

Acceptance of Vaccination among Orthodox Protestants in The Netherlands

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Acceptance of Vaccination among Orthodox Protestants in The Netherlands

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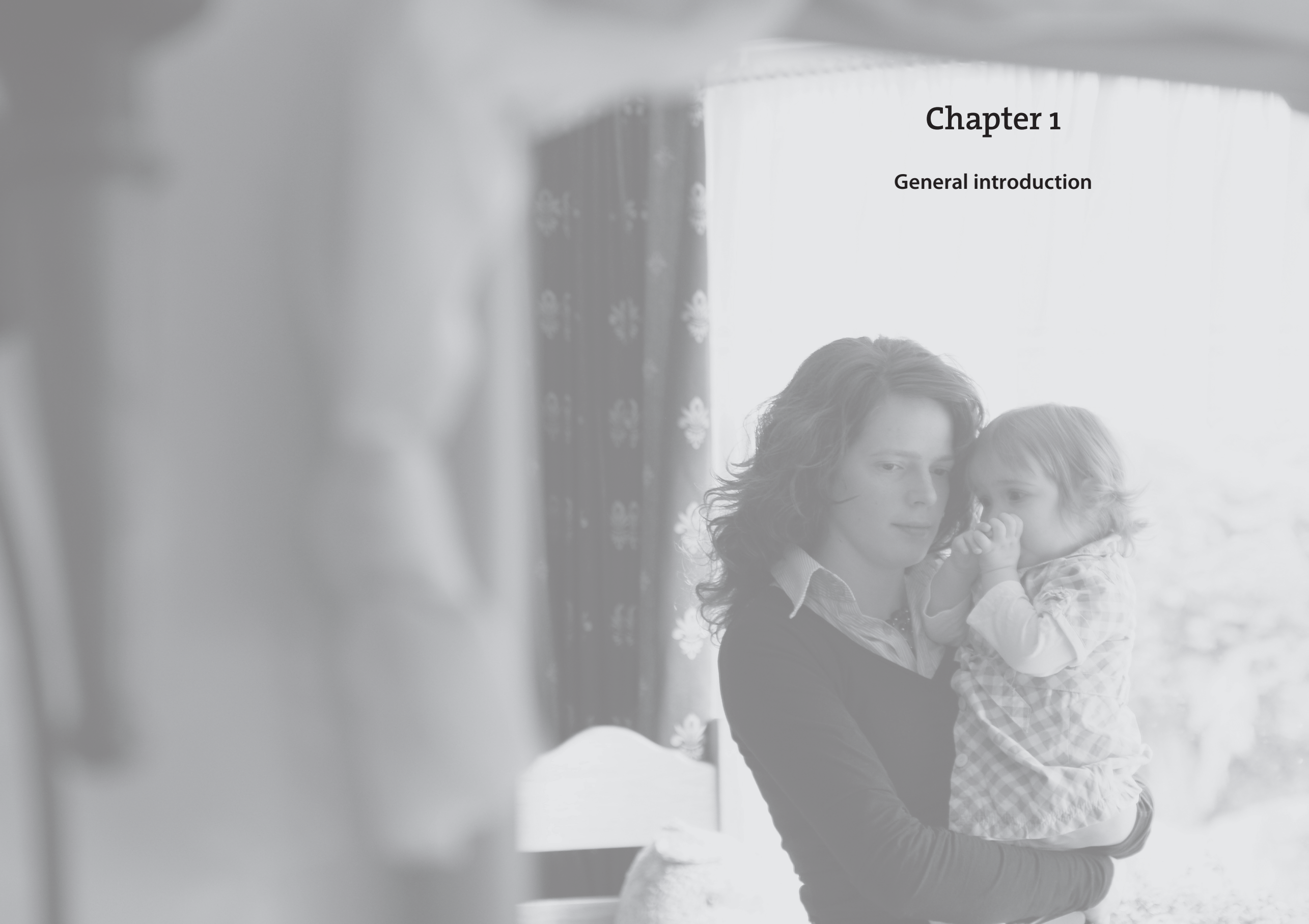
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Chapter 1

General introduction



Epidemics of vaccine preventable diseases in the Netherlands

Vaccination to prevent infectious diseases is one of the most effective medical interventions in public health. Since 1957, all children in the Netherlands are offered vaccinations according to the National Immunization Program (NIP) free of charge.¹ In 2011, the NIP consists of vaccinations against DTPP (Diphtheria, Tetanus, Pertussis and Polio), MMR (Measles, Mumps and Rubella), Hib (Haemophilus influenzae type B), Hepatitis B, Pneumococcal disease and HPV (Human Papilloma virus, for adolescent girls only), see Table 1.

Table 1 National immunization schedule in the Netherlands, October 2011

Phase	Age	Injection 1	Injection 2
1	0 months	HBV*	
	2 months	DTaP-IPV/Hib /HBV	Pneu
	3 months	DTaP-IPV/Hib /HBV	Pneu
	4 months	DTaP-IPV/Hib/HBV	Pneu
	11 months	DTaP-IPV/Hib/HBV	Pneu
	14 months	MMR	MenC
2	4 years	DTaP-IPV	
3	9 years	DT-IPV	MMR
4	12 years	HPV**	

* Only for children of a mother who tested positive for hepatitis B.

** Only for girls: Three injections with a one-month interval between the first and second and a five-month interval between second and third.

HBV = Hepatitis B
 DTaP-IPV/Hib/HBV = Diphtheria Tetanus acellular Pertussis- Inactivated Polio vaccine / Haemophilus Influenzae type B / Hepatitis B
 Pneu = Pneumococci (tenvalent)
 MMR = Measles Mumps Rubella
 MenC = Meningococci C
 HPV = Human Papilloma Virus

Source: www.rivm.nl/rvp

The effectiveness of a vaccination program depends on the level of immunity that the vaccine provides to the vaccinated individual and on the population uptake of the vaccination. While many vaccines provide lifelong protection, for some vaccines –like pertussis- immunity wanes over time.² In the Netherlands, the vaccine uptake is generally high, 90 to 95%.³ Only the recently introduced HPV vaccination has –with about 50%- a considerably lower uptake.⁴ As a result of the high vaccination coverage, the general population is well-protected against vaccine-preventable diseases and most of these diseases practically disappeared.⁵⁻⁹ Pertussis and mumps are, however, still prevalent even among vaccinated individuals but the burden of disease is considerably less than in the prevaccination era.¹⁰⁻¹³

Despite the generally high vaccination coverage, outbreaks and epidemics of vaccine preventable diseases occurred in the past decades, especially among unvaccinated individuals. In the 1960s there were a number of local polio outbreaks in orthodox Protestant villages with low vaccination coverage; the largest with 39 cases was in Staphorst in 1971.¹⁴ In 1978 and 1992-1993, polio epidemics with respectively 110 and 71 cases, spread all over the Bible belt, the area stretching from the south-west to the north-east of the Netherlands, where the orthodox Protestants live.^{15,16} In the same area a measles epidemic occurred in 1987-1988 and in 1999-2000, a rubella epidemic in 2004-2005 and a mumps epidemic in 2007-2008.¹⁷⁻²⁰ Incidentally outbreaks of measles are described in the anthroposophic community as well.^{17,21} Nevertheless, the epidemics of vaccine preventable diseases in the Netherlands are largely confined to the orthodox Protestant minority.

Orthodox Protestants as a religious minority

Protestantism in the Netherlands is historically characterized by many secessions and, incidentally, mergers. From the 19th century on, a number of orthodox Protestant denominations seceded from the Dutch Reformed Church.

In this thesis the terms orthodox Protestant, orthodox Protestantism and orthodox Protestant denominations are restricted to the subgroups of orthodox Protestants who are in Dutch known as 'bevindelijk gereformeerd' or 'reformatorisch'.

These subgroups emphasize the necessity of intense religious experiences in addition to adherence to the scripture. The Bible, the Belgic Confession of 1561, the Heidelberg Catechism of 1563 and the Canons of Dordt of 1619 are the most important writings in orthodox Protestantism. Moreover, the orthodox Protestants are heavily influenced by Dutch Reformed Pietism, (*de Nadere Reformatie*), a 17th century movement to apply the principles of the Reformation in daily life.²² They still often read texts of religious leaders of this movement.

Predestination, is an important topics in their belief. According to orthodox Protestant doctrine, God has predestined the fate of all human beings. Because of the original sin, the majority of mankind is doomed. Only few people are elected to live on in eternal bliss. These persons are informed of their election by an intense religious experience. However, they have to go through a difficult process of convert before they reach their blessed status. The importance that is attached to religious experience is the characteristic feature of the orthodox Protestant denominations concerned in this thesis, that distinguishes them from other scriptural oriented and evangelical denominations.²³

In Protestantism, the local congregation plays an important role in church order. The church members choose a church council, consisting of elders and deacons, and they appoint a pastor. The church council decides on collaboration with other local congregations. This collaboration may result in larger organizational structures: denominations. Numerous disputes among orthodox Protestants on the interpretation of the confession and liturgical and organizational issues led to the emergence and disappearance of a large number of denominations.²⁴

At present times, the largest orthodox Protestant denominations are the Reformed Congregations, the Reformed Congregations in the Netherlands, the Old Reformed Congregations and the Restored Reformed Church, see Table 2. The total membership number of these denominations is estimated to be about 220.000.²³

However, in some other Protestant denominations there are members and local congregations that equally stress the importance of intense religious experiences in addition to adherence to the scripture. They consider themselves orthodox Protestant as well and take part in orthodox Protestant social and cultural life.

The Christian Reformed Churches have a pietistic branch, gathered around the religious periodical *Bewaar het Pand*.^{25,26} The total membership number of the Christian Reformed Churches is about 75.000, the exact number of members belonging to the *Bewaar het Pand*-branch is unknown.

Within the Protestant Church in the Netherlands, with 1.8 million members the largest Protestant denomination in the Netherlands, there are also a number of pietistic pastors, congregations and individual members. The Reformed Bond (*Gereformeerde Bond*) is an association within the Protestant Church in the Netherlands that is considered to represent these pietistic pastors, congregations and members; however only part of the members of the Reformed Bond is pietistic oriented.^{27,28} It is difficult

Table 2 Orthodox Protestant subgroups

Name	Comments
Reformed Congregations (<i>Gereformeerde Gemeenten</i>)	Founded in 1907 by Rev. G.H. Kersten, also founder of the SGP (<i>Staatkundig Gereformeerde Partij</i> , the orthodox Protestant political party)
Reformed Congregations in the Netherlands (<i>Gereformeerde Gemeenten in Nederland</i>)	Seceded in 1953 from the Reformed Congregations
Old Reformed Congregations (<i>Oud Gereformeerde Gemeenten in Nederland</i>)	Founded in 1907 and merged in 1948 with the Federation of Old Reformed Congregations to Old Reformed Congregations in the Netherlands
Restored Reformed Church (<i>Hersteld Hervormde Kerk</i>)	Established in 2004, as continuation of the former Dutch Reformed Church, by congregations gathered around the periodical " <i>Het Gekrookte Riet</i> " that did not agree to the merger into the Protestant Church in the Netherlands
Pietistic branch of the Christian Reformed Churches (<i>Christelijke Gereformeerde Kerken</i>)	Founded in 1869, the denomination consists of several branches. The pietistic branch is gathered around the periodical " <i>Bewaar het Pand</i> ".
Reformed Bond within the Protestant Church in the Netherlands (<i>Gereformeerde Bond binnen de Protestantse Kerk in Nederland</i>)	Established in 1906, as an association within the former Dutch Reformed Church and since the merger in 2004 within the Protestant Church in the Netherlands. Only part of the members is pietistic oriented.
Other orthodox Protestants within the Protestant Church in the Netherlands (<i>Overige bevindelijk gereformeerden binnen de Protestantse Kerk in Nederland</i>)	Although many pietistic members of the former Dutch Reformed Church in 2004 joined the Restored Reformed Church, there are –apart from the Reformed Bond- still some pietistic members who stayed within the Protestant Church in the Netherlands
Independent congregations and individual believers (<i>Vrije gemeenten en thuislezers</i>)	A variety of small local groups and individuals, because of recruitment and classification problems not included in this thesis

to assess the membership number of the Reformed Bond; at the end of the 20th century was estimated to be around 25% of the members of the former Dutch Reformed Church, the largest denomination that merged in 2004 into the Protestants Church in the Netherlands.^{29;30}

Within the Protestant Church in the Netherlands there are also pietistic members who do not join the Reformed Bond. Their number is not exactly known.

Finally there are a number of independent pietistic orthodox Protestant congregations and a number of individual pietistic orthodox Protestants who don't belong to any church but read the Bible and other religious writings at their homes, the so called *thuislezers*.^{22;31}

In other European countries there were movements similar to Dutch Reformed Pietism e.g. Puritanism. However, in related churches -like the Scottish Presbyterian Church- vaccination is not an issue.³² Internationally, apart from the Netherlands, the only orthodox Protestant congregations that object to vaccination are the North American branches of the Reformed Congregations and the Reformed Congregations in the Netherlands, that consist of Dutch immigrants and their descendants. In the United States and Canada these congregations are known as the Netherlands Reformed Congregations.³³

Orthodox Protestants as a cultural minority

The orthodox Protestants do not only constitute a religious minority, but a cultural minority as well. In contrast to the general Dutch population, the orthodox Protestant lifestyle is largely based on the scripture and religion plays an important role in daily life. Sunday's rest is carefully observed and Sundays are generally spent attending church services and reading.

In politics, the orthodox Protestants are represented by their own political party, the SGP (*Staatkundig Gereformeerde Partij*), founded in 1918 by Rev. G.H. Kersten, also the founder of the Reformed Congregations.³⁴ The SGP advocates a bibliocratic society, that is a society fully organized on biblical principles. As men and women are considered to be "equivalent but not equal" women were until 2006 not accepted as member of the SGP and until now women do not fulfill governmental functions.³⁵

Using the Dutch freedom of education, the orthodox Protestants also founded their own schools, where lessons are taught with due observance of biblical values. Nowadays there are about 125 orthodox Protestant elementary schools and 7 orthodox Protestant highschools.

In 1971 an orthodox Protestant newspaper, *Reformatisch Dagblad*, was founded and there are orthodox Protestant magazines as well (*Terdege, Gezinsgids*). Orthodox Protestants refrain from television, theater, cinema and sports as these tend to produce idols that divert from the worship of God. Internet is accepted for business, educational and social purposes. Orthodox Protestant internet providers therefore filter the content, leaving out unchristian sites or only transmitting selected approved sites.³⁶

Historically the orthodox Protestants were rather low educated and poor, they focused more on religion than on social success. They were also very much orientated on their own cultural group and avoided the world outside. The emphasis on predestination and divine providence seemed initially to interfere with attempts to improve living standards. However, in the past decades, educational level and income position improved considerably.³⁷ Now they try to find a balance between participating in society en preserving their own cultural identity.³⁸

Orthodox Protestants and vaccination

The orthodox Protestant opposition to vaccination dates back to the 19th century. Like in other countries, severe side effects of smallpox vaccination fueled protests against compulsory vaccination.^{39;40} In 1823, the orthodox Protestant physician Abraham Capadose published his objections to vaccination.⁴¹ These were both medical and religious objections, the religious objections even more important than the medical. According to Capadose man should not interfere with divine providence. The concept of divine providence is explained in the Heidelberg Catechism, Lord's Day 10:

"Question 27: What do you understand by the providence of God?

Answer: The almighty, everywhere-present power of God, whereby, as it were by His hand, He still upholds heaven and earth with all creatures, and so governs them that herbs and grass, rain and drought, fruitful and barren years, meat and drink, *health and sickness*, riches and poverty, indeed, all things come not by chance, but by His fatherly hand."

Capadose stressed that vaccination as a preventive measure is not allowed as it is not known to humans if God intends to send disease, that vaccine –moreover- may cause disease in healthy children and that the aims of lifelong protection and eradication of disease are signs of misplaced human pride.

However, not all orthodox Protestants agreed with Capadose. Da Costa, initially also an opponent of vaccination, changed his mind after his son died of smallpox.³² Regardless of their personal decision on vaccination, all orthodox Protestants were opposed to compulsory vaccination.⁴²

The 1978 polio epidemic triggered among orthodox Protestants the discussion on vaccination. Biblical arguments in favor of vaccination were published. These arguments focus on the idea that vaccination is a gift of God and may be used in trust.³² In the church periodical of the Reformed Congregations, Vergunst suggested a compromise between advocates and opponents of vaccination comparing the biblical figures of

Ezra and Nehemia who both had to travel through enemy territory. Ezra refused a military escort, relying completely on his trust in God, while Nehemia thankfully accepted an escort as a gift God.⁴³ Vergunst concluded that the decision whether or not to accept protection should be left to the conscience of the individual church members, who had to account for their decision only in front of God. During the 1992-1993 polio epidemic the same arguments were repeated, leaving the decision whether or not to vaccinate to the orthodox Protestant parents.⁴⁴

The actual vaccination coverage among orthodox Protestants in the Netherlands is unknown; religion is not registered in the national vaccination register. On municipality level a higher proportion of voters for the SGP is associated with a lower vaccination coverage.⁴⁵

During the 1978 polio epidemic, vaccination coverage among orthodox Protestants was estimated to be varying from 50% to 85%, depending on denomination.⁴⁶ According to an opinion survey among students of orthodox Protestant high schools and their parents in 1981, that was repeated in 1998, acceptance of vaccination increased during time and there were again considerable differences among the denominations.^{37;47} The differences in position among the denominations were also observed in a study on the reports on vaccination related issues in orthodox Protestant church papers.⁴⁸

Some orthodox Protestants do not only have objections to vaccination; because of the same arguments of interference with divine providence they object to insurance as well. In contrast to the number of unvaccinated, the number uninsured of orthodox Protestants, i.e. exempted from health insurance, is exactly known, namely 11,000.⁴⁹ However the group objecting to insurance is smaller than the group objecting to vaccination.⁴⁷ An accurate estimation of vaccination coverage in the orthodox Protestant minority is, however not available.

Apart from lack of insight into the vaccination coverage among orthodox Protestants, there is also a lack of insight into the decision-making process regarding vaccination. To our knowledge there has been only one study on this subject, carried out during the polio epidemic of 1978. Veenman and Jansma identified religious objections, tradition, fear for side effects and carelessness as reasons for not being vaccinated before the start of the epidemic.⁵⁰ During the epidemic, extensive deliberations whether or not to accept vaccination took place within orthodox Protestant families, often initiated by older children. Orthodox Protestants who changed their minds and accepted second chance vaccination argued that vaccination was no longer a preventive measure while the disease was prevalent.

At present, without the immediate threat of an epidemic, it is unknown how orthodox Protestant parents decide on the vaccination of their children.

Response to orthodox Protestant objections to vaccination

In the past, many governments introduced compulsory vaccination in order to achieve sufficient immunity to stop the smallpox epidemics.³⁹ In the Netherlands vaccination has never been compulsory. However, during the end of the 19th and beginning of the 20th century smallpox vaccination was required for school entrance.¹ Although vaccination was not administered to children whose parents objected to vaccination, the requirement resulted for them in exclusion from education. In 1939 new legislation provided the possibility for the mayor to grant exemptions from the vaccination requirement. This opportunity was used by orthodox Protestant parents until smallpox vaccination was stopped.

Public debate on compulsory vaccination rose again during the polio outbreaks, especially the outbreak in Staphorst generated a lot of attention with 39 cases and 5 deaths in a picturesque traditional village.^{24;42;51} After this outbreak, and again after the polio epidemics of 1978 and 1992/1993, the Minister of Health asked for expert advice on the vaccination policy with respect to the orthodox Protestant minority. The target group itself was hardly involved in these advices. The Health Council and the National Council for Public Health advised repeatedly against compulsory vaccination.⁵²⁻⁵⁴

Given the high vaccination coverage reached on voluntary basis and the correspondingly low risk of infection, compulsion is considered not a proportionate measure and therefore not justifiable. This argument has been endorsed in literature.⁵⁵⁻⁵⁷ Moreover, according to the experts, compulsory vaccination is difficult – if not impossible- to enforce and compulsion might even result more widespread opposition.

Instead of compulsory vaccination the experts advised to enhance the information on vaccination for the orthodox Protestant target groups.^{53;54} The Minister of Health repeated the intention to start information campaigns in response to questions in Parliament during the epidemics of measles, rubella and mumps.⁵⁸⁻⁶⁰ Up until now the RIVM information campaigns on vaccination focus on the severity of the various vaccine preventable diseases and the benefits of vaccination. It is not known whether orthodox Protestants are interested in such information.

Apart from mass information campaigns, health care professionals can provide information on vaccination on individual basis. In the Netherlands vaccinations according to the NIP are administered by the professionals of child health clinics and youth health services. The child health clinics provide personal information to all parents.⁶¹ In parliament, it was suggested to enhance this strategy and to oblige unvaccinated youngsters to visit the youth health service to get personal information from a youth health care professional.⁶² This suggestion was endorsed by the KNMG, Royal Dutch Medical Association.⁶³ However, while little is known about orthodox

Protestants' decisions on vaccination, even less is known on the role of health care professionals in these decisions.

Next to providing medical information, the Minister of Health, tried to initiate a dialogue with the religious leaders of the orthodox Protestants denomination that had objections to vaccination. During the polio epidemic of 1978, the Minister sent these religious leaders a letter,⁴⁶ while in 1992 a committee of three wise men was appointed to start a dialogue with them.⁴⁴ To stimulate discussion two booklets were published with theological arguments for and against vaccination.^{32;44} Although the dialogue was not very successful – the committee reported to have had talks with representatives of only two denominations- the National Council for Public Health advised to continue the dialogue with the religious leaders.⁵⁴ It is obviously assumed that if religious leaders accept vaccination, their congregations will follow.^{64;65} However, while -as stated before- little is known about orthodox Protestants' decisions on vaccination, even less is known on the role of religious leaders in these decisions.

Outbreak control

Up until now, the control of outbreaks of vaccine preventable diseases among orthodox Protestants has been focused on the Bible belt, the area where historically the orthodox Protestants live. During the 1978 polio epidemic it was, however, noticed that the cases were no longer restricted to villages with low vaccination coverage, they also occurred among unvaccinated orthodox Protestants living in towns with high vaccination coverage.¹⁵ During the measles epidemic in 1999/2000 in one third of all municipalities in the Netherlands at least one case was registered.¹⁸ Social clustering of orthodox Protestants may be more important than geographical clustering. Details on the spread of vaccine preventable diseases in the orthodox Protestant population are however scarce.

Up until now, public health services offer second chance vaccination in response to every new epidemic in the orthodox Protestant minority. During the polio epidemics, vaccination was offered to various target groups. Initially – during local polio outbreaks- vaccination was offered to all children in the village, regardless of their vaccination status. In Staphorst it was reported that a large proportion (87%) of this target population accepted vaccination.^{14;42} During the polio epidemics in 1978 and 1992/1993 the vaccination offer was restricted to previously unvaccinated children and young adults in the Bible belt. Uptake in this target groups was however low, especially among orthodox Protestants.^{15;66} Details on the uptake of second chance MMR vaccination are unknown.

Orthodox Protestant schools are considered to play an important role in the transmission of polio. For that reason their sewage water has been monitored for early detection of polio virus circulation.^{15;16;67} Still, in the Netherlands school closure has never been applied during polio epidemics. School closure was considered ineffective, because infection has already spread before the detection of the epidemic and children have leisure time contacts as well.¹⁴⁻¹⁶ After the 1992/1993 polio epidemic, however, the Health Council recommended in case of a new polio epidemic to consider school closure.⁶⁸ In addition, in collaboration with orthodox Protestant school leaders hygiene measures were formulated to lower the risk of infection for those who refuse vaccination.⁶⁹ The role of orthodox Protestant schools in the spread of vaccine preventable diseases is thus not yet clear, neither is their significance for outbreak control.

We conclude that in the Netherlands, despite high vaccination coverage, epidemics of vaccine preventable diseases still occur. These epidemics are largely confined to the orthodox Protestant minority that has religious objections to vaccination. Nevertheless, the actual vaccination coverage among orthodox Protestants is unknown. Further, the details on their decision-making on vaccination and the role of health care professionals and religious leaders in these decisions are also unknown. Public health response focuses on information on the benefits of vaccination and second chance vaccination offered during epidemics. However, the effects of these interventions are unknown.

Outline of the thesis

The aim of this thesis is to gain insight into the vaccination coverage and vaccination decision-making processes in the orthodox Protestant community in order to formulate recommendations for a public health policy to optimally protect this specific group against vaccine preventable diseases.

The research questions are :

- What is the vaccination coverage among the orthodox Protestant minority and its various denominations?
- How do orthodox Protestant parents actually decide on the vaccination of their children?
- What are the roles of health care professionals and religious leaders in these decisions?
- What can we learn from case studies regarding the spread of vaccine preventable diseases and the effects of possible interventions?

Part one of this thesis focuses on vaccination coverage:

In chapter 2 we describe an ecological study in which the influence of orthodox Protestant denominations on municipal vaccination coverage is assessed.

In chapter 3 the vaccination coverage among the orthodox Protestant minority and its various subgroups is estimated using data from two sub-studies with a different design.

Part two focuses on the decision-making on vaccination in orthodox Protestant groups:

In chapter 4 the decision making process of orthodox Protestant parents is described, based on in-depth interviews.

In chapter 5 is described how healthcare professionals deal with orthodox Protestant parents who object to vaccination, also based on in-depth interviews.

And in chapter 6 the role of religious leaders is highlighted.

Part three comprises case studies on the feasibility of possible interventions regarding information supply, second chance vaccination and school closure in order to optimally protect the orthodox Protestant community against vaccine preventable diseases.

In chapter 7 we assessed the need for information on vaccination among orthodox Protestant youngsters, using an online questionnaire.

In chapter 8 we assessed, after the 2004/2005 rubella epidemic, in two villages with low vaccination coverage the rubella seroprevalence among unvaccinated young women and the uptake of MMR vaccination by the seronegative women.

In chapter 9 we describe the role of orthodox Protestant schools in spread of mumps in a village with low vaccination coverage during the 2007/2008 epidemic.

In chapter 10, finally, we discuss our findings and the implications for public health policy and further research.

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Chapter 2

Religious subgroups influencing vaccination coverage in the Dutch Bible belt: an ecological study

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Abstract

Background

The Netherlands has experienced epidemics of vaccine preventable diseases largely confined to the Bible belt, an area where -among others- orthodox Protestant groups are living. Lacking information on the vaccination coverage in this minority, and its various subgroups, control of vaccine preventable diseases is focused on the geographical area of the Bible belt. However, the adequacy of this strategy is questionable. This study assesses the influence of presence of various orthodox Protestant subgroups (orthodox Protestant denominations, OPDs) on municipal vaccination coverage in the Bible belt.

Methods

We performed an ecological study at municipality level. Data on number of inhabitants, urbanization level, socio-economical status, immigration and vaccination coverage were obtained from national databases. As religion is not registered in the Netherlands, membership numbers of the OPDs had to be obtained from church year books and via church offices. For all municipalities in the Netherlands, the effect of presence or absence of OPDs on vaccination coverage was assessed by comparing mean vaccination coverage. For municipalities where OPDs were present, the effect of each of them (measured as membership ratio, the number of members proportional to total number of inhabitants) on vaccination coverage was assessed by bivariate correlation and multiple regression analysis in a model containing the determinants immigration, socio-economical status and urbanization as well.

Results

Mean vaccination coverage ($93.5\% \pm 4.7$) in municipalities with OPDs ($n=135$) was significantly lower ($p < 0.001$) than in 297 municipalities without OPDs ($96.9\% \pm 2.1$). Multiple regression analyses showed that in municipalities with OPDs 84% of the variance in vaccination coverage was explained by the presence of these OPDs. Immigration had a significant, but small explanatory effect as well. Membership ratios of all OPDs were negatively related to vaccination coverage; this relationship was strongest for two very conservative OPDs.

Conclusion

As variance in municipal vaccination coverage in the Bible belt is largely explained by membership ratios of the various OPDs, control of vaccine preventable diseases should be focused on these specific risk groups. In current policy part of the orthodox Protestant risk group is missed.

Background

In the Netherlands the national vaccination program started in 1957. Despite a high vaccination coverage, in the last two decades there have been epidemics of poliomyelitis (1992-1993), measles (1999-2000), rubella (2004-2005) and mumps (2007-2008)¹⁻⁴. These epidemics were all largely confined to an area stretching from the south-west to the north-east of the country, the so-called Bible belt, where -among others- orthodox Protestant groups are living. Almost all patients in these epidemics belonged to the orthodox Protestant minority and were unvaccinated because of religious objections.

Lacking information on the vaccination coverage in the orthodox Protestant minority and its various subgroups, currently control of vaccine preventable diseases is focused on the geographical area of the Bible belt. Although the term Bible belt is generally understood as the area where the orthodox Protestants are living, the boundaries of this area are not exactly clear. It is often defined as municipalities with votes for the *Staatkundig Gereformeerde Partij* (SGP, the orthodox Protestant political party) above a certain threshold, mostly 5%⁵. However, this percentage is set arbitrarily and the defined area is subject to change, e.g. because of municipal mergers of municipalities with higher and lower percentages of votes for SGP. So the adequacy of this policy to target a risk group for vaccine preventable diseases seems questionable. Knowledge of vaccination coverage in the orthodox Protestant minority, and its various subgroups, could be helpful to focus prevention and control of vaccine preventable diseases on the persons really at risk.

The orthodox Protestants form a closed community within Dutch society⁶. They have their own churches, their own schools, their own newspaper and in politics they are represented by their own political party, the SGP. The orthodox Protestant opposition to vaccination dates back to the 19th century. At that time, like in other countries, severe side effects of smallpox vaccination fueled in the Netherlands protests against compulsory vaccination^{7,8}. Nowadays the main orthodox Protestant arguments against vaccination focus on the necessity of trust in Divine providence, referring to certain passages in the Bible⁹. A different exegesis in favour of vaccination is, however, noticed as well among orthodox Protestants¹⁰.

From the 19th century on, a number of orthodox Protestant denominations (OPDs) separated from the Dutch Reformed Church. These OPDs not only vary in their interpretation of the Bible, they seem to vary in their position towards vaccination as well. In church periodicals from 1950's up to 2000 a tendency was observed from explicit rejection to stressing the personal responsibility and individual choice of church members. According to their periodicals the Reformed Congregations in the Netherlands and the Old Reformed Congregations seem to be most persistent in refusal¹¹.

Actual vaccination coverage among the various OPDs in the Netherlands is unknown. In the registration of the national vaccination program, religion is not recorded. Moreover, as religion is not recorded in any public registration, actual membership numbers of the OPDs are even largely unknown. Since vaccination is a sensitive subject among orthodox Protestants specific research on vaccination related issues in this minority is scarce and not differentiating among the various OPDs^{12,13}. In the present study we will explore the influence of the various OPDs on municipal vaccination coverage in the Bible belt.

Apart from religious objections, the still remaining rural character of the Bible belt may influence vaccination coverage. Historically local churches of the OPDs were established in small villages in this area¹⁴. The presence of a large amount of orthodox Protestants in a small local community influences local culture. Church attendance among Protestant groups, for example, appears to be more frequent if the relative size of the Protestant group increases¹⁵. As social control interferes with personal choices that deviate from group norms, and social control is more prevalent in rural areas¹⁶, the level of urbanization may be a determinant of municipal vaccination coverage in the Bible belt.

In the Netherlands, preventive child care, including vaccinations conform the national vaccination programme, is offered free of charge to all children by child health clinics. The parents of all newborns are personally invited to visit these clinics, that are held in their neighbourhood. However, still not all eligible children may be reached. There might be cultural reasons for not attending the child health clinics. Internationally recent immigration and low socio-economical status are associated with low vaccination coverage¹⁷⁻¹⁹. These determinants may influence municipal vaccination coverage in the Bible belt as well.

The aim of this ecological study is to explore the influence of the various OPDs on municipal vaccination coverage in the Bible belt. Knowledge of vaccination coverage in the orthodox Protestant minority, and its various subgroups, could be helpful to focus prevention and control of vaccine preventable diseases on the persons really at risk.

Methods

In order to achieve the aim of the study, the following research questions were formulated:

Is there a difference in vaccination coverage between municipalities with and without OPDs?

What is the influence of the membership ratios of separate OPDs (number of members of the OPD proportional to the total number of inhabitants of the municipality) on municipal vaccination coverage in municipalities where OPDs are present?

Study design and population

An ecological study at municipality level was performed.

All 458 municipalities in the Netherlands (reference date 01-01-2006) were included. As in the Netherlands municipal merging is an ongoing process and as in small municipalities churches may attract believers from neighbouring municipalities, in the provinces Zuid-Holland, Utrecht and Gelderland municipalities were aggregated for this study. In these provinces municipalities with less than 15.000 inhabitants were aggregated according to existing plans for municipal merger or according to geographical entities like (former) islands and polders. In this way 36 municipalities were aggregated to 10 geographical entities. Thus the study includes 432 municipalities and geographical entities, comprising all inhabitants of the Netherlands.

In this study the Bible belt is defined as all municipalities and geographical entities where one or more OPDs are established (irrespective of percentage of votes for SGP).

Variables and data collection

Vaccination coverage

In this study vaccination coverage at municipal level was measured by the percentage of 2-year olds that completed DTPP (Diphtheria Tetanus Pertussis Polio) vaccination according to scheme. To avoid fluctuations caused by small numbers of children in little villages the mean percentage was calculated for the years 2003, 2004 and 2005 (which were the most recent available data). The data on municipal vaccination coverage were obtained from the Health Inspectorate (2003) and from the RIVM, the National Institute for Public Health and the Environment (2004 and 2005).

Denomination

Membership numbers of all local branches of the five largest OPDs were gathered.

- Restored Reformed Church

The Restored Reformed Church does not publish membership numbers, therefore the local membership numbers were obtained from their central church office.

- Reformed Congregations

Local membership numbers of the Reformed Congregations were obtained from their Church Year Book.

- Reformed Congregations in the Netherlands

Local membership numbers of the Reformed Congregations in the Netherlands were obtained from their Church Year Book. For the in 1980 from the Reformed Congregations in the Netherlands seceded Reformed Congregations in the Netherlands (not synodally

related) an estimate of the membership number was made based on literature²⁰. In this small group a tendency is observed to return to their mother church, therefore these members were in this study added to the Reformed Congregations in the Netherlands.

- Old Reformed Congregations

The Old Reformed Congregations do not publish membership numbers, therefore the local membership numbers were obtained from their central church office. For the Free Old Reformed Congregations, who do not join the central church office, estimates of membership numbers were based on literature²⁰. Because of religious kinship in this study the members of the free Old Reformed Congregations were added with the Old Reformed Congregations.

- Christian Reformed Churches

Local membership numbers of the Christian Reformed Churches were gathered from their Church Year Book. However, within the Christian Reformed Churches there are three different subgroups with an orthodox, intermediate or evangelical orientation. Therefore the orientation of each local branch was assessed by three informants belonging to this denomination. If at least two of them considered a local branch orthodox it was counted as such. Only the members of the orthodox branch were included in the analysis.

- Other orthodox Protestant groups, not included in the study

Within the Protestant Church in the Netherlands (the largest Protestant denomination in the Netherlands) there are some members who sympathize with orthodox Protestant exegesis. However as they are not registered as such we could not include them in our study. Another group we could not include is the small group of orthodox Protestants who do not join any denomination.

Subsequently, for every municipality in the Netherlands it was checked whether one or more local branches of the five above mentioned denominations were established in that municipality. And for those municipalities where one or more of these OPDs had been established, for each denomination the membership ratio was calculated by dividing the number of members of that specific OPD in the municipality by the total number of inhabitants of the municipality.

Urbanization

Classification of the urbanization of the municipalities was obtained from Statistics Netherlands. This classification is based on density of addresses and dichotomized in rural (<1000 addresses/km²) and urban (≥1000 addresses/km²).

Socio-economical status

Socio-economical status was indicated by the percentage of the population in a

municipality that is receiving income support. Data were obtained from Statistics Netherlands, reference date 01-01-2006.

Immigration

Immigration was indicated by the percentage of non-western immigrants living in a municipality. Data were obtained from Statistics Netherlands, reference date 01-01-2006

Votes for SGP

The percentages of votes for SGP in the 2006 elections for parliament were obtained from Statistics Netherlands. Municipalities were dichotomized in municipalities with more and less than 5% votes for SGP.

The data obtained from Statistics Netherlands, RIVM and the Health Inspectorate are openly available via internet. The data on membership numbers of the OPDs were obtained via the churches, these data are not openly available.

Analysis

Some variables had a somewhat skewed distribution, which leaves the use of parametric tests open to discussion. Therefore we performed non-parametric tests as well (N.B. both tests led to similar conclusions).

First, for all municipalities and geographical entities in the Netherlands, the effect of presence or absence of OPDs on vaccination coverage was assessed by comparing mean vaccination coverage using the independent samples t-test. As Levene's test for equality of variances was significant ($p < 0.05$) homogeneity of variance was not assumed, and therefore we used the corrected independent samples T-test in SPSS. Since the distribution of some variables was somewhat skewed we performed the Mann-Whitney test as well.

Second, for municipalities and geographical entities where one or more OPDs were present, the relationship between vaccination coverage and the explaining variables (membership ratios of the orthodox Protestant denominations, urbanization, socio-economical status and immigration) was analysed by bivariate correlation (Pearson's r) and multiple regression analysis, using a backward selection method (removal criterion $p \geq 0.1$). Since the distribution of some variables was somewhat skewed, Spearman's rho test was performed as well. Multiple regression analysis was repeated without the outliers responsible for skewed distribution of some variables. The residuals were all independent and normally distributed, there was no heteroscedacity and no collinearity.

Finally, to compare the influence of the membership ratios of various OPDs to the influence of over 5% votes for SGP the bivariate and multiple regression analyses

were repeated with the variable >5% votes for SGP replacing the membership ratios of the OPDs.

Results

Characteristics of study population

Overall the OPDs in the Netherlands had almost 220,000 members. This means that 1.3% of the Dutch population is member of one of the OPDs. The membership numbers of the various OPDs on national level are shown in table 1.

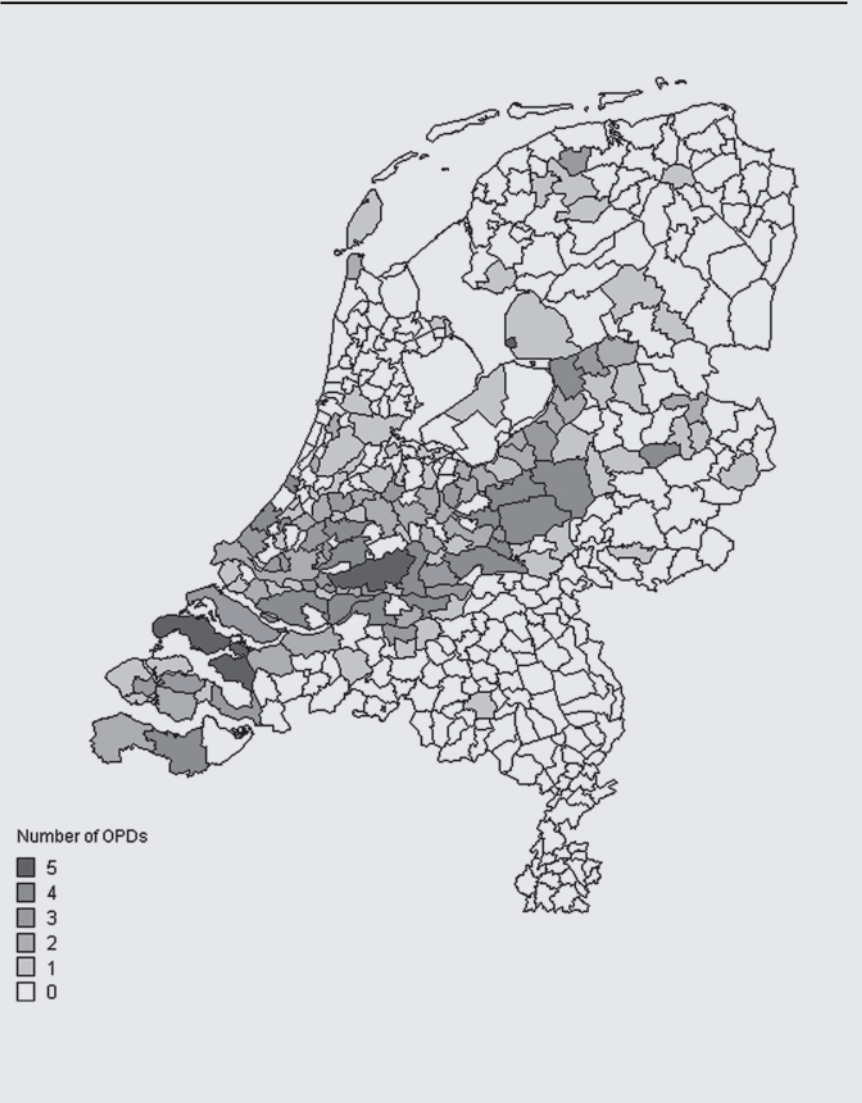
Table 1 Orthodox Protestant denominations on national level in the Netherlands

Denomination (Dutch name of denomination)	Datasource	Members	Living in municipalities with < 5% votes for SGP
Restored Reformed Church (<i>Hersteld Hervormde Kerk</i>)	Central Church Office	52690	6870 (13%)
Reformed Congregations (<i>Gereformeerde Gemeenten</i>)	Church Year Book 2006	103272	27258 (26%)
Reformed Congregations in the Netherlands* (<i>Gereformeerde Gemeenten in Nederland</i>)	Church Year Book 2007	24405	3483 (14%)
Old Reformed Congregations** (<i>Oud Gereformeerde Gemeenten</i>)	Central Church Office	21192	5647 (27%)
	Hoekstra 2008		
Christian Reformed Churches*** (<i>Christelijke Gereformeerde Kerken</i>)	Church Year Book 2006	17547	6183 (35%)
	Personal communication		
Total		219106	49441 (23%)

* including Reformed Congregations in the Netherlands, not synodally related (*buiten verband*)
** including Free Old Reformed Congregations (*Vrije Oud Gereformeerde Gemeenten*)
*** orthodox Protestant subgroup, not including evangelical or intermediate subgroups

The 432 municipalities and geographical entities in our study had a mean population of 36,781 inhabitants. In 135 of these municipalities and geographical entities one or more OPDs were established (Table 2). Their geographical distribution is shown in Figure 1.

Figure 1 Number of OPDs per municipality or geographical entity



In only 41 (30%) of these 135 municipalities and geographical entities the percentage votes for SGP was over 5%. Almost a quarter of the orthodox Protestants is living outside municipalities and geographical entities with more than 5% votes for SGP.

Vaccination coverage in relation to presence of OPDs

Including all municipalities and geographical entities, mean vaccination coverage was 95.8 % (SD 3.5). In the 297 municipalities without OPDs mean vaccination coverage was 96.9 % (SD 2.1) whereas in the 135 municipalities and geographical entities where one or more OPDs were established mean vaccination coverage was 93.5% (SD 4.7). The mean vaccination coverage of municipalities with at least one OPD (93.5%) is statistically significantly lower than the mean vaccination of municipalities without OPDs (96.9%) ($P < 0.001$). As the number of OPDs established in a municipality or geographical entity increases, mean vaccination coverage decreases (Table 2).

Table 2 Characterization of the municipalities and geographical entities, including vaccination coverage

Municipality or geographical entity	N	Mean % OPD members* (standard deviation)	Vaccination coverage (standard deviation)
Without OPD	297	-	96.9 (2.1)
With ≥ 1 OPD	135	4.9 (7.3)	93.5 (4.7)
1 OPD	60	1.4 (2.3)	96.0 (1.6)
2 OPDs	31	4.6 (7.1)	94.3 (3.5)
3 OPDs	22	8.7 (8.1)	91.9 (5.5)
4 OPDs	18	8.9 (6.7)	89.4 (5.1)
5 OPDs	4	20.6 (15.5)	82.4 (8.6)

* % OPD members = total number of members of all OPDs in the municipality combined, proportional to the population of the municipality

Influence of individual OPDs on vaccination coverage

In municipalities and geographical entities where one or more OPDs were established we assessed the influence of the individual OPDs on vaccination coverage, as well as the influence of urbanization, immigration and socio-economical status.

In Table 3 for the 135 municipalities and geographical entities with OPDs, the bivariate correlations, using Pearson's r , between the vaccination coverage and the independent variables are shown. As expected, membership ratios of all OPDs have negative

correlations with vaccination coverage, meaning that higher membership ratios are related with lower vaccination coverage. Level of urbanization showed the expected positive relation: meaning that in urban areas the vaccination coverage was higher than in rural areas. At first sight the proportions of non-western immigrants and of people dependent on income support (indicating socio-economical status) showed unexpected positive relations with vaccination coverage. This can be explained, however, because non-western immigrants and people dependent on income support mainly live in urbanized areas where the OPDs are underrepresented. Repeating bivariate correlation using Spearman's ρ gave comparable results, except for the Christian Reformed Churches ($\rho = -0.17$, $p = 0.053$) and for level of urbanization ($\rho = 0.13$, $p = 0.131$).

Table 3 also shows the result of a multiple regression analysis, using a backward selection method (removal criterion $p \geq 0.1$). Level of urbanization and socio-economical status did not have any explanatory effect. A percentage of 84 of the variance in vaccination coverage was explained by membership of the various OPDs. The b-values all showed the expected negative sign but varied for the various denominations. The largest denominations –the Reformed Congregations and Restored Reformed Church– both had b-values around -0.40. This implies that 1 per cent point increase in membership ratio is associated with only 0.40 per cent point decrease in vaccination coverage. For the Reformed Congregations in the Netherlands and the Old Reformed Congregations, b-values exceeded minus 1, which implies that 1 per cent point increase in membership ratio is associated with even more than 1 per cent point decrease in vaccination coverage. Immigration had a significant, but very small explanatory effect; the total explanation only increased to 85%. The b-value now showed the expected negative sign.

Seven municipalities or geographical entities, all strongholds of certain OPDs, were recognized as outliers. Compared to the other municipalities and geographical entities they had an extremely high membership ratio for one OPD, which might have had an undue influence on the analysis. Repeating the analysis in 128 municipalities or geographical entities, leaving out the strongholds, 73% of variance in vaccination coverage could be explained. Again level of urbanization and socio-economical status had no significant effect, and here the membership ratio of Christian Reformed Churches was removed as well. All other results are comparable with the analyses on the basis of 135 geographical entities (Table 3).

In order to check if indeed the various OPDs were influential or merely the total membership ratio of all OPDs in the municipality, we repeated the analyses replacing the membership ratios of the various OPDs by the total membership ratio of all OPDs

Table 3 Influence of OPD membership ratios on municipal vaccination coverage

Explaining variables	N= 135 municipalities or geographical entities with OPDs					N= 128 municipalities or geographical entities with OPDs, leaving out 7 outliers				
	Pearson		multiple regression			Pearson		multiple regression		
	r	p	b	t	p	r	p	b	t	p
Constant			97.15	313.20	<0.001			97.00	296.91	<0.001
% Restored Reformed Church*	-0.45	<0.001	-0.37	-7.32	<0.001	-0.46	<0.001	-0.43	-4.97	<0.001
% Reformed Congregations*	-0.63	<0.001	-0.49	-10.85	<0.001	-0.65	<0.001	-0.41	-6.78	<0.001
% Reformed Congregations in the Netherlands*	-0.66	<0.001	-1.57	-9.17	<0.001	-0.61	<0.001	-1.70	-6.27	<0.001
% Old Reformed Congregations*	-0.65	<0.001	-1.22	-6.83	<0.001	-0.61	<0.001	-1.37	-5.86	<0.001
% Christian Reformed Churches*	-0.38	<0.001	-0.36	-4.00	<0.001	-0.14	ns#			
% Nonwestern immigrants**	0.23	<0.001	-0.07	-2.54	<0.05	0.17	<0.05	-0.06	-2.22	<0.05
% With income support**	0.22	<0.05				0.18	<0.05			
Level of urbanization***	0.28	<0.001				0.24	<0.001			
Explained variance					85%					73%

Results of bivariate correlation and multiple regression analysis, showing influence of OPD membership ratios, immigration, socio-economical status and urbanization on vaccination coverage (in municipalities and geographical entities with OPDs, and leaving out outliers)

* % OPD = membership ratio of OPD= percentage of municipal population that is member of the named orthodox Protestant denomination

** % = percentage of municipal population consisting of non western immigrants respectively percentage of municipal population with income support

*** dichotomized variable: rural = 0, urban =1

ns = not significant

together. However, in this way the explanation of variance in vaccination coverage was 77% (versus 85%) in the group of 135 municipalities and geographical entities, and 64% (versus 73%) in the group of 128.

Municipalities with more and less than 5% votes for SGP

As the Bible belt is often defined as municipalities with more than 5% votes for SGP , we repeated the bivariate correlation and multiple regression analysis replacing the membership ratios of the OPDs by the dichotomized variable more than 5% votes for SGP. In bivariate correlation more than 5% votes for SGP was, as expected, negatively correlated to vaccination coverage. Multiple regression analyses showed a negative b-value as well, however the explanation of variance in vaccination coverage was only 45% in the group of 135 geographical entities, and 43% in the group of 128, (Table 4).

To assess the influence of the membership ratios of the various OPDs on vaccination coverage in municipalities with less than 5% votes for SGP, we repeated the bivariate correlation and multiple regression analyses in these municipalities and geographical entities where OPDs were present (n= 94). In that case 26% of variance in vaccination coverage could be explained, the membership ratios of the two most conservative OPDs (the Reformed Congregations in the Netherlands and the Old Reformed Congregations) and the percentage non-western immigrants had a significant influence. The b-values for both conservative OPDs exceeded again minus 1.

Discussion

Municipalities and geographical entities with OPDs had significantly lower vaccination coverage than municipalities without OPDs. Variance in vaccination coverage in municipalities and geographical entities with OPDs could largely be explained by the membership ratios of the various OPDs. This suggests that membership of an OPD is an important factor in explaining individual vaccination choice. However, we did not have data on the individual level and all relations were established on the level of municipalities, so in order to avoid the ecological fallacy, translation to individual relations has to be done with care.

Vaccination coverage among orthodox Protestants

In multiple regression the largest denominations – the Reformed Congregations and Restored Reformed Church – both had b-values around -0.40. Although our analysis was not at an individual level, this finding is a strong indication that a substantial part of the members of these denominations is vaccinated.

Table 4 Influence of votes for SGP on municipal vaccination coverage

Explaining variables	N= 135 municipalities or geographical entities with OPDs			N= 128 municipalities or geographical entities with OPDs, leaving out 7 outliers		
	Pearson r	p	multiple regression b t	Pearson r	p	multiple regression b t
Constant			96.25 212.55	<0.001		95.81 336.14
Votes for SGP*	-0.66	<0.001	-6.40 -9.42	<0.001	<0.001	-5.24 -9.75
% Non western immigrants**	0.23	<0.001			<0.05	
% With income support**	0.22	<0.05			<0.05	
Level of urbanization***	0.28	<0.001	1.54 1.69	0.094	<0.001	
Explained variance			45%			43%

Results of bivariate correlation and multiple regression analysis, showing influence of votes for SGP, immigration, socio-economical status and urbanization on vaccination coverage (in municipalities and geographical entities with OPDs, and leaving out outliers)

* dichotomized variable: < 5% votes for SGP = 0, >5% votes for SGP =1

** % = percentage of municipal population consisting of non western immigrants respectively percentage of municipal population with income support

*** dichotomized variable: rural = 0, urban =1

Two smaller denominations – the Reformed Congregations in the Netherlands and the Old Reformed Congregations – had the strongest negative relation with vaccination coverage. This is in line with the negative statements on vaccination in their church periodicals¹¹. In multiple regression analysis for both denominations the b-value exceeds -1. This could be explained assuming that the members of these two denominations not only reject vaccination for themselves but that they influence others (from their own and other denominations) to reject vaccination as well. Another possible explanation for the b-values exceeding minus 1, however, is the age distribution within these two denominations. In the Netherlands as well as in the United States orthodox Protestants refrain from family planning, their families are large and the young members of the denomination outnumber the older members^{6,21}. As in our study vaccination coverage is assessed at two years of age and membership proportion is according to the total population, the proportion members of these denominations in the two years of age cohort might exceed the proportion in the total population. Nevertheless, the findings strongly suggest that vaccination coverage in these denominations is very low.

The orthodox Protestant subgroup of the Christian Reformed Churches is the smallest denomination in our study. The b-value in the multiple regression analysis suggests that a substantial part of the members are vaccinated . In our second analysis, leaving out among others two strongholds of the Christian Reformed Churches, their influence on vaccination coverage was not significant anymore.

As in current policy the Bible belt is often defined as municipalities with more than 5% votes for SGP, we replaced the membership ratios of the OPDs by the variable more than 5 % votes for SGP. However, in this way the explanatory effect regarding variance in vaccination coverage is considerably lower.

Limitations of the study

The present study has some limitations. In this ecological study analyses could only take place at the municipality level, which hinders drawing conclusions at the individual level. Moreover municipalities were included regardless of their population number, and multiple regression analyses were not weighted for municipal population size. This means that small and large municipalities have an equal impact on the results. The aim of our study is, however, to assess the relationship between the membership ratios of the various OPDs (measured as percentage) and the municipal vaccination coverage (measured as percentage as well). The relationship itself (measured as b-value) is not dependent on the size of the municipality and we corrected for possible confounding factors such as urbanization, immigration and low socio-economical standard. Thus multiple

regression analyses weighted for municipal population size would not affect the conclusions regarding the b-values of the various OPDs.

Misclassification may occur if members of OPDs do not live in the municipality where their church is seated. We partly corrected for this problem by aggregation of small and medium sized municipalities to geographical entities like (former) islands and polders. However, municipalities where an OPD is seated might have been allocated more members of that OPD than really live in this municipality. Vaccination coverage is always measured according to home address. Since the negative correlations between OPD and vaccination coverage probably would have been even more pronounced when both variables would have been measured according to home address, this inconsistency does not interfere with our conclusions.

Finally, variance in vaccination coverage could not be completely explained by the variables in our model. In international literature low vaccination coverage is related to lack of health insurance, lack of reimbursement and lack of long term preventive care^{17,22,23}. In the Netherlands this is not expected to be a problem as vaccinations according to the NVP are provided free of charge. Travelling communities, like Roma and Irish travellers are associated with outbreaks of vaccine preventable diseases²⁴. However, in the Netherlands travelling communities are not expected to influence municipal vaccination coverage as these travelling communities are small (an estimated 20,000 persons) and vaccination coverage among children travelling with fairs was comparable to the general Dutch population²⁵.

Apart from religious objections to vaccination, parents may have philosophical objections or a critical attitude towards vaccination because of perceived side effects^{26,27}. These non-religious objections are often confined to MMR-vaccination as measles, mumps and rubella are considered to be useful diseases to strengthen the immune system²⁸.

As these objections are not registered we could not take them into account. However, we tried to minimize their influence by choosing DTPP-vaccination coverage as the dependent variable. Orthodox Protestant objections concern all vaccinations.

Until now preparedness for epidemics of vaccine preventable diseases in the Netherlands has been focused on the geographical area of the Bible belt, often defined as municipalities with over 5% votes for SGP. However, 23 % of the OPD-members is living outside this area and our study showed that in municipalities with less than 5% votes for SGP, where OPDs are present, the membership ratios of the most conservative OPDs still have a significant influence on vaccination coverage. In current policy, orthodox Protestants living outside the area defined as Bible belt are not addressed by health promotion and vaccination campaigns during epidemics. The orthodox Protestants constitute a closed community maintaining almost all social contacts

within their own group⁶ and orthodox Protestants living outside the municipalities with more than 5% votes for SGP are at considerable risk for infection during epidemics. Therefore we suggest to include them in prevention and control measures. As the orthodox Protestants have a strong social infrastructure, public health workers may seek cooperation with orthodox Protestant intermediaries like schools or patients' associations, in order to prevent and control outbreaks of vaccine preventable diseases.

Conclusion

Municipal vaccination coverage in the Dutch Bible belt is largely dependent on the membership ratios of the various OPDs. Control of vaccine preventable diseases should therefore be focused on these religious risk groups.

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Chapter 3

Measuring vaccination coverage in a hard to reach minority

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Abstract

Background

Although childhood vaccination programs have been very successful, there are some hard to reach minority groups that object to vaccination. The Netherlands has experienced several epidemics of vaccine preventable diseases, confined to the orthodox Protestant minority. However, vaccination coverage in this minority is still unknown and this hampers prevention and control of epidemics.

Methods

We estimated vaccination coverage among the orthodox Protestant minority and its various subgroups (denominations), using two sub-studies with different design and study population. For both sub-studies separately, we determined overall vaccination coverage and vaccination coverage per denomination. The results were compared and discussed.

Results

An online survey was filled out by 1778 orthodox Protestant youngsters, invited via orthodox Protestant media using a snowball method. Next to that, results of a national sample study on vaccination were used, of which only orthodox Protestant respondents were included in our analyses (N= 2129). Overall vaccination coverage among orthodox Protestants in the Netherlands was estimated to be at minimum 60 %. Moreover, in both sub-studies three clusters of denominations could be identified, with high (>85%), intermediate (50-75%) and low (<25%) vaccination coverage.

Conclusion

The integration of both sub-studies, with their own specific strengths and weaknesses, added to our insight in the vaccination coverage in this minority. Based on these results we recommend to focus prevention and control of vaccine preventable diseases on the orthodox Protestant subgroups with intermediate and low vaccination coverage.

Introduction

Childhood vaccination programs have been very successful in controlling infectious diseases. However, even in affluent societies like in Western Europe, there are minority groups with low vaccination coverage.¹ Some marginalized groups are not sufficiently reached by vaccination programs²⁻⁴ and an increasing number of parents refuse vaccination because of philosophical objections and safety concerns.⁵ Social clustering of unvaccinated children may lead to outbreaks of vaccine preventable diseases.⁶ The last decades the Netherlands has experienced epidemics of poliomyelitis, measles, rubella and mumps, all largely confined to an orthodox Protestant minority with religious objections to vaccination.⁷⁻¹⁰ These objections find their origin in the trust in Divine providence. God has predestined health and disease and man should completely rely on God as He knows what is best for someone in his or her specific situation. Other orthodox Protestants come to a different conclusion: the availability of vaccines is a gift from God, and man should use whatever means God gives us to remain healthy.¹¹ The vaccination coverage among the orthodox Protestant minority is unknown. Information on vaccination coverage is, however, necessary for adequate prevention and control of vaccine-preventable diseases in this group.

Like other minority groups, the orthodox Protestants form a hard to reach population. About 1.5 % of the Dutch population belongs to this minority of an estimated 250,000 persons. Moreover, the orthodox Protestant minority is subdivided into various denominations, each having its own interpretation of the confession and its own position towards vaccination.¹²

Vaccination is a sensitive subject among orthodox Protestants. The decision whether or not to vaccinate one's children might be an inner struggle. The general public doesn't understand the refusal of vaccination while an epidemic is going on and during the polio epidemics the media reacted aggressively, depicting the orthodox Protestants as backward and accusing them of child abuse.¹³ Negative reactions from the general public add to the tendency of orthodox Protestants to focus on their own cultural group.¹⁴ The willingness to participate in research on such a sensitive subject as vaccination is therefore low.

The few scientific publications on vaccination in orthodox Protestant groups show that refusal of vaccination is not complete.¹⁵⁻¹⁷ Our recent ecological study on the influence of orthodox Protestant subgroups on municipal vaccination coverage showed that two very conservative denominations (the Reformed Congregations in the Netherlands and the Old Reformed Congregations) had a strongly negative influence on municipal vaccination coverage, while the negative influence of two larger denominations (the Restored Reformed Church and the Reformed Congregations)

was moderate, and the other denominations hardly had any influence.¹⁸ This suggests that the orthodox Protestant denominations might be classified in three clusters with low, intermediate and high vaccination coverage.

Historically the orthodox Protestants live geographically clustered in a rural area stretching from the south-west to the north-east of the Netherlands, the so-called Bible belt.¹⁹ However, even within the Bible belt the various denominations are not equally dispersed, members of one denomination clustering in one village and members of another denomination clustering in another. Because of the division in subgroups and geographical clustering it's not only hard to obtain the cooperation of the orthodox Protestants, it's hard to obtain a representative sample of this minority as well.

The aim of the present study is to achieve a reliable estimation of the vaccination coverage within this hard to reach minority, and its various denominations, using two sub-studies varying in design.

Methods

We used data from two sub-studies to assess vaccination coverage in the orthodox Protestant minority and compared the results.

Source population of study populations

The orthodox Protestant minority in the Netherlands consists of an estimated 250,000 persons and is divided in denominations. The largest orthodox Protestant denominations are the Restored Reformed Church (55,000 members), the Reformed Congregations (103,000 members), the Reformed Congregations in the Netherlands (23,000 members) and the Old Reformed Congregations (18,000 members). Orthodox branches of some other Protestant denominations are reckoned to the orthodox Protestant minority as well. For example, within the Christian Reformed Churches (75,000 members) there is an orthodox branch of an estimated 18,000 followers, while within the Protestant Church in the Netherlands (estimated membership number 1.8 million) there is an orthodox branch 'the Reformed Bond' and another small branch is orthodox without following the Reformed Bond.

Internet survey on vaccination coverage among orthodox Protestant youngsters

Design and study population

In a cross sectional design orthodox Protestant youngsters in the age of 16 to 23 years old were invited to take part in an online survey. The survey was carried out in 2008,

in co-operation with the NPV, a patients association on Christian basis, representing amongst others the orthodox Protestants. The NPV approached all her youth members (N= 550) by e-mail, inviting them to take part in the study. Moreover they asked them to forward the e-mail invitation to their friends (snowball method). Furthermore orthodox Protestant youth were approached via banners on specific websites for this group and via an orthodox Protestant newspaper.

Data collection

Participants were asked to fill out an easily accessible online questionnaire. Questions focused on participation in the National Vaccination Program specifically DTP and MMR vaccinations, denomination, education and need for information on vaccination.

Inclusion criteria

In our analyses all respondents with known, orthodox Protestant denomination and known vaccination status were included.

National sample study on the immunity of the Dutch population to vaccine preventable diseases

Design and study population

In 2006-2007 a population-based cross-sectional national survey, was conducted by the RIVM in order to assess immunity to infectious diseases, especially vaccine preventable diseases.²⁰⁻²²

In this study a representative sample of 40 Dutch municipalities was taken. Within each municipality about 400 people in the age of 0-79 years old were randomly selected for participation. An extra sample was taken in eight municipalities with low vaccination coverage in the Bible belt area. In total 17,223 individuals were invited in the regular sample and 4366 individuals were invited in the low vaccination coverage municipalities.

Data collection

Participants were invited to come to a location within the municipality to donate a blood sample for serological testing and to fill out a questionnaire on present and past health status, vaccination status, denomination, education, occupation and travel history. Persons who did not comply to blood donation were asked to fill out only the questionnaire.

Inclusion criteria

In our analyses all respondents with known, orthodox Protestant denomination and known vaccination status in the age of 0 to 55 years were included, from the regular sample as well as from the low vaccination coverage municipalities. (Respondents

over 55 years old were excluded as they were born before the start of the National Vaccination Program in the Netherlands).

Variables

In both studies for every respondent the following variables were selected: age (in years), sex (male/female), educational level, denomination, and vaccination status.

Denomination was classified according to the above mentioned denominations.

Vaccination status was classified in vaccinated and not vaccinated. As religious objections concern vaccination in general, we did not distinguish vaccination status for the various vaccinations. Thus a child vaccinated against DTP, but not vaccinated against MMR is in this study considered as vaccinated.

Analysis

For both studies separately, the characteristics of the respondents were described and the overall vaccination coverage and the vaccination coverage per denomination were determined. The results were compared and an explanation was sought for any differences between the results of both studies.

Results

Characteristics of the respondents of the sub-studies

Internet survey

As the internet survey was performed in a population of which the total number was not known, we cannot calculate the response ratio. Among the NPV members, who were initially approached, the response ratio was 28 % (N=152). The online questionnaire was eventually filled out by 1778 respondents, 9% of them were directly recruited via the NPV, 51% via orthodox Protestant media and 40% via the snow ball method.

1713 respondents adhered to our inclusion criteria.

Almost half of the respondents were members of the Reformed Congregations, see Table 1. Respondents came from all over the country. Most of the respondents were women, the mean age was about 19 years old and they were middle-high educated.

National sample study

The overall response in the national sample study was 47 % in the regular sample and 54 % in the low vaccination coverage municipalities. 2129 persons adhered to the criteria for inclusion in our analysis, 968 from the regular sample and 1161 from the 8 low vaccination coverage municipalities. Almost half of the respondents belonged to the Protestant Church in the Netherlands, see Table 2. Especially among members of smaller denominations there was municipal clustering: 60% of the respondents of the

Table 1 Characteristics respondents Internet survey

Denomination	N (1713)	% N	% men	Age (in years)		% middle- high educated
				Mean	SD	
Protestant Church in the Netherlands (without Reformed Bond)	185	10.8	31.4	18.7	2.6	95.7
Reformed Bond	92	5.4	28.6	19.4	2.4	96.7
Christian Reformed Churches	120	7.0	30.0	18.9	2.5	94.2
Restored Reformed Church	257	14.9	23.0	18.8	2.5	92.6
Reformed Congregations	772	45.1	25.9	19.0	2.5	94.2
Reformed Congregations in the Netherlands	190	11.1	21.3	18.9	2.4	89.5
Old Reformed Congregations	97	5.7	24.0	18.9	2.5	90.7

Table 2 Characteristics respondents National sample study

Denomination	N (2129)	% N	% men	Age (in years)		% middle- high educated*
				Mean	SD	
Protestant Church in the Netherlands (without Reformed Bond)	984	46.2	45.3	21.1	17.7	68.9
Reformed Bond	260	12.2	49.6	19.6	16.7	61.5
Christian Reformed Churches	79	3.7	44.3	20.6	16.3	75.6
Restored Reformed Church	220	10.3	42.3	16.6	15.5	55.9
Reformed Congregations	394	18.5	54.1	16.5	15.8	49.5
Reformed Congregations in the Netherlands	136	6.4	47.8	13.9	14.5	44.1
Old Reformed Congregations	56	2.6	55.4	18.1	16.7	32.3

*For children up to 15 years educational level of the mother was registered

Reformed Congregations in the Netherlands were from one municipality as well as almost 60% of the respondents of the Old Reformed Congregations (from another municipality). There was a large diversity in age, with an overrepresentation of children under five years old (33 %).

Vaccination coverage

Overall vaccination coverage in the Internet study was 64.3% (95% CI 62.0-66.6%) whereas overall vaccination coverage in the National sample study was 77.3% (95% CI 75.5-79.1%). These results vary considerably, however, the composition of both study populations according to denomination varied considerably as well. As almost half of the respondents of the National sample study belonged to the Protestant Church in the Netherlands, and only few members of this church are orthodox, we also calculated vaccination coverage without this denomination. Among the remaining 1145 respondents of the National sample study vaccination coverage was 61.0% (95% CI 58.2-63.8%), among the remaining 1528 respondents of the Internet survey this was 60.9% (95% CI 58.5-63.3%).

The vaccination coverage per denomination ranged from less than 15% to more than 95%, see Table 3. However, within each sub-study the denominations could –according to the results of our previous ecological study– be classified in a high, intermediate and low vaccination coverage cluster, without any overlap in the confidence intervals of the vaccination coverage between the clusters. The high vaccination coverage cluster consists of the Protestant Church in the Netherlands, the Reformed Bond within the Protestant Church in the Netherlands and the Christian Reformed Churches. Vaccination coverage in this cluster is over 85%. The intermediate vaccination coverage cluster consists of the Restored Reformed Church and the Reformed Congregations, with a vaccination coverage of about 50 to 75%. And the low vaccination coverage cluster consists of the Reformed Congregations in the Netherlands and the Old Reformed Congregations, with a vaccination coverage of less than 25%.

Discussion

Based on two sub-studies, with different design and study population, we estimated vaccination coverage among the orthodox Protestant minority in the Netherlands and its various denominations. Although there were some differences in results between the sub-studies, overall vaccination coverage among orthodox Protestants was estimated to be at minimum 60%. In the Internet survey overall vaccination coverage was 64%, whereas in the National sample study this was 77%. However, leaving out the members of the Protestant

Table 3 Vaccination coverage by denomination (% vaccinated and 95% CI)

	Internet survey	National sample study
Vaccination coverage clusters		
<i>High</i>	91.4 (88.7-94.1)	94.9 (93.7-96.1)
<i>Intermediate</i>	67.5 (64.4-70.4)	58.5 (54.6-62.4)
<i>Low</i>	15.3 (11.1-19.5)	16.1 (11.0-21.2)
<i>Total</i>	64.3 (62.0-66.6)	77.3 (75.5-79.1)
Denomination		
Protestant Church in the Netherlands* (without Reformed Bond)	93.0 (88.6-96.0)	96.1 (94.8-97.2)
Reformed Bond	95.7 (89.8-98.6)	89.6 (85.4-92.9)
Christian Reformed Churches*	85.8 (77.9-90.7)	96.2 (90.0-99.0)
Restored Reformed Church	65.4 (59.4-71.0)	74.6 (68.5-78.0)
Reformed Congregations	68.3 (64.9-71.5)	49.5 (44.6-54.4)
Reformed Congregations in the Netherlands	11.6 (7.6-16.7)	14.7 (9.5-21.4)
Old Reformed Congregations	22.7 (15.1-31.8)	19.6 (10.8-31.6)

*Denomination with relatively small orthodox Protestant branch. In the Internet survey only members of this orthodox Protestant branch are included, whereas in the National sample study all members are included.

Church in the Netherlands, whose members were overrepresented in the National sample study, resulted in an overall vaccination coverage of 61% in both sub-studies. Within the orthodox Protestant minority three clusters of denominations could be distinguished with high (>85%), intermediate (50-75%) and low (< 25%) vaccination coverage. The differences in the results between the sub-studies and between the denominations show the importance of a robust study design.

Both sub-studies have their specific strengths and weaknesses.

Internet survey

Since our study population is hard to reach and our study concerns a sensitive subject we chose an internet design for one sub-study. Internet is easily accessible from all over the country and guarantees a high degree of anonymity. Although orthodox Protestants object to television and recreational use of internet, internet is widely used for educational purposes and mutual contact as is confirmed by the existence of specific orthodox Protestant websites.²³

Recruitment of participants via orthodox Protestant channels implies that in denominations with a small orthodox Protestant branch, like the Protestant Church in the Netherlands and the Christian Reformed Churches, only this orthodox branch is addressed. And as vaccination coverage in this branch is likely to be lower than in the non-orthodox majority of these denominations, this recruitment method may explain the difference in vaccination coverage between the sub-studies for these denominations.

The number of participants in the internet survey was unexpectedly high. However, according to the Dutch population, women and middle-highly educated persons were overrepresented. As among orthodox Protestants a higher educational level is associated with a higher vaccination coverage, the overrepresentation of middle-highly educated respondents may have influenced the results.¹⁶

Compared to their membership numbers, the Reformed Congregations and the Reformed Congregations in the Netherlands (that seceded from the former in 1953) provided a relatively high proportion of respondents. Rev. Kersten, the founder of the Reformed Congregations, was also the founder of the SGP, the orthodox Protestant political party in The Netherlands.²⁴ The increased social and political awareness in these denominations –as compared to other orthodox Protestant denominations– may explain the higher willingness to participate in the survey.

Finally, the participants of the Internet survey were not randomly recruited. As in this hard to reach minority a more reliable sampling method was not available, we used all possible ways of recruitment, including a snow ball method. The recruitment procedures may be difficult to reproduce and the representativeness of the respondents and the generalization of the results remain questionable.²⁵

National sample study

Strength of the National sample study is that the participants were randomly selected. However, to recruit enough orthodox Protestants in the study there was an oversampling of eight municipalities with the lowest vaccination coverage in the Bible belt. As the various orthodox Protestant denominations are not equally dispersed in the Bible belt this oversampling introduces clustering of respondents of specific denominations in these municipalities. The effect on the measuring of vaccination coverage is illustrated by a study on tetanus protection, in which vaccination coverage

among orthodox Protestants –based on these eight municipalities– was estimated to be only 32%.²¹ In addition to this, vaccination coverage among members of an orthodox Protestant denomination in a specific village may deviate from the overall vaccination coverage within that denomination, due to local processes and local interaction.

Another possible weakness is that respondents were invited for blood donation –which may have been a threshold for participation– and that they were invited at a location in the village, so participation was publically visible. The response in the national sample study was in general mediocre, however the response in the low vaccination coverage sample was not worse than in the regular sample and comparable to another study in this population.¹⁷

Vaccination data

Vaccination status was assessed anamnestically. Several reports indicate that parental recall of vaccination is inaccurate, however this inaccuracy concerns mostly the number of injections and timeliness.^{26,28} Overall community surveys based on parent held cards and recall data provide reasonable estimates of vaccination coverage for public health purposes.²⁷ Since vaccination is a sensitive subject among orthodox Protestants that certainly will be remembered, we expect our respondents will recall this information accurately, providing reliable data. Serological analyses, based on the National sample study showed that protection against tetanus and pertussis were indeed lower among unvaccinated orthodox Protestants than in the general population.^{21,22}

Vaccination coverage for specific vaccines

In this study vaccination coverage was not specified for specific vaccines. Religious objections to vaccination concern vaccination as a preventive measure, interfering with Divine providence, thus religious objections concern all vaccines regardless of the disease that is vaccinated against. However, orthodox Protestants who do not have any religious objections to vaccination in general, may have other objections to specific vaccines e.g. because of (assumed) side effects. The results of the Internet survey showed that 55 % of the respondents was vaccinated against both DTPP and MMR, 9% was partially vaccinated (in most cases vaccinated against DTPP but not against MMR) and 35 % was not vaccinated at all. Thus, vaccination coverage for specific vaccines may be lower than the general vaccination coverage reported here. However, regarding the spread of epidemics, social clustering seems more important than actual vaccination coverage. The epidemics of measles (1999-2000), mumps (2007-2008) and rubella (2004-2005) hardly spread beyond the orthodox Protestant groups,⁷⁻⁹ while a measles outbreak in the anthroposophic community (2008) did not spread to the orthodox Protestant minority.²⁹

Future research

This study focused on measuring the actual vaccination coverage in the orthodox Protestant minority. More, qualitative, research is planned on decisions on vaccination in this community. As hard to reach minorities in Europe may vary in their social position and motives for refusing vaccination, we consider knowledge of the specific characteristics of these minorities as a prerequisite for adequate measures to prevent and control vaccine preventable diseases. Collaboration with community based organizations – like in our case the NPV- increases insight in the needs of the specific minority.³⁰

Conclusion

We assessed vaccination coverage among the hard to reach orthodox Protestant minority in the Netherlands, comparing two sub-studies with a different design and study population. While both studies have their specific strengths and weaknesses, the integration of the results adds to our insight in the vaccination coverage among the orthodox Protestants. Overall vaccination coverage in this minority is estimated to be at minimum 60% , however three clusters of denominations could be distinguished with high (>85%), intermediate (50-75%) and low (< 25%) vaccination coverage.

As the orthodox Protestant community consists of only 1.5% of the Dutch population and more than half of their members are vaccinated, the low vaccination coverage in this minority does hardly influence national vaccination coverage. Nevertheless, because of social clustering of susceptible persons, the members of denominations with low and intermediate vaccination coverage have an increased risk of contracting vaccine preventable diseases, as was confirmed by the epidemics in the past decades. Therefore we recommend to focus prevention and control of vaccine preventable diseases in the orthodox Protestant minority on these subgroups.

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Chapter 4

How orthodox Protestant parents decide on the vaccination of their children: a qualitative study

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Abstract

Background

Despite high vaccination coverage, there have recently been epidemics of vaccine preventable diseases in the Netherlands, largely confined to an orthodox Protestant minority with religious objections to vaccination. The orthodox Protestant minority consists of various denominations with either low, intermediate or high vaccination coverage. All orthodox Protestant denominations leave the final decision to vaccinate or not up to their individual members.

Methods

To gain insight into how orthodox Protestant parents decide on vaccination, what arguments they use, and the consequences of their decisions, we conducted an in-depth interview study of both vaccinating and non-vaccinating orthodox Protestant parents selected via purposeful sampling. The interviews were thematically coded by two analysts using the software program Atlas.ti. The initial coding results were reviewed, discussed, and refined by the analysts until consensus was reached. Emerging concepts were assessed for consistency using the constant comparative method from grounded theory.

Results

After 27 interviews, data saturation was reached. Based on characteristics of the decision-making process (tradition vs. deliberation) and outcome (vaccinate or not), 4 subgroups of parents could be distinguished: traditionally non-vaccinating parents, deliberately non-vaccinating parents, deliberately vaccinating parents, and traditionally vaccinating parents. Except for the traditionally vaccinating parents, all used predominantly religious arguments to justify their vaccination decisions. Also with the exception of the traditionally vaccinating parents, all reported facing fears that they had made the wrong decision. This fear was most tangible among the deliberately vaccinating parents who thought they might be punished immediately by God for vaccinating their children and interpreted any side effects as a sign to stop vaccinating.

Conclusion

Policy makers and health care professionals should stimulate orthodox Protestant parents to make a deliberate vaccination choice but also realize that a deliberate choice does not necessarily mean a choice to vaccinate.

Background

Despite high vaccination coverage, there have recently been measles, mumps, and rubella epidemics largely confined to an orthodox Protestant minority that objects to vaccination in the Netherlands.¹⁻³ This orthodox Protestant minority consists of about 250,000 individuals representing a number of denominations that separated from the Dutch Reformed Church. Each orthodox Protestant denomination has its own specific interpretation of the confession, but predestination, election and the importance attached to intense, personal religious experiences play an important role in all of the denominations. Orthodox Protestants believe that God has predestined the fate of all human beings: only few are elected to live on in eternal bliss; they are informed of their blessed status by an intense religious experience.

Orthodox Protestants also constitute a cultural minority and have their own political party – the *Staatkundig Gereformeerde Partij* (SGP), their own newspaper, and their own schools. The social clustering of unvaccinated individuals promotes, however, the transmission of vaccine preventable diseases, and the measles, mumps and rubella epidemics even spread to their orthodox Protestant relatives in Canada.

The orthodox Protestant opposition to vaccination dates back to the nineteenth century. In 1823, the orthodox Protestant physician Abraham Capadose published his objections to vaccination.⁴ Referring to the severe side-effects of smallpox vaccination at that time, he stated that man was not allowed to cause disease in a healthy body. According to Capadose: both health and disease were given by God and man should not interfere with divine providence. Although not all orthodox Protestants agreed with Capadose at the time, he nevertheless had many sympathizers. The introduction of compulsory smallpox vaccination for school entrance in 1872 and continuation of this to 1939 enhanced resistance to vaccination among orthodox Protestants.⁵

In the 1960s, after the start of a National Immunization Program in the Netherlands, the incidence of the target diseases decreased sharply. However, outbreaks of vaccine preventable diseases confined to unvaccinated orthodox Protestant minority groups still occurred. The polio epidemics of 1971, 1978, and 1992 led to particularly heated public debate because the general public could not understand the refusal to vaccinate young children who might otherwise be struck by this disabling disease.⁵⁻¹⁰ Also among the orthodox Protestants, these polio epidemics fueled a discussion of the acceptability of vaccination.¹¹ Biblical arguments in favor of vaccination were circulated by orthodox Protestant opinion leaders.¹² And as a compromise, it was suggested that each congregation member was free to make his or her own personal decision and account for this to only God.¹³ The final decision to vaccinate children or not is thus left to the orthodox Protestant parents.

Parental decision making with regard to vaccination is a complex process. Not only religious considerations but also medical and psychosocial considerations can play a role.¹⁴⁻¹⁷ Despite recurrent epidemics, there has been only one study –to our knowledge– of the motives to accept or refuse vaccination among orthodox Protestants. During the 1978 polio epidemic, Veenman and Jansma identified the following as major reasons for not being vaccinated prior to the outbreak of the epidemic: religious objections, family tradition, and fear of possible side-effects.¹⁸ Many unvaccinated individuals subsequently changed their minds during this epidemic and decided to undergo vaccination afterall. Those who formerly objected to vaccination on religious grounds argued that, because the polio disease was so prevalent, vaccination did not constitute a preventive measure and was therefore allowed under these specific circumstances. In contrast, those who still refused vaccination viewed the epidemic as a test of their faith.

The aim of the present study in light of the societal circumstances outlined above is to gain insight into how orthodox Protestant parents –without the immediate threat of an epidemic– decide to vaccinate or not vaccinate their children. The research questions were:

- Do orthodox Protestant parents make a deliberate decision with regard to the vaccination of their children?
- What arguments do orthodox Protestant parents use to justify their vaccination decisions?
- What consequences of their decisions to vaccinate or not vaccinate do orthodox Protestant parents face?

Methods

Research design

Because of the explorative character of our study we chose a qualitative research design and conducted semi-structured, in depth interviews.

Setting and study population

In the Netherlands, all children are offered a series of vaccinations free of charge by child health clinics under the auspices of the National Immunization Program. Vaccination is neither obligatory nor required for school entrance. The rate of voluntary vaccination is high: vaccination coverage in the general population is about 95%.¹⁹ Among the orthodox Protestant minority, three subgroups can be distinguished on largely the basis of religious denomination: high coverage (>85%) for the Reformed Bond within the Protestant Church in the Netherlands and the Christian

Reformed Churches; intermediate coverage (50-75%) for the Restored Reformed Church and the Reformed Congregations; and low coverage (<25%) for the Old Reformed Congregations and the Reformed Congregations in the Netherlands.²⁰

Our study population consisted of orthodox Protestant parents who recently had to decide whether to vaccinate their young children or not. The study population was composed via purposeful sampling: vaccinating as well as non-vaccinating parents were recruited from various orthodox Protestant denominations and various villages in the Dutch bible belt – an area of the Netherlands where orthodox Protestants are concentrated (see below for further details). Inclusion in the study population was continued until thematic saturation was reached.

Procedure

Recruitment

Participants were recruited via child health clinics in villages with low vaccination coverage due to religious objections. The selection of these villages was based on the results of a previous study.²¹ We selected villages with low vaccination coverage and high numbers of orthodox Protestants of a certain denomination, in order to include all denominations. We approached the local child health clinic professionals and asked them to select orthodox Protestant parents who were willing to be interviewed. A snowball approach was also applied: following the interviews, the participants were asked if they knew of other orthodox Protestant parents –preferably from another-denomination or another village– who might be willing to be interviewed as well. The intermediaries, namely the child health clinic professionals and interviewed parents, were given written information on the study to distribute to possible participants. When parents agreed to be interviewed, one of the researchers contacted them to explain the procedures further and answer any questions. An interview appointment was then made at a location, date, and time that was convenient for the parents.

Interview

The interviews were conducted in 2009 by trained interviewers (GvIJ and WLMR) with a medical background and no membership in one of the orthodox Protestant minority groups. Most interviews were conducted in home of the parents after obtaining informed consent. The interviewers used a topic list that was based on information of key-informants such as orthodox Protestant medical professionals, see Table 1. This topic list was loosely followed, starting with the composition of the family and vaccination status of the children. The interviews were of an exploratory nature and the interviewers did not express their opinions on vaccination or religion. At the end of the interview, the interviewees were explicitly asked if they had anything that had not yet been discussed to add. The average duration of the interviews was 60 minutes.

Table 1 Interview topics

Introduction

Research on acceptance of vaccination among orthodox Protestants
Aim is to gain insight into the extent of vaccination and decision making with regard to such

Questions

What is the composition of your family?
Have you had your child/children vaccinated?

Why or why not?

- Can you tell us more about this?
- Do other things play a role as well?
(medical aspects, side effects, importance of having had childhood diseases, religious aspects)

When did your decision making take place?

- o Before/during pregnancy/first months of life?
- o Reconsideration with next child or in a new life phase ?

Who decides?

- o Roles of husband and wife. Have you been vaccinated? And your husband/wife?
- o What does your family think about vaccination? Has this influenced your decision?
- o What do people in your church think about vaccination? Has this influenced your decision? Which church do you belong to? Discussions of decision? Asked for advice? From whom?

Did you find it a difficult decision?

Have you ever regretted your decision?

Did you previously think differently about vaccination?

For non-vaccinating:

- What would you do during an epidemic? Polio?
- What would do in case of an injury? (tetanus vaccination)
- What would you do when influenza vaccination is called for? (age, medical grounds)
- Specific circumstances : travel, work (hepatitis B and influenza for nursing)

Own opinions of older children? What would you think if your children later made a different decision?

What do you think of people who do/do not have their children vaccinated?

- And if they belong to your own church?

Do you receive reactions to the fact that you are vaccinated/not vaccinated from your surroundings?

Do your surroundings know that you have been vaccinated/not been vaccinated?

Topic of conversation ?

What kinds of reactions do you receive? From whom?

For non-vaccinating:

- How do doctors and other organizations react to your non-vaccination?

Do you have anything that has not yet been addressed to add?

Analysis

The interviews were recorded and transcribed verbatim. The transcripts were then analyzed thematically using the qualitative software program Atlas.ti. As our study had an explorative character we chose a grounded theory approach with an open coding sytem²². There were no predefined coding themes, the coding system was entirely based on the content of the data. Two analysts (WJCvA and WLMR) coded the transcripts independent of each other. The initial coding was reviewed, discussed, and refined until consensus could be achieved. Coding themes were for example "divine providence" and "trust in God" that became both subcategories of "religious arguments". All transcripts were coded and discussed by both analysts. The concepts emerging from the coding – such as the existence of four different subgroups of parents- were assessed using the constant comparative method from grounded theory. This means that when the concept of the four subgroups was identified, previously analyzed interviews were reviewed in order to check if their content fitted into this concept.

Ethics

The study was approved by the research ethics committee of the Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands; CMO number 2010/462.

Results

Participant characteristics

Initially 28 orthodox Protestant families were approached, one family did not participate because of practical constraints. From 27 families, we interviewed one or both parents: 21 mothers, 3 fathers, and 3 couples. The families belonged to various denominations and 13 families started vaccinating their children. Further details are shown in Table 2.

The decision-making process: Tradition versus deliberate choice

The majority of parents decided around the birth of their first child on whether or not they would take part in the National Immunization Program. With regard to the vaccination decision-making process, two subgroups of parents could be distinguished: parents who followed tradition versus parents who made a deliberate choice.

The parents who followed tradition did not go through an explicit decision-making process. They hardly discussed the topic of vaccination and simply did the same as their parents did. If they came from a non-vaccinating family, they refused vaccination; if they came from a vaccinating family, they agreed to vaccination.

Table 2 Characteristics of orthodox Protestant parents participating in study

	Total	Traditionally NON- vaccinating parents	Deliberately NON- vaccinating parents	Deliberately vaccinating parents ⁴	Traditionally vaccinating parents
<i>Participating families</i>	27	8	6	9	4
Interviewee(s)					
Mother	21	7	4	8	2
Father	3	1	1	0	1
Both parents	3	0	1	1	1
Vaccination coverage for denomination²⁰					
High ¹	3	0	1	2	0
Intermediate ²	14	0	4	6	4
Low ³	10	8	1	1	0
Number of children					
1-2	11	2	2	5	2
3-4	8	3	2	1	2
5-11	8	3	2	3	0

¹ Protestant Church in the Netherlands, Reformed Bond, and Christian Reformed Churches

² Restored Reformed Church and Reformed Congregations

³ Reformed Congregations in the Netherlands and Old Reformed Congregations

⁴ Two families stopped vaccination because of the occurrence of unexpected medical events; they are nevertheless included here.

Respondent 5, traditionally non-vaccinating family:

We were both a member of the same type of congregation; that makes difference. You have been given the same values. It was no longer a point of discussion.

Respondent 11, traditionally vaccinating family:

Yes, did we really think about it? We didn't really consciously think about it because both of us have also been vaccinated. You just continue on, really ... I wouldn't know of anyone in my family who hasn't done it.

Those parents who made a deliberate choice considered both to vaccinate and not to vaccinate. Although the man is the head of the family in orthodox Protestantism, in the cases in our study of making a deliberate decision, the decision was mostly made by the two parents after lengthy discussion. Some of the couples making a deliberate choice discussed the topic with their parents or asked their friends' opinion. None of the participants making a deliberate choice discussed the topic with the religious leaders of their churches. Personal religious experiences were sometimes reported to play an important role in their final decisions, however. Many of the parents making a deliberate choice prayed to God to help them with their decision and some reported having received a sign from God.

Respondent 13, deliberately vaccinating family:

.... I thus put my bible down on the seat of the car and, just before I got to the Public Health Building, I opened up the bible and there it stood, that the stuff that is given may be used. Things were clear for me then.

For both parents who followed tradition and parents who made a deliberate choice, the vaccination decision was made for all children to come. Although some parents reported reconsidering the decision with the birth of every new child, this did not lead to a different decision. Moreover, all of the parents agreed that the parents are responsible for the vaccination decisions as long as the children live in their homes; the children take on responsibility when they come of age and marry.

The final decision: Four subgroups of parents and their arguments

When the nature of the vaccination decision-making process is considered together with the final outcome regarding participation in the National Immunization Program (i.e., vaccination) or not, four subgroups of orthodox Protestant parents could be distinguished:

1) parents who followed tradition and refused vaccination, 2) parents who made a deliberate choice and decided against vaccination, 3) parents who made a deliberate choice and decided in favor of vaccination, and 4) parents who followed tradition and accepted vaccination.

The characteristics of the respondents in each subgroup are summarized in Table 2. Characteristic statements for each subgroup are presented in Table 3.

Traditionally non-vaccinating parents

The traditionally non-vaccinating parents all belonged to denominations with low vaccination coverage. They referred to religious doctrine to explain their refusal of vaccination. Man should not interfere with divine providence and man *cannot* interfere with divine providence because God is almighty. The timing of a medical

Table 3 Characteristic comments for the four subgroups of orthodox Protestant parents

Traditionally non-vaccinating parents: Man should not and cannot interfere with the will of God

Religious arguments against vaccination

Whether I have my children vaccinated or not does not matter to me because I don't believe in it. I believe that if God wants to spare my children from an accident, then He will spare them from it. (Respondent 1)

This is even strengthened by all that I have been through....You can simply see that you have nothing to say. (Respondent 26)

Because we believe that there is a God who steers our lives and leads us and that we should not get ahead of his deeds. We cannot predict what he brings or does not bring upon us. (Respondent 16)

Medical arguments

But a childhood disease...to immunize against it? Looking at the children, they simply come down with it. I also had it earlier myself. And you get over it; it's just part of things. (Respondent 9)

You don't have any complaint or any disease. And then you inject something that makes your child sick. (Respondent 16)

Psychosocial consequences of the decision

(In case of a polio epidemic) I think that I would end up in a real dip. The struggle then begins. Maybe I should have (vaccinated them); then they would have maybe (not have become ill)... (Respondent 1)

Deliberately non-vaccinating parents: Trust in a personal relationship with God

Religious arguments against vaccination

I know for sure that God cares for me. And that the things He sends me, that may also be disease, that He will help me to cope with it. (Respondent 23)

I mean, I say to myself afterwards –I hope that I never have to go through this again– but it has been really good for our family, our marriage, but also our religious life. Through this we live closer to God. (Respondent 10)

Medical arguments

And purely without looking at the Bible, I have to say that it looks like the vaccination program has had paid off as far as the immunization goes. (Respondent 23)

Psychosocial consequences of the decision

(In case of a polio epidemic) I would really find it horrible if one of my children or my husband would get it, I really would. I cannot bear to think of it. And I count on being spared of this. I would try to explain later to my child why I didn't do it, purely on the basis of faith. (Respondent 10)

Table 3 Continued

Deliberately vaccinating parents: Breaking with tradition

Religious arguments for vaccination

Yes, you may use the means that are there and I am convinced that it says in the Bible that the Lord Jesus himself also says at a given point that... you have flat roofs in Israel, and then he says that fences should be put around them because otherwise they fall off. (Respondent 7)

For me, the Lord is not bound to vaccination. Then I would think of God in much too little terms. If he was bound to vaccination. If he really wants something to happen us, then he is not dependent on vaccination. (Respondent 13)

I simply lack the faith; I don't have it. When you hear some stories or read some books, they have such a faith...But that faith, I don't have it. (Respondent 22)

Medical arguments

Because you want to protect your children against everything... (Respondent 8)

Psychosocial consequences of the decision

Imagine that the decision is wrong. Just a bit of fear, because you made a decision on rational grounds but *more* than just the rational may be at play. You read, of course, about the possible effects and, certainly when I first had her vaccinated, I found it scary. You break with something you grew up with. (Respondent 21)

And I was really shocked by that... I didn't dare to talk with anyone about it simply because I, myself, thought that I had done it. I found the guilt on my part to be so heavy..., that I really didn't talk to anyone about it. (Respondent 4) (stopped vaccination)

Traditional vaccinating parents: What arguments are there against?

No religious arguments

I cannot say that I know someone who does not do it. I have the idea that by us in the church, certainly here, that it's simply accepted....I also cannot think up any arguments for why it should not be allowed. (Respondent 15)

Medical arguments

I have also thus seen that you should not underestimate these illnesses... but I think then, well, what does it do with the immune system of your child? (Respondent 9)

Psychosocial consequences of the decision

None reported.

intervention is of critical importance for them: Preventive measures are not accepted while curative and palliative measures often are. Tetanus post-exposure prophylaxis was typically considered a cure and thus accepted by these parents. Some of the traditional non-vaccinating parents in our study therefore also accepted polio

vaccination in the case of an epidemic. When faced with immediate danger, vaccination was no longer considered preventive by them.

Respondent 24, traditionally non-vaccinating family

I can remember when polio was rampant; you could be given a sugar cube with the virus, that is what they recommended and many of us – including myself – swallowed such a cube. But there was a real danger then. And that's something different, in my opinion.

Apart from their religious objections, the traditionally non-vaccinating parents sometimes had concerns about vaccine safety and particularly about the disease-inducing properties of vaccines, however they reported these concerns were not decisive. They were still used to the presence of infectious childhood diseases like mumps and measles, which they did not consider very serious.

Deliberately non-vaccinating parents

Deliberately non-vaccinating parents often live in a community with both vaccinating and non-vaccinating orthodox Protestants, for example, one of the spouses has been vaccinated while the other has not. These parents also used predominantly religious arguments but mostly in connection with their trust in God. Even if God sends a disease, he has a purpose for it. The personal relationship with God plays a major role in the decision to not vaccinate; the parents put all their trust in God. Such experiences as life-threatening diseases only enhance one's relationship with God. Deliberately non-vaccinating parents stress the significance of the disease rather than deny the medical effectiveness of vaccination.

In contrast to the other deliberately non-vaccinating parents, one orthodox Protestant couple –both from a traditionally vaccinating background– decided against vaccination of their children for non-religious reasons; they were convinced that vaccines could have major side-effects and therefore preferred their children to acquire immunity by conquering infections with the aid of homeopathy.

Deliberately vaccinating parents

The deliberately vaccinating parents were mostly *not* vaccinated themselves. After lengthy discussions, they decided to break with a longstanding tradition in their families.

Although they cite the medical benefits of vaccination, they used predominantly religious arguments to justify their decision to vaccinate. They consider vaccination a gift from God to be used in gratitude. However, in the interviews, they elaborated more on the counterarguments to the religious objections to vaccination than on

their own arguments in favor of vaccination. These parents reported that, after thinking things over, they could not see any good reason to *not* vaccinate

Traditionally vaccinating parents

Traditionally vaccinating parents were vaccinated themselves and did not see any religious objections to vaccination. They did not relate the issue of vaccination to their belief in God. Medical arguments were used to justify their decision. If they had any doubts about vaccination, these concerned the possible adverse effects of the immunization itself.

Psychosocial consequences

Many orthodox Protestant parents feared to regret their decision on vaccination in future. The traditionally and deliberately non-vaccinating parents both considered epidemics –and particularly polio epidemics– to be an ordeal and feared that their faith would not be sufficiently strong to endure it. But most of all, they feared their children possibly becoming severely ill and dying.

On the other hand “first generation” deliberately vaccinating parents feared the adverse effects of vaccination as these are taken as a sign from God that they have made the wrong decision. Two deliberately vaccinating parents, for example, stopped the vaccination series when unexpected medical events arose. In one case, the daughter still came down with the measles after being vaccinated. In the other case, serious adverse effects arose but were later found to be the symptoms of an underlying disease. In light of apparent adverse vaccination effects, the mother did not dare to continue vaccination. In her opinion and in response to her prayers, she had received a sign from God to stop vaccination.

Respondent 4, initially deliberately vaccinating family that stopped vaccination

Now, yeah, I wanted to know for sure for myself whether I could continue or not. I didn't know for myself but also didn't dare to anymore. I was so afraid. I thought “you'll soon see that it was all my fault” and “what have I done to the child” ... and then I prayed specifically: “Lord, if you want us to no longer vaccinate, then let the oldest who has had all the vaccinations get the mumps. Now, a couple of weeks later, he came down with the mumps. I was certain about things then.

Referring to the generally very high vaccination coverage in The Netherlands, some non-vaccinating parents reported discussions with colleagues or neighbors who did not understand their objections to vaccination. On the other hand, some of the deliberately vaccinating parents –particularly those living in a largely non-vaccinating community– mentioned feeling uncomfortable in light of social control. They did not dare to speak of their decision to vaccinate with members of the congregation or even family members.

Respondent 22, deliberately vaccinating family

Because if there's the mumps or the measles, that's the talk of the day at school and they ask out of interest if we have already had them. I don't tell them that we've been vaccinated then but simply say nothing. I just walk a bit further up if I notice that they're talking about them.

Only the traditionally vaccinating parents did not report any psychosocial consequences of their decision to vaccinate.

Discussion

In terms of the process underlying the decision to vaccinate or not vaccinate, the orthodox Protestant parents in our study could be divided into those who were guided by tradition and those who made a deliberate choice. In combination with the actual decision, this produced four subgroups: traditionally non-vaccinating parents, deliberately non-vaccinating parents, deliberately vaccinating parents, and traditionally vaccinating parents. All subgroups –except the traditionally vaccinating parents– used predominantly religious arguments to justify their decision. And all subgroups –except the traditionally vaccinating parents– reported psychosocial consequences of their decision.

Tradition versus deliberate choice

Many of the orthodox Protestant parents in our study reported simply following the tradition in their families. Tradition is indeed an important factor in the acceptance or refusal of vaccination – not only among orthodox Protestants.¹⁴ “Band wagoning” or going along with the majority was first described in connection with vaccination decision-making in 1994.¹⁵ In the general population, band wagoning plays an important role as the majority of vaccination decisions in the Netherlands are made without much deliberation.²³ For traditionally non-vaccinating orthodox Protestant parents, refusing vaccination is part of a longstanding tradition and therefore part of the group's identity.⁹ Moreover, in orthodox Protestantism following tradition is valued and thus has a positive connotation.²⁴ During the interviews, some traditionally non-vaccinating respondents referred to the biblical tribe of the Rechabites who were known for their fidelity to the customs of their ancestors. Veenman and Jansma also reported tradition to play an important role in the vaccination decision-making among the most conservative orthodox Protestant denominations. This was attributed to the paucity of contact with vaccinating individuals within these denominations at that time.¹⁸

For the parents who made a deliberate choice on vaccination, the trigger for thinking things over was most often the birth of their first child.. The same was found in a study of vaccination decision-making among orthodox Protestant families in the Dutch province of Zuid-Holland.²⁵ Interventions aimed at stimulating deliberate decision-making, instead of following tradition, should therefore focus on the parents of firstborns.

Religious versus medical arguments

Three of the four subgroups distinguished in this study offered predominantly religious arguments to justify their vaccination decisions. Medical arguments thus appeared to be of minor importance among orthodox Protestant parents.

These findings are in line with the results of previous research showing that orthodox Protestant youngsters in the Netherlands were far more interested in the religious aspects of vaccination than in the medical aspects.²⁶ In a Canadian study on refusal of immunization, it was also reported that for Dutch immigrants (belonging to religious congregations related to the denominations described here) religious arguments were decisive.²⁷ However, in both these studies orthodox Protestants who accepted vaccination were not included. Our finding that “first generation” deliberately vaccinating parents also predominantly use religious arguments indicates that non-vaccinating orthodox Protestant parents will probably not be convinced by medical arguments to change their position towards vaccination.

In our study, the subgroup of traditionally vaccinating parents was the only subgroup of parents that offered predominantly medical arguments to justify their choice. Like among other –not orthodox Protestant– parents in the Netherlands some of them had doubts on the safety of vaccines.²³ These doubts, however, did not (yet) result in refusal of vaccination. In a systematic review of qualitative studies on parental attitude towards vaccination, ‘concern on the safety of vaccines’ was the most reported barrier to vaccination.²⁸ Although this concern was also reported by some traditionally non-vaccinating parents, it was not decisive for them. Moreover, for the traditionally non-vaccinating parents lack of vaccine safety had a religious connotation: Man is not allowed to cause disease in a by God given healthy body.^{4,13} Therefore, regarding their arguments, the deliberately non-vaccinating family who did not vaccinate their children because of doubts on vaccine safety fits better in the general population in the Netherlands than in the non-vaccinating orthodox Protestant subgroups described above.

Psychosocial consequences

For all of the orthodox Protestant parents in our study with the exception of the traditional vaccinating parents, the vaccination decision was accompanied by a considerable fear of the consequences. This fear was most tangible among the deliberately vaccinating

parents who feared immediate punishment. For parents in doubt, this fear may be a reason to refrain from vaccination – also because errors of omission (and thus not vaccinating) are generally “preferred” over errors of commission.¹⁶ For parents facing adverse effects of vaccination, this fear may be the reason to stop vaccinating as found in the present study.

Other factors possibly influencing acceptance of vaccination

Trust in the provider

In qualitative studies on acceptance of vaccination, trust in the provider of childhood vaccinations and the medical community in general is identified as an important and possibly decisive factor.^{17,28} For the orthodox Protestant parents we interviewed, this trust -or lack of trust- in the provider seemed, however, not an issue. Like almost all parents in the Netherlands they regularly visited the child health clinics, if not for vaccination then for monitoring growth and development. Moreover, for the general population in The Netherlands, lack of trust in the provider of childhood vaccinations seems not a major issue either.²⁹

Socio-economic factors

In the international literature, socio-economical factors are often mentioned as an explanation for low vaccination coverage. One possible reason for refraining from vaccination may indeed be a lack of insurance.^{30,31} In the Netherlands, however, vaccination via the National Immunization Program is provided by the government, free of charge. Although some orthodox Protestant parents are uninsured because they think that insurance interferes with divine providence, the costs cannot be the reason for refraining from vaccination. Moreover, the group of uninsured orthodox Protestants is only about 11,000 and is thus considerably smaller than the group refusing vaccination.³²

Position of women

Another issue possibly influencing vaccination coverage is the position of women within the orthodox Protestant minority. Until 2006, the orthodox Protestant political party (SGP) did not accept female members because “the man is the head of the woman” and married women are expected to stay at home to care for the children.⁹ Particularly in the most conservative denominations, education is considered less important for girls than for boys.³³ Given that maternal educational level is an important determinant of child health³⁴, the position of women in a religious minority might influence vaccination coverage as well. In the orthodox Protestant minority in the Netherlands, the educational level of the mother indeed correlates positively with the child being vaccinated.³⁵ While few orthodox Protestant girls enter university, they now have the same representation as other Dutch girls in the different levels of

secondary education in the Netherlands and even outnumber orthodox Protestant boys in the higher levels of secondary education.³⁶ This increase in educational level among orthodox Protestant females may thus lead to increased acceptance of vaccination by deliberately vaccinating parents in future.

Strengths and limitations

Generalizability

This study focuses on a specific religious minority in the Netherlands. Detailed information on their decision-making on vaccination is important for public health policy in the Netherlands. The generalizability of our results to religious minorities with low coverage in other countries is, however, limited. Among the orthodox Protestants we described, objections to vaccination are rooted in the religion itself. In other religious minorities with low vaccination coverage, there may be other barriers to vaccination, such as practical constraints or complot theories.³⁷⁻⁴⁰ Nevertheless, it is important to keep in mind that religious minorities with objections to vaccination will probably not be convinced to change their position by medical arguments

Recruitment of participants

The orthodox Protestants in the Netherlands are a hard-to-reach minority.²⁰ Therefore we recruited our participants via intermediaries and a snowball method. Especially the snowball method may lead to overrepresentation of subgroups that are already enrolled. In order to ensure that all orthodox Protestant subgroups were represented we specifically sought vaccinating as well as non-vaccinating parents of denominations not yet (sufficiently) included. Moreover we continued inclusion until data saturation was reached.

In the traditional orthodox Protestant role pattern the woman cares for the children and visits the child healthcare centre with them. Our recruitment methods thus resulted in an overrepresentation of women. Although according to orthodox Protestant customs the man is the head of the family, we do not consider this a problem. Regarding vaccination the woman is expected to carry out the couple's decision, and she is trusted by her husband to do so.

Social desirability

As for orthodox Protestants vaccination is a delicate subject, we chose semi-structured interviews as method to explore the decision-making. However, interviews are by definition subjective and prone to social desirability bias. In order to prevent social desirable answers the interviewers tried to create a confidential atmosphere. They were respectful regarding the religious beliefs of the participants and did not express their opinions on vaccination. Because of the private nature of the decision-making triangulation was not feasible. Nevertheless we think we have sufficiently combated

social desirability bias by including a vaccinating parent belonging to a denomination with low vaccination coverage as well as non-vaccinating parents belonging to denominations with high vaccination coverage.

Conclusion

Based on the decision-making process (i.e., follow tradition or make a deliberate choice) and the outcome (i.e., vaccinate or not), four subgroups of orthodox Protestant parents could be distinguished: traditionally non-vaccinating parents, deliberately non-vaccinating parents, deliberately vaccinating parents, and traditionally vaccinating parents. All of the subgroups with the exception of the traditionally vaccinating parents offered predominantly religious arguments to justify their vaccination decision. Similarly, all of the subgroups with the exception of the traditionally vaccinating parents faced fears that they had made the wrong choice.

Policymakers and health care professionals can play an important role in stimulating orthodox Protestant parents to make a deliberate choice on vaccination. In doing this, however, they should realize that a deliberate choice does not necessarily mean a choice in favor of vaccination. Moreover, they can play an active role in handling the consequences of a particular decision by informing vaccinating parents of adverse vaccination effects and how to deal with them, and giving non-vaccinating parents a second chance for vaccination. Although health is an important value, the vaccination decision making of orthodox Protestant parents shows health to not be the only important value in life – at least for them.

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Chapter 5

How healthcare professionals respond to parents with religious objections to vaccination: a qualitative study

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Abstract

Background

In recent years healthcare professionals have faced increasing concerns about the value of childhood vaccination and many find it difficult to deal with parents who object to vaccination. In general, healthcare professionals are advised to listen respectfully to the objections of parents, provide honest information, and attempt to correct any misperceptions regarding vaccination. Religious objections are one of the possible reasons for refusing vaccination. Although religious objections have a long history, little is known about the way healthcare professionals deal with these specific objections. The aim of this study is to gain insight into the responding of healthcare professionals to parents with religious objections to the vaccination of their children.

Methods

A qualitative interview study was conducted with health care professionals (HCPs) in the Netherlands who had ample experience with religious objections to vaccination. Purposeful sampling was applied in order to include HCPs with different professional and religious backgrounds. Data saturation was reached after 22 interviews, with 7 child health clinic doctors, 5 child health clinic nurses and 10 general practitioners. The interviews were thematically analyzed. Two analysts coded, reviewed, discussed, and refined the coding of the transcripts until consensus was reached. Emerging concepts were assessed using the constant comparative method from grounded theory.

Results

Three manners of responding to religious objections to vaccination were identified: providing medical information, discussion of the decision-making process, and adoption of an authoritarian stance.

All of the HCPs provided the parents with medical information. In addition, some HCPs discussed the decision-making process. They verified how the decision was made and if possible consequences were realized. Sometimes they also discussed religious considerations. Whether the decision-making process was discussed depended on the willingness of the parents to engage in such a discussion and on the religious background, attitudes, and communication skills of the HCPs. Only in cases of tetanus post-exposure-prophylaxis, general practitioners reported adoption of an authoritarian stance.

Conclusion

Given that the provision of medical information is generally not decisive for parents with religious objections to vaccination, we recommend HCPs to discuss the vaccination decision-making process, rather than to provide them with extra medical information.

Background

Vaccination programs have successfully controlled many infectious diseases. In recent years, however, healthcare professionals (HCPs) have faced increasing concerns about the value of childhood vaccination.¹ Parental decision making with regard to vaccination is complex. Medical, psychological, social, and cultural aspects can play a role.²⁻⁴ Moreover, the medical information provided and trust in the HCP can play a role as well.⁵⁻⁷

Although not all HCPs recommend childhood vaccinations according to the national immunization schedule^{8,9}, most are convinced of the value of vaccination and many find it difficult to deal with parents who object to vaccination.

Religious objections are one of the possible reasons for refusing vaccination. In the Netherlands, an orthodox Protestant minority of about 250,000 members has religious objections to vaccination. Forty percent of them has been found to *not* be vaccinated at all.¹⁰ Epidemics of polio, measles, rubella, and mumps have broken out among this group and spread to their relatives in Canada.¹¹⁻¹⁴ Orthodox Protestant objections to vaccination focus on the necessity of trust in divine providence. On biblical grounds arguments for vaccination are put forward as well: vaccination may be considered as a gift of God to be used in gratitude.¹⁵ Orthodox Protestant churches leave it up to parents to decide to have their children vaccinated or not.

During the polio epidemic of 1978, Veenman and Jansma identified among orthodox Protestants religious objections, family tradition, and fear of possible side-effects as major reasons for not being vaccinated.¹⁶ More recently, we performed a study on vaccination decision-making among orthodox Protestant parents and found that vaccinating as well as non-vaccinating parents predominantly used religious arguments to justify their decision. If side-effects of vaccination were mentioned, they often had a religious connotation. Non-vaccinating parents who primarily refused vaccination because of interference with divine providence, also mentioned that man is not allowed to cause disease in a by God given healthy body. On the other hand orthodox Protestant parents who broke with tradition and participated in the NIP, interpreted side-effects as a sign of God that they had made the wrong choice.¹⁷

In the Netherlands, all children are offered vaccination free of charge via local child health clinics (CHCs) as part of a National Immunization Program (NIP) (see Table 1). CHC staff consists of trained CHC doctors and trained CHC nurses. They also monitor the children's growth and development.¹⁸ During the standard home visit for every newborn baby, the CHC nurse provides the parents with vaccination information and registers whether the child will participate in the NIP or not. If the parents are unsure,

Table 1 National immunization schedule in The Netherlands

Phase	Age	Injection 1	Injection 2
1	0 months	HBV*	
	2 months	DTaP-IPV/Hib /HBV	Pneu
	3 months	DTaP-IPV/Hib /HBV	Pneu
	4 months	DTaP-IPV/Hib /HBV	Pneu
	11 months	DTaP-IPV/Hib /HBV	Pneu
	14 months	MMR	MenC
2	4 years	DTaP-IPV	
3	9 years	DT-IPV	MMR
4	12 years	HPV**	

* Only for children of a mother who tested positive for hepatitis B.
** Only for girls: Three injections with a one-month interval between the first and second and a five-month interval between second and third.

HBV = Hepatitis B
DTaP-IPV/Hib/ HBV = Diphtheria Tetanus acellular Pertussis Inactivated Polio vaccine/ Haemophilus Influenzae type B/ Hepatitis B
Pneu = Pneumococci (tenvalent)
MMR = Measles Mumps Rubella
MenC = Meningococci C
HPV = Human Papilloma Virus

the topic is addressed by the CHC doctor during the first consultation at the CHC. Participation in the NIP is on voluntary basis; vaccination coverage is nevertheless high: more than 95% in 2-year olds.¹⁹ General practitioners (GPs) or family physicians are not involved in the NIP. Other medical care, however, primarily involves GPs. People are listed with a GP who provides general medical care and who coordinates access to specialists and hospital care.²⁰ The GPs conduct an Influenza Immunization Program, focused on adults and children with a medical indication such as chronic heart or lung disease. Like the NIP this Influenza Immunization Program is offered free of charge.

Religious objections to vaccination have a long history, nevertheless little is known about the way HCPs deal with these specific objections. The American Academy of Pediatrics issued a guideline “Responding to parental refusals of immunization of children” that advises to listen respectfully to all objections, provide honest information, and attempt to correct any misperceptions.²¹ A Dutch brochure on objections to

vaccination advises largely the same.²² Few papers were published on the actual response of health care professionals to parents with objections to vaccination.^{23;24} The objections in these studies concerned vaccine safety and HCPs responded to them by trying to convince the parents of the medical benefits of vaccination. The response of health care professionals to parents with religious objections to vaccination has -to our knowledge- never been studied.

A qualitative study was therefore undertaken to gain insight into the responses of HCPs to parents with these specific objections to the vaccination of their children. The research questions were:
How do HCPs respond to parents with religious objections to vaccination?
Which determinants influence HCPs’ responses to parents with religious objections to vaccination?

Methods

Study design

Because of the explorative character of our study we chose a qualitative research design using a grounded theory approach.²⁵ Semi-structured interviews were undertaken with HCPs who had ample experience with orthodox Protestant parents. According to the grounded theory approach, inclusion of participants was continued until data saturation was reached, coding of the data was entirely based on their content, and emerging concepts were assessed for consistency by reviewing previously coded interviews.

Study population

The study population was composed via purposeful sampling. Participants were recruited in villages with large orthodox Protestant populations. The selection of these villages was based on the results of a previous study.²⁶ HCPs with different professional backgrounds (CHC doctors, CHC nurses and GPs) and different religious backgrounds were approached by the researchers and invited to participate. HCPs who had little or no experience with orthodox Protestants were excluded. Inclusion of participants was continued until data saturation was reached; this was after 22 interviews. We initially approached 6 more HCPs, 5 of them were excluded because they were not seeing orthodox Protestant patients and 1 HCP could not be interviewed due to logistic problems. Thus, in the end, 22 HCPs who all had ample experience with religious objections to vaccination were interviewed: 7 CHC doctors, 5 CHC nurses and 10 GPs. Six of them were members of orthodox Protestant churches. Participant characteristics are summarized in Table 2.

Table 2 Characteristics of participants

	CHC doctors	CHC nurses	GPs
N	7	5	10
Gender			
Male	0	0	10
Female	7	5	0
Religion			
Orthodox Protestant	1	0	5
Protestant	3	1	3
Other or no religion	3	4	2
Working experience			
Mean (years)	18	8	24
Range(years)	4-29	1-17	4-32

Data collection

Two interviewers (GvIJ and WLMR) visited the HCPs between January 2009 and June 2010 at their practices to interview them with regard to a number of vaccination topics (see Table 3). The topic list was constructed on the basis of an exploratory meeting with key persons from the orthodox Protestant community, the NIP and CHCs who were represented in the advisory committee of the project. The interviews lasted an average of 30 minutes (range 20- 45 minutes). Because vaccination is a particularly sensitive subject among orthodox Protestant parents, observation of consultations was not feasible.

Analysis

The interviews were recorded and transcribed verbatim. The transcripts were thematically analyzed using the qualitative software program Atlas.ti 6.0. Two analysts (WvA and WLMR) independently coded the transcripts and subsequently reviewed, discussed, and refined the coding schemes until consensus was reached. All transcripts were coded and discussed by both analysts. Emerging concepts were assessed using the constant comparative method from grounded theory: previously analyzed interviews were reviewed in order to check if their content fitted into the concept.²⁵

Table 3 Interview topics

- Spontaneous questions or remarks of orthodox Protestant parents on the topic of vaccination:
 - Medical aspects
 - Adverse reactions
 - Religious aspects
 - Catch up vaccinations for previously unvaccinated children
 - Regrets following vaccination
 - Other
- Response to these questions
- Raising the topic of vaccination during consultations:
 - When, why, and how
- Insight into parental decision making
 - Time of decision making and reconsideration
 - o Newborns
 - o Epidemics
 - o Specific circumstances: travel, work, wounds (tetanus)
 - Decision-making process
 - o Influence of partners, family, and friends
 - o Influence of clergymen and church members
 - Decisive factors in decision making
- Experience working in communities with low vaccination coverage
- Affinity with orthodox Protestant religion

Results

HCPs reported three different manners of responding to religious objections to vaccination: provision of medical information, discussion of the vaccination decision-making process, and adoption of an authoritarian stance. These manners of responding are described in greater detail below. Characteristic quotes for each manner of responding are summarized in Table 4.

The manner of responding which was applied depended on characteristics of the child, the child’s parents, and the HCP him/herself. For each manner of responding the determinants are described.

Provision of medical information

All HCPs reported to respond to religious objections to vaccination predominantly with medical information. They stated that the provision of medical information was

Table 4 Three manners of responding to parents with religious objections to vaccination

1. Providing medical information
<i>They think measles is not that serious, it's just a childhood disease. But measles can be really serious and I try to explain that, that it may have serious complications. (Respondent 2, CHC doctor)</i>
<i>They're not impressed by mumps. And whooping cough? I explain that infants may even die of lack of breath, that's the risk if they're not vaccinated. But that doesn't result in enough fear to make them start vaccination, even not in the presence of whooping cough at school. They just wait and see. (Respondent 12, CHC nurse)</i>
<i>There is still some ignorance. How vaccination works, that it doesn't cause disease, the side-effects. I'll explain that. (Respondent 5, CHC doctor)</i>
<i>I told them about the immune system and antibodies. How that has been created in the human body, and what vaccination exactly does (Respondent 15, GP)</i>
<i>You may give them a lot of information, tell them that it is better to vaccinate, but they do not change their point of view. (Respondent 10, CHC nurse)</i>
<i>It remains hard. I regularly tell them what the illnesses do and also refer them to our website. On the basis of that information, very few come around to vaccination, however. And then you lose heart. (Respondent 2, CHC doctor)</i>
2. Discussing the decision-making process
<i>If they are in doubt I'll discuss that. But I cannot advise them in religious matters. I ask them what they want to know and send them some information brochures. And we note in the case history at the subject vaccination "in doubt". So next time the doctor will come back to it. (Respondent 8, CHC nurse)</i>
<i>I stress that it's a personal decision. It's all right with me if they don't vaccinate, as long as it is a deliberate choice. I always ask them if they know any people from their church who do vaccinate. They never know. And then I tell them that more and more people, also from their church, choose to vaccinate. I try to entice them away from tradition. (Respondent 1, CHC doctor)</i>
<i>[I discuss with them] how they reached their decision, if they have talked about it with others, or if they agree. And if they are aware of the possible consequences. Can they live with that? If your child becomes afflicted, will your faith be enough? Will you be able to handle things, accept things, not have a moral dilemma. Parents who can respond to all of this, they have carefully thought things through. (Respondent 3, CHC doctor)</i>
<i>I try to find out how they feel about vaccination and why they came to me to talk about it. Apparently they're not sure what to do. They like to hear the arguments for and against, and I know the medical arguments. But I also know the religious arguments and these arguments are discussed as well. In fact, it's more pastoral than medical. (Respondent 14, orthodox Protestant GP)</i>

Table 4 Continued

<i>They sometimes ask: "What should I do?" That's difficult, I don't answer such a question. They have to decide themselves. I give them some material, on which they can base their choice. I show them the pros and cons, medically but also religiously. In the Bible there are arguments for and against vaccination, but it's up to them to weigh these arguments. (Respondent 16, orthodox Protestant GP)</i>
<i>I try to tell the whole story, objectively. About the smallpox vaccination in the past and modern vaccines today. I also mention that it's important that they can account for their choice. If you don't feel right about it, you should ask yourself if you should continue in that direction or reconsider your choice. (Respondent 22, orthodox Protestant GP)</i>
3. Adoption of an authoritarian stance (regarding tetanus post-exposure prophylaxis)
<i>Tetanus is something that you would not wish upon your worst enemy. If your kid should come down with this, you would never forgive yourself. So I say: "The wound will be cleaned and now a shot because you've never been vaccinated and you've got dirt in your system" and that is usually swallowed more or less without a problem. (Respondent 17, GP)</i>
<i>I try anything I can think up to persuade them. Only once I didn't succeed. (Respondent 15, GP)</i>
<i>They have to take it. Well, ... of course they are not obliged to it. But I explain them that the risk is really high in such a situation. And if I advise them to take a shot, they do so. (Respondent 16, GP)</i>
<i>I sometimes say: "If you get any problems, just tell them that the doctor said that you had to take it." (Respondent 19, GP)</i>

their most important contribution to vaccination decision-making, nevertheless many of them thought the provision of such information to be not very rewarding. CHC doctors and nurses reported to provide information on the severity of the vaccine preventable diseases, the benefits of vaccination, and its possible side-effects. They said they attempted to correct any misperceptions and offered later vaccination to parents who were in doubt. The extent of the information that was provided was determined by a characteristic of the child: being firstborn or not. When the child was not a firstborn, most CHC doctors and nurses simply asked if the parents still objected to vaccination. Orthodox Protestant families are large, and CHC doctors and nurses reported not wanting to “bother” the parents too much for fear that they would stop coming to the CHCs for monitoring.

The same was found for the GPs offering influenza vaccination. All of the GPs provided patients with medical information about the vaccination. Moreover, the specific risks of influenza for the patient with a particular medical condition were explained. After repeated vaccination refusal, the GPs generally reported stopping discussion with the patients.

Discussion of the decision-making process

In addition to the provision of medical information, the HCPs sometimes discussed the vaccination decision-making process itself. That is, the HCPs verified just how the decision not to vaccinate was made and whether or not the possible consequences of non-vaccination were realized. Some HCPs said they also briefly discussed religious considerations, while others suggested the parents to read a booklet on the religious arguments for and against vaccination published by some orthodox Protestant ministers.¹⁵ Still others systematically discussed all religious arguments for and against vaccination. Whether HCP s discussed the vaccination decision-making process or not depended first and foremost upon the willingness of the parents to engage in such a discussion. In addition, discussion of the decision-making process depended on HCP-related factors: their religious backgrounds, their attitude to religious objections to vaccination and their communication skills, see Table 5.

Especially an orthodox Protestant background, or at least proper knowledge of the orthodox Protestant religion, was reported to be important. The orthodox Protestant GPs reported being consulted –a few times a year– by orthodox Protestant parents for advice on whether to have their children vaccinated or not. In these cases, most of the GPs reported systematically discussing both the medical and religious arguments for and against vaccination with the parents. One of the GPs even reported using religious considerations to support the final decision making in a dissenting couple.

Respondent 14, GP:
If one does and the other doesn't, then I point to their vows; they are married; they promised in the church that the wife would follow the husband.... If they cannot figure things out themselves, then the husband as head of the family should make the decision and the wife follow him on this. This sometimes works.

Although all orthodox Protestant GPs realized that they could set an example, none of them revealed the vaccination status of their own children to their patients. They reported that they always left the final decision on taking part in the NIP up to the parents.

Table 5 Determinants of the professional influencing the discussion of the decision-making process

1. Religious background / knowledge on orthodox Protestant religion

Orthodox Protestant

Especially when I show them that I know these denominations, they tell more about their deliberations. I think they tell me a lot more than most of my colleagues. (Respondent 5, CHC doctor)

They know that I 'm a confessor of one of the orthodox Protestant denominations, therefore they come to me with their questions. I can easily go into it, because I feel what the problem is. (Respondent 18 , GP)

They know that I'm a member of one of the orthodox Protestant congregations. They want discuss the ethical aspects. (Respondent 22 , GP)

Protestant

They are not talking to someone who knows nothing about it. They have the idea that I can place myself in their shoes and know the terminology. (Respondent 1, CHC doctor)

I show them that I'm interested in their background, and I tell them about my Protestant background. Not orthodox, but just Protestant. That makes a difference, they expect that I will understand them. And that's why they tell me about their considerations. (Respondent 4, CHC doctor)

No or other religion

Sometimes I ask them: "What is it, that is written in the Bible?" And then I get a phrase that I don't understand at all. (Respondent 12, CHC-nurse)

2. Attitude towards parents with religious objections to vaccination

I don't have any affinity with their religion. At that moment [during the polio-epidemic] I couldn't imagine that you refused to have your children vaccinated. I rather got angry than that I tried to understand it. I still don't understand it, or maybe I don't want to understand it, that's also possible. (Respondent 17, GP)

The moral dilemma, I can't relate to that. It is something that doesn't play a role on my part at all. ...I can only indicate what we vaccinate for; they have to fight the moral battle themselves. (Respondent 8, CHC nurse)

There are always people who don't accept it. That's their philosophy of life, and I resigned to it, through the years. It's their way of thinking and you have to respect it. (Respondent 21, GP)

I find it interesting to learn about their arguments, to talk about it. (Respondent 1, CHC doctor)

Table 5 Continued

My approach is to go along with them, I know why they didn't have their children vaccinated, at least I think I know, and from that point of view I reason why this specific vaccination would be necessary, or not. (Respondent 14, orthodox Protestant GP)

3. Communication skills

This isn't part of providing sound medical information [...] You certainly feel that you would like to do something more, but you don't know what form to give this. (Respondent 6, CHC doctor)

I'm glad if I am able to discuss the subject and get to know why parents decide to vaccinate their children. But I don't find out why they refuse. That is more difficult. (Respondent 4, CHC doctor)

Apart from the religious background of the HCPs, their attitude to religious objections to vaccination seemed to be important. Some of the HCPs lacked affinity with the dilemmas of the orthodox Protestant parents while others tried to understand their position.

Finally some HCPs reported that they were willing to discuss the vaccination decision-making process but felt they lacked the skills to do so.

Authoritarian stance

The third manner of responding to religious objections to vaccination, described by the HCPs, was to adopt an authoritarian stance and tell the parents what they must do in their child's best interest. In cases of tetanus post-exposure prophylaxis almost all of the GPs reported to use their medical authority to make parents comply with the immunization regimen prescribed for unvaccinated individuals.

The GPs adopted this authoritarian stance only in cases of tetanus post-exposure prophylaxis. Given that almost all of the GPs in these cases adopted an authoritarian stance, while none of them did so in any other cases, this approach seemed to be completely dependent on the child running a high risk of serious disease.

Discussion

We identified three manners of responding to parents with religious objections to vaccination: the provision of medical information, the discussion of the vaccination decision-making process, and adoption of an authoritarian stance. The manner of responding was shown to depend on characteristics of the child, the willingness of the parents to engage in a discussion of the vaccination decision, and some personal characteristics of the HCPs themselves.

The three manners of responding to religious objections to vaccination resemble to recent models of medical decision making (in the context of the doctor-patient relationship) in which the informative, the shared decision-making, and the paternalistic approaches are distinguished.²⁷⁻²⁹ There is, however, a major difference: while providing medical information on vaccination fits into the informative approach, and the adoption of an authoritarian stance on tetanus post-exposure prophylaxis fits into the paternalistic approach, discussing the vaccination decision-making process cannot be considered as shared decision-making. Shared decision making means that patient's preferences are taken into account in a final decision that is endorsed by both the doctor and the patient. A prerequisite for shared decision making is that the available options be medically equivalent.³⁰ This is questionable in cases of vaccination and simply untenable in cases of tetanus post-exposure prophylaxis where refusal has a high risk of adverse outcome. Thus, the aim of discussing the vaccination decision-making process with parents who refuse vaccination is to help them make a well-considered decision; that is not necessarily a decision endorsed by the HCP.

All HCPs primarily responded by providing medical information and correcting any misconceptions regarding vaccination. They considered the provision of medical information a key competence of HCPs, and their most important contribution to acceptance of vaccination. Orthodox Protestant youngsters, however, are more interested in religious aspects of vaccination than in medical aspects.³¹ And orthodox Protestant parents predominantly use religious arguments to justify their decision on vaccination.¹⁷ Therefore the influence of medical information on parents' final decisions is expected to be limited, as was noticed by some HCPs in the present study. The discussion of the decision-making process required –except from parental willingness to engage in such a discussion– some religious knowledge, a positive attitude towards parents with religious objections to vaccination, and adequate communication skills.

The religious background of HCPs influences their attention to religious considerations in general clinical practice. In a recent study in the USA, older pediatricians with Christian backgrounds paid more attention to religious considerations than younger,

non-religious pediatricians.³² Similarly, GPs with a Protestant background in the Netherlands have been found to pay more attention to religious considerations in their practice than GPs with a Catholic background.³³ While to our knowledge the present study is the first to focus on the influence of religious background on vaccination discussions, our finding that in particular the HCPs with an (orthodox) Protestant background discussed the decision-making process and the religious considerations involved are in line with these studies. Some extra education on religious aspects of vaccination and training in communication skills could for the other HCPs possibly facilitate the discussion of the decision-making process with orthodox Protestant parents, however the effects of such discussions should be evaluated.

Limitations

The data for this study were collected via interviews with HCPs, and –by definition– subjective. However, the findings are in line with the results of previous studies among orthodox Protestants.^{17,31} Because of the sensitive character of the subject vaccination among orthodox Protestants, observation of the HCPs during real life consultations was not feasible. In other research the response of HCPs to simulation patients presenting with standardized problem scenarios was observed.^{20,21} Although this method seems to be more objective, in these studies the trust between patient and HCP could not be taken into account. We found that orthodox Protestant parents sometimes preferred to consult their orthodox Protestant GPs with doubts about vaccination, instead of the CHC doctors and nurses who provide the vaccinations. This stresses the importance of trust. Perfectly provided medical information is not what orthodox Protestant parents are looking for.

Another possible limitation of the present study is that the gender distribution of the participants was not balanced. All of the CHC doctors and nurses were female and all of the GPs were male. However, 94 % of CHC doctors and the vast majority of CHC nurses in the Netherlands are female while only a third of the GPs in the Netherlands are female.^{34,35} Our study population is therefore fairly representative. We tried to include female GPs in our study but, when approached, the female GPs referred us to male colleagues as they saw the orthodox Protestant patients. Given that perceived similarity of values between doctor and patient is an important factor in patient satisfaction,³⁶ it is not surprising that orthodox Protestant patients –who generally have conservative views with regard to gender roles and expect women to stay at home and care for the children³⁷– tend to choose a male GP, if possible with same religious background. The adoption of an authoritarian stance in cases of tetanus post-exposure prophylaxis, which was only seen among the GPs and thus the male participants in this study, could be a gender effect. This seems unlikely in light of the extenuating circumstances created by tetanus exposure, however.

Conclusion

In this study, we identified three manners in which HCPs respond to parents with religious objections to vaccination: provision of medical information, discussion of the vaccination decision-making process, and adoption of an authoritarian stance. The choice of approach depends on the medical condition of the child, the willingness of the parents to engage in discussion, and the personal characteristics of the HCPs themselves. Given that for parents with religious objections to vaccination medical information is generally not decisive, we recommend HCPs to discuss the vaccination decision-making process – if parents are willing to engage in such a discussion- rather than to provide them with extra medical information.

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Chapter 6

The role of religious leaders in acceptance of vaccination within a minority group

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Submitted for publication



Abstract

Objectives

To assess the role of religious leaders in acceptance or refusal of vaccination within an orthodox Protestant minority group with low vaccination coverage.

Methods

Qualitative study involving semi-structured interviews with orthodox Protestant religious leaders in the Netherlands. Transcripts were thematically analyzed, and emerging concepts assessed for consistency using constant comparative method from grounded theory.

Results

Data saturation was reached after 12 interviews. Attitudes of religious leaders were compatible with attitudes of congregation members who appointed them. Three subgroups of religious leaders stood out: those who did not address vaccination as it was fully accepted in their congregation, those who focused on a deliberate choice, and those who preached not to vaccinate. None were willing to promote vaccination on behalf of authorities.

Conclusions

Given that objections to vaccination are rooted in religious doctrine and orthodox Protestant leaders owe their authority to their interpretation and application of this doctrine, their positions on vaccination will not change easily. The dialogue with religious leaders pursued by the Dutch government is therefore unlikely to increase vaccination coverage.

Introduction

In order to effectively reach target populations, public health promotion efforts have tried to engage faith-based organizations over the past few years.^{1,2} The involvement of religious leaders in health-related interventions has generally been found to improve the participation of their congregations in these interventions and thus promote positive health outcomes.³ To reach a high level of vaccination coverage worldwide, organizations such as Unicef now advocate enhancing trust in immunization by –among other things– seeking partnership with religious leaders and groups.⁴ Religious leaders are highly esteemed, and their authority can convince members of their congregations to accept or reject vaccination.

A number of epidemics that started in the orthodox Protestant population of the Netherlands and spread to their religious counterparts in Canada raised public debate about how to increase vaccination coverage among such minority groups.⁵⁻¹³ In the Netherlands, an orthodox Protestant minority of 250,000 has religious objections to vaccination. This orthodox Protestant minority comprises a number of denominations that separated from the Dutch Reformed Church and can therefore vary in its interpretation of the confession and its position on vaccination.¹⁴ Some refuse vaccination because it interferes with divine providence. Others accept vaccination nowadays as a gift of God. In a recent study, we identified three clusters of orthodox Protestant denominations with differing levels of vaccination coverage: high (>85%: Reformed Bond, Christian Reformed Churches), intermediate (50-75%: Restored Reformed Church and Reformed Congregations), and low (<25%: Old Reformed Congregations and Reformed Congregations in the Netherlands).¹⁵

During two polio epidemics in the Netherlands in the years 1978 and 1992, respectively, the Minister of Health tried to initiate a dialogue with orthodox Protestants opposed to vaccination. In 1978, a booklet countering the religious arguments against vaccination helped fuel the discussion.¹⁶ In some denominations, the counterarguments were clearly considered; in others, congregations were still advised against vaccination.¹⁷ In 1992, the Minister of Health appointed a committee of three wise men who invited the principal religious leaders to discuss the vaccination issue. However, they reported that they had only had talks with representatives from two denominations, the others refused.¹⁸

Despite such failure to communicate, the National Council for Public Health in the Netherlands advised the Minister to continue the dialogue with orthodox Protestant leaders in the expectation that once orthodox Protestant leaders are convinced of the benefits of vaccination, members of their congregations will follow.¹⁹ Some successes of this kind have indeed been achieved in India and Africa.^{4,20} But the validity of this

assumption has never been checked for the situation in the Netherlands. The aim of the present study was thus to identify the role of orthodox Protestant religious leaders in the acceptance or refusal of vaccination by members of their congregations. The specific research questions were as follows.

1. Do orthodox Protestant religious leaders address the topic of vaccination in their contacts with members of their congregations? If so, when and how do they address the topic?
2. To what extent are orthodox Protestant religious leaders willing to enter into a dialogue with authorities on the topic of vaccination?

Methods

Setting

In Protestantism, local churches are autonomous. The members of the local church choose a church council from their midst. The council consists of elders and deacons who then approach a member of the clergy to pastor their church. Following acceptance of the post and installation, the pastor conducts services, delivers sermons, organizes bible classes and confirmation classes, and provides pastoral care. The elders assist with pastoral care; the deacons manage the church finances and also help with pastoral care (e.g., financial help for members, house calls). Due to a requirement of divine vocation, the most conservative Protestant congregations in the Netherlands have very few clergy. In the local churches for these denominations today, the position of pastor is often vacant; the elders thus take over some of the tasks.^{21,22}

Study design, population, and procedure

In a qualitative study, semi-structured interviews were conducted with orthodox Protestant pastors who were selected via purposeful sampling. The pastors from various orthodox Protestant denominations –or the elders and deacons when no pastor was available– were approached by the researchers and invited to participate in this study. An interviewer (WLMR) visited those who agreed to participate in their homes to interview them with regard to numerous vaccination topics (see Table 1). The interviews lasted 60 minutes on average. Inclusion and thus the interviewing of participants was continued until data saturation was reached.

Analysis

The interviews were recorded and transcribed verbatim. The transcripts were thematically analyzed using the qualitative software program Atlas.ti 6.0. Two analysts (SK and WLMR) independently coded the transcripts and subsequently reviewed,

discussed, and refined the coding schemes until consensus was reached. Emerging concepts were assessed using the constant comparative method from grounded theory.²³

Table 1 Interview topics

Introductory questions: How many people are in your congregation? How long have you had your position here? Where were you previously appointed? Do you have an idea of what the vaccination coverage in your congregation is?
Do you receive questions about vaccination from the members of your congregation? What kinds of questions? <ul style="list-style-type: none">- Interpretation of the bible and other text- Personal advice with regard to decision-making- Doubts of conscience following illness or vaccination From whom and when? How do you handle such? More questions during epidemic outbreaks?
Do you have an idea of the decision-making process regarding vaccination in the families in your congregation? What factors are, in your opinion, decisive?
Do you, yourself, raise the topic of vaccination for discussion? <ul style="list-style-type: none">- During home visits- During confirmation classes- In sermons- Otherwise- During epidemic outbreaks
Do you have contact with other religious leaders on the topic of vaccination or other topics? <ul style="list-style-type: none">- From your own denomination?- From other denominations?- Regularly? Or only during epidemics outbreaks?
Have you had contact with the government about vaccination or other topics? <ul style="list-style-type: none">- Regularly? Or only during epidemics outbreaks?- With the mayor? With the public health service? With general practitioners?
What is your position on possibly obligatory vaccination?
Is there anything else that you think is of importance and would therefore like to add?

Results

Data saturation was reached after a total of 12 interviews with 7 pastors, 3 elders, and 2 deacons. Most of the interviewees belonged to denominations with nationally intermediate to low levels of vaccination coverage (see Table 2). During the inclusion phase, two other pastors were approached but refused to participate: one for practical reasons; the other considered the issue unimportant.

With regard to their addressing of the subject vaccination in contacts with congregation members, three subgroups of religious leaders stood out: those who do not address the topic of vaccination, those who focus on deliberate choice, and those who preach against vaccination (see Table 2).

Religious leaders who do not address the topic of vaccination

The three religious leaders who did not address the topic of vaccination in their contacts with members of their congregation considered refusing vaccination to be something of the past and mentioned the polio epidemic of 1978 as a turning point. All of these leaders fully accepted vaccination, were vaccinated themselves, and also had children who were vaccinated. They were pastors from either the Restored Reformed Church or the Reformed Congregations, denominations with an intermediate national level of vaccination coverage. However, they either knew that nearly all of the members of their local congregation were vaccinated or expected this to be the case. They did not receive questions about vaccination during confirmation classes or other pastoral care. To provide some insight into the stance of more conservative orthodox Protestant groups, one of these leaders nevertheless raised the topic in confirmation classes but reported the youth to not see any religious objections with regard to vaccination. An older religious leader reported receiving more questions about vaccination during the polio epidemic in 1978:

I was always honest and let people know that we were vaccinated. But I can't say that I served a role model function. I can't say that the people then said "Oh, the pastor does it, so we should, too". (Respondent 12)

Religious leaders who focus on deliberate choice

The four religious leaders who focused on deliberate choice reported stimulating parents to make a decision that they could agree upon, could justify towards God, and could justify towards their children.

Table 2 Subgroups of religious leaders according to their role in influencing acceptance or refusal of vaccination among congregations

	Don't address topic	Focus on deliberate choice	Preach against vaccination
N	3	4	5
Denomination	RRC RC	CRC RRC RC	ORC RCN
Position	Pastor	Pastor	Elder or deacon
Estimated local vaccination coverage	High	Intermediate	Low
Personal decision on vaccination	Acceptance	Refusal	Refusal
Way of addressing the topic	Not applicable	Discussion	Preaching Teaching
Mission field	Not applicable	Pastoral care Confirmation classes	Sermons Confirmation classes

RRC = Restored Reformed Church
RC = Reformed Congregations
CRC = Christian Reformed Churches
ORC = Old Reformed Congregations
RCN = Reformed Congregations in the Netherlands

Then I try to emphasize that it is a personal choice. You shouldn't do it, or refrain from it, for me. It's a bit of tradition but... you should reflect on it. Don't just blindly follow, like "my parents didn't do it, so I won't either." I really like for them to reflect and think for themselves. My child can later ask me: "Why didn't you do it?". I have to have an answer then. And I have it then. And others should have it then as well. (Respondent 1)

The religious leaders focusing on deliberate choice all came from churches with a mixture of vaccinated and non-vaccinated members. In contrast to the other subgroups of religious leaders, they reported sometimes receiving questions about vaccination, particularly from young parents who did not agree on vaccination. In order to stimulate deliberate decision-making, the topic of vaccination was then discussed in personal meetings with these parents. Various bible passages but also the decision-making process and the psychological consequences of their decisions were considered during these meetings.

The rule that I, myself, follow in those sorts of situations is that you cannot place a burden on someone's conscience. They have to find a way out, together, and respect each other's standpoints. And things should tip to the side of the one who says "I can't live with this." (Respondent 3)

The same religious leaders also stimulated discussion of the arguments for and against vaccination in confirmation classes but reported rarely mentioning the topic in sermons as they considered sermons too much of a one-way affair. While aiming to stimulate deliberate decision-making and a conscious choice, they did not hide their own points of view. All of these leaders reported not being vaccinated, not having their children vaccinated, and relating their personal experiences with God rewarding their choice to not vaccinate when discussing the topic with members of the congregation.

At the same time, if they ask me my personal opinion, I give it to them. We have, personally, never dared to have our children vaccinated. We have also always seen that the Lord takes care of us. (Respondent 8)

Religious leaders who preach against vaccination

The five leaders who preached against vaccination propagated their conviction that vaccination is not allowed. This subgroup consisted of elders and deacons clearly refusing to be vaccinated. They all belonged to either the Old Reformed Congregations or the Reformed Congregations in the Netherlands, which are the two denominations with a nationally very low level of vaccination coverage. These denominations are also the denominations with very few clergy. The elders and deacons reported that vaccination is not an issue in their congregations as the doctrine is clear: Man should not interfere with divine providence. The elders reported never receiving questions about vaccination during pastoral care. However, one elder mentioned always raising the topic himself during pre-marital consultations. In contrast to the other subgroups, this subgroup of religious leaders reported that vaccination was sometimes mentioned in sermons. The proper interpretation of the bible on the topic of vaccination was also taught during confirmation classes.

Primarily during the lesson on divine providence. It's talked about there. Insurance, vaccination, yeah. That everything is in God's hands and that we should leave things up to God and that we cannot intervene. But, this is also sometimes touched upon in sermons. People know it, how things are, but in confirmation classes it is explained in more detail. (Respondent 6)

Dialogue with authorities

Regardless of the subgroup they belong to, all of the religious leaders thought that vaccination should remain voluntary in the Netherlands and also that, if vaccination is required under specific circumstances (e.g., for medical personnel), religious exemptions should be possible.

No, I think that people should really be left free in this because there are people— and I also have respect for this — who really do not and cannot — on the basis of their inner convictions — allow it to be done. ... (Respondent 12)

Although orthodox Protestants are generally law-abiding and the orthodox Protestant political party considers government to be an instrument of God,²⁴ the respondents nevertheless emphasize that — in the case of obligatory vaccination — the laws of God overrule the laws of man and they will not obey to governmental rules.

Most of the religious leaders in our study said that they would be willing to enter into a dialogue with authorities, at least during an epidemic. In their opinion, such a dialogue could increase the understanding of both the authorities and the general public for the orthodox Protestant arguments against vaccination and the orthodox Protestant way of life. The dialogue could, moreover, address control measures rather than vaccination. One elder, for example, reported consulting the Municipal Health Services for advice on whether to cancel a large public meeting during the 1992 polio epidemic. The respondents in our study nevertheless doubted that a dialogue specifically aimed at increasing vaccination coverage would be effective. This is because the religious leaders consider explanation of the bible and guidance with regard to the application of biblical principles during daily life to be their core business; they are therefore not willing to promote vaccination simply on the behalf of authorities.

That the government calls, for instance, for everyone to be vaccinated. ... I won't let me be guided by this. No, then I think that what the government says is well-intended, but I have to look to scripture first and then to the government. That is what Peter, for example in Acts 5, says to the high priest — who represents the government in Jerusalem. A situation arises in which something that is not in accordance with the bible gets imposed and Peter elegantly states "We must obey God rather than men." These moments can occur, thus. Contact is good, but they should not impose things on me. That is not in accordance with scripture. (Respondent 2)

Discussion

With regard to their addressing of the topic of vaccination in contacts with congregation members, three subgroups of orthodox Protestant religious leaders could be distinguished in our study: those who do not address the topic; those who focus on members of the congregation making their own deliberate choice; and those who preach against vaccination. All three subgroups nevertheless agree that vaccination in the Netherlands should remain voluntary. They are willing to participate in a dialogue with authorities, but unwilling to promote vaccination on the behalf of authorities.

Secularization

As far as we know, the influence of religious leaders on public health interventions in the Netherlands has not been previously studied. This is not surprising as the Netherlands is a very secularized country. In 2002 only one third of the population reported being a member of a religious congregation.²⁵ Religious leaders may thus not be the most appropriate intermediaries for interventions aimed at the general population because they are only in a position to reach a small portion of a country's population. On the other hand religious leaders can help to approach minority groups with a common religion. Collaboration with Islamic religious leaders has for example been suggested to help increase living donor kidney transplantation within ethnic minority groups.²⁶ In a similar vein, the target population for increasing vaccination coverage is orthodox Protestant groups, which means that their religious leaders could conceivably serve as intermediaries. We found, however, that the orthodox Protestant leaders were not willing to promote vaccination.

Church order and religious leaders attitudes towards vaccination

Unlike many other religions and their churches, the orthodox Protestant church order is organized in a democratic, bottom-up manner with the local congregation appointing its leaders who thus have views compatible with the majority of the members.²¹ This practice is reflected in our results.

Those religious leaders who do not address vaccination all came from congregations where vaccination is no longer an issue; everyone –including the religious leader participating in our study– accepts vaccination. There is therefore no more need to increase vaccination coverage among the members of such congregations.

The religious leaders who preach against vaccination, in contrast, take a dogmatic stance that clearly reflects the views of most of the members of their congregation. It is very unlikely that these religious leaders will change their standpoint on vaccination and even more unlikely that such a change of standpoint would be accepted by the congregation. The church council can even dismiss a religious leader who changes position on an important issue.

Those religious leaders who focus on members making a deliberate choice are leaders who face a congregation with members in doubt. They stimulate religious argumentation and care for the psychological consequences of one's decisions. The "open" perspective of these religious leaders is probably influenced by their specific education in pastoral and spiritual care.²⁷ However, these religious leaders do not only stimulate deliberate decision-making, they also provide guidance by discussing the scripture. This exegesis reflects their personal attitude towards vaccination. It is striking that all religious leaders who focus on a deliberate choice personally object to vaccination. Therefore it is expected that these religious leaders –although they stimulate a deliberate choice– do not stimulate acceptance of vaccination.

Nature of the objections to vaccination

The successes reported by Unicef for the strategy of seeking partnerships with religious leaders are for developing countries – countries that have just started or expanded their immunization programs and also have high levels of illiteracy.⁴ The religious leaders are mainly Islamic imams and Catholic priests who explain the duty of parents to secure the well-being of their children to their congregations (i.e., preach about vaccination). Another report of a successful intervention comes from the USA, where the involvement of religious leaders in the campaign to increase influenza vaccination coverage indeed increased coverage among adults.²⁸ This study was conducted in an underserved, inner city location that had practical barriers to attaining vaccination. Yet another successful example of partnering with religious leaders concerned the politically-motivated boycott of the polio vaccination campaign in Nigeria on grounds that the vaccine might be unsafe: Religious leaders were successfully convinced to stop the boycott once the safety of the vaccine was guaranteed by foreign biomedical experts of the same religion.²⁰

The situation in the Netherlands is very different from the situation in developing countries. Since 1957, all children have been offered vaccinations free-of-charge under the National Immunization Program. Socio-economic barriers are thus not relevant. National vaccination coverage is about 95%.²⁹ Among the orthodox Protestant population in the Netherlands, however, there has been opposition to vaccination for over 150 years and this opposition is deeply rooted in religious doctrine.^{10;14;21} Unicef stresses in its manual for partnering with religious leaders the importance of seeking a case for vaccination *within* the relevant religious doctrine or holy books.⁴ Among orthodox Protestants, however, the topic of vaccination has been discussed over and over again, and the religious leaders all have chosen their position in this discussion long time ago, based on their interpretation of scripture. Moreover, because the interpretation and application of scripture is their core business, they owe their authority among congregation members to their religious ideas. Changing these ideas in order to help increase vaccination coverage would thus affect their credibility

and undermine their authority. The dialogue with religious leaders pursued by the Dutch government is therefore not likely to increase vaccination coverage.

Possible limitations

A possible limitation of our study is the lack of respondents from denominations with a nationally high level of vaccination coverage: Only one of our respondents represented such a group. Given that we continued to include participants until no new information could be gleaned, we do not think that inclusion of more participants from denominations with a nationally high level of vaccination coverage would alter our results. We expect the far majority of religious leaders from such denominations to fully accept vaccination, just as their congregations do, and thus fit into the first subgroup of religious leaders distinguished in our study: those who see no need to address the topic because it is already accepted.

Another possible limitation is the inclusion of only elders and deacons from the Old Reformed Congregations and Reformed Congregations in the Netherlands. Their educational backgrounds are different from the educational backgrounds of the pastors included in our study. The elders and deacons also have regular jobs and thus fulfill their religious duties in their spare time. Most orthodox Protestant denominations collaborate with universities on the education of their pastors, but the few pastors in the Old Reformed Congregations and Reformed Congregations in the Netherlands are educated “on the job” by more experienced pastors, as divine vocation is the only requirement for them.²¹ Given that the pastors in these denominations are also scarce and congregation members will therefore predominantly have contact with elders and deacons, we consider the elders and deacons acceptable representatives.

Conclusion

Orthodox Protestant religious leaders are appointed by their congregations and therefore generally hold views that are compatible with those of the majority. With regard to their role in influencing the acceptance or refusal of vaccination, three subgroups could be distinguished: those who see no need to address vaccination as it is fully accepted by their congregation; those who focus on having members of their congregation make a deliberate choice but nevertheless express their own personal objections; and those who clearly preach against vaccination. As the religious leaders owe their authority to their religious ideas and the objections they may have to vaccination are deeply rooted in religious doctrine, a major change of position on the issue could affect their credibility and undermine their authority. The dialogue with religious leaders pursued by the Dutch government is thus not likely to contribute to increased vaccination coverage. Before seeking partnerships with religious leaders

for purposes of health promotion, moreover, the religious stance of the leaders with regard to a specific activity should be determined and taken into consideration.

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Chapter 7

Information on vaccination: meeting the needs of unvaccinated youngsters in the Netherlands

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Abstract

To improve vaccination coverage in the Netherlands, compulsory consultation of the youth health service has been suggested for unvaccinated youngsters. It is assumed that sound medical arguments will convince them to accept vaccination. We assessed the need for information of the highest risk group, the unvaccinated orthodox Protestant youngsters. Only 21% of over 600 respondents were interested in medical aspects of vaccination, whereas more than 50% were interested in religious aspects. Their preferred information source was a Christian organization, not the youth health service. Our study shows the importance of exploration of the target group before introducing a new policy.

Introduction

Despite a high vaccination coverage, the Netherlands recently experienced epidemics of vaccine preventable diseases largely confined to an orthodox Protestant minority (250,000 persons) with low vaccination coverage due to religious objections^{1,2}. Several local projects were carried out to increase protection against vaccine preventable diseases in this minority, without much results^{3,4}. Nevertheless, with every epidemic or possible threat of an epidemic, public debate focuses on methods to increase vaccination coverage. Recently, Members of Parliament suggested the Minister of Health to summon unvaccinated youngsters to consult the youth health service to get personal information on the benefits of vaccination and then decide themselves whether they want to be vaccinated⁵. This suggestion was supported by KNMG, the Royal Dutch Medical Association⁶. It is assumed that unvaccinated youngsters need sound medical information to convince them to accept vaccination. This assumption, however, has not been checked with the target group.

Among orthodox Protestants, religious aspects play an important role in the decision on vaccination. In the Bible one can find arguments pro as well as contra vaccination⁷. The orthodox Protestant minority is divided in various denominations, some of them are pronounced in their refusal of vaccination. However, all orthodox Protestant denominations state that ultimately their members are free to decide themselves whether or not to vaccinate, having to account for their choice only to God.

Moreover, the attitude towards vaccination is, in general, often not the result of thorough deliberation⁸. People may simply follow the decision of others, because they expect them to have made a deliberate decision, or just because they want to belong to the group⁹. Especially youngsters are very sensitive to peer group opinion. Therefore decisions on vaccination of orthodox Protestant youngsters may be influenced by peer group opinion as well.

In this study we assessed whether orthodox Protestant youngsters are in need of information on vaccination and if so, what are their preferred sources of information.

Methods

The study population consisted of orthodox Protestant youngsters in the age of 16 to 23 years old. According to orthodox Protestant customs, these youngsters come of age and may reconsider their parents decision on vaccination. As they usually marry young, they will soon have to decide on vaccination of their own children as well. Various ways of recruitment were used. To reach the target group we cooperated with NPV Dutch Patients Association, an association on biblical foundations of 70,000 members, representing members who accept vaccination as well as those who refuse.

The NPV invited all 550 youth members by e-mail to answer an online questionnaire. Moreover, the NPV members were invited to forward the invitation, including the web link to the questionnaire, to their family and friends (snowball method). Apart from this, banners were placed on specific websites for the orthodox Protestant youth, flyers were distributed at an orthodox Protestant family fair and an article on the survey was published in the orthodox Protestant newspaper, all including the web link. The questionnaire, that was filled out anonymously, contained questions on denomination, education, vaccination status, need for information on vaccination and preferred source of information. Descriptive analyses were performed, using SPSS version 16.0.

Results

1778 online questionnaires were filled out. 65 questionnaires were excluded from further analyses because of missing data on denomination, vaccination status or need for information, resulting in a response of 1713 completed questionnaires. 606 respondents (35%) were not vaccinated. Further analyses focus on these unvaccinated respondents.

Characteristics of respondents

11% of the unvaccinated respondents were recruited directly via NPV e-mails, 39% via family or friends by the snowball method, another 30% via websites for orthodox Protestant youth and the remaining 20% in other ways. According to postal codes respondents were living all over the Netherlands. Mean age was 19 years. Women (75%) and highly educated people (39%) were overrepresented. The distribution of the orthodox Protestant denominations among the respondents was conform the distribution on national level.

Need for information

Only 21% of the unvaccinated orthodox Protestant youngsters indicated that they were interested in medical information on vaccination, see Table 1. As far as they were interested, they preferred to get medical information from the NPV. The youth health service –although an option in multiple choice questions- was hardly ever mentioned. About half (53%) of the unvaccinated youngsters was interested in information on religious aspects of vaccination and 60% was interested in information on their peer groups’ opinion. For both aspects, the NPV was –again– the preferred source of information. To gain more thorough insight into the target population we performed subgroup analyses for men and women and for low/middle and high educated youngsters. There were no significant differences in need for information between these subgroups.

Table 1 Need for information on vaccination of unvaccinated orthodox Protestant youngsters in the Netherlands (N=606) and their preferred sources of information

	Interested in subject	Preferred source	
	% (N)	of information	% (N)
Medical information	21 (128)	General Practitioner	13 (17)
		Youth Health Service	3 (4)
		NPV*	69 (88)
		Other	15 (19)
Religious information	53 (321)	Parents	12 (38)
		Church	24 (77)
		NPV*	50 (162)
		Other	14 (44)
Peer group information	60 (366)	Family / friends	14 (52)
		School	11 (41)
		Church	15 (54)
		NPV*	49 (181)
		Other	10 (38)

*NPV= Dutch Patients’Association, a Christian organization

Discussion

We performed an open online survey to get more insight in the need for information on vaccination among unvaccinated orthodox Protestant youngsters. For several reasons we choose for an internet survey. Internet use is widespread in the Netherlands, also among orthodox Protestants. In 2008 87% of the orthodox Protestants had a computer at home, 88% of them were connected to the internet¹⁰. As vaccination is a sensitive subject in the orthodox Protestant minority, the anonymity of an online survey lowers the threshold for participation. Moreover, it enabled us to recruit participants from all over the country. Although the representativeness of the study population in an open survey might be questionable, we achieved a high response in this hard to reach population. The overrepresentation of women and high educated people among the respondents may indicate that they are more interested in the subject vaccination than men and lower educated people and that the overall need for information might be lower than our findings.

The results show that, as far as unvaccinated orthodox Protestant youngsters are interested in vaccination, they are predominantly interested in information on religious aspects and their peer groups opinion. Probably these aspects are more important in their decision on vaccination than medical aspects. We didn't ask why youngsters were not interested in medical aspects, however, some mentioned spontaneously that the subject was sufficiently covered in biology lessons at school. The finding that the respondents preferred to get information via the NPV might of course be biased by the role of the NPV in the recruitment. However, among respondents otherwise recruited, the NPV was still by far the most popular source of information. The youth health service was hardly ever mentioned by the respondents. Healthy Dutch youngsters only have a few contacts with the youth health service in their lives, they seem to prefer a more familiar source of information.

For the NPV the results of our study are reason to start an information campaign on all aspects of vaccination, to promote discussion on the subject and deliberate decision. A deliberate decision, however, does not guarantee acceptance of vaccination. As the medical professionals of the youth health services are not expected and not equipped to provide the non-medical information the unvaccinated youngsters are interested in, the suggested compulsory consultation of the youth health service is not likely to be successful. Although the results of the NPV campaign on vaccination coverage remain uncertain, this campaign meets at least the needs of the target population.

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Chapter 8

Feasibility of a rubella screening and vaccination programme for unvaccinated young women

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Abstract

The feasibility of a rubella screening and vaccination programme for unvaccinated young women was assessed after the 2004/2005 epidemic in the Netherlands. All 640 young women in two villages with low vaccination coverage were invited for a rubella seroprevalence test. Information on vaccination status was gathered by written questionnaire. Women testing seronegative were offered free rubella vaccination. The feasibility of the programme was evaluated in terms of participation, rubella susceptibility, and acceptance of vaccination offer by seronegative women. The participation rate was 48% (95% CI 44-52%) with 108 unvaccinated participants. Eleven per cent (95% CI 6-19 %) of them were identified as susceptible to rubella, of whom 17% (95% CI 2-48%) accepted a vaccination offer. In the end only 0.9% (95 % CI 0.1-2.5%) of the target population was provided protection by the programme. Under the present conditions this programme proved not to be an efficient strategy for rubella protection.

Short Report

Rubella is generally a mild infectious disease. During pregnancy, however, it may cause serious congenital malformations in the foetus known as congenital rubella syndrome (CRS). Rubella and CRS can be prevented by vaccination¹ and, in the Netherlands rubella vaccination was introduced for girls only as part of a national vaccination programme in 1974. In 1987, this was replaced by the two dose Measles, Mumps, and Rubella (MMR) vaccination for all children. Despite vaccination coverage of over 95%, a rubella epidemic occurred in 2004/2005 and similar to rubella outbreaks among the Amish in the USA², this epidemic was largely confined to an orthodox Protestant minority group that refrains from vaccination for religious reasons³.

To prevent CRS, all young women should be protected against rubella either via vaccination or the acquisition of a natural immunity prior to childbearing age. During the 2004/2005 epidemic, the Dutch municipal health services offered free MMR vaccination to unvaccinated children and adolescents. However, the acceptance of this was very limited. Similarly, a personal recall for missed vaccinations to unvaccinated 16-year olds (as registered in the Provincial Vaccination Register) also showed only 7% vaccination acceptance⁴.

In contrast to the low vaccination acceptance rates, the unvaccinated rubella patients and their parents proved very willing to undergo diagnostic procedures to confirm rubella infection during the epidemic despite the results having no therapeutic consequences for them. Given the interest of unvaccinated girls and their parents in the serostatus of the girls, it was decided to develop a screening programme to detect rubella susceptibility among unvaccinated young women, offer MMR vaccination to those found to be seronegative, and thereby increase protection against rubella. This strategy has been suggested by others⁵, and the objective of the present study was therefore to test the feasibility of such a strategy.

All 640 women aged 14 to 20 years from two villages with large unvaccinated orthodox Protestant populations were invited to take part in the study. Overall MMR vaccination coverage in these villages was 63 % for the birth cohorts invited for the study. The target group of the programme were unvaccinated young women but to avoid stigmatization, the serological test was offered to all young women, irrespective of vaccination status.

Invitations for the serological test and questionnaires accompanied by an informed consent form were mailed to all of the women in the study population. For girls under the age of 18 years, the parents were approached and asked to provide their written consent.

Vaccination status was assessed retrospectively via the questionnaire. Women who did not know their vaccination status were assumed to not have been vaccinated.

Blood samples were taken in the villages by nurses from the municipal health service. To foster participation, the blood samples were collected via finger prick, which has been shown to allow sufficiently sensitive serological testing relative to testing of serum collected via venapuncture⁶⁷. Blood obtained via finger prick was spotted on filter paper and dried. The blood specimen was reconstituted in the laboratory and tested for the presence of rubella specific IgG antibodies (Dade Behring immunoassay). Rubella IgG test results < 4 IU/ml were classified as negative; test results ≥ 15 IU/ml were classified as protective; test results between 4 and 14 IU/ml were classified as equivocal. Women with initially equivocal test results were asked to provide a second blood sample but now via venous puncture. These blood samples were again tested for rubella IgG albeit using another test (AxSYM immunoassay) due to the different logistics associated with the collection of the different blood samples. Venous blood test results ≥ 15 IU/ml were considered protective. All of the participants received personal written feedback regarding the laboratory results. Unprotected women were offered MMR vaccination free of charge.

Only the analyses of the data from the subgroup of previously unvaccinated participants are presented here. Discussion of waning immunity among the subgroup of vaccinated women is beyond the scope of this report. The data were analyzed using the SPSS software (version 13). Percentages were calculated for participation, rubella susceptibility, and acceptance of vaccination. The different subgroups of participants classified according to religious denomination, age, and education were compared using Fisher Exact tests.

The participation in our study was 48% (95% CI 44-52%). A total of 307 women participated in the study of whom 108 (35%, 95% CI 30-41%) belonged to the target group of unvaccinated women. The characteristics of the participants are presented in Table 1. Vaccination status was significantly related to religious denomination. The majority of the unvaccinated women (77 women, 71%) belonged to orthodox Protestant denominations. Vaccination status was not associated with age or educational level.

Eleven per cent (95% CI 6-19%) of the unvaccinated women were susceptible to rubella. The results of the serological testing of the finger prick blood from 108 unvaccinated women showed 5 (5%) to be seronegative, 10 (9%) to have equivocal results and 93 (86%) to be protected against rubella. After venous blood testing for those with initially equivocal results, 3 more women could be considered protected as their venous rubella IgG was ≥ 15 IU/l; 5 women were unprotected, and 2 women did not show up for repeated testing and were therefore also considered unprotected. So in the end, 12 (11 %, 95% CI 6-19%) unvaccinated women were considered

Table 1 Characteristics of respondents

Age (years)	n	%
14 – 17	205	66.8
18 – 20	102	33.2
Total	307	100.0
Education		
Low	205	67.0
High	101	33.0
Total	306	100.0
Religion		
Orthodox Protestant	87	28.8
Other religions	140	46.4
No religion	75	24.8
Total	302	100.0
Vaccination status		
Vaccinated	199	64.8
Not vaccinated	91	29.6
Unknown by respondent	17	5.5
Total	307	100.0

susceptible to rubella. Rubella susceptibility in the unvaccinated women was clearly associated with religious denomination. A higher percentage of the women belonging to orthodox Protestant religious denominations were protected against rubella when compared to the women belonging to other religious denominations or women with no religious denomination (Table 2). In addition, a higher percentage of the younger unvaccinated women (i.e., those 14 to 17 years of age) were protected against rubella when compared to the older group (i.e., those 18 to 20 years of age). Rubella susceptibility in unvaccinated women was not associated with educational level.

Only 17% (2 out of 12, 95% CI 2-48%) of rubella susceptible, formerly unvaccinated women agreed to subsequent MMR vaccination by the municipal health service. Both women did not belong to an orthodox Protestant denomination.

These outcomes were used to assess the feasibility of the screening and vaccination programme. The efficiency of the programme is dependent on the participation rate of the target group, their rubella susceptibility and the acceptance of vaccination by

Table 2 Rubella susceptibility of unvaccinated women according to religion and age (n=108)

	Percentage susceptible (n)	Percentage protected (n)
Total	11 % (12)	89 % (96)
According to religion ^{1,2}		
- orthodox Protestant	4 % (3)	96 % (74)
- other or no religion	31 % (9)	69 % (20)
According to age ³		
- 14 - 17 years	4 % (3)	96 % (67)
- 18 - 20 years	24 % (9)	76 % (29)

¹ Information on religious denomination was missing for 2 respondents.

² Fisher's Exact Test: p< 0.001

³ Fisher's Exact Test: p= 0.004

those susceptible. Thus it can be concluded that $0.48 \times 0.11 \times 0.17 \times 100 = 0.9\%$ (95% CI 0.1-2.5%) of the targetgroup of unvaccinated young women was provided protection by the programme. In other words: the invitation of 100 unvaccinated young women for rubella screening will lead to acceptance of a vaccination offer by only 1 susceptible woman. 10 women will remain susceptible because they do not agree to screening ($0.52 \times 0.11 \times 100 = 6$ women) or refuse vaccination after testing seronegative ($0.48 \times 0.11 \times 0.83 \times 100 = 4$ women). 89 out of 100 unvaccinated women are already protected by naturally acquired immunity.

Our results show that rubella screening of unvaccinated women prior to childbearing age, followed by the offering of MMR vaccination for those who tested seronegative, has only a very limited effect on rubella protection in an area with low vaccination coverage due to religious objections.

The participation rate in our study was 48%. As the vaccination coverage found for our study population is consistent with the historical vaccination coverage, it could be assumed that the participation rate for the target group of unvaccinated young women was independent of their vaccination status and equal to the overall participation rate. Moreover the participation rate found in this study is comparable to the participation rate of 52.5% found in a 1996 population-based immunosurvey of low vaccine coverage municipalities in the Netherlands⁸. The necessity of parental

consent for girls under the age of 18 did not affect participation. The participation rate for the younger group was even higher than the participation rate for the older group. As the aim of the screening and vaccination programme is to prevent rubella in pregnancy, the fact that for most women between 14 and 20 years of age, pregnancy is not an issue as yet may contribute to the relatively low participation rates we found. Preconception rubella screening and vaccination may thus result in higher participation rates and has recently been recommended by the Dutch Health Council⁹.

The rubella susceptibility among unvaccinated young women was found to be only 11 %, which reflects the high likelihood of naturally acquiring the rubella infection in these villages. Before the 2004/2005 epidemic there must have been circulation of rubellavirus in the Netherlands as well, as the rubella seroprevalence in areas with low vaccination coverage in the 1996 population-based serosurvey for the same generation of unvaccinated youth -who were then 5 to 10 years of age- was already about 65 %. [10] The higher seroprevalence among unvaccinated orthodox Protestant women relative to other groups of unvaccinated women is consistent with the observation that the vast majority of cases in the 2004-2005 epidemic was found to occur in groups who refrained from vaccination for religious reasons³. Along these lines, the finding that the 14- to 17-year old unvaccinated women were better protected against rubella than the 18- to 20-year old women may reflect the fact that the younger age group had a higher probability of exposure during attendance of –an often orthodox Protestant– secondary school than the older age group, which no longer attended school.

The acceptance of the vaccination offer among the previously unvaccinated seronegative women was limited. We could not assess the acceptance of the offer with much precision, however, due to the small number of women identified as susceptible. Nevertheless, the reasons for low vaccination acceptance may be similar to the reasons mentioned for low participation. Religious objections may also certainly give rise to a conflict of conscience on the part of unprotected young women in particular. As pregnancy is not as yet an issue, moreover, the decision to accept vaccination can also be postponed. And it is therefore possible that a vaccination offer following preconceptional screening will result in higher rates of vaccination acceptance.

Applying the Wilson-Jungner criteria for mass screening adopted by the WHO in 1968, we conclude that, although there is a serious health problem, a suitable test and an appropriate treatment, screening of unvaccinated women prior to child bearing age is –at the observed levels of participation, rubella susceptibility and vaccination

acceptance– most probably not a cost-effective strategy in the Netherlands and therefore not recommended.

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Chapter 9

The role of schools in the spread of mumps among unvaccinated children: a retrospective cohort study

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Abstract

Background

In the Netherlands, epidemics of vaccine preventable diseases are largely confined to an orthodox Protestant minority with religious objections to vaccination. The clustering of unvaccinated children in orthodox Protestant schools can foster the spread of epidemics. School closure has nevertheless not been practiced up until now. A mumps epidemic in 2007-2008 gave us an opportunity to study the role of schools in the spread of a vaccine preventable disease in a village with low vaccination coverage.

Methods

A retrospective cohort study was conducted among the students in four elementary schools and their siblings. The following information was collected for each child: having had the mumps or not and when, school, age, MMR vaccination status, household size, presence of high school students in the household, religious denomination, and home village. The spread of mumps among unvaccinated children was compared for the four schools in a Kaplan-Meier analysis using a log-rank test. Cox proportional hazard analyses were performed to test for the influence of other factors. To correct for confounding, a univariate Cox regression model with only school included as a determinant was compared to a multivariate regression model containing all possible confounders.

Results

Out of 650 households with children at the schools, 54% completed a questionnaire, which provided information on 1191 children. For the unvaccinated children (N=769), the Kaplan-Meier curves showed significant differences among the schools in their cumulative attack rates. After correction for confounding, the Cox regression analysis showed the hazard of mumps to be higher in one orthodox Protestant school compared to the other (hazard ratio 1.43, $p < 0.001$). Household size independently influenced the hazard of mumps (hazard ratio 1.44, $p < 0.005$) with children in larger households running a greater risk.

Conclusion

If and when unvaccinated children got mumps was determined by the particular school the children and their siblings attended, and by the household size. This finding suggests that school closure can influence the spread of an epidemic among orthodox Protestant populations, provided that social distancing is adhered to as well. Further research on the effects of school closure on the final attack rate is nevertheless recommended.

Background

In recent years, school closure has frequently been suggested as a strategy to mitigate epidemics. Using real life data on social contacts and serological evidence of infection, Wallinga et al. showed in a simulation study of the spread of mumps and pandemic influenza that school-aged children and young adults have the highest incidence of infection and contribute most to the further spread of infection during a respiratory epidemic in a completely susceptible population. This pattern is irrespective of the infectivity of the disease and suggests that the targeting of school-aged children to contain an epidemic can be very effective¹. In addition, there are reports of the beneficial effects of school holidays and school strikes on the spread of influenza and other respiratory infections^{2,3}. The exact role of schools in the spread of epidemics remains to be seen, however.

In the Netherlands, epidemics of vaccine preventable diseases are largely confined to the orthodox Protestant minority population that objects to vaccination⁴⁻⁶. In the pluriform Dutch school system, moreover, orthodox Protestants have their own schools. There are about 125 orthodox Protestant elementary schools and 7 orthodox Protestant high schools, with the latter serving students from a large geographic region. In contrast to — for example — Belgium and the USA^{7,8}, vaccination is neither obligatory nor inquired about for school admission. The clustering of unvaccinated students in orthodox Protestant schools may thus foster the spread of vaccine preventable diseases among this population, but school closure has yet to be practiced because it is assumed that the children will have considerable contact outside the school and infections can be transmitted during leisure time activities as well, especially in such a densely populated country as the Netherlands.

A mumps epidemic in the Netherlands in 2007-2008⁹ allowed us to conduct a retrospective cohort study of the role of schools in the spread of mumps in a village with low vaccination coverage. Mumps used to be a common childhood disease in the Netherlands, but the incidence decreased sharply after MMR vaccination was included in the National Immunization Program in 1987^{10,11}. MMR vaccination coverage in the Netherlands is high with over 95% for the first dose at age 14 months and over 90% for the second dose at age 9 years¹². As already noted, MMR vaccination coverage is considerably lower among orthodox Protestant groups with only about 55% and considerable variation across denominations from less than 15% to more than 85%¹³. In the autumn of 2007, a mumps epidemic occurred in the so-called Bible belt of the Netherlands where orthodox Protestant groups live. The first cases were detected in the Rivierland region¹⁴ but, at the time, mumps was not a notifiable disease; general practitioners and pediatricians only reported laboratory confirmed cases on a

voluntary basis. During the ensuing epidemic, at least 89 cases of mumps were reported to the National Institute of Public Health and the Environment [RIVM]⁹; 22 cases came from the Rivierenland region. As only a small minority of suspected cases underwent laboratory testing, the real extent of the epidemic was much larger than reported to the RIVM¹⁵.

As suggested after previous epidemics of vaccine preventable diseases in the Netherlands¹⁶, orthodox Protestant schools may play a role in the spread of the disease. However, household contacts may play an even more important role than school contacts as household contact — particularly in larger families — is known to play a central role in the transmission of infectious diseases^{17,18}. Orthodox Protestant families generally refrain from family planning and are therefore usually large. In addition, other social contacts including the church may possibly play a role. For orthodox Protestants, the church is an important part of their social lives. They go to church twice on Sunday, and activities are often organized by the churches for children and young people. The spread of an epidemic along the lines of a religious denomination also thus seems plausible.

The aim of the present study was to assess the role of elementary schools in the spread of mumps among unvaccinated children in a village with low vaccination coverage due to religious objections. Research questions were if there are any differences in the attack rates and time of onset for the mumps among the unvaccinated children connected to the particular elementary schools. And if differences are detected, can they be explained by factors other than the school, such as the size of the household or the particular religious denomination.

Methods

Study design and population

We performed a retrospective cohort study in a village of 6000 inhabitants in the Rivierenland region of the Netherlands, which is in the middle of the Dutch Bible belt. In 2007, MMR vaccination coverage among the 9-year olds in this village was 44%. The village has 4 elementary schools, 2 of which are orthodox Protestant, 1 Protestant, and 1 public. An orthodox Protestant high school as well as other high schools are in the neighboring towns. The study population consisted of all students in the four elementary schools and their siblings up to 21 years of age. The study period was from the 1st of September 2007 to the 1st of September 2008.

Variables and data collection

For every child, the following determinants were collected: elementary school connection (orthodox Protestant schools A and B, other elementary schools C and D), age (in years), MMR vaccination status (no MMR, 1 MMR, or 2 MMR), household size (≤ 3 or > 3 children), presence of high school students in the household (yes or no), denomination (Reformed Congregations, Reformed Congregations in the Netherlands, other Protestant denomination, other or no religion), and home village (study village or other village). Outcome variables were clinical signs of mumps (yes or no) as assessed by the parents and the week of onset for the clinical signs of mumps.

Based on the WHO clinical case definition, mumps was defined as an acute onset of swelling of the cheeks lasting at least two days¹⁹. The week of onset of clinical signs of mumps was measured with respect to the start of the epidemic in the village as defined by the regional health authorities. The week of onset also thus represents the survival time until the mumps appeared.

Questionnaires were distributed via the four elementary schools. The 650 households with one or more children attending one of these schools were invited to participate in the study. The parents received an introductory letter from the municipal health service, which explained the aims of the study and offered to provide additional information. The recipients were asked to complete one questionnaire per household and thereby provide information on all of the individuals up to 21 years living in the household. Given the sensitive nature of the topic of vaccination in the orthodox Protestant minority population, the questionnaires were completed anonymously and the vaccination data provided by the parents were not checked against the national vaccination register. The completed questionnaires were returned to the municipal health service via regular mail, free of charge. Return of the questionnaire was considered informed consent.

Analysis

Possible differences in the characteristics of the households and children in the four elementary schools were tested by ANOVA or chi-square tests.

The spread of mumps among the unvaccinated children –in terms of cumulative attack rate over time– was compared for the four schools by Kaplan-Meier-analysis, using a log-rank test. A Cox proportional hazard analysis was performed to examine the influence of other factors like household size and religious denomination. Due to the small numbers of unvaccinated children in schools C and D (i.e., 28 and 3, respectively), the Cox proportional hazard analysis was restricted to the orthodox Protestant schools A and B. To correct for confounding, a univariate Cox regression model containing only school connection as determinant was compared to a

multivariate model containing all possible confounders (age, household size, presence of high school students in the household, religious denomination, and home village). Statistical analyses were performed using SPSS version 16.0. A p-value <0.05 was considered significant.

Ethics

The research conformed to the Helsinki declaration and Dutch legislation and was approved by the research ethics committee of the Radboud University Nijmegen Medical Centre, reference number 2010/431.

Results

Response and characteristics of the study population

Of the 650 households with one or more children attending one of the villages' elementary schools, 54% (351) completed the questionnaire. This provided information on 1191 children 0 to 21 years of age. The characteristics of the respondents per school are shown in Table 1. Vaccination coverage varied widely across the schools: from less than 15% for those children with a connection to the orthodox Protestant schools to over 90% for those children with a connection to the other schools.

The children with a connection to the orthodox Protestant schools A and B belonged to largely two orthodox Protestant denominations, namely the Reformed Congregations and the Reformed Congregations in the Netherlands. Both denominations were represented at both of the schools. The children with a connection to school C belonged to largely the other Protestant denominations. The majority of the children connected to school D had some other or no religious denomination.

Spread of mumps in relation to the four schools

Almost half of the respondents (47%, 95% CI 45-50%) reported clinical signs of mumps. The vast majority (98%, 95% CI 96-99%) of the cases occurred among the unvaccinated children. The attack rates across the four schools varied widely (see Table 2), which could be expected in light of the major differences in vaccination coverage. For the subgroup of unvaccinated children, the attack rates also varied across the schools with the rates much higher for those children with a connection to the orthodox Protestant schools A and B than for those children with a connection to schools C and D ($p < 0.05$) (see Table 2). Furthermore, 59% (109/186) of the cases among the students at school A and 53% (68/128) of the cases among the students at school B could be classified as possibly secondary cases of mumps (i.e., onset of symptoms one incubation period past the infectious period of another case in the same grade, thus

Table 1 Response rates, household characteristics, and child characteristics per school

School	Response households (%)	Household with secondary school pupils ¹ (%)	Mean number of children per household ² (range)	Children in study	Mean age ³ (SD)	Children living outside study village ⁴ (%)	MMR vaccination status ⁵		
							Un-vaccinated (%)	MMR1 (%)	MMR2 (%)
A	124 (55)	68 (55)	4.1 (1-12)	504	10.3 (± 5.3)	220 (44)	443 (88)	31 (6)	30 (6)
B	93 (50)	37 (40)	3.7 (1- 9)	344	9.3 (± 5.4)	110 (34)	295 (86)	31 (9)	18 (5)
C	97 (63)	48 (49)	2.8 (1- 7)	272	9.7 (± 4.9)	18 (7)	28 (10)	109 (40)	135 (50)
D	37 (37)	9 (24)	2.0 (1- 4)	71	9.5 (± 4.8)	0 (0)	3 (4)	36 (51)	32 (45)
Total	351 (54)	162 (46)	3.3 (1-12)	1191	9.8 (± 5.2)	348 (29)	769 (65)	207 (17)	215 (18)

¹ Chi-square 12.809, df 3, $p = 0.005$

² ANOVA: Welch $F = 43.983$, df 168.178, $p < 0.005$

³ ANOVA: $F = 2.566$, df 3, $p = 0.053$

⁴ Chi-square 1.490E2, df 3, $p < 0.005$

⁵ Chi-square 6.578E2, df 6, $p < 0.005$

Table 2 Mumps attack rate per school for all children and for unvaccinated children

School	All children			Unvaccinated children		
	N	Attack rate (%)	95% CI	N	Attack rate (%)	95% CI
A	504	66	62-70	443	75	71-79
B	344	63	58-68	295	72	67-77
C	272	5	3- 8	28	32	15-49
D	71	1	0- 4	3	0	-
Total	1191	47	45-50	769	72	68-75

in the third week following onset of symptoms of the other case). Using the same definition, there were no possibly secondary cases at schools C and D.

The Kaplan-Meier curves showed significant differences in the cumulative attack rates over time for the four elementary schools (log rank test $p < 0.001$, see Figure 1). The epidemic affected unvaccinated children with a connection to school A significantly earlier than unvaccinated children with a connection to school B (log rank test $p < 0.05$). For the three unvaccinated children with a connection to school D no cases of mumps were reported.

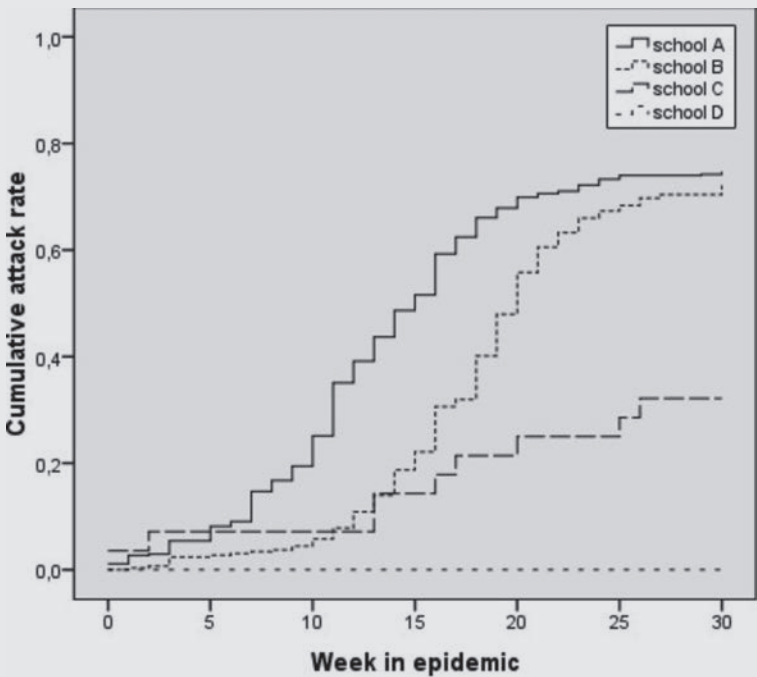
Comparison between the two orthodox Protestant schools

In order to check that the significant differences in the Kaplan-Meier curves were caused by the connection to the particular elementary schools and not by such factors as household size or religious denomination, Cox proportional hazard analyses were performed. Due to the small numbers of unvaccinated children with connections to schools C and D, these analyses were restricted to the orthodox Protestant schools A and B.

The univariate Cox proportional hazard analysis showed the hazard of mumps among the unvaccinated children with a connection to school A to be significantly higher than the hazard among the unvaccinated children with a connection to school B. The hazard ratio was 1.45 (95 % CI 1.22-1.72).

Multivariate Cox proportional hazard analyses showed no confounding by age, household size, presence of high school students in the family, religious denomination, or

Figure 1 Spread of mumps among unvaccinated children connected to four elementary schools



home village. The corrected hazard ratio for school A compared to school B was 1.43 (95% CI 1.19-1.71), see Table 3. In addition to the school connection, however, the household size appeared to independently influence the risk of getting the mumps, with a hazard ratio of 1.44 ($p < 0.005$) for unvaccinated children from large households (> 3 children) versus unvaccinated children from small households, see Table 3.

Table 3 Hazard ratios for possible determinants of mumps in unvaccinated children related to orthodox Protestant schools

	Hazard ratio	95% CI	p
School ¹	1.43	1.19-1.71	<0.001
Age ²	1.00	0.98-1.16	0.97
Household size ³	1.44	1.16-1.79	<0.005
High school students in household ⁴	1.13	0.89-1.42	0.32
Denomination			0.39
- Reformed Congregations ⁵	0.77	0.53-1.13	0.18
- Reformed Congregations in the Netherlands ⁶	0.79	0.56-1.12	0.19
Home village ⁷	1.16	0.96-1.40	0.13

¹ School A compared to school B
² Age in years
³ Families with > 3 children compared to families with ≤ 3 children
⁴ Families with high school students compared to families without high school students
⁵ Reformed Congregations compared to other Protestant denominations
⁶ Reformed Congregations in the Netherlands compared other Protestant denominations
⁷ Other villages compared to study village

Discussion

This retrospective cohort study shows the role of schools in the spread of an epidemic of mumps among unvaccinated children in a village with low vaccination coverage. When four schools in the same village were compared, the final mumps attack rates were much higher among the unvaccinated children with a connection to an orthodox Protestant school than among the other unvaccinated children. Given that the vaccination coverage in the non-orthodox schools was above 90%, the low attack rates among the unvaccinated children with a connection to these schools can probably be attributed to a herd effect²⁰.

When the two orthodox Protestant schools were compared, the unvaccinated children with a connection to orthodox Protestant school A were affected earlier during the epidemic than the unvaccinated children with a connection to the other orthodox Protestant school within the same village (i.e., school B). Given that we

controlled for possibly confounding factors, this finding shows schools to play a role in the spread of infectious disease among orthodox Protestant groups. Schools involve social clustering and, once the mumps has been introduced into a school, it can thus spread more easily among children at the same school than among other children. The school attended by unvaccinated children and their siblings –together with household size– thus determined whether the children got the mumps or not and when. And this suggests that school closure can influence the spread of an epidemic within an orthodox Protestant population.

The question, of course, is whether or not school closure influences the final outcome of the epidemic. In a simulation study of pandemic influenza, the closing of schools and keeping children at home reduced the final attack rate by 90% — without the further use of vaccines or antivirals. For this result, however, the children had to be quarantined for the extent of the epidemic, which is given the impact on education not desirable and obviously not achievable in real life²¹.

When considering the effects of school closure, compliance with social distancing during school closure is of critical importance. Recent experiences with school closure for influenza prevention showed the majority of the children to visit at least one social event during the school closure period^{22,23}. Nevertheless, over all contact rates during a school closure period are likely to be considerably lower than during regular school periods. German school children reported four times less contacts on Sundays than on school days, for example²⁴.

According to an international diary study about 20% of the contact for people living in the Netherlands is leisure time contact e.g., during sports or other activities²⁵. The orthodox Protestant way-of-life differs greatly from this, however. For religious reasons, members of this population refrain from sports, cinema, and television²⁶. Leisure time activities are nevertheless organized by the churches for such orthodox Protestant children, which means that the variable religious denomination can serve as a proxy variable for leisure time activities. In the present study, religious denomination was nevertheless not found to significantly influence the spread of mumps. However, orthodox Protestant children will —like other children— visit family and friends. In the extra leisure time generated by school closure social distancing remains therefore of critical importance.

The perceived seriousness of a disease is an important determinant of compliance with social distancing²². According to another study that we conducted, orthodox Protestant parents perceive polio to be a particularly serious health threat and thus something that warrants not only social distancing but even consideration of

vaccination (manuscript in preparation). Schools may also play a role in the spread of polio. At the beginning of the 1992-1993 polio epidemic, laboratory signs of polio infection were far more prevalent at the orthodox Protestant schools of the siblings of the index case than at other schools²⁷. Therefore we recommend that school closure be considered during a next polio outbreak. We further recommend additional research and simulation studies in particular to gain more insight into the effects of school closure on the final attack rates of epidemics of vaccine preventable diseases in orthodox Protestant populations, while also taking the durations of school closure and levels of vaccination coverage into account.

Some possible limitations on the present study

The overall response rate in our study was 54%. The response rates at the orthodox Protestant schools A and B were slightly higher than the response rate of 48 % in another study among a orthodox Protestant population²⁸ and considerably higher than the response rate of 37% at school D where mumps did not appear to be an issue. Given that school D was the smallest school in the village and — as a public school — had a nationally representative vaccination coverage of >95%, we do not think that the low response rate of this school affected our results. A non-response analysis was nevertheless not feasible as vaccination is a sensitive subject and the respondents in our study returned their questionnaires anonymously; we could not, thus, check the actual vaccination status of our respondents in the national register.

Several reports indicate that parental recall of vaccination may be inaccurate but that the inaccuracy concerns mostly the number of injections and vaccination dates²⁹⁻³¹. Given that vaccination is a particularly sensitive topic among orthodox Protestants, we expected our respondents to recall at least whether or not their children are vaccinated against MMR. Nevertheless, recall inaccuracy is a possible limitation of the present study.

When the vaccination coverage of 35% among our respondents is compared to the registered vaccination coverage for the village (44%), unvaccinated respondents appear to be overrepresented. This overrepresentation can be explained, however, by the participation of students from orthodox Protestant schools and their siblings who *live* in other villages.

The outcome variable in the present study was the clinical diagnosis of mumps. As mumps is generally construed to be a mild disease, only a minority of patients consult their GPs with regard to symptoms. Our case definition was therefore based upon clinical assessment by the parents while it is known that 30% of cases of mumps infection go without symptoms³². The real amount of mumps may therefore be

underestimated in the present study, but such underestimation should apply to all schools and therefore not affect our comparison of the schools.

In closing it should be noted that as part of our recruitment strategy, households with only children under four years of age or only high school students were not included in the study. In orthodox Protestant families, mothers are supposed to stay at home to care for their children, which means that transmission via day care centers that are rarely frequented by orthodox Protestants is not very likely. Transmission among high school students may, however, be more important in the spread of the epidemic, particularly during the early stages¹. While the presence of high school students in a family with elementary school children did not influence the hazard of mumps, we cannot exclude the possibility that high school students played a role in the initial introduction of mumps into the village.

Conclusion

During the mumps epidemic of 2007-2008 we studied the spread of mumps among unvaccinated children in a Dutch village with a large orthodox Protestant population. The particular school that was attended by the unvaccinated children and their siblings determined — together with the size of the household — whether these children got the mumps and when.

This suggests that school closure can influence the spread of future epidemics — particularly in orthodox Protestant populations and when social distancing is adhered to. Before deciding on school closure, however, further research is recommended to gain greater insight into the necessary duration of such school closure and its effects on final attack rates.

Acknowledgements

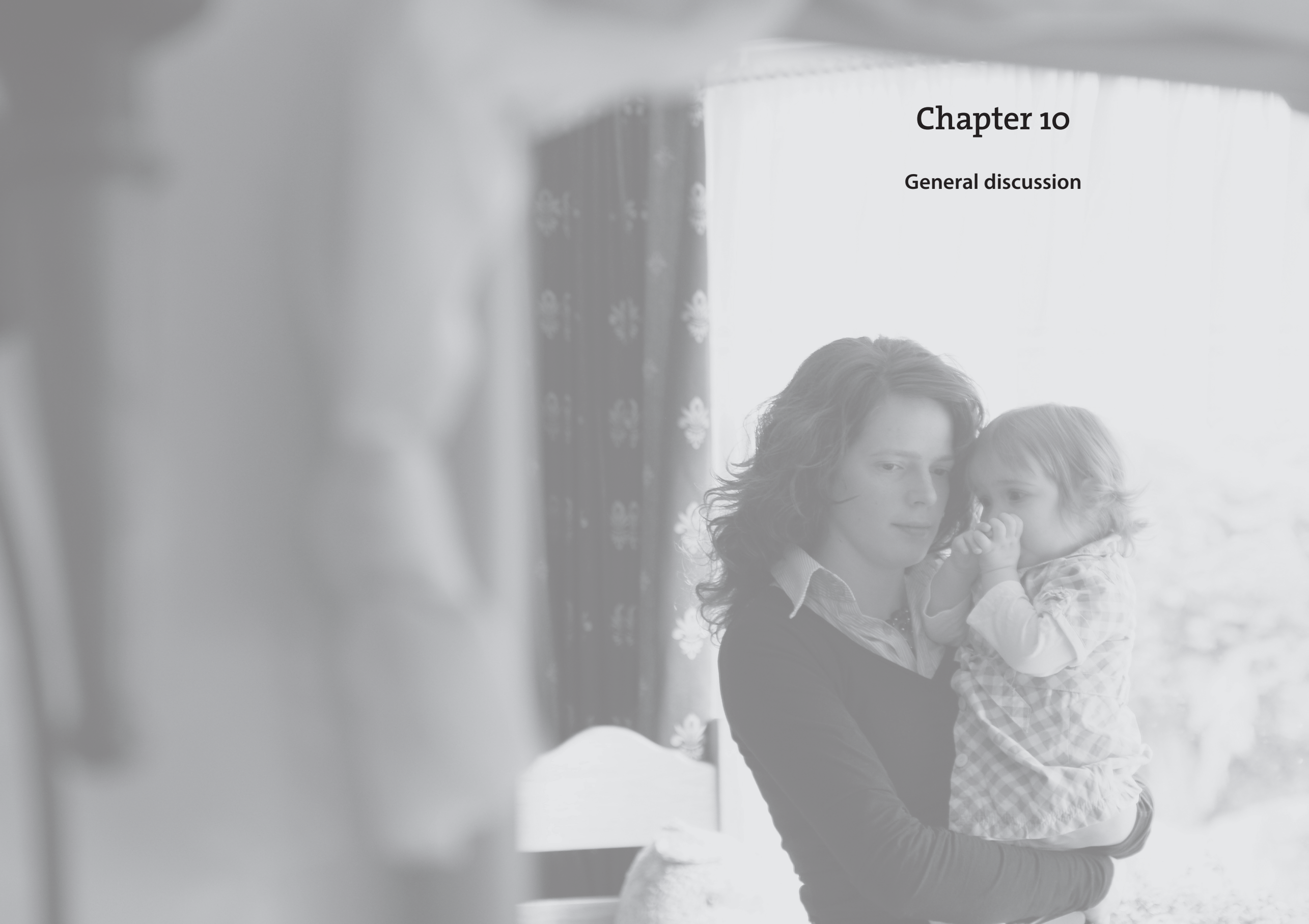
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Chapter 10

General discussion



General discussion

Despite a generally high vaccination coverage in the Netherlands, there have been epidemics of vaccine preventable diseases largely confined to the orthodox Protestant minority. The aim of this thesis is to gain better insight into the vaccination coverage and vaccination decision-making processes in the orthodox Protestant community, in order to formulate recommendations for a public health policy to optimally protect this specific group against vaccine preventable diseases.

We start this chapter with the main findings of this thesis. As our study population was hard to reach, which influenced the feasibility of performing research in this population, we continue with some methodological considerations. Then the main findings and possible future developments are discussed. The implications for public health policy and further research are discussed and we end with conclusions.

Main findings

1. The orthodox Protestant population group consists of about 250,000 persons. About a quarter of the members of the orthodox Protestant denominations are living outside the Bible belt. (Chapter 2)
2. Overall vaccination coverage in the orthodox Protestant minority is about 60%. Vaccination coverage is highly dependent on denomination. Three clusters of denominations can be distinguished with either high (>85%), intermediate (50-75%) or low (<25%) vaccination coverage. (Chapter 2 and 3)
3. Orthodox Protestant parents generally decide on the vaccination of their children as a couple, without discussing it with family, friends, health care professionals or religious leaders. (Chapter 4, 5 and 6) With regard to the decision making on vaccination, four subgroups of orthodox Protestant parents can be distinguished: traditionally non-vaccinating parents, deliberately non-vaccinating parents, deliberately vaccinating parents and traditionally vaccinating parents. (Chapter 4)
4. Orthodox Protestants are more interested in religious arguments for and against vaccination, than in medical arguments. (Chapter 4, 5 and 7)
5. Except for the traditionally vaccinating parents, orthodox Protestant parents sometimes fear to have made the wrong decision. Non vaccinating parents expect this fear to arise during epidemics –especially in case of polio- while ‘first generation’

vaccinating parents experience this fear around the actual vaccination of their children. (Chapter 4)

6. Health care professionals respond to orthodox Protestant objections to vaccination primarily by providing medical information. Some health care professionals also discuss the decision-making process. (Chapter 5)
7. The influence of religious leaders on parental decisions on vaccination is limited. (Chapter 4 and 6) Regardless of their personal view on the subject, they are not willing to promote vaccination on behalf of authorities. (Chapter 6)
8. Case studies of rubella and mumps show high attack rates among unvaccinated orthodox Protestant children and youngsters. (Chapter 8 and 9) Uptake of second chance MMR vaccination by seronegative orthodox Protestant young women was low. (Chapter 8)
9. Orthodox Protestant schools played a role in the spread of mumps among unvaccinated children and youngsters. (Chapter 9)

Methodological considerations

Participation of the orthodox Protestant community

The orthodox Protestants constitute a relatively small religious and cultural minority that tends to isolate itself from “the world”.¹ Vaccination is, moreover, a sensitive subject among orthodox Protestants. Not only may the decision to vaccinate or not lead to an inner struggle, the reaction of society to refusal of vaccination has often been strongly negative.²⁻⁵ In such an atmosphere, objections to vaccination can easily extend to objections to research on vaccination, especially when there are doubts on the aims and possible consequences of the study.⁶

The research for this thesis was carried out within an academic collaborative centre, in which local government, local public health services and a university participate.⁷ To get more acquainted with the orthodox Protestant community and overcome objections to the research project, collaboration with the orthodox Protestant community was sought. Local representatives of the orthodox Protestant community were invited to take part in the project advisory committee. The NPV Dutch Patients’ Association –a patients’ association that among others represents orthodox Protestants who refuse vaccination as well as those who accept vaccination– was also involved in the committee. The involvement of representatives of the orthodox Protestant community was crucial for the success of the project. They advised on

study design and all kinds of practical aspects. Moreover, they assisted with recruitment of participants. Unfortunately, some planned intermediaries –e.g. orthodox Protestants schools– refrained from participation as they considered the subject too sensitive and not relevant for their educational mission. Therefore, we had to apply a less robust snowball method to include the orthodox Protestant youngsters in our studies.

Background information

Scientific research on orthodox Protestants’ objections to vaccination is scarce. The orthodox Protestant minority almost exclusively lives in the Netherlands and systematic historiography started only recently.⁸ Sources like for example church periodicals are not easily accessible. Recently (in April 2011) an online database was introduced, providing access to various orthodox Protestant newspapers, periodicals and magazines.⁹ This database contains a lot of information. However, just a small part covers the subject ‘vaccination’.

Although there is extensive literature on objections to vaccination, there are considerably less papers on religious objections to vaccination. The papers on orthodox Protestant objections to vaccination almost all originate from the Netherlands: papers on the much smaller orthodox Protestant community in Canada are few.¹⁰⁻¹² International studies among other religious minorities appear not appropriate for most studies in this thesis because low vaccination coverage in these religious communities is largely due to practical constraints and non-religious objections.¹³⁻¹⁶

Despite the scarcity of scientific papers on the subject, we gathered as much information as possible by searching grey literature, like reports of expert committees. We subsequently searched the references cited in these publications and included them if feasible. In this way we probably got a fairly complete overview of literature, because in the end we did not encounter any new references anymore.

Composition of the study population

The orthodox Protestant minority is not easy to define. The main characteristic is the importance the members attach to religious experiences in addition to adherence to the scripture. However, there are many denominations, congregations and individuals who more or less express these characteristics. The lack of a uniform definition results in considerable variation in the subgroups that are included in literature on the orthodox Protestant minority, varying from only the largest denominations¹⁷ to even the smallest free local congregations.¹⁸ This hampers comparison of the various populations.

In our studies, we choose to not only include the largest orthodox Protestant denominations, wherever possible we included smaller orthodox Protestant groups

as well. To gain more insight into the number of orthodox Protestants and their dispersion in the Netherlands, we created a database containing the numbers of orthodox Protestants per denomination per municipality. Because religion is not registered by the authorities in the Netherlands, we used information of church year books, central church offices, literature¹⁸ and expert advice.

Not all orthodox Protestant subgroups could be included in the database. Free local orthodox Protestant congregations and individual believers were excluded, because of classification problems. And for two groups it was not possible to accurately assess the numbers. This concerns the Reformed Bond within the Protestant Church in the Netherlands and the small group of orthodox Protestant members within the Protestant Church in the Netherlands not belonging to the Reformed Bond.^{19,20} As the analyses in chapter 2 were performed using this database, the members of the Reformed Bond and the other orthodox Protestant members within the Protestant Church in the Netherlands could not be included. In the studies described in the chapters 4 to 7 all orthodox Protestant denominations and orthodox Protestant branches within denominations are included. However, in the village case studies (chapter 8 and 9) inclusion was restricted to the denominations that were present in these villages.

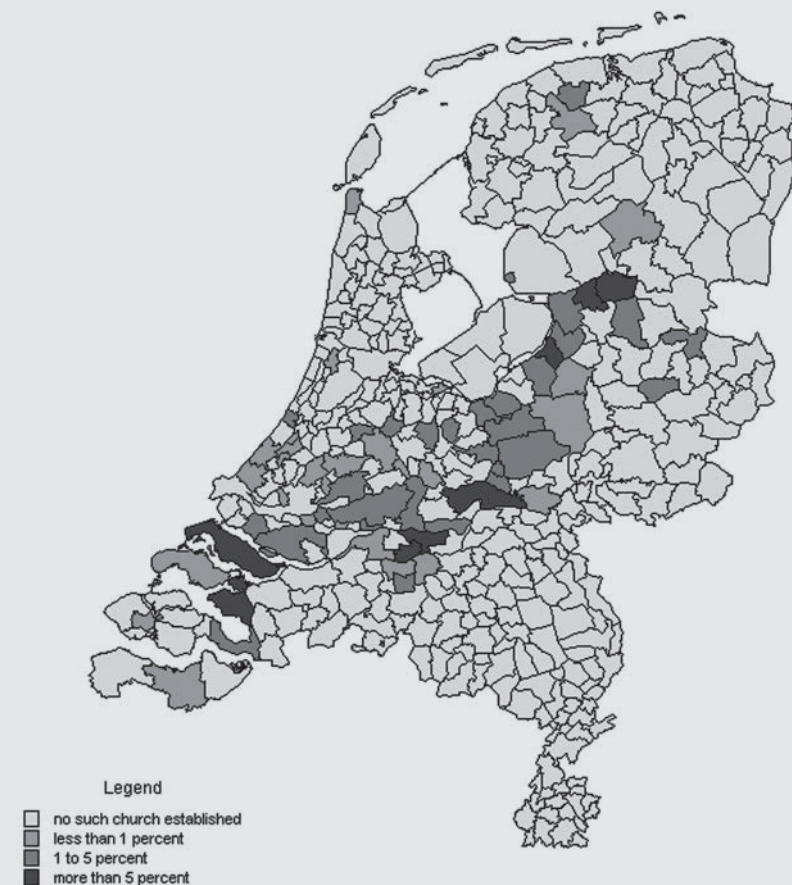
Sampling

Apart from the historical clustering of orthodox Protestants in the so called Bible belt, stretching from the south-west to the north-east of the Netherlands,²¹ we found that the members of the various denominations are also not equally dispersed within the Bible belt, see Map 1 -5. This clustering hampers obtaining a representative sample of the orthodox Protestant population proportionately to the membership numbers of the various denominations.

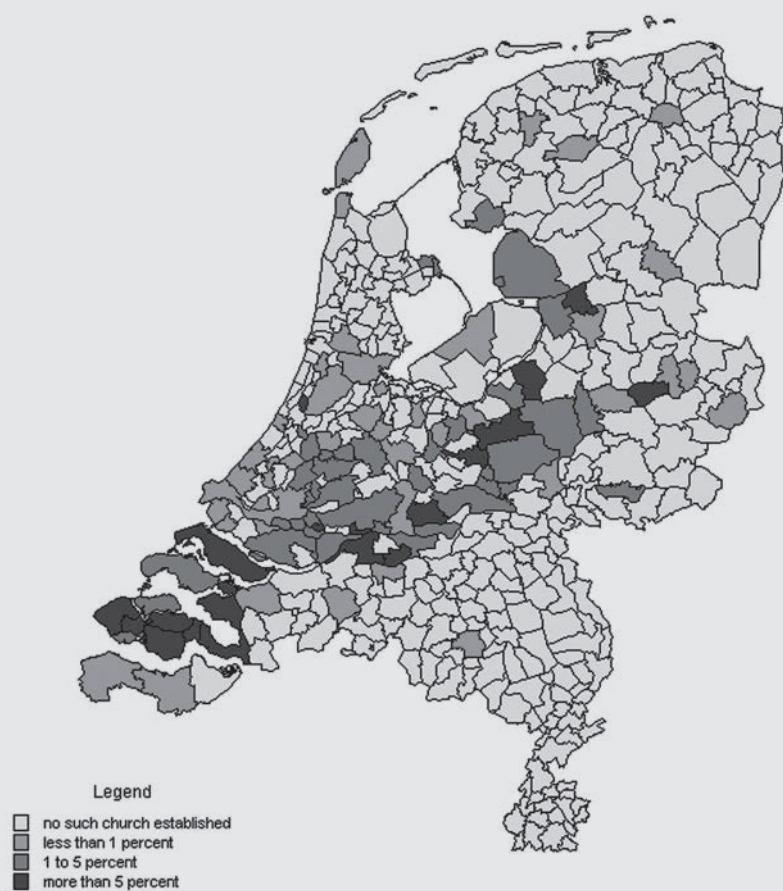
In our quantitative studies, to overcome this problem as good as possible, we used and combined various different samples. Moreover we compared the results of the vaccination coverage per denomination as measured in chapter 3 to the results of the analysis of the influence of the various denominations on municipal vaccination coverage described in chapter 2. All results support the conclusion that within the orthodox Protestant minority three clusters of denominations can be distinguished with either high, intermediate or low vaccination coverage.

In the qualitative studies of chapter 4, 5 and 6 we applied purposeful sampling in order to include the whole spectrum of possible participants in our interviews. We used the findings of chapter 2 and 3 to guide our sampling and intended to recruit participants of various denominations (with high, intermediate or low vaccination coverage) and from various places. After inclusion of the first participants, we also

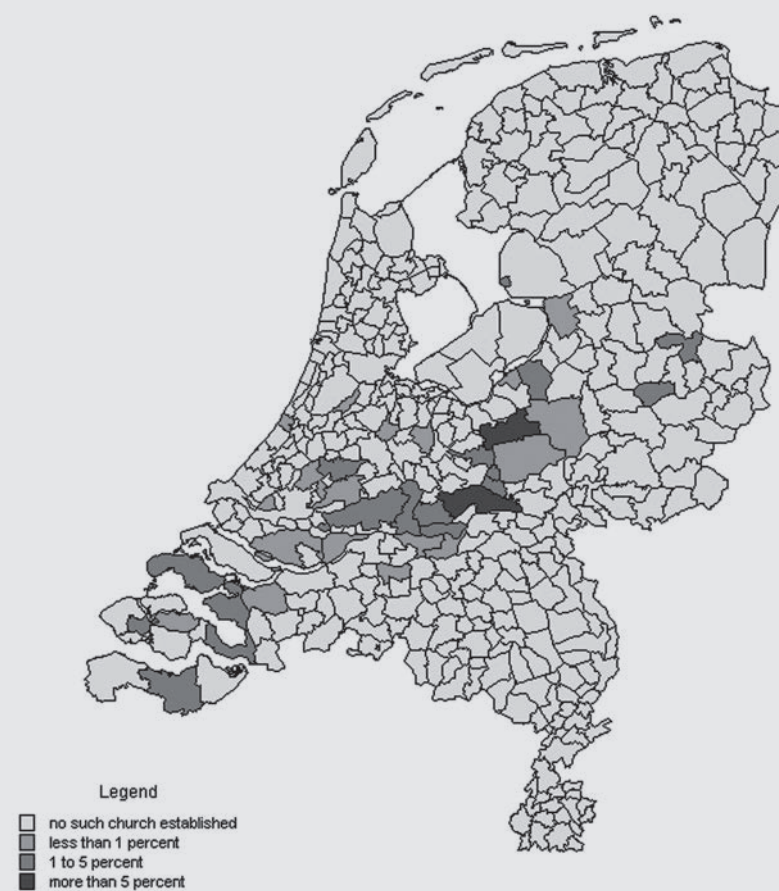
Map 1 Restored Reformed Church;
membership ratio per municipality or geographical entity



Map 2 Reformed Congregations;
membership ratio per municipality or geographical entity



Map 3 Reformed Congregations in the Netherlands;
membership ratio per municipality or geographical entity



Map 4 Old Reformed Congregations;
membership ratio per municipality or geographical entity



Map 5 Christian Reformed Churches, orthodox Protestant branch;
membership ratio per municipality or geographical entity



used a snowball method to recruit via the participants new participants from specific denominations. We were, however, still dependent on the availability and willingness of the targeted participants, and therefore some subgroups –such as vaccinating parents from denominations with low vaccination coverage- are only scarcely represented.

Regarding the case studies in chapter 8 and 9 one should realize that the villages where these studies were conducted are examples of villages with a large orthodox Protestant community and that the exact attack rates of mumps and seroprevalence of rubella among orthodox Protestants in other villages may vary according to the denominations that are present. Despite this shortcoming these case studies provided us with excellent study populations for a detailed study on the spread of disease within a community.

Grounded theory approach

As there was hardly any previous research on the objections to vaccination in the orthodox Protestant community, our study had an explorative character. Therefore we chose in our qualitative studies a grounded theory approach. We did not formulate any hypotheses before the start of the data collection. The data were thematically analyzed using an open coding system, entirely based on the content of the data. Emerging concepts were validated according to the constant comparative method of grounded theory.²²

We deliberately did not use any health promotion theories, as these theories are aimed at change of behavior, while we were interested in the decision making process itself. By explicitly not granting any positive or negative value to vaccination, we tried to avoid introducing bias by the researchers.

As we performed three qualitative studies with various study populations (parents, health care professionals and religious leaders) we were also able to compare the results of these studies regarding the decision-making process of the parents and the influence of health care professionals and religious leaders on this process. All results support the conclusion that orthodox Protestant parents generally decide on vaccination without much discussion with health care professionals or religious leaders.

Discussion of the main findings

Orthodox Protestants and the Bible belt

Demographic characteristics of the orthodox Protestant minority are subject to change. Despite the secularization in the Netherlands, in the past decades the membership numbers of all orthodox Protestant denominations have been increasing, mainly because of the high birth rates in these denominations.¹⁷ In future, however, membership numbers will probably stabilize or even decrease because of growing acceptance of family planning and because of youngsters who leave the church.²³⁻²⁶ We found that about a quarter of the orthodox Protestants are currently living outside the Bible belt. The increasing tendency among orthodox Protestants to follow higher education and pursue professional careers has probably added to a movement out of the Bible belt, as is illustrated by the presence of the Reformed Congregations in university cities like Eindhoven and Groningen.^{27,28} On the other hand, in some regions an ongoing concentration of orthodox Protestants has been noticed, accompanied by the building of mega-churches.²⁹

In the spread of epidemics social clustering seems, however, more important than geographical clustering. During the 1978 polio epidemic unvaccinated orthodox Protestants living in municipalities with high vaccination coverage outside the Bible belt were affected as well.³⁰ Meanwhile, a measles outbreak in 2008 was confined to the anthroposophic community and did not spread to the orthodox Protestant community.³¹ Only during a measles epidemic in 1987/1988 both the orthodox Protestant and the anthroposophic community were affected.³² The other recent epidemics were largely confined to the orthodox Protestant minority.^{12,31,33-35} Therefore, public health interventions to control vaccine preventable diseases should focus on the risk group of orthodox Protestants and no longer on the geographical area of the Bible belt.

Vaccination coverage highly dependent on denomination

Vaccination coverage in the orthodox Protestant minority is highly dependent on denomination. Within the orthodox Protestant minority three clusters of denominations can be distinguished with either high, intermediate or low vaccination coverage. High vaccination coverage (>85%) was found among the Reformed Bond, other orthodox Protestant members of the Protestant Church in the Netherlands not belonging to the Reformed Bond, and orthodox Protestant members of the Christian Reformed Churches. Intermediate vaccination coverage (50-75%) was found in the Restored Reformed Church and the Reformed Congregations. Low vaccination coverage (<25%) was found in the Reformed Congregations in the Netherlands and the Old Reformed Congregations.

This pattern of denominations with high, intermediate and low vaccination acceptance seems stable throughout the years. The same pattern was also found in an opinion

survey in 1985 and in a study on the stance towards vaccination in church periodicals from 1950 to 2000.^{27,36} During the polio epidemic of 1978, however, an estimation was published claiming a vaccination coverage of 50% for the Old Reformed Congregations and the Reformed Congregations in the Netherlands, while we found a vaccination coverage less than 25%.^{30,37} The estimation in 1978 was not based on research, but on a personal impression. It appeared that the majority of cases (65/110) during the 1978 epidemic occurred among members of the relatively small Reformed Congregations in the Netherlands.³⁰ At that time the exceptionally high attack rate was explained by exceptionally intensive transmission in this denomination, the estimated vaccination coverage was not questioned. In a subsequent study among orthodox Protestant high school students, however, none of the members of the Reformed Congregations in the Netherlands was vaccinated.³⁸ Therefore in hindsight the estimation of a vaccination coverage of 50% in the Reformed Congregations in the Netherlands must have been wrong.

The overall vaccination coverage of 60% that we found in the orthodox Protestant minority is thus dependent on the composition of the orthodox Protestant minority, that is on the relative proportions of the various denominations. This composition of the orthodox Protestant minority may change during time because believers can switch from one denomination to another. Driven by religious controversies, sometimes complete local congregations –including their minister- decide to switch to another denomination. This happened for example after the secession of the Restored Reformed Church in 2004. More common, however, are switches of individual members. Congregation members who value the preaching of a specific minister – from their own or another denomination- may switch to his congregation. Marriage may be the reason to switch to the denomination of the partner. These changes take place quite regularly. The Reformed Congregations for example welcomed in 2006 about 800 new members, mainly coming from more conservative denominations like the Old Reformed Congregations, while 2000 members left the Reformed Congregations mainly for the Protestant Church in the Netherlands, the Christian Reformed Churches and the Restored Reformed Church, thus suggesting a movement towards less conservative denominations with higher acceptance of vaccination.³⁹

Because of the possible future changes in the composition of the orthodox Protestant minority and in the acceptance of vaccination, it is important to repeat the assessment of vaccination coverage in the orthodox Protestant minority regularly, for example every ten years.

Orthodox Protestant parents and the decision to vaccinate or not

Orthodox Protestant parents decide on the vaccination of their children as a couple,

without much discussion with family, friends, health care professionals or religious leaders. This is reported by the orthodox Protestant parents themselves as well as by the health care professionals and religious leaders we interviewed.

According to their way of decision making (following tradition or making a deliberate choice) and the outcome (accepting or refusing vaccination) four subgroups of orthodox Protestant parents can be distinguished: traditionally non-vaccinating parents, deliberately non-vaccinating parents, deliberately vaccinating parents and traditionally vaccinating parents.

Although following tradition in the orthodox Protestant community probably has a more positive connotation than in the general population, “doing what the others do” is in vaccination decisions not restricted to this minority.⁴⁰ Also in the general population in the Netherlands only a minority of the parents was found to have made a deliberate decision on vaccination, thinking about it thoroughly.⁴¹ However, it is expected that a well considered decision has a greater endurance. In ethical discussions of religious or philosophical refusal of vaccination, a deliberate decision –taking into account the possible negative consequences for the child- plays an important role.^{42,43} Therefore deliberate decision-making should be stimulated.

Medical arguments are not decisive; religious arguments are

In orthodox Protestant parents’ decision-making on vaccination, religious arguments are dominant not only in case of refusal but also for justification of acceptance of vaccination. This is in line with the need for information on vaccination reported by unvaccinated orthodox Protestant youngsters: they are more interested in the religious aspects of vaccination than in the medical aspects.

In general, public health professionals do not seem to sufficiently realize that for their target populations there are other important values in life than health.⁴⁴ The focus on religion rather than on health is a difference between orthodox Protestants and the anti-vaccination lobby that needs attention.

Sympathizers of the Dutch Association for Critical Vaccination (NVKP) – like health care professionals- focus on the physical health of their children, however they have a divergent perception of the risks of vaccination.^{45,46} In response to their objections to vaccination health care professionals may discuss the possible side effects of vaccination. Anthroposophic parents focus on the spiritual health of their children.^{47,48} They consider going through childhood diseases beneficial for the spiritual development of the child, however they want to prevent severe disease and death. In response to their objections to vaccination health care professionals may discuss the severity of vaccine preventable diseases.

Orthodox Protestants, on the other hand, do not focus on health, they focus on religious doctrine or faith in God. Many health care professionals in our study confined

their information to the medical aspects of vaccination -like the safety of vaccines and the severity of diseases- that might convince other parents, but are less relevant in the decision-making in the orthodox Protestant population. Campaigns to increase vaccination coverage are also focused on medical benefits of vaccination and thus not very successful among the orthodox Protestant population.^{49,50} Therefore health care professionals should acknowledge the importance of religious arguments in the decision making of orthodox Protestant parents and not just repeat medical information.

Fear to have made the wrong decision

Except for the traditionally vaccinating parents, orthodox Protestant parents sometimes fear to have made the wrong decision. Non vaccinating parents expect this fear to arise during epidemics –especially in case of polio. Although during epidemics second chance vaccination will be offered, this will probably not calm the fear as acceptance of vaccination may be felt to be wrong as well. In case of a polio epidemic, health care professionals as well as religious leaders may help orthodox Protestant parents to cope with this fear.

'First generation' vaccinating parents, on the other hand, report to experience fear to have made the wrong decision around the actual vaccination of their children. Moreover, they interpret side effects of vaccination as a sign of God that they are on the wrong way. Therefore health care professionals should give special attention to these parents, explain the possible side effects and support them to cope with their fears.

Health care professionals can support deliberate decision-making

Apart from providing medical information, some health care professionals support deliberate decision-making by discussing the decision-making process. Orthodox Protestant general practitioners are specifically consulted for support and advice, while some Child Health Clinic professionals raise the subject of decision-making themselves.

The health care professionals in our study who support the decision-making process consider some affinity with orthodox Protestant religion necessary to be able to discuss the subject and to be taken seriously by the parents. Some health care professionals who have less experience with the orthodox Protestant community were interested in tools for discussion.

Therefore child health clinic professionals working with orthodox Protestant parents should receive information on the backgrounds of this specific group and tools how to support the decision-making process.

Limited influence of religious leaders

Religious leaders do not directly influence the vaccination decisions of their congregation

members. Orthodox Protestant parents report to not discuss their decision with pastors or elders, while religious leaders report to be seldom consulted on this subject. Moreover, orthodox Protestant religious leaders are appointed by their congregation and will articulate an opinion shared by that congregation, as we noticed in our interviews. They may confirm that opinion in preaches or publications in church papers. Because religious leaders owe their authority to their exegesis, it is not expected that they will easily change their point of view on an issue regarding the interpretation of the scripture.

Therefore dialogue with orthodox Protestant religious leaders –as was sought during the polio-epidemics and recommended by advisory committees^{37,42,51,52} - will not increase acceptance of vaccination.

High infection rates of rubella and mumps provide natural immunity

Case studies on rubella and mumps show high infection rates among unvaccinated orthodox Protestant children, resulting in natural immunity.

Given the fact that an individual is unvaccinated, getting the disease in childhood can have beneficial effects as this may provide lifelong natural immunity. Many infectious "childhood" diseases have more complications in adults, especially rubella can cause severe congenital malformations if infection occurs during pregnancy.⁵³ In the case study of chapter 8 is shown that -after the 2004/2005 epidemic- almost all unvaccinated orthodox Protestant young women in the villages were naturally protected against rubella. It is therefore questionable whether measures to control the epidemic among children –such as isolation of cases and quarantine of contacts- as were taken in Canada,¹² are effective in long term. By preventing infection in childhood susceptible girls remain susceptible and may be infected later in life, possibly during pregnancy. Second chance vaccination is not expected to be effective in the orthodox Protestant population, since we showed that even in young women who knew that they were not protected MMR vaccination uptake was low. Therefore, in this specific group letting children acquire natural immunity to rubella and mumps may be preferable to preventing these infections in children.

Orthodox Protestant schools influence the spread of vaccine preventable diseases

In a village case study we show that during the 2007/2008 mumps epidemic orthodox Protestant schools played a role in the spread of the infection among unvaccinated children and youngsters. Internationally school closure and exclusion policies are commonly applied. For example in Germany during a measles epidemic it was found that exclusion of susceptible children immediately after the first measles case was detected in the school was more effective in controlling the outbreak than exclusion after the second case.⁵⁴ In the Netherlands school closure has never been applied

during epidemics under the assumption that the susceptible children will get infected anyway and school closure would only prolong the duration of the epidemic. The Health Council, however, suggested in 1995 to consider school closure in case of a new polio epidemic.⁵⁵

School closure may be effective in reducing morbidity if the susceptible children are meanwhile protected by vaccination or if the disease can be eliminated or eradicated, so the susceptible children do not just get infected at a later stage. With respect to vaccine preventable diseases in the orthodox Protestant community, school closure is for now probably only feasible in case of a polio epidemic. We found that among orthodox Protestants polio is perceived as a very serious disease, and at least for some of them a polio epidemic may be reason to accept second chance vaccination. Even without school closure, it was shown that, at the end of the 1978 polio epidemic, not all susceptible children were infected.³⁸ School closure may further reduce transmission. Moreover, polio is almost eradicated worldwide and the next polio epidemic –if it occurs- might be the last one. Unvaccinated orthodox Protestants who are not infected during that epidemic, will never be infected. Therefore, in case of a polio epidemic, closure of orthodox Protestant schools should seriously be considered.

Implications for public health policy

Based on the results of our studies we formulate the following recommendations for a public health policy with respect to vaccination and outbreak control. The aim is to optimally protect the orthodox Protestant community against vaccine preventable diseases.

Vaccination policy

- ➔ Deliberate decision-making on vaccination should be stimulated. Policy makers and health care professionals should take into account that among orthodox Protestants medical arguments are not decisive and that both vaccinating and non-vaccinating parents may fear to have made the wrong decision.
- ➔ To stimulate deliberate decision-making facilitate publication of a brochure or website on religious arguments for and against vaccination by the orthodox Protestant community itself.
- ➔ To stimulate deliberate decision-making provide child health clinic professionals with back ground information on orthodox Protestant religion and culture and provide them with tools how to discuss the decision making process and how to support parents who fear to have made the wrong decision.

Outbreak control

- ➔ Public health interventions to control vaccine preventable diseases should focus on the orthodox Protestant community, and not on the geographical area of the Bible belt. Policy makers should take into account that religious leaders will not advocate vaccination and uptake of second chance vaccination during epidemics will be low, except –maybe- during a polio epidemic.
- ➔ Let unvaccinated orthodox Protestant children acquire natural immunity to rubella and mumps, to prevent complications of these diseases in adulthood.
- ➔ Seriously consider school closure in case of a polio outbreak.

Based on our experiences working with the orthodox Protestant community during the research project we also recommend to consider the following points:

- ➔ Involve representatives of the orthodox Protestant community in the control of outbreaks of vaccine preventable diseases. Their advice will add to the feasibility and acceptance of measures.
- ➔ Involve orthodox Protestant organizations e.g. for school managers, students, and health care workers in the communication on outbreaks and epidemics.
- ➔ Use internet in the communication on outbreaks and epidemics, as it is widely used among orthodox Protestants.

Implications for further research

In this thesis we assessed present vaccination coverage in the orthodox Protestant community and gained insight into decision-making processes regarding vaccination. More research is however needed to adjust vaccination policy and outbreak control to future developments and needs.

- ➔ Vaccination coverage in the orthodox Protestant minority should be assessed on a regular basis, for example every ten years, because of possible changes in the composition of the orthodox Protestant minority with regard to the relative proportions of the various denominations and possible changes in the acceptance of vaccination per denomination.

- ➔ Future outbreaks of vaccine preventable diseases in the orthodox Protestant community should be carefully monitored in order to learn more about transmission patterns within this community. For both unvaccinated and vaccinated patients, denomination should be registered as well as connections to orthodox Protestant schools.
- ➔ To gain greater insight into the necessary duration of school closure in case of a polio epidemic and its effects on the final attack rate, mathematical modeling is recommended, taking into account various levels of acceptance of second chance vaccination.
- ➔ Efforts to enhance deliberate decision-making on vaccination should be evaluated from parental and professional point of view.

Final conclusion

The studies in this thesis show that within the orthodox Protestant minority, there are considerable differences in acceptance of vaccination. Although all churches leave the decision to vaccinate or not to the parents, vaccination coverage is highly dependent on denomination. Many parents – vaccinating as well as non-vaccinating – base their decision on tradition in their families. To ensure that these parents can account for their decision, deliberate decision-making should be stimulated. It should be realized, however, that such a deliberate decision, can still be a decision not to vaccinate. Moreover, health care professionals and policy makers should realize that for orthodox Protestant parents who break with the tradition not to vaccinate, religious arguments to justify this decision are more important than medical arguments. Stressing the medical benefits of vaccination again and again will not convince these parents. Although health is generally considered to be very important, for orthodox Protestant parents it is not the only important value in life.

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Summary
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Summary

In the Netherlands, despite high vaccination coverage, epidemics of vaccine preventable diseases still occur. These epidemics are largely confined to the orthodox Protestant minority that has religious objections to vaccination. The aim of this thesis is to gain insight into the actual vaccination coverage and the vaccination decision-making processes in this minority. Based on the results of our studies recommendations are formulated for a public health policy to optimally protect this specific group against epidemics of vaccine preventable diseases.

In **chapter 1** the orthodox Protestant community is described.

The orthodox Protestants (*bevindelijk gereformeerden* or *reformatorsche gezindte* in Dutch) constitute a religious minority of about 250.000 persons. The orthodox Protestants emphasize the necessity of personal religious experiences, in addition to adherence to the –in their view correctly interpreted– scripture. Predestination is an important theme in their belief. Within the orthodox Protestant minority there are many subgroups –denominations– all having their own specific interpretation of the confession. The orthodox Protestants do not only constitute a religious minority, but a cultural minority as well. In contrast to the general Dutch population, the orthodox Protestant lifestyle is largely based on the scripture and religion plays an important role in it. Social life is focused on their own subgroup, with their own orthodox Protestant schools, media and political party.

The orthodox Protestant objections to vaccination date back to the 19th century and have a religious background: Health and disease are sent by God, and man should not interfere with divine providence. However, there are also religious arguments in favor of vaccination: Vaccination is a gift of God and may be used in trust. The orthodox Protestant denominations leave the final decision whether or not to vaccinate to the conscience of their members, the orthodox Protestant parents. Details on their decision-making and the resulting vaccination coverage are unknown. Public health authorities respond to the objections to vaccination and epidemics of vaccine preventable diseases by launching information and vaccination campaigns. The effects of these campaigns are, however, unknown.

In the first part of the thesis we describe two quantitative studies to assess vaccination coverage within the orthodox Protestant community.

Chapter 2 is an ecological study in which the influence of orthodox Protestant denominations on municipal vaccination coverage is assessed.

As religion is not registered in the Netherlands, membership numbers of the orthodox Protestant denominations had to be obtained from church year books and via church offices. Mean vaccination coverage in municipalities where orthodox Protestant denominations were present was with 93.5% significantly lower than in municipalities without orthodox Protestants. (96.9%). Multiple regression analyses showed that in municipalities with orthodox Protestants 84% of the variance in vaccination coverage was explained by the presence of the various orthodox Protestant denominations. Membership ratios of all orthodox Protestant denominations were negatively related to vaccination coverage; this relationship was strongest for two very conservative denominations. The results of this study suggest that vaccination coverage may differ among the various orthodox Protestant denominations.

In **chapter 3** the vaccination coverage among the orthodox Protestant minority and its various subgroups was estimated. The integration of two sub-studies, with their own specific strengths and weaknesses, added to our insight into the vaccination coverage in this hard to reach minority. Results of an online survey filled out by orthodox Protestant youngsters recruited via a snowball method were compared to results of the orthodox Protestant participants in a national sample study. Combining the results of both sub-studies overall vaccination coverage among orthodox Protestants in the Netherlands was estimated to be at minimum 60 %. Moreover, in both sub-studies three clusters of orthodox Protestant denominations could be identified, with either high (>85%), intermediate (50-75%) or low (<25%) vaccination coverage.

The second part of this thesis consists of three qualitative studies on orthodox Protestant decision-making on vaccination. These studies were based on in-depth interviews, that were thematically analyzed using grounded theory approach.

In **chapter 4** the decision making process of orthodox Protestant parents is analyzed, based on 27 interviews with orthodox Protestant parents. Using characteristics of the decision-making process (tradition vs. deliberation) and outcome of the decision (vaccinate or not), four subgroups of parents could be distinguished: traditionally non-vaccinating parents, deliberately non-vaccinating parents, deliberately vaccinating parents, and traditionally vaccinating parents. Except for the traditionally vaccinating parents, all used predominantly religious arguments to justify their vaccination decisions. Also with the exception of the traditionally vaccinating parents, all reported sometimes facing fears that they had made the wrong decision. This fear was most tangible among the deliberately vaccinating parents who thought they might be punished immediately by God for vaccinating their children and interpreted any side effects as a sign to stop vaccinating. Although policy makers and health care professionals should stimulate orthodox Protestant parents to make a deliberate vaccination choice

they should realize that a deliberate choice does not necessarily mean a choice to vaccinate.

In **chapter 5** is described how healthcare professionals deal with orthodox Protestant parents who object to vaccination. Participants were 12 child health clinic workers and 10 general practitioners. These health care professionals predominantly responded to parental religious objections with medical information. Some of them also discussed the vaccination decision-making process with the parents. They verified how the decision was made, if possible consequences were realized and touched upon religious considerations. The willingness of the parents played a role in the occurrence of such a discussion but also the professional, religious background, attitudes, and communicative skills. Only in cases of tetanus post-exposure-prophylaxis, general practitioners reported adoption of an authoritarian stance. Given that medical information is generally not decisive for parents with religious objections to vaccination, it is recommended that health care professionals should not confine themselves to the provision of medical information and discuss the vaccination decision-making process whenever possible.

In **chapter 6** the role of religious leaders is highlighted. Twelve orthodox Protestant religious leaders from various denominations were interviewed on their stance towards vaccination and their role in parental decision-making. As in Protestantism religious leaders are appointed by their congregations, the attitudes of these religious leaders were reflected in attitudes of the congregations that appointed them. Three subgroups of religious leaders stood out: those who did not address vaccination as it was fully accepted in their congregation, those who focused on a deliberate choice of their congregation members, and those who preached not to vaccinate. None of the religious leaders was willing to promote vaccination on behalf of the authorities. Because the objections to vaccination are rooted in the interpretation of the scripture, and the religious leaders owe their authority to their personal interpretation of the scripture, their positions on vaccination will not change easily. The dialogue with religious pursued by the Dutch authorities is therefore unlikely to increase vaccination coverage.

Part three comprises case studies on the feasibility of possible interventions regarding information supply, second chance vaccination and school closure in order to optimally protect the orthodox Protestant community against vaccine preventable diseases.

In **chapter 7** we assessed the need for information on vaccination among orthodox Protestant youngsters, using an online questionnaire. To improve vaccination coverage in the Netherlands, compulsory consultation of the youth health service has been

suggested for unvaccinated youngsters. It is assumed that sound medical arguments will convince them to accept vaccination. We assessed the need for information of unvaccinated orthodox Protestant youngsters. Only 21% of over 600 respondents were interested in medical aspects of vaccination, whereas more than 50% were interested in religious aspects. Their preferred information source was a Christian organization, not the youth health service. This study stresses again that among orthodox Protestants religious aspects of vaccination are more important than medical aspects.

In chapter 8 we assessed, after the 2004/2005 rubella epidemic, in two villages with low vaccination coverage the feasibility of a rubella screening and vaccination programme for unvaccinated young women. All 640 young women in the two villages were invited for a rubella seroprevalence test. Women testing seronegative were offered free rubella vaccination. Rubella seroprevalence among unvaccinated orthodox Protestant young women was with 96 % significantly higher than among other unvaccinated young women (69%). The feasibility of the screening and vaccination programme was evaluated in terms of participation, rubella susceptibility, and acceptance of vaccination offer by seronegative women. In the end, less than 1% of the target population of unvaccinated young women was provided protection by the programme. Under the present conditions the programme proved not to be an efficient strategy for rubella protection.

In chapter 9 we assessed the role of orthodox Protestant schools in spread of mumps in a village with low vaccination coverage during the 2007/2008. A retrospective cohort study was performed among the pupils of the four primary schools of the village and their siblings. For the unvaccinated children (N=769), there were significant differences in attack rates among the schools, with the orthodox Protestant schools having the highest attack rates (75% and 72% versus 32% and 0% for the other schools). Cox regression analyses showed that if and when unvaccinated children got mumps was determined by the particular school the children and their siblings attended, and by the household size. This finding suggests that school closure can influence the spread of an epidemic among orthodox Protestant populations, provided that social distancing is adhered to as well.

Finally, in **chapter 10**, we discuss our findings and the implications for public health policy and further research.

The vaccination coverage in the orthodox Protestant community is highly dependent on denomination. Because of the possible future changes in the composition of the orthodox Protestant minority and in the acceptance of vaccination, it is important to repeat the assessment of vaccination coverage in the orthodox Protestant minority

regularly to adjust vaccination policy and outbreak control to future developments and needs.

For orthodox Protestant parents medical arguments are not decisive. The importance of religious arguments should be acknowledged by health care professionals and policy makers. Publication of a brochure or website on religious arguments for and against vaccination by the orthodox Protestant community itself should be facilitated rather than the provision of extra medical information. Moreover, health care professionals may support deliberate decision-making by discussing the decision-making process. Therefore child health clinic professionals working with orthodox Protestant parents should receive information on the backgrounds of this specific group and tools how to support the decision-making process. Dialogue with orthodox Protestant religious leaders –as was sought during the polio-epidemics and recommended by advisory committees - will not increase acceptance of vaccination. To learn more on transmission patterns of vaccine preventable diseases in the orthodox Protestant community future outbreaks should be carefully monitored. Moreover, in case of a polio outbreak school closure should be considered.

The studies in this thesis show that within the orthodox Protestant minority, there are considerable differences in acceptance of vaccination. Many parents – vaccinating as well as non-vaccinating- base their decision on tradition in their families. To ensure that these parents can account for their decision, deliberate decision-making should be stimulated. It should be realized, however, that such a deliberate decision, can still be a decision not to vaccinate. Although health is generally considered to be very important, for orthodox Protestant parents it is not the only important value in life.

Samenvatting

Ondanks de hoge vaccinatiegraad treden er in Nederland nog steeds epidemieën op van door vaccinatie te voorkomen infectieziekten. Deze epidemieën blijven grotendeels beperkt tot de reformatorische gezindte, een minderheidsgroepering met religieuze bezwaren tegen vaccinatie. Het doel van dit proefschrift is om inzicht te verkrijgen in de vaccinatiegraad en de besluitvorming over vaccinatie in de reformatorische gezindte. Op basis van de resultaten van onze studies worden aanbevelingen gedaan voor een public health beleid om deze groep optimaal te beschermen tegen epidemieën van door vaccinatie te voorkomen ziekten.

In **hoofdstuk 1** wordt de reformatorische gezindte beschreven.

De reformatorische gezindte (ook bekend onder de naam bevindelijk gereformeerden) is een religieuze minderheidsgroep van ongeveer 250.000 personen. Zij benadrukken de noodzaak van persoonlijke religieuze ervaringen, naast het leven volgens Bijbelse voorschriften. Predestinatie is een belangrijk thema binnen het geloof. De reformatorische gezindte omvat vele verschillende kerken -denominaties- die allemaal hun eigen, specifieke interpretatie van het geloof hebben. De reformatorische gezindte vormt niet alleen een religieuze, maar ook een culturele minderheidsgroep. In tegenstelling tot de algemene bevolking in Nederland is de leefwijze van de bevindelijk gereformeerden grotendeels gebaseerd op de Bijbel en speelt het geloof een belangrijke rol. Het sociaal-maatschappelijke leven speelt zich vooral af in eigen kring, met eigen scholen, eigen media en een eigen politieke partij.

De bezwaren tegen vaccinatie dateren uit de 19^e eeuw en hebben een religieuze achtergrond: ziekte en gezondheid worden gestuurd door God; de mens mag niet ingrijpen in de goddelijke voorzienigheid. Maar er zijn ook religieuze argumenten voor vaccinatie: vaccinatie kan ook gezien worden als een geschenk van God, dat in vertrouwen gebruikt mag worden. De bevindelijk gereformeerde kerken laten de uiteindelijke beslissing om al dan niet te vaccineren over aan het eigen geweten van hun leden, de bevindelijk gereformeerde ouders. Details over hun besluitvorming en de vaccinatiegraad in de reformatorische gezindte zijn niet bekend. Volksgezondheidsautoriteiten reageren op de bezwaren tegen vaccinatie en daaruitvoortvloeiende epidemieën met voorlichtings- en vaccinatiecampagnes. Het effect van deze campagnes is echter niet bekend.

In het eerste deel van dit proefschrift worden twee kwantitatieve studies beschreven om de vaccinatiegraad in de reformatorische gezindte te bepalen.

Hoofdstuk 2 is een ecologische studie naar de invloed van de aanwezigheid van bevindelijke gereformeerde kerken op de gemeentelijke vaccinatiegraad. Omdat geloofsovertuiging in Nederland niet is opgenomen in het bevolkingsregister werden de ledenaantallen en vestigingsplaatsen van de verschillende bevindelijk gereformeerde kerken verzameld via kerkelijke jaarboeken en kerkelijke bureaus. De gemiddelde vaccinatiegraad was in gemeenten waar bevindelijk gereformeerde kerken waren gevestigd met 93,5% significant lager dan in gemeenten zonder bevindelijk gereformeerde kerken (96,9%). Multiële regressie analyse liet zien dat in gemeenten met bevindelijk gereformeerden 84% van de variantie in de vaccinatiegraad werd verklaard door de aanwezigheid van de diverse bevindelijk gereformeerde kerken. Voor alle bevindelijk gereformeerde kerken bleek het percentage leden in een bepaalde gemeente omgekeerd evenredig te zijn met de vaccinatiegraad in die gemeente. Deze relatie was het sterkst voor twee zeer behoudende kerkgenootschappen. De resultaten van deze studie suggereren dat er tussen de verschillende kerken verschillen zijn in de vaccinatiegraad van de leden.

In **hoofdstuk 3** wordt de vaccinatiegraad in de gehele reformatorische gezindte en in de verschillende kerken geschat. De combinatie van twee verschillende deelstudies met hun eigen sterke en zwakke punten droeg bij aan het inzicht in de vaccinatiegraad in deze moeilijk bereikbare doelgroep. De resultaten van een online enquête onder reformatorische jongeren die waren benaderd via een sneeuwbal methode werden vergeleken met de resultaten van de bevindelijk gereformeerde deelnemers van een landelijk steekproefonderzoek. Op basis van de resultaten van beide deelstudies werd de vaccinatiegraad in de gehele reformatorische gezindte geschat op tenminste 60%. In beide deelstudies waren drie clusters van bevindelijk gereformeerde kerken te onderscheiden met een hoge (>85%), middelmatige (50-75%) of lage (<25%) vaccinatiegraad.

Het tweede deel van dit proefschrift bestaat uit drie kwalitatieve studies naar besluitvorming over vaccinatie in de reformatorische gezindte. Deze studies zijn gebaseerd op diepte-interviews die thematisch werden geanalyseerd, gebruikmakend van de 'grounded theory' benadering.

In **hoofdstuk 4** wordt het besluitvormingsproces van reformatorische ouders geanalyseerd, aan de hand van 27 interviews met reformatorische ouders. Op basis van de kenmerken van het proces (traditie versus bewuste keuze) en de uitkomst van de besluitvorming (wel of niet vaccineren) worden vier subgroepen ouders onderscheiden: traditioneel niet-vaccinerende ouders, bewust niet-vaccinerende ouders, bewust vaccinerende ouders en traditioneel vaccinerende ouders. Met uitzondering van de traditioneel vaccinerende ouders gebruikten alle subgroepen

voornamelijk religieuze argumenten om hun keuze te rechtvaardigen. Eveneens met uitzondering van de traditioneel vaccinerende ouders rapporteerden alle subgroepen soms bang te zijn voor de gevolgen van hun beslissing. Deze angst was het meest uitgesproken bij de bewust vaccinerende ouders, die vreesden om door God te worden gestraft voor het vaccineren; zij interpreteerden bijwerkingen van de vaccinatie als teken van God om te stoppen. Hoewel het belangrijk is dat beleidsmakers en medische professionals bevindelijk gereformeerde ouders stimuleren om een bewuste keuze te maken ten aanzien van vaccinatie, moeten zij zich realiseren dat een bewuste keuze niet altijd een keuze voor vaccinatie is.

In **hoofdstuk 5** wordt beschreven hoe medische professionals omgaan met ouders met religieuze bezwaren tegen vaccinatie. Deelnemers aan de studie waren 12 consultatiebureau medewerkers en 10 huisartsen. In reactie op de religieuze bezwaren tegen vaccinatie gaven deze professionals vooral medische informatie. Sommigen bespraken ook het besluitvormingsproces: hoe de besluitvorming tot stand was gekomen, of de ouders de mogelijke consequenties overzagen, en soms werden ook religieuze overwegingen besproken. De bereidheid van ouders om hun besluitvorming te bespreken speelde een belangrijke rol bij het tot stand komen van deze gesprekken, maar ook de religieuze achtergrond, attitude en communicatieve vaardigheden van de professional. Alleen in het geval van tetanus postexpositieprofylaxe rapporteerden huisartsen een paternalistische houding aan te nemen en sterk op immunisatie aan te sturen. Omdat medische informatie voor ouders met religieuze bezwaren tegen vaccinatie niet van doorslaggevend belang is voor hun besluitvorming, wordt aan professionals geadviseerd daar waar mogelijk ook het besluitvormingsproces te bespreken.

In **hoofdstuk 6** wordt de rol van religieuze leiders belicht. Twaalf ambtsdragers van verschillende bevindelijk gereformeerde kerken werden geïnterviewd over hun standpunten ten aanzien van vaccinatie en hun rol in de besluitvorming van de ouders. Omdat in het Protestantisme de lokale kerkgemeente zelf de dominee, ouderlingen en diakenen kiest, kwamen de standpunten van deze ambtsdragers veelal overeen met de standpunten van de gemeente waar zij waren aangesteld. Er waren drie subgroepen ambtsdragers te onderscheiden: ambtsdragers die geen aandacht besteedden aan vaccinatie omdat vaccinatie volledig geaccepteerd was in hun gemeente, ambtsdragers die een weloverwogen keuze stimuleerden en ambtsdragers die vaccinatie duidelijk afwezen. Geen van de ambtsdragers was bereid om op verzoek van de overheid vaccinatie te promoten. Omdat de bezwaren tegen vaccinatie voortkomen uit de interpretatie van de Bijbel, en met name de dominees hun autoriteit juist ontleen aan hun interpretatie van de Bijbel, zullen zij hun

standpunt ten aanzien van vaccinatie niet snel veranderen. De dialoog met religieuze leiders, die de Nederlandse overheid nastreeft, zal dus waarschijnlijk niet leiden tot een verhoging van de vaccinatiegraad.

Het derde deel van het proefschrift omvat case studies over mogelijke interventies zoals extra voorlichting, extra vaccinatie aanbod en schoolsluiting tijdens epidemieën om de reformatische gezindte optimaal te beschermen tegen door vaccinatie te voorkomen ziekten.

In **hoofdstuk 7** wordt de informatiebehoefte van reformatische jongeren over vaccinatie beschreven, op basis van de resultaten van een online enquête. In de Tweede Kamer werd om de vaccinatiegraad te verhogen voor ongevaccineerde jongeren een verplicht consult bij de Jeugdgezondheidszorg voorgesteld om hen voor te lichten over vaccinatie. Daarbij werd er van uitgegaan dat medische argumenten hen zouden overtuigen om zich te laten vaccineren. Wij bestudeerden de informatiebehoefte van ongevaccineerde reformatische jongeren. Slechts 21% van de meer dan 600 respondenten was geïnteresseerd in de medische aspecten van vaccinatie, terwijl meer dan 50% geïnteresseerd was in de religieuze aspecten. Informatie over vaccinatie ontvingen zij bovendien het liefst via een christelijke organisatie, niet via de Jeugdgezondheidszorg. Deze studie toont opnieuw aan dat in de reformatische gezindte de religieuze aspecten van vaccinatie belangrijker zijn dan de medische aspecten.

In **hoofdstuk 8** bestudeerden we, na de rubella-epidemie van 2004/2005, in twee dorpen met een lage vaccinatiegraad, de haalbaarheid van een rubella screenings- en vaccinatieprogramma voor ongevaccineerde jonge vrouwen. Alle 640 jonge vrouwen in de beide dorpen werden uitgenodigd voor bloedonderzoek naar rubella-antistoffen. Aan vrouwen die niet beschermd waren werd gratis vaccinatie tegen rubella aangeboden. Ongevaccineerde bevindelijk gereformeerde jonge vrouwen bleken met een seroprevalentie van 96% significant beter beschermd tegen rubella dan andere ongevaccineerde jonge vrouwen (69%). De haalbaarheid van het screenings- en vaccinatieprogramma werd geëvalueerd met betrekking tot de deelname, vatbaarheid en acceptatie van vaccinatie door niet beschermde vrouwen. Uiteindelijk werd minder dan 1% van de doelgroep ongevaccineerde jonge vrouwen door het programma beschermd. Onder de huidige omstandigheden bleek het programma geen efficiënte strategie voor bescherming tegen rubella.

In **hoofdstuk 9** bestudeerden we de rol van reformatische scholen in de verspreiding van bof in een dorp met een lage vaccinatiegraad, tijdens de epidemie van 2007/2008. Een retrospectieve cohortstudie werd uitgevoerd onder de leerlingen van de vier

basisscholen in het dorp en hun broers en zussen. Onder de ongevaccineerde kinderen (N=769) waren er significante verschillen in de incidentie van bof tussen de verschillende scholen, waarbij de incidentie onder leerlingen van de reformatische scholen het hoogst was. (75% en 72% vergeleken met 32% en 0% voor de andere scholen). Cox regressie analyse liet zien dat of en wanneer ongevaccineerde kinderen bof kregen, werd bepaald door de school die zichzelf of hun broers en zussen bezochten en door de gezinsgrootte. Deze resultaten suggereren dat schoolsluiting de verspreiding van een epidemie in de reformatische gezindte zou kunnen beïnvloeden, op voorwaarde dat de buitenschoolse contacten tussen de leerlingen eveneens beperkt worden.

Tenslotte worden in **hoofdstuk 10** de resultaten van het gehele onderzoek besproken en de implicaties voor volksgezondheidsbeleid en verder onderzoek.

De vaccinatiegraad binnen de reformatische gezindte blijkt sterk afhankelijk te zijn van de verschillende kerken waartoe de leden behoren. Omdat in de toekomst zowel de samenstelling van de reformatische gezindte (naar kerkelijke herkomst) als de acceptatie van vaccinatie kunnen veranderen, is het belangrijk om de vaccinatiegraad met enige regelmaat opnieuw te meten, zodat vaccinatiebeleid en outbreak controle aangepast kunnen worden aan toekomstige ontwikkelingen en behoeften.

Voor bevindelijk gereformeerde ouders zijn medische argumenten niet doorslaggevend in de besluitvorming over vaccinatie. Medische professionals en beleidsmakers dienen zich het belang van religieuze argumenten te realiseren. Om een weloverwogen besluitvorming te stimuleren is het beter de publicatie te faciliteren van religieuze argumenten voor en tegen vaccinatie –door organisaties uit de reformatische gezindte zelf- dan om nog meer medische informatie te verspreiden. Bovendien zouden medische professionals weloverwogen besluitvorming kunnen stimuleren door het besluitvormingsproces zelf te bespreken. Daartoe zouden medewerkers van consultatiebureaus meer informatie moeten krijgen over de achtergronden van deze specifieke groepering en tips hoe de besluitvorming ondersteund kan worden. De dialoog met bevindelijk gereformeerde religieuze leiders - zoals werd nagestreefd tijdens de polio-epidemieën- zal de vaccinatiegraad niet verhogen.

Om meer inzicht te krijgen in de verspreiding van door vaccinatie te voorkomen ziekten binnen de reformatische gezindte is het van belang toekomstige outbreaks nauwkeurig te monitoren. Bovendien zou in geval van een polio-uitbraak schoolsluiting moeten worden overwogen.

De studies in dit proefschrift laten zien dat er binnen de reformatische gezindte grote verschillen zijn in de acceptatie van vaccinatie. Veel ouders –zowel vaccinerende als niet-vaccinerende- baseren hun keuze vooral op de traditie in hun familie. Om er

voor te zorgen dat deze ouders hun keuze kunnen verantwoorden is het belangrijk dat weloverwogen besluitvorming wordt gestimuleerd. Men moet zich echter wel realiseren dat een weloverwogen besluitvorming ook kan betekenen dat men bewust niet vaccineert. Hoewel gezondheid in het algemeen heel belangrijk wordt gevonden, is het voor reformatorische ouders niet het enige dat telt in het leven.

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Curriculum vitae

Helma Ruijs werd op 1 januari 1964 geboren in Oss. Na haar eindexamen Gymnasium B aan het Titus Brandsma Lyceum in Oss startte zij in 1982 met de studie Geneeskunde aan de Katholieke Universiteit in Nijmegen. Tijdens haar studie volgde zij een co-schap Geneeskunde in ontwikkelingslanden in Tanzania.

Na het behalen van haar artsexamen in 1990 is zij gaan werken bij GGD Rivierenland in Tiel. Daar begon zij direct met de -toen nieuwe- cursus Infectieziektebestrijding, gevolgd door de opleiding Algemene Gezondheidszorg (later omgezet in arts voor Maatschappij en Gezondheid, profiel infectieziektebestrijding). Daarna volgde nog de propedeuse Nederlands Recht. Aanvankelijk was zij bij de GGD werkzaam in verschillende werkvelden: infectieziektebestrijding, sociaal-medische advisering, forensische geneeskunde en –op detacheringsbasis– verslavingszorg.

Vanaf 1999 ging zij zich steeds meer richten op de infectieziektebestrijding. Naast haar GGD-werkzaamheden leidde zij verschillende projecten voor de Landelijke Coördinatie Infectieziektebestrijding. Toen de LCI in 2005 opging in het RIVM Centrum Infectieziektebestrijding, trad zij parttime in dienst bij het RIVM. Daar is zij nu als arts infectieziektebestrijding belast met intercollegiale advisering en richtlijnontwikkeling. Tevens is zij hoofdredacteur van het Infectieziektenbulletin.

Vanuit GGD Rivierenland was Helma actief betrokken bij de oprichting van de academische werkplaats AMPHI, een samenwerkingsverband tussen GGD-en in Oost Nederland en UMC St Radboud in Nijmegen. Het doel van AMPHI is om wetenschappelijk onderzoek, praktijk en beleid te integreren. Mede op basis van haar praktijkervaring met de epidemieën van polio, mazelen en rodehond startte zij eind 2006 met het door ZON-Mw gesubsidieerde onderzoekproject "Acceptatie van vaccinatie in de reformatische gezindte" wat geresulteerd heeft in dit proefschrift. Naast haar werkzaamheden bij het RIVM wil Helma het wetenschappelijk onderzoek op het grensvlak met praktijk en beleid voortzetten.

Helma woont samen met Maarten Belgers, zij hebben twee kinderen Peter (1996) en Marloes (1999).

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