Tobacco control policies and socio-economic inequalities in smoking cessation

Evaluating natural experiments

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General discussion
AIMS

The general aim of this thesis was to assess the effect of tobacco control policies on smoking cessation and socio-economic inequalities therein. In this chapter, I reflect on the main findings of this thesis, along with methodological issues relevant for their validity and generalizability. Next, I present overarching conclusions distilled from this combined body of work. Lastly, leading from these reflections and conclusions, I will discuss implications for policy, and recommendations for future research.

MAIN FINDINGS

Tobacco control policy

The aim of Part I of this thesis was to describe recent developments in tobacco control policies in Europe and underlying patterns. In Chapter 2, we began by describing general patterns in how tobacco control policies developed over time in Europe. We found that the sum of policies could be clustered together in their development in three distinct components. The first component included the price of tobacco and smoking cessation support services. Countries’ performance on this component varied to a large degree between countries, but not much improvement was observed over time. The second component captured restrictions on tobacco advertising in print media, cinemas, and outdoors. Nearly all countries performed well on this component from the beginning of the study period. The third component contained smoking bans in public places, health warning labels, and bans on advertising and display of tobacco at the point of sale. For this component, strong progress was observed in nearly every country in Europe, but there were differences in the timing and strength of the progress. Overall, we can conclude that tobacco control policy development was not quite uniform across Europe during the past decade, but the variance in development differed between specific policy areas.

In Chapter 3, we set out to study particular underlying aspects that might shape tobacco control policy development, specifically the political environment. We found that there was no single influence that was stable over the entire period (1996-2010). However, up to around 2003, there was a (non-significant) pattern, that countries with a predominantly left wing government implemented more tobacco control policies. Government effectiveness seemed to be important mostly in the period of most rapid changes in policy (2001-2005). After 2005, when the FCTC
entered into force, the importance of both national political indicators further diminished. The overall results suggest that whereas the influence of national political factors on tobacco control policy development declined in Europe since the 1990s, the influence of other factors (possibly the FCTC and EU directives) has increased instead.

**Socio-economic inequalities in smoking behaviour**

In Part II, the aim was to describe socio-economic inequalities in smoking behaviour across Europe. Chapter 4 focused on smoking cessation over more than two decades. The results were separated into two periods, 1987-1995 and 2002-2012 (no data was available in between). In the first period, smoking cessation increased significantly in all population groups, and inequalities by SES were constant or slightly decreasing. However, in the second period, smoking cessation only increased among the high SES groups. This leads us to conclude that since the 1990s, rates of smoking cessation have stagnated among the lower SES groups, and socioeconomic inequalities in smoking cessation have increased in Europe.

In Chapter 5, we looked specifically at socio-economic inequalities in the use of electronic cigarettes (ENDS), a recent addition to the spectrum of smoking/nicotine-related behaviours. Overall use of ENDS was highest among teenagers and young adults, and those with a higher education or still studying, while no differences were found according to social class. Use of ENDS specifically as a tool to quit smoking was not common, i.e. below 10% in all groups. Moreover, only 7.1% of those who made a quit attempt used ENDS specially to quit smoking, with no differences by education or social class. The vast majority of ENDS users were also current smokers of regular cigarettes.

**Tobacco control policy and precursors of smoking cessation**

In Part III of this thesis, we aimed to evaluate associations between tobacco control policy measures and behaviour related to smoking cessation. In Chapter 6, we did this by investigating how the volume of online search queries for smoking cessation information changed around the introduction of new tobacco control measures. We found that the introduction of a smoking ban in bars and restaurants was followed by a significant short-lived increase in the smoking cessation search volume. The reimbursement of smoking cessation medication in 2011 had a more lasting effect on the search volume. This significantly increased from 3 weeks after implementation, and remained significantly higher up to one year after implementation. The reimbursement was cancelled in 2012, and when it was
reintroduced in 2013, the effects were somewhat smaller. Still, a significant increase in search volume was found, lasting up to 32 weeks after implementation. Thus, we conclude that tobacco control policies can have short- or medium-term effects on smoking cessation related behaviour.

In Chapter 7, we set out to study the effects of introducing pictorial health warning labels on cigarette packages on online searches for smoking cessation information. We used data from Denmark, France, Ireland, Norway, Switzerland, and the United Kingdom. In most cases, effect sizes were small and not statistically significant. Only in the UK did we see a significant increase in the search volume at 2-3 months after implementation, but this might be a spurious finding. From these results, it would seem that introducing pictorial health warning labels on cigarette packages is not effective in increasing smoking cessation related information seeking. However, it is well documented that pictorial health warnings do have a significant impact on other outcomes, such as preventing uptake of smoking (among children) and changing smokers’ attitudes towards tobacco use.

**Tobacco control policy and socio-economic inequalities in smoking cessation**
The aim of part IV was to evaluate associations between a comprehensive set of tobacco control policies and socio-economic inequalities in smoking cessation. In Chapter 8, we assessed the relationship between the total score for tobacco control (TCS) in the Netherlands over two decades and smoking cessation among low and high SES groups. Between 1988 and 2000, tobacco control policies were not associated with smoking cessation at all. From 2001 onwards, there was a significant positive association, i.e. a stronger policy score was associated with higher rates of smoking cessation. This finding was similar for low and high SES groups, with a possible distinction in the timing of this effect. The strongest association for the high SES group was observed one year after implementation of the policies, whilst for the low SES group the strongest association was found two years after implementation. Lastly, no association was found between tobacco control policies and the number of cigarettes smoked per day by those who did not stop smoking. Overall, we conclude that the strong set of policies introduced in the 2000s was associated with increased quitting, whereas the weaker policies introduced in the 1990s were not.

In Chapter 9, we studied the whole EU, using Eurobarometer survey data from 2006, 2009, and 2012. We studied the associations between the TCS (both total score
and six domain scores) and both smoking cessation and smoking intensity. We found a significant association of the TCS score and smoking cessation among the high educated group, but not among the middle and low educated groups. When these results were specified by policy domain, a similar pattern emerged: five out of six domains were significantly associated with smoking cessation for the high educated group only. Moreover, we found that a higher TCS score was significantly associated with a lower number of cigarettes smoked per day, but not among the low educated group. Therefore, we can conclude that the recent developments in tobacco control policy in Europe were most effective among the higher educated groups, whereas no significant associations were found among the lower educated groups.

**Mechanisms of tobacco control policy effects**

In part V, we aimed to describe in more detail the causal mechanisms through which tobacco control policies can affect smoking cessation. We chose to focus on tobacco taxes in Chapter 10, as these have consistently been found to be the most effective tobacco control policy. Many reviews had already focused on the effect size, often in terms of price elasticity, but our focus was on finding out how this effect is achieved. Through a systematic literature review of medical, sociological, economical and grey literature, we synthesized evidence on the basis of which we developed a theoretical framework. This framework describes which mechanisms lead from an increase in the tax/price of tobacco to changes in smoking behaviour (cessation, cutting down, brand switching). The most striking finding was the low number of studies containing any evidence on the mechanisms. From the limited number of studies, we were able to distinguish three mechanisms: 1) an increase in tax leads to stronger societal antismoking norms, which in turn lead to smoking cessation; 2) an increase in the spending on tobacco leads to an inability to meet other essential needs, such as housing or food, which in turn leads to smoking cessation; and 3) the announcement of a tax increase will cause a smoker to balance the cost of tobacco versus the utility derived from it, the increased cost means increased chances of this balance turning out negatively, which leads to smoking cessation. The findings of this study can help to inform policymakers on how to apply a comprehensive tobacco control strategy to future tax increases to maximize the impact of the tax.
METHODOLOGICAL ISSUES

Measures
In most of the studies included in this thesis, we have relied on the use of self-reported measures (smoking status, smoking cessation, etc.). Although these are often used, and in many cases validated, they do have some limitations. Smoking status measured by self-report when validated by saliva or urine cotinine levels has been shown to be reliable in most cases, or slightly underestimated. Only among those who do not smoke every day or who smoke very few cigarettes per day there was a larger discrepancy between self-reported smoking and cotinine levels. Some studies have reported small differences in the validity of self-reported smoking between high and low SES groups, others did not. It seems that some differential misclassification might occur, but not to the extent that it could explain the socio-economic inequalities reported in this thesis and throughout the literature.

Smoking cessation can be measured in several ways, perhaps the simplest one is to use the quit ratio, as we have done in Chapters 4, 8, and 9 of this thesis. The quit ratio is the proportion of ever-smokers that has since quit smoking. This measure is often available, as many questionnaires where smoking is not the main focus only make the distinction between current, former, and never smokers. However, it is a fairly crude measure, as it fails to provide more information about the smoking history of the respondent. This becomes especially important when the quit ratio is used to evaluate short-term changes following the introduction of new policies, as it cannot distinguish those who have quit smoking recently from those who have quit many years before. The quit ratio is more suited to use in long-term trend analyses, as gradual changes over time are well reflected in the quit ratio, and less dependent on recent quitting. For studies aiming to study short-term effects (of policies), a measure that captures the moment of quitting would be better suited.

A central question in the studying of trends in (socio-economic) inequalities, and in the discussions about policies to decrease these inequalities is whether to focus on absolute inequalities or relative inequalities (or both). However, this question is often overlooked. Researchers tend to focus on one or the other (most often on relative inequalities), while policymakers often completely fail to specify which of the two they address. An example used by Mackenbach, seen in table 1, clearly shows the different conclusions that could be drawn when focusing on absolute versus relative inequalities. In the example, absolute inequalities decreased from a rate difference of 100 to 70 (a 30% decrease), while at the same time relative inequalities increased
from a rate ratio 2.0 to 2.4 (a 20% increase). Oftentimes when the prevalence decreases, relative inequalities become more pronounced. Conversely, when the population-wide prevalence decreases, absolute inequalities tend to decrease. This begs the question what the goal of the policy should be. To reduce differences between the low and high SES groups, or to improve the outcomes in the low SES group? Achieving a decrease in relative inequalities can be difficult, as is demonstrated by the studies in this thesis, among many others. Achieving a decrease in absolute inequalities is easier, and it makes sense from the perspective of the low SES group. For this group, the primary concern would be an improvement in their own health, rather than their health being equal to that of the high SES group. In this thesis, I have mostly focused on relative inequalities. In many of the included countries, the prevalence of smoking was still substantial for most of the study period. Therefore, it seems unlikely that conclusions based upon absolute inequalities instead of relative inequalities would have been very much different. At any rate, it must be acknowledged that all groups, including the low SES groups, have benefitted from the policies evaluated in this thesis. However, looking at the inequalities that remain today, both relative and absolute, I feel strongly that more needs to be done to address these inequalities in the future, and the focus on relative inequalities can help strengthen this message.

**Table 1** Illustration of the difference between absolute and relative inequality measures (adapted from Mackenbach).

<table>
<thead>
<tr>
<th></th>
<th>Old situation</th>
<th>New situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality rate among high SES</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Mortality rate among low SES</td>
<td>200</td>
<td>120</td>
</tr>
<tr>
<td>Rate ratio</td>
<td>2.0 (200/100)</td>
<td>2.4 (120/50)</td>
</tr>
<tr>
<td>Rate difference</td>
<td>100 (200-100)</td>
<td>70 (120-50)</td>
</tr>
</tbody>
</table>

Although SES is very much a central concept in this thesis, there are many ways to measure it. We have mainly used measures of educational level and occupational class to represent SES, however in Chapter 10, income was the main measure of SES. Each measure has its own merits and limitations, which might influence the conclusions drawn from these studies. Previous studies have made direct comparisons between different measures of SES, which could shed some light on their relative contributions to inequalities in smoking behaviour. Education was compared to occupational class, activity status, household income, accumulated wealth, and housing tenure. Activity status and household income were not
significantly predictive of smoking, but the other four measures were. However, there were some differences by age group and by sex as to which measure of SES was most predictive of smoking.\textsuperscript{12} In the studies in this thesis where we included both education and occupation, we saw few differences in the overall conclusions based on these results. So it would seem that the inequalities observed in this thesis are fairly robust to the measure of SES used. However, based on the differences that were found in this thesis as well as previous studies, future studies would do well to include more than one measure of SES wherever possible.

For our policy evaluation studies, we have relied strongly on the TCS. Because of its quantitative nature, it is readily comparable across countries and over time, and transparent in its composition.\textsuperscript{13} However, the lack of data on enforcement is one of its key limitations, as evaluating a policy that is implemented on paper but not upheld in practice is rather pointless. It seems reasonable to assume that if policies in our study had not been enforced properly, our estimates of their potential effectiveness could be affected. Another limitation of using the TCS is the way it measures the price of tobacco, which is the most popular price category (MPPC). Because price is the biggest component of the overall TCS score (30\%), this measure has a strong impact on the results of studies using the TCS. Although the MPPC is a good representation of what the average smoker in the country spends on cigarettes, low SES smokers in particular might be able to obtain cigarettes at (sometimes considerably) lower prices than the MPPC.\textsuperscript{14–17} This might explain why we found no evidence of effects of this measure of tax increases among low SES groups in Chapters 8 and 9. However, compared to econometric studies that show greater tax effects among low SES groups than among high SES groups, perhaps the use of MPPC data (such as in the TCS) makes for a more real-life scenario.

\textbf{Designs}

In this thesis, we have mostly employed a combination of country comparisons and time trend studies. These have been useful to study the impact of tobacco control policies in Europe, but both of these designs have some (shared) limitations. The main difficulty in comparing the impact of similar tobacco control policies between two countries (or using a country without the policy as a control for a country with the policy) is ensuring comparability. Smoking is a complex behaviour, influenced by many contextual factors at different levels, e.g. societal norms regarding smoking,\textsuperscript{18} economic development,\textsuperscript{19} or the position of women in society.\textsuperscript{20} If the compared countries are similar in terms of such contextual variables, country comparisons could be a very useful design, especially if residual confounding by
those contextual variables is adjusted for. The 11 European countries included in Chapters 3 and 4 are by-and-large comparable on many contextual variables. Moreover, we have adjusted for GDP and ever-smoking prevalence. However, we cannot rule out any residual confounding. In our studies of 27 European countries (Chapters 2, 5, and 9), the comparability is probably more problematic, as these include several Eastern European and former Soviet Union countries. The larger societal differences between these countries makes comparing policy effects between countries even less straightforward, although it has the advantage of providing more representative estimates for Europe as a whole.

When studying long term trends (say 20 years), similar issues are likely to arise. The national level environment that shapes smoking behaviour and smoking policy is likely to undergo substantial change over such a period. When we compared the 1990s and 2000s in the Netherlands in Chapter 8, we saw strong improvements in tobacco control, but society changed in many other aspects as well. A benefit of trend studies within countries is that most of the changes in confounders, e.g. the overall smoking prevalence and societal antismoking norms, are likely to be gradual. This would provide the perfect background to study the potential impact of rapid changes in tobacco control policy, and consider these as ‘natural experiments’. Comparing two single points in time could still be problematic, but using data at many intervals provides a good design to study changes in smoking behaviour. Moreover, the Google Trends analyses in Part III showed how the availability of weekly or monthly data allows for the use stronger tests, using statistical methods such as time-series analyses. These analyses can be used to provide not only detailed estimates of the effect size, but also specific information on the duration of the effect. It would have been ideal to use a similar approach for actual smoking cessation, but then we would need weekly or at least monthly smoking cessation data, which are not available for the majority of European countries. Being able to use four data points per year, like in the Dutch national survey used in Chapter 8, is already quite a rare luxury.

**Quantitative data**

A more general issue regarding the analyses in this thesis, is that (apart from Chapter 10) it employs a quantitative approach. This does have the benefits of being (relatively) easy to measure and compare, and it provides (the impression) of ‘hard facts’. However, it never tells the complete story. Qualitative data can supplement this with more detailed information on the *why* and *how* that are behind the observed (lack of) effects. We see this in Chapter 10, where the realist approach yields more
insight into a process that has often been reduced to simple numbers. The realist approach, and the incorporation of both quantitative and qualitative studies from several fields of research, has the potential to provide a more complete picture and a fuller understanding of the policy effects being studied. From these experiences, I am convinced that a similar approach, a combination of quantitative and qualitative data, would be the best approach for any type of policy analysis. Quantitative data would be used to show the effect in general, with a main strength being the ability to quantify the magnitude of the effect while adjusting for possible confounding factors. Qualitative data from interviews or focus-groups could then supply a more detailed understanding of how policy X led to effect Y among people in group Z. The perspective of those affected by the policy could provide invaluable insights for refining the policy to optimize its effects. In addition, one could also include policy documents and interviews with policymakers, to get a better view of the rationale and expectations that shaped the introduction of the policy.

Apart from using qualitative data, there are other ways to gain more detailed insights in the processes of behaviour change associated with tobacco control policy implementation. One example of a quantitative research design created with this purpose in mind is the International Tobacco Control (ITC) Policy Evaluation Project. The conceptual model of the ITC study explicitly includes many psychosocial factors that are intermediaries between policy and effect. For example, before studying whether health warning labels on cigarette packages have any effects on attitudes or behaviour, they measure the noticeability and salience of the labels. If people did not notice them, it seems unlikely that any further effect could be observed. The ITC project enjoys the general benefits of a quantitative approach, with the added benefit of more detailed information on the individual links in the causal chain between policy and effect.

**INTERPRETATION OF MAIN FINDINGS**

One of the key results from this thesis is that we did not find any evidence that tobacco control policies would have diminished socio-economic inequalities in smoking cessation in Europe. In most studies we found either a stronger effect for high SES groups and a weaker effect for low SES groups, or no effects among low SES groups at all. In some studies we found similar effects in both groups, but in no study did we find a stronger effect for the low SES group. This has several possible reasons, which I shall discuss here, but perhaps more importantly, it should serve as
a call to action for future research and policy, both of which will be discussed in further sections.

Part of the explanation of why tobacco control policies are less effective among low SES smokers is found in the distinction between quit attempts and quit success. Low and high SES groups on average make an equal amount of quit attempts, but quit success rates in the high SES group are twice as high as in the low SES group. A review by Hiscock highlighted several reasons for the lower chance of successful quitting among low SES smokers: a low level of social support for quitting, and a pro-smoking norm in the direct social environment; the level of addiction (low SES smokers are often the most heavily addicted); lack of self-efficacy in smoking cessation; and stress. Tobacco control policies have the potential to address most of these issues, except possibly sources of (financial) stress, work stress, etc. Moreover, affecting a single one of these issues might not be enough, because if the other barriers remain in place, raising quitting success rates remains an uphill battle.

The one measure most often mentioned as having potentially equity-positive effects (i.e. decreasing inequalities) is tobacco taxation. Review studies that come to this conclusion often base their results on econometrical studies, which have some limitations. Firstly, virtually all of them report outcomes in terms of the price elasticity of tobacco consumption. This is a macro-level measure which does not reflect individual responses to tax increases, as it cannot distinguish quitting from cutting down, or a decrease in one subgroup from an increase in another. Moreover, if smokers shift to smuggled or illicit tobacco, their actual consumption could be unchanged, even though observed national consumption levels decreased. Putting aside the criticism of this design, even the short-term changes in elasticity of current smoking found in these studies might be overestimating the effect by failing to take relapse into account. This could be a reason why price-elasticity studies yield different results than smoking cessation studies such as ours. Furthermore, a recent review with a focus on the equity effects of tobacco control policies found only about half of tax increase evaluations showed an equity positive effect. Although this is more than can be said for any other type of policy, it still shows that the effect of raising taxes is not unanimously equity positive. Suggested explanations for the lack of an equity positive effect include: effects of taxes do not show strongly in smoking prevalence, but mostly in smoking intensity; the tax increase was too small to achieve any effect; the effect of tax increases has declined over time (since the introduction of other advanced tobacco control policies); and smoking is more important to low income smokers as a way of coping with stress. Moreover, in our
own realist review (Chapter 10), we found that making a balance of the cost and utility of smoking is a main mechanism leading to cutting down or quitting. However, the fact that the main mechanism seems to be more valid for high SES smokers than for low SES smokers might even point towards a negative equity impact. It could also mean that for the cost/utility balance to tip in favour of smoking cessation among low SES smokers, the price increases need to be substantial and abrupt instead of small and gradual.

Social norms could also provide part of the explanation for an overall lack of equity positive effects. In our review (Chapter 10), we found some support for societal antismoking norms having a positive influence on quit rates. However, these ‘objectively measured’ societal norms are only part of the picture. Smoking norms can be dissected in distinct constructs, including explicit norms based on what other people say and do, but also more implicit aspects that rely on the individual’s perceptions. These include the perception of how many people smoke and quit (descriptive norm), the perceived acceptability of smoking in society (injunctive norm), and the perception of whether people think you should quit (subjective norm). The injunctive norm has been found to differ between low SES and high SES smokers, with a more accepting injunctive norm among the low SES smokers. In one study some evidence was found that such an accepting injunctive norm reduced the odds of using pharmacotherapy for smoking cessation. In our review, we also found that being surrounded by a generally pro-smoking norm seems to be a buffer against the effects of price policies.

Another main component of a comprehensive tobacco control strategy, smoke-free laws in public places, has also been associated with equity negative outcomes. Whereas exposure to smoke-free policies in bars and restaurants is similar for low and high SES groups, high SES groups are more likely to encounter smoke-free laws at their workplace. This shows the need of properly implementing and enforcing comprehensive smoke-free policies in the workplaces of low SES smokers. However, increasing the reach of smoke-free policies might not fully address the negative equity effect. It seems that low SES smokers have more negative opinions about the smoke-free laws, which might negatively affect their compliance with them. Moreover, forcing smokers to smoke outside bars and restaurants might increase feelings of stigmatization. This stigma might serve to increase motivation to quit smoking, however when internalized, it might in turn reduce motivations to quit and self-efficacy in quitting among low SES smokers. In addition, smoke-
free bars and restaurants are much less effective among older people,\textsuperscript{36} as they tend not to go out as much, which limits the population impact of these policies.

When the other tobacco control policy components are considered, the lack of a demonstrable equity-positive effect on the population level is not surprising. Mass media campaigns, when targeted at the low SES, have the potential to be equity positive, but many are not especially targeted and their equity effects are inconsistent.\textsuperscript{25} Moreover, in many European countries, the spending on mass media campaigns has either been consistently low or steadily declining in recent years.\textsuperscript{13,37–39} As for smoking cessation services, their equity impact is generally mixed or unclear, while the kind of targeted approach that could decrease inequalities has only been implemented in the UK.\textsuperscript{25,40} Lastly, health warning labels and restrictions on tobacco advertising seem to be equally effective among low and high SES groups.\textsuperscript{25} In conclusion, very little evidence has been found for positive equity impacts of tobacco control policies of all types. This can be seen in Table 2, which displays the findings of the review by Brown et al. that assessed the available evidence for the equity impact of different types of tobacco control policies.\textsuperscript{25}

**Table 2** The equity impact of population-level tobacco control policies (reproduced from Brown et al.).\textsuperscript{25}

<table>
<thead>
<tr>
<th>Policy type</th>
<th>Equity impact\textsuperscript{1}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Increases in tax/price of tobacco products</td>
<td>14</td>
</tr>
<tr>
<td>Smoke-free – voluntary, regional, partial</td>
<td>1</td>
</tr>
<tr>
<td>Smoke-free – compulsory, national, comprehensive</td>
<td>2</td>
</tr>
<tr>
<td>Mass media campaigns</td>
<td>3</td>
</tr>
<tr>
<td>Mass media campaigns – quitlines and NRT</td>
<td>5</td>
</tr>
<tr>
<td>Restrictions on advertising and promotion of tobacco</td>
<td>2</td>
</tr>
<tr>
<td>Population-level cessation support interventions</td>
<td>4</td>
</tr>
<tr>
<td>Settings based interventions (community, hospital)</td>
<td>2</td>
</tr>
<tr>
<td>Multiple policies</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total policies</strong></td>
<td><strong>33</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{1} Equity impact: + (positive), +/- (neutral), - (negative), M (mixed), ? (unclear), T (total number of studies). \textsuperscript{2} Some studies assessed more than one policy, therefore totals might not always add up.
IMPLICATIONS FOR POLICY

The strongest conclusion from this thesis is that the policies that have been introduced in the past two decades have not been enough to reduce socio-economic inequalities in smoking. Thus, there is a great benefit to be gained by strengthening efforts to achieve increased cessation rates among disadvantaged populations. For instance, modelling studies with data from 19 European countries have shown that relative inequality in mortality (from all causes) between low and high educated groups could be reduced by 26% for men and 32% for women by reducing inequalities in smoking.\(^{41}\) Reducing these inequalities is imperative, as inequalities in society (income inequalities, health inequalities, smoking inequalities) will eventually have countless negative effects, not only for the lower groups, but for society as a whole.\(^{42}\) Therefore, in this section I will try to provide some thoughts on how to reduce inequalities in smoking.

First, it is important to realize when considering past and current tobacco control policies, that they seldom have as a stated objective to reduce inequalities. In most cases, tobacco control has been aimed at reducing smoking in the general population and preventing uptake among youth. For tobacco taxes in particular, this aim was often combined with the aim to generate a source of revenue for the government. Even in the FCTC, the word ‘inequalities’ does not appear at all.\(^{43}\) Nonetheless, population-wide tobacco control policies can have a substantial impact on population-wide smoking rates, and in the long term on population health. Although these effects may ‘trickle down’ to the low SES groups in time,\(^{44}\) we cannot expect that to be sufficient to reduce inequalities. The European Commission has published some reports on health inequalities, wherein they acknowledge the role of smoking as a driver of health inequalities.\(^{45-47}\) However, suggested measures to reduce these inequalities in smoking remain vague. If reducing inequalities is not an explicit policy objective, it seems unfair to expect much from these policies in this regard. In some isolated cases, reducing inequalities was included as a specific policy objective. In the UK, in 1998 ‘A White Paper on Tobacco’ entitled ‘Smoking Kills’ was published. In this document, the UK government outlined their vision and strategy concerning smoking, with one of the key goals being “to improve the health of the worst off in society and to narrow the health gap”.\(^{48}\) One of the specific policy actions to achieve this goal was the implementation of the National Health Service (NHS) smoking cessation services. Interestingly, this also happens to be one of the very few policies with strong evidence of its ability to decrease inequalities in smoking.\(^{49}\) Therefore, my recommendation would be that we need policies that are explicitly aimed at reducing
inequalities. To strengthen these aims, milestone targets could be formulated in terms of ‘reducing inequalities to X % or less within Y years’. As the prevalence of smoking decreases further, it would be wise for such a reduction in inequalities to be formulated in terms of absolute inequalities.

A second, potentially fruitful, focus for policymakers lies in achieving a higher reach of programs and services among the low SES groups. The impact of most policies or interventions is determined by their effectiveness multiplied by their reach.\(^5\) It is often assumed that maximizing the effectiveness of interventions is enough to address the issue. This oversimplification and neglect of the reach of interventions might be one of the reasons why so many policies have failed to decrease inequalities. The importance of the reach of policies can be highlighted by the example of the NHS smoking cessation services. Like in most other interventions, cessation success rates were lower in the low SES group compared to the high SES group. However, by locating the services in the most disadvantaged areas and providing an incentive for service providers to recruit more low SES smokers, they achieved a higher reach among low SES groups. This higher reach was able to more than compensate for the lower success rates and resulted in a net equity positive effect.\(^25\) Thus it would be an advisable strategy for future policies, including but not limited to cessation services and mass media campaigns, to employ a similarly targeted approach. In the Netherlands, this approach has not yet been implemented nationally, but it has been trialled. Trial results showed that for recruiting low SES smokers to attend smoking cessation behavioural therapy, the general practitioner was the most common channel.\(^51\) Quit rates for those attending the therapy were higher than background quit rates, and highest in the rolling groups (where people can join any time).\(^52\) For frequently attending sessions, it was important that there were no organisational barriers (such as not being contacted by session organisers), and that the smoker’s social environment was supportive.\(^53\) These trial results are promising, showing that a nationally targeted approach such as in the UK could also work in the Netherlands or elsewhere.

Ultimately, we must realize that socio-economic inequalities in smoking do not arise in isolation, they are inextricably linked to broader social and economic determinants.\(^54\) Therefore, we cannot expect tobacco control policies alone to completely eradicate or even substantially reduce socio-economic inequalities in smoking. An important way to effectively address these inequalities is to address the upstream social determinants.\(^55\) If tobacco use is determined by educational level, strategies to promote a decent level of education throughout society will eventually
also contribute to decreasing tobacco use. Addressing upstream social determinants requires structural policy changes like improvements in education, employment, welfare, social security, housing, etc. These areas are integral to improvements in health, especially for those in the most deprived groups. For instance, policies that can increase income levels have been shown to increase smoking cessation rates.\textsuperscript{56}

In recent years, E-cigarettes (ENDS) have been a hot topic in the tobacco control debate, questioning whether they are part of the problem or part of the solution. Proponents focus on the potential for ENDS to succeed where NRT and other interventions in the past have failed to bolster population-level quit rates. Opponents highlight the fact that the health effects of (prolonged) ENDS use are as of yet not fully known\textsuperscript{57–59} and that there is no strong evidence yet that using ENDS is effective to quit smoking.\textsuperscript{60,61} In Chapter 5, we saw that in 2012 ENDS were mostly being used by current smokers of high SES. This finding was replicated in the 2014 wave of the same Eurobarometer survey and elsewhere.\textsuperscript{62,63} If ENDS use does not improve quit success, and users remain mainly high SES smokers, then ENDS are not likely to be able to contribute to decreasing socio-economic inequalities. With some much still uncertain, a cautious policy approach to ENDS seems warranted. This could mean first offering tried and tested methods for smoking cessation, such as NRT, Varenicline or Bupropion, combined with cognitive behavioural therapy.\textsuperscript{64} ENDS could then be suggested as a last resort for smokers who have tried and failed to quit using other available methods.

Although we see (in this thesis and elsewhere) that smoking rates are stagnating, that doesn’t necessarily mean that the current set of policies is no longer useful. WHO FCTC progress reports show that in 2014, only about 60\% of substantive FCTC articles were implemented worldwide.\textsuperscript{65} For instance in the Netherlands, the FCTC shadow report showed that out of 13 policy areas, only 2 fully met the requirements and further recommendations set by the FCTC.\textsuperscript{66} On the majority of policy areas (8 out of 13), the minimum requirements were not fully met, but most were met partially. Although the Netherlands are certainly no frontrunner in terms of tobacco control, there are still many countries, also within Europe that are lagging even more behind. It is clear that, in the Netherlands, in Europe, and worldwide, there is still a lot to gain by fully complying with the tried and tested policies of the FCTC. To reach this goal, it would help to make the FCTC a stronger tool, with sanctions for countries failing to meet the required policy targets.
For countries where most of the FCTC policies have been fully implemented and smoking rates are amongst the lowest in the world (e.g. Australia, Finland, and New Zealand), the next step is to move towards a virtually tobacco free society.\textsuperscript{67, 68} Crucial to this ‘endgame’ vision is to explicitly state the goal of a near 0% smoking prevalence, and a clear target date by which to achieve this (preferably no further than 20 years away).\textsuperscript{69} Measures of an endgame strategy could focus on industry regulation and reducing the availability of cigarettes. This would help fight the common misperception that “They (cigarettes sic.) can’t be that bad if they are still sold everywhere”.\textsuperscript{70} More specific proposals include granting more regulatory powers to government agencies, limiting the amount of tobacco products available for sale, and an outright ban on selling and manufacturing cigarettes.\textsuperscript{71} What is interesting about these types of measures in light of the focus of this thesis is that they are by definition directed at all SES groups. If tobacco sales banned, this would most likely affect low SES and high SES smokers equally. In the end, these type of measures might be the only tool able to really tackle inequalities in smoking, and smoking in general. Although these endgame measures might seem unrealistic right now, remember that smoke-free bars were deemed equally unrealistic some 20 years ago. Some countries have already set target dates for a smoke-free society, such as New Zealand (2025),\textsuperscript{72} and Finland (2040).\textsuperscript{73} In most other countries, where smoking rates are still higher, there is probably insufficient political and societal support for such a move at this time. If Europe is to move towards the endgame, the role of the EU has to be considered. Implementing endgame strategies (such as a ban on production or sale of tobacco) would likely be impeded by the EU internal market regulations. Real progress could be made if the EU would be mandated to protect and promote public health, rather than protecting the internal market.

**RECOMMENDATIONS FOR FUTURE RESEARCH**

For future policy evaluation studies to become more reliable, and provide more specific policy-relevant conclusions, they need more data than those are available in many studies. Policy-relevant outcomes, such as whether the policy was even noticed, or opinions regarding the policy, should be included. With these moderating factors one can assess the causal pathways from policy to effect. The ITC project is a good example showing the benefits of these additional data. However, to fully benefit from this approach, more countries would need to join the ITC, as currently 28 countries have been included (10 in Europe). Moreover, in some countries, it has been years since the last wave of data collection. For the ITC, and tobacco control
policy evaluation studies in general, having more frequently collected data would be of great value, since this allows for more sophisticated modelling, such as time-series analyses, and more accurate and causal implications. Increasing the frequency of data collection at little cost is now feasible though internet-based data collection methods.

One of the challenges of studying smoking behaviour, is that trends in smoking behaviour are constantly changing, thus creating the constant need for new evidence and possibly new policies to be evaluated. In the past, increases in the use of e.g. menthol cigarettes, ‘light’ cigarettes, and roll-your-own cigarettes have been followed by increases in research attention, and consequently policy attention for these topics.\textsuperscript{74–76} In more recent years, partly in response to the increases in smoke-free policies, there has been more attention for smokeless tobacco products such as snus,\textsuperscript{77,78} and of course the hot-topic of the 2010s: electronic cigarettes.\textsuperscript{61,63,79–81} Since there is no long term data available yet to firmly establish the harmfulness of these products, there is a clear need for more research. To study health outcomes of ENDS use, long term cohort studies, such as the studies by Doll and Hill in the 1950s that studied the health outcomes of smoking,\textsuperscript{82} would be ideally suited. To study the effects of policy regarding ENDS, a comparative study design, such as used in this thesis, could be applied. Comparing countries where ENDS are banned or tightly regulated with countries where ENDS can be freely sold and advertised, would provide an estimate of the effectiveness of such bans or tight regulations.

However, a need for more research does not always equate to a need for more data. This thesis shows some good examples of reusing existing data. Datasets like the Eurobarometer, DCSSH, and national health surveys are a rich source of data, that are in many cases readily available. Future research projects would be well-advised to utilize existing data before possibly supplementing it with collection of new data. Using existing data is particularly suited for comparative studies examining several countries and/or periods of time to study the effect of tobacco control policies, which was a central aim of the SILNE project.\textsuperscript{83} Moreover, comparative analysis designs can be further elaborated, for instance by comparing both within countries and between countries. We have used this approach in a study, not included in this thesis, where smoking rates among migrant groups in the US are compared to the US-born population, as well as to the populations in their respective countries of origin.\textsuperscript{84} If these and other novel approaches are applied, we still have a lot to learn from comparative studies.
Taking the existing data approach one step further can be to use ‘big data’. The internet, social media, and smartphones or similar devices are constantly collecting data on a wide variety of behavioural variables, such as your interests, your friends, or even your location. Harnessing these kinds of data can be a promising new avenue to complement existing data sources. One example used in Chapters 6 and 7 of this thesis is Google Trends.85 This can be used to study trends in searching for information, an aspect of behaviour that was previously ‘unseen’. Another potentially very rich data source is Twitter and similar social media, which could for instance shed light on the way smoking is being perceived and talked about online.86 Behaviours and opinions like these could be intermediate outcomes between interventions and behaviour change, but they are often not assessed. Doing so can be difficult using traditional research methods, therefore there lies a tempting challenge for future researchers to harness the full potential of all kinds of new data sources.

One overarching recommendation, is that future tobacco control research could benefit greatly from utilizing a more multidisciplinary approach. The issue of how to tackle smoking is a complex one that touches upon many disciplines. Performing research solely within one field of science can provide some pieces of the puzzle, but may lack the overview needed to put the pieces together. Using a truly multidisciplinary approach can synthesize these pieces into an integral understanding of the issue of smoking. This thesis is strongly rooted in epidemiology, with some influences from political sciences (Part I), behavioural psychology, and economics (Part V). Moreover, in Part V, the realist review is a good example of using an approach that has its merits in one discipline (social policy evaluation),87 but is relatively novel in another discipline (epidemiology). In the field of epidemiology, we tend to focus on association studies to assess policy effects. Although these are certainly useful to ascertain the effectiveness of policies, they often fail to provide much insight into the ‘black box’ between policy and effect. Moreover, when interventions are implemented, this is never done in a social or policy vacuum. Rather than just controlling for them, outside influences should be taken into account, as they can make or break the actual success of the intervention. Supplementing epidemiological studies with insights and approaches from other disciplines (such as the realist approach) could bring us much closer to opening the black box.
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Chapter 11


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