Vaccinating : self-evident or not? : development of a monitoring system to evaluate acceptance of the national immunization program

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Vaccinating: self-evident or not?

**Development of a monitoring system to evaluate acceptance
of the National Immunization Program**

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Vaccinating: self-evident or not?

Development of a monitoring system to evaluate acceptance of the National Immunization Program

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Universiteit Maastricht,
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Chapter 1

General introduction

General introduction

In the Netherlands, the National Immunization Program (NIP) is a voluntary program that offers childhood vaccinations free of charge and includes vaccines against twelve infectious diseases, with DTaP-IPV-Hib-HepB at 2, 3, 4 and 11 months of age, 10-valent conjugated pneumococcal vaccine at 2, 4 and 11 months, MMR and MenC at 14 months, DTaP-IPV at 4 years of age, MMR and DTaP at 9 years of age, and HPV16/18 (girls only) at 12 years of age. The Dutch Health Council recommends on the desirability to include vaccines into the NIP. Based on these recommendations, the Minister of Health decides on changes to the NIP. The National Institute of Public Health and the Environment (RIVM / PHI) manages the program implementation and provides information about the NIP for parents and child vaccine providers (CVPs). Furthermore, the PHI is responsible for monitoring the vaccination program. Through several surveillance methods (i.e., disease surveillance, immunosurveillance, surveillance of microbial population dynamics, and surveillance of adverse events) they provide insight into the disease incidence, the (duration of) protection in the population against vaccine-preventable diseases included in the program, and (changes into) the pathogen and into the vaccination coverage (Kimman et al., 2006). Overall, the vaccination coverage in the Netherlands is high and amount to 99% for vaccines among children up to 4 years, and 92% for boosters in children aged 4 and 9 years (van Lier, Oomen, et al., 2013). Despite the high overall coverage there are pockets of unvaccinated people. A short report of Woonink (2009) showed possible reasons of parents in the Netherlands to refuse vaccination for their children like religion, anthroposophical or homeopathic lifestyle, or being a member of the association for critical vaccination in the Netherlands. Ruijs et al. (2012) have provided insight in factors that influenced vaccine refusal among religious parents.

Children aged 0–4 years receive the vaccines at child welfare centers (CWC), where they also receive free-of-charge health check-ups during consults on a scheduled basis. CVPs administer the vaccines at CWCs. Parents can choose between a regular CWC and a CWC based on anthroposophy, a spiritual philosophy founded by Rudolf Steiner (Woonink, 2009). When the child is two weeks old, a nurse of the CWC visits the parents at their home and gives some oral information about the NIP. When the child is 4–6 weeks old, parents receive (before the first NIP vaccination) through mail a brochure with information about the NIP vaccines, diseases, the vaccination schedule, side effects, and with a reference to the website of the Public Health Institute (PHI). Administration of vaccines for children aged 4 and 9 years is organized by municipal health services (MHS).

In 2009, the vaccine against Human Papillomavirus (HPV) was introduced into the NIP. A catch-up campaign was organized for girls aged 13 to 16 years old and the vaccination coverage (50%) turned out to be lower than expected (70%) (van Keulen et al., 2013). Nowadays, girls receive twice the HPV-vaccine (organized by MHS) when they are twelve years old. The current

vaccination coverage of HPV is still lower (i.e., 58%) than the vaccination coverage of other vaccines in the NIP (i.e., 95% (van Lier, Oomen, et al., 2013)).

Praeventis

In the Netherlands, the electronic national immunization register Praeventis monitors the individual vaccination status for children up to 18 years living in the Netherlands. The system is used to invite children for the NIP. When children are born and registered in the population register of the Netherlands, they are automatically registered in Praeventis, until the age of 19. Praeventis was implemented in 2005, and before the introduction of Praeventis, regional immunization registers produced invitation and reminder letters and registered the vaccines that were administered. Praeventis controls the stock of vaccines, monitors information about vaccination fees for the different executive organizations that are involved in the NIP, and monitors the vaccination coverage (van Lier et al., 2012). Based on information from Praeventis about the vaccination coverage of the NIP, an annual report is published by the PHI on nationwide level and for each municipality (van Lier, Oomen, et al., 2013). Data of Praeventis can also be used for inviting parents to participate in research, and by this, research can be obtained to get insight in the influence of ethnicity, religion and social economic status on vaccination uptake (van Lier, van de Kasstele, de Hoogh, Drijfhout, & de Melker, 2013).

Unrest in the NIP

The overall high vaccination coverage in the Netherlands does not give full information on the (changing) motivation of parents to vaccinate or not. Parents who still choose to vaccinate their child might have some doubts. In addition, they may not make a deliberate decision to vaccinate their child. Unexpected factors from outside the NIP (e.g. epidemics, media, disagreeing professionals and anti-vaccination lobbying) can influence and alter parents' attitude towards vaccination, which may result in lower vaccination coverage. In the UK, in 1974, a report described 36 neurological reactions to whole-cell pertussis vaccine (Gangarose et al., 1998). The following media attention to this report resulted in a lower vaccination coverage of the pertussis vaccine. Confidence in the vaccine was restored after publication of a national review of vaccine efficacy. In addition, general practitioners who achieved the target of vaccine coverage, received financial incentives which also contributed to recovery of the vaccination coverage (Gangarose et al., 1998). The experience with the suggested MMR-autism link in the UK is another good example of a situation that influenced parents' attitude and vaccination behavior. Dr. Wakefield and colleagues published a paper in 1998 that suggested empirical evidence of a link between the MMR vaccination and autism (Brown et al., 2012). Extensive media attention for this study caused fear among generations of parents, with a lower MMR vaccination coverage as a result, followed by epidemics of measles in the UK (Brown et al., 2012). In 2010, the Wakefield paper was retracted based on methodology and ethical flaws (Council, 2010). Although the paper was retracted and other studies did not show an association between the MMR vaccine and autism

(Elliman & Bedford, 2007), unrest about the MMR vaccine remained and still seems to cause lower vaccination coverage (Brown et al., 2012). In the Netherlands, the introduction of the HPV vaccination in the NIP caused commotion. The vaccine targets 12-year-old girls, but in 2009 a catch-up campaign was organized, for girls aged 13 and 16 years old. The expected vaccination coverage of this catch-up campaign turned out to be lower, for several reasons: the novelty of the vaccine, only girls were invited for the HPV vaccine, and HPV being a sexual transmitting disease (Rondy, van Lier, van de Kasstele, Rust, & de Melker, 2010). In addition, some scientists were skeptical about safety and efficacy of the vaccine, which caused a national debate in the media (Rondy et al., 2010).

The situations mentioned above showed that media might have a major influence at parents' attitude towards vaccination. Because people use the internet for information about vaccines and usage of (social) media is omnipresent, messages will spread very fast among parents (Betsch et al., 2012). Messages at the internet might negatively influence parents attitude and intention to vaccinate. Betsch, Renkewitz, Betsch, and Ulshöfer (2010) showed in an experimental study that participants, who visited vaccine critical-websites, reported an increased perceived risk of vaccinating and a decreased intention to vaccinate.

Monitoring system

The experience with the introduction of the HPV vaccine, the report about the pertussis side effects, and the publication about the MMR autism link, are examples that show that unrest about NIP vaccines can develop unexpectedly and fast (Brown et al., 2012; Gangarose et al., 1998; Rondy et al., 2010). To be able to timely intervene when there is unrest and have current knowledge about parental vaccination decision-making, it is essential to monitor the determinants of acceptance of vaccination for both parents and CVPs. With an appropriate monitoring system, trends can be followed in parental decision-making and CVPs attitude and experience with the NIP. So far, no system has been developed in the Netherlands to monitor the acceptance of the NIP among parents and CVPs. The goal of the monitoring system will be to evaluate trends and changes in decision-making of parents about childhood vaccination and being able to predict and timely intervene when there is unrest within the NIP.

Input for the monitoring system

For developing the monitoring system to evaluate the acceptance of childhood vaccination, more insight in how parents make the decision whether to vaccinate their child or not within the NIP is needed. Earlier research showed that parents who choose to vaccinate their child seem to do so because they believe that vaccinating is important and they fear the infectious diseases, while the decision itself is taken not very deliberately but rather something that is 'expected of parents' to do (Bond & Nolan, 2011; Paulussen, Hoekstra, Lanting, Buijs, & Hirasing, 2006; Tickner, Leman, & Woodcock, 2007). Parents who refuse vaccination for their child(ren), perceive childhood vaccines as unsafe and ineffective, believe that the targeted infectious

diseases are not severe, and that vaccinating is more risky than refusing vaccination (Brown et al., 2010; Gust, Kennedy, et al., 2005). Paulussen et al. (2006) showed that parents' intention to vaccinate was most strongly determined by parents' attitude towards vaccination. Positive attitudes of Dutch parents towards vaccination were associated with the belief that the vaccine is safe, and vaccinating is the best way of protecting children against infectious diseases (Paulussen et al., 2006). Negative attitudes were associated with the belief that children receive too many vaccines simultaneously and the perception that vaccinating affects natural development. Since the study of Paulussen et al. (2006) has been performed a few years ago, and because their study mostly focused at parents who choose vaccination for their child, updated research is needed for developing the monitoring system, about determinants that influence parents' intention to vaccinate or (partially) refuse vaccination for their child.

Besides parents, CVPs play an important role in the NIP, because they administer the vaccines and communicate with parents about the NIP. Parents perceive the CVPs as the most reliable source for vaccine related information (Brown et al., 2010; Gust, Brown, et al., 2005). In addition, CVPs (positive) attitude towards the NIP is important because different studies showed that it might influence parents' attitudes and intention to vaccinate their children (Freeman & Freed, 1999b; Stefanoff et al., 2010; Swennen, Van Damme, Vellinga, Coppieters, & Depoorter, 2001). It is important to get insight in CVPs attitudes and experiences with the NIP, therefore we included them in this research project.

Dissertation outline

The studies that have been conducted in this PhD project were aimed at providing input for the development of a monitoring system to evaluate the acceptance of the NIP. For developing the system, research needs to be done to get insight in the determinants that influence Dutch parents' decision whether to vaccinate or not. The most important determinants that influence parents vaccination decision will be included in the monitoring system. In addition, more research is needed in CVPs experiences and the vaccine related messages presented on the internet. This research project will focus at children aged 0-4 years, and will not include parents who refuse vaccination based on religion, since extensive research have already been performed among these parents (Ruijs, Hautvast, Kerrar, van der Velden, & Hulscher, 2013; Ruijs et al., 2012; Ruijs et al., 2011).

First, insight was obtained in the determinants that influenced parents' decision to vaccinate or refuse vaccination for their children. We started with qualitative research. **Chapter 2** describes the focus groups that were conducted with parents who visited an anthroposophical CWC. Lower participation rates within the NIP were found among this group of parents (Duvell, 2001; Kasper et al., 2009; van Velzen, de Coster, Van Binnendijk, & Hahné, 2008; Wadl et al., 2011; Zuzak, Zuzak-Siegrist, Rist, Staubli, & Simoes-Wüst, 2008), and no research had been done in the Netherlands to explore the psychosocial determinants that influenced the lower vaccination

coverage among anthroposophical parents. The goal of this study was to find out which factors might influence the decision of the parents to (partially) refuse vaccination for their child(ren).

Mixed results have been found in previous research about the participation rate of immigrant parents in the NIP (Hontelez, Hahne, Koedijk, & De Melker, 2009; Mollema, Wijers, et al., 2012; van Lier, van de Kasstele, et al., 2013). Possible reasons for a lower participation rate among immigrant parents are unknown. Therefore, **Chapter 3** presents a focus group study to get insight in the factors that influence vaccination decision-making among parents with different ethnic backgrounds.

Since reasons for refusing vaccination among anthroposophical, religious, and immigrant parents have been investigated, insight was needed in other reasons of parents for refusing childhood vaccination. **Chapter 4** gives insight in these other reasons of parents to (partially) refuse vaccination for their children with the use of online focus groups (because it was not feasible to organize a meeting at one location).

The hepatitis B vaccine was introduced in the NIP in 2011. Before the introduction of the hepatitis B vaccine, insight was needed in whether parents would vaccinate their child against hepatitis B. **Chapter 5** shows the psychosocial determinants that influenced parents' decision to vaccinate their child against Hepatitis B, and whether parents' intention is a good predictor of their actual vaccination behavior.

Results of the focus group studies showed that parents search for information themselves and that they have a need for more NIP information. Therefore, a questionnaire study was performed (**Chapter 6**), to get insight in parental information seeking behavior and their need for NIP information.

To quantify the findings of the focus groups among parents and to get insight in the relative importance of the determinants that influenced parents' intention to get their children vaccinated, a questionnaire study was performed to model parental vaccination decision making (**Chapter 7**).

CVPs administer vaccines within the NIP and are perceived as the most important and reliable source for information. **Chapter 8** shows the results of a questionnaire study to get insight in CVPs attitude about the NIP and their experience with parents that visit the CWC.

The internet is a medium that is highly used, not only to search for information, but also to exchange information and opinions about childhood vaccination. We therefore analyzed internet data (social media, twitter and newspapers) during the measles outbreak (in 2013) in the Netherlands, to get insight in the sources, the topics and sentiments of vaccine related messages and differences between classic (newspaper) and social media messages. **Chapter 9** shows the results of this internet study.

The studies performed so far, give insight in the determinants that influenced parents decision, why they and what information they searched for, the experience of CVPs within the NIP, and the vaccine messages presented on the internet. All these results were needed to develop

the monitoring system. **Chapter 10** describes the different parts of the proposed monitoring system.

Finally, **Chapter 11** summarizes and discusses the major findings of the studies. Moreover, it will discuss the practical implications of the results and suggestions for future research.

It should be noted that this thesis is primarily a collection of published articles. Most chapters were written as stand-alone pieces so some repetition is inevitable throughout the thesis.

Chapter 2

Factors that influence vaccination decision-making by parents who visit an anthroposophical child welfare center: a focus group study

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Abstract

In recent years, parents have become more disparaging towards childhood vaccination. One group that is critical about the National Immunization Program (NIP) and participates less comprises parents with an anthroposophical worldview. Despite the fact that various studies have identified anthroposophists as critical parents with lower vaccination coverage, no research has been done to explore the beliefs underlying their childhood vaccination decision-making. We conducted a qualitative study using three focus groups ($n = 16$) of parents who visit an anthroposophical child welfare center. Our findings show that participants did not refuse all vaccinations within the Dutch NIP, but mostly refused the Mumps, Measles and Rubella (MMR) vaccination. Vaccination decisions are influenced by participants' lifestyle, perception of health, beliefs about childhood diseases, perceptions about the risks of diseases, perceptions about vaccine effectiveness and vaccine components, and trust in institutions. Parents indicated that they felt a need for more information. Sufficient references should be provided to sources containing more information about childhood vaccination, especially about the effectiveness of vaccines and vaccine components and the risks, such as possible side effects, and benefits of vaccination. This may satisfy parents' information needs and enable them to make a sufficiently informed choice whether or not to vaccinate their child.

Introduction

In recent years, parents have become more disparaging towards childhood vaccination (Blume, 2006). Different studies show reasons why parents are critical and sometimes refuse vaccination for their children. These include anxiety about side effects, the perception that vaccine-preventable diseases are not serious, and a lack of trust in herd immunity (Benin, Wisler-Scher, Colson, Shapiro, and Holmboe (2006)). This suggests that parents who refuse vaccination are concerned about long-term health problems as a result of vaccination (Bennett & Smith, 1992) and have doubts about the safety of vaccines (Kennedy, Brown, & Gust, 2005). However, these factors vary between different groups of parents who may refuse vaccination. One of the groups who is critical about the National Immunization Program (NIP) and participates less comprises parents with an anthroposophical worldview.

Anthroposophy is a spiritual movement that was founded at the beginning of the 20th century by Rudolf Steiner, an Austrian philosopher. In anthroposophic care, health is viewed as a matter of body, soul and spirit, and a balance between these three. There are anthroposophical medical practices in 80 countries around the world (Hamre, Kiene, & Kienle, 2004) and anthroposophy has been applied in various social domains such as education (Steiner schools), art, architecture, and agriculture (biodynamic farming). Various countries have reported lower participation of anthroposophical parents in the NIP including Germany, Sweden, Switzerland, Austria, the UK, and the Netherlands (Alm, Swartz, Lilja, Scheynius, & Pershagen, 1999; de Velzen, De Coster, Van Binnendijk, & Hahné, 2008; Duvell, 2001; Kasper et al., 2009; Wadl et al., 2011; Zuzak et al., 2008). Due to the lower vaccination coverage and especially the MMR (Mumps Measles Rubella) vaccination, outbreaks of infectious diseases such as measles still occur among these populations (de Velzen et al., 2008; Duvell, 2001; Kasper et al., 2009; Wadl et al., 2011).

In the Netherlands, the anthroposophical community comprises some 4,300 members (Woonink, 2009). However, the expected number of people with an anthroposophical worldview is higher. Dutch parents can choose whether their children (aged 0-4 years) receive their vaccines and health check-ups in a standard child welfare center (CWC) or an anthroposophical CWC. Anthroposophical child vaccine providers (CVP) are more willing to adapt the NIP if asked to by the parents, compared to CVPs at a standard CWC (Mollema, Staal, van Steenberg, Paulussen, & de Melker, 2012). The Dutch NIP is managed by the National Institute of Public Health and the Environment (RIVM), is voluntary and free of charge, and has an overall vaccination coverage of 95% (van Lier et al., 2011).

Despite the fact that anthroposophists are identified as critical parents with lower vaccination coverage, no research has been done in the Netherlands and elsewhere to explore their beliefs about childhood vaccination. This qualitative study was conducted, by means of focus group discussions, to gain more insight into parents' experience at an anthroposophical CWC, the factors that influence their vaccination decision-making, and their need for information.

Methods

Participants and procedure

In total, three focus groups ($n = 16$) were conducted with parents who visit an anthroposophical CWC. Doctors and nurses from three different anthroposophical CWCs in the Netherlands invited parents to participate. Parents received an information letter regarding the study objectives and procedures and could inform the researchers whether they wished to participate by sending an email to an email address. Parents who did so then received more details about the date and location of the focus group discussions.

Study setting

The focus groups were held in the evening at the anthroposophical CWC that the parents visited, and lasted about 2 hours. Every focus group had the same moderator (IH) and different assistants. Informed consent was obtained and participants received a gift voucher of €30 as an incentive. The focus groups were held between May 2011 and June 2012 and were approved by the Psychology Ethics Committee of Maastricht University. The focus groups were based on a semi-structured protocol with open-ended questions. The topic list was pilot-tested with colleagues and then revised. This revised and final version was used for all three focus groups.

The focus groups started with an introduction about the objectives of the study and the role of the participants during the focus group. After that, participants introduced themselves with their names and family composition and reasons why they visited an anthroposophical CWC. Then parents were asked to write down what they perceived as positive and negative aspects of the Dutch NIP. Next, more in-depth questions were asked about which factors influenced their decision whether or not to vaccinate their child, the influence of their social environment in their vaccination decisions, and their need for information. At the end, the focus group was evaluated together with the participants.

Analysis

The three focus groups were recorded with a digital voice recorder and transcribed verbatim. The data were processed with the software program Nvivo 9 (QSR International) and then analyzed based on thematic analysis (Braun, 2006) to explore different factors influencing the parents' decision whether or not to vaccinate their child. Different themes were explored and an inductive process was used to derive sub-themes from the six main themes. The data were analyzed and coded by the moderator (IH) and an independent researcher analyzed and recoded one focus group. Afterwards initial coding was compared, reviewed, discussed, and refined until consensus was achieved, leading to an improved coding scheme and criteria.

Results

Participants

The group of 16 participants consisted of two parents with one child, four parents with two children, another four with three children, one with four children, and one parent with five children. Two couples participated in the focus groups. One of these couples had one child and the other had two. Fourteen of the 16 participants were female. All parents indicated that they had postponed vaccination for at least one child. One parent had refused all vaccinations for her children, while the other parents had partially vaccinated their child. Of the parents who partially vaccinated their children, all refused the MMR, pneumococcal and meningococcal C vaccinations. The DT-IPV (Diphtheria, Tetanus, and Polio) vaccine was mostly accepted ($n = 6$), next the DTaP-IPV (Diphtheria, Tetanus, Pertussis, and Polio) vaccine ($n = 3$) and then the DTaP-IPV-Hib (Diphtheria, Tetanus, Pertussis, Polio, and *Haemophilus influenzae* type b) vaccine ($n = 2$). The other parents ($n = 3$) had not yet decided whether or not to have their child vaccinated.

The six themes derived from the focus group discussion were divided into sub-themes and are described below with relevant quotes from the participants.

Positive and negative aspects of the Dutch NIP

The parents agreed that one positive aspect of the Dutch NIP is that the vaccines are free of charge and available for everyone: *"I think it's good that vaccines are available to everyone, regardless of your background."* Some participants ($n = 4$) mentioned that some diseases are less prevalent thanks to vaccination. *"The first thing that came to mind was that certain dangerous diseases are less common."*

One perceived negative aspect of the Dutch NIP was that it is a standard program: *"It's a pity that it's a standard program and there's little regard for the child's personal development"*, and that vaccinating is the general norm: *"One thing I don't like about it is that it's considered the norm to automatically or blindly follow the program, and that if you refuse vaccination, you have to justify your reasons."*

Anthroposophical CWC

Because all of the parents in these focus groups visited an anthroposophical CWC, we were interested in why they had chosen an anthroposophical CWC and what their experiences were.

Reasons to visit an anthroposophical CWC

Some parents ($n = 6$) visit an anthroposophical CWC because they have an anthroposophical background, lifestyle or beliefs: *"We chose an anthroposophical CWC because it was the obvious choice for us. As a child, I always went to an anthroposophical CWC, so it was part of my upbringing."* Another parent said: *"We chose anthroposophical health care a long time ago because it has a different view of health, and it doesn't only look at physical aspects, but also spiritual aspects."* Other parents ($n = 5$) said they visited an anthroposophical CWC because they had had a negative

experience at a standard CWC: *"I first went to a regular CWC, but they were very strict and you almost felt guilty if you wanted to postpone or even considered postponing the vaccination"*.

Experience at anthroposophical CWC

All participants mentioned they had a positive experience when visiting an anthroposophical CWC. Most anthroposophical CWCs have longer consultations than standard CWCs and are therefore able to dedicate more time to informing the parents: *"The consultations are very pleasant, there's no pressure, the information you get is broad and clear and they make sure that you've really had the chance to think through the consequences [of not vaccinating]. If you have any questions at a later time, you can always call."* The parents also indicated that they appreciated it that health care workers at anthroposophical CWCs emphasize that parents have their own responsibility in making choices for their children: *"They [the health care workers] make it very clear that it's your own decision. They insist on nothing."*

Factors influencing decision-making

The participants described various factors that influenced their choice whether to refuse or accept vaccinations for their children. These included lifestyle, perception of health, beliefs about childhood diseases, risk perception of the diseases, perceptions about vaccine effectiveness and vaccine components, and trust in institutions.

Lifestyle

The parents indicated that the lifestyle they had might positively influence the health of their children. They tried to raise their children to be as healthy as possible so that their immune systems would be strong and able to cope with infectious diseases. One parent said: *"You can make sure your child is healthy and has a strong immune system. I think that's something I try to succeed in."* Some parents ($n = 5$) indicated that a peaceful environment was important: *"We had a babysitter, our children did not went to day care, so they grew up in a quiet environment. This made me confident that I could postpone vaccination."* Another parent said: *"They both went to childcare at a very late age, or we had a babysitter at home, so the care that our children get is good, there was a rest around them that supported them."* Other parents ($n = 6$) mentioned that good nutrition such as breastfeeding was an important protector against infectious diseases: *"Because I breastfed for a long time I thought: 'well my child will get a lot of protection from breast milk.'"*

Perception of health

The perception that the parents had about the health of their children was an important factor in their vaccination decisions: *"I look at how well she's developed. She's not weak, she's a very strong child and I have so much confidence in her. She's so healthy and I didn't want to interfere with that, so she hasn't been vaccinated."* Most parents ($n = 9$) who refused vaccinations indicated that

they had a lot of confidence in the health of their child: *"I have a lot of confidence in children's own healing power."*

Childhood diseases

Some of the parents (n = 5) believe that certain diseases, so-called childhood diseases, are essential to the development of a child: *"According to anthroposophy, some childhood diseases contribute to your personal development, diphtheria, tetanus and polio are not part of that development and so we accepted this vaccine."* Another parent said: *"I notice that the children are a bit listless when they have fever. They have fever for a few days, and then they make a sudden leap forward, or they start getting teeth. I've had childhood diseases myself. I had measles quite severely, but once it's over you've become stronger because you've overcome something."* All parents refused the MMR vaccination, because they believe that the illnesses related to these vaccines are childhood diseases. Some of the parents (n = 3) expected their child to get the disease, but said they would reconsider vaccination if their children had not had the disease by a certain age: *"If they [children] have finished elementary school and they still haven't had MMR diseases, then we'll discuss the vaccination again. Because, well, at some point you're no longer a child."*

Risk perception of disease

The decision whether or not to vaccinate is also based on the perceived severity and susceptibility of the vaccine-preventable diseases. One parent said about vaccine-preventable diseases in general: *"If you take a look at the percentages, there's a very small number of children who have severe cases of it [the vaccine-preventable diseases]."* Some parents (n = 8) mentioned that they believe children are highly susceptible to tetanus and therefore vaccinated their child against it: *"Tetanus is the most important for me, because I think you can get that very easily."* However, most parents (n = 13) mentioned that the perceived severity of the disease is important: *"We both had mumps, measles and rubella and we survived, so we don't vaccinate against MMR."* Another parent said: *"I think diphtheria and polio are very severe diseases, even though the chance of getting them is very small, so I can imagine that we'll choose to vaccinate our daughter for that. We also vaccinated our sons against it."*

Vaccine effectiveness

Some of the participants (n = 5) had doubts about the effectiveness of the vaccines: *"The graphs and reports I've read don't prove its [the vaccination's] effectiveness to me."* Another parent said: *"I would like to ask the Public Health Institute (PHI) to show that vaccines are effective, this is never shown to me."* *"I believe that they vaccinate with components that are not effective, that is a shame."*

Vaccine components

Parents also had doubts about the components of the vaccines: *"It [the components] is all poison that you're injecting, so there's no positive component in a vaccination."* Parents (n = 5) were also

negative about combination vaccines, because they felt that their freedom of choice was limited (they could not choose separate vaccines) and because of a perceived overload for their child: *"I'm happy I didn't do it [vaccinate child with combination vaccine]. How can you inject that into such a small child? And combining vaccines, just so you only have to give one injection ... Then I think, do you really have such different views about it, like, well, it cannot hurt, or is it because of efficiency?"* Another parent said: *"I think that lots of parents would stop vaccinating if combination vaccines were the only vaccines offered. [...] But if we're able to choose, I think more people will continue to vaccinate their children because they can select which vaccines they want."*

Trust in institutions

There were different findings about trust in institutions. A few parents (n = 2) mentioned that if their child gets sick (because they refused vaccination) they would trust the health care in the Netherlands: *"I trust the health care in the Netherlands, but first and foremost I trust the health of my child."* Other parents (n = 3) mentioned trust in the processes used to develop the vaccines: *"Well I have a lot of confidence in the technical process. I mean, I trust their account of what's in the cocktail, and that there aren't many other things in it and that it's been made very carefully and with the appropriate level of controls."* However, parents (n = 7) did not always trust the information provided by the PHI: *"I have no confidence in their [the PHI] honesty or in them being open about how it works. I'd say the information is manipulated, not with bad intention, but because of their convictions."*

Responsibility for negative consequences

This qualitative study showed that, whichever choice the parents make, they are willing to take responsibility for negative outcomes: *"You need a strong vision. What if your child gets polio. We thought 'okay, we can deal with that. [...]'. So we took that responsibility."* Another parent said: *"Look, you cannot say as an anthroposophist, 'well, we rely on the fact that polio has almost disappeared because most people are vaccinated'. The only thing you can say as an anthroposophist is: 'if my child gets that disease, then that's his or her path, that's the path of development for that particular child'. So that's the risk you take."*

Social environment

The parents discussed the different experiences they had with their social environment. Sometimes their social environment, such as their family, influenced their thinking about vaccination: *"I once had a conversation with my mother about it and she said that I reacted badly to the vaccines, just like my brother and sister. Then I thought: 'okay, if we reacted badly to the vaccines, maybe I shouldn't vaccinate my child just yet.'" Most parents (n = 9) indicated that they did not tell other people in their social environment about their decision to refuse or postpone vaccination: "My family, well they don't even think about it. They vaccinate their children and follow the general Dutch NIP. I don't talk with them about vaccination. I do my own thing." Sometimes parents chose*

not to discuss vaccination with others in their social environment because they had received negative reactions in the past: *"I got social support from my mother, not from the rest. [They said] I was irresponsible; they didn't want to talk about it."* Another parent said: *"If I did the same as my social contacts, then I'd just do it [vaccinate] and take part in the general Dutch NIP. I always have to defend myself."*

Information need

A topic that was mentioned by all of the parents was their need for information. Different topics of information were mentioned. Almost all participants ($n = 12$) indicated they wanted more information about the risks of vaccinating: *"More information about the risks of vaccinating. Information that explains there are risks involved in getting vaccinated. There's not enough of that kind of information."* The parents also wanted more scientific facts: *"I think that information should be objective and that means being complete, so including background on the disease, percentages of fatal cases, and so forth, so you know what the risks are. So information about the side effects as well, like the percentages of cases with side effects, just objective scientific measurable things."* Other parents ($n = 3$) mentioned that they would like more information to be provided about the vaccine components in, for example, the vaccine leaflet: *"If I buy paracetamol at the drugstore, there's a leaflet included. Why not with vaccines?"*

Parents mentioned that despite the fact that they do not always trust the PHI, the institute should still provide parents with information about the Dutch NIP: *"Anybody can put information on the Internet, so I'd say the PHI is the best source for information about the Dutch NIP."* It was mentioned and acknowledged by other parents in the focus group ($n = 6$) that if the PHI were more transparent regarding the sources they used in their education material, they would be perceived as more reliable: *"It's important that the PHI lists the references for the information given in the education materials. By doing that, they would make the information more reliable."*

Discussion

This study explored factors that were associated with vaccination decision-making among parents with an anthroposophical worldview. Our findings show that parents in this study did not refuse all Dutch NIP vaccinations, but mostly refused the MMR vaccination. The participants made a deliberate decision whether or not to vaccinate. This is not in line with 81% of Dutch parents who are reported to make no comparative assessment of vaccinations (Paulussen et al., 2006). The vaccination decisions of parents in this study are related to their lifestyle, perception of health, beliefs about childhood diseases, risk perception of the diseases, perceptions about vaccine components and vaccine effectiveness, and trust in institutions.

A previous study indicated that there is limited time for consultations at CWCs and therefore limited time to discuss childhood vaccination with parents (Mollema, Staal, et al., 2012). This does not apply to parents who visit an anthroposophical CWC. All parents in this study indicated that they had positive experiences when visiting an anthroposophical CWC and mentioned that the consultations were longer and they were provided with more information. Some parents had had a negative experience at a standard CWC and indicated that standard CWCs are not flexible enough with regard to the Dutch NIP. These negative experiences may have resulted in their reluctance to accept the Dutch NIP and PHI guidance.

Parents in this study are not fully opposed to childhood vaccination. Mostly these parents refuse the MMR vaccination because they perceive measles, mumps, and rubella to be childhood diseases that are essential for the physical and mental development of their child. This is consistent with findings among anthroposophists by Duvell (2001). The rejection of the MMR vaccination is also reflected in lower vaccination coverage for the MMR vaccine (Alm et al., 1999; de Velzen et al., 2008; Duvell, 2001; Kasper et al., 2009; Wadl et al., 2011; Zuzak et al., 2008) and outbreaks of measles among anthroposophists (de Velzen et al., 2008; Duvell, 2001; Kasper et al., 2009; Wadl et al., 2011). Another factor that was associated with parents' choice whether or not to vaccinate is the low perceived risk of the vaccine-preventable diseases, which is also shown in other studies (Bond & Nolan, 2011; Brewer et al., 2007; Brown et al., 2010). In addition, this study shows that the perceived severity of a disease seems to be more important than the perceived susceptibility to that disease. Parents indicated that they were aware of the possible negative outcomes of not vaccinating their child and were willing to take responsibility for those outcomes.

Most Dutch NIP vaccinations are combination vaccines. The parents were quite negative about the combination vaccines because of the perceived overload of the immune system (an anxiety also felt by parents who accepted all childhood vaccination (Hilton, Petticrew, & Hunt, 2006; Tickner, Leman, & Woodcock, 2006)) and because it limits their choices in vaccinating (parents can only vaccinate their children with combination vaccines and cannot choose separate vaccines). This point of view seems in line with wishes of anthroposophical CVPs to offer a flexible schedule and no combination vaccines (Mollema, Staal, et al., 2012), while CVPs at a regular CWC were positive about the combination vaccines because of their efficiency (Mollema, Staal, et al., 2012). Some studies mentioned that another important factor for refusing vaccination is the side effects (Benin et al., 2006; Duvell, 2001). The parents in our study were specifically concerned about the negative effects of the vaccine components. Besides that, some parents in this study had doubts about the efficacy of the vaccines. The findings above suggest that determinants that are associated with vaccination decision making among anthroposophists are comparable to determinants held by parents in general. Only the view about healthy child development and childhood diseases distinguishes the parents in this study from parents in general.

Another topic that is raised by different studies among parents who refuse vaccination is their information need (Gust, Kennedy, et al., 2005; D. A. Gust et al., 2008; Kennedy & Gust, 2005). Parents in this study indicated they need information about the risks of vaccination as well as the components and effectiveness of the vaccines, and that they would like to receive more detailed scientific information. Not only the parents would like more information; anthroposophical CVPs have also indicated that they need more information to better educate parents (Mollema, Staal, et al., 2012). Parents mentioned the CVPs as the most important source of information about childhood vaccination (Heininger, 2006; Manufacturers, 2004). The focus should, therefore, not only be on providing information to parents, but also to CVPs, which would enable them to provide parents with more and better information. In addition, if parents' information needs are not fulfilled, they might start searching for information themselves, with the result that their vaccination decision-making may be influenced by widespread anti-vaccine messages (Betsch, 2011; Davies, Chapman, & Leask, 2002; Kata, 2011). Parents do not always trust the PHI, but the institute is still perceived as the most important, logical and reliable information source about the Dutch NIP. To increase the reliability of the information provided by the PHI, references should be listed about the information sources used in their education material.

It should be mentioned that this study has some limitations. First, it might be that our study did not reach full saturation (Basch, 1987). During the third focus group, no new themes emerged, compared to the former two focus groups, so we assumed that more focus groups were unnecessary but we did not test this by conducting a final focus group. The second limitation of our study is that we have no insight into the parents' demographic variables, like levels of education. A study by Hak, Schönbeck, de Melker, Van Essen, and Sanders (2005) showed that highly educated parents are more critical towards childhood vaccination. Third, there is potential for moderator bias in this study (Stewart, Shamdasani, & Rook, 2006). We tried to avoid this by the use of a standardized topic list, an assistant who was present at the focus groups, digital voice recorder and verbatim transcriptions.

Further quantitative research on perceptions about the (Dutch) NIP is needed to be able to generalize results. The six themes that emerged from these results could be useful for developing quantitative research about parents, and anthroposophical parents in particular, who are critical of childhood vaccination. Quantitative research is also needed to get more insight in which determinants are most important in the decision making of parents with an anthroposophical worldview and whether these determinants are different from determinants influencing vaccine refusal in general.

Conclusion

This study showed that anthroposophical parents in this study are not opposed to vaccination in general. Their decision is not solely based on weighing the risks of vaccination against those of non-vaccination; it also depends on the parents' lifestyle and views about healthy child development. Parents in this study reported a need for information about childhood vaccination. However, not all parents want the same amount of information that these parents require. Layered information might therefore be an appropriate method to fulfill the information need of all parents. Sufficient references to sources containing more information about childhood vaccination should be provided, especially regarding the effectiveness of vaccines and vaccine components and the benefits and risks of vaccination, such as the possible side effects. This may satisfy parents' information needs and enable them to make a sufficiently informed choice whether or not to vaccinate their child. Further research is needed on how this information can best reach the parents who need it and if the information geared towards anthroposophical parents should be different from information geared towards parents that refuse childhood vaccination in general.

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Chapter 3

Vaccination decision-making of immigrant parents in the Netherlands

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Abstract

Although the vaccination coverage in most high income countries is high, variations in coverage rates on the national level between different ethnic backgrounds are identified. In The Netherlands, participation in childhood vaccination among groups of non-Western descent is somewhat lower compared to other groups. A qualitative study was performed to explore factors that influence decision-making among parents with different ethnic backgrounds in The Netherlands. Six focus groups were conducted with 33 mothers of Moroccan, Turkish and other ethnic backgrounds with at least one child aged 0-4 years. Data were analysed using thematic analysis. Parents had a positive attitude towards childhood vaccination and a high confidence in the advices of Child Vaccine Providers (CVPs). Vaccinating their children was perceived as self-evident and important. Parents do perceive a language barrier in understanding the provided NIP-information, and they had a need for more NIP- information, particularly about the targeted diseases. Another barrier parents perceived was the distance to the Child Welfare Center (CWC), especially when the weather was bad and when they had no access to a car. More information about targeted diseases and complete information regarding benefits and drawbacks of the NIP should be provided to the parents. To fulfill parents' information needs, NIP information meetings can be organized at CWCs in different languages. Investigation of the utility of providing NIP information material in Turkish, Arabic and Berber language is also recommended. Providing information tailored to these parents' needs is important to sustain vaccination participation, and to ensure acceptance of future vaccinations.

Introduction

Throughout the world, childhood immunization is a major public health intervention for preventing disease and mortality (Streefland, Chowdhury, & Ramos-Jimenez, 1999). In The Netherlands, the overall vaccination coverage is 95% (except for HPV) (van Lier et al., 2011), and the National Immunization Programme (NIP) is coordinated by the National Institute for Public Health and the Environment (RIVM). The NIP includes 12 target diseases (i.e., polio, diphtheria, tetanus, pertussis, rubella, measles, mumps, disease caused by *Haemophilus influenzae* type b, meningococcal C disease, hepatitis B, pneumococcal disease and cervical cancer caused by human papillomavirus (HPV)), is non-mandatory, and free of charge (van Lier et al., 2011; van Lier, van de Kasstelee, et al., 2013). At Child Welfare Centers (CWCs), children receive NIP vaccinations and also free health check-ups.

Although the vaccination coverage in The Netherlands is high, some parents are critical about childhood vaccination and refuse vaccination for their children. Groups with lower vaccination coverage rates in The Netherlands are people refusing vaccinations based on anthroposophical beliefs (Harmsen, Ruiter, et al., 2012), religion (Ruijs et al., 2012), or other beliefs like the possible side effects of vaccines (Woonink, 2009). Some studies also indicated that the participation in childhood vaccination is somewhat lower for certain ethnicities. Mollema, Wijers, et al. (2012) reported a lower participation in the NIP among groups of non-Western descent. van Lier, van de Kasstelee, et al. (2013) indicated that although combined full uptake of vaccines (uptake of all vaccines together) was slightly lower among children of parents with different ethnic backgrounds (ranging from 1.2% for both parents born in Morocco to 3.4% for both parents born in other non-Western countries) for each of the separate vaccinations, participation was similar to those of Dutch origin.

Other countries, such as the United States (Groom, Washington, Smith, & Bryan, 2008; Luman, McCauley, Shefer, & Chu, 2003; Philip J. Smith & Singleton, 2011), United Kingdom (Baker, Bandaranayake, & Schweiger, 1984), and Australia (Paxton, Rice, Davie, Carapetis, & Skull, 2011) also reported lower vaccination participation rates among children with different ethnic backgrounds, but reasons for these racial differences in immunization coverage at the country level were not well understood. Limited access for minority groups to primary care and misconceptions about risks and benefits of vaccination were suggested to play a role (Chu, Barker, & Smith, 2010; Luman et al., 2003). Studies in The Netherlands suggested several factors that might influence vaccination rates among ethnic groups. One factor could possibly be the language barrier, because the invitation letter and NIP information material parents receive at home are written in Dutch (Mollema, Wijers, et al., 2012; van Lier, van de Kasstelee, et al., 2013). van Lier, van de Kasstelee, et al. (2013) indicated that a more frequent change of residence and therefore not receiving (follow up) invitations for vaccination could be a possible explanation for the slightly lower full coverage rates. In addition, vaccinations given abroad that were not registered in The Netherlands, unfamiliarity with the health care system, and different opinions

regarding specific vaccinations were raised as possible reasons (van Lier, van de Kasstelee, et al., 2013). Different studies (van der Wal, Diepenmaat, Pauw-Plomp, & van Weert-Waltman, 2001; van der Wal, Diepenmaat, Pel, & Hirasig, 2005) suggested that possible contributing factors for lower participation rates among ethnic groups are: not fully completed vaccination program at time of measurement, missing of interference from youth health care and CWC in the first period of life, and under-registration of vaccinations. Giving an opposite viewpoint, Streefland et al. (1999) indicated that parents with different ethnic backgrounds in The Netherlands perceive vaccination as self-evident, and thereby suggests that compliance rates in this group might even be higher than those of Dutch parents, and that non-immunized children were mostly found among illegal immigrants.

Although some studies focused on lower vaccination coverage among children from different ethnic groups, so far no qualitative study explored factors that influence decision-making among parents with different ethnic backgrounds in The Netherlands. Therefore, this qualitative focus group study was conducted, particularly among parents with Moroccan and Turkish nationality, the two largest ethnic groups in the Netherlands ((CBS), 2013). We also wanted to get more insight into CWC-visitation, perception of the current provided NIP-information, information need of the parents, and attitude towards possible future new vaccinations within the NIP. Better understanding of factors influencing vaccination decision-making of these parents is needed to gain more insight into how high vaccine uptake rates in this group can be maintained, and how the education about the NIP can be more responsive to these parents' needs.

Methods

Study participants

Six focus groups were conducted with mothers of different ethnic backgrounds who had at least one child aged 0-4 years old. The total number of participants was 33, and all participants were female. Two groups (N = 7, 7) consisted of mothers of Moroccan nationality, two groups (N = 4, 3) of Turkish mothers and two groups (N = 6, 6) comprised mothers of different nationalities (Netherlands (n = 6), Morocco (n = 2), Afghanistan (n = 1), Somalia (n = 1), Poland (n = 1), Belgium (n = 1)). Moroccan and Turkish mothers participated in separate focus groups to create transparency and avoid obstacles due to cultural differences. The two mixed groups were used to study ethnicity among persons with other ethnic backgrounds than Moroccan and Turkish. At the time of the focus groups, all mothers had lived in the Netherlands for at least one year.

Study setting

All six focus groups were held during regular mother-baby group meetings organized by the welfare organization 'Cumulus Welzijn' in Utrecht, The Netherlands. 'Cumulus Welzijn' provides activities, services, and facilities to local residents including parental support group meetings

where the development of the new-born baby is stimulated. A total of six focus groups were considered to be sufficient because in the final two focus groups no new information was generated and data saturation was reached. The focus groups were conducted in April and May 2012, and each focus group discussion lasted one hour.

Procedure

All focus groups were facilitated by a moderator and an assistant. Besides the moderator, the assistant, and the participants, a female group leader (who normally leads the mother-baby group meetings at 'Cumulus Welzijn') was present. In the Moroccan and Turkish groups, this group leader translated the conversation for mothers who had difficulties with the Dutch language. She had no role in leading the discussion. Focus group participants were offered a gift voucher of €10 as a gratitude for their participation. Anonymity and confidentiality of participants was assured. Only the moderator and assistant had access to the data. Names and private information were not used in the transcripts and final report. The study was approved by Maastricht University's Ethics Research Board of Psychology.

The topic list was constructed based on themes derived from available literature and in consultation with experts. The focus group topic list was pre-tested with colleagues and afterwards revised. All focus groups were semi-structured and the discussion proceeded in three parts: it started with an opening question in which participants introduced themselves and expressed whether or not they visited a CWC. The second part focused on participants' vaccination decision-making process; questions were asked about the influence of social environment, role of culture and religion, role and assessment of received information, knowledge level concerning NIP-vaccinations, and possible practical barriers. In the third part, supplemental information was gathered about the satisfaction of the participants with the NIP, if they would like to see some changes within the NIP, and their opinion about possible future vaccinations within the NIP.

Analysis

The focus groups were audio taped and transcribed verbatim. Qualitative computer software MAXQDA (VERBI Software, Germany) version 10 was used to analyze the content of the focus group transcripts. To identify themes and sub-themes, thematic analysis was performed (Braun, 2006). Separate analyses were performed for the Moroccan, Turkish, and mixed groups, and identified themes were compared between the groups. A coding frame was developed and transcripts were coded and analyzed by the moderator (HB). Initial codes were assigned to text fragments, and then were refined and arranged in themes and sub-themes. To enhance the reliability of data analysis, a sample of the transcripts was coded independently (IH). Afterwards, comparison of the codes took place and differences were discussed until consensus was reached. By using this method together with peer debriefing during the research process, researcher bias was reduced.

Results

Four main themes were extracted from the focus group discussions. Some of the main themes were divided into sub-themes. The themes are summarized below with relevant quotes of participants. Results of Moroccan, Turkish, and other participants were described together, because the findings were mostly similar.

Study participants

All participants were female. Most participants had one child ($n = 13$), eight participants had two children, five participants had three children, four participants had four children, two participants had six children, and for one participant, the family size was unknown.

Participation NIP and child welfare center

All participants confirmed that their children so far had received all NIP-vaccinations, corresponding to the Dutch NIP schedule.

Child welfare center visitation

Participants from all groups were familiar with the CWC for both health check-ups and receiving vaccinations for their child. Nearly all participants visited the same CWC in their neighborhood, and perceived CWC visitation as self-evident and important: *'I visit with my child the CWC. We [the mothers] all have the same opinion, that it is just very important'* (Moroccan participant). Another Moroccan participant said: *'Yes, it is obvious; it is just a normal thing to do [visiting the CWC]'*

Accessibility

For almost all participants, the CWC was well accessible: *'No, I have no problems in accessing the Child Welfare Centre'* (Turkish participant). A few participants mentioned that the CWC is located too far from their homes, and some participants mentioned that the distance negatively influenced the CWC visitation, but not when their children had to receive vaccinations: *'I didn't go the first time, I had an appointment, but I didn't go. It [the CWC] was just too far away. After that I did go, because they [children] needed vaccinations, so I went there because of the vaccinations, otherwise I wouldn't go there'* (Moroccan participant). Another participant said: *'I think the CWC is located too far, especially when the weather is bad and I need to walk because I do not have a car'* (Moroccan participant).

Satisfaction with CWC services

There were mixed findings about the satisfaction of the provision of NIP vaccinations, health check-ups and the approach of childhood vaccine providers (CVPs). Most participants were unsatisfied with the limited consultation time. Moroccan and Turkish participants indicated that they did not receive enough attention, and that there was not enough time to ask

questions during CWC visitations: *'Here [at the CWC] everything goes quick, quick, quick'* (Moroccan participant). Another Turkish participant said: *'They never have a conversation with you; consults always take place automatically and very quick. Many parents regret that because they don't receive enough attention.'* In the mixed groups, participants emphasized that they did not receive enough information, but they perceived the CWC as accessible for asking questions: *'They do not further explain what it means. That's really a shame, I think. They give the injections but they do not explain how and what. However, when I do have questions, I think it is possible to ask them'* (Participant mixed group). Two Turkish participants were not satisfied about the vaccination skills of the CVPs, but they indicated that this did not influence their decision to vaccinate: *'Some CWC nurses, they don't inject well. They are so rough when they give the injection. I did not like that but I did not say anything about it'* (Turkish participant).

Factors influencing parental decision making

Several factors were associated with the decision of participants to vaccinate their child, such as: their attitude towards the NIP, cultural and religious aspects, perceived social norm, negative experiences with vaccination and adverse events, knowledge level and understanding of the NIP, and practical issues.

Attitude towards vaccination

Almost all participants had a positive attitude towards childhood vaccination and mentioned that vaccination of their children is important because it benefits and protects their children's health: *'I did not really thought about whether to vaccinate or not, I thought it is just normal, you should be protected against diseases. I actually thought it was necessary. You hear it for years that children are being vaccinated and we have all been vaccinated ourselves. So it is just logical that they [the children] get vaccinated'* (Turkish participant). Most participants perceived vaccination as self-evident and some participants thought that participating in the NIP is mandatory: *'It is so obvious that you think that it is obligatory'* (Moroccan participant). Turkish participants emphasised that it is important and logical to follow the advice of experts and CVPs: *'So very often you think as a parent; they are the experts, they know better than us'* (Turkish participant). Another Turkish participant said: *'If the CVP says it is good, then I assume that it is good. I have confidence in their advice'*.

Cultural aspects and religion

Most of the (Muslim) participants indicated that according to Islam, vaccination was considered as something beneficial: *'Our faith tells us that we must protect our body well. That is our starting point'* (Turkish participant). Another participant said: *'We also get vaccinated in Morocco, it is just important to protect your children against diseases'* (Moroccan participant).

Perceived social norm

Most participants indicated that they had no conversations with neighbors, friends or family about vaccinations. *'No, nobody talks about it. I think most mothers realize that it is very important and that it is something that has to be done for the health of their child'* (Moroccan participant). Although most participants did not discuss vaccination with their social environment, for some Turkish participants' their feelings of uncertainty about negative CWC experiences were a subject to discuss with friends or neighbors: *'I asked my friend how it went with vaccinating their child. She told me the same, that they gave the injection all of a sudden. So I thought: okay, it is normal'* (Turkish participant).

Negative experiences with vaccination and adverse events

Some participants experienced adverse reactions after vaccinating their child: *'After my daughter was vaccinated she was sick for a week, she had 40 degrees of fever and vomited. I thought for 8 days that my daughter was dying'* (Moroccan participant). Although this parent had a negative experience with vaccination, this did not influence her decision for future vaccinations: *'No, I continued to have my daughter vaccinated'* (Moroccan participant). A participant from the mixed group became more afraid of vaccinations because her baby recently had febrile seizures after vaccination: *'And now I am afraid because every time he gets a shot, he gets high fever. That is why I am afraid of the next shot: will he be okay this time?'* (Participant mixed group).

Some Turkish participants were sometimes worried about the vaccinations: *'The first time, with your first child, you worry more; what is going to happen, how does he or she respond? I was worried'* (Turkish participant). Another Turkish participant said: *'You do not get answers about the cause of the reaction. That fear stays in your mind'*. Nevertheless, most participants continued vaccinating their child: *'Yes, even if there are side effects, I will continue with vaccinating my child. Each drug has side effects, then you also do not quit, you also proceed'* (Turkish participant).

Transition and practical issues

None of the participants had problems with missing vaccinations because of transition to The Netherlands: *'No, it was not a problem. I was instantly referred to the child welfare center when I came from Barcelona to the Netherlands'* (Moroccan participant).

Participants perceived no problems in receiving vaccination invitations or responding to calls. CWC appointments were clear and feasible to them: *'Yes, everything was clear to me, I never had problems with that'* (Moroccan participant). Some participants had questions about how to continue the vaccination schedule when they went on holiday to their home country, but none of them missed vaccinations due to holiday abroad: *'Then I called [the CWC] and they rescheduled my appointment'* (Turkish participant).

Level of knowledge and understanding NIP

The majority of participants perceived their knowledge of vaccinations and the NIP as insufficient. Most participants know in general when the vaccines are given, but do not know against what infectious diseases the vaccines will protect: *'You don't know what these injections are for. You only hear the abbreviation [of the vaccine] when they are given, but not for what kind of diseases the injections are for'* (Moroccan participant). *'You have them [the children] vaccinated but you don't know what kind of vaccinations they get'* (Turkish participant).

Information

Several factors concerning NIP-information were extracted from the focus groups: evaluation of the received NIP information, perception of the language of the received information, information-seeking behavior, and information need of the participants.

Evaluation of received information

Almost all Moroccan participants evaluated the amount and content of information they received from CVPs as insufficient: *'Because they don't give you an explanation during vaccination...you just receive the jabs and you are finished. How many shots you get and for which diseases, that has actually never been told'* (Moroccan participant).

Among Turkish participants, experiences with receiving information varied. Turkish participants were more satisfied with the amount and content of information they received from CVPs and the Public Health Institute (PHI): *'Yes, it was sufficient'* (Turkish participant). Some participants received information about vaccination when they visited the CWC: *'Yes, when I went to the CWC they explained what can happen, or told me that I need to keep an eye on something. They told me that every time I visited the CWC'* (Turkish participant). Others said they did not receive information: *'No, I did not get information. Normally in Turkey, they give some explanation before injecting, but in the Netherlands I did not get that'* (Turkish participant). In the mixed groups, most participants indicated that they received information by mail but they received little or no information from CVPs: *'You do not really receive information about it. You only receive the information leaflet'* (Participant mixed group).

The information leaflet from the PHI with information about the NIP was received and read by most Turkish participants: *'Yes, I received it [the leaflet] together with the invitation letter'* (Turkish participant). Among Moroccan participants, the leaflet was less well known: *'I never received it. I never received information about vaccinations'* (Moroccan participant). The leaflet was poorly read by Moroccan and Turkish participants: *'No I never read it'* (Moroccan participant mixed group). Only some participants from the mixed group read it: *'Yes I have read the brochure'* (Participant mixed group).

Perception of language received information

In both Moroccan and Turkish groups, the language of the education material was considered an obstacle for reading and understanding the content. Moroccan participants emphasized that there is a substantial group of Moroccans who do not understand the Dutch language, and therefore are not able to read the information leaflet in Dutch: *'There are many people here in the district who can't speak the Dutch language and are not able to read it. So, I think when you give a leaflet, it is important to give it in their own language too'* (Moroccan participant). Also in the Turkish group, a few participants could not read the information material due to language barrier: *'It is difficult for me; I do not understand the Dutch language'* (Turkish participant). This was the same for the non-Dutch participants in the mixed group: *'I have problems with the Dutch language. I cannot read Dutch, I do not understand all the words'* (Non- Dutch participant mixed group). Some participants asked their husband or a friend to translate the information: *'My husband reads it for me, explains to me what it means'* (Moroccan participant mixed group).

Most Turkish and Moroccan participants would like to receive information in respectively Turkish, Arabic and Berber language: *'Yes I want it in Turkish... because in that case, I know at least why my child receives that vaccination, otherwise I don't know'* (Turkish participant). Participants indicated that provision of information in their own language would not influence their vaccination decision: *'I don't think so. I will get the vaccines, no matter what'* (Turkish participant).

Information seeking behavior

Most of the time, the participants used the CVPs and the Internet as a source to get information about vaccination. Some Turkish participants searched for additional information in their own language on the Internet, or asked questions at CVPs: *'In advance I thought about what questions I would like to ask, what I wanted to know and then she [the CVP] explained it...because of her explanation I knew what to expect'* (Turkish participant).

Some Moroccan participants and participants from the mixed groups mentioned that they sometimes asked for more information about vaccination at CVPs: *'Yes, I ask questions before my child gets the injection. I ask first, and then my child gets the vaccination'* (Participant mixed group). Sometimes (when possible) they talked with a doctor in their own language. Other Moroccan participants did not realize that they could ask for more information, or time constraints kept them from asking for information: *'No, at that time, you don't think about it'* (Moroccan participant).

Some participants searched for online information when there was a possible side effect: *'I will search for information on the Internet, if I know my child gets ill from the injections. When everything goes well, I will not search for information'* (Moroccan participant). In the mixed groups, the use of the Internet varied. Some participants indicated that they regularly used the Internet to find more information about vaccinations: *'I read a lot in my own language. I search for information on the Internet'* (Participant mixed group). Most of them used the search engine Google. Other participants did not search online for vaccination information: *'I never*

searched for information myself. I don't know why...I just not really thought about it' (Participant mixed group).

Information need

Most participants preferred more oral information from CVPs during CWC consultations: *'That they explain where the vaccinations are for, that they give more face-to-face information during the consult, not that you just have to get your information from the leaflet. I prefer spoken information, because I will remember it better'* (Participant mixed group).

Participants would like to be more informed about the targeted infectious diseases and the prevalence of the diseases: *'More information about the vaccinations themselves [...] more information about where the vaccinations are good for, and what they protect for'* (Moroccan participant).

Moroccan participants also desired more information about drawbacks of vaccination from the RIVM, because it would enable them to make a well-informed decision: *'You hear things in the media but you don't know whether that information is right. I would like to receive complete information from the RIVM with advantages and disadvantages. When we hear the pro's and con's from the RIVM about vaccination, we can make a better choice'* (Moroccan participant).

Attitude towards future vaccinations

Participants had different opinions about possible future NIP vaccinations. Some participants were suspicious towards new vaccinations: *'Vaccination against diphtheria or tetanus, that kind of diseases, is required for all your children, you simply choose for that. But for new vaccines, which are new to the market and are not thoroughly investigated, I have doubts about that'* (Turkish participant). In case of new vaccines, parents would like to receive information about reasons for introduction of the new vaccine, severity of the disease and the risk for their children to get the disease: *'I would think about it and would like to know what kind of vaccine it is, against what kind of disease it will protect, and why the vaccine is introduced. In case of a new vaccine, I would not just vaccinate my child.'* (Turkish participant). Other participants were less critical towards possible new future NIP- vaccinations: *'It does not matter to me, if it is necessary, then it is necessary. I assume that every vaccination, when added, is needed'* (Participant mixed group).

Discussion

This study explored factors that were associated with the decision to vaccinate their child among parents with different ethnic backgrounds. Results show that the majority of parents made the decision to vaccinate their child(ren) based on: a positive general attitude towards childhood vaccination, a high confidence in the advice of CVPs, and a positive influence of religious beliefs to get their child vaccinated. For some parents, there was a language barrier

in understanding the provided NIP-information, the distance to the CWC was too far, and they indicated to have a need for more NIP- information.

Most parents had a positive attitude towards childhood vaccination, and perceived vaccination as self-evident, which is also shown in a study of Streefland et al. (1999). Paulussen et al. (2006) showed that most indigenous Dutch parents had a positive attitude towards childhood vaccination, and the decision for vaccination is also not preceded by extended reflection.

Cultural aspects and religion (e.g. Islam) had a positive association with the decision of Turkish and Moroccan parents to vaccinate their child. According to the parents, Islam indicates that protecting the child's health by means of vaccination is something beneficial. This is not in line with orthodox protestant religion in The Netherlands, which is shown to be highly related to vaccination refusal (Ruijs et al., 2012).

Some parents had a negative experience with vaccinating their children (adverse events), but this experience did not influence their decision to vaccinate. This is not in line with other research that showed that parents who had a negative experience with childhood vaccination were less likely to accept future vaccines (Blume, 2006; Sporton & Francis, 2001; Woonink, 2009).

CWC-visitation for vaccination is common among Moroccan and Turkish parents. It is shown that in the Netherlands 89% of parents with different ethnic backgrounds and 91% of indigenous Dutch parents visit the CWC ((CBS), 2008). Although most parents visit the CWC, some parents indicated that they did not visit CWCs because the distance from their home was too far, which is in line with earlier research (Verheij, van Boven, & Kosterman, 2001). Especially when they had no access to a car and the weather was bad, they did not visit the CWC. Most parents indicated that they always visited the CWC when the child needed a vaccine, which was not the case for health check-ups. Although CWCs are well accessible in The Netherlands, (the average distance to a Dutch CWC is 2.5 km (Deuning, 2006), and in cities, distances are even shorter), the access to the CWC seems to be a barrier for parents. More (quantitative) research is needed to get insight into how often parents do not visit the CWC because the CWC is located too far, and whether this influenced attending health check-ups and/or vaccination appointments.

Other practical barriers, like often changing their residence, children born abroad, and unfamiliarity with the health system (van Lier, van de Kastele, et al., 2013), did not seem to play a role in the vaccination decision of the parents. van der Wal et al. (2005) indicated that vaccination coverage of children who were born abroad was not well registered and therefore vaccination coverage seemed lower. This barrier is not shown because this study focused at parents' beliefs and personal barriers, therefore more research is needed to explore whether under-registration is an issue in the lower reported vaccination coverage.

This study showed that the language of the information material was considered an obstacle in understanding the provided information, and parents would like to receive the education material in their native language (i.e., Turkish, Arabic or Berber). Language barrier was suggested in other studies to play a possible role in the vaccination decision-making process of parents

with different ethnic backgrounds (Mollema, Wijers, et al., 2012; van Lier, van de Kassteele, et al., 2013). In The Netherlands, there is a policy that the information from the government and public health institutes should be in Dutch, to stimulate citizens to learn the Dutch language ((Rijksvoorlichtingdienst), 2006). However, we suggest providing NIP-information material in parents' native language for parents who cannot read and understand the Dutch language. This might enable the parents to make better-informed decisions.

Moroccan and Turkish parents perceived their knowledge about vaccination as insufficient, and they have a need for more information about the NIP, which is in line with other research (Austvoll-Dahlgren & Helseth, 2010; Evans et al., 2001). Parents would specifically like to get more information about the diseases that the vaccinations protect for, and not only information about the advantages but also the possible disadvantages of vaccinating their children. They prefer to receive the information orally, which is in line with a study of Hak, Schönbeck, Melker, Essen, and Sanders (2005) among Dutch parents. The preference of oral information is also reflected in the fact that the provided information leaflets were poorly read, also by parents who understand the Dutch language, a finding that is supported by (Timmermans, Henneman, Hirasing, & van Der Wal, 2005).

Overall, parents had a lot of confidence in the advice of CVPs to vaccinate their children, which is also shown in other studies (Sporton & Francis, 2001; Streefland et al., 1999). Despite this, most parents were unsatisfied about the limited consultation time during CWC-visits. They did not receive enough attention from CVPs, and there was limited time to ask questions. Earlier research showed that CVPs indicated that there is limited time to discuss vaccination with parents (Mollema, Staal, et al., 2012). CVPs should be aware of the oral information need of parents with different ethnic backgrounds and their role in parents' decision-making process, and should therefore actively provide information towards parents about the NIP. Due to the limited time for CVPs to provide information that the parents need for more NIP information, it might be useful if CWCs organize meetings to provide (oral) information about the NIP in different languages.

Some limitations of this study need to be considered. By including Moroccan and Turkish parents, an important insight in influencing factors among the two biggest ethnic groups in The Netherlands is reached. Nevertheless, including parents of different ethnic backgrounds like Antillean or Surinamese participants, the third biggest group in the Netherlands, might also have been useful. Another limitation of this study might be selection bias, because all participants of the focus groups completely vaccinated their children according with the NIP. Therefore, future research should be conducted to get insight in the factors that influenced parents whose children are not (completely) vaccinated. While this qualitative study provides useful insight in acceptance of childhood vaccination and factors that influence decision-making about vaccination of parents with different ethnic backgrounds, quantitative confirmation of the findings is recommended among a large population of parents with different ethnic backgrounds.

Conclusion

This study showed that parents with different ethnic backgrounds had a positive attitude to vaccinate their child within the NIP, and perceived vaccinating their child(ren) as self-evident. Parents perceive practical barriers like the distance to the CWC and not understanding the Dutch language. Furthermore, parents had a need for more NIP information. These findings suggest that information provision about the NIP towards parents with different ethnic backgrounds deserves extra attention. To fulfill the information need of the parents, more information about targeted diseases and complete information regarding benefits and drawbacks of the NIP should be provided. This should be provided not only by the PHIs, but also by CVPs, because parents with different ethnic backgrounds have a lot of confidence in CVPs, and have the preference to receive oral information. To fulfill parents' information need, NIP information meetings can be organized at CWCs in different languages. Investigation of the utility of providing NIP information material in Turkish, Arabic and Berber language is also recommended. Providing information tailored to these parents' needs is important to sustain vaccination participation, and can be an influence in acceptance of future vaccinations.

Chapter 4

Why parents refuse childhood vaccination: a qualitative study using online focus groups

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Abstract

In high income countries, vaccine-preventable diseases have been greatly reduced through routine vaccination programs. Despite this success, many parents question, and a small proportion even refuse vaccination for their children. As no qualitative studies have explored the factors behind these decisions among Dutch parents, we performed a study using online focus groups. In total, eight online focus groups ($n = 60$) which included Dutch parents with at least one child, aged 0-4 years, for whom they refused all or part of the vaccinations within the National Immunization Program (NIP). A thematic analysis was performed to explore factors that influenced the parents' decisions to refuse vaccination. Refusal of vaccination was found to reflect multiple factors including family lifestyle; perceptions about the child's body and immune system; perceived risks of disease, vaccine efficacy, and side effects; perceived advantages of experiencing the disease; prior negative experience with vaccination; and social environment. The use of online focus groups proved to be an effective qualitative research method providing meaningful data. Information provided by the NIP turned out to be insufficient for this group of parents. More trust in the NIP and deliberate decisions might result from increased parental understanding of lifestyle and disease susceptibility, the impact of vaccinations on the immune system, and the relative risks of diseases and their vaccines. The public health institute should also inform parents that the NIP is recommended but non-mandatory.

Introduction

In recent decades, vaccine-preventable diseases have been greatly reduced through routine vaccination programs in high income countries (WHO, 2012). In The Netherlands, the National Immunization Program (NIP) is a voluntary program that offers childhood vaccinations free of charge and includes vaccines against twelve infectious diseases (i.e., polio, diphtheria, tetanus, pertussis, rubella, measles, mumps, disease caused by *Haemophilus influenzae* type b, meningococcal C disease, hepatitis B, pneumococcal disease and cervical cancer caused by human papillomavirus (HPV)). Children aged 0-4 years receive the vaccines at child welfare centres (CWC), where they also get free-of-charge health check-ups during consults attended alternately by physicians and nurses on a scheduled basis. Parents can choose between a regular CWC or a CWC based on anthroposophy, a spiritual philosophy founded by Rudolf Steiner (Woonink, 2009). The Dutch Health Council recommends the vaccines included in the NIP, and the National Institute of Public Health and the Environment (RIVM) manages the program implementations of the NIP and provides parents and health care workers with information about vaccinations. Parents of infants receive some oral information about the NIP when a nurse of the CWC visits the parents at their home in the first week after birth of their infant. After that (when the child is 4-6 weeks old), parents receive a brochure with information about vaccines, (vaccine-preventable) diseases, vaccination schedules, and side effects.

Overall, vaccination coverage in The Netherlands is 95% (except for HPV) (van Lier et al., 2011). Despite the success of the NIP, many parents appeared to become more critical about childhood vaccination in the last few years, at least as far as HPV-vaccination is concerned. In The Netherlands, there was a wide debate in the national press about the 2009 introduction of vaccination for HPV for 12 year old girls, resulting in mixed messages and confused feelings in the population (Rondy et al., 2010). The expected HPV vaccination coverage of 70% turned out to be about 50% (Kemmeren & de Melker, 2010). Also, at the end of 2009, during the H1N1 influenza pandemic, Dutch parents criticized the quality of information about the risks and benefits of the influenza vaccination, which was provided by the national health authorities (Bults, Beaujean, Richardus, van Steenbergen, & Voeten, 2011). A well-known group who refuse vaccination are conservative Protestants living in what is called the Bible Belt region, which stretches from the southwest to the northeast of the country. Such refusals have been influenced by tradition or predominantly religious arguments (Ruijs et al., 2012). Parents who refuse vaccinations might also be influenced by other factors.

Refusal of childhood vaccination may be influenced by concerns about vaccine components, low perceived likelihood and severity of the infectious diseases, and a trusting relationship with a natural healer or another respected person who doubts vaccination safety and effectiveness (Benin et al., 2006; Gust, Brown, et al., 2005). Hilton et al. (2006) showed that some parents fear an overload of the immune system caused by combination vaccines. Additionally, the perception that vaccination is more risky than non-immunization (Smailbegovic, Laing, &

Bedford, 2003) and issues of harm, distrust and access might play a role in refusing childhood vaccination (Mills, Jadad, Ross, & Wilson, 2005). According to Sporton and Francis (2001), parents who refused vaccination made a well-considered decision based on an assessment of the benefits and the risks of vaccination, the child's susceptibility to the potential disease, and the acceptance of responsibility for that decision.

The aim of this study is to attain more insight into these factors in order to design public information and interventions that will help parents make decisions that best serve their children and the wider community. We performed internet-based focus groups with parents who had refused all or part of the NIP recommendations for children 0-4 years old.

Methods

The focus group discussions were conducted online because the diverse population was difficult to reach and lived throughout The Netherlands, making face-to-face focus groups infeasible. Online focus groups are used more and more (Zwaanswijk et al., 2007), in part because participants can choose their own time to answer questions. Moreover, costs and time can be saved through the automatic and accurate storing of discussion data (Tates et al., 2009). The focus group method in general is effective for exploring people's opinions and experiences (Tates et al., 2009). The group process can help individuals to clarify their views that might not emerge from a one-on-one interview.

Study participants

Study participants were randomly selected from Praeventis, the vaccination database in The Netherlands. Participants were selected based on the vaccination status of their children (0-4 years old). Postal codes were used to exclude residents of the Bible Belt, whose reasons for refusing vaccinations have been explored by others (Ruijs et al., 2012). We invited 250 parents with partially vaccinated children (PV parents) and 250 parents with children not vaccinated at all (NV parents). We defined children (aged 0-4 years) as partially vaccinated when they missed one or more NIP vaccinations, and as not vaccinated when they missed all vaccinations in the program.

Procedure

Parents received a letter containing information about the study and a reply form to complete and return if they wanted to participate. Those opting to participate received an e-mail with information about the use of the online focus groups and a personal log-in name and password, by which they could anonymously access the online forum. When participants responded to each topic discussed by the online group they received a gift voucher of €30 as an incentive. Of the researchers, only the moderator and assistant had access to the forum, for collecting the

data. Anonymity of statements in the transcripts and in the final report was ensured, as was confidentiality of the data. Because data collection was through the Internet, participants gave informed consent by clicking a button after having read all relevant information. The study was approved by Maastricht University's Ethics Committee of Psychology.

Study setting

The focus groups were based on a semi-structured protocol with open-ended questions and minimal control, allowing participants to discuss all aspects of each posting. The list of topics was developed beforehand, in consultation with all the authors, and subsequently tested with other colleagues who had young children. Each of the online focus groups was conducted over 5 days during one week. The focus groups ran during November and December 2011. The forum was accessible only to parents who had responded to the invitation letter and received a log-in name and password. Each week, Monday through Friday, the moderator posted a new topic at the forum daily, and the group participants were alerted by e-mail. All postings remained open for response throughout the week. The focus groups were a-synchronic, which means that participants were free to log into the forum discussions at any time to read all postings and respond within one week. The moderator regularly checked the forum and, when necessary, asked additional questions to clarify comments of participants. The content and format of postings were identical for all focus groups.

The forum for each group started with an introduction and with questions for participants about their family composition, the CWC that they visited, and perceived positive and negative aspects of the NIP. On the second day, parents were asked which factors influenced their decision to refuse any or all vaccinations. On the third day, they were asked about their need for NIP information. The fourth day focused on their perceptions about new vaccines within the NIP. The fifth day was used to end the discussion, with an evaluation of the focus group by the participants. After conducting 8 sets of focus groups, analysis indicated that data saturation had been reached, making the inclusion of more respondents unnecessary.

Analysis

The data was analyzed based on a thematic analysis (Braun, 2006) performed to explore factors that influenced parents' decision to refuse vaccination. The main themes of the data were based on the topics and questions posted at the online forum. An inductive process was used to code and analyze the data for the sub-themes from these main themes. The data was analyzed and coded by the moderator. An independent researcher analyzed a sample of the data; afterwards the initial coding was compared, reviewed, discussed, and refined until consensus could be achieved, which led to a more representative coding scheme and criteria. Using software program NVivo 9 (QSR International), separate analyses were conducted for PV parents and NV parents.

Results

Participants

In total, we held 8 one-week online focus groups with all the parents who responded to the invitation ($n = 60$) and who had refused all or part of NIP vaccinations on non-religious grounds. Of the 8 groups, 5 included parents who completely refused vaccinations ($n = 39$, 7-9 parents each), and 3 included parents who partially refused vaccinations ($n = 21$, 7 parents each).

Five parents had one child; most parents had two ($n = 34$) or three children ($n = 14$); 6 parents had four children, and one parent had five children. Most parents visited a regular CWC (NV = 25, PV = 19), some parents visited an anthroposophical CWC (NV = 10, PV = 1), and some parents used no CWC at all (NV = 4, PV = 1). Because of the anonymity of the participants, no other demographic variables (like gender) were available.

The four main themes (i.e., topics at the online forum) were divided into sub-themes and are summarized below with relevant quotes of the participants. Despite separate analyses, the findings on parents who partially and completely refused vaccination are described together, because they were very similar. The few differences between these two sub-groups are described at the end of the results section.

Positive and negative aspects of the NIP

Regarding theme one, PV and NV participants were asked to mention some positive and negative aspects of the NIP in general. Participants agreed that a positive aspect of the NIP is that it is well organized: *"It is a well-organised 'machine'"* (NV). Another positive is that vaccines are freely available. Participants who realized that the NIP is non-mandatory felt positive about this, too: *"A positive aspect is that you have access to vaccines in The Netherlands and, as a parent, you have a free choice"* (PV).

Some participants mentioned that there were too many vaccines and that vaccination in the NIP started too early: *"A negative is that more and more vaccines are added"* (PV.) Another participant said: *"I find it unfortunate that the RIVM vaccinates at a very young age when the immune system is hardly built"* (NV). Another negative aspect that participants agreed upon was that they felt vaccination was mandatory, although it is not: *"You get the feeling that you MUST do it. When you do not vaccinate you receive a reminder to vaccinate by post. You feel almost guilty if you do not participate"* (PV).

Determinants of vaccine refusal

Theme two focused on parental decision-making. Various factors were associated with the choice of parents to refuse vaccination partially or completely. These were related to lifestyle and parental perceptions about the body and the immune system of the child, risk perception of diseases and vaccination side effects, perceived vaccine effectiveness, the potential advantages of experiencing the disease, negative experiences with vaccination, and social environment.

Lifestyle

Lifestyle of the participants appeared an important correlate for refusing vaccination. Participants mentioned that their healthy lifestyle promotes their children's health, and therefore the risk of getting an infectious disease is reduced. Some participants focused only on nutrition: *"We rely on our 'preventive' eating habits and lifestyle. Especially good nutrition ensures that you do not get ill"* (NV). Other participants focused on other aspects of a healthy lifestyle, such as giving children a peaceful basis for life: *"All my choices are currently aimed to give my children a peaceful basis for life: choose to breastfeed (about 1.5-2 years), raise children in a small-scale home, part-time work, first half-year no childcare, minimize shopping/travelling with young children. All kinds of things that do not overcharge the immune system"* (NV).

Immune system

Most participants also mentioned that they believed that the immune system of the child was not yet adequately developed to receive vaccinations: *"Administering many different viruses/ bacteria at the same time seems to me a huge attack on the immune system of someone"* (NV). Another participant said: *"A baby's immune system has built up thanks to the mother, and it is not desirable in my eyes to give the child all kinds of substances that can disrupt the whole immune system"* (PV).

Risk perception disease

The risk perception of the disease is low, because some participants seemed to think that their children were not likely to contract infectious diseases and that infections were not likely to be transmitted to their child: *"I also assumed, based on the fact that both children did not come that much in contact with other children at a very young age, that the risks [of getting the disease] were less"* (PV). Furthermore, some participants mentioned that vaccine-preventable diseases are not that severe and can be easily treated: *"Most of them [the diseases] are not life threatening and, with support of the family paediatrician or homeopathic doctor, they are easy to treat"* (NV).

Risk perception of vaccine side effects

Participants who perceived little risk of the disease accordingly believed that the likelihood of negative consequences of vaccination is higher and that these consequences are more severe than getting the disease: *"There are many unpleasant side effects and diseases that are due to the vaccinations, and this is always dismissed as untrue"* (PV). One participant said: *"We also have serious doubts about the consequences of vaccinations. [...] We also see a link between vaccinations and some behavioural problems"* (NV). Other participants doubted certain components of the vaccines: *"They also get many germs at once, I consider this mechanism unproven"* (PV). Another participant doubted about the negative consequences of the adjuvants in vaccines: *"There are adjuvants in vaccines that are poisonous, such as mercury and aluminium, and you really do not want that in your body, even in small quantities"* (NV).

Perceived efficacy vaccine

Participants were also worried whether or not vaccine efficacy is adequate and if vaccines would lead to protection: *"Some diseases are obsolete and disease agents mutate, so the protection is not always 100%. Some vaccines work only temporarily, while the side effects may be permanent (i.e., allergies, chronic colds, autism etc.). Even though children were vaccinated, there are still epidemics (such as mumps, whooping cough)"* (PV). Another participant said: *"I refused vaccination against pertussis, because the effect of pertussis vaccination does not seem to be large. More and more people get pertussis, despite new vaccines and the fact that children get vaccinated at a younger age"* (NV).

Perceived advantages of having a disease

Some participants believed that attracting a vaccine-preventable disease was something positive for their child(ren). These participants cited the advantage of life-long immunity: *"Let the body itself go through the disease. This is good for building up the resistance by the body itself. Diseases often give life-long immunity, while vaccines often protect for only 15 years"* (PV). Some participants believed a child would develop physically and/or mentally after getting a disease: *"You could say that the experience of a disease has a particular function; it makes a certain physical and/or mental development possible"* (NV).

Negative experience with vaccination

A negative experience with childhood vaccination influenced the decision making of participants. Some participants were influenced by a negative story in the media: *"Two years ago there was the case in which something went wrong with vaccinations for young children. Shortly after that, we refused a vaccination"* (PV). Some have had a negative experience in their own environment: *"Death in the family within 24 hours after vaccination...made me gain more in-depth knowledge. Together we made the choice not to vaccinate"* (NV). Others cited a very personal negative experience: *"Our oldest daughter (10 years) got epilepsy after vaccination. She got attacks for forty-five minutes. It was not clear to us that it was because of the vaccinations until she got such a heavy attack after the MMR vaccination that she ended up in intensive care. It's unbelievable, but doctors deny any form of adverse reactions following vaccination"* (NV).

Social environment

There were mixed findings as to whether people in the social environment were related with parental choice to refuse vaccination. Some participants said their environment had not influenced their choice at all, whereas others said they were influenced by their friends or family members: *"In my environment I had one friend who also looked critically at vaccinations. Partly because of that, I gained more in-depth knowledge"* (PV). Another participant said: *"I had a conversation with my mother and sister about whether to vaccinate or not. My sister did not adhere to the vaccination schedule; she vaccinated her children later than recommended"* (NV). Other

participants indicated that no one in their environment influenced them: *"No people in our environment influenced our decision. We didn't know people who were critical towards vaccination"* (NV).

Interestingly, some participants said that they did not talk about their choice to refuse vaccination with others in their environment, because they expected negative reactions: *"In my environment, I sometimes have to defend why we do not follow 'the norm' [to vaccinate]"* (PV). Another participant said: *"We are the only ones who did not vaccinate! Our choice has often led to discussions, and more than once people showed that they thought we were crazy"* (NV).

Need for Information

Theme three focused on the informational needs of participants. Many mentioned that they did not receive enough information from the RIVM about childhood vaccination: *"Negative to the NIP, I think, is that parents get absolutely no information about the vaccines. A box of paracetamol has a leaflet with a big piece of text, but about vaccinations we are only told that the puncture site may be painful, or that the child can get some fever"* (PV). Participants indicated they would like to get more information about their freedom of choice: *"I miss strong objective information about the background and choice options that you have as a parent, like vaccinating later...or choosing some vaccinations but not others"* (PV). Specific information about the possible negative consequences of vaccines, like side effects, is also needed: *"I also think that parents are not fully informed about the side effects and ingredients of vaccines by the RIVM."* (PV) Another participant stated: *"I would like to have open and honest information, whereby the disadvantages and risks of vaccination are discussed so parents could make a well-considered decision"* (NV).

Because participants' information need was not fulfilled, they started to seek information by themselves. Some said that it was hard for them to find the right information and to make a choice to vaccinate or not, based on all the positive and negative information they found. One said: *"Although I am trained to read and evaluate research, I had great difficulty to find my way in all the information"* (NV). Another said: *"We searched for all kinds of information, and the problem is: there is too much and you do not know how to filter. What is an opinion, what is a fact? Who is trustworthy, who is not?"* (NV).

New vaccines in the NIP

Theme four focused on possible new vaccines being added to the NIP in the future. Participants had mixed feelings whether they would accept new vaccines or not. Some said that they would refuse all new vaccines in advance, because there are already enough vaccines in the NIP: *"Even more vaccinations? My goodness, I think it is already too much! Let nature take its own course, please"* (PV). Other participants said they would weigh the pros and cons of each new vaccine and make a deliberate choice: *"Facing new vaccines, we think the same as compared with existing*

vaccines: how is the vaccine tested? What is exactly in it? What would be the side effects, etcetera. We are not fundamentally against it" (PV).

Differences between NV and PV parents

Participants who partially or completely refused vaccination reported many similarities in the way they think and make decisions about vaccination. However, there were still some differences between the two groups. For example, participants who completely refused vaccination reported having positive experiences with not vaccinating their child(ren). They mentioned that compared to children who were vaccinated, their unvaccinated children were less often sick: *"It is our experience that our child, compared with vaccinated children at his age within our environment, is less sick, and when he is sick he recovers more quickly" (NV).* The participants who completely refused vaccination also discussed herd immunity, saying it was not a reason they refused vaccination. They did not depend on it to protect their unvaccinated child. Indeed, some regretted the presence of herd immunity because it reduces the chance that their child will get the disease and thereby develop natural immunity against the disease: *"It is absolutely not true that our children have not been vaccinated because others do. I rather hope that my children get certain childhood illnesses at a young age than (because of the high vaccination coverage) getting the disease when they are older" (NV).* These participants also mentioned that they trusted the health care in The Netherlands and believed that when their child gets sick, the quality of health care is good enough to take care of their child: *"We rely on the various methods of treatment, both conventional and alternative, when we face serious diseases" (NV).*

Among PV participants, we found that some had not thought beforehand about refusing a certain vaccination. Some refused or postponed vaccination simply because their child was sick at the time, and therefore was not able to receive the vaccine: *"I followed my feelings and did not vaccinate my child especially when I suspected that something was troubling, like a cold or some other inconvenience" (PV).* Another participant said: *"The main reason [to not vaccinate] was that my daughter struggled with her health, and that I first wanted that she would be healthy before she got vaccinated" (PV).*

Discussion

This study explored what factors are important in refusal of childhood vaccination by parents. Like Sporton and Francis (2001), we found that most refusal of vaccination is based on deliberate decision-making of parents. Our results show that this decision is based on multiple factors, such as the lifestyle of parents, perceptions about the body and the immune system of the child, risk perception of diseases and vaccination side effects, perceived vaccine effectiveness, perceived advantages of experiencing the disease, negative experience with vaccination, and

parents' social environment. In addition, this study shows that the use of online focus groups is an effective qualitative research method resulting in meaningful data.

An important determinant of refusing vaccination is the lifestyle of parents. Some of our participants stated that living a healthy life decreases the risk of getting an infectious disease. This determinant was also mentioned by Meszaros et al. (1996). This indicates that not only perceptions and beliefs about childhood vaccination are an important factor in parents' decision to refuse vaccination, but also that the general lifestyle of the parents might play a role.

Another determinant, which has also been reported by other studies (Bond & Nolan, 2011; Brown et al., 2010; Whyte, Whyte, Cormier, & Eccles, 2011) is risk perception. A 2007 meta-analysis of studies linking risk perception and vaccination by Brewer et al. (2007) points to risk perception as an important factor in health behaviour. Our study shows that parents who refuse vaccination believe that the side effects of vaccines could be severe, that vaccine-preventable diseases are not that severe, and that their child is not very susceptible. These beliefs might reflect the fact that vaccine-preventable diseases have been reduced to the point that their risks seem less important than vaccination risks (Gust, Woodruff, Kennedy, & Brown, 2003). It therefore seems important that public health institutes keep communicating about the severity and susceptibility of vaccine-preventable diseases.

Besides the perceived risk of disease versus vaccination, our findings as well as those of Hilton et al. (2006) suggest that parents fear the immune system in infancy is not adequately developed for a good response to vaccination. They apparently have not received enough information about the influence of vaccines on the immune system of their child, and their resulting doubts cause them to refuse vaccination.

Benin et al. (2006) showed that parents who refused vaccination reported a trusting relationship with a natural healer or some other respected person having doubts about vaccination. Our study shows similar results, in that a proportion of the parents visited an anthroposophical CWC. Besides this, some parents mentioned that experiencing a disease is positive, leading to certain physical and/or mental development. This perception seems consistent with the anthroposophical lifestyle and view about vaccination (Woonink, 2009). The vaccination coverage among anthroposophists in The Netherlands is somewhat lower compared to the rest of the population (van Velzen et al., 2008), and a study of Harmsen, Ruiter, et al. (2012) showed that parents who visited an anthroposophical CWC mostly refused the Mumps, Measles, and Rubella (MMR) vaccination because they perceive these diseases as essential for the physical and mental development of their child. These findings might indicate that parents with an anthroposophical lifestyle and/or parents who visit an anthroposophical CWC might be more critical towards childhood vaccination. However, the influence of anthroposophical CWCs on parents' decision making is so far not clear and therefore more research is needed.

Interestingly, this study showed mixed results about the influence of the social environment. As found previously (Tickner et al., 2007), sometimes parents feel supported in vaccination refusal by their family and friends, with whom they discuss the issue. Others discuss it with

no one, in part due to fear of negative responses from their community. Brown et al. (2010) mentioned that parents felt that their decision to vaccinate or not would be judged by people around them.

Mills et al. (2005) and Brown et al. (2010) showed in their studies that forgetting to make an appointment or to schedule an appointment were also factors that influenced a lower vaccination coverage. This factor was not found in this focus group study, future quantitative research is needed to explore this further.

Other studies have shown that parents need more information about childhood vaccination (Gust, Kennedy, et al., 2005; Kennedy & Gust, 2005; May, 2005). Our study results showed that this is true also for Dutch parents. They would particularly like more information about the side effects of the vaccines, the components of the vaccines and more assurance that the NIP is non-mandatory.

Parents in this study indicated that when they start searching for information, it is hard to find reliable information and to make a choice from all the information they find. RIVM should therefore supply more information about childhood vaccination and also list reliable sources of additional information. In addition to official websites, social media should also be listed because of the growing proportion of online communicators, including vocal and active anti-vaccination groups (Betsch et al., 2012). Along with the risks of non-vaccination, the official information should address the risks of vaccination. Official language should be moderate, avoiding extreme formulations, because a strong assertion that there is no risk in vaccination can paradoxically lead some people to suspect or perceive a higher risk (Betsch & Sachse, 2012) [31].

Our study has both strengths and limitations. The primary strength is its use of online focus group discussions. At our online forum, parents were anonymous and therefore free to say whatever they wanted. In addition, parents could log in and respond whenever they had time, which might have resulted in a high response to every posting. Besides these strengths of the online focus group, a limitation might be that parents responded less to other parents' comments compared to face-to-face focus groups, which might have resulted in less discussion. Although qualitative studies do not seek to achieve representativeness through randomization, our study is limited by its lack of demographic information. Such information would have made findings more representative with regard to, for example, gender, educational attainment, and age. Another limitation is a possible response bias, as parents who are more negative about childhood vaccination might have been more willing to participate. Unfortunately, we have no access to information about the background of parents' non-response to our invitation. While this qualitative study provides useful insight in the factors that influence decision-making about vaccination of parents who refused vaccination, quantitative confirmation of the findings is recommended among a large population of parents to get insight in which determinants are most important.

Conclusion

This study provides an in-depth insight into the perception of parents who took the deliberate decision to refuse all or part of the free vaccinations in the Dutch NIP. Information currently provided by the RIVM turned out to be insufficient for this group of parents. They are in need of verifiable knowledge about the effects of vaccination on the development of a child's immune system; how much a healthy lifestyle can, by itself, protect children from vaccine-preventable disease; and what are the real risks, consequences and complications of such disease. At the same time, the information must increase trust in the NIP by providing more detail about vaccine side effects and more assurance that the NIP is not mandatory. Access to additional sources of reliable information should be provided. Listening to critical parents is useful for developing communication strategies that suits their concerns and reduce their feelings of ambivalence in decision making about childhood vaccinations. Further study is needed on how such information could best reach the parents who need it.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

IH develop the study design, performed the data collection, data analysis and wrote the manuscript. LM, HdM, RR, TP and GK discussed the study and focus group design. All authors contributed to the draft of the final manuscript; their remarks were discussed and processed into the final version that was finally approved by all authors.

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Chapter 5

Psychosocial determinants of parents' intention to vaccinate their newborn child against hepatitis B

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Abstract

From October 2011, the Netherlands started to vaccinate all newborns against hepatitis B. The aim of the present study was to get insight in the psychosocial factors that determine parents' intention to vaccinate their child against hepatitis B, and to test whether intention to vaccinate is a good predictor of actual vaccination behaviour. In total, 2000 parents of newborns (0-2 weeks old) received a self-report questionnaire measuring intention towards hepatitis B vaccination and its psychosocial determinants (response rate 45.6%). Participants were invited for follow-up research and subsequently offered the opportunity to have their child vaccinated against hepatitis B. The findings showed that the large majority of parents intend to vaccinate their child against hepatitis B. The intention to vaccinate was most strongly determined by parents' attitude towards hepatitis B vaccination, which in turn was positively associated with perceived benefits of the vaccination and perceptions of the child's susceptibility to hepatitis B. The majority of the 246 parents that accepted the invitation for a follow-up study had their child vaccinated (83.7%). Intention was found to be a significant predictor of vaccination behaviour although less strong than expected. It is concluded that Dutch parents were positive towards hepatitis B vaccination in terms of both intention and behaviour. To further sustain parents' positive attitudes towards hepatitis B vaccination, educational campaigns should strengthen the benefits of vaccination along with emphasizing the child's risk to hepatitis B infection.

Introduction

In the Netherlands, the National Immunization Programme (NIP) is a voluntary programme offering vaccination for children free of charge. The programme started in 1957 with a national immunization campaign against polio, diphtheria, tetanus and pertussis. In the years that followed it gradually expanded with vaccination against rubella, measles, mumps, *Haemophilus influenzae* type b, meningococcal C disease, hepatitis B (risk groups), pneumococcal disease, and human papillomavirus (HPV). In general the participation in the NIP is high with a coverage rate of around 95% among infants in the Netherlands (van Lier et al., 2011).

In 2009 the Dutch Health Council positively advised the Minister of Health, Welfare and Sports to include universal vaccination against hepatitis B in the NIP, because of the expected extra health benefits for the general population compared to risk group vaccination only, and the vaccination being cost-effective (Health-Council, 2009). From October 2011, the Netherlands started to vaccinate all newborns against hepatitis B at 2, 3, 4 and 11 months of age. The hepatitis B vaccine is combined with the regular DTaP-IPV-Hib vaccine (Health-Council, 2009).

Hepatitis B virus (HBV) infection is an important cause of morbidity and mortality worldwide as it can lead to severe liver dysfunction (Mahoney, 1999). The probability of developing chronic hepatitis B (CHB) is high when the infection is acquired perinatal or in preschool years. In low-endemic countries, most infections are acquired in adult life (Chen, Wang, & Yu, 2000). Although the prevalence of hepatitis B is low in the Dutch population, every year between 200 and 300 cases of acute hepatitis B and about 1500 cases of chronic hepatitis B are reported. Besides that, over the last years, the average annual number of mortalities from chronic hepatitis B is 23 (Health-Council, 2009).

Recent studies suggest that parents have become more critical towards the NIP (Hak, Schönbeck, de Melker, et al., 2005; Paulussen et al., 2006). This was for example reflected in the public response to the first HPV vaccination campaign in 2009 (Rondy et al., 2010) and the criticism towards the quality of information that national health authorities provided about the risks and benefits of vaccination during the influenza pandemic of 2009 (Bults et al., 2011). According to a Dutch study in 2010, 9% of the parents whose child was not eligible for receiving hepatitis B vaccination based on risk factors, and was fully vaccinated against diphtheria, tetanus, pertussis, polio and *Haemophilus influenzae* type b (DTaP-IPV-Hib) had a negative attitude towards universal hepatitis B vaccination (Hontelez, Hahné, Oomen, & de Melker, 2010). Another Dutch qualitative study in 2011 (Sodoyer et al., 2011) suggested that parents were willing to accept the hepatitis B vaccination, but liked to receive more detailed information. Studies outside the Netherlands showed that parents had a positive attitude to having their children vaccinated against hepatitis B (Dannetun, Tegnell, & Giesecke, 2007) and that the main reason for not accepting Hepatitis B immunization was parental concern about side effects (Bigham et al., 2006).

A study of factors that influence parents' decision to have their children vaccinated under the Dutch NIP showed that intention to vaccinate was most strongly determined by parents' attitude towards vaccination, which in turn was positively influenced by parents' beliefs about the positive outcomes of vaccination, the perceived risks of not vaccinating the child and the resulting regret parents expect to experience when the child would contract a disease that could be prevented with vaccination (Paulussen et al., 2006). These and other social cognitive factors might also be critical for parents' acceptance of hepatitis B vaccination for their children.

So far, little is known about the psychosocial determinants of acceptance of hepatitis B vaccination among parents of newborns in the Netherlands. Typically, psychosocial factors are more proximal determinants of behaviour than sociodemographic (e.g., gender, education) or cultural variables (e.g., social norms) and they can be influenced by educational interventions (Kok, Schaalma, de Vries, Parcel, & Paulussen, 1996). Insight into the psychosocial determinants of hepatitis B vaccination is a prerequisite for designing effective public education promoting vaccination uptake among parents.

Theoretical Framework

Social cognition models specify potentially modifiable cognitive antecedents of health behaviours (for a review of social cognition models, see Armitage and Conner (2000); for an integration of the different models, see Fishbein et al. (2001)). The present study used the Theory of Planned Behaviour (TPB) (Ajzen, 1991) to assess social cognitive factors that explain parents' motivation to accept hepatitis B vaccination for their newborn child. The Theory of Planned Behaviour holds that people's behavioural motivation is reflected in their *intention* to undertake the behaviour and that intention, in turn, is determined by attitude, perceived social norm, and perceived behavioural control. *Attitude* represents a person's evaluation of the anticipated outcomes of the behaviour (e.g., will it lead to valued outcomes?). In this study, a distinction was made between three outcome expectancies: perceived benefits, perceived risk, and anticipatory negative affect. *Perceived benefits* reflect parents' beliefs about the positive consequences of having their child vaccinated. *Risk perception* accounts for the weighted result of the parents' perceived susceptibility and severity of contracting the vaccine-preventable disease. Similarly, also parents' perceived risk was assessed with regard to possible side-effects of adding hepatitis B to the combined vaccine. *Anticipatory negative affect* refers to negative emotional reactions that parents would expect to experience as a result of having their child vaccinated, (i.e., worries about the side effects of the vaccine). *Perceived social norm* reflects the social approval a person anticipates from significant others in response to performing (or not performing) a behavior (Fishbein & Ajzen, 2010). A distinction was made between what significant others think we should do (referred to as injunctive norms) and what others have done or are doing (descriptive norm). Finally, *perceived behavioural control* refers to the person's

anticipated mastery of the behaviour. Perceived behavioural control is closely related to Bandura's construct of self-efficacy (i.e., feeling able to successfully perform the target behaviour) (Ajzen, 1998; Bandura, 1997, 1998). In this study we combined measures of perceived behavioural control and self-efficacy into one index of perceived behavioural control (Fishbein & Ajzen, 2010).

Besides the concepts derived from the Theory of Planned Behaviour, two other concepts were incorporated in the framework. The first is *consideration*, which puts forward whether immunization of the child is perceived as self-evident and the amount of thought given to the process of vaccination decision making. We included this concept, because earlier studies had shown its relevance (Tickner et al., 2007). We also included a measure of perceived *choice restriction*; that is, the parents' evaluation of the fact that they cannot choose between a combination vaccine with or without hepatitis B.

The aim of the present study was to get insight into the psychosocial determinants of parents' intention to vaccinate their child against hepatitis B, and to test whether their intention is a good predictor of the actual vaccination status of their child. This study was conducted before the introduction of hepatitis B vaccination in the Netherlands in October 2011. A quantitative survey was conducted among parents of newborns after which hepatitis B vaccination behaviour was followed up. Based on this analysis, psychosocial determinants were identified that do or do not predict actual vaccination uptake and thus can serve as an important target for future educational campaigns.

Methods

Participants and procedure

A random sample of 2000 parents of newborns (0-2 weeks old), not yet eligible for hepatitis B vaccination, was selected from the national vaccination register, Praeventis. In this register all children in the Netherlands are registered with their vaccination status and current address. Postal areas with low socio economic status (SES) were oversampled because of an expected lower response rate. The study was approved by the Institutional Review Board of the University Medical Centre Utrecht.

Questionnaires together with a letter and return envelope were sent to the parents of the newborns. Participants who completed the questionnaire received a voucher of 10 euros as a tribute. To link intention with actual vaccination behaviour, participants were asked at the end of the questionnaire if they could be approached for further research, without an explanation of the contents of the future research. Within 4 weeks, those parents that indicated their interest received a second letter with the offer to vaccinate their newborn with the DTaP-IPV-Hib vaccine including hepatitis B. Parents were free to either accept or reject the hepatitis B vaccination. In addition, as a condition for the approval of the study, the parents received extra

information about the disease hepatitis B, an informed consent, information about insurance that will cover possible harm caused by the study, a letter directed to the family physician of the parents with information about the fact that the child had received hepatitis B vaccine ahead of the countrywide introduction in the NIP, and stickers that could be pasted on the vaccination card at the child health centre. The child's vaccination status was checked afterwards in the Praeventis database.

The questionnaire

The demographic variables age, gender and educational level were assessed with appropriate items. The psychosocial measures were based on 7-point Likert scales with the end-points labeled as 1 = *totally disagree* and 7 = *totally agree* (unless labels are otherwise indicated). For each measure, scores on items that showed sufficient internal consistency (Cronbach's alpha $\alpha > .60$ or Pearson correlation coefficient $r > .50$ with two items) were averaged into one single concept. Items were recoded such that higher scores reflect a stronger presence of the concerned variable.

Intention was measured by one item (i.e., 'If given the opportunity, I would vaccinate my child against hepatitis B').

Attitude was measured by three semantic-differentials (i.e., 'To vaccinate my child against hepatitis B I think is...very unwise-very wise'; 'very unimportant-very important'; 'very unnecessary-very necessary'; $\alpha = .90$).

Perceived benefits was measured with three items (i.e., 'Hepatitis B vaccination is a good way to protect my child against hepatitis B'; 'I think it is really important that the vaccination of my child contribute to the protection of others'; 'By vaccinating my child against hepatitis B, I will protect him/her well against hepatitis B'; $\alpha = .73$).

Anticipatory negative affect was measured with two items (i.e., 'I am worried about the side effects by the addition of hepatitis B vaccination to the standard injection'; 'I am concerned about the working of the vaccination'; $r = .51$).

For risk perception, one item measured parents' *perceived severity of the disease* (i.e., 'I believe that hepatitis B is a severe disease') and one item measured parents' *perceived severity of side effects* (i.e., 'I believe the side effects of hepatitis B could be severe'). The *perceived susceptibility of the disease* was measured with two items (i.e., 'I think it is very likely that my child gets hepatitis B (without the hepatitis B vaccination)'; 'I think there is a chance my child gets hepatitis B within 10 years (without the hepatitis B vaccination)' $r = .51$), followed by a one item measure of the *perceived susceptibility of side effects* (i.e., 'I think the risk of side effects increases when hepatitis B vaccination is added to the standard injection').

Three items were used to measure perceived social norm (i.e., 'Most people who are important to me, think I should vaccinate my child against hepatitis B'; 'Most of my friends will vaccinate their child against hepatitis B'; 'Most of the people who are important to me appreciate it when I will vaccinate my child against hepatitis B'; $\alpha = .87$).

Finally, three items measured *perceived behavioural control* (i.e., 'if getting the opportunity, I am confident that I can get my child vaccinated against hepatitis B'; 'If having the opportunity, I can get my child vaccinated even though he/she will not like this'; 'To vaccinate my child against hepatitis B I think is...very difficult-very easy'; $\alpha = .81$).

Choice restriction was measured with two items. (i.e., 'What do you think of combining hepatitis B vaccination with DTaP-IPV-Hib vaccination...very good idea-very bad idea'; 'I think it is very annoying I cannot choose between a vaccination with or without hepatitis B...totally disagree-totally agree'; $r = .51$). Finally, two items measured *consideration* (i.e., 'Vaccinating my child is something I have to think about for a long time'; 'Vaccinating my child is not self-evident'; $r = .70$).

Data analysis

SPSS Version 19.0 was used to analyze the data. Following a descriptive analysis (frequencies) of the sample, the association between the demographic variables, psychosocial measures and intention was analyzed with Pearson correlation coefficients. Those demographic and psychosocial variables that showed significant associations with intention ($p < .01$) were entered simultaneously in a multiple linear regression analysis to assess their unique contribution to the explanation of intention and the total amount of variance explained in intention. To assess the contribution of the three outcome expectancies (i.e. perceived benefits, anticipatory negative affect, risk perception measures) in explaining attitude, a multiple linear regression analysis was used. A logistic regression analysis was conducted to link intention with actual vaccination behaviour.

In the analyses linking intention with actual vaccination behaviour, only the respondents who participated in follow-up (parents who were offered the hepatitis B vaccination) were included. In all the other analysis the respondents who filled in the questionnaire were included. Results were considered significant at $p < .01$.

Results

Response

Of the 2000 questionnaires that were distributed, 912 questionnaires were returned (45.6%). Six questionnaires were not included in the analyses, because the respondents skipped the sociodemographic items. As a result, 906 respondents were included in the analyses. Of these 906 respondents, 333 (36.8%) gave permission to participate in follow-up research. These 333 respondents were offered the hepatitis B vaccination for their newborn child and asked to return an informed consent form. We received 246 informed consent forms. These 246 respondents were included in the analysis to assess the extent to which intention predicts behaviour.

Descriptive statistics

The mean age of the respondents was 30.5 years (16 to 48 years). The majority (81.2%) of the respondents were female. About half of the respondents (50.4%) had finished a higher education or university. Of the respondents, 32.6% worked within the healthcare or welfare sector and 18.3% of the respondents reported being unemployed. For the majority of the respondents (52.3%), the newborn child was their first child, 34.8% had a second child, 10.2% having 3 children, and 2.7% having 4 or more children. Among those participants with experience in NIP, 97.8% indicated that their experience was good whereas 2.2% of the respondents reported they had a bad experience. Of the respondents, 89.7% indicated that their opinion about vaccination was not influenced by religion or any other conviction, 6% answered that religion had influenced their opinion about vaccination, while others state that homeopathy (1.7%), natural cure (1%), anthroposophy (0.1%) and not further specified convictions (0.9%) had influenced their opinion. An independent samples t-test showed no significant difference in intention to vaccinate between male and female parents ($t(905) = .78, p = .37$) and no significant difference in intention between low and middle/high SES ($t(904) = 0.95, p = .34$). Educational level ($F(8, 897) = 1.27, p = .26$), and age ($r = .02, p = .48$) were not significantly related with intention to vaccinate. We oversampled low SES parents because we expected that the response rate of these parents would be somewhat lower. This hypothesis was right, 24.5% of the parents with living in an area with low SES filled in the questionnaire, compared to 57.8% of the parents living in an area with a middle/high SES ($t(905) = 134.37, p = .001$).

Psychosocial determinants of parents' vaccination intention

Table 1 presents the Pearson correlations, means and standard deviations (SD) for the psychosocial measures and intention. Most parents reported a positive intention to vaccinate their child against hepatitis B in combination with a positive attitude towards hepatitis B vaccination. Parents perceived a positive social norm from friends and important others concerning the immunization against hepatitis B and believe they are able to get their child vaccinated. The overall perceived susceptibility towards the disease was low, but parents believed that hepatitis B is a severe disease. It seems that parents do not have many problems with the fact they cannot choose between a vaccination with or without hepatitis B and the majority of the parents perceive vaccination against hepatitis B as self-evident and do not report a high amount of thought to the process of vaccination decision making. Table 1 shows that all psychosocial measures included in the analyses are significantly correlated to vaccination intention, measures with $r = .10$ -.23 indicating a small effect, $r = .24$ -.36 indicating a moderate effect and $r \geq .37$ indicating a large effect (Cohen, 1988, 1992). Strong positive correlations with intention were found for the TPB variables attitude, perceived social norm and perceived behavioural control. This also applies for the perceived benefits of vaccination. Strong negative correlations with intention were found for the amount of thought given to the process of vaccination decision making and choice restriction.

Table 1 Mean score (SD), intercorrelation and results of multiple linear regression of determinants of vaccination intention (N = 906)

	b	S.E.	p-value	1	2	3	4	5	6	7	8	9	10	11	12
1. Intention															
2. Attitude	.84	.04	p<.001	.86											
				p<.001											
3. Perceived social norm	.13	.03	p<.001	.67	.70										
				p<.001	p<.001										
4. Perceived behavioural control	.07	.04	p=.11	.70	.75	.70									
				p<.001	p<.001	p<.001									
5. Susceptibility disease	.01	.02	p=.72	.26	.30	.25	.18								
				p<.001	p<.001	p<.001	p<.001								
6. Susceptibility side effects	-.05	.02	p=.03	-.24	-.22	-.14	-.26	.02							
				p<.001	p<.001	p<.001	p<.001	p=.57							
7. Severity disease	-.04	.02	p=.04	.16	.22	.23	.24	.03	.05						
				p<.001	p<.001	p<.001	p<.001	p=.45	p=.13						
8. Severity side effects	.03	.02	p=.21	-.16	-.16	-.10	-.27	.12	.45	.12					
				p<.001	p<.001	p=.002	p<.001	p<.001	p<.001	p<.001					
9. Perceived benefits	-.01	.04	p=.83	.64	.71	.61	.70	.21	-.21	.27	-.17				
				p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p<.001				
10. Anticipatory negative affect	-.01	.02	p=.54	-.30	-.28	-.25	-.45	.08	.45	-.03	.48	-.34			
				p<.001	p<.001	p<.001	p<.001	p=.02	p<.001	p=.40	p<.001	p<.001			
11. Consideration	-.04	.03	p=.10	-.62	-.64	-.54	-.66	-.18	.24	-.19	.17	-.60	.34		
				p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p<.001		
12. Choice restriction	-.06	.03	p=.40	-.66	-.69	-.53	-.67	-.17	.34	-.10	.28	-.54	.48	.61	
				p<.001	p<.001	p<.001	p<.001	p<.001	p<.001	p=.002	p<.001	p<.001	p<.001	p<.001	
R ²	.76														
Mean score †				5.34	5.52	5.09	5.59	2.67	4.12	5.74	3.91	5.49	3.71	2.86	2.37
SD				1.39	1.13	1.23	1.07	1.21	1.32	1.18	1.32	0.99	1.38	1.37	1.37

Note: † Scale range 1 to 7, SD = Standard Deviation, R² = Explained Variance, b = unstandardized regression coefficient, S.E. = Standard Error

The results of the multiple regression of parents' vaccination intention are shown in Table 1, second column. Attitude showed to be the most powerful correlate of intention with a positive attitude resulting in more positive intentions. Also perceived social norm significantly accounted for unique variance in intention. The variables in the regression model explained 76% of the variance in intention ($R^2 = .76$).

To gain more insight into factors that influence the attitude of parents towards hepatitis B vaccination, a multiple linear regression analysis was conducted that regressed attitude on the three categories of outcome expectancies: perceived benefits, anticipatory negative affect and risk perception measures. Significant unique contributions were found for perceived benefits and perceived susceptibility towards hepatitis B (see Table 2), whereas the contributions of the other three risk perception measures and anticipatory negative affect failed to reach significance despite significant positive univariate associations with attitude (see Table 1). Overall, the outcome expectancy measures explained 55% of the variance in attitude ($R^2 = .55$).

Table 2 Results of multiple linear regression analysis of determinants of attitude (N = 906)

	b	S.E.	p-value
Perceived benefits	.75	.03	$p < .001$
Anticipatory negative affect	-.02	.02	$p = .41$
<u>Risk Perception</u>			
Susceptibility disease	.14	.02	$p < .001$
Susceptibility side effects	-.05	.02	$p = .02$
Severity disease	.04	.02	$p = .11$
Severity side effects	-.01	.02	$p = .70$
R^2	.55		

Note: b = unstandardized regression coefficient, S.E. = Standard Error

Finally, of the 246 parents who sent back their informed consent in response to an offer for the hepatitis B vaccination, 206 parents (83.7%) actually had their child vaccinated against hepatitis B. The intention was found to be a significant predictor of vaccination behaviour ($OR = 1.53$, 95% CI: 1.21 – 1.93). This is also confirmed in Table 3, which shows that among those parents that took the vaccination for their child a majority of 79.3% ($n = 195$) reported a positive intention by scoring 5 or higher. However, intention only explained a small amount of the variance in behaviour (Nagelkerke $R^2 = .09$). To get more insight in the intention-behaviour relationship, we conducted an ANOVA analysis and calculated the effect size (Cohen's d) (Cohen, 1992). This analysis showed that parents who got their child vaccinated against hepatitis B reported a significant higher intention ($M = 5.75$, $S.D. = 1.23$) than those parents that did not accept the offer to get their child vaccinated ($M = 4.88$, $S.D. = 1.68$, $F(1,73) = 14.88$, $p < .01$). The effect size was $d = 0.59$, which represents a moderately strong relationship between intention and behaviour (Cohen, 1992).

Table 3 Crosstab of parents' intention to vaccinate (range 1: low intention - 7: high intention) and parents' actual vaccination behaviour (Hepatitis B vs. No hepatitis B vaccine) (N = 246)

	1 (low intention)	2	3	4	5	6	7 (high intention)	Total
No hepatitis B vaccine	2 50%	2 50%	3 42.9%	9 25%	8 19.5%	8 10%	8 10.8%	40 16.3%
Hepatitis B vaccine	2 50%	2 50%	4 57.1	27 75%	33 80.5%	72 90%	66 89.2%	206 83.7%
Total	4 100%	4 100%	7 100%	36 100%	41 100%	80 100%	74 100%	246 100%

Discussion

This study shows that a majority of the participating parents intend to vaccinate their child against hepatitis B, which is consistent with the findings of Hontelez et al. (2010) and Sodoyer et al. (2011). Overall, parents reported a positive attitude towards hepatitis B vaccination, and believed their opinion was shared by important others in their social environment. Together these concepts explained a large proportion of the variance in intention (76%). Furthermore, parents felt able to choose vaccination, which correlated positively with intention. However, this measure of perceived behavioural control failed to explain any unique variance in intention.

Most parents perceived vaccination against hepatitis B as self-evident and reported not giving much thought to the decision making process. These findings correspond with the results of Paulussen et al. (2006) who reported that 81% of the Dutch parents in the National Immunization Program did not make a comparative assessment of the pros and cons of vaccination before accepting it.

Attitude was found to be the strongest correlate of the intention to vaccinate. Additional analyses found that positive attitudes were most strongly influenced by the perceived benefits of the hepatitis B vaccine and to a lesser extent by perceptions of the child's susceptibility towards hepatitis B infection. Overall, the chance that the child would get hepatitis B was considered low, which is consistent with the actual risk of hepatitis B in the Netherlands among those that do not belong to a recognized risk group. The severity of hepatitis B was evaluated as high, but this measure did not appear to be a significant correlate of attitude in the multivariate analyses. In sum, parents do believe that hepatitis B is a severe disease, but believe that their child is not very susceptible to get hepatitis B, as was found in earlier research (Sodoyer et al., 2011).

Absence of choice between a vaccine with or without hepatitis B was not considered problematic for most parents. However, parents with a lower intention to vaccinate perceived this fact as more problematic than those with a higher intention. The demographic variables age, gender and education level were not related to vaccination intention.

In this study we had the unique chance to offer parents the opportunity to vaccinate their child against hepatitis B, ahead of the countrywide introduction of this vaccine. In this way we could link intention with vaccination behaviour. Based on a logistic regression analysis, intention appeared to be a significant but weak predictor of the parents' decision to vaccinate their child ($R^2 = .09$). The weak contribution of the intention measure to the prediction of behaviour is not in line with a meta-analysis of the association between intention and future behaviour across a wide range of health behaviours conducted by Sheeran (2002), who found that intention explained 28% of the variance in behaviour. In the specific domain of vaccination uptake, a study of van Keulen, Otten, van der Pal, Kocken, and Ruiter (2010) found that the intention to vaccinate against HPV explained 69% of variance in behaviour. On the other hand, Juraskova et al. (2011) found that intention predicted a significant but relatively small proportion of variation (9.6%) in the uptake of HPV vaccination. A reason for the weak contribution of intention to the prediction of behaviour in the logistic regression analysis might be the low variances we received in the intention and behaviour measures in the sample that participated in the follow-up study. Among those parents that applied for the follow-up study, 79.3% of the parents reported a positive intention towards vaccination uptake (by scoring 5 or higher), and 83.7% of the parents actually got their child vaccinated. The large majority of the parents choose to vaccinate their child against hepatitis B (table 3), which is consistent with the high vaccination coverage in the Netherlands (around 95% (van Lier et al., 2011)). Indeed, an ANOVA analysis on the intention score at baseline that compared parents at follow-up who got their child vaccinated with those who did not, suggested a moderately strong relationship between intention and behaviour. The effect size of $d = 0.59$ that we found was lower than the effect size generally reported in correlational studies of the intention-behaviour relationship (Sheeran, 2002), but higher than the strength of the effect of intention on behaviour found in experimental studies (Webb & Sheeran, 2006).

A limitation of this study was that some concepts (i.e. susceptibility of side effects, severity of disease and side effects) were measured with only 1 item. This was done to reduce the length of the questionnaire and thus increase the response rate. The disadvantage is that the measurement specificity might have been lower which has a negative impact on assessing the true relationships between these variables and intention. On the other hand, most concepts were strongly related with intention. Another limitation might be response bias, first because the results of this study are based on an overall questionnaire response rate of 45.6%. Indeed we found that parents living in area with low SES participated less compared to those living in middle/high SES area. On the other hand we find no association between SES and educational level on intention to vaccinate. Unfortunately, however, no further data were available to compare participating parents with non-participating parents. Second, response bias may also have been a factor due to a relatively low response rate for follow-up (36.8%). Parents who participated in follow-up might have been more positive towards the hepatitis B vaccination. However, it should be noted that these parents only learned that this follow-up study would

include an offer of the hepatitis B vaccination after they gave their permission to be contacted for the follow-up study. Besides these limitations, the study population received information (i.e. about hepatitis B disease and insurance provided to study participants) that was not offered or available to the general population of parents of newborn children when the national hepatitis B immunization programme was implemented. This study-related intervention might be a potential threat to the generalization of the study findings.

In conclusion, Dutch parents are positive towards hepatitis B vaccination in terms of both intention and behaviour. To further sustain parents' positive attitudes towards hepatitis B vaccination, educational campaigns should strengthen the benefits of vaccination along with emphasizing the child's risk to hepatitis B infection rather than stressing once more the severity of hepatitis B infection.

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Chapter 6

Parental information-seeking behavior in childhood vaccinations

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Abstract

People want to be well informed and ask for more information regarding their health. The public can use different sources (i.e. the Internet, health care providers, friends, family, television, radio, and newspapers) to access information about their health. Insight into the types and sources of vaccine related information that parents use, and reasons why they seek extra information is needed to improve the existing information supply about childhood vaccinations. Dutch parents with one or more children aged 0-4 years received an online questionnaire (N = 4000) measuring psychosocial determinants of information-seeking behaviour and self-reports of types and sources of vaccine information searched for (response rate 14.8%). We also tested two invitation approaches (i.e., reply card versus Internet link in invitation letter) to observe the difference in response rate. Almost half of the parents (45.8%) searched for extra information. Of all the respondents, 13% indicated they had missed some information, particularly about side effects of vaccines (25%). Intention to search for vaccination information was influenced by positive attitude and perceived social norm towards information-seeking behaviour. There was no difference in the response rate between the two invitation approaches. The information provided by the National Immunization Programme (NIP) might be sufficient for most parents. However, some parents mentioned that they did not receive enough information about side effects of vaccinations, which was also the topic most searched for by parents. Public Health Institutes (PHIs) and child healthcare workers should therefore be aware of the importance to mention this aspect in their communication (materials) towards parents. The PHIs must ensure that their website is easy to find with different search strategies. Since the child healthcare worker is perceived as the most reliable information source, they should be aware of their role in educating parents about the NIP.

Introduction

Nowadays, individuals take an active role in managing their own health. People want to be well informed and ask for more information regarding their health (Rains, 2007). The public can use different sources (i.e. the Internet, health care providers, friends, family, television, radio and newspapers) to access information about their health (Anderson, 2004; Brashers, Goldsmith, & Hsieh, 2002; Dolan, Iredale, Williams, & Ameen, 2004; Johnson & Meischke, 1993; Kivits, 2004; Napoli, 2012). Although physicians remain the most highly trusted information sources (Hesse et al., 2005), the use, popularity and perceived importance of the Internet to get health information is rising (Kummervold et al., 2008). Advantages of the use of Internet to search for information are the widespread access, anonymity, social support, and the ability to tailor information to one's needs (Cline & Haynes, 2001). Another advantage might be the large amount of available information. However, this also might be a disadvantage because of the difficulty to understand all the provided information and to know what information is objective and trustworthy (Downs, de Bruin, & Fischhoff, 2008; May, 2005).

Childhood vaccination is a health topic that is highly searched (Bean, 2011; Betsch et al., 2012). Most parents (79.6%) use 2 to 6 sources when searching for information about childhood vaccination (Jones et al., 2012). Different studies have shown that healthcare providers are perceived as the most common and trusted sources of vaccine related information (Kennedy, Basket, & Sheedy, 2011; Stefanoff et al., 2010). Jones et al. (2012) and Downs et al. (2008) showed that when parents did not view their child healthcare provider as a reliable source of information, they were more likely to obtain information about vaccination through the Internet with the help of search engines (Madden, Nan, Briones, & Waks, 2012). The use of Internet to search for vaccine related information was clearly visible during the pandemic influenza outbreak in 2009 in the Netherlands, when 56% of the acceptors of H1N1 influenza vaccine and 75% of decliners of the H1N1 vaccine searched for information on the Internet (Bults et al., 2011). Bults et al. (2011) showed that 22% of the vaccine acceptors and 25% of the vaccine decliners visited Internet sites that were critical of vaccination. Anti-vaccination messages are more widespread on the Internet than in other media (Davies et al., 2002). These anti-vaccination messages might negatively influence parents' vaccination decisions (Betsch et al., 2010; Kata, 2011). Lehmann, Ruiter, and Kok (2013) showed that social media more critically evaluated (influenza) vaccination information than news media.

Some parents feel under informed and report a lack of vaccine-related knowledge (Austvoll-Dahlgren & Helseth, 2010; Evans et al., 2001). Hak, Schönbeck, de Melker, et al. (2005) showed that among Dutch parents, 89% want an improvement of the current vaccination education, and that they would like to be educated by health care workers. In the Netherlands, parents receive oral information about the National Immunization Programme (NIP) when a nurse of the child welfare centre visits the parents at their home when their infant is about two weeks old. When the child is 4-6 weeks old, parents receive through surface mail a brochure

with information about vaccines, diseases, the vaccination schedule, side effects, and with a reference to the website of the National Institute of Public Health and the Environment (RIVM). When children are 8 weeks old, they will get their first vaccination at the child welfare centre, where they also receive health check-ups. In the Netherlands, the NIP is managed by the RIVM, is voluntary and free of charge, with an overall coverage of 95% in 2012 (van Lier, Oomen, et al., 2013).

So far, no systematic research has been done in the Netherlands about parental information-seeking behaviour in childhood vaccinations. We therefore conducted a quantitative study to get more insight in parents' information seeking behaviour about the NIP and in their information need. Insight into topics and sources of vaccine related information that parents use, and reasons why they seek extra information is needed to improve existing information supply about the NIP. In particular, we would like to get more insight in the psychosocial determinants that influence the intention of parents to search for information about the NIP. Insight in these determinants might be useful to explore the drivers of parents to search for information.

We also tested in this study two invitation approaches to observe the difference in response rate. Research showed that different invitation approaches resulted in different response rates. A systematic review of Edwards et al. (2002) showed that when surveys were sent by recorded delivery, when stamped return envelopes were used, participants were contacted before sending questionnaires, and when a reminder was used, response was more likely. Since we had used an online questionnaire, we were interested in what kind of invitation method was most effective: sending an invitation letter with a reply card where parents could fill in their e-mail address and then received an e-mail with an Internet link to access the questionnaire, or an invitation letter with an Internet link to the questionnaire.

Theoretical Framework

To study the psychosocial determinants that influence parents' intention to seek information about childhood vaccination, we used the Reasoned Action Approach (RAA) of Fishbein and Ajzen (2010), which is the most recent formulation of the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The TPB is a well-founded theory and often used in health behaviour research (Askelson et al., 2010; Lemmens et al., 2005; Norman, Armitage, & Quigley, 2007) and in information seeking behaviour studies (Clarke & McComas, 2012; R.J. Griffin, Neuwirth, Dunwoody, & Giese, 2004; R.J. Griffin et al., 2008; Kahlor, 2007).

The RAA indicates that intention, the desire to perform certain behaviour, is determined by attitude towards the behaviour, perceived norm, and perceived behavioural control. Attitude is a positive or negative evaluation of the behaviour. Perceived norm is the perceived social pressure to perform (or not to perform) a behaviour. Perceived behavioural control is an assessment of the individual's confidence in being able to perform the behaviour (Fishbein & Ajzen, 2010).

The direct measures attitude, perceived norm and perceived control are determined in turn by behavioural, normative and control beliefs. These beliefs constitute specific expectations about the outcomes of the behaviour, anticipated support from significant others, and barriers and facilitators to perform the behaviour.

Behavioural beliefs (i.e., behavioural belief strength and outcome evaluation) are the indirect measures of attitude and are beliefs of an individual about the outcome of performing a particular behaviour. Normative beliefs (i.e. injunctive normative beliefs and descriptive normative beliefs) are the indirect measures of perceived norm. The injunctive normative beliefs include injunctive normative belief strength and motivation to comply, which refers to beliefs that particular referents approve or not approve behaviour. The descriptive normative beliefs include the descriptive normative belief strength and the identification with the referent. These descriptive normative beliefs refer to a belief of an individual that a particular referent will perform or not perform the behaviour. Control beliefs (i.e. the power of control and control belief strength) are indirect measures for perceived control. These beliefs refer to particular factors that could facilitate or impede performance of the behavior (Fishbein & Ajzen, 2010).

Methods

Design & Procedure

This cross-sectional study design by means of an online self-reported questionnaire were offered in 2012, to a sample of 4000 parents in who lived in the Netherlands, with at least one child aged 0-4 years, randomly selected from Praeventis, the national database for vaccination registration (van Lier et al., 2012).

Two invitation approaches were used and parents were randomly assigned to one of those two. In one approach, parents received an invitation letter regarding the study objectives and procedures, and could inform the researchers whether they wished to participate by sending a reply-card with their e-mail address. Parents who did so then received an e-mail with an Internet link to access the questionnaire. The other approach consisted of the same invitation letter, with an Internet link. Parents could type the Internet link in their web browser to get direct access to the questionnaire. The aim of these two invitation approaches was to evaluate which resulted in the highest response rate. After three weeks, reminder letters with the Internet link to the questionnaire were sent to all of the 4000 parents. Participants were assured of their privacy and confidentiality of their responses in the invitation letter and at the start of the questionnaire. Those who participated gave their informed consent by filling out the questionnaire. This study was approved by the Maastricht University's Ethics Research Board.

Questionnaire

The demographic variables gender, age, country of birth, education, household income, number of children in the family and self-reported vaccination status of the children were measured with appropriate items. The other items were based on 7-point Likert scales with the end-points labelled as 1 = totally disagree and 7 = totally agree. Items were averaged into one single concept when they showed sufficient internal consistency (Cronbach's alpha $\alpha > .60$ or Pearson correlation coefficient $r > .50$ with two items). Evaluation of the personal experience with the NIP was measured with one item (i.e., 'How is your general experience with the NIP?' 'Very bad-very good'). Two items measured consideration: whether immunization of the child is perceived as self-evident, and the amount of thought given to the process of vaccination decision making (i.e., 'Vaccinating my child is self-evident' and 'I don't have to think long about vaccinating my child'; 'Totally disagree - totally agree'; $r = .75$). Attitude towards the NIP was measured with three semantic differentials (i.e. 'I think the NIP is ... very bad - very good'; 'very unimportant - very important'; 'very unreliable - very reliable'; $\alpha = .88$).

To get insight in the information need of parents about the NIP, parents were asked multiple-choice questions at what time, from whom and how they would like to receive information and if they missed any information about the NIP. Parents were also asked if they have searched for information about the NIP in the past (yes-no question). Only parents who indicated they had already searched for information got access to the last part of the questionnaire. This part consisted of multiple choice questions about where and when parents had searched for information, which information sources they had used, and whether these information sources had influenced their choice to vaccinate and their opinion about the NIP (self-reported).

The psychosocial determinants of information seeking were based on 7-point Likert scales with the end-points labelled as 1 = totally disagree and 7 = totally agree. Intention was measured with three items (i.e., 'I expect that I will search for information about the NIP in the future'; 'I intend to search for information about the NIP in the future'; 'It is likely that I will search for information about the NIP in the future'; $\alpha = .94$). Attitude was measured by three semantic differentials (i.e., 'Information seeking about the NIP, I think is...very bad-very good'; 'very unwise-very wise'; 'very unimportant-very important'; $\alpha = .83$). Perceived norm was measured with three items (i.e., 'Most people around me think I should search for information about the NIP'; 'Most people who are important to me think I should search for information about the NIP'; 'Most people similar to me think I should search information about the NIP'; $\alpha = .86$). Perceived control was measured by three items (i.e., 'I can judge what reliable information about vaccinations is'; 'After reading all the pros and cons about vaccinations, I can choose whether or not I will vaccinate my child'; 'I can find the information that I am searching for'; $\alpha = .85$). Table 4 shows the items of the indirect measures of the RAA.

Data-analysis

To analyse the data, IBM SPSS Statistics version 19.0 was used. Descriptive analysis was used to summarize the demographic characteristics. To find out if gender, age, country of birth, and education were related to intention to seek information, *t*-tests, Pearson correlation coefficients and One-Way ANOVA's were conducted. The bivariate associations between the psychosocial measures of information seeking behaviour were analysed with Pearson correlation coefficients.

To indicate whether gender, age, country of birth, and education were related with parents' information need and information seeking behavior, a multivariate logistic regression analysis was performed. Descriptive analysis was used for the information need of parents and for items about the actual information seeking behaviour, and parents' self-reported influence from the used information sources on their vaccination decision and their opinion of the NIP.

To show the unique contribution of variables to the explanation of intention and the total amount of variance explained in intention, we conducted a linear hierarchical regression analysis. In the first step we included all direct psychosocial measures of the RAA. In the second step we included past behaviour, general attitude about the NIP and consideration, and in the third step we included the demographic variables that showed significant associations with intention ($p < .01$).

To analyse the contribution of the indirect measures in the prediction of the direct measures of the RAA, we conducted separate linear regression analysis for each direct measure. Finally, differences in the beliefs between participants with high and low intentions to search for vaccine related information were analysed. Therefore, the sample was divided into two groups using a median split on the intention measure, and analysis was done with independent-samples *t*-tests.

Results

Response rate

A total of 592 out of 4000 (15%) parents completed the questionnaire. Of the 2000 parents who received the information letter with reply card, 211 (11%) returned the reply card, and 135 of those parents (64%; 6.8% of 2000) completed the questionnaire. Of the other 2000 parents who received an information letter with Internet link, 143 (7.2%) completed the questionnaire. Reminder letters with the Internet-link were sent after three weeks to all the 4000 parents. Before the reminder, 278 (7%) parents completed the questionnaire, and after the reminder, another 314 (8%) parents.

Descriptive statistics

Of the 592 respondents, 85% were female. The mean age was 35 years ($SD = 5.3$). 92% were born in the Netherlands, and 54% had finished higher education or university. Half of the

respondents (51%) had a household income above modal (modal gross household income per year is €32 500 (CBS, 2012)). Most respondents had two children (47%) while 82% reported that their first child received all the recommended vaccinations within the NIP. 16% were partially vaccinated, and 2% were not vaccinated at all.

Overall, the respondents reported a positive experience with the NIP ($M = 5.69$, $SD = 1.18$), a positive general attitude towards the NIP ($M = 5.81$, $SD = 0.89$), and that vaccinating their child(ren) was self-evident ($M = 5.89$, $SD = 1.38$). A small proportion of the respondents (8.4%) indicated that religious beliefs or another conviction had influenced their opinion about childhood vaccination. Parents who indicated this, stated that religion had the most influence on their opinion ($M = 4.74$, $SD = 2.05$).

An independent sample *t*-test found no significant differences between males and females in their intention to search for information ($t(590) = -1.73$, $p = .47$), and no significant difference whether parents were born in the Netherlands or not ($t(592) = -0.38$, $p = .71$). Age ($r = -.02$, $p = .49$) and educational level ($F(18, 573) = 1.02$, $p = .43$) were also not significantly related with intention to search for information.

Information need of the parents

A logistic regression analysis showed that parents who were born in the Netherlands had a higher need for information than those who were born in another country ($OR = 0.42$, 95% CI: 0.22 - 0.81). All the other demographic variables (i.e., age ($OR = 0.98$, 95% CI: 0.94 - 1.03), gender ($OR = 1.55$, 95% CI: 0.81 - 2.96), education level ($OR = 1.14$, 95% CI: 0.98 - 1.32)) showed no significant influence to parents' information need.

Overall, parents indicated that they would like to receive information about the NIP after birth, but before the first vaccination of their child. Most parents (33%) thought the child welfare centre was the most reliable source to provide information about childhood vaccination, followed by the general practitioner (29%), and the RIVM (22%). Parents would like to receive the information in a brochure (63%) or by a letter (55%).

Of all the parents, 13% ($n = 79$) indicated that they did not receive enough information from the RIVM about the NIP. Of the parents who had missed information, most of them would like to receive more information about possible negative consequences of vaccines (25%) and side effects of vaccines (18%). Other topics parents would like to receive more information about were: the components of the vaccines (10%), reasons for including vaccines in the programme (7%), and counter indications for vaccination when, for example, the child is sick or has a chronic disease (6%).

Information seeking behaviour

A logistic regression analysis showed that parents who were born in the Netherlands were more likely to search for information than those who were born in another country ($OR = 0.31$, 95% CI: 0.16 - 0.59). Also higher educated parents ($OR = 1.23$, 95% CI: 1.10 - 1.38) and parents

with an older age ($OR = 1.04$, 95% CI : $1.00 - 1.08$) were more likely to search for information. Gender ($OR = 1.38$, 95% CI : $0.83 - 2.30$) had no significant influence to parents' information seeking behaviour.

Almost half of the respondents ($n = 271$, 46%) searched for information about the NIP. More than a third (36%) of the parents started to search for information after the birth of their child and before the first vaccination, followed by 24% of the parents who started to search for information between the vaccination rounds in the NIP. The most common topics that parents searched for were: side effects (82%), vaccines (60%), diseases (56%), and the vaccination schedule (51%). Parents reported that when they found information about the NIP they looked for, they did not search for more NIP related information again ($M = 3.75$, $SD = 1.56$).

The information sources that parents used most were: the Internet (41%), the doctor (26%) and nurse (23%) of the child welfare centre, their family (21%) and friends (18%). Among the parents who used the Internet, the website of the RIVM was the most used Internet site (49%), followed by Google and other search engines (29%). Some parents (8%) visited the Internet site of the association of critical vaccination in the Netherlands. Parents who used the website of the RIVM reported that the website had almost no influence on their choice to vaccinate or not ($M = 3.17$, $SD = 1.63$), and a small influence on their opinion about the NIP ($M = 3.84$, $SD = 1.56$). Parents who consulted the doctor and/or the nurse at the child welfare centre reported that these health care workers had a small influence on their choice to vaccinate or not (doctor: $M = 3.52$, $SD = 1.75$; nurse: $M = 3.64$, $SD = 1.73$) and on their opinion about the NIP (doctor: $M = 3.68$, $SD = 1.79$; nurse: $M = 3.90$, $SD = 1.73$). Family and friends were also perceived as not having a big influence on parents' choice to vaccinate their child or not (family: $M = 4.31$, $SD = 1.76$; friends: $M = 3.75$, $SD = 1.64$), and on their opinion about the NIP (family: $M = 4.19$, $SD = 1.78$; friends: $M = 3.69$, $SD = 1.60$). Parents indicated that the information they found was complete ($M = 4.91$, $SD = 1.38$) and gave an answer to their questions ($M = 4.98$, $SD = 1.40$).

Direct and indirect measures of intention to search for information

Table 1 shows the means, standard deviations (SD) and Pearson correlations for the direct measures of the RAA. Parents had a positive attitude towards information seeking about the NIP ($M = 5.23$, $SD = 0.90$), and perceived a weak pressure from their social environment to search for information ($M = 3.18$, $SD = 1.33$). Parents believed they were able to search for information about the NIP ($M = 5.72$, $SD = 1.05$).

To get insight in the strength of the association among the direct measures and intention, Pearson correlation were calculated. In terms of effect sizes, small associations are correlations with r between .10 and .23; a correlation between .24 and .36 shows a moderate effect, and a correlation of $r > .37$ indicates a large association (Cohen, 1992). The direct measures attitude and perceived norm showed a strong positive association with intention to search for information about the NIP (see Table 1).

Table 1 Correlation matrix and mean scores (SD) of direct measures of the RAA

	1.	2.	3.	4.
1. Intention				
2. Attitude	.44*			
3. Perceived norm	.51*	.38*		
4. Perceived control	.04 ^{n.s.}	.16*	-.04 ^{n.s.}	
Mean score	3.92	5.23	3.18	5.72
SD	1.5	0.8	1.3	1.0

Note: * $p < .001$, n.s. = not significant, scale range: 1-7, SD= Standard Deviation

Table 2 shows the results of the linear hierarchical regression of intention on the direct measures. The demographic variables gender, age and educational level were not significantly related with intention to search for information, and were therefore not included in the regression analysis. The first column shows the regression with all the direct RAA measures. Attitude and perceived norm are the most powerful significant predictors of intention to search for information about the NIP. The direct measures of the RAA explained 34% of the variance in intention to search for information about the NIP ($R^2 = .34$). Adding past behaviour, general attitude about the NIP, and considerations about the choice to vaccinate in the second step showed a negative significant contribution of general attitude about the NIP, and a positive significant contribution of past behaviour (whether parents already searched for information about the NIP) at intention. The amount of thought given to the choice to vaccinate or not (consideration) was not significantly associated to parents' intention to search for NIP information, while attitude and perceived norm remained significant. By including these measures, the explained variance increased to 36% ($R^2 = .36$).

Table 2 Linear hierarchical regression analyses of intention on the direct measures of RAA, past information-seeking behaviour, NIP attitude, and considerations

	<i>r</i>	<i>b</i>	SE	<i>p-value</i>	<i>B</i>	SE	<i>p-Value</i>
Attitude information seeking	.44*	0.49	.06	.00	0.42	.07	<.001
Perceived norm	.51*	0.46	.04	.00	0.40	.04	<.001
Perceived control	.04*	0.02	.05	.66	0.05	.05	.27
Past information-seeking behaviour	.29*				0.42	.11	<.001
NIP attitude	-.07 ^{n.s.}				-0.17	.08	.03
Considerations about choice to vaccinate	-.12*				0.02	.05	.62
R^2		.34			.36		
ΔR^2					.03		<.001

Note: *b* = unstandardized regression coefficient, SE = Standard Error, R^2 = explained variance

* $p < .001$, n.s. = not significant

Table 3 shows the linear regression analysis of the direct measures on the related indirect measures of the RAA. Finding information to increase knowledge was positively associated with parents' attitude to search for information. The belief that increasing knowledge about the NIP is good, and that talking about the NIP with others is good, was also positively associated with parents' attitude. The behavioural beliefs explained 55% ($R^2 = .55$) of the variance in attitude to search for NIP information. The belief that friends, family, the general practitioner, and other parents, think that they should search NIP information was positively associated with perceived norm. Also, the belief that other parents and friends search for NIP information themselves was

Table 3 Linear regression analyses of direct RAA measures on the related indirect RAA measures

Behavioural belief strength	Attitude		
	b	S.E.	p-value
Finding information about the NIP increases my knowledge	0.15	.03	<.001
By searching for information about the NIP, it will be more easy for me to make a choice whether to vaccinate my child or not	0.05	.02	.03
By searching for information about the NIP, I will be more easy for me to talk with others about vaccination	0.00	.03	.90
Making a choice about whether or not to vaccinate my child, I think is... <i>Very bad-Very good</i>	0.02	.02	.33
Increasing knowledge about the NIP, I think is... <i>Very bad – Very good</i>	0.41	.03	<.001
R^2	.55		
Normative beliefs	Perceived Norm		
	b	S.E.	p-Value
My friends think I should search for information about the NIP	0.08	.03	<.05
My family think I should search for information about the NIP	0.43	.03	<.001
My general practitioner think I should search for information about the NIP	0.08	.03	<.01
My nurse/doctor at the child welfare centre think I should search for information about the NIP	0.00	.02	.99
Other parents in my environment with young children (0-4 years) think I should search for information about the NIP	0.16	.03	<.001
Most of my friends search for information about the NIP	0.09	.02	<.001
R^2	.85		
Control Beliefs	Perceived Control		
	b	S.E.	p-value
If I want, I know for sure that I am able to find information about the NIP	0.01	0.02	.47
If I want, I have enough skills to find information about the NIP	0.43	0.01	<.001
I can assess what reliable information about vaccines is	-0.00	0.01	.62
After reading all the pros and cons about vaccines, I can choose whether or not I will vaccinate my child	0.02	0.01	.05
R^2	.95		

Note: b = unstandardized regression coefficient, SE = Standard Error, R^2 = explained variance

positively associated with the direct measure perceived norm. The normative beliefs explained 85% ($R^2 = .85$) of the variance in perceived norm to search for NIP information. One item of the control beliefs: 'If I want, I am confident that I am able to find information about the NIP' was excluded from the regression analysis because of multi-collinearity. The other control beliefs: having enough skills, and being able to find the wanted information, were positively associated with perceived control. The control beliefs explained 95% ($R^2 = .95$) of the variance in perceived control to search for NIP information.

Differences in beliefs between high and low intenders

To determine differences in beliefs between those with higher and lower intention to search for vaccine related information, the sample was divided into two groups based on a median split in the intention distribution (median = 4.0), which is presented in Table 4. Parents with a high intention seem to have stronger beliefs that searching for vaccine related information will make it easier to make a decision whether to vaccinate their child or not. Parents with a high intention also felt a higher social pressure of their social environment (friends, family, general practitioner, nurse/doctor child welfare centre) to search for information. Parents with low and high intentions both felt confident to search for information and thought that they were able to find the information they were searching for.

Discussion

This study shows that most parents believe that health care workers at child welfare centers are the most reliable source to provide information about the NIP, which is in line with previous research (Freed, Clark, Butchart, Singer, & Davis, 2011; D. Gust et al., 2008; P.J. Smith, Kennedy, Wooten, Gust, & Pickering, 2006; Stefanoff et al., 2010). Parents would like to receive information that is presented in a brochure or folder, which is not in line with a study of Hak, Schönbeck, de Melker, et al. (2005), who showed that Dutch parents preferred to be educated by health care workers. Downs et al. (2008) showed that parents often feel under-informed and lack relevant vaccination knowledge, which is not completely in line with this study, where only 13% of the respondents reported not receiving enough information, mainly about side effects and possible negative consequences of childhood vaccination. It seems that the information provided by the RIVM is sufficient for most of the parents.

Although a small amount of the parents indicated to have a need for information, almost half of the respondents (46%) searched for information about the NIP. This is less than the amount of Dutch parents that searched for information during the H1N1 pandemic in 2009 (76% of vaccine decliners and 56% of vaccine acceptors) (Bults et al., 2011). The difference might be caused because the H1N1 was a pandemic with a lot of media attention. Parents perceived health care workers as the most reliable source of vaccine related information, but

Table 4 Difference between the beliefs of high and low intenders beliefs, based on a median split of intention

Indirect measures	Items	Low Intenders (n = 338) M (SD)	High Intenders (n = 254) M (SD)	p-value
Behavioural belief strength	- Finding information about the NIP increases my knowledge	4.84 (1.53)	4.97 (1.05)	.35
	- By searching for information about the NIP, it will be more easy for me to make a choice whether to vaccinate my child or not	3.99 (1.69)	4.49 (1.31)	<.01
	- By searching for information about the NIP, I will be more easy for me to talk with others about vaccination	4.25 (1.70)	4.51 (1.09)	.11
Outcome evaluation	- Making a choice about whether or not to vaccinate my child, I think is... <i>Very bad – Very good</i>	4.85 (1.57)	5.27 (1.39)	<.01
	- Increasing knowledge about the NIP, I think is... <i>Very bad – Very good</i>	4.87 (0.95)	5.13 (0.99)	.02
	- Talking about the NIP with others, I think is... <i>Very bad – Very good</i>	4.55 (1.06)	4.95 (0.97)	<.001
Injunctive normative belief	- My friends think I should search for information about the NIP	1.71 (0.85)	2.92 (1.13)	<.001
	- My family think I should search for information about the NIP	1.97 (1.12)	2.99 (1.13)	<.001
	- My general practitioner think I should search for information about the NIP	1.87 (1.06)	2.96 (1.12)	<.001
	- My nurse/doctor at the child welfare centre think I should search for information about the NIP	2.05 (1.26)	3.14 (1.25)	<.001
	- Other parents in my environment with young children (0-4 years) think I should search for information about the NIP.	1.90 (1.01)	3.01 (1.16)	<.001
Descriptive normative belief strength	- Most of my friends search for information about the NIP	2.15 (1.22)	3.16 (1.09)	<.001
	- Other parents in my environment with young children (0-4 years) search for information about the NIP	3.05 (1.36)	3.64 (1.04)	<.001
Power of control	- If I want, I know for sure that I am able to find information about the NIP	5.90 (1.16)	5.69 (1.06)	.07
	- If I want, I have confident that I am able to find information about the NIP	5.65 (1.23)	5.44 (1.06)	.09
	- If I want, I have enough skills to find information about the NIP	5.78 (1.37)	5.54 (1.15)	.08
Control belief strength	- I can assess what reliable information about vaccines is	4.25 (1.50)	4.33 (1.26)	.61
	- After reading all the pros and cons about vaccines, I can choose whether or not I will vaccinate my child	4.95 (1.60)	4.96 (1.35)	.91
	- I can find the information that I am searching for	5.35 (1.31)	5.26 (1.12)	.49

Note: M = Mean, SD = Standard Deviation, scale range: 1-7

they used the Internet most of the time to search for information, which is also shown in a study of Downs et al. (2008). This study shows that the information parents searched for most of the time (side effects and possible negative outcomes of vaccination) was the same information they missed from the Public Health Institute (PHI), despite the fact that side effects is a topic that is mentioned in the education material by the PHI in the Netherlands. It might be that the information provided by the PHI about side effects is not enough, or that parents do not read the material well enough and therefore feel under informed. PHIs should therefore try to improve their communication (materials) about childhood vaccination by including more or other information about side effects, and possible negative consequences of childhood vaccination. Healthcare workers should also be aware of the information need of parents, and try to educate them about side effects when parents visit the child healthcare centre.

To get insight into the drivers that influence parents' intention to search for vaccine related information, we used the Reasoned Action Approach (RAA) of Fishbein and Ajzen (2010). The measures of the RAA explained 34% of the variance in intention, which is somewhat lower than the average of 41% that was found in a review of the TPB by Godin and Kok (1996). Although the RAA seems to be a useful theory to explore drivers for vaccine related information seeking behaviour, other factors like: perceived hazard characteristics, affective response to risk, information sufficiency and someone's personal capacity to learn, which are part of the Risk Information Seeking and Processing (RISP) model of Robert J. Griffin, Dunwoody, and Neuwirth (1999), might increase the explained variance of intention by psychosocial determinants.

Overall, parents had a positive attitude towards information seeking about the NIP and perceived a low influence of their social environment to search for information. Although parents reported a low social pressure to search for information, parents' social environment seems to have a significant influence on the intention to search for information, which is in line with a study of Clarke and McComas (2012). Searching for information may be driven by people's social environment, because sharing information may contribute to the feeling of belonging to a group (Boot & Meijman, 2010).

This study showed that highly educated parents searched for more information and when parents were more negative about the NIP, they were more likely to search for information. Parents indicated that the information they found did not have a big influence at their attitude or intention to vaccinate or not. Although parents indicated that the information they found did not have a big influence, Betsch et al. (2010) showed in an experiment that searching for information might turn out to have a negative influence at parents' perceptions and intention to vaccinate, especially when they visit vaccine-critical websites. A study in the US (Kata, 2010) showed that when parents search for vaccine related information, out of the 30 sites, 21 were immunisation sites, and 5 of them were classified as anti-vaccination. In addition, Wolfe and Sharp (2005) showed that a search on the word "vaccination" produced more anti-vaccination than pro-vaccination websites. When parents use less specific search terms, they were more likely to find vaccine critical websites (Downs et al., 2008). To prevent parents from visiting

vaccine-critical websites, Public Health Institutes should be aware of parents information need, try to fulfil this need by improving their communication materials, and assure that their websites are easy to find, even when parents use negative search terms about the NIP. The PHI could also communicate to parents where to find reliable information about childhood vaccination.

Another aim of our study was to investigate two different invitation approaches (i.e., reply card versus Internet link in invitation letter) to test the difference in response rate. The parents who received a reply card had a higher response (11%), but not all parents completed the questionnaire, so at the end, the response rate of the two different approaches was the same (7%). The information letter with the link to the questionnaire is the preferred method, because this is a more time efficient approach compared to reply cards. When time is not an issue, more effort could be done to include all the parents who returned the reply card and did not complete the questionnaire to get a higher response rate. In this study, the response rate was doubled after sending a reminder. The positive effect of a reminder is also shown in other studies (Edwards et al., 2002; Göritz & Crutzen, 2012). We therefore recommend to use a reminder when sending out (online) questionnaires.

This study also has several limitations. First of all, there might be response bias, because the results of this study are based on an overall questionnaire response rate of 15%. Unfortunately no further data was available to compare participating parents with non-participating parents. A second limitation might be that although in the Netherlands 96% of all 12 to 75 year-olds use the internet, (Statistics Netherlands, 2012) only those who had access to the Internet could complete the questionnaire.

Conclusion

Only 13% of the respondents searched for extra information about the NIP, so the information provided by the NIP might be sufficient for most parents. However, some parents mentioned that they did not receive enough information about side effects of vaccinations. PHIs and child healthcare workers should therefore be aware of the importance to mention this aspect in their communication (materials) towards parents. Because most parents used the search engine on the internet to get vaccine related information, the PHI must ensure that their website is easy to find with different search strategies. This study also showed that parents who were more negative about the NIP were more likely to search for information about the NIP which might result in more negative attitudes because of the chance of visiting anti-vaccination websites. Listening carefully to the needs of parents who are more negative about the NIP and trying to fulfill their information need with reliable sources is therefore important. Because the child healthcare worker is perceived as the most reliable information source, they should be aware of their role in educating parents about the NIP.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors discussed the study design and research instrument. IH and GD prepared the questionnaire and performed the data collection and data analysis. IH wrote the first version of the manuscript. All authors contributed to the draft of the final manuscript; their remarks were discussed and processed into the final version that was finally approved by all authors.

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Chapter 7

A model of parents' intention to vaccinate their child

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A model of parents' intention to vaccinate their child.

Abstract

Insight into the determinants of parents' intention to participate in the National Immunisation Programme (NIP) is important to know which interventions are needed to maintain current high vaccination uptake. The aim of this study is to develop a theory- and data-based model of determinants of parents' intention to vaccinate their children within the NIP in The Netherlands. In total, 2150 parents with at least one child aged 0-3.5 years were invited to respond to an online questionnaire. Of the 2150 invited parents, 797 (37.1%) parents completed the questionnaire. Overall, parents had a positive intention and attitude towards childhood vaccination. Of all the respondents, 81.0% indicated that vaccinating their child was self-evident, and 82.6% indicated that they did not give much thought to their decision. Structural Equation Modelling (SEM) showed that beliefs about vaccines, anticipated regret, and attitude were the strongest predictors of intention. Attitude was most strongly affected by beliefs about the vaccines, moral norms towards vaccination, and trust in the NIP. The model explained 59% of variance in intention, and 53% of variance in attitude. The results indicate that interventions promoting vaccination uptake should at least target critical beliefs about the vaccines, anticipated regret, moral norms, and need to preserve trust in the NIP. Future research needs to verify if the applied framework also fits with other populations (i.e., parents who are critical towards vaccination, and populations in other countries).

Introduction

Routine vaccination programmes have shown to be effective in reducing vaccine-preventable diseases (WHO, 2012). The National Immunisation Programme (NIP) in The Netherlands is voluntary, free of charge, and protects against twelve infectious diseases. Vaccines are administered at a regular visit at Child Welfare Centers (CWC) or a CWC based on anthroposophy (a spiritual philosophy founded by Rudolf Steiner (Woonink, 2009)). In both centres, children aged 0–4 years also get free-of-charge health check-ups. The overall vaccination coverage in the NIP in The Netherlands is 95% (except for HPV) (van Lier et al., 2011).

Insights into the determinants that affect parents' vaccination intention provide leads for developing interventions and promoting vaccine uptake. Tickner et al. (2007) indicated that most parents who followed the recommended vaccination programme did not make an informed decision, and believed vaccinating their child was important. Furthermore, parents who chose to vaccinate their child feared the infectious diseases, however, they also believed that they were not at risk from the infectious diseases, but did not want to take risks with their child's health (Bond & Nolan, 2011). In contrast, parents who refused vaccination seemed to have done so because of perceived advantages of experiencing the disease, negative experiences with previous vaccinations, and the belief that the child is still too young because their immune system is not developed enough to cope with vaccinations (Harmsen, Mollema, et al., 2013). In addition, they doubted the safety and effectiveness of the vaccines, perceived the infectious diseases as not severe (Brown et al., 2010), and believed that vaccination is more risky than not being vaccinated (Gust, Brown, et al., 2005). In The Netherlands, some parents also refused vaccination based on religion and anthroposophy (Harmsen, Ruiter, et al., 2012; Ruijs et al., 2012).

Quantitative studies have tried to assess the relative importance of determinants in parental decision making about vaccination of their child(ren). These findings confirm the assumption of social cognition models of behaviour indicating that intention is the strongest predictor of (vaccination) behavior (Sheeran, 2002; van Keulen et al., 2010). Intention to vaccinate was found to be determined by parents' attitude towards vaccination, which in turn was influenced by parents' beliefs and perceived risks of the vaccine and the diseases, anticipated regret of not being vaccinated (Harmsen, Lambooi, et al., 2012; Paulussen et al., 2006), and trust (Gust, Kennedy, et al., 2005). Besides attitude, other predictors were found for parents' intention to vaccinate, in particular social norms (Harmsen, Lambooi, et al., 2012; Paulussen et al., 2006), practical barriers (Bates & Wolinsky, 2014; Gowda, Schaffer, Dombkowski, & Dempsey, 2012; Pulcini, Massin, Launay, & Verger, 2013), moral norm (Dubé et al., 2012; Juraskova et al., 2011), and making a deliberate choice whether to vaccinate or not (Harmsen, Lambooi, et al., 2012; Tickner et al., 2007).

The present study aims to update previous empirical work and the study by Paulussen et al. (2006), which was conducted in 2006 in The Netherlands, by identifying current determinants

of Dutch parents' intention to vaccinate their children, and by exploring possible relationships between determinants with the help of Structural Equation Modelling. More specifically, based on previous research (Bates & Wolinsky, 2014; Dubé et al., 2012; Gowda et al., 2012; Gust, Kennedy, et al., 2005; Harmsen, Lambooi, et al., 2012; Juraskova et al., 2012; Paulussen et al., 2006; Pulcini et al., 2013; Sheeran, 2002; Tickner et al., 2007; van Keulen et al., 2010), we hypothesized an empirical model in which intention is predicted by parents' perceived norms, perceived barriers, whether they made a conscious decision or not (consideration), and attitude; the latter as the most important predictor of intention. Parents' attitude in turn is determined by parents' anticipated regret of not vaccinating their child, trust in the NIP, beliefs about the vaccines, risk perception of the disease and side effects, perceptions about combination vaccines, and beliefs about diseases (see Figure 1).

Figure 1 Schematic illustration of theoretical model

Methods

Participants and procedure

Participants were selected and invited in collaboration with Flycatcher Internet Research (Flycatcher, 2014). The Flycatcher panel is only used for research, and not for marketing or sales. In total, 2150 parents with at least one child aged 0-3.5 years were invited to respond to the questionnaire. We aimed to get a representative sample of the Dutch population, therefore a randomized sample was taken for gender, age, and level of education. The digital questionnaire was pre-tested by Flycatcher (technically and content) before it was put online on January 29th

2013. On February 1st, a reminder was sent to the non-responders. The invited respondents had access to the questionnaire until February 5th 2013.

The questionnaire

The demographic variables age, gender, income and educational level were measured with appropriate items. Past vaccination behaviour was measured by asking parents the number of reported vaccinations their child had received, whether they vaccinated their children on time and, if relevant, reasons for postponing vaccination, and if they were affiliated with a particular religion or lifestyle. The psychosocial measures were based on 7-point Likert scales with points labeled as 1 = totally disagree, 2 = disagree, 3 = slightly disagree, 4 = do not disagree/do not agree, 5 = slightly agree, 6 = agree, 7 = totally agree (unless labels are otherwise indicated). Composite measures were constructed by averaging single-item scores if sufficient consistency was reached (Cronbach's alpha >.50 and when the outcomes of confirmatory factor analysis appeared satisfactorily (>.45). For the determinant risk perception, the perceived severity of the disease is multiplied with the perceived susceptibility of the disease (same for perceived severity and susceptibility of side effects) based on the description of risk perception in the protection motivation theory of Rogers (Rogers, 1983). These psychometric characteristics are presented in Table 1.

Data analysis

Descriptive analysis (frequencies) was used to describe characteristics of the sample. Differences in demographics between responders and non-responders, and the effect of demographic variables on intention were analysed with a multivariate logistic regression analysis, independent samples t-test, a one-way ANOVA, and a post hoc Bonferroni test.

Structural Equation Modelling (SEM) was used to examine the determinants of parents' intention to vaccinate their child or not, using R statistical software version 3.0.1 using Lavaan package (R, 2012). SEM is a statistical technique for testing and estimating causal relations (Kline, 2005). Before testing the full model, the associations between the psychosocial determinants were analysed with Pearson correlations. To test the complete structural model, all variables were entered simultaneously. To check all measures in the path model for normality, standard errors of $\sqrt{(6/N)}$ and $\sqrt{(24/N)}$ were used to evaluate the skewness (normal distribution when $S < 3.0$) and kurtosis (normal distribution when $K < 20.0$) (Kline, 2005). Intention was non-normally distributed and the path-model was first analyzed with a square-root transformed intention variable. Since the square-root intention and regular intention showed similar fit, this paper will report the regular intention measure. The model fit indices that were evaluated were: the Comparative Fit Index (FCI), the Tucker Lewis Index (TLI), the Root Mean Square Error of Approximation (SRMEA), and the Standardized Root Mean Square Residual (SRMR). A CFI > 0.90, a TLI > 0.90, RMSEA and SRMR reflects a good fit of values less than 0.05, or acceptable fit ranging between 0.05-0.08 (Kline, 2005). A non-significant χ^2 with a $p > 0.05$ threshold reflects

Table 1 Items, factor loadings and Cronbach's alpha of determinants

Determinants	Cronbach's Alpha (α)	Factor loadings
Attitude	0.92	
"I think vaccinating my children within the NIP is:"		
- Very bad-Very good		0.56
- Very unimportant-very important		0.57
- Very unnecessary-very necessary		0.72
- Very undesirable-very desirable		0.76
- Very unpleasant-very pleasant		0.76
- Very harmful-very harmless		0.78
- Very alarming-very reassuring		0.82
Perceived Norm	0.84	
The people who are important to me, appreciate it when I vaccinate my child(ren)		0.82
Other parents with children that I know, think it is important that I will vaccinate my child(ren)		0.86
The people who are important to me, vaccinate their child(ren)		0.82
Other parents with children that I know, vaccinate their child(ren)		0.63
Barriers	0.70	
In my situation it is impossible to make an appointment at the child health center for the vaccines of my child, when I have time/when I am available.		0.69
I did not understand the information about vaccinations for my child that I received together with the vaccination invitation.		0.77
I am afraid of the needles/jabs that my child gets when he/she gets vaccinated.		0.62
The distance from my house to the child health center is too far to get my child(ren) vaccinated.		0.75
Perception combination vaccines	0.67	
I think it is very unpleasant that I cannot choose for separate vaccines.		0.52
I think the use of combination vaccines is too much for the immune system of my child.		0.64
I think it is very unpleasant that my child receives two shots at one visit, because he/she will have pain twice.		0.74
Trust	0.90	
I trust the information that I receive from the government about the NIP.		0.63
When the government recommends vaccination for my child, I trust that this is good for my child.		0.61
I am confident that the pharmaceutical industry that makes the vaccine provides safe and effective vaccines.		0.65
I have confidence in the doctors and nurses of the Child Health Center.		0.80
I have confidence in the information I get from the nurses and doctors at the Child Health Center about the NIP.		0.73
I have confidence in the Dutch health care, when my child gets an infectious disease because he/she is not vaccinated, he/she will get good care.		0.71
Consideration	0.76	
Vaccinating my child(ren) is self-evident.		0.82
I do not have to think hard, whether I should vaccinate my child(ren) or not.		0.80
Before I choose to vaccinate my children or not, I have thought extensively about it.		0.44

Table 1 Items, factor loadings and Cronbach's alpha of determinants (continued)

Determinants	Cronbach's Alpha (α)	Factor loadings
Moral Norm	0.89	
I think it is bad when parents do not vaccinate their child within the NIP.		0.72
I think it is not done to refuse a vaccination within the NIP for my child.		0.78
I think it is my responsibility to get my child vaccinated within the NIP.		0.76
I think it is the responsibility of every parent to vaccinate his/her child within the NIP.		0.80
Intention	0.94	
I intend to vaccinate my children within the NIP.		0.87
It is very likely that I will vaccinate my child(ren) within the NIP.		0.82
I expect that I will vaccinate my children within the NIP.		0.86
Anticipated regret not vaccinating	-	
When I choose <u>not to vaccinate</u> my child and he/she will get an infection, I really would regret this decision		-
Risk perception disease	-	-
The target diseases (of the NIP) can be very severe.		
When I <u>do not vaccinate</u> my child, there is a big chance that he/she will get an infectious disease.		-
Risk perception side effects	-	-
The side effects of vaccinations within the NIP can be very severe.		
When I vaccinate my child within the NIP, there is a big chance he/she will get severe side effects.		-
Beliefs vaccine	0.83	
There are less infectious diseases in the Netherlands because of the NIP.		.64
The NIP promotes a healthy development of my child.		.81
There are substances in vaccinations within the NIP that might be harmful for the health of my child.		.52
Vaccinating my children within the NIP is a good way to protect the health of other children in the environment of my child.		.82
Vaccinating my children within the NIP is a good way to protect the health of adults in the environment of my child.		.75
By getting an infectious disease, you might get complications. Vaccinations within the NIP are a good way to protect complications of infectious diseases.		.81
I think it is unpleasant that vaccinations are painful for my child.		.03
I think my child is too young to get him/her vaccinated within the NIP when he/she is 2 months old.		.69
I think the immune system of my child is not developed enough when he/she is 2 months old, to be vaccinated within the NIP.		.70
Beliefs disease	0.83	
Experiencing an infectious disease contributes to a positive mental and physical development of my child.		0.87
Experiencing an infectious disease is positive for my child.		0.90
Experiencing an infectious disease will lead to a better lifelong protection than a vaccination.		0.75

a good fit, but it should be noted that the χ^2 is very sensitive to sample size, χ^2 nearly always rejects the model when large samples are used (Kline, 2005).

Results

Response

Of the 2150 invited parents with at least one child aged 0-3.5 years, 797 (37.1%) parents completed the questionnaire. A multivariate logistic regression analysis showed no significant differences between responders and non-responders on age (OR 1.02 = 95% CI: 0.99 – 1.05), woman (OR = 1.15, 95% CI: 0.89 – 1.48) versus man, and a small significant difference between medium (OR = 1.07, 95% CI: 0.67 – 1.71), and high education (OR = 1.37, 95% CI: 1.07 – 1.74) versus low education.

Descriptive statistics

The mean age of the respondents was 32.9 (SD = 3.9) years. About half of the respondents were women (51.8%). Most of the parents finished a medium (44.2%) or a higher level of education (34.9%), which is comparable with the statistics of the CBS (Statistics Netherlands) ((CBS), 2012). Most parents had a modal household income (21.3%) or income above modal (49.9%) (modal gross household income per year is €32 500 (CBS, 2012)). Of the respondents, 19.9% did not work (anymore) and 16.7% worked in the healthcare and welfare sectors. Most parents (81.4%) were born in The Netherlands, 3.4% in Turkey, 2.5% in Morocco, 2.4% in the (former) Dutch Antilles, 2.8% in Surinam, 3.4% in other non-Western countries, and 3.3% in other western countries. Almost half of the parents had one child (49.7%), other parents had 2 children (36.1%), 3 children (8.9%) or more than three (5.3%). Of all parents, 61.6% indicated that they were religious or affiliated with a particular lifestyle: religion (16.6%), homeopathy (12.8%), natural cure (13.5%), and anthroposophy (18.7%).

Of the respondents, 90.5% indicated that their youngest child was completely vaccinated, 6.9% of the respondents stated that their child was partially vaccinated, and 2.6% of the respondents indicated that their child was not vaccinated at all within the NIP. In total, 92.1% of the respondents answered that their child started with the vaccinations at the age of 2 months. Reasons for starting later than 2 months were: child was sick (32.6%), perceptions that child was too young to get vaccinated (33.6%), doubts about vaccinating their child (21.1%), or that it was not possible to make an appointment on time (13.4%).

An independent t-test showed no significant differences on the intention to participate in the NIP ($t(795) = -1.27, p = .20$) between men ($M = 5.86, SD = 1.23$) and women ($M = 5.97, SD = 1.18$). Parents who were born in The Netherlands ($M = 6.02, SD = 1.24$) were more likely to get their children vaccinated than parents who were not born in the Netherlands ($M = 5.72, SD = 1.12, t(795) = -3.30, p = .001$). A small positive association was found between age and parents

intention to vaccinate ($r = .09, p < .05$). A one-way ANOVA showed a significant difference on intention and parents educational level ($F(2, 795) = 3.73, p = .02$). Post hoc comparison using the Bonferroni test indicated that intention among parents with medium ($M = 5.83, SD = 1.28$) versus high educational level ($M = 6.08, SD = 1.15$) was significantly different ($p = .03$). The intention to vaccinate was not significantly different for parents with low educational level ($M = 5.83, SD = 1.12$) compared to medium and high educational level. The demographic variables were not included in the model testing, because we were mainly interested in the psychosocial determinants that influence parents' intention to vaccinate their child.

Psychosocial determinants of parents' intention to vaccinate their children

Table 2 shows the correlations and means (SD) of the psychosocial determinants. Overall, parents had a positive intention and attitude towards childhood vaccination. They experienced a high perceived social norm and not many barriers. Parents experienced a high moral norm and thought they would regret not vaccinating their children. They believed the targeted infectious diseases were severe and that their children were susceptible for the targeted infectious diseases. They did not think the side effects were very severe, and thought that their children were not very susceptible to the side effects. Parents trusted the information provided by the PHI, and the recommendations by the doctors and nurses of the CWCs to vaccinate their child. Of all the respondents, 81.0% (Scale 5-7 at 7-point Likert scale) indicated that vaccinating their child was self-evident and 82.6% (Scale 5-7 at 7-points Likert scale) indicated that they did not think long about vaccinating their child.

Table 2 shows that all psychosocial determinants included in the analyses were significantly correlated to vaccination intention and attitude, measures with $r = .10-.23$ indicate a small effect, $r = .24-.36$ indicates a moderate effect, and $r > .37$ indicating a large effect (Cohen, 1988, 1992). Strong positive correlations with intention were found for attitude, perceived social norm, perception about combination vaccines, trust in the NIP, moral norms, beliefs about effectiveness and components of vaccines, and anticipated regret when not vaccinating. Strong negative correlations with intention were found for perceived barriers, and making a deliberate choice whether to vaccinate or not reflected in the item 'consideration'. For attitude, strong positive correlations were found for perceptions about combination vaccines, trust in the NIP, moral norm, perceived risk of the disease, beliefs about effectiveness and components of the vaccines, and anticipated regret when not vaccinating. Strong negative correlations with attitude were found for making a deliberate choice whether to vaccinate or not (i.e., consideration), and the perceived risks of side effects.

Structural equation model for parents' intention to vaccinate their child

The model fit indices for the pre-defined model (Figure 1) were rather poor: CFI = 0.89, TLI = 0.77, RMSEA = 0.13, SRMR = 0.03, $\chi^2 = 0.00$. A final model (Figure 2) was defined by adding four paths based on the modification indices (reported change in χ^2 that result from freeing fixed

Table 2 Mean score (SD), and correlations of determinants

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Intention	-												
2. Attitude	.63**	-											
3. Perceived Norm	.40**	.36**	-										
4. Barriers	-.36**	-.30**	-.18**	-									
5. Combivaccines	.46**	.45**	.22**	-.36**	-								
6. Trust	.59**	.56**	.38**	-.36**	.54**	-							
7. Consideration	-.56**	-.49**	-.30**	.18**	-.32**	-.45**	-						
8. Moral Norm	.61**	.63**	.47**	-.18**	.39**	.56**	-.60**	-					
9. Risk perception disease	.34**	.37**	.33**	-.18**	-.17**	.31**	.32**	.44**	-				
10. Risk perception side effects	-.41**	-.37**	-.14**	.27**	.44**	-.47**	-.26**	-.38**	.03	-			
11. Behavioural beliefs vaccine	.63**	.63**	.44**	-.36**	.67**	.66**	-.47**	.64**	.35**	-.53**	-		
12. Behavioural beliefs disease	-.29**	-.21**	-.18**	.25**	-.28**	-.23**	.14**	-.22**	-.12**	.27**	-.34**	-	
13. Anticipated regret not vaccinating	.60**	.55**	.43**	-.21**	.29**	.42**	-.48**	.65**	.46**	-.23**	.53**	-.24**	-
Mean score	5.92	5.39	5.23	2.34	4.73	5.19	2.95	5.22	4.06	2.21	4.71	3.55	5.86
SD	1.21	1.12	1.08	1.06	1.23	1.00	0.89	1.33	1.50	1.34	0.86	1.26	1.39

Note: ** $p < .01$, SD = standard deviation

parameters) and strong significant correlations, including paths from moral norm to attitude, and from anticipated regret, trust in the NIP, and beliefs vaccine to intention. This final model showed a good fit with CFI = 0.99, TLI = 0.96, RMSEA = 0.05, SRMR = 0.01, and $\chi^2 = 0.003$. The model showed that parental intentions to vaccinate their child is best predicted by; a positive attitude, having trust in the NIP, high perceived social norms, high moral norms, high anticipated regret of not vaccinating, not making a deliberate decision, having positive beliefs about vaccines, and low perceived barriers of getting their child vaccinated. A high risk perception of the disease, the perception that combination vaccines are good, positive beliefs about the vaccines, high anticipated regret of not vaccinating, high trust in the NIP, and high moral norm influenced a positive attitude of parents about childhood vaccination. The model explained 59% of variance in intention, and 53% of variance in attitude.

Figure 2 Structural equation model of parents' vaccination intention. (N = 797, R² = explained variance, ovals represent latent variables, rectangles represent observed variables, behaviour has not been measured).

Discussion

This study shows that parents have a positive intention and attitude towards vaccination, and that parents perceive vaccinating their child as self-evident. The beliefs about vaccines,

anticipated regret, and attitude are the strongest predictors of intention. Attitude is most strongly influenced by beliefs about the vaccines, moral norm to vaccinate, and trust in the NIP.

Of the parents, 81.0% mentioned that vaccinating their child was self-evident, and 82.6% indicated that they did not think long about vaccinating their child. These percentages are in line with a study of Paulussen et al. (2006), which showed that 81% of the parents believed vaccinating was self-evident. Thus, it seems that the amount of parents who did not make a deliberate choice to vaccinate their child(ren) did not change over the last eight years. As Paulussen et al. (2006) already mentioned in their discussion, these parents did not form a full picture of the benefits and drawbacks of vaccinating their children, and might therefore be more vulnerable for counter-arguments expressed by other parents or in public media. To avoid this, the Public Health Institutes (PHIs) and Child Vaccine Providers (CVPs) should assure that all parents make a deliberate decision, that they are aware of the benefits and drawbacks of vaccination, and are thereby less prone to negative messages about the NIP.

This model is in line with other research, which showed that parental attitude, perceived social norms, practical barriers, moral norm to vaccinate, and making a deliberate choice whether to vaccinate their child or not influenced parents' intention to get their child vaccinated (Bates & Wolinsky, 2014; Dubé et al., 2012; Gowda et al., 2012; Gust, Kennedy, et al., 2005; Harmsen, Lambooi, et al., 2012; Juraskova et al., 2012; Paulussen et al., 2006; Pulcini et al., 2013; Tickner et al., 2007). This study also showed that attitude towards vaccination is predicted by beliefs and perceived risk of vaccines and diseases, anticipated regret of not vaccinating, and trust in the NIP, which is also presented in other research (Gust, Kennedy, et al., 2005; Harmsen, Lambooi, et al., 2012; Paulussen et al., 2006). The fit of the first proposed model increased by including paths from moral norm to attitude, and from trust, anticipated regret and beliefs about vaccines to intention. A relation with anticipated regret and vaccination intentions was shown previously (Godin, Vezina-Im, & Naccache, 2010) and van der Weerd, Timmermans, Beaujean, Oudhoff, and van Steenbergen (2011) also showed in their study that high levels of trust in the government was associated with high levels of intention to receive the vaccination (against H1N1). So far, no research showed a pathway from moral norm and beliefs about the vaccine to intention. More research should be done to get insight into whether these pathways will also be shown in other populations.

The final model showed a good fit, which means that our model is a good representation of parents' intention to make decisions about vaccinating their child(ren) or not. However, more research is needed to find out whether this model also represents a good fit in other populations (i.e., among critical parents and populations in other countries). Some limitations of this study should be mentioned. A limitation of SEM is that we calculate a causal relationship, while this is a cross-sectional study, therefore the model should be tested in future longitudinal research designs. Another limitation might be that we used participants from an internet research panel, because they are used to complete questionnaires. This model should also be tested among Dutch parents who are not part of an internet research panel.

This model is important for PHIs to get insight into the decision making of parents about whether to vaccinate their child or not. By getting insight into the most important determinants and their relations, practitioners and developers are better equipped to select the primary targets for their interventions. First of all, attitude plays a major role in parental decision-making. For sustaining a high attitude, communication should focus on rewarding outcomes, which makes sure that parents are aware of the vaccines protection, and are able to cope with possible negative outcomes (such as side effects of vaccines) (Maibach & Cotton, 1995). Secondly, beliefs about vaccines are an important determinant, not only as a predictor of attitude, but also directly to intention. Based on this model, it seems that the beliefs about vaccines (effectiveness of the vaccine, influence of vaccine at immune system, and the vaccine being painful) are more important in parents' decision making than beliefs about the infectious diseases. Communication should therefore focus on the characteristics and efficacy of the vaccines. Thirdly, a high moral norm positively affects attitude and intention. Moral norm can be incorporated in communication, for example by positioning vaccination in the context of "good parenting" (Petty & Cacioppo, 2009). Fourthly, a method to increase anticipated regret is asking people to imagine how they would feel after not vaccinating their child (Richard, van der Pligt, & De Vries, 1995). Fifthly, another important determinant appeared to be trust (in the government, in the information, and in CVPs that administer the vaccines). Cooper, Larson, and Katz (2008) indicated that sustaining a high trust is important and therefore governments and PHI should listen and understand perceptions of the public about the vaccination programme. In that way, they are better able to inform them about risks and vaccines, and also able to incorporate their beliefs and perceptions in planning vaccine policies.

In conclusion, this study showed a model that represents important determinants and their pathways in vaccination decision making among parents. This leads to relevant input on aspects needing attention in communication. Some suggestions have been made about how to improve the communication based on the results of this model. Nevertheless, more research is needed about how to develop effective communication materials and strategies to inform parents about childhood vaccination.

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Chapter 8

Child vaccine providers' experiences with the National Immunisation Programme and their consults with parents

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Abstract

Child Vaccine Providers (CVP) provide health check-ups for children, administer vaccines, and communicate with parents about health related topics and the National Immunisation Programme (NIP). Parents perceive CVPs as the most reliable source for vaccine information. We performed a questionnaire study to get more insight in CVPs attitude towards the NIP, experiences with the NIP, their need for information and education, and their experience with (critical) parents who visit the child welfare centre (CWC). We conducted a cross-sectional study by means of an online self-report questionnaire. In total, 25 managers of CWC organizations were willing to recruit CVPs in their organization for participation in the research. They sent the questionnaire to 1427 CVPs and 432 (30%) CVPs completed the questionnaire. CVPs reported a positive attitude towards the NIP, and perceived the targeted diseases within the NIP as severe. A part of the CVPs (39.8%) indicated that they sometimes avoid a discussion with parents about the NIP, because of time limit and not being able to answer all questions. Most CVPs spent 1-2 minutes or 2-5 minutes on informing parents about the NIP during a consult, while 12% of the CVPs do not inform parents at all. Only 16.4% received education in how to communicate with parents about the NIP, and 51.4% would like to receive more education about the NIP. CVPs were satisfied with the current NIP, which is well organized in their opinion. Although CVPs mentioned they were able to communicate about the NIP with parents, the majority of CVPs would like to be trained in how to communicate with critical parents. More research is needed into effective education programmes for CVPs to communicate with (critical) parents, including allotting more time for CVPs to inform parents.

Introduction

Professional healthcare workers play a key role in National Immunisation Programmes (NIP), because they administer the vaccines and communicate with parents about the NIP. These child vaccine providers (CVPs) are perceived by parents as the most reliable source for vaccine information (Freed et al., 2011; D. Gust et al., 2008; Harmsen, Doorman, et al., 2013; Hesse et al., 2005; Stefanoff et al., 2010) and their (positive) attitude towards the NIP is important because it may have an impact on parents' attitudes and intention to vaccinate their children (Freeman & Freed, 1999a; Stefanoff et al., 2010; Swennen et al., 2001; Taylor & Newman, 2000).

Various studies have been conducted to get insight in CVP's attitude towards the NIP and communication with parents about the NIP. These studies have indicated that CVPs in general have a positive attitude towards childhood vaccinations and that they evaluate vaccinations as safe, effective and necessary (Leask et al., 2008). But also that they experience insufficient time to communicate with parents, have a need for more information to be better able to address parental concerns and to promote childhood vaccination, and that they are concerned about the components, numbers of vaccines, and timing of vaccines within the programme (Cotter, Ryan, Hegarty, McGabe, & Keane, 2003; Leask et al., 2008). These findings have been supported by a recent qualitative study in the Netherlands (Mollema, Staal, et al., 2012).

In the Netherlands, the immunisations are obtained at Child Welfare Centres (CWCs). Parents visit with their children (0-4 years old) the CWC for non-mandatory health check-ups and NIP vaccinations, all free of charge. Parents can choose between a regular CWC (there are 1282 regular CWCs in the Netherlands (Atlas, 2014)) or a CWC based on anthroposophy, a spiritual philosophy founded by Rudolf Steiner (Woonink, 2009) (there are 25 anthroposophical CWCs in the Netherlands (Harmsen, Ruiter, et al., 2012)). When the infant is two weeks old, a nurse of the CWC visits the parents at their home and give some oral NIP information. Parents receive through surface mail a brochure with information about vaccines, diseases, the vaccination schedule, side effects, and with a reference to the website of the Public Health Institute (PHI) when the child is 4-6 weeks old. Children receive their first vaccination at the CWC when they are 8 weeks old. In the Netherlands children are vaccinated against twelve target diseases (i.e., polio, diphtheria, tetanus, pertussis, rubella, measles, mumps, disease caused by *Haemophilus influenzae* type b, meningococcal C disease, hepatitis B, pneumococcal disease and cervical cancer caused by human papillomavirus (HPV)) (van Lier, van de Kasstelee, et al., 2013).

Because only a qualitative study of Mollema, Staal, et al. (2012) was performed in the Netherlands, a questionnaire study was performed to get more quantitative insight in CVPs attitude, experience with the NIP, their need for information and education, and their experience with (critical) parents who visit the CWC.

Methods

Design and procedure

We conducted a cross-sectional study by means of an online self-report questionnaire. The management of all CWC organizations (there are multiple CWCs within one organization) in the Netherlands were asked (in December 2013) to recruit CVPs in their organization for participation in this study. They received an e-mail with an explanation of the study and a link to the online questionnaire. In addition, all managers of CWCs were asked to e-mail the researchers about their decision to participate and to how many CVPs they sent the link to the questionnaire. In the invitation letter and at the start of the questionnaire, respondents were assured of their privacy and confidentiality of their responses. The respondents who participated gave their informed consent by filling out the questionnaire.

Questionnaire

The (demographic) variables gender, age, at which organization the CVPs worked for, for how many years and how many hours per week, were measured with appropriate items. Questions about the number of injections during one consult, information need and provision, questions about the attitude of parents towards the NIP that visit the CWC, dialogue with the parents, and educational need of CVPs, were also measured with appropriate items (see Table 1). The other items (see Table 2) were based on 7-point Likert scales with points labeled as 1 = totally disagree, 2 = disagree, 3 = slightly disagree, 4 = do not disagree/do not agree, 5 = slightly agree, 6 = agree, 7 = totally agree (unless labels are otherwise indicated). Items that measured attitude (i.e. 'I think the NIP is...very good – very bad'; 'very important – very unimportant'; 'very necessary – very unnecessary'; 'very desirable – very undesirable'; 'not harmful at all – very harmful'; 'not worrying at all – very worrying') were averaged into one single concept when they showed sufficient internal consistency (Cronbach's alpha $\alpha > .60$). Specific belief-items were derived from the qualitative study of Mollema, Staal, et al. (2012) and additional focus groups with CVPs in the Netherlands performed by the first author (unpublished data). The main topics of the questionnaire were; CVPs' experience with the NIP, risk perception of diseases and perceived side effects of vaccines within the NIP, experience with information supply, experience and dialogue with parents that visit the CWC, informing parents, CVPs' education need, and perceptions towards possible new vaccines in the future.

Data analyses

To analyze the data, IBM SPSS Statistics version 19.0 was used. Descriptive analyses were performed to summarize all the variables. To find out whether there are differences between doctors and nurses, independent sample *t*-tests were conducted.

Results

The results section starts with a description of the respondents, thereafter the results are described in order of the main topics in the questionnaire. The answers to the multiple-choice items with the highest percentages are described in the text and all items and answers of the multiple-choice questions are presented in Table 1. The means and standard deviations of the scaled items are not described in the text, but presented in Table 2. The findings on doctors and nurses are described together and the few differences between them are described at the end of the results section and presented in Table 2.

Descriptive statistics

In total, 25 managers of CWC organizations invited a total of 1427 CVPs for completing the online questionnaire, and 432 (30%) CVPs finally completed the questionnaire. Almost all respondents were female (98%), and worked at a regular CWC (99.5%), only two CVPs worked at an anthroposophical CWC (0.5%). Most of the respondents were nurses (64.6%), the other respondents were doctors (35.4%). The mean age of the respondents was 45.8 years. Almost half of the respondents (45.8%) worked 17-24 hours per week, and worked for more than 15 years at a CWC (41.7%).

Perception NIP

CVPs had a positive attitude towards the NIP. The CVPs did not feel that their opinion about the NIP had changed over the past five years. CVPs were satisfied with the way the current NIP is organized, and did not think there are too many vaccines within the NIP.

Perception diseases and side effects of vaccines

CVPs reported that the targeted diseases within the NIP are severe. They were not sure whether children who *were not* vaccinated are susceptible for the target diseases and did not think that children who *were* vaccinated are susceptible for the target diseases. CVPs believed that side effects from vaccines within the NIP are not very severe, and that there is a small chance that children get severe side effects from vaccines in the NIP.

Combination vaccines

Most CVPs indicated that two injections during one consult is the maximum number (66.4%). However, 17.1% mentioned that when there are good reasons, any number of injections during one consult is acceptable. The CVPs did not think that there are too many combination vaccines within the NIP, and did not want a flexible NIP, where parents can choose their own vaccination schedule for their children.

Table 1 items and percentages

Items	%
How many injections are acceptable for you during one consult?	
- 1 injection	1.6%
- 2 injections	66.4%
- 3 injections	10.2%
- 4 injections	4.6%
- When there is a good reason, any number of injections is acceptable	17.1%
When there are changes within the NIP, I would like (besides the information we already receive) <u>more</u> information.	
- Yes	31.0%
- No	69.0%
What is the percentage of parents that visit the CWC who...:	
- Have questions about the NIP	29.0%
- Have doubts about whether to vaccinate their child(ren) or not	8.9%
- Have a negative attitude towards the NIP	5.7%
- Partially refuse vaccination	5.5%
- Do not want to vaccinate their children at all	3.2%
Which parents that visit your CWC have a lot (more than average) questions about the NIP? *	
- High educated parents	83.3%
- Medium educated parents	22.7%
- Low educated parents	4.6%
- Parents who have religious objections against vaccination	25.9%
- Anthroposophical parents	53.2%
- Immigrant parents	3.5%
- Parents with a homeopathic lifestyle	50.0%
- Parents who are member of the Dutch Association Critical Vaccination	28.2%
Which parents that visit your CWC have a few (less than average) questions about the NIP? *	
- High educated parents	6.7%
- Medium educated parents	36.6%
- Low educated parents	82.6%
- Parents who have religious objections against vaccination	14.1%
- Anthroposophical parents	3.7%
- Immigrant parents	64.1%
- Parents with a homeopathic lifestyle	0.9%
- Parents who are member of the Dutch Association Critical Vaccination	2.3%
Parents who have questions, ask most questions about: *	
- Side effects of vaccination	93.3%
- Postponing vaccination	79.2%
- Immune system of the child	31.5%
- Long term consequences of vaccination	32.9%
- Seriousness of the disease	18.3%
- Frequency of occurrence disease	23.8%
- Role pharmaceutical industry NIP	14.6%

Table 1 items and percentages (continued)

Items	%
- Finance of the NIP	1.2%
- Decision-making of including vaccine in the NIP	5.6%
- Independence of RIVM	11.3%
- Leave out vaccines NIP	41.9%
Which parents that visit your CWC have doubts about the NIP? *	
- High educated parents	65.0%
- Medium educated parents	23.8%
- Low educated parents	4.9%
- Parents who have religious objections against vaccination	31.3%
- Anthroposophical parents	58.8%
- Immigrant parents	1.9%
- Parents with a homeopathic lifestyle	52.3%
- Parents who are member of the Dutch Association Critical Vaccination	25.2%
Which parents that visit your CWC have a negative attitude about the NIP? *	
- High educated parents	28.2%
- Medium educated parents	7.6%
- Low educated parents	3.5%
- Parents who have religious objections against vaccination	35.9%
- Anthroposophical parents	57.4%
- Immigrant parents	0.9%
- Parents with a homeopathic lifestyle	41.0%
- Parents who are member of the Dutch Association Critical Vaccination	38.7%
I avoid discussion with parents about the NIP, because....: *	
- I never avoid discussion with parents	60.2%
- This negatively influences my relationship with the parent(s)	11.6%
- I do not have enough time during the consult	20.4%
- I am not able to answer all questions	15.3%
When parents have many questions or have doubts about vaccination, we offer them an extra consult.	
- Yes	55.3%
- No	44.7%
How often do you schedule an extra consult (on average)?	
- Once per week	1.7%
- Once per month	5.9%
- Once every six months	31.0%
- Once a year	23.0%
- Less than once a year	33.1%
- Other	5.4%
How long does the extra consult take (on average)?	
- 0-5 minutes	2.5%
- 6-10 minutes	19.7%
- 11-15 minutes	37.2%
- 16-20 minutes	37.2%
- Longer than 20 minutes	3.3%

Table 1 items and percentages (continued)

Items	%
Which topics are mostly discussed during the extra consult? *	
- Nip schedule	67.4%
- Components vaccines	28.9%
- How the vaccines work	55.6%
- Preventing the infectious diseases	54.4%
- Symptoms of the infectious diseases	28.0%
- Severity and susceptibility for infectious diseases	49.0%
- Side effects of vaccines	68.6%
- Alternatives of vaccination	20.1%
Who will provide the extra consult?	
- The CWC doctor	63.3%
- The CWC nurse	3.8%
- Both	31.0%
- Other	1.7%
How many minutes do you spend giving NIP information to the parents?	
- Less than 1 minute	6.9%
- 1-2 minutes	37.7%
- 2-5 minutes	39.4%
- 5-7 minutes	9.7%
- 7-10 minutes	3.9%
- 10-15 minutes	1.6%
- More than 15 minutes	0.7%
How many minutes would you like to spend giving NIP information to the parents?	
- Less than 1 minute	3.7%
- 1-2 minutes	29.6%
- 2-5 minutes	44.0%
- 5-7 minutes	15.7%
- 7-10 minutes	5.8%
- 10-15 minutes	0.5%
- More than 15 minutes	0.7%
When I give information to the parents, I give most of the times information about: *	
- I do not give information to parents at all about the NIP	11.8%
- Side effects	90.0%
- Where to report side effects	38.4%
- Why the current vaccines are included in the NIP	31.7%
- NIP schedule	72.9%
- Seriousness of diseases	22.0%
- Susceptibility of the diseases	6.0%
- Decision-making inclusion vaccine in NIP	3.5%
- Finance of NIP	0.7%
- Role pharmaceutical industry NIP	0.5%
- Development of vaccines	1.6%
The information leaflet for the parents (that is provided by the RIVM) contains sufficient information	

Table 1 items and percentages (continued)

Items	%
- Yes	93.3%
- No	6.7%
Have you received education in how to communicate with parents about the NIP?	
- Yes	16.4%
- No	60.0%
- I don't know	23.6%
Have you received education in how to communicate with parents that are critical about the NIP?	
- Yes	11.3%
- No	66.9%
- I don't know	21.8%
I would like to receive more education about the NIP	
- Yes	51.4%
- No	48.6%
I would like to get education about: *	
- How to discuss vaccination with parents who are critical or have doubts about the NIP	67.1%
- Vaccinations within the NIP	36.5%
- Side effects of vaccination	51.4%
- Contra-indications of vaccination	49.1%
- Seriousness of the target infectious diseases	42.8%
- Susceptibility of children for target infectious diseases	42.8%
- Decision-making of inclusion of vaccines within the NIP	38.3%
- Finance of NIP	13.5%
- Role pharmaceutical industry NIP	38.7%
- Schedules when child missed one or more vaccines	57.2%

Note: * Multiple answers possible

Information about NIP

CVPs indicated that they received information on time and that they get enough information from the PHI about changes within the NIP (69.0%). They believed the information from the PHI was objective. The CVPs were satisfied about the amount of science-based updates of the NIP, but they would like to know more about the NIP messages that are spread by the media and the internet.

CVPs' perceptions of parental concerns

CVPs estimated that approximately one-third (29.0%) of the parents who visit the CWC have questions about the NIP, 8.9% of the parents have doubts about vaccination, and 5.7% of the parents have a negative attitude towards vaccination. Overall, CVPs accepted that parents have doubts about whether to vaccinate their child or not, but did not understand that parents refuse to vaccinate their children.

CVPs were asked which parents have most and least amount of questions at the CWC about the NIP. Of the CVPs 83.3% mentioned that high-educated parents, 53.2% that anthroposophical

parents, and 50.0% that parents with a homeopathic lifestyle have many questions. About 82.6% of the CVPs reported that parents with a lower education asked the least amount of questions when they visit the CWC, whereas 64.1% of the CVPs thought this is the case for immigrant parents. Most frequently asked questions of parents are about side effects of vaccines (93.3% of the CVPs), delay of vaccines (79.2% of the CVPs) and refusing vaccines within the NIP (41.9% of the CVPs).

CVPs were asked which parents have doubts about vaccinating their children and which parents have a negative attitude towards childhood vaccination. Of the CVPs, 24.1% reported that high-educated parents, 21.8% that anthroposophical parents, and 19.4% that parents with a homeopathic lifestyle have doubts about whether to vaccinate their child or not. CVPs mentioned that anthroposophical parents (57.4% of the CVPs), parents with a homeopathic lifestyle (41.0% of the CVPs), parents who were member of the Dutch Association of Critical Vaccination (38.7% of the CVPs), and orthodox Protestants (35.9% of the CVPs) have a negative attitude towards childhood vaccination.

Dialogue with parents about the NIP

CVPs indicated that they mostly inform parents about the NIP and that most of the times they try to persuade parents when they doubt the vaccinations. The CVPs thought they were very well able to explain to parents why vaccines are provided within the NIP, they felt sufficiently confident when parents asked critical questions, and they felt some trust in responding to these questions. They mentioned that it is sometimes hard to have a discussion with parents about the NIP, and 39.8% of the CVPs sometimes avoided discussion with parents about the NIP. The reasons for avoiding discussions were time constraints (20.4%), not knowing the answers to all questions (15.3%), and that it might negatively influence their relationship with the parents (11.6%). CVPs evaluated their relationship with parents who are, versus who are not critical towards vaccination, equally well.

Informing parents about the NIP

During one consult, 37.7% of the CVPs spent 1-2 minutes on informing parents about the NIP, 39.4% 2-5 minutes. Of the CVPs, 44.0% would like to spend 2-5 minutes to inform parents about the NIP, and 29.6% 1-2 minutes. Some CVPs (11.8%), most nurses (65%), did not inform parents about the NIP at all. The CVPs who informed parents (88.2%), gave information about side effects (90.0%), the NIP schedule (72.9%), and where to report side effects (38.4%). They indicated not always having enough time to provide information towards parents about the NIP. Almost all CVPs believed that the information leaflet that parents usually receive about the NIP contains sufficient information (93.3%).

Extra consult NIP

More than half of the CVPs (55.3%) offered an extra consult at their CWC when parents had many questions about the NIP. A third of the CVPs mentioned that the CWC they work for

scheduled an extra consult less than once a year (33.1%), 23% did so once a year, or once every six months (31.0%). CVPs mentioned that an extra consult took 11-15 minutes (37.2%), or 16-20 minutes (37.2%). During an extra consult the CVPs mentioned to provide information about; side effects of vaccines (68.6%), the NIP schedule (67.4%), how the vaccines work (55.6%), and presence of infectious diseases (54.4%). The extra consult was most of the times provided by the doctor (63.3%) from the CWC.

Education experience, and need for education

Only 16.4% of the CVPs indicated they have received education in how to communicate with parents about the NIP, and 11.3% in how to communicate with critical parents about the NIP. Half of the CVPs would like to receive more education about the NIP (51.4%). These CVPs would like to receive more education about: how to discuss the NIP with parents who are critical or who have doubts (67.1%), catch-up schedules (i.e. when a child missed a vaccine in the NIP schedule) (57.2%), possible side effects of vaccines within the NIP (51.4%), and contra-indications of vaccines (49.1%).

Cross-tabbing of being educated with received education, showed that of CVPs who would like to be educated in how to discuss the NIP with parents who are critical or have doubts (67.1%), 8.8% already received education in how to discuss the NIP with parents, 70.5% never received education and 20.9% cannot remember whether they received education or not. Of the CVPs who trusted their ability to communicate with parents about the NIP (86.6%), 65% would like to receive additional education in how to communicate with (critical) parents about the NIP.

New vaccines

CVPs believed a vaccine against meningococcal type b disease, disease caused by the respiratory syncytial virus, and disease caused by rotavirus within the NIP was most necessary. CVPs perceived a vaccine within the NIP against varicella and influenza as less important.

Differences between doctors and nurses

Doctors had more often a positive attitude towards the NIP, and believed that the NIP was better organized than nurses. Doctors perceived the diseases as more severe and nurses believed children were more susceptible for infectious diseases. The nurses were also more likely to believe that the number of vaccines within the NIP is too much and were somewhat less positive about combination vaccines. Nurses also believed more than doctors did that children are susceptible for side effects of vaccines. Nurses were more satisfied about the amount of time during a consult to discuss the NIP with parents, but felt less confident in answering all questions of parents about the NIP. Nurses also perceived the information provided by the PHI as somewhat less objective. The doctors were more positive about possible new vaccines like varicella and Meningococcal type B.

Table 2 Mean score (SD) of items questionnaire, Means (SD) of nurses and doctors and independent sample t-test of doctors and nurses

Item*	Mean (SD) (N = 432)	Mean (SD) doctors (N = 153)	Mean (SD) nurses (N = 279)	p-value differences doctors / nurses
Attitude ($\alpha = .82$)	6.22 (0.45)	6.34 (0.46)	6.16 (0.44)	$t(428) = 4.09, p < .001$
Did your opinion about the NIP changed the past 5 years? My opinion... (1 = became much more positive, 2 = became more positive, 3 = remained the same, 4 = became more negative, 5 = became much more negative)	2.89 (0.54)	2.88 (0.57)	2.89 (0.52)	$t(428) = -0.52, p = 0.60$
I am really satisfied with the current NIP.	5.74 (0.93)	5.82 (0.82)	5.69 (0.98)	$t(428) = 1.60, p = .11$
The NIP is very well organized.	6.19 (0.62)	6.32 (0.51)	6.13 (0.66)	$t(428) = 3.21, p < .01$
I think that the amount of infectious diseases against which is vaccinated within the NIP (12 infectious diseases) is too much.	2.82 (1.52)	2.45 (1.45)	3.01 (1.53)	$t(323) = -3.89, p < .001$
The diseases against which is vaccinated within the NIP can be very severe.	6.36 (0.66)	6.57 (0.52)	6.25 (0.70)	$t(428) = 4.89, p < .001$
I think there is a good chance that children who are not vaccinated get an infectious disease (against which is vaccinated within the NIP).	4.17 (1.54)	3.79 (1.63)	4.37 (1.45)	$t(279) = -3.62, p < .001$
I think there is a good chance that children who are vaccinated get an infectious disease (against which is vaccinated within the NIP).	2.12 (1.06)	1.88 (0.95)	2.26 (1.10)	$t(346) = -3.81, p < .001$
I think the side effects of vaccines within the NIP can be very severe.	2.75 (1.43)	2.52 (1.40)	2.88 (1.44)	$t(428) = -2.49, p = 0.01$
I think there is a good chance that children get very severe side effects of vaccines within the NIP.	2.00 (0.92)	1.81 (0.86)	2.11 (0.93)	$t(330) = -3.31, p < .01$
Many children get very severe side effects of vaccines within the NIP.	1.74 (0.72)	1.56 (0.63)	1.83 (0.76)	$t(358) = -4.03, p < .001$
I think there are too many combination vaccines within the current NIP.	2.36 (1.29)	2.11 (1.28)	2.50 (1.27)	$t(428) = -3.05, p < .01$
I would like a flexible NIP: that I can decide together with the parents, when and what vaccine the child gets.	2.63 (1.72)	2.52 (1.51)	2.68 (1.60)	$t(428) = -1.02, p = .31$
When there are changes within the NIP we receive information on time.	5.64 (1.11)	5.64 (1.06)	5.65 (1.12)	$t(428) = 0.15, p = .88$
The information that we receive, provided by the PHI, is objective.	5.37 (1.06)	5.59 (0.88)	5.24 (1.14)	$t(376) = 3.22, p < .001$
I do not receive enough information about updates of scientific research about the NIP.	3.98 (1.53)	4.21 (1.47)	3.86 (1.56)	$t(428) = 2.22, p = .03$
I would like to receive updates about what is going on in the media and internet about the NIP.	5.10 (1.35)	5.22 (1.34)	5.04 (1.36)	$t(428) = 1.29, p = .20$

Table 2 Mean score (SD) of items questionnaire, Means (SD) of nurses and doctors and independent sample t-test of doctors and nurses (continued)

Item*	Mean (SD) (N = 432)	Mean (SD) doctors (N = 153)	Mean (SD) nurses (N = 279)	p-value differences doctors / nurses
I know who to contact when I have questions about the NIP.	6.15 (0.94)	6.18 (0.83)	6.14 (0.99)	$t(428) = 0.49, p = .63$
I do understand when parents have doubts about whether to vaccinate their child(ren) or not.	4.75 (1.37)	4.65 (1.50)	4.81 (1.30)	$t(272) = -1.16, p = .25$
I do understand when parents do not want to vaccinate their child(ren).	2.95 (1.44)	2.82 (1.42)	3.03 (1.45)	$t(428) = -1.47, p = .14$
When parents have questions about the NIP, I always start a conversation with them.	6.28 (0.67)	6.39 (0.55)	6.21 (0.71)	$t(428) = 2.59, p = .01$
I always try to convince parents to vaccinate when they have doubts about it.	5.25 (1.31)	5.43 (1.20)	5.15 (1.36)	$t(428) = 2.17, p = .03$
I am able to explain to parents why the vaccines are provided within the NIP.	6.04 (0.67)	6.12 (0.64)	5.99 (0.67)	$t(428) = 1.79, p = .07$
I feel confident when parents ask questions about the NIP.	4.96 (1.37)	5.20 (1.54)	4.83 (1.55)	$t(428) = 2.35, p = .02$
I have trust that I am able to answer all questions of parents about the NIP.	4.82 (1.37)	5.14 (1.27)	4.64 (1.40)	$t(428) = 3.61, p < .001$
I think it is hard to have a discussion with parents about the NIP.	3.32 (1.60)	3.26 (1.58)	3.35 (1.61)	$t(428) = -0.45, p = .65$
My relationship with parents that are critical towards the NIP is worse compared to the relationship with parents who are not critical towards the NIP.	2.31 (1.13)	2.41 (1.26)	2.26 (1.05)	$t(264) = 1.30, p = .20$
There is enough time during a consult to discuss the NIP with parents.	4.16 (1.72)	3.85 (1.82)	4.33 (1.64)	$t(428) = -2.78, p < .01$
I think a vaccine against rotavirus within the NIP is: Very unnecessary – very necessary	4.13 (1.30)	4.22 (1.48)	4.07 (1.19)	$t(255) = 1.05, p = .30$
I think a vaccine against varicella within the NIP is: Very unnecessary – very necessary	3.09 (1.22)	3.48 (1.51)	2.87 (1.43)	$t(294) = 3.99, p < .001$
I think a vaccine against influenza for children within the NIP is: Very unnecessary – very necessary	2.78 (1.48)	2.92 (1.32)	2.70 (1.16)	$t(428) = 1.75, p = .08$
I think a vaccine against Meningococcal B within the NIP is: Very unnecessary – very necessary	4.63 (1.21)	4.97 (1.19)	4.45 (1.18)	$t(305) = 4.29, p < .001$
I think a vaccine against RSV (Respiratory Syncytial Virus) is: Very unnecessary – very necessary	4.50 (1.29)	4.70 (1.37)	4.39 (1.23)	$t(428) = 2.31, p = .02$

Note: SD = Standard Deviation, * Scale range 1-7 (unless otherwise indicated)

Discussion

This study shows that overall, CVPs have a positive attitude towards the NIP and were satisfied with how the NIP is currently organized. They mostly give information to parents about possible side effects and the NIP schedule. Some CVPs avoid discussion with parents about the NIP. Although CVPs mentioned they were able to communicate the NIP with parents, they would like to receive additional education in how to communicate with critical parents.

Previous studies (Hak, Schönbeck, Melker, et al., 2005; Pielak et al., 2010) also showed that CVPs had a positive attitude towards the NIP. Opposite to a previous qualitative study by Mollema, Staal, et al. (2012), most CVPs were satisfied with the information they received from the PHI about changes in the NIP, and perceived this information as objective.

CVPs indicated that parents who have a negative attitude and doubts about childhood vaccination are most of the times highly educated, and anthroposophical parents. These findings support earlier research (Hak, Schönbeck, Melker, et al., 2005; Harmsen, Ruiter, et al., 2012) and indicate that CVPs are aware of parents with a negative attitude towards childhood vaccination and that they recognize different parent groups and their backgrounds in criticism concerning the NIP.

A substantial proportion of CVPs sometimes avoid discussion with parents about the NIP, due to insufficient time; an aspect that is also found in other studies (Cotter et al., 2003; Pielak et al., 2010). Most CVPs take 1-2 minutes or 2-5 minutes per consult to educate parents. Only a small proportion never provides information about childhood vaccinations to parents. When parents do not receive sufficient information about the NIP, they are more likely to search the internet and become exposed to vaccine-critical websites, which might affect parents' perceptions and intention toward vaccination negatively (Betsch et al., 2010). Inadequate knowledge about the vaccination schedule, benefits, and side effects may result in suboptimal vaccination rates (Simone, Carrillo-Santistevé, & Lopalco, 2012). This study showed that even though most CVPs believe they are able to communicate with (critical) parents, they still feel the need for additional education in how to communicate with (critical) parents about the NIP.

Some limitations of this study should be mentioned. The first limitation is that only two (out of 25) anthroposophical CWCs were included in this study, therefore no comparison could be made between CVPs who work at a regular CWC and at an anthroposophical CWC. Because lower participation in the NIP has been found among parents that visit an anthroposophical CWC (Harmsen, Ruiter, et al., 2012), differences in CVPs that work at a regular or anthroposophical CWC are interesting. In the future, more effort should be done to include CVPs from anthroposophical CWCs. A second limitation might be participation bias, because the managers of the CWCs decided whether they wanted to participate in this study or not. It might be that only the motivated managers forwarded the e-mail with the link to the questionnaire to the CVPs.

In conclusion, findings show that CVPs have a need for education and they sometimes avoid discussion with parents (caused by limited time, a lack of knowledge, and the perception

that due to discussion their relation with the parents might get worse). More research should be done about how to develop education for CVPs and if it is possible to provide more time for educating parents.

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Chapter 9

Content analysis of tweets, social media and online news articles during the measles outbreak in the Netherlands

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Abstract

In May 2013, a measles outbreak began in the Netherlands among orthodox Protestants, who often refuse vaccination for religious reasons. This event provided a good opportunity to examine public opinions shared on twitter and social media during the outbreak. We also compared reported measles cases with online media coverage, to assess whether media messages followed the epidemiological curve of the measles outbreak. We analysed measles-related tweets, social media messages and online news articles coverage over a 7-month period (15th of April 2013 to 11th of November 2013). Measles related tweets and social media messages, and online news articles were coded with regard to topic and sentiment. All the measles related news articles were coded. Our findings showed that social media followed the online news articles coverage, rather than the epidemiological curve of the outbreak. All data sources showed three large peaks, possibly triggered by announcements about the measles outbreak by the Dutch National Institute for Public Health (RIVM) and statements made by politicians. Most messages were informing the public about the measles outbreak (i.e., about the incidence of measles) and the leading opinion was frustration regarding unvaccinated orthodox Protestants. The monitoring of online (social) media messages might be useful for the RIVM in deciding how best to respond to the public in relation to disease outbreaks. Additionally, the data from media messages provides insight about the opinions of the public towards disease outbreaks, which could enable the RIVM to respond appropriately to public concerns. We suggest monitoring of tweets and social media messages, since differences were observed between the topics and sentiments of these data sources. Publically available data contains a vast dearth of information; however, analysis of social media messages and tweets is laborious. Therefore, further research is required to develop an automatic coding system of relevant information for analysis.

Introduction

In May 2013, a measles outbreak began in the Netherlands among orthodox Protestants, who often refuse vaccination for religious reasons (Knol et al., 2013). This event provided a good opportunity to examine public opinions shared on twitter and social media during this outbreak. In the Netherlands, the National Immunisation Programme (NIP) offers childhood vaccinations free of charge and vaccinations are not compulsory. Overall, the vaccination coverage among children up to 4 years is high (99%) in the Netherlands and somewhat lower (92%) for boosters in children aged 4 and 9 years (van Lier, Oomen, et al., 2013). Since 1987, children have been offered vaccination against measles, mumps and rubella in a two-dose schedule, at 14 months and nine years of age, with a coverage of 96% and 93%, respectively (van Lier, Oomen, et al., 2013). Vaccination coverage among orthodox Protestants was assessed in 2006-2008 and was found to be about 60% (Ruijs et al., 2011). Orthodox Protestants are a close-knit community in the Netherlands, consisting of approximately 250,000 persons. Predestination is an important doctrine in their beliefs and refusal of vaccination is based on the idea that people should not interfere with divine providence (Woonink, 2009). Other groups in the Netherlands that partly refuse measles vaccination include Anthroposophists and those with critical stances towards vaccination (Harmsen, Mollema, et al., 2013; Harmsen, Ruiter, et al., 2012).

At the end of February 2014, the incidence of measles was 0.16 per 1000 (2,640 measles cases) in the Netherlands, resulting in 182 hospitalizations (6.9% of measles cases). In October 2013, a death occurred in a 17 year-old girl, who was not vaccinated for religious reasons. The number of reported cases began to decline in October 2013 and at the end of February 2014, the RIVM announced the outbreak was over. Control measures implemented in July 2013, such as offering early vaccinations to children aged between 6 and 14 months of age living in municipalities with a low vaccination coverage (<90%) were ended.

At the start of this measles outbreak, there was a lot of media attention and focus on the RIVM, with requests for weekly updates of reported measles cases. In addition, some well-known politicians made public statements such as; "parents should take their responsibility and vaccinate their children" (nu.nl; a Dutch news website) and "clergymen should call for vaccinating their religious community" (television and in *Algemeen Dagblad*; a Dutch national newspaper), which provoked public discussion. These statements led to further discussions in social media about childhood vaccination. Social media is fast becoming an important area for the acquisition of new information. Almost 90% of the Dutch population aged 12 years and older use the Internet and of those, 70% are active on social media, particularly Facebook and Twitter (i.e., Web 2.0) (Statistics Netherlands, 2013).

The H1N1 pandemic in 2009 was the first example in which a global pandemic occurred in the age of Web 2.0, leading to several studies performing content analyses of tweets during this pandemic (Chew & Eysenbach, 2010; Signorini, Segre, & Polgreen, 2011). Results of these studies showed that in 2009, H1N1-related tweets were primarily used to spread information from

credible sources, but were also a source for the exchange of opinions and experiences among the public. In addition, Signorini et al. (2011) showed that estimates of influenza-like illness derived from Twitter, accurately tracked reported disease levels. Fung et al. (2013) showed that people response differently at social media to different disease outbreaks. Analysing internet messages is therefore useful in gaining insight into the publics' opinion, which might differ depending on the type of disease outbreak. The measles outbreak in the Netherlands provides a good opportunity to analyse information people share on twitter and social media in relation to this outbreak.

Adding to previous analyses of social media with regard to infectious disease outbreaks, this study aims to provide more insight into the origins of social media content: by comparing social media content with (1) online news articles content, and with (2) the epidemiological curve, i.e., the number of reported measles cases. This study also adds to previous findings by examining media and disease data of an outbreak that affected a highly specific subpopulation. This subpopulation consisted mostly of orthodox Protestants, who have vaccination beliefs that contrast beliefs of the general population. Therefore, this analysis will provide insight into the role of social media regarding a health crisis that clearly separates high and low risk populations.

Methods

Data online (social) media

As we were interested in the online (social) media messages during the measles outbreak in the Netherlands in 2013, we used the search term 'mazelen' (i.e., measles) to select social media messages, articles from newspapers and tweets. Data were gathered from 15th of April 2013 (i.e., several days before the start of the measles outbreak) to 11th of November 2013 (i.e., several days after the report of the measles-related death on 28th of October).

Data were retrieved from the databases LexisNexis (newspapers), Twiqs.nl (tweets) and a monitoring tool called Finchline (for tweets, newspapers and social media messages). Finchline is used by the RIVM and continuously monitors online news articles, social media and twitter (Finchline, 2014). Social media included messages from websites such as fora, weblogs, Facebook and others (e.g., other social networks, advertisements, comments, information sites, status updates, podcasts, reviews/evaluation of products, social photo websites, social video websites and wikis). For the selected articles in the newspapers (which were published online but were also available in paper version), all the national newspapers in the Netherlands were checked (i.e., NRC Handelsblad, De Volkskrant, Trouw, De Telegraaf, Algemeen Dagblad, Spits and Metro). We further included the religious oriented newspapers Reformatorisch Dagblad and Nederlands Dagblad.

Data on measles cases

Data on the number of measles cases were retrieved from the notification data of measles by the RIVM. The measles case definition (based on clinical, laboratory and epidemiological criteria) of WHO and ECDC was used (ECDC, 2014).

Table 1. Topics of social media messages, online news articles and tweets

Topic	Definition	Example (message, article or tweet)
Measles incidence (including: measles incidence, measles deaths, reported measles cases, people experiencing measles, and consequences of measles infection)	Objective information about the incidence of measles	"Number of measles cases has increased to 161" (title article)
Orthodox Protestants	Opinions about persons refusing vaccination for religious reasons	"Unbelievable that the love for God can be greater than the love for your own child" (tweet)
Critical towards vaccination	Opinions about persons who are critical towards vaccination (e.g. Anthroposophists)	"To remember: also followers of Rudolf Steiner (anthroposophical theory) and the Dutch society for conscientious vaccination are very much against vaccination! Also their children are taking a risk at getting measles" (message)
Perceived risks (including: perceived severity measles disease and not vaccinating against measles, adverse events, effectiveness measles vaccine)	How public perceived risks of measles disease and measles vaccine	"... ""That (i.e., measles) was not that severe at all, I have experienced flu disease, which was much more severe" (message)
Measles prevention (including: additional vaccinations, maternal measles antibodies, obligatory vaccination, vaccinating secretly, vaccinating employees, vaccinating religious people)	Preventive measures taken to control the measles spread	"Young adult without a measles vaccination cannot camp during summer" (tweet)
Trust and role institutions (including: role government, role media, conspiracies)	No trust in information supply, should government interfere in whether people should vaccinate or not and allegations about production of vaccines and vaccine components	"Subtle lies about measles by the RIVM..? Naivety..?" (tweet)
Other	If it did not belong to one of the topics above	"What makes that the exam and a measles infection are similar? Only children are affected!" (tweet)
Information not related to measles outbreak	If it had nothing to do with the measles outbreak or a relation with the measles outbreak could not be found	"The mortality of dolphins on the East coast of the USA is caused by a measles related virus" (tweet)

Manual topic and sentiment analyses

Data analysis was started by estimating the relative proportion of weekly media messages and reported measles cases from April 15 to November 11, 2013 by scaling the numbers to the highest peak for all four data sources. The highest peak was assigned a score of 100. The reported measles cases by week of onset of exanthema were plot against the number of weekly media messages to see whether media followed the epidemiological curve.

Furthermore, we analysed the content of the messages (i.e., topic) and how the messages were expressed (i.e., sentiment). To identify the topics, thematic analysis was performed (Braun, 2006). A codebook was developed and initial codes provided various topics ($N = 25$). Upon review and discussion, infrequently used (sub) topics were collapsed into larger (main) topics ($N = 8$). Table 1 shows the topics that emerged from the data with examples of titles of news and social media messages.

The sentiments in the online news articles generally differ from the sentiments in the social media. The sentiments for news articles fit better with objective non-judgmental messages, whereas the sentiments for social media fit better with more personal and opinionated messages. Sentiments for news articles were therefore based on the classification used by Vasterman and Ruigrok (2013), which included the following three sentiments: alarming, reassuring, and neutral or none or both of the first two sentiments. Table 2 shows examples of titles of news articles with these three sentiments. The sentiments for tweets and social media messages were based on the article by Chew and Eysenbach (2010), which included, amongst others, frustration, humour/sarcasm, concern, relief, question, minimised risk, information and personal experiences. Table 3 shows examples of tweets and social media messages for these various sentiments.

Table 2. Sentiments of news articles

Sentiment	Example title news article
Alarming	"Teenager dead by measles infection"
Reassuring	"Start of extra vaccinations against measles"
Neutral	"Measles epidemic has stabilized"

For coding purposes, we limited the number of social media messages by selecting every tenth message or tweet. This resulted in 552 out of 5,521 social media messages in total and 2,020 out of 20,201 tweets in total. The number of social media messages unrelated to the measles outbreak was 88 (16%). The total number of messages used for the analyses was therefore 464. The number of tweets not related to the measles outbreak was 38 (1.9%). The total number of tweets used for the analyses was therefore 1,982 of which 626 (32%) were retweets. To be able to compare the topics of tweets with the topics of social and news articles,

Table 3. Sentiments of tweets and social media messages

Sentiment	Definition	Example (tweet/message)
Frustration	Tweet/message contains anger, irritation, contempt, critics or source is flabbergasted.	"How stupid can you be by not vaccinating your children against measles."... (tweet)
Humour/sarcasm	Tweet/message is funny or expresses sarcasm.	"HAHAHAHAHAHA. He had drawn red spots on his head and said: 'oooooh I have measles' (tweet)
Concern	Tweet/message contains fear, concern, anxiety, worry or grief about themselves or others.	"Around me many vaccinated children with measles. A bit strange and alarming I think. Is there something known about this by the RIVM?" (tweet)
Relief	Tweet/message contains joy, happiness or relief	"Thank God we are a liberal country (i.e., that we have a choice to vaccinate or not)" (message)
Question	Tweet/message contains a question or questions at which the user likes to receive an answer	"This you probably know: what happens when you get measles? Do you need treatment or does it go away spontaneously" (tweet)
Minimised risk	Tweet/message minimises the risk at measles infection and/or the possible complications	"That (i.e., measles) was not that severe at all, I have experienced flu disease, which was much more severe" (message)
Information	Tweet/message contains information, informative retweets and/or other information sources about measles	"RIVM expects more measles cases because school holidays are over" (tweet)
Personal experience	Tweet/message contains a personal experience/story about the disease without expressing any concerns	"My daughter has had encephalitis as a complication of an unknown virus infection" (message)
Other	Tweet contains none of the above 8 sentiments	"At the left wing also a number of persons are not vaccinating because of other reasons" (message)
Information not related to measles outbreak	Tweet has nothing to do with the measles outbreak or a relation with the measles outbreak could not be found	"The mortality of dolphins on the East coast of the USA is caused by a measles related virus" (tweet)

we selected again every tenth tweet of the 2,020 tweets mentioned above, which resulted in 202 tweets of which 6 tweets were not related to the measles outbreak and were excluded from the analysis. We analysed retweets separately from tweets, as retweets might provide insight into what people find interesting and important.

The topics and sentiments were coded for all articles found in newspapers (N = 362). The number of news articles to be analysed was 282, as 69 (20%) were unrelated to the measles outbreak. Of the 282 articles, 79 were published in the two religious oriented newspapers and 203 were published in the seven non-religious oriented newspapers. Both the topic and sentiment were only available for the articles in these two religious oriented newspapers.

Each message was coded independently by two raters to establish coding reliability (i.e., Cohen's Kappa with values <0 indicating no agreement, 0-0.20 slight agreement, 0.21-0.40 fair

agreement, 0.41-0.60 moderate agreement, 0.61-0.80 substantial agreement, and 0.81-1 as almost perfect agreement (Landis & Koch, 1977). During coding the sentiments of tweets and coding the sentiments and topics of social media messages, there were some differences in insights between the raters. For example, one of the raters coded a part of the tweets as informative tweets while the other two raters (i.e., each rater coded two third of the tweets) coded these tweets as informative tweets. Regarding interpretation of the social media messages, one of the two raters interpreted the social media messages related to orthodox Protestants differently compared to other rater. While another rater interpreted informative messages as neutral messages. After discussing these differences, informative messages (both tweets and social media messages) and the social media messages with the topic orthodox Protestants were re-coded and the kappa was estimated. Table 4 shows the inter-rater reliability estimates for the coded sentiments and topics for the three data sources.

Table 4. Inter-rater reliability (kappa) estimates for sentiment and topic for the three data sources

Data source	Sentiment, kappa	Topic, kappa
Tweets	.79	.77
Social media	.58	.65
News articles	.80	.81

Results

Comparing number of measles cases and media reports

During the measles outbreak, three large peaks with a small width were observed for all three types of media data with little variation observed (Figure 1). The first peak in mid-June coincided with the announcement of the start of the measles outbreak. The second peak in mid-July corresponded with the announcement that control measures were to be implemented (i.e., additional vaccinations groups considered most at risk) by RIVM. The second peak also corresponded with public statements made by well-known politicians. The third peak coincided with the announcement that an unvaccinated adolescent had deceased due to measles complications.

The number of measles cases peaked in mid-July, which was reflected by the peaks in the media reports. However, at the end of August, the number of measles cases increased and peaked at the end of October, while the number of online media messages was decreasing. Another contrary pattern occurred after the announcement of the measles related death on the 28th of October, with the number of media messages increasing and the number of measles cases decreasing.

Figure 1. Comparison of relative proportions of weekly tweets, social media messages, and online news articles to measles cases from April 15 to November 11, 2013. Figure 1 was scaled to the highest peak in week 28 for all four data sources. This peak was assigned a score of 100.

Topic analyses

Most tweets, social media messages and news articles were about measles incidence, while most retweets addressed the topic of measles prevention (Table 5). Perceived risks of measles disease and measles vaccine, and orthodox Protestants were also frequently reported topics. Overall, topics in relation to critical towards vaccination and the trust and role of public health institutions were less often presented in the media messages.

Comparing the topics of religious versus non-religious oriented newspapers showed that most articles in both types of newspapers were about measles incidence and measles prevention (Table 6). The percentages of the topics did not differ much between the religious and non-religious oriented newspapers, except that the topic orthodox Protestants seemed to be more present in religious oriented newspapers.

Table 5. Topics of coded measles tweets, retweets, social media messages and news articles

Topic	Tweets (N = 136)	Retweets (N = 60)	Social media (N = 467)	News articles (N = 282)	Total (N = 945)
Measles incidence	41%	23%	20%	53%	33%
Measles prevention	17%	28%	20%	27%	22%
Perceived risk	10%	5%	19%	5%	13%
Orthodox Protestants	15%	15%	13%	5%	11%
Critical towards vaccination	2%	7%	11%	6%	8%
Other	12%	12%	11%	1%	8%
Trust and role of institutions	3%	10%	6%	3%	5%

Table 6. Topics of coded measles articles in religious and non-religious oriented newspapers

Topic	Religious newspapers (N = 79)	Non-religious newspapers, (N = 203)	Total (N = 282)
Measles incidence	44%	57%	53%
Measles prevention	30%	26%	27%
Critical towards vaccination	6%	5%	6%
Orthodox Protestants	10%	3%	5%
Perceived risk	6%	4%	5%
Trust and role institutions	0%	4%	3%
Other	3%	0.5%	1%

Sentiment analyses

Sentiment information was frequently found in all three data sources (see Table 7), with the highest proportion in tweets (49%). Furthermore, we found that the sentiment relating to frustration was often coded, and was highest in social media messages (23%). Overall, the sentiments relating to humour/sarcasm and other were expressed in the messages of the different data sources but to a lesser extent than sentiments relating to information and frustration. Sentiments relating to concern, question, minimized risk, relief and personal experience were hardly expressed in the tweets, social media messages and news articles.

We also analysed how content was expressed in news articles and compared religious with non-religious oriented newspapers (Table 8). It was observed that measles articles in religious newspapers were more neutral, less alarming and more reassuring than articles in non-religious newspapers.

Table 7. Sentiments of coded measles tweets, retweets and social media messages

Sentiment	Tweets (N = 1356)	Retweets (N = 626)	Social media (N = 464)	Total (N = 2446)
Information	49%	34%	18%	39%
Frustration	18%	37%	23%	24%
Humor/Sarcasm	11%	12%	10%	11%
Other	9%	7%	28%	12%
Concern	4%	4%	8%	5%
Question	6%	2%	3%	4%
Minimized risk	2%	1%	6%	2%
Relief	1%	1%	1%	1%
Personal experience	1%	0.2%	4%	1%

Combining the analyses of topics and sentiments

Of the tweets (retweets included) and social media messages with topics relating to measles incidence or measles prevention, we found that most were informative (56% and 36%, respectively). The subtopic of the measles related death within the topic measles incidence was mostly

Table 8. Sentiments of coded news articles in religious and non-religious oriented newspapers

Sentiment	Religious newspapers (N = 79)	Non-religious newspapers (N = 150)	Total (N = 229)
Alarming	30%	46%	40%
Reassuring	24%	13%	17%
Neutral	47%	41%	43%

related to the sentiment of frustration (i.e., frustration about Orthodox Protestant parents not vaccinating their child). Of the messages with content about orthodox Protestants, we found that most of the sentiment qualified as frustration (48%).

Of the social media messages with the topic perceived risk, we found that most qualified as minimised risk (30%) (i.e., in combination with subtopic measles disease is not severe), concern (22%) (i.e., in combination with subtopic measles disease is severe), or neutral (19%) (i.e., in combination with subtopics adverse events and perceived effectiveness vaccine). Of the social media messages with the topic critical towards vaccination, most messages qualified as neutral (43%) and frustration (39%). Of the social media messages with topic relating to trust and the role in public health institutions, most qualified as frustration (53%) and neutral (30%).

Both the topic and sentiment were only available for the articles in the religious oriented newspapers. Of the news articles with the topic about measles incidence, we found most qualified as neutral (49%) and alarming (46%). Of the articles with the topic regarding measles prevention, most were qualified as reassuring (50%) and neutral (29%). Of the news articles with the topic with reference to orthodox Protestants, all qualified as neutral.

Discussion

The number of tweets, social media messages and news articles showed a similar distribution over time with three large peaks. This pattern deviated significantly from the epidemiological curve, since an increased number of measles cases were not in line with a decline in media messages. A plausible reason is the commencement of the schools after the summer break, which caused an increase in the number of measles cases. The spread of measles virus had been found to have occurred mostly at schools (Knol et al., 2013). However, the measles outbreak had been long covered by the media and other topics had gained prominence since. Another discrepancy was observed in the distribution of social media messages versus reported measles cases following the announcement of the measles related death. This resulted in an increase in the number of social media messages, while the number of measles cases was decreasing. A possible explanation might be that something 'new' had occurred in connection with the outbreak and people wanted to share their frustration about this measles related death, who was not vaccinated for religious reasons. Signorini et al. (2011) showed that estimates of influenza-like

illness derived from Twitter accurately tracked reported disease levels, which was not the case in our study. Our findings point to the importance of differentiating between illnesses; in the face of this measles outbreak, Twitter followed online news articles that presented their own curve, rather than following epidemiological curve.

The two most frequently discussed topics, measles incidence and measles prevention, were similar for tweets, social media messages and news articles. However, the sentiments of the messages of these sources differed somewhat. This was also shown by Lehmann et al. (2013) who performed a study on the coverage of influenza vaccination on news websites and social media websites. Our findings showed that most tweets were informative, whereas most social media messages were qualified as providing neutral and frustration sentiment and most news articles were qualified as providing neutral and alarming sentiment.

Some differences were also observed between tweets and retweets. Most tweets were about measles incidence and were qualified as informative, whereas most retweets were about measles prevention and were qualified as frustration. Therefore, it seemed that people found it more important to express their frustration than informing others about the measles outbreak. We also compared religious and non-religious oriented newspapers. It was observed, as expected, that the topic orthodox Protestants was somewhat more present in religious newspapers. Furthermore, results showed that despite the high risk of measles among orthodox Protestants, measles articles in religious oriented newspapers were more neutral, less alarming and more reassuring than articles in non-religious oriented newspapers.

Similar to the studies on content analyses of H1N1-related tweets (Chew & Eysenbach, 2010; Signorini et al., 2011) our study showed that tweets and also social media messages were primarily used to disseminate information, and that they were also used to share opinions. Tweets and social media messages can therefore be used as a measure of public interest or concern. Chew and Eysenbach (2010) also mentioned that tweets were a source of experiences. However, in our study, this was only somewhat the case for the social media messages where people (i.e. non-orthodox Protestants) reported about their personal (past) experience with measles. This difference might be due to Chew and Eysenbach (2010) analysing tweets related to an unknown disease and vaccine (i.e., H1N1 pandemic) and to a disease spread throughout the whole population. Our study, in contrast, was about a well-known disease and vaccine and the outbreak mostly affecting unvaccinated orthodox Protestants. It might be that orthodox Protestants are not very active on social media themselves and therefore did not share their experiences with the measles disease.

A limitation of this study might be that our study population is not well-defined. In 2012, about 90% of the Dutch population aged 12 years and older were Internet users (Statistics Netherlands, 2013), but it was beyond the scope of this study to identify characteristics of our study population. It has been shown that the use of social media does not vary much by gender, ethnicity and educational degree (Statistics Netherlands, 2013), but this may not be the case for those who write about measles on social media. Furthermore, we had no insight into whether

the sentiments about the measles outbreak we identified in our data sources, were in line with the sentiment of the general public. Further research is needed to ascertain if an association can be found in the topics and sentiments of messages presented in media messages and among the general public. A last limitation was the low kappa for coding sentiments expressed in the social media messages. Overall, social media messages contain larger volumes of text stories and personal experiences compared with tweets and news articles. This led to difficulties in coding. Sometimes several sentiments are expressed in the same message, and the coder has to decide which sentiment is most dominant. Despite these limitations, the biggest advantage of using online data is the continuous data collection and the user-generated content.

We also wanted to explore whether and how we should monitor the online (social) data about the NIP and what the added value will be for the RIVM. We believe monitoring online (social) data is important so that the RIVM is aware of the beliefs and opinions of the public about the NIP and is able to timely detect and respond to possible concerns. Additionally, as the announcements by the RIVM on their website had a considerable effect on the message volume and posting behaviour. The use of this and other online methods may have potential usefulness in public health. Based on our findings we suggest not to monitor online news articles, since the same topics are presented in tweets and social media. We do recommend the monitoring of tweets, retweets and social media messages, since differences were observed between the topics and sentiments of these data sources and retweets might indicate what people find interesting and important. However, analysing social media messages and tweets is very time consuming. Therefore, more research is needed to develop a system that automatically codes messages relating to various NIP diseases. This system would enable the analysis of large amounts of data and allow detection of differences in thoughts and emotions people share on the Internet. Furthermore, it might be sufficient to first examine the volume of tweets relating to a specific public health event and compare it with the volume of tweets prior to occurrence of the public health event. This could enable decision making as to whether the tweets, retweets and social media messages should be analysed in more detail using the coding schemes for topics and sentiments used in this study.

Conclusion

The number of measles related tweets, social media messages and online news articles showed a similar distribution over time, with three large peaks in June, July and October. However, this pattern deviated significantly from the epidemiological curve. Social media was found to have followed online news articles, rather than the epidemiological curve. The peaks in the number of news articles could very well be explained by the announcements by the RIVM (i.e., start of the outbreak, additional vaccinations and measles related death) and statements made by well-known politicians. Most messages were about informing people about the measles outbreak

and the leading opinion was frustration regarding orthodox Protestants who often do not vaccinate for religious reasons. This might give arguments that the public favours measles vaccination. Monitoring online (social) media messages might therefore be useful for RIVM in deciding whether to respond and how to respond to the public about infectious disease outbreaks. Additionally, the data provide insight in the opinions of the public about infectious diseases outbreaks, which could enable the RIVM to respond appropriately to possible concerns.

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Chapter 10

Development of a monitoring system to evaluate the acceptance of childhood vaccination

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Abstract

In The Netherlands, the Public Health Institute (PHI) is developing a monitoring system to evaluate parental acceptance of childhood vaccines of the National Immunization Programme in the Netherlands (NIP). This monitor will be added to the PHIs overall quality assurance policy concerning the implementation of the NIP. The goal of the system is to monitor changes in determinants that influence parents' decisions on childhood vaccinations in order to timely anticipate possible negative trends in vaccination acceptability. The monitoring system will consist of qualitative and quantitative methods measuring, at regular intervals, the acceptance among both parents and child vaccine providers next to real-time surveillance of online (social) media. Monitoring vaccination acceptance is important to get insight into processes determining vaccination uptake and for targeting NIP-related implementation policies to the needs of important stakeholders (i.e., managers of CWCs, professionals, parents, Ministry of Health, Dutch Health Council).

Introduction

The vaccination coverage in the National Immunization Program (NIP) is a key factor for successful control of vaccine preventable diseases. In The Netherlands, uptake has been high (95% (van Lier, Oomen, et al., 2013)) since the introduction of routine vaccination in 1957. At present, children are offered vaccination free of charge and on a voluntary basis, with DTaP-IPV-Hib-HepB at 2, 3, 4 and 11 months of age, 10 valent conjugated pneumococcal vaccine at 2, 4 and 11 months, MMR and MenC at 14 months, DTaP-IPV at 4 years of age, MMR and DTaP at 9 years of age, and HPV16/18 (girls only) at 12 years of age. Child Vaccine Providers (CVPs) administer the vaccines at regular Child Welfare Centers (CWCs). Almost all parents visit a regular CWC or an anthroposophical CWC (Woonink, 2009). Vaccination coverage in The Netherlands is closely monitored with the use of Praeventis (electronic national immunization register) (van Lier et al., 2012). Besides monitoring the vaccination coverage, different surveillance systems have been implemented in The Netherlands to evaluate the NIP (i.e., disease surveillance, immunosurveillance, surveillance of microbial population dynamics, and surveillance of adverse events) (Kimman et al., 2006). However, these surveillance systems do not give full and real time information on possible changes in the motivation of parents to vaccinate or not.

Recent experience with the introduction of vaccination against Human Papillomavirus (HPV) into the NIP among girls 12 years of age has shown that a new vaccine can lead to a tense climate concerning vaccine acceptance. Inclusion of the HPV vaccination in 2009 led to negative media attention and uptake of this catch-up campaign was around 50% (van Keulen et al., 2013) (the current vaccination coverage of HPV is 58% (van Lier, Oomen, et al., 2013)). Furthermore, parents who comply with the program might already have some doubts. Paulussen et al. (2006) showed that 81% of the Dutch parents do not make a deliberate choice whether to vaccinate or not. They argued that those parents are vulnerable for changing their attitudes and behavior when they become exposed to new, but negative information about the vaccines from outside the NIP (e.g. epidemics, media, disagreeing professionals and anti-vaccination lobbying) might influence and change their positive attitude towards vaccination, and as a result, parental participation in the NIP might decrease. Besides known religious objections, a diffuse movement has emerged involving people who have critical views about vaccination, including highly educated parents and supporters of certain types of alternative medicine (Hak, Schönbeck, Melker, et al., 2005; Woonink, 2009). We consider it therefore essential to monitor the determinants of acceptance of vaccination for parents as well as for CVPs. This latter group, because they administer the vaccines, provide vaccine related information towards parents, and they are perceived by parents as the most important source for information about vaccination (Bond & Nolan, 2011; Brown et al., 2010).

Up to now, many countries have systems in place to monitor vaccine coverage ((VENICE), 2009). In addition, in the UK, a system to monitor the acceptance of childhood immunisation has been performed for several years (Yarwood, Noakes, Kennedy, Campbell, & Salisbury, 2005).

The goal of this system was to track factors that affecting opinions and perceptions of mothers about the NIP. With the use of surveys, the trends in knowledge, attitudes, experience, and recall of advertising have been investigated. Another project in the UK is being developed to monitor public confidence in immunisation programs in different countries worldwide, with the use of online reports of websites (Larson et al., 2013; Vaccine-Confidence, 2014). By monitoring the Internet, early signs of vaccine issues can be detected.

We aimed to set-up a monitoring system in The Netherlands to evaluate the acceptance of the NIP. The goal of this system is to monitor trends and changes in determinants of parents' intention to vaccinate their child within the NIP, and being able to timely intervene when needed. We mainly focus on acceptance of vaccination in the infant programme, i.e. up to 4 years of age. The monitoring system will not focus on different groups that refuse vaccination in The Netherlands. We are interested in the acceptance of the NIP among the Dutch public at large. Beliefs of groups who are critical towards vaccination that would be taken over by other parents, will be shown in the monitoring system.

To develop the monitoring system, more insight was needed in the vaccination decision-making of parents, the role of the CVPs, and the internet. These results will give input for the different parts of the monitoring system. In this article, we summarize the methods used to generate input for the system and present the conceptual framework of the monitoring system.

Methods

Below we describe shortly the research methods used to get insight in determinants that influenced parents' vaccination decision, the experience of CVPs in the NIP, and the internet.

Qualitative research

Focus groups were performed among various groups of parents aiming to obtain insight into factors that might influence their decision-making, and to get insight into the CVPs perception and experiences with the NIP. Face-to-face focus groups have been performed among parents who completely vaccinated their children (unpublished data), and also among parents who visited anthroposophical CWCs (Harmsen, Ruiter, et al., 2012), and with immigrant parents (Harmsen, Bos, et al.). Focus groups among the two latter groups were performed because a lower vaccination coverage was found (van Lier, van de Kasstele, et al., 2013; van Velzen et al., 2008). The well-known group refusing vaccination on religious ground has already been extensively studied by Ruijs et al. (2012). They conducted interviews among parents who refused vaccination based on religion.

To get insight into other reasons of parents for refusing vaccination, focus groups were conducted with parents who partially and completely refused vaccination (Harmsen, Mollema, et al., 2013). The focus groups were performed online, because it was not feasible to organise

a meeting where parents could be at the same time and at the same location. Finally, because CVPs administer vaccines and are perceived as the most important source of vaccine related information (Bond & Nolan, 2011; Brown et al., 2010), face-to face focus groups among CVPs were conducted (Mollema, Staal, et al., 2012).

Questionnaire data of parents and CVPs

Based on the results of the focus groups, three questionnaires have been developed to quantify the results and to get insight into the relative importance of the determinants. The first questionnaire for parents was performed to develop a model for parents' vaccination decision-making (Harmsen, Mollema, et al.). The second questionnaire gave insight into parental information seeking behavior and their need for NIP information (Harmsen, Doorman, et al., 2013). This questionnaire was performed because parents indicated in focus groups that they had a need for information and searched for information themselves (Harmsen, Mollema, et al., 2013; Harmsen, Ruiter, et al., 2012). The third questionnaire gave insight into the CVPs attitudes towards the NIP and their experiences with parents who visit the CWC (Harmsen, Ruiter, et al.).

Internet data

The Internet is the most used source for parents to search for information (Hesse et al., 2005) and it is also used to share vaccine related information. We were therefore interested in the (social) media messages that are presented on the Internet about childhood vaccination, especially when there are changes, or when there is an outbreak within the NIP. To get insight into the amount of messages over time, the content, and the sentiments of vaccine related messages on the Internet during an outbreak, we analysed (social) media data during the measles outbreak in 2013 in The Netherlands (Mollema et al.).

*Special event = unrest in (social) media or at CWC, introduction new vaccine, change within NIP

Figure 1 Schematic representation of monitoring system

Results

Based on experience with the research explained above we present the different parts of the monitoring system, existing of; focus groups, questionnaires, a sentinel system, and an Internet monitor. In addition, we explain the frequency and content of the various research methods that is recommended to be implemented in the monitoring system. In Figure 1, a schematic representation of the monitoring system is given.

Focus groups

In our focus groups, we found that parents who refuse vaccination made a deliberate decision. Parents base their choice whether to vaccinate or not on multiple factors. These factors include lifestyle, perceptions of the health of the child, beliefs about childhood diseases, perceptions about development of the immune system of the child, perceived risk of side effects, perceived risk of getting the disease, and whether practical barriers were present. The focus groups with CVPs showed that CVPs have a positive attitude towards the NIP, and they perceived their relation with parents as crucial, but mentioned to have limited time to discuss the NIP with parents.

Focus group studies are useful to identify previously (unknown) factors that might influence the acceptance of the NIP amongst parents and CVPs. Focus groups among parents and CVPs (face-to-face and/or online) will therefore only be performed in the monitoring system when there are major changes or events within the NIP (i.e., introduction of a new vaccine, changes in the current NIP, high activity in (social) media and unrest at CWCs). When new determinants are found that might influence parents' decision and new factors in CVPs experience with the NIP, they will be included in the questionnaires for parents and CVPs (see 3.3).

Questionnaire parents

The results of the questionnaires among parents showed that most parents (81%) perceived vaccinating as self-evident and had a positive attitude and intention towards vaccinating their child. Parents' attitude was most strongly affected by beliefs about vaccines, moral norms towards vaccinating, and trust in the NIP.

To get systematical insight into which determinants are important in parents' vaccination decision, a questionnaire for parents with children aged 0-4 years old will be part of the system. This questionnaire will be the same questionnaire that has been used to model parents vaccination decision (Harmsen, Mollema, et al.), with the possibility to include and delete questions when needed. Every month, a random 20% of parents whose child is registered that month in Praeventis (i.e., approximately 2900 parents, expected response rate is 10%) will be invited to complete the digital questionnaire before the first vaccination of their child at the CWC (before the child is 2 months old). Additionally, a longitudinal component is included as the same parents will receive the questionnaire, following two other NIP contact moments (i.e., before vaccination when child is 14 months and 4 years old). By following parents for three NIP contact

moments, we are able to monitor trends in the determinants of parents' intention to vaccinate their child (which will be analysed every month), and design educational intervention to counter negative developments in an early stage. It will also give us information in differences between generations of parents. We propose to analyse the importance of determinants and the proposed model of the determinants that influenced parents' intention to vaccinate every year.

Questionnaire CVPs

From the CVP questionnaire study, we have learnt that they have in general a very positive attitude towards the NIP. The questionnaire study also showed that CVPs would like to receive additional training in how to inform parents about the NIP, and that they would like to spend more time in informing parents about the NIP.

Insight in CVPs attitude, experience with the NIP, their need for education, and the difficulties in communicating with (critical) parents about the NIP is needed. We therefore propose to include the above mentioned questionnaire for CVPs in the monitoring system to be able to detect changes in CVPs attitude and their experience with organisation of the NIP, and evaluate their opinion with regard to the information and education they receive about the NIP.

The questionnaire for CVPs, that already has been used to get insight in CVPs attitude and experience within the NIP (Harmen, Ruiter, et al.), will be part of the monitoring system. The questionnaire will be sent out every year to CVPs to be able to monitor trends in their attitude and experience within the NIP. CVPs will be invited for this questionnaire through the management of the CWCs. Effort needs to be done to include CVPs from anthroposophical CWCs, to get insight into the differences between regular and anthroposophical CWCs. Close contact with anthroposophical CWCs is therefore needed.

CWC sentinel

Besides questionnaires for CVPs, we also intend to have contact with a number of CWCs in The Netherlands and use them as a sentinel to get insight in the questions parents ask, and how many parents refuse and have doubts about vaccination. This contact with CVPs might identify unrest at the CWCs about vaccines at a very short notice. In every province in The Netherlands (there are twelve provinces), one (regular and when possible anthroposophical) CWC will function as a sentinel. The sentinel CWCs will receive a monthly online questionnaire with a limited number of items. The questionnaire will include items about the parents that visit their CWC, the questions parents ask about the NIP, whether parents refused or doubted vaccination for their child, and which reasons they had. The Public Health Institute (PHI) receives the questionnaire and when needed, communicates through the medical advisors of the PHI with the managers of the CWCs about how and when to intervene. The results of this sentinel can also be used as input for the questionnaire for parents and CVPs.

Internet monitor

The last part of the monitoring system will be the Internet monitor. Research showed that insight into the volume of social media messages over time is useful. In-depth insight into content and sentiments are useful when a peak in the volume of the number of messages is perceived, when there are changes within the NIP, or during an outbreak of an NIP infectious disease.

The aim of the Internet monitor within the monitoring system is to get insight into the questions the public ask on the Internet, and in the topics and sentiments of (social) media messages presented on the Internet. By using this monitor, unrest might be detected in the NIP, including unrest during an outbreak, or when there changes within the NIP.

Currently, we use a monitoring tool called Finchline at the PHI, which continuously monitors online news, social media and twitter (Finchline, 2014). The Internet monitor automatically produces a daily report about vaccine-related messages posted on the Internet, with information about the volume of the messages, sources and the complete content of the message. In previous research (Internet monitor during measles outbreak (Mollema et al.)), codebooks to categorise topics and sentiments of the messages have been developed. These codebooks will be used in future analysis of Internet monitoring data.

At the end of every week, the daily reports of that week will be analysed based on volume, and when needed (i.e., a high peak in volume, or when there are changes or an outbreak within the NIP), in-depth analysis will be conducted. Based on the in-depth analysis, the PHI will assess whether the messages might cause unrest, and whether the PHI should intervene. Examples of possible interventions would be to answer the questions of the public, correct misperceptions, or change the current NIP communication. When new vaccination beliefs are presented on the Internet, they can also be included in the questionnaire for parents, to test whether these beliefs influence parents' decision.

Discussion

Despite the attention given over decades towards the acceptance of childhood vaccination, we are one of the first who propose to develop a systematic monitoring system to evaluate the acceptance of the NIP. Based on previous extensive research, both qualitative and quantitative, the monitoring will consist of focus groups among parents and CVPs, questionnaires for parents and CVPs, CWCs as a sentinel, and an Internet monitor.

The monitoring system can be used by various stakeholders. The results can be used by the PHI as an input for developing effective (education) interventions for parents and CVPs. Results of the monitoring system will also be reported in the annual vaccination coverage report of the PHI. This report aims to inform professionals of the NIP, as well as the ministry of Health. Managers of CWCs and other professionals who work with vaccines will be informed about the

determinants that influence parents' decision, and about CVPs experiences within the NIP. The information could also be of use to inform or adapt current information towards the general public on how (other) parents make the decision with regard to vaccination. Furthermore, PHIs from other countries might be interested in the system as well as the monitoring results. Finally, the Ministry of Health, as well as the Dutch Health Council, will make use of the knowledge collected through the monitoring system, enabling them to take into account the current acceptance of the NIP and the perceptions of possible changes and new vaccines within the NIP among parents and CVPs.

Further attention should be given towards financing, implementing, testing, and evaluating the monitoring system at the PHI. This includes recruiting participants, analysing data gathered by the various parts of the system, evaluating, and when needed, changing parts of the monitoring system. The monitoring system also needs to be tested whether it is sensitive enough to detect a change in determinants and parents intention to get their child vaccinated. More research is also needed on what interventions should be taken to change various determinants. Analysing the data of the Internet monitor on sentiments and content is labour intensive, therefore future research is needed whether analysis could be done with the use of machine learning. We performed one study to get insight into vaccine related messages during the measles outbreak. More research is needed with data from the Internet monitor to be able to recognise which messages are amplifiers of unrest on (social) media, and when and how to respond to messages online.

In the UK, a monitoring system to track factors that influenced opinions and perceptions of parents about the NIP has been used for several years (Yarwood et al., 2005). Our system differs from this system in not only including surveys, but also qualitative research and an Internet monitor. Besides that, our system does not only focus on parents, but also on CVPs. Another system that will be developed in the UK is a system to monitor the Internet (Larson et al., 2013; Vaccine-Confidence, 2014). Our system will have the advantage of combining results of questionnaires and focus groups with results from the Internet monitor.

The success of a vaccination programme largely depends on stable and high vaccine uptake, and thus relying on trust of the public towards the offered vaccinations. Thereby, the implementation of a monitoring system will fill an important gap in the existing monitoring activities like disease surveillance and vaccine efficacy.

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Conflict of interest

None of the authors has a conflict of interest.

Chapter 11

General discussion

General discussion

The general aim of the dissertation was to set up a framework for a monitoring system to evaluate the acceptance of the National Immunization Program (NIP) among parents and Child Vaccine Providers (CVPs). The monitor will be used to inform future interventions to keep the level of trust in the NIP at its current high level, as reflected in the participation rate of 95%. To determine the components of the monitoring system a variety of empirical studies have been carried out to identify important correlates of parental decision-making with regard to the NIP, CVPs experiences with the NIP, and vaccine related messages presented on the Internet. The findings of these studies have been reported in the previous chapters, including a general outline of the envisioned monitor system (Chapter 10). This final chapter summarizes these findings, discusses their strengths and weaknesses, and provides recommendations and suggestions for future research and program development.

Determinants that influence parents' decision to vaccinate

Parents intention and their final decision to vaccinate or not is influenced by environmental and personal determinants. The qualitative and quantitative studies that were performed in this research project provided insight in these important determinants.

Focus group studies were conducted with anthroposophical parents (Chapter 2) and parents who (partially) refused vaccination for their child (Chapter 4), to gain insight in the determinants that influenced their decision. It was found that these parents make a conscious and deliberate decision whether to vaccinate or not and they did not perceive vaccinating as self-evident. Furthermore, these parents reported a high perceived risk of possible side effects and a low perceived risk of getting the disease and the severity of the disease. Risk perception has also been reported in other studies as an important determinant of vaccine decision-making (Bond & Nolan, 2011; Brown et al., 2010; Whyte et al., 2011).

In the surveillance literature, lower vaccine uptake is reported among children of anthroposophical parents for MMR (measles mumps rubella) (Alm et al., 1999; Duvell, 2001; van Velzen et al., 2008; Wadl et al., 2011; Zuzak et al., 2008), which sometimes caused outbreaks of measles (Duvell, 2001; Kasper et al., 2009; van Velzen et al., 2008; Wadl et al., 2011). Findings of the focus groups showed that most anthroposophical parents, refused the MMR vaccination for their child, because they perceived these diseases as childhood diseases. They perceive these diseases as essential for the physical and mental development of the child.

Parents who (partially) refused vaccination (Chapter 4) indicated that having a healthy life-style would decrease the risk of getting infectious diseases, a factor also found by Meszaros et al. (1996). These parents also feared that the immune system of their child is not well developed enough to cope with the vaccines.

To quantify the results of the focus groups (Chapter 2, 3, 4, unpublished results of focus groups among parents who completely vaccinated their child), and to get insight in the relative

importance of the determinants that influence parents' intention to vaccinate in the general public, a questionnaire has been developed. Chapter 7 presents the questionnaire study among parents with at least one child aged 0-3,5 years. Overall parents reported a positive attitude towards childhood vaccination and attitude was found to play an important role in parental vaccination decision-making. Attitude has been found in other studies for being an important determinant in parents' intention to vaccinate (Gust, Kennedy, et al., 2005; Paulussen et al., 2006). Our study also showed that beliefs about vaccines (i.e., effectiveness and components of vaccines) are more important in parents vaccination intention than beliefs about the diseases. Moral norms about vaccinating influenced parents' attitude and intention positively. Trust was also identified as an important determinant of parents' vaccination decision, which has also been reported in another study (Larson, Cooper, Eskola, Katz, & Ratzan, 2011). Other important determinants of a positive intention to vaccinate were low anticipated regret of not vaccinating, high perceived social norms, not making a deliberate decision, and no perceived barriers. Tailoring NIP information

Since individuals differ in the factors that determine their intention and vaccination decision, the development of tailored information provision is recommended. Tailoring communication is a combination of strategies and information to reach one specific person. The communication is individualized and based on the characteristics of that person (Noar, Benac, & Harris, 2007). For the development of tailored communication, an individualized assessment of members of the population is needed (Noar et al., 2007).

This means that each parent should receive, next to the standard NIP education in the leaflet, personalized NIP information, which is in line with the most important determinants that influence their decision to vaccinate. For example, information towards anthroposophical parents could be tailored to their beliefs of childhood diseases, and information towards other parents who refuse vaccination might be tailored to their beliefs of a healthy lifestyle and its influence on infectious diseases. Information towards parents who vaccinate their child could be tailored to the perceived moral norm to vaccinate and their beliefs of characteristics of the vaccines.

Tailored communication can reach thousands of individuals, especially with the use of computer-based tailoring, and has been effective in multiple health-related and preventive behaviors (Noar et al., 2007; Rimer & Kreuter, 2006). This suggests tailored communication being useful in parents' vaccination decision-making. However, more research is needed whether this approach will be (cost-) effective within the NIP.

Making a deliberate vaccination decision

We found that four out of five parents perceived vaccinating their child as self-evident and that even more did not think long about whether to vaccinate their child or not (Chapter 7). The focus group study (Chapter 3) targeting different ethnic groups also showed that they perceived vaccinating their child as self-evident. These results are in line with an earlier study of

Paulussen et al. (2006). According to the Elaboration Likelihood Model (ELM), (Petty & Cacioppo, 2009) there are two processing routes for developing attitudes and beliefs: central and peripheral route. The central path is used when parents care about vaccinating their child and are able to understand vaccine related information, which will result in a deliberate decision. The peripheral path is used when parents have little or no interest for the NIP. These parents do not make a deliberate decision. According to the ELM, attitudes based on peripheral processing are less stable over time than attitudes based on central processing (Petty & Cacioppo, 2009).

The current vaccination coverage is high (i.e. 95%) and the low elaboration level in vaccination decision-making does not seem to be a problem. However, it seems that parents who do not make a deliberate decision might be easily influenced by negative messages from their social environment or by (social) media messages. Betsch et al. (2010) showed in an experimental study that negative messages on websites increased parents' risk perception of vaccines and decreased parents' intention to vaccinate. To make parents more resilient against those (negative) messages, it is important that they are aware of why they choose to vaccinate their child and make a deliberate decision.

Parents should therefore be informed about the benefits and costs of childhood vaccination (tailored at their important determinants), so they can make an informed and deliberate decision. Informed decision-making requires transparent and evidence-based information on the potential advantages and disadvantages of vaccines. Only providing information is not enough for parents to making a deliberate decision. The PHI and CVPs should make sure that parents understand all the NIP information they receive and should, when needed, guide them in their decision.

It might raise the question whether an informed decision might cause a decline in the vaccination coverage. However, Wegwarth, Kurzenhäuser-Carstens, and Gigerenzer (2014) showed in an experimental study that a leaflet with information that includes all information to make an informed-decision improved perceived risk, risk judgments and led to an actual vaccination uptake. This informed decision did not undermine the vaccine uptake.

Information need and seeking-behavior

Chapter 6 presents a questionnaire study to get insight in the information need of parents about the NIP and their information seeking-behavior. In general, 13% of the parents indicated that they did not receive enough information. Parents would like to receive more information about side effects, the components of vaccines, effectiveness of the vaccines, the NIP being non-mandatory, and about the diseases that the vaccines protect for (Chapter 2, 3, 4 and 6). It is important that these topics are presented in information materials about the NIP, so parents are able to make an informed decision, their need for information will be fulfilled, and they will be more resilient against counter argumentations. This information should be provided in short in the information leaflet all parents receive. An extended version of this information should be provided at the website of the PHI.

Although only 13% indicated to have a need for information, 46% mentioned that they searched for more information themselves, most of all on the Internet (Chapter 6). The Internet has gained prominence in the area of public health in general and vaccination decision-making in particular; not only to search for information, but also to share vaccine related information. Because of the important role of the Internet, data were collected at the Public Health Institute (PHI) with the use of Finchline, a tool to monitor vaccine related messages on the Internet (tweets, social media messages and online news articles). Between May 2013 and February 2014, there was a measles outbreak in the Netherlands (Knol et al., 2013). Data was gathered from Finchline between May and November 2013 to get insight in the number of messages over time, and in topics and sentiments of the messages (Chapter 9). Three large peaks in the number of tweets, social media messages and online news articles were observed, which can be explained by public announcements of the Dutch PHI about the measles outbreak, and statements of Dutch politicians. The content of twitter, social media and news messages were in line with each other and focused on informing the public about the measles outbreak and the expressions of frustration towards orthodox Protestants who did not vaccinate for religious reasons. Our study showed, in line with studies on content analyses of H1N1-related tweets (Chew & Eysenbach, 2010; Signorini et al., 2011), that tweets were primarily used to spread information, but were also used for sharing opinions and could therefore be used as a measure of public interest and concerns. Therefore, continuous monitoring of the Internet is important for gaining insight in parents' information need and opinions about the NIP. This insight might be useful in detecting unrest about the NIP, counter misinformation, and providing insight in whether educational campaigns are effective. Since analyzing content and sentiments of online messages is very time consuming, in-depth analysis (i.e., analyze topics and sentiments of messages) can also only be performed when large peaks in messages over time are observed.

Inoculation

Overall, parents reported a positive attitude towards childhood vaccination, and attitude was found to play an important role in parental vaccination decision-making (Chapter 7, (Gust, Kennedy, et al., 2005; Paulussen et al., 2006)). Besides informing parents to make them resilient against negative vaccine messages, this positive attitude towards childhood vaccination should be strengthened. One way to strengthen the attitude of people is with inoculation. Inoculation theory indicates that preexisting attitudes, beliefs or opinions should be strengthened, because then people are better able to defense future attacks (Pfau, 1995). To strengthen attitude and beliefs, the inoculation process consist of posing a threat, followed by refutational preemption (i.e., providing information for people so they can strengthen their attitudes against future threats). For the threat, it is important that it will serve as a motivational trigger. The threat will cause some degree of anxiety about the future stability of people's attitudes. If parents are aware and accept the vulnerability of their attitudes, they will be motivated to strengthen them. It is critical that the threat is strong enough to keep the receiver defensive, but weak

enough to not actually change those preexisting ideas. For example, this means that parents will be informed about their unstable positive attitude towards the NIP, that when they search for information or when they talk to other parents about the NIP, their attitude might be easily changed into a negative attitude. This threat will cause anxiety and will make parents aware that their positive attitude towards childhood vaccination is unstable and vulnerable.

After providing the threat, one or more potential counterarguments should be preemptively refuted. This means that arguments and/or evidence that can be used to refute arguments against attitudinal attacks should be provided, as well as by practicing the defend of beliefs through counterarguing (Compton & Pfau, 2005; Insko, 1967; Wyer, 1974). Identifying and refuting as many of these counterarguments as possible is needed, and the most common and most persuasive counterarguments should be refused first (Pfau, 1995). Effective counterarguments should be tailored to the receivers since the arguments should be in favor with their preexisting thoughts (Flay & Burton, 1990; Pfau & Parrott, 1993). These counterarguments should focus at possible future attacks at determinants that influence parents' attitude towards vaccination found in this research project, like perceptions about side effects, risks of the diseases, and beliefs about vaccines and diseases. For example, counterarguments could be developed for a possible future attack at parents' perception that NIP infectious diseases are severe.

Sustaining high trust in the NIP

Trust is an important determinant in parents' vaccination decision (Chapter 7; Larson et al. (2011). This research project showed that overall parents trust the NIP and the PHI, but that parents who (partially) refused vaccination for their child, have a lower trust in the NIP and the PHI (Chapter 4). Sustaining a high trust can be organized by understanding specific vaccine concerns such as doubts about vaccine effectiveness and concerns about side effects (Larson et al., 2011). The qualitative and quantitative studies performed in this research project are good examples of how to detect these concerns. For sustaining a high trust, it is also important to communicate honest about uncertainties and risks of vaccines and being transparent about how decisions are made within the NIP (Larson et al., 2011), which enables parents to make an informed decision. It should also be clear where parents could find this (reliable) information about the NIP, mainly, because parents indicated that it is hard for them to find reliable NIP information (Chapter 4). The PHI needs to provide links to different reliable information sources about vaccine related topics for parents and professionals at their website and in their education materials. In addition, the website of the PHI should be easy to find when parents use positive and negative vaccine related search terms in Internet search engines. CVPs should also be aware of these reliable information sources when they provide information towards parents.

Train CVPs for effective communication with parents

Since parents perceive CVPs as the most reliable source for vaccine related information (Bond & Nolan, 2011; Brown et al., 2010), Chapter 6), they administer vaccines within the NIP and

provide NIP information towards parents, insight in CVPs attitude and experience with the NIP is needed. Chapter 8 presents a questionnaire study among CVPs. The CVPs have a positive attitude towards the NIP and they are satisfied with how the current NIP is organized, a finding in line with a qualitative study of Mollema, Staal, et al. (2012) performed in the Netherlands. CVPs seem to be able to recognize different groups of parents with different backgrounds who are critical towards vaccination, like highly educated parents and anthroposophists. Some CVPs avoid having discussion with parents about the NIP, mostly because of insufficient time, which is also found in other studies (Cotter et al., 2003; Pielak et al., 2010). CVPs take 1-2 or 2-5 minutes to inform parents about the NIP during a consult. When they provide information to parents, they mostly focus at possible side effects and the NIP schedule. They further indicated that they are able to communicate with (critical) parents about the NIP, but would still like to receive education in how to communicate with these parents.

CVPs are suitable to provide (tailored) NIP information towards parents. To provide this information, being able to answer questions, and have discussion with parents about the NIP, the CVPs should receive education. CVPs should receive education in how to guide parents in their deliberate vaccination decision, in how to strengthen positive attitudes and beliefs about the NIP in parents according to inoculation theory, and in how to provide tailored information and fulfill the different information needs of the parents. This is in line with suggestions of Healy and Pickering (2011) who indicated that CVP's should know the concerns of parents about childhood vaccination and need to understand why parents can be misinformed about vaccination. Other research also mentioned that CVPs should take into account the educational level of parents and prepare themselves for questions that parents could ask (Kriwy, 2011). Larson et al. (2011) mentioned that health providers should be transparent about uncertainty and risks of childhood vaccination.

The PHI should develop education for CVPs and ensure that CVPs receive up-to-date NIP information, also for sentiments and topics of messages presented on the Internet. For providing tailored information towards parents, a computerized tool should be developed which can support CVPs in providing tailored information towards the parents. CVPs should have easy access to this tool during their consults with parents. Since CVPs indicated that they have limited time to provide NIP information, and providing more time for a consult with parents is not feasible, NIP information meetings should be organized for parents, so they can receive the information they need.

Intention-behavior link

From October 2011, the Hepatitis B vaccine was introduced into the NIP. We executed a study to get insight in whether parents would accept this vaccine and which determinants influenced their decision-making (Chapter 5). This study showed that parents had a positive attitude towards vaccinating their child against hepatitis B and perceived vaccinating against hepatitis B as self-evident. Parents' positive attitude towards hepatitis B vaccination is most strongly

influenced by the perceived benefits of the vaccine. Parents perceive hepatitis B as a severe disease but did not think their child is very susceptible getting hepatitis B, which is supported by earlier research (Sodoyer et al., 2011).

The study reported in Chapter 5 additionally created an opportunity to investigate whether parents' intention to vaccinate their child against hepatitis B is a good predictor of their actual vaccination behavior, by offering the parents the hepatitis B vaccine for their child after filling in the questionnaire. Results showed that parents' intention is a moderately strong predictor of their vaccination behavior (with an effect size of $d = .59$). This effect size is lower than the effect size reported in a review of correlational studies (Sheeran, 2002), but stronger than the effect between intention and behavior presented in a meta-analysis of experimental studies (Webb & Sheeran, 2006).

It seems that most parents, who intend to vaccinate their child, get their child vaccinated. Chapter 3 showed that immigrant parents have a positive attitude and perceive vaccinating their child as self-evident. Nevertheless, different studies showed mixed findings about the participation of immigrant parents in the NIP (Mollema, Wijers, et al., 2012; van Lier, van de Kasstelee, et al., 2013). Practical barriers (i.e., language barrier, frequent change of residence, under-registration of vaccinations) were mentioned as possible reasons for the lower vaccination coverage among immigrant parents (Mollema, Wijers, et al., 2012; van Lier, van de Kasstelee, et al., 2013; Verheij et al., 2001). These practical barriers were also presented in the focus group study performed in this research project. Immigrant parents mentioned that when the weather was bad, when they had no access to a car, or the Child Welfare Center (CWC) was too far from their home, they did not visit the CWC. Another practical barrier showed in this study was a language barrier. Parents were not always able to read and speak the Dutch language. This may result in not understanding the invitation letter to get their child vaccinated, and may point at the need to provide information towards parents in different languages. Despite the strong intention-behavior relation, attention should be paid towards possible barriers that might prevent parents from actually vaccinating their child. Especially in the case of immigrant parents, the PHI should provide information materials in different languages. These translations should not only be presented on the Internet, but also a link towards the information in different languages should be provided in the information leaflet that all parents receive.

Monitoring system

Based on the empirical research about parents' intention to vaccinate their child (Chapter 2-5, 7), the communication needs of CVPs (Chapter 8), and the Internet monitor (Chapter 9), we proposed a monitoring system to continuously evaluate acceptance of the NIP in the Netherlands (Chapter 10). We advised that the monitoring system should consist of different elements: (a) focus groups among parents and CVPs (only when there are major changes or events within the NIP); (b) a monthly questionnaire among parents, to get insight in the determinants that influence their vaccination decision; (c) an annual questionnaire to get insight in CVPs experience

and attitude towards the NIP; (d) CWCs as a sentinel; and (e) an Internet monitor. This proposed monitoring system differs from the two monitoring systems in the UK (Larson et al., 2013; Yarwood et al., 2005) by including not only surveys, but also qualitative research methods among which focus groups and an Internet monitor, and including besides parents, also CVPs.

Limitations and strengths research project

Some limitations of this research project should be mentioned. First of all, we based the results of the determinants that influence parents intention on cross-sectional studies which makes it hard to imply causal relationships. For the causal relationship, longitudinal research would be needed. In the future when the monitoring system is implemented, it is recommended to perform longitudinal data analysis to verify causal relationships. In the proposed monitoring system, parents will receive a questionnaire before each of the three NIP consultations in the period the child is between 0 and 4 years old, which makes it possible to conduct longitudinal data analysis and investigate causal relationships. Experimental studies might also be useful for getting insight in causal relations. Since this research project showed that parents attitude is an important determinant of their intention to vaccinate, experimental research could be used to indicate whether changing parents attitude will result in a different intention. For example, parents' attitude could be manipulated with the use of vaccine related information or another intervention. After providing this information, it should be checked whether parents' intention to vaccinate changed. Another limitation of this research project might be that the questionnaire study, which represents a model about the determinants that influenced parents' intention to vaccinate (Chapter 7), focused at the general population. Including parents that represents the general Dutch public (i.e. a high participation of the NIP) was the goal of the study, but not enough parents who refused vaccination were included for being able to separately analyze the determinants of vaccinations among these groups of parents (i.e. anthroposophical parents, other parent who refuse vaccination, immigrant parents). The proposed monitoring system will also not focus on different groups that refuse vaccination in The Netherlands. The reason for this is that we are interested in the acceptance of the NIP among the Dutch population at large and beliefs of groups who are critical towards vaccination that would be taken over by other parents, will be shown in the monitoring system. The final limitation might be that we analyzed data from the Internet monitor during the measles outbreak, and not during normal circumstances (no outbreak). We were therefore not able to compare the content of messages during an outbreak situation and a non-outbreak situation.

Besides the limitations mentioned above, the strengths should also be declared. First, this study focused at parents and CVPs experiences within the NIP and their need for information and education using a bottom-up approach (i.e., listening to the public and their needs). It is important to listen to the public and their needs, because communicating with parents and CVPs is not only providing information, but also listening to them. By listening, the needs of parents and CVPs will be taking into account, which might result in sustaining a high trust in

the NIP and the PHI. Second, in the UK, one of the monitoring systems only collected data with the use of surveys among mothers. The strength of our research project is that we did not only focus at parents, but also at CVPs who administer vaccines within the NIP and communicate with the parents. Furthermore, the proposed monitoring system does not only include questionnaires, but also qualitative research and an Internet monitor, which will aim at complete insight in acceptance of the NIP for children 0-4 years old. Third, in this study project we used methods that can also be used in other (research) domains. We developed online focus groups, because in one study (Chapter 4) it was not feasible to organize a meeting at one time and one location. These online focus groups were very useful and recommended to use in other studies.

Future research

Future research should focus at implementing, and evaluating the monitoring system. For implementing the monitoring system, it is important to maintain the core elements of the monitoring system (Elliot & Mihalic, 2004; Lee, Altschul, & Mowbray, 2008). A clear implementation plan that describes these core elements and details the steps in delivering the monitoring system should be developed (Bartholomew, Parcel, Kok, Gottlieb, & Fernández, 2011). Performance objectives (what is needed to implement the monitoring system) for program implementers should address how to put the core elements of the monitoring system into place (Bartholomew et al., 2011). After implementing the monitoring system, evaluation about the effectiveness of the monitoring system is needed. Evaluation is the systematic and objective assessment of a project, with the aim to determine the relevance of objectives, efficiency, effectiveness, impact, and sustainability (Kusek & Rist, 2004). A framework to evaluate the monitoring system should be used. For example, the framework developed by the Center for Disease Control and Prevention (CDC) which describes steps and standards for program evaluation (Milstein & Wetterhall, 2000). The steps and standards described in this framework could be used for evaluating the monitoring system, since this framework has been used by other public health organizations for evaluating routine activities. This framework has two parts: it provides different steps for effective evaluation, and it provides standards for effective evaluation. The six different steps (i.e., 1. Engage stakeholders, 2. Describe the program, 3. Focus the evaluation design, 4. Gather credible evidence, 5. Justify conclusion, 6. Ensure use and share lessons learned) provide a guide for evaluating the project. The standards (i.e., utility standards, feasibility standards, propriety standards, and accuracy standards) will help to conduct a balanced evaluation.

Some suggestions have been given for developing interventions based on the results of this research project. Parents should make an informed and deliberate decision, NIP information should be tailored, with the use of inoculation parents' attitude towards the NIP should be strengthened, and CVPs need to be educated in how to communicate with parents. In the future, systematic research is needed for developing interventions based on these suggestions. For the systematic development of theory- and evidence-based interventions, a framework such as Intervention Mapping can be used (Bartholomew et al., 2011). Intervention Mapping

provides a detailed description of the development process and the content of the program. Intervention Mapping consist of six different steps: 1. Conduct needs assessment, 2. Create matrices of change objectives, 3. Select theory-based intervention methods and practical implications, 4. Develop intervention program, 5. Plan adoption and implementation of intervention, 6. Generate an evaluation plan. Completing the different steps of Intervention Mapping will give a description of the design, implementation and evaluation of a theory- and evidence-based intervention. The current research project can be perceived as step one in the Intervention Mapping method, the needs assessment. The needs assessment is a systematic study for identifying relevant determinants and behaviors. Because the current research project already gave much insight in the determinants, the following steps should be followed for developing adequate interventions.

More research is needed to get insight in how much social media messages influence attitudes beliefs and intentions of parents about the NIP. Betsch et al. (2010) already showed that negative messages on the Internet increased perceived risk of vaccines and decreased parents' intention to get their child vaccinated. Experimental studies should be conducted in the Netherlands to see whether this is the same for the Dutch population and whether vaccine critical websites have an influence at parents' vaccination behavior. More research also needs to be done to find out whether it is possible to predict unrest about childhood vaccination with the use of the Internet monitor, and what causes unrest at the Internet (i.e., what are the amplifiers of unrest).

Conclusion

This research project showed that most parents have a positive attitude and intention to vaccinate their child within the NIP. Parents who (partially) refuse vaccination make a deliberate decision, based on multiple factors. Most parents perceived vaccinating their child as self-evident, which might be a risk because they did not make a deliberate decision and might therefore be easily influenced by negative social (media) messages. These parents need to make an informed decision and their attitude should be strengthened with the use of inoculation. CVPs are important in the NIP, because they administer vaccines, provide NIP information, and parents perceive them as the most reliable source for NIP information. CVPs should be educated how to inform (critical) parents about the benefits and withdrawals of the NIP and how to strengthen parents' attitude with the use of inoculation. Monitoring the Internet is useful to get insight in the volume of (social) media NIP messages. When needed, in-depth analysis can be performed to get insight in the sentiments and the topic of these messages. The results of these studies were used for developing a system to monitor the acceptance of the NIP. The proposed monitoring system consists of different elements: (a) focus groups among parents and CVPs; (b) a monthly questionnaire among parents; (c) an annual questionnaire among CVPs; (d) CWCs as sentinels; and (e) an Internet monitor. Future research should focus at implementation and evaluation of the monitoring system.

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Valorization

Valorization

This section describes the social value of this research project by pointing out the relevance of the project and the proposed monitoring system, the target groups, the final product (i.e., monitoring system), whether the monitoring system is innovative and how the results should be implemented.

The National Immunization Program aims to protect the Dutch population against infectious diseases. As a result of high vaccination coverage the target diseases and their complications have declined substantially. To keep this program successful, remaining high coverage and trust in the program is essential. This thesis generates insight into the acceptance of the vaccination program and proposes a monitoring system to evaluate the acceptance of the National Immunization Program (see Chapter 10). The proposed monitoring system will consist of focus groups among parents and CVPs, questionnaires for parents and CVPs, CWCs as a sentinel, and an Internet monitor (see Chapter 10). The results of the studies as well as the proposed monitoring systems will be used to enable timely information and possibilities to intervene aiming to maintain trust and high acceptance. In Chapter 10 we have described the broad spectrum of stakeholders that could benefit from this system, i.e. the public, professionals in the NIP field, Ministry of Health, the PHI and the Dutch Health Council (see Chapter 10). While a system to monitor the acceptance of the NIP is innovative in itself, this monitoring system is also innovative since up to now no system is available in the Netherlands, using quantitative methods, qualitative methods, and an Internet monitor. Time and money is needed after this PhD to enable implementation, and evaluation of the monitoring system as well as for developing interventions based on the results of this research project. When there is enough money and time, the PHI will implement the monitoring system into their regular surveillance of the NIP.

Summary

Summary

In the Netherlands, the vaccination coverage of the National Immunization Program (NIP) is monitored with the use of Praeventis (electronic immunization register). Monitoring the vaccination coverage does not give full information on the (changing) motivation of parents' decision whether to vaccinate their child or not. The aim of this research project was to set up a monitoring system to evaluate the acceptance of the NIP among parents and child vaccine providers (CVPs). To determine components of the monitor system, studies presented in previous chapters have been performed to identify important determinants that influence parents' intention and their final decision to vaccinate their child within the NIP.

Chapter 2 presents a focus group study among anthroposophical parents. The goal of this study was to gain insight in the determinants that influenced their vaccination decision. It was found that anthroposophical parents are not opposite against all vaccinations within the NIP, make a conscious and deliberate decision whether to vaccinate their child or not and do not perceive vaccinating as self-evident. Most anthroposophical parents refused the MMR (measles mumps rubella) vaccination for their child, because they perceived these diseases as childhood diseases (i.e., diseases perceived as essential for the physical and mental development of the child). Anthroposophical parents do not perceive the disease as very severe and believe their children are not that susceptible for the infectious diseases. Parents experienced visiting an anthroposophical Child Welfare Center (CWC) as positive with longer consultations and more NIP information, than at a regular CWC. Parents have a need for more NIP information particularly about the risks of vaccination, the components, and effectiveness of the vaccines. The PHI should provide references to parents with (reliable) sources where this information is presented. This may fulfill parents' information needs, which enables them to make an informed decision whether to vaccinate their child or not.

Chapter 3 describes a focus group study with parents with different ethnic backgrounds in the Netherlands. The aim of this study was to get insight in the determinants that influenced their decision to accept or refuse vaccination for their child, because mixed findings were presented on their participation in the NIP. This study showed that these parents have a positive attitude towards childhood vaccination and perceived vaccinating their child as self-evident. Their religion (e.g. Islam) was positively related to the intention to vaccinate the child, since according to the Islam the protection of children's health is important. Immigrant parents mentioned that when the weather was bad, when they had no access to a car, or the CWC was too far from their home, they did not visit the CWC, which indicates that they experienced practical barriers to get their child vaccinated. Another practical barrier showed in this study was a language barrier. Parents were not always able to read and speak the Dutch language. This may result in not understanding the invitation letter to get their child vaccinated, and may point at the need to provide information towards parents in different languages.

Chapter 4 presents an online focus group study with parents who partially or completely refused vaccination for their child. The goal of this study was to find out which determinants influenced parents' decision to (partially) refuse vaccination for their child, except for religious and anthroposophical objections. This study showed that these parents make their decision based on multiple factors. Parents mentioned that having a healthy lifestyle would decrease the risk of getting infectious diseases and they feared that the immune system of the child is not well developed enough to cope with vaccines. These parents also reported a high perceived risk of possible side effects and a low perceived risk of getting the disease and the severity of the disease. Mixed results were found about the influence of the social environment and parents' vaccination decision. Some parents felt supported by their social environment others felt judged. Communication strategies should focus at the determinants found in this study, to correspond with parents' concerns which might reduce their feelings of ambivalence in decision-making about childhood vaccinations.

Chapter 5 shows a questionnaire study to get insight in whether parents would accept the Hepatitis B vaccine and which determinants will influence their decision. This study also created an opportunity to investigate whether parents' intention to vaccinate their child against hepatitis B is a good predictor of their actual vaccination behavior, by offering the parents the hepatitis B vaccine for their child after filling in the questionnaire. Results showed that parents' intention is a moderately strong predictor of their vaccination behavior. This study also showed that most parents had a positive attitude towards the hepatitis B vaccine and perceived vaccinating against hepatitis B as self-evident. Parents' positive attitude towards hepatitis B vaccination is most strongly influenced by the perceived benefits of the vaccine. Parents perceived hepatitis B as a severe disease but do not think their child is very susceptible for getting hepatitis B. Educational campaigns should be developed for sustaining a positive attitude towards hepatitis B vaccination, by strengthen the benefits of vaccination together with emphasizing the child's risk to hepatitis B infection.

Chapter 6 presents a questionnaire study, to get insight in the information need of parents and their information seeking-behavior. In general, 13% of the parents indicated that they did not receive enough information. Parents would like to receive more information particularly about side effects of vaccines. Although only 13% indicated to have a need for information, 46% mentioned that they searched for more information themselves, most of all on the Internet. Despite the fact that most parents use the Internet as a source for information, parents perceived CVPs as the most reliable source for vaccine related information. The PHI is recommended to provide more information towards parents about the NIP, and to ensure that their website is easy to find at the Internet. CVPs should be aware of their role in educating parents, since they are perceived as the most reliable source for information.

Chapter 7 shows a questionnaire study among parents with at least one child aged 0-3,5 years to quantify the results of the focus groups (Chapter 2 – 4, and unpublished results of focus groups with parents who completely vaccinated their child), and to get insight in the relative

importance of the determinants that influence parents' intention to vaccinate. Overall parents reported a positive attitude towards childhood vaccination, which played an important role in parental vaccination decision-making. Our study also showed that beliefs about vaccines were more important in parental decision-making than beliefs about diseases. Communication should therefore focus at characteristics of vaccines more than the diseases. Moral norms about vaccinating influenced parents' attitude and intention positively. Trust in the NIP is also an important determinant in parents' vaccination decision. Most parents (81%) perceived vaccinating their child as self-evident and 82.6% did not think long about whether to vaccinate their child or not. Results of this study indicate that interventions promoting vaccination uptake should target the most critical determinants (i.e., anticipated regret, moral norms, trust in the NIP) that influence parents intention to vaccinate.

Chapter 8 presents a questionnaire study among CVPs to get insight in CVPs attitude and experience with the NIP. CVPs have a positive attitude towards the NIP and they are satisfied with how the current NIP is organized. CVPs seem to be able to recognize different groups of parents with different backgrounds who are critical towards vaccination, like highly educated parents and anthroposophists. Some CVPs avoid having discussion with parents about the NIP, mostly because of insufficient time. CVPs take 1-2 or 2-5 minutes to inform parents about the NIP during one consult. When they provide information to parents, they mostly focus at possible side effects and the NIP schedule. They further indicated that they are able to communicate with (critical) parents about the NIP, but would still like to receive education in how to communicate with these parents. Therefore, effective education programmes for CVPs about how to communicate with (critical) parents should be developed.

Chapter 9 shows a study to get insight in the vaccination content people share on the Internet, during the measles outbreaks in the Netherlands. Three large peaks in the number of tweets, social media messages and online news articles were observed, which can be explained by announcements of the Dutch PHI about the measles outbreak, statements of Dutch politicians, and the death of a girl caused by a measles infection. The content of the messages focused at informing the public about the number of measles cases, and the sentiment mostly found was frustration towards orthodox Protestants, who do not vaccinate their child for religious reasons. Our study showed that tweets were primarily used to spread information, but were also used for sharing opinions and could therefore be used as a measure of public interest and concerns.

Chapter 10 presents the final aim of this research project: the proposed monitoring system. Based on qualitative and quantitative research to get insight in the determinants that influenced parents' intention to vaccinate their child (Chapter 2-7), research among CVPs (Chapter 8) and the Internet monitor (Chapter 9), we proposed a monitoring system to evaluate acceptance of the NIP in the Netherlands. The monitoring system will consist of different parts: (a) focus groups among parents and CVPs (only when there are major changes or events within the NIP), (b) a monthly questionnaire among parents, to get insight in the determinants that influence

their vaccination decision, (c) an annual questionnaire to get insight in CVPs experience and attitude towards the NIP, (d) CWCs as a sentinel, and an (e) an Internet monitor. Monitoring vaccination acceptance is important to get insight into trends and changes in parental vaccination decision-making, being able to timely intervene when there is unrest, and for targeting NIP-related implementation policies to the needs of important stakeholders (i.e., managers of CWCs, professionals, parents, Ministry of Health, Dutch Health Council).

Finally, **Chapter 11** summarizes and discusses the major findings of the studies and provides recommendations and suggestions for future research. First of all, since most parents perceive vaccinating their child as self-evident, they might be easily influenced by (negative) messages. To make them more resilient against these messages, they should be aware of why they choose to vaccinate their child. Parents should be enabled to make a deliberate decision and therefore needs to be informed about the benefits and withdrawals of childhood vaccination. Second, parents' positive attitude towards the NIP should be strengthened with the use of inoculation. The inoculation process consists of posing a threat, following with refutational preemption (i.e., providing information for people so they can strengthen their attitudes against future threats). Third, since different determinants influence different parents' intention to vaccinate, tailored communication should be developed in which each parent will receive NIP information, in line with the most important determinants that influence their decision to vaccinate. Fourth, it was shown that trust is an important determinant that influence acceptance of childhood vaccination and should remain high. Sustaining a high trust can be organized by understanding concerns about vaccines, by listening to the public and their needs, by communicating open and clear, and being transparent about how decisions are made within the NIP. Fifth, education should be developed for CVPs about how they can best inform parents about the NIP with the most important benefits and withdrawals of vaccination, how to strengthen parents' positive attitudes and beliefs about the NIP of parents, and how to provide tailored information and fulfill the different information needs of the parents.

Samenvatting

Samenvatting

In Nederland wordt de vaccinatiegraad van het Rijksvaccinatieprogramma (RVP) gemonitord door Praeventis (elektronisch vaccinatieregister). Het monitoren van de vaccinatiegraad alleen geeft geen volledig inzicht in de (veranderende) motivatie van ouders om hun kinderen wel of niet te laten vaccineren. Het doel van dit onderzoeksproject is om een monitoringsysteem op te zetten om de acceptatie van het RVP te evalueren onder ouders en consultatiebureau-medewerkers. Om te achterhalen welke componenten onderdeel moeten zijn van het monitoringsysteem, zijn studies in de voorgaande hoofdstukken uitgevoerd om belangrijke determinanten te achterhalen die de intentie en uiteindelijke keuze van ouders om hun kind binnen het RVP te vaccineren beïnvloeden.

Hoofdstuk 2 presenteert een focusgroep studie onder antroposofische ouders. Het doel van dit onderzoek was om inzicht te krijgen in de factoren die de keuze van ouders tot vaccineren beïnvloeden. Het onderzoek laat zien dat antroposofische ouders niet tegen alle vaccinaties zijn binnen het RVP, dat ze een bewuste en weloverwogen keuze maken en dat ze vaccineren niet als vanzelfsprekend zien. De meeste ouders hebben de BMR (Bof, Mazelen, Rode Hond) -vaccinatie geweigerd, omdat zij deze ziektes zien als kinderziektes (ziektes die worden gezien als essentieel voor lichamelijke en geestelijke ontwikkeling van het kind). Antroposofische ouders vinden de ziektes niet ernstig en denken dat de kans klein is dat hun kind infectieziekten krijgt. Ouders gaven aan dat ze het bezoeken van een antroposofisch consultatiebureau (CB) als positief ervaren, met langere consulten en meer informatie over het RVP dan op reguliere CB's. Ouders gaven aan meer informatie te willen ontvangen over het RVP, met name over de risico's van vaccineren, de componenten van vaccins en over de effectiviteit van de vaccins. Referenties naar bronnen waar deze informatie te vinden is, moeten worden gefaciliteerd voor ouders. Dit kan ervoor zorgen dat aan de informatiebehoefte van ouders wordt voldaan en kan bijdragen aan een geïnformeerde keuze tot vaccineren.

Hoofdstuk 3 beschrijft een focusgroepstudie met ouders met verschillende etnische achtergronden woonachtig in Nederland. Het doel van de studie was om inzicht te krijgen in de determinanten die de keuze tot vaccineren beïnvloeden, omdat gemengde bevindingen zijn gevonden over de deelname van deze ouders aan het RVP. Dit onderzoek laat zien dat deze ouders een positieve attitude hebben ten aanzien van het RVP en dat ze het vaccineren van hun kinderen als vanzelfsprekend zien. Het geloof (de Islam) heeft een positieve invloed op de intentie van ouders om hun kind te laten vaccineren, omdat volgens de Islam de bescherming van de gezondheid van kinderen belangrijk is. Deze ouders gaven aan dat wanneer het slecht weer is, ze geen gebruik konden maken van een auto, of wanneer het CB te ver weg was van hun huis, ze het CB niet bezochten. Dit laat zien dat men praktische barrières ervaart binnen het RVP om hun kind te vaccineren binnen het RVP. Een andere barrière benoemd door de ouders is een taalbarrière. Ouders waren niet allemaal in staat om Nederlands te lezen en te spreken. Dit

kan ertoe geleid hebben dat deze ouders de uitnodigingsbrief voor deelname aan het RVP niet begrepen hebben. Informatie moet daarom worden verstrekt in verschillende talen aan ouders.

Hoofdstuk 4 presenteert de resultaten van een online focusgroepstudie met ouders die hun kinderen gedeeltelijk of helemaal niet hebben laten vaccineren. Het doel van dit onderzoek was om determinanten te achterhalen, uitgezonderd van religieuze en antroposofische bezwaren, die de keuze van ouders tot (gedeeltelijk) weigeren van vaccinatie beïnvloeden. Het onderzoek laat zien dat ouders hun keuze baseren op meerdere factoren. Ouders gaven aan dat een gezonde levensstijl het risico op het krijgen van een infectieziekte zal verminderen en vreesden dat het immuunsysteem van het kind onvoldoende ontwikkeld is om met vaccins om te gaan. Deze ouders ervaren een hoog risico voor bijwerkingen en denken dat de infectieziektes niet ernstig zijn en dat de kans klein is dat hun kind een infectieziekte krijgt. Gemengde resultaten zijn gevonden voor de invloed van de sociale omgeving op de keuze van ouders. Sommige ouders gaven aan gesteund te worden door hun sociale omgeving, anderen voelden zich veroordeeld. Bovenstaande determinanten geven inzicht in het ontwikkelen van communicatiestrategieën die aansluiten op de zorgen en behoeftes van ouders en ambivalente gevoelens over het maken van een keuze tot vaccineren kunnen verminderen.

Hoofdstuk 5 beschrijft een vragenlijstonderzoek met als doel te achterhalen of ouders het hepatitis B-vaccin accepteren en welke determinanten hun keuze beïnvloeden. Deze studie creëerde ook een kans om te onderzoeken of de intentie van ouders om te vaccineren tegen hepatitis B een goede voorspeller is van het daadwerkelijke vaccinatiegedrag. Dit is onderzocht door ouders het hepatitis B-vaccin aan te bieden nadat ze de vragenlijst hebben ingevuld. De resultaten laten zien dat de intentie van ouders een gemiddeld sterke voorspeller is van het daadwerkelijke vaccinatiegedrag. Deze studie laat ook zien dat ouders een positieve attitude hebben ten aanzien van het Hepatitis B-vaccin en vaccineren tegen hepatitis B vanzelfsprekend vinden. De positieve attitude van ouders werd het sterkst beïnvloed door de waargenomen voordelen van het hepatitis B-vaccin. Ouders gaven aan hepatitis B een ernstige ziekte te vinden maar denken niet dat de kans groot is dat hun kind hepatitis B krijgt. Voorlichtingscampagnes zouden moeten worden ontwikkeld om de attitude ten aanzien van hepatitis B-vaccinatie positief te houden door de waargenomen voordelen van het hepatitis B-vaccin en de waargenomen kans op risico hepatitis B infectie te versterken.

Hoofdstuk 6 presenteert een vragenlijst onderzoek naar de informatiebehoefte en het informatiezoekgedrag van ouders over het RVP. In het algemeen geeft 13% van de ouders aan dat ze onvoldoende informatie krijgen over het RVP. Ouders zouden graag meer informatie willen ontvangen, met name over de bijwerkingen van de vaccins. Ondanks het feit dat 13% van de ouders meer informatie wil ontvangen, geeft 46% aan informatie te hebben gezocht, vooral op het internet. Hoewel de meeste ouders het internet gebruiken als een bron van informatie, zien ouders de CB-medewerkers als meest betrouwbare bron voor RVP-informatie. Het RIVM moet meer informatie verstrekken aan ouders over het RVP en moet ervoor zorgen dat hun website makkelijk te vinden is op het internet. CB-medewerkers moeten bewust zijn van hun

belangrijke rol in het geven van voorlichting aan ouders, omdat ze worden gezien als de meest belangrijke bron voor informatie.

Hoofdstuk 7 laat een vragenlijst onderzoek zien onder ouders met ten minste één kind (in de leeftijdscategorie 0 - 3,5 jaar) om de resultaten uit de focusgroepen (Hoofdstuk 2 – 4, en ongepubliceerde resultaten van focusgroepen met ouders die hun kinderen volledig hebben laten vaccineren) te kwantificeren en om inzicht te krijgen in het relatieve belang van de determinanten die de intentie tot vaccineren van ouders beïnvloedt. Ouders gaven aan een positieve attitude te hebben ten aanzien van het RVP. Attitude speelt ook een belangrijke rol in de keuze van ouders tot vaccineren. Dit onderzoek laat tevens zien dat overtuigingen over vaccinaties belangrijker zijn dan de overtuigingen omtrent ziektes. Communicatie moet daarom meer focussen op de karakteristieken van vaccins dan op die van de ziektes. De morele norm om te vaccineren beïnvloedt de attitude en intentie positief. Vertrouwen in het RVP speelt ook een belangrijke rol in de vaccinatiekeuze van ouders. De meeste ouders (81%) vinden het vaccineren van hun kind binnen het RVP vanzelfsprekend en 82,6% denkt er niet uitvoerig over na. Deze resultaten laten zien dat interventies om vaccinatiedeelname te promoten moeten focussen op de meest belangrijke determinanten die de intentie van ouders beïnvloeden (i.e., geanticipeerde spijt van niet vaccineren, morele norm en vertrouwen in het RVP).

Hoofdstuk 8 presenteert een vragenlijst studie onder CB-medewerkers om inzicht te krijgen in hun attitude en ervaring binnen het RVP. CB-medewerkers hebben een positieve attitude ten aanzien van het RVP en zijn tevreden met de huidige organisatie van het RVP. Daarnaast zijn ze in staat om verschillende groepen kritische ouders, zoals hoog opgeleide ouders en antroposofen, te herkennen. Sommige CB-medewerkers vermijden het hebben van een discussie met ouders over het RVP, meestal door een gebrek aan tijd. CB-medewerkers geven 1 tot 2 minuten of 2 tot 5 minuten voorlichting over het RVP per consult. Als ze informatie geven over het RVP gaat dit met name over mogelijke bijwerkingen en het RVP-schema. Ze geven verder aan in staat te zijn om te communiceren met (kritische) ouders over het RVP, maar willen desondanks opgeleid worden hoe te communiceren met ouders. Daarom moeten effectieve opleidingsprogramma's worden opgezet voor CB-medewerkers over hoe te communiceren met (kritische) ouders.

Hoofdstuk 9 laat een studie zien om inzicht te krijgen in vaccinatieberichten die mensen delen op het internet tijdens de uitbraak van mazelen in Nederland. Drie grote pieken zijn te zien in het aantal twitterberichten, social mediaberichten en nieuwsartikelen. Deze kunnen verklaard worden door aankondiging van het RIVM omtrent de mazelenuitbraak, uitspraken van Nederlandse politici, en het overlijden van een meisje door mazelen. De inhoud van de berichten was met name gefocust op het informeren van het publiek over het aantal mazelengevallen. Het sentiment van de berichten was vooral frustratie over gereformeerde ouders die hun kinderen niet lieten vaccineren. Dit onderzoek laat zien dat twitterberichten met name gebruikt werden om informatie te verspreiden, maar ook om meningen te delen. Daardoor

kan de inhoud van deze berichten worden gebruikt als maatstaf voor publieke interesses en zorgen.

Hoofdstuk 10 presenteert het uiteindelijke doel van dit onderzoeksproject: het aanbevelen van het monitoringsysteem. Gebaseerd op kwalitatief en kwantitatief onderzoek om inzicht te krijgen in de determinanten die de intentie tot vaccineren van ouders beïnvloeden (Hoofdstuk 2-7), onderzoek onder CB-medewerkers (Hoofdstuk 8), en de internet monitor (Hoofdstuk 9), bevelen we een monitoringsysteem aan om de acceptatie van het RVP te evalueren. Het monitoringsysteem zal bestaan uit verschillende onderdelen: (a) focusgroepen onder ouders en CB-medewerkers (alleen als er veranderingen zijn of onrust is binnen het RVP), (b) een maandelijks vragenlijst onder ouders, om inzicht te krijgen in de determinanten die de keuze tot vaccineren beïnvloeden, (c) een jaarlijkse vragenlijst om inzicht te krijgen in de ervaring en attitude van CB-medewerkers binnen het RVP, (d) CB's als peilstations, en (e) een internetmonitor. Het monitoren van de acceptatie van vaccinatie is belangrijk om inzicht te krijgen in trends en veranderingen in de keuze tot vaccineren van ouders, het tijdig voorspellen van onrust en voor het bepalen van RVP-gerelateerde beleidsimplementaties die voldoen aan de behoeften van belangrijke stakeholders (zoals, managers van CB's, professionals, ouders, Ministerie van Volksgezondheid, en de Gezondheidsraad).

Ten slotte, **Hoofdstuk 11** bediscussieert de bevindingen van de verschillende onderzoeken en geeft aanbevelingen en suggesties voor toekomstig onderzoek. Ten eerste, de meeste ouders vinden het vaccineren van hun kind binnen het RVP vanzelfsprekend, hierdoor kunnen ze makkelijk worden beïnvloed door negatieve berichten. Om deze ouders weerbaarder te maken tegen deze berichten, moeten ze bewust zijn van de redenen waarom ze ervoor gekozen hebben om hun kind te laten vaccineren. Ouders moeten een weloverwogen keuze kunnen maken. Dit kan door ze te informeren over de voor- en nadelen van vaccineren. Ten tweede, de positieve attitude van ouders ten aanzien van het RVP kan versterkt worden met behulp van inoculatie. Het inoculatieproces bestaat uit het bieden van een bedreiging, gevolgd door tegenargumenten (i.e., informatie om attitude te versterken tegen toekomstige bedreigingen). Ten derde, aangezien verschillende determinanten de keuze van verschillende ouders beïnvloeden, zal getailorde informatievoorziening (informatie op maat) naar ouders moeten worden ontwikkeld, zodat elke ouder RVP-informatie ontvangt wat overeenkomstig is met de belangrijkste determinanten die hun keuze tot vaccineren beïnvloeden. Ten vierde, vertrouwen is een belangrijke determinant in de acceptatie van vaccinatie en moet hoog blijven. Het hoog houden van vertrouwen kan worden georganiseerd door te luisteren naar het publiek en hun behoeftes waardoor zorgen over vaccinaties worden begrepen. Er moet open en helder worden gecommuniceerd en het RIVM moet transparant zijn over hoe keuzes binnen het RVP worden gemaakt. Ten vijfde, training moet worden opgezet voor CB-medewerkers over hoe ze het beste ouders kunnen informeren over de voor- en nadelen van vaccinatie, hoe ze de attitude van ouders het beste kunnen versterken en hoe ze getailorde informatie moeten geven en de informatiebehoefte van ouders kunnen vervullen.

Dankwoord

Dankwoord

En dan nu aangekomen bij het meest gelezen hoofdstuk: het dankwoord. Ook al staat alleen mijn naam op de voorkant, ik heb dit proefschrift natuurlijk niet helemaal alleen geschreven. Fijn dat ik nu de gelegenheid heb om iedereen kort te bedanken!

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Curriculum Vitae

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Irene Harmsen was born in Coevorden, the Netherlands on the 28th of January 1987. After completing her secondary school education at de Nieuwe Veste in 2004, she studied the Bachelor of Nursing at Hogeschool Windesheim. During this Bachelor, she visited Ethiopia for four months for an internship. In 2008, she finished her Bachelor of Nursing and started the pre-master Psychology at the University of Twente. In 2009, after she finished her pre-master, she started the Master Health and Risk Psychology at the University of Twente and in 2010 she obtained her Master's degree. During the pre-master and master Psychology, she worked as a nurse in a psychiatric institute and a rehabilitation center. In October 2010 she started her PhD project, of which the results are presented in this dissertation, at the National Institute for Public Health and Environment (RIVM) in collaboration with Maastricht University and TNO. She completed her PhD project under guidance of Prof. dr.Gerjo Kok, Prof. Dr. Rob Ruiter, Dr. Hester E. de Melker, and Dr. ir. Liesbeth Mollema. During her PhD, she visited Michigan University for four months and worked at the department of epidemiology under supervision of Prof. Dr. Boulton.