It comes and goes in waves

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It comes and goes in waves

Evaluation of inconsistently implemented
tobacco control policies in the Netherlands

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Evaluation of inconsistently implemented tobacco control policies in the Netherlands

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Chapter 1

Introduction

Tobacco use as a cause of major health problems

More than 60 years ago, a group of British researchers initiated a prospective cohort study of male physicians to investigate the link between tobacco smoking and various diseases. The study demonstrated that smoking is strongly associated with increased mortality and an increased risk of several serious diseases, such as vascular and respiratory diseases and cancer (Doll, Peto, Boreham, & Sutherland, 2005). Around the same time, a second, retrospective study found a link between smoking and cancer (Wynder & Graham, 1950). Since then, several other large-scale studies confirmed these findings (Centers for Disease Control and Prevention, 1993; Hammond & Horn, 1988; Price et al., 1999; U.S. Department of Health and Human Services, 2004; Willett et al., 1987). Besides lung cancer, smoking is related to an increased risk of many other forms of cancer, such as stomach cancer and pancreatic cancer. It is estimated that smokers are approximately 25 times more likely than non-smokers to develop any form of cancer (American Cancer Society, 2014; Jayes et al., 2016). Moreover, even light smoking has been found to damage the heart and blood vessels and may lead to stroke or heart attack (NHLBI, 2015). People who are exposed to secondhand smoke have increased risks to develop these diseases as well (American Cancer Society, 2015; Centers for Disease Control and Prevention, 2015).

Smoking not only has consequences for individuals and their environment, but also for society and governments. Estimates of the social costs of smoking suggest a total of €544 billion in Europe every year (European Commission, 2012). These costs occur due to increased medical care and lost productivity for smokers and people exposed to secondhand smoke, and premature mortality due to smoking. Currently, smoking is the most preventable cause of death. Despite this, more than 1 billion people worldwide smoke cigarettes, more than 5 million people die every year due to direct tobacco use, and an estimated 600,000 people die because of long-term exposure to secondhand smoke (World Health Organization, 2016a).

The FCTC: developed to tackle tobacco use

In 2003, the World Health Assembly of the World Health Organization (WHO) adopted the Framework Convention on Tobacco Control (FCTC) to counteract the trend of increased tobacco consumption in many parts of the world. The FCTC is a legally binding instrument with a total of 38 articles that describes which interventions should be implemented to decrease tobacco use, along with guidelines and recommendations about how this can be best achieved (World Health Organization, 2003a). The FCTC includes specific policies such as Article 11 in which the requirements on packaging and design of cigarette packs are outlined. It also includes more indirect interventions that should be taken to decrease smoking, for example Article 5.3 that states that the process of policymaking of tobacco control must be protected from the influence of the tobacco in-

dustury. According to the World Bank, six FCTC policies should be prioritized by national governments to reduce tobacco use and the death and disease it causes (World Bank, 2011): first, price increases through higher taxes on cigarettes and other tobacco products should be implemented; second, smoking should be banned in public and work places; third, comprehensive bans on advertisement and promotion of tobacco products should be installed; fourth, consumers should be better informed about the dangers of smoking, for example by media coverage and educational campaigns; fifth, large warning labels on packages of cigarettes and other tobacco products should be implemented; and sixth, smokers who wish to quit should receive the help they need, for example access to smoking cessation medication and other cessation therapies (World Bank, 2011). The policies and interventions of the FCTC have been proven to be effective and cost-effective in decreasing tobacco use (Fichtenberg & Glantz, 2002; Huang, Chaloupka, & Fong, 2014; Levy, Chaloupka, & Gitchell, 2004; World Health Organization, 2003b).

Over the past 60 years, since the discovery of the relationship between smoking and its deadly consequences, most countries have recognized that tobacco use is a policy problem that needs a governmental response. By 2015, 180 countries had ratified the FCTC (Framework Convention Alliance, 2015). Ratification of the Convention implies that countries accept that they are legally bound by the Convention and that they take measures to realize the obligations of the FCTC. The WHO regularly monitors the results of the implementation of the FCTC worldwide by governmental progress reports, and recently presented a number of positive developments. For example, between 2013 and 2015, five new countries implemented comprehensive smoke-free laws, six countries implemented smoking cessation services, twelve countries implemented large graphic warning labels on cigarette packs, seven countries implemented a ban on tobacco advertising, promotion and sponsorship, and seven countries raised taxes for cigarettes substantially (World Health Organization, 2015). The WHO estimated that more than one billion people were reached by these interventions.

The large number of interventions included in the FCTC illustrate that many actions can be undertaken by countries to decrease smoking, but the large number of non-adopted policies also indicates that many countries can still do more (World Health Organization, 2014). However, not all measures may have been chosen for implementation by governments, and full implementation may not always be feasible. This indicates a need to monitor and evaluate the level of policy implementation and its potential effects. The evaluation of the FCTC policies and measures at the national as well as the international level is a complicated process, requiring intensive collaboration between researchers. Every country has a different policy environment and different factors that influence policy adoption and implementation, such as cultural values, governmental institutional factors, level of political support for measures, strength of the national tobacco control alliance, and quality of the public health infrastructure (Cairney, Studlar, & Mamudu, 2012).

Monitoring tobacco use and tobacco control policies: the ITC Project

The International Tobacco Control (ITC) policy evaluation Project was specifically designed to systematically evaluate the effects of tobacco control policies as described in the FCTC (Fong, Cummings, & Shopland, 2006; ITC Project, 2016). The project was founded in 2002, just before the FCTC was adopted in 2003. The ITC Project conducts longitudinal surveys among nationally representative cohorts of smokers, as well as non-smokers in some cases. By 2016, 28 countries from all continents participated in this project, and the resulting data provide a unique opportunity to compare the effects of policies in the different countries. The ITC Project applies the same methodology in all countries by using the same or similar survey questions and comparable strategies to recruit respondents. This means that fairly reliable comparisons across countries can be made. The ITC Project research design allows for cross-sectional and longitudinal cross-country comparisons (Fong, Cummings, Borland, et al., 2006). One possible approach for this is to compare countries that implemented specific policies with those that did not in a quasi-experimental design. Besides these international comparisons, policy evaluations at a national level are possible as well by comparing pre- versus post-policy measurements and performing long-term trend analyses.

It is not only important to examine whether tobacco control policies are effective in smoking reduction, but also to analyze for whom they are effective and which psychosocial mechanisms play a role in this relationship. This approach is essential to be able to support and strengthen policies for specific target groups. An example concerns financial reimbursement of smoking cessation support. If research shows that this policy only works for smokers who are motivated to quit and that few smokers are actually motivated, one conclusion could be that it might be useful to implement an intervention to increase smokers' motivation before or at the same time as the reimbursement is provided to smokers (Richardson, Cullen, Mowery, McCausland, & Vallone, 2011).

The ITC Project aims to study the various effects of tobacco control policies in detail and to give recommendations about how the impact of policies can be increased. Therefore, the surveys of the ITC Project not only include policy-specific variables, but also variables that are known to be important in the smoking cessation process. Figure 1 shows the conceptual framework of the ITC Project (Fong, Cummings, Borland, et al., 2006). The psychosocial variables used in this framework are derived from several behavior change models such as the Health Belief Model (Rosenstock, 1974), Theory of Planned Behavior (Ajzen, 1991), Social Cognitive Theory (Bandura, 1986), and Protection Motivation Theory (Rogers & Prentice-Dunn, 1997).

Figure 1: The conceptual framework of the ITC Project.

Tobacco control policies and evaluation in the Netherlands

Although the prevalence of smoking in the Netherlands is decreasing, approximately 25% of the Dutch population is an occasional smoker, and 18% of the population smokes daily (Statistics Netherlands, 2016). Compared with many other countries, the prevalence is low, but several other European countries such as the United Kingdom and Denmark have a much lower prevalence (World Health Organization, 2016b). Concerning FCTC policy adoption, the Netherlands ranked 13 out of 34 European countries that were evaluated by the Tobacco Control Scale in 2013, the same rank the Netherlands received in 2010 (Joossens & Raw, 2014). Figure 2 shows an overview of all European countries and their score on the Tobacco Control Scale. The higher a country ranks on that scale, the better it performs regarding implementation of tobacco control policies.

The Netherlands ratified the FCTC in January 2005 and the Dutch government has since submitted regular progress reports to the WHO. As a critical counterpart, shadow reports were produced by non-governmental organizations that evaluated the implementation of the FCTC. A selection of the most relevant articles of the FCTC was made in these shadow reports. The first shadow report was released in 2012, concluding that only one policy (monitoring of tobacco use) was implemented in a manner that conforms to the requirements of the FCTC. According to the report, the implementation of six articles could be improved, while an additional six articles were not yet fully implemented (Rennen & Willemsen, 2012). The second shadow report was published in 2015 and concluded that three articles were fully implemented conforming with FCTC requirements, specifically tax and price measures, financial resources to support imple-

mentation of the FCTC measures, and illicit trade regulations. The implementation of two articles could be improved, and eight articles were not in accordance with the obligations of the FCTC (Heijndijk & Willemsen, 2015).

In 2008, a team of researchers from the Netherlands joined the ITC Project and has since collected annual data among approximately 2,000 smokers and quitters to evaluate national tobacco control policies and campaigns. Several national and international evaluations that used the Netherlands data have been published. Furthermore, one previous doctoral thesis has been published in 2012, focusing on the implementation process and effects of smoking restrictions in the hospitality industry (Nagelhout, 2012). Conclusions from that thesis were that smoking restrictions can have a positive impact on smoking cessation, and that compliance with and support for smoking restrictions in the hospitality industry were low in the Netherlands compared with other European countries.

Figure 2: European countries ranked by their Tobacco Control Scale score.

Background of this thesis

The present thesis had as general objective to assess the impact of tobacco control policies in the Netherlands and three specific aims. The first aim was to evaluate the effects of tobacco control policies in the Netherlands that were changed after their implementation. The second aim was to investigate socioeconomic subgroup differences in the effects of tobacco control policies. Finally, the third aim was to assess the validity of instruments to measure intention to quit smoking that are included in the ITC Netherlands Survey.

Inconsistent tobacco control policy implementation processes in the Netherlands

In the Netherlands, several tobacco control policies have been implemented in the past years that were (partly) reversed and reinstated or adapted after implementation. Inconsistent implementation is likely to influence its impact; however, an assessment of these consequences has been lacking. The inconsistent implementation processes that were evaluated in this thesis apply to the regulation of electronic cigarettes, smoking restrictions in the hospitality sector, and the reimbursement of smoking cessation support. A timeline of implementation dates and changes in these policies is given in Table 1.

E-cigarettes

Electronic cigarettes (e-cigarettes) are devices that vaporize a liquid into an aerosol that can be inhaled by users. These liquids usually contain propylene glycol and glycerol mixed with various concentrations of nicotine (or no nicotine) and flavorings. The worldwide rise of e-cigarettes was rapid, and very soon researchers began to investigate their effect on smokers as well as on non-smokers. There were and still are many questions and concerns from researchers, public health policy makers, and e-cigarette users. In particular, there are worries about the safety of e-cigarettes, consequences for the health of the user and the environment, renormalization of smoking, and what the effects of e-cigarette use on youth are, for example possible transitioning to smoking tobacco cigarettes. On the other hand, the potential of e-cigarettes as smoking cessation tool and as a product to decrease secondhand smoke exposure to non-smokers are discussed. Previous research and reviews reported inconsistent findings (Hajek, Etter, Benowitz, Eissenberg, & McRobbie, 2014; Hartmann-Boyce et al., 2016; Patterson, Hilton, & Weishaar, 2016). Research on e-cigarettes is still in an early phase since the product has only been available on the market since 2003. In the Netherlands, e-cigarettes were introduced in 2007. Therefore, few studies are available to provide data about the long-term effects, for example concerning use and dual use (using e-cigarettes and smoking regular cigarettes at the same time). Furthermore, technical aspects of the product are constantly changing. The so-called first generation e-cigarettes were very different than the fourth generation e-cigarettes that are available

now. Current, more advanced e-cigarettes have larger batteries and larger tanks than the first generation products, as well as coils that increase vapor production. They also no longer have the appearance of regular cigarettes. These technical improvements are developing fast and more time is needed for researchers to produce reliable long-term study findings on the effects of these new products. When e-cigarettes were introduced in the Netherlands in 2007, they were classified as consumer products, and their introduction was accompanied by extensive advertisements. However, the legal status of the products changed in 2008 to medications which meant that advertising for e-cigarettes was banned. In 2012, the legal status changed back to consumer products, and advertising was allowed once again. The impact of those changes in the legislation on awareness and use of the products have not been studied in detail before and was therefore investigated in chapter 2 of this thesis.

Smoking restrictions in public places

Previous research has shown that smoking restrictions in public places are effective in smoking reduction and in protecting non-smokers from exposure to secondhand smoke (Callinan, Clarke, Doherty, & Kelleher, 2010; Fichtenberg & Glantz, 2002). In 2002, the Dutch government decided that workplaces should become smoke-free, but that the hospitality sector got a temporary exception, contingent on the results of a self-regulation trajectory. When the smoke-free workplaces were implemented in 2004, acceptance of, as well as compliance with the restrictions was high (Verdonk-Kleinjan, Rijswijk, Candel, De Vries, & Knibbe, 2012; Verdonk-Kleinjan, Rijswijk, De Vries, & Knibbe, 2013). However, the implementation of a smoke-free hospitality sector appeared to be more complex. In 2008, a smoking ban was implemented in all hospitality venues. Resistance immediately occurred among owners of small bars. Many bar owners joined an organization that was set up to fight the smoking ban and that had ties with the tobacco industry (Gonzalez & Glantz, 2013). In 2009, small bars were exempted from the law, but this exception was reversed in 2010. Later in 2010 the exception for small bars was reinstated, but again reversed in 2014. Previous research suggested that larger effects may have been obtained if the smoking restrictions had been implemented without exceptions and reversals (Mons et al., 2012; Nagelhout, De Vries, et al., 2012). Previous studies have also shown that support for smoking restrictions in public places is increasing (Fong et al., 2013; Maguire, Brinkley, & Mansfield, 2010; Mons et al., 2012). However, only a few studies have investigated the social acceptance of smoking restrictions in the long term. High social acceptance suggests that respondents would not only comply with the restrictions due to the enforcement of the legislation, but because they personally accept the restrictions and understand their benefits. Social acceptance of smoke-free policies is vital for good compliance (Borland, Yong, Siahpush, et al., 2006; Nagelhout et al., 2011). Therefore, long-term trends of social acceptance of smoking restrictions in public places and associated factors are examined

in chapter 3 of this thesis. In addition, we assessed trends of, and factors related to the implementation of voluntary home smoking bans between 2005 and 2014.

Reimbursement of smoking cessation support

Previous research has shown that quit attempts are more successful when smokers receive support, such as behavioral counseling combined with nicotine replacement therapy (Patnode et al., 2015; Stead, Koilpillai, Fanshawe, & Lancaster, 2016). Research has also shown that reimbursing cessation support leads to favorable outcomes regarding use of cessation therapy, quit attempts, and quit success (Kaper, Wagena, Willemsen, & Van Schayck, 2005; Reda, Kotz, Evers, & Van Schayck, 2012). In 2011, reimbursement of cessation support was implemented in the Netherlands. The implementation of the reimbursement was accompanied by a mass media campaign that aimed to inform smokers about the reimbursement policy. The reimbursement was reversed in 2012, but reinstated in 2013. There was no media campaign during the second implementation in 2013. It is important to evaluate whether reimbursement of cessation support leads to more use of medication and more quitting, especially among smokers with low income who might benefit most from the reimbursement. Consequently, the topic of chapter 4 of this thesis was to evaluate the impact of reimbursing smoking cessation support in 2011 on smoking behavior, in particular among low income smokers.

Socioeconomic subgroup differences

Previous research has shown large differences in smoking and quitting behavior between people with a low socioeconomic status (SES) as compared to people with a high SES background (Hiscock, Bauld, Amos, Fidler, & Munafo, 2012; Reid, Hammond, Boudreau, Fong, & Siahpush, 2010). For example, low SES smokers seem to be less motivated to quit, more addicted to tobacco, and less compliant to cessation support. The gap between people with a low as compared to a high SES background regarding their smoking behavior tends to get wider over time (Bosdriesz, Willemsen, Stronks, & Kunst, 2015; Nagelhout, De Korte-de Boer, et al., 2012). Therefore, analysis of the moderating role of SES was an important element in the previously described studies. In this context, it is also valuable to examine whether SES differences in the effects of tobacco control policies differ across countries and over time in order to decrease socioeconomic inequalities. The topic of chapter 5 was to evaluate potential subgroup effects for four tobacco control policies as triggers to think about quitting: cigarette prices, warning labels on cigarette packs, smoking restrictions in public places, and reimbursement of smoking cessation. In the Netherlands, cigarette prices were substantially (> 5%) increased in 2008 and in 2010. During the study period (2008-2014), the Netherlands had textual warning labels on cigarette packs. In addition to the evaluation of these

policies in the Netherlands, the other countries of the ITC Europe Project, specifically France, Germany, Ireland, Scotland, and the rest of the UK were included.

Table 1: Timeline of recent policy developments in the Netherlands.

	E-cigarettes	Smoking restrictions in hospitality sector	Reimbursement of smoking cessation support	Cigarette prices	Mass media campaigns
2007	Introduced to the market as consumer products				
2008	Classified as medications	Implementation of smoking restrictions		Cigarette price increase of > 5% (adjusted for inflation)	Campaign to inform population about smoking restrictions in the hospitality sector + smoking cessation campaign
2009		Exception for small bars			
2010		Reversal of exception for small bars (February)		Cigarette price increase of > 5% (adjusted for inflation)	Campaign to inform smokers about reimbursement of smoking cessation support as of 2011
		Reinstatement of exception for small bars (November)			
2011			Implementation of reimbursement policy		
2012	Reclassified as consumer products		Reversal of reimbursement policy		Campaign to denormalize smoking, targeted at non-smokers
2013			Reinstatement of reimbursement policy		Campaign to denormalize smoking, targeted at non-smokers
2014		Reversal of exception for small bars			Campaign to encourage smokers to quit for 28 days in October

Validation of instruments to measure intention to quit smoking

An important assessment for the ITC Project is to determine influences of policies on smokers' intention to quit smoking. Previous research has shown that intention to quit is the strongest predictor of making a quit attempt (Borland et al., 2010; Hyland et al., 2006; Vangeli, Stapleton, Smit, Borland, & West, 2011). The ITC Netherlands Survey includes several measures of quit intention. These instruments had not been compared

before regarding their validity. Validation of survey instruments is important to be certain an instrument measures what it is supposed to measure. Furthermore, it is not sufficient to perform a validation test only once as the findings may be coincidental or only valid for the specific study sample or under the conditions of that specific study. Therefore, it is necessary to repeat validation tests in different contexts and preferably with different study subjects to generalize the findings to other populations (Altman & Royston, 2000). The external validation of one of the instruments for intention to quit (the Motivation To Stop Scale) was the subject of chapter 6.

The assessment and comparison of the predictive, as well as construct validity of the three instruments for intention to quit that are included in the ITC Netherlands Survey was the topic of chapter 7. Predictive validity refers to the extent to which a score on a measurement instrument predicts an outcome that is measured at a later point in time (Berger, Imbos, & Janssen, 2000; Cronbach & Meehl, 1955). Construct validity refers to the extent to which a measurement instrument is related to other variables as suggested by a previously validated theory (Berger et al., 2000; Cronbach & Meehl, 1955).

Research questions in this thesis

The research questions of this thesis are:

- Chapter 2: What is the trend in prevalence of using e-cigarettes between 2008 and 2014 among smokers in the Netherlands? Which reasons do smokers report for starting using e-cigarettes? Which socio-demographic and smoking-related factors are associated with ever and current use of e-cigarettes?
- Chapter 3: What are the trends of social acceptance of smoking restrictions in public places and home smoking bans between 2005 and 2014 in the general population in the Netherlands? Which socio-demographic factors are associated with social acceptance of smoking restrictions and with implementing home smoking bans?
- Chapter 4: Are there income differences in the impact of the reimbursement of smoking cessation support and the accompanying media campaign? In particular, what is the impact on use of behavioral counseling, use of medication, quit attempts, and quit success?
- Chapter 5: Which trends and socioeconomic differences can be identified regarding policy triggers for thinking about quitting smoking? Are there differences in these triggers between six European countries?
- Chapter 6: What is the predictive validity of the Motivation To Stop Scale on making a quit attempt? Are there differences in the findings of a Dutch sample of smokers compared to an English sample?

- Chapter 7: Which of three different instruments to measure intention to quit smoking has the best predictive and construct validity in the context of the Theory of Planned Behavior?

In chapter 8, the main findings of the studies are described. Furthermore, methodological limitations of the research in this thesis are discussed. Finally, implications for future research and for tobacco control policies are outlined.

Chapter 2

Prevalence and reasons for use of electronic cigarettes among smokers

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ABSTRACT

Background: Not much is known about how people in the Netherlands respond to electronic cigarettes (e-cigarettes); how many know about them, which people try them, keep using them and why, and what are changes over time regarding awareness and use?

Methods: We used samples of smokers aged 15 years and older from 2008 (n=1,820), 2010 (n=1,702), 2013 (n=1,530), and 2014 (n=1,550) as part of the International Tobacco Control (ITC) Netherlands Survey. Reasons for use and characteristics of smokers were examined using the sample from 2014. Logistic regression analyses were conducted to evaluate the associations between smoking-related variables with ever trying e-cigarettes and current e-cigarette use.

Results: In 2014, 91.4% of Dutch smokers reported being aware of e-cigarettes (97.1% in 2008, 89.2% in 2010, and 85.5% in 2013), 40.0% reported having ever tried them (13.4% in 2008, 14.5% in 2010, and 19.6% in 2013), and 15.9% were currently using them (4.0% in 2008, 1% in 2010, and 3.9% in 2013). The main reason given for using e-cigarettes was to reduce the number of regular cigarettes smoked per day (79%). Ever trying e-cigarettes among those aware of e-cigarettes was associated with being young, smoking more regular cigarettes per day, having made a quit attempt in the last year, having used smoking cessation pharmacotherapy in the last year, and reporting high awareness of the price of regular cigarettes. Smokers who kept using e-cigarettes had a higher educational background, had higher harm awareness for the health of others, and were less likely to have a total smoking ban at home.

Conclusion: E-cigarettes are increasingly used by Dutch smokers. Commonly endorsed motivations for current e-cigarette use were to reduce tobacco smoking and because e-cigarettes are considered to be less harmful than tobacco cigarettes.

INTRODUCTION

Electronic cigarettes (e-cigarettes) are devices that have been developed to mimic the sensations and pleasure smokers get from regular cigarettes. Some e-cigarettes resemble the appearance of regular cigarettes, while others are designed to look unusual or fashionable. Most e-cigarettes are reusable, and both the prefilled cartridges and the bottles of e-liquid can be bought with or without nicotine, and with a variety of flavours. They need not have meaningful levels of any toxicant apart from the nicotine if properly manufactured, and as nicotine in the doses they deliver is relatively safe for short term use, their short term safety profile is considered acceptable (Caponnetto et al., 2013; Hajek, Etter, Benowitz, Eissenberg, & McRobbie, 2014). Long term effects are unknown at this point; therefore, a lot of discussion is still ongoing about their safety and regulation (Borland, 2011; Farsalinos & Stimson, 2014; Stimson, Thom, & Costall, 2014; World Health Organization, 2009).

E-cigarettes were introduced to the global market in 2003. In various countries, awareness and use have risen since then (King, Alam, Promoff, Arrazola, & Dube, 2013; Pepper & Brewer, 2014; Yong et al., 2015). Previous studies were usually limited to studying socio-demographic characteristics of e-cigarette users, while other smoking-related variables to describe e-cigarette users, such as harm awareness of smoking and use of smoking cessation pharmacotherapy, have not been studied yet. Furthermore, little is known about which characteristics distinguish people who try an e-cigarette but stop using it from people who keep using them. The current study examines both socio-demographic characteristics and smoking-related variables of smokers who try e-cigarettes and smokers who keep using them.

To date, few studies about characteristics of users and reasons for using e-cigarettes have been done in Europe. The study of Adkison, O'Connor, Bansal-Travers, et al. (2013) showed marked differences in use across similar countries with different regulatory environments for e-cigarettes. This suggests that the regulatory environment influences awareness, beliefs, and use. Currently, the way e-cigarettes are regulated differs considerably between countries. The Netherlands is an especially interesting case because the legal context for e-cigarettes changed twice within a period of five years. E-cigarettes have been sold in the Netherlands since 2007. They were first classified as consumer products and were commercially promoted and advertised extensively. In 2008, the government claimed that e-cigarettes which contain nicotine should be classified as medicines. This claim was confirmed by a court decision. This decision included an advertisement ban for e-cigarettes, but it was still legal to sell them. At the same time, the government released a public warning about e-cigarettes, saying that not enough information was known about the safety of e-cigarettes. However, in 2012 the classification of e-cigarettes was revised, and they were reclassified as consumer products. This means that advertisements for e-cigarettes were allowed again, and the first mass media advertisements started in 2013. It furthermore means that it is legal to use

e-cigarettes in public places like the hospitality industry, while smoking regular cigarettes in the hospitality industry has been prohibited in the Netherlands (with the exception of designated smoking rooms) since 2008 (Nagelhout et al., 2011). Disposable e-cigarettes cost approximately as much as regular cigarettes in the Netherlands, while refillable devices are much cheaper. In our study, we examined awareness and use of e-cigarettes in the Netherlands throughout the changes in the legal context for e-cigarettes between 2008 and 2014.

Previous research reported various reasons for using e-cigarettes among smokers and current e-cigarette users: to reduce or quit smoking regular cigarettes, because e-cigarettes are considered to be less harmful than regular cigarettes, to protect the health of the social environment, to avoid smoking bans, because of the lower price of e-cigarettes, because of the better taste and smell of e-cigarettes, out of curiosity, and because of the pleasure of the smoking process which is mimicked by e-cigarettes (Adkison, O'Connor, Bansal-Travers, et al., 2013; Dawkins, Turner, Roberts, & Soar, 2013; Dockrell, Morison, Bauld, & McNeill, 2013; Etter, 2010; Etter & Bullen, 2011; Goniewicz, Lingas, & Hajek, 2013; Richardson, Pearson, Xiao, Stalgaitis, & Vallone, 2014; Zhu et al., 2013). The reason that was mentioned most often in most countries was to quit smoking regular cigarettes. Besides quitting, the most often mentioned reasons were to reduce smoking regular cigarettes and because e-cigarettes were considered to be safer/less harmful than regular cigarettes. Next to these main reasons, three more potential reasons were included into the current study, namely whether e-cigarettes were used because of the lower price compared to regular cigarettes, because of the better taste of e-cigarettes, and to avoid smoking bans.

Previous studies focussing on characteristics of e-cigarette users found mixed results. With respect to the association between socio-demographic variables and ever trying e-cigarettes, some studies found that more females had ever tried e-cigarettes (Adkison, O'Connor, Bansal-Travers, et al., 2013; Regan, Promoff, Dube, & Arrazola, 2013; Zhu et al., 2013), while other studies found that more males had ever tried them (Choi & Forster, 2013; Kralikova, Novak, West, Kmetova, & Hajek, 2013). Furthermore, several studies found that more young people had ever tried e-cigarettes (Choi & Forster, 2013; Dockrell et al., 2013; Kralikova et al., 2013; Zhu et al., 2013). One study found that a high income was associated with ever trying e-cigarettes (Adkison, O'Connor, Bansal-Travers, et al., 2013) while another one indicated that a low income was related to ever trial (Regan et al., 2013). The same holds true for education: one study found that highly educated people were more likely to ever have used e-cigarettes (Pearson, Richardson, Niaura, Vallone, & Abrams, 2012), while other studies found that a low education was associated with ever trying them (Regan et al., 2013; Zhu et al., 2013). Regarding current use of e-cigarettes, one study found that a high education was associated with current use (Adkison, O'Connor, Bansal-Travers, et al., 2013), while others reported a relationship with a low educational background (Regan

et al., 2013; Zhu et al., 2013), and with being female and young (Zhu et al., 2013). Apparently, no specific user profile can be generated yet.

For the current study, we used a nationally representative sample, while some other studies used only e-cigarette users or smokers with the intention to quit (Etter & Bullen, 2011; Odum, O'Dell, & Schepers, 2012). The aim of the current study was to describe the prevalence of e-cigarette awareness and use and to examine characteristics of tobacco smokers who used e-cigarettes in the Netherlands. The following questions were answered: 1) How many smokers were aware of e-cigarettes and used them in 2008, 2010, 2013, and 2014? 2) Why did smokers start to use e-cigarettes? 3) What are characteristics of those who ever tried e-cigarette and current e-cigarette users?

METHODS

Sample

Data were derived from the International Tobacco Control (ITC) Netherlands Survey. Dutch tobacco smokers aged 15 years and older were selected from a probability-based web database (Nagelhout et al., 2010). The ITC Survey is a cohort study; respondents are invited to participate and are surveyed each year (Fong, Cummings, Borland, et al., 2006). Drop-out is replenished each year by inviting new smokers from the database (Thompson et al., 2006). We used data from the most recent survey wave in which e-cigarette use was assessed: wave 8, which was conducted in 2014. To investigate the prevalence of awareness and use of e-cigarettes, we additionally used data from wave 1 (2008), wave 4 (2010), and wave 7 (2013). Participants were classified as smokers if they had smoked at least 100 cigarettes in their lifetime and were currently smoking at least monthly (Hyland et al., 2006). A total of 2,224 smokers participated in survey wave 1; 1,702 smokers were included in survey wave 4; 1,530 smokers participated in survey wave 7; and 1,550 smokers of survey wave 8 were included. Of the smokers who participated in survey wave 1, 48% also participated in survey wave 4, 21% in survey wave 7, and 16% in survey wave 8. We did not include quitters because the sample size of quitters who were currently using e-cigarettes was too small (n=0 in 2008, n=2 in 2010, n=7 in 2013, and n=30 in 2014).

Measurements

Awareness of, ever trying, and current use of e-cigarettes

Awareness was measured by asking smokers whether they had ever heard of e-cigarettes. If respondents answered 'yes', they were asked whether they had ever used an e-cigarette (Adkison, O'Connor, Bansal-Travers, et al., 2013). If these respondents

answered 'yes' again, they were considered to have tried e-cigarettes. These smokers were then asked how often they currently used an e-cigarette (daily, at least once a week, at least once a month, less than monthly, or stopped altogether) (Adkison, O'Connor, Bansal-Travers, et al., 2013). Smokers who used an e-cigarette at least monthly were considered to be current users. Furthermore, we asked current users whether their e-cigarettes contained nicotine (yes/no/don't know). All e-cigarette users (ever as well as current use) were also tobacco smokers at the time of measurement because we restricted our analyses to current tobacco smokers.

Reasons for use of e-cigarettes

All current e-cigarette users in the 2014 survey (wave 8) were asked six questions about reasons why they started to use e-cigarettes which they could answer with 'yes' or 'no'. The main question was posed as, 'Why did you start using e-cigarettes?', and the six 'yes' or 'no' questions were as follows: 1) 'They may not be as bad for your health', 2) 'They taste better', 3) 'They are cheaper than regular cigarettes' 4) 'So you can smoke in places where smoking regular cigarettes is banned', 5) 'To make it easier to cut down on the number of cigarettes you smoke', 6) 'As a way to help you quit' (Adkison, O'Connor, Bansal-Travers, et al., 2013). Respondents could report more than one reason.

Socio-demographic variables

Socio-demographic variables were gender, age, income, and education. Age was categorised into the following groups: 15-24 years, 25-39 years, 40-54 years, and 55 years and older. Monthly household income was categorised into three levels: low (< 2,000 euro), moderate (2,000-3,000 euro), and high (> 3,000 euro). Respondents who did not answer the income question (n = 334) were recorded in a separate category (Hitchman et al., 2012; Nagelhout, Van den Putte, et al., 2014).

Smoking-related variables

Smoking-related variables were included in addition to the reasons for using e-cigarettes. To measure harm awareness, respondents were asked how often in the previous month they thought about the harm of their smoking for their own health and the health of others (1 = never, 5 = very often) (Naghelout, Van den Putte, et al., 2012). To assess whether e-cigarettes were used to reduce or quit smoking, we asked how many regular cigarettes respondents smoked per day (1 = <10 cigarettes, 2 = 11-15 cigarettes, 3 = 16-20 cigarettes, 4 = >20 cigarettes per day) (Adkison, O'Connor, Borland, et al., 2013), whether they had made a quit attempt in the previous year (yes/no) (Hyland et al., 2006), and whether they had used any smoking cessation pharmacotherapy in the previous year (yes/no) (Kasza et al., 2013). Furthermore, we asked respondents two questions about smoking bans: what the rules about smoking were inside their home (1 = smoking is allowed anywhere, 2 = smoking is allowed in some

rooms, 3 = smoking is never allowed inside their home, 4 = smoking is never allowed, except under special circumstances) (Borland, Young, Cummings, et al., 2006) and whether they had smoked tobacco at all during their last visit to a bar or pub (yes/no) (Nagelhout et al., 2011). Finally, respondents were asked how often in the previous month they thought about the money they spent on smoking and how much they enjoyed smoking (1 = never, 5 = very often) (Siahpush, Borland, & Yong, 2007).

Analyses

All analyses were conducted with SPSS version 20.0. Data were weighted by age and gender to be representative for smokers in the Netherlands (Thompson et al., 2006). Assumptions for logistic regression analysis (linearity and multicollinearity) were tested and, in case of non-linearity (education and home smoking ban), this was solved by categorising variables. Completed education was categorised into three groups: low (primary education and lower pre-vocational secondary education), moderate (middle pre-vocational secondary education and secondary vocational education), and high (senior general secondary education, [pre-] university education, and higher professional education). The home smoking ban variable was dichotomised into whether respondents had a total smoking ban at home (yes/no) (Mons et al., 2013).

Descriptive statistics showed the prevalence of awareness of, ever trying, and current use of e-cigarettes in all included waves. Sensitivity analyses with complete cases were performed. These revealed that the pattern of results did not change when only using complete cases.

Logistic regression analyses were used to evaluate the association between socio-demographic and smoking-related variables, with e-cigarette use among smokers in the most recent survey wave (separately for ever trying and current use). We chose to report results of bivariate regression analyses next to multivariate analyses. Besides the multivariate 'forced entry' method, we used the 'backward' method to select predictor variables. By using the 'backward' method, the statistical power was increased as only relevant predictor variables were included in the analysis. Respondents who were aware of e-cigarettes at time of assessment were included in the analyses assessing ever trying them (n = 1,550). Respondents who had ever used e-cigarettes at time of assessment were included in the analyses for current use (n = 619).

Items that were answered with 'refused' or 'don't know' were recoded as missing values and filled using multiple imputations. Pooled estimates were reported where possible; this was not possible for the backward regression analyses because model parameters varied by imputation; therefore, results of the original data were reported for these analyses. Multiple imputations increased the sample size which could be included in the analysis because logistic regression analysis would exclude many cases due to listwise deletion. The only exceptional variable was income; respondents who refused to answer this question were grouped into an extra category because 21.1% of

respondents chose this answering option. The percentage of missing values ('refused' or 'don't know') ranged for all other variables from 0.1% to 8.4%. The percentage of cases with at least one missing value was 63; therefore the number of imputations was set at 70 (Bodner, 2008). Furthermore, we adjusted for the time a respondent participated in the cohort because previous research has shown that responses can vary as a function of time in sample (Driezen & Thompson, 2011).

Ethics

The surveys were cleared for ethics by the Research Ethics Board of the University of Waterloo (ORE # 18920). Surveys of this kind do not require ethics clearance in the Netherlands.

RESULTS

Sample Description, Awareness, and Use of E-Cigarettes

Table 1 shows the socio-demographic characteristics of respondents of 2008, 2010, 2013, and 2014. Figure 1 shows that reported awareness of e-cigarettes decreased between 2008 and 2010 from 97.1% to 89.2% ($p < 0.001$) and decreased again to 85.5% in 2013 ($p < 0.01$), but increased in 2014 to 91.4% ($p < 0.001$), to around 2010 levels. The percentage of smokers who ever used e-cigarettes increased non-significantly from 2008 (13.4%) to 2010 (14.5%) ($p = 0.40$). It increased significantly from 2010 to 2013 (19.6%) ($p < 0.001$) and from 2013 to 2014 (40.0%) ($p < 0.001$). The percentage of smokers who were currently using e-cigarettes decreased between 2008 (4.0%) and 2010 (1.0%) ($p < 0.001$). This was followed by an increase between 2010 and 2013 (3.9%) ($p < 0.001$) and a further large increase between 2013 and 2014 (15.9%) ($p < 0.001$).

Of the current users, most smokers used their e-cigarette at least once a week in 2008 (59.1%), in 2013 (70.6%), and in 2014 (64.9%). In 2010, far fewer current users used the e-cigarette that often (23.5%). We asked whether people used e-cigarettes which contained nicotine to respondents in 2013 and 2014. Most people, 66.4% and 84.9%, respectively, reported that they did.

Prevalence and reasons for use of electronic cigarettes among smokers

Table 1: Characteristics of smokers (%) (weighted data).

	Wave 1 (n = 1,820)	Wave 4 (n = 1,702)	Wave 7 (n = 1,530)	Wave 8 (n = 1,550)
Gender				
Male	54.2	54.1	52.0	51.6
Age group				
15-24	13.8	16.5	16.8	16.8
25-39	28.5	26.8	24.6	24.1
40-54	33.9	31.9	32.1	30.9
55+	23.8	24.8	26.5	28.2
Income level				
Don't want to say/don't know	22.4	28.0	30.9	29.1
Low	25.8	22.6	22.2	24.1
Moderate	24.1	20.8	19.7	19.8
High	27.8	28.7	27.1	27.0
Educational level				
Low	38.2	36.1	28.5	25.8
Moderate	43.0	42.4	47.2	44.2
High	18.8	21.5	24.3	30.0
Ever heard of e-cigarettes				
Yes	97.1	89.2	85.5	91.4
Ever tried e-cigarettes				
Yes	13.4	14.5	19.6	40.0
Currently using e-cigarettes				
Yes	4.0	1.0	3.9	15.9
Frequency of current use				
Daily	22.4	7.9	31.2	29.2
At least once a week	36.7	15.6	39.4	35.7
At least once a month	18.8	2.0	9.2	13.3
Less than monthly	22.0	74.5	20.1	21.9
Current e-cigarette contains nicotine				
Yes	Not measured	Not measured	66.4	84.9
No			28.2	11.7
Don't know			5.4	3.4

Figure 1: Trends of awareness, ever use, and current use among smokers.

Reasons for Using E-Cigarettes

Respondents who were currently using e-cigarettes in wave 8 (2014) were asked why they started to use e-cigarettes (see Table 2). The reason mentioned most often was that e-cigarettes were used to smoke fewer regular cigarettes (79.0%), followed by being perceived as less harmful for health than regular cigarettes (77.2%). Least often mentioned was the better taste of e-cigarettes compared to regular cigarettes (18.1%).

Table 2: Reasons for use among smokers and current e-cigarette users 2014 (N=246) (weighted data).

	%
To make it easier to cut down on the number of cigarettes you smoke	79.0
They may be not as bad for your health	77.2
Because they are cheaper than regular cigarettes	61.3
As a way to help you quit	57.8
So that you can smoke in places where smoking regular cigarettes is banned	57.4
As an alternative to quitting	48.2
Because e-cigarettes taste better than regular cigarettes	18.1

Characteristics of Those Ever Trying E-Cigarettes and Current Users

Table 3 shows the results of the bivariate and multivariate logistic regression analyses regarding ever trying e-cigarettes among those who reported awareness. Results of the bivariate regression analysis showed that men were more likely to have used e-cigarettes, and respondents of 55 years and older were less likely. Respondents who often thought about the harm of their smoking for their own health were more likely to have used e-cigarettes, as were respondents who smoked more than 20 cigarettes per

Prevalence and reasons for use of electronic cigarettes among smokers

Table 3: Bivariate and multivariate logistic regression analyses of associations of ever trial of e-cigarettes among smokers 2014 (Odds Ratios and 95% Confidence Intervals) (weighted data).

	Ever trial of e-cigarettes		
	Bivariate analysis	Multivariate 'forced entry' analysis (n = 1,270)	Multivariate 'backward' analysis (n = 1,118)
Gender			
Female	0.81 (0.66 to 1.00)*	0.85 (0.67 to 1.09)	
Male	1.00	1.00	
Age group			
15-24	1.52 (1.09 to 2.11)*	1.89 (1.27 to 2.82)**	2.04 (1.36 to 3.06)***
25-39	2.01 (1.50 to 2.71)***	1.99 (1.41 to 2.81)***	2.22 (1.57 to 3.13)***
40-54	1.71 (1.30 to 2.25)***	1.50 (1.10 to 2.05)*	1.62 (1.18 to 2.23)**
55+	1.00	1.00	1.00
Income level			
Don't want to say	0.94 (0.69 to 1.27)	0.79 (0.56 to 1.12)	
Low	1.15 (0.85 to 1.56)	1.03 (0.73 to 1.46)	
Moderate	1.06 (0.77 to 1.45)	0.99 (0.70 to 1.41)	
High	1.00	1.00	
Educational level			
Low	0.77 (0.58 to 1.02)	0.84 (0.60 to 1.18)	
Moderate	1.05 (0.82 to 1.35)	1.18 (0.88 to 1.57)	
High	1.00	1.00	
Harm awareness			
Harm awareness self †	1.20 (1.09 to 1.33)***	1.14 (0.98 to 1.32)	
Harm awareness others †	0.97 (0.87 to 1.08)	0.82 (0.71 to 0.96)*	
Reduce/quit smoking			
Number of cigarettes per day (only daily smokers)			
10 or less	0.39 (0.28 to 0.55)***	0.40 (0.27 to 0.58)***	0.37 (0.25 to 0.54)***
11-15	0.51 (0.36 to 0.73)***	0.51 (0.35 to 0.75)***	0.47 (0.32 to 0.70)***
16-20	0.56 (0.39 to 0.82)**	0.58 (0.39 to 0.85)**	0.57 (0.38 to 0.84)**
More than 20	1.00	1.00	1.00
Quit attempt made last year			
Yes	2.00 (1.59 to 2.52)***	1.51 (1.13 to 2.03)**	1.52 (1.13 to 2.05)**
No	1.00	1.00	1.00
Smoking cessation pharmacotherapy used last year			
Yes	5.52 (3.42 to 8.93)***	3.74 (2.18 to 6.41)***	3.59 (2.07 to 6.22)***
No	1.00	1.00	1.00
Avoid smoking bans			
Having a total smoking ban at home			
Yes	0.86 (0.68 to 1.08)	0.88 (0.66 to 1.16)	
No	1.00	1.00	
Smoking in bar/pub last visit			
Yes	1.07 (0.87 to 1.33)	0.79 (0.61 to 1.02)	0.79 (0.61 to 1.02)
No	1.00	1.00	1.00
Price awareness †	1.29 (1.17 to 1.42)***	1.15 (1.01 to 1.30)*	1.16 (1.04 to 1.31)*
Enjoy smoking †	1.09 (0.98 to 1.22)	1.07 (0.94 to 1.22)	

* p < 0.05, ** p < 0.01, *** p < 0.001, † on a scale from 1 to 5

day, who had made a quit attempt in the previous year, and who used smoking cessation pharmacotherapy in the previous year. Finally, respondents who often thought about the money they spent on smoking had a higher chance of ever having used e-cigarettes.

Results of the multivariate regression analysis with the 'forced entry' method demonstrated that the same variables remained significantly associated with ever having used e-cigarettes, except for gender and harm awareness for own health. Instead, often thinking about the harm of smoking for the health of other people was associated with a lower chance of ever having used an e-cigarette. When conducting a multivariate logistic regression with the 'backward' method, the association with harm awareness for the health of other people disappeared again while the association with the other variables as in the analysis with the 'forced entry' method remained significant.

Table 4 shows the results of the bivariate and multivariate logistic regression analyses which investigate associations between socio-demographic and smoking-related factors on the one hand and current e-cigarette use on the other hand among those ever trying e-cigarettes. Results of the bivariate regression analysis revealed that respondents of the lowest age groups (15-24 years and 25-39 years) were less likely to currently use e-cigarettes than smokers of 55 years and older. Furthermore, respondents with a moderate educational background were less likely to currently use e-cigarettes than highly educated smokers. Moreover, respondents who often thought about the harm of their smoking for the health of other people were more likely to keep using e-cigarettes. Smokers who had a total smoking ban at home and who had smoked during their last visit to a bar or pub were less likely to be current e-cigarette users.

In a multivariate logistic regression with the 'forced entry' method, the association of education, harm awareness for the health of other people, and having a smoking ban at home remained significant in the model. Furthermore, smokers who often thought about the harm of smoking for their own health were less likely to currently use e-cigarettes. Respondents who smoked 11-15 cigarettes per day were more likely to be current users than respondents smoking more than 20 cigarettes per day. In a multivariate logistic regression with the 'backward' method, the same variables remained significantly associated with current use as in the analysis with the 'forced entry' method.

Prevalence and reasons for use of electronic cigarettes among smokers

Table 4: Bivariate and multivariate logistic regression analyses of associations of current use of e-cigarettes among smokers 2014 (Odds Ratios and 95% Confidence Intervals) (weighted data).

	Current use of e-cigarettes		
	Bivariate analysis	Multivariate 'forced entry' analysis (n = 598)	Multivariate 'backward' analysis (n = 523)
Gender			
Female	1.16 (0.84 to 1.62)	1.25 (0.85 to 1.83)	
Male	1.00	1.00	
Age group			
15-24	0.48 (0.28 to 0.85)*	0.52 (0.26 to 1.03)	0.54 (0.28 to 1.06)
25-39	0.61 (0.37 to 0.98)*	0.78 (0.44 to 1.37)	0.70 (0.41 to 1.20)
40-54	1.33 (0.85 to 2.08)	1.58 (0.95 to 2.63)	1.64 (0.99 to 2.73)
55+	1.00	1.00	1.00
Income level			
Don't want to say	0.92 (0.56 to 1.52)	0.96 (0.54 to 1.71)	
Low	0.80 (0.51 to 1.26)	0.63 (0.36 to 1.08)	
Moderate	0.82 (0.51 to 1.33)	0.94 (0.54 to 1.62)	
High	1.00	1.00	
Educational level			
Low	0.98 (0.63 to 1.54)	0.89 (0.53 to 1.49)	0.82 (0.49 to 1.40)
Moderate	0.54 (0.37 to 0.79)**	0.52 (0.33 to 0.81)**	0.56 (0.36 to 0.87)*
High	1.00	1.00	1.00
Harm awareness			
Harm awareness self †	0.93 (0.79 to 1.10)	0.68 (0.53 to 0.87)**	0.73 (0.58 to 0.92)**
Harm awareness others †	1.20 (1.01 to 1.42)*	1.32 (1.03 to 1.70)*	1.31 (1.04 to 1.64)*
Reduce/quit smoking			
Number of cigarettes per day (only daily smokers)			
10 or less	1.04 (0.62 to 1.74)	1.61 (0.89 to 2.89)	1.74 (0.98 to 3.09)
11-15	1.43 (0.86 to 2.36)	1.87 (1.08 to 3.25)*	1.92 (1.09 to 3.39)*
16-20	1.25 (0.75 to 2.09)	1.62 (0.93 to 2.85)	2.05 (1.15 to 3.66)*
More than 20	1.00	1.00	1.00
Quit attempt made last year			
Yes	0.97 (0.69 to 1.35)	1.09 (0.69 to 1.73)	
No	1.00	1.00	
Smoking cessation pharmacotherapy used last year			
Yes	1.08 (0.67 to 1.72)	0.87 (0.47 to 1.61)	
No	1.00	1.00	
Avoid smoking bans			
Having a total smoking ban at home			
Yes	0.46 (0.31 to 0.68)***	0.41 (0.26 to 0.64)***	0.46 (0.29 to 0.72)***
No	1.00	1.00	1.00
Smoking in bar/pub last visit			
Yes	0.64 (0.46 to 0.90)*	0.78 (0.52 to 1.17)	
No	1.00	1.00	
Price awareness †	1.08 (0.93 to 1.26)	1.14 (0.93 to 1.39)	
Enjoy smoking †	1.09 (0.90 to 1.31)	1.01 (0.81 to 1.26)	

* p < 0.05, ** p < 0.01, *** p < 0.001, † on a scale from 1 to 5

DISCUSSION

The aim of the current study was to gain insight into the prevalence, motives, and characteristics of smokers who are using e-cigarettes in the Netherlands. We found a decrease in reported awareness of e-cigarettes between 2008 and 2013, likely due to the prohibition of advertising. This was also associated with a parallel decline in current use, although both trends had turned around by 2014, following the easing of restrictions in 2012 and the reappearance of advertising in 2013 which took place after the measurement in 2013. The massive increase in use between 2013 and 2014 is particularly notable. This increase in use is also in line with trends in other countries (Dockrell et al., 2013; Yong et al., 2015). With regard to the self-reported reasons for use, we found that e-cigarette users report to use them mainly to reduce their smoking or because they consider e-cigarettes as being less harmful than regular cigarettes. This is in line with previous research (Adkison, O'Connor, Bansal-Travers, et al., 2013; Dawkins et al., 2013; Goniewicz et al., 2013; Kralikova et al., 2013; Zhu et al., 2013). Price was also clearly important, as a majority (61%) reported that they started to use e-cigarettes because they considered them to be cheaper than regular cigarettes, and concerns about the price of cigarettes were similarly positively associated with trial. Few other studies included price as a possible motivation to use e-cigarettes, and these found mainly lower percentages (Etter & Bullen, 2011; Zhu et al., 2013). In our study, few smokers report using e-cigarettes as an alternative to quitting, while most report using them to reduce the number of cigarettes smoked per day, which is reassuring. Smokers seem to be aware of the dangers of smoking for their health and regarded e-cigarettes as an alternative or replacement to decrease these health risks, a finding also reported in other studies (Dockrell et al., 2013; Etter, 2010; Etter & Bullen, 2011). It is notable that most are using e-cigarettes even though they do not prefer the taste of e-cigarettes.

Regarding the socio-demographic characteristics of e-cigarette users, young people and men were more likely to have ever tried e-cigarettes compared to older age groups and women. Previous studies also found that young people more often tried e-cigarettes compared to older groups (Choi & Forster, 2013; Dockrell et al., 2013; Kralikova et al., 2013; Zhu et al., 2013). This is notable because trends in tobacco smoking show that young people smoke decreasing amounts of tobacco in the Netherlands (Bruggink, 2013). The association between ever trying e-cigarettes and gender was investigated in previous studies as well, but with mixed results (Adkison, O'Connor, Bansal-Travers, et al., 2013; Choi & Forster, 2013; Kralikova et al., 2013; Regan et al., 2013; Zhu et al., 2013). In contrast to the results of trial use, current use was not higher among men, and it was lower among young smokers than older smokers. Apparently, young people and men are more likely to try e-cigarettes, but not to keep using them. This is in accordance with previous research showing that men and young people tend to experiment more with new products (Centers for Disease Control and Prevention,

2010). With respect to education, we found that smokers with a moderate educational background were less likely to currently use e-cigarettes than highly educated smokers. Previous research regarding educational differences in current use showed no clear results (Adkison, O'Connor, Bansal-Travers, et al., 2013; Regan et al., 2013; Zhu et al., 2013). No differences in use according to income were found in the present study.

To the best of our knowledge, this study is the first which investigated the contribution of other smoking-related factors to e-cigarette use among smokers. We found that smoking many cigarettes per day, having made a quit attempt in the last year, and having used smoking cessation pharmacotherapy in the last year was associated with ever trying e-cigarettes. This is in accordance with the most often mentioned reason for using e-cigarettes found in the present study, namely to reduce smoking regular cigarettes. The finding of a strong association with previous use of smoking cessation pharmacotherapy is of particular interest. It could be that interest is concentrated among smokers who are open to using clean forms of nicotine or that e-cigarette users previously used smoking cessation medication to quit smoking but failed and tried using e-cigarettes instead. Moreover, smokers with high price awareness of regular cigarettes were more likely to try an e-cigarette. This is in accordance with reporting the lower price of e-cigarettes as a reason to start using them which was found in the present study among more than half of current e-cigarette users. If it is considered desirable to encourage smokers to switch, then keeping a large price differential may be important, as few will switch or even begin dual use on the basis of the taste, and health concerns may not be enough for many.

Regarding the associations with current use, only a few variables remained significantly associated in the analyses. A positive association between current use and harm awareness for the health of other people suggests that smokers might use e-cigarettes to protect their environment from tobacco smoke exposure. Smokers who smoked many cigarettes per day were more likely to try an e-cigarette, while current use was associated with smoking relatively fewer cigarettes per day. It is possible that these smokers smoke fewer cigarettes because of the dual use with e-cigarettes, but we could not determine this with the present study. Furthermore, respondents who do not smoke at home were less likely to keep using e-cigarettes. A possible explanation is that implementing a total smoking ban at home includes e-cigarettes. Future research should take this into account and should look into reasons to keep using e-cigarettes among current users.

Strengths and Limitations

An important strength of the current design was that we used a sample from the general population of smokers. Some other studies recruited users via forums or websites for e-cigarettes or via shops where users bought e-cigarettes, which could bias the results.

Several important limitations should be taken into consideration when interpreting our results. First, the analysis of use relied on cross-sectional data, making causal hypothesising impossible. Second, the sample of current e-cigarette users was relatively small, which could have resulted in limited power to identify small but potentially important associates of e-cigarette use. However, the results give an important first impression of the group of current Dutch e-cigarette users and provide a starting point for future research about factors that determine whether people keep using e-cigarettes and why. Third, the reasons to use e-cigarettes were listed; respondents had no option to fill in other reasons, so some reasons for use may be missing. Fourth, the exact timing of use of smoking cessation pharmacotherapy was not measured. Respondents were only asked whether they used medication in the last year. Future research should investigate whether smokers started using e-cigarettes before, during or after using medication to clarify their motivation for using e-cigarettes even more.

Conclusion

E-cigarettes are increasingly used by Dutch smokers. Awareness and use of e-cigarettes seemed to be capable of being influenced by mass media advertisements. The findings from the present study showed that commonly endorsed motivations for current e-cigarette use were to reduce tobacco smoking and because e-cigarettes are considered less harmful than tobacco cigarettes, but it remains uncertain how many smokers are successful in reducing or quitting smoking due to e-cigarettes. Therefore, it is vitally important that long-term health and cessation effects of e-cigarettes are examined and communicated to the public.

Chapter 3

Social acceptance of smoking restrictions during 10 years of policy implementation, reversal, and reenactment in the Netherlands

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ABSTRACT

Introduction: Little is known about the extent to which smoking restrictions are socially accepted in a country such as the Netherlands where smoking restrictions have been implemented and reversed several times. The current study assessed trends as well as factors associated with two indicators of social acceptance of smoking restrictions in the Netherlands: acceptance of smoking in public places and implementation of home smoking bans.

Methods: We used data from the Dutch Continuous Survey of Smoking Habits (DCSSH) between 2005 and 2014 ($n = 182,826$). The DCSH is a national population survey with a cross-sectional design in which respondents aged 15 years and older are surveyed weekly.

Results: Acceptance of smoking in public places decreased for six out of eight included venues, with the largest decrease for smoking in restaurants. The decrease in acceptance was larger among younger respondents and smokers. Smoking on terraces was an exception: decrease in acceptance there was larger among older respondents and ex-smokers. Implementation of home smoking bans increased over time. Having implemented a home smoking ban was associated with being male, being younger, having a high socio-economic status, and being ex- or never smoker.

Conclusions: Social acceptance of smoking restrictions has increased in the Netherlands, despite a suboptimal implementation process of smoking restrictions. However, there is still potential for improvement as acceptance of smoking is still quite high for some public venues like bars. It is important to strengthen smoking restrictions in order to further denormalize smoking in the Netherlands.

Implications: We examined the extent to which smoking restrictions are socially accepted in the Netherlands where smoking restrictions have been implemented and reversed several times. Acceptance of smoking in public places decreased and implementation of home smoking bans increased between 2005 and 2014. Social acceptance of smoking restrictions increased in the Netherlands despite a suboptimal implementation process of smoking restrictions. However, acceptance of smoking in bars remains relatively high.

INTRODUCTION

Secondhand smoke can have severe health consequences for non-smokers such as cancer, asthma, COPD, and various heart diseases (U.S. Department of Health and Human Services, 2014). Therefore, implementation of smoking restrictions to protect people from exposure to tobacco smoke was incorporated into Article 8 of the Framework Convention of Tobacco Control (FCTC) by the World Health Organization (World Health Organization, 2003a). Smoking restrictions have been implemented by many countries that ratified the FCTC although a recent study indicated that the adoption rate of smoking restrictions was highest immediately after the ratification of the FCTC, and that this effect of the FCTC decayed within several years (Uang, Hiilamo, & Glantz, 2016). Previous research showed that compliance with smoking restrictions is relatively high in most developed countries (Biener, Garrett, Skeer, Siegel, & Connolly, 2007; Edwards et al., 2008; Minardi et al., 2014; Okoli, Johnson, Pederson, Adkins, & Rice, 2013). Smoking restrictions that are complied with are effective in reducing secondhand tobacco smoke exposure (Callinan, Clarke, Doherty, & Kelleher, 2010; Edwards et al., 2008; Verdonk-Kleinjan et al., 2009).

However, little is known about the social acceptance of smoking restrictions. It is possible that smokers comply with the restrictions simply because they have to, but that they would resume smoking if it was allowed again. High acceptance of smoking in public places would indicate that people are not aware or do not agree with the need and benefits of smoking restrictions, which increases the risk of non-compliance. Smokers could defy smoking restrictions or could pressure owners of public venues to allow them to smoke. For example, in the Netherlands smoking is tolerated late at night in some bars when bar owners think that chances of compliance checks are low (Nagelhout, Willemsen, Van Hoof, & Pieterse, 2014). Furthermore, some concerns have been voiced suggesting an increase in smoking at home after implementation of smoking restrictions in public places. These concerns include that if smokers would comply with those smoking restrictions, they would compensate the lack of smoking opportunities in the public sphere by more smoking in the private sphere. According to the “last refuge” model, especially restrictions at recreational venues would lead to more smoking at home and therefore more exposure to secondhand smoke to other family members (Borland, Yong, Cummings, et al., 2006). Whereas smokers may have to show public commitment to smoking bans, they still could lack private commitment, leading to no personal acceptance of smoking restrictions. The installment of smoking bans at home is a reflection of such personal acceptance of non-smoking. We therefore examined both acceptance of smoking in public places and implementation of home smoking bans in the current study. An increase in unacceptance of smoking in public places as well as at home would be an indicator that smoking restrictions might lead to denormalization of smoking instead of merely obeying the law. Other studies showed that smoking restrictions can indeed increase smokers’ feelings of being stigmatized and change social

norms about smoking (Betzner et al., 2012; Hammond, Fong, Zanna, Thrasher, & Borland, 2006).

Previous studies showed decreases over time in acceptance of smoking in public places and increases in support of smoking bans (Callinan et al., 2010; Fong et al., 2013; Maguire, Brinkley, & Mansfield, 2010; Mons et al., 2012). Moreover, previous research indicates that implementation of smoking restrictions in public places probably does not result in an increase of smoking at home, but may even lead to a decrease (Hyland et al., 2008; Kairouz, Lasnier, Mihaylova, Montreuil, & Cohen, 2015; Minardi et al., 2014; Mons et al., 2013). However, most previous studies focused on smoking restrictions at one venue and did not examine long-term trends. Acceptance of smoking in public places and implementing home smoking bans may differ within certain groups. Previous studies found mixed results regarding socio-demographic differences, but did find that non-smokers were more supportive of smoking restrictions and more likely to implement home smoking bans than smokers (Kairouz et al., 2015; Maguire et al., 2010; Mons et al., 2013; Mons et al., 2012). Further information about whether subgroup differences can be found could be important to develop targeted interventions in order to increase social acceptance of smoking restrictions, for example by educational campaigns.

Smoking restrictions in the Netherlands

Smoke-free workplaces including public transportation were implemented in January 2004 in the Netherlands, and this legislation has not changed since. Implementation of a smoke-free hospitality sector, however, did not proceed that straightforward (Gonzalez & Glantz, 2013; Heijndijk & Segaar, 2015; Heijndijk & Willemsen, 2015; van Bladeren, 2011). In July 2008, a smoking ban for the hospitality sector was implemented. Comparable to other workplaces, owners of hospitality venues were allowed to create designated smoking rooms but personnel was not allowed to serve there. Several owners of small bars were unwilling to comply with this legislation and joined the organization “Save the small hospitality industry entrepreneur” that was set up to fight the smoking ban and that had ties with the tobacco industry (Gonzalez & Glantz, 2013). After lawsuits by bar owners against the State, the smoking restrictions were reversed in July 2009 for owner-only bars with no further employees, and smoking was allowed there again. In February 2010, the Supreme Court overruled this decision and determined that smoking restrictions should apply to all hospitality venues as originally intended. In June 2010, a general election took place in the Netherlands which resulted in the formation of a new government. The decision of the former government to apply smoking restrictions to all hospitality venues was reversed again for small bars (< 70 m²) without employees in November 2010 by the newly elected government (Heijndijk & Segaar, 2015). In February 2013, a voting about hospitality industry smoking restrictions took place within the government that resulted in the decision to apply the smoking

ban to all hospitality venues again, which was realized in October 2014. However, owners of hospitality venues were still allowed to have designated rooms where smoking was allowed.

The Netherlands Food and Consumer Product Safety Authority investigated compliance with smoking restrictions at various hospitality venues. This research was done by observations of the venues and reporting the number of venues where no smokers were seen (Nederlandse Voedsel- en Warenautoriteit, 2014, 2015). Figure 1 gives an overview of the various policy changes and compliance with smoking restrictions in bars and clubs in the Netherlands from 2005 to 2014. It shows that compliance decreased when smoking restrictions were partially reversed, but later increased again.

The aim of the current study was to investigate trends in social acceptance of smoking restrictions during 10 years of implementation, reversal and reenactment of smoking restrictions in the Netherlands. In addition, we examined which socio-demographic factors were associated with social acceptance of smoking restrictions and whether these associations changed over time.

METHODS

Design and sample

We used data from the Dutch Continuous Survey of Smoking Habits (DCSSH). The DCSSH is a national population survey with a cross-sectional design in which respondents aged 15 years and older are surveyed weekly. Respondents of the DCSSH are randomly selected from a nationally representative panel of marketing research agency TNS NIPO. This panel includes more than 140,000 potential respondents who regularly participate in internet-based research and who are actively recruited by TNS NIPO via mail and telephone. For the current study, we used data from 2005 to 2014 ($n = 182,826$). Between 2005 and 2008, surveys were conducted using household web interviewing; as of 2009, personal-level web interviewing was used. Approximately 18,000 respondents participated in the survey each year (response rate = 68% in 2014).

Figure 1: Overview of the implementation (white, grey, and black blocks) and compliance (grey and black lines) in percentage of hospitality venues where no smokers were observed; only available as of 2009 (Nederlandse Voedsel- en Warenautoriteit, 2014, 2015)) with smoke-free hospitality industry legislation in the Netherlands.

Measurements

Acceptance of smoking in public places

To assess acceptance of smoking in public places, we asked six questions on a 5-point scale about whether respondents found it acceptable to smoke in places where smoking was not allowed, i.e. in a restaurant, in a bar, in public transportation, and at schools, as well as in places where smoking is still allowed, i.e. in the car with non-smokers, and on the street (1 = absolutely unacceptable, 2 = unacceptable, 3 = neutral, 4 = acceptable, 5 = absolutely acceptable). As of 2008, also data from two additional venues were available: acceptance of smoking at workplaces (where smoking is prohibited) and smoking on terraces of restaurants and bars (where smoking is allowed). To investigate trends of acceptance, we used mean values of these variables from each included survey year. To examine associations of acceptance with other factors, we combined all items except smoking at workplaces and smoking on terraces into one scale (Cronbach's $\alpha = 0.80$).

Home smoking bans

To measure the rules about smoking at respondents' homes, we asked respondents who were living with at least one young child in their home: "Do people smoke at your home? 1 = always, 2 = regularly, 3 = sometimes, 4 = never". The first three answers were combined, indicating having implemented no home smoking ban (0), while the last option indicated having a complete smoking ban inside a respondent's house (1).

Covariates

Covariates were sex, age, gross yearly household income, level of completed education, and smoking status (smoker, ex-smoker, never smoker). Age was categorized into: 15-24 years, 25-39 years, 40-54 years, and 55 years and older. Income was categorized into three groups: low (less than 28,500 euro), moderate (between 28,500 and 45,000 euro) and high (more than 45,000 euro). Level of education was also categorized into three groups: low (primary education and lower pre-vocational secondary education), moderate (middle pre-vocational secondary education and secondary vocational education) and high (senior general secondary education, (pre-) university education and higher professional education). To determine the smoking status, all respondents were asked: "Do you (ever) smoke or do you not smoke at all?" Respondents who answered that they smoked were defined as current smokers. Respondents who answered that they did not smoke were asked: "Have you smoked in the past?" Respondents who answered that they had smoked in the past were defined as ex-smokers and respondents who answered that they had not smoked in the past as never smokers (Nagelhout, De Korte-de Boer, et al., 2012; Willemsen, Hoogenveen, & Van der Lucht, 2002).

Analyses

First, we plotted trends of acceptance of smoking at all included venues and of having implemented a complete home smoking ban. Next, we tested whether these trends changed significantly between the first and the last year of measurement using independent-samples t-tests (acceptance) and Pearson Chi-Square tests (home smoking bans), stratified by smoking status. We furthermore conducted hierarchical linear and logistic regression analyses with three steps using the “Enter” method. The dependent variable was the scale for acceptance of smoking in the linear regression analysis, and whether or not respondents had implemented a complete home smoking ban in the logistic regression analysis. In the first step, we tested whether acceptance of smoking and having a home smoking ban changed significantly between 2005 and 2014 by specifying “survey year” (trend) as continuous variable. In the second step, we added the above outlined covariates to identify factors associated with acceptance of smoking and having a home smoking ban. In the third step, we included interaction terms on top of the main effects for all covariates by survey year to examine whether associations changed over time. We performed sensitivity analyses with each interaction included separately into the third model of both regression analyses, and the pattern of results remained the same compared to the models with all interactions included. To get more specific information about trends at the different venues, we performed secondary analyses with acceptance of smoking for each venue as separate outcome measures.

Respondents had the opportunity to refuse answering the income question or to answer with “don’t know”. These responses were recoded as missing values and excluded from the analyses ($n = 40,743$), resulting in a sample size of 142,083 respondents for the regression analyses. In all analyses, sampling weights for age, sex, educational level, working hours, geographic region, urbanization, and household size were applied to make the data representative for the Dutch population. We used an alpha level for significant differences of < 0.05 . All analyses were conducted with SPSS version 21.

RESULTS

Sample description

Table 1 shows the socio-demographic characteristics and the smoking status of the included respondents. Due to the different method of data collection as of 2009 (as described in the methods), the distribution of scores before and after 2009 changed for age, income and education. The proportion of participants who were categorized as smokers decreased between 2005 (27.8%) and 2014 (23.2%), while the proportion of ex-smokers slightly increased (from 33.9% to 35.2%), as did the proportion of never smokers (from 38.3% to 41.6%).

Table 1. Sample descriptions from 2005 to 2014 (weighted data).

	2005 (n=19,344)	2006 (n=18,031)	2007 (n=14,730)	2008 (n=18,627)	2009 (n=19,716)	2010 (n=18,784)	2011 (n=18,615)	2012 (n=18,299)	2013 (n=18,396)	2014 (n=18,284)
Sex										
Male (%)	49.1	49.1	49.1	49.0	49.3	49.3	49.2	49.3	49.3	49.3
Age										
15-24 (%)	14.7	14.7	14.7	14.7	14.7	14.9	14.8	14.8	14.9	14.8
25-39 (%)	30.3	30.3	30.7	30.8	25.3	24.5	23.7	23.1	22.7	22.7
40-54 (%)	26.4	26.5	26.1	26.0	27.6	27.9	28.1	28.1	28.0	27.5
55 and older (%)	28.6	28.5	28.5	28.6	32.4	32.8	33.5	34.0	34.4	34.9
Income										
Low (%)	36.0	35.7	36.2	34.6	32.4	33.7	33.6	36.0	35.6	35.3
Moderate (%)	34.7	37.3	35.5	36.3	32.6	31.2	32.2	32.0	31.9	32.5
High (%)	29.2	27.0	28.3	29.2	35.0	35.1	34.2	32.1	32.4	32.2
Education										
Low (%)	44.4	44.5	44.5	44.5	29.7	28.3	29.3	28.0	26.5	26.1
Moderate (%)	33.6	33.6	33.6	33.6	41.8	41.7	40.3	40.3	41.7	41.7
High (%)	21.9	21.9	21.9	21.9	28.6	29.9	30.4	31.7	31.8	32.2
Smoking status										
Smoker (%)	27.8	28.2	27.5	26.7	27.7	27.2	24.7	25.9	25.0	23.2
Ex-smoker (%)	33.9	32.8	32.4	32.0	34.4	34.8	36.0	34.6	35.1	35.2
Never smoker (%)	38.3	39.0	40.1	41.2	37.9	38.0	39.4	39.4	39.9	41.6

Trends in acceptance of smoking in public places and home smoking bans

Figure 2A shows the trends of acceptance of smoking at all included venues. Acceptance of smoking in public transportation, in the car with non-smokers, and at schools was quite low, ranging from 1.4 (on a scale from 1-5 with a higher score indicating higher acceptance) to 1.6 between 2005 and 2014. Acceptance of smoking in public transportation, at schools, in restaurants, and in bars decreased significantly between 2005 and 2014 among smokers, ex-smokers, and never smokers (see Supplementary Table S1 for the stratified results). The largest decrease was observed regarding smoking in restaurants among all three groups. Acceptance of smoking in cars with non-smokers increased slightly but statistically significantly among all three groups (from 1.27 to 2.03 for all groups combined), and acceptance of smoking on the street increased significantly among smokers (from 3.84 to 4.11) and never smokers (from 2.94 to 3.08). Acceptance of smoking at workplaces decreased significantly between 2008 and 2014 among all three groups (from 2.74 to 1.55 for all groups combined), as did acceptance of smoking on terraces (from 4.45 to 2.54 for all groups combined).

We additionally analyzed the trends of unacceptance (score 1 and 2) and of acceptance (score 4 and 5) (not shown in tables). Acceptance of smoking increased for all venues, but only slightly. Unacceptance of smoking decreased for smoking on the street, on terraces, and in cars with non-smokers, remained stable for smoking in public transportation, and increased for smoking in bars, at work, in restaurants, and at schools. The largest decrease in unacceptance was found for smoking on the street, and the largest increase for smoking in restaurants.

Figure 2B displays the trends of having implemented a complete home smoking ban separately for smokers, ex-smokers, and never smokers. Smokers were least likely to have implemented a home smoking ban compared to ex-smokers and never smokers. Having a complete home smoking ban increased significantly between 2005 and 2014 among all three groups (see Supplementary Table S1 for the stratified results). In 2005, 42.5% of the smokers, 65.5% of the ex-smokers and 77.9% of the never smokers had a smoking ban at home. In 2014, this had increased to 55.1% of smokers, 85.2% of ex-smokers and 90.8% of never smokers.

Figure 2: Trends of acceptance of smoking (A) and having implemented a complete home smoking ban (B).

Trends of mean acceptance (1=absolutely unacceptable, 5=absolutely acceptable) (A) [†]

*Venues where smoking was restricted in 2014

[†] All trends between 2005 and 2014 were statistically significant

Trends of having implemented a complete home smoking ban (B) [†]

[†] All trends between 2005 and 2014 were statistically significant

Chapter 3

Supplementary Table S1: T-tests and Chi-Square tests regarding trends of acceptance of smoking and home smoking bans.

	Baseline [†]	2014	Test statistics
<u>Smokers</u>			
Social unacceptance of smoking... (mean‡ (SD))			
In public transportation	1.82 (1.14)	1.70 (1.07)	t = 2.36*
At schools	1.95 (1.21)	1.78 (1.10)	t = 3.10**
In the car with non-smokers	1.81 (1.11)	2.03 (1.21)	t = -4.14***
In a restaurant	3.98 (1.21)	2.12 (1.25)	t = 32.99***
At work	2.74 (1.28)	2.41 (1.25)	t = 8.02***
In a bar	4.25 (1.13)	3.35 (1.40)	t = 15.83***
On a terrace	4.45 (1.00)	3.94 (1.23)	t = 10.92***
On the street	3.84 (1.37)	4.11 (1.14)	t = -4.51***
Home smoking ban (%)	42.5	55.1	$\chi^2 = 8.28^{**}$
<u>Ex-smokers</u>			
Social unacceptance of smoking... (mean‡ (SD))			
In public transportation	1.35 (0.78)	1.24 (0.63)	t = 3.63***
At schools	1.43 (0.85)	1.27 (0.66)	t = 5.32***
In the car with non-smokers	1.27 (0.66)	1.36 (0.78)	t = -3.51***
In a restaurant	2.60 (1.40)	1.41 (0.83)	t = 24.56***
At work	1.83 (1.07)	1.64 (0.96)	t = 7.14***
In a bar	3.15 (1.39)	2.26 (1.33)	t = 17.03***
On a terrace	3.59 (1.36)	2.88 (1.39)	t = 14.16***
On the street	3.30 (1.42)	3.34 (1.27)	t = -0.85
Home smoking ban (%)	65.5	85.2	$\chi^2 = 33.12^{***}$
<u>Never smokers</u>			
Social unacceptance of smoking... (mean‡ (SD))			
In public transportation	1.37 (0.81)	1.27 (0.66)	t = 3.37***
At schools	1.48 (0.87)	1.32 (0.71)	t = 5.42***
In the car with non-smokers	1.29 (0.69)	1.37 (0.76)	t = -2.98**
In a restaurant	2.29 (1.27)	1.39 (0.80)	t = 20.93***
At work	1.70 (0.96)	1.55 (0.89)	t = 6.70***
In a bar	2.90 (1.38)	2.13 (1.23)	t = 15.50***
On a terrace	2.99 (1.40)	2.54 (1.30)	t = 10.19***
On the street	2.94 (1.44)	3.08 (1.27)	t = -2.64**
Home smoking ban (%)	77.9	90.8	$\chi^2 = 31.56^{***}$

* p < 0.05, ** p < 0.01, *** p < 0.001

[†] 2005 for: in public transportation, at schools, in the car with non-smokers, in a restaurant, in a bar, on the street; 2008 for: at work, on a terrace

[‡] On a scale from 1 to 5 (1 = absolutely unacceptable, 5 = absolutely acceptable)

Factors associated with acceptance of smoking in public places and home smoking bans

Table 2 shows which factors were associated with acceptance of smoking at all venues (except workplaces and terraces) combined. Acceptance of smoking decreased significantly between 2005 and 2014, indicating that respondents found smoking at all included venues less acceptable over time. Furthermore, more acceptance of smoking was associated with being male, being young, having low income and education, and being smoker. All interaction terms that were added into step 3 were statistically significant. The largest effect sizes were found for trend*age (Beta = 0.13) and for trend*smoking status (Beta = 0.15). Results of stratified analyses (not shown in tables) revealed that the decrease of acceptance over time among respondents who were categorized into the younger age groups was larger compared to respondents from the older age groups. Stratification by smoking status showed that acceptance of smoking decreased more over time among smokers than among ex-smokers and never smokers.

In secondary analyses (not shown in tables), we examined the acceptance of smoking for each venue separately. The same factors were associated with acceptance of smoking in these secondary analyses as in the analyses with all venues combined into one scale. We also analyzed the interactions between trend*age and trend*smoking status for each venue separately. These analyses revealed that the decrease over time regarding acceptance of smoking at schools, in public transportation, in bars, in restaurants, and at work was larger among respondents with a young than a high age, but the decrease was larger regarding smoking on terraces among respondents with a high than a young age. The increase regarding smoking in the car with non-smokers and smoking on the street was largest among middle-aged respondents. Furthermore, the decrease over time regarding acceptance of smoking at schools, in bars, in restaurants, and at work was largest among smokers while the decrease regarding smoking in public transportation and on terraces was largest among ex-smokers. The increase regarding smoking in the car with non-smokers was largest among smokers and regarding smoking on the street among ex-smokers.

Table 2 also shows the factors associated with having implemented a complete home smoking ban. First of all, the odds of having a home smoking ban increased over time. Furthermore, women were less likely to report having implemented a home smoking ban than men. Respondents aged 25-39 years were more likely to report a home smoking ban than respondents aged 55 years and older. Respondents with low income and education were less likely to have implemented a complete home smoking ban than respondents with high income and education. Smokers were finally less likely to have a home smoking ban than never smokers. None of the interaction terms for trend by covariate was statistically significant, indicating that the factors associated with having implemented home smoking bans did not change significantly over time.

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Table 2: Linear regression analysis showing factors associated with acceptance of smoking (range: 1 = absolutely unacceptable, 5 = absolutely acceptable) and logistic regression analysis showing factors associated with having implemented a complete home smoking ban (yes/no).

	Acceptance of smoking B (SE), Beta	Home smoking ban OR (95% CI)
<u>Step 1:</u>		
Trend (2005-2014)	-0.05 (0.00), -0.13***	1.12 (1.10 to 1.13)***
<u>Step 2:</u>		
Trend (2005-2014)	-0.03 (0.00), -0.10***	1.11 (1.09 to 1.13)***
Sex		
Female	-0.06 (0.01), -0.04***	0.67 (0.62 to 0.73)***
Male	Ref.	Ref.
Age		
15-24	0.41 (0.01), 0.16***	1.88 (1.16 to 3.04)**
25-39	0.32 (0.01), 0.17***	2.18 (1.65 to 2.89)***
40-54	0.20 (0.01), 0.10***	1.48 (1.12 to 1.96)**
55 and older	Ref.	Ref.
Income		
Low	0.09 (0.01), 0.05***	0.63 (0.56 to 0.71)***
Moderate	0.05 (0.01), 0.03***	0.81 (0.73 to 0.90)***
High	Ref.	Ref.
Education		
Low	0.14 (0.01), 0.08***	0.32 (0.28 to 0.37)***
Moderate	0.06 (0.01), 0.04***	0.55 (0.49 to 0.61)***
High	Ref.	Ref.
Smoking status		
Smoker	0.92 (0.01), 0.48***	0.16 (0.14 to 0.18)***
Ex-smoker	0.20 (0.01), 0.11***	0.74 (0.66 to 0.83)***
Never smoker	Ref.	Ref.
<u>Step 3^a:</u>		
Trend*sex	0.01 (0.00), 0.03**	1.02 (0.98 to 1.05)
Trend*age	0.01 (0.00), 0.13***	1.02 (0.99 to 1.06)
Trend*income	-0.00 (0.00), -0.02*	1.01 (0.98 to 1.03)
Trend*education	-0.01 (0.00), -0.05***	0.98 (0.95 to 1.01)
Trend*smoking status	0.02 (0.00), 0.15***	1.02 (0.99 to 1.04)

* p < 0.05, ** p < 0.01, *** p < 0.001

^a Step 3 also includes all main effects from step 2

DISCUSSION

The aim of the current study was to investigate changes in social acceptance of smoking restrictions during a decade of inconsistent smoking restrictions in the Netherlands. We used acceptance of smoking in public places and having implemented home smoking bans as indicators of social acceptance of smoking restrictions. Smoking in public transportation, at schools, in restaurants, in bars, and at workplaces became less acceptable over time. At all these venues smoking was not allowed by law in 2014 in the Netherlands. It is notable that the largest decrease was found at venues where smoking restrictions were implemented during or immediately before the study period: at workplaces and at the hospitality sector. Yet, the acceptance of smoking in bars remained quite high compared to smoking in restaurants. The gap between these two venues only became wider from 2005 to 2014. It is likely that the frequent changes in legislation and the exemptions for small bars affected the acceptance of smoking. Previous research from the Netherlands as well as other European countries showed that compliance with smoking restrictions was also lower at venues with partial compared to comprehensive policies (Filippidis et al., 2016; Nagelhout, De Vries, et al., 2012; Nagelhout et al., 2011; Nederlandse Voedsel- en Warenautoriteit, 2015; World Health Organization, 2007). A smoother implementation of smoking restrictions in the Netherlands might have led to lower acceptance of smoking in bars and higher compliance with the smoking ban in bars, at levels comparable to restaurants.

We furthermore found a decrease regarding acceptance of smoking on terraces of hospitality venues, and an increase regarding smoking on the street and regarding smoking in the car with non-smokers. At all three venues smoking was allowed by law in 2014 in the Netherlands. Acceptance of smoking in cars with non-smokers was already quite low in 2005 and remained low up to 2014. These findings indicate that high support from the population could be expected if smoking restrictions in cars with non-smokers would be implemented. For the time being, implementation of a smoking ban on terraces of hospitality venues will probably not get a lot of support by the Dutch population.

Regarding home smoking bans, we found that the Dutch population increasingly implemented complete bans. The concerns that the implementation of smoking restrictions in public places would be related to a displacement to smoking at home were not supported in the current study. Ex-smokers as well as never smokers implemented consistently more home smoking bans than smokers between 2005 and 2014. The implementation of home smoking bans by smokers did decrease at first between 2007 and 2008, when the smoke-free hospitality sector was implemented in the Netherlands. However, as of 2008, the percentage of smokers who implemented home smoking bans increased again to levels much higher than 2007. The general increase could be an indicator of increasing personal acceptance and commitment to smoking bans. We furthermore found that men, people aged 25-39 years, people with a high socioeconomic

background, and never smokers were most likely to have implemented a complete home smoking ban. These findings are in line with several previous studies (Hilliard et al., 2015; Mons et al., 2013; Zhang, Martinez-Donate, Kuo, Jones, & Palmersheim, 2012). Future research should investigate how acceptance of smoking in public places and the implementation of home smoking bans interact or are causally related to each other. We found in our study that public smoking restrictions did not lead to compensation by more smoking at home, but rather added to denormalization of smoking by a decrease in smoking at home. Therefore, it is possible that tightening of public smoking bans leads to more home smoking bans.

We found a number of subgroup differences regarding acceptance of smoking in public places and implementing home smoking bans. A low level of social acceptance of smoking restrictions was in particular observed among people with a low socioeconomic background and smokers. Measures to increase this acceptance, for example campaigns to increase knowledge and awareness of the harm of secondhand smoke, should therefore be targeted at these groups. A notable finding of the current study was that the decrease of acceptance of smoking in public places over time was largest for younger respondents and smokers. This is reassuring because the long-term effects regarding secondhand smoke exposure are probably largest if acceptance further decreases among these groups compared to other groups. For example, smokers who find smoking in bars decreasingly acceptable are more likely to not smoke there anymore.

Limitations and strengths

One limitation of the current study is the change in survey methodology as of 2009 that led to changes in the sample composition. Therefore, it might be possible that our results are not fully generalizable to the entire Dutch population. Another limitation is that we could only include data from the Netherlands. It would be interesting to compare the findings of the current study with data from other countries to get information about whether the Dutch trends can also be observed elsewhere, for example in countries that implemented comprehensive smoking restrictions all at once. Moreover, our design was cross-sectional and therefore not suitable to draw conclusions about causality. Future research could measure social acceptance of smoking restrictions longitudinally to track individual changes over time. Strengths of the current study are the large sample size, and that we could analyze data from quite a long period of time with many changes in the smoking restrictions which gives valuable insight into long-term developments and trends.

Conclusion

Social acceptance of smoking restrictions increased among the Dutch population between 2005 and 2014, despite a suboptimal implementation process of smoking restrictions in bars. However, acceptance of smoking remains quite high for some public places, especially for bars. Higher successes could probably have been obtained with a smoother policy implementation process. The Dutch population increasingly implemented home smoking bans, indicating that the implementation of smoking restrictions in public places was not related to a displacement to smoking at home.

Chapter 4

Are there income differences in the impact of a national reimbursement policy for smoking cessation treatment and accompanying media attention?

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ABSTRACT

Background: This study examined possible income differences in the impact of a national reimbursement policy for smoking cessation treatment and accompanying media attention in the Netherlands in 2011.

Methods: We used three waves of the International Tobacco Control (ITC) Netherlands Survey, a nationally representative longitudinal sample of smokers aged 15 years and older ($n=1,912$). The main analyses tested trends and income differences in outcome measures (smokers' quit attempt rates, use of behavioral counseling, use of cessation medications, and quit success) and awareness variables (awareness of reimbursement possibilities, the media campaign, medications advertisements and other media attention) with Generalized Estimating Equations analyses.

Results: In the first half of 2011, there was a significant increase in quit attempts (Odds Ratio (OR) = 2.02, $p < 0.001$) and quit success (OR = 1.47, $p < 0.001$). Use of counseling and medications remained stable at 3% of all smokers in this period. Awareness of reimbursement possibilities increased from 11% to 42% (OR = 6.38, $p < 0.001$). Only awareness of the media campaign was associated with more quit attempts at the follow-up survey (OR = 1.95, $p < 0.001$). Results were not different according to smokers' income level.

Conclusions: The Dutch reimbursement policy with accompanying media attention was followed by an increase in quit attempts and quit success, but use of cessation treatment remained stable. The impact of the policy and media attention did not seem to have decreased or increased socioeconomic inequalities in quit attempts, use of cessation treatment, or quit success.

INTRODUCTION

Smoking tobacco is highly addictive and smoking cessation leads to withdrawal symptoms, making it difficult for smokers to stay tobacco-free (USDHHS 2010). There are various behavioral smoking cessation interventions and medications available on the market to help smokers quit smoking. Despite the availability of treatment, many smokers attempt to quit smoking without the use of assistance (Shiffman et al. 2008, Borland, Li, et al. 2012). Reasons for not using treatment include financial barriers (Gross et al. 2008, Willems et al. 2013). Financial barriers can be reduced by reimbursement policies for smoking cessation. Such policies may be more effective among smokers with lower income levels, because the use of cessation treatment is lower in this group (Shiffman et al. 2008) and the price of treatment may be a barrier for them (Giskes et al. 2007). This is important, because smokers with lower income levels smoke more cigarettes per day and have lower quit rates than smokers with higher income levels (Siahpush et al. 2006, Nagelhout, De Korte-de Boer et al. 2012).

A recent review concluded that reimbursing smokers for their use of smoking cessation treatment increased the use of treatment, the number of attempts to quit smoking and the number of successful quit attempts (Reda et al. 2012). However, income differences were not reported. In fact, few original studies have looked at income differences. Tremblay et al. (2009) examined differences in the use of a reimbursement policy in a province of Canada (Quebec). Their findings suggest that the reimbursement policy was more effective in reaching financially disadvantaged smokers, as evidenced by greater use of reimbursed cessation medications by employment assistance recipients than other insured persons. Furthermore, stop smoking services have been successful in reaching financially disadvantaged smokers in the United Kingdom (Bauld et al. 2007, West et al. 2013). However, these services have specifically focused on reaching this group by using targeted media campaigns, basing and promoting smoking cessation services in deprived areas, and offering an exemption from paying the (small) prescription charge for medications for people on low incomes (Bauld et al. 2007, Murray and McNeill 2012, West et al. 2013). It is unclear whether a national reimbursement policy that does not focus on reaching low income smokers could achieve similar effects.

In January 2011, a national reimbursement policy for smoking cessation treatment was implemented in the Netherlands. Behavioral counseling was already reimbursed prior to 2011 and, depending on their particular insurance package, some smokers were already able to get a reimbursement for cessation medications (nicotine replacement therapy and prescription medications) from their supplementary insurance. Because the combination of cessation medications and behavioral counseling is most effective in helping smokers to quit (Hartmann-Boyce et al. 2013), medications were only reimbursed to smokers provided that they also participated in multi-session evidence-based behavioral counseling (face-to-face, group, or telephonic counseling). Once a year,

smokers could claim full reimbursement for smoking cessation treatment from their health insurance company. This was paid only after spending the mandatory deductible of 170 Euro per year for any health care costs. This means that smokers were only fully reimbursed when they had completed their deductible.

The implementation of the reimbursement policy was accompanied by a media campaign that ran from December 2010 to January 2011. This campaign explained the reimbursement policy and focused on motivating smokers to quit smoking with the use of behavioral counseling and cessation medications (Willems et al. 2012). There was also an increase in commercial advertisements about cessation medications from the pharmaceutical industry and some of these communicated the new reimbursement possibilities. Finally, there were numerous news stories about the policy on television, on the radio, in newspapers, and on the internet. Media attention that increases the awareness of the reimbursement policy can potentially be important to increase the use of the reimbursement and the level of smoking cessation (Reda et al. 2012). Therefore, it is important to take media attention into account when studying the impact of a reimbursement policy.

The reimbursement policy in the Netherlands was discontinued after one year due to government budget cuts. This provides a unique opportunity to examine the impact of this policy under real-world conditions. In a previous study, we examined the impact of the reimbursement policy with a sample of smokers that was followed until six months after policy implementation (Nagelhout et al., 2015). In the current study, we also conducted a survey when the policy was already discontinued. This design has the advantage of functioning as a within-country natural experiment.

The following research questions were examined:

- (1) Are there changes in quit attempts, use of behavioral counseling, use of cessation medications, and quit success through time?
- (2) Are there changes in awareness of reimbursement possibilities and awareness of media attention about the reimbursement through time?
- (3) Are awareness of reimbursement possibilities and awareness of media attention about the reimbursement associated with quit attempts, use of behavioral counseling, use of cessation medications, and quit success?
- (4) Are the findings from research questions 1 to 3 different for low, medium, and high income smokers?

METHODS

Design

In this study, we used three survey waves of the International Tobacco Control (ITC) Netherlands Survey. One wave of the survey was conducted before the implementation of the national reimbursement policy (wave 4 in 2010), one wave was conducted after the policy was implemented (wave 5 in 2011), and one wave was conducted after the policy was discontinued (wave 6 in 2012). Figure 1 shows a timeline with the survey waves, the implementation and discontinuation of the reimbursement policy and the timing of the media campaign. As can be seen in Figure 1, the survey waves were in May and June of each year. Because this does not correspond with the policy timing from January to December, the measures of quit attempts, use of behavioral counseling and use of cessation medications were restricted to the last six months before the survey wave, as highlighted in Figure 1.

Figure 1: Timeline of 2010, 2011 and 2012 with the survey waves, the implementation of the reimbursement policy, the timing of the media campaign, and the period for the quit attempts, use of behavioral counseling, and use of cessation medications measures.

Sample

A large probability-based web database from TNS NIPO was used to recruit Dutch smokers aged 15 years and older. More information about the baseline Dutch web survey can be found elsewhere (ITC Project, 2009, Nagelhout et al. 2010). In follow-up surveys of the ITC cohorts, samples are replenished at each wave to maintain a sample size of approximately 2,000 respondents per wave (Thompson et al. 2006).

Of the 1,961 respondents from wave 4, 1,567 (79.9%) participated in wave 5. In wave 5, a replenishment sample of 482 respondents was added. Of the 2,049 respondents from wave 5, 1,736 (84.7%) participated in wave 6. A replenishment sample of 286 respondents was added in wave 6. Respondents who were lost to follow-up were younger, more likely to be female, higher educated, and more likely to be a heavier smoker than respondents who participated in the follow-up surveys (Nagelhout, De Vries et al. 2012).

To answer research questions 1 and 2, all respondents (including the replenishment samples) from wave 4, wave 5 and wave 6 who smoked at the previous wave (e.g. for wave 6, only those who smoked at wave 5) were included in the analyses (between 1,912 and 1,971 smokers per wave). In the multivariate analyses for research questions 1 and 2, only respondents who participated in all three waves, who smoked at the previous wave, and who answered all questions that we used in the analyses were included ($n = 845$). To answer research question 3, only respondents who participated in wave 5 and 6, who were smokers in wave 5, and who answered all questions that we used in the analyses were included ($n = 991$).

Measures

Control variables

Multivariate analyses were adjusted for gender, age group, and heaviness of smoking. Age was categorized as 15 to 24, 25 to 39, 40 to 54, and 55 years and older. The Heaviness of Smoking Index (HSI) was created as the sum of two categorized measures: number of cigarettes per day and time before smoking the first cigarette of the day (Heatherton et al. 1989). HSI values ranged from 0 to 6 and have been found to be positively associated with nicotine dependence (Heatherton et al. 1989).

Income level

Monthly gross household income was categorized into three levels: low (less than 2,000 Euro), medium (2,000 to 3,000 Euro) and high (more than 3,000 Euro). Respondents who did not answer the income question were recorded in a separate category.

Awareness variables

Awareness of reimbursement possibilities was measured by asking respondents whether they thought they were eligible for reimbursement for the use of cessation medications. This variable was dichotomized as (1) “yes” and (0) “no” or “don’t know”.

Awareness of the media campaign about the reimbursement policy was measured by asking respondents how often they saw the television commercial, heard the radio commercial, saw any of the posters or noticed something on the internet from this specific media campaign. Respondents answered these four separate questions on a 4-point scale from (0) “never” to (3) “often”. An index was created by computing a mean score of awareness of the four different parts of the campaign for every respondent, ranging from 0 to 3.

Awareness of advertisements for cessation medications was measured by asking respondents how often they noticed advertisements for cessation medications. Respondents could answer this on a 4-point scale from (0) “never” to (3) “often”.

Awareness of (other) media attention about the reimbursement policy was measured by asking respondents how often they saw or heard something in the media about health insurance reimbursement of cessation medications. This question also had a 4-point response scale from (0) “never” to (3) “often”.

Outcome measures

Quit attempts were measured with the question: “Have you made any attempts to stop smoking since the last survey?” (Hyland et al. 2006, Kahler et al. 2009). Respondents who answered in the affirmative were asked in which month they started their attempt to quit smoking. A variable was created that categorized whether respondents started a quit attempt since January of the survey year or not.

Use of behavioral counseling was measured by asking respondents whether they received advice or information about quitting smoking from a local stop-smoking service, such as a stop-smoking course, counseling from a nurse or from a specialized nurse practitioner in the last six months (Borland, Li, et al. 2012).

Use of cessation medications was measured by asking respondents whether they used any nicotine replacement therapy or prescription medications in the past year (Fix et al. 2011, Borland, Li, et al. 2012). Affirmative responses were restricted to respondents who attempted to quit smoking since January of the survey year.

Quit success was assessed by asking respondents who had attempted to quit whether they were back to smoking or still stopped. Respondents who were still stopped, or who were back to smoking but reported smoking less than once a month, were defined as successful quitters. Respondents who did not attempt to quit, or who were back to smoking more than once a month, were defined as smokers (Hyland et al. 2006).

Ethics

The surveys were cleared for ethics by the Research Ethics Board of the University of Waterloo (ORE #19425).

Analyses

All analyses were performed with SPSS version 19.0 and were weighted by age and gender to be representative of the smoker population in the Netherlands (ITC Project, 2009).

Trends and income differences in outcome measures (research question 1) and awareness variables (research question 2) were tested with Generalized Estimating Equations (GEE) analyses. This technique extends multivariate regression analysis to allow for longitudinal analysis of repeated measures in which observations from individuals who completed multiple survey waves are correlated. The dependent variables quit attempts, use of behavioral counseling, use of cessation medications, quit success, and awareness of reimbursement possibilities were dichotomous measures and, therefore, the binomial distribution was used and the logit link (Ballinger, 2004). The other awareness variables were measured on a scale from 0 to 3. These analyses used the normal distribution and the identity link (Ballinger, 2004). Survey wave was designated as the repeated measure variable and the variables of interest were income level and (in separate analyses) the interactions between income level and survey wave (research question 4). All GEE analyses were adjusted for the above mentioned control variables. The unstructured correlation structure was used because this closely approximates the true correlation structure in large samples (Jin, 2011). We performed sensitivity analyses with the exchangeable correlation structure and found that this did not change our results (data not shown).

The associations between awareness variables on wave 5 with outcome measures on wave 6 (research question 3) were tested with multivariate logistic regression analyses, while controlling for the above mentioned control variables. Interactions between income level and awareness variables were added to separate regression analyses (four interactions per analysis) to examine whether there were income level differences in the associations between awareness variables and outcome measures (research question 4).

To adjust for multiple comparisons (8 GEE models and 4 regression models), estimates were considered to be significant when the p-value was below 0.004 (0.05/12) (Bland and Altman, 1995).

RESULTS

Sample characteristics

Sample characteristics for wave 4, wave 5, and wave 6 are shown in Table 1. Notable is that a relatively large group of respondents (27-28%) did not answer the question about their income. There were no significant differences between the distributions of sample characteristics between waves.

Table 1: Sample characteristics on wave 4 (n = 1,912), wave 5 (n = 1,971) and wave 6 (n = 1,919) among respondents who smoked at the previous wave.

	2010 (wave 4)	2011 (wave 5)	2012 (wave 6)	
Gender				
Male (%)	52.8	53.6	54.4	$\chi^2 = 0.06$, p = 0.970
Female (%)	47.2	46.4	45.6	
Age group				
15-24 years (%)	15.2	25.3	16.9	$\chi^2 = 5.73$, p = 0.454
25-39 years (%)	27.2	30.7	26.6	
40-54 years (%)	31.9	24.1	30.0	
55 years and older (%)	25.7	19.8	26.5	
Smoking status				
Daily smoker (%)	80.1	75.4	74.9	$\chi^2 = 2.55$, p = 0.636
Occasional smoker (%)	8.3	6.8	6.1	
Ex-smoker (%)	11.6	17.8	19.0	
Heaviness of smoking ^a				F = 2.64, p = 0.072
Mean	2.4	2.5	2.4	
SD	1.5	1.7	1.5	
Income level				
Low (%)	21.8	21.3	21.6	$\chi^2 = 0.14$, p = 0.999
Medium (%)	21.7	20.1	20.5	
High (%)	29.4	30.8	30.0	
No answer (%)	27.1	27.9	27.9	

^a On a scale from 0 to 6.

Differences in outcome measures

As can be seen in Table 2, the quit attempt rate was 14% in wave 4, 17% in wave 5, and 15% in wave 6. A multivariate GEE analysis (Table 4) confirmed the increase in quit attempts between wave 4 and 5 (Odds Ratio (OR) = 2.02, p < 0.001) and between wave 4 and 6 (OR = 1.67, p < 0.001). An additional analysis in which the reference category for the survey wave was changed to wave 5 (not shown in tables) revealed that the change between wave 5 and 6 was not significant (OR = 0.83, p = 0.087).

Table 2: Percentage of smokers by income level and wave who attempted to quit smoking, who used behavioral counseling to quit smoking, and who quit smoking successfully.

	2010 (wave 4) n = 1,912	2011 (wave 5) n = 1,971	2012 (wave 6) n = 1,919
All smokers			
Quit attempt (% yes)			
Low income level	13.1	16.1	15.7
Medium income level	12.7	17.6	13.5
High income level	12.6	18.2	15.1
Total group	13.9	16.8	14.5
Use of behavioral counseling (% yes)			
Low income level	3.1	2.9	3.9
Medium income level	5.3	4.8	2.5
High income level	1.6	4.8	2.4
Total group	2.7	3.4	2.8
Use of cessation medications (% yes)			
Low income level	3.3	3.6	3.6
Medium income level	2.4	4.1	1.5
High income level	1.4	1.5	4.5
Total group	2.6	2.7	3.0
Quit success (% yes)			
Low income level	9.1	12.7	15.9
Medium income level	14.4	21.4	20.9
High income level	11.9	20.4	21.2
Total group	11.6	17.8	19.0
All smokers who tried to quit smoking			
Use of behavioral counseling (% yes)	n = 271	n = 338	n = 287
Low income level	5.5	9.0	6.2
Medium income level	11.5	14.5	3.8
High income level	2.8	10.9	5.7
Total group	7.2	9.7	3.5
Use of cessation medications (% yes)			
Low income level	25.5	22.4	23.1
Medium income level	18.9	23.2	11.3
High income level	11.3	8.2	29.9
Total group	18.8	16.3	20.4
Quit success (% yes)			
Low income level	29.6	22.4	32.3
Medium income level	32.1	40.6	49.1
High income level	21.1	34.5	23.0
Total group	25.2	31.2	32.9

Use of behavioral counseling was somewhat higher in wave 5 than in wave 4, both among all smokers and among smokers who attempted to quit smoking (Table 2). How-

ever, this increase was not significant at the $p < 0.004$ level that we used to adjust for multiple comparisons in the GEE analysis among all smokers ($OR = 1.70$, $p = 0.017$) (Table 4). The increase among smokers who attempted to quit smoking was not tested because the sample size was too small (about 300 smokers per wave). For the same reason, this was also not tested for use of cessation medications and quit success.

Use of cessation medications remained stable at 3% of all smokers across waves (Table 2). This was confirmed in the GEE analysis (Table 4), which did not show a significant change between waves.

In wave 4, 12% of all smokers and 25% of smokers who tried to quit smoking reported to have quit successfully (Table 2). In wave 5, this increased to 18% of all smokers and 31% of smokers who tried to quit smoking. The quit success rates increased further in wave 6. A GEE analysis among all smokers (Table 4) confirmed the increased quit success between wave 4 and 5 ($OR = 1.47$, $p < 0.001$) and between wave 4 and 6 ($OR = 1.84$, $p < 0.001$). An additional analysis (not shown in tables) confirmed the increase between wave 5 and 6 ($OR = 1.25$, $p < 0.001$).

There were no significant income differences in quit attempts, use of behavioral counseling, use of cessation medications, or quit success for all waves together (Table 4). Also, there were no significant interactions between income level and survey wave. This means that there were no income differences in the increase in quit attempts and quit success after the implementation of the reimbursement policy.

Differences in awareness variables

Table 3 shows that awareness of reimbursement possibilities, medications advertisements, and other media attention was higher in wave 5 than in waves 4 and 6. This corresponds with the fact that the reimbursement policy was implemented between wave 4 and 5 and reversed between waves 5 and 6. Multivariate GEE analyses (Table 4) confirmed a significant increase between waves 4 and 5 for awareness of reimbursement possibilities ($OR = 6.83$, $p < 0.001$), awareness of medications advertisements ($Beta = 0.25$, $p = 0.003$), and awareness of other media attention about the reimbursement ($Beta = 1.05$, $p < 0.001$). The decrease between waves 5 and 6 (not shown in tables) was significant for awareness of reimbursement possibilities ($OR = 0.20$, $p < 0.001$), awareness of medications advertisements ($Beta = -0.35$, $p < 0.001$) and awareness of other media attention ($Beta = -0.57$, $p < 0.001$).

There were significant income differences in awareness of medications advertisements for all waves together (Table 4), but these differences were only present between respondents who did not report their income and respondents with high income. Respondents with low and medium income levels did not differ from the high income group. There were no significant interactions between income level and survey wave for any of the awareness variables (Table 4).

Income differences in the impact of a national reimbursement policy

Table 3: Percentage of smokers by income level and wave who were aware of the reimbursement possibilities, of the campaign, advertisements for cessation medications, and other media attention.

	2010 (wave 4)	2011 (wave 5)	2012 (wave 6)
Awareness of reimbursement possibilities (% yes)	n = 1,912	n = 1,971	n = 1,919
Low income level	9.8	44.3	13.8
Medium income level	11.0	45.8	14.2
High income level	16.1	40.6	17.2
Total group	11.2	41.8	13.4
Awareness of the campaign about the reimbursement policy ^{a,b} (mean, SD)			
Low income level	-	0.6 (0.6)	-
Medium income level	-	0.6 (0.6)	-
High income level	-	0.6 (0.5)	-
Total group	-	0.6 (0.6)	-
Awareness of advertisements for cessation medications ^a (mean, SD)			
Low income level	1.1 (1.0)	1.3 (1.0)	0.9 (1.0)
Medium income level	1.1 (0.9)	1.4 (1.0)	1.0 (1.0)
High income level	1.2 (1.0)	1.4 (1.0)	1.1 (0.9)
Total group	1.1 (0.9)	1.3 (1.0)	1.0 (1.0)
Awareness of (other) media attention about the reimbursement policy ^a (mean, SD)			
Low income level	0.3 (0.7)	1.4 (1.0)	0.8 (0.9)
Medium income level	0.4 (0.7)	1.3 (1.0)	0.8 (0.9)
High income level	0.5 (0.7)	1.4 (1.0)	0.8 (0.9)
Total group	0.4 (0.7)	1.3 (1.0)	0.8 (0.9)

Chapter 4

Table 4: Summary of eight GEE analyses among respondents who smoked at the previous wave in which income level and wave are used as predictors of (1) quit attempts, (2) use of behavioral counseling, (3) use of cessation medications, (4) quit success, and awareness of (5) the reimbursement policy, (6) the campaign, (7) advertisements for cessation medications, and (8) other media attention about the reimbursement policy.

	1. Quit attempt (n = 845) OR† (95% CI)	2. Use of behavioral counseling (n = 845) OR (95% CI)	3. Use of cessation medications (n = 845) OR (95% CI)	4. Quit success (n = 845) OR (95% CI)
Income level ^b	p = 0.222	p = 0.335	p = 0.704	p = 0.205
No answer	0.82 (0.61 to 1.12)	0.80 (0.43 to 1.49)	1.09 (0.58 to 2.05)	1.06 (0.84 to 1.33)
Low	1.10 (0.80 to 1.52)	0.94 (0.50 to 1.76)	1.31 (0.67 to 2.57)	0.94 (0.72 to 1.23)
Medium	1.07 (0.78 to 1.48)	1.37 (0.78 to 2.39)	1.44 (0.75 to 2.76)	1.19 (0.96 to 1.48)
High	1.00	1.00	1.00	1.00
Wave ^c	p < 0.001	p = 0.041	p = 0.051	p < 0.001
4	1.00	1.00	1.00	1.00
5	2.02 (1.57 to 2.60)*	1.70 (1.10 to 2.64)	1.90 (1.10 to 3.27)	1.47 (1.27 to 1.71)*
6	1.67 (1.30 to 2.14)*	1.21 (0.74 to 1.97)	1.74 (1.04 to 2.92)	1.84 (1.59 to 2.13)*
Income * wave ^d	p = 0.696	p = 0.335	p = 0.019	p = 0.615
	5. Awareness of reimbursement possibilities (n = 845) OR (95% CI)	6. Awareness of the campaign about the reimbursement policy ^a (n = 845) Beta (95% CI)	7. Awareness of advertisements for cessation medications (n = 845) Beta (95% CI)	8. Awareness of (other) media attention about the reimbursement policy (n = 844) Beta (95% CI)
Income level	p = 0.523	p = 0.487	p < 0.001	p = 0.059
No answer	0.87 (0.67 to 1.14)	0.05 (-0.04 to 0.15)	-0.22 (-0.33 to -0.11)*	-0.10 (-0.19 to -0.01)
Low	0.97 (0.74 to 1.27)	0.07 (-0.03 to 0.17)	-0.08 (-0.19 to 0.04)	-0.03 (-0.12 to 0.06)
Medium	1.07 (0.82 to 1.41)	0.07 (-0.04 to 0.17)	0.02 (-0.08 to 0.12)	0.03 (-0.06 to 0.12)
High	1.00	1.00	1.00	1.00
Wave	p < 0.001		p < 0.001	p < 0.001
4	1.00	-	1.00	1.00
5	6.83 (5.55 to 8.40)*	-	0.25 (0.19 to 0.32)*	1.05 (0.98 to 1.12)*
6	1.37 (1.07 to 1.75)	-	-0.10 (-0.16 to -0.03)*	0.48 (0.42 to 0.54)*
Income * wave	p = 0.310		p = 0.203	p = 0.023

† All GEE coefficients are adjusted for gender, age group, and heaviness of smoking.

* To adjust for multiple comparisons, estimates are considered significant when the p-value is below 0.004.

^a Questions about awareness of the campaign were only asked directly after the campaign ran, in wave 5. Therefore, 'wave' is not used as a predictor in this GEE analysis.

^b p-value for overall 3 df test for income

^c p-value for overall 2 df test for wave

^d p-value for overall 6 df test for income by wave interaction (separate analyses)

Associations between awareness variables and outcome measures

Multivariate logistic regression analyses (Table 5) revealed that awareness of the campaign about the reimbursement policy at wave 5 was significantly associated with more quit attempts at wave 6 (OR = 1.95, $p < 0.001$), but the other awareness variables were

not. None of the awareness variables were significantly associated with use of behavioral counseling, use of cessation medications, and quit success among all smokers at wave 6. There were no significant interactions between awareness variables and income level.

In an additional analysis (not shown in tables), we repeated the analysis for quit success and added use of behavioral counseling and use of cessation medications in the past 6 months at wave 6 as predictors in the model. Use of behavioral counseling was not significantly associated with quit success ($OR = 0.67$, $p = 0.577$), but use of cessation medications was ($OR = 5.49$, $p < 0.001$). Other results remained the same.

DISCUSSION

The Netherlands implemented a national reimbursement policy for smoking cessation treatment in 2011. In this paper, we examined possible income differences in the impact of the reimbursement policy and the accompanying media attention.

The first research question was whether there were changes in quit attempts, use of behavioral counseling, use of cessation medications, and quit success through time. Significant increases in quit attempts and quit success were found in the first half year that the policy was in place. Previous research conducted under controlled conditions found that reimbursing smokers for their use of cessation treatment increased the use of treatment (Reda et al. 2012). In the current real-world study, an increase in use of counseling and medication could not be demonstrated in the first half year that the policy was in place. This is similar to what we found in an earlier study among Dutch smokers that also only examined the first half year (Nagelhout et al., 2015). However, other Dutch studies that examined the whole year that the policy was in place, found large increases in calls to the national quitline (Willemsen et al. 2013) and in the number of prescriptions for smoking cessation medications (Verbiest et al. 2013) in the second half of 2011. This can be explained by the fact that smokers may have waited with using smoking cessation treatment until the second half of the year, when they knew they had already spend the mandatory deductible for their health care costs of that year.

The second research question was whether there were changes in awareness of reimbursement possibilities and awareness of media attention about the reimbursement through time. Awareness of reimbursement possibilities increased between the first and second survey and decreased again between the second and third survey. This corresponds with the fact that the reimbursement policy was implemented between the first and second survey and reversed between the second and third survey.

Table 5: Multivariate logistic regression analyses of associations between awareness variables on wave 5 with quit attempts, use of behavioral counseling, use of cessation medications, and quit success on wave 6.

	Quit attempt (n = 991)		Use of behavioral counseling (n = 991)		Use of cessation medications (n = 991)		Quit success (n = 991)	
	Odds Ratio (95% confidence interval)	p-value	Odds Ratio (95% confidence interval)	p-value	Odds Ratio (95% confidence interval)	p-value	Odds Ratio (95% confidence interval)	p-value
Gender								
Male	1.02 (0.73 to 1.42)	0.906	0.96 (0.47 to 1.97)	0.912	1.07 (0.53 to 2.14)	0.847	1.55 (1.03 to 2.33)	0.037
Female	1.00		1.00		1.00		1.00	
Age group								
15-24 years	1.31 (0.73 to 2.37)	0.362	0.14 (0.01 to 2.50)	0.184	0.94 (0.10 to 9.26)	0.958	0.25 (0.10 to 0.58)*	0.001
25-39 years	1.10 (0.69 to 1.75)	0.693	0.42 (0.13 to 1.41)	0.163	4.03 (1.15 to 14.08)	0.029	0.50 (0.30 to 0.84)	0.008
40-54 years	1.19 (0.79 to 1.80)	0.407	1.23 (0.56 to 2.69)	0.609	5.35 (1.69 to 16.98)	0.004	0.28 (0.17 to 0.47)*	<0.001
55 years and older	1.00		1.00		1.00		1.00	
Heaviness of smoking	1.04 (0.94 to 1.15)	0.492	1.52 (1.17 to 1.97)*	0.002	1.64 (1.27 to 2.12)*	<0.001	0.85 (0.76 to 0.96)	0.008
Income level								
No answer	0.79 (0.50 to 1.24)	0.304	1.19 (0.43 to 3.33)	0.736	1.30 (0.48 to 3.53)	0.602	0.62 (0.36 to 1.07)	0.087
Low	0.75 (0.47 to 1.20)	0.228	1.70 (0.66 to 4.33)	0.269	1.10 (0.39 to 3.15)	0.856	0.59 (0.34 to 1.04)	0.068
Moderate	1.16 (0.75 to 1.81)	0.500	1.09 (0.37 to 3.15)	0.879	2.46 (1.00 to 6.04)	0.050	0.66 (0.38 to 1.14)	0.134
High	1.00		1.00		1.00		1.00	
Awareness of reimbursement possibilities								
Yes	1.21 (0.85 to 1.72)	0.281	1.63 (0.75 to 3.53)	0.219	0.97 (0.47 to 1.99)	0.929	1.05 (0.68 to 1.61)	0.836
No	1.00		1.00		1.00		1.00	
Awareness of the campaign about the reimbursement policy	1.95 (1.40 to 2.71)*	<0.001	1.93 (1.00 to 3.74)	0.051	1.35 (0.69 to 2.65)	0.376	1.78 (1.17 to 2.73)	0.008
Awareness of advertisements for cessation medications	0.92 (0.76 to 1.11)	0.388	1.00 (0.66 to 1.49)	0.987	1.06 (0.71 to 1.57)	0.773	0.72 (0.57 to 0.91)	0.006
Awareness of (other) media attention about the reimbursement policy	0.94 (0.76 to 1.15)	0.553	1.08 (0.69 to 1.71)	0.734	0.90 (0.59 to 1.36)	0.615	0.88 (0.68 to 1.13)	0.317

* To adjust for multiple comparisons, estimates are considered significant when the p-value is below 0.004.

The third research question was whether awareness of reimbursement possibilities and awareness of media attention about the reimbursement was associated with quit attempts, use of behavioral counseling, use of cessation medications, and quit success. Only awareness of the media campaign was associated with more quit attempts at the follow-up survey. Our findings thus suggest that the media campaign about the reimbursement was responsible for some of the increase in smoking cessation attempts. The campaign message was that it is possible to ‘really’ quit smoking if you use cessation treatment and that this is now reimbursed. It is possible that this positive message has, for example, increased smokers’ self-efficacy expectations or their perception of social support. Interesting is that our results imply that the Dutch media campaign had a long-term impact on smoking cessation attempts, while the campaign lasted only a few months.

The fourth research question was whether the findings from the first three research questions differed for low, medium, and high income smokers. We did not find income differences in our study, which is in contrast with beliefs suggesting that a reimbursement policy may be more effective among smokers with lower income levels (Giskes et al. 2007). A possible explanation is that smoking cessation treatment was only reimbursed after smokers completed their mandatory deductible of 170 Euro per year for any health care costs. Therefore, the treatment was not truly free of charge, which may have been a barrier especially for low income smokers. Also notable is that there appeared to be no income differences in the association between awareness of the media campaign and quit attempts. A recent review about smoking cessation media campaigns reported that there is some evidence that campaigns about how to quit smoking may increase socioeconomic inequalities in smoking (Durkin et al. 2012). However, this was not found in our study.

Limitations

In this study, we did not have a control region where the policy was not implemented. Changes in outcome measures could thus also have been caused by influences other than the policy or the media attention. Another limitation of our study was that respondents lost to follow-up between survey waves were younger, more likely to be female, higher educated, and more likely to be a heavier smokers than respondents who participated in the follow-up surveys. This could mean that our results are not fully generalizable to the population of Dutch smokers. Also, quit success is measured by asking those who attempted to quit smoking whether they are back to smoking or still stopped in the ITC Surveys (Hyland et al. 2006). Some of these respondents may turn out not to be successful in quitting smoking after the survey. It should also be noted that our findings may have been different if the surveys had been conducted at a later time in the year. Finally, we examined income differences in the impact of the policy because the price of cessation treatment may be a barrier especially for low income

smokers. Income is often used as an indicator of socioeconomic status (SES) (Schaap and Kunst, 2009), but other indicators of SES were not taken into account in this study. Also, more than a quarter of respondents did not report their income. In sensitivity analyses, we found that our findings were very similar when using education instead of income in the analyses.

Conclusion

This study aimed to examine possible income differences in the impact of the national reimbursement policy for smoking cessation treatment and accompanying media attention in the Netherlands. An increase in attempts to quit smoking and quit success was found after the implementation of the reimbursement policy. Our findings suggest that the media campaign about the reimbursement policy was responsible for some of the increase in quit attempts. No change in use of behavioral counseling and medications was found. These findings are all similar to what was found in another study that examined the Dutch reimbursement policy with a different dataset (Nagelhout et al., 2015). A new finding is that the Dutch reimbursement policy with accompanying media attention did not seem to decrease income inequalities in smoking. However, because it also did not seem to have increased inequalities and it did increase smoking cessation, we recommend implementing reimbursement policies together with media campaigns that stimulate quitting.

Chapter 5

Trends and socioeconomic differences in policy triggers for thinking about quitting smoking

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ABSTRACT

Introduction: The aim of the current study is to investigate trends and socioeconomic differences in policy triggers for thinking about quitting in six European countries.

Methods: Data were derived from all available survey waves of the International Tobacco Control (ITC) Europe Surveys (2003-2013). France conducted three survey waves (n=1,420-1,735), Germany three waves (n=515-1,515), the Netherlands seven waves (n=1,420-1,668), Ireland three waves (n=582-1,071), Scotland two waves (n=461-507), and the rest of the United Kingdom conducted seven survey waves (n=861-1,737). Smokers were asked whether four different policies (cigarette price, smoking restrictions in public places, free or lower cost medication, and warning labels on cigarette packs) influenced them to think about quitting. Generalized Estimating Equation (GEE) models were estimated for each country.

Results: Cigarette price was mentioned most often in all countries and across all waves as trigger for thinking about quitting. Mentioning cigarette price and warning labels increased after the implementation of price increases and warning labels in some countries, while mentioning smoking restrictions decreased after their implementation in four countries. All studied policy triggers were mentioned more often by smokers with low and/or moderate education and income than smokers with high education and income. The education and income differences did not change significantly over time for most policies and in most countries.

Conclusions: Tobacco control policies work as a trigger to increase thoughts about quitting, particularly in smokers with low education and low income and therefore have the potential to reduce health inequalities in smoking.

INTRODUCTION

Despite the implementation of multiple tobacco control policies and smoking cessation interventions in many countries, tobacco use remains the number one preventable cause of death and disease (World Health Organization, 2012). Increasingly, the burden of tobacco use has become concentrated within low socioeconomic status (SES) groups (Giskes et al., 2005; Harper & Lynch, 2007; Hiscock, Bauld, Amos, & Platt, 2012; Hosseinpoor et al., 2012), and tobacco use has been found to account for a considerable proportion of the health inequalities as a function of SES. Thus, it is becoming increasingly important to understand what factors trigger quitting among low SES smokers to inform public health policies and programs that could increase quitting among those population groups for whom quitting is considerably more difficult (Hiscock, Bauld, Amos, Fidler, & Munafò, 2012).

Research has confirmed the basic theoretical notion that thinking about quitting is an essential prerequisite for attempting to quit (Caleyachetty, Lewis, McNeill, & Leonardi-Bee, 2012; Fong, Cummings, Borland, et al., 2006). Specific environmental cues can be beneficial to trigger people's intentions to change their behavior, as described for example in the Health Belief Model (Rosenstock, 1974), Reasoned Action Approach (Fishbein & Ajzen, 2010), Social Cognitive Theory (Bandura, 1986), and Protection Motivation Theory (Rogers & Prentice-Dunn, 1997). A policy or change in policy could be such a trigger. For example, the implementation of smoking restrictions in public places can be a trigger for smokers to re-evaluate their smoking behavior (Hammond, McDonald, Fong, Brown, & Cameron, 2004). If these policy triggers are weaker for low SES smokers in stimulating quitting, such policies may widen SES differences.

Several studies have identified the reasons smokers cite for quitting smoking. The most frequently mentioned reason is concern for one's current as well as future health (Baha & Le Faou, 2010; Gallus et al., 2013; Grotvedt & Stavem, 2005; Kaleta et al., 2012; McCaul et al., 2006; Pisinger, Aadahl, Toft, & Jorgensen, 2011; Vangeli & West, 2008). Other reasons include social pressure, children, disliking being addicted, improving physical fitness, and financial costs. Some studies also investigated income or education differences regarding these reasons (Grotvedt & Stavem, 2005; Pisinger et al., 2011; Vangeli & West, 2008). These studies generally conclude that low SES smokers are more likely than high SES smokers to quit smoking because of the costs and because of current health-related reasons. Smokers with high income are more likely to quit smoking because they dislike being addicted.

There have been few studies on income and education differences regarding policy triggers that influence thinking about quitting smoking. One study conducted in England tested whether there existed SES differences in mentioning various triggers for quitting (Vangeli & West, 2008). For smoking restrictions, no SES differences were found; in contrast, warning labels and financial costs were more often mentioned by low SES

groups. Another study found that after the implementation of workplace smoking restrictions in France, smoking restrictions were mentioned more frequently by employed than unemployed smokers as motive for wanting to quit, but in general this reason was reported quite rarely (Baha & Le Faou, 2010). However, these studies were conducted at only one measurement point in time and only in one country. Therefore, it is unknown whether mentioning policy triggers for quitting and socioeconomic differences change after the implementation of policies.

The aim of the current study was to investigate trends and socioeconomic differences in policy triggers for thinking about quitting in six European countries: France, Germany, the Netherlands, Ireland, Scotland, and the rest of the United Kingdom (UK). These countries have ratified the WHO Framework Convention on Tobacco Control (FCTC) (World Health Organization, 2003a). Furthermore, they implemented cigarette price increases, smoking restrictions in public places, reimbursement of cessation medication, and warning labels, although the specific regulations vary.

An overview of the implementation dates of policies in the included countries is shown in Figure 1. The timing and magnitude of retail cigarette price changes varied between countries (European Commission, 2014). We adjusted the retail cigarette prices for inflation in each country (World Bank, 2015) and only included adjusted price increases of at least 5% because larger price increases were associated with more smokers reporting to consider quitting in previous research (Guillaumier et al., 2014; Scollo, Hayes, & Wakefield, 2013). Smoking restrictions in public places were implemented in all countries, but there were exceptions in some countries (e.g., in Germany smoking restrictions vary between federal states). All countries, except Germany, had at least some level of reimbursement for stop-smoking medication, but in the Netherlands, the reimbursement was introduced in 2011, discontinued in 2012, and reinstated in 2013. Finally, warning labels on cigarette packs were mandatory in the six countries; France implemented textual warning labels in 2003 and pictorial warning labels between 2010 and 2011 and thus changed the health warnings during the current study. Germany and the Netherlands implemented textual warning labels in 2003 and 2002 respectively, and had them throughout the whole study period. Ireland implemented textual warning labels in 2002 and pictorial warning labels in 2013. The UK (including Scotland) implemented textual warning labels in 2003 and pictorial warning labels between 2008 and 2010. The UK thus also changed the health warnings during the current study, but no Scottish data from the time after the implementation were available.

Figure 1: Timeline of changes in tobacco control policies in the six countries, including timing of the survey waves and number of respondents.

● = Adjusted cigarette price increases of at least 5%; ◆ = Smoking restrictions in public places; ▲ = Reimbursement of stop-smoking medication; ◻ = Health warning labels on cigarette packs

With data from the International Tobacco Control (ITC) Europe Surveys, we examined trends in self-reported triggers for as many as seven yearly waves in some countries. The following research questions were addressed: 1) Do self-reported triggers for thinking about quitting change over time?, 2) Are there education and income differences regarding reporting these triggers?, and 3) Do these education and income differences change over time?

METHODS

Design and samples

Data from the ITC Surveys in six European countries were analyzed: France, Germany, the Netherlands, Ireland, Scotland, and the rest of the UK. The ITC Surveys follow a longitudinal cohort design. The countries varied with respect to the number of survey waves and the time interval between survey waves (Figure 1). The study period ranged from 2003 until 2013. As in all countries participating in ITC, respondents in the ITC Europe Surveys who were lost to attrition were replenished by recruiting new respondents from the same sampling frame to the cohort at every survey wave, except for Germany wave 2 and 3, Ireland wave 3, and UK wave 8 where replenishment was not possible due to funding constraints. Drop-out between the first and the last included wave ranged across countries between 35% in Scotland (two waves) and 88.5% in the UK (seven waves). In all countries, younger smokers were more likely to drop out of the sample and in France and Scotland smokers with low education. In each of the six countries, the sampling was at the national level. For the current study, smokers of 18 years and older in each wave were included in the analyses. Smokers were defined as respondents who smoked at least 100 cigarettes in their lifetime and were currently smoking cigarettes at least monthly. More details about the specific methods and the theoretical framework of the ITC Project are published elsewhere (Fong, Cummings, Borland, et al., 2006; ITC Project, 2016; Thompson et al., 2006).

For the current study, all available survey waves of all ITC Europe countries were used, with two exceptions. Wave 2 of the Netherlands Survey was excluded because this was a 'subwave' in-between the yearly survey waves with a smaller sample size. Wave 1 of the UK Survey was excluded because the outcome variables were not yet measured in that wave; Scottish data were excluded from all the UK waves. The number of studied survey waves ranged between two (Scotland) and seven (UK) per country. Also, sample sizes varied between countries and survey waves (1,420-1,735 in France; 515-1,515 in Germany; 1,393-1,668 in the Netherlands; 582-1,071 in Ireland; 461-507 in Scotland; 861-1,737 in the UK). All countries surveyed respondents via the telephone except for the Netherlands, where the internet was used.

Measurements

Smokers were asked whether four different policies led them to think about quitting: ‘In the past 6 months, have each of the following things led you to think about quitting?’ 1) The price of cigarettes, 2) Smoking restrictions in public places like restaurants, cafes and pubs, 3) Free, or lower cost, stop-smoking medication, 4) Warning labels on cigarette packages. Response options were: not at all, somewhat, very much. The answers were dichotomized into ‘not at all’ (0) and ‘somewhat’ and ‘very much’ (1).

Furthermore, respondents were asked about their level of completed education and their income. Due to differences in educational systems across the six countries, the measures of completed education were only partially comparable. Completed education was categorized into low (none completed, elementary school and lower secondary education), moderate (secondary vocational education and middle secondary education), and high (upper secondary education, university and post-graduate). Respondents from the Netherlands, Ireland, Scotland, and the rest of the UK were asked about their monthly gross household income, while respondents from France and Germany reported their monthly net household income. The response options for the income question were not the same across the countries. Therefore, within each country, a three-level income variable was created: low, moderate, and high. This approximated an even distribution as closely as possible, which allowed comparisons to be made across countries. Respondents also had the opportunity to refuse to answer the income question or answer it with ‘don’t know’. This group was relatively small in most countries (Table 1). Sensitivity analyses with and without an extra category for respondents who did not answer the income question were performed for Germany and the Netherlands where this group was largest. This did not change the pattern of the results and therefore, this group was excluded from all reported analyses.

Other covariates were gender, age, and level of nicotine dependence. Age was categorized into: 18-24 years, 25-39 years, 40-54 years, and 55 years and older. The Heaviness of Smoking Index (HSI) was used as indicator of level of nicotine dependence (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). This index is the sum of the categorized number of cigarettes smoked per day and the time to the first cigarette of the day. The range of the HSI is from 0 to 6, with a higher score indicating higher nicotine dependence.

Analyses

All analyses were conducted with SPSS version 20.0. In all analyses, sampling weights were computed based on gender and age and applied within each country. Pearson Chi-Square analyses were conducted for each country to assess statistical significance of changes in mentioning whether the four policies led smokers to think about quitting between each pair of two consecutive waves. We expected that the implementation of

a policy would be followed by an increase of mentioning this policy as a trigger in the subsequent survey wave. Therefore, we calculated the percentage of increases when these were expected and compared this with the percentage of increases when these were not expected. The exact timing of the implementation of the policies and the timing of the survey waves (depicted schematically in Figure 1) was used to determine the expectations (indicated with shadings in Table 2).

Furthermore, Generalized Estimating Equation (GEE) models were estimated for each country. Outcome measures in the GEE analyses were the dichotomized four policy triggers for thinking about quitting. Therefore, the binomial distribution and the logit link were used (Ballinger, 2004). The unstructured correlation structure was used because this structure is most valid for large samples (Jin, 2011). The repeated measure variable was survey wave, and the parameters of interest were income, education, and wave. All GEE analyses were adjusted for gender, age group at baseline, and HSI. Furthermore, we adjusted for respondents' number of survey waves (time in sample) because previous research has shown that survey responses can vary as a function of time in sample (Driezen & Thompson, 2011). Moreover, we included interaction terms on top of the main effects for income by survey wave and for education by survey wave in separate analyses to examine whether income and education differences changed over time. Every analysis was conducted for each country separately. Due to the relatively large number of comparisons being made, an alpha level for significant differences of <0.01 was chosen (Lang & Secic, 2006).

Sensitivity analyses (adjusted GEE analyses) concerning the association between mentioning a policy as trigger and making a quit attempt in the next year revealed acceptable associations. Mentioning cigarette price was significantly associated with quit attempts in all countries except for the UK (including Scotland). Mentioning smoking restrictions was associated with quit attempts in the Netherlands, Ireland and the UK (excluding Scotland). Mentioning free or lower cost medication was associated with quit attempts in all countries except for Ireland and Scotland. Mentioning warning labels was associated with quit attempts in all countries except for France, the Netherlands and Scotland.

Ethics

The surveys were cleared for ethics by the Research Ethics Board of the University of Waterloo and by the appropriate institutions of each country when needed.

RESULTS

Sample description

Table 1 shows the socio-demographic characteristics of smokers of the first wave that was included for each country (wave 2 for the UK, wave 1 for the other countries). The Netherlands and the UK (excluding Scotland) had the highest percentage of low education smokers. A greater percentage of German and Dutch smokers did not report their income.

Table 1: Sample characteristics of smokers at first included survey wave, by country (weighted data).

	France (2006)	Germany (2007)	The Netherlands (2008)	Ireland (2003)	Scotland (2006)	UK (Scotland excluded) (2003)
	n=1,735	n=1,515	n=1,668	n=1,071	n=507	n=1,737
Sex						
Male (%)	55.7	57.7	54.3	51.3	54.3	49.0
Age group						
18-24 years (%)	17.5	13.7	11.5	20.2	11.5	15.2
25-39 years (%)	35.6	31.0	29.3	36.2	25.5	31.8
40-54 years (%)	32.5	36.1	34.8	25.7	33.1	29.9
55 years and older (%)	14.4	19.1	24.5	17.9	29.9	23.1
Education						
Low (%)	16.9	22.6	37.9	31.7	23.0	37.6
Moderate (%)	36.3	37.0	42.7	34.1	35.3	23.8
High (%)	46.8	40.5	19.4	34.1	41.7	38.5
Income						
Low (%)	40.6	37.6	36.6	33.4	38.1	27.3
Moderate (%)	29.0	26.2	26.9	21.8	41.7	33.9
High (%)	27.0	22.4	14.9	35.9	11.7	31.7
Not reported (%)	3.4	13.9	21.6	8.9	8.5	7.0

Most frequently reported triggers

Table 2 shows the frequencies of smokers who reported that a specific policy was a trigger for them to think about quitting by country and wave. Mentioning cigarette price as trigger ranged on average from 59% in the Netherlands to 74% in Ireland. Mentioning smoking restrictions in public places ranged on average from 29% in the Netherlands to 55% in Ireland. Mentioning free or lower cost medication ranged on average from 18% in Germany to 48% in Scotland. Mentioning warning labels as a trigger for thinking about quitting ranged on average from 17% in the Netherlands to 45% in Ireland.

By far the most common reported policy trigger in all countries at all waves was cigarette price. The second most frequently reported policy trigger was free or lower cost of cessation medication in the Netherlands, Ireland, and Scotland, and smoking restrictions in public places in Germany and the rest of the UK. The least common policy trigger was warning labels on cigarette packs in all countries except in France, where it was the second most common trigger at wave 3.

Shaded cells in Table 2 indicate where an increase was expected based on a change in a tobacco control measure (i.e. cigarette price increase, introduction or intensifying of smoking restrictions, free or lower cost medication, and warning labels). Across the four policy domains, the percentage of significant increases where these were expected was 29% (4 out of 14) while the percentage of significant increases where these were not expected was 14% (8 out of 56). Regarding smoking restrictions in public places, we found significant decreases in four countries when increases were expected.

Changes in triggers over time

Table 3 shows the results of the GEE analyses by country which examined income, education, and time (survey wave) differences in mentioning policy triggers for thinking about quitting. Price of cigarettes as a trigger for thinking about quitting increased significantly across survey waves in France (OR=1.24, $p<0.001$) and the Netherlands (OR=1.13, $p<0.001$), while no change across waves could be demonstrated in the other countries. Reporting smoking restrictions decreased in France (OR=0.72, $p<0.001$), Germany (OR=0.72, $p<0.001$), the Netherlands (OR=0.92, $p<0.001$), and Scotland (OR=0.66, $p=0.005$). No change could be demonstrated in Ireland and it increased in the UK (OR=1.14, $p<0.001$). There was no significant change across survey waves in mentioning free or lower cost medication as a trigger for thinking about quitting in any of the countries where this question was asked (it was not assessed in France). There was a significant decrease across waves in reporting warning labels on cigarette packs as a trigger for thinking about quitting in the UK (OR=0.95, $p<0.001$), but no change over time could be demonstrated in the other countries.

Education and income differences

As shown in Table 3, price of cigarettes was more often reported as a trigger for thinking about quitting by moderate education (compared to high education) smokers in Germany and Scotland, and more often by low and/or moderate income (compared to high income) smokers in France, Germany, the Netherlands, and Scotland. For the UK, the interaction between education and survey wave was significant ($p=0.004$). Stratified analyses for the UK (not shown in tables) showed that reporting of price of cigarettes as a trigger for thinking about quitting increased across waves among high education

smokers, while it decreased among moderate education smokers, but both associations were not significant.

Table 2: Percentages of smokers who answered 'yes' to the question whether a certain policy would lead them to think about quitting (weighted data)^a.

	Price of cigarettes (%)	Smoking restrictions in public places (%)	Free or lower cost medication (%)	Warning labels on cigarette packs (%)
France				
Wave 1 (n=1,735)	61.8	35.6	Not measured	33.9
Wave 2 (n=1,540)	62.8	30.2*		30.8
Wave 3 (n=1,420)	76.1**	23.6**		36.1*
Germany				
Wave 1 (n=1,515)	72.3	39.4	21.8	27.9
Wave 2 (n=912)	70.9	30.3**	16.1**	28.4
Wave 3 (n=515)	64.6	25.6	16.7	24.5
The Netherlands				
Wave 1 (n=1,668)	52.2	37.1	29.1	16.8
Wave 3 (n=1,393)	57.1*	30.6**	39.4**	19.4
Wave 4 (n=1,632)	52.1*	25.4*	30.8**	17.5
Wave 5 (n=1,603)	61.5**	25.6	34.5	17.7
Wave 6 (n=1,499)	60.9	27.2	32.0	15.4
Wave 7 (n=1,420)	67.0*	24.8	28.7	15.0
Ireland				
Wave 1 (n=1,071)	76.5	60.4	41.5	47.5
Wave 2 (n=912)	73.3	56.7	41.2	46.1
Wave 3 (n=582)	73.3	48.2*	51.6**	42.1
Scotland				
Wave 1 (n=507)	69.7	53.3	49.0	39.7
Wave 2 (n=461)	71.5	42.5**	46.2	39.0
UK (Scotland excluded)				
Wave 2 (n=1,737)	65.5	35.1	36.8	41.8
Wave 3 (n=1,653)	69.1	41.4**	44.4**	38.3
Wave 4 (n=1,562)	71.5	52.2**	49.2*	37.9
Wave 5 (n=1,522)	71.0	53.8	45.8	35.4
Wave 6 (n=1,672)	65.0**	51.5	42.5	30.1*
Wave 7 (n=1,333)	62.4	49.1	39.0	33.8
Wave 8 (n=861)	65.2	45.8	42.6	40.9**
n increases when expected	2/4=50%	0/6=0%	0/2=0%	2/2=100%
n increases when not expected	2/14=14%	2/12=17%	4/14=29%	0/16=0%

^a p-values for Pearson Chi-Square tests of differences with the previous survey wave

shaded cells are cells in which increases are expected based on policy changes (as depicted in Figure 1)

* p<0.01, ** p<0.001

Smoking restrictions in public places were more often mentioned by smokers with low education in Germany, and more often by smokers with low and moderate income in France. The interaction between education and survey wave was significant for Scotland ($p=0.009$). Stratified analyses showed that the decrease in reporting of smoking restrictions as a trigger in Scotland was larger among high education smokers. Also, the interaction between income and survey wave was significant for reporting of smoking restrictions as a trigger for Scotland ($p=0.009$) and the rest of the UK ($p=0.006$). Stratified analyses showed that the decrease across waves was larger among moderate income smokers than high income smokers in Scotland, and that the increase was larger among high income smokers than among low and moderate income smokers in the UK.

Free or lower cost medication was reported more often by smokers with low and/or moderate education in Germany and the Netherlands, and more often by low and/or moderate income smokers in Germany, the Netherlands, Ireland, and the UK.

Warning labels on cigarette packs were mentioned more often by low education smokers in Scotland, and more often by low and/or moderate income smokers in France, the Netherlands, and Ireland. The interaction between education and survey wave was significant for France ($p=0.007$). Stratified analyses showed that there was an increase in reporting of warning labels as a trigger for thinking about quitting among low education smokers in France, while no change could be demonstrated among smokers with moderate and high education.

Table 3: GEE analyses^a showing associations of time (wave), education, and income with four triggers for thinking about quitting for six countries (weighted data).

Price of cigarettes		France OR (95% CI)	Germany OR (95% CI)	The Netherlands OR (95% CI)	Ireland OR (95% CI)	Scotland OR (95% CI)	UK OR (95% CI)
Main effects							
Wave		1.24 (1.10 to 1.39)**	0.91 (0.82 to 1.00)	1.13 (1.08 to 1.18)**	0.96 (0.70 to 1.31)	0.89 (0.68 to 1.18)	1.01 (0.98 to 1.04)
Education							
High		1.00	1.00	1.00	1.00	1.00	1.00
Moderate		1.12 (0.95 to 1.33)	1.63 (1.28 to 2.06)**	1.04 (0.89 to 1.21)	0.82 (0.61 to 1.09)	2.10 (1.28 to 3.44)*	1.15 (1.00 to 1.31)
Low		1.28 (1.02 to 1.62)	1.35 (1.02 to 1.77)	0.95 (0.80 to 1.13)	0.96 (0.70 to 1.30)	1.92 (1.14 to 3.25)	1.03 (0.89 to 1.18)
Income							
High		1.00	1.00	1.00	1.00	1.00	1.00
Moderate		1.20 (1.03 to 1.40)	1.33 (1.07 to 1.65)	1.21 (1.05 to 1.40)*	1.03 (0.81 to 1.31)	2.20 (1.31 to 3.70)*	1.08 (0.96 to 1.21)
Low		1.45 (1.22 to 1.72)**	1.69 (1.34 to 2.14)**	1.41 (1.21 to 1.63)**	1.23 (0.94 to 1.60)	1.72 (0.97 to 3.04)	1.20 (1.04 to 1.38)
Interaction effects (separate analyses)^b							
Education * wave		p = 0.064	p = 0.367	p = 0.559	p = 0.339	p = 0.095	p = 0.004
Income * wave		p = 0.562	p = 0.272	p = 0.088	p = 0.460	p = 0.420	p = 0.454
Smoking restrictions							
		France OR (95% CI)	Germany OR (95% CI)	The Netherlands OR (95% CI)	Ireland OR (95% CI)	Scotland OR (95% CI)	UK OR (95% CI)
Main effects							
Wave		0.72 (0.63 to 0.81)**	0.72 (0.65 to 0.81)**	0.92 (0.88 to 0.96)**	0.83 (0.64 to 1.08)	0.66 (0.50 to 0.88)*	1.14 (1.11 to 1.17)**
Education							
High		1.00	1.00	1.00	1.00	1.00	1.00
Moderate		1.16 (0.98 to 1.37)	1.20 (0.97 to 1.48)	0.95 (0.82 to 1.11)	0.95 (0.75 to 1.21)	1.09 (0.73 to 1.62)	1.06 (0.94 to 1.20)
Low		1.28 (1.02 to 1.60)	1.43 (1.11 to 1.84)*	1.08 (0.90 to 1.29)	0.94 (0.73 to 1.22)	1.27 (0.80 to 2.01)	1.05 (0.93 to 1.19)
Income							
High		1.00	1.00	1.00	1.00	1.00	1.00
Moderate		1.38 (1.18 to 1.62)**	1.25 (1.00 to 1.56)	0.98 (0.84 to 1.15)	1.25 (1.02 to 1.54)	1.59 (0.94 to 2.68)	0.91 (0.81 to 1.01)
Low		1.39 (1.17 to 1.65)**	1.25 (1.00 to 1.56)	1.04 (0.88 to 1.23)	1.06 (0.84 to 1.32)	1.33 (0.76 to 2.33)	0.99 (0.88 to 1.13)
Interaction effects (separate analyses)^b							
Education * wave		p = 0.021	p = 0.055	p = 0.049	p = 0.434	p = 0.009	p = 0.540
Income * wave		p = 0.079	p = 0.568	p = 0.644	p = 0.025	p = 0.009	p = 0.006

Free or lower cost medication		France OR (95% CI)	Germany OR (95% CI)	The Netherlands OR (95% CI)	Ireland OR (95% CI)	Scotland OR (95% CI)	UK OR (95% CI)
Main effects							
Wave	Not measured		0.98 (0.86 to 1.11)	0.98 (0.94 to 1.02)	1.02 (0.79 to 1.32)	0.84 (0.62 to 1.13)	1.03 (1.00 to 1.05)
Education							
High			1.00	1.00	1.00	1.00	1.00
Moderate			1.98 (1.52 to 2.57)**	1.33 (1.13 to 1.56)**	1.12 (0.88 to 1.43)	1.52 (1.01 to 2.29)	1.10 (0.97 to 1.24)
Low			2.21 (1.63 to 3.00)**	1.21 (1.01 to 1.46)	1.34 (1.04 to 1.72)	1.77 (1.10 to 2.86)	1.13 (1.00 to 1.29)
Income							
High			1.00	1.00	1.00	1.00	1.00
Moderate			1.53 (1.14 to 2.04)*	1.02 (0.87 to 1.20)	1.17 (0.94 to 1.47)	1.77 (1.03 to 3.04)	1.13 (1.01 to 1.26)
Low			1.50 (1.12 to 2.00)*	1.32 (1.13 to 1.56)**	1.57 (1.24 to 1.98)**	1.40 (0.77 to 2.54)	1.22 (1.08 to 1.39)*
Interaction effects (separate analyses)^b							
Education * wave			p = 0.216	p = 0.184	p = 0.672	p = 0.563	p = 0.149
Income * wave			p = 0.811	p = 0.395	p = 0.110	p = 0.193	p = 0.254
Warning labels on cigarette packs							
France	OR (95% CI)		Germany OR (95% CI)	The Netherlands OR (95% CI)	Ireland OR (95% CI)	Scotland OR (95% CI)	UK OR (95% CI)
Main effects							
Wave	1.11 (0.99 to 1.23)		0.94 (0.85 to 1.04)	0.96 (0.91 to 1.01)	0.77 (0.59 to 1.01)	1.07 (0.79 to 1.44)	0.95 (0.93 to 0.98)**
Education							
High	1.00		1.00	1.00	1.00	1.00	1.00
Moderate	1.22 (1.03 to 1.44)		1.25 (0.98 to 1.59)	1.13 (0.92 to 1.39)	1.15 (0.90 to 1.46)	1.38 (0.91 to 2.11)	0.96 (0.84 to 1.09)
Low	1.24 (0.99 to 1.56)		1.41 (1.07 to 1.86)	1.22 (0.97 to 1.54)	1.11 (0.85 to 1.45)	2.16 (1.36 to 3.43)*	1.11 (0.97 to 1.26)
Income							
High	1.00		1.00	1.00	1.00	1.00	1.00
Moderate	1.24 (1.07 to 1.43)*		1.20 (0.96 to 1.50)	1.26 (1.03 to 1.56)	1.21 (0.99 to 1.49)	1.09 (0.63 to 1.88)	1.00 (0.89 to 1.12)
Low	1.41 (1.20 to 1.66)**		1.32 (1.06 to 1.65)	1.62 (1.31 to 2.01)**	1.54 (1.23 to 1.93)**	1.29 (0.71 to 2.32)	1.18 (1.04 to 1.35)
Interaction effects (separate analyses)^b							
Education * wave	p = 0.007		p = 0.557	p = 0.029	p = 0.460	p = 0.199	p = 0.356
Income * wave	p = 0.199		p = 0.282	p = 0.380	p = 0.034	p = 0.149	p = 0.432

^a All analyses were adjusted for sex, age, HSI, and time in sample.

^b p-values for overall tests of model effects * p<0.01, ** p<0.001

DISCUSSION

The aim of the current study was to examine trends and socioeconomic differences in reporting four policies as a trigger for thinking about quitting among smokers in six European countries. We found that cigarette price was mentioned most often by smokers in all countries and across survey waves as a trigger for thinking about quitting. This is in line with previous studies which found that cigarette price increases can stimulate smoking cessation and motivation to quit (Brown, Platt, & Amos, 2014c; Cavazos-Rehg et al., 2014; Ross, Blecher, Yan, & Hyland, 2011). Another study in which respondents were asked how useful they thought different tobacco control policies are revealed that reimbursement for smoking cessation was much higher rated than price increases or the extension of smoking bans (Ferketich et al., 2016). The differences between this study and our study may be explained by the fact that this study measured how useful the general population thought the policies were, while our study measured whether policies triggered smokers to think about quitting.

The first research question was whether self-reported triggers for thinking about quitting would change over time. With respect to cigarette price, an increase in reporting of this trigger was seen in the Netherlands and France. This was in accordance with actual price increases corrected for inflation in the Netherlands. There were increases in mentioning this as a trigger between 2008 and 2009 after a price increase in 2008, and the same was found between 2010 and 2011. In France, there was an increase between 2008 and 2012, although no large price increases were implemented. In total, half of the cigarette price increases were followed by a significant increase in smokers mentioning cigarette price as a trigger for thinking about quitting.

In contrast, with regard to smoking restrictions in public places, the implementation was followed by a decrease in mentioning this as a trigger for thinking about quitting in four countries. We found a general increase in mentioning this trigger in the UK, but this increase took place before the implementation of the smoking restrictions in 2007. However, previous research showed that smoking restrictions are effective in stimulating smoking cessation (Wilson et al., 2012). Therefore, a probable explanation for our finding is that smokers quit smoking in anticipation of the actual implementation of the smoking restrictions as previous research showed as well (Fowkes, Stewart, Fowkes, Amos, & Price, 2008).

With respect to warning labels on cigarette packs, we saw an increase between 2008 and 2012 in mentioning this as a trigger for thinking about quitting in France which is likely to be related to the introduction of pictorial warning labels in France between April 2010 and April 2011. We also found a decrease between 2003 and 2004 in the UK where text warning labels were implemented in 2003 before the (wave 2) survey measurement. Furthermore, mentioning warning labels increased between October 2008 and the second half of 2010 in the UK where pictorial warning labels were introduced between October 2008 and September 2010. This is consistent with previ-

ous research showing that implementing textual as well as pictorial warning labels is associated with changes in self-reported indicators of impact (European Commission, 2009; Hammond et al., 2004). Taking the results together, we found partial support for our expectation that smokers would be more likely to mention recently implemented policies as a trigger for thinking about quitting. We saw more expected increases (29%) than unexpected increases (14%).

The second research question was whether there were education and income differences regarding these policy triggers for thinking about quitting. It is notable that all policies were mentioned more often by low and/or moderate education smokers than high education smokers and by low and/or moderate income smokers than high income smokers. Education differences were especially large for free or lower cost medication and for warning labels, while income differences were especially large for price of cigarettes and free or lower cost medication. Most previous studies that investigated socioeconomic differences in reporting reasons to quit also described that groups with a low SES mentioned economic costs more often than smokers with a high SES (Gallus et al., 2013; Hill, Amos, Clifford, & Platt, 2013; Pisinger et al., 2011; Vangeli & West, 2008). Previous studies on socioeconomic differences in the impact of free or lower cost medication and warning labels showed mixed results (Brown, Platt, & Amos, 2014a; Giskes et al., 2007; Hitchman et al., 2012; Vangeli & West, 2008; Yong et al., 2014).

For the third research question we examined whether the education and income differences changed over time. We saw that for most policies and in most countries, the associations did not change significantly over time. The largest change was that low education smokers in France mentioned warning labels more often over time than moderate and high education smokers. Because pictorial warning labels were introduced in 2010, this suggests that these warning labels might function more often as a trigger among low education smokers.

Practical implications

The results of the present study showed that low SES smokers perceive changes in policies more often as a trigger for thinking about quitting than high SES smokers. However, previous research indicated that low SES smokers are less likely to quit smoking (Hiscock, Bauld, Amos, Fidler, et al., 2012). Future public health campaigns, which often accompany new policies, should therefore be targeted at low SES smokers to support them in their quitting. Previous research showed mixed results regarding the effect of such campaigns for different socioeconomic subgroups, but emphasized the importance of sufficient exposure and campaign reach for low SES groups (Durkin, Brennan, & Wakefield, 2012). With these campaigns, low SES smokers could be well informed about the introduction of new policies and reminded that this is a good opportunity to make a quit attempt.

Limitations

Several limitations should be taken into account when interpreting the results. First of all, the survey waves were not always conducted immediately before and after a change in policy which would have made the interpretation of the relationships between policy implementation and thinking about quitting more straightforward. Another limitation is that the measures used in this study were self-reported perceptions of impact. Smokers' perceptions of what triggered them to think about quitting may differ from actual triggers. We also only investigated policy triggers for thinking about quitting among continuing smokers, i.e. those who did not quit due to the policy implementation. Because such triggers could actually influence cessation behavior, we have most likely underestimated the importance of policy triggers after the actual policy implementation. Moreover, a considerable number of respondents were lost to follow-up. Because young smokers were more likely to drop out of the sample in all countries, the results of the current study may not be fully generalizable to all smokers. Furthermore, the included countries conducted different numbers of survey waves, with a different number of participants, and different time intervals between survey waves which impedes the interpretation of country differences. Nevertheless, most findings were comparable across countries.

Conclusion

Tobacco control policies have the potential to work as a trigger to increase thoughts about quitting in smokers with low education and low income. The four policies examined in this study (cigarette price, smoking restrictions in public places, free or lower cost medication, and warning labels) were mentioned more often as triggers for thinking about quitting by low/moderate education and low/moderate income smokers than high education and high income smokers. The education and income differences did not change significantly over time for most policies and in most countries. Our findings about self-reported perceptions of impact suggest that tobacco control policies have the potential to reduce health inequalities in smoking.

Chapter 6

External validation of the Motivation To Stop Scale (MTSS)

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ABSTRACT

Background: The Motivation To Stop Scale (MTSS) is a single-item instrument which has been shown to predict quit attempts in the next 6 months in a previous validation study conducted in England. The aim of the current study was to determine the external validity of the MTSS among Dutch smokers in predicting quit attempts in the next 12 months. A secondary aim was to compare the discriminative accuracy of the MTSS with that of a Stages of Change assessment.

Methods: We analysed data from three consecutive waves of the International Tobacco Control (ITC) Netherlands Survey ($n = 1,272$). We conducted logistic regression analyses with the baseline score of the MTSS (measured in 2012 or 2013) predicting a quit attempt in the next 12 months (measured in 2013 or 2014). We furthermore compared the area under the Receiver Operating Characteristics (ROC_{AUC}) curves of the MTSS and a Stages of Change measure.

Results: A total of 450 smokers (35.4%) made a quit attempt between baseline and 12 months follow-up. The regression analysis showed a positive relationship between scoring on the MTSS and quit attempts (odds ratio = 18.15, 95% confidence interval = 8.12 to 40.58 for the most versus least motivated group). The discriminative accuracy of the MTSS ($ROC_{AUC} = 0.68$) was marginally higher than that of a Stages of Change assessment ($ROC_{AUC} = 0.65$), but not statistically significant ($p = 0.21$).

Conclusion: The MTSS is an externally valid instrument to predict quit attempts in the next 12 months.

INTRODUCTION

Previous research has shown that intention to quit smoking is one of the most important predictive markers of future quit attempts (Hyland et al., 2006; Topa & Moriano, 2010; Vangeli, Stapleton, Smit, Borland, & West, 2011). There are additional factors that play a role in predicting quit attempts, including beliefs that one should stop or motivation-related indicators like enjoying smoking (Borland et al., 2010; Smit, Fidler, & West, 2011; Yong & Borland, 2008). Previous studies used different ways to establish these predictive relationships (Savoy et al., 2014; Sciamanna, Hoch, Duke, Fogle, & Ford, 2000; Yzer & Van den Putte, 2014). It is important to have one valid instrument to measure the motivation to quit smoking which can be applied in various studies. In recognition of this need, the Motivation To Stop Scale (MTSS) was developed and internally validated (Kotz, Brown, & West, 2013).

The MTSS is a 7-level single-item instrument which incorporates intention, desire and belief to quit smoking (Kotz et al., 2013). This instrument was developed for use in large scale tracking surveys by RW in collaboration with the English Department of Health and Central Office of Information, and is based on the PRIME Theory (Kotz et al., 2013; West & Brown, 2013). An important aspect of the MTSS is that it combines these different concepts and is therefore cost-effective compared to other instruments which split them into separate items. The initial validation study of the MTSS was conducted with data from the “Smoking Toolkit Study”, an ongoing monthly household survey in England using computer-assisted face-to-face interviews (The Smoking Toolkit Study, 2016). This study showed a strong linear association between the response categories of the MTSS and quit attempts in the next 6 months. However, the instrument requires external validation before it can be applied with confidence in future research. Such external validation should take place using independently collected data from a different setting than used to develop and internally validate the instrument (Altman & Royston, 2000). We therefore used data from the International Tobacco Control (ITC) Netherlands Survey for the present study (ITC Project, 2016). The ITC Netherlands Survey follows a longitudinal cohort design in which smokers and quitters are surveyed each year using computer-assisted web interviews. The most important differences between the studies are therefore the study populations (Dutch instead of English smokers), the survey mode (web instead of face-to-face interviews), and the length of follow-up (12 months instead of 6). Furthermore, as the MTSS was translated into Dutch for the present study, it was tested whether it would perform comparably in a different language than the one it was developed. The MTSS does not include any country- or culture-specific elements. Therefore, no differences in scoring on the MTSS as a function of culture were expected.

Another measure of motivation which has been frequently applied in smoking cessation studies is the “Stages of Change” (Bully, Sanchez, Zabaleta-Del-Olmo, Pombo, & Grandes, 2015). A PubMed search (“Stages of Change” AND “smok*”) yielded more

than 360 publications. The Stages of Change is based on the Transtheoretical Model (TTM) (Prochaska & DiClemente, 2005) and was primarily developed to tailor interventions to respondents in each stage specified by the model. However, the Stages of Change is also often used as an indicator of intention to quit smoking. For this, smokers are allocated into one of three stages: 1) not planning to quit (precontemplation), 2) planning to quit within the next 6 months, but not within the next 30 days (contemplation), or 3) planning to quit within the next 30 days (preparation) (DiClemente et al., 1991). While it is often used, previous research indicated that the validity of the Stages of Change is not very well established. For example, the stages do not seem to be distinct categories, different algorithms to form the stages exist which have not been compared empirically, and they underestimate the motivation to quit smoking in comparison with other measures of motivation (Brug et al., 2005; Herzog, 2008; Sutton, 2001; West, 2005). It would be useful to assess the validity of the Stages of Change in predicting future quit attempts and to compare it with the MTSS.

The primary aim of this study was to investigate the predictive validity of the MTSS in a different language and setting and over a longer time interval than in the initial validation study. In addition, we aimed to compare the accuracy of the MTSS and the Stages of Change in discriminating between smokers who did and who did not attempt to stop during follow-up.

METHODS

Design and sample

Data were collected by the longitudinal ITC Netherlands Survey (ITC Project, 2016). Dutch smokers aged 16 years and older were selected from a probability-based web database (Nagelhout et al., 2010). Participants were classified as smokers if they had smoked at least 100 cigarettes in their lifetime and were currently smoking cigarettes at least monthly. We used data from three survey waves: wave 6 (2012), wave 7 (2013) and wave 8 (2014). Respondents who were lost to attrition were replenished by recruiting new respondents from the same database (Zethof et al., 2016). Drop-out of smokers between wave 6 and wave 8 was 31.4%, and younger smokers were more likely than older smokers to drop out of the sample.

Respondents were included into the analyses if they were smoker and answered the MTSS question (see below) in wave 6 and the quit attempt question (see below) in wave 7 ($n = 215$), or if they were smoker and answered the MTSS question in wave 7 and the quit attempt question in wave 8 ($n = 1,057$). The MTSS was added only to the replenishment survey of wave 6; therefore, the sample which could be included from this wave was smaller. In wave 7, the MTSS was administered to the whole sample (recontact and replenishment). These groups were combined into one sample ($n = 1,272$).

Measurements

Quit attempt

All smokers were asked: “Have you made any attempts to stop smoking in the last year?” (yes/no). We used data from this question from wave 7 and wave 8.

MTSS

The MTSS was initially developed and validated in English (Kotz et al., 2013). To apply it to the ITC survey, it was translated into Dutch independently by three tobacco research experts who are skilled in both languages (see Supplementary Table S1 for the Dutch translation). Inconsistencies in the translation were discussed until consensus was reached.

To assess the motivation to stop smoking, smokers in wave 6 and wave 7 were asked: “Which of the following describes you?” Response options were: 1) “I don’t want to stop smoking”, 2) “I think I should stop smoking but don’t really want to”, 3) “I want to stop smoking but haven’t thought about when”, 4) “I REALLY want to stop smoking but I don’t know when I will”, 5) “I want to stop smoking and hope to soon”, 6) “I REALLY want to stop smoking and intend to in the next 3 months”, and 7) “I REALLY want to stop smoking and intend to in the next month”. This ordering reflects: 1) absence of any belief, desire, or intention, 2) belief only, 3) moderate desire but no intention, 4) strong desire but no intention, 5) moderate desire and intention, 6) strong desire and medium-term intention, and 7) strong desire and short-term intention (Kotz et al., 2013).

Table S1: English and Dutch version of the MTSS.

English version MTSS	Dutch version MTSS
Which of the following describes you?	Wat is voor u het meest van toepassing?
1: I don’t want to stop smoking	1: Ik wil niet stoppen met roken
2: I think I should stop smoking but don’t really want to	2: Ik denk dat ik zou moeten stoppen met roken maar wil niet echt
3: I want to stop smoking but haven’t thought about when	3: Ik wil stoppen met roken maar heb nog niet nagedacht over wanneer
4: I REALLY want to stop smoking but I don’t know when I will	4: Ik wil écht stoppen met roken maar ik weet niet wanneer ik dat ga doen
5: I want to stop smoking and hope to soon	5: Ik wil stoppen met roken en ik hoop dit snel te doen
6: I REALLY want to stop smoking and intend to in the next 3 months	6: Ik wil écht stoppen met roken en ben van plan dit te doen in de komende 3 maanden
7: I REALLY want to stop smoking and intend to in the next month	7: Ik wil écht stoppen met roken en ben van plan dit te doen in de komende maand

Stages of Change

An assessment of the Stages of Change was measured in wave 6 and wave 7 by asking smokers: “Are you planning to quit smoking...” with four response categories: 1) “within

the next month”, 2) “within the next six months”, 3) “somewhere in the future, beyond six months”, and 4) “no, never”. This question was combined with the question whether smokers had made a quit attempt in the previous year to define the Stages according to the most recent algorithm published by the founders of the TTM (Cancer Prevention Research Center, 2015; Velicer et al., 1995). Smokers who chose the first response option and had made a quit attempt in the previous year were categorised into the preparation stage of the TTM. Smokers who chose the first option but made no previous quit attempt were classified into the contemplation stage, as were smokers who chose the second response option. Smokers who chose the third and fourth option were classified into the precontemplation stage.

Covariates

Covariates were age, sex, monthly gross household income, level of completed education, daily versus occasional smoking status, and the Heaviness of Smoking Index (HSI) (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). Age was categorised into: 16-24 years, 25-39 years, 40-54 years, and 55 years and older. Monthly household income was categorised into three levels: low (< 2,000 euro), moderate (2,000-3,000 euro), and high (> 3,000 euro). Respondents who did not answer the income question (n = 390) were recorded in a separate category. Completed education was categorised into three groups: low (primary education and lower pre-vocational secondary education), moderate (middle pre-vocational secondary education and secondary vocational education), and high (senior general secondary education, (pre-) university education, and higher professional education). The HSI was used as indicator of the level of nicotine dependence. This index is the sum of the categorised number of cigarettes smoked per day and the time to the first cigarette of the day (Heatherton et al., 1989). The HSI ranges from 0 to 6, with a higher score indicating higher nicotine dependence.

Analyses

We tested differences between mean scores on the MTSS among socio-demographic subgroups using one-way analyses of variance (ANOVA) with Tukey HSD post-hoc tests. Next, we determined the predictive validity of the MTSS on making a quit attempt in the next 12 months. We did this first with a χ^2 -test for a linear-by-linear-association between the MTSS and making a quit attempt, and second with simple as well as multiple logistic regression analyses. We adjusted the multiple regression analysis for age, sex, income, education, smoking status, and HSI. We also adjusted for the time a respondent participated in the cohort because previous research has shown that responses can vary as a function of time in sample (Driezen & Thompson, 2011). We calculated the area under the Receiver Operating Characteristics (ROC_{AUC}) curves for the MTSS and the Stages of Change to assess the discriminative accuracy. For the primary comparison, we applied the most recently published algorithm which includes previous quit behaviour

to form the Stages of Change. A sensitivity analysis without previous quit behaviour and without combining response categories of the Stages of Change question was performed because previous studies frequently used algorithms subdividing the precontemplation stage and without previous quit behaviour (Nagelhout, De Vries, Fong et al., 2012; Prenger et al., 2013; Thyrian et al., 2008; Yong et al., 2014). We separately tested differences between the ROC_{AUC} of the MTSS and the ROC_{AUCs} of both assessments of the Stages of Change by using the DeLong test (DeLong, DeLong, & Clarke-Pearson, 1988).

Missing values (“refused” or “don’t know”) occurred for education ($n = 11$, 0.9%), HSI ($n = 71$, 5.6%), and Stages of Change ($n = 95$, 7.5%). Respondents who chose these response options were excluded from the multiple regression analysis, resulting in a sample size of 1,192 smokers for this analysis. All analyses were conducted with SPSS version 20.0, except for the comparison of the ROC_{AUCs} which was done using R (Robin et al., 2011).

Ethics

The surveys were cleared for ethics by the Research Ethics Board of the University of Waterloo and the Central Committee on Research Involving Human Subjects in the Netherlands.

RESULTS

Sample description

The baseline characteristics of the 1,272 included smokers are displayed in Table 1. Comparing the Dutch ITC sample with the English sample from the Smoking Toolkit Study (Kotz et al., 2013), respondents were similar with respect to socio-demographic and smoking-related characteristics, but differed regarding their scores on the MTSS. Almost one third of the smokers ($n = 402$, 31.6%) in our sample stated that their motivation to stop was at level 2 (“I think I should stop smoking but don’t really want to”), whereas most smokers in the initial validation study answered the MTSS question with level 4 (“I REALLY want to stop smoking but don’t know when I will”, 23.8%) or level 1 (“I don’t want to stop smoking”, 20.7%). In the current study, 6.8% ($n = 86$) of smokers scored the two highest levels of motivation, while this was 18% in the Smoking Toolkit Study.

Smokers from the Smoking Toolkit Study were significantly more motivated to quit smoking (mean MTSS score = 3.63, $sd = 1.97$) than smokers from the ITC sample (mean MTSS score = 2.88, $sd = 1.55$), $t(3143.05) = 12.75$, $p < 0.001$. Three-quarter of smokers ($n = 883$) in our sample were categorised into the precontemplation Stage of Change.

Chapter 6

Table 1: Baseline characteristics of included smokers (n = 1,272).

	Included smokers
Sex	
Male, % (n)	51.4 (654)
Age group, % (n)	
16-24 years	22.2 (282)
25-39 years	26.7 (340)
40-54 years	29.0 (369)
55 years and older	22.1 (281)
Education, % (n)	
Low	27.9 (352)
Moderate	46.0 (580)
High	26.1 (329)
Income, % (n)	
Low	21.7 (276)
Moderate	18.3 (233)
High	29.3 (373)
Not reported	30.7 (390)
Daily smoker, % (n)	90.6 (1,153)
Heaviness of Smoking Index, mean (SD)	2.3 (1.5)
MTSS score, % (n)	
1: "I don't want to stop smoking"	18.7 (238)
2: "I think I should stop smoking but don't really want to"	31.6 (402)
3: "I want to stop smoking but haven't thought about when"	18.1 (230)
4: "I really want to stop smoking but I don't know when I will"	16.3 (207)
5: "I want to stop smoking and hope to soon"	8.6 (109)
6: "I really want to stop smoking and intend to in the next 3 months"	3.3 (42)
7: "I really want to stop smoking and intend to in the next month"	3.5 (44)
Stage of Change, % (n)	
Precontemplation	75.0 (883)
Contemplation	21.3 (251)
Preparation	3.7 (43)

Table 2 shows the mean MTSS scores for the different socio-demographic subgroups. Post-hoc tests revealed that smokers aged 25-39 years were more motivated to stop smoking than smokers of the other age groups. Low educated smokers were less motivated to quit than smokers with a moderate or high educational background.

Table 2: Mean MTSS scores among socio-demographic subgroups (range: 1 = low motivation to stop, 7 = high motivation).

	Mean (SD) MTSS score	Group differences
Sex		
Male	2.9 (1.6)	F(1) = 0.17, p = 0.68
Female	2.9 (1.5)	
Age group		
16-24 years	2.8 (1.4)	F(3) = 5.06, p < 0.01
25-39 years	3.2 (1.7)	
40-54 years	2.8 (1.5)	
55 years and older	2.7 (1.6)	
Education		
Low	2.7 (1.5)	F(2) = 5.26, p < 0.01
Moderate	3.0 (1.5)	
High	3.0 (1.6)	
Income		
Low	2.8 (1.6)	F(3) = 1.12, p = 0.34
Moderate	2.9 (1.6)	
High	3.0 (1.6)	
Not reported	2.8 (1.5)	

Performance of the MTSS

A total of 450 smokers (35.4%) had made a quit attempt between baseline and 12 months follow-up. Figure 1 presents the percentage of smokers who made a quit attempt, stratified by their baseline MTSS score. Comparable to the initial validation study, the MTSS showed a linear increase: smokers with higher baseline MTSS scores tended to be more likely to have made a quit attempt (linear-by-linear association: $\chi^2(1) = 127.154$, $p < 0.001$). More smokers who scored level 5 (“I want to stop smoking and hope to soon”) than level 6 (“I REALLY want to stop smoking and intend to in the next 3 months”) of the MTSS made a quit attempt in the present study, but this difference was not statistically significant ($\chi^2(1) = 0.831$, $p = 0.36$). Smokers scoring level 6 were still more likely to make a quit attempt than smokers scoring level 4 (“I REALLY want to stop smoking but I don’t know when I will”).

Figure 1: Percentage of smokers who made a quit attempt in the next 12 months in the current Dutch sample (International Tobacco Control (ITC) Survey; black bars) and in the next 6 months in the initial English validation sample (Smoking Toolkit Study (STS); grey bars), stratified by MTSS score.

Table 3 shows the unadjusted and adjusted associations between scoring on the MTSS and making a quit attempt in the next 12 months. In both analyses, the odds to make a quit attempt tended to increase with increasing motivation. For example, the odds ratio of making a quit attempt was 18.15 (95% confidence interval (CI) = 8.12 to 40.58) for the most versus least motivated group in the unadjusted analysis. The linear relationship between scoring on the MTSS and making a quit attempt can also be seen in the log transformation of the adjusted odds ratios in Supplementary Figure S1.

Table 3: Odds ratio (OR) and adjusted odds ratio (aOR^a) of making a quit attempt in the next 12 months follow-up (any versus none) for the various levels of motivation.

Level of motivation at baseline	OR (95% CI) (n = 1,272)	aOR ^a (95% CI) (n = 1,192)
1: "I don't want to stop smoking"	1.00	1.00
2: "I think I should stop smoking but don't really want to"	1.85 (1.24 to 2.75)	1.71 (1.13 to 2.57)
3: "I want to stop smoking but haven't thought about when"	2.26 (1.47 to 3.48)	2.00 (1.27 to 3.14)
4: "I really want to stop smoking but I don't know when I will"	3.52 (2.29 to 5.42)	3.34 (2.14 to 5.22)
5: "I want to stop smoking and hope to soon"	8.72 (5.21 to 14.61)	7.65 (4.45 to 13.14)
6: "I really want to stop smoking and intend to in the next 3 months"	6.22 (3.10 to 12.48)	5.78 (2.77 to 12.07)
7: "I really want to stop smoking and intend to in the next month"	18.15 (8.12 to 40.58)	14.15 (5.93 to 33.77)

^a OR adjusted for age, sex, income, education, Heaviness of Smoking Index, daily versus occasional smoking status, and time in sample

Figure S1: Log transformation of adjusted odds ratios of making a quit attempt in the next 12 months follow-up for the various levels of motivation.

Comparison of the MTSS with the Stages of Change

Three ROC curves were calculated to investigate the accuracy of the MTSS and two Stages of Change measures (Supplementary Figure S2). The MTSS discriminated between smokers who made any versus no quit attempt with an ROC_{AUC} of 0.68 (95% CI = 0.65 to 0.71), which is comparable to the ROC_{AUC} of the MTSS in the Smoking Toolkit Study (0.67). The ROC_{AUC} of the Stages of Change using the latest published algorithm including previous quit behaviour and combining two response categories was 0.65 (95% CI = 0.62 to 0.69). The ROC_{AUC} of the Stages of Change using the most frequently used algorithm without previous quit behaviour and without combining response options was 0.68 (95% CI = 0.65 to 0.71). The ROC_{AUC} of the MTSS did not differ significantly from the ROC_{AUC} s of both measures of the Stages of Change ($p = 0.21$ and $p = 0.82$ respectively).

Figure S2: Receiver operating characteristics (ROC) curves showing the accuracy to predict making a quit attempt for A: the MTSS: $ROC_{AUC} = 0.68$ (95% CI = 0.65 to 0.71), B: the Stages of Change including previous quit behaviour: $ROC_{AUC} = 0.65$ (95% CI = 0.62 to 0.69), C: the Stages of Change without previous quit behaviour: $ROC_{AUC} = 0.68$ (95% CI = 0.65 to 0.71).

DISCUSSION

We conducted an external validation study of the MTSS to investigate its usefulness in predicting quit attempts in the next 12 months in a sample of Dutch smokers. In addition, we compared the MTSS with two assessments of the Stages of Change, another frequently used instrument to measure smokers' intention to quit (Bully et al., 2015). The MTSS showed a linear increase in the percentage of smokers who made a quit attempt with increasing motivation and also increasing odds to make a quit attempt.

An unexpected finding was that the percentage of smokers who scored level 6 of the MTSS ("I REALLY want to stop smoking and intend to in the next 3 months") and subsequently made a quit attempt was slightly lower than that of smokers scoring level 5 ("I want to stop smoking and hope soon") in our sample. A possible explanation for this is that respondents understood these response categories in a different way than expected and differently than in the original English version. For example, smokers may have interpreted level 5 as being sooner in time than level 6, resulting in a higher probability to make a quit attempt. It is also possible that smokers who scored level 5 were actually more motivated than smokers who scored level 6, but that those smokers were reluctant to make a commitment when exactly they will quit as stated in level 6. Future research using the Dutch version of the MTSS should take this into consideration and possibly examine the underlying reasons for this unexpected pattern. Another possible explanation is the smaller sample size of our study compared to the initial validation study. Smokers were categorised into one of seven MTSS groups and some of these were quite small in our sample. Future studies with a larger sample could be used to compare the patterns.

We furthermore found some subgroup differences in scores on the MTSS. Smokers aged 25-39 years were more motivated to quit compared to the other age groups, and smokers with a low educational background were less motivated than smokers with a high or moderate education. Previous studies about subgroup differences in motivation to quit found mixed results (Kotz & West, 2009; Reid, Hammond, Boudreau, Fong, & Siahpush, 2010; Siahpush, McNeill, Borland, & Fong, 2006).

The discriminative accuracy of the MTSS was as good as or marginally better than the two different assessments of the Stages of Change. An advantage of the MTSS is that the distribution of its scores was more towards normal than that of both measures of the Stages of Change; three-quarters of smokers in our sample were allocated into the precontemplation stage. Furthermore, the Stages of Change categorises smokers into three or four groups while the MTSS has seven groups. This means that the MTSS can distinguish subgroups of smokers more sensitively than the Stages of Change. However, survey instruments should ideally be tested and compared using several methods. Future research should focus on other validation tests in addition to predictive validity for different instruments that measure motivation to quit smoking.

Smokers from our sample scored differently on the MTSS compared to the initial validation study sample as fewer smokers in the ITC sample scored the high levels of motivation to quit and they were less motivated to quit (Kotz et al., 2013). The association with subsequent quit attempts is difficult to compare between the initial and the external validation studies because the time to follow-up was twice as long in our study. Future research could compare these proportions with the same follow-up duration (either using the STS sample with 6 months or the ITC sample with 12 months follow-up). Nevertheless, it is useful to know that the MTSS also performed well after a different time interval than used in the Smoking Toolkit Study. The ROC_{AUC} of the MTSS was 0.68 in our sample and 0.67 in the initial validation study which is close to the acceptable threshold of 0.70 (Hosmer & Lemeshow, 2000). This similarity is a sign of a stable validity and also reassuring as previous research indicated that other external validation studies often show weaker performance of predictive measurement instruments than in the derivation studies (Siontis, Tzoulaki, Castaldi, & Ioannidis, 2015).

Limitations and strengths

A limitation of this study is that, due to time constraints, the MTSS was not translated as systematically as recommended for example by Wild et al. (Wild et al., 2005). This would have reduced the chance that differences on scoring would be due to linguistic misconceptions. By translating it independently and discussing it by three researchers, we aimed to minimise this risk. A second limitation was that more young smokers dropped out of the sample between the three used survey waves. Our results may therefore not be generalizable to the whole population of Dutch smokers.

External evaluation in addition to internal validation of measurement instruments is clearly desirable in order to determine their generalizability (Altman & Royston, 2000). One important strength of the present study is that, to the best of our knowledge, this is the first study which examined the external validity of an instrument to measure motivation to stop smoking. Other strengths include the relatively large sample size of the current study and use of a probability-based sampling approach which improves the representativeness of our findings.

Conclusion

The MTSS performed well when validated in an external sample, in a different language and with a longer time interval than in the original validation setting. Our results are in accordance with those of the initial validation study with respect to all psychometric assessments.

Chapter 7

Construct and predictive validity of three measures of intention to quit smoking

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ABSTRACT

Introduction: The aim of the study was to compare the construct validity and the predictive validity of three instruments to measure intention to quit smoking: a Stages of Change measure, the Motivation To Stop Scale (MTSS) and a Likert scale. We used the Theory of Planned Behaviour as theoretical framework.

Methods: We used data from the International Tobacco Control (ITC) Netherlands Survey. We included smokers who participated in three consecutive survey waves ($n=980$). We measured attitude, subjective norm, and perceived behavioural control in 2012, intention to quit with three instruments in 2013, and having made a quit attempt in the last year in 2014. We conducted Structural Equation Modelling with three models for the instruments of intention separately, and with one model that included the three instruments simultaneously.

Results: All three instruments of intention were significantly and positively related to attitude and perceived behavioural control but none was related to subjective norm. All three instruments were significantly and positively related to making a quit attempt. The relation of the Likert scale with making a quit attempt ($\beta=0.38$) was somewhat stronger than that of the Stages of Change measure ($\beta=0.35$) and the MTSS ($\beta=0.22$). When entering the three instruments together into one model, only the Likert scale was significantly related to making a quit attempt.

Conclusions: All three instruments showed reasonable construct validity and comparable predictive validity. Under the studied conditions, the Likert scale performed slightly better than the Stages of Change measure and the MTSS.

Implications: An assessment of the Stages of Change, the Motivation To Stop Scale (MTSS) and a Likert scale showed comparable predictive and construct validity as measures for intention to quit smoking. All three instruments can be used in future research; however, under the studied theoretical framework, i.e. the Theory of Planned Behaviour, the Likert scale performed slightly better than the other two instruments.

INTRODUCTION

According to the Theory of Planned Behaviour (TPB), if smokers evaluate smoking cessation as positive (attitude), if they think that important others want them to quit smoking (subjective norm) and if they are convinced that they can quit (perceived behavioural control), this results in high intention to quit, leading to a higher likelihood of actually quitting (Ajzen, 1991; De Vries & Mudde, 1998). Previous research has confirmed that intention to quit is the strongest predictor of making a future quit attempt (Hyland et al., 2006; Vangeli, Stapleton, Smit, Borland, & West, 2011). It is important for researchers to use the most valid instruments to assess these theoretical concepts. The aim of our study was to determine and compare the construct validity and the predictive validity of three different instruments that were used to measure intention to quit smoking in previous research: 1) an assessment of the Stages of Change, 2) the Motivation To Stop Scale (MTSS), and 3) intention measured by a Likert scale.

The Stages of Change concept is part of the Transtheoretical Model (Prochaska & DiClemente, 2005), which distinguishes three stages prior to behaviour change: *precontemplation* (not planning to quit), *contemplation* (planning to quit within the next 6 months) and *preparation* (planning to quit within the next month). In the present study, we used a slightly modified algorithm and subdivided the precontemplators by adding a group of smokers who plan to quit smoking beyond the next 6 months because previous research has shown that the group of precontemplators often is not homogenous (Balmford, Borland, & Burney, 2008; Borland, Partos, Yong, Cummings, & Hyland, 2012; Dijkstra, Bakker, & De Vries, 1997; Hall et al., 2012; Herzog & Blagg, 2007; Nagelhout et al., 2012). The MTSS was developed for use in large scale tracking surveys by West and colleagues in collaboration with the English Department of Health, and is based on the PRIME Theory of motivation (West & Brown, 2013). The instrument incorporates intention (e.g., “I intend to stop smoking in the next month”), desire (e.g., “I want to stop smoking”) and belief (e.g., “I think I should stop smoking”) to quit (Hummel, Brown, Willemsen, West, & Kotz, 2017; Kotz, Brown, & West, 2013). Another frequently used method to measure intention to quit smoking is by means of a Likert scale, for example by asking how likely it is that smokers would quit within a specific time frame (Bakker, Nijkamp, Sloot, Berndt, & Bolman, 2015; Smit, De Vries, De Munter, & Hoving, 2013; Van den Putte, Yzer, & Brunsting, 2005; Wong & Cappella, 2009).

Previous studies assessing the validity of measures of intention to quit smoking have been conducted for the Stages of Change and these have found mixed results (Bondy et al., 2010; Dijkstra, Conijn, & De Vries, 2006; Herzog, 2008; Kraft, Sutton, & McCreath Reynolds, 1999; Velicer, Norman, Fava, & Prochaska, 1999). Studies about the validity of the MTSS have found a good predictive validity of the instrument (Hummel et al., 2017; Kotz et al., 2013). We are not aware of any studies about the validity of Likert intention scales in tobacco control research. To the best of our knowledge, this is the first study that analyses and compares three different measures of intention to quit smoking re-

garding their construct and predictive validity. Construct validity refers to the extent to which an instrument adequately assesses the theoretical construct it is intended to and was designed to measure (Nunnally & Bernstein, 1994). In particular, hypothesized relations of a construct with other constructs should then be reflected by the empirical relations between measurements of these constructs. In the present study, an instrument of intention has good construct validity if it is positively related to measurements of attitude, subjective norm, perceived behavioural control, and making a quit attempt. Predictive validity refers to the extent to which an instrument can predict a certain outcome that is measured later in time (Cronbach & Meehl, 1955). In the current study, a strong association between the instruments for intention and making a quit attempt would be indicative of good predictive validity.

In the present study, we addressed the following research questions: 1) which of the three instruments has the best construct validity?, 2) which of the three instruments has the best predictive validity, and 3) do the different instruments have added value when used together in one model?

METHODS

Design and sample

We used data from three consecutive survey waves from the International Tobacco Control (ITC) Netherlands Survey, which is part of the global ITC Project (Fong et al., 2006; ITC Project, 2016; Thompson et al., 2006). The ITC Netherlands Survey follows a prospective cohort design with annual surveys. Data for Wave 6 were collected in May-June 2012, for Wave 7 in May-June 2013, and for Wave 8 in May-June 2014. The ITC Netherlands Surveys were conducted using computer-assisted web interviews among a probability sample of Dutch smokers and quitters (Nagelhout et al., 2010). Respondents who were lost to follow-up between survey waves were replenished by recruiting new respondents from the same sampling frame (Zethof et al., 2016).

For the current study, we included respondents aged 15 years and older who participated in Waves 6, 7 and 8 ($n=1,210$), and who were smoking in Waves 6 and 7. This resulted in an analysis sample size of $n=980$. Respondents were classified as smoker if they had smoked at least 100 cigarettes in their lifetime and were currently smoking cigarettes at least monthly.

Measurements

Covariates (2012)

An overview of the measured variables is given in Table 1. We included sex, age, monthly gross household income, level of completed education, the Heaviness of Smoking Index (HSI), daily versus occasional smoking status, and whether or not respondents had made a quit attempt in the previous year (measured in 2012) as covariates into the analyses. Age was categorised into: 15-24 years, 25-39 years, 40-54 years, and 55 years and older. Monthly household income was categorised into three levels: low (<2,000 Euros), moderate (2,000-3,000 Euros), and high (>3,000 Euros). Completed education was also categorised into three groups: low (primary education and lower pre-vocational secondary education), moderate (middle pre-vocational secondary education and secondary vocational education), and high (senior general secondary education, (pre-) university education, and higher professional education). The HSI was used as indicator of the level of nicotine dependence. This index is the sum of the categorised number of cigarettes smoked per day and the time to the first cigarette of the day. The HSI ranges from 0 to 6, with a higher score indicating higher nicotine dependence (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989).

Theory of Planned Behaviour determinants of intention to quit (2012)

Smokers' attitude towards quitting smoking was measured by asking: "If you quit smoking within the next 6 months, this would be..." Respondents used a 5-point Likert scale to indicate their responses on three continua: unwise to wise, unpleasant to pleasant, and negative to positive (Van den Putte, Yzer, Brunsting, & Willemsen, 2005). Cronbach's alpha for these items was 0.84.

Subjective norm about quitting was measured by asking smokers: "How do you think that most of the people who are important to you would feel about your quitting smoking within the next 6 months?" Respondents answered this question on a 5-point Likert scale (1 = strongly disapprove, 5 = strongly approve) (Van den Putte, Yzer, & Brunsting, 2005).

Perceived behavioural control to quit smoking was measured by asking smokers: "Suppose you want to quit smoking within the next 6 months, will you be able to resist smoking when: ...you just woke up?", "...you have experienced something annoying?", "...you are having a cup of coffee or tea?", "...you are drinking alcohol?", and "... you are offered a cigarette?" Response options for these questions were "I will certainly be able" (5), "I will probably be able" (4), "Maybe I will be able, maybe not" (3), "I will probably not be able" (2), and "I will certainly not be able" (1) (Hoving, Mudde, & De Vries, 2006). Cronbach's alpha for these items was 0.84.

Intention to quit (2013)

The first measure of intention was an assessment based on the Stages of Change. Smokers were asked: “Are you planning to quit smoking: ...within the next month?” (4), “...within the next 6 months?” (3), “...sometime in the future, beyond 6 months?” (2), and “...or are you not planning to quit?” (1) (Borland et al., 2012; Hall et al., 2012; Nagelhout et al., 2012). Respondents also had the opportunity to answer with “don’t know”. Those respondents were subsequently asked: “If you had to choose, what would you answer to this question be: Are you planning to quit smoking...” with the same response options as used in the first question.

The second measure was the MTSS. Smokers were asked: “Which of the following best describes you?” Response options were: “I don’t want to stop smoking” (1), “I think I should stop smoking but don’t really want to” (2), “I want to stop smoking but haven’t thought about when” (3), “I really want to stop smoking but don’t know when I will” (4), “I want to stop smoking and hope to soon” (5), “I really want to stop smoking and intend to in the next 3 months” (6), and “I really want to stop smoking and intend to in the next month” (7) (Kotz et al., 2013).

For the third measure, we used the question: “Are you planning to quit smoking within the next 6 months?” Respondents answered this question on a 5-point Likert scale (1 = very unlikely, 2 = unlikely, 3 = maybe, maybe not, 4 = likely, 5 = very likely) (e.g., (Van den Putte, Yzer, & Brunsting, 2005).

Quit attempts (2014)

To measure whether respondents had attempted to quit, we asked all respondents: “Have you made any attempts to stop smoking in the last year?” (yes/no) (Hyland et al., 2006).

Ethics

The ITC Netherlands Surveys received clearance by the University of Waterloo’s Office of Research Ethics.

Statistical analyses

Respondents had the opportunity to refuse to answer the included survey questions or to answer with “don’t know”. These response options were recoded into missing values. The variable with most missing values was income (30.4%, n=298). The missing values of all variables were filled using multiple imputation. This procedure saves persons for the analysis and thus yields more power for statistical testing. Analysis based on multiple imputation is a valid procedure in case the data are missing at random, that is, the missingness only depends on variables included in the analysis (Enders, 2010). Because the percentage of incomplete cases was 47%, following guidelines on the number of impu-

tations (White, Royston, & Wood, 2011), analysis results are presented that are based on 50 imputed datasets.

We conducted attrition analyses, sample description, and correlation analyses using SPSS 21.0. To examine the construct and predictive validities of the three instruments for intention, we performed Structural Equation Modelling using Mplus 7.3 (Muthén & Muthén, 2007). The Comparative Fit Index (CFI), the Tucker-Lewis-Index (TLI), and the Root-Mean-Square Error of Approximation (RMSEA) were used to determine the model fits. A good model fit was indicated if the CFI and the TLI were >0.90 , and the RMSEA was <0.05 (Hox & Bechger, 1998). We entered attitude and perceived behavioural control as latent constructs into the analyses. All other concepts were measured with single items and therefore entered as observed variables. The three measures of intention were not normally distributed and therefore specified as categorical variables. We adjusted all analyses for the previously described covariates. We furthermore applied sampling weights for age and gender to make the data representative for the population of Dutch smokers. To answer the first two research questions, we tested the model three times, with one model for each measure of intention. To answer research question 3, we tested the model with all three instruments entered simultaneously. We calculated the degree of multicollinearity for all models, and this turned out to be low. The Variance Inflation Factors (VIF) ranged from 2.47 to 2.76 for the three intention instruments. The cut-off points for these values vary, but in general VIF smaller than 10 indicate that the degree of multicollinearity is not problematic (Menard, 1995; Myers, 1990).

RESULTS

Attrition analyses

We compared respondents who were included in the analysis sample ($n=980$) with respondents who were excluded, either because they quit smoking in Wave 7 or dropped out of the cohort ($n=624$). The mean age of smokers who were included (40.8 years) was higher than the mean age of smokers who were excluded (36.1 years) ($t=5.97$, $p<0.001$). Smokers who were included had a higher level of nicotine dependence ($t=2.29$, $p<0.05$). The proportion of daily smokers compared to occasional smokers was higher in the analysis sample than in the group that was excluded ($\chi^2=10.1$, $p<0.01$). Smokers who were included into the analysis sample and smokers who were excluded did not differ regarding the sex distribution, their income, education, attitude towards quitting, perceived behavioural control to quit, subjective norm about quitting, and any of the three intention instruments.

Chapter 7

Table 1: Sample characteristics for 2012, 2013 and 2014 (weighted data).

	Analysis sample (n = 980)
2012	
Sex	
Male, %	50.3
Age	
15-24 years, %	21.4
25-39 years, %	25.2
40-54 years, %	30.0
55 years and older, %	23.4
Income	
Low, %	44.4
Moderate, %	31.5
High, %	24.0
Education	
Low, %	31.8
Moderate, %	47.3
High, %	20.9
Heaviness of Smoking Index (HIS), mean (SD)*	2.36 (1.50)
Smoking status	
Daily smoker, %	93.1
Occasional smoker, %	6.9
Quit attempt made in the last year	
Yes, %	29.3
Attitude towards quitting, mean (SD)**	3.98 (0.76)
Subjective norm about quitting, mean (SD)**	4.22 (0.79)
Perceived behavioural control to quit, mean, (SD)**	3.26 (0.92)
2013	
Stages of change, % (n)	
Not planning to quit	17.9 (159)
Beyond 6 months,	58.9 (524)
Within the next 6 months	18.6 (165)
Within the next month	4.6 (41)
Motivation To Stop Scale (MTSS), % (n)	
I don't want to stop smoking	18.6 (177)
I think I should stop smoking but don't really want to	32.6 (311)
I want to stop smoking but haven't thought about when	17.8 (170)
I really want to stop smoking but I don't know when I will	16.9 (161)
I want to stop smoking and hope to soon	8.3 (79)
I really want to stop smoking and intend to in the next 3 months,	3.4 (32)
I really want to stop smoking and intend to in the next month	2.4 (23)
Likert scale ("Are you planning to quit within the next 6 months?"), % (n)	
Very unlikely	20.3 (195)
Unlikely	24.6 (237)
Maybe, maybe not	39.1 (376)
Likely	8.8 (85)
Very likely	7.2 (69)
2014	
Quit attempt made in the last year	
Yes, %	33.5

* on a scale from 0 to 6, ** on a scale from 1 to 5

Sample description

In 2012, most respondents of the analysis sample ($n=980$) were daily smokers (93.1%), and had made no quit attempt in the previous year (70.7%) (see Table 1). Furthermore, most respondents had quite a low intention to quit smoking in 2013. Regarding the Stages of Change measure, most smokers (58.9%) planned to quit sometime in the future, beyond 6 months. Almost one third of the smokers (32.6%) scored level 2 of the MTSS, indicating that they thought they should stop smoking but did not really want to. Most smokers (39.1%) scored level 3 of the Likert scale, indicating that they “maybe or maybe not” would quit smoking within the next 6 months. In 2014, 33.5% of the respondents had made a quit attempt in the previous year.

Correlations

Table 2 shows the correlations between the TPB determinants (measured in 2012), the three intention measures (in 2013) and making a quit attempt (in 2014). Attitude, subjective norm and perceived behavioural control were significantly correlated with all three intention instruments. Attitude correlated more strongly (range from $r=0.35$ to $r=0.39$) with all three instruments than subjective norm (range from $r=0.15$ to $r=0.24$) and perceived behavioural control (range from $r=0.19$ to $r=0.24$). Furthermore, attitude was highly correlated with subjective norm ($r=0.48$, $p<0.001$). All three measures of intention correlated significantly with making a quit attempt (the Likert scale: $r=0.35$, $p<0.001$; the Stages of Change measure: $r=0.32$, $p<0.001$; and the MTSS: $r=0.31$, $p<0.001$).

Table 2: Pearson correlations between the TPB determinants (2012), intention to quit measures (2013), and making a quit attempt (2014).

	1	2	3	4	5	6	7
1. Attitude towards quitting (2012)	1.00						
2. Subjective norm about quitting (2012)	0.48***	1.00					
3. Perceived behavioural control to quit (2012)	0.19***	0.05	1.00				
4. Stages of Change (2013)	0.39***	0.24***	0.22**	1.00			
5. Motivation To Stop Scale (MTSS) (2013)	0.39***	0.20***	0.19**	0.71***	1.00		
6. Likert scale (2013)	0.35***	0.15***	0.24***	0.69***	0.67***	1.00	
7. Quit attempt (2014)	0.17***	0.11**	0.10**	0.32***	0.31***	0.35***	1.00

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Structural Equation Models

Models with separate instruments of intention

The model fit indicators of the three models were reasonable (CFI=0.93 to 0.94, TLI=0.88 to 0.89, RMSEA=0.03 to 0.04). The factor loadings of attitude and perceived behavioural control were all significant.

The model that included the Stages of Change measure explained 25% of the variance in making a quit attempt. Attitude ($\beta=0.37$, $p<0.001$) and perceived behavioural control ($\beta=0.16$, $p<0.01$) were significantly and positively related to the Stages of Change measure, but subjective norm was not significantly related ($\beta=0.04$, $p=0.43$) (see Figure 1A). Furthermore, the Stages of Change measure was significantly and positively related to making a quit attempt ($\beta=0.35$, $p<0.001$).

The model that included the MTSS explained 20% of the variance in making a quit attempt. Attitude was significantly and positively related to the MTSS ($\beta=0.43$, $p<0.001$), as was perceived behavioural control ($\beta=0.09$, $p<0.05$) (see Figure 1B). In contrast, subjective norm was not related to the MTSS ($\beta=-0.01$, $p=0.77$). Moreover, the MTSS was significantly and positively related to making a quit attempt ($\beta=0.22$, $p<0.001$).

The model that included the Likert scale explained 27% of the variance in making a quit attempt. Attitude ($\beta=0.32$, $p<0.001$) and perceived behavioural control ($\beta=0.18$, $p<0.001$) were significantly and positively related to the Likert scale, but subjective norm was not ($\beta=-0.04$, $p=0.38$) (see Figure 1C). The Likert scale was also significantly and positively related to making a quit attempt ($\beta=0.38$, $p<0.001$).

Model with all three instruments of intention

Figure 2 shows the results of the model with all three instruments of intention entered at once. All three instruments were related to attitude. The Stages of Change measure and the Likert scale were also related to perceived behavioural control. However, in this model only the Likert scale was significantly related to making a quit attempt ($\beta=0.31$, $p<0.001$). The other two instruments did not have a significant contribution in addition to the Likert scale in explaining the variation in quit attempts.

Figure 2: Structural Equation Models assessing the pathways between the TPB determinants (2012), the three instruments for intention to quit (2013) and making a quit attempt (2014). To simplify the presentation, the covariates and factor loadings were left out, and only pathways and estimates of interest are depicted. Dashed arrows indicate non-significant estimates. The reported results are for standardised variables.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

DISCUSSION

The aim of the current study was to determine the construct as well as the predictive validity of three measures of intention to quit smoking in the context of the Theory of Planned Behaviour (TPB) (Ajzen, 1991). We compared a measure of the Stages of Change, the MTSS, and a Likert scale.

Our first research question was which of the three instruments had the best construct validity. None of the tested instruments was positively related to subjective norm about quitting, but all of them were positively related to attitude about quitting, perceived behavioural control to quit, and attempts to quit. This indicates that all three instruments had comparable and reasonable construct validity in our study. Previous research has also found a weak relation between subjective norm and quit intention (Armitage & Conner, 2001; Godin, Valois, Lepage, & Desharnais, 1992; Nagelhout et al., 2012). Therefore, it is possible that our results are not an indicator for low validity of the instruments for quit intention, but that subjective norm is actually weakly related to intention to quit smoking.

The second research question was which instrument had the best predictive validity. The model that included the Likert scale had the highest explained variance in making a quit attempt. Furthermore, the relation of the Likert scale with making a quit attempt was slightly stronger than the relation of the Stages of Change measure and the MTSS. Therefore, the predictive validity of the Likert scale was somewhat better than that of the Stages of Change measure and the MTSS. It should be noted that all three instruments were significantly positively related to making a quit attempt.

We also entered all three instruments together in one model to examine whether they would have added value to each other (third research question). Only the Likert scale was significantly and positively related to making a quit attempt in that model. The other two instruments seemed to add no extra information to the prediction of making a quit attempt. This means that in future studies, under conditions that are similar to those of the present study, it is not necessary to add more than one instrument of intention to a model that aims to explain quit attempts.

The three instruments used different response options and labels which led to different categorisations of intention, and smokers were allocated into subgroups in a different way. The Stages of Change measure uses four response options, and all of them include fixed time frames of when a smoker plans to quit. The MTSS is more sensitive by using seven response options of which some use fixed timeframes. The Likert scale only asks about the intention to quit in the next 6 months and uses no further timeframes. Researchers of future studies should be aware of those differences between the instruments. If one wants to use an instrument with the highest predictive validity and relatively high construct validity under the TPB, the Likert scale seems to be a good choice. However, if one wants to have more information about when exactly a respondent plans to quit and, for example, wants to tailor an intervention based on the

moment a smoker intends to quit, a researcher might prefer using the Stages of Change measure or the MTSS.

Limitations

The current study has several limitations. First of all, we only investigated whether attitude, subjective norm and perceived behavioural control would be related to the three measures of intention to quit. It is possible that other constructs are related to intention as well, such as the “processes of change” of the Transtheoretical Model (Velicer, Prochaska, Fava, Norman, & Redding, 1998). However, these variables were not included in the ITC Netherlands Survey. Second, we used mainly observed variables in the current study. It would be important to compare our results with models that solely use latent variables, in particular for subjective norm because subjective norm was not related to any of the intention instruments. It is possible that full construct validity could not be shown due to the single item measure that we used for subjective norm, making correlations with this measure prone to attenuation effects because of its moderate reliability. Third, there was one year between the measurements of the TPB determinants, the measurements for intention to quit, and making a quit attempt. It is possible that a different time interval might produce different results. Fourth, we could not adjust our analyses for respondents’ baseline intention to quit because the MTSS was only since 2013 included into the ITC Netherlands Survey. Finally, our results may not be fully generalizable to the whole population of Dutch smokers. Smokers who were less addicted and occasional smokers were more likely to be excluded from the analyses. In particular, we found higher dropout of young respondents, which has been reported in a previous publication about attrition in the ITC Netherlands Survey (Zethof et al., 2016).

Conclusion

In this study of smokers in the Netherlands, a measure of the Stages of Change, the MTSS, and a Likert scale showed comparable and reasonable construct validity as well as comparable predictive validity as instruments of intention to quit. The conditions of construct validity and predictive validity were slightly better met by the Likert scale in comparison with the other two instruments in our study.

Chapter 8

Discussion

The aim of this thesis was threefold. The first aim was to evaluate the impact of inconsistent tobacco control policies in the Netherlands. Second, the thesis focused on assessing potential subgroup differences according to socioeconomic status (SES) in these evaluations. The policies that were evaluated were the legislation of electronic cigarettes, smoking restrictions in public places, reimbursement of smoking cessation support, cigarette prices, and warning labels on cigarette packs. The third aim of this thesis was to assess and compare the validity of different instruments to measure intention to quit smoking. In this chapter, the main results of the conducted studies are described and the findings are compared with other recent studies. In addition, several methodological limitations of the studies in this thesis are discussed, and finally, implications for future research and for future tobacco control policies in the Netherlands are outlined.

Inconsistent tobacco control policy implementation processes in the Netherlands

E-cigarettes

Chapter 2 evaluated changes in legislation of electronic cigarettes (e-cigarettes) in the Netherlands. This was done by analyzing changes in smokers' awareness, ever use, and current use of e-cigarettes in 2008, 2010, 2013, and 2014 using ITC Netherlands data. Important findings were that awareness and use of e-cigarettes decreased or remained stable in the years that they were regulated as medications (2008-2012), and that awareness and use increased when e-cigarettes were regulated as consumer products from 2012 onwards. We suggested that this trend pattern might be caused by the changes in the legal status of e-cigarettes, in particular the advertisement ban between 2008 and 2012. In addition, we found that the most often reported reasons for starting to use e-cigarettes were health-related, specifically that e-cigarettes are perceived to be helpful to cut down on the number of regular cigarettes and to be less harmful than regular cigarettes. In conclusion, the changed legislative environment may have affected awareness and use of e-cigarettes.

The results of this study are mostly in line with previous research. A review about e-cigarettes showed a general increase in awareness and use of e-cigarettes across countries (Pepper & Brewer, 2014). A cross-sectional study that examined awareness and use of e-cigarettes among smokers from Australia, the UK, the USA, and Canada showed that awareness was relatively high in countries where e-cigarettes are legally sold and marketed (73% in the USA and 54% in the UK) and quite low in countries where sale of e-cigarettes is forbidden (40% in Canada and 20% in Australia) (Adkison, O'Connor, Bansal-Travers, et al., 2013). The same pattern was found for use of e-cigarettes. In another study, a longitudinal comparison of awareness and use of e-cigarettes was conducted in Australia and the UK in the context of the different legislation in these countries (Yong et al., 2015). The legislation in both countries did not change during the study period. The authors described that awareness and use was greater in the UK than

in Australia, but that both increased in the two countries from 2010 to 2013. The results of our study are therefore in accordance with other studies, and confirmed that stricter regulation of e-cigarettes including advertisement bans or purchase restrictions may reduce awareness and use. However, a previous study failed to find an association between awareness of e-cigarette advertisement and use of e-cigarettes (Nagelhout et al., 2016). It is likely that other factors in addition to advertisement affect awareness and use of e-cigarettes, for example attention by news media.

Smoking restrictions in public places

The objective of chapter 3 was to examine social acceptance of smoking restrictions in public places in the Netherlands, in particular in the context of the inconsistent legislation of smoking restrictions in bars. This was done by using data from the repeated cross-sectional Dutch Continuous Survey of Smoking Habits (DCSSH) from 2005 to 2014 in order to analyze the impact of this irregular legislation on social acceptance of smoking in public places as well as on the implementation of home smoking bans. The study revealed that social acceptance of smoking in public places increased while acceptance of smoking at home decreased during the study period. However, the acceptance of smoking in bars remained relatively high compared with restaurants. We suggested that this might be the result of the exceptions and reversals of these exceptions for small bars.

The implementation and effects of smoking restrictions in public places on various outcomes have been previously studied in some detail in the Netherlands and other countries. Previous studies have found that compliance with smoking restrictions was high in the general population (Biener, Garrett, Skeer, Siegel, & Connolly, 2007; Edwards et al., 2008; Minardi et al., 2014), and that smoking restrictions are effective in preventing exposure to secondhand smoke (Callinan, Clarke, Doherty, & Kelleher, 2010; Verdonk-Kleinjan et al., 2009). However, less research has been done about the impact on social norms and the extent to which smoking restrictions contribute to social acceptance of smoking. A study using ITC data from Canada, Australia, the US, and the UK found that respondents living in areas with comprehensive smoking restrictions in the hospitality sector reported a higher level of social denormalization of smoking than respondents who lived in areas with partial smoking restrictions (Hammond, Fong, Zanna, Thrasher, & Borland, 2006). The authors of another study also concluded that communities with strong smoking restrictions were perceived as more 'antismoking' than areas with less strong restrictions (Hamilton, Biener, & Brennan, 2008). Another study conducted in-depth interviews and focus groups with smokers and asked about their experiences and personal consequences of smoking restrictions (Betzner et al., 2012). Smokers indicated that they felt less temptation to smoke and more inconvenience and confrontation with their addiction. Furthermore, smoking restrictions increased social unacceptability and negative reactions to smoking. A study about the nature and process of stigmatization following the implementation of smoking re-

strictions in Scotland revealed that smokers experienced separation from non-smokers, self-stigmatization, and loss of social status (Ritchie, Amos, & Martin, 2010). A study using data from the ITC Netherlands Survey, however, found that smokers did not feel higher levels of negative judgment and stigmatization shortly after the introduction of smoking restrictions in the hospitality industry (Nagelhout, Willemsen, et al., 2012). The findings of our study are mostly in line with previous findings, and it can be concluded that smoking restrictions in public places likely contributed to a decrease in social acceptance of smoking.

Reimbursement of smoking cessation support

Chapter 4 investigated what the impact of reimbursement of smoking cessation support was after its introduction in 2011 in the Netherlands. Data from the ITC Netherlands Survey showed that the reimbursement was associated with more quit attempts and more quit success in 2011 and 2012 than in 2010. However, it was not associated with more use of medication or use of counseling. Awareness of the accompanying media campaign was associated with more quit attempts. Awareness of the reimbursement possibilities sharply increased from 2010 to 2011, and decreased again from 2011 to 2012 to levels almost as low as 2010. In conclusion, reimbursement of cessation support seems to increase smoking cessation, and that effect may have been larger because of the media campaign.

The findings of our study are partly in accordance with previous research. A study comparing Canadian provinces with and without reimbursement of smoking cessation medication found, comparable to our study, an increase in quit success after use of medication (White et al., 2015). However, also an actual increase in use of medication in areas where medication was reimbursed was found which is in contrast to our findings. A recent study investigated the impact of reimbursement in the Netherlands from 2010 to 2013 (Van Boven & Vemer, 2016). The authors concluded that initial use of, as well as adherence to medication was higher during times of reimbursement than in periods without reimbursement. Another study reported that reimbursement of medication led to more quitting in the Netherlands and that more than twice as many smokers quit due to the reimbursement than due to substantial cigarette price increases (Over et al., 2014). The objective of another study was to examine whether the reimbursement implemented in 2011 was associated with an increase in the number of smokers signing up for telephonic cessation counseling (Willemsen, Segaar, & Van Schayck, 2013). The authors reported a more than 10-fold increase as compared with 2010 and a parallel decrease of smoking prevalence in the population. The findings of our study contributed to previous research in that we found that the media campaign that was developed to accompany the reimbursement enhanced the impact of the reimbursement regarding quit attempts. A possible reason for the inconsistent findings is the timing of the ITC survey waves that might not be optimal regarding the implementation of the reimbursement.

Socioeconomic subgroup differences

No SES differences in use of e-cigarettes were found in chapter 2, except that in 2014 smokers with a moderate educational background were slightly less likely to currently use e-cigarettes than smokers with a high educational background. The results of chapter 3 demonstrated that people with low SES regarded smoking in public places as well as at home more acceptable than people with high SES. The association between acceptance of smoking in public places and SES changed only marginally between 2005 and 2014, and it remained stable for the association between implementing home smoking bans and SES. The evaluation of reimbursement of smoking cessation support in chapter 4 revealed that there were no income differences in any of the investigated outcomes.

Chapter 5 evaluated socioeconomic differences regarding the subjective effect of four tobacco control policies, and their function as psychological triggers for smokers to consider quitting. The policies discussed were cigarette price increases, smoking restrictions in public places, reimbursement of smoking cessation support, and warning labels on cigarette packs. ITC data from six European countries were used for this investigation: France, Germany, the Netherlands, Ireland, Scotland, and the rest of the UK. Across all six countries, cigarette price increases were more often mentioned as a trigger to think about quitting than the other three policies. Furthermore, the four policies were mentioned more often by low SES smokers as trigger to think about quitting than by high SES smokers across all countries. In the Netherlands, this was particularly the case for cigarette price increases and reimbursement of cessation support. Additionally, an increasing number of Dutch smokers reported price increases as a trigger to think about quitting from 2008 to 2013. In conclusion, the four tobacco control policies have the potential to trigger particularly low SES smokers to think about quitting, and the greatest impact may be obtained by cigarette price increases.

Several previous reviews have been conducted to evaluate the social equity impact of tobacco control policies. Two reviews examined the impact on adults (Brown, Platt, & Amos, 2014c; Hill, Amos, Clifford, & Platt, 2014), and one examined the impact on youth (Brown, Platt, & Amos, 2014b). These studies concluded that cigarette price increases had the highest potential to decrease socioeconomic inequalities in smoking which is in accordance with our study.

Validation of instruments to measure intention to quit smoking

Chapter 6 investigated the external predictive validity of the Motivation To Stop Scale (MTSS), a single-item instrument with seven response options. The aim was to examine whether results from ITC Netherlands data were in accordance with the findings of the internal validation study that was conducted in England (Kotz, Brown, & West, 2013). The external validation that is described in chapter 6 showed that scoring on the MTSS

was positively associated with making a quit attempt within the next 12 months, and that the MTSS had a good accuracy to discriminate between smokers who made a quit attempt and smokers who made no quit attempt. These results indicated that the MTSS had a good predictive validity among the ITC Netherlands sample.

In chapter 7 three different instruments for intention to quit were compared regarding their construct, as well as their predictive validity: a Stages of Changes measure, the MTSS, and a 5-point Likert scale. This was again done with data from the ITC Netherlands Survey. The theoretical framework for this study was the Theory of Planned Behavior (TPB) (Ajzen, 1991). The results showed that all three instruments were comparable in their construct validity and in their predictive validity of making a quit attempt in the next 12 months. Under the studied conditions, the Likert scale performed slightly better than the other two instruments. We concluded that the Likert scale could be used if researchers aim to use the TPB as theoretical background. However, more information about the exact moment when a smoker wants to quit is given by the other two instruments. Those instruments could therefore be more suitable, for example, to develop tailored interventions in the context of smoking cessation.

Previous research that assessed the validity of instruments to measure intention to quit smoking revealed mixed results. The internal validation study of the MTSS showed a good predictive validity of the MTSS in making a quit attempt (Kotz et al., 2013). This was confirmed in our external validation study. Several previous studies have been conducted that measured the validity of the Stages of Change with mixed results (Bondy et al., 2010; Brug et al., 2005; Herzog, 2008; Velicer, Brick, Fava, & Prochaska, 2013; West, 2005). The results of our study contributed to previous research by showing that three frequently applied instruments for intention to quit had comparable construct and predictive validity under the studied conditions, but also that none of the tested models had a notably high explained variance in predicting quit attempts, which ranged from 20% to 27%. Previous research testing applications of the TPB has shown a slightly higher explained variance in the relationship between intention to quit with smoking and smoking cessation (Godin & Kok, 1996). A possible explanation for this rather low variance is that one or several of the used instruments had a low validity. This could have been the instruments for intention to quit, but also one of the other instruments (attitude, subjective norms, and perceived behavioral control) because the items that we used for these constructs were not validated prior. Furthermore, it is possible that we failed to include relevant covariates. Intention and motivational factors are not the only predictors of behavior, but other variables play an additional role that we failed to measure or include in the model. In conclusion, all three studied instruments could be used in future research, but it might also be useful to further test and to refine instruments for intention to quit. Which instrument is chosen should furthermore depend on the theoretical background and the purpose of the study.

Methodological limitations

The studies conducted for this thesis have several methodological limitations. First, almost all studies used exclusively data from the Netherlands. It would be important to compare our findings regarding the evaluation of tobacco control policies with results from other countries, but we could do that in only one study (chapter 5). Reasons for this are that relatively few other European countries participated in the global ITC Project during the study period, and these European countries partly applied different fieldwork periods and, in some cases, measured different concepts or policies.

Second, as we mainly performed longitudinal analyses using the ITC Netherlands data, we could only use data with a one-year interval between measurements. For the study of psychosocial processes this is certainly not optimal. Furthermore, the timing of policy implementations and changes could not be matched with the survey waves. Ideally, much more continuous monitoring would be conducted, immediately before and several times after an implementation. This would ensure that short-term as well as long-term effects are caught. However, due to practical reasons such as funding constraints, ethical and methodological considerations regarding respondents who should not be surveyed too often, and dynamic policy processes that are not predictable, this is not realistic for longitudinal studies. For longitudinal monitoring such as in the ITC Project, annual measures seem to be the most feasible solution to minimize dropout and bias. A complement to longitudinal research such as the ITC surveys is repeated cross-sectional monitoring. We used in one of our studies (chapter 3) data from the DCSSH study, a cross-sectional survey that interviews respondents weekly. This design gives valuable insights about population effects of tobacco control and complements longitudinal research.

A third limitation is that the ITC Netherlands cohort had higher dropout rates of young and male smokers (Zethof et al., 2016). Therefore, the results of our findings from the ITC studies might not be fully generalizable to the population of Dutch smokers. However, by carefully replenishing the respondents that dropped out and by applying sampling weights, we tried to minimize this effect.

Fourth, all responses in the surveys were self-reported which increases the risk of different forms of bias. For example, respondents could remember things in a different way than they actually happened or give socially desirable answers. We tried to prevent the latter by making the surveys anonymous, but still found high rates of non-response for sensitive variables, such as income.

Finally, several instruments used in the ITC Netherlands surveys and in this thesis have not been validated. Validated theoretical constructs are usually measured with multiple items while the ITC Netherlands Survey often includes single items to prevent dropout of respondents caused by too long questionnaires.

Implications for future research

Several research questions regarding the studied tobacco control policies remain unanswered. We found in chapter 2 that legislation of e-cigarettes likely affects awareness and use of the products. The legislation of e-cigarettes has changed again in 2016 as part of the revised Tobacco Products Directive that was implemented in the European Union (European Commission, 2016). This new regulation includes that sale of e-cigarettes to people younger than 18 years is forbidden, advertisement for the product is restricted, and leaflets providing information about health and product safety must be inserted in the packages (National Institute for Public Health and the Environment, 2016). The impact of these measures on purchase and use of e-cigarettes should be investigated in future research. Furthermore, compliance with the new legislation should be studied to be able to evaluate the new legislation. This can yield important information about the role of e-cigarettes for public health, for example whether the new legislation prevents youth below 18 years of age to use e-cigarettes.

The results of chapter 4 showed that reimbursement of smoking cessation support has the potential to increase smoking cessation although we did not find an increase in use of medication after the reimbursement was implemented. Still, it could be interesting to study more in-depth to what extent smokers are familiar with the various counseling options they have at their disposal when they want to quit. It may be important to examine whether smokers are aware who they can approach for help, how they can choose the best therapy, where they can get smoking cessation medication, and how they can receive reimbursement. In addition, future research should investigate whether smokers with high awareness of these options still perceive any barriers to use medication or nicotine replacement therapy. Such information is particularly valuable for policymakers who wish to improve the current smoking cessation infrastructure in the Netherlands.

The studies in this thesis showed that several tobacco control policies were implemented and subsequently changed again in the Netherlands. This is a quite unique case since few other countries weaken tobacco control once policies are implemented. It is important to further investigate what the effects of such inconsistent implementation processes are on compliance with and effectiveness of the related tobacco control measures. The communication of policy makers about the reasons for the inconsistency and the role of public health in these decision processes may play an essential role in this relationship. Support for the measures and trust in their effectiveness and benefits might otherwise decrease among the population while previous research has shown that support is important for compliance with tobacco control measures, such as smoking restrictions in public places (Borland, Yong, Siahpush, et al., 2006; Nagelhout et al., 2011). For example, when smoking restrictions in public places are reversed, people might wonder whether those restrictions actually are effective in decreasing exposure to secondhand smoke. This could subsequently decrease compliance with the policies when they are reintroduced.

Implications for tobacco control policies in the Netherlands

Concerning the specific tobacco control policies that were investigated in this thesis, several implications can be formulated. Regarding smoking restrictions in public places that were the topic of chapter 3, we found that social acceptance of these restrictions increased in the Netherlands and that there is potential to make more public venues smoke-free. This is particularly important for places where exposure of non-smokers to secondhand smoke is high. In our study, acceptance of smoking in the car with non-smokers was very low in 2005 and remained low to 2014. This suggests that a smoking ban in the car would probably receive a lot of support from the population. The UK and parts of the USA, Canada and Australia have recently implemented smoking bans for cars that carry children. Research has shown that secondhand smoke exposure in cars can still be substantial, in particular among low SES families, but that it decreased after the implementation of such bans (Elton-Marshall, Leatherdale, Driezen, Azagba, & Burkhalter, 2015; Moore et al., 2015). Smoking in restaurants and workplaces is already prohibited in the Netherlands, but our results imply that designated smoking rooms could be also banned in such environments. The acceptance of smoking in bars remained higher than in restaurants, and banning rooms for smokers in drinking establishments might be less supported by the population. The results of our study confirmed previous findings indicating that low SES respondents report higher acceptance of smoking. Therefore, it would be useful to implement educational campaigns about the harm of secondhand smoke tailored to low SES respondents when implementing smoking restrictions.

The aim of chapter 4 was to examine the impact of reimbursement of smoking cessation support on smoking behavior, in particular among low income smokers. In addition, we investigated whether the media campaign that ran during the introduction of the reimbursement had additional effects. We found that awareness of the reimbursement as well as the campaign was associated with more quitting. However, we did not find any income differences in the studied effects. Our results imply that reimbursement of smoking cessation support should be maintained in the Netherlands to further decrease smoking prevalence and increase smoking cessation. Furthermore, it is useful to regularly run mass media campaigns to inform and remind smokers of the possibility to receive reimbursement for cessation support, and the promising effects of medication and counseling on quitting, in particular since little attention was paid to it by the media after 2011. A study about Google searches for 'quit smoking' in the Netherlands after the introduction of the reimbursement in 2011 and in 2013 revealed that information seeking was increased for a longer period of time in 2011 (52 weeks) than in 2013 (32 weeks) (Troelstra, Bosdriesz, De Boer, & Kunst, 2016). Furthermore, since cessation support is only reimbursed after smokers spent their mandatory deductible of €385 in 2016, it is recommended to exclude cessation support from this deductible. As a result, smokers could always receive reimbursement for cessation support, independent of their other health care costs.

Chapter 5 focused on the evaluation of four tobacco control policies across six countries. It showed that cigarette price increases were reported most often across all countries as trigger to quit smoking. In addition, price increases were mentioned more often by low SES smokers as trigger to quit. Therefore, cigarette prices should regularly be increased to trigger thoughts about quitting, especially among low SES smokers. This could eventually lead to more quitting and to a decrease of socioeconomic inequalities in smoking although future research should further investigate this relationship. It is recommended to increase the prices substantially because previous research using different hypothetical scenarios of price increases has shown that once a specific price level is reached, the great majority of smokers would consider quitting (Guillaumier et al., 2014; Scollo, Hayes, & Wakefield, 2013). In addition, previous research revealed that price increases can reduce smoking prevalence among youths and adults (Chaloupka, Straif, & Leon, 2011; Chaloupka, Yurekli, & Fong, 2012; Nikaj & Chaloupka, 2014). Moreover, cigarette price increases are one of the most cost-effective tobacco control policies (De Kinderen, Wijnen, Evers, Hiligsmann, & Paulus, 2016).

Valorization Addendum

The aim of this valorization addendum is to describe the societal relevance and impact of this thesis. Five aspects of valorization will be discussed: 1) the relevance of this thesis besides its scientific relevance, 2) the target groups outside the scientific field that are affected by the results of this thesis, 3) activities and products that result from the findings in this thesis, 4) the innovativeness of the findings in this thesis, and 5) the implications for the planning of the project.

Relevance

Reduction of tobacco use is highly relevant for various stakeholders. Tobacco smoking is the most preventable cause of death with nearly 6 million deaths per year (Centers for Disease Control and Prevention, 2017, World Health Organization, 2011). These findings were also reason for the World Health Organization to adopt the FCTC with the aim to tackle the global tobacco epidemic (World Health Organization, 2003a). In addition, socioeconomic inequalities in tobacco use are becoming larger, including in the Netherlands (Bosdriesz, Willemsen, Stronks, & Kunst, 2015; Nagelhout, De Korte-de Boer, et al., 2012). These inequalities are responsible for a high burden of death and disease in Europe (Mackenbach, Stirbu et al., 2008). Moreover, as smoking and its consequences are related to high costs for individuals, societies and governments, a reduction of tobacco use could also be related to a decrease in health costs (European Commission, 2012). Tobacco control policies are thus an effective and cost-effective way to decrease the smoking prevalence, and have the potential to decrease socioeconomic inequalities (Fichtenberg & Glantz, 2002; Huang, Chaloupka, & Fong, 2014; Levy, Chaloupka, & Gitchell, 2004; World Health Organization, 2003b). However, it is important that these policies are implemented in such a way that this (cost-)effectiveness can be realized. In the Netherlands, several tobacco control policies have been reversed and reinstalled after implementation, and not much research has been conducted to evaluate this implementation deficiency. The findings of this thesis contribute to the field of research about the effectiveness of tobacco control policies and policies about the regulation of e-cigarettes, in particular of policies that were frequently changed after implementation.

Target groups

Policy makers

The results of this thesis can be used by policy makers who are responsible for health promotion in the Netherlands. They could use them as a source of information, for example about which policy is most promising to increase smoking cessation or which specific difficulties or problems can be expected during the implementation. The results can also be valuable to set priorities for different policies, to better implement measures or to improve the current policy situation. Specifically, the results from this

thesis can serve as scientific basis to strengthen and expand smoking restrictions in public places. Furthermore, it supports the need to reimburse smoking cessation treatment and to increase cigarette prices. Additionally, our results showed that low SES smokers remain a vulnerable target group that needs specific interventions such as educational campaigns or other forms of support.

Non-governmental tobacco control organizations

In the Netherlands, several non-governmental and non-profit organizations are active in tobacco control such as the Dutch Alliance for a Smokefree Society, the Dutch Cancer Society, the Lung Foundation Netherlands, the Netherlands Heart Foundation, and the Trimbos Institute. These organizations prepare, for example, reports and fact sheets, develop interventions and campaigns, and give advice to policy makers. The results of this thesis can be used by these organizations in their work. For example, chapter 2 of this thesis showed that educational campaigns about the harm of secondhand smoking that are tailored to low SES smokers should be developed.

General population

The general population is another group of interest for the findings of this thesis. First, smokers are stakeholders who could benefit from the findings in this thesis. There are many smokers who want to quit, but do not know how they can do this or who do not succeed in their quit attempts and keep relapsing (Borland, Partos et al., 2012). The findings in chapter 4 of this thesis showed that many smokers in the Netherlands do not use medication for their quit attempt, although research has shown that medication can be effective in supporting smokers to quit (Patnode et al., 2015; Stead, Koilpillai, Fanshawe, & Lancaster, 2016). Furthermore, the results showed that a media campaign that informs smokers about the possibility to get reimbursement for the medication had positive effects. If this measure would be strengthened, for example by excluding smoking cessation support from the mandatory deductible in the Netherlands and by a related informative campaign, smokers could benefit from this.

Non-smokers are affected by tobacco use as well, although to a lesser degree. The results from chapter 3 have shown that smoking in public places becomes socially less acceptable over time which might be reassuring for many non-smokers. It can be expected that this trend will continue in the next years, and that smoking will become even less acceptable, also among smokers. This means that exposure to harmful secondhand smoke will probably also decrease in the coming years. Moreover, non-smokers partially share the financial burden of increased morbidity and mortality that are caused by smoking and its consequences. Some results in this thesis have shown that several tobacco control policies have the potential to increase smoking cessation. If more smokers actually quit, this would subsequently also affect the costs of smoking that apply to the whole population.

Activities and products

One important product of the ITC Netherlands Project is an ITC National Report (ITC Project, 2015). In this report, key findings concerning the Netherlands were presented in an international context by comparing the Netherlands with other countries participating in the ITC Project. A remarkable result from this report was that smokers from the Netherlands are not very concerned and do not often think about the harm of secondhand smoke when compared to smokers from other countries. The results from chapter 3 in this thesis showed that smoking in public is more accepted by low SES smokers. When these results are combined, the need for educational campaigns tailored to this topic and target group becomes even clearer. The release of this report was accompanied by a press release from Maastricht University that was subsequently picked up by several media.

The results of this thesis are the product of collaborations between several universities and non-governmental organizations. Researchers from Maastricht University, the University of Amsterdam and the Dutch Alliance for a Smokefree Society collaborated in this project. In addition, there was occasional collaboration with the Dutch Cancer Society and the Trimbos Institute, for example to include research findings in fact sheets.

The publication of the study that is presented in chapter 3 of this thesis was also accompanied by a press release from Maastricht University. In this press release, the results of our study showing that smoking in public places and at home became less accepted during the past years were presented. Previous research has shown that smoking restrictions in public places can have positive effects on smoking behavior, and our study added that there were additional positive effects on the societal acceptance of smoking. This press release was subsequently picked up by media and followed by interviews about the findings.

The results of this thesis were presented at several national and international conferences, including the conference of the Dutch Network of Tobacco Researchers (NNvT), the European Conference on Tobacco or Health (ECToH), and the Europe meeting of the Society for Research on Nicotine and Tobacco (SRNT).

Furthermore, several results from the ITC Netherlands Project were used to support the scientific basis for a long-term plan for tobacco control by the Dutch Cancer Society and by the Dutch Alliance for a Smokefree Society. In addition, results were used as scientific basis for a communication trajectory about the harm of (secondhand) smoking by the Ministry of Health, Welfare and Sport.

Innovation

Research about the effects of tobacco control policies has a long tradition, but it remains important to continue to monitor and evaluate such policies. Particularly innovative in this thesis is the study about e-cigarettes that is presented in chapter 2. E-

cigarettes are relatively new on the market, and the ITC Netherlands Survey is one of the first projects that collected data about it immediately after the introduction to the market. This allows for longitudinal trend analyses about e-cigarettes as of 2008 while most other studies started much later with data collection.

Another innovative aspect of this thesis is the evaluation of policy developments over time, including reversals and reimplementations of policies. In other studies, often only one policy change is evaluated, such as the introduction of smoking restrictions in the hospitality sector. These studies can only capture short-term effects of that policy while it is possible that those effects change over time, in particular when the policy context changes, for example after changes of the government. Therefore, it is important to evaluate policy developments also over a longer period of time as was done in chapter 3 and 4 of this thesis. The focus of chapter 3 is on the repeatedly changed smoking restrictions in bars in the Netherlands, and in chapter 4 on the changes in the reimbursement of smoking cessation support. Specifically, we found that smoking became less accepted by the Dutch population during the past ten years (chapter 3), and that awareness of the opportunity to receive reimbursement for smoking cessation support increased when reimbursement was implemented, and decreased when reimbursement was reversed (chapter 4).

Validation studies in the context of tobacco control research are not often done, in particular not in large and representative samples. It is usually too costly to include several instruments that measure the same concept in a survey over several years while this is necessary for comparative validation studies as presented in chapter 7 of this thesis. In addition, including these instruments makes a survey longer which can be inconvenient for respondents who fill in the survey. Therefore, conducting two validation studies was a relatively exceptional opportunity that could result in more cost-effective decisions for future surveys.

Planning

This project will continue in the future and already received funding for this continuation. This means that monitoring and evaluation of tobacco control policies in the Netherlands at the national and international level will continue for several more years. This follow-up research will also be done with the same cohort as used in this thesis. In addition, because six new European countries have joined the project in 2015, the findings from the Netherlands will be placed in an even larger European context. This also means that international collaborations will not only be continued, but also extended. The financial costs of this project are expected to remain comparable with previous years as the ITC Netherlands Project will continue to conduct observational research with one online survey per year. A risk of such longitudinal research is that respondents get less motivated over time to participate and drop out of the cohort. In addition, response bias may occur because the survey includes mainly the same questions each

year. However, this is taken into account in the ITC Project by recruiting new respondents and by adjustments of statistical analyses. It can be expected that the benefits outweigh these risks. Longitudinal analyses are the only method to investigate individual-level changes over time which is important to investigate long-term effects of tobacco control policies. Furthermore, as increasingly more countries participate in the ITC Project, more cross-country comparisons can be made, with the result that countries can better learn from each other how to implement the policies of the FCTC in the most efficient way.

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Summary

The aim of this thesis was threefold. The first aim was to evaluate the impact of inconsistent tobacco control policy implementation processes. The second aim was to investigate subgroup differences according to socioeconomic status (SES) in these evaluations. Finally, the third aim was to assess the validity of different instruments to measure quit intention. The policies that were the subject of this thesis were the legislation of electronic cigarettes (e-cigarettes), smoking restrictions in public places, reimbursement of smoking cessation support, cigarette prices, and warning labels on cigarette packs. In particular, the focus in these evaluations was on legislation that substantially changed after implementation and, in some cases, was even temporarily reversed. Regarding instruments to measure intention to quit, the validity of 1) the Motivation To Stop Scale (MTSS), 2) an assessment of the Stages of Change, and 3) intention measured with a Likert scale was assessed. Most studies used data from the International Tobacco Control (ITC) Netherlands Survey, a longitudinal cohort study with annual measurements among approximately 2,000 smokers and quitters. A total of 28 countries, worldwide, participate in the ITC Project, and at the time of the described studies, six European countries participated: the Netherlands, France, Germany, Ireland, Scotland, and the rest of the UK.

Inconsistent policy implementation

Results of chapter 2 revealed that when the legislation of e-cigarettes changed, awareness as well as use of the product changed as well. When legislation included an advertisement ban, awareness and use decreased, whereas both increased in periods when advertisements were allowed. Chapter 3 investigated trends and factors associated with social acceptance of smoking restrictions in public places. This was done in the context of regular changes in the legislation of smoking restrictions in bars in the Netherlands. This study showed a decrease in social acceptance of smoking in public places and an increase in the implementation of home smoking bans. Reimbursement of smoking cessation support in the Netherlands was associated with an increase in quit attempts and quit success, but not with higher use of medication and counseling (chapter 4). Furthermore, awareness of a media campaign that accompanied the implementation of the reimbursement was related to more quit attempts, implying that the campaign increased the impact of the reimbursement. Awareness of reimbursement possibilities sharply increased from 2010 to 2011, and decreased again from 2011 to 2012.

Socioeconomic differences

There were no notable socioeconomic differences regarding e-cigarette awareness and use, and no income differences in the impact of the reimbursement of smoking cessation support and the accompanying media campaign. However, there were differences in the social acceptance of smoking restrictions in public places. Respondents with low

levels of income and education were more likely to accept smoking in public places and less likely to implement home smoking bans than respondents with high levels of income and education. In chapter 5, six European countries were compared and the impact of four tobacco control policies regarding their potential to trigger thoughts about quitting was examined: cigarette price increases, warning labels on cigarette packs, reimbursement of smoking cessation support, and smoking restrictions in public places. Trends and factors associated with triggers to quit were analyzed in this study. Results showed that price increases were the most often mentioned trigger to think about quitting across countries. In addition, there were socioeconomic differences regarding tobacco control policies that triggered smokers to consider quitting. Smokers with low socioeconomic backgrounds were more likely to mention the studied tobacco control policies as triggers to thinking about quitting over time and across countries during the studied period.

Validation of instruments to measure intention to quit

In chapter 6, the external validity of the MTSS regarding its ability to predict subsequent quit attempts was assessed. Our external validation study confirmed the findings of a previous internal validation study, showing that the MTSS predicted making a quit attempts in the next 12 months, and that scoring on the MTSS was positively associated with subsequent quit attempts. In chapter 7, the predictive, as well as the construct validity of three instruments to measure intention to quit was determined and compared: the MTSS, an assessment of the Stages of Change, and a Likert scale. Results implied that the three instruments had a reasonable and comparable validity, but that the Likert scale performed slightly better than the other two instruments under the studied conditions.

Implications for future research

Several research questions about tobacco control policies remain unanswered. First, the new regulation of e-cigarettes that came into force in 2016 should be evaluated, including for example sale restrictions to youth below 18 years of age, advertisement restrictions, and leaflets containing information about health and product safety in packages. Compliance with the new regulation and effects on use of e-cigarettes, for example among minors, should be studied. Second, research could focus on examining whether smokers in the Netherlands are aware of the various counseling options they have when they want to quit. This may help to improve use of smoking cessation support in the Netherlands. Third, the effects of inconsistent implementation processes of tobacco control policies on compliance with and effectiveness of these tobacco control measures should be further investigated. Specifically, the role of communicating the reasons for inconsistent implementation processes by policy makers, support for tobac-

co control measures among the population, and trust in the effectiveness of those measures could be examined. This may be important to improve the implementation of policies and to increase their effects.

Implications for tobacco control policy

Our research has three important implications for tobacco control policies in the Netherlands. First, smoking restrictions in public places could be strengthened and expanded to new places in the Netherlands. In particular, there is low social acceptance for smoking in cars with non-smokers, suggesting that high support for smoking restrictions in the car can be expected. In addition, educational campaigns about the harm of secondhand smoke tailored to low SES smokers are needed. Second, reimbursement of smoking cessation support should be continued as it helps smokers to quit. Furthermore, regular media campaigns about the reimbursement for support and its effectiveness can enhance this effect. Third, cigarette prices should regularly and substantially be increased because this is the most promising tobacco control intervention. Price increases might also help to reduce socioeconomic inequalities in smoking.

Samenvatting

Dit proefschrift had drie doelen. Het eerste doel was het evalueren van de invloed van inconsistente implementatieprocessen van tabaksontmoedigingsbeleid. Het tweede doel was het onderzoeken van sociaaleconomische verschillen in deze evaluaties. Tenslotte was het derde doel het meten van de validiteit van verschillende instrumenten om stopintentie te meten. In dit proefschrift werden de volgende beleidsmaatregelen onderzocht: de wetgeving ten aanzien van elektronische sigaretten (e-sigaretten), rookverboden op openbare plekken, vergoeding van stoppen-met-rokentherapie, sigaretenprijzen en waarschuwingen op sigarettenpakjes. Hierbij ging het steeds om wetgeving die na invoering nog substantieel veranderde en zelfs in sommige gevallen tijdelijk werd teruggedraaid. Met betrekking tot instrumenten om stopintentie te meten werd de validiteit bepaald van 1) de Motivation To Stop Scale (MTSS), 2) een maat voor de Stages of Change en 3) intentie gemeten met een Likert-schaal. Voor de meeste studies werden data van het ITC Nederland onderzoek gebruikt, een longitudinale cohortstudie met jaarlijkse metingen onder ongeveer 2.000 rokers en stoppers. In totaal nemen 28 landen wereldwijd deel aan het ITC Project en op het moment van de beschreven studies namen zes Europese landen deel: Nederland, Frankrijk, Duitsland, Ierland, Schotland en de rest van Groot-Brittannië.

Inconsistente beleidsimplementatie

Wij hebben in hoofdstuk 2 beschreven dat wanneer de wetgeving ten aanzien van e-sigaretten veranderde ook bewustzijn en gebruik van het product veranderden. Wanneer wetgeving een reclameverbod inhield, daalden bewustzijn en gebruik van e-sigaretten terwijl beiden stegen in perioden wanneer reclame wel was toegestaan. In hoofdstuk 3 zijn trends en factoren onderzocht die geassocieerd zijn met sociale acceptatie van rookverboden op openbare plekken. Dit werd gedaan naar aanleiding van regelmatige wijzigingen in de wetgeving van rookverboden in café's in Nederland. Deze studie heeft aangetoond dat sociale acceptatie van roken op openbare plekken afnam en de implementatie van rookverboden in de thuissituatie toenam. Vergoeding van stoppen-met-rokentherapie in Nederland was geassocieerd met meer stoppogingen en meer succesvolle stoppogingen, maar niet met meer gebruik van medicatie en counseling (hoofdstuk 4). Bovendien was bewustzijn van een mediacampagne die parallel liep met de implementatie van de vergoeding geassocieerd met meer stoppogingen. Dit wijst erop dat de campagne het effect van de vergoeding mogelijk versterkt heeft. Bewustzijn van de mogelijkheden voor vergoeding steeg sterk tussen 2010 en 2011 en daalde weer tussen 2011 en 2012.

Sociaaleconomische verschillen

Wij vonden geen noemenswaardige sociaaleconomische verschillen met betrekking tot bewustzijn en gebruik van e-sigaretten en geen inkomensverschillen in de effecten van

de vergoeding van stoppen-met-rokenthherapie en de begeleidende mediacampagne. Wij vonden wel verschillen in de sociale acceptatie van rookverboden op openbare plekken. Respondenten met een laag inkomen en een laag opleidingsniveau vonden roken in het openbaar meer acceptabel en voerden minder vaak rookverboden in de thuissituatie in dan respondenten met een hoog inkomen en opleidingsniveau. In hoofdstuk 5 werden zes landen met elkaar vergeleken. Hierbij werd de invloed van vier tabaksontmoedigingsmaatregelen onderzocht met betrekking tot hun potentie om gedachten over stoppen met roken te stimuleren: verhogen van sigarettenprijzen, waarschuwingen op sigarettenpakjes, vergoeding van stoppen-met-rokenthherapie en rookverboden op openbare plekken. In deze studie analyseerden wij trends en factoren geassocieerd met beleid als aanleiding om na te denken over stoppen met roken. De resultaten toonden aan dat in alle landen prijsverhogingen het vaakst genoemd werd als aanleiding om over stoppen met roken na te denken. Daarnaast werden er sociaaleconomische verschillen gevonden met betrekking tot beleidsmaatregelen die rokers stimuleerden om over stoppen na te denken. Rokers met een lage sociaaleconomische status noemden gedurende de studieperiode en in alle geïnccludeerde landen vaker de bestudeerde beleidsmaatregelen als stimulans om over stoppen na te denken dan rokers met een hoge sociaaleconomische status.

Validatie van instrumenten om stopintentie te meten

In hoofdstuk 6 werd de externe validiteit van de MTSS bepaald met betrekking tot het vermogen om toekomstige stoppogingen te voorspellen. Onze externe validatiestudie heeft de resultaten van een eerdere interne validatiestudie bevestigd en aangetoond dat de MTSS in staat was om stoppogingen in de volgende 12 maanden te voorspellen en dat het scoren op de MTSS positief geassocieerd was met het ondernemen van een stoppoging. In hoofdstuk 7 werd de predictieve en de constructvaliditeit van drie instrumenten voor stopintentie gemeten en vergeleken: de MTSS, een maat voor de Stages of Change en een Likert-schaal. De resultaten wezen uit dat de drie instrumenten redelijke en vergelijkbare validiteit hadden, maar dat de Likert-schaal enigszins betere resultaten vertoonde onder de bestudeerde omstandigheden.

Implicaties voor vervolgonderzoek

Een aantal onderzoeksvragen met betrekking tot tabaksontmoedigingsbeleid blijven nog onbeantwoord. Ten eerste zou de nieuwe wetgeving ten aanzien van e-sigaretten die in 2016 geïmplementeerd werd, geëvalueerd kunnen worden. Dit houdt bijvoorbeeld in: het verbod op verkoop van e-sigaretten aan jongeren onder de 18 jaar, de beperkingen op reclame en de bijsluiters over gezondheids- en productveiligheid. Zowel de naleving van de nieuwe wetgeving als ook het effect op gebruik van e-sigaretten, bijvoorbeeld onder jongeren, zou bestudeerd kunnen worden. Ten tweede zou onder-

zoek zich kunnen richten op de vraag of rokers in Nederland zich bewust zijn van de verschillende opties voor therapieën die zij hebben als zij willen stoppen. Dit zou een bijdrage kunnen leveren aan het verbeteren van het gebruik van stoppen-met-rokenth therapieën in Nederland. Ten derde zouden de effecten van inconsistente implementatieprocessen van tabaksbeleid op naleving en effectiviteit van de betreffende tabaksmaatregelen verder bestudeerd kunnen worden. Onderzoek zou bijvoorbeeld gericht kunnen zijn op de rol van communicatie door beleidsmakers over de redenen voor inconsistente implementatieprocessen, draagvlak voor tabaksmaatregelen in de populatie of vertrouwen in de effectiviteit van deze maatregelen. Dit zou bij kunnen dragen aan het verbeteren van de implementatie van beleid en het vergroten van de effecten van beleid.

Implicaties voor tabaksontmoedigingsbeleid

Ons onderzoek heeft drie belangrijke implicaties voor tabaksontmoedigingsbeleid in Nederland. Ten eerste zouden rookverboden op openbare plekken versterkt en naar nieuwe plekken uitgebreid kunnen worden. Er was vooral een geringe maatschappelijke acceptatie voor het roken in de auto in de aanwezigheid van niet-rokers. Dit suggereert dat een rookverbod in de auto waarschijnlijk veel maatschappelijke steun zal krijgen. Daarnaast wordt aangeraden om educatieve campagnes over de schade van meeroken te implementeren die specifiek gericht zijn op rokers met een lage sociaaleconomische status. Ten tweede wordt aanbevolen om de vergoeding van stoppen-met-rokenth therapie voort te zetten omdat het rokers helpt om te stoppen. Verder zouden regelmatige mediacampagnes over de vergoeding en de effectiviteit van therapieën dit effect kunnen versterken. Ten derde zouden sigarettenprijzen regelmatig en substantieel verhoogd moeten worden, omdat dit de meest veelbelovende interventie voor tabaksontmoediging is. Dit zou ook een bijdrage kunnen leveren aan het verkleinen van sociaaleconomische verschillen in roken.

Zusammenfassung

Die vorliegende Dissertation verfolgte insgesamt drei Forschungsziele. Erstens wurden im Rahmen einer Evaluationsstudie die Auswirkungen von inkonsequent eingeführten Tabakkontrollmaßnahmen untersucht. Gegenstand des zweiten Forschungsziels war es, die Unterschiede zwischen sozioökonomischen Untergruppen zu erforschen. Das dritte Forschungsziel beschreibt die Beurteilung der Validität verschiedener Instrumente, die die Absicht mit dem Rauchen aufzuhören, messen. Die politischen Maßnahmen, die Gegenstand dieser Dissertation waren, sind die Gesetzgebung für elektrische Zigaretten (E-Zigaretten), Rauchverbote an öffentlichen Plätzen, Kostenrückerstattung von Unterstützungsmaßnahmen bei der Tabakentwöhnung, Zigarettenpreise und Warnhinweise auf Zigarettenverpackungen. Im Besonderen wurde in diesen Evaluationen der Fokus auf die Gesetzgebung gelegt, welche nach der Einführung erheblich geändert wurde, und in einigen Fällen sogar temporär aufgehoben wurde. Zur Bestimmung der Güte unterschiedlicher Instrumente, die die Absicht mit dem Rauchen aufzuhören messen, wurde die Validität von 1) der Motivation To Stop Scale (MTSS), 2) einer Messung der Stages of Change und 3) der Absicht mit dem Rauchen aufzuhören gemessen mit einer Likertskala bestimmt. In den meisten Studien in dieser Dissertation wurden Daten der International Tobacco Control (ITC) Netherlands Studie benutzt, einer longitudinalen Kohortenstudie mit jährlichen Messungen bei ungefähr 2.000 Teilnehmern, welche sowohl Raucher als auch ehemalige Raucher umfasst. Insgesamt nehmen weltweit 28 Länder am ITC Projekt teil, wobei zum Zeitpunkt der Studien in dieser Dissertation sechs europäische Länder teilnahmen: die Niederlande, Frankreich, Deutschland, Irland, Schottland und der Rest des Vereinigten Königreiches.

Inkonsequente Einführung von Tabakkontrollpolitik

Die Ergebnisse aus Kapitel 2 zeigten, dass sich mit jeder Änderung der Gesetzgebung für E-Zigaretten, auch die Bekanntheit und der Gebrauch des Produktes änderten. In Zeiten, in denen die Gesetzgebung ein Werbeverbot beinhaltete, sanken Bekanntheit und Gebrauch, wohingegen sowohl Bekanntheit als auch Gebrauch anstiegen, sobald Werbung erlaubt war. In Kapitel 3 wurden Trends sozialer Akzeptanz von Rauchverböten an öffentlichen Plätzen, sowie die hiermit assoziierten Faktoren untersucht. Dies fand im Kontext von regelmäßigen Änderungen in der Gesetzgebung zur Einführung eines Rauchverbotes in niederländischen Kneipen statt. Diese Studie zeigte eine Abnahme der Akzeptanz von Rauchen an öffentlichen Plätzen und eine Zunahme der Akzeptanz bei der Einführung von Rauchverböten im eigenen Zuhause. In den Niederlanden konnte ein positiver Zusammenhang festgestellt werden zwischen der Kostenrückerstattung von Unterstützungsmaßnahmen bei der Tabakentwöhnung und einer Zunahme an Rauchstoppversuchen und erfolgreichen Rauchstoppversuchen (Kapitel 4). Ein Zusammenhang mit steigendem Medikamentengebrauch oder Beratungsbedarf konnte allerdings nicht festgestellt werden. Außerdem stand die Bekanntheit einer Medienkampagne, die zeitgleich zur Einführung der Kostenrückerstattung lief, in Zusammenhang mit

einer gesteigerten Anzahl an Rauchstoppversuchen. Dies deutet darauf hin, dass die Kampagne den Effekt der Kostenrückerstattung verstärkt hat. Die Bekanntheit der Möglichkeit zur Kostenrückerstattung stieg von 2010 bis 2011 deutlich an und sank danach von 2011 bis 2012 wieder.

Sozioökonomische Unterschiede

Es konnte gezeigt werden, dass es keine bemerkenswerten sozioökonomischen Unterschiede bezüglich Bekanntheit und Gebrauch von E-Zigaretten gab. Außerdem zeigten sich keine Einkommensunterschiede bezüglich der Effektivität der Kostenrückerstattung von Unterstützung bei der Tabakentwöhnung und der begleitenden Medienkampagne. Es gab allerdings Unterschiede in der sozialen Akzeptanz von Rauchverböten an öffentlichen Plätzen. Studienteilnehmer mit niedrigem Einkommens- und Bildungsstand zeigten eine höhere Wahrscheinlichkeit das Rauchen an öffentlichen Plätzen zu akzeptieren und eine niedrigere Wahrscheinlichkeit das Rauchen im eigenen Zuhause zu verbieten als Studienteilnehmer mit hohem Einkommens- und Bildungsstand. In Kapitel 5 wurden sechs europäische Länder dahingehend miteinander verglichen, inwieweit vier Tabakkontrollmaßnahmen dazu führen konnten, Raucher zu stimulieren über die Möglichkeit mit dem Rauchen aufzuhören nachzudenken: Anstieg von Zigarettenpreisen, Warnhinweise auf Zigarettenverpackungen, Kostenrückerstattung von Unterstützung bei der Tabakentwöhnung und Rauchverbote an öffentlichen Plätzen. Die Trends und Faktoren, die mit Gedanken über das Aufhören assoziiert waren, waren Gegenstand dieser Studie. Die Ergebnisse zeigten, dass in allen sechs Ländern der Anstieg von Zigarettenpreisen die am häufigsten genannte Ursache war, das Aufhören in Erwägung zu ziehen. Zusätzlich ergaben sich sozioökonomische Unterschiede bezüglich Tabakkontrollmaßnahmen, die bei Rauchern Gedanken über das Aufhören auslösen. Studienteilnehmer mit niedrigem sozioökonomischen Hintergrund zeigten im Verlauf der Studie und in allen Ländern eine höhere Wahrscheinlichkeit, die untersuchten Tabakkontrollmaßnahmen als Auslöser zu nennen, darüber nachzudenken mit dem Rauchen aufzuhören.

Validierung von Instrumenten zur Messung der Absicht mit dem Rauchen aufzuhören

In Kapitel 6 wurde die externe Validität der MTSS bezüglich ihres Vermögens nachfolgende Rauchstoppversuche vorherzusagen, bestimmt. Unsere externe Validierungsstudie bestätigte die Ergebnisse einer vorherigen internen Validierungsstudie. Die Ergebnisse unserer Studie zeigten, dass die MTSS Rauchstoppversuche in den folgenden 12 Monaten vorhersagte, und dass der Wert der MTSS positiv mit nachfolgenden Rauchstoppversuchen assoziiert war. In Kapitel 7 wurde die prädiktive Validität und die Konstruktvalidität von drei Instrumenten zur Absicht das Rauchen aufzugeben ermittelt und verglichen: die der MTSS, die einer Messung der Stages of Change und die einer Likert-

skala. Die Ergebnisse deuteten darauf hin, dass die drei Instrumente eine angemessene und vergleichbare Validität haben, aber dass die Likertskala unter den untersuchten Umständen etwas besser abschnitt als die zwei anderen getesteten Instrumente.

Bedeutung für zukünftige Forschung

Mehrere Forschungsfragen zur Tabakkontrollpolitik bleiben nach wie vor unbeantwortet. Erstens sollte die 2016 in Kraft getretene neue Gesetzgebung für E-Zigaretten Gegenstand zukünftiger Evaluationsstudien werden. Diese umfasst zum Beispiel Verkaufseinschränkungen an Jugendliche unter 18 Jahren, Einschränkungen der Werbung und in den Verpackungen liegende Beipackzettel mit Informationen über Gesundheits- und Produktsicherheit. Die Einhaltung dieser neuen Gesetzgebung und die Effekte auf den Gebrauch von E-Zigaretten, zum Beispiel unter Jugendlichen, sollten untersucht werden. Zweitens sollten sich zukünftige Studien der Forschungsfrage annehmen, ob Raucher in den Niederlanden mit den verschiedenen Beratungsmöglichkeiten zur Rauchentwöhnung vertraut sind. Dies könnte in den Niederlanden dazu beitragen, dass Raucher Beratungsangebote vermehrt nutzen und die Tabakentwöhnung erleichtern. Drittens sollte die Auswirkungen von inkonsequent eingeführter Tabakkontrollpolitik auf Einhaltung und Effektivität dieser Tabakkontrollmaßnahmen weiterführend untersucht werden. Im Besonderen sollte geprüft werden, welche Auswirkung es hat, wie die Gründe für diese inkonsequente Einführung vom Gesetzgeber kommuniziert werden. Außerdem sollte untersucht werden, inwiefern die Bevölkerung Tabakkontrollmaßnahmen unterstützt und solche Maßnahmen als effektiv erachtet. Diese Erkenntnisse könnten wichtig sein, um die Einführung der Maßnahmen zu verbessern und ihre Effektivität zu steigern.

Bedeutung für Tabakkontrollpolitik

Aus unseren Forschungsergebnissen lassen sich drei wichtige Empfehlungen für die Tabakkontrollpolitik in den Niederlanden ableiten. Erstens könnten Rauchverbote an öffentlichen Plätzen in den Niederlanden verstärkt und auf neue Plätze ausgeweitet werden. Vor allem die soziale Akzeptanz für Rauchen im Auto in der Anwesenheit von Nichtraucher war niedrig, was darauf hindeutet, dass eine große gesellschaftliche Unterstützung für ein Rauchverbot in Autos erwartet werden kann. Außerdem werden Aufklärungskampagnen benötigt, die über die Risiken und Gefahren von Passivrauchen informieren, und die speziell auf Raucher mit niedrigem sozioökonomischem Status zugeschnitten sind. Zweitens sollte die Kostenrückerstattung von Unterstützung bei der Tabakentwöhnung fortgeführt werden, da diese Rauchern nachweislich hilft, mit dem Rauchen aufzuhören. Zusätzlich können regelmäßige Medienkampagnen über die Möglichkeit der Kostenrückerstattung von Unterstützungsmaßnahmen und deren Effektivität dazu beitragen, dass diese Effekte noch gesteigert werden. Drittens sollten die Zigarettenpreise regelmäßig und maßgeblich erhöht werden, da dies die vielversprechends-

te Tabakkontrollmaßnahme ist. Preiserhöhungen könnten außerdem dazu beitragen, die sozioökonomischen Unterschiede im Rauchen zu verringern.

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Curriculum Vitae

Karin Hummel was born on December 16, 1982 in Braunschweig, Germany. She graduated from secondary school in 2001 and worked for one year at a kindergarten, before she moved to the Netherlands and started studying Arts Therapies at the University of Applied Sciences in Sittard. After achieving her Bachelor's degree in 2006 and having worked at the psychiatric department of the hospital in Sittard, she realized that she was also interested in preventing diseases in addition to treating them. In 2007, Karin therefore decided to study Health Sciences at Maastricht University, the Netherlands with the main focus on Prevention and Health, and she received her Bachelor's degree in 2010. This was followed by a Master Program on Health Education and Promotion at the same university. Her Master thesis was about the validation of the Dutch version of an instrument that can be used in the context of childhood overweight prevention, and she graduated in 2011. During the Bachelor and Master Program, she worked as a student research assistant at the department of Health Promotion at Maastricht University, and gained first research experience in several projects. She enjoyed being involved in scientific research, and therefore she started working as a research assistant in 2011, after which she decided to pursue a career in academia. Therefore, in December 2012, she started as a PhD candidate at the department of Health Promotion at Maastricht University. The results of her research are presented in this thesis. In December 2016, she finished her PhD project and continued working at Maastricht University as a post-doctoral researcher on a project about tobacco control policy evaluation.

Publication list

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