20-ounce bottle of soda that had 2.5 servings in the bottle. Only 60% could calculate the number of carbohydrates consumed if they ate half a bagel when the serving size was a whole bagel. (Rothman *et al.*, 2006).

The reasons most people gave for these misapprehensions were that they did not understand the serving size information, they were confused by extraneous material on the label, and they calculated incorrectly. Information failures may contribute to the adoption of unhealthy behaviours and lifestyles through inadequate knowledge or understanding of the long-term consequences of such behaviours.

The problem of self-control

Among the many reasons why people ignore sound advice on health and nutrition, even though they are aware of the economic and health costs involved, lack of what we commonly call self-control is an obvious one. People generally prefer an immediate benefit to a delayed one, even if the later one is larger. Likewise, they discount the longer-term negative consequences of an act that procures immediate gratification. Even if people understand the negative consequences of eating too much or not exercising, this counts less than the more immediate pleasure or other benefit they obtain from consumption (O'Donoghue and Rabin, 1999; Scharff, 2009).

A key characteristic of people who lack self-control is procrastination (Ariely, 2008, Chapter 6). Those who have poor self-control do not lack knowledge and information, they are often perfectly aware what they are doing or not doing is bad for their health in the long run, and they are willing and ready to change their behaviour, in the future. And they truly believe in their commitment to change. But when tomorrow comes, of course, they are no longer prepared to change. This inconsistency of preferences over time, which is the cause of procrastination, is what makes people with poor self-control especially vulnerable to the influences of an obesogenic environment.*

The importance of self-control and ability to delay gratification, is well exemplified by the famous “marshmallow experiment” (Mischel *et al.*, 1992). Pre-school children who were able to refrain from eating a marshmallow when they were offered one, in order to gain a second marshmallow reward later, grew up with fewer behavioural problems and a better school performance than children who were not able to delay gratification. Although obesity was not among the outcomes directly assessed in the study, the experiment is relevant to the issue of weight gain because it shows that self-control is an important feature of personality, linked to long-term behavioural and social outcomes, of which obesity is very likely to be one amidst ever increasing environmental pressures.

* O'Donoghue and Rabin (1999) observe that most behaviours suggesting the presence of self-control problems might also be explained in a framework of time-consistent preferences. For instance: “suppose a person becomes fat from eating large quantities of potato chips. She may do so because of a harmful self-control problem, or merely because the pleasure from eating potato chips outweighs the costs of being fat.” Procrastination, however, is a clear sign of present-biased preferences and poor self-control. In practice, “the existence of present-biased preferences is overwhelmingly supported by psychological evidence, and strongly accords to common sense and conventional wisdom” and “even relatively mild self-control problems can lead to significant welfare losses”.

External costs of obesity

The obese do not pay the full price attached to their condition. Society at large picks up the “externalities” bill. Externalities linked to obesity may result in the social or other costs and benefits not being fully reflected in their private costs and benefits to individual consumers. For example, a fat person needs more room on public transport than a thin one, but does not pay a higher price for the ticket (although some airlines are introducing extra charges for people who do not fit standard seats). This is a negative externality of being fat, as are the additional costs to health systems of obesity related diseases (or to hospitals of having to buy equipment to cope with larger patients).

Fiscal externalities are potentially the most important ones. When health care is funded through public expenditure, the cost of the additional health care needed by an obese person is borne by taxpayers. If an insurance plan or other third party payer is involved, the cost will be shared among all those covered by the plan, who pay a premium for their care. However, as discussed before, it is still unclear whether the additional health care expenditures generated by obesity may or may not be offset by decreased expenditures later in life, due to premature mortality.

Externalities are also associated with the social mechanisms which make unhealthy behaviours spread within families, social networks and peer groups as a true multiplier effect. These external costs are very difficult to quantify, but no less important than others which translate more easily into monetary figures.

Externalities generally provide a strong justification for considering interventions. Evidence of important externalities from smoking and alcohol abuse, among other things, has made possible the implementation of severe restrictions on tobacco and alcohol consumption. Virtually all market and rationality failures will translate either into an excessive or a too limited consumption of lifestyle commodities such as food and physical activity, relative to the levels that would be socially desirable. Actions aimed at correcting the effects of those failures may tackle directly the mechanisms through which failures manifest themselves, for instance, by providing information when this is lacking or by making individuals pay for the negative external effects of their own consumption, possibly through taxation.

However, it is not always possible, or effective, to act directly on those failures. Prevention may also tackle failures indirectly, by acting on any relevant determinants of health, to redress the initial overconsumption or underconsumption. For instance, when information is too complex to be communicated effectively, the effects of poor information on consumption may be compensated by using taxes or other financial incentives.

Identifying the determinants of obesity

An economic approach to obesity and prevention seeks to identify the determinants of obesity – those which have changed over time, contributing to the development of the obesity epidemic, as well as those which have not changed or have changed slowly, contributing mainly to disparities in obesity across individuals – and to find out whether failures like the examples above may have been at play.

The determinants of health and disease have become the objects of a field of study in its own right, to which many disciplines have contributed over the course of the past three decades. Studies have pointed to at least three important groups of determinants of the obesity epidemic:

1. *Supply-side factors*, including the changing roles of the industries that supply lifestyle commodities; their increased and increasingly sophisticated use of promotion and persuasion; and changes in production technologies, and productivity dynamics that have shaped trends in market prices.
2. *Government policies*, including subsidies (e.g. agriculture) and taxation affecting the prices of lifestyle commodities; transport policies, some of which have led to an increased use of private means of transportation; urban planning policies leaving scarce opportunities for physical activity, or leading to the creation of deprived and segregated urban areas that provide fertile grounds for the spread of unhealthy lifestyles and ill health.
3. *Changes in working conditions*, including decreased physical activity at work, increased participation of women in the labour force, increasing levels of stress and job insecurity, longer working hours for some jobs.

Education and socio-economic status are causally linked to powerful social disparities in obesity. However, the ways these determinants act is complex. They play an important role in women, but a much less important role in men. The way they affect obesity has changed over time. Obesity used to be a condition of the wealthy, and still is in many low- and middle-income countries. But in virtually all high-income countries obesity is now a condition of the poor and least educated. This is not because their individual characteristics are fundamentally different from those of people higher up the social ladder, but mainly because they are exposed to less favourable and more compelling environmental pressures.

Understanding the pathways through which diseases are generated is a necessary but not a sufficient condition for preventive action. If more women have taken up employment, and if they have been working such long hours that the time they used to dedicate to the preparation of meals for themselves and their families is now drastically reduced, it means that all those involved, women, their families, their employers, must have acted on the expectation

that those changes would lead to a welfare gain, despite the possible negative consequences on health from poorer nutrition (Anderson *et al.*, 2002, showed that increased female labour force participation contributed to increases in child obesity, although Cutler *et al.*, 2003, disputed this claim). And a welfare gain has likely been attained, given that the trend has been consolidating over time. Acting on the labour market dynamics described above simply with the aim of preventing negative health effects, may result in a conflict with the aspirations of those who triggered those dynamics.

The prevention of chronic diseases inevitably interferes with lifestyles and social phenomena which are of value to many people. Some forms of prevention aim at widening choice by making new options available to consumers: healthier foods for a lower price; new opportunities for physical activity – for instance, more green spaces in urban areas, or new active means of transportation. In these cases, interference with individual lifestyles may be very mild. But prevention can be much more intrusive when the consequences of unhealthy lifestyles are particularly undesirable, or when specific circumstances make rational choices difficult or unlikely (for instance, when children are involved) or when information is lacking. In these cases prevention may impinge more heavily on individuals, up to the point of restricting their choices by banning options that present the highest risks for health.

The political costs of prevention, in the form of interference with individual choice, often follow an inverse pattern relative to the economic costs of prevention. Interventions that involve lower degrees of interference tend to have higher economic costs, and *vice versa*.

The book's main conclusions

Overweight and obesity rates have been increasing relentlessly over recent decades in all industrialised countries, as well as in many lower income countries. OECD analyses of trends over time, as well as projections of overweight and obesity rates over the next ten years, draw a grim picture about the present and possible future, contributing new evidence to a growing international literature. The circumstances in which people have been leading their lives over the past 20-30 years, including physical, social and economic environments, have exerted powerful influences on their overall calorie intake, on the composition of their diets and on the frequency and intensity of physical activity at work, at home and during leisure time. On the other hand, changing individual attitudes, reflecting the long-term influences of improved education and socio-economic conditions have countered increasing environmental pressures to some extent.

Social factors

OECD analyses confirm the existence of what has been described elsewhere as a “social multiplier” effect, corresponding to the clustering of overweight and obesity within households, social networks, and possibly other levels of aggregation (Cutler and Glaeser, 2007). This is likely to have contributed to the rapid spread of overweight and obesity, especially in high-income countries, making this expansion more and more similar to a classic epidemic. The social multiplier effect reflects externalities of lifestyles, particularly within households. The impact on other individuals’ health may be less direct in this case than, for instance, in the case of passive smoking, but it is no less important. In a policy perspective, such externalities are likely to be more relevant than those associated with health expenditures, which remain somewhat controversial. The role played by education, health literacy and information as determinants of obesity suggests that lifestyle choices could be improved by changing individual endowments and the availability of information. There is also some evidence of rationality failures in choices concerning diet and physical activity, associated with lack of self-control and inconsistent preferences over time, which may have contributed to the obesity epidemic.

Many OECD countries have been concerned not only about the pace of the increase in overweight and obesity, but also about inequalities in their distribution across social groups, particularly by socio-economic status and by ethnic background. Large inequalities across social groups are observed in women, while substantially milder inequalities, or none at all, are observed in men. Acting on the mechanisms that make women in poor socio-economic circumstances so vulnerable to obesity, and women at the other end of the socio-economic spectrum much more able to handle obesogenic environments, is of great importance not just as a way of redressing existing inequalities, but also because of its potential effect on overall social welfare. The current distribution of obesity appears particularly undesirable, as it is likely to perpetuate the vicious circle linking obesity and disadvantage by intergenerational transmission.

Prevention needs consensus

The question addressed in this book, then, is how to trigger meaningful changes in obesity trends. The short answer is by wide-ranging prevention strategies addressing multiple determinants of health. The reality is that every step of the process is conditioned not just by public health concerns, but by history, culture, the economic situation, political factors, social inertia and enthusiasm, and the particularities of the groups targeted. For example, the fact that interventions and impacts may be asynchronous can create a political obstacle, especially during periods of cuts in public expenditures.

Politicians may be reluctant to approve spending when any benefit may not appear for several decades. Those designing and implementing a prevention strategy are faced with the difficult task of having to devise a mix of interventions that takes into account various tradeoffs, including those among available resources, distribution of costs and health effects across population groups, and interference with individual choice.

A wide consensus on what should be done, when and with what means would of course make things easier. However, although the contribution and co-operation of many agents is needed for the success of a prevention strategy, none of the agents potentially involved, at any point in time, possesses all the information, tools and power required for the planning of comprehensive chronic disease prevention strategies, and none of the agents is able to take a sufficiently long time perspective to make such planning possible.

Insufficient evidence

Governments in the OECD area have implemented a wide range of interventions at the national and local levels, particularly during the past five years. Governments have been taking action in response to calls by international organisations and pressure by the media and the public health community, but without a strong body of evidence of the effectiveness of interventions, and virtually no evidence of their efficiency and distributional impact. The opportunity cost of resources used by governments to promote healthy diets and physical activity may be high, and most governments have not yet engaged in open discussions of possible rationales for intervention. In the private sector, employers, the food and beverage industry, the pharmaceutical industry, the sports industry and others have made potentially important contributions to tackling unhealthy diets and sedentary lifestyles, often in co-operation with individual governments and international organisations, although there is still insufficient evidence of the effectiveness of such interventions.

The adoption of a “multi-stakeholder” approach is increasingly invoked as the most sensible way forward in the prevention of chronic diseases. But while few if any of those involved would argue with this in theory, the interests of different groups are sometimes in conflict with each other and it is not always possible to find a solution where nobody loses out. Yet at the same time, no party is in a position to meaningfully reduce the obesity problem and associated chronic diseases without full co-operation with other stakeholders.

Who pays?

The question of who pays for and who benefits from prevention strategies is a case in point. Economic analysis contrasts the costs involved in implementing preventive interventions with the expected health outcomes of

those interventions, without distinction as to who might bear the costs. The conclusion that many such interventions are efficient is based on the assumption that the health outcomes generated by the interventions are of value to those who bear the relevant costs. This would be the case for governments that view the enhancement of individual and population health as one of the goals of their action.

However, at least some of the costs of preventive interventions might be shifted onto the private sector, as long as these interventions generate outcomes that may be of value to potential payers. Parents for example, increasingly expect schools to carry out a number of roles apart from teaching children academic subjects. They might be willing to pay for school-based initiatives from which their children could benefit, such as expanded sports facilities, better food in canteens, or personalised nutrition programmes. Here the funder – the parent – has a clear obligation to aid the beneficiary and can be expected to act altruistically. The argument is more complicated regarding business. Initiatives taken by the food industry, for instance in relation to self-regulation of advertising or nutrition labelling, have the effect of charging the industry with a significant portion of the cost of those actions. The cost may be transferred to consumers, but the impact of the action may be to damage profitability, either through the extra cost itself, or because consumers buy less of the product when they understand what it is made of. Of course, if, as mentioned earlier, the alternative is even harsher regulation imposed by public authorities, the industry may see the cost as worthwhile.

Most interventions are efficient, but none can solve the problem alone

Despite the many complications, the overall conclusion from our study is that most interventions are efficient, as illustrated by broad cost-effectiveness categories, relative to a scenario in which no systematic prevention is undertaken and chronic diseases are treated once they emerge. Some interventions can even lead to overall cost savings. However, if individual interventions were to be implemented in isolation, they would have a limited impact on the overall scale of the obesity problem, reducing the obese population, at best, by less than 10%, although they would all increase life expectancy and disability-adjusted life expectancy. Although the most efficient interventions are outside the health care sector, health systems can make the largest impact on obesity and chronic conditions by focusing on individuals at high risk. Interventions targeting younger age groups are unlikely to have any meaningful health effects at the population level for many years. The cost-effectiveness profiles of such interventions may be favourable in the long term, but remain unfavourable for several decades at the start of the interventions. In general, the scale of the impact of individual interventions is limited by the difficulties involved in reaching a large

proportion of the national population, so the wider the range of actions included in prevention strategies, the greater their effectiveness.

In policy terms, the main lesson is that there is no magic bullet that will be effective against all the causes of obesity across all age and socio-economic groups. But effective interventions do exist in all the main areas of action, and this book will help policy makers to assess their options and combine them in a practical, cost-effective manner.

Overview of the remaining chapters

This book proposes an economic approach to the study of obesity and chronic disease prevention, based on work undertaken by the OECD, partly in collaboration with the World Health Organisation (WHO). The concepts and analyses presented here provide a basis for developing and evaluating policies to maintain and improve population health by reducing the occurrence and the impact of chronic diseases. The proposed economic framework is centred on the hypothesis that prevention may provide the means for increasing social welfare, enhancing health equity, or both, relative to a situation in which chronic diseases are simply treated once they emerge. The book develops the steps required for testing this hypothesis in relation to the prevention of chronic diseases linked to unhealthy diets, sedentary lifestyles and obesity.

The scale and characteristics of the obesity epidemic, which is the most immediate and visible reflection of changing patterns of diet and physical activity, are addressed in the next two chapters. The findings presented in these chapters reflect the ways in which obesity has spread among adults in recent decades and its distribution across population groups, mainly based on analyses of health survey data from 11 OECD countries. Historical trends and projections of overweight and obesity rates are presented in Chapter 2, along with a challenging analysis of the relative contributions of age, period and cohort effects in the development of the obesity epidemic. Social disparities in obesity along several dimensions are discussed in Chapter 3, followed by a comprehensive review of the impacts of obesity on employment, earnings and productivity.

A special contribution by Tim Lobstein follows Chapter 3 and completes the picture by expanding the child obesity dimension of the analysis of recent trends in obesity. Lobstein's discussion of the phenomenon adds to the findings of OECD analyses of child obesity in four countries, including projections of child overweight and obesity rates over the next ten years reported in Chapter 2 and analyses of social disparities in child obesity reported in Chapter 3.

Some of the key pathways through which obesity and chronic diseases are generated are discussed in Chapter 4. There the question is addressed of whether such pathways are simply the outcome of efficient market dynamics,

or the effect of market and rationality failures preventing individuals from achieving more desirable outcomes. Special attention is placed on information, externalities and self-control issues, including a detailed discussion of the role of social multiplier effects in the obesity epidemic. Evidence of similar failures is reviewed and the scope for prevention to address some of the consequences of those failures is discussed.

Donald Kenkel provides a further in-depth analysis of the role of information in relation to obesity in a special contribution which follows Chapter 4.

Actions taken by OECD governments and by the private sector in response to the obesity epidemic are reviewed in Chapter 5, partly based on a survey undertaken by the OECD of recent government policies aimed at improving diet and physical activity. The main characteristics and potential impact of interventions are assessed in relation to the degree to which they are likely to interfere with individual choice.

In a further special contribution which follows Chapter 5, Francesco Branca and his co-authors provide an overview of the breadth and effectiveness of local-level initiatives to improve diets and physical activity and discuss how these relate to national programmes.

An economic analysis of a set of nine interventions aimed at tackling obesity by improving diets and physical activity is the subject of Chapter 6. The main focus of the chapter is on five OECD countries – Canada, England, Italy, Japan and Mexico. Interventions range from health education and promotion in various settings to fiscal measures and regulation, to counselling of individuals at risk in primary care. These were identified on the basis of their prominence in the current policy debate, and of the availability of sufficient evidence of their effectiveness. The analysis was based on a micro-simulation model designed in collaboration with the WHO to assess the impact of changes in risk factors on chronic diseases, quality of life, longevity and expenditure. The likely distributional consequences of such changes by age, gender and socio-economic status are also presented in Chapter 6.

The strengths and limitations of government regulation and self-regulation of food advertising to children, two of the preventive interventions assessed in Chapter 6, are presented in two special contributions which follow the chapter.

Finally, the relevance of the findings presented throughout the book for government policy aimed at tackling the growing obesity epidemic is discussed in Chapter 7. The conclusions of the book emphasise the distinct contribution of an economic approach to prevention, highlight the key messages which emerge from OECD work on obesity and the challenges countries will face in the future.

Key messages

- Major progress in health care and public health over the past century, associated with a sustained economic growth, has contributed to improvements in population health and longevity, but has not prevented an expansion of the burden of chronic diseases in OECD countries.
- Much of the burden of chronic diseases is linked to lifestyles, with tobacco smoking, obesity, diet and lack of physical activity being responsible for the largest shares of such burden.
- Existing evidence shows that mortality increases steeply with BMI once individuals cross the overweight threshold. The lifespan of an obese person is up to 8-10 years shorter (for a BMI of 40-45) than that of a normal-weight person, mirroring the loss of life expectancy suffered by smokers.
- An obese person generates higher health care expenditures than a normal-weight person and costs increase disproportionately at increasing levels of BMI. However, this does not provide a complete picture of the economic burden associated with obesity.
- Over a lifetime, existing estimates suggest that an obese person generates lower expenditures than a person of normal weight (but higher than a smoker, on average).
- Assessing opportunities to modify existing health care needs and expenditures at the margin (as done in Chapter 6) is more important than producing generic estimates of the costs associated with obesity.
- Prevention can be one of the most effective ways of improving population health, but the small size of the risk reduction, at the individual level, and the time required for this to materialise, make it difficult for people to fully appreciate the value of prevention.
- An economic approach to the prevention of chronic diseases recognises the importance of human goals that are potentially in competition with the pursuit of good health and the social and material constraints which influence individual choice and behaviours.
- An economic approach to prevention aims at identifying possible factors, technically market failures, which limit opportunities for people to make healthy lifestyle choices, and devising suitable strategies to overcome such failures.

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