Smoke-free Parents:

Providing a smoke-free future for parents and their children

Tessa Scheffers-van Schayck

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(met een samenvatting in het Nederlands)

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Contents

CHAPTER 1

General introduction

Tobacco use among (expecting) parents

Tobacco use is a serious public health burden, killing over 8 million people worldwide each year (World Health Organization, 2020). Within the tobacco epidemic, (expecting) parents form a high priority population (Melvin & Gaffney, 2004; Schuck et al., 2013). Worldwide, 1.7% of women smoke during pregnancy, of whom 72.5% smoke on a daily basis (Lange et al., 2018). In addition, about half a billion children are exposed to second-hand smoke (SHS, i.e., smoke from burning tobacco products and that has been exhaled by the person smoking) at home (Mbulo et al., 2016). In the Netherlands, the prevalence of smoking during pregnancy lies above the global average, with 7.4% of women smoking at some point during their pregnancy and 3.5% of women who smoke during the entire pregnancy (Scheffers-van Schayck, den Hollander et al., 2019). The prevalence of smoking during pregnancy is especially high among women with a low educational level (16%) compared to women with a high educational level (3%; Scheffers-van Schayck, den Hollander et al., 2019). It is also estimated that there are more than 1.3 million smoking parents whose children live at home in the Netherlands (Springvloet et al., 2018). In addition, the prevalence of parents smoking inside the house increases when children become older (Abbott & McCarthy, 2009). For instance, in the Netherlands, 29% of smoking parents of children between 0 and 3 years smoke inside the house vs. 48% of smoking parents whose children are between 12 and 18 years (Springvloet et al., 2018).

There is ample evidence showing that smoking has adverse consequences for parents and their (unborn) children. Smoking during pregnancy is associated with detrimental health effects on women's pregnancies (e.g., low birth weight, preterm birth, and obstetric complications) and on children's development (e.g., reduced lung function, sudden infant death syndrome, and behavioral and developmental problems; Gutvirtz et al., 2019; Hofhuis et al., 2003; Oken et al., 2008; U.S. Department of Health and Human Services, 2006). Furthermore, children's exposure to SHS is associated with sudden infant death syndrome and having an increased likelihood to develop middle ear disease, asthma, and other lung problems (Hofhuis et al., 2003; U.S. Department of Health and Human Services, 2006; Zacharasiewicz, 2016). In addition to SHS, children whose parents smoke are also exposed to third-hand smoke (THS). THS is the residual tobacco smoke pollutants that remain on surfaces (e.g., furniture and clothes) and in dust after tobacco has been smoked (Matt et al., 2011). Young children are particularly vulnerable to THS due to hand-to-mouth and object-to-mouth behaviors, playing near the floor, spending more time indoors, and being in close physical contact with their smoking parents (Matt et al., 2004, 2011). Although there is limited evidence on the health consequences of THS exposure in children, it is clear that THS consists of toxic tobacco smoke pollutants (Acuff et al., 2016; Ferrante et al., 2013). Finally, having parents who smoke substantially increases the risk for a child to experiment with smoking. A meta-analysis (that also included a Dutch study [Otten et al., 2007]) showed that when both parents smoke, children

are almost three times more likely to smoke compared to children whose parents do not smoke (Leonardi-Bee et al., 2011).

Based on the high prevalence of (expecting) parents who smoke and the adverse health consequences for parents and their (unborn) children, it is essential that (expecting) parents quit smoking (Melvin & Gaffney, 2004). Smoking cessation will not only *directly* reduce (expecting) parent's risks of smoking-related morbidity and mortality (Critchley & Capewell, 2003; Doll, 1994; Godtfredsen et al., 2008), eliminate children's exposure to SHS and THS from parental smoking, and reduce children's risks of smoking-related health problems (Lancaster et al., 2001; Matt et al., 2004, 2011; Rosen et al., 2012), but also *indirectly* reduce the chance that children of smoking parents initiate smoking in the future (Bricker et al., 2003).

Recent developments in the Netherlands

In the last couple of years, several national initiatives were deployed to protect (unborn) children from exposure to tobacco smoke in the Netherlands. For example, the Dutch Cancer Society, Dutch Hearth Foundation, and the Dutch Lung Foundation started a roadmap towards a Smoke-free Generation (Dutch translation: *de Rookvrije Generatie*) in 2015. This roadmap aims to create a society where every child, born in 2017 and onwards, is protected from tobacco smoke and the temptation to smoke (Gezondheidsfondsen voor Rookvrij, n.d.). The roadmap provides a platform for initiatives and policies that contribute to a Smoke-free Generation (e.g., creating smoke-free environments for children, reducing the number of points of sale, increasing the price of tobacco through higher taxes). A key part of the approach is to create a high degree of social acceptance concerning tobacco control in which organizations, (local) governments, and health facilities are committed to create a smoke-free generation. So far, the majority (73%) of the Dutch municipalities are committed to create a Smoke-free Generation (I&O research, 2020). With respect to creating smoke-free environments for children, the Smoke-free Generation movement has resulted in – among others – more than 250 smoke-free children's farms (Gezondheidsfondsen voor Rookvrij, 2020).

Another initiative is the Taskforce Smoke-free Start (Dutch translation: *de Taskforce Rookvrije Start*) that was initiated in 2016. The Taskforce Smoke-free Start is a collaboration of professional associations for healthcare professionals (e.g., pediatricians, midwifes, general practitioners, and maternity nurses), the Dutch Ministry of Health, Welfare, and Sport, and several other knowledge and funding organizations (e.g., Trimbos Institute and The Netherlands Organization for Health Research and Development [Dutch translation: *ZonMw*]). The overall objective of the Taskforce Smoke-free Start is to increase the number of (expectant) parents that quit smoking (Taskforce Rookvrije Start, n.d.). For this purpose, the Taskforce Smoke-free Start aims to 1) prioritize the topic of smoking cessation among (expecting)

parents on the agendas of professional associations for healthcare professionals; 2) stimulate collaboration between healthcare professionals with respect to smoking cessation; and 3) help healthcare professionals in addressing smoking cessation with (expectant) parents. So far, more than 1,000 healthcare professionals have signed up as 'ambassador' of the Taskforce Smoke-free Start (Taskforce Rookvrije Start, n.d.). All these healthcare professionals are stimulated and receive a variety of tools to promote smoking cessation among (expecting) parents within their organizations.

Smoking cessation counseling for (expecting) parents

A range of Cochrane reviews on behavioral smoking cessation interventions have demonstrated positive effects in reaching abstinence among smokers, including mobile phone text messaging interventions, incentives for smoking cessation, internet-based interventions, individual behavioral counseling programs, group behavior therapy interventions, and telephone counseling programs (Lancester et al., 2017; Matkin et al., 2019; Notley et al., 2019; Stead et al., 2017; Taylor et al., 2017; Whittaker et al., 2019). In addition to these interventions for the general population, several smoking cessation interventions that are specifically tailored to (expecting) parents have been examined. A Cochrane review showed that psychosocial interventions (e.g., counseling) could decrease the number of women who smoke in late pregnancy by 35% (Chamberlain et al., 2017). Furthermore, multiple smoking cessation interventions tailored to parents of children 0-18 years have been examined in the past 25 years. Yet, a recent overview on the overall effectiveness of these parent-tailored interventions was missing, which created a gap in evidence. Therefore, for the present thesis, a meta-analysis on the effectiveness of smoking cessation interventions tailored to parents of children (0-18 years) was conducted and the results are presented in **Chapter 3**.

To increase the probability that smoking cessation interventions tailored to (expecting) parents are effective, it is important to tailor these interventions to the specific characteristics and needs of (expecting) parents who smoke. Research has shown that tailored (vs. non-tailored) health promotion interventions are more effective (Krebs et al., 2010; Lustria et al., 2013; Noar et al., 2007). Although multiple studies examined characteristics of women who smoke around pregnancy (Härkönen et al., 2018; Mohsin & Bauman, 2005; Penn & Owen, 2002; Simmons et al., 2014; Smedberg et al., 2014; Solomon et al., 2007), the majority of these studies mainly focused on sociodemographic characteristics (e.g., age and educational level), and less on other characteristics (e.g., maternal alcohol and drugs use and partner's smoking behavior around pregnancy). In addition, to our knowledge no Dutch study with a large and representative sample has examined these characteristics of women so far. In order to provide opportunities for tailoring and improving smoking cessation interventions for (expecting) parents, more insight

into these characteristics is needed. Therefore, by using the cross-sectional data of a large and representative population-based study from the Netherlands (i.e., the Monitor on Substance Use and Pregnancy; Tuithof et al., 2017), the present thesis examined demographic, substance use-related, and pregnancy-related risk and protective characteristics of women who smoke before or during pregnancy, quit smoking during pregnancy, and relapse postpartum (**Chapter 2)**.

Telephone counseling to help parents quit smoking

Within the range of smoking cessation interventions, telephone counseling is widely used as an evidence-based intervention to help people quit smoking (Matkin et al., 2019). A recent Cochrane review (including 65 studies) showed that the provision of telephone counseling significantly increased quit rates among smokers (RR = 1.25, 95% CI = 1.15 - 1.35; Matkin et al., 2019). In our meta-analysis on parent-tailored smoking cessation interventions (**Chapter 3**), more than half (n = 10) of the included studies examined parent-tailored face-to-face interventions that were supplemented with at least one (in some studies optional) telephone counseling session (Borrelli et al., 2010, 2016; Caldwell, 2018; Chan et al., 2008, 2017; Curry et al., 2003; Hannöver et al., 2009; Mahabee-Gittens et al., 2008; Winickoff et al., 2010). In addition, a couple of other studies examined interventions that were exclusively telephone based (supplemented with self-help materials (e.g., Abdullah et al., 2005; Schuck, Bricker et al., 2014). One of these studies was conducted among 903 parents in China and examined a telephone counseling program that included three calls of 20-30 minutes (Abdullah et al., 2005). The results showed that at six months post-intervention, the odds of reporting abstinence was 2.1 higher for parents who received telephone counseling than for parents in the control condition (95% CI = 1.4 – 3.4; 15.3% vs. 7.4%). In brief, a telephone smoking cessation counseling program could have the potential to help parents quit smoking and protect their children from exposure to parental smoking.

One of the advantages of telephone counseling programs is that it can be proactively delivered, which means that counselors initiate contact and offer services to smokers (Prochaska et al., 2001). Evidence suggests that proactive (vs. reactive) smoking cessation interventions could result in higher inclusion rates of smokers (Drehmer et al., 2016; Marcane Belisario et al., 2012). Other advantages of telephone counseling are 1) its quick and easy service for smokers to use at a moment that suits them; 2) no traveling is needed; 3) it can be tailored to the personal needs of smokers; and 4) its feasibility to reach a large population (Matkin et al., 2019). These practical advantages of telephone counseling programs could be particularly appealing to parents, because of their busy lives with taking care of their children and other demanding tasks.

A Dutch proactive parent-tailored telephone smoking cessation counseling program

A couple of years ago a Dutch parent-tailored telephone smoking cessation counseling program was examined in a randomized controlled trial (RCT) by Schuck, Bricker, et al. (2014). This program included up to seven counselor-initiated phone calls and was based on motivational interviewing (Rollnick & Miller, 1995) and cognitive behavioral skill building. Smoking cessation counselors encouraged parents to use nicotine replacement therapy (NRT) or pharmacological treatment. In addition to the telephone counseling program, parents also received three parent-tailored booklets (called "Smoke-free parents"). Each booklet included motivational messages, tips and advice, and didactic information on smoking cessation.

For the RCT, parents of children 9-12 years were recruited via primary schools and asked to participate in the study. In total, 512 parents received either the telephone smoking cessation counseling program (intervention condition) or a self-help brochure on smoking cessation (control condition). Results showed that parents who received telephone counseling had higher odds of reporting abstinence (i.e., 7-day point prevalence abstinence [PPA]) at three and twelve months follow-up compared to parents in the control condition (three months: 44.5% vs. 12.1%; OR = 6.89; 95% CI = 4.18 – 11.36; 12 months: 34.0% vs. 18.0%; OR = 2.81; 95% CI = 1.76 – 4.49). Moreover, a benefit of the telephone counseling sessions was also shown by the 6-month PPA at 12 months follow-up (23.4% vs. 5.9%; OR = 5.51; 95% CI = 2.81 – 10.59). Mediation analyses showed that increased self-efficacy to refrain from smoking in tempting and stressful situations, and the increased willingness to accept sensations that cue smoking could be important underlying mechanisms that explain the effectiveness of the parent-tailored telephone counseling program (Schuck, Otten et al., 2014). To summarize, these promising results showed that this intensive Dutch proactive telephone smoking cessation counseling program could help parents to quit smoking and thereby providing a smoke-free future for themselves and their children.

Is the Dutch proactive parent-tailored telephone smoking cessation counseling program also effective under more real-world circumstances?

Currently, there is no evidence-based smoking cessation program tailored to parents available in the Netherlands. Although the results on the effectiveness of the Dutch parent-tailored telephone counseling program were promising (Schuck, Bricker et al., 2014), the effectiveness was examined in an efficacy trial. This means that the telephone counseling program was examined under optimal, highly controlled, circumstances (Flay, 1986; Glasgow et al., 2003). For example, parents received 100 euro for their participation in the study and parents in the intervention condition did not have to pay for the telephone counseling program, as it was offered for free

(Schuck, Bricker et al., 2014). These two aspects do not reflect the real world, because smokers often have to pay to receive smoking cessation support in the Netherlands. The situation around the reimbursement of smoking cessation support is complex and changed in the Netherlands over the last couple of years. In brief, at the moment that the studies described in the present thesis were conducted (between 2016 and 2019), most health insurance agencies reimbursed smoker's application for a selection of smoking cessation support only once a year if the smoker's obligatory deductible excess had already been fully charged (see e.g., Anderzorg, n.d.). Since January 2020, under specific conditions (e.g., smoking cessation counselors need to have an agreement with the health insurance agencies), smokers do not have to pay their obligatory deductible excess for smoking cessation support anymore (Trimbos-instituut, n.d.-b). Because the Dutch telephone counseling program was examined in an efficacy trial, the results of this trial provided limited evidence on whether the program would be effective when tested and implemented under more real-world circumstances. This is one of the reasons that the results of the efficacy trial did not lead to a wide scale implementation in the Netherlands.

In contrast to efficacy trials, effectiveness trials aim to examine interventions under more real-world circumstances (Glasgow et al., 2003). More specifically, in effectiveness trials interventions are examined among e.g. a more diverse target group, various settings, and delivered by multiple agents (Glasgow et al., 2003). The step-wise process from efficacy research to effectiveness research to implementation research is a long and slow process (Glasgow et al., 2003). In addition, this process does not give insight into the possibility that the effectiveness of an intervention could depend on the implementation or recruitment strategy that is used (Bernet et al., 2013). For example, perhaps a parent-tailored smoking cessation program is more effective when parents are recruited via healthcare settings than via social media. To overcome these problems, Curran and colleagues (2012) developed a trial design in which the effectiveness and the implementation of interventions are examined simultaneously. The strengths of this hybrid design are that it increases the speed of the implementation of effective interventions, it enables the identification of important implementation strategies and interactions, and it provides important and useful information for researchers and decision-makers concerning the implementation (Bernet et al., 2013; Curran et al., 2012; Landes et al., 2019). Therefore, in order to gain more insight into the effectiveness of the Dutch parent-tailored proactive telephone counseling program under more real-world conditions, a study with an effectiveness-implementation hybrid design was carried out in the present thesis (**Chapter 4, Chapter 5**).

Cost-effectiveness of parental smoking cessation interventions

In addition to assessing the effectiveness of smoking cessation interventions, it is important to evaluate the interventions from a broader cost-effectiveness

perspective. Information about the cost-effectiveness of interventions is crucial for policy makers in their decision to implement interventions (Flay et al., 2005). A couple of Dutch studies yielded positive results with respect to the cost-effectiveness of smoking cessation interventions (Christenhusz et al., 2012; Smit et al., 2013; Stanczyk et al., 2014; van den Brand et al., 2019). For example, a recent Dutch trial with incentives for smoking cessation at the work-place showed that the intervention was cost-effective at 14 months follow-up if society was willing to pay the costs of € 11.546 for each quitter (van den Brand et al., 2019). Although, there is some evidence on the cost-effectiveness of telephone smoking cessation counseling programs (Hollis et al., 2007; Parker et al., 2007), to our knowledge, no evidence exists on the cost-effectiveness of parent-tailored telephone smoking cessation counseling programs, or parent-tailored smoking cessation interventions in general. In the present thesis, this gap is being addressed in **Chapter 6**.

Recruitment venues for parental smoking cessation interventions

Besides the limited evidence on the (cost-)effectiveness of the Dutch proactive parent-tailored telephone counseling program, it was also unknown how the telephone counseling program could be successfully implemented in the Netherlands. The impact of an intervention does not solely depend on the effectiveness, but also on the extent to which the target group has access to the intervention and is willing to use the intervention (McClure et al., 2006). Recruitment venues are pivotal in this regard. In the efficacy trial, parents were recruited via primary schools (Schuck et al., 2013; Schuck, Bricker et al., 2014). By using primary schools as a venue to recruit participants it is possible to reach a major proportion of parents who smoke. Moreover, schools can serve as a 'teachable setting' in which parents are reminded of their role as parents (Schuck et al., 2013). Yet, the rate of parents who participated in the efficacy trial was low with a response rate of 5% (Schuck et al., 2013). In addition to schools, online mass media (e.g., websites and social media) could be used to recruit parents for smoking cessation interventions. As is the case with primary schools, online mass media also has the potential to reach the majority of parents. Recent numbers show that 95% of the Dutch population (12-55 years old) used social media in 2019 (Centraal Bureau voor de Statistiek, 2020). Furthermore, several studies proved that online mass media is successful in recruiting smokers (An et al., 2007; Heffner et al., 2013; Ramo et al., 2014). To our knowledge, so far no study has examined whether online mass media could be a viable approach to recruit parents for smoking cessation interventions. Therefore, the present thesis aims to gain more insight into the question whether school settings and online mass media are successful venues to recruit parents for a parent-tailored telephone smoking cessation counseling program (**Chapter 7**).

Most parental smoking cessation intervention studies have been carried out in healthcare settings (**Chapter 3**). The strength of these settings is that a strong link

can be made between the parent's smoking behavior and the tobacco-related health problems that children experience (Winickoff et al., 2005). Also, research showed that parents are willing to speak with healthcare professionals about their smoking while their child was hospitalized and would accept a free telephone counseling program (Winickoff et al., 2001). In addition, because of the youth healthcare system in the Netherlands, parents are encouraged to frequently visit youth healthcare centers in the context of their child's health. In the Netherlands, children between 0 and 17 years receive preventive youth healthcare from e.g. child healthcare clinicians and nurses (Nederlands Centrum Jeugdgezondheid, 2018). The aim of youth healthcare is - among others - to provide education on the emotional, social, and physical development of children to parents, monitor children's development, and to enable early identification of any problem (Nederlands Centrum Jeugdgezondheid, 2018). Parents are asked to visit youth healthcare centers 15 times in the first four years of their child's life (Nederlands Centrum Jeugdgezondheid, 2018), creating multiple opportunities to encourage smoking parents to quit smoking. The question whether healthcare settings are successful venues to recruit parents for a parent-tailored telephone smoking cessation counseling program is being addressed in **Chapter 7** of the present thesis.

Although healthcare settings could serve as an opportunity to connect parents with evidence-based smoking cessation interventions, there are also some barriers that healthcare professionals have reported in several studies. Examples of these barriers are lack of time to address smoking cessation, concern about negative reactions from parents, parents' lack of interest in quitting smoking, and healthcare professionals' lack of confidence to address smoking cessation (Blumenthal, 2007; Frankowski et al., 1989, 1993; Pérez-Stable et al., 2001; Vogt et al., 2005). Dutch studies revealed quite similar barriers (Hutchinson et al., 2014), but also showed that the majority of healthcare professionals found it is their job to address parental smoking cessation (Bommelé et al., 2018). These results emphasize the opportunities to connect parents with smoking cessation treatment via healthcare settings in the Netherlands, but also the need of healthcare professionals for more tools and support to address parental smoking cessation. For the present thesis, a tool was developed to support healthcare professionals in addressing parental smoking cessation and aid the referral of parents to an evidence-based parent-tailored smoking cessation program (see for more information on this tool the next paragraph and **Chapter 8**). In addition, an implementation study was conducted to explore the facilitators, barriers, and suggestions for improvement in the implementation of the newly developed tool in healthcare settings (**Chapter 8**).

The present follow-up study

Currently, there is no evidence-based parent-tailored smoking cessation intervention available in the Netherlands. This is unfortunate, since it is estimated that the

target group for such an intervention in the Netherlands is about 47.000 parents of children 0-18 years old who want to quit smoking within a month (Trimbos-instituut, Rijksinstituut voor Volksgezondheid en Milieu, & Centraal Bureau voor de Statistiek, 2018). Therefore, based on the promising results of the efficacy trial on the Dutch proactive parent-tailored telephone smoking cessation counseling program (Schuck, Bricker et al., 2014), the overall aim of the present follow-up study was to address two main questions: 1) is the Dutch proactive parent-tailored telephone smoking cessation counseling program effective and cost-effective when tested under more real-world conditions; and 2) what could be successful strategies to recruit parents for the program? Answering these questions will provide valuable information regarding the potential for widespread implementation of the telephone counseling program in the Netherlands and on how this could be done successfully.

To address abovementioned questions on the (cost-)effectiveness and implementation of the Dutch proactive parent-tailored telephone smoking cessation counseling program 'Smoke-free Parents' (SFP), a follow-up trial was conducted by adopting an effectiveness-implementation hybrid design (Bernet et al., 2013; Curran et al., 2012; Landes et al., 2019). The program SFP resembled the telephone counseling program that was examined in the previous efficacy trial (Schuck, Bricker et al., 2014), was based on motivational interviewing (Rollnick & Miller, 1995), and included six telephone calls initiated by the smoking cessation counselors of SineFuma (one of the certified Dutch quitlines). Smoking cessation counselors discussed multiple topics, including smoking history, cravings, and relapse prevention. Parents were also encouraged to use NRT or pharmacological treatment. The counselors followed a protocol on which topics to discuss during the sessions. However, the order and intensity differed based on the needs and preferences of parents (tailoring). In addition to six telephone calls, parents received a supplementary parent-tailored brochure that provided information about smoking and smoking cessation, exercises, and tips (see **Chapter 4** for more information on the telephone counseling program).

Two different approaches to successfully recruit parents for the telephone counseling program were examined: a mass media approach (i.e., primary schools and online mass media) and a healthcare approach (i.e., healthcare professionals and specialized youth healthcare professionals). Parents who were recruited via the mass media approach were asked to register for a proactive, free, and informal phone call from a smoking cessation counselor of SineFuma. During this phone call, parents that met the inclusion criteria were informed about the RCT and asked for participation. They also received more information about the telephone counseling program (e.g., the number of calls and the costs that parents potentially had to pay for). Parents decided whether they wanted to participate in the RCT during or soon after this phone call. In case parents did not want to participate in the RCT,

they could receive the telephone counseling program outside the RCT context (i.e., parents did not participate in the RCT). To recruit parents via the healthcare approach, a time-saving and convenient referral tool was developed in collaboration with multiple representatives of healthcare professionals. This referral tool enabled healthcare professionals to refer parents for a proactive phone call from a smoking cessation counselor. Healthcare professionals could register parents via our website, telephone or fax (see **Chapter 8** for a more detailed description of the referral tool that was developed for healthcare professionals). The process and content of this phone call and the registration process for the RCT was for the greater part identical to the process via the mass media approach. For both approaches the program uptake (i.e., the number of parents who actually start with the telephone counseling program after being approached), the cost-per-participant (i.e., the recruitment costs to recruit one parent that starts with the telephone counseling program), and the barriers that prevented parents from participating in the telephone counseling program were assessed (**Chapter 7**). Based on prior research on recruiting parents for smoking cessation interventions via healthcare settings (Drehmer et al., 2016; Mahabee-Gittens et al., 2008; Winickoff et al., 2003, 2006), we expected that the program uptake would be higher for the healthcare approach than for the mass media approach.

Parents who participated in the RCT randomly received the parent-tailored telephone counseling program (intervention condition) or a self-help brochure on smoking cessation (control condition) after they had completed the baseline assessment. At three months follow-up, parents were invited to complete a second online questionnaire. The primary outcome was 7-day PPA at three months follow-up. Based on the results of the previous efficacy trial (Schuck, Bricker et al., 2014), it was expected that parents who received the telephone counseling program were more likely to reach abstinence than parents in the control condition. A more detailed description of the complete study can be found in the study protocol (see **Chapter 4**).

Overview of the present thesis

The present thesis provides information on the effectiveness of smoking cessation interventions tailored to parents in general, and more specifically on the (cost-) effectiveness and implementation of the Dutch proactive telephone smoking cessation counseling program SFP tailored to parents of children 0-18 years old. For this thesis, data of the Dutch Monitor on Substance Use and Pregnancy (Scheffers-van Schayck, den Hollander et al., 2019; Tuithof et al., 2017) were analyzed to investigate indicators of women who smoked before, during, and after their pregnancy. In addition, a meta-analysis was conducted on the overall effectiveness of smoking cessation interventions tailored to parents of children 0-18 years old. Finally, a follow-up study with an effectiveness-implementation hybrid design was

carried out to examine the (cost-)effectiveness and implementation of the telephone smoking cessation counseling program SFP. The key questions of the present thesis are:

1. What are the indicators of women who smoke before, during, and after their pregnancy? (**Chapter 2**)
2. What is the overall effectiveness of smoking cessation interventions tailored to parents of children between 0 and 18 years? (**Chapter 3**)
3. What is the (cost-)effectiveness of the Dutch proactive parent-tailored telephone smoking cessation counseling program SFP when examined under more real-world circumstances? (**Chapters 4**, **5**, and **6**)
4. What is the program uptake of SFP after parents were recruited via a mass media approach or a healthcare approach? (**Chapter 7**)
5. Which barriers and facilitators experience healthcare professionals when working with the SFP referral tool and how can the implementation of the tool be improved in healthcare settings? (**Chapter 8**)

A summary and reflections on the main findings are presented in **Chapter 9**. This chapter also includes the limitations of the thesis, the implications of the findings for practice, and directions for future research. The final chapter, **Chapter 10** includes a Dutch summary of the present thesis.

CHAPTER 2

Smoking behavior of women before, during, and after pregnancy: Indicators of smoking, quitting, and relapse

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Authors contribution

M.T. was responsible for the recruitment and data collection. T.S.-v.S. was responsible for the analyses and report of the study results. R.O., R.E., and M.K. were supervisors. All authors read and approved of the final manuscript.

Abstract

Introduction: Smoking cessation during pregnancy and preventing relapse postpartum is a pivotal public health priority. This study examined the risk and protective indicators of women who (a) smoke before pregnancy; (b) smoke during the entire pregnancy; (c) successfully quit smoking during pregnancy; and (d) relapse postpartum.

Methods: This paper reports secondary analyses of the Dutch population-based Monitor on Substance Use and Pregnancy (2016). A representative sample of mothers of young children (N = 1,858) completed questionnaires at youth healthcare centers. Bivariate and multivariate logistic regression analyses were conducted.

Results: Main results showed that women's smoking around pregnancy was strongly associated with the partner's smoking status before pregnancy, partner's change in smoking during pregnancy, and partner's change in smoking postpartum. Women's educational level and cannabis use before pregnancy were also related with women's smoking before and during pregnancy. Women's intensity of alcohol use before pregnancy was ambiguously related with women's smoking before and during pregnancy.

Conclusion: One of the key findings of this study suggests that it is essential that partners quit smoking before pregnancy and do not smoke during pregnancy. If partners continue smoking during pregnancy, they should quit smoking postpartum. Healthcare professionals can play an important role in addressing partners' smoking and giving them evidence-based cessation support before, during, and after pregnancy.

Introduction

Smoking during pregnancy and relapse postpartum is a major public health concern (Levitt et al., 2007; Riaz et al., 2018). Smoking during pregnancy has detrimental health effects on women's pregnancies (e.g., pre-term birth and low birth weight; Hofhuis et al., 2003) as well as on infants' and children's physical health and cognitive and social development (e.g., neurodevelopmental and behavioral problems; Ekblad et al., 2010, 2015; Hofhuis et al., 2003; Williams et al., 1998). In addition, children's exposure to secondhand smoke has been associated with, among other risks, increased frequency of asthma (DiFranza et al., 2004; Hofhuis et al., 2003) and an increased risk that children will start smoking in the future (Leonardi-Bee et al., 2011).

Pregnancy could serve as a teachable moment for women to quit smoking (McBride et al., 2003). This argument is supported by recent research showing that women are more likely to quit smoking during pregnancy than before pregnancy (Crozier et al., 2009). Nonetheless, many women continue to smoke during pregnancy. A large study using representative national samples from 54 low- and middle-income countries provided evidence that the pooled prevalence of any tobacco use in pregnancy was 2.6%, with the highest prevalence in Turkey (15.0%; Calevachetty et al., 2014). Moreover, postpartum relapse rates of women who quit smoking during pregnancy are also high. A meta-analysis showed that 43% of women who stopped smoking during pregnancy began smoking again at 6 months postpartum (Jones et al., 2016). In addition, subgroup analyses of this meta-analysis revealed that the rate of women who relapsed at 6 months postpartum increased to 74% when only studies with biochemically validated abstinence data were included (Jones et al., 2016).

Multiple smoking cessation and relapse prevention interventions for pregnant women have been developed and tested (see e.g. Donatelle et al., 2000; Hannöver et al., 2009; Reitzel et al., 2010), but evidence for their effectiveness is mixed. A Cochrane review illustrated that psychosocial interventions could decrease the number of women who smoke in late pregnancy by 35% (Chamberlain et al., 2017). In addition, financial incentives and interventions that included feedback (e.g., information about fetal health status) have proven effective in reducing the prevalence of smoking women in late pregnancy (Chamberlain et al., 2017). In contrast, postpartum relapse prevention interventions have shown limited effects (Hajek et al., 2013; Levitt et al., 2007). It seems that many women and their offspring do not receive the maximum health benefits of smoking cessation (Jones et al., 2016). Therefore, there is still considerable room for improvement with regard to cessation and relapse-prevention interventions in pregnancy. Effectiveness might be improved by tailoring interventions toward specific characteristics, risk and protective indicators, and needs of the target group. Multiple systematic reviews and meta-analyses have shown that tailored (vs.

non-tailored) health promotion interventions are more effective (Krebs et al., 2010; Lustria et al., 2013; Noar et al., 2007).

In order to provide women who smoke with tailored and (cost-)effective help to quit smoking before and during pregnancy and to avoid postpartum relapse, a profound understanding of this specific population is essential. So far, many studies have examined different characteristics of women who either (1) smoked before or during pregnancy, (2) quit smoking during pregnancy, or (3) relapsed postpartum. A large study focusing on smoking before pregnancy found that women who did not take folic acid, who had a low educational level, who had an unplanned pregnancy, and who lived alone were more likely to smoke before pregnancy (Smedberg et al., 2014). Other studies found that women who were younger (Mohsin & Bauman, 2005; Nur, 2017; Xu et al., 2013), were unmarried, or lived alone (Nur, 2017; Pen & Owen, 2002; Smedberg et al., 2014), had a low educational level (Härkönen et al., 2018; Mohsin & Bauman, 2005; Nur, 2017; Pen & Owen, 2002; Smedberg et al., 2014; Xu et al., 2013), lived in an extended family (Nur, 2017), did not take folic acid (Smedberg et al., 2014), and had partners who smoked (Pen & Owen, 2002) were more likely to smoke during pregnancy. In addition, women were more likely to quit smoking during pregnancy when they were married (Kia et al., 2018), had a higher socioeconomic status (Mohsin & Bauman, 2005), had a higher educational level (Connor & McIntyre, 1999; Kia et al., 2018; Lu et al., 2001), lived with a non-smoking cohabitant (Kia et al., 2018; Lu et al., 2001), and smoked fewer cigarettes before pregnancy or quitting (Kia et al., 2018). Finally, women were more likely to relapse postpartum when they quit smoking during instead of before pregnancy (Polanska et al., 2001; Solomon et al., 2007), did not breastfeed (Polanska et al., 2001; Simmons et al., 2014), had a smoking environment at home (Polanska et al., 2001; Simmons et al., 2014), had more family and friends who smoked, had a partner that continued smoking during pregnancy, smoked more cigarettes per day before pregnancy, and were younger and unmarried (Solomon et al., 2007). To conclude, the majority of studies solely examined the associations between risk indicators and women's smoking behavior with respect to one or two moments around women's pregnancy (e.g., before or during pregnancy). Only two studies examined risk and protective indicators at all points around pregnancy (i.e., before, during, and after) in the same study. However, the data in these two studies were collected more than 20 years ago and lacked findings on smoking during pregnancy (Colman & Joyce, 2003) or combined smoking before and during pregnancy (Kahn et al., 2002). Moreover, most studies mainly focused on sociodemographic indicators and less on partner's smoking status or other maternal substance use (e.g., alcohol and cannabis) around pregnancy. The combination of looking at all three points around pregnancy and including various indicators provides a more complete picture of whether (change in) behavior of women and their context before pregnancy is associated with smoking of women later on during or after pregnancy.

The current study uses cross-sectional data of a representative population-based study from the Netherlands (i.e., the Monitor on Substance Use and Pregnancy) to exploratively examine demographic, substance-use-related, and pregnancy-related risk and protective indicators of women who (a) smoke before pregnancy; (b) smoke during the entire pregnancy; (c) successfully quit smoking during pregnancy; and (d) relapse postpartum. The use of a large representative sample, a broad spectrum of indicators (i.e., sociodemographic, partner's smoking behavior around pregnancy, and other maternal substance use), and the measurement of three time points around pregnancy helps to gain insight into the characteristics of women who smoke around pregnancy and provides information on whether the characteristics differ over the three time points around pregnancy. These insights may contribute to the development of tailored cessation and relapse prevention interventions.

Methods

Sample

The Dutch Monitor on Substance Use and Pregnancy (Tuithof et al., 2017) is a representative population-based cross-sectional study in which mothers have to answer questions retrospectively about their substance use (i.e., smoking, drinking, and drug use) before, during, and after pregnancy. For the present study, we used only the data collected in 2016 (the Monitor will be repeated in 2018). In the Netherlands, all children up to 18 years old receive preventive healthcare at youth healthcare centers (YHC; Nederlands Centrum Jeugdgezondheid, 2018). Therefore, to collect a sample that properly represented mothers with young children (i.e., youngest child younger than five years) and to maximize the chance that mothers with a low socioeconomic status would participate in this study, mothers were recruited at YHC centers. A total of 34 cities across the Netherlands were randomly selected to be approached for participation in the Monitor. In total, 27 (79.4%) of these cities agreed to participate, and their YHC centers were included. For the seven cities that did not want to participate, other cities of similar urbanicity in the same region were approached, and all YHC centers in these cities registered for participation. In total, 46 YHC centers, distributed throughout 35 cities in the Netherlands, participated.

The cluster sampling strategy resulted in a representative sample of Dutch mothers with young children with some small deviations. For instance, the percentage of Western mothers in this sample was higher than that of the entire Dutch population (86.8% vs. 80.5%). After being weighted for age, educational level, and ethnicity, the sample properly represented Dutch mothers with young children. In total, 1,858 mothers (M = 31.69; SD = 4.69) were included. The average age of the youngest child was 11.14 months (SD = 12.22).

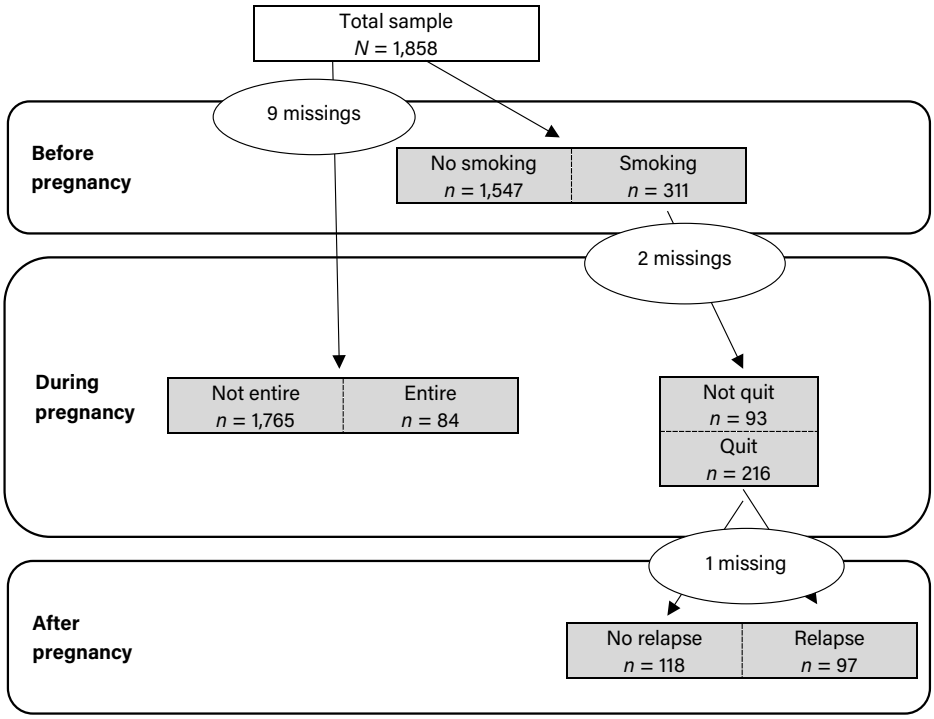
Data collection

Data were collected in November and December 2016. Mothers who visited a YHC center with their child were asked whether they would like to participate in a study on health behaviors of mothers of young children. To participate, participants needed to be a mother of children aged 0–4 years. There were no exclusion criteria. Mothers received oral instructions by trained research assistants and gave permission to participate in our study (active informed consent). Participation included that mothers filled out a short questionnaire (~5 min) at the YHC center while waiting for their appointment. The response rate was 94.2%. Some mothers declined to participate because they could not speak Dutch fluently. Mothers who did not agree to participate due to a lack of time were offered the opportunity to fill out a paper or online version of the questionnaire later at home. Participants filled out the questionnaire on a tablet (84.4%), paper (13.6%), or online (2.0%). Because of the sensitivity of this study's topic and to minimize socially desirable answers, research assistants approached the mothers and emphasized that the data would be collected and processed anonymously.

Measures

In the questionnaire, maternal smoking status was assessed with respect to three different time points around the pregnancy: before, during, and after pregnancy. With respect to the maternal status before pregnancy, mothers were asked whether they had smoked in the four weeks before their pregnancy. Smoking during pregnancy was measured for each trimester separately (i.e., 1–3 months; 4–6 months; 7–9 months), by asking mothers whether they had smoked at all during each trimester. Smoking status after pregnancy was assessed by asking whether they had smoked in the past four weeks. Four groups were constructed (Figure 1). From the total sample, the first group consisted out of women who smoked in the four weeks before pregnancy (reference group: women who did not smoke before pregnancy). From this first group, a second group was selected including women who successfully quit smoking at some point during pregnancy through the end of the pregnancy (i.e., did not smoke in the third trimester; reference group: women who did not successfully quit smoking during pregnancy). From the second group we selected a third group, consisting out of women who had successfully quit smoking during pregnancy, but relapsed postpartum (reference group: women who successfully quit smoking during pregnancy and remained smoke-free postpartum). Finally, a fourth group was constructed, including women who smoked during the entire pregnancy (i.e., all three trimesters; reference group: women who did not smoke or who only smoked before pregnancy or who smoked less than three trimesters during pregnancy). Women could belong to more than one group. For instance, women who successfully quit smoking at some point during the pregnancy could also belong to the group of women who relapsed after pregnancy (Figure 1).

Figure 1
The Four Groups of Women that Were Constructed to Include in the Analyses



Several maternal sociodemographic indicators were assessed, including age (four categories), educational level (low: primary education or pre-secondary vocational education/medium: secondary (vocational) education/high: higher vocational education or university), ethnicity (Dutch/other-Western/non-Western), and living situation (partner and children/other). The following risk and protective indicators were measured: (a) breastfeeding (yes/no); (b) intake of folic acid before and during pregnancy (yes/no); (c) intensity of alcohol use before pregnancy (i.e., number of glasses alcohol consumed on days that women drank alcohol before pregnancy: non-drinkers, 1 glass, ≥2 glasses); (d) alcohol use during pregnancy (yes/no); (e) cannabis use before pregnancy (yes/no); (f) partner's smoking status before pregnancy (yes/no); (g) change in partner's smoking behavior during pregnancy (compared to before pregnancy: partner did not smoke before and during pregnancy/partner's smoking decreased or partner quit smoking during pregnancy/partner smoked as much or more during pregnancy); (h) change in partner's smoking behavior postpartum (compared to before and during pregnancy: partner did not smoke before, during, and after pregnancy/partner smoked before or during pregnancy but not after pregnancy/partner smoked after pregnancy); (i) talked about smoking

cessation with a healthcare professional during pregnancy (yes/no); and (j) use of smoking cessation support during pregnancy (yes/no). Breastfeeding included any breastfeeding without a required minimum duration. Use of smoking cessation support during pregnancy (e.g., nicotine replacement therapy, behavioral coaching, and e-health interventions) was categorized "yes" if mothers checked at least one of the cessation support answer options on the question whether they had used any of the following smoking cessation support options. If mothers indicated that they had not used any support, it was categorized "no". Because this study aimed to be nationally representative and the data were collected when mothers were waiting for their appointment at the YHC centers, the questionnaire was very short and no data were collected on e.g. nicotine dependence, mental health disorders or other indicators related to smoking behavior.

Statistical analyses

In order to control for the clustered sampling procedure and to ensure that the data were representative of Dutch women with young children, all analyses were carried out using the Complex Samples Module of the software program Statistical Package for the Social Sciences, version 20. Because most questionnaires were collected digitally, missing data was not an issue. First, frequencies were calculated to provide characteristics of the four groups. Note that these groups could not be compared, as women could belong to two or more groups. Next, to determine the most important indicators related to the four groups, a 2-stage approach was carried out. First, bivariate logistic regression models were used for each outcome variable. If the *p* value of the bivariate model (BM) was lower than 0.05, it was considered statistically significant. Second, multivariate logistic regression models were built for the four groups. The significant indicators from the BM were entered simultaneously in the multivariate models (MM). Adjusted ORs, 95% CIs, and p-values are reported.

Results

Table 1 presents the weighted descriptive statistics for the risk and protective indicators for the total sample and for each group. Of the 1,858 women who participated in this study, 358 women (20.2%) reported that they had smoked at some time around pregnancy. More specifically, 17.4% smoked before pregnancy, 4.9% smoked during the entire pregnancy, 12.0% successfully quit smoking during pregnancy, and 5.5% successfully quit smoking during pregnancy but relapsed postpartum. Of the women who successfully quit smoking during pregnancy, 46.1% relapsed postpartum. In total, 82.3% of these women relapsed within six months postpartum.

Indicators associated with women who smoked before pregnancy

Table 2 presents the BM and MM of risk and protective indicators that were associated with women who smoked before pregnancy. According to the BM, women who smoked before pregnancy were younger, less educated, and lived without a partner more often compared to women who did not smoke before pregnancy. In addition, women who smoked before pregnancy less often took folic acid before pregnancy, more often used substances before pregnancy (i.e., higher intensity of alcohol use, any cannabis use), and more often had a partner who smoked before pregnancy. Most associations remained significant in the MM except younger age and the use of folic acid before pregnancy.

Indicators associated with women who smoked during the entire pregnancy

The BM shows that women who smoked during the entire pregnancy were younger, less educated and lived without a partner more often than women who did not smoke during the entire pregnancy (Table 2). In addition, they were more likely to have a lower intensity of alcohol use before pregnancy and use any cannabis before pregnancy than women who did not smoke during the entire pregnancy. Lastly, women who did (vs. did not) smoke during the entire pregnancy were more likely to have a partner who smoked during the pregnancy. In the MM, low educational level, living without a partner, and smoking of the partner during pregnancy remained significantly associated with smoking of the mother during the entire pregnancy. Finally, the intensity of alcohol use before pregnancy appears to be a protective indicator; that is, women who smoked during the entire pregnancy were more likely to have a lower intensity of alcohol use before pregnancy than women who did not smoke during the entire pregnancy.

Table 1
Descriptive Statistics for Demographic and Other Indicators for Total Sample and Each Group

Indicators	Total sample *N* (%)	Women who smoked BP *N* (%)[a]	Women who smoked during the entire pregnancy *N* (%)[a]	Women who successfully quit smoking DP *N* (%)[a]	Women who relapsed PP *N* (%)[a]
N	1858	311	84	216	97
Maternal age					
18-24	127 (8.7)	44 (17.0)	14 (20.4)	25 (14.1)	8 (9.6)
25-29	455 (28.6)	102 (35.8)	28 (34.7)	69 (35.9)	38 (44.8)
30-34	739 (38.4)	100 (30.1)	20 (23.0)	80 (34.2)	33 (30.8)
35+	528 (24.4)	65 (17.1)	22 (21.8)	42 (15.7)	18 (14.8)
Educational level					
Low	153 (11.8)	48 (19.8)	26 (36.4)	23 (14.6)	13 (18.8)
Medium	705 (38.1)	170 (52.5)	50 (55.1)	110 (49.3)	57 (53.7)
High	1000 (50.1)	93 (27.7)	8 (8.4)	83 (36.1)	27 (27.5)
Living situation					
Partner and children	1735 (92.0)	258 (81.1)	66 (76.1)	183 (83.0)	80 (80.8)
Other	123 (8.0)	53 (18.9)	18 (23.9)	33 (17.0)	17 (19.2)
Ethnicity					
Dutch	1469 (69.4)	256 (74.7)	71 (79.0)	175 (72.4)	78 (71.6)
Other Western	144 (10.6)	26 (11.4)	6 (9.6)	19 (12.1)	6 (9.0)
Other non-Western	244 (20.0)	29 (13.9)	7 (11.4)	22 (15.5)	13 (19.4)

Table 1 Continued

Indicators	Total sample *N* (%)	Women who smoked BP *N* (%)[a]	Women who smoked during the entire pregnancy *N* (%)[a]	Women who successfully quit smoking DP *N* (%)[a]	Women who relapsed PP *N* (%)[a]
Intake of folic acid BP					
No	569 (33.1)	130 (44.5)	24 (32.6)	99 (48.3)	39 (44.8)
Yes	1289 (66.9)	181 (55.5)	60 (67.4)	117 (51.7)	58 (55.2)
Intake of folic acid DP					
No	133 (8.6)	23 (8.3)	11 (14.6)	12 (6.1)	4 (5.0)
Yes	1718 (91.4)	286 (91.7)	73 (85.4)	204 (93.9)	93 (95.0)
Breastfeeding					
No	490 (26.1)	123 (38.9)	45 (50.8)	71 (32.2)	35 (35.7)
Yes	1351 (73.9)	185 (61.1)	39 (49.2)	144 (67.8)	62 (64.3)
Intensity of alcohol use BP					
Non-drinkers	1012 (57.2)	123 (40.4)	64 (75.0)	56 (27.0)	27 (29.2)
1 glass	415 (21.5)	63 (21.7)	7 (9.5)	53 (26.3)	27 (29.7)
≥ 2 glasses	423 (21.3)	125 (38.0)	13 (15.5)	107 (46.7)	43 (41.1)
Alcohol use DP					
No	1757 (95.4)	291 (94.6)	80 (95.7)	203 (94.5)	93 (95.4)
Yes	91 (4.6)	17 (5.4)	4 (4.3)	12 (5.5)	4 (4.6)

Table 1 Continued

Indicators	Total sample *N* (%)	Women who smoked BP *N* (%)[a]	Women who smoked during the entire pregnancy *N* (%)[a]	Women who successfully quit smoking DP *N* (%)[a]	Women who relapsed PP *N* (%)[a]
Cannabis use BP					
No	1818 (97.8)	285 (90.2)	78 (91.3)	200 (90.7)	87 (86.3)
Yes	33 (2.2)	25 (9.8)	6 (8.7)	16 (9.3)	10 (13.7)
Smoking of partner BP					
No	1345 (71.1)	97 (30.8)	18 (23.4)	76 (34.1)	29 (27.8)
Yes	510 (28.9)	214 (69.2)	66 (76.6)	140 (65.9)	68 (72.2)
Change in partner's smoking DP compared to BP					
Did not smoke BP and DP	1335 (71.7)	106 (34.6)	21 (26.7)	82 (38.2)	31 (30.7)
Decreased or quit	230 (13.0)	92 (29.4)	22 (24.7)	67 (31.3)	29 (32.1)
As much as or increased	268 (15.3)	107 (36.0)	41 (48.6)	62 (30.5%)	35 (37.2)
Change in partner's smoking PP					
Did not smoke at all	1336 (72.3)	124 (41.2)	28 (36.5)	95 (44.6)	39 (39.4)
Smoked BP or DP, but not PP	76 (4.1)	24 (7.0)	4 (4.5)	21 (8.9)	2 (1.8)
Smoked PP	419 (23.6)	159 (51.8)	52 (59.0)	98 (46.5)	55 (58.8)
Talked about smoking cessation with healthcare professionals DP					
No	253 (80.3)	249 (80.9)	48 (56.9)	197 (92.3)	84 (91.0)
Yes	59 (19.7)	56 (19.1)	36 (43.1)	15 (7.7)	9 (9.0)

Table 1 Continued

Indicators	Total sample *N* (%)	Women who smoked BP *N* (%)[a]	Women who smoked during the entire pregnancy *N* (%)[a]	Women who successfully quit smoking DP *N* (%)[a]	Women who relapsed PP *N* (%)[a]
Use of smoking cessation support DP					
No	295 (93.6)	288 (94.0)	74 (89.2)	207 (96.8)	91 (95.5)
Yes	22 (6.4)	20 (6.0)	10 (10.8)	8 (3.2)	5 (4.5)

Note. The percentages are weighted for age, educational level, and ethnicity. BP = before pregnancy; DP = during pregnancy; PP = postpartum.
[a] Does not add to the subsample size due to missing values.

Indicators associated with women who successfully quit smoking during pregnancy

Table 3 presents the BM and MM of risk and protective indicators associated with women who successfully quit smoking during pregnancy. The BM showed that women who did (vs. did not) successfully quit smoking during pregnancy were more likely to have a higher educational level, a higher intensity of alcohol use before pregnancy, and a partner who did not smoke before and during pregnancy or who cut down on smoking during pregnancy. In addition, women who did (vs. did not) successfully quit smoking during pregnancy were less likely to have talked about smoking cessation with a healthcare professional or used smoking cessation support during pregnancy.

In the MM, a high educational level and a higher intensity of alcohol use before pregnancy remained significantly associated with successfully quitting during pregnancy, as well as a lower rate of talking with a healthcare professional and no use of smoking cessation support.

Indicators associated with women who relapsed postpartum

According to the BM, maternal age was significantly related to relapsing postpartum. In addition, women who relapsed postpartum more often had a partner who continued smoking postpartum or who did not smoke at all (vs. a partner who quit smoking postpartum) compared to women who did not relapse postpartum (Table 3). In the MM, only the partner's smoking behavior postpartum remained significant. It appears that women who relapsed postpartum more often had a partner who continued smoking postpartum or a partner who did not smoke at all compared to women who did not relapse postpartum.

Table 2

Indicators Associated with Women who Smoked Before Pregnancy (n = 311) Versus Women who Did Not Smoke Before Pregnancy (n = 1547) and with Women who Smoked During the Entire Pregnancy (n = 84) Versus Women who Did Not Smoke During the Entire Pregnancy (n = 1765)

	Smoking BP				**Smoking during the entire pregnancy**			
	BM		**MM**		**BM**		**MM**	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Maternal age		< .001		.10		.004		.43
18-24	3.73 [2.20, 6.32]		1.78 [.88, 3.61]		2.83 [1.38, 5.79]		1.19 [.49, 2.90]	
25-29	2.00 [1.41, 2.84]		1.37 [.95, 1.99]		1.37 [.81, 2.33]		.88 [48, 1.59]	
30-34	1.13 [.82, 1.56]		.97 [.69, 1.35]		.66 [.38, 1.14]		.72 [.37, 1.43]	
35+	1		1		1		1	
Educational level		< .001		< .001		< .001		< .001
Low	3.88 [2.56, 5.89]		3.05 [1.88, 4.96]		21.29 [8.47, 53.50]		11.30 [4.31, 29.62]	
Medium	2.96 [2.21, 3.96]		2.84 [2.02, 4.00]		9.15 [4.06, 20.61]		5.20 [2.12, 12.73]	
High	1		1		1		1	
Living situation		< .001		< .001		< .001		.002
Partner and children	1		1		1		1	
Other	3.83 [2.76, 5.31]		2.38 [1.54, 3.66]		4.01 [2.42, 6.66]		2.42 [1.40, 4.17]	
Ethnicity		.16				.08		
Dutch	1.68 [.98, 2.91]				2.05 [1.11, 3.78]			
Other Western	1.69 [.76, 3.75]				1.61 [.56, 4.59]			
Other non-Western	1				1			

Table 2 Continued

	Smoking BP				Smoking during the entire pregnancy			
	BM		MM		BM		MM	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Intake of folic acid BP		< .001		.48		.94		
No	1.81 [1.34, 2.46]		1.14 [.79, 1.66]		.98 [.54, 1.76]			
Yes	1		1		1			
Intake of folic acid DP						.11		
No					1.90 [.86, 4.22]			
Yes					1			
Intensity of alcohol use BP		< .001		< .001		.01		.02
Non-drinkers	1		1		1		1	
1 glass	1.52 [1.01, 2.28]		2.11 [1.39, 3.21]		.32 [.14, .76]		.41 [.18, .90]	
≥ 2 glasses	3.21 [2.42, 4.27]		4.61 [3.23, 6.58]		.54 [.32, .91]		.56 [.33, .94]	
Alcohol use DP						.91		
No					1			
Yes					.93 [.27, 3.28]			
Cannabis use BP		< .001		< .001		.001		.09
No	1		1		1		1	
Yes	18.31 [6.54, 51.25]		9.85 [3.53, 27.44]		5.03 [2.00, 12.66]		3.13 [.83, 11.75]	
Smoking of partner BP		< .001		< .001				
No	1		1					
Yes	8.79 [6.94, 11.14]		6.78 [5.30, 8.68]					

Table 2 Continued

	Smoking BP				Smoking during the entire pregnancy			
	BM		MM		BM		MM	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Change in partner's smoking DP compared to BP						<.001		< .001
Did not smoke BP and DP					1		1	
Decreased or quit					5.53 [2.84, 10.76]		4.42 [2.33, 8.42]	
As much as or increased					9.87 [6.68, 17.49]		7.50 [4.05, 13.89]	

Note. The outcome variables were categorized as "smoking four weeks before pregnancy" (yes = 1; no = 0) and "smoking during the entire pregnancy (i.e., during all three trimesters)" (yes = 1; no = 0). BM = bivariate model; BP = before pregnancy; DP = during pregnancy; MM = multivariate model.

Table 3

Indicators Associated with Women who Successfully Quit Smoking During Pregnancy (n = 216) Versus Women who Did Not Successfully Quit Smoking During Pregnancy (n = 93) and with Women who Relapsed Postpartum (n = 97) Versus Women who Did Not Relapse Postpartum (n = 118)

	Successfully quitting smoking during pregnancy				**Relapsing postpartum**			
	BM		**MM**		**BM**		**MM**	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Maternal age		.09				.04		.17
18-24	.74 [.35, 1.58]				.61 [.20, 1.85]		.67 [.22, 2.08]	
25-29	1.29 [.72, 2.31]				1.77 [.82, 3.82]		1.55 [.76, 3.16]	
30-34	2.02 [1.04, 3.92]				.96 [.45, 2.02]		.92 [.43, 1.96]	
35+	1				1		1	
Educational level		< .001		.02		.08		
Low	1		1		2.58 [1.03, 6.46]			
Medium	1.79 [.94, 3.43]		1.98 [.94, 4.16]		1.80 [.93, 3.48]			
High	8.77 [3.78, 20.36]		4.33 [1.59, 11.84]		1			
Living situation		.14				.38		
Partner and children	1.49 [.88, 2.53]				1			
Other	1				1.31 [.71, 2.42]			
Ethnicity		.52				.52		
Dutch	.61 [.23, 1.60]				.62 [.21, 1.83]			
Other Western	.81 [.21, 3.14]				.42 [.09, 1.88]			
Other non-Western	1				1			

Table 3 Continued

	Successfully quitting smoking during pregnancy				Relapsing postpartum			
	BM		MM		BM		MM	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Intake of folic acid use		.12				.32		
No	1				.79 [.49, 1.27]			
Yes	.60 [.32, 1.14]				1			
Intake of folic acid use		.06				.54		
No	1				.68 [.19, 2.40]			
Yes	2.34 [.95, 5.76]				1			
Breastfeeding						.28		
No					1.34 [.78, 2.30]			
Yes					1			
Intensity of alcohol use BP		< .001		< .001		.34		
Non-drinkers	1		1		1			
1 glass	6.47 [2.79, 15.01]		5.76 [2.02, 16.39]		1.09 [.44, 2.74]			
≥ 2 glasses	6.73 [3.76, 12.04]		5.34 [2.37, 12.07]		.70 [.34, 1.47]			
Alcohol use DP		.91				.65		
No	1				1			
Yes	1.07 [.30, 3.80]				.72 [.18, 2.99]			
Cannabis use BP		.69				.14		
No	1				1			
Yes	.82 [.31, 2.16]				2.67 [.73, 9.80]			

Table 3 Continued

	Successfully quitting smoking during pregnancy				Relapsing postpartum			
	BM		MM		BM		MM	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Change in partner's smoking DP compared to BP		.006		.13				
Did not smoke BP and DP	2.31 [1.23, 4.32]		1.84 [.81, 4.19]					
Decreased or quit	1.94 [1.08, 3.48]		2.35 [.97, 5.66]					
As much as or increased	1		1					
Change in partner's smoking PP						.002		.005
Did not smoke at all					1		1	
Smoked BP or DP, but not PP					.15 [.30, 7.38]		.17 [.03, .85]	
Smoked PP					2.03 [1.07, 3.82]		1.94 [1.04, 3.63]	
Talked about smoking cessation with healthcare professionals DP		< .001		< .001		.49		
No	1		1		.71 [.26, 1.92]			
Yes	.10 [.06, .18]		.12 [.05, .27]		1			

Table 3 Continued

	Successfully quitting smoking during pregnancy				Relapsing postpartum			
	BM		MM		BM		MM	
Indicators	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***	**OR [95% CI]**	***p***
Use of smoking cessation support DP		.003		.006		.36		
No	1		1		.45 [.08, 2.50]			
Yes	.24 [.10, .60]		.18 [.06, .59]		1			

Note. The outcome variables were categorized as "Smoking before pregnancy, successfully quitting at some time during pregnancy through the end of the pregnancy (i.e., did not smoke in the third trimester)" (yes = 1; no = 0) and "Smoking before pregnancy, successfully quitting smoking during pregnancy (i.e., did not smoke during at least the third trimester), but relapsing postpartum" (yes = 1; no = 0). BM = bivariate model; BP = before pregnancy; DP = during pregnancy; MM = multivariate model; PP = postpartum.

Discussion

This study offers a different and unique perspective by drawing together risk and protective indicators for before, during, and after pregnancy as a combined analysis in one single sample. Moreover, a broad set of indicators was examined, including sociodemographic indicators, women's substance use, smoking behavior of the partner around pregnancy, and use of smoking cessation support. A major finding of this study is that the relationship between the partner's smoking status and the smoking status of women around pregnancy cannot be underestimated. Women who smoked before pregnancy were nearly seven times more likely to have a partner who smoked before pregnancy compared to women who did not smoke before pregnancy. Similarly, two-thirds of the women who smoked during the entire pregnancy also had a partner who smoked during pregnancy. Women who did (vs. did not) smoke during the entire pregnancy were 7.5 times more likely to have a partner who smoked as much as before pregnancy or increased smoking during pregnancy. In addition, women who did (vs. did not) smoke during the entire pregnancy were nearly 4.5 times more likely to have a partner who decreased their smoking or quit smoking during pregnancy. Finally, women who did (vs. did not) relapse postpartum were nearly twice as likely to have a partner who continued smoking postpartum. These findings are consistent with prior studies (Kia et al., 2018; Orton et al., 2018; Penn & Owen, 2002; Simmons et al., 2014; Xu et al., 2013) and provide more insight into the relationship between the timing of the partner's smoking behavior and maternal smoking status around pregnancy (e.g., women who smoked during the entire pregnancy were nearly 4.5 times more likely to have a partner who decreased their smoking or quit smoking during pregnancy compared to women who did not smoke during the entire pregnancy).

Another important finding of this study is the one that highlights the profound association between women's educational level and their smoking status before and during pregnancy. This study found that women who did (vs. did not) smoke before pregnancy were about three times more likely to have a low or medium educational level. In addition, women who did (vs. did not) smoke during the entire pregnancy were nearly 11.5 times more likely to have a low educational level and more than five times more likely to have a medium educational level. Conversely, women who did (vs. did not) successfully quit smoking during pregnancy were more than four times more likely to be highly educated. These findings are in line with previous studies (Härkönen et al., 2018; Kahn et al., 2002; Kia et al., 2018; Nur, 2017; Penn & Owen, 2002; Smedberg et al., 2014) and emphasize that more attention is needed to help women with a lower educational level to quit smoking before and during pregnancy.

With respect to the impact of maternal substance use on smoking around pregnancy, our findings showed that women who did (vs. did not) smoke before pregnancy

were nearly ten times more likely to have also used cannabis before pregnancy. This study adds to the evidence that cannabis and tobacco are concurrently used among women around pregnancy (El Marroun et al., 2008; Passey et al., 2014). The role of intensity of alcohol use before pregnancy on smoking around pregnancy was ambiguous. On the one hand, women who did (vs. did not) smoke before pregnancy were more likely to have a higher intensity of alcohol use before pregnancy. On the other hand, women who did (vs. did not) successfully quit smoking during pregnancy were more likely to have a higher intensity of alcohol use before pregnancy. Although women's educational level might play a role here (more educated individuals tend to drink more alcohol than less educated individuals; van Laar et al., 2018), the MM demonstrated that the relationship between intensity of alcohol use and women's smoking status is maintained even when taking women's educational level into account. Therefore, it is difficult to comprehend these mixed results, and more research is needed on the relationship between women's intensity of alcohol use before pregnancy and women's smoking behavior around pregnancy.

Two other contrasting findings of this study showed that women who did (vs. did not) successfully quit smoking during pregnancy had talked about smoking cessation with a healthcare professional during pregnancy less often and also used smoking cessation support during pregnancy less often. However, a Cochrane review revealed that smokers who quit smoking more often talked about smoking cessation with healthcare professionals (Stead, Buitrago et al., 2013). In addition, research has shown that smokers are much more likely to quit smoking when they receive smoking cessation support (e.g., telephone counseling; Stead et al., 2016). Our findings could be caused by a selection effect. That is, it may be the case that healthcare professionals mostly talked about smoking cessation with women who were more addicted to smoking and therefore found it more difficult to quit smoking. Likewise, smoking cessation support may have been mostly used by women who were more addicted to smoking.

Strengths and limitations

A major strength of this study concerns the recruitment strategy. In the Netherlands, nearly all parents visit YHC centers regularly so that their children's physical and social development can be monitored (Nederlands Centrum Jeugdgezondheid, 2018). Because women were recruited at YHC centers that were randomly selected at the city level, this study was able to recruit a sample that was largely representative of Dutch women with young children. Another strength is that we included some indicators (e.g., change in partner's smoking during and after pregnancy) in the analyses that, as far as we know, have not been examined before. Because of this, we were able to examine whether any change in partners' smoking around pregnancy affected women's smoking status around pregnancy. This investigation resulted in some new insights concerning the association between

partners' smoking behavior and women's smoking status around pregnancy (e.g., women were less likely to smoke during the entire pregnancy when their partner decreased their smoking or quit smoking during pregnancy compared to women whose partner smoked as much as or increased their smoking during pregnancy). These insights could be important for the development and/or improvement of smoking cessation and relapse prevention interventions that are tailored to this specific group. A limitation of this study is that the data were collected at one moment (i.e., cross-sectional), so no causal relations can be concluded. In addition, two of the examined indicators (i.e., alcohol use during pregnancy and change in partner's smoking postpartum) had cell values < 5 in some of the investigated groups (e.g., women who relapsed postpartum). Therefore, caution is needed in interpreting these results. A third limitation is that the data were selfreported and not biochemically validated. Biochemical validation was impossible due to the study design. In selfreport, an important source of underreporting is related to the social-desirability bias (Schneider & Schütz, 2008), which should be minimized as far as possible. The fact that 94.2% of the women who were approached agreed to participate in this study illustrates that they were willing to provide answers on this sensitive topic. Moreover, the questionnaires were completely anonymous (i.e., names and contact information were not collected) and the women filled in the questionnaires by themselves to further decrease such bias. A fourth limitation is that the data were retrospectively obtained, which could make them subject to recall bias. However, several studies have provided evidence that recall on smoking behavior during pregnancy is quite accurate (Ergin et al., 2014; Hensley Alford et al., 2009). Ergin et al. (2014) assumed that this accuracy is a result of the social stigma associated with smoking during pregnancy and the fact that pregnancy is experienced as an important life event.

Implications for practice

This study emphasizes the importance of having a smoke-free partner at all points around pregnancy. More specifically, our results suggest that it is essential that partners who smoke quit smoking before pregnancy and do not smoke during pregnancy. Still, when partners are not able or willing to quit smoking before or during pregnancy, it is pivotal for partners to be encouraged to quit smoking postpartum, since women who relapsed postpartum more often had a partner who continued smoking postpartum compared to women who did not relapse postpartum. Based on these findings, it might not be sufficient for healthcare professionals to address partners' smoking and provide them with effective cessation support exclusively during pregnancy. Instead, it is necessary for healthcare professionals to also address partners' smoking behavior and provide them with evidence-based cessation support before and after pregnancy. A systematic review found nine studies that tested smoking cessation interventions for partners of pregnant women (Hemsing et al., 2012). Only two of these studies (in which partners received

e.g. nicotine replacement therapy) yielded positive results on partner's smoking cessation (McBride et al., 2004; Stanton et al., 2004). However, there was no evidence that these results were maintained postpartum (i.e., one study did not examine this [Stanton et al., 2004], and the other study did not report these results [McBride et al., 2004]). The postpartum period could serve as a key time-point to provide smoking partners with cessation interventions, since at this time-point partners have a heightened awareness that being a smoker is in conflict with being a "good parent" (Flemming et al., 2015). Thus, further research should not exclusively focus on developing and examining smoking cessation interventions for partners during pregnancy. Instead, the main focus of further intervention research should be to examine how partners can abstain from smoking before and after pregnancy.

Finally, this study underlines that women who smoked before pregnancy more often used cannabis and/or had a high intensity of alcohol use before pregnancy than women who did not smoke before pregnancy. Research showed that concurrently continuing to both smoke and use other substances (such as alcohol and cannabis) during pregnancy can have serious adverse health effects for women's pregnancies and their fetuses (Viteri et al., 2015). In many cases, women do not know that they are pregnant during the first few weeks of their pregnancy. Therefore, in order to limit women's concurrent substance use during these early weeks of pregnancy, it is important that women of childbearing age who use substances concurrently receive information on the importance of quitting smoking and other substances before pregnancy.

CHAPTER 3

The effectiveness of smoking cessation interventions tailored to smoking parents of children aged 0-18 years old: A meta-analysis

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Authors contribution

T.S.-v.S. was responsible for the literature search, the data selection and extraction process, quality assessment, and reporting the study results. A.M. contributed to the data selection and extraction process and quality assessment. A.M., R.O., R.E., and M.K. reviewed and contributed to earlier versions of the manuscript. All authors read and approved the final manuscript.

Abstract

Introduction: A meta-analysis was conducted to examine the effectiveness of smoking cessation interventions tailored to parents of children aged 0–18 years.

Methods: A systematic search was carried out in PsycInfo, Embase, and PubMed in March 2020. A manual search of the reference lists of the included studies and systematic reviews related to the topic was also performed. Two authors independently screened the studies based on the following inclusion criteria: (a) effect studies with control groups that examine smoking cessation interventions tailored to parents of children (0–18 years); and (b) full-text original articles written in English and published between January 1990 and February 2020. In total, 18 studies were included in the analyses. The TiDieR checklist and the Cochrane Risk of Bias Tool 2.0 were used to extract data and to assess the risk of bias. Consensus among authors was reached at each stage.

Results: Random-effects meta-analyses were performed. With a total number of 8,560 parents, the pooled relative risk was 1.62 (95% CI = 1.38–1.90; $p < .00001$), showing a modest effect of the interventions on smoking cessation. Overall, 13.1% of the parents in the intervention conditions reported abstinence versus 8.4% of the parents in the control conditions.

Conclusion: Smoking cessation interventions tailored to parents are modestly effective. To increase the effectiveness and the impact of these interventions in terms of controlling tobacco use and public health, it is crucial for further research to explore how these interventions can be improved.

Introduction

Children's exposure to secondhand smoke (SHS) is a worldwide problem. Approximately half a billion children are exposed to SHS at home (Mbulo et al., 2016). Parental smoking in the home is a major source of children's exposure to SHS and thirdhand smoke (THS; Johansson et al., 2004; Matt et al., 2011). Ample evidence has illustrated that exposure to SHS leads to serious health consequences for infants, children, and adolescents (Hofhuis et al., 2003; Öberg et al., 2011; US Department of Health and Human Services, 2006). For example, children's exposure to SHS has been associated with sudden infant death syndrome, reduced lung function, and lower respiratory illnesses (Hofhuis et al., 2003; US Department of Health and Human Services, 2006). In addition to SHS, children can also be exposed to THS. THS "consists of residual tobacco smoke pollutants that remain on surfaces and in dust after tobacco has been smoked, are re-emitted into the gas phase, or react with oxidants and other compounds in the environment to yield secondary pollutants" (Matt et al., 2011, p. 1219). The presence of THS in the air, in dust, and on surfaces indicates that very young children are particularly vulnerable to THS due to crawling, hand-to-mouth and object-to-mouth behaviors, and playing near the floor (Acuff et al., 2016). To date, limited research has been published to identify the health consequences of exposure to THS in children (Acuff et al., 2016; Ferrante et al., 2013). However, it is known that THS leads to exposure to toxic tobacco smoke pollutants (Acuff et al., 2016; Ferrante et al., 2013). In addition to the health consequences of children's exposure to parental smoking, children of smoking parents are more likely to smoke in the future (Clergue-Duval et al., 2019; Otten et al., 2007). This emphasizes the need to protect children from exposure to parental smoking.

Multiple interventions that primarily focus on reducing children's exposure to SHS in the home have been developed, examined, and shown to be effective (e.g., Harutyunyan et al., 2013; Hovell et al., 2000). However, the gains of interventions aimed at reduction to SHS exposure may be limited compared to interventions that aim at parental smoking cessation. First, since the focus of these interventions is reduction of children's exposure to SHS and not parental smoking cessation per se, these interventions are not likely to eliminate the detrimental health consequences of smoking to parents themselves. In addition, SHS reduction interventions are also not likely to completely eliminate children's exposure to THS. However, when parents quit smoking, children's exposure to SHS and THS is eliminated (Johansson et al., 2004), the risk for children to start smoking diminishes (Bricker et al., 2003), and the odds of morbidity and mortality for parents themselves decrease (Doll et al., 1994). Third, interventions that primarily focus on parental smoking cessation, instead of on reduction of children's exposure to SHS and parental smoking cessation, have also been shown to be relatively more effective (Rosen et al., 2012). Fourth, research has shown that many parents want to quit smoking and even try to quit smoking

(Hymowitz et al., 2005). In brief, based on this evidence, it is essential to examine interventions that exclusively aim at parental smoking cessation and not at reducing children's exposure to SHS. Parental smoking cessation may not be different from adult smoking cessation per se. However, the motivation to quit smoking could be different among parents than among other adult smokers (e.g., parents want to quit smoking because of their children's health; Halterman et al., 2010; Kanis et al., 2014).

To date, multiple interventions that mainly aim at parental smoking cessation have been examined. Several (systematic) reviews and meta-analyses have assessed parental smoking cessation rates of SHS reduction and cessation interventions (Rosen et al., 2012, 2014, 2015; Tyc et al., 2008). To our knowledge, only one meta-analysis (performed in 2012) examined interventions in which parental smoking cessation was the main objective (Rosen et al., 2012). However, this analysis was carried out as a subgroup analysis and included only five studies. Since 2012, several new studies (e.g., Borrelli et al., 2016; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014) have been published, which requires an update. In addition, this previous meta-analysis focused on interventions tailored to parents of young children (aged between 0 and 6 years), thereby limiting the contribution as the effects of parental smoking are not limited to early childhood and the level of children's exposure to parental smoking increases when children become older (Abbott & McCarthy, 2009; ter Weijde et al., 2015). To summarize, there is a gap in evidence on the effectiveness of interventions that mainly aim at parental smoking cessation. Because of this gap and the potential of these interventions to eliminate the detrimental health consequences of smoking and exposure to smoking, the aim of this meta-analysis was to examine effect studies testing interventions (e.g., telephone counseling) that mainly aim at helping parents (of children and adolescents aged 0–18 years) to quit smoking.

Methods

Search strategy and data selection process

This study was conducted in accordance with the PRISMA statement (Moher et al., 2009) and registered in the Prospero database of systematic reviews (registration No. CRD42018086797). In collaboration with the first author, a professional information expert in searches for systematic reviews performed a systematic literature search in PsycInfo, Embase, and PubMed in March 2020. The search terms that were used included a combination of terms for parents, cessation, program, and smoking. In addition, a manual search of the reference lists of the included studies, systematic reviews, and meta-analyses related to our topic was performed. To be included, the studies had to be: (a) effect studies (e.g., randomized controlled trials; RCTs) with control groups that examined smoking cessation interventions tailored to current parents (of children and adolescents 0–18 years old); (b) studies

of which the primary outcome was smoking cessation (e.g., self-reported 7-day point prevalence abstinence; PPA) and not reduction in children's exposure to SHS or relapse prevention; and (c) full-text original articles written in English and published between January 1990 and February 2020. Studies that involved cessation interventions for pregnant women were excluded because pregnant women who smoke are a specific target group and more likely to have multiple and complex problems in addition to their nicotine addiction (e.g., family and financial problems; DiClemente et al., 2009). Studies that aimed at both smoking cessation and relapse prevention/reduction in SHS exposure were only included if smoking cessation was the primary outcome. In cases where full-text articles were not available, attempts were made to obtain the full-text articles from the authors.

Figure 1

PRISMA Study Flow Diagram

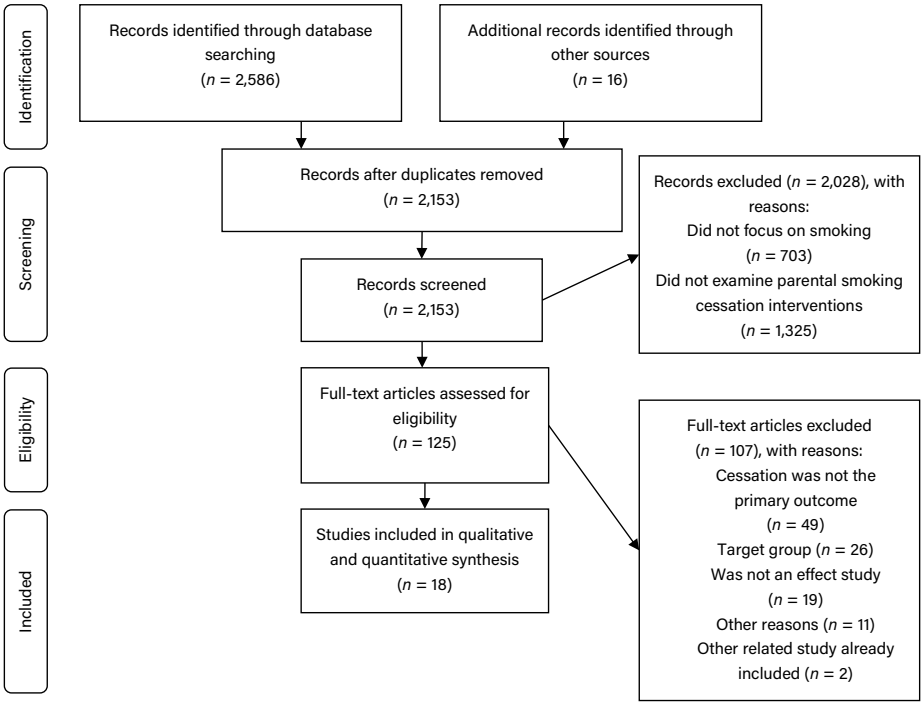


Figure 1 presents the PRISMA study flow diagram (Moher et al., 2009). After excluding duplicates, the titles and abstracts of 2,153 studies were independently screened by two authors (T.S.-v.S. and A.M.) based on the inclusion criteria (agreement: 95.8%; Cohen's kappa = .55). If there were any doubts about the eligibility of studies, studies were included for full-text screening. At this stage, 2,028 studies were excluded. The full text of the remaining 125 potential eligible studies were independently read by the

same 2 authors and checked for inclusion (agreement: 89.6%; Cohen's kappa = .72). Of these 125 studies, 107 were excluded due to various reasons (see Figure 1). Overall, 18 studies were included in the subsequent analyses. Any disagreements between the two screening authors throughout the data selection process were resolved by discussion and, if necessary, by consulting a third author (R.O. or M.K.).

Data extraction process and risk of bias assessment

One author (T.S.-v.S.) used the TiDieR checklist (Hoffmann et al., 2014) to extract data from the 18 included articles. For four studies (Abudullah et al., 2005; Caldwell et al., 2018; Hannöver et al., 2009; Severson et al., 1997), four other articles were also used for the data extraction (Abdullah et al., 2004; Thyrian et al., 2006; Tingen et al., 2013; Wall et al., 1995). A second author (A.M.) and a research assistant checked whether the data extraction was done correctly (each checked approximately half of the articles). The following data were extracted concerning the study characteristics: authors, year of publication, methodological and sample characteristics (e.g., study design, country, age of parents, sample size), and primary outcomes and measurements (e.g., measurement method and biochemical validation; see Table 1). In addition, a variety of intervention characteristics were extracted (e.g., theories or theoretical principles, providers, activities, and materials; see Table 2). The following data were extracted for the overall statistical analysis: number of parents in the intervention and control conditions, and number of parents that reported abstinence in the intervention and control conditions.

In addition, for the four subgroup analyses the following data were extracted: (a) theoretical basis of the intervention (yes/no); (b) provision of nicotine replacement therapy (NRT) during the intervention (yes/no); (c) risk of bias judgement (low risk of bias/some concerns about bias/high risk of bias), and (d) intervention that parents in the control condition received (passive/active). Interventions that were provided to the control condition (e.g., a self-help brochure) were categorized as "active" if the interventions focused on smoking cessation. In contrast, if the interventions did not focus on smoking cessation, they were categorized as "passive."

The risk of bias was assessed using the Cochrane Risk of Bias Tool 2.0 (Higgins et al., 2016). Two authors (T.S.-v.S. and A.M.) independently assessed the risk of bias at outcome level for the 17 studies on three levels (i.e., low risk of bias, some concerns about bias, and high risk of bias). Because the authors of one of the included studies (Scheffers-van Schayck, Otten et al., 2019) were for the greater part also involved in the present meta-analysis, the risk of bias assessment was conducted by two independent researchers. More specifically, the 18 studies were assessed on the following criteria: (a) randomization process (i.e., randomization and concealment); (b) blinding of participants, caretakers, and research staff; (c) missing outcome data; (d) measurement of the outcome, and (e) selection of the reported results.

Disagreements between the authors in the process of data extraction and risk of bias assessment were resolved through discussion and, if necessary, by consulting a third author (R.O. or M.K.). Moreover, if important information was not reported in a given article, the authors of that study were contacted for additional information.

Statistical analyses

To examine the effectiveness of smoking cessation interventions tailored to parents, meta-analyses were carried out by computing relative risks (RR; using random-effects meta-analyses and the Mantel-Haenszel method) in Review Manager (version 5.3). In addition, four pre-specified subgroup analyses and two sensitivity analyses were performed.

In order to include primary outcomes that were as consistent as possible, we selected 7-day PPA (or an outcome that most closely resembled 7-day PPA; e.g. 30-day PPA) if a study had multiple cessation outcomes. If outcomes were measured at multiple time points, we decided to include the outcome that was assessed at the latest follow-up, which conforms with other related meta-analyses (Rosen et al., 2012, 2014). The cessation outcomes that were included in our meta-analyses were not always reported as the primary cessation outcomes in the selected studies (see Table 3 for the outcomes that were included in the meta-analysis). Because only a few studies carried out a biochemical validation and we preferred for the outcomes to be as consistent as possible, we chose not to include outcomes that were biochemically validated. If only the results of complete case analyses were reported in the studies, the results concerning the cessation rates were adapted (i.e., missing values at follow-up are recorded as "smoker"). Three of the included studies (Borrelli et al., 2016; Groner et al., 2000; Yu et al., 2017) were 3-arm RCTs that included two intervention conditions. Based on the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins & Green, 2011), we decided to combine the cessation rates of the two intervention conditions in the first two studies, since the rates did not significantly differ (Groner et al., 2000; Yu et al., 2017). With respect to the third study (Borrelli et al., 2016), the effectiveness of the smoking cessation intervention was only tested between two (and not three) conditions, so no adaptations had to be made. Two other included studies were cluster-RCTs (Caldwell et al., 2018; Severson et al., 1997). Based on the *Cochrane Handbook* (Higgins & Green, 2011), we decided to apply the intraclass correlation of 0.0009 for quitting, as reported by Severson et al. (1997), to the results of the two cluster RCTs to verify for potential biases. To test heterogeneity, the I^2 statistic, the 95% confidence intervals (CI) of the effect sizes for each study, and the χ^2 test were inspected. If the χ^2 test was insignificant ($p > .05$), $I^2 < 30\%$, and the CIs overlapped, there was considered to be no heterogeneity. Funnel plots were created to explore potential publication bias and Egger's test and rank correlation tests were carried out to statistically test the possibility of

publication bias. If the funnel plot was asymmetrical and the tests were significant ($p < .05$), there was considered to be publication bias.

With respect to the additional statistical analyses, four pre-specified subgroup analyses were carried out based on prior research (Rosen et al., 2012, 2014): (a) theoretical basis of the intervention (yes/no); (b) provision of NRT during the intervention (yes/no); (c) risk of bias judgement (low risk/some concerns/high risk), and (d) intervention received by parents in the control condition (passive/active). Moreover, to test whether the results of the meta-analysis were robust, sensitivity analyses were performed by replicating the analyses: (a) without the three studies for which the operationalization of the cessation rates was unclear (Caldwell et al., 2018; Ralston & Roohi, 2008; Yu et al., 2017), and (b) with the studies that also reported the results of the complete case analyses (Borrelli et al., 2010; Caldwell et al., 2018; Chan et al., 2005, 2017; Curry et al., 2003; Mahabee-Gittens et al., 2008; Schuck, Bricker et al., 2014; Yu et al., 2017).

Results

Description of included studies

Table 1 provides an overview of the characteristics of the studies included in this meta-analysis. All 18 studies were RCTs, divided into 16 individual RCTs (of which two were pilot-RCTs; Chan et al., 2005; Mahabee-Gittens et al., 2008) and two cluster-RCTs (Caldwell et al., 2018; Severson et al., 1997). Although most studies had two conditions, three studies had three conditions (Borrelli et al., 2016; Groner et al., 2000; Yu et al., 2017). There were also some small differences in the recruitment settings used. In total, 13 studies recruited parents via a healthcare setting (Abdullah et al., 2005; Chan et al., 2005, 2008, 2017; Curry et al., 2003; Groner et al., 2000; Hannöver et al., 2009; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008; Ralston et al., 2013; Severson et al., 1997; Winickoff et al., 2010; Yu et al., 2017), two studies recruited parents via schools (Caldwell et al., 2018; Schuck, Bricker et al., 2014), and three studies recruited parents via various settings (Borrelli et al., 2010, 2016; Scheffers-van Schayck, Otten 2019). In addition, the included studies differed by publication date (one before 2000 [Severson et al., 1997], eight between 2000 and 2009 [Abdullah et al., 2005; Chan et al., 2005, 2008; Curry et al., 2003; Groner et al., 2000; Hannöver et al., 2009; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008], and nine in or after 2010 [Borrelli et al., 2010, 2016; Caldwell et al., 2018; Chan et al., 2017; Ralston et al., 2013; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014; Winickoff et al., 2010; Yu et al., 2017]), the country in which the studies were conducted (ten in the USA [Borrelli et al., 2010, 2016; Caldwell et al., 2018; Curry et al., 2003; Groner et al., 2000; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008; Ralston et al., 2013; Severson et al., 1997; Winickoff et al., 2010], five in China [Abdullah et al., 2005; Chan et al., 2005, 2008, 2017; Yu et al., 2017], two

in the Netherlands [Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014], and one in Germany [Hannöver et al., 2009]), and the sample sizes (from 42 [Ralston & Roohi, 2008] to 2,901 parents [Severson et al., 1997]). Finally, the majority of studies focused on the smoking behavior of both fathers and mothers (Abdullah et al., 2005; Borrelli et al., 2010, 2016; Caldwell et al., 2018; Chan et al., 2005; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008; Ralston et al., 2013; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014; Winickoff et al., 2010), while seven studies only focused on maternal (n = 4, Curry et al., 2003; Groner et al., 2000; Hannöver et al., 2009; Severson et al., 1997) or paternal smoking behavior (n = 3, Chan et al., 2008, 2017; Yu et al., 2017).

Description of the interventions

Table 2 presents an overview of the characteristics of the interventions that were examined in the included studies. The majority (n = 15) of the interventions were delivered face-to-face (Borreli et al., 2010, 2016; Caldwell et al., 2018; Chan et al., 2005, 2008, 2017; Curry et al., 2003; Groner et al., 2000; Hannöver et al., 2009; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008; Ralston et al., 2013; Severson et al., 1997; Winickoff et al., 2010; Yu et al., 2017). All interventions included multiple sessions (face-to-face and/or telephone), except for three interventions that included only one session (Groner et al., 2000; Ralston & Roohi, 2008; Ralston et al., 2013). In addition, most interventions had a theoretical base or rationale. Only two studies did not report any information on this (Severson et al., 1997; Yu et al., 2017). In less than half (n = 7) of the interventions, parents received some form of NRT (or were encouraged to use NRT; Borrelli et al., 2010, 2016; Caldwell et al., 2018; Chan et al., 2017; Ralston & Roohi, 2008; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014). Finally, 12 studies reported some information on tailoring of the intervention to parents (Abdullah et al., 2005; Borrelli et al., 2010; Caldwell et al., 2018; Chan et al., 2005; Curry et al., 2003; Hannöver et al., 2009; Mahabee-Gittens et al., 2008; Ralston et al., 2013; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014; Severson et al., 1997; Winickoff et al., 2010).

Risk of bias assessment

The risk of bias assessment of the 18 included studies can be found in Table 3. Both the judgement for all criteria and the overall judgement are depicted. As illustrated in Table 3, 15 studies scored "some concerns." All three of the other studies scored "high risk" on the overall judgement because an urn randomization procedure was carried out (Borrelli et al., 2016) or because baseline imbalances were found on smoking-related variables between the conditions (Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008).

Table 1
Study Characteristics, Methods, and Results of the 18 Included Studies (Alphabetically Ordered)

General information	Methods				
First author; year; country	**Study design**	**N[a]**	**Recruitment setting**	**Target group**	**Gender (% males)**
Abdullah; 2005; China	2-arm RCT	903	Healthcare setting and another research project	Daily or occasional smoking parents of children aged 5 years	84.3%
Borrelli; 2010; United States	2-arm RCT	133	Healthcare setting, mass media, other research projects, other participants, and other sources	Daily smoking parents of children with asthma (< 18 years)	27.1%
Borrelli; 2016; United States	3-arm RCT	560	Healthcare setting and community	Daily smoking parents of children with asthma or healthy children (3–17 years)	17.9%
Caldwell; 2018; United States	2-arm cluster-RCT	453 (smoking parents: 110)[d]	School setting	Smoking and non-smoking parents of children in fourth grade	IC: 11% CC: 10%
Chan; 2005; China	2-arm pilot RCT	80	Healthcare setting	Daily smoking parents of sick children	73.8%
Chan; 2008; China	2-arm RCT	1,483	Healthcare setting	Non-smoking mothers who had a current smoking partner and a sick child	0%
Chan; 2017; China	2-arm RCT	1,158	Healthcare setting	Parents of infants (0–18 months) of whom the mothers did not smoke and the fathers smoked daily	50%

						Results
	Age	CC	PO[b]	Biochemical validation PO	Type of measure-ment PO	Cessation rates PO
	≤ 35 years: 34.7%; 36–45 years: 54.6%; ≥ 46 years: 10.7%	One stage-matched self-help materials	Self-reported 7-day PPA at 6-month FU	Yes	TI	IC: 15.3%; CC: 7.4%; OR = 2.1 [95% CI = 1.4, 3.4]
	M = 36.8 years; *SD* = 9.6 years	There was no CC in this study. This study had two IC	Self-reported 7-day PPA at 3-month FU	Yes	Q	PAM-IC: 22.0%; BAM-IC: 18.4%; OR = 1.25 [95% CI = 0.53, 2.92]
	M = 35.4 years; *SD* = 1.0 year	There was no CC in this study[c]	Self-reported 30-day PPA at 4-month FU	Yes	Q	PAM-IC: 18.2%; Enhanced-PAM-IC: 9.9%; OR: 2.12 [95% CI = 1.09, 4.12][c]
	IC: *M* = 39.4 years; *SD* = 16 years; CC: *M* = 36.6 years; *SD* = 9 years	Self-help materials on smoking cessation	Self-reported quit status at 48-month FU	Yes	Q	IC: 41%; CC: 13%; $p < .001$[e]
	25–34 years: 27.5%; 35–44 years: 45.0%; 45–58 years: 27.5%	Healthy diet counseling for parents of sick children	Self-reported 7-day PPA at 1-month FU	No	TI	IC: 7.5%; CC: 2.5%; $p = .62$
	80.8% of the fathers were between 31 and 50 years	Usual care	Self-reported 7-day PPA at 12-month FU	No	TI	IC: 11.3%; CC: 9.3%; $p = .21$
	IC: *M* = 31.3 years (mothers)/ *M* = 35.7 years (fathers); CC: *M* = 31.2 years (mothers)/ *M* = 35.4 years (fathers)	Self-help materials on smoking cessation and a brief advice	Self-reported 7-day PPA at 12-month FU	Yes	TI	IC: 13.7%; CC: 8.0%; OR = 1.92 [95% CI = 1.16, 3.17]

Table 1 Continued

General information	Methods				
First author; year; country	**Study design**	**N[a]**	**Recruitment setting**	**Target group**	**Gender (% males)**
Curry; 2003; United States	2-arm RCT	298	Healthcare setting	Smoking mothers	0%
Groner; 2000; United States	3-arm RCT	479	Healthcare setting	Daily smoking mothers of children (< 12 years)	0%
Hannöver[f]; 2009; Germany	2-arm RCT	642	Healthcare setting	Mothers who had recently given birth and smoked regularly (or had smoked regularly before and/or during pregnancy)	0%
Mahabee-Gittens; 2008; United States	2-arm pilot RCT	356	Healthcare setting	Current smoking parents/legal guardians of children ≤ 18 years	21%
Ralston; 2008; United States	2-arm RCT	42	Healthcare setting	Daily smoking parents of children who were hospitalized for respiratory illness	IC: 48%; CC: 34%

						Results
	Age	**CC**	**PO[b]**	**Biochemical validation PO**	**Type of measure-ment PO**	**Cessation rates PO**
	M = 34 years	No information	Self-reported 7-day PPA at 12-month FU	Yes	TI + in person survey	IC: 13.5%; CC: 6.9%; OR = 2.77 [95% CI = 1.24, 6.60]
	16 years and older	Age-appropriate child safety information and corres-ponding hand-outs	Self-reported 7-day PPA at 6-month FU	No	TI + Q	This study had two IC. Cessation rate of all mothers: 3.7%. No significant differences between the three conditions
	M = 25.9 years; *SD* = 5.5 years	Self-help materials on smoking cessation	Self-reported 4-week PPA at 24-month FU	No	TI + Q	IC: *n* = 151; CC: *n* = 187; IC: 9%; CC: 4%; Difference in proportions: 4.3% [95% CI = -0.9, 10.3][e]
	M = 31.9 years; *SD* = 9.2 years	Usual care, no specific information on smoking cessation	Repeated self-reported 7-day PPA at 6-week and 3-month FU	No	TI	IC: 4.2%; CC: 1.7%; OR = 2.58 [95% CI = 0.56, 12.0]
	IC: Age ≥ 25 years: 76%; CC: Age ≥ 25 years: 71%	A brief anti-smoking message and referral to the state's quitline	Self-reported quit status at 6-month FU	No	Q	IC: 14% [95% CI = 3, 36]; CC: 5% [95% CI = 0.1, 24]

3

Table 1 Continued

General information	Methods				
First author; year; country	**Study design**	**N[a]**	**Recruitment setting**	**Target group**	**Gender (% males)**
Ralston; 2013; United States	2-arm RCT	60	Healthcare setting	Daily smoking parents of children who were hospitalized	IC: 20%; CC: 34%
Scheffers-van Schayck; 2019; the Netherlands	2-arm RCT	83	Healthcare setting, school setting, and online mass media	Daily or weekly smoking parents of children 0-18 years	42.2%
Schuck; 2014; the Netherlands	2-arm RCT	512	School setting	Daily or weekly smoking parents of children 9-12 years	47.5%
Severson[g]; 1997; United States	2-arm cluster RCT	2,901	Healthcare setting	Mothers (current smokers or recent quitters) of newborns	0%
Winickoff; 2010; United States	2-arm RCT	101	Healthcare setting	Parents (current smokers or recent quitters) of newborns	IC: 33%; CC: 34%

						Results
	Age	**CC**	**PO[b]**	**Biochemical validation PO**	**Type of measure-ment PO**	**Cessation rates PO**
	IC: *M* = 29.9 years; CC: *M* = 28.3 years	Age-appropriate written patient education and safety recommen-dations	Self-reported ≥ 7-day PPA at 2-month FU	No	TI	IC: 17% [95% CI = 7 – 34]; CC: 20% [95% CI = 9, 38]
	M = 39.2 years; *SD* = 7.2 years	Self-help materials on smoking cessation	Self-reported 7-day PPA at 3-month FU	Yes	Q	IC: 53.3%; CC: 13.2%; OR = 7.54 [95% CI = 2.49, 22.84]
	M = 42.2 years; *SD* = 5.4 years	Self-help materials on smoking cessation	Self-reported 7-day PPA at 12-month FU	Yes	Q	IC: 34.0%; CC: 18.0%; OR = 7.54 [95% CI = 1.76, 4.49]
	IC: *M* = 25.7 years; *SD* = 5.8 years; CC: *M* = 25 years; *SD* = 5.6 years	Self-help materials on the conse-quences of SHS	Repeated self-reported 7-day PPA at 6- and 12-month FU	No	Q	IC: *n* = 1,073; CC: *n* = 802; IC: 2.3%; CC: 1.2%; $\chi^2 = 2.94$ $p < .05$[e]
	IC: median age: 28 years; CC: median age: 30 years	Usual care	Self-reported 7-day PPA at 3-month FU	Yes	TI	IC: *n* = 33; CC: *n* = 33; IC: 15%; CC: 9%; $p > .05$[e]

Table 1 Continued

General information	Methods				
First author; year; country	**Study design**	**N[a]**	**Recruitment setting**	**Target group**	**Gender (% males)**
Yu; 2017; China	3-arm RCT	342[d]	Healthcare setting	Smoking fathers and non-smoking mothers of newborns	49.6%

Note. CC = control condition; FU = follow-up; ; IC= intervention condition; PO = primary outcome; PPA = point-prevalence abstinence; Q = questionnaire; RCT = randomized controlled trial; SHS = secondhand smoke; TI = telephone interview.

[a] Table 1 presents the number of parents who were included in the statistical analyses of the studies.

[b] Table 1 presents the primary outcomes that were reported in the studies. In case it was unclear what the primary cessation outcomes were, 7-day PPA (or an outcome that most closely resembled 7-day PPA; e.g. 30-day PPA) was reported as primary outcome in Table 1. If cessation outcomes were measured at multiple time points, results assessed at the latest FU were reported as primary outcome in Table 1. The primary cessation outcomes that were reported in the studies were not always included in our meta-analyses (see Table 1 for the outcomes that were included in the meta-analysis).

[c] This study had three conditions, but the interventions were only tested in two conditions. For the purpose of this meta-analysis, only the cessation rates between the two intervention conditions are reported.

[d] Complete case analyses (and no intention-to-treat analyses) were carried out in this study.

[e] The results reported concern parents who smoked at enrollment.

						Results
	Age	**CC**	**PO**[b]	**Biochemical validation PO**	**Type of measure-ment PO**	**Cessation rates PO**
	Fathers: *M* = 31.8 years; *SD* = 4.5 years; Mothers: *M* = 29.6 years; *SD* = 3.8 years	Usual care with no information on SHS and smoking cessation	Self-reported quit status at 12-month FU	No	Q	This study had two IC. IC-1: 16.7%; IC-2: 22.7%; CC: 9.7%; IC-2 vs. IC-1: OR = 1.38 [95% CI = 0.67, 2.84]; IC-2 vs. CC: OR = 2.93 [95% CI = 1.24, 6.94]; IC-1 vs. CC: OR = 2.13 [95% CI = 0.88, 5.15]

[f] Hannöver et al. (2009) and Thyrian et al. (2006) examined the same intervention. Only the results of Hannöver et al. (2009) were included in the meta-analysis, because these cessation outcomes were assessed at a later FU. Additional information on the enrollment and intervention was found in Thyrian et al. (2006).

[g] Severson et al. (1997) and Wall et al. (1995) examined the same intervention. Only the results of Severson et al. (1997) were included in the meta-analysis, because these cessation outcomes were assessed at a later FU. Additional information on the sample, enrollment, and intervention was found in Wall et al. (1995).

Table 2
Intervention Characteristics of the 18 Included Studies (Alphabetically Ordered)[a]

First author (year)	Theoretical base or rationale	Mode of delivery	Sessions (number / duration)	Short description
Abdullah (2005)	TMC; 5Rs	Telephone; self-help materials	three telephone counseling sessions (20-30 minutes); hotline available if needed	Counselors adopted a non-directive approach (including enhancing parent's stage of readiness in quitting smoking) and addressed several topics on cessation
Borrelli (2010)	SCT; MI; clinical guidelines for smoking cessation; Elicit-Provide-Elicit Process	Face-to-face; telephone; self-help materials	three home visits; one phone call (5–10 minutes)	This study had two intervention conditions: BAM & PAM. BAM focused on increasing the parent's self-efficacy to quit smoking through teaching; PAM focused on increasing risk perception by using graphical and verbal feedback on the parent's carbon monoxide level and the child's SHS exposure level. Parents were also motivated to quit smoking and strategies for quitting were discussed
Borrelli (2016)	MI	Face-to-face; telephone	two home visits (1 hour); 6 telephone calls (15–20 minutes)	This study had two intervention conditions: PAM & enhanced-PAM. Both: two home visits on smoking cessation and asthma (e.g., by providing graphical and verbal feedback parent's carbon monoxide level). Four months later, parents received six telephone calls on asthma symptoms and management; enhanced-PAM: parents received smoking cessation counseling (including e.g. MI and building readiness/ confidence for change) and a second round of exposure to SHS feedback (i.e., comparing the SHS value that was obtained during the home visits to the current SHS value)

	NRT	Training providers	Tailoring	Fidelity
	No	4-day training course on smoking cessation; counselors had to pass a final assessment in order to give counseling	Tailored to the parent's needs, queries, and stage of change	10% of the calls were audio recorded and evaluated for accuracy and completeness, which was satisfactory
	Yes	Counselor was trained in MI and the protocol; skill acquisition was determined by observation of counseling behaviors	PAM was designed to be consistent with the values of the Latino culture	Weekly supervision between counselor and trainers; a weekly review of patient exit interviews, counseling sessions, and documentation of intervention components delivered
	Yes	Counselors were trained using e.g. role-plays and a written treatment protocol; skill acquisition was determined by intervention delivery with pilot participants; 20% of the sessions was weekly reviewed with counselors	No information	Best practice guidelines were followed; sessions were coded using the MITIC by three coders

Table 2 Continued

First author (year)	Theoretical base or rationale	Mode of delivery	Sessions (number / duration)	Short description
Caldwell (2018)	MI	Face-to-face; telephone (optional); self-help materials	eight sessions (10–15 minutes; telephone or at schools/local community settings)	In the sessions, multiple communication strategies were applied (e.g., reflective listening)
Chan (2005)	Standardized six-step approach for motivating health behavior change	Face-to-face; telephone	One face-to-face session (30 minutes) at the HCC; one phone call after a week	The session included: (a) an assessment of parent's stage of readiness; (b) the standardized six-step approach for motivating health behavior change; (c) an appropriate stage-matched intervention to increase motivation and decrease resistance to quit; the aim of the phone call was to check on parents' progress in smoking cessation
Chan (2008)	TPB	Face-to-face; self-help materials; telephone	One face-to-face session; one phone call after a week	The intervention was provided to non-smoking mothers whose partners smoked and included: (a) education on the health risks of passive smoking exposure for sick children (mothers were motivated to advise their partners to quit smoking); (b) a routine procedure, including: a 5-minute standardized health advice on SHS, self-help materials for mothers and partners, and a 1-week telephone follow-up

	NRT	Training providers	Tailoring	Fidelity
	Yes	Counselors were trained in MI and had extensive experience with patient counseling; counselors used a scripted protocol to provide the sessions	Tailored to parents and their individual needs and readiness to change; matched sex/racial/ethnically counselor	No information
	No	The provider was a trained nurse counselor	Stage-matched intervention on smoking cessation	No information
	No	The providers were nurses	No information	No information

Table 2 Continued

First author (year)	Theoretical base or rationale	Mode of delivery	Sessions (number / duration)	Short description
Chan (2017)	TMC; SCT; SET	Face-to-face; telephone; self-help materials	Both: family counseling session (optional) Mothers: one face-to-face session at the HCC and two telephone sessions (30 minutes) Fathers: three telephone sessions (30 minutes)	The intervention was provided to daily smoking fathers and non-smoking mothers. The self-help materials and counseling sessions focused on smoking cessation. The optional family counseling session had several aims, including establishing mutual support between parents
Curry (2003)	MI; 3As	Face-to-face; self-help materials; telephone	Brief message from clinician during visit at the HCC and one face-to-face session at the clinic and up to three phone calls from nurses / study interventionists	Clinicians provided: (a) a brief motivational message to inform mothers about smoking and SHS and the health consequences; (b) a self-help brochure on smoking cessation; (c) asked mothers to have an in-person motivational interview with a nurse for a few minutes after the child's visit. Nurses/study interventionists: (a) had an-person motivational interview to motivate mothers to consider quitting smoking; (b) provided up to three telephone counseling calls that encouraged mothers to read the self-help brochure, boost their motivation to quit smoking, and provided technical assistance to quit smoking

	NRT	Training providers	Tailoring	Fidelity
	Yes	Nurse counselors with extensive training and experience in smoking cessation	No information	No information
	No	70 clinicians received individual training (e.g., role-playings). The motivational interview and telephone counseling was delivered by nurses and study interventionists who received individual training (eight hours) and an extensive intervention manual	Tailored to mothers by the 10 intervention goals that were based on mothers' readiness to quit smoking	Quarterly in-person lunch meetings; biweekly supervision by telephone; counselors needed to complete visit and telephone call summary sheets on the intervention components that were delivered. These sheets were reviewed

Table 2 Continued

First author (year)	Theoretical base or rationale	Mode of delivery	Sessions (number / duration)	Short description
Groner (2000)	HBM	Face-to-face; self-help materials	One face-to-face session at the HCC	This study had two intervention conditions: Child Health Group (CHG) and Maternal Health Group (MHG). Both interventions included self-help materials on smoking cessation. CHG: counseling session on the hazards of SHS on children, but not on the mothers' health. MHG: counseling session on the effects of smoking on their mothers' health, not on the children's health
Hannöver (2009)	MI; relapse prevention; TMC	Face-to-face; telephone; self-help materials	One face-to-face session at home (up to 45 minutes) and two telephone sessions (up to 45 minutes)	The counseling sessions included balancing of the pros and cons of smoking, the health consequences of smoking and exposure to SHS, self-efficacy for behavior change, exploring high-risk situations and relapse prevention strategies, and the abstinence violation effect
Mahabee-Gittens (2008)	5As; 5Rs	Face-to-face; telephone; self-help materials	One face-to-face session (10–15 minutes) at HCC and one telephone session (optional)	In the face-to-face session, parents were encouraged to quit smoking and their readiness to quit smoking was assessed. Parents who were interested in quitting in the next six months received a brief description of the state's quitline and were asked about interest in referral. Parents who did not want to be referred received tobacco cessation brochures
Ralston (2008)	Clinical Practice Guideline (Treating Tobacco Use and Dependence)	Face-to-face	One message (> 10 minutes) during a face-to-face session (> 30 minutes)	An extensive anti-smoking message that included practical counseling with an emphasis on problem solving and inclusion of pharmacotherapy

	NRT	Training providers	Tailoring	Fidelity
	No	A trained research nurse provided the counseling session	No information	No information
	No	Counselors were trained and had weekly supervision meetings with a supervisor to ensure adherence to the intervention strategy using recorded counseling sessions	Tailored to mothers' stage of change	Counseling sessions were recorded. The MITIC was used to evaluate the counselor's adherence to the MI (overall rated as proficient to expert quality)
	No	Counseling session was delivered by the principal investigator or trained clinical research coordinator. The quitline was delivered by counselors of the Ohio Quitline	Parents who were called by the quitline received information and/or counseling that was tailored to their stage of change	No information
	Yes	A pediatric hospitalist who received smoking cessation counseling training from a certified tobacco educator	No information	No information

Table 2 Continued

First author (year)	Theoretical base or rationale	Mode of delivery	Sessions (number / duration)	Short description
Ralston (2013)	MI; Clinical Practice Guidelines (Treating Tobacco Use and Dependence)	Face-to-face and self-help materials	One face-to-face message (< 10 minutes) during child's hospitalization	Parents received (a) a brief message and self-help materials on smoking cessation; (b) a referral card of the state quitline with a recommendation to call the quitline within two months; (c) age-appropriate written patient education and safety recommendations
Scheffers-van Schayck (2019)	MI	Telephone; self-help materials	Six telephone sessions (20 minutes) during 10 weeks	Multiple topics were discussed during the counselor-initiated telephone sessions (e.g., cravings). Parents received the self-help brochure on smoking cessation at the start of the counseling. This brochure included didactic information about smoking cessation, motivational messages, exercises, and tips
Schuck (2014)	Cognitive behavioral skill-building and MI	Telephone; self-help materials	Up to seven telephone sessions during three months (intake session: 30 minutes; follow-up sessions: 10 minutes)	Counselor-initiated telephone sessions and three tailored supplementary brochures on smoking cessation that provided motivational messages, didactic information, tips and advice, and 'parent-relevant information' (e.g., effects of SHS on children)
Severson (1997)	No information	Self-help materials; face-to-face; videotape	Four face-to-face sessions at the HCC	During the face-to-face sessions, women received self-help materials on e.g. detrimental health effects of SHS and hints for quit strategies. Mothers also received oral counseling (e.g., brief advice). A videotape was shown to mothers on potential adverse health effects of smoking and benefits of quitting

NRT	Training providers	Tailoring	Fidelity
No	A pediatric hospitalist who received training in smoking cessation counseling and MI from certified trainers	Tailored to the parent's stage of change	No information
Yes	Counselor was thoroughly trained, experienced, and certified in delivering smoking cessation counseling	The counseling was tailored to the needs of parents (e.g., in the intensity of the topics). The brochure included relevant information for parents	The counselor followed a protocol on which topics to discuss during the sessions
Yes	Counselors of the Dutch national quitline received extensive training and had multiple years of experience	The brochures were tailored to parents by providing 'parent-relevant information'	No information
No	Pediatricians and office nurses received training (45 minutes). Research staff regularly visited pediatrician offices to support the staff	The self-help materials at the four well baby visits were tailored to mothers' current smoking status	Some women were called to ascertain the provider's adherence to the protocol. Chart data showed that the implementation of the protocol decayed over time

Table 2 Continued

First author (year)	Theoretical base or rationale	Mode of delivery	Sessions (number / duration)	Short description
Winickoff (2010)	SLT; TMC; HBM; MI; 5As	Face-to-face; telephone; web-based	One face-to-face session (15 minutes) and one phone call (optional)	The aim of the face-to-face counseling session was to encourage parents to accept smoking cessation support. In addition, letters were faxed to four healthcare professionals. Parents were offered pro-active telephone counseling: - if declined: encouraged to discuss quitting options with their healthcare professional, received contact information of the quitline and were encouraged to call the quitline - if accepted but unavailable: received self-help materials on smoking cessation by mail - if accepted and available: telephone counseling and a web-based cessation program were offered
Yu (2017)	No information	First intervention: face-to-face; Second intervention: face-to-face; text messages	Both: three face-to-face sessions at home. Second intervention: additional text messages in upcoming months	This study had two intervention conditions. Both interventions: face-to-face counseling on the consequences of SHS to infants, education on establishing a smoke-free home, and self-help materials. Second intervention: parents received text messages on the risks of SHS for mothers and their infants. Fathers also received messages that encouraged them to quit smoking

Note. HCC = Healthcare center; HBM = Health Belief Model; MI = Motivational Interviewing; MITIC = Motivation Interviewing Treatment Integrity Code; NRT = nicotine replacement therapy; SCT = Social Cognitive Theory; SET = Social Ecological Theory; SHS = secondhand smoking; SLT = Social Learning Theory; TMC = Transtheoretical Model of Change; TPB = Theory of Planned Behavior.

[a] Intervention characteristics were extracted only from reported intervention descriptions from the respective published effect papers or protocol / intervention development papers.

	NRT	Training providers	Tailoring	Fidelity
	No	Trained staff	Materials were tailored to parental smokers and to their personal circumstances and included stage-appropriate intervention techniques	No information
	No	Trained healthcare workers	No information	No information

Table 3
Classification of the 18 Included Studies for the Subgroup Analyses and Risk of Bias Assessment

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Abdullah (2005)	7-day PPA at 6-month FU	Yes	No	Active	Randomization: SC Blinding: SC Missing data: LR Measurement of the outcome: SC Selection of the results: SC Overall: SC
Borrelli (2010)	7-day PPA at 3-month FU	Yes	Yes	Active	Randomization: LR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC
Borrelli (2016)	7-day PPA at 12-month FU	Yes	Yes	Active	Randomization: HR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: HR

Table 3 Continued

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Caldwell (2018)	Quit status at 48-month FU	Yes	Yes	Active	Randomization: SC Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC
Chan (2005)	7-day PPA at 1-month FU	Yes	No	Passive	Randomization: SC Blinding: SC Missing data: LR Measurement of the outcome: SC Selection of the results: SC Overall: SC
Chan (2008)	7-day PPA at 12-month FU	Yes	No	Active	Randomization: LR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC

Table 3 Continued

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Chan (2017)	7-day PPA at 12-month FU	Yes	Yes	Active	Randomization: SC Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC
Curry (2003)	7-day PPA at 12-month FU	Yes	No	Not reported[b]	Randomization: LR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC
Groner (2000)	7-day PPA at 6-month FU	Yes	No	Passive	Randomization: SC Blinding: SC Missing data: SC Measurement of the outcome: LR Selection of the results: SC Overall: SC

Table 3 Continued

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Hannöver (2009)	4-week PPA at 24-month FU	Yes	No	Active	Randomization: SC Blinding: SC Missing data: LR Measurement of the outcome: SC Selection of the results: SC Overall: SC
Mahabee-Gittens (2008)	7-day PPA at 3-month FU	Yes	No	Passive	Randomization: HR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: HR
Ralston (2008)	Quit status at 6-month FU	Yes	Yes	Active	Randomization: HR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: HR

Table 3 Continued

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Ralston (2013)	≥ 7-day PPA at 2-month FU	Yes	No	Passive	Randomization: LR Blinding: SC Missing data: SC Measurement of the outcome: LR Selection of the results: SC Overall: SC
Scheffers-van Schayck (2019)	7-day PPA at 3-month FU	Yes	Yes	Active	Randomization: LR Blinding: SC Missing data: LR Measurement of the outcome: LR Selection of the results: LR Overall: SC
Schuck (2014)	7-day PPA at 12-month FU	Yes	Yes	Active	Randomization: LR Blinding: SC Missing data: LR Measurement of the outcome: SC Selection of the results: LR Overall: SC

Table 3 Continued

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Severson (1997)	7-day PPA at 12-month FU	Not reported	No	Active	Randomization: SC Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC
Winickoff (2010)	7-day PPA at 3-month FU	Yes	No	Passive	Randomization: SC Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC

Table 3 Continued

First author (year)	Outcome included in meta-analysis	Theoretical basis of the intervention[a]	Provision of NRT during intervention	Intervention delivered to the control condition	Risk of bias
Yu (2017)	Quit status at 12-month FU	Not reported	No	Passive	Randomization: LR Blinding: SC Missing data: SC Measurement of the outcome: SC Selection of the results: SC Overall: SC

Note. FU = follow-up; HR = high risk; LR = low risk; PPA = point-prevalence abstinence; SC = some concerns.
[a] Because little variance was found between the two subgroups, no subgroup analysis was performed.
[b] No information was provided on what parents in the control condition received in Curry et al. (2003). Therefore, this study was not included in the subgroup analysis.

Intervention effects and subgroup analyses

The results of the meta-analysis are displayed in Figure 2. With a total number of 8,560 parents, the pooled RR was 1.62 (95% CI = 1.38–1.90; $p < .00001$), showing a significant but modest effect. Overall, 13.1% of parents in the intervention conditions versus 8.4% of the parents in the control conditions reported smoking abstinence. The funnel plot did not show noteworthy deviations (Figure 3). In addition, the Egger's test and the rank correlation test did not yield significant results (Egger's test: $p = .38$; rank correlation test: $p = .50$), indicating no risk of publication bias. Although heterogeneity was low ($I^2 = 23\%$; $\chi^2 = 22.07$; $p = .18$), pre-specified subgroup analyses were carried out. Results revealed no significant differences for provision of NRT during the intervention (yes: RR = 1.79; 95% CI = 1.40–2.29 vs. no: RR = 1.49; 95% CI = 1.22–1.83), risk of bias in overall judgement (some concerns: RR = 1.64; 95% CI = 1.37–1.98 vs. high risk: RR = 1.48; 95% CI = 1.00–2.20), and intervention delivered to the control condition (passive: RR = 1.51; 95% CI = 1.02–2.23 vs. active: RR = 1.64; 95% CI = 1.36–1.90). Eventually, no subgroup analysis was performed concerning the theoretical basis of the intervention, because little variance was found between the two subgroups (Table 3). The classification of the studies for the subgroup analyses can be found in Table 3. To test the robustness of the overall results, sensitivity analyses were performed by replicating the model without the three studies (Caldwell et al., 2018; Ralston & Roohi, 2008; Yu et al., 2017) of which the operationalization of the smoking cessation outcome was unclear. Results revealed a pooled RR of 1.57 (95% CI = 1.33–1.86; $p < .00001 = I^2 = 27\%$), indicating no substantial difference. The second sensitivity analysis, in which only studies were included that reported the results of the complete case analyses (Borrelli et al., 2010; Caldwell et al., 2018; Chan et al., 2005, 2017; Curry et al., 2003; Mahabee-Gittens et al., 2008; Schuck, Bricker et al., 2014; Yu et al., 2017), revealed a pooled RR of 1.79 (95% CI = 1.29–2.47; $p < .00001$; $I^2 = 79\%$).

Figure 2

Meta-analysis of Relative Risks of the Effects of Smoking Cessation Interventions Tailored to Parents

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI
Abdullah (2005)	68	444	34	459	10.3%	2.07 [1.40, 3.06]
Borrelli (2010)	15	68	12	65	4.6%	1.19 [0.61, 2.36]
Borrelli (2016)	34	170	26	171	8.2%	1.32 [0.83, 2.09]
Caldwell (2018)	24	68	5	42	2.9%	2.96 [1.23, 7.17]
Chan (2005)	3	40	1	40	0.5%	3.00 [0.33, 27.63]
Chan (2008)	85	752	68	731	13.7%	1.22 [0.90, 1.64]
Chan (2017)	82	598	45	560	11.9%	1.71 [1.21, 2.41]
Curry (2003)	22	156	10	147	4.2%	2.07 [1.02, 4.23]
Groner (2000)	11	317	7	162	2.6%	0.80 [0.32, 2.03]
Hannöver (2009)	13	151	8	187	3.1%	2.01 [0.86, 4.73]
Mahabee-Gittens (2008)	27	237	7	119	3.4%	1.94 [0.87, 4.32]
Ralston (2008)	3	21	1	21	0.5%	3.00 [0.34, 26.56]
Ralston (2013)	5	30	6	30	2.0%	0.83 [0.28, 2.44]
Scheffers-van Schayck (2019)	24	45	5	38	3.0%	4.05 [1.71, 9.59]
Schuck (2014)	87	256	46	256	13.3%	1.89 [1.38, 2.59]
Severson (1997)	57	1038	37	776	9.9%	1.15 [0.77, 1.72]
Winickoff (2010)	5	33	3	33	1.3%	1.67 [0.43, 6.41]
Yu (2017)	39	203	9	96	4.5%	2.05 [1.04, 4.06]
Total (95% CI)		**4627**		**3933**	**100.0%**	**1.62 [1.38, 1.90]**
Total events	604		330			

Heterogeneity: Tau² = 0.02; Chi² = 22.07, df = 17 (P = 0.18); I² = 23%
Test for overall effect: Z = 5.97 (P < 0.00001)

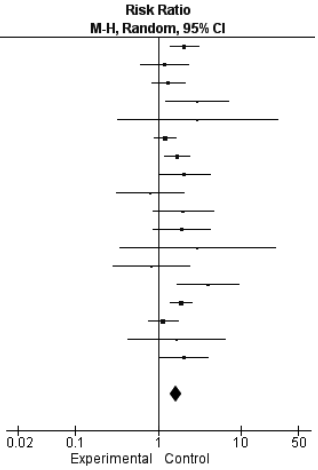
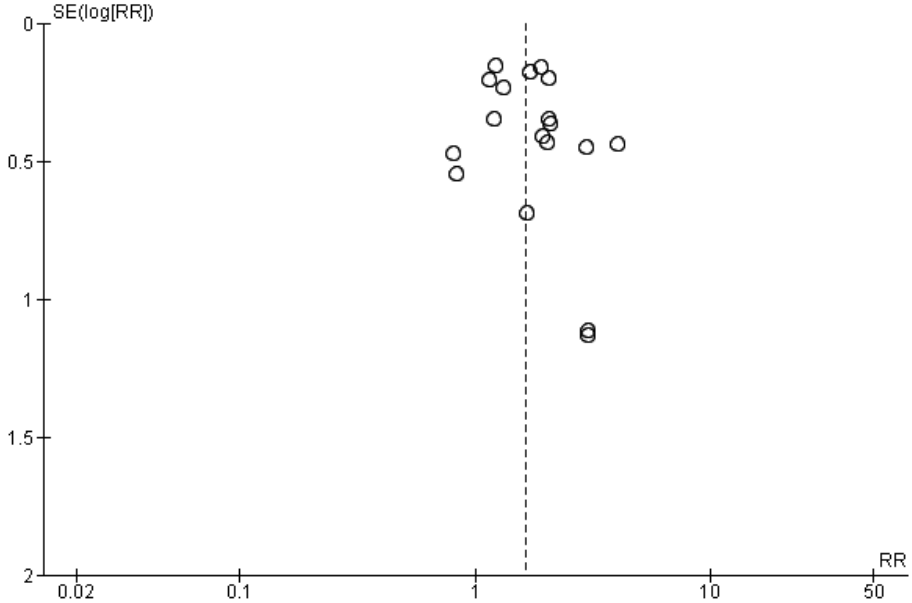


Figure 3

Funnel Plot of Pooled Effects of Smoking Cessation Interventions Tailored to Parents



Discussion

This meta-analysis provides an overview of smoking cessation interventions tailored to parents of children and adolescents (aged 0–18 years). The overall results revealed that 13.1% of the parents in the intervention conditions reported smoking abstinence at follow-up compared to 8.4% of the parents in the control conditions. The pooled risk ratio showed that parents in the intervention conditions were 1.62 times more likely to quit smoking than parents in the control conditions, representing a significant but modest effect. Yet, small effect sizes can still have important implications (Prentice & Miller, 1992). Even though some of the included studies yielded higher effect sizes (e.g., Abdullah et al., 2005; Hannöver et al., 2009; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014), the overall results suggest that improvement of smoking cessation interventions tailored to parents is warranted.

Smoking cessation interventions tailored to parents might be improved by combining these interventions with a tobacco prevention intervention for children. If parents receive a smoking cessation intervention and are asked to provide antismoking socialization to their children (e.g., to talk to their children about their experiences with smoking), parents could experience less cognitive dissonance, for example, because their smoking status and their expressions of antismoking values to their children will match (Jackson et al., 2016). This hypothesis was supported in an RCT in which a relapse prevention intervention for parents who had quit smoking for ≥24 h was tested. Parents in the intervention condition were encouraged to provide antismoking socialization to their children whereas parents in the control condition received no treatment. Results showed that this intervention was effective in both the short and long term (3-year follow-up; Hayes et al., 2018; Jackson et al., 2016). This finding corresponds to one of the studies included in this meta-analysis, which examined an intervention that focused on both parental smoking cessation and prevention of children initiating smoking (Caldwell et al., 2018). Its results showed that the self-reported abstinence rates of parents in the intervention condition significantly increased in the longer term (from 6% at end of the treatment/2-year follow up to 41% at the 4-year follow-up; $p < .001$). In addition, significantly more parents in the intervention condition reported abstinence compared to the parents in the control condition at the 4-year follow-up (41 vs. 13%; $p < .001$). Although the biochemical validation did not find significant differences between the two conditions at the 4-year follow-up, the authors suggested that the high abstinence rates of parents in the intervention condition at the 4-year follow-up could be explained by the fact that children were enrolled in a school- and home-based tobacco prevention intervention. Further research is needed to gain more insight into whether a smoking cessation intervention for parents in which they are also engaged in providing antismoking socialization to their children, or the

combination of a smoking cessation intervention for parents and a school-based tobacco prevention intervention for children, could increase the abstinence rates of parents more than when parents only receive a smoking cessation intervention.

Although the overall results showed that the smoking cessation interventions tailored to parents had a modest effect in terms of smoking abstinence, some of the included studies that had lower risk of bias (i.e., no score of "high risk" and ≥1 score of "low risk" on any of the criteria of the risk of bias assessment) revealed higher effect sizes (e.g., Abdullah et al. 2005; Hannöver et al., 2009; Scheffers-van Schayck, Otten et al., 2019; Schuck, Bricker et al., 2014; Yu et al., 2017). These results indicate that not all included smoking cessation interventions have to be improved and that some of these interventions could be ready for implementation. It is important to examine how these interventions can be successfully implemented by investigating how parents can be reached and encouraged to accept and use the interventions. A related question concerns how the costs that parents possibly have to pay to receive the interventions could be reimbursed (e.g., by health insurance) so that more parents are able to accept these evidence-based interventions. A couple of the included studies in this meta-analysis reported information about the costs of the interventions. For example, in a study that was based on data from the USA, Severson et al. (1997) reported that mothers had to pay up to $25 for the intervention. In contrast, Scheffers-van Schayck, Otten et al. (2019) reported higher costs of the intervention in the Netherlands (range € 302.50–363). However, the amount that these parents actually had to pay for the intervention depended on their health insurance. In other studies, parents received NRT or the behavior counseling for free (Borrelli et al., 2010, 2016; Chan et al., 2017; Ralston et al., 2013; Schuck, Bricker et al., 2014). A Cochrane review showed that full reimbursement of smoking cessation interventions (vs. no reimbursement) increased the use of interventions, the number of quit attempts, and the abstinence rates at six months or longer (van den Brand et al., 2017). In contrast, partial reimbursement versus no reimbursement did not significantly increase the use of smoking cessation interventions (van den Brand et al., 2017). Thus, full reimbursement could increase the impact of smoking cessation interventions in its effectiveness and acceptance by smokers.

The pooled risk ratio of this meta-analysis corresponds to a large extent to the pooled risk ratio of 1.69 (95% CI = 1.2–2.4; p = .003) that was found in a previous subgroup analysis (Rosen et al., 2012). However, in contrast to previous research (Rosen et al., 2012, 2014), we did not find any significant differences in the subgroup analyses concerning the provision of NRT during the intervention and the intervention that was delivered to the control condition (passive/active). These results could be explained by the fact that we included more studies and our studies primarily focused on parental smoking cessation (and not on reduction of exposure to SHS). Both sensitivity analyses yielded quite similar effect sizes compared to

the effect size of the main analysis. The effect size of the first subgroup analysis (that excluded three studies for which the operationalization of the cessation rates was unclear) was smaller than the effect size of the main analysis (RR = 1.57). The somewhat larger effect size (RR = 1.79) of the second subgroup analysis (that only included complete cases) could be explained by the fact that this subgroup analysis did not include the cessation rates of parents who did not complete the follow-up assessment, therefore yielding a more positive (biased) image of the effectiveness of the interventions (West et al., 2005). Yet, the fact that the results of the sensitivity analyses did not substantially differ from the results of the main analysis underlines the robustness of these results.

Limitations

This meta-analysis had several limitations. First, we were unable to include biochemically validated abstinence rates in our meta-analysis. Although guidelines recommend the use of biochemical validation (West et al., 2005), only 50% of the included studies validated abstinence rates biochemically. Because we aimed at having outcomes that were as consistent as possible, we decided to include only self-reported abstinence rates. A second methodological limitation is that none of the included studies scored "low risk" on the overall judgement of the risk of bias assessment, while three studies scored "high risk," indicating that the results of the included studies (and therefore also the results of this meta-analysis) could have been biased. In particular, there is a possibility of selection bias in three of the included studies due to limitations in the randomization of parents to the interventions (Borrelli et al., 2016; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008). Therefore, caution is needed in interpreting the results of the present meta-analysis. In addition, the fact that all included studies scored at least "some concerns" on the overall judgement indicates that future research should be methodologically improved, and guidelines (e.g., the CONSORT statement; Schulz et al., 2010) should be followed in the reporting of future studies. Finally, although eight of the studies included only parents who smoked cigarettes (Borrelli et al., 2010, 2016; Chan et al., 2017; Curry et al., 2003; Groner et al., 2000; Ralston et al., 2013; Winickoff et al., 2010; Yu et al., 2017), in other studies it was not clear whether parents only smoked cigarettes or whether they also used other tobacco products (e.g., e-cigarettes; Lequy et al., 2019). Related to this, most studies did not report whether the interventions only aimed at stopping smoking cigarettes or if it also impacted the use of other tobacco products. This is a limitation as the smoke of other tobacco products also contains pollutants (Baker et al., 2000), which urges the need for knowledge about the effects of smoking cessation interventions on the use of other tobacco products as well.

Conclusion

To the best of our knowledge, this is the first meta-analysis on interventions that are primarily aimed at helping parents (of children and adolescents aged 0–18 years) to quit smoking. Although the results of this meta-analysis should be interpreted with caution and some of the included interventions yielded promising results, overall results suggest that smoking cessation interventions tailored to parents are modestly effective. Future studies should test which factors of smoking cessation interventions (with high effect sizes) make these interventions effective in terms of smoking abstinence. For instance, are interventions more effective when children of smoking parents experience smoking-related health problems? To increase the effectiveness and the impact of these interventions in terms of public health and controlling tobacco use, it is crucial for further research to explore how these interventions can be improved.

Acknowledgements

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CHAPTER 4

Evaluation and implementation of a proactive telephone smoking cessation counseling for parents: A study protocol of an effectiveness-implementation hybrid design

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T.S.-v.S. is responsible for the recruitment, data collection and analysis, and report of study results. RO, RE, and MK are supervisors and grant applicators. All authors read and approved the final manuscript.

Abstract

Introduction: Detrimental health consequences of smoking for both parents and children stress the importance for parents to quit. A Dutch efficacy trial supported the efficacy of proactive telephone counseling on parents. Still, how this program would function in "real world" conditions and how parents could be optimally reached is unclear. Therefore, this study will use an innovative method to examine the recruitment success of two recruitment approaches (i.e., via a healthcare approach and a mass media approach) to test the (cost-)effectiveness of the program.

Methods: A two-arm randomized controlled trial and an implementation study (i.e., process evaluation) are conducted. Parents (N = 158) will be randomly assigned to the intervention (i.e., telephone counseling) or control conditions (i.e., self-help brochure). Primary outcome measure is 7-day point prevalence abstinence at three months follow-up. Qualitative and quantitative research methods are used for the process evaluation. We expect that parents in the intervention condition have higher cessation rates than parents in the control condition. We also expect that the recruitment of parents via (youth) healthcare services is a more promising recruitment approach compared to mass media.

Discussion: Results will have implications for the effectiveness of a proactive telephone counseling and provide directions for its successful implementation.

Introduction

Cigarette smoking continues to be the most preventable cause of mortality and morbidity (World Health Organization, 2013). In the Dutch population of 17 million people, close to 19,200 people died from smoking-related diseases (e.g., lung cancer and Chronic Obstructive Pulmonary Disease [COPD]) in 2014 (van Laar et al., 2017). In addition, in 19% of Dutch families with children younger than 18 years, children are exposed to indoor smoking (ter Weijde et al., 2015). Exposure to Environmental Tobacco Smoke (ETS) has detrimental effects on children's physical health, including increased incidences of middle ear disease, reduced lung function, and increased frequencies of childhood asthma and bronchitis (DiFranza et al., 2004; Hofhuis et al., 2003). It is important that parents quit smoking to eliminate the majority of the children's ETS (Johansson et al., 2004) and diminish the risk for children to start smoking (Bricker et al., 2003; Otten et al., 2007). Moreover, it reduces the odds of morbidity and mortality for smoking parents themselves (Jha et al., 2013).

The existing research suggests that most parents want to quit smoking and even tried to quit smoking (Hymowitz et al., 2005). In addition, most parents would accept smoking cessation support, such as telephone counseling programs (Winickoff et al., 2006). A review consisting of 77 (quasi) randomized controlled trials (RCT) on telephone counseling programs confirmed that these programs are effective in increasing smoking cessation rates (Stead, Hartmann-Boyce et al., 2013). Moreover, Hollis et al. (2007) found that telephone counseling programs are cost-effective (i.e., the degree to which something is effective in relation to its costs). Recently, a tailored telephone counseling program for smoking parents was tested in The Netherlands (Schuck, Bricker et al., 2014). Parents who smoke (N = 512) were recruited in an RCT and assigned to the intervention condition (i.e., tailored telephone counseling and supplementary materials) or the control condition (i.e., a standard self-help brochure). Parents who received telephone counseling were more likely to report 7-day point prevalence abstinence at three months follow-up (44.5% vs. 12.1%; OR = 6.89; 95% CI = 4.18–11.36) and to use nicotine replacement therapy (48.4% vs. 20.9%) compared to parents who received a standard self-help brochure. Among parents who did not quit smoking, those who received telephone counseling were more likely to make a quit attempt (85.2% vs. 68.1%) and to implement a complete home smoking ban (39.5% vs. 26.1%) compared to parents who received the self-help brochure. Altogether, this study provided evidence that telephone counseling tailored to smoking parents is effective in helping parents quit smoking and developing parenting practices that protect their offspring from ETS exposure (Schuck, Bricker et al., 2014).

Although Schuck, Bricker et al. (2014) found that the telephone counseling program was effective, they tested it in an efficacy trial. This means that the program was

evaluated under optimum conditions (Flay, 1986); the program was offered for free, and participating parents were rewarded with € 100 after completing the study. Therefore, how the telephone counseling program would function when examined in "real world" conditions (i.e., in an effectiveness trial) is unclear. Moreover, despite its effectiveness, intervention success also depends on the extent to which people have access to the intervention and the acceptance and utilization of these interventions (McClure et al., 2006). An important predictor of the reachability of smoking cessation interventions concerns their recruitment strategy (McDonald, 1999). Recruitment strategies can be classified into proactive recruitment strategies (i.e., people are contacted directly, and services are offered to them) and reactive recruitment strategies (i.e., people are informed about the availability of an intervention and those who are interested have to volunteer to participate; Prochaska et al., 2001). Many interventions use a reactive recruitment strategy (Velicer et al., 1999), which could explain why only a minority of smokers use smoking cessation interventions (Hughes et al., 2009). In contrast, proactive recruitment strategies have proven to be effective in improving the reachability of smoking cessation interventions (Marcano Belisario et al., 2012; McClure et al., 2006; Schuck et al., 2013) and in promoting smoking cessation among smokers (Abdullah et al., 2005; Lando et al., 1992; Tzelepis et al., 2009).

In addition to recruitment strategies, recruitment venues are also important aspects of the reachability of smoking cessation interventions. In the Dutch efficacy study, primary schools were used to recruit smoking parents for the telephone counseling program (Schuck et al., 2013). According to the authors, primary schools can reach the majority of smoking parents and function as a 'teachable setting' for smoking parents (Schuck et al., 2013). The results of this study have shown that the primary schools are willing to promote telephone smoking cessation counseling to parents. In addition, this recruitment channel resulted in relatively low recruitment costs (€ 21.74 per parent) and a high reach (approximately 10,000 households). However, despite the low costs, the response rate was low (5%), even though participating parents were rewarded with € 100 after completing the study. The effect of the financial reward of € 100 for the participants' willingness to participate on the response rate of smoking parents of children in primary schools is unclear. Further research is needed to gain insight into whether primary schools are a good recruitment channel to connect smoking parents with a proactive telephone smoking cessation counseling.

Online mass media (e.g., smoking cessation websites and social media) is another promising channel that could connect parents who smoke with a proactive telephone counseling program. In the Netherlands, smokers who are interested in smoking cessation can visit various smoking cessation websites, including the national online smoking cessation website (i.e., www.ikstopnu.nl). This website, funded by

the Dutch government, had 89,116 unique visitors in 2016 (van der Putten, 2017). Some studies have provided evidence that online mass media can be successful and cost-effective in recruiting smokers for cessation support (Graham et al., 2009; Heffner et al., 2013; Smit et al., 2012). However, to our knowledge, little is known about whether online mass media is successful in connecting parents who smoke to a proactive telephone counseling program. Hence, further research is needed to assess the implementation of this program.

In addition to a mass media approach, the healthcare setting can also be suitable for addressing parental smoking (Hipple et al., 2013; Solberg et al., 2001; Winickoff et al., 2014). Winickoff et al. (2001) found that 74% of smoking parents whose children are hospitalized would enroll in a free telephone counseling cessation program. Moreover, these parents are also more motivated to quit smoking, since they worry more about the consequences of their smoking for their children's respiratory diseases (Winickoff et al., 2003). In the Netherlands, youth healthcare could be an ideal setting to address parental smoking cessation, as the Dutch youth healthcare provides preventive healthcare to all children (aged 0 to 17 years old; Nederlands Centrum Jeugdgezondheid, 2018). In the Netherlands, all parents must visit youth healthcare centers 15 times in the first four years of their child's life (Nederlands Centrum Jeugdgezondheid, 2018). In addition, youth healthcare professionals are expected to address parental smoking (cessation) at least four times during that time, if applicable (Nederlands Centrum Jeugdgezondheid, n.d.). Research shows that it is considered to be the (youth) healthcare professional's role to address parental smoking (Cluss & Moss, 2002; Frankowski et al., 1993; Hutchinson et al., 2014). However, (youth) healthcare professionals experience several barriers in doing so (e.g., a lack of time, the possibility of damaging the doctor-patient relationship, and lack of confidence in own smoking cessation counseling skills; Frankowski et al., 1993; Hutchinson et al., 2014; Pérez-Stable et al., 2001). Therefore, it is essential to provide a convenient, user-friendly, and time-saving intervention to (youth) healthcare professionals that does not jeopardize the doctor-patient relationship. In the present study, a time-saving and convenient tool will be provided that allows (youth) healthcare professionals to easily refer smoking parents to a telephone counseling (see the methods section for an elaborate description of our tool).

In sum, this effectiveness study takes a novel method by examining the recruitment success of two recruitment approaches (i.e., a mass media approach and a healthcare approach) to test the (cost-)effectiveness of a telephone smoking cessation counseling program and whether the effectiveness depends on the recruitment approach. The mass media approach includes two recruitment channels: mass mailings through primary schools and online mass media. The healthcare approach also consists of two recruitment channels: general healthcare and youth healthcare. A 2-arm RCT will be carried out to test the (cost-)effectiveness of the telephone

counseling. Based on earlier results of Schuck, Bricker et al. (2014), it is expected that parents who receive telephone counseling show higher smoking cessation rates at three-month follow-up compared to parents who receive the control condition. Concerning the implementation of the telephone counseling, a process evaluation of the recruitment success will be conducted for two recruitment approaches. It is expected that (youth) healthcare will be a more promising recruitment approach for connecting smoking parents with the telephone counseling compared to mass media channels (online approach and mass mailings trough primary schools), as most of these parents are motivated to quit and find it acceptable to be directed to telephone counseling in the context of their child's health (Winickoff et al., 2003, 2006).

Methods

Study design

Because both the (cost-)effectiveness and the implementation strategy of the telephone counseling program will be examined, an effectiveness-implementation hybrid design will be adopted. This design has multiple advantages, including improving the capability to identify important implementation strategies and interactions, increasing the speed of implementing the interventions once deemed effective, and providing valuable information for decision makers (Bernet et al., 2013; Curran et al., 2012). With respect to the RCT, parents who smoke will receive two online questionnaires during a period of three months. In total, 158 smoking parents will be randomly assigned to the intervention (i.e., telephone counseling) or control (i.e., self-help brochure) condition. The study design is depicted in Figure 1.

Participants and recruitment

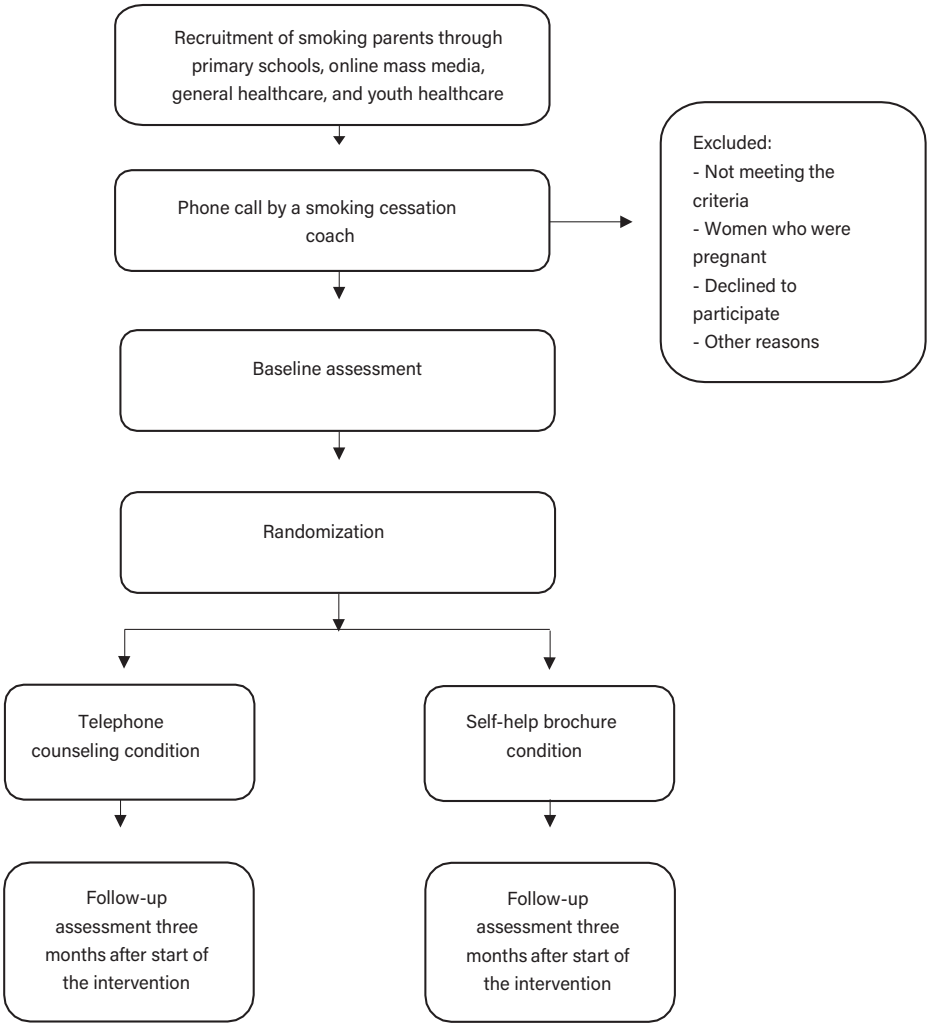
In total, 158 smoking parents will be recruited through four different recruitment channels (i.e., primary schools, online mass media, general healthcare, and youth healthcare), which will be distinguished as two different recruitment approaches (mass media approach and healthcare approach).

Mass media approach

Primary schools

A random sampling strategy will be used to recruit smoking parents through their children's primary schools across all 12 provinces of The Netherlands. The randomly selected primary school boards will be asked to (a) distribute invitation letters to all children (aged 4–12 years) and ask children to hand these letters to their parents; or (b) send the letters directly to the parents via e-mail. The primary schools decide which option they prefer. The invitation letters, which are targeted on parents in general and not personalized, will include a description of the study's purpose, frequency of the assessments, and inclusion criteria.

Figure 1
Study Design



Smoking parents recruited via primary schools will be able to register for the study by completing the registration form (active informed consent) on the study website or by returning the form via mail. After the completion of the registration form, the parents will be called by professional counselors of SineFuma (one of the Dutch certified quit lines). During this phone call conversation, parents will receive additional information about the study (e.g., parents who will be randomized to the telephone counseling program might have to pay for the program [based on the parents' health insurance], whereas parents who are randomized to the control

condition do not have to pay for their intervention) based on which they will either confirm or withdraw their registration.

Online mass media

Parents will be recruited through social media and two smoking cessation websites, including the Dutch national smoking cessation website. With respect to social media, multiple paid Facebook advertisements will be created and used for several months. The advertisements will target on parents who are interested in smoking (cessation). Both format and message of the advertisements can differ, depending on what message and/or format will be more successful in recruiting parents who smoke. Whether advertisements are successful or not will be based on the click through ratio (i.e., the ratio of users who click on the Facebook ad of the total users who view the ad) and the costs per click on the ads. Parents who will be recruited through online mass media have to complete a short registration form (i.e., name, telephone number, and e-mail address) on the website of SineFuma so that they can be called by the coaches within one week. Parents who will fulfil the inclusion criteria will be given a description of the study. Parents who will not fulfil the inclusion criteria will not be included in the study, but they will be offered telephone counseling. Parents who will be willing to participate in this study will receive a registration form and will be asked to return the completed form (active informed consent) by mail or online on the study website.

Healthcare approach

Healthcare and youth healthcare professionals (henceforth referred to as healthcare professionals) will be recruited using multiple methods, e.g., word of mouth among healthcare professionals and social media (i.e., Facebook and LinkedIn). Participating healthcare professionals will receive materials to be used for support. When smoking parents come to see a healthcare professional, they will be asked whether they want to receive effective smoking cessation support and whether they want a smoking cessation coach to call them. When parents give their permission, healthcare professionals will be able to register them online, by telephone or by fax. Subsequently, professional counselors of SineFuma will contact these parents within one week. The registration process for the study will be identical to the registration process through online mass media.

Inclusion criteria

To participate in the RCT, parents will have to: (a) be a parent/caretaker of a child between 0 and 18 years old; (b) be at least a weekly smoker; (c) have the intention to quit smoking currently or in the future; and (d) give informed consent to participate. Pregnant women will be excluded, and telephone counseling will be offered. The ethics committee of the Trimbos Institute has approved this study's protocol (201607_52-1606).

Study conditions

After giving informed consent and completing the baseline assessment, parents will be randomly assigned to one of the two trial conditions: telephone counseling condition or control condition.

Telephone counseling condition

In the telephone counseling condition, parents will receive up to six proactive counseling phone calls (20 min) over a period of 10 weeks. The telephone counseling is based on motivational interviewing (MI), which is "a directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence" (Rollnick & Miller, 1995, p. 325). It aims to motivate patients to change, to focus on the changes that are most important to them, and to focus on their strengths instead of weaknesses and problems (Rollnick et al., 2010). MI has been widely used for smoking cessation interventions, and it has proven effective for smoking cessation support (Heckman et al., 2010; Hettema & Hendricks, 2010).

The telephone counseling program will be performed by professional smoking cessation counselors of SineFuma who are thoroughly trained, experienced, and certified in delivering telephone counseling to support smoking cessation. During the six calls, multiple topics will be discussed, including information about nicotine replacement therapy, personal motivation and smoking history, preparation for the quit date, withdrawal symptoms, craving, relapse prevention, weight gain, and having a smoke-free future. Since the smoking cessation counselors will book individual appointment with parents at times that suit them, uptake will be maximized and drop-outs will be minimized. The results of Schuck, Bricker et al. (2014) showed that in the telephone counseling condition 224 parents (87.5%) indicated receiving at least one counseling call and 212 (82.8%) indicated receiving at least three calls. Of parents who received calls, the mean number of calls received was 5.5 (SD = 1.8). In addition, all parents will receive a supplementary brochure on smoking cessation, which was designed for this study as supplementary material for parents. The brochure Smoke-free Parents (Dutch translation: *Rookvrije Ouders*) consists of 22 pages (color-printed, size: 30x21 centimeters) and provides didactic information about smoking that is relevant to parents (e.g., information about ETS) as well as exercises, motivational messages, and tips that are relevant to parents who want to quit smoking. To guarantee quality and comprehensibility of the brochure, professional counselors of SineFuma and communication experts were involved in the development of the brochure. Parents will receive this brochure by mail immediately after the start of the telephone counseling program.

Control condition

Parents in the control condition will receive a self-help brochure on smoking cessation within one week after completing the baseline assessment. The brochure

'What you should know about smoking cessation' (Dutch translation: *Wat je zou moeten weten over stoppen met roken*) is a 16-page, color-printed booklet (size: 30x21 centimeters) developed by the Trimbos Institute. The brochure includes elements that have shown to be effective, such as using positive formulation and focusing on the benefits of smoking cessation. The brochure is divided into nine parts: information about smoking and smoking addiction, deciding to quit smoking, consequences of smoking, advantages of smoking cessation, tips and exercises, available smoking cessation methods, pharmacotherapy, maintenance of smoking cessation, and physical symptoms associated with quitting smoking. Parents in the control condition will be able to receive the telephone counseling program at the end of the study (i.e., when parents have completed the second assessment).

Data collection

The timing of the data collection will be different for each recruitment channel. Parents will be recruited gradually from September 2016 to September 2018. This means that the data of the two assessments will be obtained at different moments during the data collection (i.e., at the start of the study and at three months after the start of the intervention). All parents will receive a personal invitation by e-mail to complete two questionnaires online at a secured website. The web survey software application Jambo (January 2017) will be used to collect parents' answers. At the end of the study, multiple family excursions will be raffled among parents (e.g., free entry permits for an amusement park). The parents will be told that the raffles will not be part of the parents' incentives to enroll in the study, but to complete the two online questionnaires.

Randomization

An independent member of the research group will conduct randomization using a computer generated allocation sequence. Parents will be stratified by educational level (i.e., low: no high school diploma/no vocational training; medium: vocational training or high school diploma; high: college degree), recruitment channel (i.e., primary schools, healthcare, youth healthcare, and online mass media), and number of cigarettes smoked per day (i.e., less than 10; 10–20; 21 or more). When both parents live in the same household and participate in this study, randomization will be carried out at household level to avoid contamination between the two conditions.

Sample size

Based on the results of Schuck, Bricker et al. (2014), our power calculation (Stata 12.1, Stata Corp., College Station, TX, USA) indicated that 72 parents per recruitment approach (36 intervention and 36 control) is sufficient to detect 7-day point prevalence abstinence at three months follow-up with a large effect ($p1 = 0.445$; $p2 = 0.121$; Power = 0.80; $\alpha = 0.05$). Because we want to examine differences in

smoking cessation rates between the two recruitment approaches, we have to double from 72 to 144 parents. Based on the drop-out rates at three months follow-up of Schuck, Bricker et al. (2014; i.e., 10% in the control group and 3.9% in the intervention group), we will anticipate 10% drop-out. This means that we will aim to recruit a minimum of 158 participating parents in total.

Outcomes

The primary outcome measure will be 7-day point prevalence abstinence at three months follow-up. In addition, secondary outcome measures include: (a) occurrence of at least 24 h of abstinence at three months follow-up; (b) increase in motivation to quit; (c) number and duration of quit attempts; (d) use of and adherence to nicotine replacement therapy; (e) implementation of smoking restrictions at home; and (f) change in smoking-related cognitions (e.g., social norms, attitudes towards smoking, and self-efficacy). Moreover, to compare the success rates in this study with other studies, one outcome of the Russell Standard (Clinical) version 2 (West, 2005) will also be included as a secondary outcome (i.e., 14-day point prevalence abstinence at 4 weeks after the designed quit date).

Economic evaluation

The present study examines the cost-effectiveness of the telephone counseling program in accordance with the CHEERS checklist (Husereau et al., 2013). Four types of costs will be considered: (a) the costs of offering the interventions; (b) recruitment costs for each recruitment approach and channel; (c) costs stemming from healthcare uptake; and (d) costs stemming from losses in productivity, in both paid work and volunteer jobs. Costs of the interventions and recruitment channels and approaches (e.g., sending materials to healthcare professionals and advertisements on Facebook) will be monitored during the study. Other costs will be calculated by using standard cost prices (for reference year 2014), which are published in the Dutch guideline for costing (Hakkaart-van Roijen et al., 2016). The data on costs stemming from healthcare uptake and losses in productivity will be collected using the Trimbos/iMTA Questionnaire on Costs associated with Psychiatric illness (TiC-P; Bouwmans et al., 2013). The TiC-P is the most widely used patient-reported measure of health service utilization in The Netherlands (Ferrari et al., 2016). The cost-effectiveness analyses (CEA) will be conducted along the RCT, with 7-day point prevalence abstinence at three months follow-up as the primary outcome (i.e., the incremental effect). The incremental costs will be calculated as the average cost difference between the conditions. Both the incremental effect and incremental costs will be combined to compute the incremental cost-effectiveness ratio (ICER; incremental costs/incremental effects). To manage stochastic uncertainty, 2500 non-parametric bootstraps will be used and the bootstrapped ICERs will be plotted on the ICER plane. Based on the four quadrants of the ICER plane, four scenarios are possible regarding the telephone

counseling program, which can: (a) costs more and be more effective; (b) costs more and be less effective; (c) costs less and be less effective; and (d) costs less and be more effective. As seen from a health-economics perspective, the second and fourth scenarios are clear cut cases for decision-makers, with the second scenario being the least attractive (and the intervention is dominated by its alternative [the self-help brochure]) and the fourth scenario being the most attractive, and decision-makers will opt for the intervention. On the other hand, the first scenario is more difficult for decision-makers. In this scenario, one needs to decide how much one is willing to pay for an additional unit of effect (one extra parent who was successful in refraining to smoke; Hoch et al., 2006). To facilitate this decision, an ICER acceptability curve will be plotted with the probability that one deems the intervention to be cost-effective (on the y-axis) against various willingness-to-pay ceilings (on the x-axis). Finally, the CEA will be completed by performing one-way sensitivity analyses directed at uncertainties in major cost-drivers. This is done to ascertain the robustness of the CEA findings.

Statistical analyses

Statistical analyses will be carried out to assess whether the randomization results in an equal baseline distribution of relevant participant characteristics across conditions. In case of group differences at baseline, confounding variables will be included in subsequent analyses. All analyses will be conducted in accordance with the intention-to-treat principle (i.e., all parents randomized to one of the two conditions will be included in the analyses examining the study hypotheses) as per the Consolidated Standards of Reporting Trials (Schulz et al., 2010). Moreover, a completers-only analyses will be conducted, i.e., only parents with outcome data on all assessments will be included in the analyses. To compare cessation rates across different groups, logistic regression analyses will be conducted. In addition, Mplus will be used to test for moderation and subsequently, multi-group testing with bootstrapping will be conducted to assess differences between recruitment approaches. Effect sizes and 95% confidence intervals (CI) will be reported to determine the magnitude and effect of the intervention.

Process evaluation

Our process evaluation will examine: (a) the recruitment success (i.e., the number of parents who signed up to be called by a smoking cessation counselor divided by the number of parents who started the intervention) of the four recruitment channels (i.e., primary schools, online mass media, healthcare, and youth healthcare) as well as the overarching approaches (i.e., mass media and healthcare); (b) the number of the counseling phone calls parents received and whether this differs between the four recruitment channels and overarching approaches; (c) the facilitators of and barriers to participation of parents and professionals in the recruitment channels (e.g., whether the costs of the telephone counseling program keep parents from

receiving the program); and (d) parents' experiences, opinions, and perceptions with regard to the telephone counseling program (e.g., whether parents have suggestions for improvement of the program and whether there were any topics that were missing and should have been discussed during the sessions). In accordance with Linnan and Steckler (2002) multiple important process evaluation components will be included, such as fidelity (e.g., whether healthcare professionals follow the recruitment protocol), reach (e.g., the extent to which parents were reached by the different recruitment channels), and context (e.g., factors that affect the recruitment or telephone counseling program). Questionnaires, semi-structured interviews, and focus groups will be used to collect the data at a process level.

Discussion

This study protocol describes the hybrid design of an effectiveness-implementation study that takes an innovative method by examining the recruitment success of two recruitment approaches (i.e., a mass media approach and a healthcare approach) to test the (cost-)effectiveness of a proactive telephone counseling program for smoking parents of children aged 0–18 years. By evaluating the different recruitment approaches and their effect on the (cost-)effectiveness, this study aims to provide more insight into how this smoking cessation program can be efficiently and sustainably implemented in The Netherlands. Based on earlier results of Schuck, Bricker et al. (2014), it is hypothesized that the cessation rates of parents who receive telephone counseling will be higher at three months follow-up compared to the cessation rates of parents who receive a self-help brochure. In addition, it is expected that (youth) healthcare professionals will be a more promising recruitment approach for connecting smoking parents with the telephone counseling program compared to (online) mass media because most parents are motivated to quit and find it acceptable to be directed to telephone counseling when their child's health is concerned (Winickoff et al., 2003, 2006).

Strengths and limitations

A strength of this study is that the Russell Standard (Clinical) version 2 (West, 2005) will be used to assess smoking cessation. It provides standard criteria of successful smoking cessation rates to enable meaningful comparisons between different studies (West, 2005). Another strength is that as an effectiveness and an implementation study, it allows for the identification of important implementation strategies and interactions, offering valuable information to decision-makers (Bernet et al., 2013; Curran et al., 2012). In addition, a mixed-method design (i.e., quantitative and qualitative research) yields stronger evidence because of convergence and confirmation of the results (Johnson & Onwuegbuzie, 2004). In accordance with Schuck, Bricker et al. (2014) some secondary outcomes will be included. However, our power calculation was only based on the primary outcome. Another limitation

is that we will not be able to assess smoking cessation rates with a long term assessment (e.g., one year follow-up). However, in accordance with Schuck, Bricker et al. (2014) we have a follow-up assessment at three months. In addition, we will use the Russell Standard (Clinical) version 2 (West, 2005) to assess smoking cessation rates. Therefore, we are able to compare our smoking cessation rates with that of other studies. Finally, smoking cessation will be measured using self-reports, which may lead to an under-reporting due to the social desirability bias (Fendrich et al., 2005). To verify this potential bias, we will inform parents in the introduction of the second questionnaire that a random subsample of parents (30%) will be approached for biochemical validation (NicAlert dipstick; Nyomax, Hasbrouck Heights, NJ, USA).

Conclusions

The results of this study will reveal whether the telephone counseling program is effective in "real life" conditions. If the program will not be as strong as we expect we will search for reasons and try to clarify why our results do not correspond to the results of Schuck, Bricker et al. (2014). Consequently, we will think about how the telephone counseling program can be improved. The results of Hayes et al. (2017) could be important and relevant suggestions for the improvement of the program. This study will also provide information on how and where to implement the telephone counseling program for smoking parents in the most optimal manner in The Netherlands. If all four recruitment channels will turn out successful in recruiting smoking parents (i.e., high recruitment rates and similar costs/participant), we will be able to conclude that a combination of all four recruitment channels should be used to implement the telephone counseling program. In contrast, if only one recruitment channel turns out to be unsuccessful (i.e., extremely low recruitment rates and/or low quit rates), this particular channel should not be used to implement this program.

CHAPTER 5

Proactive telephone smoking cessation counseling tailored to parents: Results of a randomized controlled effectiveness trial

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T.S.-v.S. was responsible for the recruitment, data collection and analysis, and report of study results. R.O., R.E., and M.K. were supervisors and grant applicators. All authors read and approved the final manuscript.

Abstract

Introduction: A recent Dutch efficacy trial showed the efficacy of a telephone smoking cessation counseling program tailored to smoking parents. Currently, it is unknown whether such telephone counseling would be effective under more real-world conditions. This study aimed to examine the effectiveness of the parent-tailored telephone smoking cessation counseling program in a two-arm randomized controlled effectiveness trial and whether the effectiveness depended on the recruitment approaches that were used to recruit parents (mass media vs. healthcare).

Methods: In total, 87 parents received either telephone counseling (intervention) or a self-help brochure (control). Parents were asked to complete questionnaires at baseline and three months follow-up.

Results: Results showed that the odds of reporting 7-day point-prevalence abstinence at three months follow-up was 7.54 higher for parents who received telephone counseling than for parents in the control condition (53.3% vs. 13.2%, 95% CI = 2.49–22.84). Because inclusion was lower than anticipated, interaction-effects of condition and recruitment approach could not be interpreted.

Conclusion: The present study demonstrates that the parent-tailored smoking cessation telephone counseling program is effective in helping parents to quit smoking. Yet, before large-scale implementation, future research should focus on how recruitment of parents via the recruitment approaches could be improved.

Introduction

Worldwide, children are currently more heavily exposed to secondhand smoke (SHS) than any other age group (Öberg et al., 2011). Children's exposure to SHS predominantly occurs at home where their close relatives (e.g., parents) smoke (Öberg et al., 2011), making it difficult for children in such situations to avoid or protect themselves from the hazards of SHS. There is ample evidence that children's exposure to SHS can lead to serious short- and long-term health consequences (DiFranza et al., 2004; Hofhuis et al., 2003; U.S. Department of Health and Human Services, 2006). Parental smoking cessation is the most effective way to avoid harm to children from exposure to SHS at home (Chan et al., 2017). Moreover, parental smoking cessation reduces the likelihood that children will start smoking themselves when they are older (Bricker et al., 2003).

To date, several effective smoking cessation interventions for parents have been developed and examined (Abdullah et al., 2005; Borelli et al., 2010, 2016; Chan et al., 2017; Curry et al., 2003; Groner et al., 2000; Ralston & Roohi, 2008; Ralston et al., 2013; Severson et al., 1997). Recently, a telephone smoking cessation counseling program tailored to parents was examined in the Netherlands (Schuck, Bricker et al., 2014). Parents who smoked (N = 512) were recruited through primary schools in a two-arm randomized controlled trial (RCT). Parents received telephone counseling (intervention condition) or a self-help brochure (control condition). Results revealed that at three months follow-up, the odds of reporting 7-day point-prevalence (PPA) was 6.89 higher for parents in the intervention condition compared to parents in the control condition (95% CI = 4.18–11.36). Among parents who did not quit smoking at three months follow-up, parents in the intervention condition smoked fewer cigarettes per day, made more attempts to quit, and more often showed 24 h abstinence compared to parents in the control condition ($p < 0.001$). Even in the long term, at 12 months follow-up, more parents who received telephone counseling showed abstinence compared to parents in the control condition. In short, this telephone counseling program proved to be effective in helping parents to quit smoking, thereby protecting children from exposure to their parents' smoking.

Although the results of Schuck, Bricker et al. (2014) are promising, and telephone counseling certainly has the potential to decrease the number of parents that smoke, the results are limited in that the counseling program was examined in an efficacy trial. This means that the telephone counseling program was tested under optimal controlled circumstances (e.g., parents received € 100 for participating in the study and the telephone counseling program was offered for free, whereas often smokers have to pay for smoking cessation counseling in the Netherlands [depending on the type of health insurance they have]; Flay, 1986). Thus, it remains unclear how the telephone counseling program would function under more real-world circumstances

and whether the findings of the efficacy trial are generalizable to everyday practice. This is an important limitation to address, as interventions worthy of implementation need to be effective under conditions that resemble the conditions in the real world (Flay et al., 2005).

In order to establish the optimal conditions under which an intervention can be most successfully implemented, it is also necessary to know whether the effectiveness of an intervention depends on the recruitment approach that was used. For example, perhaps a telephone counseling program tailored to parents is more effective when parents are recruited by a pediatrician as compared to social media. Thus far, many studies have examined the effectiveness of smoking cessation interventions for parents in (youth) healthcare settings (Chan et al., 2008, 2017; Groner et al., 2000; Hannöver et al., 2009; Mahabee-Gittens et al., 2008; Ralston & Roohi, 2008; Ralston et al., 2013; Yu et al., 2017). A few studies recruited smoking parents through primary schools (Caldwell et al., 2018; Schuck, Bricker et al., 2014), a birth cohort study (Abdullah et al., 2005), or via other channels (e.g., flyers and cultural events; Borrelli et al., 2010). To our knowledge, however, no studies have explored whether the effectiveness of a smoking cessation intervention for parents depends on the recruitment approach that was used. However, a profound understanding of the effectiveness of the telephone counseling program and the role of recruitment is paramount prior to widespread implementation.

In order to gain more insight into the potential impact of the telephone smoking cessation counseling program that was previously examined in the aforementioned efficacy trial (Schuck, Bricker et al., 2014), the present study had two aims. The first aim was to examine the effectiveness of the telephone counseling program in a two-arm effectiveness RCT. The second aim was to test whether the effectiveness of the telephone counseling program depended on the manner of recruitment (healthcare vs. mass media). Based on Schuck, Bricker et al. (2014), we hypothesized that parents who received telephone counseling (intervention condition) would be more likely to report 7-day PPA at three months follow-up compared to parents who received a self-help brochure (control condition). In addition, we hypothesized the telephone counseling program would be more effective for parents who were recruited via the healthcare approach than for parents who were recruited via the mass media approach. The rationale behind this hypothesis was that these parents could be more motivated to quit smoking, since healthcare professionals addressed their smoking and its consequences for their children's health. Moreover, discussing smoking cessation with healthcare professionals could be a 'teachable moment' for parents (Mahabee-Gittens et al., 2008; Winickoff et al., 2003)

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Methods

Study design

The effectiveness of the telephone smoking cessation counseling program was examined in a two-arm single-blind RCT, which was part of a larger study in which the implementation of the telephone counseling program was also assessed by adopting an effectiveness-implementation hybrid design (Bernet et al., 2013; Curran et al., 2012). The present study only reports the results of the RCT, as the results of the implementation study will be reported elsewhere. Parents who smoke were randomly assigned to the intervention condition (telephone counseling) or to the control condition (a self-help brochure). The study was registered in the Netherlands Trial Register (NTR6092), and the ethics committee of the Trimbos Institute approved the study's protocol (201607_52-1606). More information on the design, recruitment, data collection, and treatment conditions of this study can be found in the study protocol (Scheffers-van Schayck et al., 2018). No important changes to methods were made after the study protocol was published.

Recruitment

Parents who smoke were recruited in the Netherlands between September 2016 and September 2018. A mass media approach (i.e., primary schools and online mass media) and a healthcare approach (i.e., healthcare and youth healthcare) were used for implementation and recruitment of parents.

Mass media approach

Primary schools

Between September and November 2016, 619 primary schools were randomly approached to distribute information letters among parents of children (aged 4–12 years). In total, 101 (16.3%) primary schools agreed to distribute invitation letters. The invitation letters were targeted to parents in general and were not personalized. The invitation letters included a description of the study's aim and inclusion criteria, as well as the frequency of the assessments. In addition, parents were told that several family excursions would be raffled among the participating parents. The aim of the raffle was to encourage parents to complete the assessments, not to encourage parents to enroll in the study. To minimize performance bias, parents were told that the study aimed to examine the effectiveness of two smoking cessation interventions. Parents could register on the study website or by returning the form via mail (active informed consent). After registration, parents were called by professional smoking cessation counselors from SineFuma (one of the Dutch certified quit lines), and additional information was provided (e.g., parents who were randomized to the telephone counseling program may have had to pay for the program, depending on their health insurance). Parents could either confirm or withdraw their registration. Because fewer parents registered for the study than

expected, the same 101 primary schools were approached again between October 2017 and January 2018 and were asked to distribute the information letter by e-mail or mail for a second time. In total, 77.0% of the primary schools agreed to do so.

Online mass media

Parents were recruited through social media and two smoking cessation websites, including the Dutch national smoking cessation website www.ikstopnu.nl (English translation: www.IQuitNow.nl). Multiple paid Facebook and Instagram advertisements were created and deployed between September 2017 and May 2018. The Facebook advertisements and information on the websites aimed to recruit parents that were interested in smoking cessation. Parents who were interested in receiving a free, informal, and proactive phone call with a smoking cessation counselor could complete a short registration form (including name, telephone number, and e-mail address) on the website of SineFuma. Parents were contacted by a smoking cessation counselor within one week. During this phone call, parents were screened as to whether they could participate in the RCT by checking the inclusion criteria (see "participants" for more information). If parents met the inclusion criteria, more information about the RCT was provided. Parents who agreed to participate received an invitation letter by mail to confirm their participation and were asked to return the completed form by mail or on the study's website. Telephone counseling was offered outside the study context to parents who did not meet the inclusion criteria or who did not want to participate in the study.

Healthcare approach

General healthcare and youth healthcare professionals (hereinafter healthcare professionals) were recruited via several methods, including visiting healthcare centers and conferences, giving presentations, mailings, social media, and word of mouth. Healthcare professionals who wanted to participate in the study could register by filling out a short registration form on a website from the Trimbos Institute that provides healthcare professionals with information about smoking. After registration, healthcare professionals were called by the research team and received more information about the study.

In collaboration with a group of representatives of healthcare professionals, the research team developed a convenient and time-saving tool that they could use to refer parents to effective smoking cessation support (i.e., participating in the RCT or receiving telephone counseling). Healthcare professionals could register parents who were interested in smoking cessation via our website, telephone or fax. Subsequently, within one week, parents were called by a smoking cessation counselor from SineFuma. During this phone call, parents that met the inclusion criteria were asked to participate in our study. Parents who did not meet the inclusion criteria or who did not want to participate in the present study could receive the

telephone counseling program outside the study context. The registration process for the study was identical to the registration process through online mass media. Healthcare professionals could refer parents to our RCT or the telephone counseling program between December 2016 and September 2018.

Participants

To participate in the RCT, parents had to: (a) be a parent/caretaker of a child between 0 and 18 years old; (b) be at least a weekly smoker; (c) have the intention to quit smoking currently or in the future; and (d) give informed consent to participate. Pregnant women were excluded from the study, but telephone counseling was offered to them outside the study context. Based on the results of Schuck, Bricker et al. (2014), a power calculation (Stata 12.1, Stata Corp., College Station, TX, USA) revealed that a sample size of 72 parents per recruitment approach (36 intervention and 36 control) was sufficient to detect 7-day PPA at the three months follow-up assessment with a large effect ($p1 = 0.445$; $p2 = 0.121$; power = 0.80; $\chi^2 = 0.05$). Because we aimed at examining differences in smoking cessation rates between the two recruitment approaches, we doubled the target sample size from 72 to 144 parents. Thus, in anticipation of 10% drop-out, we aimed to recruit a minimum of 158 participating parents in total. However, due to lower inclusion rates than expected, a total of 83 smoking parents were recruited, randomized, and included in the analyses (42.2% male; $M = 39.2$; $SD = 7.20$). This means that we were still able to test our main hypothesis, but our hypothesis regarding the interaction effect of the recruitment approaches could only be tested in an exploratory manner.

Data collection

Parents were asked to fill out two questionnaires: a baseline assessment and a 3-month follow-up assessment. The web survey software application Jambo Research Software (2017) was used to collect parents' answers. Parents received a personal invitation by e-mail to fill out two questionnaires at a secure website. After completion of the baseline assessment, parents were randomly assigned to one of the two trial conditions (i.e., telephone counseling condition vs. self-help brochure condition) by means of a computer algorithm with a block size of 2. True random codes were used from www.random.org. Stratified randomization was used based on educational level (i.e., low: no high school diploma/no vocational training; medium: vocational training or high school diploma; high: college degree), recruitment channel (i.e., primary schools, healthcare, youth healthcare, and online mass media), and number of cigarettes smoked per day (i.e., less than 10; 10–20; 21 or more). When parents lived in the same household and both participated ($n = 3$ parent couples), randomization was carried out at household level to avoid contamination. Randomization was concealed until parents were assigned to one of the two conditions and an automatic e-mail with the result was sent to the research team.

Three months after parents had received the telephone counseling program or self-help brochure, parents were approached to fill out the follow-up questionnaire online. A subsample of parents who reported that they had abstained from smoking for the previous seven days at the follow-up assessment were approached for biochemical validation. Home visits were conducted to collect saliva samples (NicAlert dipstick [Nyomax, Hasbrouck Heights, NJ, USA]). Parents who scored > 10 ng/mL were considered "smokers".

Treatment conditions

To minimize performance bias, parents were informed that the study aimed to examine the effectiveness of two smoking cessation interventions. Parents were blind to which of the two smoking cessation interventions was the intervention condition. The research team and the smoking cessation counselor that provided the telephone counseling program were not blind to this information.

Telephone counseling (intervention condition)

Parents who were allocated to the intervention condition received telephone counseling. The telephone counseling program included six proactive 20 min counseling phone calls over a period of 10 weeks. The counseling sessions were performed by one professional smoking cessation counselor of SineFuma who was thoroughly trained, experienced, and certified in delivering smoking cessation counseling. The counseling was based on motivational interviewing, which is an effective smoking cessation counseling approach (Heckman et al., 2010; Hettema & Hendricks, 2010). Multiple topics were discussed during the counseling, including use of nicotine replacement therapy (NRT), smoking history, withdrawal symptoms, cravings, and relapse prevention. The counselor followed a protocol on which topics to discuss during the sessions. However, the intensity and the order in which the topics were discussed could differ based on the needs and preferences of parents (tailoring). In addition to the telephone counseling, parents received a supplementary brochure, which was developed for the study. This tailor-made brochure Smoke-free Parents (Dutch translation: *Rookvrije Ouders*) provided didactic information about smoking, smoking cessation, motivational messages, exercises, and tips that were relevant for parents who wanted to quit smoking. To guarantee quality and comprehensibility, professional counselors of SineFuma and communication experts of the Trimbos Institute were involved in the development of the brochure. Parents received the brochure at the start of the telephone counseling program.

Self-help brochure (control condition)

Parents who were assigned to the control condition received a self-help brochure by mail within one week after they had completed the baseline assessment. The brochure "What you should know about smoking cessation" (Dutch translation: *Wat je zou moeten weten over stoppen met roken*) was a 16-page, color-printed booklet

developed by the Trimbos Institute. It included elements that have been shown to be effective (e.g., focusing on advantages of smoking cessation) and discussed several topics (e.g., consequences of smoking and available smoking cessation methods). At the end of the study, the telephone counseling program was offered to parents who were allocated to the control condition during the study.

Measurements

Primary outcome

The primary outcome was 7-day PPA at three months follow-up. At the follow-up assessment, parents were asked whether they had smoked (even a single puff) or used any other form of tobacco during the past seven days (yes/no). If parents answered "yes" on one or both questions they were considered "smokers".

Secondary outcomes

The secondary outcomes included: (a) occurrence of 24 h PPA at three months follow-up (*yes/no*); (b) 14-day PPA at four weeks after the designated quit date (yes/no; The Russell Standard; West, 2005); and (c) use of NRT (e.g., nicotine patches) or any smoking cessation medication (e.g., Champix; yes/no). Among parents who did not report abstinence at three months follow-up, the following secondary outcomes were tested: (a) increase in motivation to quit smoking during the study; (b) number of quit attempts during the study; (c) duration of quit attempts during the study (less than one week/one week or more); and (d) implementation of smoking restrictions at home (yes/no). With respect to the latter, parents were asked what rules they had concerning smoking in their house and could select from (a) "smoking is never allowed in the house"; (b) "smoking is sometimes allowed"; (c) "smoking is allowed in some rooms only"; and (d) "there are no rules about smoking in the house". In line with Hyland et al. (2009), parents who selected that smoking was never allowed in the house were considered to have a smoke-free home. A dichotomous scale was used with 0 = 'not having a smoke-free home' and 1 = 'having a smoke-free home'. The outcomes 'increase in motivation to quit during the study' and 'implementation of smoking restrictions at home' were measured at both assessments. All other outcomes were only assessed at the three months follow-up assessment. No changes to the outcomes were made after the study protocol had been published (Scheffers-van Schayck et al., 2018).

Statistical analyses

Data were analyzed according to the intent-to-treat (ITT) principle. Analyses were carried out using Statistical Package for the Social Sciences (SPSS), version 25 (IBM, Armonk, NY, USA). Parents who did not complete the follow-up assessment were considered "smokers" for the three smoking cessation outcomes (i.e., 7-day and 24 h PPA at three months follow-up and 14-day PPA at four weeks after the

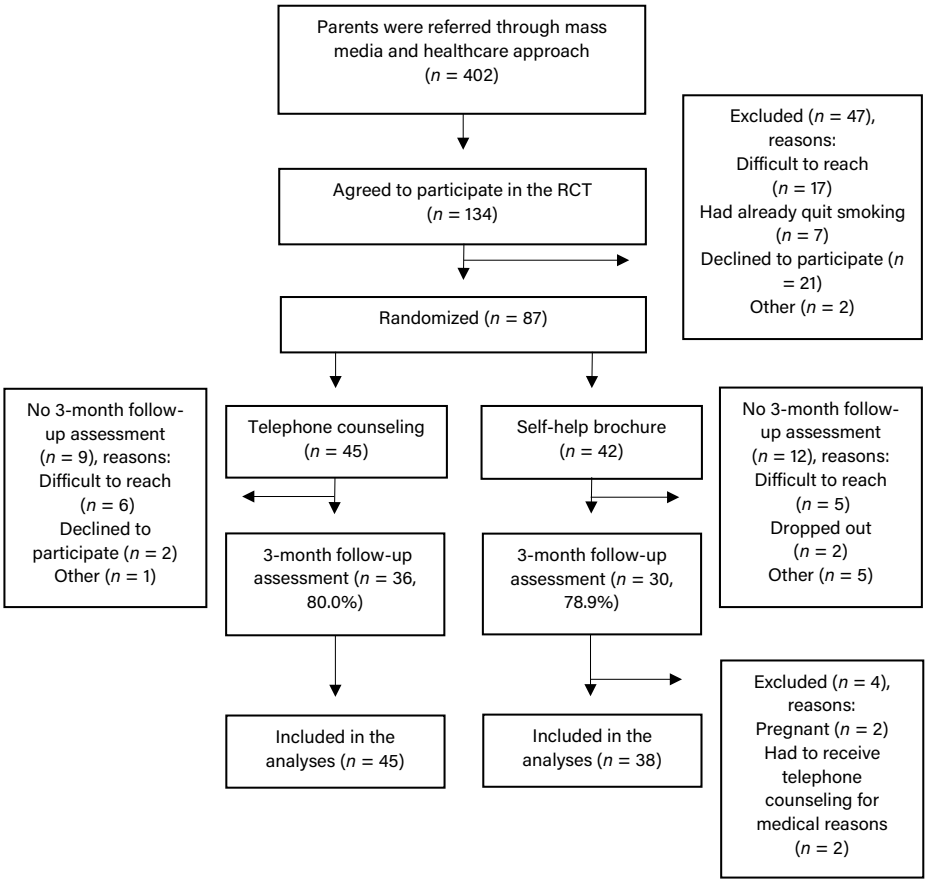
designated quit date; Schuck, Bricker et al., 2004). In line with the efficacy trial (Schuck, Bricker et al., 2004), multiple imputation was used to handle missing data for additional outcomes. If significant correlations between baseline variables and primary and secondary outcomes were found, the baseline variables were included in the imputation model. Twenty imputed data sets were generated. Four parents were excluded from analyses, because they were pregnant ($n = 2$) or because they resigned from the study because they had been assigned to the control condition but needed to receive the telephone counseling program (e.g., for medical reasons; $n = 2$).

Bivariate logistic regression models were used to compare cessation rates between the two conditions. Odds ratios (OR) were not adjusted for baseline characteristics, since none of the baseline characteristics were significantly correlated with the primary outcome. Independent t-tests were carried out for continuous outcomes, and chi-square tests were used for categorical outcomes. To determine the robustness of the primary outcome, a sensitivity analysis was carried out by considering parents who did not complete the follow-up assessment to be "quitters". The interaction effect between condition and recruitment approach was tested in an exploratory manner by computing a product term and including this term in the logistic regression analysis. Because this study was underpowered to examine the interaction effect, additional logistic regression analyses were performed to gain more insight into the relationship between the recruitment approaches and the smoking cessation outcomes. These additional analyses are not reported in the trial registration and the study's protocol (Scheffers-van Schayck et al., 2018). Descriptive statistics (% for categorical variables and means and standard errors for continuous variables), ORs, 95% confidence intervals (CI), χ^2, and p-values are reported.

Results

The flow of the participants, follow-up rates, and number analyzed are depicted in Figure 1. In total, 402 parents were recruited via the healthcare and mass media approach. Of these, 87 parents completed the baseline assessment and were randomized, and 83 parents were included in the analyses. The follow-up rate for the primary outcome was 79.5% (66 parents). Parents who did not complete the follow-up assessment were contacted by phone and e-mail, but most did not respond after these repeated requests. No significant difference was found in the follow-up rate between the intervention and control conditions (80.0% vs. 78.9%; $\chi^2 = 0.01$; $p > .05$). Parents lost at follow-up were more likely to use medical treatment and to be unemployed and were less likely to complete a house smoking ban compared to the remaining parents.

Figure 1
Flowchart of Recruitment and Data Collection



Characteristics of the participants

Table 1 presents the characteristics of the parents who were included in the analyses (N = 83). The mean age was 39.2 years and 42.2% of the parents were male. On average, parents had smoked 20.4 years and smoked 15.5 cigarettes per day. The majority of the parents (83.1%) reported that they had implemented a complete smoking ban at home. In total, 34.9% of the parents had a partner who also smoked. No significant differences were found in the baseline characteristics between the intervention and control conditions ($p > .05$). We did find significance differences in three baseline characteristics between the two recruitment approaches. Compared to parents who were recruited via healthcare professionals, parents who were recruited via the mass media approach were significantly older (M = 41.83 years; SD = 7.07 years vs. M = 37.72 years; SD = 6.91 years; $t(81) = 2.58$; $p = .010$), higher

educated (46.7% vs. 13.2%; $\chi^2 = 11.69$; $p = .003$), and had significantly less often a child with chronic respiratory illness (10.0% vs. 66.0%; $\chi^2 = 24.24$; $p < .001$).

Table 1
Key Characteristics of Parents at Baseline

Characteristics	**Total sample (*N* = 83)**	**Telephone counseling (*n* = 45)**	**Self-help brochure (*n* = 38)**
Age (mean, SD)	39.2 (7.20)	39.3 (7.66)	39.1 (6.71)
Gender % (*n*)			
Male	42.2 (35)	46.7 (21)	36.8 (14)
Nationality % (*n*)			
Dutch	94.0 (78)	93.3 (42)	94.7 (36)
Educational level % (*n*)			
Low	27.7 (23)	28.9 (13)	26.3 (10)
Medium	47.0 (39)	46.7 (21)	47.4 (18)
High	25.3 (21)	24.4 (11)	26.3 (10)
Marital status % (*n*)			
Married/living together	71.1 (59)	73.3 (33)	68.4 (26)
Divorced/widowed and now single	7.2 (6)	4.4 (2)	10.5 (4)
Single	16.9 (14)	17.8 (8)	15.8 (6)
Employment status % (*n*)			
Unemployed	18.1 (15)	20.0 (9)	15.8 (6)
Homemaker	7.2 (6)	6.7 (3)	7.9 (3)
Paid employment	74.7 (62)	73.3 (33)	76.3 (29)
Medical treatment % (*n*)	15.7 (13)	15.6 (7)	15.8 (6)
Cardiovascular disease % (*n*)	7.2 (6)	11.1 (5)	2.6 (1)
Chronic respiratory illness % (*n*)	12.0 (10)	13.3 (6)	10.5 (4)
Chronic respiratory illness child % (*n*)	45.8 (38)	40.0 (18)	52.6 (20)
Cigarettes per day (mean, SD)	15.5 (6.67)	15.0 (5.48)	16.0 (7.88)
Years of smoking (mean, SD)	20.4 (7.39)	21.1 (8.0)	19.6 (6.66)
FTND score (mean, SD)	4.3 (2.29)	4.4 (2.19)	4.3 (2.45)
Complete home smoking ban % (*n*)	83.1 (69)	86.7 (39)	78.9 (30)
Partner smoking % (*n*)			
Yes	34.9 (29)	33.3 (15)	36.8 (14)

Note. No significant differences ($p > .05$) were found in any measure between the intervention and control conditions.

Outcomes

Smoking cessation rates

Table 2 shows the smoking cessation rates for the intervention and control conditions. The odds of reporting 7-day PPA at three months follow-up was 7.54 higher for parents who received telephone counseling than for parents who received the self-help brochure (95% CI = 2.49–22.84). In addition, effects in favor of the telephone counseling program were also found for 24 h PPA at three months follow-up (OR = 6.64; 95% CI = 2.41–18.31) and 14-day PPA at four weeks after the designated quit date (OR = 8.23; 95% CI = 2.72–25.02). A sensitivity analysis on the primary outcome, in which parents who did not complete the follow-up assessment were considered quitters, revealed that the odds of reporting 7-day PPA at three months follow-up was still 5.29 times higher in favor of the telephone counseling program (95% CI = 2.06–13.55). No significant interaction effect was found between condition and the two recruitment approaches on the effectiveness of the telephone counseling program (7-day PPA at three months follow-up: OR = 6.08; 95% CI = 0.54–68.16; 24 h PPA at three months follow-up: OR = 3.41; 95% CI = 0.37–31.07; 14-day PPA at four weeks after the designated quit date: OR = 1.23, 95% CI = 0.12–12.96). Yet, as presented in Table 3, relatively more parents who were recruited via the mass media approach quit smoking compared to parents who were recruited via the healthcare approach. Moreover, additional analyses showed some evidence that parents who were recruited via the mass media approach had higher odds to report 7-day PPA at three months follow-up than parents who were recruited via the healthcare approach. However, adjusted logistic regression analyses showed no significant differences between the recruitment approaches and smoking cessation outcomes (Table 3).

Table 2
Smoking Cessation Outcomes Between Intervention (n = 45) and Control Condition (n = 38)

Smoking cessation outcomes	Telephone counseling % (*n*)	Self-help brochure % (*n*)	OR [95% CI][a]
Primary outcome			
7-day PPA at 3-month FU	53.3 (24)	13.2 (5)	7.54 [2.49, 22.84]
Secondary outcomes			
24-hour PPA at 3-month FU	60.0 (27)	18.4 (7)	6.64 [2.41, 18.31]
14-day PPA at 4-week after the designated quit date	55.6 (25)	13.2 (5)	8.23 [2.72, 25.02]

Note. Intention-to-treat analyses were carried out. In accordance with the Russell Standard criteria, parents who did not complete the follow-up assessment were considered "smokers". CI = confidence interval; FU = follow-up; PPA = point prevalence abstinence.
[a] Because none of the baseline variables shown in Table 1 were significantly correlated with the primary outcome, no adjusted ORs were calculated.

Table 3
Smoking Cessation Outcomes Between Condition and Recruitment Approaches

Smoking cessation outcomes	Telephone counseling % (*n*)		Self-help brochure % (n)		OR [95% CI]	Adjusted OR [95% CI][a]
	Healthcare (*n* = 29)	Mass media (*n* = 16)	Healthcare (*n* = 24)	Mass media (*n* = 14)		
Primary outcome						
7-day PPA at 3-month FU	37.9 (11)	81.3 (13)	12.5 (3)	14.3 (2)	2.79 [1.09, 7.14]	2.90 [.88, 9.56]
Secondary outcomes						
24-hour PPA at 3-month FU	48.3 (14)	81.3 (13)	16.7 (4)	21.4 (3)	2.22 [.89, 5.55]	1.63 [.52, 5.04]
14-day PPA at 4-week after the designated quit date	44.8 (13)	75.0 (12)	8.3 (2)	21.4 (3)	2.53 [.997, 6.44]	1.91 [.60, 6.03]

Note. Intention-to-treat analyses were carried out. In accordance with the Russell Standard criteria, parents who did not complete the follow-up assessment were considered "smokers". CI = confidence interval; FU = follow-up; OR = odds ratio; PPA = point prevalence abstinence.
[a] Adjusted for age, educational level, and chronic respiratory illness child.

Use of NRT and smoking cessation medication

Significantly more parents in the intervention condition than parents in the control condition reported that they had used NRT during the study (66.7% vs. 26.3%; $\chi^2 = 7.748$; $p = .005$). No significant difference was found between the two conditions in using smoking cessation medication (11.1% vs.10.5%; $\chi^2 = 0.453$; $p = .501$).

Secondary outcomes among parents who did not report abstinence

Among the parents who did not report abstinence at three months follow-up, no significant differences were found on the secondary outcomes (Table 4). Because only 14 parents indicated not having implemented a complete home smoking ban at the baseline assessment (see also Table 1), no analyses were performed to test whether significantly more parents in the intervention condition than parents in the control condition had implemented a complete home smoking ban during the study.

Table 4

Secondary Outcomes Among Parents in the Intervention ($n = 21$) and Control Condition ($n = 33$) Who Did Not Report Abstinence at Three Months Follow-up

Secondary outcomes	Telephone counseling	Self-help brochure	*p*
Increase in motivation to quit during the study (*M*, *SE*)	-1.17 (.76)	-1.00 (.42)	> .05
Number of quit attempts during the study (*M*, *SE*)	2.2 (.37)	1.7 (.21)	> .05
Duration of longest quit attempt during the study[a]			> .05
Less than one week % (*n*)	25.0 (4)	48.3 (14)	
One week or more % (*n*)	75.0 (12)	51.7 (15)	

Note. Intention-to-treat analyses were carried out. In accordance with the Russell Standard criteria, parents who did not complete the follow-up assessment were considered "smokers". Because only 14 parents indicated not having implemented a complete home smoking ban at the baseline assessment, no analyses were performed to test whether significantly more parents in the intervention condition than parents in the control condition had implemented a complete home smoking ban during the study.

[a] Duration of longest quit attempt was calculated among smokers who reported a quit attempt (intervention condition: $n = 16$; control condition: $n = 29$).

Discussion

This study provides insight into the effectiveness of a parent-tailored telephone smoking cessation counseling program under more real-world conditions. As hypothesized, the odds of reporting 7-day PPA at three months follow-up was 7.54 higher for parents who received telephone counseling than for parents who only received a self-help brochure on smoking cessation (95% CI = 2.49–22.84). These results yielded similar high effect sizes compared to the results of the efficacy

trial at three months follow-up (44.5% [telephone counseling] vs. 12.1% [self-help brochure]; adjusted OR = 6.89; 95% CI = 4.18–11.36; Schuck, Bricker et al., 2014). A possible explanation for the small differences between 14-day PPA at 4-week after the designated quit date and 7-day and 24 h PPA at three months follow-up could be the emphasis on relapse prevention in the telephone counseling program. The last sessions with the counselors focus on dealing with craving and difficult moments. Having the opportunity to interact with a counselor on this topic and discuss personal situations that might make it harder to stay quit may decrease the likelihood that parents relapse at three months follow-up.

Results of other RCTs that examined the effectiveness of smoking cessation interventions tailored to parents at three months follow-up were mixed. The majority of these studies showed non-significant results concerning smoking abstinence (Curry et al., 2003; Mahebee-Gittens et al., 2008; Ralston & Roohi, 2008; Winickoff et al., 2010). Only one study yielded positive effect sizes (Chan et al., 2008), which were lower than the effect sizes found in the efficacy trial (Schuck, Bricker et al., 2014) and the present study. The interventions that were provided to parents in the other studies included, among others, three telephone counseling sessions (Curry et al., 2003) or parents were offered to be referred to a quit line (Mahabee-Gittens et al., 2008; Winickoff et al., 2010). In two other studies, participating parents did not receive a telephone-based intervention but received, among others, an extensive (>10 min) anti-smoking message with a pediatric hospitalist and provision of NRT (Ralston & Roohi, 2008) or non-smoking mothers were, among others, motivated to advise their smoking partners to quit smoking (Chan et al., 2008). Possibly, the combination of an intensive parent-tailored telephone counseling program (including 6 sessions), NRT and a parent-tailored self-help brochure is particularly beneficial. Further research should examine which factors of the program that were examined in the efficacy trial and the present study make the intervention so highly effective. In addition, to provide parents with effective smoking cessation interventions, more evidence is needed about whether the combination of elements (i.e., six telephone counseling sessions, NRT, and a parent-tailored self-help brochure) is indeed more effective than other smoking cessation interventions tailored to parents.

One of the strengths of the efficacy trial was that the results revealed that the telephone counseling program also yielded benefits to parents who had not quit smoking at three and 12 months follow-up (Schuck, Bricker et al., 2014). For example, significantly more parents who received telephone counseling made more quit attempts by three and 12 months follow-up than did parents in the control condition. In contrast to the efficacy trial, no significant differences were found among parents who did not report abstinence at three months follow-up concerning the secondary outcomes increase in motivation to quit smoking, number of quit attempts during the study, and duration of longest quit attempt during the study. These unexpected

findings could be explained by the small number of parents that were included in the analyses (n = 21 [intervention condition]; n = 33 [control condition]). Although, these results were not significant, most results were directed in the expected way or in line with the efficacy trial.

The power calculation revealed that a sample size of at least 144 parents was needed in order to have sufficient power to examine the interaction effect between condition and recruitment approach with a large effect. Because only 83 parents were included in the analyses, this study was underpowered to examine the interaction effect. As our sample size did not allow us to interpret potential interaction effects, we concentrated on alternative ways to obtain information about differences in the effectiveness of the telephone counseling program between the two approaches. Descriptive results illustrated that relatively more parents who were recruited via the mass media approach quit smoking compared to parents who were recruited via the healthcare approach. In addition, we found some evidence that parents who were recruited via the mass media approach had higher odds to report 7-day PPA at three months follow-up than parents who were recruited via the healthcare approach. These results point in the direction of a mass media approach being a more effective recruitment approach than the healthcare approach. However, caution is warranted as - because of the small sample size - our findings may be less reliable (reflected in the broad confidence intervals in the regression analyses) and are not very robust. A larger sample size is needed to examine whether the effectiveness of the telephone counseling program depends on the recruitment approach. For implementation purposes, it is not sufficient to solely look at the impact of a recruitment approach on the effectiveness of the intervention. It is also important to consider the success rate of the possible recruitment approaches (McClure et al., 2006). In other words, it is necessary to consider which recruitment approach is most successful in recruiting the target group (i.e., how many people were recruited and how many of them actually started the intervention). In brief, to determine which recruitment approach should be employed in recruiting parents for telephone counseling, further research should also examine the success rates of the healthcare and mass media approaches. In addition, the present study showed that it was challenging to recruit smoking parents, as the number of parents that was needed was not reached due to a high drop-out of parents after they had been referred. This stresses the need for more information on why parents decided not to be willing to receive telephone counseling or to participate in the RCT and how recruitment could be improved.

Strengths and limitations

A major strength of the present study is that the telephone counseling program was tested in an effectiveness trial under more real-world conditions (i.e., parents were recruited via approaches that could be used as recruitment approaches when

the telephone counseling program is implemented in the future, parents did not receive € 100 for participating in the study, and parents had to pay for the costs of the telephone counseling program if it was not covered by their health insurance). As the distinction between efficacy and effectiveness should be viewed as a spectrum instead of a strict dichotomy (Fritz & Cleland, 2003), we think that, based on the characteristics of the present study, this study more closely resembles an effectiveness than an efficacy trial. A second strength is that parents were recruited via two recruitment approaches that were set up in everyday practice, without any interference to stimulate the inclusion. Both of these strengths contributes to the generalizability of our findings to everyday practice. A third strength is that Russell Standard (Clinical) version 2 (West, 2005) was used to assess smoking abstinence which enables meaningful comparisons between different studies.

In addition to its strengths, this study has four major limitations. First, in contrast to the efficacy trial, the effectiveness of the telephone counseling program was not examined at the long term (e.g., 12-month follow-up). In the course of the study, the decision was made to extend the recruitment of parents in order to increase the inclusion. As a result, a 12-month follow-up was no longer possible within the course of the study. The results of the efficacy trial revealed that the telephone counseling program remained effective at 12 months follow-up (34.0% of the parents in the intervention condition reported 7-day PPA vs. 18.0% of the parents in the control condition; OR = 2.81; 95% CI = 1.76–4.49; Schuck, Bricker et al., 2014). Based on these results and the findings of the present study, we expect that the telephone counseling program remains effective in the long term. The second limitation is that the self-reported abstinence status was only biochemically validated for a few parents. A subsample of parents who reported smoking abstinence at three months follow-up was approached for biochemical validation (n = 17). Participation required some saliva to be collected from parents during a home visit. The majority of the approached parents (n = 13) did not want to participate for various reasons. Results of the biochemical validation confirmed the quit status of two parents. With respect to the other two parents who participated in the biochemical validation, results showed that they were either heavily exposed to SHS or were light smokers. Because biochemical validation confirmed the quit status of the majority of parents (81.8%) in the efficacy trial (Schuck, Bricker et al., 2014), we do not expect this confirmation rate to be lower for the present study. A third limitation is that the 95% CIs of the effect sizes concerning the smoking cessation outcomes were quite wide. Therefore, caution is needed in interpreting these results. Finally, it should be recognized that the number of parents in this study is relatively low, given that several channels were involved to recruit smoking parents. Because only a small proportion of the source population was included in our study, generalizability of our conclusions to the larger population of smoking parents is limited to some extent.

Implications for practice and suggestions for further research

This effectiveness trial showed that the telephone smoking cessation counseling program tailored to parents is effective in helping parents to quit smoking within three months follow-up, when tested under more real-world conditions. However, it remains unclear whether the program is also cost-effective. Information on the cost-effectiveness of a health promotion intervention is essential for policy makers to decide whether or not to implement the intervention. Therefore, further research should examine the cost-effectiveness of the parent-tailored telephone smoking cessation counseling program. In addition, intervention success is not solely determined by the effectiveness of the intervention, but is also affected by the extent to which people have access to and are willing to use the intervention (McClure et al., 2006).

As mentioned previously, for the implementation of the telephone counseling program, it is crucial to test which recruitment approach is most successful in recruiting parents and how recruitment could be improved. When considering the success rates of the recruitment approaches, it is also important to assess their costs of the recruitment approaches. If recruitment approaches result in high recruitment costs, policy makers may be less likely to employ those approaches to implement the interventions. Finally, it is important to explore how parents who received the telephone counseling program experienced the program and whether any improvements can be made in order to expand the benefits of the telephone counseling program.

Conclusion

The results of the present effectiveness study show that a parent-tailored telephone smoking cessation counseling program is effective in encouraging parents to quit smoking within three months. Implementation of the telephone counseling program could be considered, taking the difficulties of the recruitment of parents into account. To increase the impact of this evidence-based program in terms of public health and tobacco control among parents and their children, it is essential to gain insight into how recruitment of parents via different recruitment approaches (i.e., healthcare vs. mass media) could be improved.

CHAPTER 6

An economic evaluation of a proactive parent-tailored telephone smoking cessation counseling program

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T.S.-v.S. was responsible for the recruitment, data collection and economic analysis, and report of study results. B.W. was responsible for the economic analysis. R.O., R.E., and M.K. were supervisors and grant applicators. All authors read and approved the final manuscript.

Abstract

Introduction: This trial examined the cost-effectiveness of a proactive parent-tailored telephone smoking cessation counseling program from a societal perspective.

Methods: After baseline assessment, 87 parents were randomly assigned to the intervention (telephone counseling) or control condition (self-help brochure). Primary outcome was costs per self-reported quitter at three months follow-up. Incremental cost-effectiveness ratios (ICER) and cost-effectiveness acceptability curves were calculated.

Results: Results showed higher effects and costs for the intervention condition (53.3%; € 1,275.99) than for the control condition (13.2%; € 280.03), resulting in an ICER of € 2,491.

Conclusion: If society is willing to pay € 2,491 for each additional parent who quits smoking, telephone counseling is cost-effective.

Introduction

Parental smoking has severe health consequences for parents and their children (U.S. Department of Health and Human Services, 2014). To protect children from their exposure to parental smoking, diminish their chance to initiate smoking, and to reduce parents' risk of smoking-related morbidity, parents need to quit smoking. Parent-tailored smoking cessation interventions are effective in helping parents quit smoking (Scheffers-van Schayck et al., 2020). More specifically, the Dutch proactive parent-tailored telephone smoking cessation counseling program 'Smoke-free Parents' (SFP) was shown to be effective (e.g., Scheffers-van Schayck, Otten et al., 2019). With respect to implementation purposes, it is also important to evaluate health promotion interventions from a broader cost-effectiveness perspective (Flay et al., 2005). There is some evidence on the cost-effectiveness of telephone smoking cessation counseling programs (e.g., Parker et al., 2007). Yet, to our knowledge, no evidence exists on the cost-effectiveness of parent-tailored telephone smoking cessation counseling programs. To facilitate widespread implementation of SFP, more insight is needed into the cost-effectiveness. Therefore, as part of an RCT in which parents received SFP (intervention) or a self-help brochure (control), the aim of the present study was to examine the cost-effectiveness of SFP. It was hypothesized that SFP would be more costly, but also more effective than the self-help brochure.

Methods

Study design

This economic evaluation was part of a trial in which both the (cost-)effectiveness and implementation of the parent-tailored telephone smoking cessation counseling program SFP were examined. More in-depth information on the trial can be found elsewhere (Scheffers-van Schayck, Otten et al., 2019). The trial was registered in the Netherlands Trial Register (NTR6092) and the ethics committee of the Trimbos Institute approved this study's protocol (201607_52-1606).

Participants and setting

Smoking parents were recruited via healthcare settings and mass media (i.e., primary schools and online mass media) in the Netherlands between September 2016 and September 2018. Parents could register (or were registered by healthcare professionals) for a free proactive phone call about SFP from smoking cessation counselors. During this phone call, parents were asked to participate in the RCT. Participation consisted of completing two online questionnaires (at baseline and three months follow-up) and being assigned to the intervention (SFP) or control (self-help brochure) condition. To participate in the RCT, parents needed to: (a) have a child between 0 and 18 years old; (b) be at least a weekly smoker; (c) have the intention to quit smoking currently or in the future; and (d) give informed consent.

Pregnant women and other parents who were not eligible for, or did not want to participate in the RCT were given the opportunity to receive telephone counseling outside the study context. In total, 87 parents participated of whom 83 were included in the analyses (42.2% male; *M* = 39.2 years; *SD* = 7.20 years).

Study conditions

The program SFP included six motivational interviewing-based telephone calls (± 20 minutes per call) from a smoking cessation counselor and a supplementary parent-tailored brochure on smoking cessation that was developed for this study. The control condition received a general self-help brochure on smoking cessation.

Identification and measurement of costs and effects

The Consolidated Health Economic Evaluation Reporting Standards (Husereau et al., 2013) and the Dutch manual for cost analysis in healthcare research (Hakkaart-van Roijen et al., 2016) were followed for the economic evaluation. The cost-effectiveness analyses (CEA) were conducted from a societal perspective. This means that four different types of costs were identified: healthcare costs (e.g., consultations with healthcare professionals), productivity costs (e.g., absenteeism from work), intervention costs (e.g., costs for telephone counseling), and patient and family costs (e.g., informal work). The Dutch TiC-P questionnaire (Bouwmans & Hakkaart-van Roijen, 2013) was administered to identify all types of costs at baseline and three months follow-up. Medication costs were calculated using prices based on the Daily Defined Dosage (see: www.medicijnkosten.nl). Other costs were calculated in concordance with the Dutch manual (Hakkaart-van Roijen et al., 2016). All costs were expressed in Euros and indexed for the year 2018 (based on the consumer price index, Statistics Netherlands). The primary outcome for the CEA was costs per self-reported quitter (i.e., 7-day point-prevalence abstinence) at three months follow-up.

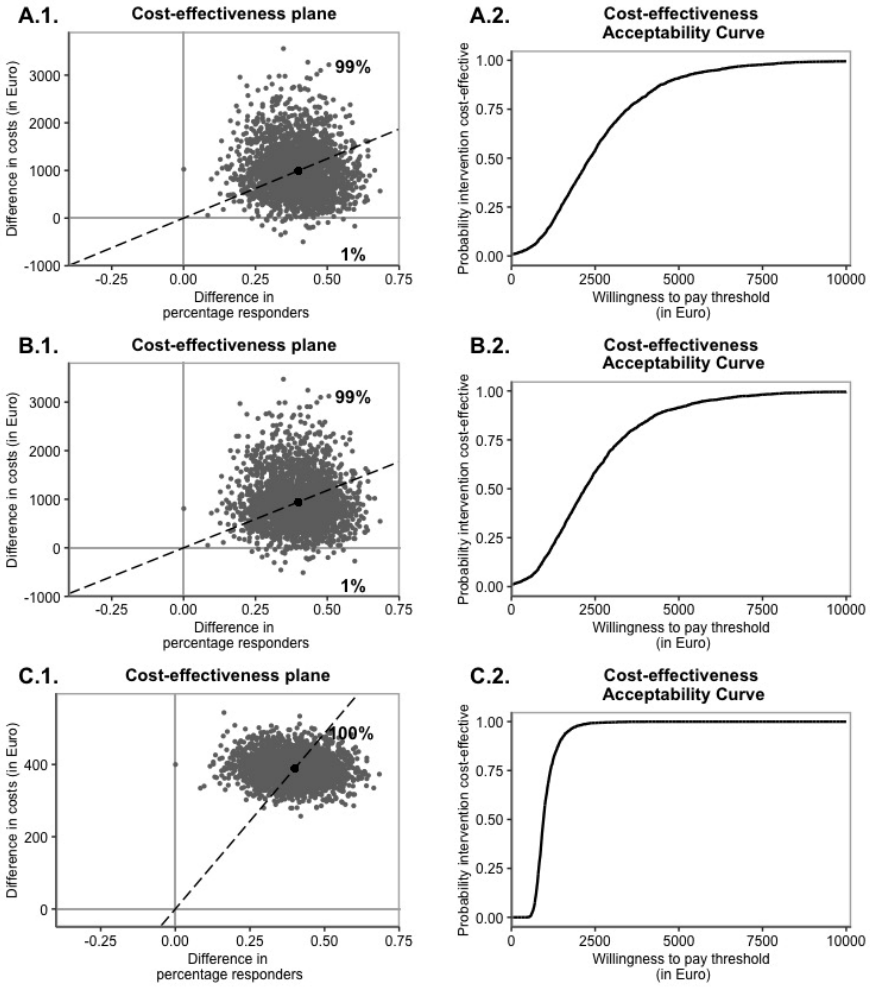
Statistical analyses

The CEA was performed according to the intention-to-treat principle, where parents who did not complete the follow-up assessment were considered "smokers". The incremental cost-effectiveness ratio (ICER) was calculated by dividing the incremental costs by the incremental effects. To quantify the uncertainty around the ICER and to handle missing cost data, predictive mean matching, a Bayesian imputation method, with single imputation was embedded in 2,500 nonparametric bootstraps of seemingly-unrelated regression equations. At three months follow-up, 20 patients were missing (*n* = 10; 26% in the control condition and *n* = 10; 22% in the intervention condition). Subsequently, the bootstrapped cost-effectiveness ratios were plotted on cost-effectiveness planes. Cost-effectiveness acceptability curves (CEAC) were constructed to demonstrate the probability that SFP is cost-effective over a range of ceiling ratios. To demonstrate the robustness of the main analysis

(i.e., societal perspective without baseline adjustments), sensitivity analyses were carried out for the societal perspective with baseline adjustment and a healthcare perspective. Data were analyzed in R (version 4.0.3).

Figure 1

Incremental cost-effectiveness plane (left) and cost-effectiveness acceptability curve (right) for the 2,500 bootstrapped incremental costs per responder for main analysis (A.1. & A.2.), sensitivity analysis with baseline adjustment (B.1. & B.2.), and sensitivity analysis when assuming a healthcare perspective (C.1. & C.2.)



Note. The cost-effectiveness planes present the differences in costs (y axis) and parental smoking cessation (x axis) between the intervention (SFP) and control (self-help brochure) condition.

Results

Participant characteristics and follow-up rates are described elsewhere (Scheffers-van Schayck, Otten et al., 2019). Table S1 (see supplementary materials) presents the mean costs of resource use at three months follow-up for both conditions. Parents who received SFP had higher total costs and rates of abstinence (€ 1,275.99; 53.3%) than parents in the control condition (€ 280.03; 13.2%) at three months follow-up (Table S2 in supplementary materials). From the societal perspective, the ICER was € 2,491 for each additional parent who quits smoking compared to the control condition (Table S2). The ICER of the sensitivity analyses were lower (respectively € 2,363 and € 972). The cost-effectiveness planes and the CEAC for the main and sensitivity analyses are presented in Figure 1. The cost-effectiveness planes show that almost all bootstrapping results lie in the north-east quadrant (Figures 2.A.1., 2.B.1., and 2.C.1.), indicating that SFP was more effective, but also more costly than the control condition. The CEAC of the main analysis shows that the probability that SFP is cost-effective is >50% when society is willing to pay more than € 2,348 per additional parent who quits smoking, with higher probabilities when increasing willingness to pay.

Discussion

As hypothesized, the present study showed that the proactive telephone counseling program SFP resulted in higher costs and effects than the control condition over a 3-month follow-up period. From societal perspective, the ICER was € 2,491, implicating that SFP is cost-effective if society is willing to pay € 2,491 for each additional parent that quits smoking. Because there is no accepted monetary cut-off point for smoking cessation in the Netherlands currently (van den Brand et al., 2019), it is difficult to draw firm conclusions about whether SFP is indeed cost-effective. However, the costs saved by parents quitting smoking will easily be higher than the costs that are involved in SFP (de Kinderen et al., 2016). Furthermore, compared to the cost-effectiveness results of other smoking cessation interventions in the Netherlands, the results of the present study are relatively low (range € 1,500 [Stanczyk et al., 2014] to € 11,546 [van den Brand et al., 2019]; amounts uncorrected for inflation and time preferences).

This study has several limitations. First, the cost-effectiveness was not examined at the long term. Hence, it is currently unknown whether SFP could also be cost-effectiveness at the long term. In addition, the data were based on self-report, which might have led to biased data. However, self-reported data can be reliable when administrative data are not available (Noben et al., 2016). In conclusion, taken these limitations into account, the present study illustrates that the proactive telephone counseling program SFP could be cost-effective.

Table S1
Mean Costs of Intervention and Control Condition at Three Months Follow-Up

Cost type	Intervention condition	Control condition
Intervention costs	€ 362	€ 14
Healthcare costs		
General practitioner visits	€ 30	€ 27
Hospital visits	€ 9	€ 14
Psychologist visits	€ 56	€ 6
Company doctor visits	€ 16	€ 0
Medication	€ 10	€ 26
Total healthcare costs (95% CI)[a]	€ 119 (€ 61–€ 191)	€ 79 (€ 40–€ 130)
Patient and family costs		
Travel costs	€ 2	€ 1
Informal care[b]	€ 3	€ 9
Total patient and family costs (95% CI)[a]	€ 5 (€ 1–€ 14)	€ 10 (€ 1–€ 31)
Productivity costs		
Absenteeism	€ 703	€ 135
Presenteeism	€ 50	€ 8
Total productivity costs (95% CI)[a]	€ 792 (€ 91–€ 1994)	€ 174 (€ 0–€ 657)
Total costs (95% CI)[a]	€ 1278 (€ 557–€ 2500)	€ 277 (€ 74–€ 760)

Note. CI = confidence interval.
[a] Based on single imputations nested in 2,500 bootstrap replications (hence, mean costs per items do not necessarily add up to [sub]total costs).
[b] Informal care includes unpaid work (e.g., domestic work, taking care of children, volunteer work).

Table S2
Cost-Effectiveness Estimated of Incremental Costs Per Responder, Based on 2,500 Bootstrap Replications

				Distribution of cost- effectiveness plane			
Analysis	**Incremental costs (95% CI)***	**Incremental effects (95% CI)***	**Mean ICER**	**NE %**	**SE % (dominant)**	**SW %**	**NW % (inferior)**
Societal perspective (main analysis)	€ 996 (€ 155 - € 2,195)	40.0% (21.4% - 57.8%)	€ 2,491	99	1	0	0
Societal perspective (sensitivity analysis – baseline adjustment for difference in costs)	€ 945 (€ 113 - € 2,237)	40.0% (21.4% - 57.8%)	€ 2,363	99	1	0	0
Healthcare perspective (sensitivity analysis)	€ 389 (€ 316 - € 472)	40.0% (21.4% - 57.8%)	€ 972	100	0	0	0

CI = confidence interval; ICER = incremental cost-effectiveness ratio; NE = north-east quadrant; NW = north-west quadrant; SE = south-east quadrant; SW = south-west quadrant.

CHAPTER 7

Program uptake of a parent-tailored telephone smoking cessation counseling: An examination of recruitment approaches

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Authors contribution

T.S.-v.S. was responsible for the recruitment, data collection and analysis, and report of study results. D.W.W. reviewed and edited the first drafts of the manuscript. R.O., R.E., and M.K. were supervisors and grant applicators. All authors read and approved the final manuscript.

Abstract

Introduction: Recently, a Dutch proactive parent-tailored telephone smoking cessation counseling program, Smoke-free Parents (SFP), was demonstrated to be effective in helping parents to quit smoking. This study aimed to examine the program's uptake and the costs of two recruitment approaches (i.e., healthcare vs. mass media) for SFP. In addition, parent's barriers to participating in SFP and the characteristics of participating parents were assessed.

Methods: As part of an effectiveness-implementation hybrid trial, 402 smoking parents were recruited via healthcare settings and mass media for an informal, proactive, and free phone call with a smoking cessation counselor about SFP (the Netherlands, September 2016 – September 2018). Parents were asked whether they wanted to participate in SFP. If parents refused, reasons for decline and additional information (e.g., educational level) were collected.

Results: Results revealed that 26.4% of the recruited parents participated in SFP. Although the program uptake of parents recruited via mass media was slightly, but not significantly, higher than via healthcare (27.3% vs. 26.8%; $p = .92$), the healthcare approach resulted in lower costs per participant (€ 99.62 vs. € 205.72). Smoking cessation counselors were unable to reach almost one third (32.7%) of the parents after they had agreed to be called about SFP.

Conclusion: The present study showed that more than a quarter of all recruited parents participated in SFP and that the mass media approach and healthcare approach can be used to recruit parents for SFP. To increase the number of parents participating in SFP, it is important to overcome the identified barriers that prevent parents from participating.

Introduction

Children's exposure to secondhand smoke (SHS) occurs predominantly at home, with parents and other relatives who smoke (Öberg et al., 2011), and has adverse consequences for children's health, including increased risk of asthma (DiFranza et al., 2004; U.S. Department of Health and Human Services, 2006). In addition, thirdhand smoke (THS), the residual tobacco smoke pollutants that remain in dust and on surfaces, may also have adverse health consequences (Matt et al., 2011). Fortunately, many parents want to quit smoking (Hymowitz et al., 2005), providing a key opportunity to increase the number of parents that quit and improve their health and to decrease the number of children exposed to SHS and THS.

Recently, a proactive telephone-based smoking cessation counseling program tailored to parents, called Smoke-free Parents (SFP), was examined in the Netherlands (Schuck, Bricker et al., 2014). Parents were proactively contacted and offered services by a smoking cessation counselor. In this randomized controlled trial (RCT), smoking parents (N = 512) received telephone counseling or a self-help brochure (control condition). Results revealed that 12 months after the intervention began, 34.0% of the parents in the intervention condition reported 7-day point prevalence abstinence vs. 18.0% of the parents in the control condition (OR = 2.81; 95% CI = 1.76–4.49). Based on these findings, the program has the potential to help parents quit smoking and protect their children from SHS and THS exposure at home (Schuck, Bricker et al., 2014).

The impact of an intervention does not depend solely on the efficacy of the intervention but also on the extent to which the intervention is accepted and utilized by its intended targets (McClure et al., 2006). In other words, once parents are recruited for a smoking cessation intervention, it is crucial that they actually start the intervention (i.e., program uptake). With respect to SFP, it is currently unknown to what extent parents are likely to start the telephone counseling program after being recruited via different approaches (e.g., healthcare settings) and whether the program uptake differs between recruitment approaches. More information about the program uptake of SFP via different recruitment approaches is needed for a successful implementation of SFP on a national scale. For implementation purposes, it is also important to gain information about (a) the relative costs of the recruitment approaches (i.e., cost-per-participant [CPP]); (b) barriers that prevent parents from participating in SFP; and (c) whether participating parents have different characteristics from non-participating parents. The present study aims to address these issues by examining the program uptake of parents in SFP following two recruitment approaches (i.e., mass media and healthcare settings). The mass media approach was chosen because of its ubiquitous use by population-level cessation programs (e.g., quitlines). Moreover, a broader group of smoking

parents can be recruited via the mass media approach compared to the healthcare approach, since not every child of parents who visit healthcare professionals in hospitals or youth healthcare centers. Healthcare settings were chosen because parents are receptive to cessation interventions in these settings and these settings could serve as "teachable moments" (Curry et al., 2003; Mahabee-Gittens et al., 2008; Winickoff et al., 2003).

Based on prior research on recruiting parents for smoking cessation interventions via healthcare settings (Drehmer et al., 2016; Mahabee-Gittens et al., 2008; Winickoff et al., 2003;2006), we expected that the program uptake would be higher for the healthcare approach than for the mass media approach. No explicit hypothesis was formulated beforehand with respect to the two approaches' recruitment costs. Characteristics of the participating parents, including age, gender, educational level, and average number of cigarettes smoked per day, were examined. It was hypothesized that participating parents had higher education levels and smoked fewer cigarettes per day on average than parents who did not participate in SFP (Hyland et al., 2006; Reid et al., 2010).

Methods

Study design

This study was part of a large effectiveness-implementation hybrid trial (Bernet et al., 2013; Curran et al., 2012) of the Dutch counseling program SFP. More information on the study design can be found elsewhere (Scheffers-van Schayck et al., 2018; Scheffers-van Schayck, Otten et al., 2019). This study was registered in the Netherlands Trial Register (NTR6092) and approved by the ethics committee of the Trimbos Institute (201607_52-1606).

Recruitment

The two recruitment approaches, mass media approach and healthcare approach, are described briefly below and more extensively elsewhere (Scheffers-van Schayck et al., 2018; Scheffers-van Schayck, Otten et al., 2019).

Mass media approach

The mass media approach included two recruitment channels: primary schools and online mass media.

Primary schools

Between September and November 2016, 619 primary schools throughout the Netherlands were randomly selected and asked to distribute invitation letters among parents of children (4-12 years of age) for registration for the RCT. In total, 101 (16.3%) schools agreed to do so. Most schools that did not participate indicated that they

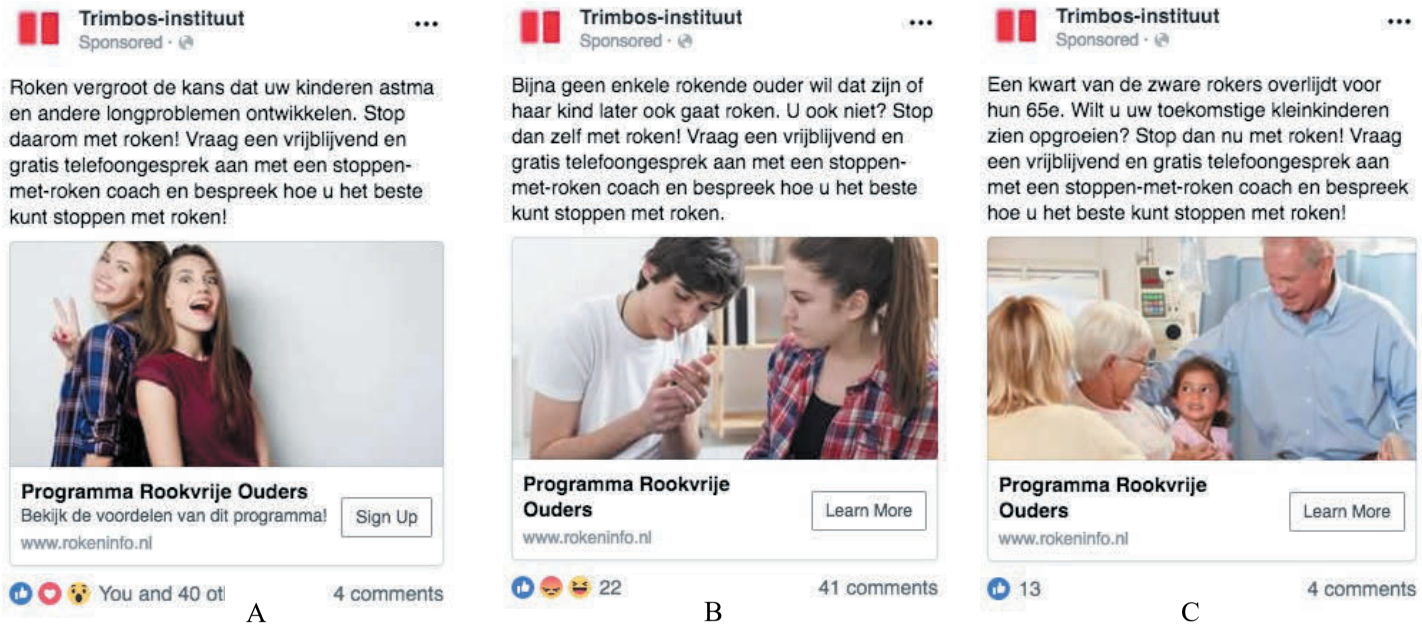
were too busy, they did not see it as their task to promote smoking cessation or that their standard answer to questions on possible research involvement is no. Because fewer parents registered for the study than expected, the same schools were asked to bring the study to parents' attention a second time. Because the aim was to examine the recruitment of parents for SFP under real-world conditions as much as possible, the content of the invitation letters was changed compared to the first invitation. Instead of inviting parents to participate in the study, parents received information about SFP and were invited to register for a free proactive phone call with a smoking cessation counselor, during which parents were invited to participate in the RCT (see "procedure" for more information). In total, 77.0% of the 101 primary schools agreed to distribute the letters a second time.

Online mass media

Parents were recruited through two smoking cessation websites (one of which can be found on every Dutch cigarette pack), where parents could find information about SFP and could register for a free proactive phone call with a smoking cessation counselor. In addition, multiple paid Facebook and Instagram advertisements aimed at motivating parents to quit smoking and register for a free call about SFP were deployed between September 2017 and January 2018. Because fewer parents registered than expected, a specialized advertising agency was hired to develop five advertisements targeting smoking parents. These advertisements were deployed between January 2018 and May 2018 (see Figure 1). In total, 17,807 people were reached with at least one of the five advertisements. The total number of clicks on the five advertisements was 1,754 and the total impressions was 66,156, which leads to a click-through rate (i.e., the number of clicks on the advertisements divided by the impressions of the advertisements) of 2.6%.

Figure 1

The Five Advertisements that Were Deployed for the Recruitment of Parents via Online Mass Media (The Netherlands, 2018)



Note. A: English translation: Smoking increases the chance for your children to develop asthma and other respiratory illnesses. So quit smoking! Ask for an informal and free phone call with a smoking cessation counselor to discuss how you can quit smoking best!
B: English translation: Most parents do not want their children to start smoking when they are older. What about you? Quit smoking! Ask for an informal and free phone call with a smoking cessation counselor to discuss how you can quit smoking best!
C: English translation: About 25% of heavy smokers die before their 65th birthday. Would you like to see your grandchildren grow up? Quit smoking now! Ask for an informal and free phone call with a smoking cessation counselor to discuss how you can quit smoking best!

D

E

D: English translation: I wish I had known before that my smoking behavior has severe health consequences for my children, because then I would have quit smoking a lot sooner. My advice to other parents: quit smoking! Ask for an informal and free phone call with a smoking cessation counselor to discuss how you can quit smoking best!

E: English translation: Smoking increases the chance for your children to develop asthma and other respiratory illnesses. So quit smoking! Ask for an informal and free phone call with a smoking cessation counselor to discuss how you can quit smoking best!

Healthcare approach

The healthcare approach included two different groups of healthcare professionals: general healthcare professionals and youth healthcare professionals. In the Netherlands, youth healthcare provides preventive healthcare to all children aged 0-17 years. Around 95% of Dutch parents with children aged 0-4 years reported having visited youth healthcare centers (Centraal Bureau voor de Statistiek, 2014). Youth healthcare professionals working at these centers participated in this study.

Several meetings were organized with a group of representatives of general healthcare professionals and youth healthcare professionals (hereinafter healthcare professionals) to develop the SFP referral tool and to ask them to promote SFP among their colleagues. Healthcare professionals interested in using the SFP referral tool could register for the study on the website. After registration, healthcare professionals received a phone call from the research team, during which they were given further information and could choose to withdraw or confirm their registration.

Between December 2016 and September 2018, healthcare professionals could refer parents to SFP by asking them whether they were interested in receiving a free proactive phone call in which information was provided on the SFP program by a smoking cessation counselor. Parents who agreed were registered by phone, fax or online. To assist healthcare professionals with referring parents to SFP, a toolkit was developed containing a SFP poster, a small information card for parents, and an information card for healthcare professionals on the referral tool.

Procedure

After parents were recruited through the mass media approach or healthcare approach, three smoking cessation counselors of SineFuma (a Dutch certified quitline) attempted to reach parents up to five times via telephone, text messages, e-mail and/or WhatsApp at different moments during the day. Following a script, the counselors screened parents for RCT inclusion criteria: (a) being recruited via the mass media approach or healthcare approach and intending to quit smoking currently or in the future; (b) having children between 0 and 18 years; and (c) being at least weekly smokers. Eligible parents were informed about the RCT and about possible costs for the telephone counseling program. When this study was conducted, most health insurance agencies reimbursed the costs for smoking cessation support, but the amount of reimbursement varied by health insurance type (Trimbos-instituut, n.d.-a). If parents agreed to participate in the RCT, the research team sent a registration form to parents to confirm their registration. Telephone counseling outside the RCT was offered to parents who declined participation or who did not fulfil the inclusion criteria. If parents did not want to participate in the

RCT nor to receive telephone counseling outside it, they were asked to note a reason for declining. Data were collected on parents' gender, educational level, age, and average number of cigarettes smoked each day. The platform program Caspio (2018) was used to exchange data between SineFuma and the research team.

Measures and statistical analyses

The data were analyzed using Excel, SPSS (version 25.0), and R.

Program uptake

Program uptake was operationalized as the number of parents recruited via the recruitment approach divided by the number of parents that participated in SFP (i.e., those who were randomized in the RCT plus those who received telephone counseling outside the RCT).

Recruitment costs and CPP

The recruitment costs for the mass media approach included costs for: (a) the dissemination of letters to the schools; (b) the development and hosting of the study website for the schools; (c) the advertisements on social media; and (d) adding information about SFP to the national smoking cessation website. The recruitment costs for the healthcare approach included costs for: (a) the development of materials for healthcare professionals; (b) the dissemination of materials to healthcare professionals; and (c) the recruitment of healthcare professionals at conferences (promotion costs). Personnel costs (e.g., costs of the research team's time investment) were not collected. To calculate the CPP for both recruitment approaches, the costs for each approach were divided by the number of parents that participated in SFP.

Parents' barriers to participation in SFP

During the informal phone call with the smoking cessation counselors, parents were asked whether they wanted to participate in the RCT or receive SFP outside the study context (see "Procedure" for more information). In case parents did not want to participate in the RCT nor receive SFP outside the study context, the counselors asked parents to give a reason for declining during the same phone call. The classification of these reasons included two stages. First, two members of the research team independently classified the first 75 reasons into categories (inductive coding) and searched for different themes between the categories. After reaching consensus about the categories and themes, the two researchers independently categorized the remaining 145 reasons. At the end of the first stage, 31 categories were constructed. In the second stage, these were combined into two main categories in discussion with a third researcher. The first category 'reasons for declining' included seven subcategories: (a) too expensive; (b) had already quit smoking; (c) did not want to quit smoking; (d) did not want to receive cessation

assistance; (e) wanted to receive other cessation assistance; (f) had already found other cessation assistance; and (g) other. The second category 'other reasons for not participating after referral' included two subcategories: (a) unable to reach (identified by the research team when the smoking cessation counselors were either unable to reach parents at all or unable to reach parents after they had been able to reach parents once); and (b) did not fulfil the inclusion criteria (i.e., the inclusion criteria for participating in the RCT; e.g., being a parents/caretaker of a child between 0 and 18 years old; Scheffers-van Schayck, Otten et al., 2019). A two proportion Z test was performed in R to test whether the parents' barriers were significantly more often found for the mass media approach or healthcare approach.

Characteristics of parents who did vs. did not participate in SFP

The smoking cessation counselors asked parents several demographic and smoking-related characteristics, including gender, age, educational level (low/medium/high; Centraal Bureau voor de Statistiek, 2019), and average number of cigarettes smoked per day. Parents who did not meet the inclusion criteria, or who were unable to reach were excluded from the analyses on the characteristics. In total, 257 parents were included in the analyses. However, due to missing values, the number of parents varied for each characteristic.

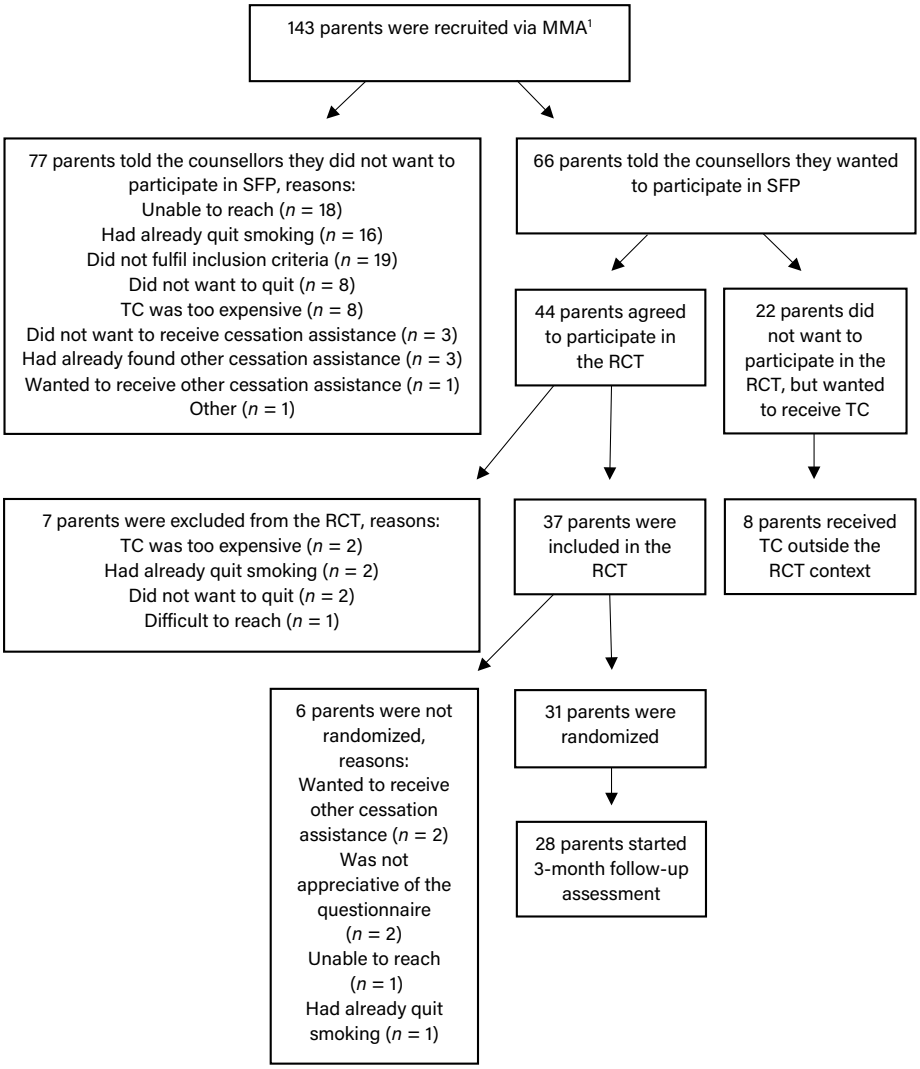
Results

Program uptake and recruitment costs

The flow of parents through the study for the mass media approach and healthcare approach is depicted in Figures 2 and 3. Overall, 402 parents were recruited, of whom 106 (26.4%) participated in SFP. The program uptake via the mass media approach (n = 39; 27.3%) and via the healthcare approach (n = 67; 26.8%) did not significantly differ (p = .92). More specifically, the program uptake via primary schools was 46.4% (number of parents that were recruited via primary schools: 28; number of parents that participated in SFP: 13). For online mass media, the program uptake was 22.6% (number of parents that were recruited via online mass media: 115; number of parents that participated in SFP: 26). Regarding recruitment costs (Table 1), the CPP were substantial higher for the mass media approach (€ 205.72) than for the healthcare approach (€ 99.62). More specifically, the recruitment costs for primary schools were € 4,427.90 (CPP: € 340.61). For online mass media, recruitment costs were € 3,595.37 (CPP: € 138.28).

Figure 2

Flowchart Mass Media Approach

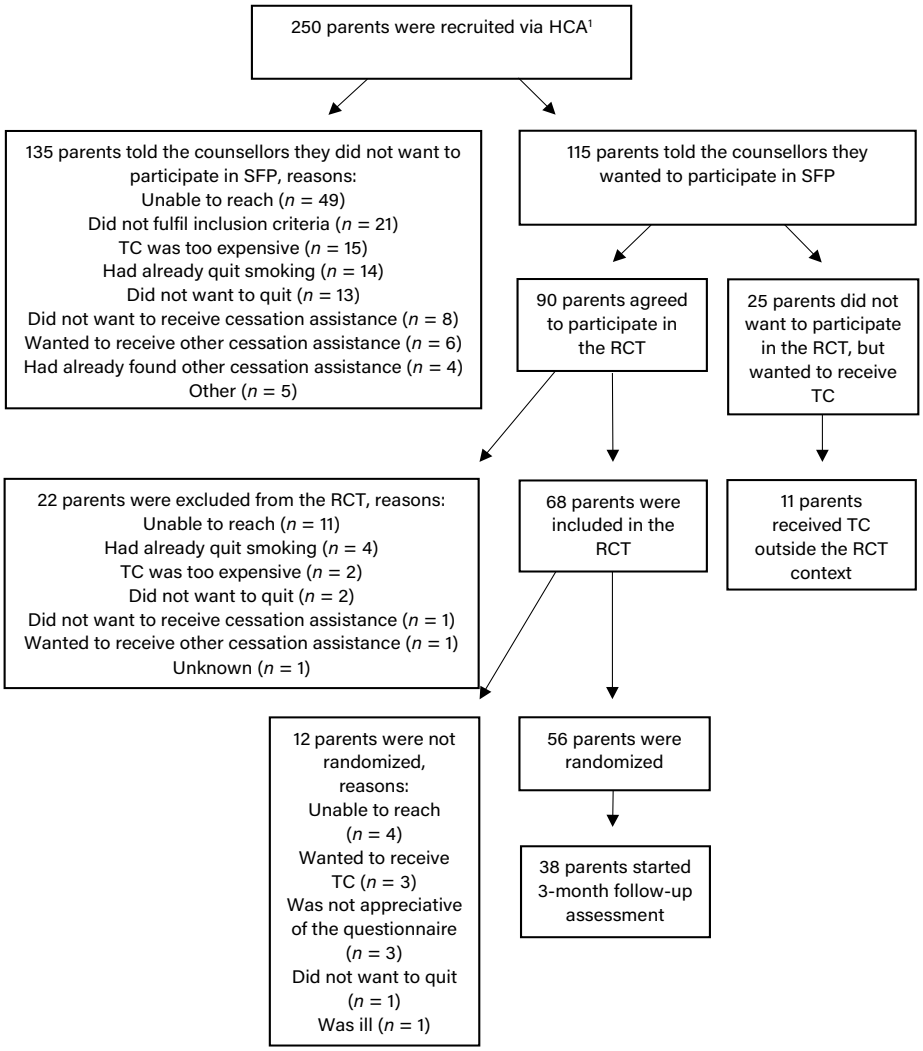


Note. MMA = mass media approach; RCT = randomized controlled trial; SFP = Smoke-free Parents; TC = telephone counseling.

[1] For nine parents it was unknown via which recruitment approach they were recruited. Therefore, the sum of parents who were recruited via the mass media approach and healthcare approach is not equal to the total number of parents that were recruited (N = 402).

Figure 3

Flowchart Healthcare Approach



Note. HCA = healthcare approach; RCT = randomized controlled trial; SFP = Smoke-free Parents; TC = telephone counseling.

[1] For nine parents it was unknown via which recruitment approach they were recruited. Therefore, the sum of parents who were recruited via the mass media approach and healthcare approach is not equal to the total number of parents that were recruited (N = 402).

Table 1
Recruitment Costs (in Euros) and CPP[a] for the Mass Media Approach and Healthcare Approach (*N* = 106; The Netherlands; 2016-2018)

Recruitment costs	MMA (*n* = 39 parents)	HCA (*n* = 67 parents)
Dissemination of letters to primary schools	€ 372.58	NA
Website primary schools	€ 4,055.32	NA
Social media (Facebook and Instagram)	€ 3,389.67	NA
National smoking cessation website	€ 205.70	NA
Development of materials	NA	€ 4,286.43
Dissemination of materials	NA	€ 1,045.57
Promotion costs conferences	NA	€ 1,242.88
Social media (Facebook and Instagram)	NA	€ 99.71
Total costs	€ 8,023.27	€ 6,674.59
CPP[a]	€ 205.72	€ 99.62

Note. CPP = cost-per-participant; HCA = healthcare approach; MMA = mass media approach; NA = not applicable.
[a] The CPP is based on the total recruitment costs divided by the number of parents who participated in SFP (i.e., sum of parents who were randomized in the RCT and parents who received telephone counseling outside the RCT).

Parents' barriers to participation in SFP

As illustrated in Table 2, 'unable to reach' was most often found as reason for not participating in SFP (32.7%). In addition, parents often mentioned that they had already quit smoking (15.0%) or that SFP was too expensive (10.5%). Concerning the mass media approach (Figure 2 and Table 2), the most common reasons were 'unable to reach' (23.4%) and 'had already quit smoking' (20.8%). Parents who were recruited via the healthcare approach (Figure 3 and Table 2) were most often unable to reach by the smoking cessation counselors (36.3%) or did not fulfil the inclusion criteria (15.6%). The reason 'had already quit smoking' was significantly more often mentioned by parents recruited via the mass media approach versus the healthcare approach.

Table 2
Percentages of Parents' Barriers to Participation in SFP Overall and for the Mass Media Approach and Healthcare Approach (*N* = 220; The Netherlands; 2016-2018)

Barriers	Overall (%)	MMA (%)	HCA (%)	Difference between approaches
Reasons for declining				
Had already quit smoking	15.0	20.8	10.4	.04*
TC was too expensive	10.5	10.4	11.1	.87
Did not want to quit	9.5	10.4	9.6	.86
Did not want to receive cessation assistance	5.0	3.9	5.9	.52
Had already found other cessation assistance	3.2	3.9	3.0	.71
Wanted to receive other cessation assistance	3.2	1.3	4.4	.22
Other	2.7	1.3	3.7	.31
Other reasons for not participating after referral				
Unable to reach[a]	32.7	23.4	36.3	.05
Did not fulfil inclusion criteria[b]	18.2	24.7	15.6	.15

Note. HCA = healthcare approach; MMA = mass media approach; TC = telephone counseling.
[a] Unable to reach was identified by the research team when the smoking cessation counselors were either unable to reach parents at all or unable to reach parents after they had been able to reach parents once.
[b] Examples of the inclusion criteria for the RCT were (a) being at least a weekly smoker; (b) being a parent/caretaker of a child between 0 and 18 years old; and (c) having the intention to quit smoking currently or in the future (Scheffers-van Schayck, Otten et al., 2019).
* $p < .05$.

Characteristics of parents who did vs. did not participate in SFP

Parents who participated in SFP were significantly older than parents who did not (M = 39.61; SD = 7.28 vs. M = 36.97; SD = 7.40; $t(187) = -2.636$; $p = .009$). No significant differences were found for gender ($\chi^2 = .000$; $p = .985$), educational level ($\chi^2 = .481$; $p = .786$), or average number of cigarettes smoked daily ($t(228) = .068$; $p = .946$).

Discussion

This study examined program uptake and costs of mass media approach and healthcare approach for the proactive parent-tailored telephone smoking cessation counseling program SFP (Scheffers-van Schayck, Otten, 2019; Schuck, Bricker et al., 2014). A key finding was that only 26.4% of the parents contacted via the recruitment approaches participated in SFP. Both approaches were equally useful for recruiting parents for SFP, as there were no differences in program uptake. However, CPP was substantially lower for the healthcare approach versus mass media approach, although the CPP of both approaches was lower than found in other research (Lopez et al., 2008).

In comparison with other studies assessing program uptake of smokers who were recruited via child healthcare settings and referred to a quitline, the rates found in this study (26.8%) were in the mid-range (respectively 15%, 29%, and 84%; Mahabee-Gittens et al., 2008; Sisterhen, et al., 2010; Winickoff et al., 2010). The high drop-out of parents after referral was caused by several barriers that prevented parents from participating in SFP. For example, the results show that the reason "had already quit smoking" was significantly more identified in the mass media approach compared to the healthcare approach. When looking into the four different recruitment channels, the results suggest that the percentage of parents reporting that they had already quit smoking was higher in the online mass media channel (25.4%) compared to other channels (e.g., medical healthcare professionals: 10.4%; primary schools: 0%). However, caution is needed when interpreting these results, since the number of parents that were recruited via each recruitment channel substantially differed (range: 24 – 224).

Three main barriers were found that prevented parents from participating in SFP. First, 10.5% of the parents cited the high costs of SFP as a reason for declining when parents discussed the costs of SFP with the smoking cessation counselors during the informal phone call. During the study, SFP cost between € 302.50 (2016/2017) and € 363 (2018). When this study was conducted, most health insurance agencies reimbursed the costs for smoking cessation support once a year, but the amount of reimbursement varied by health insurance type (Trimbos-instituut, n.d.-a). Evidence shows that while partial reimbursement vs. no reimbursement did not significantly increase the use of smoking cessation interventions, full reimbursement of these interventions compared to no reimbursement did increase the use of interventions, the number of quit attempts, and the abstinence rates at six months or longer (van den Brand et al., 2017). Thus, full reimbursement of smoking cessation treatment seems to be important to increase reach and impact.

A second reason that parents mentioned for declining to participate in SFP concerned a lack of motivation to quit (9.5%), which is in line with other research (Burns et al., 2011). Recruiting parents for smoking cessation interventions in the context of their children's health could be a strength, because there may be a teachable moment for motivating a quit attempt (Curry et al., 2003; Mahabee-Gittens et al., 2008; Winickoff et al., 2003). However, recruiting parents for smoking cessation treatment could also be more challenging, because they are less likely to experience serious smoking-related health consequences compared to smokers of older ages (Jha & Peto, 2014), and, therefore, they may be less likely to be motivated to quit smoking and receive assistance. One potential way to increase parents' motivation may be to focus on the role conflict between being a parent and a smoker. One study found that parents who experienced this conflict were more likely to plan to quit smoking in the future (Friebely et al., 2013).

Another important reason for non-participation in SFP is that smoking cessation counselors were unable to reach 32.7% of the parents after they had agreed to be called about SFP. Difficulty reaching smokers after they have been referred to a quitline is a common barrier (Willet et al., 2009). Although our smoking cessation counselors attempted to connect with parents by sending text messages and e-mails in addition to their call attempts, future research might examine the effectiveness of utilizing and personalizing these lower-cost strategies and employing different framing strategies (e.g., loss vs. gain). Future research could explore effective ways to reach difficult-to-reach parents and motivate them to engage in smoking cessation interventions.

Limitations

Several limitations of this study should be acknowledged. First, due to the study design we were unable to examine the reach of SFP (i.e., the total number of parents that was actually reached with SFP). To gain more insight into the potential reach of SFP, further research is warranted. Second, the examination of the costs of the recruitment approaches did not include any personnel costs (e.g., costs of the research team's time investment). The research team's time investment could have influenced the results of the present study. However, as a research team we aimed to influence the recruitment of parents as little as possible, because we wanted to examine the recruitment under real world conditions. Related to this, the length of time it took healthcare professionals to refer parents to SFP was also not examined. However, we expect this time cost to be minimal, since healthcare professionals reported that the referral tool was convenient and time-saving.

Implications for practice and directions for future research

Based on the results of this study, it could be concluded that the healthcare approach is a more successful recruitment approach than mass media approach,

since the recruitment costs were substantially lower and there was no significant difference in the rates of program uptake. However, the recruitment approaches could reach different subgroups of parents. Our data showed that, compared to parents who were recruited via the mass media approach, parents recruited via the healthcare approach were younger, less educated, and more likely to have a child with chronic respiratory illness (Scheffers-van Schayck, Otten et al., 2019). Thus, by using both recruitment approaches, it is likely that a more diverse group of smoking parents can be reached for SFP.

Although the rates of program uptake of SFP fall within the wide range of previous studies, future research could examine how the program uptake could be improved to enhance the impact of SFP, such as by altering some of the recruitment strategies. For example, distributing invitation letters to parents via their children's primary schools might be less successful than giving short presentations on SFP during parent sessions at schools. In addition, program uptake could be improved by overcoming the barriers that parents reported in this study. For example, health insurance agencies and governments could explore ways to provide full reimbursement of SFP.

Conclusion

This study shows that the mass media approach and healthcare approach can be used to recruit parents for SFP. In addition, multiple barriers were identified that prevented parents from participating in SFP, including the costs of SFP and parents' lack of motivation to quit smoking. To increase the number of parents that start SFP, it is important to find solutions to overcome these barriers.

CHAPTER 8

Implementation of a proactive referral tool for child healthcare professionals to encourage and facilitate parental smoking cessation: A mixed-methods study

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Revised and resubmitted for publication

Authors contribution

T.S.-v.S. was responsible for the recruitment, data collection and analysis, and report of study results. B.H.W. reviewed and edited the first drafts of the manuscript. R.O. and M.K. were supervisors and grant applicators. All authors read and approved the final manuscript.

Abstract

Introduction: Recently, the parent-tailored telephone based smoking cessation counseling program 'Smoke-free Parents' was shown to be effective in helping parents to quit smoking. To implement this program in healthcare settings in the Netherlands, the research team developed a proactive referral tool to refer parents to Smoke-free Parents. The aim of the present implementation study was to explore the facilitators, barriers, and suggestions for improvement in the implementation of this referral tool.

Methods: Child healthcare professionals (N = 68) were invited to complete two online (quantitative and qualitative) questionnaires and to participate in a telephone semi-structured qualitative interview between April 2017 and February 2019. After inductive coding, thematic analyses were performed on the qualitative data. Descriptive analyses were performed on the quantitative data.

Results: The data from both questionnaires and the telephone interview revealed that the majority of the child healthcare professionals found the Smoke-free Parents referral tool accessible and convenient to use. Yet there were several barriers that limited their use of the tool. The data revealed that one of the main barriers that healthcare professionals experienced was parental resistance to smoking cessation assistance. In addition, healthcare professionals noted that they experienced tension when motivating parents to quit smoking, as they were not the parent's, but the child's healthcare provider. Additionally, healthcare professionals reported being concerned about the lack of information about the costs of Smoke-free Parents, which limited professionals referring parents to the service.

Conclusion: Although healthcare professionals reported rather positive experiences with the Smoke-free Parents referral tool, the use of the tool was limited due to barriers. To increase the impact of the Smoke-free Parents telephone-based smoking cessation counseling program via healthcare settings, it is important to overcome these barriers. Suggestions for improvement in the implementation of the referral tool in healthcare settings are discussed.

Introduction

Worldwide, more than half a billion children are exposed to secondhand smoke (SHS) at home (Mbulo et al., 2016). Children are primarily exposed to SHS by parental smoking (Pugmire et al., 2014). Children who are exposed to SHS are more likely to develop respiratory illnesses, including asthma and bronchitis, and to initiate smoking in the future (Hofhuis et al., 2003; Otten et al., 2007; U.S. Department of Health and Human Services, 2006). To decrease the adverse health consequences for parents (e.g., respiratory and cardiovascular diseases, and cancer; U.S. Department of Health and Human Services, 2014) and their children, and to reduce the chance that children start smoking, it is paramount that smoking parents receive evidence-based smoking cessation interventions that help them to quit smoking.

Healthcare professionals play an essential role in identifying smokers, motivating them to quit smoking, and offering them evidence-based smoking cessation treatment (Fiore et al., 2000). National clinical practice guidelines have been developed in several countries to help healthcare professionals to address smoking cessation and provide treatment (Fiore et al., 2000; 2008; Trimbos-instituut & Nederlands Huisartsen Genootschap, 2017). A frequently used approach is Ask-Advise-Refer (AAR), whereby healthcare professionals *ask* patients about their tobacco use, *advise* smokers to quit, and reactively *refer* smokers who are interested in quitting to evidence-based cessation interventions (e.g., a quitline; Bernstein et al., 2006; Schroeder, 2005; Vidrine et al. 2013). Reactive referral means that smokers receive the contact information of smoking cessation services and are encouraged to initiate contact themselves (Bentz et al., 2006; Bernstein et al., 2006). In contrast to reactive referral, healthcare professionals can proactively refer parents to evidence-based smoking cessation interventions, i.e. smokers are directly contacted by the smoking cessation services. Research suggests that proactive recruitment strategies could increase the inclusion of smokers into smoking cessation interventions compared to reactive recruitment strategies (Drehmer et al., 2016; Marcano Belisario et al., 2012).

About ten years ago, a proactive parent-tailored telephone smoking cessation counseling program was developed in the Netherlands (Schuck et al., 2011). This counseling program included up to seven telephone calls (initiated by certified smoking cessation counselors) during a period of three months (Schuck et al., 2011). A randomized controlled trial (RCT) showed the effectiveness of this telephone counseling program at three and twelve months follow-up (Schuck, Bricker et al., 2014). Based on the promising results of this efficacy trial, the research team developed and conducted a follow-up trial using an effectiveness-implementation hybrid design (Bernet et al., 2013; Curran et al., 2012; Landes et al., 2019). This follow-

up trial had two aims. The first aim was to examine the effectiveness of the Dutch telephone counseling program (now called "Smoke-free Parents" [SFP]) in a more real-world setting (i.e., an effectiveness trial). More information on the rationale behind and the results of this effectiveness trial can be found elsewhere (Scheffers-van Schayck et al., 2018; Scheffers-van Schayck, Otten et al., 2019). The second aim was to examine in an implementation study how SFP could be implemented in – among others – healthcare settings (Scheffers-van Schayck et al., 2018). Healthcare settings were selected as proactive recruitment approach, because it was assumed that parents are receptive to smoking cessation interventions in these settings and these settings could serve as a "teachable moment" (Curry et al., 2003; Mahabee-Gittens et al., 2008; Winickoff et al., 2003).

The development of an implementation strategy for SFP in healthcare settings

To support implementation in healthcare settings, the research team developed a comprehensive implementation support strategy. The research team first organized and hosted several expert meetings with ten representatives of Dutch child healthcare professionals preliminary to the follow-up trial. The aim of these meetings was to develop an implementation strategy to implement SFP in healthcare settings. During these meetings, these professionals stated that they needed a system that enables them to proactively refer smoking parents to SFP. Based on this information and on the evidence of proactive recruitment (Drehmer et al., 2016; Marcano Belisario et al., 2012), the research team developed a proactive referral tool in collaboration with the healthcare professionals as an implementation strategy.

The referral tool consisted of two main steps. First, healthcare professionals could use the tool to refer parents to SFP (online, by fax or by phone) if parents were interested in quitting smoking and willing to receive evidence-based treatment. Second, a smoking cessation counselor from SineFuma (one of the Dutch certified quit lines) approached parents who were referred to SFP within one week. During this brief (5-10 minutes), free, informative, and proactive phone call, counselors provided more information about SFP (e.g., the costs of the program [between € 300 and € 370] that parents might need to pay if their health insurance did not reimburse the costs). Parents could withdraw or confirm their registration for SFP during this phone call.

During the expert meetings, the representatives also mentioned to be in need of a toolkit that could support healthcare professionals with using the referral tool. Therefore, the research team developed a free toolkit as an implementation strategy in collaboration with the representatives. The toolkit included: 1) a paper-based information card (size A5) for healthcare professionals that provided information about the referral tool; 2) a small paper-based card (size A6) that healthcare

professionals could give to parents to inform them about SFP and the risks of children's exposure to SHS; and 3) a poster of SFP. Healthcare professionals who signed up for the referral tool (and the implementation study, see "Methods" for more information) received the toolkit by mail and were asked to disseminate the toolkit among their co-workers.

The final implementation strategy of the research team was to contact healthcare professionals by phone when they had signed up for the referral tool (and the implementation study). The aim of this phone call was to inform healthcare professionals about the SFP referral tool, toolkit, and the implementation study. Because the referral tool was developed with the aim to be convenient in its use as much as possible and the instructions were provided in the toolkit, the healthcare professionals received no additional face-to-face training. However, if healthcare professionals had some questions about the referral tool and/or toolkit, they approached the research team by phone and e-mail.

The present implementation study

Currently, it is unknown what the experiences were of healthcare professionals who used the SFP referral tool. Therefore, as part of the overall follow-up trial, the present implementation study aimed to explore the facilitators, barriers, and suggestions for improvement in the implementation of the proactive SFP referral tool in healthcare settings. The data collected through interviews and questionnaires yield essential insights into the experiences of healthcare professionals and provide important directions for further development and widespread implementation of the tool in healthcare settings.

Methods

Design and ethics

The present implementation study is part of a large trial that uses an effectiveness-implementation hybrid design (Bernet et al., 2013; Curran et al., 2012; Landes et al., 2019) to examine the effectiveness and implementation of the Dutch proactive telephone smoking cessation counseling program SFP tailored to parents of children aged 0-18 years. Further information on the complete study design can be found elsewhere (Scheffers-van Schayck et al., 2018; Scheffers-van Schayck, Otten et al., 2019). The ethics committee of the Trimbos Institute approved this study's protocol (201607_52-1606).

Participants and recruitment

In the Netherlands, children between 0 and 17 years receive different types of child healthcare (see Table 1). In the present study, two groups of child healthcare professionals participated: medical child healthcare professionals and specialized

child healthcare professionals. Medical child healthcare professionals (e.g., general practitioners and pediatricians) provide medical care to children. Specialized child healthcare professionals (e.g., child healthcare clinicians and nurses) provide preventive healthcare that includes – among others – monitoring children's development, providing vaccinations to children, enabling early identification of any problems, and referring children to specialist care if needed (Nederlands Centrum Jeugdgezondheid, 2018). For this type of healthcare, parents are encouraged to visit youth healthcare centers 15 times in the first four years of their child's life. In addition, when children are in primary and secondary school they have regular check-ups at school. Because around 95% of Dutch parents with children between the ages of 0 and 4 years reported to have visited youth healthcare centers (Centraal Bureau voor de Statistiek, 2014), these centers could be a viable implementation setting for SFP.

Table 1
An Overall Overview of Different Types of Child Healthcare in the Netherlands

Age of child	Care providers	Care location	Type of care provided
Before birth	Midwives, gynecologists, and obstetrics	Midwifery practices and hospitals	Women receive prenatal care during their pregnancy
0-2 weeks old	Maternity nurses	Care at home	Women and infants receive postnatal care for a couple of hours during the first ten days postpartum
0-17 years old	Specialized child healthcare clinicians and nurses	Youth healthcare centers and schools	Children's physical/cognitive/behavioral development is being monitored and children receive multiple vaccinations throughout the years
0-17 years old	General practitioners, pediatricians, and other child healthcare clinicians and nurses	General practices, hospitals, and medical clinics	Children receive medical care if needed

After the SFP referral tool had been developed, the ten representatives of medical child and specialized child healthcare professionals (hereinafter: healthcare professionals) who were involved in the development of the referral tool were asked to bring the referral tool and the implementation study to their co-workers' attention for recruitment and implementation purposes. In addition, between November 2016 and September 2018, healthcare professionals were recruited for the study via social media, the Dutch national smoking cessation website for healthcare professionals,

mailings, and by presentations that the research team gave at multiple conferences and healthcare centers. All healthcare professionals that provided (medical) care to children could register online for the referral tool and the study. No other eligibility criteria were formulated.

After registration, healthcare professionals were called by the research team to receive more information on the study and the use of the referral tool. Participation in the study included healthcare professionals being asked to work with the referral tool and to complete two online short questionnaires and one semi-structured telephone interview on their experiences with the referral tool. Verbal informed consent for participation in the study was received during the informative phone call; written informed consent was collected at the start of one of the two questionnaires. In total, 68 healthcare professionals participated in the implementation study. After healthcare professionals had confirmed their registration for the implementation study, the research team sent the toolkit (e.g., paper-based information cards, see "Introduction" for more information) to them and their colleagues for free. The research team distributed 811 toolkits among the participating healthcare professionals and their colleagues (representing 56 hospitals and youth healthcare centers). The majority of the hospitals/youth healthcare centers were represented in the study by one healthcare professional. The colleagues of these healthcare professionals did not need to participate in the study to receive a toolkit (this explains why the number of spread toolkits is substantially higher than the number of participating healthcare professionals). However, in case that colleagues of participating healthcare professionals contacted the research team about the referral tool and/or implementation study, the research team invited these colleagues to participate in the study.

Data collection

During the expert meetings preliminary to the present implementation study, the representatives emphasized that it was crucial that the implementation of the SFP referral tool and the participation in the implementation study did not ask much time from the healthcare professionals. Therefore, the aims of the data collection were to prevent the overburdening of healthcare professionals on the one hand, but, on the other hand, to collect different types of data that were profound and complementary as much as possible (i.e., triangulation; Greene et al., 1989; Heale & Forbes, 2013) and to strive for saturation. Because of this, healthcare professionals were invited to complete two short online questionnaires and one semi-structured telephone interview.

The research team found it important that healthcare professionals, who were recruited after the start of the data collection, were still able to work with the SFP referral tool and to participate in the present implementation study. Because of this,

the recruitment and the data collection of this study overlapped for the greater part (recruitment: from November 2016 to September 2018; data collection: from April 2017 to February 2019). An overview of the data collection is presented in Table 2.

Table 2
Overview of the Data Collection for the Present Implementation Study

	Telephone interview	**First questionnaire**	**Second questionnaire**
Timing	April 2017 – August 2017	March 2018	November 2018
Instruments	Semi-structured telephone interview based on the framework of Linnan and Steckler (2002). The interview guide included seven open and closed questions	MIDI with five additional open and closed questions	Qualitative questionnaire including three open questions
Aims	To collect in-depth data on the barriers and facilitators on the implementation of the SFP referral tool (experienced by HCP)	To identify multiple determinants (e.g., self-efficacy and relevance) that affected the use of the SFP referral tool by HCP	To prioritize the barriers that HCP experienced in using the SFP referral tool and to find suggestions to overcome these barriers
Number of HCP approached[a]	35	59	62
Number of HCP completed[b]	25 (71.4%)	31 (52.5%)	32 (51.6%)

Note. HCP = healthcare professionals; MIDI = Measurement Instrument for Determinants of Innovations; SFP = Smoke-free Parents.
[a] The number of approached professionals differed between the questionnaires and telephone interview, because healthcare professionals could register for the study, while the data collection had already started.
[b] Nine (13.2%) healthcare professionals completed all three assessments.

Semi-structured telephone interviews

Semi-structured telephone interviews were carried out so that in-depth data could be collected on the barriers and facilitators on the implementation of the SFP referral tool. After healthcare professionals had worked about four months with the SFP referral tool, they were individually approached by telephone for a telephone interview by the primary researcher (T.S.-v.S). Several criteria determined whether

healthcare professionals were approached. For example, healthcare professionals were not approached if the research team had already spoken more informally with healthcare professionals just before the telephone interview or if healthcare professionals were approached for the interview and one of the two questionnaires (that were carried out at an established moment) during the same period of time. Because of these criteria, around half of the healthcare professionals (n = 33, 48.5%) was not approached for the telephone interview.

For the large follow-up trial, a process evaluation was conducted based on the framework of Linnan and Steckler (2002). This framework was chosen because it provides an overview on how to conduct a process evaluation for public health interventions and research. To connect with the follow-up trial and to be able to provide more insight into the barriers and facilitators that healthcare professionals experienced with the SFP referral tool, the interview guide of the telephone interview was based on several components of this framework. These components were: dose delivered, fidelity, context, dose received, and reach. The interview guide included a selection of seven closed and open questions (see appendix A). The interviews were short (about 20 minutes), because the research team did not want to overburden the healthcare professionals and data were also collected through the online questionnaires. All interviews were conducted in Dutch and audio recorded.

Online questionnaires

All healthcare professionals that participated at the time received a personal invitation by email to complete the online questionnaires. The secure web survey software application Jambo Mobile was used to collect healthcare professionals' answers on both questionnaires. The first questionnaire that was sent to 59 healthcare professionals was the Dutch questionnaire Measurement Instrument for Determinants of Innovations (MIDI; Fleuren et al., 2014). The research team used the MIDI, because this quantitative questionnaire made it possible for the research team to obtain a broad overview of multiple determinants (e.g., self-efficacy and relevance) that affected the use of the SFP referral tool by the healthcare professionals (Fleuren et al., 2014). The majority of the questions (e.g., "I have sufficient knowledge to use the referral tool") were rated on a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). Because researchers can select the determinants of the MIDI they are interested in, the first questionnaire included 19 closed questions and statements (covering 11 determinants of the MIDI), three questions on demographics, and two additional open and closed questions on strategies that healthcare professionals applied to motivate parents to quit smoking.

The second online questionnaire was sent to 62 healthcare professionals. Based on the data that were collected through the telephone interviews and the first questionnaire on the barriers that healthcare professionals experienced in using

the SFP referral tool, the aim of the second questionnaire was to prioritize these barriers and to find suggestions to overcome these barriers. Therefore, the research team developed a short qualitative online questionnaire with three open questions in which healthcare professionals were asked to indicate the three main barriers they experienced in working with the SFP referral tool. In addition, they were asked to provide a possible solution for each mentioned barrier.

Analyses

Of the 68 participating healthcare professionals, three were excluded from the analysis because they were a midwife or obstetrician.

Semi-structured telephone interviews

Two research assistants transcribed verbatim the 24 audio recordings of the interviews. Subsequently, two members of the research team (i.e., T.S.-v.S. and a research assistant) inductively coded two transcripts individually (by using MAXQDA 18.2) after which the codes were discussed and the codebook was agreed on. Subsequently, based on the codebook, three more transcripts were coded individually by the same researchers and results were discussed. This process was repeated multiple times for the remainder of the transcripts whereby transcripts were individually coded and the results were subsequently discussed. Any disagreements between the two researchers were resolved by discussion, and if necessary, by consulting a third member of the research team.

After all transcripts were coded, the same researchers carried out thematic analysis, following the guidelines proposed by Braun and Clarke (2006). This means that the researchers individually searched for themes that focused on the barriers and facilitators of the SFP referral tool across all codes by looking at the relationships between the codes and grouping these codes together. Both researchers made an overview of the themes derived from the interviews, which were both discussed and improved several times until a final version was made that was discussed with the other members of the research team.

Online questionnaires

With respect to the first questionnaire, the closed questions were analyzed in Statistical Package for the Social Sciences, version 25. Descriptive statistics (% for categorical variables and means and standard deviations for continuous variables) are reported.

With respect to the second qualitative questionnaire, all reported barriers and suggestions to overcome the barriers were inductively coded by T.S.-v.S. and discussed with RO. Thematic analysis was performed by identifying themes within and across the reported barriers and suggestions and grouping the codes together

(Braun & Clarke, 2006). The primary researcher made an overview of the themes derived from the questionnaire, which was discussed with RO and MK. In total, four themes were identified for the barriers: (a) healthcare professionals experience resistance against smoking cessation among parents; (b) healthcare professionals experience lack of time to discuss smoking with parents; (c) characteristics of SFP; and (d) costs of SFP. In addition, six themes were identified for the suggestions: (a) healthcare professionals need to align with the stages of parent's change in quitting tobacco use; (b) some characteristics of SFP need to be changed; (c) healthcare professionals need more time to discuss smoking with parents; (d) SFP needs to be completely reimbursed; (e) healthcare professionals and parents need to receive education about smoking and how to discuss smoking; and (f) more healthcare professionals should discuss smoking cessation with parents. Two barriers and four suggestions that healthcare professionals reported in the second questionnaire were not categorized, because they did not fit into the themes. Although healthcare professionals were asked to number three barriers and three suggestions, not every healthcare professional did so (i.e., the questions were not mandatory). In total, missing data for each barrier or suggestion ranged from 1 to 21.

Results

Participant characteristics

In total, 68 healthcare professionals participated in the present study. Table 3 presents some key characteristics of the healthcare professionals who were included in the analyses (N = 65).

Table 3
Sample Characteristics of Healthcare Professionals Who Were Included in the Analyses (N = 65)

Characteristics	*N* (%)
Female	60 (92.3%)
Medical healthcare	52 (80.0%)
Profession	
Pediatrician	10 (15.4%)
Nurse	41 (63.1%)
Specialized child healthcare professional	13 (20.0%)
Other	1 (1.5%)
Number of years working as healthcare professionals and seeing parents and children (*M, SD*)[a]	23.0 (10.7)

Note. [a] Data were only available from healthcare professionals who completed the MIDI and were included in the analyses (n = 28).

Facilitators, barriers, and suggestions for improvement in the implementation of the SFP referral tool

The thematic analysis led to five overall themes in which the facilitators, barriers, and suggestions for improvement in the implementation of the SFP referral tool are integrated. Results that include percentages were derived from the questionnaires.

Theme 1: General experiences with the SFP referral tool

Healthcare professionals reported that the tool was convenient to use and accessible. Only a few of the healthcare professionals reported that the referral tool was too difficult to use (10.7%; n = 3), as noted by agreement with the question "the referral tool is too difficult to use for me" in the first questionnaire. In addition, a couple of the healthcare professionals reported that the referral tool did not match with the way healthcare professionals were used to discuss smoking cessation with parents (10.7%; n = 3, first questionnaire). Five healthcare professionals (17.9%) reported in the second questionnaire they did not experience any barrier in working with the SFP tool (Table 4).

Although healthcare professionals reported rather positive experiences, the majority of them mentioned in the interviews they did not use the tool often, since many parents did not want to be referred to SFP.

Table 4
Main Barriers and Suggestions to Overcome Barriers in Working With the SFP Tool[a]

Barriers[b]	*N* = 47	Suggestions	*N* = 37
HCP experience resistance against smoking cessation among parents	23 (48.9%)	HCP need to correspond to the stages of parent's change in quitting tobacco use	16 (43.2%)
Characteristics of SFP	8 (17.0%)	Some aspects of SFP need to be changed	6 (16.2%)
Costs of SFP	5 (10.6%)	SFP needs to be completely reimbursed	3 (8.1%)
Lack of time to discuss smoking with parents	6 (12.8%)	HCP need to have more time to discuss smoking with parents	6 (16.2%)
		More HCP should discuss smoking cessation with parents	3 (8.1%)
		HCP and parents need to receive education about smoking and how to discuss smoking	3 (8.1%)

Note. HCP = healthcare professionals; SFP = Smoke-free Parents.
[a] Derived from the second questionnaire.
[b] Five healthcare professionals reported they did not experience any barrier in working with the SFP tool.

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> *"I am very happy that you started this project and it is very clear for me how to use the tool. It is just a pity that only two parents wanted to participate"* (healthcare professional 18).

Healthcare professionals mentioned that the costs, and the vagueness of the potential costs, of SFP was a major barrier for parents not being referred to SFP (see also Table 4). Related to this, one healthcare professional said that participating in SFP did not guarantee parents they would successfully quit smoking. This in combination with the potential high costs of SFP parents might had to pay made parents reluctant of being referred.

> "*That makes it complicated. If you would be sure that SFP works and you quit smoking, then it is worth considering. (...) But if people do not quit and continue smoking, they pay in spades. So then they prefer spending their money on smoking over spending money on cessation assistance"* (healthcare professional 2).

More than two thirds (67.9%) of the healthcare professionals reported in the first questionnaire they were unhappy with the fact they could not provide clarity about the costs of SFP to parents.

Theme 2: It varies by healthcare professionals to what extent they discuss smoking with parents

Although the majority of the healthcare professionals mentioned that they regularly discussed smoking with parents, this was not the case for all healthcare professionals. For example, in the interviews most specialized youth healthcare professionals themselves indicated that they only discussed smoking cessation when there was an exceptional situation (e.g., when parents smoked a lot). Also, healthcare professionals mentioned that they perceived large differences among their colleagues with regard to the quality and intensity with which smoking cessation was discussed with parents.

> *"My colleagues ask about parents' tobacco use most times. But really inventorying the reasons of parents to smoke, or assessing parent's readiness to quit smoking, and discussing the options of cessation assistance, I think that can be improved a lot"* (healthcare professional 15).

Healthcare professionals mentioned that they did not (extensively) discuss smoking cessation with parents, because they were afraid of damaging their relation of trust with parents.

> *"It is a vulnerable topic to discuss because of the relationship of trust with parents. You need to make sure that parents do not feel pressed into the defense or being accused. (...) Yet, I can imagine that this could be a barrier for healthcare professionals to discuss this topic with parents"* (healthcare professional 3).

In addition, a couple of healthcare professionals reported that some parents were not willing to talk about smoking.

> *"And with other people (...), a door closes when you want to talk about smoking with them. That is very difficult. (...) And I need to be careful, because I want them and their children to keep coming"* (healthcare professional 18).

Although healthcare professionals themselves indicated that the extent to which they discuss smoking with parents varies, the majority (89.3%) of the healthcare professionals reported in the first questionnaire that it is their job to refer smoking parents to evidence-based smoking cessation interventions.

> *"I speak a bit on behalf of the child and I think it is my job to discuss it. (...) You know, sometimes I tell parents that I do not want to be accused in the future that I have never told them to quit smoking"* (healthcare professional 3).

Furthermore, the majority of healthcare professionals reported in the first questionnaire that the SFP referral tool made it easier to discuss smoking cessation (67.9%; $n = 19$) and to help parents with quitting tobacco use (60.7%; $n = 17$).

Theme 3: Healthcare professionals find it difficult to motivate parents to quit smoking and to refer them to SFP

Whereas the majority of healthcare professionals reported in the first questionnaire that they were able to ask parents about their smoking status (92.8%; $n = 26$) and to advise smoking parents to quit smoking (89.3%; $n = 25$), fewer healthcare professionals reported they could provide motivational messages to parents to quit smoking (35.7%; $n = 10$).

> *"No, I do ask the question whether they want to quit smoking. But in most cases they are not motivated to quit and then the conversation is finished"* (healthcare professional 14).

In the interview and the first questionnaire, healthcare professionals described several reasons that parents reported for not wanting to quit smoking. For example, parents did not experience any tobacco-related health problems, they were physically and psychologically addicted to nicotine, they were afraid they could not successfully quit smoking, they smoked outside which they thought was sufficient for their children's health, or they experienced too much stress at the moment. Moreover, healthcare professionals mentioned that parents wanted to have some time to think about the referral before actually being referred.

> *"A lot of people want to think about it first. They have not given much thought on quitting smoking, so they want to have some time for reflection"* (healthcare professional 13).

However, some healthcare professionals also thought that some parents used the reason "I want to think about it first" as an excuse for not being referred to SFP.

Although not every healthcare professional mentioned to be in need of training on how to discuss smoking cessation with parents and how to motivate them to quit smoking, some healthcare professionals pointed out they wanted to receive training. Further, healthcare professionals mentioned that, in addition to the materials of the SFP toolkit, they wanted to receive some practical and easy accessible tools (e.g.,

example sentences and informative and motivational materials they could give to parents) they could use to motivate parents to quit smoking.

Theme 4: Healthcare professionals are not the parent's, but the child's healthcare provider

One of the characteristics of the SFP referral tool is that healthcare professionals can offer evidence-based smoking cessation treatment to parents via their children. However, multiple healthcare professionals mentioned they experienced tension when they tried to motivate parents to quit smoking and to refer them to SFP, since they were not the parent's, but the child's healthcare provider.

> *"Look, the difficulty is that parents are not our patients. If parents would be my patients, I would feel more freedom to make a telephone appointment at a later moment to discuss their smoking. But when you make a follow-up appointment with parents while they are not your patients, you are treating them"* (healthcare professional 13).

Related to this, multiple healthcare professionals said that some parents did not expect healthcare professionals to discuss their smoking and to refer them to SFP during a consult that was marked by their children's, and not their own, health.

> *"Yesterday I had a mother of a patient who thought she came to see me for her child. She was completely overwhelmed by me. She said she was here for her child, and now we were talking about her. So I replied that I understood her feelings, but her behavior was related to her child's health"* (healthcare professional 6).

Theme 5: Healthcare professionals have limited time to discuss smoking cessation with parents

The majority of healthcare professionals mentioned that an important barrier for not extensively discussing smoking cessation with parents was that they had limited time to do so (Table 4). Some healthcare professionals reported that their consults with parents and children lasted between ten and 15 minutes in which multiple topics needed to be discussed. In addition, when children experienced health problems that were not related to their parent's smoking, it was seen as less relevant to discuss smoking with parents when there was not a lot of time.

> *"There are quite a few patients who visit us because their children have health problems that are not related to their parent's smoking. Even though smoking is bad for them, parents and their children come for something else. In these cases, the focus of the consult is not on the parent's smoking"* (healthcare professional 14).

Also, multiple healthcare professionals reported that parents and their children visited them only a few times a year, which delays the process in helping parents to quit smoking. Healthcare professionals reported that they needed more time to discuss smoking cessation with parents as a suggestion for this major barrier.

Discussion

The present implementation study examined the facilitators, barriers, and suggestions for improvement in the implementation of the proactive SFP referral tool in healthcare settings. The healthcare professionals found the tool accessible and convenient to use. Yet, they also reported that several barriers limited their use, and thus the implementation, of the tool.

The first barrier that made the implementation of the SFP referral tool difficult is that healthcare professionals reported that they faced resistance to smoking cessation (or even talking about smoking cessation) among parents and, as a result, found it difficult to refer parents to SFP. According to healthcare professionals, parents had various reasons for not wanting to quit smoking or being referred to SFP (e.g., they experienced too much stress). These reports by Dutch healthcare professionals are not completely in line with previous studies from the United States showing that most parents were positive about talking about smoking with their child's healthcare professional and that the majority of parents was open to receive some help to quit smoking (e.g., receiving information about where to get assistance; Cluss & Moss, 2002; Mahabee-Gittens & Gorden, 2008; Moss et al., 2006). More specifically, several American studies found high percentages of parents accepting (or reporting to be willing to accept) to be referred to a quitline if offered by a child's healthcare professional. For example, an RCT that was carried out in pediatric settings showed that 89% of parents in the intervention condition accepted to be referred to a quitline (Mahabee-Gittens et al., 2008). Another study found that 64% of the parents would accept enrollment in a telephone smoking cessation counseling program if offered by a child's doctor (Winickoff et al., 2006). Although we do not know the exact proportion of parents that agreed to be referred to SFP, based on the interviews with the healthcare professionals it is likely lower than 89%.

A possible explanation for these differences in parent's attitudes and acceptance rates could be cultural. In Dutch culture, personal choice and compromise and negotiation (instead of conflict) are highly valued (Willemsen, 2018). Because of this, Dutch healthcare professionals might feel less comfortable in addressing smoking cessation and prefer to find a compromise (e.g., try to motivate parents to smoke outside the house). It may also be that the perceptions of healthcare professionals are primarily based on a couple of negative responses of parents and not on the majority positive responses of parents (the negativity bias; Ito & Cacioppo, 2010;

Moss et al., 2006; Vaish et al., 2008). Further research into parent's attitudes toward smoking cessation assistance by healthcare professionals is needed, as, to the best of our knowledge, there has been no nationwide study that examined parent's attitudes towards addressing parental smoking in the pediatric setting in the Netherlands. Assessing these attitudes could provide insight into whether the perceptions of healthcare professionals on parent's attitudes towards addressing smoking correspond to the actual perceptions of parents themselves.

Another explanation for the resistance that healthcare professionals faced to smoking cessation among parents could be the less optimal timing of addressing the parent's smoking behavior. Our data show that multiple healthcare professionals reported that some parents had not foreseen that their smoking would be addressed during a visit with their child's healthcare provider. Further, the results from the interviews illustrate that some healthcare professionals experienced tension when motivating parents to quit smoking, as they were not the parent's, but the child's healthcare provider. Both aspects could lead to situations in which parents and healthcare professionals feel less comfortable to discuss smoking cessation, and thus limits the implementation of the SFP referral tool in healthcare settings.

A final major barrier that made the implementation of the SFP referral tool difficult concerns the potential costs of SFP that parents have to pay. In the Netherlands, it is obligatory for people to have health insurance (Rijksoverheid, n.d.). At the time that the present study was carried out, health insurance agencies reimbursed evidence-based smoking cessation interventions once a year depending on the health insurance that smokers had and whether smokers already used their deductible. Healthcare professionals reported that the high costs of SFP (between € 300.00 and € 400.00) and the vagueness of whether parents needed to pay for SFP, caused that parents did not want to be referred to SFP. This is a missed opportunity for the implementation of SFP in the Netherlands. A Cochrane review showed that full reimbursement of smoking cessation interventions increased the use of smoking cessation behavioral interventions and the abstinence rates at six months or longer (van den Brand et al., 2017). From 2020, people's deductible is, under certain circumstances, not applicable on evidence-based smoking cessation treatment anymore in the Netherlands (Trimbos-instituut, n.d.-b). This means that it has become less likely that parents have to pay for their treatment. Yet, despite this recent positive development, the implementation of the SFP referral tool in healthcare settings and the acceptance rate of SFP among parents can substantially be improved if health insurance agencies fully reimburse SFP for parents (van den Brand et al., 2017).

Implications for practice and directions for future research

The present study provides two main implications to improve the implementation of the SFP referral tool in healthcare settings. First, instead of asking healthcare professionals to motivate parents to be referred to SFP in limited time, healthcare professionals could only assess parent's smoking status and ask smoking parents whether they would be open to be proactively contacted by another professional (e.g., clinical social workers or counselors) to talk about their smoking (and other health-related lifestyle topics if necessary) more extensively. During this informal conversation, this professional could correspond to the stages of parent's change in quitting tobacco use and apply various techniques, including motivational interviewing, problem-solving, and cognitive behavioral skill building (Rollnick & Miller, 1995). In case parents are motivated to quit smoking, the professionals could ask whether parents are willing to be referred to SFP. The benefit of such an approach is that this could be a solution to multiple barriers that were found in the present implementation study and previously published studies, including healthcare professionals experience a lack of time to discuss smoking (Blumenthal, 2007; Frankowski et al., 1989; Frankowski et al., 1993; Hutchinson et al., 2014; Kaplan et al., 2004; Vogt et al., 2005), healthcare professionals see parents only a few times a year (Hutchinson et al., 2014), healthcare professionals are afraid to damage their relationship of trust with parents (Hutchinson et al., 2014), healthcare professionals feel less skilled to motivate parents to quit smoking (Blumenthal, 2007; Hutchinson et al., 2014; Kaplan et al., 2004), healthcare professionals find it less relevant to discuss smoking with parents when children do not experience any smoking-related health problems (Hutchinson et al., 2014), and healthcare professionals are not the parent's, but the child's healthcare provider. Future research could explore whether above mentioned approach could be effective in overcoming these barriers and could improve the implementation of the SFP referral tool in healthcare settings.

A second approach to improve the implementation of the SFP referral tool concerns the costs of SFP. In case health insurance agencies are not able to fully reimburse the costs of SFP for parents, it is important that healthcare professionals are better able to inform parents about the potential costs. Therefore, a potential interim solution could be to develop an easy accessible online tool that healthcare professionals could use to inform parents about the potential costs of SFP. More specifically, by answering some questions about the health insurance of parents (e.g., what health insurance do parents have) in an online tool, healthcare professionals are better able to make an estimation about the potential costs of SFP and inform parents.

Limitations

The present study had several limitations. First, the healthcare professionals who participated in this study were limited to only a few different types of healthcare professionals (e.g., pediatricians and pediatric nurse practitioners). In the Netherlands, other types of healthcare professionals (e.g., maternity nurses) also work in pediatric settings (in primary care) and are potential users of the SFP referral tool. Currently, it is unknown whether the results of the present study are generalizable to these other types of healthcare professionals. To enhance broad implementation of the SFP tool among healthcare professionals in healthcare settings, future research could explore whether the SFP referral tool could also be used by other types of healthcare professionals and whether any (small) adaptations to the tool are needed (tailoring). Second, for implementation purposes, the recruitment of healthcare professionals and the data collection among healthcare professionals partially overlapped. After the first round of interviews and questionnaires was conducted, new healthcare professionals were still joining the study. Therefore, not all healthcare professionals were approached for both questionnaires and the telephone interview which resulted in less collected data. However, we expect the consequences of the different distribution of healthcare professionals over the interview and questionnaire rounds to be minimum, because saturation of information seemed to be reached after the last interviews and round of questionnaires.

Conclusion

The present implementation study showed that healthcare professionals found the SFP referral tool easy accessible and convenient to use. However, the use of the tool among healthcare professionals was limited due to several barriers that they experienced in the implementation. The main barriers concerned the resistance that healthcare professionals faced to smoking cessation among parents and the potential high costs of SFP. To increase the impact of the evidence-based telephone smoking cessation counseling program SFP via healthcare settings, it is important to overcome these barriers. Future research could examine whether more parents will be referred to SFP after they have been referred to a clinical counselor to discuss their smoking. In addition, health insurance agencies need to be encouraged to fully reimburse SFP. These changes could improve the implementation of the SFP referral tool in healthcare settings and result in more parents quitting smoking.

CHAPTER 9

General discussion

The present thesis aimed to gain insight into the effectiveness of smoking cessation interventions tailored to parents in general, and more specifically into the (cost-) effectiveness and implementation of the Dutch proactive telephone smoking cessation counseling program 'Smoke-free Parents' (SFP), tailored to parents of children aged 0-18 years. This discussion presents a summary of the main findings of the present thesis, followed by an elaborated reflection on these findings. The implications for practice, limitations of the present thesis, and directions for future research are also discussed.

Summary of the main findings

Chapter 2 presents an examination of risk and protective indicators of women who smoked before, during, or after their pregnancy. Data were from the Dutch Monitor on Substance Use and Pregnancy 2016. A large nationally representative sample of 1,858 mothers of young children (i.e., youngest child younger than five years) completed a short questionnaire on their substance use (i.e., tobacco, alcohol, and drugs) before, during, and after their pregnancy. Results revealed a strong association between the partner's smoking status and the smoking status of women around pregnancy. For instance, women who smoked before pregnancy were nearly seven times more likely to have a partner who smoked before pregnancy compared to women who did not smoke before pregnancy. In addition, women who did (vs. did not) relapse postpartum were nearly twice as likely to have a partner who continued smoking postpartum. Another indicator that showed to be strongly associated with women's smoking status before and during pregnancy was women's educational level. For example, women who smoked during the entire pregnancy were over five times more likely to have a medium educational level and nearly 11.5 times more likely to have a low educational level compared to women who did not smoke during the entire pregnancy. Moreover, women who successfully quit smoking during pregnancy (vs. women who did not successfully quit) were more likely to be high educated. These findings emphasize the importance of having a smoke-free partner before, during, and after pregnancy and helping women who are lower educated to quit smoking before and during pregnancy.

In **Chapter 3** the results of a meta-analysis on the effectiveness of smoking cessation interventions tailored to parents of children between 0 and 18 years are presented. In total, 18 studies that primarily examined parental smoking cessation were included. The overall results showed that parents in the intervention conditions were 1.62 times more likely to quit smoking than parents in the control conditions (13.1% vs. 8.4%; 95% CI = 1.38–1.90; $p < .00001$), indicating that parent-tailored smoking cessation interventions are modestly effective. To increase the effectiveness and the impact of these interventions on tobacco use, it is important that future research examines how these interventions could be improved. These interventions might be

improved by asking parents who participate in a smoking cessation intervention to participate in a tobacco prevention intervention for children, in which they provide antismoking socialization to their children.

Chapter 4 describes the study protocol of a randomized controlled trial (RCT) in which both the implementation and effectiveness of the Dutch proactive parent-tailored telephone smoking cessation counseling program SFP were examined by using an effectiveness-implementation hybrid design. In the RCT, parents were recruited via either a mass media approach (i.e., primary schools and online mass media) or via a healthcare approach (i.e., healthcare professionals and specialized youth healthcare professionals). After parents had completed the baseline assessment, they were randomly allocated to the intervention condition (i.e., telephone counseling) or control condition (i.e., self-help brochure). The primary outcome was 7-day point-prevalence abstinence (PPA) at three months follow-up. The study was registered in the Netherlands Trial Register (NTR6092) and the local ethics committee of the Trimbos Institute approved the study's protocol (201607_52-1606).

Chapter 5 presents the results on the effectiveness of the telephone counseling program SFP under more real-world circumstances. In total, 83 parents were included in the analyses. The results showed that the odds of reporting 7-day PPA at three months follow-up was 7.54 higher for parents who received the telephone counseling program than for parents in the control condition (95% CI = 2.49–22.84). Because the inclusion of parents was lower than expected, interaction effects between recruitment approach (i.e., healthcare approach vs. mass media approach) and condition (i.e., intervention vs. control) could not be interpreted. Future research with a larger sample size is needed to examine potential moderation effects.

Chapter 6 presents the results of the cost-effectiveness analyses. Parents in the telephone counseling condition had higher costs (€ 1,275.99), but this condition also had a higher percentage of parents that quit smoking (53.3%) than the control condition (€ 280.03; 13.2%). From a societal perspective, the incremental cost-effectiveness ratio was € 2,491 for each additional parent who quit smoking compared to the control condition. If the society is willing to pay € 2,491 for each additional parent who quits smoking, the telephone counseling program is cost-effective. Because an accepted monetary cut-off point for smoking cessation does not exist in the Netherlands currently, it is difficult to conclude whether the telephone counseling program is indeed cost-effective.

In **Chapter 7** the results of the program uptake of parents for the telephone counseling program SFP are presented. In total, 402 parents were recruited for SFP between September 2016 and September 2018. Of these parents, 26.4% participated

in SFP (i.e., participating in the RCT or receiving telephone counseling outside the RCT context). Although the program uptake of SFP was slightly, but not significantly, higher for the mass media approach than for the healthcare approach (27.3% vs. 26.8%), the healthcare approach resulted in lower recruitment cost-per-participant (€ 99.62 vs. € 205.72). The main barriers that parents reported for their decline to participate in SFP were that they had already quit smoking and that SFP was too expensive. Another important reason for parents not participating after referral as reported by smoking cessation counselors was the difficulty of the counselors to reach parents after the referral. The results showed that parents could be recruited for SFP via both recruitment approaches, since the cost-per-participant were not extremely high and the program uptake of both approaches did not significantly differ. Yet, to increase the impact of SFP in terms of controlling tobacco use among parents, future research should examine how program uptake could be increased by addressing the barriers that parents prevented from participating.

Chapter 8 presents the results of the implementation study that was conducted to investigate the barriers, facilitators, and suggestions for improvement in the implementation of the proactive SFP referral tool in healthcare settings. For this mixed-methods study, healthcare professionals (N = 68) were asked to complete two online questionnaires with open and closed questions and to participate in a semi-structured telephone interview. The results showed that the majority of the healthcare professionals found the SFP referral tool accessible and convenient to use. But there were some barriers that limited the implementation of the referral tool in healthcare settings. Examples of important barriers are: (a) healthcare professionals faced resistance to smoking cessation among parents; (b) healthcare professionals experienced tension when motivating parents to quit smoking, since they were not the parent's, but the child's healthcare provider; (c) healthcare professionals have limited time to address parental smoking cessation and they see parents only a few times a year, which delays the process in helping parents to quit smoking; and (d) the costs, and the vagueness of the potential costs, of SFP were a major reason for parent's decline to be referred to SFP. To improve the implementation of the SFP referral tool in healthcare settings, it is important to overcome these barriers. Suggestions to overcome the barriers are discussed in **Chapter 8**.

Table 1
Summary of the Main Findings in the Present Thesis

Main findings	Chapter
Women who smoked before, during, or after pregnancy (vs. women who did not smoke) were more likely to have a partner who smoked before, during, or after pregnancy. In addition, women who smoked before or during pregnancy were more likely to have a lower educational level than women who did not smoke before or during pregnancy. Women who successfully quit smoking during pregnancy (vs. women who did not successfully quit) were more likely to be high educated. Finally, use of cannabis before pregnancy was positively associated with women's smoking status before pregnancy.	2
Our meta-analysis, including 18 studies, showed that parents who received parent-tailored smoking cessation interventions were 1.62 times more likely to quit smoking than parents in the control condition (13.1% vs. 8.4%; 95% CI = 1.38–1.90; $p < .00001$), indicating a modest effect.	3
The proactive parent-tailored telephone smoking cessation counseling program SFP showed to be effective when examined under more real-world circumstances. The odds of reporting 7-day PPA at three months follow-up was 7.54 higher for parents who received SFP than for parents in the control condition (53.3% vs. 13.2%; 95% CI = 2.49–22.84).	5
The telephone counseling condition resulted in higher costs (€ 1,275.99) and a higher percentage of parents that quit smoking (53.3%) than the control condition (€ 280.03; 13.2%). From a societal perspective, the incremental cost-effectiveness ratio was € 2,491 for each additional parent that quits smoking compared to the control condition. The telephone counseling program is cost-effective if the society is willing to pay € 2,491 for each additional parent that quits smoking.	6
The program uptake of SFP after parents were recruited was 26.4%. The healthcare approach and mass media approach are equally useful in recruiting parents for SFP, since the program uptake of both approaches did not significantly differ and the recruitment cost-per-participant were relatively low (mass media approach: 27.3%, € 205.72; healthcare approach: 26.8%, € 99.62).	7
The main reasons of parent's decline to participate in SFP were that they had already quit smoking and that SFP was too expensive. In addition, almost one third of the parents who did participate in SFP was difficult to reach after their referral.	7
Healthcare professionals found the proactive SFP referral tool convenient to use. However, they experienced several barriers that limited their use, and thus the implementation, of the referral tool in healthcare settings (e.g., parent's resistance to smoking cessation).	8

Note. CI = confidence interval; PPA = point-prevalence abstinence; SFP = Smoke-free Parents.

Reflections on the main findings

The importance of helping both (expecting) parents to quit smoking

The present thesis showed the strong association between women's smoking before, during, and after pregnancy and the partner's smoking status around pregnancy (**Chapter 2**). Women who smoked before pregnancy were nearly seven times more likely to have a partner who smoked before pregnancy compared to women who did not smoke before pregnancy. Women who did (vs. did not) relapse postpartum were also nearly twice as likely to have a partner who continued smoking postpartum. In addition, women who successfully quit smoking during pregnancy (vs. women who did not quit) were more than twice as likely to have a partner who decreased or quit smoking during pregnancy. The link between women's and their partners smoking behavior is consistent with previous studies (Cobb et al., 2014; Foulstone et al., 2017; Homish & Leonard, 2005; Jackson et al., 2015; Penn & Owen, 2002; Xu et al., 2013). This shows the importance of motivating both (expecting) parents to quit smoking and offering them evidence-based cessation treatment. In the present thesis, smoking cessation counselors discussed with parents who were referred to SFP whether their partner smoked and if they were interested in quitting. In case these partners were interested in quitting, SFP was offered to partners and parents could quit together. In the RCT, 29 parents (34.9%) had a smoking partner (**Chapter 5**). Yet, only three parent couples participated and received the telephone counseling program, which illustrates the difficulty of motivating partners to engage in smoking cessation treatment.

Healthcare professionals (e.g., general practitioners, midwives, and fertility specialists) could play an important role by asking smoking partners of (expectant) mothers to quit smoking and offering them evidence-based smoking cessation treatment. Yet, due to various reasons (e.g., lack of time), it is likely that smoking cessation is not always being discussed when smoking partners visit healthcare professionals. In addition, sometimes partners are not present when (expecting) women visit a healthcare professional (Willemse et al., 2019) . Therefore, it is pivotal to reach smoking partners also via other channels. A potential channel could be mass media campaigns. Evidence indicates that mass media campaigns can increase the number of adults quitting smoking (Bala et al., 2017; Durkin et al., 2012). In the Netherlands, the 28-day mass media campaign 'Stoptober' was initiated in 2014 and reaches more than 50,000 smokers each year. Three months after the start of the campaign, 71.8% of respondents stopped smoking and consumption was reduced among sustained smokers (Troelstra et al., 2019). Although a more rigorous study design should be used to test its effectiveness, data from this pre- and posttest study show first indications that the Dutch mass media campaign 'Stoptober' could be effective in decreasing smoking prevalence (Troelstra et al., 2019). In conclusion, to minimize the serious health consequences of smoking

for (expecting) parents themselves and their offspring (Hofhuis et al., 2003; U.S. Department of Health and Human Services, 2006) and to decrease the number of (expecting) smoking women, more attention is needed to motivate partners to quit smoking and offering them evidence-based smoking cessation treatment.

Parents' lack of motivation to quit smoking

The telephone counseling program SFP was developed because it was expected that parents would participate in such a program (Schuck, Bricker et al., 2014). Previous research had shown that recruiting parents for smoking cessation interventions could serve as a teachable moment for parents to quit smoking (Curry et al., 2003; Winickoff et al., 2003). In addition, other studies found that the majority of parents accepted (or reported to be willing to accept) a quitline if offered in a pediatric setting (Mahabee-Gittens & Gordon, 2008; Winickoff et al., 2006). Moreover, almost two thirds of adults smokers expressed concern about modeling smoking to children (Hitchman et al., 2010). In short, based on this evidence it was expected that recruiting parents for SFP in the context of their children's health could be a successful approach to reach a group of smokers who might be less motivated to quit for themselves, but are willing to quit because of their children's health.

However, the present thesis illustrates that recruiting parents for smoking cessation programs in the Dutch context was way more complicated than expected, because many parents do not seem to be motivated enough to quit smoking or to receive evidence-based smoking cessation treatment. This thesis shows that the parents' lack of motivation to quit smoking affected the acceptance of SFP by parents at two moments. First, healthcare professionals reported that one of the main reasons for not using the SFP referral tool was because parents were not willing to quit smoking (**Chapter 8**). Healthcare professionals reported multiple reasons for parents not wanting to quit smoking. Examples of these reasons are: parents were afraid of not being able to make a successful quit attempt, parents experienced too much stress, parents did not experience any tobacco-related health problems, and parents smoked outside which they found sufficient for protecting their children's health. The second moment that parents' lack of motivation to quit smoking affected the acceptance of SFP concerns the moment when smoking cessation counselors called parents about SFP after they had been registered for an informal and free proactive call from trained counselors. Almost 15% of the parents who did not want to participate in SFP told the smoking cessation counselors they were not interested in quitting smoking or receiving smoking cessation treatment (**Chapter 7**).

Several explanations can be given for the lack of parents' motivation to quit smoking and receiving support. First, the timing of addressing parental smoking. Multiple healthcare professionals mentioned that parents had not expected that their smoking was going being addressed, since the consult was marked by their child's

health, and not their own. Therefore, some parents indicated to need some time to think about whether they would be willing to quit smoking before they agree to be referred to a counseling program like SFP. Another explanation for the lack of parents' motivation is that parents could have lower odds to experience adverse smoking-related health problems than smokers of older ages (Jha & Peto, 2014), which makes it feel less urgent for them to quit smoking.

A potential approach to increase parents' motivation to quit smoking is to focus on the role conflict between being a smoker and being a parent who wants the best for his or her child. One study among parents showed that experiencing this conflict was associated with an increased chance of planning to quit smoking in the future (Friebely et al., 2013). Another potential fruitful approach to increase the motivation of parents could be to send text messages with motivational messages to parents throughout a longer period of time (e.g., 6 months). These messages could be sent to parents (with their permission) when they are not yet ready to be referred to SFP by their healthcare professional or when parents are not yet ready to start with SFP when they are being called by the smoking cessation counselors after their referral. The benefits of sending text messages to smokers are that these can be sent automatically and are low in costs. In addition, it can potentially reach a high proportion of smoking parents, since 87% of the Dutch households has a smartphone (Arends-Tóth, 2019). Research has demonstrated that sending text messages can be effective in recruiting smokers into smoking cessation programs (Marcano Belisario et al., 2012). In addition, since the motivation of smokers to quit smoking is unstable over time and spontaneously changes (Hughes et al., 2005, 2013), the benefit of sending multiple text messages over a longer period of time (vs. a short period of time or just one single text message) is that smokers are more likely to receive a text message at a moment that they are more motivated to quit smoking. Based on this evidence, further research could test whether sending motivational text messages to parents who do not have enough motivation to quit smoking would increase the number of parents that start with SFP.

Does every target group of smokers need to receive a tailored smoking cessation intervention?

Multiple smoking cessation interventions have been examined for specific target groups, including – among others – parents (**Chapter 3**), women who are pregnant (Chamberlain et al., 2017; Claire et al., 2020), young people (Fanshawe et al., 2017), cancer survivors (Mujcic et al., 2020), people diagnosed with coronary heart disease (Barth et al., 2015), people with current or past depression (van der Meer et al., 2013), and people with schizophrenia (Tsoi et al., 2013). Evidence shows that tailored health promotion programs have beneficial effects over non-tailored programs (Krebs et al., 2010; Lustria et al., 2013; Noar et al., 2007). In addition, within the large group of smokers, there are some groups that need special attention (van Schayck et al.,

2017). These are – among others – pregnant women, children and adolescents, people with a low socioeconomic status, people with chronic diseases (e.g., cancers, respiratory illness, tuberculosis, and mental illness), and people who use waterpipe or cannabis (van Schayck et al., 2017).

The question is, however, whether it is necessary and beneficial to develop interventions for every single target (sub)group (e.g., grandparents, single-parent families or two-parent households). Developing, examining the efficacy and effectiveness, and implementing new smoking cessation interventions is an extensive process (Glasgow et al., 2003). In addition, the underlying effective Motivational Interviewing (MI) technique (Heckman et al., 2011; Hettema & Hendricks, 2010; Rollnick & Miller, 1995; Rollnick et al., 2010) of many smoking cessation interventions is also recommended in several national clinical practice guidelines to be used as a technique to motivate and assist people in quitting smoking (Fiore et al., 2008; Trimbos-instituut & Nederlands Huisartsen Genootschap, 2017). Because of the extensive evidence on MI, it is probably not necessary to examine each tailored smoking cessation intervention that uses MI as a technique in multiple extensive effect studies (e.g., large RCTs). Perhaps it would be more efficient, beneficial, and time and cost saving if new smoking cessation interventions that use MI would be tested in other less intensive research designs that focus more on how the interventions suit the target group best in its specific context (tailoring). For example, the plan-do-study-act (PDSA) cycle can be used to test whether a change leads to an improvement in real-world settings (ACT Academy, n.d.; Taylor et al., 2014; Tichnor-Wagner et al., 2017). The PDSA cycle has widely been used in healthcare improvement (Taylor et al., 2014). In the first phase of the cycle, the team (including e.g. researchers and professionals that work with the intervention) plans the test by asking what change is going to be tested, how it is going be tested (e.g., what measures), and what the expected results will be of the change. In the second phase, the do-phase, the team carries out the test and collects data to measure the expected results. In the third phase, the team studies the data collected in the do-phase and compares the results with the expected results. In the final phase, the team makes a decision on whether to keep, revise, or remove the change and whether it is necessary to start a new cycle. Although cycles of 90 days are common, cycles can also be shorter or longer depending on the research question that needs to be addressed (Tichnor-Wagner et al., 2017).

With respect to the smoking cessation program SFP that includes parent-tailored telephone counseling (based on MI) and parent-tailored self-help materials, two RCTs showed the beneficial effects of this program with regard to parental smoking cessation (**Chapter 5**). Although the evidence confirms the effectiveness of SFP for smoking parents in general, SFP could be further developed to target smoking parents in specific contexts (e.g., parents who are lower educated, single-parent

households, parents who do not speak Dutch). If SFP will be further developed to specific subgroups of smoking parents, it could be more beneficial to use more time and cost saving research designs instead of conducting large effectiveness trials.

Other methods to help parents quit smoking and protect children from exposure to parental smoking

The fact that parent-tailored smoking cessation interventions are modestly effective (**Chapter 3**) and that the program uptake of SFP showed not to be extremely high (26.4%; **Chapter 7**), raises the question whether it would be helpful to intensify other methods to help parents quit smoking and protect children from exposure to parental smoking. These other methods could be applied in addition to continuing attempts to improve the effectiveness and reach of parent-tailored smoking cessation interventions, since a stronger (vs. less stronger) combination of multiple tobacco control approaches results in more quit attempts and lower prevalence of smoking (Feliu et al., 2019). One of these methods could be to increase the tobacco tax. Multiple international studies showed that an increase in tobacco tax contributes to a decrease in smoking prevalence among adult smokers (Chaloupka et al., 2012; International Agency for Research on Cancer, 2011). Because of this, tobacco tax increases are one of the measures mentioned in the National Prevention Agreement (Dutch translation: *het Nationaal Preventieakkoord*) of the Dutch government and multiple organizations in 2018 (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). As part of the National Prevention Agreement, the tax on a pack of 20 cigarettes was increased with one euro in 2020 and the price of a pack of 20 cigarettes could be increased to ten euros in 2023 (Ministerie van Volksgezondheid, Welzijn en Sport, 2018).

In addition to abovementioned method, creating more smoke-free public places could be a successful method to help parents quit smoking. By creating more smoke-free public place, fewer parents are exposed to smoking and see other people smoke. In the Netherlands, the number of public places where it is prohibited to smoke increased during the last two decades. For example, the Dutch government enforced the smoking ban in public transport and workplaces in 2004 (although with exceptions) and the smoking ban in the hospitality sector in 2008 (also with exceptions; Willemsen, 2018). In addition, the Dutch government enforced a smoking ban at school properties in August 2020 (Ministerie van Volksgezondheid, Welzijn en Sport, 2020). There is ample evidence proving the benefits of applying smoke-free legislation. For example, smoke-free legislation has been associated with more successful quit attempts and a decrease in preterm births and hospital attendance of children due to respiratory illnesses (Been et al., 2014; Faber et al., 2017; Nagelhout et al., 2011, 2012).

Although the Dutch government established several smoking bans, there are still public places for children where they are exposed to smoking. In 2015, the national movement Smoke-free Generation (Dutch translation: *de Rookvrije Generatie*) was founded to stimulate organizations, governments, and health facilities to contribute to a smoke-free generation by creating – among others – smoke-free public places (e.g., playground, children's farms, and sport clubs; see for more information **Chapter 1**). In addition, the National Prevention Agreement includes multiple objectives with respect to creating smoke-free environments for children (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). For example, in 2020 all children's farms and day care centers were required to be smoke-free (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). Although the efforts of the Smoke-free Generation movement and the National Prevention Agreement have resulted in more smoke-free public places since 2018, there are still ample public places where children are exposed to smoking (van Giessen et al., 2019). For example, in 2019 only 41% of the children's farms was smoke-free (vs. 20% in 2018), 75% of the day care centers was smoke-free (the number of day care centers that were smoke-free in 2018 is unknown), and 50% of the registered playgrounds was smoke-free (vs. 30% in 2018; van Giessen et al., 2019). Currently, it is unknown whether the objectives of the National Prevention Agreement with respect to creating smoke-free environments for children were met in 2020. Whether or not the objectives of the National Prevention Agreement were met in 2020, extra efforts need to be made by the Dutch government to increase the number of smoke-free public places, the number of parents that quit smoking, and the number of children who are protected from smoking.

Implications for practice

The results of the present thesis have several implications for controlling tobacco use among parents.

Further development and nationwide implementation of SFP

The present thesis contributes to the evidence that the Dutch proactive parent-tailored telephone smoking cessation counseling program SFP is effective in helping parents to quit smoking and protecting children from the hazards of their exposure to SHS at home. It also showed that the SFP is cost-effective if the society wants to pay € 2,491 for each additional parent that quits smoking. Although there is no accepted monetary cut-off point for smoking cessation in the Netherlands currently, the costs saved by someone quitting smoking will easily exceed the costs that are involved in SFP (de Kinderen et al., 2016). Finally, this thesis provides some directions for successful and sustainable implementation of the program in the Netherlands. Based on our results, the Trimbos Institute received funding from the Dutch Ministry of Health, Welfare, and Sport for further development and nationwide

implementation of SFP as from 2019. With this funding, the Trimbos Institute was able to make some changes to SFP and to enhance implementation of SFP via the Taskforce Smoke-free Start (Dutch translation: *de Taskforce Rookvrije Start*) and the national smoking cessation website www.ikstopnu.nl (English translation: www.IQuitNow.nl).

The following changes were made to SFP to enable widespread implementation. First, SFP is no longer exclusively delivered by one smoking cessation organization (as was the case during the study), but is carried out by several organizations. For this purpose, the Trimbos Institute has developed a platform for smoking cessation counselors to register to become a SFP-counselor. To guarantee the quality of the program, smoking cessation counselors need to meet several criteria to be allowed to deliver SFP, including being registered in the Dutch Quality Register Smoking Cessation (Dutch translation: *Kwaliteitsregister Stoppen met Roken*), applying MI in the telephone coaching program, providing a minimum of six counseling sessions, contact parents within one week after referral, and attending informative meetings on SFP hosted by the Trimbos Institute. Secondly, in addition to the paper-based magazine Smoke-free Parents (SFP; Dutch translation: *magazine Rookvrije Ouders*) a digital version of the magazine was developed to enable easy distribution among parents. The benefit of a digital magazine is the opportunity for parents to click on websites where they can obtain more information or watch videos on related topics. The content of the magazine has not changed for the greater part, although it has been slightly shortened to make it more appealing. Finally, to match the materials of the SFP toolkit for healthcare professionals with the materials of the Taskforce Smoke-free Start, the lay-out and some of the content of the SFP materials has been changed.

From 2019 onwards, SFP is the official parental smoking cessation program of the Taskforce Smoke-free Start and the Trimbos Institute. This means that SFP is mentioned on the majority of the materials of the Taskforce Smoke-free Start (e.g., brochures and videos for parents and healthcare professionals and e-learnings for healthcare professionals). In addition, the referral tool that healthcare professionals use when referring parents to SFP can be found on the official website of the Taskforce Smoke-free Start. So far, more than 1,000 healthcare professionals have signed up as 'ambassador' of the Taskforce Smoke-free Start. Through frequent newsletters, sent by the Taskforce Smoke-free Start, these ambassadors receive information and tips on how to address parental smoking cessation and how to pay attention to this topic within their organizations.

In addition to the implementation via the Taskforce Smoke-free Start, SFP is also being implemented via the national smoking cessation website www.ikstopnu.nl (English translation: www.IQuitNow.nl). This website is depicted on every cigarette

package and, thus, could have a large reach among smokers. In 2018, this website had 138,412 unique visitors (Kamps, 2019). Furthermore, the present thesis showed that a different subgroup of parents was reached via the mass media approach than via the healthcare approach (**Chapter 5**), which emphasizes the importance of implementing SFP via the national smoking cessation website. Parents who visit the national smoking cessation website (www.ikstopnu.nl/rookvrijeouders) can read some information about SFP and watch an animation video on the importance of parental smoking cessation. Parents who are interested in SFP can register for a free, informal, and proactive call from one of the SFP smoking cessation counselors.

Parents should receive full reimbursement when enrolling in SFP

The present thesis showed that for multiple parents the costs of SFP were a major reason to decline participation, as reported by healthcare professionals and parents themselves. During the study, the costs of SFP ranged between € 302.50 (2016/2017) and € 363 (2018) for the complete counseling program. The situation around the reimbursement of smoking cessation treatment is quite complex in the Netherlands. In short, it is mandatory to have a health insurance for which everyone pays a monthly premium (Rijksoverheid, n.d.). At the time of the study, the annual reimbursement of the costs of evidence-based smoking cessation interventions by health insurance agencies depended on the specific health insurance agency and the type of health insurance that smokers had. Furthermore, although health insurance agencies reimbursed the costs in some cases, often smokers needed (partly) to pay for SFP because of their deductible (with a minimum of € 385 a year between 2016 and 2018).

Since January 2020, under certain conditions, people's deductible is not applicable anymore for the use of evidence-based smoking cessation treatment (Trimbos-instituut, n.d.-b). This means that it is more likely that smokers have to pay less for their smoking cessation treatment or that they receive the treatment for free. Notwithstanding this positive development, it is pivotal that *all* smoking parents receive SFP for free. A Cochrane review showed that although partial reimbursement vs. no reimbursement did not significantly increase the use of smoking cessation interventions, full reimbursement vs. no reimbursement did increase the use of interventions, number of quit attempts, and the abstinence rates at six months or longer (van den Brand et al., 2017). Thus, to increase the impact and reach of SFP among parents, SFP should be offered for free to all parents. In addition, in the current Dutch situation, health insurance agencies reimburse the costs of evidence-based smoking cessation treatment only once a year (Trimbos-instituut, n.d.-a). However, Dutch numbers show that of the smokers who seriously tried to quit smoking during the last 12 months, the average number of serious quit attempts is 2.8 (Trimbos-instituut, Rijksinstituut voor Volksgezondheid en Milieu, & Centraal Bureau voor de Statistiek, 2018). Moreover, there is ample evidence showing that

smokers need multiple attempts before reaching abstinence for a year or longer (Chaiton et al., 2016). The fact that health insurance agencies reimburse the costs of smoking cessation interventions only once a year is a missed opportunity to increase the number of successful quit attempts with evidence-based smoking cessation treatment. In short, the number of parents that participates in SFP could be increased by providing parents full reimbursement of the costs multiple times a year.

Limitations of the present thesis

Several limitations of the present thesis should be acknowledged. An in-depth discussion of the study-specific limitations can be found in chapters 2-8.

Self-report of smoking behavior and biochemical validation

The data on smoking behavior in the Monitor on Substance Use and Pregnancy, the meta-analysis, and the RCT were self-reported and not biochemically validated. In the Monitor on Substance Use and Pregnancy biochemical validation was impossible due to the study design. With respect to the meta-analysis, less than 50% of the included studies performed a biochemical validation. Because we strived our outcomes to be as consistent as possible, we decided to include only self-reported abstinence rates. In the RCT, we planned to biochemically validate the data on smoking behavior. Therefore, a subsample of parents who reported abstinence at the three months follow-up assessment was approached for biochemical validation (n = 17). Because only four parents agreed to participate, we were unable to perform a reliable biochemical validation. The fact that the results of the present thesis were based on self-reported data might have led to an over-report of abstinence rates (Connor Gorber et al., 2009; Morales et al., 2013; West et al., 2005).

Lack of power to test the interaction effect between the recruitment approach and condition

A priori power analysis ($p1$ = 0.445; $p2$ = 0.121; Power = 0.80; α = 0.05) showed that 72 parents per recruitment approach were needed to detect a small to moderate effect on 7-day point-prevalence abstinence at the three months follow-up assessment in the RCT. In order to be able to examine whether the effectiveness of the telephone counseling program differed for each recruitment approach, this number would need to be doubled to 144 parents. In anticipation of a 10% drop-out, the aim was to recruit a minimum of 158 participating parents. Due to a lower inclusion rate than expected, 87 parents participated in the trial and 83 parents were included in the subsequent analyses. Hence, we did not have sufficient power to test the interaction effect between the recruitment approach (i.e., mass media vs. healthcare) and condition (i.e., telephone counseling vs. self-help brochure). Additional analyses provided some preliminary evidence in favor of the mass media

approach. However, this finding is less reliable and robust. If we want more insight in the interaction effect, further research with a larger sample size would be needed.

Inability to test the longer term effectiveness of SFP

In the present thesis, the effectiveness of SFP was examined at three months follow-up. Consistent with the previous efficacy trial by Schuck, Bricker et al. (2014), the aim of the present thesis was to examine the effectiveness of SFP at three and twelve months follow-up. Yet, due to lower inclusion rates, the decision was made to extend the recruitment of parents. Because of this, the follow-up assessment at 12 months was no longer possible within the course of the study. The results of the previous efficacy trial showed that the telephone counseling program was still effective at the 12-month follow-up assessment (Schuck, Bricker et al., 2014). In total, 34.0% of the parents in the intervention condition reported 7-day PPA vs. 18.0% of the parents in the control condition (OR = 2.81; 95% CI = 1.76–4.49, Schuck, Bricker et al., 2014). Because the 3-month follow-up results of the previous efficacy trial (OR = 6.89; 95% CI = 4.18–11.36) correspond to the 3-month follow-up results of the present effectiveness trial (OR = 7.54; 95% CI = 2.49–22.84), it is expected that the telephone counseling program remains effective in the long term if tested under more real world circumstances.

Directions for future research

Investigating how to increase the reach of SFP

The present thesis shows that SFP is an effective counseling program that helps parents to quit smoking and increases the likelihood that children grow up in a smoke-free house. However, to increase the potential impact (efficacy * reach; Abrams et al., 1996) of SFP, it is important to increase the number of parents that have access to and actually start the program. This is in particular important, because it is estimated that the target group for SFP in the Netherlands is about 47.000 parents of children 0-18 years old who want to quit smoking within a month (Trimbos-instituut, Rijksinstituut voor Volksgezondheid en Milieu, & Centraal Bureau voor de Statistiek, 2018). The fact that in the present thesis 402 parents were recruited for SFP of whom 106 (26.4%) participated in SFP (**Chapter 7**), emphasizes the need to increase the reach of SFP. This could be enhanced in several ways: improving the present recruitment channels, testing new recruitment channels, and developing and examining new implementation strategies.

Improving the present recruitment channels

The present thesis examined two recruitment approaches that both included two different recruitment channels: mass media approach (i.e., online mass media and primary schools) and healthcare approach (i.e., healthcare professionals and specialized youth healthcare professionals). The examined channels seem to be

proper channels to recruit parents for SFP, but the strategy within the channels to recruit parents could be improved. For example, with regard to the primary schools, invitation letters about SFP were distributed among parents of children between 4 and 12 years old. However, evidence suggests that recruitment methods with a higher degree of personal contact (vs. lower degree) are more effective in recruiting smokers for smoking cessation interventions (Marcano Belisario et al., 2012). So, perhaps more parents would have registered for SFP if someone informed parents about SFP during meetings at schools. In the Netherlands, the program "Bright in school" (Dutch translation: *Helder op school*) is a school-based prevention intervention on substance use (i.e., smoking, alcohol and drugs use) and excessive gaming for children and adolescents (Trimbos-instituut, n.d.-c). Parents are actively involved with this program through – among others – special parent meetings at schools. Future research could explore whether the strategies within the used recruitment channels can be improved, and more specifically, if the program uptake of SFP would be higher via schools if it is offered to parents in a more interactive and personalized way via programs such as "Bright in school".

Testing new recruitment channels

The reach of SFP could be enhanced by developing and testing new recruitment channels. A potential recruitment channel is maternity care that is provided to all parents after childbirth in the Netherlands. In short, parents receive between 24 and 80 hours (spread over 10 days) professional maternity care at home (Zorginstituut Nederland, n.d.). During this period, professionals take care of women and their newborns, give instructions to parents on how to take care of their newborns and help with doing some of the daily basic household chores. Because maternity assistants are available for parents for several days, they have a unique position to discuss smoking cessation with parents and refer them to SFP. A recent Dutch study among maternity assistants showed that 62% of the maternity assistants does not refer parents to smoking cessation support (van Aerde et al., 2020). In addition, 57% does not (completely) know where they can refer parents to and 94% of these maternity assistants reported to be interested in information on interventions they can refer to. These results indicate that maternity assistants are in need of an intervention as SFP. Future research could examine whether maternity care is indeed a successful recruitment channel for SFP by assessing the program uptake of parents via maternity assistants and exploring the potential barriers and facilitators that they could experience in working with SFP.

Developing and examining new implementation strategies

The results of the present thesis show that the mass media approach and healthcare approach are equally useful to recruit parents (**Chapter 7**) and that both recruitment approaches reach a different subgroup of parents in terms of age, educational level, and having a child with chronic respiratory illness (**Chapter 5**). This underlines

the importance of using both recruitment approaches for the implementation of SFP. However, within the present (and potential new) recruitment approaches, new implementation strategies could be developed and examined to increase the reach of SFP. For example, one of the main barriers in enrolling parents with SFP was the difficulty of reaching parents after their referral. The smoking cessation counselors tried to contact parents up to five times by phone, text messages, and e-mail (if applicable). Although the smoking cessation counselors called parents at times that suited parents best, about one third of the parents who did not participate in SFP were parents who were difficult to reach (**Chapter 7**). This is a missed opportunity. Therefore, it is important to find ways to overcome this barrier. A potential way to reach more parents after their referral is to send multiple text messages with motivational messages to them throughout a longer period of time (e.g., 6 months) in addition to the phone calls from the smoking cessation counselors during the first week (see for a more elaborated rationale behind sending motivational text messages page 186; Arends-Tóth, 2019; Hughes et al., 2005, 2013; Marcano Belisario et al., 2012). Future research could examine whether, in addition to the phone calls, sending text messages to parents who are difficult to reach would increase the number of parents that start with SFP.

Investigating how to improve the effectiveness of parent-tailored smoking cessation interventions

Our meta-analysis showed that the overall effectiveness of parent-tailored smoking cessation interventions is modest (**Chapter 3**). This implicates that the effectiveness of these interventions needs to be improved. A potential way to increase the effectiveness could be by providing incentives (e.g., vouchers or cash) to smokers who quit smoking. A Cochrane review revealed that there is a high-certainty evidence that incentives boost long-term abstinence rates (i.e., six months or longer) in mixed populations studies (Notley et al., 2019). In addition, providing incentives was especially effective among pregnant women (RR = 2.38; 95% CI = 1.54–3.69).

Another way to increase the effectiveness of parent-tailored smoking cessation interventions could be by combining these interventions with tobacco prevention interventions for children. Several studies in which a smoking cessation intervention for parents in combination with a tobacco prevention intervention for children was provided, yielded promising results (Caldwell et al., 2018; Hayes et al., 2018; Jackson et al., 2016). Examples of these tobacco prevention interventions for children are interventions in which parents were asked to provide antismoking socialization to their children or children received a tobacco prevention intervention at school. Because these studies did not examine whether the combination of providing a cessation and a prevention intervention to parents and their children was more effective than solely a cessation intervention for parents, further research could

examine this research question to see whether this is a successful method to increase the effectiveness.

Concluding statement

The findings presented in this thesis contribute to the research field focusing on helping (expecting) parents to quit smoking by showing the importance of having a smoke-free partner before, during, and after pregnancy and the urgency of increasing the effectiveness of parent-tailored smoking cessation interventions worldwide. The present thesis also strengthens the evidence of the effective Dutch proactive parent-tailored telephone smoking cessation counseling program SFP and suggests that SFP could be cost-effective. Finally, the results of this thesis show that SFP could be implemented via healthcare settings and mass media. As a consequence of the results presented in this thesis, SFP has been the official parental smoking cessation intervention of the Taskforce Smoke-free Start and the Trimbos Institute since 2019. This means that SFP is now being implemented nationwide and is available for parents and healthcare professionals in the Netherlands. To increase the impact of SFP, the present thesis provides several directions to increase its use among parents and healthcare professionals.

CHAPTER 10

Dutch summary (Nederlandse samenvatting)

Roken is wereldwijd één van de grootste problemen voor de volksgezondheid. Jaarlijks overlijden meer dan acht miljoen mensen wereldwijd aan de gevolgen van roken. Ook al is het percentage rokende volwassenen (18 jaar en ouder) de afgelopen jaren in Nederland afgenomen, recente cijfers laten zien dat in 2019 21,7% van de volwassenen rookte. Van deze groep rookte bijna driekwart (73,3%) dagelijks. (Aanstaande) ouders vormen een speciale groep binnen de groep rokers. Hun rookgedrag kan namelijk niet alleen grote gezondheidsgevolgen hebben voor henzelf (bijvoorbeeld verhoogde kans op verschillende ziektes, waaronder kanker en COPD), maar ook voor hun (ongeboren) kinderen. Kinderen die (tijdens de zwangerschap) blootgesteld worden aan tabaksrook hebben bijvoorbeeld een grotere kans op wiegendood en het ontwikkelen van longproblemen (bijvoorbeeld astma). Bovendien hebben kinderen van rokende ouders tot drie keer meer kans om later zelf ook te gaan roken. Kortom, om de kans op ernstige gezondheidsgevolgen voor (aanstaande) ouders en hun kinderen te verkleinen en de kans te verkleinen dat er nieuwe rokers bijkomen, is het belangrijk dat (aanstaande) ouders stoppen met roken en toegang hebben tot effectieve stoppen-met-roken programma's die hen hierbij kunnen helpen. Het doel van dit proefschrift was om hieraan bij te dragen door vier belangrijke onderzoeksvragen te beantwoorden:

1. Welke kenmerken hebben vrouwen die vóór of tijdens de zwangerschap roken, tijdens de zwangerschap stoppen met roken en na de zwangerschap terugvallen?
2. Hoe effectief zijn stoppen-met-roken programma's voor ouders van kinderen tussen de 0-18 jaar?
3. Wat is de (kosten)effectiviteit van de Nederlandse telefonische stoppen-met-roken coaching Rookvrije Ouders voor ouders van kinderen 0-18 jaar als deze in de praktijk wordt onderzocht?
4. Hoe kan de telefonische coaching Rookvrije Ouders succesvol en duurzaam geïmplementeerd worden in Nederland?

In deze samenvatting worden bovenstaande onderzoeksvragen kort beantwoord. Aan het einde van deze samenvatting worden beknopt de sterke aspecten en beperkingen van dit proefschrift en de belangrijkste implicaties van de resultaten uit dit proefschrift beschreven. Deze samenvatting eindigt met een aantal suggesties voor vervolgonderzoek en een conclusie.

Onderzoeksvraag 1: Welke kenmerken hebben vrouwen die vóór of tijdens de zwangerschap roken, tijdens de zwangerschap stoppen met roken en na de zwangerschap terugvallen?

In **Hoofdstuk 2** is op basis van de landelijke en representatieve Monitor Middelengebruik en Zwangerschap (N = 1.858 vrouwen met kinderen jonger

dan vijf jaar) onderzocht welke kenmerken vrouwen hebben die vóór of tijdens de zwangerschap roken, tijdens de zwangerschap stoppen met roken en na de zwangerschap terugvallen (d.w.z. opnieuw beginnen met roken). Uit deze studie blijkt dat er een sterk verband is tussen vrouwen die rondom de zwangerschap roken en het rookgedrag van hun partner. Vrouwen die bijvoorbeeld vóór de zwangerschap rookten hadden bijna zeven keer vaker een partner die ook vóór de zwangerschap rookte dan vrouwen die niet vóór de zwangerschap rookten. Ook hadden vrouwen die tijdens de zwangerschap waren gestopt met roken maar na de zwangerschap weer terugvielen, twee keer zo vaak een partner die na de zwangerschap rookte dan vrouwen die niet terugvielen.

Naast de rookstatus van de partner, liet deze studie zien dat het opleidingsniveau van vrouwen ook een belangrijke risicofactor is voor het rookgedrag van vrouwen vóór en tijdens de zwangerschap. Vrouwen die vóór de zwangerschap rookten hadden bijna vier keer vaker een laag opleidingsniveau en bijna drie keer vaker een middelbaar opleidingsniveau dan vrouwen die niet vóór de zwangerschap rookten. Ook waren vrouwen die de hele zwangerschap rookten vaker lager opgeleid. In vergelijking met hoogopgeleide vrouwen rookten vrouwen met een laag opleidingsniveau elf keer vaker en vrouwen met een middelbaar opleidingsniveau vijf keer vaker tijdens de hele zwangerschap. Deze resultaten benadrukken het belang om niet alleen te focussen op het aanbieden van stoppen-met-roken begeleiding aan vrouwen vóór, tijdens of na de zwangerschap, maar ook om de partners van vrouwen te motiveren te stoppen en begeleiding aan hen te bieden. Tevens laten de resultaten zien dat er in de stoppen-met-roken zorg meer aandacht gegeven moet worden aan het bereiken en includeren van vrouwen met een lager opleidingsniveau.

Onderzoeksvraag 2: Hoe effectief zijn stoppen-met-roken programma's voor ouders van kinderen tussen de 0-18 jaar?

Hoofdstuk 3 beschrijft de resultaten van een meta-analyse van studies die de effectiviteit van stoppen-met-roken programma's voor ouders van kinderen 0-18 jaar onderzocht hebben. Effectstudies waarbij stoppen met roken door ouders (en bijvoorbeeld niet de vermindering van blootstelling van kinderen aan tabaksrook) de belangrijkste uitkomstmaat was, werden geïncludeerd. In totaal zijn 18 studies meegenomen in de meta-analyse. De resultaten laten zien dat stoppen-met-roken programma's effectief zijn: ouders in de interventiegroep hadden een 1,62 keer grotere kans om te stoppen met roken dan ouders in de controlegroep (13,1% vs. 8,4%). Ook al zijn stoppen-met-roken programma's effectief, het effect blijkt bescheiden te zijn. Om ervoor te zorgen dat meer ouders stoppen met roken, is het belangrijk dat er onderzocht wordt hoe stoppen-met-roken programma's voor ouders van kinderen 0-18 jaar verbeterd kunnen worden. Deze programma's kunnen mogelijk verbeterd worden door ouders bijvoorbeeld een actieve rol te geven binnen

preventieprogramma's die gericht zijn op het voorkomen dat hun kinderen starten met roken.

Onderzoeksvraag 3: Wat is de (kosten)effectiviteit van de Nederlandse telefonische stoppen-met-roken coaching Rookvrije Ouders voor ouders van kinderen 0-18 jaar als deze in de praktijk wordt onderzocht?

Een aantal jaar geleden is er in Nederland speciaal voor ouders een telefonische stoppen-met-roken coaching met aanvullende brochures over stoppen met roken ontwikkeld. Uit een effectstudie (een *efficacy trial*) uit 2014 is gebleken dat deze telefonische coaching effectief is: 34% van de ouders die de telefonische coaching hadden ontvangen gaf op de twaalf maanden nameting aan gestopt te zijn met roken ten opzichte van 18% van de ouders die een algemene zelfhulpbrochure over stoppen met roken had ontvangen. Echter, deze effectstudie had een belangrijke beperking. De telefonische coaching was namelijk niet in de praktijk, maar in een gecontroleerde setting onderzocht. Zo hoefden ouders die de telefonische coaching ontvingen niets te betalen voor de coaching en ontvingen ouders die meededen met het onderzoek € 100,- voor hun deelname. Omdat dit niet de hedendaagse praktijk in Nederland is, was dit toentertijd één van de redenen om de telefonische coaching niet landelijk te implementeren.

Om meer inzicht te krijgen in de (kosten)effectiviteit van de telefonische coaching (vanaf nu Rookvrije Ouders genoemd) in de hedendaagse praktijk, is een vervolgonderzoek opgezet. In **Hoofdstuk 4** wordt de opzet van deze *effectiveness trial* uitgebreid beschreven. In het kort werden rokende ouders van kinderen 0-18 jaar gevraagd om mee te doen met een *randomized controlled trial* (RCT). Nadat ouders aan het begin van het onderzoek een vragenlijst hadden ingevuld, werden ze op basis van toeval toegewezen aan één van de twee mogelijke groepen. Ouders in de interventiegroep ontvingen de telefonische coaching Rookvrije Ouders en het Magazine Rookvrije Ouders. Dit magazine was speciaal voor ouders ontwikkeld en bevatte ouder-gerelateerde onderwerpen met betrekking tot (stoppen met) roken. Ouders in de controlegroep ontvingen een algemene zelfhulpbrochure over stoppen met roken. Drie maanden later werden alle ouders gevraagd om opnieuw een vragenlijst in te vullen. In totaal gaf 53,3% van de ouders in de interventiegroep op de nameting aan gestopt te zijn met roken ten opzichte van 13,2% van de ouders in de controlegroep (zie ook **Hoofdstuk 5**). Dit betekent dat ouders die de telefonische coaching en het magazine ontvingen een meer dan zeven keer verhoogde kans hadden om op de nameting gestopt te zijn met roken dan ouders die de zelfhulpbrochure hadden ontvangen.

Hoofdstuk 6 presenteert de resultaten van de kosteneffectiviteitsanalyses. Hieruit blijkt dat voor ouders die de telefonische coaching ontvingen meer kosten

gemaakt waren dan voor ouders in de controlegroep (€ 1.275,99 vs. € 280,03). Vanuit maatschappelijk perspectief (waarbij gezondheidszorgkosten, arbeidskosten, interventiekosten en patiënt- en familiekosten worden meegenomen) resulteert dit in een incrementele kosteneffectiviteitsratio[1] van € 2491,- per extra ouder die stopt met roken vergeleken met de controlegroep. Met andere woorden, als de maatschappij bereid is om gemiddeld € 2491,- te betalen voor iedere extra ouder die stopt met roken, is de telefonische coaching kosteneffectief. Op dit moment bestaat er geen Nederlandse drempelwaarde die aangeeft hoeveel de maatschappij bereid is om te betalen om iemand te laten stoppen met roken. Echter, de kosten die bespaard worden doordat iemand stopt met roken overschrijden de kosten die gemoeid zijn met de telefonische coaching Rookvrije Ouders.

Onderzoeksvraag 4: Hoe kan de telefonische coaching Rookvrije Ouders succesvol en duurzaam geïmplementeerd worden in Nederland?

Naast de vraag over de (kosten)effectiviteit van de telefonische coaching Rookvrije Ouders, was het tweede doel van het vervolgonderzoek om te onderzoeken hoe de telefonische coaching landelijk geïmplementeerd kan worden in Nederland. Een belangrijke vraag hierbij was wat effectieve kanalen zijn om ouders te werven voor de telefonische coaching Rookvrije Ouders. Deze vraag wordt geadresseerd in **Hoofdstuk 7.** Op basis van eerdere studies werden twee wervingskanalen onderzocht: massamedia en gezondheidszorg. Via massamedia zijn ouders geworven via bassischolen, sociale media (bijvoorbeeld Facebook) en websites (bijvoorbeeld www.ikstopnu.nl). Ouders werden door middel van informatiebrieven via basisscholen, advertenties op sociale media en informatie op websites geattendeerd op de mogelijkheid om binnen één week door een stoppen-met-roken coach van SineFuma (één van de gekwalificeerdere stoppen-met-roken aanbieders in Nederland) gebeld te worden over de telefonische coaching Rookvrije Ouders. Tijdens dit gratis en vrijblijvend telefoongesprek ontvingen ouders meer informatie over de coaching (bijvoorbeeld over de inhoud en eventuele kosten) en konden ze beslissen of ze wel of niet wilden starten met de coaching. Ook vroegen de stoppen-met-roken coaches aan ouders of ze mee wilden doen met de RCT (zie onderzoeksvraag 3). Ouders die niet met de RCT mee wilden doen, konden de telefonische coaching buiten de RCT ontvangen (en hoefden dus geen vragenlijsten in te vullen).

Om ouders via de gezondheidszorg te werven is in samenwerking met zorgprofessionals (bijvoorbeeld kinderartsen) een doorverwijstool ontwikkeld. Met behulp van deze doorverwijstool waren zorgprofessionals uit de

1 De incrementele kosteneffectiviteitsratio geeft de verhouding weer van het verschil in kosten en het verschil in effecten tussen interventies.

jeugdgezondheidszorg en medische zorg in staat om ouders die willen stoppen met roken door te verwijzen naar de telefonische coaching Rookvrije Ouders. Zorgprofessionals konden ouders online doorverwijzen of via de telefoon of fax. Ouders die waren doorverwezen werden binnen één week gebeld door een stoppen-met-roken coach om meer informatie te krijgen over de telefonische coaching en het onderzoek (net zoals bij ouders die via massamedia waren doorverwezen).

De resultaten in **Hoofdstuk 7** laten zien dat in de periode tussen september 2016 en september 2018 in totaal 402 ouders zijn geworven (massamedia: n = 143; gezondheidszorg: n = 250; kanaal onbekend: n = 9). Van deze 402 ouders is 26,4% gestart met Rookvrije Ouders (d.w.z. meegedaan met de RCT of de telefonische coaching buiten de RCT ontvangen). Dit laat zien dat een grote groep ouders uitvalt nadat ze zijn doorverwezen via zorgprofessionals of massamedia. Eén van de belangrijke redenen voor deze hoge uitval is dat bijna één derde (32,7%) van de ouders die niet met Rookvrije Ouders startte niet meer bereikbaar was nadat ze hadden aangegeven gebeld te willen worden door een stoppen-met-roken coach. Daarnaast gaf 10,5% van de ouders die niet meededen aan dat de telefonische coaching te duur was en wilde 9,5% van de ouders niet stoppen met roken. Kortom, dit onderzoek laat zien dat ouders verschillende barrières ervaren die hen ervan weerhouden om met Rookvrije Ouders te starten. Om het aantal ouders dat met Rookvrije Ouders start te verhogen, is het belangrijk om deze barrières weg te nemen.

In **Hoofdstuk 7** is ook gekeken naar de vraag of de kosten en het aantal ouders dat met Rookvrije Ouders start verschilt tussen de twee wervingskanalen (massamedia en gezondheidszorg). Uit de resultaten blijkt dat het aantal ouders dat met Rookvrije Ouders start niet significant verschilt tussen de twee wervingskanalen (massa media: 27,3%; gezondheidszorg: 26,8%). Daarnaast waren de kosten om één ouder te werven die met Rookvrije Ouders startte voor beide wervingskanalen relatief laag, maar voor massamedia wel substantieel hoger dan voor de gezondheidszorg (€ 205,72 vs. € 99,62). Kortom, omdat de wervingskosten voor beide kanalen relatief laag zijn en omdat het aantal ouders dat met Rookvrije Ouders start amper verschilt tussen de twee wervingskanalen kan de telefonische coaching via beide wervingskanalen geïmplementeerd worden.

Om meer inzicht te krijgen in de implementatie van de doorverwijstool en de telefonische coaching Rookvrije Ouders via de gezondheidszorg, is een *mixed-methods study* uitgevoerd om de barrières en faciliterende factoren van de doorverwijstool te onderzoeken. Deze *mixed-methods study*, waarin zowel kwantitatieve als kwalitatieve data verzameld zijn, is beschreven in **Hoofdstuk 8**. Zorgprofessionals (N = 68) werden gevraagd om twee korte online vragenlijsten in te vullen en mee te doen met een semigestructureerd telefonisch interview. De

resultaten laten zien dat de meerderheid van de zorgprofessionals de doorverwijstool makkelijk en laagdrempelig vindt. Echter, zorgprofessionals ervaren een aantal barrières die het gebruik en de implementatie van de doorverwijstool beperken. Voorbeelden van deze barrières zijn: (a) de weerstand die zorgprofessionals bij ouders ervaren om te stoppen met roken; (b) de spanning die zorgprofessionals ervaren om ouders te motiveren te stoppen met roken, aangezien ze de zorgverlener van kinderen, en niet hun ouders, zijn; en (c) de mogelijke kosten van de telefonische coaching die ouders moeten betalen. Om de implementatie van de doorverwijstool en de telefonische coaching Rookvrije Ouders in de gezondheidszorg te verbeteren, is het belangrijk om deze barrières weg te nemen.

Sterke punten en beperkingen

Dit proefschrift heeft een aantal sterke punten en beperkingen. Een sterk punt is dat er in het onderzoek naar de telefonische coaching Rookvrije Ouders gebruik is gemaakt van het *effectiveness-implementation hybrid design*. Met behulp van dit design was het mogelijk om de effectiviteit van de telefonische coaching Rookvrije Ouders te onderzoeken in een context waarin de coaching ook is geïmplementeerd. Naast het wetenschappelijke bewijs dat al over de effectiviteit van de telefonische coaching bestond, heeft dit proefschrift hiermee aanvullend wetenschappelijk bewijs geleverd over de effectiviteit van de telefonische coaching in de praktijk en inzichten gegeven in hoe de telefonische coaching succesvol geïmplementeerd kan worden in Nederland.

Een beperking van dit proefschrift is dat de data gebaseerd zijn op zelf-rapportage en dat de uitkomstmaten met betrekking tot stoppen met roken niet biochemisch gevalideerd zijn. Hierdoor is het mogelijk dat ouders in de vragenlijsten aan hebben gegeven gestopt te zijn met roken, terwijl ze niet gestopt waren. Dit kan gezorgd hebben voor hogere stoppercentages van ouders in de interventie- en controlegroep. Een andere beperking is dat de effectiviteit van de telefonische coaching in dit proefschrift niet op de langere termijn is onderzocht (bijv. twaalf maanden na de start van de interventie), terwijl dit wel aanbevolen wordt in de *Russell Standard*. Echter, de eerdere *efficacy trial* heeft aangetoond dat de telefonische coaching ook op de twaalf maanden nameting effectief is. Omdat de effecten op de drie maanden nameting tussen beide studies sterk overeenkomen, is de verwachting dat de telefonische coaching ook op de langere termijn effectief is in de hedendaagse praktijk.

Belangrijkste implicaties voor de praktijk

De resultaten van dit proefschrift hebben belangrijke implicaties voor de verdere implementatie en doorontwikkeling van de telefonische coaching Rookvrije Ouders. Gebaseerd op de resultaten uit dit proefschrift hebben het Trimbos-instituut en de Taskforce Rookvrije Start besloten om Rookvrije Ouders op landelijk niveau te

implementeren. In het kort betekent dit dat Rookvrije Ouders door de Taskforce Rookvrije Start en het Trimbos-instituut als het officiële stoppen-met-roken programma voor ouders wordt beschouwd en via verschillende kanalen van de Taskforce Rookvrije Start wordt geïmplementeerd (bijvoorbeeld via e-learnings, animaties voor ouders en zorgprofessionals en andere materialen). Naast de implementatie via de Taskforce Rookvrije Start wordt Rookvrije Ouders ook geïmplementeerd via de website www.ikstopnu.nl. Deze website staat op ieder pakje sigaretten afgebeeld en heeft onder andere daardoor een groot bereik onder rokers.

Om landelijke implementatie mogelijk te maken is Rookvrije Ouders doorontwikkeld. Zo is er een online platform ontwikkeld waardoor Rookvrije Ouders niet meer door één stoppen-met-roken aanbieder, maar door meerdere stoppen-met-roken aanbieders gegeven kan worden. Stoppen-met-roken coaches die aan de kwaliteitscriteria voldoen kunnen zich aanmelden als Rookvrije Ouders-coach. Ouders die door zorgprofessionals worden doorverwezen of zichzelf via de website www.ikstopnu.nl aanmelden voor een vrijblijvend en gratis telefoongesprek over de telefonische coaching worden op basis van een verdeelsleutel toegewezen aan een stoppen-met-roken coach. Vervolgens worden deze ouders binnen één week gebeld door een stoppen-met-roken coach en beslissen ouders tijdens of na dit telefoongesprek of ze willen starten met de telefonische coaching. Sinds het Trimbos-instituut en de Taskforce Rookvrije Start in 2019 hebben besloten de telefonische coaching Rookvrije Ouders landelijk te implementeren, hebben wekelijks meerdere ouders een vrijblijvend telefoongesprek met een stoppen-met-roken coach over de telefonische coaching Rookvrije Ouders gehad.

Suggestie voor vervolgonderzoek

Om in de toekomst het bereik en de impact van de telefonische coaching te verhogen, is het belangrijk om de werving van ouders via de twee kanalen te verbeteren en om te onderzoeken hoe de barrières van ouders weggenomen kunnen worden. Zo kan er bijvoorbeeld onderzocht worden of ouders via scholen beter bereikt worden als Rookvrije Ouders gekoppeld wordt aan preventieprogramma's over roken, zoals "Helder op School". Een andere manier om het bereik en de impact van de telefonische coaching te verhogen is door nieuwe wervingskanalen te onderzoeken. Kraamzorg kan bijvoorbeeld een kanaal zijn waarmee veel rokende ouders bereikt kunnen worden, aangezien kraamverzorgenden meerdere dagen ondersteuning geven aan ouders in de thuisomgeving en in die periode stoppen met roken bespreekbaar maken met ouders.

Conclusie

De resultaten uit dit proefschrift geven aanwijzingen voor hoe de stoppen-met-roken zorg voor (aanstaande) ouders verbeterd kan worden. Dit proefschrift laat het belang zien om bij vrouwen vóór, tijdens en na de zwangerschap ook de rookstatus

van de partners uit te vragen en partners te motiveren te stoppen met roken en stoppen-met-roken begeleiding aan te bieden. Tevens blijkt uit dit proefschrift dat het belangrijk is om meer onderzoek te doen naar hoe stoppen-met-roken programma's voor ouders van kinderen 0-18 jaar verbeterd kunnen worden. Ten slotte heeft dit proefschrift het bewijs voor de effectiviteit van de Nederlandse telefonische stoppen-met-roken coaching Rookvrije Ouders verstevigd en richtingen gegeven hoe de telefonische coaching succesvol en duurzaam geïmplementeerd kan worden in Nederland. Op basis van de resultaten uit dit proefschrift wordt Rookvrije Ouders sinds eind 2019 landelijk geïmplementeerd en worden wekelijks meerdere ouders doorverwezen naar de telefonische coaching Rookvrije Ouders.

CHAPTER 11

References, Acknowledgement (dankwoord), List of publications, and Curriculum Vitae

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"U maakte deze wereld

en geeft ons elke morgen

de kans om met Uw liefde

een dag voor haar te zorgen."

Schrijvers voor Gerechtigheid, uit "Heer, vergeef ons"

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Curriculum Vitae

Tessa Scheffers-van Schayck was born on May 15, 1992 in Nijmegen, the Netherlands. After completing her secondary education (pre-university education) at Porta Mosana College in Maastricht in 2010, she started a Bachelors program in Psychology with a specialization in Developmental Psychology and a minor in Public Governance and Management at Utrecht University. In 2016, Tessa obtained her Master's degree in Youth, Education, and Society at Utrecht University. For her Master's program she did a research internship at the Trimbos Institute under supervision of dr. Carmen Voogt and prof. dr. Rutger Engels.

In 2016, Tessa started her PhD studies at the Trimbos Institute and Utrecht University. Tessa presented her research at several national and international conferences. She also had the opportunity to review for several international peer-reviewed journals. Throughout the PhD program, she supervised multiple students in writing their Bachelors and Masters theses. To pursue a research visit (3,5 months) at the Center for Hope, Huntsman Cancer Institute, in Salt Lake City (USA), she received competitive grants from the René Vogels Stichting and the Stichting Astma Bestrijding (Dutch Foundation for Asthma Prevention). During this visit in 2019, she collaborated with professor David Wetter and his research team.

During her PhD studies, Tessa got involved in other research projects at the Trimbos Institute. Since January 2019, she has a position as scientific researcher at the department of Epidemiology of the Trimbos Institute. In addition, Tessa has been working as a teacher at the department of Development & Education of Youth in Diverse Societies at Utrecht University since November 2019. Tessa is happily married with her husband Daan who she met during her studies in Utrecht. They live together in Utrecht and love to go hiking in the mountains, do volunteer work, and spending time with friends and family.