Vaccine 28 (2010) 2070–2075

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Determinants for HPV vaccine uptake in the Netherlands: A multilevel study

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ARTICLE INFO

Article history:
Received 5 October 2009
Received in revised form
17 December 2009
Accepted 17 December 2009
Available online 30 December 2009

Keywords:
Human papillomavirus vaccines
Vaccine uptake
Multilevel study

ABSTRACT

In March 2009, a HPV catch-up vaccination campaign was implemented in the Netherlands for girls born between 1993 and 1996. We performed a multilevel study to investigate determinants for HPV vaccination uptake. National coverage for the first dose was 49.9%, with regional uptakes ranging from 31% to 61%. Data was gathered from individual to regional level. Our results suggest that organizing information meetings at schools and communicating with gynaecologists might be beneficial. Lower uptake among various ethnic groups and in areas with higher proportion of voters for Religious Political Parties indicate that communication on HPV vaccine should be adapted to religious and ethnic communities. Furthermore, lower uptake in areas with lower socioeconomic status needs attention since participation to cervical screening is also lower in these areas.

1. Introduction

Following advice from the Dutch Health Council in March 2008, the Minister of Health decided to introduce routine HPV vaccination in the National Immunisation Program (NIP) [1] in order to further reduce the incidence of and deaths due to cervical cancer in the Netherlands (8.44 cases and 2.41 deaths per 100,000 women yearly) [1]. The vaccine, targeting 12-year-old girls, will be implemented in the NIP in 2010. Prior to that, a catch-up campaign for girls born between January 1st 1993 and December 31st 1996 (between 13 and 16 years of age) was organized, starting in March 2009. The schedule of the used bivalent HPV16/18 vaccine consists of a first dose at baseline followed by two boosters at 1 and 6 months [2]. Delivery of the first two doses was scheduled before summer holidays. The third vaccination was given in September/October 2009. This campaign was coordinated by the National Institute for Public Health and the Environment (RIVM). The Community Health Services (CHS) were in charge of local implementation. Eligible girls received a personal invitation letter with an information leaflet. Vaccination was free of charge. They were invited to visit local (mass) vaccination sessions.

Introduction of HPV vaccine has previously been described as particularly challenging [3,4] because of several new aspects compared to the regular vaccination programmes. In fact, tackling a sexually transmitted infection (STI), this vaccine is introduced for girls only and targets infection potentially leading to cancer. Furthermore, efficient secondary prevention by cervical smears is in place since 1976 in the Netherlands [5,6]. Finally, due to the long duration between infection and the occurrence of cancer, the estimates of the long-term protection of the vaccine is based on extrapolation of shorter term effects, somehow less convincing for the public.

Scepticism of some Dutch scientists regarding HPV vaccine safety and efficacy and anti-vaccination lobbying divided the medical community by the time the catch-up campaign was implemented. The debate was widely relayed in the national media resulting in mixed messages and a feeling of confusion in the population.

Finally, the vaccination coverage for the first dose in the population targeted by the catch-up campaign was lower than the aimed 70%. Understanding reasons for the low vaccine uptake among Dutch girls is important to provide recommendations to the NIP and to determine which aspects further studies should focus on.

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doi:10.1016/j.vaccine.2009.12.042

Table 1
Data collected according to their level of aggregation.

Variable (source)	Details	Year
Individual level (vaccination register "Praeventis")		
Date of birth	x	2009
Vaccination status/MMR	Specifying one or two doses	2009
Vaccination status/HPV	For the first dose	2009
Country of birth of parents	x	2009
Date of invitation to get vaccinated against HPV	According to the letter received by girls	2009
Postal code	4-Digit postcode of girls' house	2009
Distance between girls' house and place of vaccination	Distance postcode house–postcode place of vaccination	2009
Postal code level (Netherlands Institute for Social Research)		
Socioeconomic status (SES)	Combination of the average income per household with percentage of households with low income, without a paid job and with low average education resulting in a score ranging [−4;+4]. *Note that the lower the score is, the higher the socioeconomic status is.*	2006
Municipality level (Statistics Netherlands)		
Results from last elections	Proportion of votes for Reformed political party and Christian Union, election for national assembly deputes	2006

We performed a multilevel study using available data to investigate determinants for HPV vaccine uptake as well as successful measures of implementation.

2. Methods

2.1. Data collection

Data was gathered at different levels of aggregation as detailed in Table 1. Individual data could be extracted from the national vaccination register (Praeventis). In addition, detailed statistics on various background data are publicly available on the websites of Statistics Netherlands (www.cbs.nl) and the Dutch Institute for Social Research (SCP, www.scp.nl). At the municipal level, percentages of voters for two political parties (Reformed Political Party (SGP), with predominant orthodox reformed adherents and Christian Union (Christen Unie), with Christian adherents) at last election were used as a proxy for objections to vaccinations. Indeed, orthodox reformed people, who refuse vaccination for religious reasons, are known to be concentrated among voters for these political parties. The 'status score' computed by SCP was used as a proxy for socioeconomic status (SES). This score takes into account the average income per household in a given postcode area as well as the percentage of households with low income, without paid job and with low education level [7].

Besides the collection of background data, a questionnaire was sent to all regional coordinators of the HPV vaccination campaign at the CHS. This questionnaire was originally designed by the Dutch Association for CHS to evaluate the campaign in terms of coordination and information dissemination. However, to get more insight into regional aspects of implementation of the campaign, a number of extra questions were added: logistical considerations, including place of vaccination, collaboration with schools about the time of vaccination; communication aspects, such as use of local media, contact with medical practitioners, parents, girls and schools (including phone calls, poster distribution, organization of information meetings); and local social context when the campaign was launched, with a focus on anti-HPV vaccine actions (distribution of flyers at vaccination centres and chain letters at schools) and attitude of teachers towards the campaign as perceived by CHS. Moreover, invitation letters sent to girls were reviewed in order to determine which CHS used a lottery to win an iPod (music player) as an incentive to get vaccinated.

2.2. Data analysis

Descriptive analyses were performed allocating to all girls of a given geographic area the value of that area when data were not available at the individual level. Vaccine uptake for the first dose could then be calculated per area, the vaccination status being available at the individual level.

Associations between vaccination uptake for the first dose and predictor variables were quantified using a hierarchical, or multilevel, logistic regression model [8]. Such models handle dichotomous responses, i.e. vaccination uptake, as a function of several predictors that are given at different levels of aggregation, i.e. individual level to CHS level. All predictors were put together in one multivariate model.

At higher aggregation levels than the individual level, predictors became group level predictors so that all girls within a group, e.g. municipality, were given the value of that predictor. In such cases the group ID was put in the model as a random intercept.

Vaccination date was put into the model as a random intercept also; however, no group level predictors were linked to this variable. Therefore, the effect size of vaccination date was zero on average, and was higher or lower depending on the variation in vaccine uptake that was not explained by all other predictors.

For computational reasons, all continuous predictors were centred and scaled around their means except road distance, since this variable was zero for many girls—including all girls vaccinated at school. Hence, an additional indicator variable was added to account for zero road distance. Subsequently, the estimated coefficients were scaled back to their original scale.

3. Results

The target population included 384,869 girls. The national coverage for the first dose of the HPV16/18 vaccine for this catch-up campaign was 49.9%.[1] Large regional differences in vaccine uptake were observed, ranging from 31% to 61% per CHS region (see Fig. 1).

Descriptive results are presented for background information by level of aggregation in Table 2a (all presented differences between categories are significant ($p < 0.0001$)). At the individual level, younger and older girls were slightly less vaccinated and number of previous doses of vaccine against MMR was a positive predictor

[1] Vaccination coverage on May 15th 2009 – End of the first round of the catch-up campaign. Note that girls could be vaccinated afterwards if they wished.