

Attitudes to HPV vaccination among parents of children aged 12–15 years—A population-based survey in Sweden

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In this population-based survey undertaken in Sweden in 2007, we investigated correlates of attitudes to human papillomavirus (HPV) vaccination among parents of children aged 12–15 years. We invited 16,000 parents of girls and 4,000 parents of boys, randomly selected from the Swedish population. Response rates were 70 and 69%, respectively. Multinomial logistic regression models were applied to investigate correlates of acceptability to HPV vaccination. Among studied parents, 76% were willing to vaccinate their child if the vaccine is for free and 63% were willing to vaccinate even if the vaccine comes with a cost. Having heard of HPV was associated with both willingness to vaccinate if the vaccine is free (odds ratio [OR]: 1.42; 95% confidence interval [CI]: 1.21–1.66) and willingness to vaccinate even if the vaccine is not free (OR: 1.96; 95% CI: 1.75–2.20) compared with those who never heard of HPV. Beliefs about vaccine safety and efficacy were also strong correlates of willingness to vaccinate. Parents born outside Europe and those with higher education were less willing to vaccinate if the vaccine is not free. In conclusion, the willingness to vaccinate was reasonably high and cost did not appear to be a major barrier. Information about vaccine safety and efficacy is important and parents need information about HPV and the HPV vaccine.

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Key words: HPV; HPV vaccine; acceptability; attitude; knowledge; cervical cancer; parents

The important role of the common sexually transmitted human papillomavirus (HPV) in the development of cervical cancer is well known.¹ Prophylactic HPV vaccines for the prevention of cervical cancer have now been developed. Both vaccines protect against HPV Types 16 and 18 and one vaccine also protects against condyloma acuminata (genital warts) caused by HPV Types 6 and 11. In recently published Phase III data with a follow-up of 3 years, the quadrivalent vaccine (Gardasil[®], Merck & Co., Inc.) showed 99% protection against HPV 16/18-associated CIN 2/3 and adenocarcinoma *in situ* in HPV naïve women who received the complete vaccine regimen. The same vaccine also showed 100% efficacy against genital warts.^{2,3} The other HPV 16/18 L1 virus-like-particle candidate vaccine developed for the prevention of persistent HPV infection Types 16 and 18 (Cervarix[®], GlaxoSmithKline Biologicals, Plc.) has shown 93.3% clinical efficacy against the combined incidence of HPV 16/18 related CIN2+ after 15 months of follow-up.⁴

A large number of European countries as well as United States, Australia and New Zealand have recommended including an HPV vaccine in the school vaccination program for young adolescent girls, often coupled with a catch-up program for older teenage girls.^{5–10} The Swedish National Board of Health and Welfare in November 2008 decided that girls aged 10–12 years should be offered HPV vaccination for free, starting in 2010, as part of the school vaccination program.¹¹ Purchase of the vaccine for girls aged 13–17 years is currently subsidized by around 50% by the Swedish pharmaceutical reimbursement system.

Even though HPV vaccination is recommended, there are challenges in implementing it and increasing the vaccine's uptake. Cost, logistic issues and parental acceptance probably play a key role in successful implementation of the new HPV vaccine. Previous studies in the United States, United Kingdom and the Netherlands have shown that HPV vaccine acceptance among parents

was high prior to availability of the vaccine, even though HPV awareness was fairly low.^{12–16} A recent study by the United States Center for Disease Control and Prevention found that 25% of US teenage girls had initiated vaccination 2 years after its introduction but only a quarter of HPV vaccination recipients had completed the 3-dose series.¹⁷ Some concerns that have been raised regarding HPV vaccination of children in early puberty, in a study by Marlow *et al.*,¹⁸ were that the vaccine would increase sexual activity, possible harmful side effects related to the vaccine unknown prior to vaccine licensure and the potential high cost of the vaccine.

The present study was designed to examine Swedish parents' perceptions and concerns about HPV vaccination, their willingness to vaccinate their children against HPV when the vaccine is free or not and correlates of acceptability of the new HPV vaccine.

Material and methods

Study design and population

We performed a nationwide population-based survey in 2007 where parents of 20,000 children aged 12–15 years (16,000 girls and 4,000 boys) were invited to participate in the study. In Sweden, every citizen has a unique personal identification number (PIN), comprising information about sex and date of birth. These numbers are stored in the centralized Swedish Population Register, which has links between children and their parents/custody holders and contains their current addresses. Parents/custody holders with children aged 12–15 years who were Swedish residents were selected by random sampling from the Swedish Population Register. Because parents of girls (but not parents of boys) are planned to be followed in the future for other study objectives, more participants in this group were recruited. For children with both parents registered as custody holders, the invitation letter was randomly addressed to either the mother or the father. Parents were selected only once, even if they had more than one eligible child. Participation was voluntary and by answering the questionnaire the parent automatically gave his or her consent to take part in the study. The study was approved by the Ethical Review Board at Karolinska Institutet, Stockholm, Sweden.

Data collection

Data collection was performed from January to May 2007. An invitation letter introducing the study was mailed to the study sample. The invitation letter also included an internet address to the study's web-based questionnaire and a unique username and

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password for each study subject to log on to the site. Three weeks after the first invitation, a reminder letter together with a paper-based questionnaire and a prestamped envelope was sent out to those who had not responded to the first invitation. Besides the web-based questionnaire, subjects had the option to fill out the paper-based questionnaire and send it back to the study center. Finally, about 3 weeks after the second reminder, a telephone contact was made with the subjects who had not yet responded to the questionnaire. Telephone interviews were conducted with those willing to answer the questionnaire over the phone. Otherwise the telephone contact was used as a reminder for the respondent to answer the web- or paper-based questionnaire.

Answers through the web questionnaire were automatically entered into a database. For telephone interviews, the interviewer entered the answers via the web-based questionnaire. The content of paper-based questionnaires was scanned into the database through optical reading.

Through the questionnaire, we collected information on socio-demographic variables, HPV and cervical cancer cancer/genital warts awareness, knowledge about HPV vaccine and willingness of parents to vaccinate their children. The entire study cohort was also linked to a database at Statistics Sweden, containing information on demographic and social characteristics. This enabled us to gather background information also on nonresponders. These data were deidentified before being sent to us.

Statistical analysis

Multiple multinomial logistic regression was used to examine the relationship between acceptance toward HPV vaccination and its correlates. Acceptance toward HPV vaccination was grouped into 3 levels: (i) negative toward HPV vaccination or not knowing whether they wanted to vaccinate or not (reference group), (ii) positive to HPV vaccination but not stating that they were willing to pay for the vaccine and (iii) positive to HPV vaccination and willing to pay for the vaccine if there is a cost.

Correlates for acceptance toward HPV vaccination were selected and retained in the model based on their potential associations with the outcome variable. Interaction terms between sex of the child and each of the other correlates were also tested.

The odds ratios (ORs) with 95% confidence intervals (CIs) from the regression analyses are presented together with *p* values for each categorical effect in the model, based on the Wald Chi-square statistic.

Results

Of the 16,000 parents of girls and 4,000 parents of boys, 11,187 (70%) and 2,759 (69%), respectively participated; hence, 13,946 parents took part in our study.

Social demographics

Table I presents the background characteristics of the study sample and the corresponding response rates. Response rates were lower among immigrants born outside the Nordic countries, parents with lower education, those not gainfully employed and parents not living with their child. Among those who participated in the study, 42% answered the web-based questionnaire, 39% answered the paper version and 18% were telephone interviewed (data not shown). Mothers accounted for 58% of the participants. The mean age of parents was 44 (SD = 5.8) years. Most parents were born in Sweden (87%), 3% in another Nordic country, 4% in another European country and 6% were born elsewhere. The majority (~70%) of the participants lived in rural or small town areas. Seventy-six percent were either married or had a partner, 38% had higher education than high school and 87% were gainfully employed. The mean number of children per household was 2.2 (SD = 1.1).

TABLE I – BACKGROUND CHARACTERISTICS OF THE STUDY SAMPLE AND CORRESPONDING RESPONSE RATES

	Frequency (%) (N = 13,946)	Response rate (%)
Gender of child		
Female	11,187 (80.2)	73.0
Male	2,759 (19.8)	70.6
Gender of parent		
Female	8,030 (57.6)	69.9
Male	5,916 (42.4)	69.0
Age (years)		
<41	4,006 (28.7)	66.4
41–45	4,848 (34.8)	70.2
>45	5,092 (36.5)	72.1
Country of origin		
Sweden	12,043 (86.5)	73.2
Other Nordic country	434 (3.1)	67.2
Other European country	594 (4.3)	55.3
Other country	851 (6.1)	48.2
Education		
<High school	1,550 (11.1)	53.5
High school or equal	7,133 (51.3)	69.4
>High school	5,224 (37.6)	77.6
Employment		
Gainfully employed	12,157 (87.4)	72.5
Not gainfully employed	1,750 (12.6)	55.7
Disposable family income (Euro/year)		
Less than 12,500 (<1st quartile)	3,474 (25.0)	60.7
12,500–20,000 (2nd quartile)	3,476 (25.0)	69.4
20,000–37,500 (3rd quartile)	3,480 (25.0)	73.9
More than 37,500 (4th quartile)	3,477 (25.0)	77.9
Family situation		
Married/cohabiting	10,616 (76.3)	72.5
Single	2,361 (17.0)	65.7
Single, not living with the child	930 (6.7)	55.8
Number of children		
1	1,775 (12.8)	70.3
2	6,321 (45.5)	73.0
3 or more	4,875 (35.0)	69.2
No children in household	937 (6.7)	55.7
Living area		
Large city	3,993 (28.6)	66.4
Rural		
North	2,380 (17.1)	73.0
South	7,572 (54.3)	70.6

Perception and concerns about HPV vaccination

Seventy-six percent of the parents stated that they were willing to vaccinate their child against HPV if the vaccine is free and 63% were willing to vaccinate their child even if the vaccine is not free. Three percent were unwilling to vaccinate and 20% did not know whether to vaccinate their child or not; altogether 24% constituted the reference group (Table II). Among those parents who would consider HPV vaccination, more than half (53%) considered 15–17 years as a preferable age to vaccinate their child. Age 12–14 years was preferred by 35% of the parents and age 18 years or older was preferred by 7% (Table II). More than 70% of parents of boys thought it would be necessary to also vaccinate girls, whereas 2% did not think so and 25% did not know. Of parents of girls, 54% thought it would be necessary to vaccinate boys as well, 41% did not know and 6% answered no. When asked if they believed their child would be fully protected against condyloma or cervical cancer after vaccination, only 14% and 6%, respectively, of the parents of girls believed so.

We also investigated what concerns the parents may have about the HPV vaccine (multiple alternatives could be chosen). The most frequently mentioned concern (selected by more than 90% of the parents) was whether the vaccine has any adverse effect. Second and third most frequently mentioned concerns were protection of the vaccine (almost 80%) and whether vaccination had to be repeated (almost 70%). When asked whether any of these would make them abstain from vaccinating their child, 75% of the parents stated that adverse effects of the vaccine would (Table III).

TABLE II – PERCEPTION OF HPV VACCINATION AMONG PARENTS

	Frequency	Percent
Acceptance of HPV vaccination		
Not willing to vaccinate	446	3.5
Do not know	2,857	20.4
Willing to vaccinate only if the vaccine is free	1,846	13.3
Willing to vaccinate even the vaccine is not free	8,691	62.8
At what age (in years) should vaccination start?		
0-11	540	5.0
12-14	3,801	35.0
15-17	5,745	52.9
≥18	780	7.2
Do you believe your child will be fully protected against condyloma after HPV vaccination?		
Yes	1,899	13.7
No	4,376	31.7
Do not know	7,546	54.6
Questions to parents of daughters		
Do you believe your daughter will be fully protected against cervical cancer after HPV vaccination?		
Yes	679	6.1
No	5,290	47.7
Do not know	5,123	46.2
Do you believe it is also necessary to vaccinate boys?		
Yes	5,642	53.6
No	606	5.8
Do not know	4,277	40.6
Question to parents of sons		
Do you believe it also is necessary to vaccinate girls?		
Yes	1,859	72.9
No	63	2.5
Do not know	629	24.7

TABLE III – CONCERNS ABOUT HPV VACCINATION

	Frequency	Percent
Which concerns do you have about the HPV vaccine? (more than one alternative could be given, $n = 13,819$)		
If the vaccine gives full protection	10,967	79.4
If the vaccine has any adverse effects	12,663	91.6
If vaccination has to be repeated	9,514	68.9
Other	1,314	9.5
I do not have any concerns	289	2.1
Do not know	354	2.6
Which of those concerns would make you abstain from vaccinating your child?		
If the vaccine does not fully protect	969	7.4
If the vaccine has adverse effects	9,785	74.7
If vaccination has to be repeated	76	0.6
Other issues	473	3.6
Do not know	1,486	11.3
None	317	2.4

willing to vaccinate if the vaccine is free (OR: 0.38; 95% CI: 0.30–0.48) as well as if the vaccine is not free (OR: 0.26; 95% CI: 0.22–0.30). The corresponding ORs for those who did not know whether vaccines are safe or not were 0.57 (95% CI: 0.44–0.71) and 0.41 (95% CI: 0.34–0.49), respectively (Table IV). The same pattern was observed for those who did not believe or who did not know whether vaccination was an effective method for prevention of infectious diseases. Parents who believed their child had a boyfriend/girlfriend were more willing to vaccinate whether the vaccine is free or not. Those who believed their child had coition were more willing to vaccinate even if the vaccine is not free. However, parents were less willing to vaccinate their child if they had to pay for vaccination, both if they were worried that their child might have more partners or unprotected sex after vaccination (OR: 0.86; 95% CI: 0.74–0.99) or did not know whether this would be the case (OR: 0.54; 95% CI: 0.49–0.60).

Correlates of willingness to vaccinate and pay for HPV vaccination

In the multinomial logistic regression analyses, the reference category was unwilling/do not know whether to vaccinate the child. Parents of girls were more willing to vaccinate their child even if the vaccine is not free than those of boys (OR: 1.35; 95% CI: 1.22–1.50) (Table IV). There was also a significant interaction ($p = 0.004$) (data not shown) between sex of the child and that of the parent, such that the difference in willingness to vaccinate between mothers and fathers was more pronounced for daughters than for sons. No other significant interaction was observed with child's sex. Respondents born outside Europe were less willing to vaccinate their child compared with those born in Sweden (OR: 0.88; 95% CI: 0.69–1.12 for willing to vaccinate only if the vaccine is free, and OR: 0.77; 95% CI: 0.63–0.93 for willing to vaccinate even if the vaccine is not free). Having a higher education was also associated with decreased vaccine acceptability. Parents not gainfully employed were more acceptant toward vaccination when vaccine is free than those gainfully employed (Table IV).

Prior awareness of HPV increased parents' willingness to vaccinate. This was true for both being willing to vaccinate only if the vaccine is free (OR: 1.42; 95% CI: 1.21–1.66) and being willing to vaccinate even if the vaccine is not free (OR: 1.96; 95% CI: 1.75–2.20). To test whether having heard about HPV was a confounder with other variables, we also performed the analysis without this variable. No differences were discerned (data not shown).

Parents who believed vaccination is not safe in general or who stated that they were not sure were less willing to vaccinate their children against HPV compared with those who believed vaccination is safe. Compared with parents who believed vaccines are safe, those who believed vaccines are not safe were much less

Discussion

To better understand how HPV vaccination may be implemented in Sweden, we wanted to investigate parental attitudes toward HPV vaccination. Since the HPV vaccine was not included in the national vaccination program in Sweden when this study was conducted, we wanted to explore not only the willingness to vaccinate but also the willingness to pay for the vaccine. In this to-date largest population-based study of parents, we found that acceptability to teenage vaccination against HPV was reasonably high (76%). This is in line with existing literature where most studies observed a vaccine acceptability between 66 and 88%.^{13–15,18–20} Even when vaccination against HPV comes with a cost, up to 63% of the parents are willing to vaccinate their child.

HPV awareness has previously been reported as a predictor for acceptance but the majority of studies did not investigate or find any association.^{21,22} Our finding confirmed prior HPV awareness as a positive correlate of HPV vaccine acceptability.

We studied parents of both girls and boys because we wanted to investigate potential differences in attitudes of the parents regarding sex of the child. Overall, the difference was very small. The one factor where we found a significant difference in relation to sex of the child was willingness to vaccinate even if the vaccine is not free. Parents who were sampled because they had a daughter were more willing to vaccinate even the vaccine is not free than parents who were sampled because they had a boy.

Because of the cross-sectional nature of our study, we do not know if parents with positive attitudes toward HPV vaccination will actually vaccinate their children in the future. As of March 2009, the HPV vaccination uptake in Sweden was around 13% among girls aged 13–18 years. This is also the age group where

TABLE IV – MULTINOMIAL LOGISTIC REGRESSION ANALYSIS OF WILLINGNESS TO VACCINATE WITH NOT WILLING TO VACCINATE/DON'T KNOW AS THE REFERENCE CATEGORY

	Number of subjects in analysis	Willing to vaccinate only if the vaccine is free		Willing to vaccinate even if the vaccine is not free		<i>p</i>
		<i>n</i> (%)	OR (95% CI)	<i>n</i> (%)	OR (95% CI)	
Gender of child						
Male	2,668	418 (15.7)	1	1,517 (56.9)	1	<0.0001
Female	1,0916	1,386 (12.7)	0.98 (0.85–1.13)	7,046 (64.5)	1.35 (1.22–1.50)	
Gender of parent						
Male	5,784	718 (12.4)	1	3,684 (63.7)	1	0.13
Female	7,800	1,086 (13.9)	0.94 (0.83–1.07)	4,879 (62.6)	0.91 (0.83–1.00)	
Age (years)						
<41	3,890	605 (15.6)	1	2,408 (61.9)	1	0.002
41–45	4,739	642 (13.5)	0.87 (0.75–1.01)	2,941 (62.1)	0.91 (0.81–1.01)	
>45	4,955	557 (11.2)	0.78 (0.66–0.91)	3,214 (64.9)	0.98 (0.87–1.10)	
Country of origin						
Sweden	11,815	1,544 (13.1)	1	7,631 (64.6)	1	0.15
Other Nordic country	421	55 (13.1)	0.96 (0.68–1.36)	271 (64.4)	0.98 (0.76–1.26)	
Other European country	561	74 (13.2)	0.83 (0.62–1.11)	296 (52.8)	0.86 (0.69–1.06)	
Other country	787	131 (14.1)	0.88 (0.69–1.12)	365 (46.4)	0.77 (0.63–0.93)	
Education						
<High school	1,496	245 (16.4)	1	901 (60.2)	1	<0.0001
High school or equal	6,961	972 (14.0)	0.75 (0.62–0.91)	4,365 (62.7)	0.79 (0.68–0.92)	
>High school	5,127	587 (11.4)	0.59 (0.48–0.73)	3,297 (64.3)	0.61 (0.52–0.71)	
Employment						
Gainfully employed	11,912	1,503 (12.6)	1	7,603 (63.8)	1	0.009
Not gainfully employed	1,672	301 (18.0)	1.31 (1.09–1.56)	960 (57.4)	1.06 (0.92–1.23)	
Disposable family income (Euro/year)						
Less than 12,500 (<1st quartile)	3,359	558 (16.6)	1	2,009 (59.8)	1	<0.0001
12,500–20,000 (2nd quartile)	3,378	521 (15.4)	1.03 (0.84–1.26)	2,012 (59.6)	1.06 (0.91–1.24)	
20,000–37,500 (3rd quartile)	3,425	416 (12.1)	0.83 (0.66–1.04)	2,182 (63.7)	1.12 (0.95–1.33)	
More than 37,500 (4th quartile)	3,422	309 (9.0)	0.71 (0.56–0.91)	2,360 (69.0)	1.32 (1.11–1.58)	
Family situation						
Married/cohabiting	10,389	1,276 (12.3)	1	6,578 (63.3)	1	0.0004
Single	2,299	409 (17.8)	1.55 (1.26–1.91)	1,416 (61.6)	1.31 (1.11–1.54)	
Single, not living with the child	896	119 (13.4)	0.70 (0.34–1.48)	569 (63.5)	0.89 (0.52–1.52)	
Number of children						
1	1,733	219 (12.6)	1	1,141 (65.8)	1	<0.0001
2	6,195	759 (12.2)	0.98 (0.81–1.20)	3,966 (64.0)	0.81 (0.70–0.94)	
3 or more	4,751	703 (14.8)	1.21 (0.99–1.49)	2,880 (60.6)	0.78 (0.67–0.90)	
No children in household	905	123 (13.6)	1.57 (0.75–3.29)	576 (63.6)	1.17 (0.69–1.99)	
Living area						
Large city	3,860	500 (13.0)	1	2,410 (62.4)	1	0.031
Rural, north	2,331	351 (15.1)	1.07 (0.89–1.28)	1,421 (61.0)	0.96 (0.84–1.10)	
Rural, south	7,393	953 (12.9)	0.97 (0.84–1.11)	4,732 (64.0)	1.06 (0.96–1.18)	
Have heard about HPV						
No	3,226	362 (11.2)	1	2,366 (73.3)	1	<0.0001
Yes	10,358	1,442 (13.9)	1.42 (1.21–1.66)	6,197 (59.8)	1.96 (1.75–2.20)	
Believes vaccines are safe						
Yes	11,771	1,559 (13.2)	1	7,907 (67.2)	1	<0.0001
No	862	106 (12.3)	0.38 (0.30–0.48)	296 (34.3)	0.26 (0.22–0.30)	
Don't know	951	139 (14.6)	0.57 (0.44–0.71)	360 (37.9)	0.41 (0.34–0.49)	
Believes vaccines are efficient						
Yes	12,316	1,627 (13.2)	1	8,117 (65.9)	1	<0.0001
No	192	19 (9.9)	0.39 (0.23–0.64)	43 (22.4)	0.24 (0.17–0.36)	
Don't know	1,076	158 (14.7)	0.67 (0.53–0.84)	403 (37.5)	0.49 (0.41–0.59)	
Believes child has had girl friend/boy friend						
No	8,565	1,113 (13.0)	1	5,288 (61.7)	1	<0.0001
Yes	4,227	562 (13.3)	1.19 (1.02–1.42)	2,853 (67.5)	1.30 (1.16–1.47)	
Don't know	792	129 (16.3)	1.15 (0.89–1.48)	422 (53.3)	0.86 (0.71–1.04)	
Believes child has had coition						
No	10,921	1,438 (13.2)	1	6,842 (62.6)	1	0.10
Yes	1,605	219 (13.6)	1.18 (0.94–1.48)	1,113 (69.3)	1.22 (1.03–1.46)	
Don't know	1,058	147 (13.9)	0.89 (0.70–1.13)	608 (57.5)	0.91 (0.76–1.09)	
Worried child will have more partners/unprotected sex						
No	9,343	1162 (12.4)	1	6,271 (67.1)	1	<0.0001
Yes	1,428	206 (14.4)	0.95 (0.78–1.15)	858 (60.1)	0.86 (0.74–0.99)	
Don't know	2,813	436 (15.5)	0.80 (0.70–0.92)	1,434 (51.0)	0.54 (0.49–0.60)	

subsidies are given for the cost of vaccination. Outside this age group the vaccination uptake is very small. Even though a high proportion of parents said they were willing to vaccinate even if the vaccine is not free, the relatively high cost of HPV vaccination could still influence the vaccine uptake in Sweden. The cost bur-

den is even higher in households with several children in the age range recommended for vaccination. Sweden has a tradition of high vaccine uptake in the national vaccination program, and because the national vaccination program offers free vaccinations, parents might expect the HPV vaccine to be free as well. Besides

cost, another difficulty could be that since the recommendation to vaccinate 10- to 12-year-old girls is fairly new, parents and health care providers are still unaware about the vaccine.

A study by Rosenthal *et al.*²³ indicates that mothers who had been counseled by a physician had more positive attitudes toward the vaccination and to vaccinate their daughters prior to the sexual debut. Attitudes among health care providers are also important for successful HPV vaccine implementation.^{24–26} Similar studies on Swedish health care providers have not been carried out and therefore we do not know the level of their HPV or HPV vaccine knowledge. However, future research on health care providers' attitudes toward the vaccine could improve the interplay between health care providers and patients. When we asked parents if they think their child would be fully protected against condyloma or cervical cancer after HPV vaccination, up to 55% and 46%, respectively did not know. Therefore information from health care providers could be important for successful vaccine uptake.

More than half of the parents considered the preferable age for vaccinating their child to be 15–17 years. This is higher than in most other studies, where preferred age usually was between 10 and 14 years among the majority of parents.^{13,14,27} It could be that Swedish parents do not understand the importance of vaccination prior to sexual debut. It is likely that parents will be more willing to vaccinate their young daughters when the vaccine becomes part of the national vaccination program in year 2010, because parents will probably be less likely to opt out of a government policy. Another possible reason for this age preference could be that parents might think that their children become sexually active later than they actually do.

Another important correlate of parents' willingness to vaccinate their child against HPV was their attitude toward vaccination in general. Parents who believed vaccination to be a safe and effective way to prevent diseases were more willing to vaccinate their children against HPV. This has also been observed in several other published studies.^{18,28,29}

The willingness to vaccinate also showed some important exceptions. We observed a significantly lower interest to vaccinate

among immigrants born outside the Nordic countries. Findings similar to ours have been reported as well as findings where ethnicity was not a predictive factor for attitudes to HPV vaccination.^{14,20,30} However, our data suggest that parents born outside the Nordic countries might be a target group for more information about human papillomavirus and HPV vaccination. Educational level also seems to be an important factor for the willingness to vaccinate. Parents with higher education reported less willingness which is consistent with previous studies.^{30,31} It was noted in a study from the United States that unvaccinated children tend to come from families where mothers have a college degree and the household income was high.³²

The response rate of this study was ~70% which might impact the generalizability of the findings. However, when comparing social and demographic characteristics between respondents and nonrespondents, the differences were rather small (Table I). Our study is currently the largest investigation with regard to parental attitudes and acceptance of the HPV vaccine. It has an important advantage of being based on a nationwide sample, representative of the entire Swedish population of parents of children aged 12–15 years. The majority of studies on parental attitudes to-date have been relatively small, often concentrated to a limited geographical area and in general only have a maternal as opposed to both maternal and paternal focus.

In conclusion, this study indicates a reasonably high acceptance of HPV vaccination among parents in Sweden and cost did not appear to be a major barrier. The study also suggests that information on HPV, general vaccine safety and effectiveness are important to maintain and increase the acceptance of the HPV vaccine, something that might be critical for a successful implementation of the HPV vaccination program.

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