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# SOCIETAL AND ECONOMIC VALUE OF PRE- VENTION IN THE NETHERLANDS

Attaining happier, healthier  
and more productive lives



*Societal and economic value of prevention in the Netherlands: attaining happier, healthier and more productive lives*

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## **PREFACE**

WRR Working Paper 24 has been written as part of the project ‘Health, equality and inequality’ in which the WRR will look both at the causes and effects of differences in health status. The results of this project will be presented in a joint publication by the Dutch National Institute for Public Health and the Environment (RIVM) and WRR.

In this WRR Working Paper Lucia Fiestas Navarrete (Canadian Centre for Health Economics), Marianne de Visser (WRR) and André Knottnerus (WRR) discuss a range of evidence on the health economic and societal value of chronic disease prevention strategies that address obesity and hypertension. They also evaluate the cost-effectiveness of large-scale preventive strategies and assess the economic impact of prevention portfolios on future health sector expenditure. Finally, they review a number of policy options for the Netherlands in the area of prevention, paying particular attention to the contributions that a strong, independent and stable health technology assessment body could offer with regard to health economic appraisals in relation to both cost-containment and economic growth across diverse sectors of government involvement.

This series consists of ‘Working Papers’ produced for the WRR that it regards as sufficiently significant and valuable to merit web publishing. The authors bear responsibility for the information and views set out in this study.

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## SUMMARY

### INTRODUCTION

Rising health care and long-term care expenditure and the continual influx of costly new health technologies call for the setting of financially prudent limits across the public health care sector economy. While fiscal prudence motivates the Dutch government to transform the health care system into an increasingly operationally efficient, consumer-driven institution, the consistent introduction of market mechanisms could limit the pursuit of population health objectives. Moreover, the cost-containment logic fails to fully capture the positive economic spillovers that optimally accessible public care could offer in terms of improving the productivity of labour. This paper further expounds the argument that disease prevention is a fundamental component of both a societally and economically minded health care system.

### APPROACH

First, we review cost containment schemes to contextualize the detrimental effects that inappropriately targeted austerity policy experimentation may have on population health outcomes. Second, we elaborate on the objectives of prevention and explore the factors that may justify intervention, including potential market failures and negative spillover effects. Third, we discuss a range of evidence on the health economic and societal value of chronic disease prevention strategies that address obesity and hypertension, in order to identify the interventions representing the most efficient allocation of health resources. The fourth section examines the cost-effectiveness of large-scale preventive strategies and evaluate the economic impact of prevention portfolios on future health sector expenditure.

### DISCUSSION

It is of the utmost importance to emphasize the long-term vision that is embedded in preventive care, given that a major budgetary commitment would need to be available upfront whilst recognizing that health returns on investment are often delayed. While this long-term horizon may pose a challenge to the feasibility of implementation, it also represents an opportunity, due to the cumulative and synergistic health benefits that preventive interventions may achieve over sustained periods of time. Comprehensive prevention portfolios have greater containment potential than pure cost-minimization strategies. The Netherlands could benefit from implementing a comprehensive national prevention strategy, in which sustained investments in multi-pronged prevention and health promotion interventions are mobilized. It is important that prevention portfolios include both structural and targeted strategies in order to transform the default environments into settings where individuals are increasingly encouraged to make health-enhancing lifestyle choices. In order to be successful, interventions must continue to favoura-

bly influence the architecture of health-related choices and increase public access to the most healthy options. In parallel with this, it is also important that preventive health communication programmes include empowerment components aimed at motivating patients and individuals at risk to actively engage in sustained preventive behaviour. Behavioural economics shows that individuals may risk underweighting future benefits relative to present costs, lacking the expertise and incentives to appraise the value of preventive services on their own. For these reasons, it is increasingly important that government takes responsibility for the provision of prevention strategies aimed at correcting existing market failures. This is of paramount importance, considering that risk factors and chronic diseases generate an array of negative externalities that impinge on society, thereby increasing health expenditure whilst at the same time reducing labour productivity, household investment capacity and human capital accumulation.

Bearing this in mind, we reviewed a number of policy options for the Netherlands in the area of prevention, paying particular attention to the contributions that a strong, independent and stable health technology assessment body could offer with regard to health economic appraisals in relation to both cost-containment and economic growth across diverse sectors of government involvement.

# 1 INTRODUCTION

## 1.1 BACKGROUND AND PROBLEM DEFINITION

Severe economic turbulence in the form of generalized economic crises has set a precedent for systematic divestment in public health care across mature welfare economies (Reinhardt et al. 2002, Schmid et al. 2010). Rising health care and long-term care expenditure and the continual influx of costly new health technologies call for the setting of financially prudent limits across the public health care sector economy (Van Ewijk, Van der Horst and Besseling 2013). This has led to the articulation of health policy solutions promising to prevent the loss of invested health funds, whereby decisions are judged based on their ability to consistently increase clinical performance and halt public sector expenditure. The dominance of cost-containment policy solutions across the health sector is poignantly illustrated by the recent restructuring of the Exceptional Medical Expenses Act (AWBZ) in the Netherlands, which was accompanied by cuts equating to 3.5 billion euros and the devolution of responsibility for long-term care to families, municipalities and private insurers (Zorg Wijzer 2015). While central government makes savings by imposing stricter care eligibility restrictions, the reduction in AWBZ funding impacts heavily on the informal household burden associated with caring for chronically ill and elderly individuals<sup>1</sup>. While fiscal prudence compels the Dutch government to transform the health care system into a more operationally efficient, consumer-driven institution, the consistent introduction of market mechanisms could limit the achievement of population health objectives (Karanikolos et al. 2013). Moreover, the cost-containment logic fails to fully capture the positive economic spillovers that optimally accessible public care could offer in terms of improving the productivity of labour. It is therefore paramount to transform the economic conception of health care from an unproductive consumer of public budgets into a balanced view, recognizing that health care is a key investment when seeking to enhance societal and economic progress. Indeed, we maintain that it is possible to achieve the desired cost-saving effect of health policies through sustained investments in interventions targeting disease prevention and health promotion. By moving beyond pure cost-containment strategies, we posit that prevention and cure could offer a more economically prudent response to cur-

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1 Research has shown that the increase in informal care resulting from cost-containment policies may threaten the health and financial resources of caregivers, thereby negatively affecting labour productivity. One study found a sizeable effect of caregiving on work productivity, with caregivers reporting an average 19.2% impairment in their ability to be productive at work (Rand-Giovanetti et al. 2007). The combination of absenteeism (5.4%) and at-work productivity (80.8%) resulted in a total impact of 21.2% productivity loss due to caregiving.

rent developments, given the emphasis on delaying or mitigating the occurrence of the very diseases that contribute to the rise in health expenditure.

## **1.2 PURPOSE AND CONTENTS**

This paper further expounds the argument that disease prevention is a fundamental component of both a societally and economically-minded health care system. Indeed, when mobilized appropriately, comprehensive prevention portfolios have greater containment potential than pure cost-minimization strategies. We argue that the Netherlands would benefit from sustained investments in multipronged prevention and health promotion strategies targeting broad sections of the population (WHO 2013, Dobbs et al. 2014). To this end, this discussion paper is designed to set out the key components of a conceptual framework for the economics of chronic disease prevention.

This section outlines the problem addressed in this paper, as well as the main arguments; a review of cost-containment schemes is used to contextualize the detrimental effects that inappropriately targeted austerity policy experimentation may have on population health outcomes.

The following section elaborates on the objectives of prevention and explores the factors that may justify intervention, including potential market failures and the negative spillover effects.

The third section discusses a range of evidence on the health economic and societal value of chronic disease prevention strategies that address obesity and hypertension, in order to identify the interventions that represent the most efficient allocation of health resources.

The fourth section examines the cost-effectiveness of large-scale preventive strategies and evaluates the economic impact of prevention portfolios on future health sector expenditure.

The discussion section appraises a number of policy options for the Netherlands in the area of prevention, paying particular attention to the contributions that a strong health technology assessment (HTA) body could offer with regard to health economic appraisals in relation to both cost-containment and economic growth across diverse sectors of government involvement.

### 1.3 AUSTERITY MEASURES AND THE EFFECTS OF COST-SHARING POLICIES

Rising health care costs and the post-financial crisis environment of austerity continue to drive European countries to re-engineer health systems in accordance with cost-saving principles. Countries such as Denmark, Finland, France, Greece, Portugal and Italy have systematically reduced their coverage schemes through the introduction of user charges for health services (Karanikolos et al. 2013). Increased cost-sharing between user and insurer has been employed across health systems as a mechanism intended to reduce health care costs and safeguard quality of health care provision. As such, it could deter patients from unnecessary overuse, render individuals aware of the real costs of public care and promote discretionary spending by service users (United States Agency for Health Care Research and Quality 2015). In part due to its perceived positive implications, increased patient cost-sharing has long been used in order to regulate participation levels towards more financially prudential standards. Cost-sharing has also been suggested as a means of encouraging personal responsibility by patients and compensating the government share of costs for subsidized health care coverage. Yet increased cost-sharing in primary and specialist care could negatively affect health outcomes and in the end increase the use of resource-intensive services (see section 1.3.1). There are alternative options for responding appropriately to rising health care expenditure, including controlling the price of pharmaceuticals and medical aids and devices, restricting inappropriate use of medicines and imposing budget restrictions on hospitals and other health care provider organizations. In this paper, however, we focus on effects of cost-sharing policies.

#### 1.3.1 CUTS IN PUBLIC BUDGETS MAY NEGATIVELY AFFECT HEALTH OUTCOMES

Rising user charges tend to (i) increase the household burden of financial risk; (ii) reduce the use of high and low-value care indiscriminately;<sup>2</sup> and (iii) disproportionately affect high users of care and individuals with low socio-economic status

2 Value of care refers to the health economic value of interventions aimed at the attainment of favourable cost-effectiveness ratios (CERs). Care that falls into the category 'high-value' has a better CER than 'low-value' care. For instance, a colonoscopy performed every ten years (€ 4,527 per Quality-adjusted Life Year [QALY]) is a higher-value intervention than a guaiac faecal occult blood test performed annually (€ 6,761 per QALY) (Telford et al. 2010). Research has shown that, when confronted with rising co-payments, patients tend to reduce consumption of both high and low-value care indiscriminately as they lack the knowledge to evaluate the costs and benefits of treatments (Baicker and Goldman 2011). In this regard, higher co-payments could distort the allocative efficiency of the health system as patients are incentivized to select the least expensive treatments without taking into account their cost-(in)effectiveness. The potential losses from doing this are sometimes enormous, as it could condition future patterns of demand for interventions to cluster around less costly procedures that generate few additional quality-adjusted years of life (WHO 2000).

(SES). It follows that increased cost-sharing may be detrimental for population health and health equity (Gemmill et al. 2008). Moreover, the most susceptible populations in Europe to detrimental health outcomes are those living in countries facing the largest cuts in public budgets. Greece's economic crisis led to austerity measures that have affected the health of the Greek population and their access to public health services (Kentikelenis et al. 2014). For instance, an increase in user fees for outpatient clinics from € 3 to € 5 was associated with a deterioration in self-reported population health between 2006 and 2011 (Zavras et al. 2012). Moreover, low provision of preventive services in Greece, such as needle exchange programmes, has been associated with the worsening of an HIV epidemic among injecting drug users (European Centre for Disease Prevention and Control 2013). In Portugal, a period of increased cost-sharing schemes, which saw co-payments for primary care rise by € 2.75 and for secondary care by € 10.40, is associated with 15% of the population foregoing registration with a general practitioner and relying heavily on emergency services (Augusto et al. 2012). Furthermore, Portuguese health care professionals have suggested that reduced access to health services, as a direct consequence of increased co-payments, contributed to a 10% increase in winter deaths across the elderly population between 2011 and 2012 (Quiroz 2013). It is important to note that the statistical associations revealed by the aforementioned papers do not confirm a direct causal relationship between increased cost-sharing and detrimental health impacts. Nevertheless, these figures show a cross-country trend pointing towards underlying mechanisms linking cost-containment policies to reduced health care utilization. Looking to the future, we should consider the impact that concurrent drastic cuts to national health expenditures may have on the overall demand for and equitable distribution of health services in the Europe, as well as the long-term salutogenic and economic well-being of the population.

The experience gained from European countries that are undergoing severe health system cuts should serve as an indication that increased cost-sharing in primary and specialist care could negatively affect health outcomes and ultimately increase the use of resource-intensive services, such as emergency care – thus running counter to the cost-saving intention of containment policies.

The effects of increased cost-sharing on access to good-quality care have been examined widely. An American study found that users who declined health insurance plans due to increased cost-sharing were significantly less likely to seek primary care services and more likely to visit the emergency department for essential medical care (Wright et al. 2005). Another study observed that increased user co-payments resulted in lower rates of drug treatment, compromised adherence and more frequent therapy discontinuation (Goldman et al. 2007). In fact, each 10% increase in cost-sharing was associated with a 2-6% decrease in prescription drug spending, as well as increased use of medical services by patients suffering from

chronic conditions (ibid.; Karaca-Mandic et al. 2012; Thornton Snider et al. 2016). This is further exacerbated by a study finding that prescription cost-sharing tends to disproportionately affect the elderly and the poor among the Quebec population in Canada; the introduction of cost-sharing was associated with a reduction in the use of essential drugs of 9.1% among the elderly and 14.4% among welfare recipients (Tamblyn et al. 2001). Moreover, a number of studies have found a correlation between the lower use of preventive care services and increased user co-payments (Solanki and Schauffler 1999, Zaslavsky et al. 2000). Others have found that cancer screening rates decreased by 5.5% in insurance plans which introduced cost-sharing, and increased by 3.4% in plans which retained full coverage (Trivedi et al. 2010). However, a controlled trial (the Rand Health Insurance Experiment) conducted in the United States between 1974 and 1982 found that if consumers had to shoulder part of the cost, there were approximately one third fewer visits to a physician and a third fewer hospitalizations, but with little or no difference in health outcomes (Brook et al. 1983). The exception was persons with well-established diagnostic and therapeutic procedures such as myopia and hypertension, for whom free care brought an improvement in health. While the above body of research mostly reflects on the cost-sharing experience of North American countries including the United States and Canada, the findings may be used to draw attention to the potentially negative effects of cost-sharing in a range of international contexts. One of the cited contributions synthesized published evidence concerning the negative effects of cost-sharing on the use of prescription drugs by identifying 132 articles that portrayed the cost-containment experiences of various international health care systems (Goldman et al. 2007). In the Netherlands, the out-of-pocket threshold for patient co-payments has seen a mean annual growth of 21% between 2009 (€ 155) and 2016 (€ 385), thereby impacting the population's perceived accessibility to health services. A survey undertaken by the Dutch National Patient Consumer Federation and other national client platforms among 9,487 individuals showed that the 'own-risk' co-payment threshold was the main reason for seeking information about the cost of care by 52% of the participants, thus reflecting cost-awareness, and for 14% of participants this led to them refraining from treatment on one or two occasions (Nederlandse Patiënten Consumenten Federatie, Landelijk Platform GGZ, Ieder(In) 2015)). Another report showed that 2% of the adult population of Tilburg (N=4,000) forewent necessary visits to medical specialists or refrained from purchasing medication as a result of the increase in the co-payment threshold (Van Klaveren and Hollander 2013). Most worryingly, twice as many households that avoided using healthcare resources due to the increase in the 'own-risk' co-payment threshold were reported to be single-parent homes (ibid.). This could be an early indication that the increased reliance on co-payments as a mechanism for cost-containment disproportionately disadvantages lower-income households and individuals.

In this regard it is noteworthy that in the Netherlands there has been a significant increase in recent years in the number of elderly people presenting for emergency care, especially since 2015, which in some areas is pushing the number of patients beyond capacity, thus necessitating temporary closure of emergency care departments (TraumaNet AMC 2016). It may well be that the restructuring of the Exceptional Medical Expenses Act (AWBZ) in 2015 which was accompanied by the devolution of responsibility for long-term care to families, municipalities and private insurers ('decentralization of care'), and the concomitant closure of a significant number of nursing homes, may have contributed to this situation.

Policies that progressively shift the financial risk of health care spending on to patients have thus been shown to reduce indiscriminately the use of discretionary health services, essential medical care and important preventive care. Accordingly, important compromises need to be considered between the system efficiencies obtained through increased cost-sharing and the inefficiencies generated due to lower use of curative and preventive services in high-risk populations.

#### 1.4 POTENTIAL VALUE OF DISEASE PREVENTION

Considering that the true economic value<sup>3</sup> of health entails coupling the costs of a service with the benefits produced, the desired cost-saving effect of health policies may be best realized through investment in interventions that have high economic impact. This approach moves beyond pure, and often one-sided, cost-minimization strategies and prioritizes cost-effectiveness as a mechanism for purchasing health goods more wisely. In this sense, prevention offers an economically prudent response to the current environment thanks to its emphasis on delaying the occurrence of the very diseases that contribute to the rise in health expenditure. The focus on prevention has gained currency due to its potential impact on health and well-being, as well as the associated savings to be realized through the sustained reduction of chronic disease conditions (Levi et al. 2008, Sassi and Hurst 2008). It is thus unsurprising that the largest integrated managed care organization (health maintenance organization, HMO) in the United States, Kaiser Permanente (KP), has reformed its health care coverage and eliminated member cost-sharing for a number of preventive services, most notably breast and colorectal cancer screening, adult BMI assessment, persistence of beta-blocker treatment after heart attack, cholesterol management and comprehensive diabetes care (PR Newswire 2014).

3 In the context of this paper, economic value is conflated with societal benefit based on the assumption that the most economically sound outcome to be achieved by the health care system is in the best interests of society. In this regard, striving for a health system that reappropriates health spending towards higher-value services whilst achieving greater relative improvements in population health is both an economically and societally beneficial outcome.

Furthermore, KP has demonstrated support for preventive programmes aimed at community-wide behaviour change, such as walking school buses, which provide additional before and after-school physical activity programming targeting children and their parents (Kaiser Permanente 2014). These initiatives could allow the HMO to quantify the potential impact of lifestyle changes on communities, and ultimately on the nationwide prevalence among KP members of otherwise costly chronic conditions. In the Netherlands, preventive services at the national level include breast, cervical and colorectal cancer screening, all of which are cost-effective interventions (Van Ballegooijen 2006; Gezondheidsraad 2009, 2014; Achterberg et al. 2010). In addition, some health insurance companies have included smoking cessation programmes in their standard insurance package. Paradoxically, preventive measures such as cancer screening or early detection of (pre-)diabetes may lead to an increase in the number of patients with a diagnosed chronic condition.

In recent years, prevention has been progressively positioned at the centre of health system agendas as a means of controlling health spending. In the United States, the Trust for America's Health reported that a multi-angled approach to prevention programmes could save the country upwards of USD 16 billion annually within a five-year timeframe (Levi et al. 2008). The Commonwealth Fund estimated that prevention schemes aimed at reducing the determinants of overweight, obesity and tobacco use could reduce national health expenditure by USD 474 billion over ten years (Schoen et al. 2007). However, others challenge these findings and claim that less than 20 percent of the preventive options fall into the cost-saving category and that careful choices about frequency, groups to target and component costs are needed to increase the likelihood that interventions will be highly cost-effective or even cost-saving (Russell 2009). In this context, it has become increasingly relevant to elucidate whether prevention actually leads to savings in health spending, and at the same time to clarify what it is meant by cost-saving. Given the interdependence between population health and economic productivity, the Dutch health sector does not finance health goods and services in order to save money, but for the non-monetary benefits they provide. In order to assess the merits of prevention adequately, therefore, it is important to reposition 'cost' as an important, albeit insufficient parameter, and to better understand 'value' and investment in health and economic terms.



## **2 ECONOMIC ARGUMENT FOR DISEASE PREVENTION**

### **2.1 IS INVESTING IN HEALTH AN ECONOMICALLY SOUND POLICY?**

There is wide consensus that improving population health may deliver significant economic benefits, including the curtailment of rising health sector expenditures in both high and low-income countries (Commission on Macroeconomics and Health 2001; Wanless 2004, Suhrcke et al. 2006a). Increased health status has long been associated with higher wages and earnings, used as proxy indicators of labour productivity (Bartel and Taubman 1979, Chirikos and Nestel 1985, Cawley 2000, Contoyannis and Rice 2004, Pelkowski and Berger 2004). In addition, it has been demonstrated that permanent health conditions have adverse effects on the content and quality of the labour supply as measured by type of employment, working hours and earlier retirement from the labour force (Gannon and Nolan 2003, Pelkowski and Berger 2004, Schofield 2014). As a key predictor of greater education capital, the accrual of health capital may positively influence the higher education-related performance of individuals and households. In turn, better educational prospects may translate into greater economic opportunities for entire populations. A positive relationship has in fact been demonstrated between health status, cognitive function and educational attainment (Del Gaudio and Fantuzzo 2001). Moreover, there is an educated assumption that individuals who enjoy healthier lives are better able to envision a longer-term future for themselves and their households, thus increasing their willingness to save for retirement and invest in physical capital. Capital accumulation is in turn an important determinant of countries' economic growth potential (Suhrcke 2006a). By contrast, research has shown that severe health conditions reduce the affected households' ability to accumulate wealth beyond what could be expected on the basis of medical expenses alone, thereby suggesting a negative relationship between health status and savings (Smith 1999). Other studies have been more precise in demonstrating how the potential reduction of specific chronic conditions could translate into increased economic growth. In fact, it has been determined that a 10% reduction in cardiovascular mortality in the working-age population of high-income countries could contribute to an increase of 1% in growth per capita (Suhrcke 2006b). Similarly, research has revealed that investments in health human capital are positively correlated with the growth of per capita income across OECD countries (Gyimah-Brepong and Wilson 2004). In this regard, it seems sensible to include investments that increase the human health capital stock as part of policies aimed at meeting economic growth objectives.

## 2.2 FACTORS THAT SUBSTANTIATE GOVERNMENT INTERVENTION WITH REGARD TO PREVENTION

In order to apply an economic framework to the study of the mechanisms that promote health and prevent disease it is necessary to contextualize individual behaviour as the result of socio-economic interactions that take place over a person's life course. Through the lens of health economics, lifestyles are the product of choices relating to the consumption of commodities such as food, tobacco, alcohol, and to physical activity (Sassi and Hurst 2008). The factors that influence those health-determining choices are in turn the result of specific socio-economic and physical environments. Prevention seeks to reduce the pursuit of activities that are in conflict with health by modifying the inefficient market environments where individuals make health-demoting lifestyle choices. The assumption is that the avoidance of those market failures could increase social welfare as a result. Examples of failures that may be observed in relation to specific lifestyle choices include: (i) information failures contributing to the adoption of health-demoting and unhealthy lifestyles through an inadequate understanding of the long-term consequences of such behaviours; and (ii) externalities leading to the societal costs of certain forms of consumption not being entirely reflected in the private costs and benefits incurred by individual consumers (*ibid.*). In this regard, the benefits ensuing from addressing the inefficiencies caused by market failures may justify corrective interventions by governments. When considering the causal link between lifestyle choices and chronic disease conditions, a health economic approach is primarily concerned with immediate externalities that derive directly from acts of lifestyle consumption and deferred externalities which are generated through the link between lifestyle choices and chronic diseases (Sassi and Hurst 2008). The onset of chronic diseases and the manifestation of risk factors such as obesity and hypertension typically result in individuals becoming less productive, using medical and social resources more intensively and necessitating an array informal care provision. These phenomena generate negative externalities for society at large (*ibid.*). Moreover, as previously mentioned, research shows that in addition to (i) increased health expenditure and (ii) decreased labour productivity externalities, spillovers may occur in other important economic areas, such as (iii) savings and (iv) human capital accumulation, given the individual's compromised capacity to invest (Suhrcke et al. 2006a). In this regard, the existence and size of externalities, as well as their implications for welfare and health equity are important variables to consider when governments seek to implement preventive strategies that could compensate for the negative spillovers associated with chronic diseases.

## 2.3 HIGH IMPACT OF PRIMARY AND SECONDARY DISEASE PREVENTION STRATEGIES

Interest in preventive strategies continues to increase in view of their known impact on population health, as well as their cost-saving potential. It is indisputable that a nation's health bill and disease burden would reduce significantly if the public were to progressively and systematically adopt health-enhancing behaviours (Woolf et al. 2009). Moreover, the future health savings generated by the reduced chronic disease prevalence would largely pay for the costs that the system would incur in order to improve the population distribution of health-promoting behaviours. While tertiary prevention strategies are necessary in order to defer the complications associated with natural disease progression, our economic argument for prevention is based on the high cost-effectiveness of primary and secondary disease prevention strategies. Indeed, most health care systems tend to underfund high-value primary prevention, where services cost relatively less per unit of health gain. Instead, by concentrating most of the health expenditure on curative care and tertiary prevention strategies, health systems prioritize funding on necessary, albeit low-value health services. For instance, when comparing the value of an Erlotinib combination for the treatment of metastatic pancreatic cancer, which has a cost equivalent to € 141,426 per Quality-Adjusted Life Year (QALY) gained, to a range of social marketing smoking-cessation programmes, with a median cost equivalent of € 1,564 per QALY gained, it is evident that primary prevention is more cost-effective than curative care in the long term (Owen et al. 2011). This argument, however, does not seek to ignore the importance of funding curative care provision, but rather to shift the economic value of funding preventive services from the margins to the centre of the expenditure discourse.

### 2.3.1 IS MORE EMPHASIS ON PREVENTION MORE COST-EFFECTIVE THAN USUAL MEDICAL CARE?

Notwithstanding the strength of the economic argument for prevention, critics have put forward important counter-arguments. It has been argued elsewhere that more prevention is no more cost-effective than 'usual' medical care (Cohen et al. 2008, Russel 2009), while others have argued that primary prevention has the lowest cost-saving potential of all policy options (Mongan et al. 2008). These authors use a robust argument against prevention that concentrates on the costs incurred by health systems when strategies are successful, resulting in individuals living longer. As succinctly illustrated by the latter author, longer life spans mean more years of health care use, adding to overall costs (Mongan et al. 2008). However, unattractive prevention forecasts tend to be narrowly focused on sector-specific costs while neglecting the positive societal and economic spillovers engendered by prevention, in terms of improved labour productivity, prolonged societal and labour participation, extended contributions to informal care, tax revenue generation and corporate competitiveness. Keeping in mind that the true objective

of economic activity is the maximization of social welfare and that health is a valuable determinant of welfare, weighing the increased health care cost of a prolonged life as a shortcoming of preventive strategies is counterproductive. It is in fact true that prevention primarily defers the onset of chronic conditions and reduces the complications associated with illness. Yet regardless of the appropriateness of prevention strategies, individuals will eventually succumb, preferably in old age, to a myriad of possible conditions. As the natural progression of disease in old age is unavoidable, so are the health care costs of individuals who live longer. This is not a reason to consider prevention as an ultimately non-cost-effective alternative, given that the economic cost of ill health in old age cannot be compared to the true economic and social welfare impact of an economically productive life lived in full health. This signifies that, while prevention may not substantially affect the overall population mortality (which will continue to have a cumulative incidence of 100%), it may positively influence absolute morbidity and disease-related disability, and increase the absolute and relative average number of healthy years lived, thereby potentially generating high returns on investment in terms of labour supply and productivity, of the ability to work longer, and of remaining socially active for longer, including after retirement.

### **2.3.2 PREVENTION REQUIRES A LONGER-TERM VISION FOR HEALTH SPENDING**

The appropriate horizon from which to deduce the cost-effectiveness of preventive measures targeting complex health conditions should be long term ( $\geq 40$  years) (Lehnert 2012). In fact, the health benefits of prevention may profoundly alter the composition of chronic disease and illness in a country, but only if the appropriate interventions are implemented for a long enough period of time, allowing for the modification of individual health-promoting choices throughout people's life course. In this regard, preventing the onset of cardiovascular diseases associated with the development of hypertension does not merely entail a five-year intensive anti-hypertension programme. Instead, prevention should be viewed as a sustained investment in the environments that produce healthy choices. For instance, while still in the context of hypertension, prevention could mean collaborative action in the food environment to encourage healthier standards for daily salt intake throughout an individual's life. Moreover, consideration must be given to the implications that discounting the future costs and benefits of prevention, a common practice in economic evaluations, may have on the cost-effectiveness of strategies. Discounting implies that future costs and benefits are worth less than those occurring in the present, given the human tendency to want to pay for benefits to be enjoyed now rather than in the future. This is the Achilles' heel of prevention: while curative care may be more costly than preventive care, prevention requires the acceptance of time and the foresight to expect the population health benefits only several years after the initial investment. For this reason, the future health benefits of prevention should be discounted to reflect the population's innate preference to enjoy benefits in the present while deferring any nega-

tive effects of doing so (Torgerson and Raftery 1999). In fact, research has shown that societies tend to value current health benefits more highly than future ones, even when the magnitude of health benefits is greater in the future (Cairns 1994). Discounting the longer-term health benefits produced by preventive strategies is an important topic of discussion on which health economists who produce cost-effectiveness data in the Netherlands will have to agree. This will necessarily depend largely on their ability to capture the true value that Dutch society places on future health gains.

## **2.4 IMPETUS FOR REAPPORTIONING HEALTH SPENDING THROUGH COST-EFFECTIVENESS METRICS**

A nuanced budgetary focus on prevention strategies would signify the reapportionment of health spending in favour of higher-value services that could achieve greater relative improvements in population health at lower cost, thus providing the Netherlands with an economic opportunity to stretch its health care spending while attaining long-term health gains for the same expenditure. The Organisation for Economic Co-operation and Development (OECD) recommends that governments mobilize a taxonomy of preventive interventions as a policy tool for early-stage strategic development (Sassi and Hurst 2008). By classifying potential interventions, it is possible to identify a multi-pronged and comprehensive set of health-promoting actions that could be implemented together over time. It is equally relevant to predict the range of possible responses that could be experienced by those targeted by the interventions, while drawing on the accrued evidence on efficiency. This taxonomy must be accompanied by a subsequent analytical step involving a thorough economic evaluation of the impact of preventive interventions, prioritizing the use of cost-effectiveness metrics. As such, it is important to emphasize the role that cost-effectiveness analysis (CEA) needs to play in determining valuable future prevention strategies for the health care system. Considering the costs and benefits of preventive service provision, it is important for the Dutch system to think in terms of finding the most cost-effective ways of funding strategies that have high-value cost-saving potential. The Health Council of the Netherlands was formally responsible for adopting new health technology assessment activities and identifying interventions requiring appraisal, but the Council's HTA subcommittee has not been active during the past four years. Instead, the current HTA system in the Netherlands is fairly fragmented, with university medical centres performing HTA activities, supported by the Netherlands Organisation for Health Research and Development (ZonMw)'s health care efficiency research programme (ZonMw 2015). The Institute for Medical Technology Assessment (iMTA), based at Erasmus University Rotterdam, performs research in medical technology assessment, including health economics and health outcomes research, while HTA activities are performed at the National Institute for Public Health and The Environment (RIVM). In addition, the National

Health Care Institute, formerly the Health Care Insurance Board (CVZ) is mostly engaged in ‘assessing the importance for policy of new proposals from a health insurance perspective’ (International Network of Agencies for Health Technology Assessment 2015). They state on their website: ‘The National Health Care Institute determines and advises on which types of health care are included in the basic package and which are not.’ In the United Kingdom, the National Institute for Health and Care Excellence (NICE) has a broader mission: ‘Improving health and social care through evidence-based guidance’. Since Dutch health care insurers and learned medical societies are increasingly initiating the evaluation of new technologies, there is a great need for a robust, independent and stable agency. Cost-effectiveness analysis (CEA) is common practice in the strongest health planning bodies in countries like Canada, the United Kingdom, France and Germany, in which national agencies prioritize the health and economic value of services provided in order to systematically eschew inefficient practices (Woolf et al. 2009). It is interesting to note in this regard that the National Health Care Institute has been assigned the coordinating role in EUnetHTA (European Network for Health Technology Assessment) which is aiming to achieve joint assessments of pharmaceuticals and technologies by 2020.

The following sections will assemble relevant evidence on the health economic value of preventive strategies in order ultimately to identify the intervention portfolios that represent the most cost-effective allocation of health resources.

### **3 HEALTH ECONOMIC VALUE OF PREVENTING OBESITY AND HYPERTENSION**

#### **3.1 COSTS ASSOCIATED WITH OBESITY AND HYPERTENSION**

The burden of obesity on health care systems in developed economies ranges between 2% and 7% of overall health spending (Dobbs et al. 2014). The costs incurred in the treatment of chronic disease conditions that are generally associated with the onset of obesity may demand up to 20% of the health care budget and 94 million Disability-Adjusted Life Years (DALYs) lost due to adult overweight and obesity (ibid., Food and Agriculture Organization of the United Nations 2013). Accrued evidence of the detrimental effect of obesity on the overall productivity of labour suggests that its impact on the economy goes well beyond what is currently captured by health sector budgetary allocations, thus undermining the competitiveness of the national economy. In parallel with this, it is widely accepted that hypertension is more common in obese individuals and that there is a relationship between the blood pressure levels and degree of obesity. Potential mechanisms linking obesity to hypertension include dietary and many other factors (DeMarco et al. 2014). In upper-middle income countries, including the Netherlands, the economic burden of cardiovascular diseases associated with the development of hypertension was USD 2.52 trillion in 2008 (World Health Organization 2013). Moreover, it has been estimated that up to 13% of annual hospitalization costs for patients diagnosed with ischaemic heart or cerebrovascular diseases is directly associated with hypertension as a second diagnosis (Wang et al. 2010). This makes clear the high and growing economic burden that hypertension comorbidity places on the health system. The combination of obesity and hypertension is associated with high mortality and morbidity leading to an array of preventable chronic diseases, thereby exacerbating health care costs.

#### **3.2 FOCUS ON MULTI-PRONGED PREVENTIVE APPROACHES**

Prevention strategies that aim to effectively address the long-term impact of obesity and hypertension require a comprehensive intervention portfolio that relies on multi-pronged approaches which emphasize the effect of structural mechanisms in terms of behavioural modification. Given that these conditions result from a multitude of psychosocial and environmental determinants, an appropriate multi-angled response would require targeting of various population segments across the behavioural-structural spectrum of interventions. A comprehensive portfolio of interventions that aim to inform, enable, motivate and influence behaviour change is the best equipped to address the diversity of populations and multi-level determinants of obesity and hypertension (World Health Organization 2013, Dobbs et al. 2014). Moreover, a multi-pronged and multi-level preven-

tion tactic would be needed for interventions to have a significant impact on the widest possible range of societal sectors. Considering that the progressive modification of health-demoting dietary and physical activity behaviours would entail a shift in social and cultural norms towards increasingly salutogenic targets, a holistic prevention strategy must seek to address several very diverse segments of the population simultaneously. Although targeted interventions tend to be less cost-effective compared to population-wide schemes, they can achieve lasting effects in terms of individual behaviour change. It is important to note that when targeted prevention interventions are able to reach the population and affect health behaviours, the strategies are both less costly and more effective than later-stage curative care for obesity and hypertension-related chronic disease conditions (World Health Organization 2013, Dobbs 2014).

### 3.3 FOCUS ON STRUCTURAL INTERVENTIONS

Reliance on structural mechanisms to achieve behavioural change is a critical component of prevention strategies. While current approaches to addressing health-demoting behaviours have focused primarily on changing individual (conscious) behavioural mechanisms such as education and personal responsibility, research suggests that interventions which rely less on individual volition (i.e. endogenous determinants) and more on environmental changes (i.e. exogenous determinants) have a greater likelihood of achieving a lasting behavioural impact. By way of example, efforts to reduce obesity and hypertension in the population require a fundamental change in the external environment that shapes individual behaviour in relation to nutrition and physical activity. This illustrates the importance of radical upstream solutions emphasizing the role of employment, housing and education for the downstream behavioural risks represented in the wider obesity and hypertension prevalence (Freudenberg et al. 2015). Structural interventions rely on fundamental principles borrowed from behavioural economics, by placing the locus of individual change in the environments that encourage healthier behaviour. Structural interventions essentially nudge individuals towards healthy choices by resetting default options and anchoring healthier norms in the environments where individuals work, live and play (WRR 2014). Behaviour associated with things such as work patterns (active vs. sedentary), transport, food and a host of other factors affect a person's weight. Changing the choice architecture to address this may require a fundamental alteration in the way people live their lives. Although the effectiveness of such nudge interventions in the United Kingdom and United States is thus far largely unproven, and their sustained effect is as yet unknown, in time they may well help at the margins (Oliver and Ubel 2014). More and better research is needed to understand how nudges operate and, just as importantly, how they operate without harming autonomous choices in a way that would make people victims of manipulation (De Ridder 2014). However, there is no denying that restructuring the physical environment in a way that pro-

motes increased physical activity and healthier eating habits can be a costly alternative, both politically and financially. At the same time, we believe that progressive modification of the food environment towards healthier standards of practice is both feasible and advisable for the Netherlands. This is further expounded in the next section.

### 3.4 REVIEW OF COST-EFFECTIVE INTERVENTIONS

Research on the potential impact and cost-effectiveness of prevention strategies suggests that high-impact interventions are affordable when viewed from a societal perspective. A study that modelled an integrated population response to address obesity in the UK found that a multi-pronged abatement programme could bring approximately 20% of the overweight and obese population back into their normal weight category within five to ten years (Dobbs et al. 2014), resulting in annual savings of USD 1.2 billion to the National Health Service (NHS) (ibid.). The study assessed 44 preventive interventions and determined that 95% of them were highly cost-effective for society. In this regard, the cost-savings<sup>4</sup> throughout the British health care sector, coupled with higher labour productivity, could far outweigh the monetary investment required for preventive service delivery when evaluated over the full lifetime of the 2014 population cohort (ibid.). The intervention found to have the highest impact was portion control, which had the marginal advantage of being more profitable for the food and beverage industry due to the savings on ingredients. In fact, this single intervention could save more than two million Disability-Adjusted Life Years (DALYs) over the lifetime of the 2014 British cohort, amounting to a 4% reduction of the total disease burden attributable to overweight and obesity (ibid.). A recent Cochrane Review showed that acting to reduce the size, availability and appeal of larger-sized portions, packages and tableware has potential to reduce the quantities of food that people select and consume by meaningful amounts (Hollands et al. 2015). Reformulation of processed foods was the intervention with the second highest impact, albeit a considerably less attractive option if allowance is made for the costs that the food and beverage industry would incur in product re-engineering. This intervention could save up to 1.7 million DALYs at a price of USD 2,600 per DALY (ibid.). Other intervention areas, including parental education, provision of healthy meals at school and in the workplace and the introduction of school curricula with increased physical activity regimens, were also shown to be highly cost-effective (ibid.).

While the primary and secondary prevention of hypertension has not been studied as systematically, evidence on the effectiveness of singular intervention strat-

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In this case, cost-saving refers to the costs that are saved on curative care when prevention strategies effectively prevent the onset of chronic diseases which are associated with health-demoting lifestyle choices.

egies has been accumulated over time. Research developed on the basis of Markov models quantifying the potential economic benefits of preventions has shown that universal optimal systolic blood pressure (SBP) control could reduce health expenditure by approximately € 83 million per year in the Greek health care system (Athanasakis et al. 2014). On the other hand, an economic evaluation for the Netherlands found that favourable incremental cost-effectiveness ratios could be achieved in primary cardiovascular disease prevention through treatment with hydrochlorothiazide (HCT) 25mg in patients with mild hypertension (Stevanovic et al. 2014). Since the cost of anti-hypertensive agents in the Netherlands has reduced significantly due to the introduction of generic variants, the cost-effectiveness of widening treatments to include a larger population exhibiting milder risk factors has increased accordingly. Moreover, primary prevention of hypertension in the workplace by screening for cardiovascular risks followed by an educational programme has been shown to significantly reduce the direct medical costs associated with cardiovascular disease, as well as costs relating to absenteeism and intervention (Kontsevaya et al. 2010), albeit this study was based on a relatively small sample and the observation period was only 12 months. Confronted with growing evidence, the World Health Organization (WHO) has published a set of recommendations for programmes that mitigate hypertension as an integral element of national strategies for prevention and control of non-communicable diseases (World Health Organization 2013), recommending population-wide approaches aimed at modifying the blood-pressure distribution in the population to a healthy pattern (World Health Organization 2013). The next section examines the economic impact of large-scale multi-pronged prevention portfolios on future population health outcomes and health sector expenditures.

## 4 ECONOMIC IMPACT OF MULTI-PRONGED PREVENTIVE CARE PORTFOLIOS

### 4.1 GENERALIZED APPROACH TO A SECTORAL COST-EFFECTIVENESS ANALYSIS

Governments throughout the Organisation for Economic Co-operation and Development (OECD) have implemented a wide range of preventive interventions at national and regional levels in response to people's increasingly unhealthy dietary habits and sedentary lifestyles, giving rise to chronic diseases. This has gradually underlined the importance of decisions on budgetary allocation within health care systems being based on strong evidence of the cost-effectiveness and distributional impact<sup>5</sup> of preventive interventions (Sassi et al. 2009, Cecchini and Sassi 2015). Moreover, a comprehensive assessment of large-scale interventions is needed in order to compare combinations of different types of strategies across the entire health sector, and to evaluate the efficiency and cost-effectiveness of prevention portfolios. To this end, the WHO and the OECD carried out a generalized sectoral cost-effectiveness analysis (GCEA). The model assessed the cost-effectiveness of interventions delivered singly and in combination in order to identify the preventive care portfolios that produced the most efficient resource use (Sassi et al. 2009). The assessment was based on 24 studies covering 42 interventions in the United Kingdom, the United States, Australia and the Nordic countries, which aimed to address healthy dietary and physical activity behaviour by healthy individuals (ibid.). The main taxonomy of interventions reviewed by the OECD were (a) counselling at-risk individuals in primary care; (b) mass media campaigns; (c) school-based interventions; (c) worksite interventions; (d) fiscal measures to promote consumption of fruits and vegetables and reduce consumption of fats; (e) food advertising regulation; and (f) food labelling. The value of the GCEA approach lies in its assessment of and comparison between strategic combinations of interventions falling within different taxonomic categories. By amalgamating a range of population-based and high-risk interventions in the health economic analysis, governments benefit from care expenditure forecasts that are based on the assessment of whole-sector prevention portfolios. It is important to note that the

5 Measuring the distributional impact of prevention strategies allows the cost-effectiveness model to account for socio-economic status, as well as issues of equity and health inequalities. Given that different socio-economic groups are more or less likely to respond favourably to prevention strategies, it is important to measure how differential costs and health outcomes associated with a particular strategy are distributed across different sectors of the economy and among diverse categories of individuals (US-EPA 2015). Differences in response and intervention effectiveness across socio-economic groups may exacerbate or reduce existing health disparities, and this is likely to depend on the nature of the intervention (Sassi 2010).

costs of health care in years gained by prevention are not fully taken into account in this analysis. The analysis considered the savings incurred by the system only when chronic conditions that are epidemiologically related to the prevalence of obesity and hypertension were avoided (e.g. ischaemic heart disease, stroke). By way of illustration, an individual who benefited from a prevention strategy might have avoided suffering a stroke due to a preventive intervention, but may have succumbed later in life to a road traffic accident unrelated to the specific prevention strategy. In this case, the costs of health care in years gained by prevention (i.e. acute and end-of-life care) incurred by the system would not have been taken into account. Similarly, the labour productivity gains from individuals with reduced chronic conditions due to prevention were also not considered. We assume in this context that the total societal welfare that preventive strategies may produce in terms of improved productivity of labour are underrepresented. The economic impact analyses of single and combination strategies derived from the OECD report will be utilized in order to identify intervention strategies that reflect the cost-containment needs of the Netherlands.

## 4.2 IMPACT OF SINGLE PREVENTIVE INTERVENTIONS

At the population level, the OECD report found that the largest effects on obesity were achieved through intensive primary care counselling, due to the fact that efforts were typically concentrated on those who stood to benefit most (i.e. individuals between the ages of 25 and 65 years presenting with a BMI  $>25\text{kg}/\text{m}^2$ ). By contrast, large-scale media interventions had a small effect on obesity in view of their limited capacity to comprehensively affect individual behaviour, confirming the need for targeted interventions. With regard to chronic diseases, preventive interventions had the biggest effect on the incidence of ischaemic heart disease and stroke. As regards high-impact interventions, physician-dietician primary care counselling was identified as having the largest overall effect in reducing ischaemic heart disease, averting 3.3 cases per 100,000 individuals annually (Sassi et al. 2009). The majority of preventive interventions assessed were most effective in reducing morbidity by delaying the onset of chronic disease conditions, rather than overall mortality (ibid.). Previous research has confirmed that prevention optimizes the number of years lived in full health by deferring the onset of illness and the cost of treatment. Moreover, intensive primary care counselling produced the highest gains in terms of potential Life Years (LYS) and DALYS saved. It was estimated that at least one DALY could be saved for every ten individuals participating in counselling programmes (ibid.). By contrast, mass media campaigns consistently ranked lowest in terms of DALYS saved (one DALY saved per 121 individuals targeted). However, their extensive public reach is an important reason for considering their incorporation in mixed-intervention prevention portfolios. These findings are in line with those set out in the 2006 report published by the Health Council of the Netherlands on promoting healthy behaviours through mass media

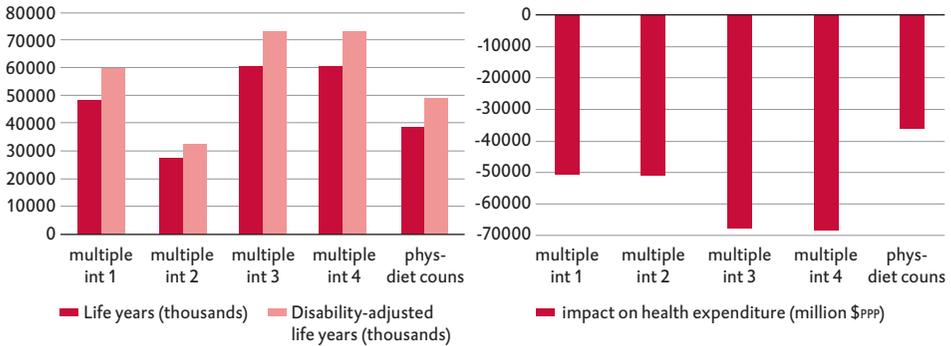
campaigns (Gezondheidsraad 2006). The report recommends that mass media information campaigns be mobilized in conjunction with targeted interventions in an attempt to promote healthy behaviour (ibid.). The OECD report also highlighted the effectiveness of interventions in relation to the time allocated for their implementation to enable a 'steady state' to be achieved (ibid.). As an example, strategies targeting children through school-based interventions took a comparatively long time to achieve steady state, thereby reducing their overall effectiveness in an extended timeframe. All interventions evaluated were shown to reduce health expenditure for the chronic disease conditions included in the model (cancer, ischaemic heart disease, diabetes, high cholesterol and hypertension). Self-regulation of food advertising and fiscal measures led to reductions in health expenditures, which more than offset the intervention costs, resulting in savings of approximately USD 6.3 billion and USD 32.6 billion, respectively, over the life course of a generational cohort.

### 4.3 COMPARISON OF STRATEGIC COMBINATIONS OF PREVENTIVE INTERVENTIONS

The OECD study examined the cost-effectiveness of four multiple interventions (MIs): (1) school-based interventions, mass media campaigns and intensive counselling; (2) fiscal measures, food advertising regulations and worksite interventions; (3) food labelling assessment, self-regulation of food advertising, school-based interventions, mass media campaigns and intensive physician-dietician counselling; and (4) an intervention based on the same interventions as in MI 3 but considering only their additive effects (Sassi et al. 2009). The findings are presented based on one generational cohort's life course (i.e. 100 years).

Figure 4.1 illustrates the health outcomes and health expenditure impacts for the four multiple interventions (MIs) as well as for physician-dietician counselling alone; the latter is presented for comparison purposes. The implementation of MI 3 and 4 generated 60 million life years (LYs) and over 72 million DALYs; MI 1 generated close to 50 million LYs and 60 million DALYs, while MI 2 generated the least number of LYs and DALYs, at 30 million each. As regards their impact on public health sector spending, MI 3 and 4 generated savings of close to USD 70 million, while MI 1 and 2 saved approximately USD 50 million each.

**Figure 4.1 Health outcomes and impact on health expenditure of combinations of interventions**



Source: Sassi et al. 2009

Multiple intervention 1: School-based intervention + mass media campaign + physician-dietician counselling

Multiple intervention 2: Fiscal measures + food advertising regulation + worksite intervention

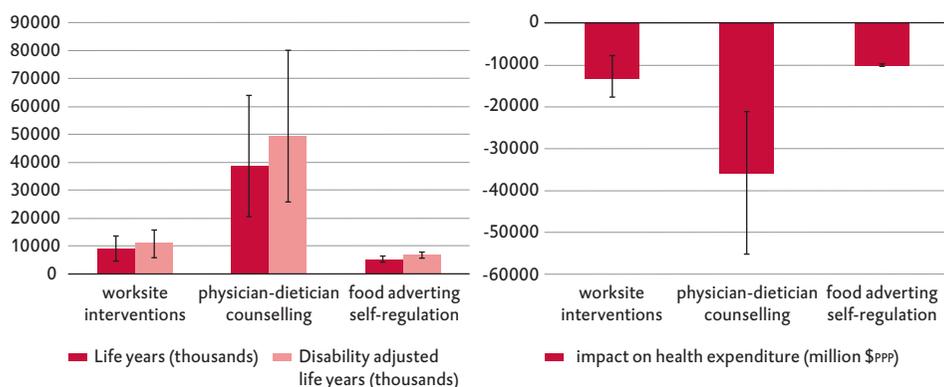
Multiple intervention 3: Food labelling + food advertising self-regulation + school-based intervention + mass media campaign + physician-dietician counselling

Multiple intervention 4: Food labelling + food advertising self-regulation + school-based intervention + mass media campaign + physician-dietician counselling

\$ppp (dollar purchasing power parity)

This shows MI 3 and 4 to be the best performing combinations of interventions in terms of their population health impact and their potential to contain costs through savings. This confirms the earlier suggestion that a large-scale multi-pronged approach is the most valuable when designing a prevention portfolio. Moreover, multiple interventions are more appropriate than single physician-dietician counselling interventions, since the effectiveness of the latter varies considerably depending on the settings in which the interventions are carried out (Figure 4.2).

**Figure 4.2 Sensitivity analysis of health outcomes and impact on health expenditure for selected interventions**

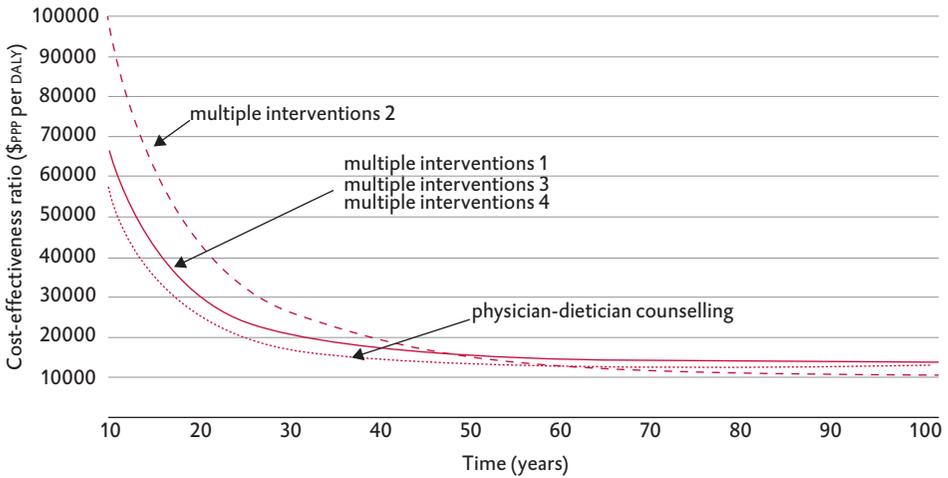


Source: Sassi et al. 2009

Figure 4.3 shows the cost-effectiveness (i.e. \$PPP (dollar purchasing power parity) per DALY) of multiple interventions. MI 2, 3 and 4 have cost-effectiveness ratios in the same order of magnitude as physician-dietician counselling, signifying that multi-pronged portfolios generate equivalent health value per unit spent with the added benefit that they also save significantly more LYs and DALYs compared to single interventions. During the first ten years, the cost-effectiveness ratios are high. As the implementation of the prevention portfolios continues, the health-promoting structural modifications have sufficient time to start affecting health outcomes positively. This is reflected in the consistent reduction in the ratios over time on the way to steady state (i.e. the situation where interventions reach the largest possible share of the intended population). At steady state, the multiple interventions converge to acquire similar health economic value, viz. approximately USD 10,000 per DALY saved.

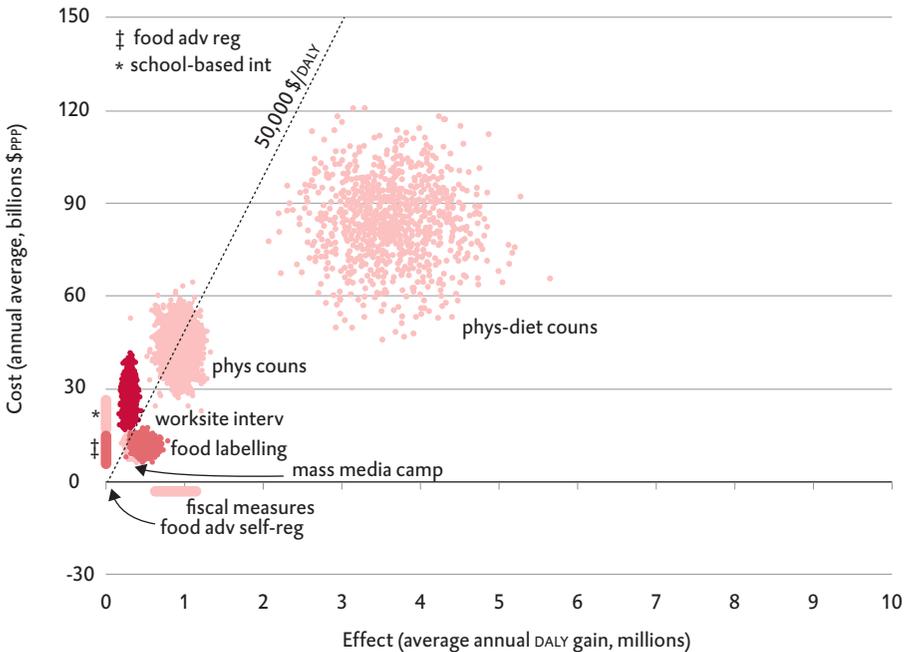
Figure 4.4 illustrates the probabilistic sensitivity analysis of all the potential combinations of costs (in annual average USD billion) and effects (in annual average million DALYs gained). The diagonal line in the figure represents the threshold of USD 50,000 per DALY, which is a commonly used value to discriminate between efficient and inefficient interventions. In the case of food labelling at year 20, the cost-effectiveness ratio is approximately USD 20,000 per DALY, based on an annual average cost of USD 10 billion and an average effectiveness of 500,000 DALYs. The ratio for physician-dietician counselling is about USD 25,000 per DALY, based on an average cost of USD 80 billion and an average effectiveness of 3 million DALYs.

**Figure 4.3 Cost-effectiveness of combinations of interventions over time (USD/DALY)**



Source: Sassi et al. 2009

**Figure 4.4 Probabilistic sensitivity analysis of the effectiveness of interventions at 20 years of follow-up**



Source: Sassi et al. 2009

This comparison demonstrates that while some structural interventions may save a smaller number of DALYs than targeted interventions, their health economic value to the system is indisputable, and they may produce more favourable cost-effectiveness ratios than interventions that solely target high-risk individuals. The stochastic clouds that lie below the horizontal axis correspond to interventions producing savings in health expenditure which more than offset the intervention costs. In this regard, interventions that modify the fiscal environment for the food and beverage industry have the highest capacity to generate net savings. Moreover, most of the interventions are cost-effective at 20 years of follow-up. Finally, as regards the distributional impact of the interventions, preventive strategies tend to have larger effects on individuals with lower SES than on their higher-SES counterparts. Thus all interventions have a favourable, albeit small, effect on health equity. However, it should be noted that the health outcomes presented in this paper are based on the assumption that the effectiveness and coverage of interventions is the same in all population groups, which may slightly misrepresent the response of low-income and high-income groups to some interventions (Sassi et al. 2009).



## 5 LOOKING AHEAD

Prevention is a fundamental component of a societally and economically-based health care system that is concerned with achieving far-reaching population health objectives. A national prevention strategy should not be reduced to the implementation of an amalgam of interventions. Instead, it is a powerful set of long-term commitments that have the potential to progressively shift the burden of disease in the Netherlands towards increasingly salutogenic population objectives. It is important to emphasize the long-term vision embedded in preventive care, given that a large budgetary commitment would need to be available upfront while health returns on investment are often delayed. While this long time horizon may pose a challenge to the feasibility of implementation, it also represents an opportunity due to the cumulative and synergistic health benefits that preventive interventions may achieve over sustained periods of time. Multiplier health effects are a circumstance that is unique to preventive measures, and which will not be realized through curative care alone<sup>6</sup>. Employers and private insurers are likely to be reluctant to shoulder the upfront expense of offering preventive services as an integral part of health insurance plans, since the health benefits will not accrue until much of their population has moved on to other jobs and/or insurance schemes. Behavioural economics dictates that individuals may risk underestimating future benefits relative to present costs, lacking the expertise and incentive to appraise the value of preventive services on their own. For these reasons, it is increasingly important that the government takes responsibility for the provision of prevention strategies aimed at correcting existing market failures. This is of paramount importance given that the onset of chronic diseases and the manifestation of risk factors typically generate an array of negative externalities that impinge on society, thereby increasing health expenditure whilst at the same time reducing labour productivity, household investment capacity and human capital accumulation. The considerable positive implications that prevention may have for population welfare and health equity offer both an avenue and a justification for government action.

Based on an accumulation of cost-effectiveness evidence, we have established that comprehensive prevention portfolios have greater cost-containment potential than pure cost-minimization strategies. In doing so, we have shown that the Netherlands could benefit from implementing a comprehensive national prevention strategy in which sustained investments in multi-pronged prevention and health promotion interventions are mobilized. It is important that prevention portfolios

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6 With the exception of integrated care, especially in the case of multimorbidities, which may be more effective than the sum of individual, separately organized interventions.

include both structural and targeted strategies, in order to transform the default environments so that individuals are increasingly encouraged to make health-enhancing lifestyle choices. Successful interventions must continue to influence the architecture of health-promoting choices by reflecting on how best to increase the population's accessibility to the most healthy options. In parallel with this, it is also important that preventive health communication programmes include empowerment components aimed at motivating patients and individuals at risk to actively engage in sustained preventive behaviour (Schulz and Nakamoto 2013). Approaches that rely on increasing patient health literacy may have lasting effects in this context by enabling individuals to exercise self-efficacy and make informed health choices (Twicler et al. 2009). Both structural and individual mechanisms targeting behavioural change are therefore critical to the success of multi-pronged prevention strategies.

While the analysis presented in this paper focused only on the savings in health care spending directly associated with the prevention of obesity, it is important to be reminded of the not inconsiderable costs that a system may incur solely from the treatment of chronic disease conditions associated with the onset of overweight and obesity. It is not possible to conclude at this juncture that investment in prevention strategies could abate the absolute health care costs incurred by the Dutch system, nor that all prevention strategies are cost-effective. In effect, much of our paper has been dedicated to sifting through potential preventive care alternatives to assess their capacity to generate health, wellbeing and savings. Yet the evidence presented suggests that a reduction in health care costs directly linked to obesity is well within the scope and ambition of future disease prevention programmes. Moreover, it is clear that obesity abatement is not entirely representative of all possible areas of disease prevention and health promotion. Other areas where prevention has and continues to succeed in achieving long-term population health goals include smoking (Blakely et al. 2015, Ekpu and Brown 2015), and child vaccinations and cancer screening programmes (Jit et al. 2015, Achterberg et al. 2010) to mention but a few. The analysis we have presented offers an insight into the cost-effectiveness of interventions that promote healthy dietary habits and increased physical activity, lifestyle choices that are strongly associated with obesity abatement. In this sense, our paper provides a comparatively small but tangible window of opportunity for policymakers interested in achieving cost-effective population health improvements via implementation of health-promotion strategies designed to lead to healthier eating habits and higher activity levels.

It is recommended that the initial investment focuses on a portfolio that includes interventions such as physician-dietician counselling, fiscal measures, food advertising regulation, food labelling and school-based interventions. Based on the analyses presented, we estimate that such a portfolio could generate upwards of 70 million DALYs by preventing an array of chronic diseases throughout the life

course of a generational cohort. Preventive interventions must capture both the general population as well as subgroups and individuals with higher magnitudes of chronic disease risk. The epidemiological model that forms the basis for prevention strategies should seek to affect behaviour over the long term across a complex causal web of distal and proximal lifestyle-oriented factors. In the same vein, the health economic prevention perspective needs to employ a long-term framework that seeks to capture the overall societal impact of interventions, not just the impact on the health sector.

Based on the cost-effectiveness evidence, it is important to stress that some of the highest-impact disease prevention strategies available to the Netherlands are those that aim to progressively restructure the food and beverage industry. These will require collaborative and sustained interactions between government and industry. We believe that self-regulated industry initiatives which secure voluntary commitments from food manufacturers, retailers and service providers on reformulation, labelling and responsible food marketing practices are a feasible first step in structurally modifying health-demoting food environments. The experiences gained in the United Kingdom with the 'Public Health Responsibility Deal', an initiative that taps into the potential for businesses and organizations to make a voluntary contribution to public health by collectively modifying the landscape in relation to food, beverages, physical activity and work, can serve as a model for the Netherlands (UK Department of Health 2015). Empirical evidence from the UK's Responsibility Deal may be extrapolated for the Netherlands, since there may be important synergies between the Dutch government's ambition to improve population health and the desire of businesses to enhance their commercial reputation, as well as to maintain a healthier, more productive workforce. For instance, by making collective public health pledges, industry stakeholders can come together to commit to voluntary salt or sugar reduction targets, to review portion sizes, to engage in marketing that promotes responsible consumption and to encourage physical activity in the workplace. These are pledges that the government can encourage businesses to espouse as part of their corporate culture, something that could benefit both private and public interests. However, it is primarily the government's responsibility to initiate collaborative approaches together with industry stakeholders that tackle the challenges caused by health-demoting lifestyle choices. Consequently, the road ahead will be dictated by how the Dutch government identifies areas where the food and beverage industry is willing to act, and how it then facilitates collective action. While voluntary public health pledges could constitute the first step in engaging the food and beverage industry on a collaborative basis, it could also be part of a programme leading towards the progressive imposition of taxes on foods that do not comply with the identified standards on salt, sugar and fat content. This is a method currently promoted by the European Public Health Alliance (EPHA) and other community health stakeholders (EurActiv 2013). Moreover, when this kind of progressive fiscal measure is applied

in tandem with fruit, vegetable and wholegrain subsidies, it can serve as a two-pronged strategy that re-engineers the food environment by encouraging the adoption of healthier choices. Phasing in fiscal measures following a programme of voluntary commitments would be a way of offering the industries concerned an array of collaborative avenues for timely change and action in the food and beverage environment. Governments across Europe have recognized the merits of fiscal measures as a means of achieving health promotion and disease prevention targets, including France, Denmark, Belgium, the UK and Hungary. And in the Netherlands, too, following an agreement between the Dutch government and the food industry (Rijksoverheid 2014), key organizations are beginning to reduce the amount of sugar in their products (Albert Heijn 2016).

Further, the potential impact of the recommendations put forward in this paper is closely connected to the growing need for the Netherlands to create a more coordinated and vigilant health technology assessment (HTA) body. Such an entity would have the capacity to systematically assess the effectiveness of preventive interventions throughout their design, implementation and evaluation phases in the following three dimensions: efficacy in changing risk factors; coverage; and time taken to reach steady state. Reinforcing the practice of cost-effectiveness would enable the country to systematically assess the health economic value of interventions across the health sector. This would be essential in order to exploit the cost-saving potential of high-impact health sector strategies, thereby positioning prevention at the centre of public health.

Likewise, it is important to note that while CEAs are instrumental when comparing value per unit spent across the health care sector (most notably in terms of QALYs), other policy alternatives could be used in a complementary way to evaluate the economic costs and benefits of preventive and curative care interventions. Societal cost-benefit analyses (SCBAs) could be progressively introduced as a critical decision-making tool in policy fields relating to health and health care, given their potential to provide an overview of the welfare effects of health interventions on society as a whole (Romijn and Renes 2013, Pomp et al. 2014). While CEAs should continue to be prioritized as a tool to determine whether particular programmes are capable of achieving the desired quality of life (QoL)-related outcomes for targeted individuals, SCBAs should be mobilized in parallel as a way of quantifying the potential impact of health policies on social welfare and economic prosperity. When assessing the value of prevention for Dutch society, therefore, CEA and SCBA metrics should be employed in tandem in order to arrive at a more comprehensive understanding of the effect that health interventions could have both *within* and *beyond* the health care sector, in both health and economic terms. The metrics used in our assessment of intervention alternatives are of great practical importance, given that the incorporation of preventive strategies within our health care system requires a deeper understanding of the long-term health, soci-

etal and economic benefits that could potentially be achieved over the longer term. It seems reasonable to suggest that the above also be taken on board by the HTA agency, which could at the same time develop a broader multisectoral scope in order to analyse the 'bigger picture' and to assess the potential of health interventions on the economy and society at large.

The impact that prevention could have on the onset and progression of an array of chronic disease conditions should provide a sufficient indication of the remarkable health and economic value of interventions that promote healthier lifestyles and environments. Indeed, the rising cost of treating preventable conditions associated with obesity and hypertension alone could demand upwards of 20% of the health care budget (Dobbs et al. 2014). While this illustrates the high and growing economic burden that preventable morbidities could place on the Dutch health system, the quality of life and labour productivity that could be lost due to proliferating preventable conditions should not be understated. Moreover, given the interdependence between population health, societal welfare and economic productivity, prevention offers a financially prudent response due to its emphasis on averting the occurrence of the very diseases that contribute to detrimental health and economic outcomes. In practice, a decision to fund prevention strategies is a political one. In this paper we have attempted to provide evidence that investing more in prevention should not be seen as simply a cost, but as a means of controlling health spending and promoting economic and social productivity and, most importantly, of providing non-monetary benefits in terms of improved quality and enjoyment of life. As an integral component in the attainment of happier, healthier and more productive lives, prevention is intrinsically aligned with the values upheld by Dutch society.



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