Social cost-benefit analysis of tobacco control policies in the Netherlands

Maatschappelijke kosten baten analyse van tabaksontmoediging

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Summary

Main outcomes

In the Netherlands approximately 23% of the population of 15 years and older smokes (19.8% of the population from 0-100 years, on which the calculations in this study are based). In the reference or base-case scenario (a scenario in which no changes are assumed in the government's current tobacco control policy for a period of 35 years), the prevalence of smoking will decrease by 2.3 percentage points over the next 35 years. In the alternative scenarios presented in this report, the prevalence could potentially decrease by 14.2 percentage points through tobacco control policies. In addition, all alternative scenarios result in a positive net benefit, though different stakeholders benefit depending on the scenario. In scenarios in which the prevalence decreases, for example as a results of mass media campaigns, the most benefits are gained by consumers (QALY gain) and employers (reduction in productivity losses) and in scenarios in which the excise tax is increased, the most benefits are gained through tax incomes. The scenarios in which a combination of both tax increases and a policy package are introduced (WHO MPOWER) result in benefits for both consumers and employers as government incomes through taxes.

Introduction

In a study in 2012 it was estimated that approximately 3.9 million people in the Netherlands smoke. In addition, smoking is one of the leading causes of cardiovascular diseases, (lung)cancer and chronic obstructive pulmonary disease (COPD). Besides the negative impacts of smoking on health, smoking also causes a significant economic burden to society. In 2010, €2.8 billion was spent on diseases caused by smoking in the Netherlands.

This report describes the societal costs and benefits of smoking, a so-called social cost-benefit analysis (SCBA). In this study, all relevant costs and benefits of smoking are presented in monetary values, while adopting a macro-economic perspective. A SCBA conform the Dutch guidelines for SCBA contributes to informed policy-making and decision-making in the field of public health. This study was commissioned by the Dutch Smoke-free Alliance (ANR) and was funded by the Dutch Cancer Society.

In this report, several smoking-related policy scenarios are being compared;

1) the current situation, which is the reference scenario;
2) an annual 5% excise tax increase;
3) an annual 10% excise tax increase;

4) (annual) mass media campaigns;
5) the introduction of a policy package defined by the WHO (consisting of smoking bans, quit smoking aids, mass media campaigns, advertisements bans - MPOWER), including an annual 5% excise tax increase;
6) the introduction of a policy package defined by the WHO (consisting of smoking bans, quit smoking aids, mass media campaigns, advertisements bans - (MPOWER), including an annual 10% excise tax increase;
7) a scenario in which the Netherlands is smoke-free in 35 years (<5% smoking prevalence);
8) a scenario in which nobody starts smoking from 2017 onwards.

In order to properly map the different interventions, a time horizon of 35 years is chosen. This means that all costs and benefits are calculated until the year 2050. This study provides an overview of the prevalence of smoking in the Dutch society, and costs and benefits expressed in monetary values of each stakeholder (e.g. consumers, employers, and excise incomes).

Method

In a SCBA, the following steps are usually undertaken:

1) Scoping the problem;
2) Determining the reference scenario (determining the costs and benefits in the reference scenario);
3) Defining the distinctive measures;
4) Defining and valuing the costs of concerning measures in the reference scenario;
5) Defining and valuing the benefits of the measures in the reference scenario;
6) Presenting an overview of the costs and benefits of each policy (net value, but also the overview of both debtor and creditor, plus the distributional effects);
7) Sensitivity analyses;
8) Presenting and interpretation of the outcomes.

For the current SCBA, we used the Chronic Disease Model (CDM) developed by the National Institute for Public Health and the Environment (RIVM), the SimSmoke model and a specially designed excel model. The CDM is a Markov model, which is used to estimate disease burden (mortality, morbidity, quality of life), and costs within the health care sector. The impact of each policy scenario - with respect to smoking prevalence and health risk - is calculated through the SimSmoke model. Combining these models, health care costs (including smoking-related health care costs) and quality

adjusted life-years (QALYs) are calculated. Next, based on the population numbers from the CDM and the SimSmoke model, the societal costs (e.g. productivity losses) are calculated through the specially designed excel model. A discount rate of 3% is used in this study. For the reference scenario, both discounted and undiscounted results are presented. The costs and benefits are presented in the following categories: the monetary value of QALY health gains (valued at €50,000 per QALY); smoking-related health care costs; other health care costs; smoking-related Alzheimer costs; smoking related eye disease costs; value of consumer surplus; government incomes through taxes; costs of fire damage; costs to the environment; absenteeism/presenteeism (direct productivity losses); productivity transfer costs; (old-age) pension transfer costs; absenteeism/presenteeism (indirect productivity losses); and intervention costs. The producer surplus and the impact of the reviewed policies on the labour market are not included in the model.

The consumer surplus is included in the model (conform guidelines) although this is a difficult concept to interpret when consumption is driven by addiction, as the smoking is (partly) involuntary. The producer surplus and the impact of the policies on the labour market are not included in the model (conform guidelines) as no policy directly intervenes within the market and changes in these sectors are expected to lead to distributional effects only on the long term.

To examine the validity of the assumptions and results in the study, several sensitivity analyses have been performed. We performed one-way sensitivity analyses by examining the impact of different valuations of the QALY (i.e. €20,000 - €100,000 - €200,000) and three different effectiveness estimates for mass media campaigns (low, normal, high impact). In addition, probabilistic sensitivity analyses were performed to examine the uncertainty around main parameters within the CDM (such as population numbers, start/stop probabilities of smoking, and health care costs).

Results

Scenario 1: The reference scenario

In this scenario no changes are assumed in the government's current smoking-related policy for a period of 35 years. It appears that the prevalence of smoking decreases with 2.3 percentage points, from 19.8% in the year 2015 to 17.5% in the year 2050. Furthermore, smoking-related health care costs will increase from €8.3 billion in 2015 to €10.9 billion in 2050 (no discounting applied). Also, the value of the consumer surplus will decrease and the value of QALYs will increase in this period.

Scenarios 2 & 3: Annual tax increase of 5% and 10%

In these scenarios the effects from an annual 5% and 10% tax increase are calculated for society. The price increase is multiplied with the total price elasticity of demand of smoking (-0.4) in each scenario. It is worth noting that only half of this elasticity is attributed to a decrease in smoking

prevalence (prevalence-elasticity of -0.2), because there are people who will smoke less but do not quit entirely. The other half (intensity-elasticity of -0.2) is attributed to a decrease in the sale of cigarettes. It is important to note that the effect of prevalence elasticity is not linear. Over time, the prevalence elasticity will decrease, however due to the complexity of the model and the annual changes in the transition rates, the absolute decrease in smoking prevalence is difficult to point out. Government income through taxes increases in both scenarios. Increasing the annual taxes by 5% leads to government income of €4.3 billion per year in 2050, and increasing annual taxes by 10% leads to government income of €23.5 billion per year in 2050 – which compares favourably to the €1.2 billion anticipated in the reference scenario. The cumulative net benefit (all the benefits minus all the costs over the whole time horizon) in these scenarios is €57 billion and €179.4 billion respectively.

Scenario 4: Mass media campaign

In this scenario, we estimated the effects of an annual mass media campaign. A mass media campaign is the provision of information through television, radio, billboards etc. to discourage smoking. International literature shows that the effectiveness of such a campaign may lead to a decrease of smoking prevalence by 0.4 - 7.0 percentage points annually; we assume a relative decrease of smoking prevalence of 1.2% each year. Based on the 2008 campaigns, it is calculated that the campaign costs will be €6.15 million in the first year and €4.62 million for each subsequent year. It is further assumed that the campaign will be renewed every three years to avoid campaign weariness, costing €6.15 million every first year of the renewal. In this scenario, the prevalence of smoking decreases to 12.5% in 2050. Furthermore, we expect to see decreases in government income through taxes, substantial QALY health gains, and substantial increases in productivity. The cumulative net benefit in this scenario is €2.2 billion.

Scenarios 5 & 6: WHO policy package with 5% and 10% annual tax increase

In these scenarios, the consequences of policy measures from the WHO FCTC treaty, the MPOWER package, are estimated – with annual tax increases of 5% and 10%. The MPOWER package consists of smoking bans, help with quitting smoking, mass media campaigns, advertisements bans and tax increases. These scenarios are a combination of provision of information/education on the one hand, and annual tax increases on the other hand. The smoking prevalence decreases in these scenarios to 7.7% and 5.6% in 2050. Also, a significant increase of government incomes through taxes and increases in productivity is apparent, as well as a strong increase in QALY health gains. The cumulative net benefit in these scenarios is €52.9 billion and €98.9 billion respectively.

Scenario 7: Smoke-free society (prevalence <5%)

In this scenario, the costs and benefits were counted back from the desired result: a smoking prevalence of <5% in 2050. No further adjustments have been made to the model compared to the reference scenario. In this scenario, the value of QALYs increase significantly and government income through taxes decreases. Also, major improvements in work productivity are noticeable. The cumulative net benefit in this scenario is €9.1 billion.

Scenario 8: Nobody starts to smoke

In this scenario, the probability that a person initiates smoking is assumed to be zero from 2017 onwards. This leads to a significant increase in QALY health gains and a decrease in government income through taxes. Also, major improvements in work productivity are noticeable in this scenario. Moreover, the prevalence decreases to 4.8% in 2050 and the cumulative net benefit in this scenario is €10.3 billion.

Conclusion

This SCBA shows that, when no new policy measures are implemented, the prevalence of smoking will decrease by 2.3 percentage points over the next 35 years. The policies reviewed in this report have the potential to decrease smoking prevalence by 14.2 percentage points (and in a 'smoking-free society scenario, by as much as 17.4 percentage points). Furthermore, the results show that the intervention costs for all scenarios are minimal, and that investing in health is beneficial as seen from both the public health and fiscal perspective. It is important to note the relationship between the chosen policy measures and the estimated impacts.

For instance, annual tax increases lead to an increase in government incomes but also result in a relatively weak effect on smoking prevalence and disease burden. In contrast, mass media campaigns also have a positive effect on smoking prevalence but a negative effect on government incomes. The WHO policy packages with 5% and 10% excise tax increases lead to a positive effect on both smoking prevalence and government income. The consumer surplus decreases in all scenarios. If the consumer surplus is not taken into account, the results of the policy scenarios show even greater positive effects.

It is necessary to keep in mind that annual tax increases may lead to crowding-out effects / frontier effects. European legislation could potentially negate these effects. Nevertheless, this SCBA shows that all scenarios presented result in both short-term and long-term positive net benefits. Hence, this study highlights important future insights to smoking cessation within the Netherlands.

Instructions for readers

This report is divided in several chapters. Chapter 1 provides an introduction and aims of the study. Chapter 2 discusses the steps usually taken to conduct an SCBA and will provide more insights into the different models that are used in order to obtain results. Next the reference scenario will be discussed (Chapter 3), afterwards the different alternative scenarios will be discussed: the scenarios which focus on an annual 5% and 10% excise tax increase (Chapter 4.1); (annual) mass media campaigns (Chapter 4.2); the introduction of a policy package defined by the WHO including an annual 5% or 10% excise tax increase (Chapter 5); a scenario in which the Netherlands is smoke-free in 35 years (<5% smoking prevalence; Chapter 6.1); and a scenario in which nobody starts smoking from 2017 onwards (Chapter 6.2). In Chapter 7 an overview is presented of the results of all the scenarios side-by-side, including the sensitivity analyses. Lastly, Chapter 8 discusses the implications of the results and discusses important methodological considerations.

Graphical representation of results

Figure 1: Overview of the smoking prevalence per scenario

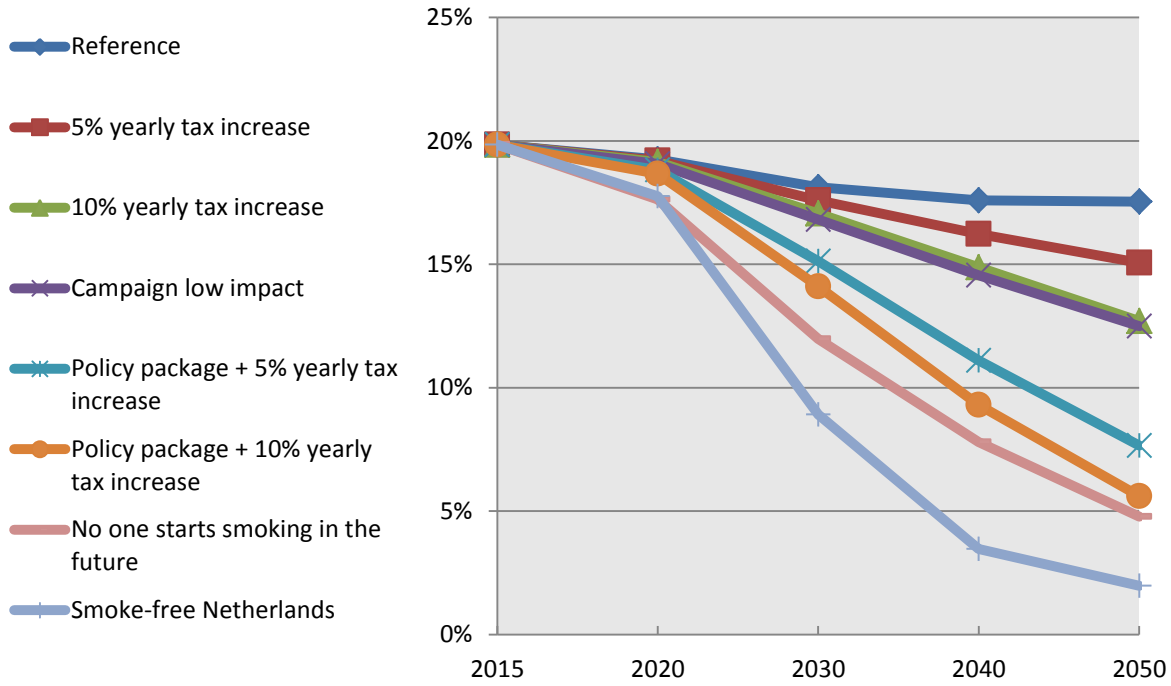
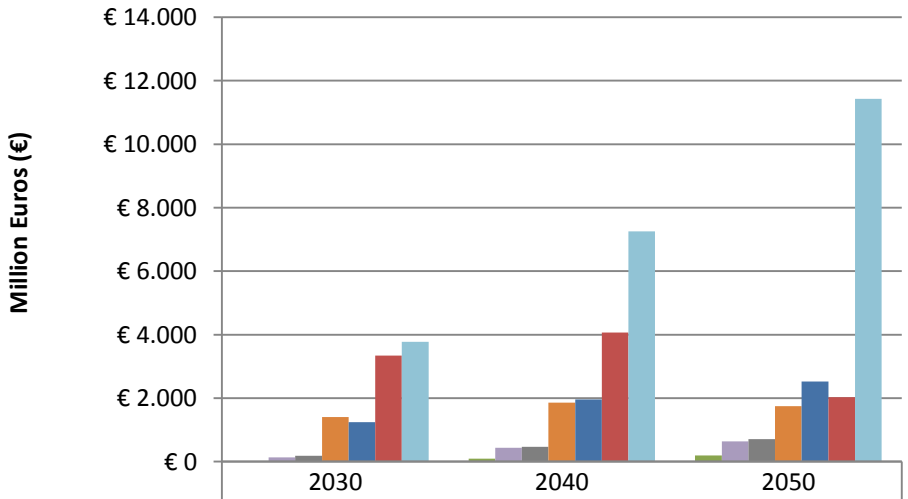


Figure 2: Incremental net benefit per scenario per year



	2030	2040	2050
Mass media campaigns	€ 18	€ 93	€ 194
Smoke-free Netherlands	€ 132	€ 434	€ 644
No one starts smoking in the future	€ 181	€ 472	€ 710
Policy package + 5% yearly tax increase	€ 1.410	€ 1.855	€ 1.745
5% yearly tax increase	€ 1.247	€ 1.961	€ 2.528
Policy package + 10% yearly tax increase	€ 3.340	€ 4.069	€ 2.034
10% yearly tax increase	€ 3.776	€ 7.253	€ 11.429

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