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RESEARCH PAPER

Trust and experience as predictors of HPV vaccine acceptance

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ABSTRACT

Background – Awareness of factors associated with uptake of new childhood vaccinations could help physicians to focus attention on those parents who are most likely to decline and ensure that they are fully informed before making a vaccination decision.

Aim - To examine the association between general vaccine attitudes, trust in doctors and the government, past experience with vaccination, and acceptance of HPV vaccination.

Design - School-based survey.

Setting - Questionnaires were sent through 10 schools in England.

Participants - Questionnaires were sent to 1205 mothers of 8-14 year old girls. Responses from 684 mothers were included in analyses.

Outcome measures - Intended acceptance of prophylactic HPV vaccination.

Results - Mothers who had high trust in doctors or the government were more likely to accept the vaccine (OR=1.35, CI: 1.22-1.50), as were those who believed their own doctor would take their vaccine concerns seriously (OR=1.70, CI: 1.23-2.36). Mothers who had delayed (OR=0.31, CI: 0.19-0.51), refused (OR=0.33, CI: 0.18-0.59), or regretted (OR=0.43, CI: 0.19-0.99) a previous paediatric vaccination were less likely to accept the HPV vaccine. The child having experienced adverse effects from a previous vaccination was not significantly associated with acceptance (OR=0.48, CI: 0.21-1.10).

Conclusions - Past experience and trust in doctors and government were associated with differential acceptance of a new vaccine. These results suggest that doctors should listen to parents' worries about vaccination, especially parents who have previously delayed or refused vaccines. It may also be beneficial for health information to emphasize the general importance of vaccination as an effective disease prevention strategy.

Running Header – HPV vaccine attitudes and past experience

INTRODUCTION

In 2002 an estimated 2.1million deaths globally were prevented by immunisation.¹ The potential for prophylactic and therapeutic vaccines is huge, and there have been steady advances in current vaccines and development of new ones.² One new vaccine with high efficacy, which has recently been licensed in the US and Europe, is Human Papillomavirus (HPV) vaccine. Infection with one of the high-risk HPV types is the necessary causal agent for cervical cancer, while low-risk HPV types can cause genital warts. The vaccine is recommended for girls aged 11-12 years in the US (CDC) and is already mandatory in one US state.

For vaccinations to be effective, high uptake is essential. The CDC Healthy Living Objective aims for sustained coverage of over 95% for all childhood vaccinations by 2010.³ In the UK in 2004/5, coverage of most childhood vaccines (diphtheria, tetanus, polio, pertussis, Haemophilus influenzae b, meningitis C) was around 94%, but MMR (Measles, mumps, and rubella vaccine) coverage was much lower (82%).⁴ Reductions in coverage with MMR are blamed on a scientific article suggesting it could increase risk of autism and Crohn's disease.⁵ The work was scientifically disputed, but high levels of media coverage raised parents' concern about the risks of the vaccine,⁶ and this view was echoed and promoted by 'celebrity parents'. Despite the fall in MMR uptake rates from 92% (in 1995/96) to 82% (in 2004/5), uptake of other scheduled vaccines has remained high, suggesting that parental attitudes towards MMR have not affected vaccination behaviour across the board. However, most of the other scheduled vaccinations are well established and the potential for vaccine safety concerns in relation to a novel vaccine is currently unknown. Qualitative work investigating parental attitudes to PnC7 (the recently

introduced pneumococcal conjugate vaccine) suggested that the MMR controversy had affected parental confidence in vaccination⁷ and a recent review identified the 'novelty factor' (worries about new vaccinations) as a possible reason for suboptimal paediatric vaccination uptake among British parents.⁸ An additional factor associated with declining vaccination is a lack of trust in doctors and the government⁹ and this factor appears to be particularly prominent among British parents who have refused the MMR for their child.⁶ Recent qualitative work identified trust in the physician as a predictor of vaccine acceptance,¹⁰ and an internet-based survey in Germany found that 95% of parents regard their physician as the most important source of information about vaccination.¹¹ Recommendation from a doctor is known to be associated with acceptance of HPV vaccination.^{12;13}

This study examines the association between general attitudes concerning the importance of vaccination and mistrust in advice on vaccination from doctors and governments, and mothers' intention to accept the new HPV vaccination for their daughter.

Previous studies assessing predictors of HPV vaccine acceptance have found that mothers whose children had received all their vaccinations in the past were more likely to be interested in vaccinating their child against HPV.^{13;14} One recent survey¹⁵ found that parents whose child had experienced an adverse effect were more concerned about the safety of vaccines, less likely to think that vaccines were valuable, and less likely to want a new baby to have all their immunisations. The children were also more likely to be missing one or more doses of three immunisations. In this study we consider the association between previous vaccine experience and intended acceptance of HPV vaccination.

MATERIALS AND METHODS

Participants

Participants were mothers with at least one daughter in school Years 4 to 9 (ages 8-14) because this includes the age group for which HPV vaccination is likely to be recommended. Participants were

recruited through 10 schools in different parts of England; inner-city (Lambeth, London), suburban (Guildford and Nottingham) and rural (Norfolk) areas. Convenience sampling was used to select the four locations and the largest secondary and two largest primary schools were selected from lists of all schools in these education authority areas. Only one primary school was selected in Nottingham, because the recruitment target was already reached.

Measures

Vaccine attitude items were adapted from those used in previous research assessing attitudes to MMR⁶ and HPV vaccination¹³. Items assessing trust in doctors and the government were from Casiday et al's study.⁶ All items are fully listed in table 2. Responses were on 4-point a scale (strongly disagree, disagree, agree, strongly agree).

Items assessing previous experience of vaccinating their children included; 'Have you ever chosen to delay one of the recommended vaccinations for any of your children', 'Have you ever chosen not to have one of the recommended vaccinations for any of your children', 'Have any of your children ever had a bad reaction to a vaccination' and 'Have you ever regretted a decision to have one of your children vaccinated.' Mothers were asked to respond 'yes' or 'no' to each of these questions.

Mothers were then asked to read a brief information sheet about HPV, including details of the link with cervical cancer and information on the vaccine and were asked 'If your daughter were invited to have the HPV vaccination, would you agree to her having it sometime soon'. Responses to this question were on a 5-point scale (definitely not, probably not, not sure, yes probably, yes definitely). Mothers who indicated 'yes probably' or 'yes definitely' were classed as being 'acceptors'. Those who indicated 'definitely not' or 'probably not', were classed as vaccine 'non-acceptors'.

Demographic variables, including mother's age, marital status, living arrangements, employment and educational qualifications and ethnicity, were recorded.

Procedure

Questionnaires were sent to mothers through participating schools in February 2006. In most cases they were posted directly to the parental home but in some schools this was not possible and they were sent home with the children. As an incentive, participants were offered entry into a prize draw with chances to win £500, £250 and £100. Second mailings to non-responders took place between March and June 2006. The study was approved by UCL Research Ethics Committee.

Analysis

Data were analysed using SPSS version 13.0. Individual attitude items were combined to create one scale assessing belief in 'importance of vaccinations' (5 items) and one assessing 'general trust in doctors and the government' (4 items); both scales showed adequate internal reliability (Cronbach's alpha = .76 and .66 respectively). A single item related to trust in the family doctor ('If I have any concerns about vaccinations they are taken seriously by my doctor') and this item was considered independently of the overall scale because of its practical significance. Casiday et al⁶ pointed out

Page 173 → contains **Table 2** only (see **p.14** of this document)

Page 174 → contains **Table 3** (see **p.15** of this document)

the importance of this distinction when they showed that although a large percentage of their sample did not trust doctors generally, most believed their own doctor would take their concerns seriously.

Three items related to 'concerns about vaccination', but because they showed relatively low internal consistency, (Cronbach's alpha = .52) as a scale, each item ('I am concerned about vaccine side effects', 'I am afraid of vaccines for my child' and 'There are too many vaccines in the schedule,') was considered separately in further analysis.

Analysis of variance was used to examine the association of the scales/items with demographic variables. Variables were entered individually into a Binary Logistic Regression to identify their value in predicting intention to accept HPV vaccination. A report on demographic, cultural and psychosocial predictors of intention to accept HPV vaccination variables in this sample is published elsewhere.¹⁶

RESULTS

1205 questionnaires were distributed and 684 questionnaires were returned giving a response rate of 56.8%. Seventy-five percent of mothers said they would 'probably' (48%) or 'definitely' (27%) accept the HPV vaccine for their daughter, 19% were unsure, and 6% said they probably or definitely would not.¹⁶

Importance of vaccination in general

Most parents were very supportive of vaccination as a health measure, with 96% agreeing that vaccinating children is a good way for parents to make a positive contribution to their child's health, and 94% believing it to be important for their child to receive all the recommended vaccinations. Most parents supported the concept of 'herd immunity', believing that more children should be vaccinated so that outbreaks do not occur (92%), that parents have a responsibility to vaccinate their child for the protection of all children (91%), and that people who don't have their children vaccinated put others at risk (78%). The addition of all these items provided us with an 'importance of vaccination' score for each respondent (mean = 16.39, SD=2.58). No demographic variables were associated with belief in the importance of vaccination. Respondents who had higher scores were more likely to accept HPV vaccination for their daughters (OR=1.29, CI=1.19-1.39, for each point on the scale).

Trust in doctors and the government

47% of respondents thought doctors are too dismissive of what parents claim about side effects and 56% thought the (UK) government was too defensive about the MMR vaccine, but most thought the

government would stop vaccinations if there was evidence of serious risk (78%). Most mothers also thought the government does a good job of 'protecting us from risks to our health' (78%). Combining these items provided us with a 'general trust in the doctors and government' score for each respondent (mean = 10.57, SD=1.83). No demographic variables were significantly associated with respondents' trust scores. Respondents with higher scores were more likely to intend to accept HPV vaccination for their daughter (OR=1.35, CI: 1.22-1.50, for each point on the trust scale). Despite believing that doctors in general are too dismissive about the MMR, most parents thought their own doctor would take their concerns about vaccination seriously (85%) and these mothers were more likely to be accepting of HPV vaccination (OR=1.70, CI: 1.23-2.36).

Vaccination concern

The majority of mothers were concerned about vaccine side effects (72%), 20% were afraid of vaccine for their children, and 22% believed that there are too many vaccinations in the childhood schedule. Mothers from more affluent backgrounds (who owned their own homes) were more afraid of vaccines for their children and more concerned about side effects than those in rented accommodation ($F(3)=3.02$, $p=.09$ and $F(3)=3.25$, $p=.022$ respectively). Controlling for demographic variables, mothers who were afraid of vaccines for their child or concerned about side effects were less likely to accept HPV vaccine for their daughter (OR= 0.49, CI: 0.38-0.63 and OR=0.57, CI: 0.43-0.77). Married mothers were more concerned about there being too many vaccinations in the current schedule ($F(4)=2.66$, $p=.032$). Controlling for marital status, concern about too many vaccines was associated with non-acceptance of the vaccine (OR=0.35, CI: 0.25-0.48).

Previous experience of vaccination

In this sample, 13% had delayed a vaccine, 8% had chosen not to have a vaccine and 8% reported their child having had a bad reaction following vaccination, but only 4% said they regretted having vaccinated a child. Mothers with more education were more likely to report having delayed ($\chi^2=11.88$, $p=.008$) or refused ($\chi^2=13.89$, $p=.003$) a vaccine in the past. They were also more likely to report

previous 'bad reactions' to vaccinations ($\chi^2=12.35$, $p=.006$). White mothers were more likely to have delayed a vaccination for their child in the past than those from black and minority ethnic groups ($\chi^2=11.02$, $p=.004$).

Mothers who reported having delayed (OR=0.31, CI: 0.19-0.51), refused (OR=0.33, CI: 0.18-0.59) or regretted (OR=0.43, CI: 0.19-0.99) a vaccination were less likely to accept HPV vaccination. Having a child who had reacted badly to a vaccine in the past showed a similar magnitude of effect, but it was not

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significantly associated with acceptance of the new HPV vaccine (OR=0.48, CI: 0.21-1.10).

DISCUSSION

Acceptance of HPV vaccination looks positive, with 75% of mothers in this survey saying they would probably or definitely give the vaccine to their daughter. A small number of mothers would not give their daughter the vaccine (6%) and a significant proportion said they were unsure (19%).

Understanding factors that predict non-acceptance of a new vaccine is important because it identifies areas that could be targeted in public health materials aimed at increasing informed uptake. This paper highlights the importance of general attitudes towards vaccines in predicting acceptance of a new vaccination, illustrating the need to educate parents about the general importance of vaccination and reassure them about vaccine safety. Respondents in this survey were less likely to be accepting of a new vaccination if they held negative attitudes about the government and doctors. This is consistent with a previous study⁶ that found lack of trust in the government associated with rejection of the MMR vaccine. These researchers emphasized the importance of MMR vaccine information

coming from sources independent of the government. The present study indicates this recommendation should also apply to information about other vaccinations.

More than 20 US states are considering making HPV vaccination a mandatory requirement for young girls.¹⁷ Most states (48) allow parents to opt out of vaccination on the basis of religious beliefs, and 19 of these also permit personal belief exemptions.¹⁸ As ethical issues behind compulsory vaccination become more prominent,¹⁹ it is important that doctors ensure parents are fully informed of the risks of the disease as well as the risks of the vaccination. One recent survey found that 95% of parents regard their physician as their most important source of information regarding vaccination¹¹ and our study shows that parents who believe their doctor takes their concerns seriously are more likely to be accepting a HPV vaccination. Doctors therefore play a vital role in parents' vaccine decision making.

Delaying, refusing or regretting having a vaccine in the past was, as predicted, associated with declining HPV vaccination, although previous experience of adverse effects following a vaccination was not significantly associated with uptake of the new HPV vaccine. Mothers who believed their vaccine concerns were taken seriously by their doctor were more likely to accept a new vaccination for their child, however research from the US suggests that some paediatricians dismiss families after they refuse vaccinations.²⁰ These results indicate that support and information in the period following vaccine delay may be vital in ensuring that parents do not refuse or delay other vaccinations they are offered. Providing tailored information that addresses the concerns of this group may be particularly useful.

Limitations

Schools were selected from a range of different areas around England, but the areas selected were chosen for convenience and the largest schools from each area were recruited into the study. The sample cannot therefore be assumed to be representative of the British population as a whole. In order to keep the sample homogenous, only mothers' attitudes to HPV vaccination were assessed and

therefore we cannot generalise the findings across all parents. Fathers' attitudes to vaccinating their daughters against HPV are likely to be an additional influence on vaccine decisions, and future work should examine paternal views.

Conclusion

These results illustrate the importance of parents' attitudes to vaccination in general, as well as previous vaccine experience, in the acceptance of a new vaccination. While vaccine concerns following the MMR controversy in the UK have had little effect on the uptake of well-established vaccines, they may lead to scepticism where new vaccines are concerned. It is important to ensure that parents get full information about vaccinations from trusted sources. Doctors should ensure that they show interest in parental concerns about vaccination, giving special attention to parents who have previously delayed or refused vaccines, because they are particularly at risk of refusing them again in the future.

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Table 1: Sample Characteristics

	Mean	SD
Respondent Age	41.1	4.9
Target daughter Age	11.1	1.8
	%	N
Employment status		
Employed (Full-time, Part-time, self-employed)	79.9	543
Unemployed	1.0	7
Full time homemaker	14.9	101
Other	3.1	21
Living situation		
Rent from local authority	10.3	69
Rent from private landlord	6.5	44
Own home (buying with a mortgage)	80.3	546
Other	2.1	14
Marital Status		
Married/cohabiting	80.8	549
Divorced/separated/widowed	11.09	81
Single	6.2	42
Education		
No formal qualifications/GCSE/O-levels	41.9	285
A levels	25.6	174
Degree level education	22.8	155
Other	8.2	56
Ethnic Background		

White	92.6	622
Non-white	6.3	42
Do not wish to answer	1.2	8

*Unaccounted percentage is missing data.

Table 2: General vaccine attitudes and acceptance of HPV vaccination

	Response % (n)	HPV Vaccine acceptance %	OR [95% CI]	P - value
Importance of vaccinations ($\alpha = .76$)			1.29 [1.19-1.39]	<.001
Vaccination is one way that parents can make a positive contribution to their children's health				
Agree	96.1 (648)	76.6		
Disagree	3.9 (26)	36.0		
More kids should be vaccinated against diseases so that outbreaks do not occur				
Agree	91.5 (606)	78.6		
Disagree	8.5 (56)	45.5		
I have a responsibility to have my children vaccinated for the protection of all children				
Agree	90.7 (610)	77.7		
Disagree	9.3 (63)	50.0		
People who don't have their kids vaccinated put others at risk				
Agree	77.8 (514)	79.2		
Disagree	22.3 (147)	61.0		
It is very important that my children receive all their vaccinations				
Agree	92.7 (626)	77.8		
Disagree	7.3 (49)	39.6		
General trust in doctors and government ($\alpha = .66$)			1.35 [1.22-1.50]	<.001
Doctors are too dismissive of what parents claim about vaccination*				
Agree	46.5 (299)	68.9		
Disagree	53.5 (344)	82.2		
The government is too defensive about MMR*				
Agree	56.1 (359)	72.5		
Disagree	43.9 (281)	80.0		
The government would stop vaccinations if there was evidence of a serious risk				
Agree	77.9 (511)	79.6		
Disagree	22.1 (145)	61.5		
The government does a good job of protecting us from risks to health				
Agree	78.1 (506)	78.9		
Disagree	23.8 (142)	61.7		
Trust in own doctor				
If I have any concerns about vaccinations they are taken seriously by my doctor			1.70 [1.23-2.36] ^a	<.01
Agree	84.8 (530)	78.4		
Disagree	15.2 (95)	58.1		
General vaccine concerns				
I am afraid of vaccinations for my children				
Agree	20.4 (137)	56.6	0.49 [0.42-2.96] ^a	<.001
Disagree	79.6 (534)	79.7		
I am concerned about vaccination side effects				
Agree	71.6 (476)	72.7	0.57 [0.43-0.77] ^a	<.001
Disagree	28.4 (363)	82.3		
There are too many vaccinations already included in the childhood vaccination schedule				
Agree	21.6 (142)	50.4	0.35 [0.25-0.48] ^b	<.001
Disagree	78.4 (515)	82.6		

* items are reversed for scale

^a controlling for living situation, ^b controlling for marital status,

Table 3: Previous vaccine experience and acceptance of HPV vaccination

	Response % (n)	Vaccine acceptance %	OR [95% CI]	P - value
Delayed a previous vaccination				
Yes	12.7 (85)	53.6	0.31 [0.19-0.51] ^c _d	<.001
No	87.3 (583)	78.1		
Refused a previous vaccination				
Yes	8.3 (56)	52.7	0.33 [0.18-0.59] ^c	<.001
No	91.7 (619)	76.7		
Had a bad reaction to a previous vaccination				
Yes	7.9 (53)	67.9	0.69 [0.37-1.27] ^c	.229
No	92.1 (620)	75.3		
Regret having given a previous vaccination				
Yes	3.7 (25)	60.0	0.48 [0.21-1.10]	.082
No	96.3 (650)	75.7		

^ccontrolling for education, ^dcontrolling for ethnicity