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The Prevention of Lifestyle-
Related Chronic Diseases:
an Economic Framework

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Jeremy Hurst**

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CHRONIC DISEASES: AN ECONOMIC
FRAMEWORK**

Franco Sassi and Jeremy Hurst

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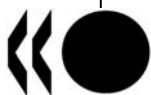
The Prevention of Lifestyle-Related Chronic Diseases: an Economic Framework

Franco Sassi and Jeremy Hurst

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ABSTRACT

This paper provides an economic perspective on the prevention of chronic diseases, focusing in particular on diseases linked to lifestyle choices. The proposed economic framework is centred on the hypothesis that the prevention of chronic diseases 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. Testing this hypothesis requires the completion of several conceptual and methodological steps. The pathways through which chronic diseases are generated must be identified as well as the levers that could modify those pathways. Justification for action must be sought by examining whether the determinants of chronic diseases are simply the outcome of efficient market dynamics, or the effect of market and rationality failures preventing individuals from achieving the best possible outcomes. Where failures exist, possible preventive interventions must be conceived, whose expected impact on individual choices should be commensurate to the extent of those failures and to the severity of the outcomes arising from them. A positive impact of such interventions on social welfare and health equity should be assessed empirically through a comprehensive evaluation before interventions are implemented.

JEL Classification: H23, H51, I12, I18.

Keywords: health determinants; non-communicable diseases; prevention; market failure; rationality; choice; cost-benefit analysis; cost-effectiveness analysis; health equity.

RÉSUMÉ

Le présent rapport appréhende dans une optique économique la question de la prévention des maladies chroniques, en mettant tout particulièrement l'accent sur celles qui sont associées au mode de vie. Le cadre économique proposé repose essentiellement sur l'hypothèse selon laquelle la prévention des maladies chroniques peut permettre d'améliorer le bien-être social ou d'accroître l'équité face à la santé, ou les deux, par rapport à une situation dans laquelle ces maladies sont simplement traitées lorsqu'elles se déclarent. Pour vérifier cette hypothèse, il faut accomplir plusieurs tâches d'ordre conceptuel et méthodologique. Il est nécessaire de cerner le processus qui aboutit à l'apparition des maladies chroniques, ainsi que les moyens susceptibles d'infléchir ce processus. Pour définir l'action à mener dans ce sens, il faut examiner si les déterminants de ces maladies sont simplement issus de la dynamique d'un marché efficient ou s'ils découlent d'une défaillance du marché et d'un défaut de rationalité qui empêchent les individus d'obtenir les meilleurs résultats possibles. Lorsqu'il y a défaillance, il est nécessaire de définir les mesures préventives qui pourraient être prises, mesures dont l'impact attendu sur les choix individuels doit être proportionnel à l'ampleur de cette défaillance et à la gravité des effets qu'elle produit. Il conviendrait d'examiner si ces mesures auront une incidence positive sur le bien-être social et l'équité face à la santé en effectuant une évaluation approfondie à l'aide de données concrètes avant leur application.

Classification JEL: H23, H51, I12, I18.

Mots clés: déterminants de la santé ; maladies non transmissibles ; prévention ; défaillance du marché ; rationalité ; choix ; analyse coûts-avantages ; analyse coût-efficacité ; équité face à la santé.

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EXECUTIVE SUMMARY

1. Unprecedented improvements in population health have been recorded in OECD countries over the course of 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 contributing to rising health care expenditures. Lifestyle choices have played an important part in the health changes described here.

2. This paper provides an economic perspective on the prevention of chronic diseases, focusing in particular on diseases linked to lifestyle choices. The paper sets out a conceptual framework centred on the pursuit of two key goals of prevention: increasing social welfare and enhancing health equity across individuals and population groups. An economic approach to chronic disease prevention may help understanding the pathways through which chronic diseases are generated; it may provide the tools for interpreting the individual and social choices that constitute a fundamental part of those pathways; it may help identifying opportunities for intervening on such choices with a view to improving individual and social welfare; and it may help understanding and addressing potential conflicts between the goals of increasing overall welfare and improving the distribution of health.

3. Testing the potential for prevention to attain its efficiency and equity goals, relative to treating chronic diseases once they emerge, requires a stepwise process which entails: (a) identifying the key factors that determine health and disease; (b) assessing possible market and rationality failures affecting those determinants; (c) identifying viable preventive interventions; (d) evaluating the impact of preventive interventions on social welfare and on health equity.

4. Understanding the pathways through which chronic diseases are generated requires an assessment of individual determinants of those diseases as well as interactions among them, over the life-course of individuals. In particular, interactions between structural determinants, such as social norms and socioeconomic conditions, and a group of determinants which tend to mediate the effects of the former, including individual biological and behavioural determinants, living and working conditions. In the latter group, a central role is played by lifestyle choices, not only because of their direct influence on health, but because they appear to mediate part of the effects of most other health determinants. Lifestyle choices have been shown to be closely associated with a significant portion of the morbidity and mortality generated by chronic diseases.

5. An economic approach to prevention involves interpreting individual lifestyles as the result of choices regarding the consumption of commodities such as, for instance, tobacco, alcohol, food, but also physical activity or leisure time, in the light of opportunity costs and other incentives. Health determinants that influence lifestyles are in turn the result of similar choices and incentives. However, there are strong suggestions, and at least some empirical evidence, that the mechanisms through which individuals make their lifestyle choices, broadly defined in economics as market mechanisms, whether or not monetary exchanges are involved, may sometimes fail to operate efficiently. If those failures could be avoided, social welfare would be increased. Examples of failures that may be observed in relation to specific lifestyle choices include the following: information failures, which may contribute to the adoption of unhealthy behaviours and lifestyles through an inadequate knowledge or understanding of the long-term

consequences of such behaviours; externalities leading to the social costs and benefits of certain forms of consumption not being fully reflected in their private costs and benefits to individual consumers (e.g. negative externalities in the case of addictive substances or unhealthy foods, or positive externalities in the case of education); failures of rationality, such as lack of self-control, which prevent individuals from making choices in their own best interest.

6. Where failures such as those described above exist, the benefits potentially deriving from tackling the inefficiencies they cause may in some cases justify some form of corrective action, either by governments or other actors. Government action may also be warranted to correct the unintended health consequences of existing public policies, or to correct situations of inequality in health among population groups that may conflict with societal distributional ethics. The targeting of specific failures in the design of prevention policies should be based on two main factors: whether these failures have a sufficiently large impact to warrant intervention by governments or other subjects; and whether the same failures are amenable to correction through appropriate, efficient and equitable actions.

7. Preventive interventions, promoted by governments or other actors, may offer opportunities to increase social welfare or enhance health equity, but they will inevitably interfere, at least to some extent, with individual lifestyle choices. The least intrusive interventions are those aimed at widening choice by expanding the range of options individuals can choose from, or those aimed at making certain existing options more affordable. These actions include support to technologies that help private self-control. Persuasion and other non-price devices such as default rules are often advocated as minimally intrusive interventions which do not significantly affect rational consumers. However, governments may not always deliver persuasion effectively and in the best interest of individuals. When some consumers are more rational than others, taxes and consumption bans would affect both rational and less rational consumers, potentially leading to welfare losses. Outright bans of selected choice options involve the highest degree of interference with individual choice. They may be difficult to enforce, particularly when demand is strong or consumption is addictive. Heavier interference with individual choices may be justified when there is evidence of significant departures from rational and efficient decision making concerning lifestyles, or when the harm deriving to individuals from those departures is particularly severe.

8. The evaluation of preventive interventions requires the adoption of an assessment model able to capture both the impacts on overall social welfare and those on the distribution of health across population groups. The assessment model must be relevant in the perspective of policies developed across different government departments, but at the same time it needs to produce results that may be comparable with those of evaluations conducted within specific sectors (e.g. health care) when preventive interventions compete for resources from departmental budgets.

9. Cost-benefit analysis is the most established approach for the evaluation of intersectoral programmes. Combining this approach with cost-effectiveness analysis would make the assessment relevant to different decision and budget perspectives, and it would improve the comparability of results across interventions. The assessment model should include measures of the externalities that may be relevant in the decision maker's perspective. It should discount costs and benefits based on the requirement that government time preferences are to remain consistent over time, although time preference patterns reflecting more closely those embodied in individual lifestyle choices may be used in predicting the likely response to preventive interventions. On the distributional dimension, evidence shows that people are willing to trade off efficiency and equity in relation to the pursuit of health. The impact of preventive interventions on health equity should be assessed by estimating changes in indicators of health distribution, but it should be best kept separate from the assessment of efficiency.

INTRODUCTION

The background to this paper

10. This paper is a product of the OECD Economics of Prevention project, which was conceived against a background of rising concern about an expected growth in the prevalence of chronic diseases in the next few decades, especially diseases linked to poor lifestyles. A substantial growth of chronic diseases is being observed and projected in relation to at least two phenomena. The first is the progressive deferral of mortality from many chronic diseases, partly attributable to better medical care. This has contributed to extending life expectancy in OECD countries, but also to an increased incidence of age-related chronic diseases. The second factor is rising age-specific incidence of some chronic diseases as a consequence of poor lifestyles. Risky lifestyles play a big part in the incidence of many chronic diseases and whereas some lifestyle trends, such as reduced smoking, are favourable in most OECD countries, others, such as consumption of poor diets, adoption of sedentary behaviour and the resulting obesity, are adversely affecting population health. Obesity and the prevalence of chronic diseases linked to obesity, such as diabetes and cardio-vascular disease, have been increasing consistently across OECD countries in the last 10-20 years (e.g. Lafortune and Balestat, 2007).

11. A rise in public expenditure on health and long-term care is projected in the next few decades (OECD Economics Department WP No 477). These projections suggest that public health care spending in the average OECD country could increase from 5.7% of GDP in 2005 to 9.6% in 2050, if efforts are not made to tackle the likely causes of the projected growth. Among such causes is the increasing trend in chronic diseases, although the impact of individual diseases varies greatly. Potential measures to contain rising health care expenditure include policies to reduce morbidity and disability, especially among the elderly, for whom the prevalence of chronic diseases is highest. The Economics of Prevention project is focussed primarily on the question of whether and to what extent efforts to prevent non-communicable diseases would increase social welfare and enhance health equity, compared with accepting the consequences of treating and managing disease.

The purpose and contents of this paper

12. This paper is designed to set out the key components of a conceptual framework on the economics of chronic disease prevention. The paper is structured in four main sections. In the first, the goals of prevention are set out, along with the main components of an economic approach to the design and analysis of preventive interventions, beginning with a discussion of the main determinants of health and economic models of health production. In the second section, the factors that may justify preventive interventions are explored, including potential market and rationality failures, especially in relation to lifestyle choices, and the unintended health consequences of existing government policies. All of these may hinder the pursuit of optimal outcomes from unfettered individual choices. In the third section, the range of options for preventive interventions and the degrees to which different options intrude on individual choice are discussed, and a taxonomy of interventions is presented. In the fourth section, an overview is provided of the approaches and methods that may be required to appraise policy options in the field of prevention paying particular attention to the problem of performing economic appraisals across different sectors of government intervention. Overall conclusions are drawn in the final section.

Section 1

Chronic diseases: an economic problem?

1.1. The burden of chronic diseases on health and longevity

13. Chronic non-communicable diseases are currently the main cause of both disability and death worldwide. This heterogeneous group of diseases, including, among others, cardiovascular conditions, cancers, chronic respiratory conditions and diabetes, affect people of all ages and social classes (WHO, 2002). Globally, of the 58 million deaths occurred in 2005, approximately 35 million, or 60%, were due to chronic causes. Most of them 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 2005-2015, meaning that of the 64 million estimated deaths in 2015, 41 million people will die of a chronic disease (WHO, 2005).

14. The burden of chronic diseases is proportionally even larger in OECD countries. The Global Burden of Disease study identified chronic diseases as the main cause of death in industrialized countries in 1990 (Murray and Lopez, 1997). In 2001, the four leading causes of death related to chronic diseases, mentioned above, killed 1,611,833 people in the US, accounting for two thirds of all the deaths, while, in 2002, they caused 86% of deaths in the European Region (WHO, 2004). Chronic diseases and the increased mortality associated with them are not distributed evenly across social groups, with those in the most disadvantaged socioeconomic conditions displaying the highest prevalence and mortality rates, and those in the most advantaged conditions the lowest rates, with a continuous gradient among groups positioned between the two extremes. In countries such as Finland, Norway, Denmark, Belgium, Austria and England researches demonstrated a widening of inequalities in premature mortality from cardiovascular diseases and many cancers between socioeconomic groups (Mackenbach, 2006).

15. The impact of chronic diseases on morbidity is also remarkable. In Denmark, an estimated 40% of the population is living with long-term conditions (WHO Europe, 2006), while in the US the majority of seventy year olds is affected by at least one chronic condition, with cardiovascular diseases alone affecting 40% of males (Adams et al., 1999). 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 coexist in many individuals. At least 35% of men over 60 years of age have been found to have 2 or more chronic conditions (WHO Europe, 2006), and of the 17 million people living with long-term chronic diseases in the UK, up to 70-80% would need support for self-care (Watkins, 2004).

16. Some improvements were recorded in recent years, as a number of countries saw decreases in mortality rates associated with selected chronic diseases. For instance, in most European countries both cardiovascular diseases in general, and coronary heart disease in particular, displayed negative trends in case fatality rates in the past 30 years (Petersen, 2005). These results are supported, on a smaller scale, by an Australian study reporting that in the period 1997-2003 age-standardized mortality rates for heart failure decreased in both sexes by about 38% (Najafi, 2006). However, the WHO MONICA project (Monitoring trends and determinants in cardiovascular disease) showed that while the incidence of coronary events fell in some of the populations covered by the study, it did not in groups observed in countries such as the Czech Republic, Denmark, East Germany, Poland and Sweden, where incidence rose in the period 1983-1996 to up to 2.8% per year (Tunstall-Pedoe, 1999). Some improvements were also recorded in the cancer

area. Despite an increasing incidence, mortality rates for several cancers were reduced in recent years thanks to substantial improvements in survival (Coleman et al., 2003).

17. Other chronic diseases display less promising trends. 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). Increases in mortality, and avoidable mortality, were also observed in association with diabetes. In France, mortality for diabetes amenable to medical care (i.e. the number of deaths that could be averted by appropriate health care) increased by 23% in men and by 35% in women between 1998 and 2003. In the US, it increased by 8% in men and 5% in women, in the period 1998-2002 (Nolte, 2008). Some of the risk factors often associated with diabetes are also on the rise, as it was shown for the prevalence of high blood pressure, one of the main risk factors for cardiovascular diseases and stroke, in US and UK (McCarron, 2006).

18. Lifestyles play an important role in determining chronic diseases and lifestyle changes are likely to be responsible for a significant proportion of their increase over time. Smoking alone is estimated to be responsible for 22% of cardiovascular diseases in industrialised countries, and for the vast majority of some cancers and chronic respiratory diseases (WHO, 2002). 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).

19. In an area in which experimental studies are particularly difficult to undertake, observational evidence has suggested for a long time that healthy lifestyles may prevent a large proportion of mortality from chronic diseases. 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, relatively to the 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., 2007). 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 (WHO, 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 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).

1.2. The implications for social welfare and the role of prevention

20. Treating chronic diseases after they emerge is likely to increase individual and social welfare. There is obviously a limit to the amount of resources that can be spent on improving the quality of life and extending the life expectancy of those suffering from chronic diseases, a limit set by the opportunity cost of those resources, but many existing treatments for the relief of chronic conditions generate benefits that are valued more highly than their costs.

21. Prevention, in principle, has the potential for increasing welfare even further, as it is meant to avoid the entire burden of chronic diseases, and not just the portion that can be averted through treatment once diseases have emerged. However, there are at least two important differences between prevention and treatment which must be taken into account in a social welfare perspective. First, prevention does not aim

at modifying the effects of disease, as the latter does not (yet) exist. Rather, it aims at modifying the conditions that make disease possible, or likely. These conditions may include aspects of the environments in which people live, the education people receive, their lifestyle choices. Changing those conditions involves in many cases a sacrifice for the same individuals, additional to the cost of any material resources required to make such changes possible. Second, the target of prevention is healthy individuals, or at least individuals who have not (yet) developed the condition or the event to be prevented. The benefit those individuals derive from prevention 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, contribute to lessening the value of prevention in the perception of the individual who receives it. The extent to which prevention may improve social welfare is determined by the juxtaposition of the costs and sacrifices mentioned earlier to the perceived value of the future risk reduction.

22. All countries in the OECD area have established health care systems which offer a wide range of treatments for chronic diseases, aimed at minimising their consequences. Few countries, if any, have so far established similarly organised and generalised 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 an increasingly valuable alternative to treatment

1.2.1. The goals of prevention

23. Preventive interventions may provide opportunities for increasing social welfare, i.e. they may generate benefits which more than offset related costs and therefore represent an efficient use of the resources involved in the realisation of such interventions. However, societal welfare may also be improved by changing the distribution of welfare, or some component of it such as health. Preventive interventions are implemented in a context of significant inequalities in health, by socioeconomic condition and other relevant dimensions, in virtually all OECD countries. Preventive interventions are unlikely to be neutral in their effects on the distribution of health and welfare. An objective of these interventions may be to support a redistribution of health, i.e. to reduce health disparities among population groups.

Increasing welfare

24. From an economic perspective, it is important to recognise that improving health is not the sole, and often not the most important, goal of human life. Individuals derive utility from many forms of consumption, and from participation in many activities, of which those linked to the pursuit of good health represent only a proportion. Health is complementary with many forms of non health-related consumption, as the former is necessary for individuals to flourish as consumers, parents, workers, and in other capacities. However, many consumption and production activities may also conflict with health, if only after a certain period of time, as when individuals wish to engage in risky behaviours such as smoking, drinking to excess, unhealthy eating, or a sedentary lifestyle.

25. Prevention will most likely affect the pursuit of activities and consumption that are potentially in conflict with health. As a consequence, individuals will be inhibited to some degree from deriving utility from those activities. Opportunities for prevention to improve welfare rest on the ability of preventive interventions to generate health improvements whose value will offset any losses of utility from changes in lifestyles or other activities. However, it should not be assumed that individuals always make lifestyle choices and engage in activities that necessarily increase or maximise their welfare. Many such choices are made in the context of imperfect markets, for instance, when consumers lack information on the consequences of consumption decisions, or when competition in the supply of a commodity is lacking and

suppliers may exercise monopolistic power. In some cases, consumers are unable to make sufficiently rational choices (as is generally the case among children, for example).

26. Additionally, lifestyle and other consumption choices are based on preferences that are subject to many influences. Examples include the family environment, the education received, peer groups and social networks, the work environment, the physical environment and existing infrastructures. The market and rationality failures mentioned previously may occur as well in relation to the social and environmental factors that influence lifestyle choices, leading to outcomes that do not necessarily enhance or maximise welfare. When this happens, preventive interventions may act to change the social and environmental conditions that account for the origin of some unhealthy behaviours, especially for those who have a lesser degree of control over their own environment, like children.

Enhancing health equity

27. The distribution of welfare across individuals and population groups is a key dimension of social welfare, of which health is an important component. Evidence of significant disparities in health status and longevity in many countries has been available for several decades, and many governments have made commitments to reduce major disparities in health on equity grounds. Concepts of equity adopted by national governments and international organisations in relation to health often focus on health *care* and tend to be centred on notions of equality with respect to some relevant dimension, a common example being equal access for equal need. However, even when the focus is narrowly placed on health care, policy decisions are sometimes inconsistent with regard to their distributional effects and the balance they achieve between the goals of equity and efficiency (Donaldson and Gerard, 1993; Sassi et al, 2001). Approaches to promoting equity with regard to health *status* have been more cautious, generally avoiding direct references to notions of equality, and rather focusing on the reduction of variations across population groups.

28. There is generally recognition that health disparities are likely to persist as long as social structures allow some degree of inequality. It has been argued that health inequalities, at least to a certain extent, are acceptable, or even desirable (Collison, 1998), because of trade-offs between equity and efficiency, non-modifiable risk factors (for example, genetic heritage) and individual choice (such as lifestyle). The question for governments is which health inequalities should be tackled, and how much effort should be put into redressing them.

29. Prevention unavoidably produces distributional effects. Different individuals and groups have different probabilities of developing chronic diseases, and have different outcomes once such diseases occur. Different individuals and groups also respond differently to preventive interventions. Potential distributional effects cannot be ignored in the design of preventive intervention. Not only they should be accounted for, but they should be openly pursued, in line with the distributional objectives of health and broader government policy. Prevention offers excellent opportunities for redistribution of health and longevity. Prevention strategies are not subject to the same moral imperative of health care, and may be more easily targeted to those individuals and groups who are deemed to need and deserve them the most.

1.3. Will preventive interventions improve social welfare? Testing the hypothesis

30. Testing the ability of specific interventions to accomplish the overarching goals of prevention, increasing social welfare and improving its distribution, requires an assessment process articulated along a number of dimensions. The process may involve judgement, as well as objective measurement of expected outcomes, partly because it may not always be possible to gather sufficient empirical evidence, partly because individual and social values play an important part in the social phenomena that are being

considered. The main steps of the process of testing whether the conditions exist for the accomplishment of the goals of prevention are as follows:

- a) **Identifying the factors that determine health and disease** and the causal pathways through which they produce their effects. The individuals affected by those determinants and the way determinants change over time also need to be assessed. For instance, some determinants may affect different individuals to different degrees, and may be relatively stable over time, in which case they will contribute to shaping the distribution of the burden of chronic diseases and its overall size. Other determinants may affect the health of most individuals exposed to them, and evolve rapidly over time, in which case they may be responsible for changes in the burden of chronic diseases. The determinants of health and disease are further discussed in the remainder of the first section of this paper.
- b) **Assessing possible market and rationality failures** characterising different layers of health determinants, as well as the unintended health consequences of existing government policies. If such failures exist, and if their extent is sufficiently large, it will be legitimate to think that individuals may not be maximising their own and social welfare through their choices. And it may be justified to consider adopting specific actions on the health determinants affected by market and rationality failures. The latter failures are a pre-condition for action, although welfare improvements potentially associated with preventive interventions must be evaluated as part of the assessment process. Potential market and rationality failures in relation to the determinants of chronic diseases are discussed in section 2 of this paper.
- c) **Identifying viable preventive interventions.** Once the determinants of chronic diseases and possible market and rationality failures are explored, suitable preventive interventions must be identified. Actions will ideally correct or compensate for the effects of any failures in the mechanisms that generate health. The viability of preventive interventions is determined, in the first instance, by their political acceptability, i.e. by the strength of the justification for the degree of interference with individual choice that the intervention involves. Broad classes of preventive strategies are discussed in section 3 of this paper, and a possible taxonomy of interventions is presented.
- d) **Evaluating the impact of preventive interventions on social welfare.** Every preventive intervention requires a detailed assessment of its efficiency and distributional impact. The objectives of this assessment are to determine whether the value of the health improvement achieved through prevention offsets any possible welfare losses and resource costs brought about by the intervention, and whether the impact of the intervention on the distribution of health across social groups is consistent with societal distributional ethics. The existing frameworks of cost-benefit and cost-effectiveness analysis may be adapted to serve the purposes of this assessment, as discussed in section 4 of this paper.

31. The four steps of the process described here will be illustrated in the remainder of this paper in general terms, with examples from various areas but without systematic reference to one risk factor, chronic disease, or preventive intervention. The framework is open to future practical applications in specific areas, particularly in relation to lifestyle-related chronic diseases.

1.4. The determinants of health and disease

32. The biological characteristics and genetic makeup of individuals play an important part in determining their state of health and disease. The effects of those characteristics are often modulated by aspects of the socioeconomic and physical environment and by the individual's interactions with such

environments. At the same time, biological characteristics often mediate the effects of the latter factors. This paper is mostly concerned with the social determinants of health, including environmental characteristics and individual choices and behaviours. The role of biological determinants of health is taken into account when interactions with social determinants are important.

33. A number of attempts have been made in recent years to conceptualize the roles and reciprocal influences of different groups of health determinants. Dramatic improvements have been recorded over time in health status and longevity (Fogel, 1994). Research has highlighted some of the factors that have contributed to such improvements, like increasing standards of living, education, access to clean water and sanitation, access to health care (Frank and Mustard, 1995). At the same time, a rise in the incidence of a number of chronic diseases (e.g. Geiss et al., 2006; Sant et al., 2006) has increased rates of disability and may affect overall life-expectancy in the long run (Olshansky et al., 2005). Also, widespread health disparities among population groups appear to persist, to varying degrees and along several dimensions, primarily socioeconomic condition, and in some cases have shown a widening in recent years (Mackenbach, 2006). A large part of the work on health determinants originated precisely from efforts to understand and tackle health inequalities, and the focus of such research has often been on the determinants of differences in health among population groups.

1.4.1. Biology, environments and choices

34. Evans and Stoddart (1994) cited the “Lalonde report” (Government of Canada, 1974) as an early attempt to frame the determinants of population health in a broader policy perspective than that associated with a medically-dominated paradigm. The report, inspired by Thomas McKeown’s work published in the 1970s, characterises the “health field” as encompassing environmental and lifestyle factors, as well as human biology.

35. Nearly at the same time, Dahlgren and Whitehead (1991) developed a model of the determinants of health inequalities centred on the individual and on his/her biological characteristics, with various “layers of influence”, or groups of factors influencing health. The latter include: individual lifestyle factors; social and community influences; living and working conditions; general socioeconomic, cultural and environmental conditions. Each of these layers has a direct influence on individual health, but interactions between layers contribute significantly to shaping the impact of each group of determinants. For instance, ample evidence suggests that lifestyle factors, or health-related behaviours, are in turn determined by social and community influences, as well as by general socioeconomic, cultural and environmental conditions. The existence of a socioeconomic gradient in all layers of determinants supports the view that these are closely interconnected. Understanding the relationships between layers of influence is as important as understanding the direct impact of each layer on individual health. The model was adopted as a conceptual basis for a review of health inequalities in the United Kingdom in the late 1990s (UK Department of Health, 1998).

36. The World Health Organization established a Commission on the Social Determinants of Health in 2005 to emphasise the role of socioeconomic influences in shaping recent dramatic changes in population health patterns and trends at the global level. Wilkinson and Marmot (2003) identified ten areas in which solid evidence exists of the role of aspects of the social environment on health, elsewhere developed into a more extensive inventory of social determinants of health and evidence of their impact (Marmot and Wilkinson, 2006). The conceptual framework developed for the work of the Commission attempts to build an overall model of the influences of two main groups of determinants: structural determinants, such as the socioeconomic and the political contexts, social structures and socioeconomic position; and intermediary determinants, which mediate the effect of the former, including biological and behavioural factors, living and working conditions, psychosocial factors and health system determinants (Solar and Irwin, 2007).

37. The following are the most important macro-areas of social determinants of health, which may interact in exerting their influences on health and disease:

- a) *Individual behavioural determinants*. These include choices and tradeoffs that contribute to shaping individual lifestyles. Individual behaviours occupy a central position among health determinants, because of their direct influences on individual health. The causal nature of many such influences has been established empirically, as discussed below in this section. A substantial component of individual behaviours is determined in response to environmental stimuli, and it is important that possible preventive interventions aiming to influence individual behaviours pay due attention to the origins of such behaviours. In fact, lifestyle choices appear to mediate at least part of the effects of most other health determinants.
- b) *Education*. In all its forms, education has been shown to be a powerful determinant of health. Parental education as well as formal schooling, general as well as health education, were consistently shown to be strongly associated with lifestyle choices, health status and longevity. The pathways through which education produces its influence on health are manifold. Education has strong effects on earnings and socioeconomic position, which in turn are associated with health, it has effects on social mobility, social cohesion and social capital, which also have influences on health.
- c) *Social and economic determinants*. These include a broad range of characteristics of the social and economic context in which people live and work, from social hierarchies to income inequality; from economic growth to social capital; from ethnic composition and cultural integration to unemployment and labour market characteristics. This important group of determinants also includes the social norms that permeate the environment in which human interactions take place, and regulate the development of such interactions. Social norms have a major influence on lifestyle choices and major shifts in the latter may only follow changes in the former.
- d) *Supply-side determinants*. These include characteristics of the markets in which commodities are exchanged that have a direct or indirect influence on health (e.g. food) particularly on the supply-side. Aspects such as the production technologies used, or the degrees of regulation and competition on such markets have potential repercussions on the health of consumers.
- e) *Environmental determinants*. These include aspects of the physical environment in which people live and work, such as characteristics of the built environment, means of transportation, environmental pollution.
- f) *Health system determinants*. The characteristics of the health system and its ability to respond to the needs of the sick, as well as to the emergence and spread of risk factors, remain critical determinants of health. These include the technical capabilities of health systems in dealing with the challenges posed by disease, in terms of medical prevention as well as cure, but also the organisation, funding and incentives built into the structure of the health system, which may lead to a more or less effective response to the above challenges.

38. A fundamental aspect of research into the determinants of health is the assessment of the causal nature of the health effects of various determinants. Experimental studies are often difficult, sometimes impossible, in the area of health determinants. The risk of selection bias in observational studies is significant, and even more so in secondary analyses of existing data sources. Longitudinal studies often facilitate the assessment of causality, but these are difficult to undertake and their availability is limited. A few opportunities exist of observing natural experiments. Alternatively, econometric techniques, for

instance those based on the use of instrumental variables, are increasingly applied in the assessment of the causal nature of the links between exposures to risk factors and chronic diseases.

39. In a policy perspective, evidence of causality is required before interventions on specific determinants can be considered. Relatively good evidence of a causal link exists for education as a determinant of health status (Arendt, 2005), longevity (Lleras-Muney, 2005), and health-related behaviours and associated risk factors, such as smoking and obesity (Kenkel et al., 2006; Gilman et al., 2008). In turn, lifestyles were shown to be causally related to chronic diseases. For instance, both active and passive smoking, as well as environmental factors, were shown to cause lung cancer (Alberg et al., 2005; Taylor et al., 2007). Aspects of diet and drinking patterns were found to cause various types of cancers (Key et al., 2004) and to be causally associated with risk factors such as hypertension (John et al., 2002). However, other associations between lifestyles and chronic diseases have not yet been proven to be causal. For instance, the association of smoking with diabetes (Willi et al., 2007), or the negative association of fruit and vegetable intake with coronary heart disease (Dauchet et al., 2006). Environmental factors such as food production technologies, restaurant density, the price of restaurant meals, and the density of urban developments have a causal influence on obesity (Cutler et al., 2003; Plantinga and Bernell, 2005; Rashad, 2006).

1.4.2. The importance of interactions between determinants

40. A large part of the research undertaken in recent years on the determinants of health focused on gathering evidence of the role of individual determinants and groups of determinants (Lurie et al., 2003). However, an increasing number of contributions emphasise the importance of the relationships between groups of determinants and the fact that certain determinants have mediating or modulating effects on the influence of other determinants. Extensive interactions between determinants are also recognised in the work of the WHO Commission on the Social Determinants of Health (Solar and Irwin, 2007), particularly between structural and intermediary determinants, as defined in section 1.4.1. Similarly, a model proposed by Kosteniuk and Dickinson (2003) distinguishes between primary and secondary determinants of health, the former encompassing socioeconomic and demographic factors and the latter a range of biological and psychosocial mediators of the effect of primary determinants, including lifestyle factors.

41. If lifestyles are viewed as independent from other determinants, and purely the result of free choice, the case for “collective intervention” is weakened. This is consistent with an individualised approach to preventing disease, not dissimilar to the traditional (personal) health care approach. It may also lead to a culture of “victim-blaming” (Evans and Stoddart, 2004). If, on the other hand, lifestyles are viewed as individual responses to environmental influences, the focus of policy will shift towards the environmental factors that determine individual behaviours.

42. Understanding interactions between individual health-related behaviours and the range of determinants that contribute to shaping such behaviours is a fundamental step in the design of effective interventions. Cutler and Glaeser (2005) observe that individual characteristics alone are unlikely to explain the uptake of health-related behaviours. If the opposite were true, individuals with certain characteristics, e.g. poor self-control, would tend to engage in different risky behaviours at the same time. On the contrary, the correlation of risky behaviours in individuals appears to be very low: smokers are unlikely to be also heavy drinkers (correlation 12.9%); obesity has virtually no correlation with smoking or heavy drinking; the uptake of medical preventive services like flu shots or screening is negatively, but very weakly, correlated with risky behaviours such as smoking, drinking, or having a high BMI. Cutler and Glaeser find empirical support for the hypothesis that certain “situational influences” are likely to trigger specific lifestyle choices in those who are exposed to such influences, with an intensity of response that may be modulated by individual characteristics. One such situational influence that the same authors explore in some depth is changes in food production technology, which are partly responsible for dietary

changes and for the rise of obesity rates, particularly in individuals and families whose time available for meal preparation and cooking has become increasingly limited (Cutler et al., 2003). This work lends support to the hypothesis that health-related behaviours are primarily determined by interactions between individual characteristics and specific environmental influences, rather than by the former alone.

43. If lifestyle choices are the result of environmental influences interacting with individual characteristics, then the socioeconomic gradient in lifestyles and related health outcomes is likely to reflect differences between individuals in the degree of control they have over their own environment. Research conducted in the United Kingdom since the 1970s on the relationship between socioeconomic position and health (Marmot, 2004) underscores the importance of the ability of individuals to gain control over their own environment as a crucial determinant of the same individuals' health and health-related behaviours. Evidence is becoming available of the role of work-related stress in the relationship between socioeconomic position and health. Stress was shown to be causally associated, for instance, with unhealthy lifestyles, the metabolic syndrome and coronary heart disease (Chandola et al., 2007). However, the direction of the causal relationship remains uncertain. Are individuals predisposed (genetically or by other means) to achieving a better control over their own environment also able to reach more privileged socioeconomic positions as well as a better health status through healthier lifestyle choices, or does a privileged socioeconomic position confer better control and healthier lifestyles?

44. A certain degree of inertia in the relationship between socioeconomic condition and health has been observed, as changes in the former do not always appear to translate swiftly into corresponding changes in the latter. The health effects of social mobility, discussed below in section 1.4.3., provide an example of such inertia. However, a larger scale phenomenon can be observed in cross-national comparisons showing very strong correlations between income and health in cross-sectional analyses, which become substantially weaker, or even disappear, when changes over time are considered. This may lead to the conclusion that factors such as technology transfer and health systems may determine the speed at which changes in wealth translate into changes in health at the national level (Deaton, 2004). A knowledge-based phenomenon similar to technology transfer might also act at the individual level, determining the speed at which changes in socioeconomic position translate into changes in health. These observations further emphasise the importance of interactions between socioeconomic condition and other determinants of health.

1.4.3. Determinants of health over the life-course and across generations

45. The importance of adopting a *life-course approach* in assessing the determinants of health and disease has been widely acknowledged (Kuh and Ben Shlomo, 2004) based on a large body of evidence indicating that many key determinants of health produce their effects over the course of many years, across different life-stages and sometimes even across generations. In such perspective, health is the result of the accumulation of influences to which an individual is exposed since conception, and of the interactions of such exposures with individual biological characteristics.

46. Adopting a life-course approach to the study of health determinants raises the degree of complexity of the analysis of causal mechanisms acting over long periods of time and of interactions between different determinants that may have an influence on health at different stages of an individual's life. It also increases the difficulties involved in producing evidence that could usefully support government policies aimed at modifying such causal pathways. However, suitable datasets, particularly from long-term cohort studies, have increasingly become available for research on intergenerational and life-course effects.

47. The clustering of exposures to factors potentially leading to chronic diseases that is observed in cross-sectional studies in certain population groups (e.g. association of many aspects of disadvantage, from

occupational hazards to inadequate housing, from poor education to low income, in the same individuals) can also be observed in a life-course perspective (Blane, 2006). Exposures to the same factors in earlier stages of life tend to correlate highly with similar exposures in later stages. Social mobility may mitigate the health effects of such exposures over time. Perhaps the most accredited model of life-course effects is the “accumulation model”, which essentially views the accumulation of exposures, and the interactions between such exposures, as responsible for the long-term health of individuals. Alternative models have also found empirical support. Some of the latter view exposures at critical stages of life as primary health determinants, others focus on the correlation of exposures at different stages in the life-course, while viewing current exposures as primarily responsible for current health status (Blane, 2006; Hallqvist, 2004). The impact of social mobility has also been studied using different models. The evidence appears to indicate that social mobility tends to produce a convergence of health status towards the mean, i.e. socially mobile individuals depart from the typical health status of the group they leave but do not fully achieve the levels characteristic of the group they join. A resultant, immediately observable, effect is a reduction in health inequalities (Blane et al., 1999b). A similar pattern has been observed in health-related behaviours (Karvonen et al., 1999).

48. It is important to note that health related behaviours (lifestyles) do not appear to be subject to the same life-course influences as health status, or at least not to the same degree. There is evidence that behaviours such as diet, physical activity and smoking correlate rather strongly with current exposures to determinants of, and risk factors for, those behaviours, but only in some cases (mainly in relation to diet) with earlier exposures (Blane et al., 1996). However, the existing evidence does not appear to be conclusive on this point.

49. Education appears to play a particularly significant role in determining intergenerational health effects as well as intergenerational social mobility (Blane et al., 1999a). This highlights the risk that individuals belonging to disadvantaged socioeconomic groups may be locked over time into pathways of disadvantage (their parents’ educational attainment determines their own, and their own in turn determines their offspring’s). This suggests that policies aimed at improving health and social outcomes by increasing educational opportunities for individuals with a background of disadvantage and lesser parental education have a potential for contributing to a prevention strategy.

1.4.4. The contribution of economic models of the production of health

50. Economic models may help in a number of ways to understand the pathways leading to non-communicable diseases and individual behaviour in relation to the risk of developing such diseases. Economic models may contribute substantially to the understanding of the mechanisms that generate health and disease, as well as those that may determine the success or failure of prevention policies. These models attempt to formally capture and quantify the effects of individual health determinants and the interdependencies between such determinants. Economic models take into account factors that are often neglected in research on health determinants such as market conditions (prices, opportunity costs), individual resources, perception of risk and rationality, time preferences. And, what is perhaps most important, they attempt to devise quantitative models and relationships illustrating how interactions between all these factors impact on the production of health.

51. Kenkel (2000) presented a comprehensive review of economic models of health production and a discussion of how these apply to disease prevention. Economic models focusing on the demand for commodities whose consumption has a potential impact on health may also enhance our understanding of pathways to disease. Leibowitz (2004) emphasised the need to broaden the scope of economic models of health production, traditionally based on Grossman’s seminal work (1962), giving a greater role to the consumption of non-medical goods and to the time component of the production function.

52. The broad framework within which most economic models of health production are set has not changed substantially since Grossman's original contributions. Grossman developed an economic model of the production of health by individuals and households in which health is viewed as a form of human capital. The model attempts to establish relationships between individual consumption behaviours (or demand) for a range of health inputs (including health care, lifestyle commodities, housing, etc.), available resources and health status. Education is viewed as a form of human capital enabling individuals to produce health more efficiently. Over time, there have been a number of important additions, extensions and specifications to earlier models, partly based on improved evidence of the relationships between health and its determinants, as well as among determinants. These have made such models more sophisticated but also more complex.

53. It may not be possible, or even desirable, to have a comprehensive model of the prevention of non-communicable diseases. The chief contribution to be expected from economic models of health production is rather on specific health-related behaviours, particularly in understanding how these contribute to the efficiency of health production and what the interdependencies are between such behaviours and other important health determinants.

54. In order to fully reflect progress in research on the determinants of health, efforts to model health production should take full account of the following aspects: (a) the role of social and environmental influences; (b) life-course factors contributing to health and disease; (c) role of education (both schooling and health knowledge); (d) uncertainty, time preference and self-control.

1.5. Main messages and conclusions

- In a context of increasing prevalence of lifestyle-related chronic diseases, prevention may offer opportunities to increase social welfare and to enhance health equity across individuals and population groups, relative to a situation in which chronic diseases are treated when they emerge.
- The potential for prevention to attain its efficiency and equity goals may be assessed through a process entailing the following four main steps: (a) identifying the key factors that determine health and disease; (b) assessing possible market and rationality failures affecting those determinants; (c) identifying viable preventive interventions; (d) evaluating the impact of preventive interventions on social welfare and on health equity.
- Understanding the pathways through which chronic diseases are generated requires an assessment of individual determinants of those diseases as well as interactions among them. In particular, interactions between structural determinants, such as social norms and socioeconomic condition, and a group of determinants which tend to mediate the effects of the former, including individual biological and behavioural determinants, living and working conditions.
- In the latter group, a central role is played by lifestyle choices, not only because of their direct influence on health, but because they appear to mediate part of the effects of most other health determinants. Lifestyle choices have been shown to be closely associated with a significant portion of the morbidity and mortality generated by chronic diseases.
- Education is an important determinant for the generality of chronic diseases. Education produces part of its effects through the shaping of lifestyle choices, but it has also an influence on health through its impact on earnings, socioeconomic condition and social mobility.

- An individual's health status is the result of recent as well as distant exposures to the action of risk factors and health determinants. A life-course approach is required to identify the mechanisms that should be acted upon in the prevention of chronic diseases.
- Establishing causal links between individual determinants, or groups of determinants, and health status is a pre-condition for taking action to prevent chronic diseases. The empirical testing of economic models of the determinants of health has contributed to overcoming some of the difficulties involved in gathering evidence of causality.

Section 2

Are interventions to prevent chronic diseases justified?

2.1. Is there an economic case for intervention?

55. Applying an economic framework to the study of the mechanisms that generate health and disease means, above all, interpreting individual behaviours and choices as the products of demand-supply interactions taking place in all aspects of human life. In this view, individual choices are essentially consumption choices and lifestyles are the result of choices regarding the consumption of commodities such as, for instance, tobacco, alcohol, food, but also physical activity or leisure time. Many factors that influence those choices, reviewed in section 1, are in turn the result of market interactions. For instance, education has an impact on health which is partly generated through the shaping of lifestyle choices, and individual education is the product of market based choices that individuals (or someone else on their behalf, e.g. their parents during childhood) make throughout their lives. Each marketplace, which may involve a certain degree of government intervention, is characterised by one or more suppliers of a commodity, and demand is based on preferences which are partly determined by the opportunity costs (prices) of different choice options.

56. The free and smooth operation of such market mechanisms is likely to have played an important role in delivering opportunities for health improvement over time. However, there are strong suggestions, and at least some empirical evidence, that the markets in which individuals make their lifestyle choices may sometimes fail to operate efficiently and if those failures could be avoided, social welfare would be increased as a result. Examples of failures that may be observed in relation to specific lifestyle choices include the following: information failures, which may contribute to the adoption of unhealthy behaviours and lifestyles through an inadequate knowledge or understanding of the long-term consequences of such behaviours; externalities leading to the social costs and benefits of certain forms of consumption not being fully reflected in their private costs and benefits to individual consumers (e.g. negative externalities in the case of addictive substances or unhealthy foods, or positive externalities in the case of education); failures of rationality, such as lack of self-control, which prevent individuals from making choices in their own best interest.

57. Where market and rationality failures exist, the benefits potentially deriving from tackling the inefficiencies they cause may in some cases justify some form of corrective action, either by governments or other subjects. Government action may also be warranted to correct the unintended health consequences of existing public policies, or to correct situations of inequality in health among population groups that may conflict with societal distributional ethics.

58. If market failure, unintended consequences of existing public policies and undesirable distributions may provide justifications for government intervention, it is not necessarily to be expected that governments will be willing and able to take action every time either of those occurs. For example, undesirable distributions of health and disease are virtually ubiquitous in modern industrialised societies, and yet in relatively few instances governments have made the tackling of health inequalities a priority in their policy agendas, partly because of the scarcity of demonstrably effective means to reduce such inequalities. Correspondingly, certain forms of market failure are often deemed insufficient to prompt government intervention. One example is negative externalities in the form of collectively-borne health care costs possibly arising from individual lifestyle choices. Governments may increasingly consider these a good cause for intervention in the future, as a growing body of evidence shows the magnitude of such externalities and their direct link to lifestyle choices. A brief review of the most likely forms of market and

rationality failure is presented in the remainder of this section, along with some examples of existing evidence of such failures in relation to specific lifestyle choices and a discussion of their likely impact on lifestyles and health. Existing reviews by Kenkel (2000) and Suhrcke et al. (2006) provide further accounts of causes of market failure in relation to the prevention of chronic diseases. None of these accounts is meant to make a definitive case in favour of intervention in markets for lifestyle commodities. Rather, their purpose is to guide the assessment of the impact of market and rationality failures in relation to specific behaviours by identifying the areas in which those failures may exist, and upon which any applications of the framework presented in this paper should focus in their analyses.

2.2. Market failures in lifestyle choices: a neoclassical economics perspective

59. In neoclassical economics, competitive markets provide the means for an efficient allocation of resources. Economic models postulate that market demand-supply interactions are the result of the self-interested behaviours of fully rational agents. A wide range of factors, or sources of market failure, may prevent such markets from attaining efficient outcomes. These include, among others, failures in establishing competitive market dynamics, leading to smaller than desirable numbers of agents on the supply-side, or the demand-side, of a market; failures of information leading consumers or suppliers to making poorly informed choices; failures related to the nature of the commodities exchanged in a market, which may generate benefits or costs on subjects other than those involved in a market transaction, which therefore would not be reflected in the price negotiated in that market. Sources of market failure that may be particularly relevant to lifestyle related chronic diseases are discussed in the remainder of this section.

2.2.1. Spill-over effects: health expenditure and productivity

60. Both the production and the consumption of a commodity may have effects that are not reflected in the market price of such commodity, because they affect subjects other than, respectively, the producer or the consumer. These spill-over effects, or externalities, may potentially generate market failures. Passive smoking is a typical externality, as it has been shown to cause negative health effects on individuals other than the smoker. Such effects would not be reflected in the price of cigarettes if this were negotiated in a free market between the smoker and the tobacco manufacturer. Negative externalities lead to over-consumption, whereas positive externalities lead to under-consumption, relative to socially desirable levels. In many cases, external effects can be “internalised”, so that consumers and suppliers may be led to exchanging quantities of a commodity that are more in line with the social benefit generated by the consumption of that commodity, rather than the private benefit enjoyed by the consumer alone. Such measures are generally transfers, taxes or subsidies, which may be imposed on, or offered to, the consumers or the suppliers of the commodity that generates the externality.

61. The use of taxes and subsidies in the presence of externalities may improve the efficiency of market exchanges, but will also produce distributional changes. Consumers and suppliers may enjoy welfare gains or suffer welfare losses to varying degrees, depending on the price elasticity, i.e. on the reactivity to price changes, of demand and supply. In addition, there will be welfare gains and losses to the third parties who experience the external effects. The latter effects may or may not be compensated. For instance, if a government imposes a tax on a form of consumption that generates negative externalities, it may or may not be possible, or desirable, for the government in question to redistribute the tax revenues raised to those who suffer the consequences of the negative externality (which will be diminished by the tax, but not eliminated altogether). Similarly, if a commodity that produces positive externalities is subsidised, it may not be possible to fund the subsidy by charging those who enjoy the positive external effects. From a mere efficiency standpoint, what matters is just that welfare gains exceed any losses, but societies are not indifferent to the distribution of those gains and losses, therefore governments will have to take this into account in assessing the desirability of a policy to address externalities.

62. Lifestyle choices, as many other forms of consumption, may produce external effects. There are immediate externalities that derive directly from acts of lifestyle consumption, such as passive smoking, violent and disorderly behaviour associated with alcohol abuse, or traffic accidents resulting from reckless driving. There are also deferred externalities, which are generated through the link between lifestyle choices and chronic diseases. Once chronic diseases emerge, and in some cases even before they emerge (e.g. when important risk factors such as hypertension or obesity begin to manifest themselves), the individuals affected will become less productive, possibly entirely unproductive, they will make a more intensive use of medical and social services, which may be publicly funded, they may require care by members of the family and friends. Conversely, a reduced life expectancy may mean a less prolonged use of publicly funded medical and social services at the end of life, as well as reduced pension payments, which are not themselves externalities, but would translate into a less onerous fiscal burden and therefore less distortion in the way the economy works. All of these phenomena involve externalities (negative the former, positive the latter) on society at large, family and friends, which can be attributed at least to some extent to the lifestyle choices originally made by the individual. The extent to which externalities can be associated with lifestyle choices depends, of course, on the strength of the link between lifestyles and disease, i.e. by the increase in the risk of developing a chronic disease associated with adopting a particular lifestyle.

63. Suhrcke et al. (2006) provide a detailed account of the externalities that may be associated with lifestyle choices and chronic diseases identifying four areas in which externalities may occur. In addition to health expenditure and productivity, discussed above, these include consumption and savings (e.g. reduced consumption associated with disease), and education and human capital accumulation (e.g. reduced education of family members). Suhrcke also emphasises the distinction between externalities that occur within the household (but some externalities within an individual's broader social network could be viewed in the same way) and externalities imposed on subjects who have no relationship with the individual. The former externalities, defined as "quasi-externalities", may be assimilated to either private or fully external effects. This is mostly a value judgement, and it is not for the economist to determine among what effects quasi-externalities should be accounted for, as long as the importance of the latter in lifestyle choices and chronic diseases is made explicit and as long as all externalities and quasi-externalities are subjected to an accurate quantitative assessment.

64. The existence and the size of externalities, as well as their implications and the room for increasing welfare and enhancing health equity by adopting suitable measures to compensate for externalities, are ultimately empirical questions. Although measuring externalities, or the effects of policies to address externalities, may be difficult in some cases, the availability of accurate measures is important in the design and implementation of any actions to correct the impact of external effects. Unfortunately, as Suhrcke emphasises, relatively little empirical evidence is available on the externalities associated with lifestyle choices and chronic diseases. The existing evidence seems to suggest that we should not assume that such externalities are necessarily large. In some cases they may be, in others not. In some cases they may be predominantly within the household, in others they may mostly affect unrelated subjects. This observation points to the need for an accurate measurement of externalities as part of any economic evaluation frameworks for the assessment of preventive interventions.

2.2.2. Behavioural spill-over effects within the household, peer groups and social networks

65. When acts of consumption made by an individual over time are not independent of each other we may have addictive or habitual behaviour, as discussed in section 2.3.2.; when acts of consumption made by different individuals are not independent of each other, as in the presence of social influences and peer pressures, we have externalities (positive or negative). When an individual's decision to adopt a certain health-related behaviour affects the likelihood that other individuals related to the first will adopt the same behaviour, it is possible that the behaviour in question will spread to a larger extent than is desirable (in the

case of negative externalities) or to a smaller extent (in the case of positive externalities). For instance, if adults' eating behaviour influences that of their children, and if we assume that adults will make their food choices freely, on the basis of their own preferences alone, and they are fully aware of the health consequences of those choices, an inefficiently large number of adults will adopt less healthy eating behaviours (which cause negative externalities on their children), and an inefficiently small number will adopt healthier behaviours (causing positive externalities).

66. There is evidence that both chronic diseases and unhealthy lifestyles are to some extent concentrated among people in disadvantaged socioeconomic groups. Individual behaviours, including lifestyle choices, are subject to large number of potentially powerful social influences that contribute to shaping individual preferences. Social influences interact with market behaviours to create what Becker and Murphy (2000) have defined as "social markets". A recent important study, based on a unique dataset, provided an empirical demonstration of the impact that social networks of family and friends may have on an individual's chances of becoming obese (Christakis and Fowler, 2007). Individuals whose friends (including those living in remote locations) or relatives had been gaining weight were substantially more likely to become themselves obese. Social influences and peer pressures are not necessarily market failures, but they can contribute to increasing the concentration of certain types of unhealthy lifestyles in some sections of the community and some neighbourhoods, rather than others. Even when social influences are not to be considered deviations from rational choice, there is an externality problem. The presence of social influences raises issues not only about the design of efficient ways to tackle unhealthy lifestyles, but also about the impact of any interventions on the distribution of health.

2.2.3. Information failures

67. Information is a critical factor for markets to operate efficiently. In order to make rational and efficient choices, consumers have to be fully informed about the characteristics and quality of the goods they consume, about the benefits (utility) they will derive from consumption, and about the opportunity costs they will incur. In the case of health-related consumption behaviours, information is often lacking on the nature and the magnitude of the associated health risks. Information may be lacking because it does not exist (e.g. information on the long-term health effects of the consumption of genetically modified crops); because it is concealed or communicated in a misleading form by parties that have a vested interest (e.g. information on the health effects of smoking withheld by the tobacco industry in the recent past); or because it is complex and not easily accessible to the lay person (e.g. information on the health risks involved in the consumption of different types of fats).

68. The importance of information in forming health-related beliefs, a first step towards influencing lifestyle choices, is shown, for instance, by Cutler and Glaeser (2006) in their analysis of the determinants of higher smoking rates in Europe compared to the USA. The authors reach the conclusion that beliefs were changed in the US when "substantial information about the harms of smoking" was made available to the public, while the same information appears to have been communicated less effectively in Europe.

69. The direct provision of information by governments (e.g. health education campaigns to influence individual lifestyles) or the regulation of information (e.g. limits on advertising, guidelines on food labelling) are usually justified by limited or imperfect information on the part of the consumer. However, Glaeser (2005) and others do not appear to support the provision of information by governments (classified as "soft paternalism") in the generality of cases. One of the main reasons for this conclusion is that governments are not always equipped for delivering complex communication strategies, and in some cases there is also a risk that government action may be influenced by the very interests it attempts to counter. When information failures cannot be fixed, for instance because communication of information is difficult, governments may still attempt to compensate for the effects of imperfect information by influencing behaviours through appropriate incentives (e.g. fiscal incentives like taxes and subsidies).

2.3. Failures of rationality in lifestyle choices

70. A relatively recent stream of economic research supported by a growing body of empirical evidence, which goes under the name of behavioural economics, provides extensions to the neoclassical paradigm referred to in the previous section. Behavioural research shows that the assumption of rationality of the agents involved in market transactions does not always reflect the behaviours of those agents. Failures of rationality may affect the way choices are made, the information upon which choices are based or the preferences that guide those choices. The first aspect includes, for instance, the use of heuristics, or rules of thumb, in decision making. The second includes a biased perception of the information available, because the way information is presented (framing) influences choices and because of cognitive errors in the interpretation of information. The third aspect includes inconsistent preferences for outcomes expected at different points in time, or for gains and losses. The potential failures of rationality that are most relevant to the prevention of lifestyle related chronic diseases are discussed below.

2.3.1. Rationality, time preferences and self-control

71. Understanding the way in which people discount future costs and benefits in making their consumption choices is critical to the design of effective policies to counter the possible long-term ill-health effects of particular forms of consumption. Lipscomb et al. (1996) have summarised the key findings from a large body of empirical literature about time preferences in relation to a variety of outcomes, including health. The aspects that appear most relevant to disease prevention are the following:

- a) “Discount rates tend to be lower when large magnitude outcomes are being traded over time (and conversely)”. This indicates that people may discount heavily future health risks that are perceived as relatively small at the time of consumption.
- b) “Discount rates tend to be lower the longer the time interval over which the trades are considered”. As time intervals, for instance, between lifestyle consumption and the manifestation of health effects, are typically long, this should lead to lower discount rates, countering to some extent the effect under (a).
- c) “Discount rates for losses are typically lower than for gains”. Again this would lead in the same direction as (b) and against (a).
- d) “The sequencing of outcomes may affect time preference”. This may have different implications, depending on the context. In the case of lifestyle-related health risks, the fact that possible adverse health outcomes are mostly relegated to a time which is relatively distant in the future, and an age at which good health may be valued less, may diminish the importance of such outcomes (heavier discounting) in the eyes of the consumer.

72. Partly in relation to the observation under (d), substantial empirical evidence, which also needs to be taken into account in the context of prevention, indicates that individual health related behaviours often reflect hyperbolic discounting. This refers to an accelerated form of discounting, which heavily penalises future outcomes in present judgements, in a way that makes time preferences inconsistent, as illustrated in box 1. This is essentially a self-control problem, possible solutions to which have been discussed in a broad literature. For instance, Glaeser (2005) argues that there is limited scope for paternalistic government intervention to counter self-control problems, as this would require “tricky social welfare decisions”, or a judgement of whether individuals’ future self, or long term preferences, should be given priority over their present self, or short term preferences. Such problems, in Glaeser’s view, are best addressed by increasing the availability of “technologies or contracts that facilitate private self-control”. An example could be the fiscal deductibility of private expenditures on devices that may facilitate self-control (e.g. nutrition advice,

organised physical activities, etc.), or coverage of nicotine replacement therapies to aid smoking cessation. The latter measures, which essentially broaden individual choice, are often viewed as non-paternalistic interventions, as discussed in section 3, although in fact they do interfere with individual choice, and they may involve a significant cost, to be shared among all social groups when interventions are publicly funded.

73. A separate, but somewhat related, issue is bounded rationality, which essentially refers to the presence of cognitive errors in the exercise of rational choice for particular forms of consumption. Examples of such cognitive errors include the erroneous or partial understanding of long-term health risks, bias associated with the framing of information upon which choices are based, and others. Paternalistic policies are often seen by governments as the primary solution to bounded rationality problems, often involving the use of incentives like taxes and subsidies, or market regulation, to address potential inefficiencies. However, as discussed before, the case for the adoption of paternalistic approaches is far from being universally supported. There appears to be greater scope in cases in which opportunities for the exercise of rational choice are particularly limited (e.g. in relation to children's consumption) or when the gains to be achieved through the use of paternalistic policies are particularly significant, i.e. in cases where other market failures, like important externalities, may add to the inefficiency caused by bounded rationality.

2.3.2. Addictive and habitual behaviours

74. Certain behaviours reflect sequences of repeated acts of consumption which are not independent of each other. This may happen because the commodity consumed generates a form of chemical dependence that makes it difficult for individuals to quit consuming it, as is the case with heroin, or because of psychological mechanisms that encourage the reiteration of consumption. The term "habit" is generally used in relation to the latter mechanisms, while the term "addiction" is applied more widely, both in relation to drugs or tobacco smoking (which involves a certain degree of dependence on nicotine) and in relation to consumption that does not involve chemical dependence (e.g. gambling addiction). However, it is the non-independence of acts of consumption that may cause concern about individuals' ability to maximise their welfare, rather than the nature of the underlying mechanisms, which often co-exist to varying degrees. The presence of a chemical dependence may strengthen the justification for intervention, but some forms of psychological addiction may also be extremely powerful and potentially damaging.

75. Once an individual has first engaged in a certain form of addictive consumption, overcoming the disincentives involved in that original choice (e.g. the opportunity cost, or price, of the commodity consumed), they will tend to continue that consumption and they will need much greater disincentives to be able to quit than those they faced when they started. Lack of self-control and inconsistent time preferences (see box 1) may be seen to produce similar effects. Individuals perceive consumption as desirable at the present time, while thinking that sometime in the future they may find it no longer desirable and they will quit. However, their current and future preferences change as time passes and those individuals tend to continue their consumption and further procrastinate quitting.

76. Habit forming behaviour is consolidated behaviour in which individuals engage over a prolonged period of time and from which they find it difficult to wean themselves. A recent report on obesity published by a UK government agency emphasises two psychological mechanisms characterising habitual behaviour that represent obstacles to behaviour change (Maio et al., 2007). The first is defined as "tunnel vision" and refers to a reduced motivation to seek and use information that may lead to a better understanding of the consequences of the behaviour in question, and to a tendency to discount the value of new information that is received, particularly when it highlights risks associated with the habitual behaviour. The second aspect is that people who engage in habitual behaviour act on the implicit assumption that if they found the behaviour desirable when they first adopted it, it must also be desirable

for them to continue to engage in the same behaviour. Factors like those described here are likely to prevent markets from working efficiently and may lead to sub-optimal outcomes for consumers. Of course consumers take up habits because they find it convenient to do so. In a short-term perspective, it may be efficient to avoid re-examining the desirability of a certain form of consumption every time consumption is repeated, but in doing so consumers may overlook longer term consequences of that consumption which may well offset any short-term efficiency gains.

77. Economic models of “rational addiction”, originally proposed by Murphy and Becker (1988), find support in empirical evidence (e.g. Chaloupka and Warner, 1999). These models assume that consumers engaging in addictive, or habitual, behaviours are rationally aware of the short term as well as the long term consequences of those behaviours and make judgements on their desirability based on both the short term and the long term opportunity costs involved. For instance, expectations about future prices will have an impact on current consumption behaviour. Of course, individuals may still be subject to information failures or failures of rationality which would make their behaviours inefficient, leading to less than desirable outcomes, or there may be important spill-over effects associated with those behaviours, which would lead to undesirable outcomes for others.

Box 1 – Time preferences, self-control and hyperbolic discounting

Individuals are not indifferent to the timing of the rewards they expect to enjoy, or the losses they expect to suffer. They generally attach a greater absolute value to rewards and losses occurring at the present time relative to those expected in the future. Therefore, they wish to delay any losses, or undesirable outcomes, and they wish to bring forward any rewards, or desirable outcomes. Rational choice models are based on the assumption that the degree to which expected future outcomes are devalued, or discounted, is consistent over time. This assumption has been challenged by a large body of empirical evidence, showing that the way individuals discount future outcomes is often inconsistent over time, with large variations across individuals in the degrees of such inconsistency. Many individuals seem to have a relatively high discount rate over near time periods and a relatively low discount rate over distant time periods. This discount structure sets up a conflict. For example, many people will choose \$50 today over \$100 in one year's time, even when interest rates are around 5% per annum. However, many of the same people will opt to take \$100 in 10 year's time over \$50 in 9 year's time. Economics associates self-control in individual choice behaviours with consistency in time preferences. Individuals who show inconsistency over time in the way they discount future outcomes are said to lack self-control.

A simplified example relating to prevention can be made based on choices about smoking, or quitting smoking. A smoker who is aware of the long term health risks associated with her habit may decide that such risks are offset by the pleasure she derives from smoking at present, therefore she will choose to postpone quitting the habit. She perceives this as a postponement because she feels that after some time (say, in 5 years) she will no longer value pleasure from current smoking more highly than long term health risks. She is convinced that in 5 years time she will be prepared to quit. However, when that time comes she will find herself discounting future health risks more heavily than she previously thought she would do, and she will still feel that the pleasure of current smoking still offsets future health risks. Inconsistency in time preferences is reflected by the discrepancy between the way the individual originally thought she would discount future outcomes in 5 years time and the way she actually discounted them once the 5 years had passed. The result is a likely indefinite postponement of the decision to quit smoking.

A mathematical illustration

In economic analysis, rational (consistent) time preferences are described by an exponential discounting function. This function (line A in figure 1) illustrates how the expected absolute value of any outcomes (rewards or losses) declines as a function of time, relative to its present value. The mathematical properties of an exponential discounting function are such that the discounted value of an outcome which an individual making a choice at time t_0 expects to occur at a future time t_1 , is determined by how far in the future t_1 is relative to t_0 , but not by the overall timing of t_0 and t_1 . On the other hand, the time preferences of individuals lacking self-control are described by a hyperbolic discounting function. The latter function (line B in figure 1) tends to drop very rapidly, but above all it is associated with inconsistent discounting of future outcomes. The perception of the value of an outcome expected to occur from a

choice is different if the choice is made at the present time relative to the same choice being made at some point in the future. For instance, let us assume we wish to assess what the perceptions of two individuals, one of whom has hyperbolic time preferences, will be in 5 years time concerning an outcome expected in the future. We may start from figure 1 and draw a vertical dotted line at year 5, as illustrated in figure 2. The sections of lines A and B to the right of the vertical dotted line show the two individuals' current perception of how they will discount future outcomes in 5 years time, i.e. of the degree to which they will devalue outcomes expected to occur farther in the future. Once 5 years have passed, the same individuals will consider making the choice they were envisaging five years before. The individual with exponential time preferences will find herself discounting expected future outcomes consistently with what she had envisaged 5 years before (lines A and A1 decline at the same rate in figure 2). Conversely, the individual with hyperbolic time preferences will attach a more sharply declining value to expected future outcomes than she had envisaged 5 years before (line B1 drops more rapidly than line B in the area to the right of the vertical dotted line). Therefore, the individual with hyperbolic time preferences will be less likely than she envisaged 5 years before to make a choice, e.g. stop smoking, involving future benefits to be balanced against a sacrifice at the present time. Essentially, she displays a lack of self-control.

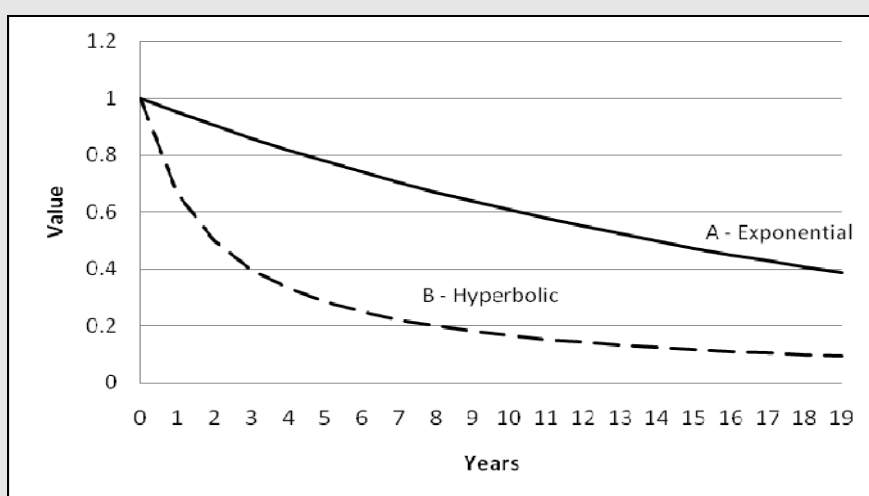


Figure 1. Alternative discounting functions. The curves show the value of rewards or losses expected to occur in a given number of years from the present, relative to the current value of those rewards or losses, which is assumed to be 1 in the graph.

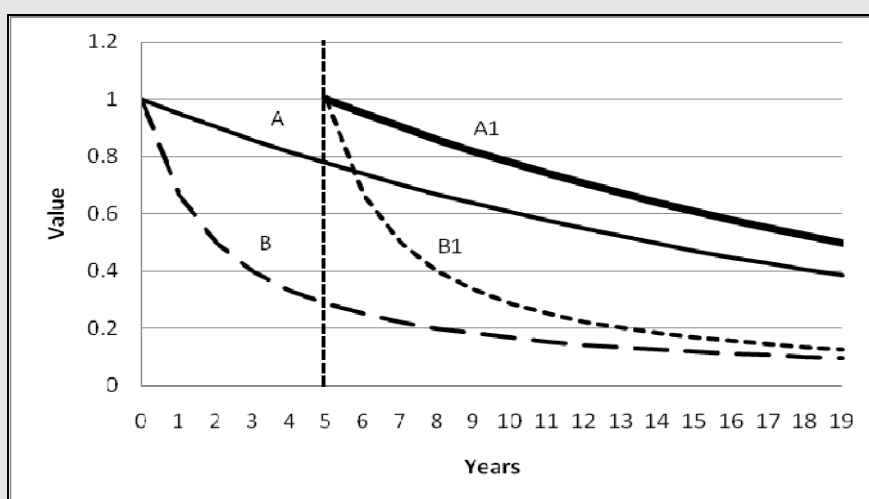


Figure 2. Consistency of time preferences with exponential and hyperbolic discounting. Lines A and B are reproduced from figure 1. Lines A1 and B1 are, respectively, the exponential and hyperbolic discounting functions 5 years after what was the present time in figure 1.

2.4. Market failures and the determinants of health

78. Lifestyle choices are subject to many influences, among which those generated by the environments in which individuals live and make their choices at different stages in their life-course may be particularly important, however indirect, as discussed in section 1. Examples of these environments include the education environment, the transportation environment, the business environment, or the labour market. These environments, in turn, are the result of the operation of market mechanisms, often subject to some degree of government intervention. The expected benefits and opportunity costs of education will determine for how long individuals will pursue education and training, within the limits set by government regulation in many countries; the availability of suitable means of public transportation will determine their willingness to give up their private vehicles; the availability of local grocery stores selling healthy foods will determine their diets, the salaries obtainable on the job market will determine their willingness and ability to spend a suitable amount of time preparing meals. If failures are present in the markets that shape those environments, for instance if the potential health consequences are not fully factored into market choices, it is possible that such environments will exert a negative influence on lifestyle choices leading to a welfare loss.

2.4.1. The role of general and health education

79. Education deserves special consideration here because of the evidence of an important causal link with health and lifestyles. Individuals who have poor education are significantly more likely to adopt unhealthy lifestyles and to be in poor health (see Grossman, 2006 for a review of current evidence) as discussed in Section 1. In economic models of health production, education is often viewed as an enabling factor, enhancing the efficiency of health production processes through two mechanisms. More educated individuals are able to obtain greater health outputs from given amounts of inputs, but they are also able to select more appropriate mixes of inputs, for instance by making healthier consumption choices (Grossman and Kaestner, 1997). A recent comprehensive review of the relationship between education and health (Feinstein et al., 2006), commissioned by the OECD's Education Directorate, supports the existence of strong causal effects of education on health outcomes. Years of formal schooling completed have a strong effect on health outcomes, whether these are measured in terms of mortality (Lleras-Muney, 2005), self-reports of health status (Adams, 2002; Arendt, 2005) and physiological indicators of health (Arkes, 2004). Additional years of schooling also appear to have a direct effect on health behaviours such as smoking (Currie and Moretti, 2003; de Walque, 2007; Grimard and Parent, 2007), alcohol consumption (Cutler and Lleras-Muney, 2006) and diet, exercise and obesity (Arendt, 2005; Spasojevic, 2003; Cutler and Lleras-Muney, 2006).

80. One of the studies discussed in the OECD review (Groot and van den Brink, 2004) arrives at the conclusion that the monetary value of the health impacts of education is equivalent to a sizable proportion (varying between 15% and 60%) of the wage effects. Cutler and Lleras-Muney (2006) reach a similar conclusion and suggest that the health returns to education increase total returns by between 15% and 55%. If the health effects of education are not factored into choices concerning the demand for education, by individuals and by governments, there may be under-consumption of education, as Cutler and Lleras-Muney, Groot and van den Brink themselves argue. Health effects may not be factored into choices because some of these effects represent externalities (individual education may have a positive effect on other individuals' health, particularly in relation to communicable diseases), and because individuals and governments may not have complete information, or may have a biased perception of the health effects of education.

81. The case for policies aimed at enhancing the provision of education, either general or health-related, should rest both on efficiency and equity arguments. Given the empirical evidence suggesting that education has a direct, causal effect on individuals' health, it must be determined whether individuals are

receiving efficient levels of education, after taking health benefits into account, i.e. if there might be market failures that would point to a sub-optimal or inequitable receipt of education and call for government intervention to increase, or change the distribution of consumption across population groups on equity grounds. Examples of such market failures include the following:

- a) *Imperfect Capital Markets.* When capital markets are such that individuals cannot borrow sufficient funds to finance investments in education, because they are unable to provide the necessary guarantees, there will be an under-consumption of education likely resulting in a welfare loss. Since those in need of borrowing financial resources are predominantly individuals from disadvantaged families (and therefore unable to borrow capital from family members), distributional issues overlap with efficiency concerns and suggest that the market system will not provide an optimal level of educational investment to maximise health and non-health related outcomes.
- b) *Information.* Unless parents and children have full information on the costs and benefits associated with educational investments, the market system will not ensure an efficient outcome and lack of information may result in underinvestment in education. To the degree that health improvements associated with better education are ignored by children and their families, individuals will not consume an efficient amount of education.
- c) *Parental influences.* In most circumstances children are unable to make informed decisions on educational matters and parents will do so on their behalf. Parents may or may not choose what is best for their children. The latter may especially be the case when the opportunity cost of investing time and efforts in children's education is high and when information or risk perception by parents is poor. On the other hand, parental education may have positive externalities on children, which would add to the private benefits of education, but which may not be among the factors influencing educational choices.

82. In OECD countries, life expectancy and quality of life are unequally distributed in the population, with individuals from higher social classes typically enjoying a longer and better life than individuals coming from disadvantaged backgrounds. Because education is a primary vehicle of social mobility and has a direct, independent effect on health status, boosting educational provision for those families with low educational attainment may be a primary vehicle to reduce the health gap that currently exists between social groups.

2.5. Unintended health consequences of existing government policies

83. A number of government policies may have unintended adverse consequences for the health of a population, possibly by providing incentives to individuals, or even forcing them, to make certain lifestyle choices. For instance, agricultural policies adopted in most OECD countries, which are mostly based on taxes and subsidies, may raise the relative prices of healthy foods, such as fruit and vegetables, and may lower the relative price of unhealthy foods, such as fats and sugar. Town planning, the design of the built environment and traffic regulation may discourage active transport (such as walking and cycling) in favour of inactive (vehicular) transport. More generally, there is growing evidence that commodities like education, often delivered through public programmes, or at least publicly financed, may be positively associated with health, partly through their effects on lifestyle choices. To the extent that these associations are causal, the question can be posed as to whether governments are fully taking such effects into account in the budgets they set for publicly-financed or publicly-provided education, as discussed in section 2.4.1.

2.6. Main messages and conclusions

- The determinants of chronic diseases are the result of market-based interactions or, in the case of government policies with unintended health consequences, they are the result of political processes pursuing legitimate public interests. Those interactions and policies are generally based on the expectation that welfare gains would be attained as a result.
- Market and rationality failures may potentially affect the efficient working of the markets in which lifestyle choices are made and of those associated with other determinants of health. Such failures may prevent markets from ensuring efficient and equitable outcomes, providing a justification for preventive interventions aimed at improving health, welfare and their distribution.
- The main potential sources of market failure include the following: spill-over effects on individuals other than those who make the lifestyle choices concerned; failures of information or communication of information; failures in the supply of lifestyle and other commodities.
- Failures of rationality, particularly those affecting consumers of lifestyle commodities, may add to the effects of classical market failures. The former include inconsistencies in time preferences, leading to poor self-control in health-related consumption, and limitations of rationality such as biased risk perception and common cognitive errors.
- Existing government policies may also produce unintended health consequences which prevent the maximisation of individual and social welfare, or an equitable distribution of health.
- Market and rationality failures, as well as government policies with unintended health consequences, may be addressed directly, with actions aimed at correcting failures, or indirectly, with actions aimed at compensating their effects. The latter may be an option when direct interventions are not possible or effective.
- The targeting of specific market failures in the design of prevention policies should be based on two main factors: whether these market failures have a sufficiently large impact to warrant government intervention; and whether the same market failures are amenable to correction through appropriate, efficient and equitable policies.

Section 3

Preventive interventions: the options and the actors

3.1. Government intervention and theories of paternalism

84. If individuals were able to make lifestyle choices, e.g. choose what foods to consume or what physical activities to undertake, through efficient market transactions, they would likely maximise their own welfare by making tradeoffs among different forms of consumption which would be fairly priced on the basis of their production costs. In the absence of significant spill-over effects, societal welfare would also be maximised, at least as an aggregation of individual welfare. However, we discussed a number of factors in section 2 which may potentially lead to inefficient market transactions and lifestyle choices that do not maximise welfare. Governments often intervene to correct market failures when these cause substantial damage to consumers and society and when interventions have the prospect of either increasing or improving the distribution of welfare. But the appropriateness and desirability of government action is not judged simply on the basis of its measurable impact on social welfare. Government intervention involves at least some interference with individual choice, whether it is intended to modify the context in which choices are made, or the way these are made. The degree to which such interference may be acceptable varies greatly across and within countries. Action aimed at steering individual choice towards improved outcomes is often termed paternalistic.

85. Although the current debate about government influence on individual choice is mostly centred on the concept of paternalism, this concept remains to a large extent ill-defined. In much of the existing literature, paternalistic action is described as interference with individual choice by a third party, in the best interest of the individual concerned, but not sought for by the individual. All three elements of this definition are to some degree ambiguous and open to value judgements. Interference with individual choice is common in modern, industrialised societies, although this does not always correspond to the above definition of paternalism. In some cases interference may not be in the best interest of the individual making choices (e.g. in the case of commercial advertising), in others it may be sought for by the same individuals (e.g. when they use agents to overcome information problems). A central issue in a policy maker's perspective is to determine what degree of interference with individual choice a preventive intervention would entail and what factors may determine the appropriateness and the acceptability of such level of interference.

86. A number of authors (Kelman, 1981; New, 1999) have proposed distinctions between action to correct market failure and paternalistic action, claiming that the former does not belong to the realm of paternalism, at least in some cases. Actions that aim at correcting market failure not seen by these authors as paternalistic include, for instance, interventions to address information failures, or failures of exchange such as those observed in a "prisoner's dilemma" situation. In the latter, the outcomes of an individual's choice are partly dependent on someone else's actions, and rational, self-interested choice, as opposed to cooperation, would lead both parties to sub-optimal outcomes. One example of this in the field of car safety is the widespread tendency in some countries to purchase large Sport Utility Vehicles and 4-wheel drive cars as a self-protection measure, which has been shown to increase the overall fatality risk, including for large car drivers, compared to a situation in which small cars were the norm (Tay, 2002).

87. In the perspective of developing a conceptual framework on chronic disease prevention, it is important to focus on degrees of interference with individual choice, particularly by government action, regardless of where we set the boundaries of paternalism. Therefore, action to correct market failure will not be seen as distinct from paternalistic action in the context of this paper. In the absence of market failure it should be assumed that transactions are efficient and individual and social welfare are maximised, so there should remain no scope for further welfare enhancement and paternalistic action would be confined

to improving the distribution of welfare across individuals and population groups. Whether we call it paternalistic or not, action to correct market failure does generally interfere with individual choice and should be subject to the same degree of scrutiny as any other action causing similar interference.

88. Based on the nature of the actions that may be undertaken to modify or influence individual choice, it is useful to distinguish among at least four types of such actions, in order of increasing degree of interference with individual choice: (a) actions aimed at improving the breadth or the attractiveness of choice options, relative to a free market situation; (b) actions to modify preferences based on characteristics of choice options other than price; (c) actions to increase the price of selected choice options; (d) banning selected choice options. The four types of actions will be illustrated in the remainder of this section.

3.1.1. Actions that may widen an individual's choice set or decrease the price (opportunity cost) of selected choice options

89. These actions are the least intrusive, because they do not actually limit the opportunities that individuals enjoy to choose the forms of consumption previously available to them, or the sacrifice involved in choosing them. Instead, these actions aim at influencing individual choices either by expanding the range of choice options available to the individual or by decreasing the price individuals have to pay when they choose options that were available previously at a higher price. A public investment in a new form of transportation that would not normally be provided through a market mechanism, e.g. a programme to make public bicycles available for temporary use in an urban setting, is an example of the former type of intervention. A programme of subsidies to public transportation to reduce their opportunity cost and increase their use is an example of the latter. Actions of these types are so mildly intrusive that they may often be regarded with favour by those who care to preserve and defend individual freedom of choice. In fact, these actions generally increase choice and therefore some may not even view them as paternalistic. Nevertheless, they do modify the set of available choice options, and they aim at achieving outcomes that differ from those that would otherwise be achieved. Furthermore, they do this at a potentially high cost, which may take various forms and may fall onto different parties. The cost of expanding choice by making available for consumption something that would not normally be provided by a market may be very high. If a commodity is not exchanged in a market, it is likely that its production costs exceed consumers' willingness or ability to pay for it. Making that commodity available to consumers means that a third party will have to bear the additional production costs, or more if the commodity is to be made available at a lower price than the consumers' maximum willingness to pay, in order to incentivise its consumption. When that third party is the State, excess production costs will be financed through public sources and the burden will be redistributed across all taxpayers (which itself involves a cost to the economy). Similarly, in the case of subsidies to make existing choice options more attractive to consumers, a redistribution of real income will take place through some form of revenue generating activity such as taxation and additional costs to the economy will arise in relation to the latter.

3.1.2. Actions aimed at influencing choices by means other than prices, through persuasion, provision of information, or other suitable means;

90. This is the most varied group of actions, as preferences can be influenced in a large number of ways, some of which may prove more intrusive than others. There are at least two broad types of actions in this category. The first type includes actions aimed at shaping tastes and preferences when these are being formed, especially during childhood. These are typically educational interventions that start from the very early years of life with informal education delivered by parents and continue with schooling and other forms of formal education. The effects of these actions on tastes and preferences may be very powerful and long-lasting, shaping lifestyles well into adult life. The second type of actions includes those aimed at

influencing established preferences, such as the provision of information, actions based on persuasion, the setting of default rules, as discussed in the remainder of this section.

91. The provision of information to consumers is one of the most classical ways of influencing their choices. When information is lacking, imperfect, or asymmetrically distributed between suppliers and consumers, markets may fail to deliver efficient transactions and a third party, generally the State, may intervene to redress the information imbalance. Although often seen as a non intrusive, or non paternalistic, form of intervention, the provision of information is seldom neutral. The direction in which new information may influence choice depends on the contents, the framing, and the method of delivery of the information, and the extent to which any third party, including the State, can be trusted to package all these elements in the best interest of the consumer is often a matter of value judgement. Of course, there are many situations in which obvious information gaps can be filled by delivering relatively simple and uncontroversial messages, but this cannot be assumed to be true in all cases.

92. When information is not lacking, a third party may still wish to reinforce a particular message to persuade consumers and steer their choices towards outcomes that are deemed to be in their best interest. For instance, consumer knowledge of the health risks associated with smoking has increased substantially over the past decades, and only a very small proportion of individuals are currently unaware of such risks (Kenkel, 2007). However, many governments have adopted the policy of printing dire health warnings on cigarette packs, the main purpose of which is not to provide information that is lacking, but to persuade consumers to limit their consumption by reinforcing a known message. Similarly, an intervention may be aimed at countering other parties' influence and persuasion attempts if the latter are not deemed to be in the best interest of consumers. This may be achieved by regulating, or banning, other parties' actions, as in the case of advertising regulation. For instance, a widely advocated strategy to prevent child obesity involves heavy regulation or outright banning of television advertising of food products during times when children represent a significant part of the audience.

93. Preferences may also be influenced in more subtle ways than through the direct provision of information. An important example is what has been described as setting the default option by advocates of "libertarian paternalism" (e.g. Sunstein and Thaler, 2003). The underlying principle is that individual preferences driving an act of choice tend to be influenced by how the default option is configured, as if departures from such default involved a cost individuals were reluctant to bear (essentially a psychological cost, but in some cases a material cost might be involved too). An example of what is meant by default option is the routine association of a certain side dish to a main course ordered in a restaurant. Customers may be entitled to demand an alternative side dish, but if they did not exercise this faculty they would receive the standard (default) option. Using a healthy option as a default instead of a less healthy one would have a significant effect on the number of customers eventually choosing to consume the healthy option. Actions involving changes in default options may display varying degrees of interference with individual choice and they may be perceived as more or less acceptable by consumers depending on the nature of the choices they aim to influence. For instance, changing the order in which food is arranged in a company cafeteria (Sunstein and Thaler, 2003) in order to steer consumer choices towards healthy options would seem a fairly non intrusive action. On the contrary, policies aimed at making organ donations a default option, with individuals being allowed to opt out, which have been shown to increase organ donations by as much as 25-30% compared to countries where the default is not consenting to donation (Abadie and Gay, 2006), have been viewed as most controversial and have been fiercely opposed in many countries. The way actions involving a change of default options produce their effects on choices may be complex and the extent to which such actions are viewed as interfering with individual choice may vary, therefore these actions require a careful planning and assessment if undesired consequences are to be avoided.

94. Actions that aim at influencing choice by means other than prices are not without costs, although they tend to be less expensive than those intended to expand the choice set. Information is a commodity that needs to be produced and delivered to consumers if it is to influence their choices. The costs involved in making the information available to consumers increase with the degree of complexity of the information required, with the difficulty of reaching the target of the information through efficient communication channels, and with the need to reiterate and reinforce messages after their first delivery. To the extent that such costs are borne by the State within the framework of public information campaigns, a certain degree of redistribution of real income will also be involved. Actions aimed at regulating the provision of information and the use of persuasion in a market setting generally involve lower costs, mostly in relation to enforcement, but it must also be considered that such actions may lead to price changes for the consumers and the commodities concerned. Actions aimed at changing default options also tend to be regulatory actions and tend to have similar cost implications as those previously discussed.

3.1.3. Actions that increase the price (opportunity cost) of selected choice options;

95. Measures to raise the price of choice options leading to less desirable health consequences are among the instruments sometimes used to influence individual preferences and guide consumption choices in the best interest of consumers. A classical example of such measures is taxation, in particular the use of indirect taxes and other levies charged on the consumption of goods that are deemed less healthy. Taxes may be required, for instance, when production costs and consumers' willingness to pay for a certain commodity are such that free market exchange leads to consumption of that commodity above desirable levels. This implies that consumers' willingness to pay does not necessarily reflect the desirability of consumption, either because of possible effects of consumption on other subjects (externalities) that individual consumers do not take into account, or because of flaws in the process through which willingness to pay is formed (e.g. lack of self-control, or bounded rationality).

96. Taxes have the effect of raising prices above some consumers' willingness to pay, putting off those consumers and leading others to cut their consumption levels. The precise impact of imposing taxes on the consumption of certain commodities is determined by the price elasticity of the demand for such commodities, i.e. by the responsiveness of consumers to price changes. An inelastic demand means that the relative change in the quantity consumers will demand is smaller than the relative change in price. An elastic demand means the opposite. The elasticity of the demand for a commodity subject to taxation is important because it determines whether consumers will increase the proportion of their own income they spend on that particular form of consumption (inelastic demand), or decrease it (elastic demand). When demand for a commodity is inelastic, levying a tax on that commodity will likely displace other forms of consumption, because the income available for other forms of consumption will shrink. Depending on the nature of the consumption that is displaced, this displacement effect may strengthen or weaken the ability of the tax to achieve its goals. If the tax is aimed at reducing the consumption of unhealthy commodities whose demand is inelastic, and consumers end up decreasing their consumption of healthy commodities, as well as their consumption of the taxed commodity, the purpose of the tax will be largely defeated. A further problem may arise when a close substitute for the taxed good is available, leading to an elastic demand. Consumers may reduce, even substantially, their consumption of the taxed commodity and replace this with an increased consumption of the substitute commodity. If the latter has similarly negative consequences on consumers' health as the former, the purpose of the tax is again largely defeated. The revenues for the suppliers of a commodity subject to taxation and for the government will also depend on the price elasticity of demand. Suppliers' revenues will shrink in any case relative to a situation without taxes (assuming price elasticity is negative), but they will shrink more if demand is elastic. Similarly, tax revenues will be smaller with an elastic demand. Among lifestyle commodities, the demand for cigarettes is known to be broadly inelastic (Gallet and List, 2003) but with variations across social groups (Townsend et al., 1994; Madden, 2007). The demand for alcoholic beverages tends to have an elasticity of about -1 (neither elastic nor inelastic) (Fogarty, 2004; Gallet, 2007). The demand for food, generally, is rather

inelastic, but the demand for specific foods may be fairly elastic, because of the likely availability of substitutes.

97. Regulatory actions aimed at restricting the availability for consumption of certain commodities (e.g. addictive goods such as alcoholic beverages, which are often sold only at certain times of the day) also have the potential for increasing the prices of such commodities, although they are not primarily meant to counter consumption through this route.

98. Taxes on lifestyle commodities, or sin taxes, tend to be controversial. They are perceived by critics as heavily and unduly interfering with individual choice. Governments levying such taxes are sometimes seen as “profiting” from unhealthy behaviours. In addition, taxes on consumption are typically regressive, unless consumption is concentrated among the wealthiest, which is certainly not the case for most potentially unhealthy lifestyle commodities, as the consumption of these tends to be concentrated among the less well off. Therefore, tax payments will weigh more heavily on the incomes of the most disadvantaged, and the revenues raised through the tax should be earmarked to benefit the same groups disproportionately (e.g. by increasing social benefits), if an adverse impact on the distribution of real income is to be avoided. In addition to distributional effects, imposing taxes on certain forms of consumption may also generate costs, mainly in relation to enforcement. When prices in a market are kept artificially high by taxation, phenomena like parallel trade and smuggling will flourish, which governments will have to regulate or repress.

3.1.4. Actions that restrict the choice set by banning selected choice options

99. The actions that involve the most extreme form of interference with individual choice are those that result in the complete banning of one or more choice options. Actions that make one option compulsory, implicitly banning all other options, are essentially of the same nature. Examples include swimming bans in dangerous waters, or compulsory wearing of bicycle helmets. These actions involve a direct limitation of individual choice and require a strong justification in order to become acceptable. Harm caused to others by an individual’s behaviour (a form of externality) is typically one such justification. Examples include the health consequences of passive smoking, or the violent behaviour that may be associated with drinking alcoholic beverages at sport events. But in some cases a potential for self-harm (as in the case of swimming bans and compulsory helmets) is deemed sufficient to justify banning certain behaviours, especially when it is assumed that individuals are not fully able to assess the potential risks involved in adopting such behaviours. The addictive nature of certain forms of consumption often strengthens the case for adopting such severely restrictive measures.

100. A ban can selectively hinder certain modalities of consumption of a commodity, with the aim of limiting the overall consumption of that commodity but not preventing it altogether. This is the case, for instance, of smoking bans in public places, or traffic speed limits. Selective bans tend to target the modalities of consumption that involve the greatest risks to the health of the individual or to the health of others that may be affected by that consumption. Alternatively, restrictive measures may be taken aimed at completely suppressing the marketing or consumption of a commodity. Examples include bans on illicit drugs, or bans of food ingredients deemed dangerous for the health of consumers such as certain preservatives or colouring agents, or, more recently, trans fatty acids (transfats).

101. Whether partial or total, bans are essentially regulatory measures and as such they are less expensive than measures aimed at persuading consumers or expanding their choice sets. However, as in the case of taxes on consumption, banning certain forms of consumption involves enforcement costs that may not be trivial. Illegal marketing and consumption of banned commodities may develop, possibly in an organised form, especially when there is strong demand for such commodities and when consumption is addictive. The impact of such activities on society, including the costs involved in countering them, if and

when relevant, should be factored into any decisions to ban specific forms of consumption. The social impact of the prohibition of harmful drugs is a stark illustration of the costs involved in this type of regulation.

3.2. Non-governmental and concerted action

102. Some of the actions described in the previous section, such as taxes or outright bans on certain forms of consumption, are clearly within the exclusive domain of government intervention. However, other types of actions, particularly those aimed at widening choice, lowering the prices of certain choice options, influencing choices through persuasion, and even some regulatory actions, may be promoted or undertaken by actors other than governments, acting alone or in cooperation with governments. These actors may be as diverse as groups of individuals organised for the pursuit of special or general interests (e.g. community action groups, patient organisations, trade unions); professional and business organisations; research organisations and think tanks; civic society organisations; or the mass media. The importance of non-governmental action is underscored, for instance, by a comparative analysis of trends in smoking rates in the US and Europe, discussed in section 2, which shows that information was conveyed more effectively in the US thanks to the entrepreneurial action of anti-smoking interest groups (Cutler and Glaeser, 2006).

103. Disparate motives may lead these actors to engage in actions aimed at influencing individual consumption choices in the best interest of consumers. Organised groups of individuals (e.g. consumer groups) may be particularly motivated to take action in situations of asymmetric market power, i.e. markets in which supply may be relatively concentrated, or in which information may be asymmetrically distributed between consumers and suppliers. In the absence of government intervention, because governments do not wish to interfere or intervention would be inefficient, consumers, or other individuals who care for their interests, may attempt to strengthen their position through organised actions. Professional organisations are a special case of such groups, particularly when professionals act as agents of consumers in the protection of their health, as with public health or medical professionals. Businesses may engage in the production and commercialisation of healthy commodities whenever market opportunities emerge, but they will also engage in the production and commercialisation of unhealthy, or potentially unhealthy, commodities when a market for these can be established. In the latter case, business organisations may be motivated to seek deviations from market dynamics in the best interest of consumers under the threat of tougher actions by other subjects, especially governments, which may affect the interests of their own members. Employers may, individually or collectively, promote lifestyle interventions for their own employees with a view to improving the overall health of the workforce and increasing productivity, or as part of a “social contract” with workers. Health insurance organisations, again individually or collectively, may find that lifestyle change and prevention may provide the means for containing health expenditures by raising average levels of health in the pool of insurees. Research organisations, think tanks and the mass media often act as watchdogs on market dynamics and other social phenomena, and in this capacity they may be motivated to take action in the interest of consumers. Actions like those envisaged so far may purportedly be in the best interest of consumers, but even when in good faith, all of the actors who may promote those actions may be prone to influences, biases, and other limitations of rationality that may cause the outcomes of such actions to deviate from their original goals.

104. Virtually all of the actors mentioned in this section are able to engage in actions aimed at influencing consumer choices through persuasion, or by other means affecting non price preferences, and they may all have incentives to do so. Interest groups may promote information campaigns or events to raise awareness about the health risks associated with certain behaviours, especially targeting the consumers who have lower degrees of control over their own choices, or those who face more challenging choices, such as children and parents. Businesses may decide to provide information and warnings to consumers against excessive or inappropriate consumption. Retailers may display healthier goods more prominently than unhealthier ones. Research-based organisations and the media may persistently target

unhealthy behaviours and disseminate messages aimed at directly changing those behaviours or stimulating others (e.g. governments, business organisations) to prevent them. Actions of the kinds discussed here may be undertaken in an organised form, typically by business organisations, leading to self-regulation schemes to which members of such organisations may voluntarily adhere. This is the case, for instance, of voluntary food labelling schemes, or schemes to limit the use of certain ingredients in manufactured foods, or voluntary regulation of advertising. These measures may have the effect of pre-empting more cogent regulatory actions by governments. But, on the other hand, consumers and other groups representing their interests may seek formal regulatory action by governments through legal challenges (Gostin, 2007) or other means.

105. Action by actors other than governments might also be aimed at widening choice, by enabling certain choice options that markets would not normally provide. As discussed previously, markets may not provide certain options when production costs are not matched by consumers with an equivalent, or greater, willingness to pay. As an alternative to government intervention, consumer groups or business organisations may have an interest in acting as catalysts to creating the economic conditions for new choice options to become available to consumers. For instance, by coordinating different business interests, commercial sponsorships may be arranged to cover part of the production costs of the commodities in question. Interest groups, or charitable organisations, may make some of their own funding available for the same purpose, particularly when the target groups that are to benefit from this action are groups at high risk or in great need.

106. The roles outlined in this section for non-government organisations are potentially very important in determining the success of complex preventive interventions. Unilateral actions by governments or others may often prove poorly effective or non viable if other actors are not fully engaged in the process of designing and implementing such actions. In most cases, the prevention of chronic diseases and their consequences on quality of life and longevity requires certain sacrifices, which may well be offset by the health benefits of prevention, but nevertheless must be understood and accepted by those who will have to bear them. Direct participation in the development of preventive interventions by all those who have a stake in the process is increasingly regarded as a pre-condition for successful prevention policies. The WHO has been promoting a multi-stakeholder approach in a range of policies for chronic disease prevention (Yach et al, 2003; Waxman and Norum, 2004) including their Global Strategy on Diet, Physical Activity and Health.

3.3. Establishing what interventions are viable

107. While the objectives of preventive interventions remain increasing social welfare and enhancing health equity, the potential for interference with individual choice that many preventive interventions display may limit the appropriateness and acceptability of such interventions. Those who intend to take action for the prevention of disease will wish to assess the desirability of that action in the light of its conformity with individual preferences, as well as along the efficiency and equity dimensions that provide measures of the attainment of the goals of prevention. Our discussion of the characteristics and impacts of the four types of actions illustrated in section 3.1. should provide a basis for assessing the appropriateness of those actions in relation to the nature of the contexts in which they are implemented. It must be emphasised that a judgement on the appropriateness of preventive actions may not be formulated in general terms, but only in relation to factors such as the nature of the lifestyle choices those actions are meant to influence, the characteristics of the individuals whose choices are to be influenced, the prevailing culture and view of the role of the state, the actions and positions taken by the media and other opinion makers, which may affect the way interference with individual choice is perceived. The latter aspects tend to vary across countries and settings, but some generalisations are possible in relation to the first two aspects, i.e. the characteristics of the choices and of the individuals to be influenced.

108. Actions of the types described in section 3.1.1. are often well accepted. They involve the least degree of interference with individual choice, in some cases they even widen choice, but they may be expensive and involve redistribution of real incomes. The case for adopting actions of these types rests primarily on the availability of evidence of their efficiency and distributional impact. Finding support for the actions described in sections 3.1.2., 3.1.3. and 3.1.4., involving progressively higher degrees of interference with individual choice, is less straightforward. Interference with choice has clear welfare implications, which must be assessed before a decision is made to intervene.

109. On the other hand, there tends to be an inverse correlation between the degree of interference with individual choice of preventive interventions and the costs of the same interventions. Forms of prevention that are least intrusive are often more expensive to implement, while more intrusive interventions tend to be progressively less costly. Of course this does not mean that the former are less likely to be efficient, as this depends on the value of the benefits generated.

110. An important distinction must be made between commodities whose consumption is invariably unhealthy, such as tobacco, and commodities whose impact on health depends on the modalities of consumption. An example of the latter is food. Certain forms of food consumption are hazardous, but most consumption is healthy, even essential for life, including some consumption of fats, sugars and salt. When interference with individual choice is motivated by the aim of protecting health, but consumption is not invariably unhealthy, interventions will be beneficial to those who tend to engage in unhealthy consumption (for whatever reasons) but will negatively affect those whose consumption is generally healthy, because the latter will have their choice sets limited by those interventions, or they will see the price of their consumption rise because of taxation or similar measures. For commodities that are not invariably unhealthy, the case for paternalistic action rests on the nature of the consumer, as well as on the nature of the commodity. With heterogeneous consumers, interventions aimed at influencing consumption choices generate tradeoffs between opposite effects in different consumer groups (O'Donoghue and Rabin, 2003). The welfare implications of these tradeoffs must be assessed scrupulously when similar interventions are planned, because such effects will contribute to the overall efficiency and distributional impact of the interventions.

111. The concept of asymmetric paternalism (Camerer et al., 2003) is a response to the tradeoffs arising with heterogeneous consumers. When some consumers have poor self-control, or cognitive limitations, while others are fully rational, asymmetric paternalism involves identifying efficient interventions that have the potential to generate large benefits for the former, while not affecting, or minimally affecting, the latter. Camerer et al. (2003) provide examples of regulatory actions that may correspond to the idea of asymmetric paternalism. Most of these would fall into the group of interventions that we described in section 3.1.2. (setting default rules, disclosing information, allowing cooling-off periods). Thaler and Sunstein's (2003) discussion of the use of interventions aimed at setting or changing default rules, referred to as libertarian paternalism, is broadly in the same line of thought. O'Donoghue and Rabin (2003) push the concept of asymmetric paternalism further into the realm of interventions that are most intrusive on individual choice, providing an example of an optimal taxation model aimed at maximising the effects on those who experience self-control problems, while minimising harm to rational consumers. They tentatively propose a number of possible solutions to implement such a taxation model, involving, for instance, the advance purchase of coupons or licenses for the consumption of potentially unhealthy commodities, which would discourage inappropriate consumption by those with self-control problems. On the other hand, authors like Glaeser (2005) support actions to facilitate private self-control by widening choice (as those discussed in 3.1.1.).

112. Bounded rationality problems are common in individual decision making and affect health-related behaviours and lifestyle choices made by many consumers in many forms of consumption. For instance, consumers may display an erroneous or a partial understanding of long-term health risks; or their

choices may be unduly influenced by the way the information available to them is framed. Glaeser (2005) argues that these sources of cognitive error make paternalistic government intervention even less attractive than in the case of self-control problems. In particular, he presents seven arguments against the use of “soft” paternalism (actions involving persuasion, of the kinds described in section 3.2.2.) by governments. Soft paternalism is seen by Glaeser as an “emotional tax on behaviour which yields no government revenues”, inevitably leading to a welfare loss. Governments may be hostages to lobbies and special interests (a phenomenon often referred to as “regulator capture”) and may be themselves subject to judgement error and bounded rationality. When such situations occur, soft paternalism often proves more difficult to monitor and sanction by the public than hard paternalism (taxes and other measures of the types described in sections 3.2.3. and 3.2.4.). This makes it undesirable for governments to engage in actions to influence individual choices through persuasion, not least because persuasion will eventually lead to the acceptance of “harder” paternalistic measures. A counterargument to Glaeser’s point that governments should not engage in persuasion, particularly in the setting of default rules, is that “paternalism is unavoidable” (Sunstein and Thaler, 2003). Governments will set default rules in any case, willingly or not. Even if they defined no rules at all, this would determine a default scenario.

113. In summary, actions that widen choice or make certain options more accessible are generally well accepted, despite the objections of some critics and their mild interference with free market interactions. These actions include support to technologies that help private self-control. Opportunities for adopting actions of these types find their main limits in their financial costs, their efficiency and distributional implications. The use of actions involving higher degrees of interference with individual choice may be met with increasing degrees of hostility, especially when only certain forms of consumption of a commodity are unhealthy and consumers differ in terms of the nature of their consumption. Persuasion and other non-price devices such as default rules and cooling-off periods are often advocated as minimally intrusive interventions responding to the ideal of asymmetric paternalism, as they do not significantly harm rational consumers. However, there are risks involved in relying on governments to deliver persuasion effectively and in the best interest of individuals, and it is difficult to monitor whether governments are able to do this. Taxes and consumption bans are more transparent and contestable, although they may lead to potentially severe welfare losses in the presence of heterogeneous consumers with varying degrees of rationality. Taxation models responding to the idea of asymmetric paternalism are possible, but their development is still at a very early stage. Actions involving higher than minimal degrees of interference with individual choice become more appropriate when the consumption of a commodity is invariably unhealthy and bears a large potential for self-harm; in the presence of important classical market failures, particularly externalities; when actions may be targeted to population groups at the upper extreme of the bounded rationality spectrum (e.g. children, whose early experiences and behaviours appear to contribute significantly to the formation of taste) or groups that are particularly exposed to external influences that may trigger unhealthy behaviours (e.g. disadvantaged socioeconomic groups).

3.4. A taxonomy of preventive interventions

114. A taxonomy of preventive interventions is a policy tool that may be used jointly by governments and other actors at an early stage of development of prevention strategies. A taxonomy provides a framework for classifying interventions, identifying a balanced set of actions to be implemented jointly or incrementally over time, allocating responsibilities for action, predicting possible responses by those who are targeted by interventions, broadly estimating the outcomes of prevention strategies involving multiple interventions. Interventions are classified in a taxonomy along one or more dimensions, according to their nature, and this provides information on a number of basic characteristics and requirements of such interventions and on some of the main outcomes to be expected from their implementation. Of course, a taxonomy is no substitute for a thorough evaluation of the impact of preventive interventions, which represents a subsequent analytical step, as discussed in section 4 of this paper, to be based on more specific

information on the detailed characteristics and ways of implementation of the interventions that are being considered.

115. A first dimension for a taxonomy may be linked to the classification of health determinants discussed in section 1. This may help to identify the area in which an intervention will be undertaken and the determinant, or determinants, upon which it will act in an attempt to prevent disease. Identifying the broad area and the specific determinants to be tackled by a preventive intervention may provide the means for allocating responsibilities for the design, implementation and financing of the intervention. Health determinants may be classified on the basis of how direct or mediated their effects on individual health are expected to be, and on the basis of the life-cycle stages at which exposure to such determinants produces a short-term or long-term influence on individual health. Both aspects are important in identifying responsibilities for action and designing suitable interventions.

116. The classification of preventive interventions proposed in this section, based on the degree to which they interfere with individual choices, may serve as a second dimension of a taxonomy. Positioning interventions relative to the four levels of interference with individual choice discussed in section 3.1. will point towards the strength of the justification required to make the intervention acceptable to the general public, and particularly to those directly targeted by the intervention. In addition, as discussed in section 3.1., for each of the four levels of the classification some basic effects that interventions are likely to produce can be identified.

117. A further aspect of a taxonomy, which may contribute to both of the dimensions previously discussed, is the possible targeting of interventions to specific population groups. There are many reasons why targeting may become part of the design of a preventive intervention. Certain individuals, or population groups, may display poorer health or have higher risks than other individuals or groups. Alternatively, targeting may focus on those who are likely to offer the greatest response to, or capacity to benefit from, the preventive intervention, with possible repercussions on the efficiency of the same intervention. Targeting may also serve the objective of ensuring the political acceptability of preventive interventions, for instance by limiting the application of measures impinging more heavily on individual choice to individuals who show a greater willingness, or even a desire, to change their lifestyles, while adopting less intrusive measures on those who are more reluctant to make the same changes.

118. The table in the appendix provides an illustration of how the two dimensions above may be combined into a taxonomy of preventive interventions. The vertical dimension is broadly inspired by the Dahlgren and Whitehead (1991) "layers of influence" model discussed in section 1. Interventions acting on determinants that influence more directly lifestyle choices made by individuals appear closer to the bottom of the list. Interventions on determinants that have a progressively less direct (but not necessarily weaker) influence on lifestyle choices appear closer to the top of the list. Interventions may act on health determinants at different stages in the life-course of an individual (e.g. antenatal, early childhood, adolescence, adult life, etc.) as indicated through examples on the same dimension. Moreover, responsibilities for action may be identified in relation to individual determinants, again indicated through examples in the table. By combining the vertical dimension with the degree of interference with individual choice discussed in this section (horizontal dimension), interventions may be positioned in the taxonomy. For illustrative purposes, selected examples of the positioning of commonly debated preventive interventions are provided in the table and discussed in the following paragraphs.

119. *Regulation to limit advertising of fast-food during television programmes for children.* This qualifies as an action on the supply of lifestyle commodities, in this case certain types of foods, which may take different forms depending on the actors who promote it. For instance, fast food manufacturers and retailers may voluntarily agree to limit their own promotion of fast food products on television at times when programmes for children are predominantly broadcast (self-regulation, as discussed in section 3.2.).

Alternatively, governmental agencies (e.g. advertising regulators) may impose such limitations, or negotiate mutually agreeable arrangements with fast food manufacturers and retailers. In all cases, regulation may be expected to have an effect on children's fast food consumption choices by changing influences on children's preferences, and the effect may prove long-lasting if preference changes in childhood are likely to have a role in long-term taste formation. Hence, the intervention would be positioned in the second column of the table.

120. *A smoking ban in public places.* An outright ban on a lifestyle choice like smoking is an intervention aimed at directly influencing individual choices, in this case by prohibiting one of the choice options. Regulations of this kind are generally imposed by governments (health ministries), although individual organisations (e.g. employers, educational institutions) may decide to adopt similar policies on their own premises, if such policies are consistent with existing legislation. A ban on certain lifestyle choices involves the highest degree of interference with individual choice, and this leads to the positioning of this type of intervention in the fourth column of the table.

121. *A workplace intervention to reduce sedentary at work.* Interventions may be implemented in workplaces aimed at increasing the physical activity of employees during working hours. For instance, employers may make suitable facilities, such as gyms or swimming pools, available on site. Alternatively, employees may be offered opportunities to take breaks from sedentary activities, or to take up less sedentary tasks during part of their working hours. Interventions of this kind would generally be enacted by employers, although it is conceivable that where the risks associated with sedentary are particularly significant governments (labour ministries, health ministries) may wish to intervene with regulatory actions targeted at specific types of jobs. Actions of the types described above would essentially widen choice for the employees concerned, by making available options previously not accessible, and therefore would appear in the first column of the table.

122. *Taxation of sugary soft drinks.* Taxation of a commodity at the point of consumption may be achieved, for instance, by setting differential rates of value added tax. Foods whose consumption is to be limited may be taxed at higher rates than others, resulting in a higher purchase price for the final consumer. An intervention of this kind would qualify as a direct attempt to influence consumer choices. Taxes are typically imposed by governments (finance ministries), at the national or local levels. Their effect is to increase the opportunity cost for individuals involved in the choice of the options that are subject to taxation, which will likely lead individuals to reduce their consumption of the commodity in question and to consider the consumption of substitute commodities. Therefore, taxes on consumption would typically appear in the third column of the table.

123. *A programme of lifestyle counselling of individuals at risk in primary care.* An organised programme may be established involving, for instance, the delivery of a counselling session to consenting individuals visiting a primary care practice for any reason and found to be at risk for the development of chronic diseases through a simple screening procedure. The counselling intervention may focus on lifestyle habits and aim at reducing the long-term risk of chronic disease by changing any unhealthy habits. Programmes of this sort may be promoted by governments (health ministries) in countries where primary care is delivered, or commissioned, by public agencies. Alternatively, they may be promoted by private health insurance plans or integrated health care delivery organisations (e.g. health maintenance organisations). Such programmes would attempt to influence lifestyle choices by raising awareness of the risks involved in certain lifestyle habits and of simple actions that may enable individuals to change unhealthy habits. Therefore, they would be positioned in the second column of the table.

124. *A programme of subsidies to producers of fruits and vegetables.* Incentives may be offered to increase the production of healthy foods such as fruits and vegetables, for instance by providing subsidies to farmers who grow them. Subsidies would qualify as an intervention on the food production system, and

would be expected to increase the likelihood that farmers engage in the production of fruits and vegetables, instead of investing in other productions, by making the former more profitable. Governments (agriculture ministries) are typically the subjects that may promote interventions of this kind, using public expenditure to fund transfers to farmers. The effect expected for consumers is essentially a larger availability of the subsidised commodity, and therefore a lower purchase price. This should have an influence on consumption choices, leading to an increased consumption of fruits and vegetables. Therefore, the intervention would typically appear in the first column of the table.

125. *A family tax credit programme to increase available income for families with young children.* Exposure to disadvantaged socioeconomic and living conditions during early childhood may have long-lasting health effects, partly through the shaping of certain lifestyle preferences. A programme to increase available income for families that are raising young children may improve the conditions in which those children spend their early years of life, improving their chances of enjoying good health in the long term. An intervention of this sort, which may be realised by offering tax credits to families with earnings below a certain threshold, would qualify as a general fiscal policy, part of the broader economic environment in which individuals lead their lives. It is typically an intervention that would be implemented by governments (finance ministries) through their tax raising powers. The intervention would have the effect of making healthy living options more affordable to low income families and therefore it would be positioned in the first column of the table.

3.5. Main messages and conclusions

- Interventions aimed at preventing diseases that are linked to lifestyles will interfere, at least to some degree, with individual lifestyle choices as they would develop in the absence of intervention.
- The least intrusive interventions are those aimed at widening choice by expanding the range of options individuals can choose from, or those aimed at making certain existing options more affordable.
- Persuasion and other non-price devices such as default rules are often advocated as minimally intrusive interventions which do not significantly affect rational consumers. However, governments may not always deliver persuasion effectively and in the best interest of individuals, and it is difficult to monitor whether they do so.
- Taxes and consumption bans are more transparent and contestable, although they may lead to welfare losses when consumers display varying degrees of rationality. Taxation models targeting the least rational consumers may be possible, but their development is still at a very early stage.
- Outright bans of selected choice options involve the highest degree of interference with individual choice. They may be difficult to enforce, particularly when demand is strong or consumption is addictive.
- Heavier interference with individual choices may be justified when departures from rational decision making and from an ideal efficient market model for lifestyle choices are significant, or when the consequences of those departures are particularly severe.
- The political costs of prevention, in the form of interference with individual choice, often follow an inverse pattern relative to the economic costs. Interventions that involve lower degrees of interference tend to have higher economic costs, and vice versa.

- A model of layers of health determinants may be combined with degrees of interference with individual choice to form a taxonomy of preventive interventions. This allows the mapping of responsibilities for the design and implementation of interventions, and the identification of the main effects to be expected in terms of choice and political acceptability.

Section 4

Assessing the efficiency and distributional impact of preventive interventions

4.1. *The economic evaluation of health interventions*

126. To determine whether preventive interventions will increase social welfare, the costs and benefits of such interventions need to be assessed against those of alternative courses of action. In the health care systems of many OECD countries, assessment of the allocative efficiency of interventions and programmes is increasingly based on the framework of *cost-effectiveness analysis*, which avoids placing monetary values on health outcomes by using quality-adjusted life years, disability-adjusted life years, or simply life years gained as common health outcome measures. However, the use of the cost-effectiveness analysis framework in the area of prevention poses a number of difficulties. Medical or public health-driven preventive interventions struggle to fit into a broad health care resource allocation framework alongside curative, diagnostic and palliative interventions, because of the somewhat uncertain and distant nature of their outcomes. This places them in a league of their own and often makes governments (and, indeed, health insurance organisations) uncomfortable about diverting resources away from uses that have a more immediate and certain return, particularly in a tightly resource-constrained health care system in which it is not even possible to fund all potentially available curative interventions.

127. When disease prevention efforts, such as improving school meals, arise in jurisdictions other than health care, or across government departments, the cost-effectiveness analysis framework is yet more problematic because the outcome measures on which it is typically based do not allow comparisons with interventions competing for the same resources (if a school meals policy is funded from the education budget, it will compete with other educational interventions, whose overall effects could hardly be measured in QALYs or averted mortality). Therefore, cost-effectiveness analysis can be part of the assessment of government policies towards primary disease prevention, but it will not be the sole, or the principal, approach in the assessment process. Given tight constraints on public finances, the starting point of any assessment of prevention policies should be a thorough assessment of long-term financial implications, from an estimation of intervention costs, including external costs involved in raising fiscal revenues, where appropriate, to impacts in terms of changes in health care expenditure and productivity.

128. The use of cost-effectiveness analysis is also common in sectors other than health care (e.g. defence), but the alternative approach of cost-benefit analysis, more solidly grounded in welfare economic theory, has been far more popular for a longer time and in a broader range of fields, for instance transport or environmental protection. The main features of the two approaches, and differences between them, are illustrated in box 2.

Box 2 – Cost-benefit and cost-effectiveness analyses

The economic appraisal of health interventions began to develop at a remarkable pace in the mid-1960s. Early studies were undertaken using the framework of cost-benefit analysis, based on the human capital approach. The apparently simpler framework of cost-effectiveness analysis, the first examples of which in the health sector were published in 1968 (Klarman et al., 1968; Levin, 1968), was gradually preferred by most researchers. In the years 1966 through 1973, on average, 42% of economic evaluations in the health field were cost-effectiveness analyses (Warner & Hutton, 1980); these became 53% in the period 1974-78 (Warner & Hutton, 1980), 59% and 64% in the periods 1979-84 and 1985-90, respectively (Elixhauser et al., 1993). At present, only a minority of economic evaluations of health interventions are cost-benefit analyses.

Cost-benefit analysis has its theoretical basis in welfare economics, whereas cost-effectiveness analysis retains a weaker link with economic theory. Recent developments in cost-effectiveness analysis have been influenced by

operational research approaches at least as much as by economics. Welfare economics is normative allocation economics and is concerned with formulating and justifying propositions by which alternative economic situations may be ranked (Mishan, 1981). The starting point of welfare economics is individual utilities and the final aim is "achieving a social maximum derived from individual desires" (Arrow, 1963). The general equilibrium analysis typical of welfare economics is based on a number of assumptions, among which is the postulate that individuals aim at maximising a well-defined utility function, based on preferences for the consumption of different goods, and that social welfare is a function of such individual preferences.

The efficiency principle upon which cost-benefit analysis is based is the potential Pareto improvement criterion. According to this criterion, a reallocation of resources which makes someone better off and someone worse off represents a welfare improvement as long as the value of the gains exceeds the value of the losses. In other words, there is an improvement as long as the losers could be compensated by the gainers if a transfer were possible at no cost. The transfer, however, does not need to take place in practice. Cost-benefit analysis assumes that utilities can be aggregated across individuals, which implies that they are cardinal and interpersonally comparable. In practice, the efficiency of a health intervention is determined within the framework of cost-benefit analysis by comparing the present value of the monetized societal costs and benefits arising as a result of the intervention. The algebraic sum of the two components is the net present value of the intervention. When this is positive, interventions represent an efficient use of resources, while interventions are inefficient when the value is negative. Judgements on the distributional implications of alternative allocations are generally left out of cost-benefit analyses, although the use of equity weights is possible.

Cost-effectiveness analysis takes the perspective of an identified decision maker, and adopts a more limited view of the benefits of health care interventions than cost-benefit analysis. Benefits are measured in natural units (e.g. survival rates, life expectancy, etc.) and traditionally along one dimension. Attempts to incorporate more outcome dimensions and to value utilities for health outcomes rather than just measuring outcomes in natural units have led to the development of a variation of cost-effectiveness analysis defined as cost-utility analysis. In its most typical form, cost-utility analysis adopts a bi-dimensional outcome measure, quality adjusted life expectancy (measured in quality adjusted life years, or QALYs), that combines life expectancy and health related quality of life in a single index. Utilities are normally elicited for the latter, while life expectancy is still measured in natural units. The QALY may be considered a measure of utility only under very restrictive assumptions.

Cost-effectiveness analysis may indicate when the adoption of a health care programme represents a Pareto improvement, or a potential Pareto improvement, only when all costs and benefits accruing to all individuals in a society are taken into account, and when the willingness to pay for the effectiveness unit is constant and the same for everyone (Johannesson, 1995). However, given that such conditions are not normally met, the normative nature of cost-effectiveness analysis remains confined to the maximisation of a specified objective function (e.g. aggregate quality adjusted life expectancy) within a budget constraint. Cost-effectiveness analysis requires a comparison of the costs and effectiveness of at least two mutually exclusive interventions. When one intervention proves superior on effectiveness grounds, but at an extra cost, an incremental cost-effectiveness ratio is calculated as the ratio of cost over effectiveness differences. Cost-effectiveness ratios for a comprehensive series of (non mutually exclusive) interventions that compete for the same pool of resources are then compared in a cost-effectiveness league table, and interventions with the lowest cost-effectiveness ratios are in principle selected as efficient uses of existing resources. When new interventions become available and are shown to have a favourable cost-effectiveness ratio, their adoption will require either expanding the existing overall budget to fund the extra cost of those interventions, or discontinuing existing interventions whose cost-effectiveness ratios may no longer appear favourable.

4.2. Assessing the health impact of prevention programmes

4.2.1. The choice of outcome measures: avoidable mortality, life expectancy, QALYs and DALYs

129. A wide range of health outcome measures have been used, or even simply proposed, in the context of cost-effectiveness analysis and in the assessment of the burden of disease. Although conceptual and empirical differences among these measures are sometimes significant, it is possible to identify a

limited number of approaches shared by most existing measures. The main approaches are reviewed in this section, particularly with regard to their possible use in the assessment of prevention programmes.

130. The concept of avoidable mortality has been used extensively since the 1980s. As illustrated by Nolte and McKee (2004) in a comprehensive review, the concept has been translated into many different measures based on varying interpretations of what deaths may be deemed avoidable. In fact, the focus of most studies using this approach has been on mortality amenable to medical care (“amenable mortality”), but there are examples in which the concept has been referred to preventable mortality. While the concept of avoidable mortality may be helpful as a measure of disease burden, or a measure of current performance of existing prevention and treatment programmes, the prospective assessment of prevention programmes does not require a similar concept. The estimated impact of a prevention programme on mortality (and morbidity) will, by definition, affect the avoidable components of such mortality (and morbidity). Therefore, the prospective assessment of the outcomes of prevention may be simply based on deaths avoided, or increases in life expectancy, well established measures that are relatively straightforward to calculate and present far fewer conceptual issues. An extension of the concept of life expectancy has been proposed in recent years with the calculation of healthy life expectancies, mostly based on health status information derived from population surveys at the national or regional levels. This development seems particularly useful in the assessment of chronic disease prevention programmes, although the degree to which current methods for calculating healthy life expectancies could be fine-tuned to assess impacts of prevention programmes targeting specific chronic diseases is somewhat unclear. The alternative measures of quality-adjusted life expectancy and disability-adjusted life expectancy, which belong broadly in the same conceptual framework, have been used more extensively in the assessment of health interventions.

131. The concept of “quality-adjusted life year” (QALY) was introduced in the early 1970s in a number of theoretical and empirical contributions (e.g. Torrance, 1970; Bush et al., 1972; Zeckhauser and Shepard, 1976). The concept remains fundamentally unchanged 35 years later, and has gained tremendously in popularity over time. The QALY framework has been widely accepted as the reference standard in cost-effectiveness analysis since the 1990s (e.g. Gold et al., 1996) and today QALYs are used in most economic evaluations of health interventions as well as by many regulatory agencies which have made cost-effectiveness analysis an integral part of their decision making processes. While QALYs may be seen as an advancement over other outcome measures because they integrate two dimensions of outcome (life expectancy and quality of life) in a relatively simple framework, they require a number of important assumptions, in the absence of which QALY maximisation would not be justified as a policy objective (Sassi, 2007).

132. The QALY framework provided a basis for the development of a number of health outcome measures, including the disability-adjusted life year (DALY) in the early 1990s, or the Healthy Life Years (HLY) indicator of health expectancy, recently adopted as one of the European Structural Indicators following the resolutions of the Lisbon European Council. The DALY is primarily a measure of disease burden (disability weights measure loss of functioning) but its use in cost-effectiveness analysis is also relatively common. As a measure of outcome in economic evaluation, the DALY differs from the QALY in a number of aspects. Most importantly, the DALY incorporates an age-weighting function assigning different weights to life years lived at different ages, and the origins of disability and quality of life weights differ significantly. Although the disability profiles upon which DALY calculations are based tend to be simple (e.g. a constant disability is often assumed), the actual calculations may be relatively complicated, as illustrated in some detail by Murray (1994) and by Fox-Rushby and Hanson (2001). Quality of life profiles (or health profiles) for QALY calculations tend to be even more elaborate, allowing for sequential upward or downward health status changes over time.

133. A further approach may consist in the use of measures of subjective well-being. Empirical evidence suggests that self-reported health and self-reported wellbeing are strongly correlated

(Subramanian et al., 2005), so strongly that the two measures “can be used as proxies for each other” (Kahneman, 2005). Self-reported health, in turn, is generally a good predictor of objective health outcomes such as mortality (Kaplan and Camacho, 1983), consistent across socioeconomic groups (van Doorslaer and Gerdtham, 2003). Incorporating a subjective element into measures of health may substantially improve our ability to assess disease burden and the impact of policies aimed at improving health and wellbeing. There are suggestions that hedonic approaches based on the measurement of levels of subjective wellbeing (Kahneman et al., 1999) associated with particular health states could provide stronger foundations for the evaluation of health and health policy than preference based approaches like the one so far incorporated into the QALY framework.

4.2.2. Monetary valuations of health outcomes

134. An established literature exists on alternative approaches to the assessment of the monetary value of a “statistical life”, life years and health improvements. Monetary values offer a significant advantage over in-kind health outcome measures in terms of direct comparability with measures of other (non-health) outcomes of government policies, as well as with measures of resource use. When the framework of cost-benefit analysis is used, in a single-sector or an intersectoral perspective, monetary measures provide the means to value health outcomes. On the other hand, monetary values are subject to the influence of a large range of factors (e.g. income, nature of health risks), and their elicitation is often prone to many forms of bias. A number of reviews have been undertaken of monetary values reported for a statistical life or for particular health risk reductions (e.g. Viscusi, 1992). These have consistently shown large ranges of variation, but also some clearly identifiable patterns (by valuation approach, individual characteristics, or characteristics of health risks). The applicability of the existing empirical evidence of the monetary value of health outcomes must be explored in the context of disease prevention and the generalisability across countries of such values must be assessed.

135. The problem of identifying a monetary value for a statistical life could be simply viewed as the derivation of a demand curve for health, in which different levels of willingness to pay are linked to specific health risk reductions. The main empirical approaches for the elicitation of such values are the following:

136. *The contingent valuation method.* Contingent valuation is the most popular approach for the assessment of willingness-to-pay (or willingness-to-accept) values. It involves a survey of a group of individuals in which a series of questions are asked aimed at eliciting the amounts respondents are willing to pay in order to obtain a certain good or service, or to enjoy the outcomes expected from the consumption of that good or service. Alternatively, questions may be framed in terms of willingness to accept a compensation for being deprived of certain forms of consumption or the benefits (utility) enjoyed from that consumption. There are many known forms of bias affecting contingent valuation exercises (see Johansson, 1995 for a review), and elicitation methods have developed over time to at least partially overcome these. Starting from the early 1970s, a large number of contingent valuation studies have been undertaken specifically in relation to health and health improvements, but research in this area is still very active.

137. *Revealed values.* An alternative to the contingent valuation approach is the identification of values that are implicit in decisions made within market settings, government policies, or other situations that may provide opportunities to establish a link between aspects of health and monetary values. Examples of this approach include the assessment of wage/risk tradeoffs in labour markets, involving the estimation of the wage premium offered in return for the acceptance of health risks by employees. Similar values may be inferred from existing government policies, for instance by comparing investments in measures aimed at reducing health risks and the size of the risk reduction expected or achieved. A further

source of revealed values is represented by court decisions for the compensation of death, injury, or other adverse health outcomes.

138. *The human capital approach.* A third approach, which was relatively popular in the 1960s but gradually lost its appeal as an approach to evaluating health, is based on the concept of health as a component of human capital. In this view, health is a factor enabling active production and participation in the economy, and the monetary value of health is equivalent to the market value of an individual's production, i.e. the discounted value of the individual's earnings over a period of time in which health is at risk (or a lifetime in case the value of life is to be assessed). This approach (as well as some of the sources of revealed values described above) is not based on individual preferences. Moreover, it implicitly assumes that the health of individuals who are less able to participate in economic production (e.g. the elderly, the disabled) has no monetary value. However, even if the human capital approach is not deemed suitable for valuing health per se, the aspects it typically measures (contributions to economic production) represent important components of the impact of prevention programmes and should not be neglected. A double-counting problem may arise when a different source of monetary values (e.g. values based on contingent valuation surveys) is used to evaluate health and at the same time productivity gains are separately assessed and included in the analysis.

4.3. Discounting long term impacts

139. Discounting represents a critical methodological issue in the assessment of prevention programmes, and in the comparison of such programmes with interventions (e.g. health care) that produce their effects over a significantly shorter period of time. There is currently a broad consensus on the need for discounting the future consequences of health interventions in economic evaluation, to reflect uncertainty and time preferences. Most analysts would also agree that both resource and health consequences need to be discounted, and at the same rate, otherwise an indefinite postponement of the programme may appear efficient. However, when discounting is consistently applied in the evaluation of prevention programmes, in which health effects are generally produced in the long term, the discounted value of such effects is substantially reduced compared to their absolute value. Once discounted at a 5% rate, the longest known national life expectancy at birth – that for females in Japan – becomes a mere 19.7 years, in the context, for instance, of a cost-effectiveness analysis of a programme to prevent mortality in the early years of life. In an authoritative review of methodological issues related to discounting in cost-effectiveness analysis, Lipscomb et al. (1996) endorse the view that prevention should be treated in the same way as other programmes.

140. The way individuals discount future health risks and the value of prevention in making lifestyle choices, as well as the extent to which these may represent failures of rationality, have been discussed in section 2.3.1. and in box 1. There are at least two related methodological issues with regard to discounting in the assessment of prevention programmes. The first is whether individual discount rates, or discount rates that may be typical of certain population groups, should be taken into consideration instead of, or in addition to, "social" discount rates (those by which policy makers would normally be guided). The second issue is whether any form of discounting other than the traditional exponential form with constant discount rate should be considered in the assessment of prevention programmes.

141. The two issues are closely related because individual time preferences in relation to lifestyle choices are not only based on a wide variety of discount rates, but are also likely to approximate a hyperbolic discount function in many cases, as much existing empirical evidence suggests. Allowing individual preferences to be taken into account may therefore require a change in standard discounting procedures. The argument in favour of this would be that by adopting standard exponential discounting governments may overestimate the benefits of prevention programmes relative to how benefits are perceived by the individuals and groups targeted by the same programmes. The latter may therefore

respond poorly to the programmes, and the benefits eventually achieved would be less than anticipated. However, it could also be argued that governments may still try to predict the response to (compliance with) a prevention programme by taking into account the time preferences of the relevant target group in a separate exercise, and then estimate the benefits obtained by those who are expected to respond using standard discounting procedures.

142. Governments, at least in principle, should strive for consistency in the judgements they make as part of the assessment of public programmes. The mathematical properties of the exponential discounting function ensure consistency in preferences over time, i.e. they are such that the relative preferences for outcomes between two points in time only depend on the distance between the two points, and not on how far these two points are from the present time. This is an essential characteristic for consistency with the theory of rational choice upon which existing evaluation methods rest, which requires stability of preferences. Therefore, it would be undesirable to embrace alternative forms of discounting (including hyperbolic discounting), which lead to preferences that may be inconsistent over time, even if these may reflect more closely individual time preferences in relation to disease prevention. Inconsistent time preferences have been identified in section 2 as a failure of rationality, and government intervention should in principle counter their effects.

4.4. Assessing the distributional impacts of prevention programmes

143. Government policies for the prevention of disease require assessment along both the efficiency and the distributional dimensions. Important tradeoffs may occur between efficiency and distributional objectives in health improvement and disease prevention, and these require specific consideration as part of policy design and implementation processes.

144. Many risk factors, such as unhealthy eating and lack of physical activity, and their associated non-communicable diseases have a greater incidence in disadvantaged groups. However, it is often the case that individuals in those disadvantaged groups respond less well than others to preventive measures. For instance, smokers in disadvantaged socioeconomic groups are known to respond less well to health publicity than their better off counterparts. However, the opposite is true for cigarette taxation (and related price changes), which elicit a greater response from the less well off. But the latter is a regressive measure, so unless some way can be found to compensate for the effects of higher tobacco taxes on people with low incomes, this form of government intervention will have adverse distributional consequences. There are likely to be analogies with health education campaigns and possible forms of taxation aimed at promoting healthy diets. Distributional issues will be examined as part of the project, for instance, in relation to the implementation of fiscal measures aimed at influencing patterns of food consumption and physical exercise.

4.4.1. Relevant distributional dimensions

145. Distributional judgements are by nature multidimensional. A number of individual characteristics are relevant to views of health equity held by governments and by individuals, as documented by a large body of evidence (e.g. Lindholm et al., 1998; Charney et al., 1989; Bowling, 1996; Dolan et al., 1999). Dimensions that have proven particularly important in the debate about the pursuit of a fair distribution of health include socioeconomic condition (in the form of income, social class, or other), ethnicity, age, gender, lifestyles.

146. Williams (1997) suggested that occupation-based social class might be one basis for incorporating a formal measure of health inequality and distributional impact in the evaluation of health interventions. Substantial evidence exists of a social-class gradient in health, where those in higher social classes enjoy longer life expectancy and better health status than those from lower classes, in virtually

every country. Many governments have addressed concerns for the poor health experienced by disadvantaged socioeconomic groups through specific policy initiatives. Lindholm et al. (1998) were able to calculate the implicit relative weights assigned by Swedish policy makers to blue- and white-collar workers with regard to policies aimed at improving health. These weights depend on the relative risks for specific diseases in the two groups, of course, but on average point to a willingness to sacrifice about 15% of the possible overall health gain in order to achieve a more equitable distribution between the two groups. Similar weights could be calculated from population surveys (which provide a different perspective relative to the policy maker's perspective above) consistently showing that a sizable proportion of respondents assigned higher priority to individuals from disadvantaged socioeconomic groups in the receipt of health interventions (e.g. 23% in Dolan et al., 1999, the remainder of respondents being indifferent). Support for actions that would redistribute health by level of education of potential beneficiaries is weaker. And virtually no support is found in population surveys for redistribution across genders. The relevance of ethnicity as an equity dimension appears to vary by country in relation to cultural attitudes. In some countries, such as the US, great efforts have been made in recent years to identify and reduce racial and ethnic disparities in health, but other countries have not shared the same concern, partly because poor health in ethnic minorities is often seen as a reflection of their lower socioeconomic position.

147. Age and lifestyles have both been at the centre of lively debates (reviewed in Sassi et al., 2001). It remains controversial whether these should be treated as legitimate equity dimensions in assessing the distributional impacts of policies aimed at improving health. Existing evidence from population surveys is not conclusive in either direction.

4.4.2. Alternative measures of distributional impact

148. If equity is to be a dimension for the assessment of the outcome of prevention programmes, distributional impacts must be measurable. In principle, a very wide variety of methods and measures could be used for this purpose. In practice, conceptual challenges and empirical difficulties restrict the choice significantly.

149. A choice is required, first of all, on the overarching approach for incorporating an equity dimension into the assessment model. Sassi et al. (2001) distinguish between a normative approach, in which the analyst pre-determines the desirable relationship between the objectives of efficiency and equity, for instance by using fixed equity weights in the analysis, and a descriptive approach in which information on distributional impacts is produced separately and presented alongside information on efficiency leaving decision makers free to exercise their own judgement on the appropriate balance between the two. Of course, no assessment model can be entirely descriptive and even the simple choice of indicators of impact is to a certain degree normative.

150. The following are examples of methods for incorporating equity into the assessment of health interventions that correspond to what was defined as a normative approach.

- a) *Use of equity-weights in cost-effectiveness analysis.* Equity weights correspond to numbers by which the health outcomes achieved by different population groups may be weighted, reflecting the degrees of priority society wishes to attach to health improvements for each group. The use of equity weights implicitly assumes the existence of a tradeoff between equity and efficiency, and weights reflect the extent to which society is prepared to sacrifice health gain in the pursuit of fairness. The greater the equity weight, the more health gain a society is willing to sacrifice to achieve improved fairness. Therefore, the social preference between various programmes will depend on the magnitude of the equity weights as well as on the relative cost-effectiveness of

healthcare programmes. The possible use of equity weights in cost-effectiveness analysis is still widely debated, but empirical applications remain scarce (see Sassi et al., 2001 for a review).

- b) *Use of monetary measures in cost-benefit analysis.* Cost-benefit analysis offers an alternative framework for incorporating equity concerns because these could be partly reflected in monetary valuations of health outcomes elicited, for instance, using a willingness-to-pay approach. In particular, willingness-to-pay values may capture respondents' "interdependent utilities", i.e. their values for health improvements achieved by other individuals who may be seen as particularly in need. However, interdependent utilities represent only one aspect of societal views of equity. Measuring those utilities does not eliminate the requirement to elicit societal values and equity weights reflecting the broader distributional ethics characterising a particular society. But there are empirical difficulties in disentangling the contribution of individual and societal values, because of the risk of double-counting (Labelle and Hurley, 1992) or conflicts between the two (Mishan, 1972).

151. Alternative normative approaches, like the "cost-value analysis" approach proposed by Nord (1999) and based on the use of the person-tradeoff technique (also used extensively in eliciting disability weights for DALY calculations), do not appear to provide satisfactory means for a comprehensive assessment of distributional impacts.

152. On the other hand, the adoption of a more descriptive approach to addressing concerns for equity in the assessment of health interventions does not require measures of equity and efficiency to be integrated within the same evaluation framework. The analyst needs to select appropriate measures of distributional impact and present these alongside efficiency indicators resulting from a separate analysis. Sassi et al. (2001) arrive at the conclusion that given the current state of knowledge about individual and societal distributional preferences, and the weaknesses of existing elicitation methods, such descriptive approach is more desirable than any normative alternative. They also list a number of basic items of information that should be provided if such descriptive approach was adopted alongside cost-effectiveness analysis (e.g. characteristics of the beneficiaries of a health intervention, costs and health impacts in different population groups, etc.). However, the analysis could be pushed slightly towards the normative end of the spectrum by calculating real indicators of distributional impact. A widely debated approach, for instance, involves the use of coefficients of inequality in age at death. The WHO adopted a modified Gini coefficient of age at death as a measure of equity of health outcomes in their analysis of the performance of health systems (Gakidou et al., 2000). In principle, it would be possible to estimate the distributional impacts of prevention programmes by predicting variations in a similar indicator likely to be generated by the programme, other things being equal. Other approaches, of course, also exist and may prove equally or more useful.

4.4.3. *Dealing with possible equity vs. efficiency tradeoffs*

153. A number of studies provide evidence that people will, in certain situations, trade-off equity and efficiency in the pursuit of health, as discussed in Sassi et al. (2001). Many such studies are framed in the context of health care choices, although most would seem generalisable to choices involving prevention programmes similarly aimed at increasing life expectancy and/or quality of life. There is evidence of trade-offs in at least the following types of situations:

- a) *When choosing between programmes which differ with respect to overall health gain and the numbers of people who benefit.* For instance, Nord et al. (1996) asked a series of questions on tradeoffs between numbers of people treated and health gain achieved by those undergoing treatment to a sample of volunteer interviewees drawn from respondents to a larger survey of attitudes to healthcare rationing in Australia. Respondents were willing to sacrifice a certain

amount of health gain in order to treat more people. Ubel et al. (1996) studied attitudes towards equity and efficiency in choosing between two screening tests for cancer in the US. One of these tests was more effective and saved more lives. But it was also more expensive. Given budget constraints, the more effective test could not be offered to everyone in the population who might benefit. The selection of people to be offered the more effective test would be made randomly. Fifty-six percent of prospective jurors (members of the public), 53% of medical ethicists and 41% of experts in medical decision-making chose to offer the less effective test to the whole population. In doing so, they were prepared to sacrifice the 100 extra lives that would be saved by offering the more effective test to half the population.

- b) *When choosing between groups which differ with respect to remaining lifetime health or total lifetime health (life expectancy or health status).* Johannesson and Gerdtham (1996) asked 80 economics students to choose between two societies, A and B, which differed in terms of the distributions of future health between two social groups. Society A contained a greater average remaining lifetime health, and society B contained a narrower distribution of remaining health. The students were told to imagine they would belong to one of these societies, but would only find out which once they had chosen between them. They had a 50% chance of belonging to either. Respondents were willing to sacrifice 1 quality-adjusted life year (QALY) from the group that was better off in terms of remaining lifetime health in order to gain 0.45 QALYs in the group that was worse off. Andersson and Lyttkens (1999) applied a similar approach using a sample of 225 economics students, who were asked to choose between two societies, each consisting of two groups of people. In this case, one group enjoyed a longer overall life-expectancy than the second group, but in one of the two societies the fortunate lived a shorter life than in the other society and the less fortunate a longer life. Differences were made to vary in a series of questions. Again, respondents indicated a willingness to sacrifice overall life-expectancy in order to achieve a more even distribution of overall life-expectancy between population groups.
- c) *When choosing between individuals who differ with respect to disease severity.* Dolan (1998) conducted a small pilot study to investigate how people value health gain in individuals with differing initial health states. The sample consisted of 35 students, who were asked to make a number of hypothetical choices. The responses showed that a given health gain by individuals who are in poor health could only be matched by a substantially larger health gain by individuals whose health was initially better.

154. All the studies mentioned above illustrate a generalised aversion to inequality in health and a willingness to sacrifice efficiency, to a certain extent, in order to achieve a more equitable distribution of health among individuals and population groups. Many policies aimed at improving health, either by preventing or treating disease, present similar tradeoffs.

155. The evidence briefly summarised in this section has potential implications for the design of preventive interventions. The studies reviewed under (a) would support the view that narrowing the target of a health promoting intervention to a subset of the population that presents the greatest opportunities for health improvement is to some extent undesirable. Studies under (b), on the other hand, suggest aversion to disparities in overall health among population groups. In many cases, those who benefit the most from prevention programmes are those (the more educated, the more affluent) who also enjoy a better overall health. Therefore, the combined evidence from studies under (a) and (b) would seem to indicate that prevention programmes should be broadly based and should exploit opportunities for improving the health prospects of the individuals and groups that present a poorer health endowment, even if such positive discrimination imposes sacrifices on efficiency grounds.

156. The third group of studies (c) may raise some concerns about the role of prevention. In fact, evidence from these studies indicates how individuals are willing to sacrifice efficiency in order to favour those suffering from diseases of a greater severity. Translating this evidence into the context of the prevention vs. treatment dichotomy would lead to a generalised penalisation of the former in favour of the latter, which adds to the penalisation introduced by discounting, discussed above in this section. However, it could be argued that the current imbalance between prevention and treatment, as illustrated, for instance, by relative expenditures on the two sets of activities by most government, may already be well beyond the views implied by the results of the studies under (c).

157. The precise extent to which efficiency could be sacrificed in favour of a fairer distribution of health is difficult to determine, although existing studies do provide some indications. The values that are and will be brought to bear on resource allocation decisions are likely to differ between countries, as well as within countries, for instance along political lines. However, in the context of prevention, striking a desirable balance between efficiency and equity is further compounded by the role played by individual lifestyle choices. The general public tends to hold individuals who have unhealthy lifestyles responsible for their choices. When someone's poor health prospects are attributable to specific lifestyle choices, people may find redistribution of health less desirable, and may be less prepared to sacrifice efficiency in favour of the former. There is some evidence from questionnaire surveys and focus group discussions (Bowling, 1996; Dolan et al., 1999) that people's aspiration to fairness in the distribution of health is somewhat attenuated in the presence of clear self-harming behaviours, although the scenarios depicted in these surveys generally do not take into account the external influences that may contribute to such behaviours. However, this evidence does not appear to have translated into explicit policy objectives at the government level. Perhaps the most explicit position was taken by the National Institute for Health and Clinical Excellence in the United Kingdom, at the end of a formal consultation of experts and of the Institute's "Citizens' council" (NICE, 2005). The conclusion reached by the Institute is that no discrimination should take place in the delivery of publicly funded health care, including medical preventive services, in relation to individual lifestyle choices, unless this is justified on clinical effectiveness grounds, i.e. when risky lifestyles diminish the effectiveness of interventions (which amounts to discrimination on efficiency, rather than equity, grounds).

4.5. Main messages and conclusions

- The evaluation of preventive interventions requires the adoption of an assessment model able to capture both the impacts of such interventions on overall social welfare and those on the distribution of health across population groups.
- The assessment model must be relevant in the perspective of policies developed across different government departments, but at the same time it needs to produce results that may be comparable with those of evaluations conducted within specific sectors (e.g. health care) when preventive interventions compete for resources from departmental budgets.
- Cost-benefit analysis is the most established approach for the evaluation of intersectoral programmes. Combining this approach with cost-effectiveness analysis would make the assessment relevant to different decision and budget perspectives, and it would improve the comparability of results across interventions.
- Externalities that are relevant to the decision maker's perspective should be assessed in the evaluation of preventive interventions, as well as the extent to which interventions are likely to change them.

- Expected future costs and benefits of preventive interventions should be discounted reflecting the requirement that government time preferences are to remain consistent over time. However, the evaluation may make use of alternative (e.g. hyperbolic) discounting options in predicting the likely response to preventive interventions.
- Evidence shows that people are willing to trade off efficiency and equity in relation to the pursuit of health. The distributional impact of preventive interventions should be assessed by estimating changes in indicators of health distribution, but it should be best kept separate from the assessment of efficiency.

Section 5

Conclusions. The role of economics in the prevention of chronic diseases

158. This paper has provided an economic perspective on the prevention of chronic diseases, focusing in particular on diseases linked to lifestyle choices. Economic principles and considerations have so far played a relatively minor role in the broad debate about prevention that has taken place in many OECD countries over the past three decades. The contribution of economics has often been seen in terms of calculating the costs associated with diseases, particularly medical care costs and productivity losses, and sometimes in terms of assessing the cost-effectiveness of preventive interventions. However, the potential for an economic approach to shape and inform the debate on prevention stretches beyond those two aspects. Economics may help us to understand the pathways through which chronic diseases are generated, which have at least as much to do with social phenomena as with human biology; it may provide the tools for interpreting the individual and social choices that constitute a fundamental part of those pathways; it may help us to identify opportunities for intervening on such choices with a view to improving individual and social welfare; and it may help us to understand and address potential conflicts between the goals of increasing overall welfare and improving the distribution of health across individuals and population groups.

159. The economic approach proposed in this paper aims to cover all of the aspects listed above. It provides a framework for the analysis of the consequences of prevention strategies that is firmly grounded in economics while drawing upon the contributions of other disciplines such as psychology, sociology, epidemiology, public health. The fundamental starting point of the proposed approach is the hypothesis that the prevention of chronic diseases 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. In other words, that prevention may be preferable to cure. This hypothesis needs to be tested as rigorously as possible whenever preventive interventions are considered for possible implementation. This paper provides a guide to the testing of that hypothesis in relation to specific disease areas and specific preventive interventions. This approach will be applied to diseases linked to diet and physical activity in a later stage of the OECD project on the economics of prevention.

160. Identifying the potential for welfare gains from disease prevention means, in the first place, understanding what people value in making their own choices and why they value certain outcomes more highly than others. Maintaining good health is an important goal for most individuals, but health is by no means the only outcome that individuals value when they choose how to lead their own lives. 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. 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 may emerge with potentially conflicting objectives. 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 maximise their chances of preserving or restoring their health, which therefore becomes their primary objective. 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, because, to the extent that individuals are the best judges of their own welfare, the social acceptability of preventive interventions, individual compliance with the same interventions, and the chances these may actually improve welfare or enhance health equity, depend on the relative weights placed on of such goals.

161. On the other hand, the economic approach taken here recognises that individual lifestyle choices are subject to influences and constraints that may prevent individuals from making the choices that would maximise their welfare. Those influences and constraints may be perceived by the same individuals as obstacles to the realisation of their goals, or would be perceived as such if individuals were fully aware of their existence. O'Donoghue and Rabin (2003) emphasise that "economists will and should be ignored if we continue to insist that it is axiomatic that constantly trading stocks or accumulating consumer debt or becoming heroin addict must be optimal for the people doing these things merely because they have chosen to do it". There are documented failures of rationality that limit the ability of individuals to make choices that would maximise their own welfare. Additionally, there are documented failures in the ways individuals interact with their environment in making some lifestyle choices. Economics interprets those interactions as market dynamics. Consistently, failures in such interactions have been interpreted in this paper as market failures, potentially limiting the ability of those markets to generate efficient lifestyle choices that would maximise individual welfare. Existing government policies may also impose constraints on individual lifestyle choices, possibly leading to unintended adverse health outcomes. Identifying the ways in which individuals are prevented from maximising their own welfare by market or rationality failures in lifestyle choices, or by existing government policies, is important not only because it provides the grounds for considering preventive interventions, but also because it may help to select interventions that are likely to be effective.

162. Interventions aimed at preventing diseases that are linked to lifestyles will interfere to some degree with individual lifestyle choices. Interference may be mild, when interventions widen choice by making new options available, or progressively more severe, up to the point of restricting choice by banning options that present the highest risks for health. Heavier interference with individual choices may be justified when departures from rational decision making and from an ideal efficient market model for lifestyle choices are particularly significant, or when the consequences of those departures are particularly severe. The political costs of prevention, in the form of interference with individual choice, often follow an inverse pattern relative to the economic costs. Interventions that involve lower degrees of interference tend to have higher economic costs, and vice versa. However, whether preventive interventions are worthwhile can only be determined in relation to their ability to attain the goals of increasing social welfare or enhancing health equity, which requires an assessment of their effectiveness in preventing disease and of the value of the health outcomes achieved.

163. 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. Compelling evidence has been gathered on the role of a number of individual determinants and on the interactions between determinants in causing chronic diseases. Several models have been developed, supported by empirical evidence, which attempt to capture broad networks of relationships between determinants, at a given point in time and over the life course of an individual. Evidence and models have been briefly reviewed in this paper, leading to the main conclusion that lifestyle choices occupy a central position in the pathways through which many important chronic diseases are generated but they are by no means the only determinants of those diseases. Moreover, other health determinants that play important roles in the development of chronic diseases do so, at least in part, through their effects on lifestyle choices. Prevention may involve actions directly aimed at changing lifestyle choices, but also actions on the factors that shape those choices, which in turn may have an independent causal effect on chronic diseases.

164. The discussion of health determinants in earlier sections of this paper highlights that education may have key role in disease prevention. It has a strong effect on lifestyle choices and on individual ability to cope with the challenges of the environments in which those choices are made. It contributes heavily to determining earnings and social position, which are key dimensions of inequality in the distribution of chronic diseases and unhealthy lifestyles, as well as individual ability to take advantage of social networks and public services such as health care. It is a primary determinant of social mobility, which is a powerful

mechanism for improving health and also for reducing health inequalities. It produces effects on health and longevity through multiple pathways, many of which have been shown empirically to have a causal nature. However, education is not among the main factors explaining recent and projected future trends in many chronic diseases. While education levels have been increasing in the OECD area, the incidence of a number of chronic diseases has also been increasing. This is not to say that the positive health effects expected from education have not been at play in recent decades, but these must have been offset by other, more powerful, effects and dynamics. A detailed exploration of such effects and dynamics is not in the remit of this paper, because it can only be undertaken with reference to specific risk factors, e.g. smoking, nutrition, physical activity, or in relation to specific chronic diseases. However, a number of general hypotheses can be formulated on the basis of the existing evidence, and the following three areas of determinants appear to have contributed significantly to recent trends in chronic diseases, mostly through their effects on lifestyle choices:

- a) **Supply-side factors**, including the changing roles of the industries that supply lifestyle commodities, their increased and increasingly sophisticated use of promotion and persuasion, changes in production technologies, productivity dynamics that have shaped trends in market prices.
- b) **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.
- c) **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.

165. Understanding the pathways through which diseases are generated is a necessary but not a sufficient condition for preventive action. The determinants of chronic diseases discussed here are the results of market-based interactions or, in the case of government policies, they are the results of political processes through which legitimate public interests have been pursued. 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. And a welfare gain has likely been attained, given that the trend has been consolidating over time. Acting on the labour market dynamics that led to the outcomes described simply with the aim of preventing their negative health effects may result in a conflict with the aspirations of those who are prepared to second those dynamics, when preventive actions are also likely to affect the gains for the subjects involved. What may justify preventive actions on any of the pathways through which chronic diseases are generated is the presence of failures of the market mechanisms upon which those pathways are generated, or failures of rationality of those who engage in market interactions. The absence of such failures would pose serious difficulties to any actions challenging dynamics that may have led to undesirable health consequences, but which were driven above all by the prospect of welfare gains.

166. A series of potential market and rationality failures have been identified in this paper in relation to lifestyle choices and their main determinants. Assessing the extent to which those failures affect the efficient working of the relevant markets is essentially an empirical question which needs to be addressed in relation to the determinants of specific diseases. The principles and the evidence discussed in earlier

sections of this paper suggests that priority should be given to the following areas of potential failures, in assessing whether preventive actions would be justified:

- a) **Externalities.** The effects of individual consumption on other individuals 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 restrictive measures on tobacco and alcohol consumption. However, externalities are not always present or important in relation to the determinants of health, and require a careful empirical assessment.
- b) **Information failures.** These are relatively common, despite an ever growing knowledge of the mechanisms through which chronic diseases are generated. For instance, many remain confused as to what constitutes an overall healthy diet. In some cases, it is difficult to distinguish information failures (lack of information or failures in the communication of information) from problems in connection with the handling of available information, the latter often attributable to failures of rationality. Direct attempts to address information failures are, in many cases, more challenging than commonly believed.
- c) **Supply-side market failures.** Given the importance of supply-side health determinants, potential failures on that side of markets for lifestyle commodities require careful scrutiny. Failures may be the result of free market dynamics, or they may be linked to unintended consequences of government policies affecting the functioning of those markets. Possible failures that need to be explored when preventive actions are considered include the following: factors leading to product developments that embody threats to good health; concentration of suppliers; barriers to entry into, or exit from, a market; uneven geographical distribution of suppliers; slow productivity growth due to failures of technology transfer processes; unintended effects of government fiscal policies, including taxes and subsidies concerning the production and supply of lifestyle commodities.
- d) **Failures of rationality.** Among these, inconsistent time preferences and lack of self-control (see box 1) have been shown to play a particularly important role in individual lifestyle choices. These failures contribute to the formation of habits and make lifestyle changes difficult. Individuals may become conscious of the inconsistencies in their own time preferences and may wish to receive help, in the form of incentives or other devices, in fulfilling their commitment to lifestyle change. Ideally, interventions aimed at addressing failures of rationality should selectively target those who display the greatest failures, to avoid penalising the more rational consumers.

167. Virtually all of the market and rationality failures discussed in this paper will translate either into an excessive or a too limited consumption of the lifestyle commodities concerned, 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; by making individuals pay for the negative external effects of their own consumption, possibly through taxation; by preventing a concentration of suppliers that may lead them to gain monopolistic power. However, it is not always possible, or effective, to act directly on those failures. In fact, preventive interventions may also tackle the effects of market and rationality failures indirectly, by acting on any relevant determinants of health, as long as those interventions are expected to counterbalance the overconsumption or underconsumption generated by the original failures. 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.

168. Determinants that change over time, such as technology, working conditions, food prices, are likely to contribute to shifts in the prevalence of chronic diseases over time. Other determinants tend to remain constant, or change slowly, and so does their distribution across population groups. The latter may not contribute to changes over time in disease prevalence, but they do make certain individuals and groups more susceptible than others to developing chronic diseases. Examples include biological and genetic determinants, psychological and cognitive attitudes, and also determinants that tend to change in the long run, but are less likely to be responsible for short term trends, like education and broader socioeconomic conditions. The design of preventive interventions in response to increases in chronic disease prevalence occurred over a relatively short period of time may focus primarily on the former group of determinants. The precise nature of such determinants must be assessed in relation to the specific chronic diseases for which changes in prevalence are observed. On the other hand, preventive interventions aimed at containing structural, or long term, rates of chronic diseases, or the distribution of chronic diseases across individuals with different levels of susceptibility and exposure to risk factors, will focus on the latter group of determinants.

169. The final test to assess whether preventive interventions are worthwhile is a comprehensive assessment of their efficiency and distributional impact. The model of evaluation required for this purpose must be sufficiently general to be relevant in a broad social welfare perspective, relevant across different government departments, but at the same time it needs to produce results that may be comparable with those of evaluations conducted within specific sectors (e.g. with cost-effectiveness analyses of health care) when preventive interventions compete for resources from departmental budgets. Cost-benefit analysis is the most established approach for the evaluation of intersectoral programmes, although assigning a monetary value to human life and health remains contentious. Measures of outcome that are typically used in cost-effectiveness analysis may be presented alongside monetary measures, to provide a certain degree of comparability with analyses conducted within the health care sector. Distributional impacts must also be measured, in order to assess the ability of preventive interventions to contribute to the pursuit of equity goals. The evidence reviewed in this paper confirms that individuals are willing to trade off efficiency and equity in relation to health. To account for such tradeoff, a distributional dimension must be added to economic evaluation models. This may be achieved, for instance, by estimating predicted changes in indicators of health distribution and by presenting those alongside indicators of efficiency.

170. In conclusion, testing the hypothesis that prevention may improve social welfare or enhance health equity requires the completion of several conceptual and methodological steps. The pathways through which chronic diseases are generated must be identified as well as the levers that could modify those pathways. Justification for action must be sought by examining whether the determinants of chronic diseases are simply the outcome of efficient market dynamics, or the effect of market and rationality failures preventing individuals from achieving the best possible outcomes. Where failures exist, possible preventive interventions must be conceived, whose expected impact on individual choices should be commensurate to the extent of those failures and to the severity of the outcomes arising from them. A positive impact of such interventions on social welfare and health equity must be demonstrated empirically through a comprehensive evaluation before interventions are implemented.

Devising prevention strategies

171. Tackling major risk factors for health, or chronic diseases linked to behaviours that are highly prevalent in a population, requires more than a single preventive intervention, however effective and broadly based it may be. Turning the tide of diseases that have assumed epidemic proportions during the course of the 20th century requires fundamental changes in the social norms that regulate individual and collective behaviours (Rose, 1992). Such changes can only be triggered by wide ranging prevention strategies addressing multiple determinants of health, strategies that are likely to develop incrementally, rather than through comprehensive planning. Although the contribution and cooperation of many agents is

needed for the success of a prevention strategy, none of the agents potentially involved, at any point in time, is in possession of the information, the tools and the power required for the comprehensive planning of chronic disease prevention, and none of the agents is able to take a sufficiently long time perspective in its action to make such an approach possible. Social norms cannot be engineered. They set the boundaries and the rules for a complex interplay of conflicting interests which we have interpreted here, using the tools of economics, as market dynamics. At the same time, it is precisely that interplay of interests that progressively adapts and changes social norms.

172. A preventive strategy is likely to develop incrementally both along a quantitative dimension (size and number of interventions) and along a qualitative dimension (nature of interventions). The economic evaluation approach presented in section 4 leads to the identification of a portfolio of interventions positioned on an efficiency frontier, providing the means for assessing the returns expected from increasing investments in the prevention of a given condition (Gaziano et al., 2007). Increasing investments may mean that the coverage of interventions is progressively expanded from selected groups to multiple groups or entire populations, but it may also mean that the range of interventions used is expanded, or both. Economic evaluation suggests ways of composing and scaling-up prevention strategies based on their efficiency, but this is only one of the criteria that will guide decisions about prevention. We recommended that economic evaluations of preventive interventions should include an assessment of distributional impacts, and that such assessment should be kept separate from the assessment of the efficiency of interventions. Economic evaluations are not meant to provide strict decision rules, but to guide decisions towards desirable societal outcomes.

173. The broad discussions in sections 2 and 3, respectively, on possible causes of market and rationality failures, and on degrees of interference with individual choice by preventive interventions, suggest complementary ways in which prevention strategies may develop incrementally towards a progressive change of social norms. Coherent prevention strategies would likely seek to first target the behaviours and social groups that display the most obvious and most significant failures to achieve efficient outcomes through active participation in market interactions. Examples of social groups with these characteristics may include children and adolescents; individuals with severe self-control or addiction problems; individuals with limited ability to obtain or process information on the health effects of their consumption. Examples of behaviours may include those that generate significant negative externalities. On the other hand, prevention strategies would likely begin to develop from interventions that involve the mildest forms of interference with individual choice, especially those aimed at widening choice or making healthy options more affordable. These would offer opportunities for lifestyle change to a potentially large number of individuals who engage in unhealthy behaviours mainly because of self-control problems, and who express a desire to give up those behaviours but find it difficult to do so.

174. The possible criteria for devising incremental prevention strategies discussed in the previous two paragraphs do not necessarily lead to consistent conclusions. The criteria are largely independent and may require tradeoffs to be made when conflicts emerge. For instance, there is evidence that individuals in disadvantaged socioeconomic circumstances tend to respond better to interventions that interfere more heavily with individual choice (e.g. taxes) than to interventions based on education or persuasion, the opposite being true for less disadvantaged groups. This is likely to impact on the efficiency of the two types of interventions. More intrusive interventions are likely to be associated with more favourable efficiency indicators when aimed at disadvantaged socioeconomic groups, and the same is true for less intrusive interventions aimed at more advantaged groups. However, the distributional implications of targeting educational interventions to the better off and taxation measures to the less well off may be highly undesirable. Even just beginning to develop a prevention strategy from interventions that involve milder degrees of interference with individual choice, but which may elicit a greater response from wealthier and more educated socioeconomic groups, might prove controversial because of its distributional implications.

175. Balancing the various criteria and dealing with the tradeoffs that may emerge constitutes a large part of the role of agents promoting the development of prevention strategies. The consequences of applying different criteria in the selection of preventive interventions, and the specific nature of the tradeoffs that may emerge, ultimately depend on the area (risk factors or chronic diseases) in which prevention strategies are to be developed. Future applications of the conceptual framework set out in this paper to specific areas will provide practical illustrations of how different criteria may be combined and how possible tradeoffs may be addressed.

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APPENDIX – A TAXONOMY OF PREVENTIVE INTERVENTIONS

Areas of intervention	Main actors	Interventions to widen choice or lower price of choice options	Interventions to influence choice other than through prices	Interventions to raise the price of selected choice options	Interventions to ban selected choice options
Interventions on the broader economic and social environment					
General fiscal policies	Governments (Finance)	<i>A family tax credit programme for families with young children (para. 125)</i>			
Welfare policies	Governments (Welfare)				
Employment policies	Governments (Labour)				
International trade agreements	Governments (Trade)				
Sectoral economic policies	Governments (Relevant ministries)				
Interventions on the physical environment and transport system					
Housing conditions	Governments (Local authorities) Housing associations				
Urban environment	Governments (Urban planning)				
Means of transportation	Governments (Transport)				
Pollution	Governments (Environment)				
Interventions on the work or school environments					
Workplace interventions	Governments (Labour, Health) Employers Trade unions	<i>A workplace intervention to reduce sedentariness at work (para. 121)</i>			

School-based interventions	Governments (Education, Health) Educational institutions				
Interventions on the supply of lifestyle commodities					
Food and drink production and retail industry	Governments (Agriculture, Industry, Nutrition Agencies) Food manufacturers and retailers	<i>A programme of subsidies to producers of fruits and vegetables (para. 124)</i>	<i>Regulation to limit advertising of fast-food during television programmes for children (para. 119)</i>		
Tobacco industry	Governments (Industry) Tobacco manufacturers				
Sports industry	Governments (Sport, Industry) Sports industry				
Education					
General education	Governments (Education, Local Authorities) Educational institutions				
Health and lifestyle education	Governments (Education, Local Authorities)				
Pre-school education	Governments (Local Authorities)				
Parenting	Governments (Local Authorities) Parents groups				
Health care interventions					
Public health	Governments (Health)				
Medical care	Governments (Health) Health Insurance Plans Health care delivery organisations		<i>A programme of lifestyle counselling of individuals at risk in primary care (para. 123)</i>		
Antenatal care	Governments (Health, Social services)				

Interventions on social and community networks					
Direct interventions on lifestyle choices (market price and availability)					
Taxation on consumption	Governments (Finance)			<i>Taxation of sugary soft drinks (para. 122)</i>	
Bans on consumption	Governments (Health, Agriculture, Industry)				<i>A smoking ban in public places (para. 120)</i>

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