Chapter 5

Improving health through cost-effective educational interventions

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This chapter presents an assessment of the cost-effectiveness of educational interventions – school-based, work-based and mass media – in reducing obesity-related disabilities. Results indicate that educational interventions via the mass media are the most cost-effective in the short run. In the long run, however, all interventions become cost-effective, especially in comparison to other health-related interventions such as physician counselling and food advertisement regulations.

5.1. Introduction

The previous chapter examined the relationships between education and health, including whether such relationships can be considered causal and which are the pathways through which education may operate. While the findings shed light on policy-relevant questions such as whether, to what extent, how and to some extent what type of education is likely to promote good health, they do not help to discriminate among different policy levers on the basis of cost-effectiveness considerations. In light of the pressures for accountability facing the governments of OECD countries, it has become increasingly important to appraise the cost-effectiveness of specific reforms, whether these involve policies that raise overall educational attainment or more targeted interventions.

This chapter reviews the state of knowledge with respect to the cost-effectiveness of educational interventions for improving health. It addresses the limited available evidence that allows for comparison of multiple interventions by developing an empirical framework for estimating the cost-effectiveness of three classes of interventions – school-based interventions, work-based interventions and mass media interventions – for improving health by reducing behavioural risk factors such as unhealthy diets and sedentary lifestyles. Findings based on European data suggest that a range of educational interventions have favourable cost-effectiveness ratios in the long run.

5.2. Economic evaluation and policy making

The primary focus of economic evaluation is to assess a range of alternative options and find the one that most efficiently maximises welfare (Folland *et al.*, 2007). Two types of economic evaluation are generally used in policy decision making: cost-benefit analysis and cost-effectiveness analysis. Both are considered more useful for policy decision making than conventional effectiveness analysis since they take into account both the effectiveness and the costs of implementing policies.

An important characteristic of cost-benefit analysis is that it values costs and benefits in monetary terms so that the results are readily interpretable in terms of value for money. The uniformity of cost and benefit measures also makes cost-benefit analysis useful when comparing resource allocation alternatives[2] for different health interventions or industries. In practice, however, it is often difficult to express benefits in monetary terms; this form of analysis is therefore more limited than it initially seems. Moreover, there are ethical issues associated with assigning monetary value to certain benefits. The health-care industry offers an example, as monetising the benefits of alternative health interventions involves putting a monetary value on human life and the quality of life (Folland *et al.*, 2007).

Cost-effectiveness analysis is a tool for comparing interventions when monetary valuation of benefits is not possible. Cost-effectiveness analysis only requires that the benefits of interventions under consideration be valued in a common unit. The drawback of the cost-effectiveness approach is that, because the benefits are not expressed in monetary terms, only projects leading to the same outcome can be compared, since the measure of a project's "effectiveness" will depend on the outcome. However, for a given outcome, cost-effectiveness analysis is ideal; it can compare the costs of various options which aim to achieve the same quantifiable non-monetary objective: in the case of health, for example, this may take the form of cost per disability-adjusted life years (DALY)[3] saved.

In spite of the usefulness of cost-effectiveness analysis and cost-benefit analysis in decision making, they have provided very limited information on the health impacts of educational interventions. This chapter addresses this knowledge gap through an assessment of the cost-effectiveness of school-based, work-based and mass media educational interventions in improving health outcomes. It looks at educational interventions that may reduce chronic diseases associated with unhealthy diets, sedentary lifestyles and obesity and estimates the costs associated with gains in DALYs resulting from each intervention (see Box 5.1 for a description of the hypothetical educational interventions considered in the analysis).

Box 5.1. **Typology of educational interventions**

School-based interventions

Schools provide access to a substantial cohort of youth from all backgrounds since enrolment is almost universal in OECD countries (Gortmaker *et al*., 1999). Children worldwide are increasingly affected by obesity, mostly because of the rapid deterioration of healthy lifestyle habits among the young. The use of school-based educational interventions is increasingly being considered to reduce childhood obesity and halt rapidly rising obesity rates in adulthood. As food preferences are formed during childhood, helping children to develop a taste for healthier foods may affect their diets into their adult lives.

The school-based intervention targets all children attending school in the age group 8-9, but it is assumed that just over 60% will participate fully in the activities which constitute the intervention. The intervention entails the integration of health education into the existing school curriculum with support from indirect education and minor environmental changes such as healthier food choices in cafeterias. The main component is an additional 30 hours per school year (*i.e.* about one hour a week) of health education focused on the benefits of a healthy diet and an active lifestyle. This is associated with an opening lecture by a guest speaker and further activities during ordinary teaching hours (*e.g.* science) with the support of school nurses. Indirect education consists of the distribution of brochures or posters, while environmental changes are pursued by renegotiating food service contracts and re-training staff.

Box 5.1. **Typology of educational interventions** ***(continued)***

Worksite-based interventions

Many adults fail to respect recommended dietary intakes and to engage in regular physical activity. Estimates of the consumption of acceptable levels of dietary intake range from as few as one in five adults in the United States to fewer than one in ten in Australia (Sorenson *et al*., 1998; Dresler-Hawke, 2007). Appropriate levels of physical activity are met by only four in ten adults in Canada and three in ten in Australia (Chan *et al*., 2004; Heart Foundation and Zurich, 2008). Because changes in lifestyle habits can have a positive effect on the health of adults even late in life (WHO, 2004), health education interventions targeting adult populations have the potential to generate significant health gains. Working adults spend a large part of their time at the workplace, where they are exposed to factors that may influence their lifestyles and health habits. Existing evidence suggests that health education, peer pressure and changes in the work environment contribute to changing lifestyles and preventing certain chronic diseases.

The intervention targets individuals between the ages of 18 and 65 working for companies with at least 50 employees. It is assumed that 50% of employers and 45% of their employees will participate in the programme. The intervention involves an introductory lecture by a guest speaker and a series of 20-minute group sessions with a nutritionist every two weeks for 20 months. Messages are reinforced by the distribution of information materials and posters in common areas and cafeterias. Other activities are co-ordinated by volunteers who also act as peer educators and organise "walk clubs" or similar initiatives. As part of the intervention, catering staff are retrained to prepare healthy dishes and food service contracts are renegotiated.

Mass media interventions

The mass media can reach vast audiences rapidly and directly. Health promotion campaigns broadcast by radio and television may raise awareness of health issues and increase health information and knowledge in a large segment of the population. The World Health Organization (2006) has described mass media interventions as having an important role in spreading the message about healthy lifestyle habits to counter the trends in obesity. Dixon *et al*. (1998) concluded that educational mass media interventions can have a significant impact on dietary habits for a relatively small budget.

The hypothetical campaign is assumed to be broadcast on television and radio channels at the national and local levels and to follow a two-year pattern alternating six months of intensive broadcasting with three months of less intensive broadcasting. During the more intensive phases, television and radio channels broadcast 30 second advertisements six times a day, seven days a week. In the less intensive phases they broadcast 15 second advertisements 3 times a day, 7 days a week. Advertisements contain messages on both diet and physical activity. Broadcast messages are supported with the distribution of printed material, which is assumed to reach 10% of households.

5.3. The cost-effectiveness of educational interventions on obesity

Causal evidence on the effectiveness of educational participation or attainment on health outcomes is mixed, with some studies indicating a statistically significant and quantitatively important effect while others report only strong associations (see Chapter 4). The limited evidence on the impact of years of schooling or educational qualifications also means that cost-effectiveness calculations based on such studies are likely to be subject to a large margin of error.[4]

While the evidence on the effect of educational attainment[5] is limited, a substantial body of research supports the hypothesis that educational interventions have a positive impact on obesity or risk factors leading to obesity.[6] For instance, health education interventions in Finland and Japan resulted in population-wide reductions in cholesterol levels and translated into sharp declines in coronary heart disease and stroke rates (WHO, 2004). Interventions based on nutritional education have, on average, increased the intake of fruits and vegetables by young people and adults by 8.4% and 9.7%, respectively, and decreased fat intake by 1.6% and 2.2%, respectively, to meet daily recommended intake amounts (Gortmaker *et al*., 1999; Perry *et al*., 1998; Reynolds *et al*., 2000; Buller *et al*., 1999; Sorenson *et al*., 1996, 1998 and 1999; Luepker *et al*., 1998).[7] Interventions that emphasise the importance of active lifestyles[8] have seen an increase in physical activity (*e.g.* Emmons *et al*., 1999).

In a review of 108 educational interventions[9] targeting obesity and related risk factors, the WHO indicates that they generally resulted in positive behavioural changes linked to obesity (WHO, 2007). Findings from the effectiveness studies reviewed by the WHO form the basis for computing the cost-effectiveness of educational interventions described in the next section.

Background

The focus of the cost-effectiveness analysis conducted for this chapter is educational interventions as opposed to educational participation or attainment targeting obesity and related risk factors.[10] The assessment compares a "do nothing" scenario – the null scenario – with the outcomes from implementing a school-based, work-based or mass media intervention. The aim is to assess the cost-effectiveness of these interventions and to identify which of the three provides the greatest value for money. The analysis is based on a methodology well-established in the health literature. It involves calculating incremental cost-effectiveness ratios (ICER) which take into account relative costs and effects/benefits (Drummond *et al*., 2005). The ICER provides a measure of the cost per healthy life year gained due to an intervention.

Box 5.2 describes the four steps followed to compute the ICER. In brief, the first step calculated the average effectiveness outcome for each and every health intervention. This was done through a synthesis of past interventions, as reported in WHO (2007). Next, the effectiveness of each intervention in terms of the total number of DALYs saved was assessed. The epidemiological model described in Annex 5.A1 was then applied to the total population of 22 European countries.[11] The model relates lifestyle habits to chronic diseases via the effects of these habits on weight. Therefore, the effect of an intervention on the prevalence of obesity (and ultimately on obesity-related diseases) can be traced by noting changes that occur in dietary habits and/or physical activity following the intervention under consideration. The resulting incidence and prevalence of obesity-related diseases are then used to calculate the total number of DALYs gained due to the intervention.

Box 5.2. **Methodology: The study design**

Synthesis of existing interventions: A synthesis of interventions aimed at reducing obesity rates was conducted to gather data on the features and characteristics of different typologies of interventions and to design the components of standard educational interventions to be used in the cost-effectiveness analysis exercise: school-based, work-based and mass media interventions (see Box 5.1). A preliminary selection of studies was evaluated to assess which components should contribute to the standard intervention and what effects to expect. The selection came from a report by the WHO (2007), which reviewed and categorised 261 interventions targeting health behaviour described in studies published between 1994 and 2006. For the purpose of this project, all studies of school- and work-based and mass media interventions were reviewed. Interventions using education and learning which were appraised by the WHO as either strongly or moderately effective were selected as pivotal for behavioural changes. Discarded from the selection were all studies reporting effectiveness in very general terms, such as intention to change fruit and vegetable intake rather than a specific change in consumption of number of fruit and vegetable servings. The selected studies were reviewed with a view to highlighting successful commonalities in the intervention methods and resulting health gains. These studies (divided by typology) were used to determine average compliance rates, key drivers of costs, expected average results (effectiveness outcomes) and the core methods necessary to achieve those results. These components were brought together to create the three standard interventions appraised in the epidemiological model.*

The epidemiological model: The model, called CDP (Chronic Disease Prevention), was jointly developed by the OECD Health Division and by the WHO. It relates the onset of disease to a chain of behaviours and lifestyles that alter individuals' risk factors for a selected number of chronic diseases. Data from a WHO publication (Ezzati *et al*., 2004) was used to construct a definition of risk factors and to identify the thresholds used to pinpoint individuals at risk. The model explicitly accounts for three groups of chronic diseases: stroke, ischemic heart disease and cancer (including lung, colorectal and breast cancer). OECD (2009) describes the model

Box 5.2. **Methodology: The study design** *(continued)*

and its related input and output variables. Briefly, to assess the impact of an intervention, the prevalence and the incidence of risk factors affected by the intervention are considered. Differences in results obtained from an intervention and from the "null scenario" represent the health effect generated by the intervention (expressed in terms of the change in total DALYs). An illustrative representation of the model can be found in Annex 5.A1.

Cost model: This model is used to assess the total net costs of interventions. It combines the costs of implementing the intervention with the costs of treating and/or managing the obesity-associated health outcomes and diseases over the entire period of the simulation.

Incremental cost-effectiveness ratio (ICER): The ICER, which provides the final unit of comparison between the interventions, is calculated by dividing the difference in total costs between the null scenario and the respective intervention by the difference in effects between the null and the intervention scenario. The resulting ratio is read as the cost per DALYs gained from the intervention. In other words, for every extra DALY that results from the intervention, the cost is the amount of the ICER. The lower the ICER the better, because the lower figure indicates that a smaller cost is associated with increasing the total DALYs of the population by one year.

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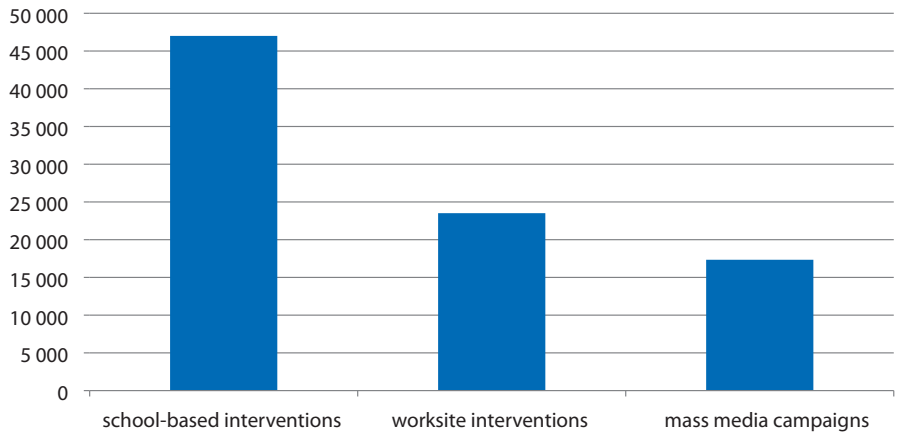
* The "effectiveness outcomes" of the three interventions established in the first step come from a wide range of sources, not constrained to specific countries. The epidemiological model, however, is based on region-specific trends for prevalence, incidence and remission rates of obesity and its evolution into related diseases. The relevant WHO region (ERU-A) includes: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Norway, Portugal, Sweden, Slovenia, Spain, the Netherlands, Switzerland and the United Kingdom.

The next step is to calculate the total associated costs of the intervention. This is done by multiplying the incidence of each disease by its respective treatment and/or management cost, and adding to this the full cost of treatment (and/or management) of all the diseases with the one-off cost of implementing the intervention. The costs and effects of each intervention are then compared to the costs and effects under the null scenario, which simply assumes current trends, in terms of both treatment and disease progression, for the duration of the cost-effectiveness simulation. Finally, the incremental difference in costs and effects between the intervention and null scenarios is used to calculate the respective ICERs which provide the incremental cost per DALYs gained under each intervention.

Findings

Figure 5.1 provides the overall results from the cost-effectiveness analysis in terms of ICERs.[12] It shows that mass media interventions are the most cost-effective of the educational interventions. A government would need to invest USD 17 300 in purchasing power parities (PPPs) for each DALY gained through mass media interventions. The price tag increases significantly under the work-based and school-based interventions scenario to USD 23 500 (PPPs) and USD 47 000 (PPPs), respectively. This may come as a surprise since Chapter 4 suggests that cognitive, social and emotional skills promote individual's capacity to prevent health problems and better manage them when they occur. One may imagine that school-based interventions are likely to be more effective in developing such skills than work-based and mass media interventions, which tend to focus more on transmission of information. However, especially in the case of school-based interventions, resources have to be made available upfront while health benefits (and savings in health expenditure) begin to materialize only decades later when children grow up and start developing chronic diseases.

Figure 5.1. **Incremental cost-effectiveness ratio (ICER) by type of educational intervention in Europe, 2005**



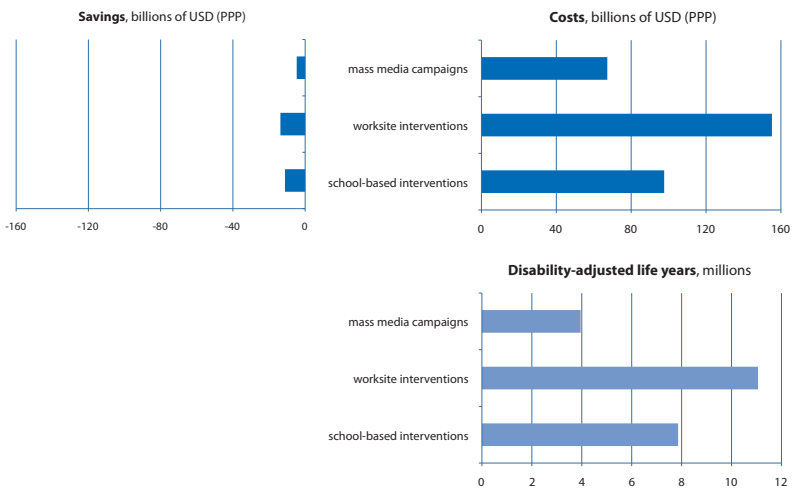
Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", OECD Health Working Papers No. 48, OECD, Paris.

Difference between intervention cost and savings in health expenditure

Figure 5.2 illustrates costs and DALYs gained by class of intervention, with costs divided into direct costs and savings.[13] By presenting the data broken down into costs and health gains, it is possible to get a sense of whether one intervention is relatively more cost-effective because it provides very high comparative gains or because it involves lower costs or a combination of both.

The upper-right figure presents the direct costs of educational interventions while the upper-left figure presents savings in health-care expenditures due to the interventions.[14] The lower figure presents DALYs gained due to the interventions; it suggests that work-based interventions confer the largest benefits, while the benefit is modest for the mass media interventions. Overall, the figure suggests that mass media interventions, in spite of the low gains in DALYs and savings in health expenditure, are the most cost-effective. Although work-based interventions confer the highest gains in DALYs, they are relatively less cost-effective owing to the high direct costs of implementation. Finally, school-based interventions are considered the least cost-effective since the gains in DALYs are not high in spite of the large direct costs and small savings in health expenditure. Hence, despite the modest impact on DALYs, mass media interventions are considered to offer the greatest value for money owing to the low operating costs.

Figure 5.2. **Intervention costs, impact on health expenditure and DALYs gained by intervention, 2005**



Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", OECD Health Working Papers No. 48, OECD, Paris.

Time frame to assess cost-effectiveness

The time frame for calculating the ICER is an important factor to consider. So far the results reported were computed on the assumption that the benefits of the intervention will accrue for 100 years after the first intervention. A period of 100 years was chosen as the baseline model to ensure that all individuals affected by the three interventions will reach the age at which the full effectiveness of interventions is achieved – referred to as the steady state (see Box 5.3).

Box 5.3. **Time frame for assessing cost-effectiveness**

The three standard interventions reach their respective steady states of full effectiveness at different points in time. This is why it is important to consider how changes in the time frame used to evaluate the cost-effectiveness of interventions might affect the calculations. To illustrate the importance which this fact might have for policy makers and to show how it depends on the target population for the three interventions, consider the following example involving school-based interventions and work-based interventions.

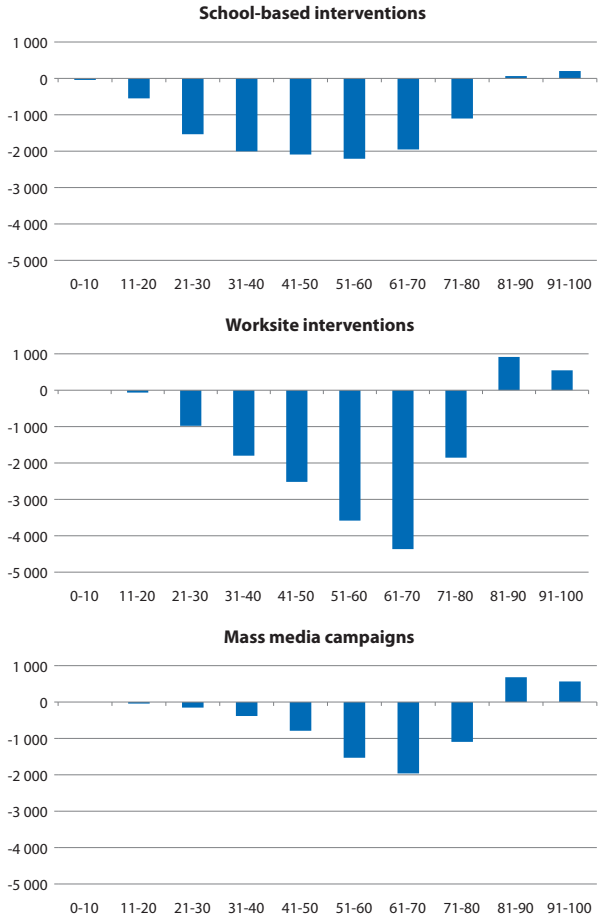
In the simulation, the school-based intervention targets 8-9-year-olds. In year 0 of the simulation, all 8-9-year-olds are exposed to the intervention. In year 1, those who were 7-8 years old in year 0 have reached the target age and are exposed to the intervention. This continues every year until year 100. Although more and more people are exposed to the intervention over time, the effect of the intervention is not realized in full until those exposed to the intervention reach the ages at which obesity-related conditions, such as heart disease, are likely to be prevalent, namely from their late 40s.

Figure 5.3* presents the health-care costs by age group for each intervention (under the 100-year scenario) with negative values representing cost savings. Figure 5.3 shows the cost-savings (from better health) until ages 71-80 and then the increased health expenditure due to people living longer and therefore using health-care resources. In the school-based intervention, the 8-9-year-olds who were first exposed (in year 0) must go through the simulation until year 100 to see the full effect of the intervention – this takes 91 years. It is for this reason that the school-based intervention does not reach the point at which its full effectiveness can be assessed until year 91.

Using similar arguments, the work-based intervention, targeting 18-65 year olds, does not reach steady state until year 35. For the mass media intervention, steady state is reached at the outset since everyone is targeted by this intervention in year 0. Since each intervention reaches its respective steady state at different points in time, their cost-effectiveness is compared at year 100 when all three have had the opportunity to reach their steady state.

*This figure can be directly compared with Figure 5.2 because the sum of the cost savings (the bars which are negative) for each intervention is represented by the bar to the left in Figure 5.2.

Figure 5.3. **Costs by age group, 2005**
Billions of US dollars (PPPs)



Note: Interventions are "cost-saving" in most age groups but become "costly" in the age group 81-100. The main cause is the increased life expectancy of the population resulting from the overall positive impact of each intervention; the number of individuals and, accordingly, the number of individuals with a disease, are higher in the intervention scenarios than in the "do nothing" scenario and, consequently, the costs for treating people affected increase as well.

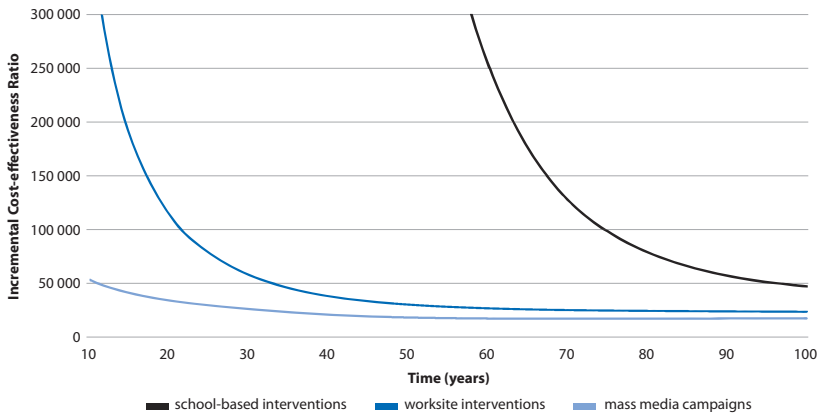
Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers* No. 48, OECD, Paris.

However, 100 years would be a relatively long time period in the context of policy decisions on the allocation of resources. Policy decisions are usually made with a much shorter-term perspective. For this reason, Figure 5.4 provides alternative estimates of ICERs based on a continuum of timeframes ranging from 10 to 100 years.[15]

Figure 5.4 suggests that mass media interventions are consistently the most cost-effective regardless of the time frame. School-based and work-based interventions are more costly in terms of their benefits both in the short and long term. However, as the time frame increases, school-based and work-based interventions gradually become more cost-effective options. Thus, while school-based and work-based interventions are significantly more costly than the mass media interventions in the short run, their cost-effectiveness improves significantly in a perspective of over 70-80 years.

Figure 5.4. **ICER by intervention from 10 to 100 years, 2005**

Thousands of USD (PPPs)



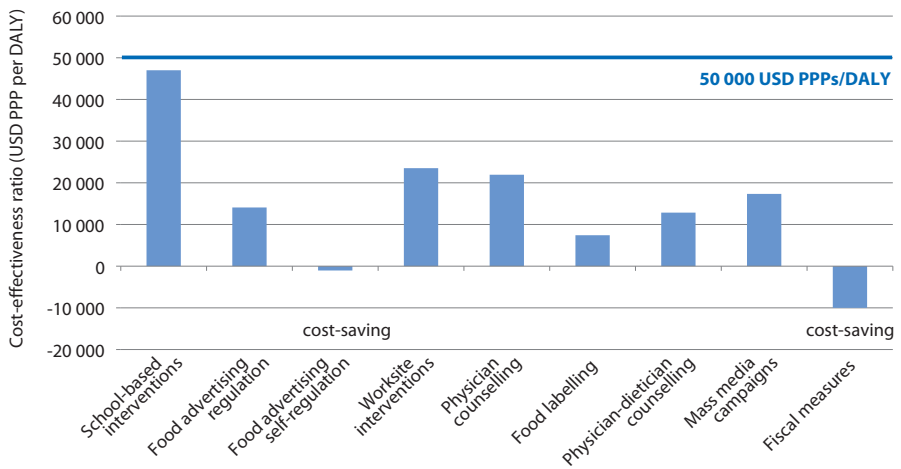
Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers* No. 48, OECD, Paris.

Educational interventions versus other interventions targeting obesity

Figure 5.1 implies that for each DALY gained through mass media, work-based and school-based interventions, a government needs to invest about USD 17 300 (PPPs), USD 23 500 (PPPs) and USD 47 000 (PPPs), respectively. Do these interventions provide good value for money? Are these interventions relatively cost-effective compared with other interventions aimed at tackling obesity-related health disabilities? Figure 5.5 presents findings on how different classes of interventions aimed at reducing obesity and obesity-related disease rates perform in terms of ICERs.

Figure 5.5 shows that all three educational interventions fall below the USD 50 000 (PPPs) mark that is sometimes used as a guideline to assess the cost-effectiveness of health related interventions (Devlin and Parkin, 2004). Hence, educational interventions can be considered viable options even compared to more conventional health interventions such as physician and dietician counselling and regulation of food advertising.

Figure 5.5. **Incremental cost-effective ratios: Comparison of selected educational and non-educational interventions**



Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers* No. 48, OECD, Paris.

Further studies have assessed the cost-effectiveness of interventions aimed at tackling obesity by calculating the cost per quality-adjusted life year (QALY). This measure is broadly comparable to the DALY measure employed in this chapter. A challenge for comparing the results of this study with QALY-based studies is that the interventions reported in the latter are generally responsive interventions targeting populations at risk rather than the general population (the case in this chapter). With this in mind, it was found that the use of the drug Orlistat for obese individuals cost GBP 45 881 (approximately USD 71 800) per QALY (O'Meara, 2000), the use of other drugs and/or surgery for high-risk individuals has a cost per QALY of no more than GBP 13 000 (approximately USD 20 340) (Avenell *et al.* 2004), while a physician-led diet and exercise programme aimed at obese individuals with impaired glucose tolerance is estimated to have a cost per QALY of GBP 13 389 (approximately USD 20 950) (Avenell *et al.* 2004).

5.4. Conclusion

Obesity has dominated public health concerns in recent years, not least because of the rapid rise in obesity rates worldwide and forecasts predicting acceleration in current trends in the years to come. Despite the importance of the obesity epidemic in public health discourse and practice, there is little evidence upon which to base solid conclusions on the cost-effectiveness of different strategies. This analysis represents a first step towards filling the knowledge gap.

The assessment of the cost-effectiveness of three educational interventions – mass media, work-based and school-based – suggests that all three can be considered cost-effective interventions for tackling obesity.[16] Moreover, it finds that mass media interventions are consistently highly cost-effective over time and are the most cost-effective of the educational interventions examined (whatever the time frame chosen) with an average ICER of USD 17 300 (PPPs) per DALY gained. Work-based interventions are initially less cost-effective but can become cost-effective and viable in the long term for an average ICER of USD 23 500 (PPPs) per DALY gained. Lastly, school-based interventions require a much longer time period to reach their full potential because they target children. However, once they reach steady state, they also prove to be relatively cost-effective, for an ICER of USD (PPPs) 47 000 per DALY gained.

Does this suggest that more resources should be allocated to mass media interventions since these confer "value for money" both in the short and the long run? This may not necessarily be the best approach if equity in health outcomes needs to be addressed. Chapter 4 suggests that the more educated are better able to understand and respond to health-related information. This implies that broadcasting campaigns may increase health inequalities unless they are accompanied by measures to ensure that disadvantaged groups make better use of the information. For their part, school-based interventions may help reduce health inequalities to some extent since many school-based interventions are targeted to the disadvantaged population in the first place.[17] Moreover, school-based interventions may also help address health inequality challenges across age groups. For countries that are concerned about rapidly increasing obesity among youth, school-based interventions may be the preferred policy choice.

It is important to note that this chapter has not taken into account externalities such as intra-household effects, whereby positive changes in lifestyle choices adopted by one household member may positively affect the habits of others. In Chapter 4, it is also suggested that community-level networks may have a powerful impact on obesity. Therefore, educational interventions may have much smaller ICERs if they shape not only the lifestyle and habits of the target of the intervention but also those of other children, classmates, co-workers, friends and others in the community.

Policies that change the environment around individuals will not be effective unless people embrace those changes by practising healthy lifestyles. It is important to understand that policy and legislation alone can only go so far; they cannot control the food choices people make or the amount of physical activity they take part in. It is in this area that educational interventions must be used because education is the key means of providing individuals with the knowledge needed to live a healthier life and thus ultimately reduce the burden of obesity through prevention.

The current evidence base indicates a need for studies that place greater emphasis on the costing component of obesity prevention efforts (Summerbell *et al.*, 2005). The need for further costing assessment is not confined to studies on prevention of obesity, but is also necessary for inventions relating to drinking and mental health. Future studies must give equal importance to the assessment of the benefits (effectiveness) as well as the cost of alternative policy options.

Notes

1. Michele Cecchini provided the results for this chapter. These analyses were carried out as part of the OECD Health Division project on the Economics of Prevention.
2. The alternative scenarios would include "no intervention".
3. The World Health Organization (WHO) defines disability-adjusted life years (DALYs) as the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability. The diseases covered are: ischemic heart disease, stroke, colorectal cancer, lung cancer and breast cancer (for females).
4. See for example Feinstein and Chevalier (2006).
5. There is also limited evidence on the effect of a year of education completed.
6. Some of this research is presented in Chapter 4. There is considerable evidence showing the benefits of educational interventions on the risk factors related to fat intake, fibre intake (measured using fruit and vegetable intake), and participation in sufficient levels of physical activity.
7. Such changes may appear minor at first glance; their importance is best understood when translated into their effect on obesity rates. However, research focused

on the further impact of these interventions on obesity rates is lacking. This study addresses this missing link by modelling how changes in lifestyle habits affect obesity rates and ultimately how they affect survival and quality of life.

8. These interventions have focused on educating adults about the benefits of physical activity on health and means to achieve it.

9. Out of a total of 261 interventions reviewed by the WHO, 108 constitute educational interventions as defined in Box 5.1.

10. The rationale for concentrating efforts on obesity, and not on one of the other domains reviewed in this report, is two-fold. First, the countries participating in the Social Outcomes of Learning (SOL) project overwhelmingly expressed great interest in understanding the ways in which education can reduce obesity. Obesity has become a global epidemic. While it is already one of the main causes of preventable deaths and disabilities worldwide, forecasts indicate that it will play an increasingly central role in contributing to the global burden of chronic disease and disability (WHO, 2006). The second reason for focusing on obesity is that, of the three health domains central to the SOL research initiative, obesity constitutes the easiest test case owing to a rich literature on the specific impact of educational interventions. Furthermore, because obesity appears to be strongly tied to lifestyle habits, health education and information are more likely to prove useful policy tools than in the other cases.

11. The 22 European countries are part of the WHO EUR-A region. They include Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Norway, Portugal, Sweden, Slovenia, Spain, the Netherlands, Switzerland and the United Kingdom.

12. Figure 5.1 assumes that the benefit of the interventions will accrue for the next 100 years and a discount rate of 3%. Implications of shortening the period of accrual are described in the following section.

13. Figure 5.2 reports the total prevention costs, total savings in health expenditure and overall effectiveness assuming the benefit of the interventions will accrue for the next 100 years.

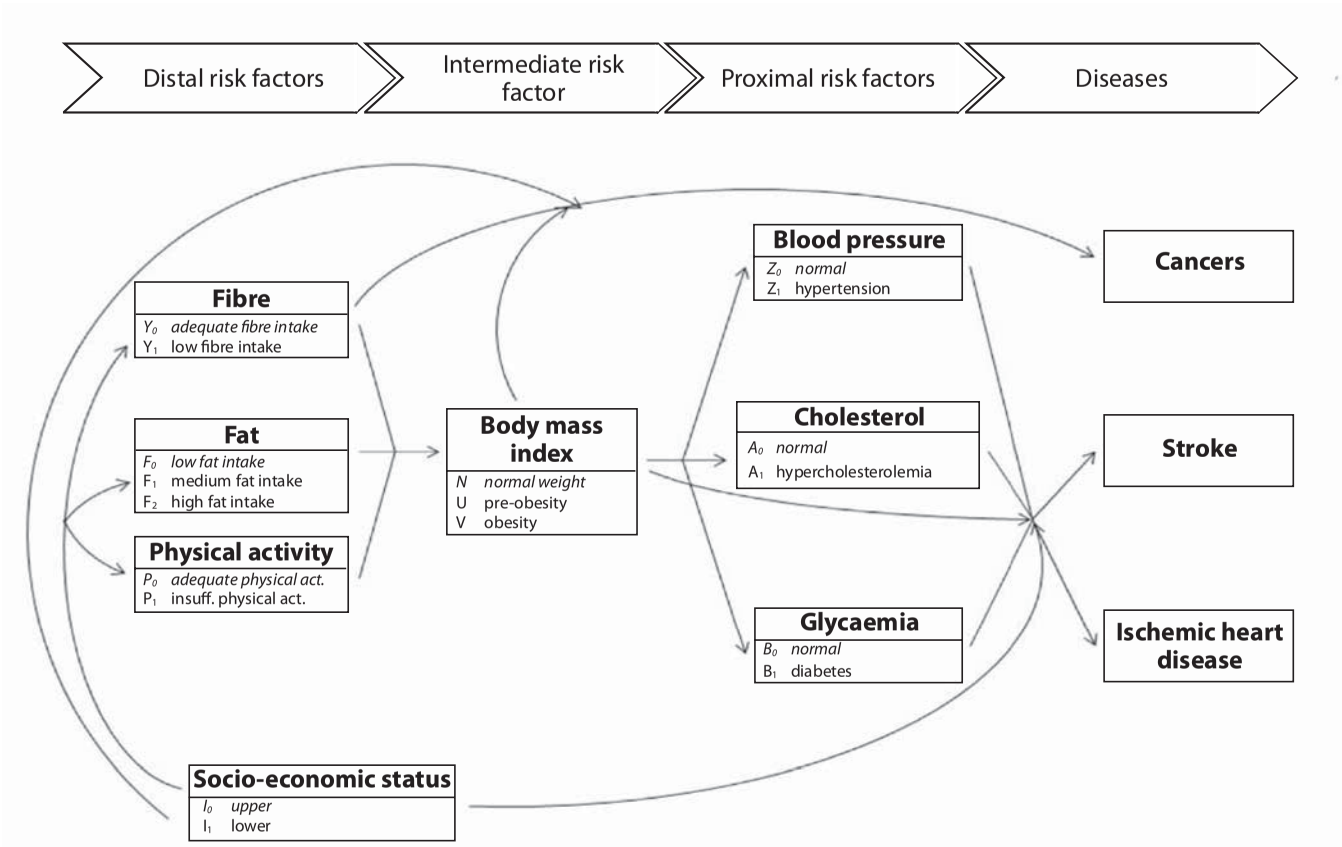
14. As mentioned before, these are savings due to reduced expenditures on cancer, ischemic heart disease, stroke, diabetes, high cholesterol and high systolic blood pressure.

15. The ICERs in Figure 5.4 have been calculated assuming a discount rate of 3% a year.

16. However, if governments need to base their policy decisions on a short-term perspective, mass media interventions are likely to be the only cost-effective and viable option.

17. Chapter 4 also suggests that the interventions may also help reduce health inequalities if they help to raise cognitive and non-cognitive traits, especially among disadvantaged children.

Annex 5.A1
The Epidemiological Model



Note: states written in *italic* are considered the reference state (*i.e.* relative risk equal to 1) in the evaluation of the relative risks.

Annex 5.A2

The WHO-CHOICE Model

The **CHOICE** (**CHO**osing **I**nterventions that are **C**ost-**E**ffective) project is a WHO initiative developed in 1998 with the objective of providing policy makers with the evidence to implement interventions and programmes that maximize health given certain budgets. To achieve this, WHO-CHOICE reports the costs and effects of a wide range of health interventions in the 14 epidemiological sub-regions (world divisions made based on geographical location and epidemiological profiles). The results of this cost-effectiveness analysis are assembled in regional databases, which policy makers can adapt to their specific country setting.

The objectives of WHO-CHOICE

- To develop a standardized method for cost-effectiveness analysis that can be applied to all interventions in different settings
- To develop and disseminate tools required to assess intervention costs and impacts at the population level
- To determine the costs and effectiveness of a wide range of health interventions, conducted with probabilistic uncertainty analysis
- To summarize the results in regional databases that will be available on the Internet
- To assist policy makers and other stakeholders to interpret and use this evidence
- To develop country contextualisation tools.

The added value of the model

Generalized cost-effectiveness analysis forms the basis of the WHO-CHOICE approach. Uniquely, this method allows existing and new interventions to be analysed at the same time. Previous cost-effectiveness analyses have been restricted to assessing the efficiency of adding a single new intervention existing sets, or replacing one existing intervention with an alternative. WHO-CHOICE allows comparison of current interventions together with interventions being considered for implementation. It takes into account synergies between interventions on the costs and effectiveness from a health system perspective.

By using WHO-CHOICE, the analyst is no longer constrained by what is already being done, and policymakers can revisit and revise past choices if necessary and feasible. Thanks to WHO-CHOICE they will also have solid evidence upon which to allocate and reallocate resources between interventions.

Source: World Health Organization (2009), *www.who.int/choice/en/.*

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