Lifestyle intervention: from cost savings to value for money

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\textbf{Abstract}

Prevention of unhealthy lifestyles has sometimes been promoted as simultaneously reducing costs and improving public health but this will unlikely prove to be true. Additional medical costs in life years gained due to treatment of unrelated diseases may offset possible savings in related diseases, but are often ignored both in health promotion policies and in economic evaluations of life-prolonging interventions. Many national guidelines explicitly recommend excluding these costs from economic evaluations or leave inclusion up to the discretion of the analyst. This may result in too favorable estimations of cost-effectiveness, feeding the unjustified optimism among policymakers regarding lifestyle interventions as a cost-saving option. However, prevention may still be a cost-effective way to improve public health, even when it does not result in cost savings, but this should be judged taking all future costs into account and be based on the true value for money provided by lifestyle interventions.

\textbf{Keywords} economic evaluation, health policy, medical costs, prevention, public health, value of health

\section*{Introduction}

It has been suggested that preventive lifestyle interventions targeted at lifestyle-related risk factors, such as smoking and obesity, have the potential of not only increasing public health but at the same time lowering health-care expenditures.\textsuperscript{1,2} These suggestions have led some policymakers to embrace preventive lifestyle interventions. For instance, in the most recent US election campaign, the Obama Administration proposed an ambitious health-care reform plan, in which prevention plays an important role: ‘Devoting more of our health-care funds to prevention will save tens of millions of dollars and improve millions of lives’.\textsuperscript{3} Such expectations regarding prevention may importantly influence health-care reforms, as was recently debated in the US context as well.\textsuperscript{4–8} An important problem then is, that although prevention may indeed increase the health of populations, these interventions, unfortunately, are, in general, unlikely to result in lower expenditures.\textsuperscript{5,9} While preventive interventions may reduce illnesses and expenditures related to risk factors, especially when they successfully prolong life, they will increase illnesses and expenditures unrelated to those risk factors primarily in gained life years. The costs of these unrelated illnesses have been demonstrated to outweigh the savings on related illnesses for the important risk factors of smoking and obesity.\textsuperscript{10,11} In spite of this, the suggestion that prevention is cost saving remains persistent both in the academic field as well as in health-care policymaking. For many, it remains counterintuitive that a healthy lifestyle results in more rather than in less lifetime health-care expenditures. This is problematic as it may result in inefficient use of health-care resources based on overly optimistic assumptions regarding lower health-care expenditures due to prevention, and thus may cause disappointment (among policymakers) when prevention fails to meet these expectations. Unfortunately, current health economic evaluations, which are intended to inform decision-makers about the most optimal use of scarce health-care resources, may strengthen these unfounded expectations regarding lifestyle intervention programs, because they normally ignore the costs of unrelated illnesses in life years gained in many jurisdictions including the UK\textsuperscript{12} and The Netherlands,\textsuperscript{13} or leave inclusion up to the analyst’s discretion in case of the
US guidelines and the WHO Guide to Cost-Effectiveness Analysis. This results in too favorable estimations of cost-effectiveness of preventive measures prolonging life and indeed sometimes even in estimated cost savings.

In order to improve this and create realistic expectations, it is important to judge preventive lifestyle interventions within the same framework as other health-care interventions. In this contribution, we elaborate on this framework, thus shifting the focus from the question whether prevention should save money towards the proper question of whether prevention offers value for money. Indeed, preventive interventions do not necessarily have to alleviate the financial burden on health-care systems in order to be eligible for funding, but rather, like other interventions, have to demonstrate good value for money. Such a relatively favorable cost-effectiveness of preventive interventions can only be asserted comprehensively when all associated costs are included in the analysis. Such assessments of all future health-care costs and benefits will provide a better understanding of the true value for money provided by lifestyle interventions compared with curative interventions, which eventually should result in more optimal use of health-care resources in terms of increasing social welfare and thus in better policymaking. In this paper, we highlight this topic further, focusing in particular on the issue of the inclusion of unrelated medical costs in life years gained when asserting the cost-effectiveness of preventive interventions. (Note that this is only one of the pressing issues regarding the methodology of economic evaluations of health-care interventions. Other controversies are discounting, the perspective to adopt for the analysis (usually health-care perspective versus societal perspective) and related to that the incorporation of certain cost categories such as productivity costs, etc. Some of these issues may also influence cost-effectiveness ratios, in particular those of life-prolonging interventions. We will return to this briefly in the discussion.)

This topic is especially relevant here since excluding this cost category may strengthen the wide-spread yet mistaken impression that prevention is cost saving or, worse still, should be cost saving in order to be attractive. Since assessing value for money also requires attention for the value of preventive interventions, we will also briefly highlight some considerations regarding the value of health gained through preventive action.

**Costs of prevention and priority setting**

The prevalence of important risk factors, such as obesity and smoking, is still high, and, for the former, even increasing. It is generally acknowledged that these risk factors have a substantial impact on the general burden of disease, and there are no signs that this impact will attenuate in the near future. These risk factors thus cause illnesses, which in turn do not only reduce public health but also cause health-care consumption, which translates into health-care expenditures. Eliminating the risk factors would therefore avoid not only illnesses but also the related care consumption and expenditures. More health, less costs, therefore. The line of reasoning behind this suggestion is temptingly straightforward indeed.

Obesity and smoking, however, do not only cause morbidity but may also reduce life expectancy. Preventive interventions may thus reduce this risk of premature death caused by such risk factors and subsequently extend life. During these life years gained, as a consequence of other, unrelated diseases, people may consume additional health care. To put it in the illustrative words of a former Dutch minister of health, Dr Els Borst: ‘Dementia is something we witness in people of ages normally not reached by smokers and obese’. These additional expenditures due to unrelated diseases in these life years gained may offset savings from avoiding risk factor-related diseases. In the end, therefore, effective preventive interventions may increase rather than decrease health-care costs.

However, while the rhetoric underlying investments in prevention in some countries may prove to be false, the investments themselves may still be worthwhile. Prevention, like other care, does not have to be cost saving in order to be attractive. Such a requirement would implicitly hold prevention ‘to a higher standard of cost-effectiveness than other medical care’. Prevention, however, may be a relatively cost-effective means of improving public health. In this respect it is important to reiterate the obvious: saving money is not the primary aim of health care. Rather, the aim is to optimally enhance health with the available resources. Exclusively focusing on the input side of the balance between costs and benefits may be considered a rather restrictive view, ‘as it ignores the value of the output of prevention and health care and may consequently lead to underinvestment in these areas’. Effectively increasing health-care expenditures while achieving something valuable, i.e. increased public health, can be completely rational.

There is no reason why this should not apply in case of preventive interventions. Thus, as Goetzel succinctly puts it: ‘Instead of debating whether prevention or treatment saves money, we should determine the most cost-effective ways to achieve improved population health…’.

The most relevant policy implications of this assertion are 2-fold. First, prevention should not be primarily seen as a cost-containment tool and second, costs and benefits of preventive interventions need to be traded-off explicitly in
common economic evaluations.26 Economic evaluation, most commonly performed as a cost-utility analysis when evaluating health-care interventions, is a useful way to identify the costs and consequences of different policy alternatives and compare them accordingly. In other words, economic evaluations demonstrate what value [in cost-utility analysis usually expressed as quality adjusted life years (QALYs)] is produced for the money spent. The role of economic evaluation is therefore indispensable in the allocation of scarce health-care resources. It would simply be impossible to set rational priorities when no insight is gained in the incremental costs and incremental benefits of a health-care technology if the aim is to optimally improve health with available resources. Moreover, economic evaluation can also be helpful in deciding where in the chain of lifestyle and disease an intervention is most efficient. Hence the increased use of economic evaluation in the process of deciding on national public funding in many jurisdictions.

**Evaluating preventive interventions**

Evidence on cost-effectiveness of preventive measures is increasingly becoming available. More involvement of institutes such as NICE in the UK are helpful in this respect as they evaluate prevention as well as other types of health care in a similar decision framework. However, the fact that prevention may increase lifetime expenditures due to an increase of unrelated diseases in life years gained is currently not adequately reflected in such evaluations, hampering good comparisons and decision-making. Preventive interventions may indeed offer good value for money when, for instance, judged against a threshold of some £20,000 to £30,000 per QALY like often mentioned in the UK setting.27 However, studies demonstrating this normally do not account for the costs of unrelated diseases in life years gained. (Note that this is relevant for any life-prolonging intervention, preventive or curative.) For example, NICE recently investigated the cost-effectiveness of several smoking cessation interventions and concluded that many interventions result in cost savings.28 This conclusion was reached, however, by ignoring the unrelated medical costs in life years gained. If these costs would be included, the interventions may not be cost saving anymore, although, in spite of this, may still be considered worthwhile. (It is also important to realize that preventive interventions may have additional consequences from a societal perspective. Then, broader costs and effects should be considered as well. We return to this issue in the discussion. Note that this point is completely independent of whether a societal perspective is adopted for the evaluation or a narrower health-care perspective).

Guidelines on pharmacoeconomic research play an influential role in how economic evaluations are performed, but differ in many aspects across jurisdictions, including regarding how to handle unrelated medical costs in life years gained. Interestingly, both the NICE guidelines and for instance the US guidelines for economic evaluations in fact prescribe ignoring these additional costs of unrelated diseases in life years gained (without a clear motivation), while the US guidelines and the WHO Guide to Cost-Effectiveness Analysis leave this decision to the discretion of the analyst. These differences seem to reflect the different positions in the literature, with some authors strongly arguing against inclusion of these costs and others equally strongly advocating the opposite. Regarding the former position, for instance Russell,29 argued against the inclusion of unrelated medical costs in gained life years because of the fact that an intervention should not be ‘punished’ simply because it is successful in prolonging life. She argued that in order to assert whether an intervention produces value for money, medical costs in life years gained are irrelevant, just as expenditures for food, housing and clothing are irrelevant. (Note that the inclusion of these latter type of expenditures, also referred to as survivor consumption costs, is currently also an area of much debate.30–34) This argument was later also mentioned by the US Panel,14 but that Panel also provided arguments in favor of including future unrelated medical costs, which is indicative for the general lack of consensus on how to handle these costs (at that time). Garber & Phelps35 showed that these costs can be excluded from an economic evaluation since their inclusion, under stringent assumptions, will not affect the relative rankings of interventions (and therefore decision-making will not be influenced). However, subsequently, it has been convincingly argued that the model and assumptions they used have rather serious limitations and will fail to reach optimal decisions.14,16 Meltzer,16 using a more suitable model, convincingly demonstrated that excluding unrelated medical costs in life years gained is at variance with lifetime utility maximization. Another key argument in favor of including unrelated medical costs in life years gained is that of *internal consistency*. Since the projections of the effects (gained QALYs) of prevention will often implicitly assume normal care use in life years gained, it is inconsistent not to include the associated medical costs.36 A recent overview of the literature indicates that majority of the more recent literature argues in favor of inclusion of the unrelated medical costs.18

It seems, therefore, that including unrelated medical costs in life years gained is becoming the new standard, at least in the theoretical literature. The practical uptake of this
dawning consensus obviously also requires the availability of sound estimates of additional medical expenditures in gained life years. Fortunately, these practical difficulties in estimating and therefore including these future medical costs are increasingly being overcome, facilitating their inclusion.\textsuperscript{20,37} Despite this, the guidelines of the Swedish Pharmaceutical Benefits Board are currently one of the few examples of guidelines advocating the inclusion of these future unrelated medical costs.\textsuperscript{38}

In order to illustrate that prevention can still be an efficient way to produce health, in spite of the additional costs in life years gained, Table 1 displays the cost-effectiveness ratios of four preventive interventions; two targeted at obesity and two promoting smoking cessation, both including and excluding unrelated medical costs in life years gained.

The—non-representative—examples in Table 1 are illustrative for the fact that excluding future unrelated medical costs alters the cost-effectiveness ratios, making them more favorable, and even cost saving for the tobacco tax increase and the intensive lifestyle program for obesity. For other examples (not included in the table), excluding these costs may make a cost-ineffective program seem cost-effective when judged against some fixed threshold. The cost-effectiveness ratios in Table 1 serve as a demonstration of what happens to the ratios when unrelated medical costs are either included or excluded and to indicate that prevention may still be an attractive investment, even when these future costs are accounted for.

The main point here is that, within a more common decision-making framework, it is not about whether an intervention saves money, but whether a preventive intervention produces value for money, i.e. whether it yields health gains at a reasonable price (that is, whether it is cost-effective), just like a curative intervention should produce value for money. In order to reach optimal decisions, one needs to be complete in assessing costs and effects. This implies that a, also and sometimes especially in the context of preventive interventions influential cost-category should not be omitted from an economic evaluation. Moreover, it is worth noting that ignoring these additional future medical costs, which may, occasionally, result in prevention appearing to be cost saving as shown above, may strengthen the unfounded idea that prevention should save costs in order to be an attractive option. Therefore, the additional costs induced by successfully extending life should not be ignored. Only then, well-informed choices can be made between (curative and preventive) interventions. In such choices, besides the costs and the health gains, also the values of these health gains play a crucial role, as highlighted below.

### The value of prevention

While cost-effectiveness ratios similar to those shown in Table 1 may normally be expected to be considered favorable by policymakers, this need not necessarily be the case with regard to preventive interventions. It has been noted that prevention appears to be judged more stringently than curative care.\textsuperscript{5} This may also have to do with the value we attach to health gains created through prevention relative to that generated through curative interventions. Especially for health policy, it is important to have knowledge of such value judgments and sentiments. Not only may they be used in normative decisions regarding the funding of different programs, but they may also (partly) explain why, in general, prevention is low on the priority list in many countries, given that only 3\% of total health-care spending on average in the OECD countries is targeted at prevention.\textsuperscript{2} (Obviously, one may also think of other reasons why spending on prevention is low. For example, policymakers may be rather short-sighted when setting priorities since they generally govern for only relatively short periods of time. Then, preventive interventions, which incur costs now while their effects may only become apparent in the future, can be an unattractive policy option when alternative (curative) solutions are available (even though at higher costs!).

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Preventive intervention</th>
<th>True CE ratio</th>
<th>CE ratio (excluding costs unrelated medical care)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>Low calorie diet\textsuperscript{47}</td>
<td>€17 900 or $24 340</td>
<td>€12 100 or $16 460</td>
</tr>
<tr>
<td></td>
<td>Intensive lifestyle program\textsuperscript{48}</td>
<td>€7 400 or $10 060</td>
<td>Cost saving</td>
</tr>
<tr>
<td>Smoking</td>
<td>Tobacco taxes increase\textsuperscript{59}</td>
<td>€2500 or $3400</td>
<td>Cost saving</td>
</tr>
<tr>
<td></td>
<td>Minimal counseling by GP (or GP assistant) in combination with nicotine replacement\textsuperscript{\textsuperscript{27}}</td>
<td>€4400 or $5980</td>
<td>€1500 or $2040</td>
</tr>
</tbody>
</table>

Costs discounted at 4\% and effects discounted at 1.5\%. Dollar price level 2009 (07/01/09: 1 euro = 1.36 dollars).
First, prevention may be less appreciated simply because it falls short of the created expectation of being a cost-saving solution. In that respect the unrealistic expectations, which may first have been created to stimulate prevention, may now backfire. Second, preventive interventions are often targeted at statistical lives—lives of unidentified individuals who benefit from the intervention. As Jenni and Loewenstein indicate, ‘society is willing to spend far more money to save the lives of identifiable victims than to save statistical victims’. And Dranove similarly states: ‘There is no reason to expect that the value of a statistical life would equal the value of an identified life’. This may be partly explained by the fact that withholding an identifiable person some treatment will have immediate and visible consequences, while this is normally not directly the case for statistical victims. Such preferences result in less priority for (primary) prevention. Third, preventive actions are targeted at people who are not (yet) sick. The urgency of such actions may be perceived as low; while for instance the ‘rule of rescue’ emphasizes the need to help those most urgently at risk of severe health loss. Society may be willing to devote more money to improve the health of someone in great and immediate need than of someone in lesser and more distant need.

Fourth, the uncertainty surrounding the costs and effects of specific preventive interventions may be relatively large, since controlled trials may be difficult to perform, time horizons to observe final outcome may be relatively long and new intervention strategies may be developed over time. Finally, societal support for collectively funding preventive (lifestyle) intervention may be low, since lifestyle may be perceived to be individuals’ own choice and responsibility and, therefore, the related health and cost consequences to be self-inflicted. This argument of culpability (whether or not considered to be applicable) may decrease the degree of solidarity society will show with the involved individuals. For some reason (perhaps related to the above-mentioned urgency and identifiability), this culpability question appears less relevant in case of curative care. Whether or not the above-mentioned preferences and attitudes, some of which appear somewhat inconsistent or irrational, should be used in policymaking is obviously open for debate, yet they may help to explain why prevention may be judged against a different threshold than curative care. If indeed a(n implicitly) lower value is, on average, attached to health gained via preventive interventions relative to curative interventions, this may also partly explain the focus on cost savings in this area.

### Discussion

Life-prolonging prevention is less likely to result in cost savings than often hoped, expected or even calculated, especially in the long run. It is important to stress this, since politically prevention is still sometimes seen as a means to reduce health-care spending. However, additional costs due to unrelated diseases in life years gained in the long run may offset savings in related diseases in the shorter run. These additional costs are often ignored in policymaking regarding prevention. While this may result in perhaps desirable investments in prevention, this may change when prevention does not result in the planned savings. If the expected savings are required to finance other health-care (reforms), the consequences of the over-optimistic view on prevention may be far-reaching. It is therefore unfortunate that also in most current economic evaluations of life-prolonging interventions the additional medical costs in gained life years are largely ignored. Changing national guidelines for economic evaluations in this respect will result in more realistic estimations of cost-effectiveness of lifestyle prevention. Theoretical arguments warrant this amendment, while practical difficulties do not appear to inhibit inclusion of these costs. An interesting area of research is the value of health gain in different contexts. If this is believed to be context dependent, the relative value of health gain through prevention also needs to be considered in order to completely judge whether prevention yields value for money.

It is important to note that the economic impact of preventive interventions is likely to vary across different jurisdictions. When only considering the impact on the health-care sector, differences in health-care financing systems between countries, among which the extent to which entitlements include coverage of different types of long-term care and social services, are obviously influential. Also, the definition of health-care costs used for estimating the cost consequences of an intervention may differ, leading to difficulties in comparisons between countries. A commonly used definition (internationally), is the OECD’s System of Health Accounts (SHA). This definition of health-care costs accounts for direct medical costs (diagnosis, treatment and nursing). However, some types of expenditures regarding long-term care or social care are excluded. If prevention will prolong life and additional expenditures in these additional life years are incurred, these are likely to be largely related to increased use of long-term care and social care. Using the SHA definition may thus underestimate the costs of prevention, but if different definitions are used in different jurisdic-
tions to account for differences in health-care systems and financing, comparability of results is hampered and similar life-prolonging interventions may have different impacts across countries in terms of health-care spending. (For example, in The Netherlands two additional definitions are used: the Dutch Health and Social Care Accounts used by Statistic Netherlands (CBS) and the Budgetary Scheme of Care used by the Dutch Ministry of Health, Welfare and Sports. While the first definition is the most complete definition, also including several types of welfare costs, the latter is more restrictive.) Comparisons may be even more difficult when also costs and savings beyond the health-care sector are considered. In this paper, we have discussed an important controversy regarding the methodology of economic evaluation of health-care interventions, i.e. the inclusion of unrelated medical costs in gained life years. Other major issues in this context, with clear relevance to the current debate, are, for instance, the perspective to adopt for the analysis and what discount rate to apply for future costs and, especially, effects.

The choice of perspective largely determines which costs and effects to include in an economic evaluation. A broad societal perspective normally takes into account all relevant—medical and non-medical, within and outside the health-care sector—costs and all relevant effects of an intervention. In contrast, a more restrictive health-care perspective in general focuses purely on those costs falling on the health-care budget. In case of the latter perspective, some cost categories, such as costs of informal care, and productivity costs, are excluded from the analysis.\(^{14,26}\)

Although from a health-care decision-maker’s point of view one may argue in favor of adopting the narrower perspective, from a welfare economic viewpoint a broad perspective including all relevant societal costs and effects is normally advocated. The choice of perspective may influence the analysis of preventive interventions in several ways. Prevention may for instance sometimes be initiated and funded in other sectors than the health-care sector, e.g. the education sector. Moreover, some lifestyle interventions may require much time-input from the participants, which represents real societal but not health-care costs. Performing economic evaluations from another (i.e. more restrictive) perspective than the societal one, may thus underestimate the societal costs associated to such interventions. Moreover, life-prolonging programs may cause other, societal costs and savings related to the consumption and productivity level of an individual. Healthy aging populations may result in additional societal savings in terms of increased productivity, less need for informal care or social services, and the delay of pension age and so on.

On the other hand, additional societal costs should also be considered, such as survivor consumption costs, such as those related to housing, clothing and food.\(^6\) How these different (societal) cost categories will influence the evaluation of life-prolonging interventions should be investigated. If a health-care perspective is adopted (like for example is currently prescribed in the UK\(^{12}\)), such broader consequences are usually ignored, as falling outside the scope of the analysis. Note that the issue of how to handle unrelated medical costs in life years gained is relevant in both perspectives.

The issue of discounting is also of particular interest for the economic evaluation of prevention. Although discounting of future costs and effects in economic evaluations of health care is widely accepted and standard practice, it remains an area of much controversy. Not only does the height of the discount rates for costs and effects differ between countries, there is also a continuing debate about whether costs and effects should be discounted at the same rate. Setting specific discounting rules may have a profound effect on the final cost-effectiveness ratios, especially for interventions that incur immediate costs and future health benefits, such as prevention.\(^{45}\) In general, using higher discount rates for health effects (that is, attaching lower weight to future health) will worsen the cost-effectiveness ratios of interventions, especially those interventions that incur current costs and distant effects (like some types of prevention). It is more recently advocated that attaching more weight to future health effects (thus using a lower discount rate for health effects), which may substantially improve the cost-effectiveness of preventive interventions, may be justified in order to account for the growing value of health gains over time.\(^{45}\)

Clearly, some of the methodological choices we have to make in order to perform economic evaluations of health-care technologies may have important consequences for health-care decision-making, especially for interventions that extend life more than increase quality of life. However, the main objective of this paper was not to discuss the consequences of methodological choices in general, but to focus on the realistic expectations and calculations of the costs and savings related to life prolonging interventions and a fair judgment of these interventions. Prevention, in that respect, should be evaluated within the same framework as other curative interventions, implying a focus on value for money. Ignoring certain, obviously relevant, cost categories without any justification may mislead health-care policymakers and result in non-optimal allocation of resources, both from a health-care and a societal perspective. As the examples mentioned in this paper show, prevention still may
offer (very) good value for money, even when accounting for unrelated medical costs in life years gained, justifying the claim of the WHO that ‘governments, in their stewardship role for better health, need to invest heavily in risk prevention, in order to contribute substantially to future avoidable mortality’.46

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